



**Rockwell  
International**

**instruction book**

*Volume I*

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**Collins AP-106/AP-107  
Flight Control Systems**

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*Volume I includes:*

|                            |                    |
|----------------------------|--------------------|
| <i>System Description</i>  | <i>523-0764803</i> |
| <i>System Installation</i> | <i>523-0764805</i> |
| <i>System Maintenance</i>  | <i>523-0764807</i> |
| <i>Unit Maintenance</i>    | <i>523-0764809</i> |

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*Volumes II and III contain unit repair information.*

*Information on the 972S-1/2/3 and 960M-2/3 is contained in the Collins Test Equipment for AP-106/AP-107 Instruction Book.*

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**Collins General Aviation Division  
Rockwell International Corporation  
Cedar Rapids, IA 52498**

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**Caution**

The material in this manual is subject to change. Before attempting any maintenance operation on the equipment covered in this manual, verify that you have complete and up-to-date publications by referring to the applicable Publications and Service Bulletin Indexes.

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We welcome your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, the paragraph or figure number, and the page number.

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**RECORD OF ADDENDUMS**

| SECTION                                                                                                                                                               | ED/REV | DATE      | ADDENDUM | DATE      | INSERTION<br>DATE/BY |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------|----------|-----------|----------------------|
| <b>AP-106/AP-107 Flight Control Systems Volume 1</b>                                                                                                                  |        |           |          |           |                      |
| <b>System Description</b>                                                                                                                                             | 5/0    | 27 Jun 84 | None     |           |                      |
| <b>System Installation</b>                                                                                                                                            | 5/0    | 27 Jun 84 | Add 2    | 14 Jan 00 |                      |
| <b>System Maintenance</b>                                                                                                                                             | 3/0    | 27 Jun 84 | Add 1    | 19 Aug 88 |                      |
| <b>Unit Maintenance</b>                                                                                                                                               | 1/0    | 27 Jun 84 | None     |           |                      |
| 913K-1/1A Computer Control                                                                                                                                            | 4/0    | 27 Jun 84 | None     |           |                      |
| 161H-1 Gain Programmer                                                                                                                                                | 4/0    | 27 Jun 84 | None     |           |                      |
| 614E-41/41A Pitch Turn<br>Control                                                                                                                                     | 4/0    | 27 Jun 84 | None     |           |                      |
| 334C-9/9A/11 Primary Servo                                                                                                                                            | 3/0    | 27 Jun 84 | None     |           |                      |
| 334D-6( ) Trim Servo                                                                                                                                                  | 3/0    | 27 Jun 84 | None     |           |                      |
| 590A-6/6A Altitude Control                                                                                                                                            | 4/0    | 27 Jun 84 | None     |           |                      |
| 590B-3 Indicated Airspeed<br>Sensor                                                                                                                                   | 3/0    | 27 Jun 84 | None     |           |                      |
| 329T-1 Turn and Slip Indicator                                                                                                                                        | 5/0    | 27 Jun 84 | None     |           |                      |
| 329A-3/3V/4/4V Horizon<br>Reference Indicator                                                                                                                         | 5/0    | 27 Jun 84 | None     |           |                      |
| 331P-1/1V Directional Gyro<br>Indicator                                                                                                                               | 4/0    | 27 Jun 84 | None     |           |                      |
| 323A-5 Flux Detector                                                                                                                                                  | 4/0    | 27 Jun 84 | None     |           |                      |
| 327C-3 Slaving Indicator                                                                                                                                              | 3/0    | 27 Jun 84 | None     |           |                      |
| NOTE: Addendum sheets should not be removed from a manual unless otherwise specified.<br>Addendum information will be incorporated in the next edition of the manual. |        |           |          |           |                      |

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Rockwell  
International

# Collins AP-106/AP-107 Flight Control System

description

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NOTICE: This section replaces fourth edition dated 1 March 1978.

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## Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.  
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
AND ENTER DATE INSERTED AND INITIALS.

| REV NO | REVISION DATE | INSERTION DATE/BY | SB NUMBER INCLUDED | REV NO | REVISION DATE | INSERTION DATE/BY | SB NUMBER INCLUDED |
|--------|---------------|-------------------|--------------------|--------|---------------|-------------------|--------------------|
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|        |               |                   |                    |        |               |                   |                    |
|        |               |                   |                    |        |               |                   |                    |
|        |               |                   |                    |        |               |                   |                    |

## description

### 1. GENERAL

The AP-106/AP-107 Flight Control System is a lightweight flight control system designed for light, twin-engine aircraft. Refer to figure 1.

The system features the building block concept to offer minimum to maximum system configuration by simple addition or removal of appropriate system units.

### 2. PURPOSE OF EQUIPMENT

The AP-106/AP-107 Flight Control System is a fully integrated autopilot/flight director/compass system that provides the pilot with the following:

- a. Heading mode
- b. Navigation mode (VOR or localizer)
- c. Approach mode with automatic glideslope capture and track
- d. Altitude hold mode
- e. Back course localizer mode
- f. Go-around mode
- g. Synchronized control wheel steering
- h. Indicated airspeed hold mode (AP-106)
- i. All angle adaptive capture for VOR, LOC, and LOC B/C (AP-106/FD-112C/V)

- j. Attitude display
- k. Heading display
- l. Radio (VOR/LOC/GS) displays
- m. Radio altimeter display (FD-112V)
- n. Computed steering display
- o. Mode selection indicators
- p. Trim indicators
- q. System integrity warning flags
- r. Automatic yaw damping (329T-1)
- s. Turn and slip indicator (329T-1)

### 3. EQUIPMENT SUPPLIED

Table 1 lists the type number, description with differences, and the Collins part number of the units that comprise the AP-106/AP-107 Flight Control System.

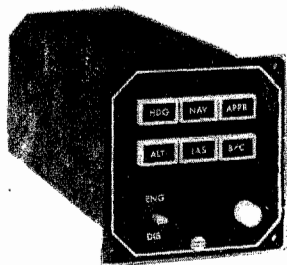
Table 2 lists all related publications for the AP-106/AP-107 Flight Control System.

### 4. SYSTEM SPECIFICATIONS

Table 3 lists the specifications for the AP-106/AP-107 Flight Control System, and table 4 lists the weight and power requirements for each unit in the system.

Table 1. System Components.

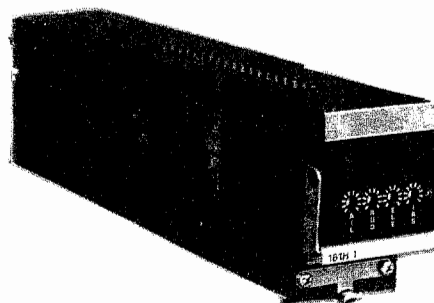
| TYPE NUMBER                    | DESCRIPTION                                | COLLINS PART NUMBER (CPN) |
|--------------------------------|--------------------------------------------|---------------------------|
| AP-106/AP-107 AUTOPILOT SYSTEM |                                            |                           |
| 913K-1                         | Basic computer/control                     | 622-0966-001              |
| 913K-1                         | Computer/control for Beech King Air 200    | 622-0966-002              |
| 913K-1A                        | Basic computer/control                     | 622-3202-001              |
| 913K-1A                        | Computer/control for Commander 690A/690B   | 622-3202-003              |
| 913K-1A                        | Computer/control for Aerostar 600/601/601P | 622-3202-004              |
| 913K-1A                        | Computer/control for Arava 102/201         | 622-3202-005              |



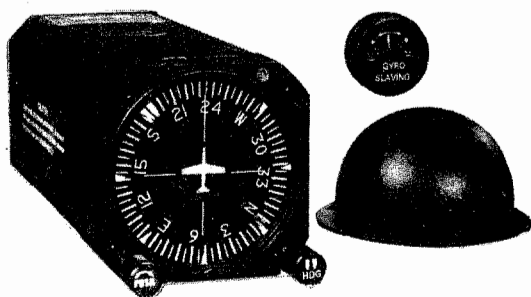
913K-1/1A  
COMPUTER/CONTROL



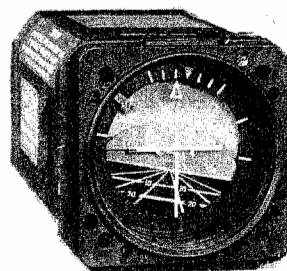
614E-41/41A  
PITCH/TURN CONTROL



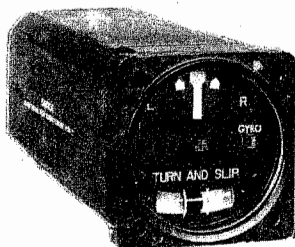
161H-1  
GAIN PROGRAMMER



MCS-107/107V  
MAGNETIC COMPASS SYSTEM



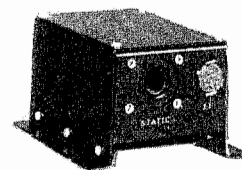
FD-106P/106PV  
FLIGHT DIRECTOR



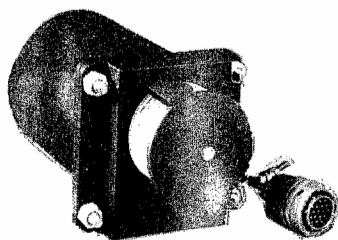
329T-1  
TURN AND SLIP INDICATOR



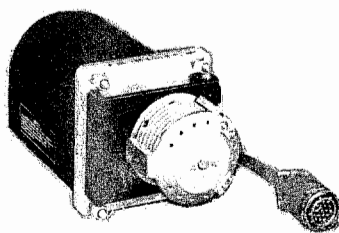
5908-3  
INDICATED  
AIRSPEED  
SENSOR



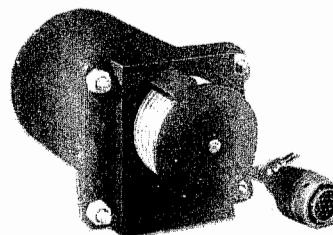
590A-6  
ALTITUDE  
CONTROLLER



334C-9  
PRIMARY SERVO



334C-9A/C-11  
PRIMARY SERVO



334D-6  
TRIM SERVO

TP4-4623-017

AP-106/AP-107 Flight Control System  
Figure 1

Table 1. System Components (Cont).

| TYPE NUMBER                           | DESCRIPTION                                                                                                                            | COLLINS PART NUMBER (CPN) |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| AP-106/AP-107 AUTOPILOT SYSTEM (Cont) |                                                                                                                                        |                           |
| 913K-1A                               | Computer/control for Nomad N-22/N-22B/N-22S                                                                                            | 622-3202-008              |
| 913K-1A                               | Computer/control for Nord 262A                                                                                                         | 622-3202-009              |
| 913K-1A                               | Computer/control for Beech T-44                                                                                                        | 622-3202-010              |
| 913K-1A                               | Computer/control for Commander 690C(840)/695(980)                                                                                      | 622-3202-013              |
| 913K-1A                               | Computer/control for Commander 690D/695A(1000)                                                                                         | 622-3202-014              |
| 913K-1A                               | Computer/control for Arava 202                                                                                                         | 622-3202-015              |
| 913K-1A                               | Computer/control for Merlin IV/Metro III                                                                                               | 622-3202-016              |
| 614E-42                               | Basic mode selector                                                                                                                    | 622-1523-001              |
| 614E-42                               | Mode selector for Beech King Air 200                                                                                                   | 622-1523-002              |
| 614E-42A                              | Basic mode selector                                                                                                                    | 622-3891-001              |
| 614E-42A                              | Mode selector for Beech King Air 200                                                                                                   | 622-3891-002              |
| 562C-13                               | Basic autopilot computer                                                                                                               | 622-1522-001              |
| 562C-13                               | Autopilot computer for Beech King Air 200                                                                                              | 622-1522-002              |
| 562C-13A                              | Basic autopilot computer                                                                                                               | 622-3595-001              |
| 562C-13A                              | Autopilot computer for Beech King Air 200                                                                                              | 622-3595-002              |
| 562C-13A                              | Autopilot computer for Beech King Air E90/C90, Beech T-44                                                                              | 622-3595-007              |
| 562C-13A                              | Autopilot computer for Commander 700                                                                                                   | 622-3595-011              |
| 562C-13A                              | Autopilot computer for Embraer EMB-110P1                                                                                               | 622-3595-012              |
| 913L-1                                | Mount for 562C-13/13A                                                                                                                  | 622-1665-001              |
| 913K-1A remote kit                    | Modification kit to convert 913K-1A into remote-mounted 562C-13A Autopilot Computer and 614E-42A Mode Selector (includes 991L-1 mount) | 622-0990-001              |
| 334C-9                                | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque                                                                       | 622-0964-001              |
| 334C-9                                | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque                                                                     | 622-0964-002              |
| 334C-9                                | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque with torque programming (25% step)                                    | 622-0964-003              |
| 334C-9                                | Primary servo, 5-65- to 20.34-N·m (50- to 180-lb·in) output torque with torque programming (25% step)                                  | 622-0964-004              |
| 334C-9A                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque                                                                       | 622-2366-001              |

Table 1. System Components (Cont).

| TYPE NUMBER                           | DESCRIPTION                                                                                                                    | COLLINS PART NUMBER (CPN) |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| AP-106/AP-107 AUTOPILOT SYSTEM (Cont) |                                                                                                                                |                           |
| 334C-9A                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque                                                             | 622-2366-002              |
| 334C-9A                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque with adjustable step torque programming                       | 622-2366-003              |
| 334C-9A                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque with adjustable step torque programming                     | 622-2366-004              |
| 334C-9A                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque for 3/32-in cable                                             | 622-2366-007              |
| 334C-9A                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque for 3/32-in cable                                           | 622-2366-008              |
| 334C-9A                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque with adjustable step torque programming for 3/32-in cable     | 622-2366-009              |
| 334C-9A                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque with adjustable step torque programming for 3/32-in cable   | 622-2366-010              |
| 334C-11                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque and rate limiting                                             | 622-2733-001              |
| 334C-11                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque and rate limiting                                           | 622-2733-002              |
| 334C-11                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque with adjustable step torque programming and rate limiting     | 622-2733-003              |
| 334C-11                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque with adjustable step torque programming and rate limiting   | 622-2733-004              |
| 334C-11                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque for 3/32-in cable                                             | 622-2733-005              |
| 334C-11                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque for 3/32-in cable and rate limiting                         | 622-2733-006              |
| 334C-11                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque with adjustable step torque programming for 3/32-inch cable   | 622-2733-007              |
| 334C-11                               | Primary servo, 5.65- to 20.34-N·m (50- to 180-lb·in) output torque with adjustable step torque programming for 3/32-inch cable | 622-2733-008              |
| 334C-11                               | Primary servo, 2.26- to 8.48-N·m (20- to 75-lb·in) output torque and rate limiting                                             | 622-2733-009              |
| 334D-6                                | Trim servo, capstan drive, high speed                                                                                          | 622-0965-001              |

Table 1. System Components (Cont).

| TYPE NUMBER                           | DESCRIPTION                                                      | COLLINS PART NUMBER (CPN)     |
|---------------------------------------|------------------------------------------------------------------|-------------------------------|
| AP-106/AP-107 AUTOPILOT SYSTEM (Cont) |                                                                  |                               |
| 334D-6                                | Trim servo, pulley drive, high speed                             | 622-0965-002                  |
| 334D-6                                | Trim servo, capstan drive, low speed                             | 622-0965-003                  |
| 334D-6                                | Trim servo, pulley drive, low speed                              | 622-0965-004                  |
| 334D-6                                | Trim servo, pulley drive for shielded cable, high speed          | 622-0965-005                  |
| 334D-6                                | Trim servo, pulley drive for shielded cable, low speed           | 622-0965-006                  |
| 334D-6                                | Trim servo, pulley drive, high speed                             | 622-0965-008                  |
| 334D-6                                | Trim servo, pulley drive, low speed                              | 622-0965-009                  |
| 334D-6A                               | Trim servo, flange drive, high speed                             | 622-3260-001                  |
| 334D-6A                               | Trim servo, flange drive, low speed                              | 622-3260-002                  |
| 334D-6B                               | Trim servo, sprocket drive, high speed                           | 622-5026-001                  |
| 334D-6B                               | Trim servo, sprocket drive, low speed                            | 622-5026-002                  |
| 334D-6C                               | Trim servo, spline drive, high speed                             | 622-5082-001                  |
| 334D-6C                               | Trim servo, spline drive, low speed                              | 622-5082-002                  |
| 590A-6                                | Altitude control                                                 | 229-9015-010                  |
| 590A-6A                               | Altitude control                                                 | 270-0859-010                  |
| 614E-41/41A                           | Pitch/turn control (square mounting flange)                      | 622-1210-001/<br>622-3246-001 |
| 614E-41/41A                           | Pitch/turn control (round mounting)                              | 622-1210-002/<br>622-3246-002 |
| 329T-1                                | Turn and salip indicator (28-V dc panel lighting)                | 270-2424-010                  |
| 329T-1                                | Turn and salip indicator (5-V panel lighting)                    | 270-2424-020                  |
|                                       | Annunciator unit, AP-106                                         | 629-0053-001                  |
|                                       | Annunciator unit, AP-107                                         | 629-0054-001                  |
| 454N-2                                | Rate/level sensor                                                | 622-2297-001                  |
| 454N-2                                | Rate/level sensor                                                | 622-2297-002                  |
| 454N-2D                               | Rate/level sensor for pitch axis of Commander 690C(840)/695(980) | 622-5375-001                  |
| 454N-2D                               | Rate/level sensor for roll axis of Commander 690C(840)/695(980)  | 622-5375-002                  |
| 454N-2D                               | Rate/level sensor for pitch axis of Embraer EMB-110P1            | 622-5375-003                  |
| 454N-2D                               | Rate/level sensor for pitch axis of Piper Cheyenne III           | 622-5375-004                  |
| 454N-3                                | Trim servo monitor                                               | 622-2814-004                  |
| 699K-2                                | Trim adapter                                                     | 622-1816-001                  |

Table 1. System Components (Cont).

| TYPE NUMBER                           | DESCRIPTION                                                                                              | COLLINS PART NUMBER (CPN)    |
|---------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------|
| AP-106/AP-107 AUTOPILOT SYSTEM (Cont) |                                                                                                          |                              |
| 991X-1                                | Universal card holder, low 1 card (one 454N-2)                                                           | 622-2745-001                 |
| 991X-1                                | Universal card holder, high 1 card                                                                       | 622-2745-002                 |
| 991X-1                                | Universal card holder, low 2 card (two 454N-2's)                                                         | 622-2745-003                 |
| 991X-1                                | Universal card holder, 1 high card and 1 low card                                                        | 622-2745-004                 |
| 991X-1                                | Universal card holder, metal card (454N-3)                                                               | 622-2745-005                 |
| 998E-1                                | Annunciator adapter                                                                                      | 622-4217-001                 |
| AP-106 AUTOPILOT SYSTEM               |                                                                                                          |                              |
| 161H-1                                | Gain programmer                                                                                          | 622-1036-001                 |
| 590B-3                                | Indicator airspeed sensor                                                                                | 229-9016-010                 |
| 390R-18                               | Mounting kit for 161H-1<br>Connector kit for 161H-1                                                      | 622-1194-001<br>618-5793-001 |
| FD-112C/V FLIGHT DIRECTORS            |                                                                                                          |                              |
| FD-112C                               | Flight director indicator, with crosspoint command bars                                                  | 622-0757-001                 |
| FD-112V                               | Flight director indicator with "V" command bars                                                          | 622-1352-001                 |
| 332D-11A/11T                          | Vertical reference                                                                                       | 792-6694-001/622-4565-001    |
| 332D-12/12A                           | Vertical gyro                                                                                            | 622-1377-001/622-3329-001    |
| 959A-1                                | Gyro transformer                                                                                         | 629-0055-001                 |
| FD-106P/PV FLIGHT DIRECTORS           |                                                                                                          |                              |
| 329A-3                                | Horizon reference indicator, with electric VG, without command bars                                      | 270-2426-010                 |
| 329A-3                                | Horizon reference indicator, with electric VG, without command bars, for 8-degree forward sloping panels | 270-2426-050                 |
| 329A-3V                               | Horizon reference indicator, with vacuum VG, without command bars                                        | 270-2426-020                 |
| 329A-3V                               | Horizon reference indicator, with vacuum VG, without command bars, for 8-degree forward sloping panels   | 270-2426-060                 |
| 329A-4                                | Horizon reference indicator, with electric VG and command bars                                           | 270-2426-030                 |
| 329A-4                                | Horizon reference indicator, with electric VG and command bars, for 8-degree forward sloping panels      | 270-2426-070                 |



Table 1. System Components (Cont).

| TYPE NUMBER                                  | DESCRIPTION                                                                                       | COLLINS PART NUMBER (CPN)      |
|----------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------|
| FD-106P/PV FLIGHT DIRECTORS (Cont)           |                                                                                                   |                                |
| 329A-4V                                      | Horizon reference indicator, with vacuum VG and command bars                                      | 270-2426-040                   |
| 329A-4V                                      | Horizon reference indicator, with vacuum VG and command bars, for 8-degree forward sloping panels | 270-2426-080                   |
| PN-101 PICTORIAL NAVIGATION (COMPASS) SYSTEM |                                                                                                   |                                |
| 328A-3G                                      | Slaving amplifier                                                                                 | 522-2644-000<br>(522-2644-011) |
| 390R-5                                       | Shockmount for 328A-3G                                                                            | 522-2930-003                   |
| 332E-4                                       | Directional gyro                                                                                  | 522-3241-000                   |
| 350X-1                                       | Shockmount for 332E-4                                                                             | 522-0240-003                   |
| 323A-2G                                      | Flux detector                                                                                     | 522-4945-001                   |
| 323A-3G-1                                    | Flux detector compensator                                                                         | 792-6134-001                   |
|                                              | Fast slaving switch kit for 328A-3G                                                               | 549-4800-000                   |
| MCS-107/107V MAGNETIC COMPASS SYSTEM         |                                                                                                   |                                |
| 331P-1                                       | Directional gyro indicator with electric drive                                                    | 270-2425-010                   |
| 331P-1V                                      | Directional gyro indicator with vacuum drive                                                      | 270-2425-020                   |
| 323A-5                                       | Flux detector                                                                                     | 270-2425-030                   |
| 327C-3                                       | Slaving indicator                                                                                 | 270-2425-040                   |

*Table 2. Related Publications.*

| PUBLICATION                                                                        | COLLINS PART NUMBER (CPN) |
|------------------------------------------------------------------------------------|---------------------------|
| AP-106   FD-112C/V   PN-101 Low Profile Flight Control System Pilot's Guide        | 523-0765014               |
| AP-107   FD-106P/PV   MCS-107/107V Low Profile Flight Control System Pilot's Guide | 523-0765015               |
| AP-107   FD-112C/V   PN-101 Low Profile Flight Control System Pilot's Guide        | 523-0765891               |
| FD-112C Flight Director Indicator Overhaul Manual                                  | 523-0764419               |
| FD-112V Flight Director Indicator Instruction Book                                 | 523-0764978               |
| 332D-11( ) Vertical Reference Overhaul Manual                                      | 523-0757989               |
| 332D-12/12A Vertical Gyro Instruction Book                                         | 523-0764848               |
| 334C-9/9A/11 Primary Servo/334D-6( ) Trim Servo Instruction Book                   | 523-0767823               |
| PN-101 Pictorial Navigation System Instruction Book                                | 523-0755824               |
| 329T-1 Turn and Slip Indicator Instruction Book                                    | 523-0769938               |
| MCS-107/107V Magnetic Compass System Instruction Book                              | 523-0769866               |
| 590A-6/6A Altitude Control Instruction Book                                        | 523-0773323               |

*Table 3. System Specifications.*

| CHARACTERISTIC          | SPECIFICATION                                                     |
|-------------------------|-------------------------------------------------------------------|
| Related documents       |                                                                   |
| FAA TSO                 | -C52a, -C9c, -C3b, -C6c, -C4c, -C5c                               |
| Weight                  | See table 4                                                       |
| Electrical              |                                                                   |
| Power requirements      | See table 4                                                       |
| Autopilot pitch limits  | ±15 degrees                                                       |
| Autopilot roll limits   | ±25 degrees                                                       |
| VOR/LOC intercept angle |                                                                   |
| AP-106                  | All angle adaptive capture                                        |
| AP-107                  | 45 degrees with 913K-1/562C-13<br>All angle with 913K-1A/562C-13A |

Table 4. System Weight and Power.

| SYSTEM COMPONENTS                                                                              | WEIGHT<br>kg (lb) | 28-V DC<br>POWER<br>MAX (NOM) | 26-V AC<br>POWER<br>MAX | MISCELLANEOUS<br>POWER<br>MAX (NOM) | PANEL<br>LIGHTING<br>POWER                |
|------------------------------------------------------------------------------------------------|-------------------|-------------------------------|-------------------------|-------------------------------------|-------------------------------------------|
| AP-106 AUTOPILOT SYSTEM                                                                        |                   |                               |                         |                                     |                                           |
| 913K-1 Computer/Control<br>(622-0966-001)                                                      | 1.36 (3.0)        | 1.8 A (1.0 A)                 | 0.1 VA                  |                                     | 75 mA (28 V dc)                           |
| 913K-1A Computer/Control<br>(622-3202-XXX)                                                     | 1.18 (2.6)        | 1.5 A (0.8 A)                 | 0.1 VA                  |                                     | 75 mA (28 V dc)                           |
| 913K-1 Computer/Control<br>(622-0966-002)                                                      | 1.36 (3.0)        | 1.8 A (1.0 A)                 | 0.1 VA                  |                                     | 700 mA (5 V dc)                           |
| 913K-1A Computer/Control<br>(622-3202-002)                                                     | 1.18 (2.6)        | 1.5 A (0.8 A)                 | 0.1 VA                  |                                     | 700 mA (5 V dc)                           |
| 562C-13/13A Autopilot<br>Computer                                                              | 1.04 (2.3)        | 1.8 A/1.5 A<br>(1.0 A/0.8 A)  | 0.1 VA                  |                                     |                                           |
| *614E-42/42A Mode Selector                                                                     | 0.32 (0.7)        |                               |                         |                                     |                                           |
| 991L-1 Mount (for 562C-13/<br>13A)                                                             | 0.16 (0.35)       |                               |                         |                                     |                                           |
| 334C-9/9A/11 Primary Servo                                                                     | 1.68 (3.7)        | 2.4 A (1.4 A)                 | 3 VA                    |                                     |                                           |
| 329T-1 Turn and Slip Indicator<br>(270-2424-010)                                               | 1.04 (2.3)        | 1.0 A (0.8 A)                 | 3 VA                    |                                     | 50 mA (28 V dc)                           |
| 329T-1 Turn and Slip Indicator<br>(270-2424-020)                                               | 1.04 (2.3)        | 1.0 A (0.8 A)                 | 3 VA                    |                                     | 115 mA (5 V dc)                           |
| 334D-6 Trim Servo                                                                              | 1.68 (3.7)        | 1.5 A (1.0 A)                 |                         |                                     |                                           |
| *590A-6/6A Altitude Control                                                                    | 0.36 (0.8)        |                               |                         |                                     |                                           |
| *614E-41/41A Pitch/Turn<br>Control                                                             | 0.14 (0.3)        |                               |                         |                                     |                                           |
| 161H-1 Gain Programmer                                                                         | 1.00 (2.3)        | 0.5 A                         | 0.3 VA                  |                                     |                                           |
| *590B-3 Airspeed Sensor                                                                        | 0.23 (0.5)        |                               |                         |                                     |                                           |
| Annunciator Unit, AP-106                                                                       | 0.23 (0.5)        | 0.5 A (0.2 A)                 |                         |                                     |                                           |
| 454N-2 Rate/Level Sensor                                                                       | 0.14 (0.3)        | 125 mA (25<br>mA)             | 0.7 VA                  |                                     |                                           |
| 454N-3 Trim Servo Monitor                                                                      | 0.18 (0.4)        | 430 mA (30<br>mA)             |                         |                                     |                                           |
| 991X-1 Universal Card<br>Carrier                                                               | 0.15 (0.33)       |                               |                         |                                     |                                           |
| 390R-18 Mount                                                                                  | 0.18 (0.4)        |                               |                         |                                     |                                           |
| 3-axis AP-106 system total<br>(includes three primary<br>servos without 454N-2/3<br>or 991X-1) | 11.08 (24.4)      | 12.5 A (7.7 A)                | 12.4                    |                                     | 125 mA (28 V dc)<br>or<br>815 mA (5 V dc) |
| *Power provided by 913K-1/1A, 562C-13/13A, or 161H-1.                                          |                   |                               |                         |                                     |                                           |

Table 4. System Weight and Power (Cont).

| SYSTEM COMPONENTS                                                | WEIGHT<br>kg (lb) | 28-V DC<br>POWER<br>MAX (NOM) | 26-V AC<br>POWER<br>MAX | MISCELLANEOUS<br>POWER<br>MAX (NOM)      | PANEL<br>LIGHTING<br>POWER                |
|------------------------------------------------------------------|-------------------|-------------------------------|-------------------------|------------------------------------------|-------------------------------------------|
| AP-107 AUTOPILOT SYSTEM                                          |                   |                               |                         |                                          |                                           |
| 913K-1 Computer/Control<br>(622-0966-001)                        | 1.36 (3.0)        | 1.8 A (1.0 A)                 | 0.1 VA                  |                                          | 75 mA (28 V dc)                           |
| 913K-1A Computer/Control<br>(622-3202-XXX)                       | 1.18 (2.6)        | 1.5 A (0.1 A)                 | 0.1 VA                  |                                          | 75 mA (28 V dc)                           |
| 913K-1 Computer/Control<br>(622-0966-002)                        | 1.36 (3.0)        | 1.8 A (1.0 A)                 | 0.1 VA                  |                                          | 700 mA (5 V dc)                           |
| 913K-1A Computer/Control<br>(622-3202-002)                       | 1.18 (2.6)        | 1.5 A (0.8 A)                 | 0.1 VA                  |                                          | 700 mA (5 V dc)                           |
| 562C-13/13A Autopilot<br>Computer                                | 1.04 (2.3)        | 1.8 A/1.5 A<br>(1.0 A/0.8 A)  | 0.1 VA                  |                                          |                                           |
| *614E-42/42A Mode Selector                                       | 0.32 (0.7)        |                               |                         |                                          |                                           |
| 991L-1 Mount (for 562C-13/<br>13A)                               | 0.16 (0.35)       |                               |                         |                                          |                                           |
| 334C-9/9A/11 Primary Servo                                       | 1.68 (3.7)        | 2.4 A (1.4 A)                 | 3 VA                    |                                          |                                           |
| 329T-1 Turn and Slip Indicator<br>(270-2424-010)                 | 1.04 (2.3)        | 1.0 A (0.8 A)                 | 3 VA                    |                                          | 50 mA (28 V dc)                           |
| 329T-1 Turn and Slip Indicator<br>(270-2424-020)                 | 1.04 (2.3)        | 1.0 A (0.8 A)                 | 3 VA                    |                                          | 115 mA (5 V dc)                           |
| 334D-6 Trim Servo                                                | 1.68 (3.7)        | 1.5 A (1.0 A)                 |                         |                                          |                                           |
| *590A-6/6A Altitude Control                                      | 0.36 (0.8)        |                               |                         |                                          |                                           |
| *614E-41/41A Pitch/Turn<br>Control                               | 0.14 (0.3)        |                               |                         |                                          |                                           |
| Annunciator unit, AP-107                                         | 0.20 (0.4)        | 0.4 A (0.2 A)                 |                         |                                          |                                           |
| 3-axis AP-107 system total<br>(includes three primary<br>servos) | 9.64 (21.2)       | 11.9 (7.2 A)                  | 12.1 VA                 |                                          | 125 mA (28 V dc)<br>or<br>815 mA (5 V dc) |
| FD-112C/V FLIGHT DIRECTORS                                       |                   |                               |                         |                                          |                                           |
| FD-112C Flight Director                                          | 3.36 (7.4)        | 0.85 A                        | 11 VA                   |                                          |                                           |
| FD-112V Flight Director                                          | 3.68 (8.1)        | 0.85 A                        | 11 VA                   |                                          |                                           |
| 332D-11( ) Vertical Gyro                                         | 3.08 (6.8)        |                               |                         | 60 VA start,<br>35 VA run at<br>115 V ac |                                           |
| Total FD-112C plus 332D-11( )                                    | 6.44 (14.2)       | 0.85 A                        | 11 VA                   | 60 VA start,<br>35 VA run at<br>115 V ac |                                           |
| Total FD-112V plus 332D-11( )                                    | 6.76 (14.9)       | 0.85 A                        | 11 VA                   | 60 VA start,<br>35 VA run at<br>115 V ac |                                           |
| *Power provided by 913K-1/1A, 562C-13/13A.                       |                   |                               |                         |                                          |                                           |

Table 4. System Weight and Power (Cont).

| SYSTEM COMPONENTS                                                  | WEIGHT<br>kg (lb) | 28-V DC<br>POWER<br>MAX (NOM) | 26-V AC<br>POWER<br>MAX | MISCELLANEOUS<br>POWER<br>MAX (NOM) | PANEL<br>LIGHTING<br>POWER |
|--------------------------------------------------------------------|-------------------|-------------------------------|-------------------------|-------------------------------------|----------------------------|
| FD-106P/PV FLIGHT DIRECTORS                                        |                   |                               |                         |                                     |                            |
| 329A-3 Horizon Reference Indicator, electric, without command bars | 1.32 (2.9)        |                               | 300 mA                  | 17 VA (14 VA)<br>(115 V ac)         | 50 mA (28 V dc)            |
| 329A-3V Horizon Reference Indicator, vacuum without command bars   | 1.00 (2.2)        |                               | 300 mA                  | 2.1 CFM vacuum<br>(4.5 to 5.2 inHg) | 50 mA (28 V dc)            |
| 329A-4 Horizon Reference Indicator, electric, with command bars    | 2.32 (5.1)        |                               | 300 mA                  | 17 VA (14 VA)<br>(115 V ac)         | 50 mA (28 V dc)            |
| 329A-4V Horizon Reference Indicator, vacuum, with command bars     | 2.00 (4.4)        |                               | 300 mA                  | 2.1 CFM vacuum<br>(4.5 to 5.2 inHg) | 50 mA (28 V dc)            |
| PN-101 COMPASS SYSTEM                                              |                   |                               |                         |                                     |                            |
| 328A-3G Slaving Amplifier                                          | 1.60 (3.5)        | 2.6 A (1.8 A)                 |                         |                                     |                            |
| 390R-5 Mount                                                       | 0.28 (0.6)        |                               |                         |                                     |                            |
| 323A-2G Flux Detector                                              | 0.69 (1.5)        |                               |                         |                                     |                            |
| 323A-3G-1 Compensator                                              | 0.12 (0.25)       |                               |                         |                                     |                            |
| 332E-4 Directional Gyro                                            | 2.04 (4.5)        |                               |                         |                                     |                            |
| 350X-1 Mount                                                       | 0.23 (0.5)        |                               |                         |                                     |                            |
| Total System                                                       | 4.96 (10.85)      | 2.6 A (1.8 A)                 |                         |                                     |                            |
| MCS-107 MAGNETIC COMPASS SYSTEM                                    |                   |                               |                         |                                     |                            |
| 331P-1 Directional Gyro Indicator, electric drive                  | 2.0 (4.4)         | 0.1 A                         | 8 VA                    | 16 VA (13 VA)                       | 50 mA (28 V dc)            |
| 323A-5 Flux Detector                                               | 0.46 (1)          |                               |                         |                                     |                            |
| 327C-3 Slaving Indicator                                           | 0.23 (0.5)        |                               |                         |                                     |                            |
| Total                                                              | 2.69 (5.9)        | 0.1 A                         | 8 VA                    | 16 VA (13 VA)                       |                            |
| MCS-107V MAGNETIC COMPASS SYSTEM                                   |                   |                               |                         |                                     |                            |
| 331P-1V Directional Gyro Indicator, vacuum drive                   | 2.0 (4.4)         | 0.1 A                         | 8 VA                    | 2.1 CFM vacuum<br>(4.5 to 5.2 inHg) | 50 mA (28 V dc)            |
| 323A-5 Flux Detector                                               | 0.46 (1)          |                               |                         |                                     |                            |
| 327C-3 Slaving Indicator                                           | 0.23 (0.5)        |                               |                         |                                     |                            |
| Total                                                              | 2.69 (5.9)        | 0.1 A                         | 8 VA                    | 2.1 CFM vacuum<br>(4.5 to 5.2 inHg) |                            |

## 5. PRINCIPLES OF OPERATION

### 5.1 AP-106 Flight Control System

Figure 2 is a functional block diagram of a maximum configuration AP-106 Flight Control System using the AP-106 Autopilot, FD-112C/V Flight Director Indicator, and the PN-101 Compass System. The following paragraphs describe the operation of each component in the system.

#### 5.1.1 Flight Director System

##### 5.1.1.1 FD-112C/V Flight Director Indicators

The FD-112C and FD-112V consist of three sections: the attitude indicator, the course indicator, and fault monitor and display. The major difference between the FD-112C and FD-112V is that the FD-112C uses separate pitch and roll command bars while the FD-112V uses a single V-command bar.

The attitude indicator (figure 3) receives 3-wire pitch and roll data from the vertical gyro. This data is applied to servo loops within the indicator that position the pitch and roll attitude displays. The roll and pitch steering signals from the autopilot are also applied to the attitude indicator to position the pitch and roll command bars.

The course indicator (figure 4) receives 3-wire heading data from the flux detector and magnetic heading data from the slaving accessory. This data is applied to a servo loop that positions the compass card display and provides a slaving signal for the slaving accessory. Course and heading data, input through the course and heading controls, is sent to the computer/control and is also displayed on the course indicator.

The fault monitor and display section monitors the directional gyro, vertical reference gyro, navigation receiver, glideslope receiver and the computer/control, and provides fault flags to indicate improper operation.

**Caution**

The AP-106/AP-107 Flight Control System has a very high degree of functional integrity. Nevertheless, the user must recognize that it is not practical to provide monitoring for all conceivable system failures and,

however unlikely, it is possible that erroneous operation could occur without a fault indication. It is the responsibility of the pilot to detect such an occurrence by means of cross-checks with redundant or correlated information available in the cockpit.

##### 5.1.1.2 332D-11( )/12( ) Vertical Reference

The 332D-11( )/12( ) senses the pitch and roll attitude of the aircraft and provides this data to the FD-112C/V, 913K-1/1A, and 329T-1.

#### 5.1.2 PN-101 Pictorial Navigation System

##### 5.1.2.1 332E-4 Directional Gyro

The 332E-4 senses any change in the aircraft direction within the horizontal plane and provides this data to the slaving accessory in the compass system. This directional data is the dynamic or short-term portion of the magnetic heading.

##### 5.1.2.2 323A-2G/323A-3G-1 Flux Detector and Compensator

The 323A-2G senses the direction of the earth's magnetic field and supplies this heading data to the slaving synchro in the flight director. The output of the slaving synchro is returned to the slaving accessory. The 323A-3G-1 compensates for any irregularities in the earth's magnetic field caused by electrical wiring or the airframe.

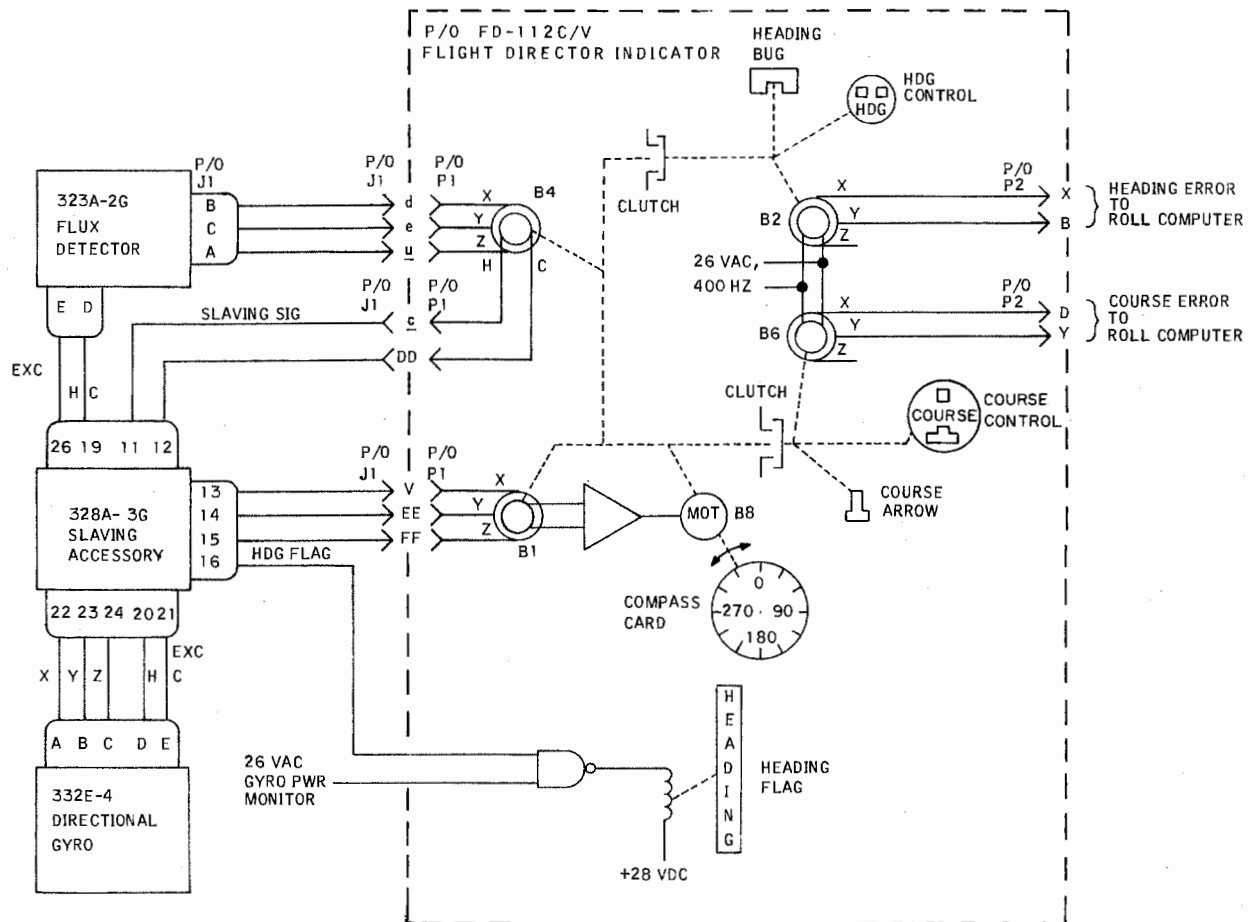
##### 5.1.2.3 328A-3G Slaving Accessory

The 328A-3G combines directional data from the gyro with the slaving signal and removes any directional error between the two. This corrected magnetic heading data is applied to the flight director to drive the synchro motor that positions the compass card and heading synchros.

#### 5.1.3 AP-106 Autopilot System

##### 5.1.3.1 913K-1/1A Computer/Control (562C-13/13A and 614E-42/42A)

The 913K-1/1A (or 562C-13/13A and 614E-42/42A) consists of four sections: The pitch computer, roll computer, trim controller, and the mode selection logic.



TP3-6434-013

Course Indicator and Compass System, Functional Block Diagram  
Figure 4

The mode logic and annunciator drive section provides the additional logic required for the IAS hold mode and the remote annunciator circuits.

#### 5.1.3.3 329T-1 Turn and Slip Indicator

The 329T-1 senses yaw axis acceleration and generates a yaw damping command signal that is applied to the rudder servo through the rudder programmer in the 161H-1. The 329T-1 also provides a visual indication of the yaw rate and slip.

#### 5.1.3.4 614E-41/41A Pitch/Turn Control

The 614E-41/41A is a manual control for entry of pitch and roll commands into the autopilot system by the pilot.

#### 5.1.3.5 590A-6/6A Altitude Control

The 590A-6/6A senses any change in altitude of the aircraft and provides the altitude and IAS programmer with an altitude error signal during the altitude hold mode.

#### **5.1.3.6 590B-2 Airspeed Sensor**

The 590B-3 provides the indicated airspeed data required for IAS gain programming and the IAS hold mode.

#### **5.1.3.7 334C-9/9A/11 Primary Servo**

The 334C-9/9A/11 servos position the aircraft control surfaces in response to commands received through the gain programmer from the computer/control and the turn and slip indicator.

#### **5.1.3.8 334D-6( ) Trim Servo**

The 334D-6( ) positions the aircraft trim surfaces in response to commands from the trim controller or the pilot. The 334D-6( ) also provides a +28-V dc trim in motion signal to operate a visual or aural annunciator.

### **5.2 AP-107 Flight Control System**

Figure 5 is a functional block diagram of a maximum configuration AP-107 Flight Control System using the AP-107 Autopilot, FD-106P/PV Flight Director, and MCS-107/107V Magnetic Compass System. The following paragraphs describe the operation of each component in the system.

#### **5.2.1 FD-106P/PV Flight Directors**

The FD-106P is a panel-mounted horizon indicator with an integral vertical gyro with electric drive. The FD-106PV is identical to the FD-106P except that the vertical gyro is vacuum driven. The flight directors provide a visual indication of the aircraft's pitch and roll attitude with respect to an artificial horizon. They also provide pitch and roll data to the computer/control, and roll data to the turn and slip indicator. Optional pitch and roll steering command bars are available to provide a visual indication of the autopilot pitch and roll command signals. Warning flags are provided to indicate failure of the electrically driven gyro and failure of the computer/control.

#### **5.2.2 MCS-107/107V Magnetic Compass System**

##### **5.2.2.1 323A-5 Flux Detector**

The 323A-5 senses the direction of the earth's magnetic field and supplies this heading data to

the slaving circuit in the directional gyro indicator.

##### **5.2.2.2 331P-1/1V Directional Gyro Indicator**

The 331P-1 is a panel-mounted directional gyro with a visual compass indicator and electrically driven gyro. The 331P-1V is the same as the 331P-1 except that the gyro is vacuum driven. Both directional gyro indicators consist of three sections: the directional gyro, slaving circuit, and the compass and heading indicator.

The directional gyro senses any change in the aircraft direction within the horizontal plane and provides this data to the slaving circuit. This data is the dynamic or short-term portion of the magnetic heading.

The slaving circuit combines the directional data from the gyro with the heading data from the flux detector and removes any directional error between the two. This corrected magnetic heading data is used to position the compass card in the indicator section. The corrected magnetic heading is also combined with desired heading data entered by the pilot through the heading control to provide heading data for the computer/control.

##### **5.2.2.3 327C-3 Slaving Indicator**

The 327C-3 provides a visual indication of the direction and amount the directional gyro is being slaved.

#### **5.2.3 AP-107 Autopilot System**

Operation of the AP-107 Autopilot System is the same as that described for the AP-106 (paragraph 5.1.3) except that the input/output signals of the 913K-1/1A Computer/Control or 562C-13/13A Autopilot Computer are not programmed by the 161H-1 Gain Programmer and the IAS hold mode of operation is not available.

### **6. CONTROLS AND INDICATORS**

Figures 6 through 12 illustrate the controls and indicators for the equipment used in the AP-106/AP-107 Flight Control System.



**ATT WARNING FLAG**  
IN VIEW WHEN AN ERRONEOUS VERTICAL GYRO INPUT, A POWER FAILURE, OR AN ATTITUDE INDICATOR SERVO FAILURE OCCURS.

**ROLL ATTITUDE SCALE**  
MOVABLE SCALE INDICATES AIRCRAFT ROLL ATTITUDE IN DEGREES WITH RESPECT TO 0° INDEX.

**TEST SWITCH**  
CHECKS ATTITUDE AND COMPASS DISPLAYS. DISPLACES ATTITUDE DISPLAY ADDITIONAL 10° PITCH UP AND ROLL RIGHT. COMPASS CARD ROTATES 10° COUNTERCLOCKWISE. ATT AND HEADING FLAGS APPEAR.

**GLIDESLOPE DEVIATION POINTER**  
INDICATES GLIDESLOPE BEAM CENTER WITH RESPECT TO AIRCRAFT LOCATION.

**GS WARNING FLAG**  
COVERS GLIDESLOPE DEVIATION POINTER WHEN GLIDESLOPE RECEIVER OUTPUT IS INVALID.

**LUBBER LINE**  
FIXED REFERENCE MARK FOR COMPASS CARD. REPRESENTS NOSE OF AIRCRAFT.

**HEADING WARNING FLAG**  
IN VIEW WHEN AN ERRONEOUS DIRECTIONAL GYRO INPUT, A POWER FAILURE, OR A COMPASS CARD SERVO FAILURE OCCURS.

**HEADING BUS**  
INDICATES SELECTED HEADING.

**COURSE ARROW**  
INDICATES SELECTED VOR RADIAL OR LOCALIZER COURSE.

**HDG SELECT CONTROL**  
POSITIONS HEADING BUG ON COMPASS CARD.

**TO-FROM POINTER**  
INDICATES FLIGHT ON SELECTED VOR RADIAL IS EITHER TO OR FROM THE VOR TRANSMITTER.

**SYMBOLIC AIRCRAFT**  
FIXED SYMBOL, INDICATES RELATIVE POSITION OF AIRCRAFT WITH RESPECT TO COURSE AND HEADING DISPLAYS.

**INCLINOMETER**  
INDICATES LATERAL ACCELERATION (SIDE SLIP)

**ROLL ATTITUDE 0° INDEX**  
FIXED MARKER INDICATES ROLL ATTITUDE 0° REFERENCE.

**PITCH ATTITUDE TAPE**  
INDICATES AIRCRAFT PITCH ATTITUDE IN DEGREES WITH RESPECT TO AIRCRAFT SYMBOL.

**COMPUTER WARNING FLAG**  
IN VIEW WHEN FLIGHT COMPUTER OUTPUT IS INVALID.

**V COMMAND BARS**  
INDICATES AMOUNT AND DIRECTION OF PITCH AND ROLL COMMANDS BY RELATIONSHIP OF BARS TO AIRCRAFT SYMBOL.

**RADIO ALTITUDE POINTER**  
INDICATES AIRCRAFT ALTITUDE WITH RESPECT TO RUNWAY.

**ARTIFICIAL HORIZON**  
INDICATES AIRCRAFT ATTITUDE WITH RESPECT TO AIRCRAFT SYMBOL.

**RAD ALT WARNING FLAG**  
IN VIEW WHEN RADIO ALTIMETER OUTPUT IS INVALID.

**AIRCRAFT SYMBOL**  
FIXED BAR SYMBOLIZES AIRCRAFT WINGS.

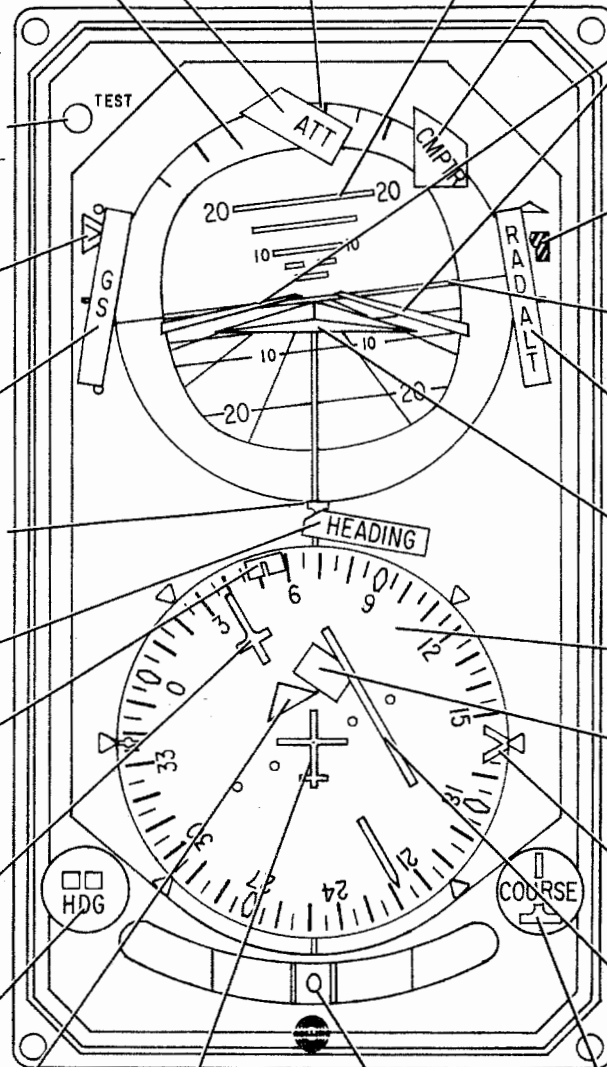
**COMPASS CARD**  
INDICATES AIRCRAFT MAGNETIC HEADING.

**NAV WARNING FLAG**  
IN VIEW WHEN NAVIGATIONAL RECEIVER OUTPUT IS INVALID.

**BEARING POINTER**  
INDICATES AIRCRAFT BEARING WITH RESPECT TO SELECTED NAVIGATIONAL AID (VOR OR ADF RECEIVER)

**LATERAL DEVIATION BAR**  
INDICATES CENTER OF SELECTED VOR RADIAL OR LOCALIZER BEAM WITH RESPECT TO AIRCRAFT LOCATION.

**COURSE SELECT CONTROL**  
POSITIONS COURSE ARROW ON COMPASS CARD.



TP3-5562-019

FD-112V Flight Director Indicator, Controls and Indicators  
Figure 7

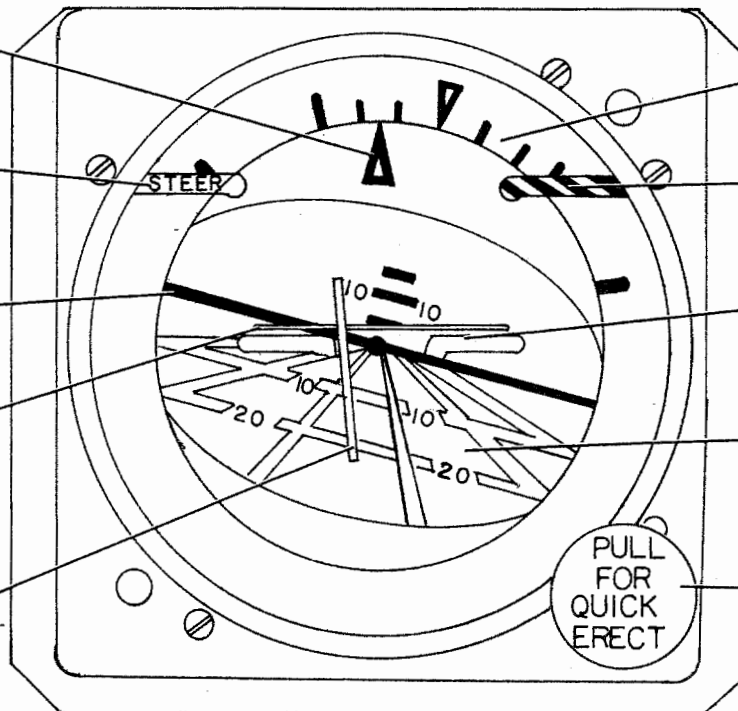
ROLL ATTITUDE 0° INDEX  
FIXED MARKER  
INDICATES ROLL  
ATTITUDE 0°  
REFERENCE.

STEERING WARNING FLAG  
IN VIEW WHEN  
COMPUTER/CONTROL  
OUTPUT IS INVALID.  
(329A-4/4V ONLY).

ARTIFICIAL HORIZON  
INDICATES AIRCRAFT  
ATTITUDE WITH  
RESPECT TO AIR-  
CRAFT SYMBOL.

PITCH COMMAND BAR  
INDICATES AMOUNT  
AND DIRECTION OF  
PITCH COMMAND BY  
RELATIONSHIP OF  
BAR TO AIRCRAFT  
SYMBOL.

ROLL COMMAND BAR  
INDICATES AMOUNT AND  
DIRECTION OF ROLL  
COMMAND BY RELATION-  
SHIP OF BAR TO AIR-  
CRAFT SYMBOL.



ROLL ATTITUDE SCALE  
MOVABLE SCALE  
INDICATES AIRCRAFT  
ROLL ATTITUDE IN  
DEGREES WITH RESPECT  
TO 0° INDEX.

GYRO WARNING FLAG  
IN VIEW WHEN POWER  
IS NOT APPLIED TO  
THE VERTICAL GYRO.  
(329A-3/4 ONLY).

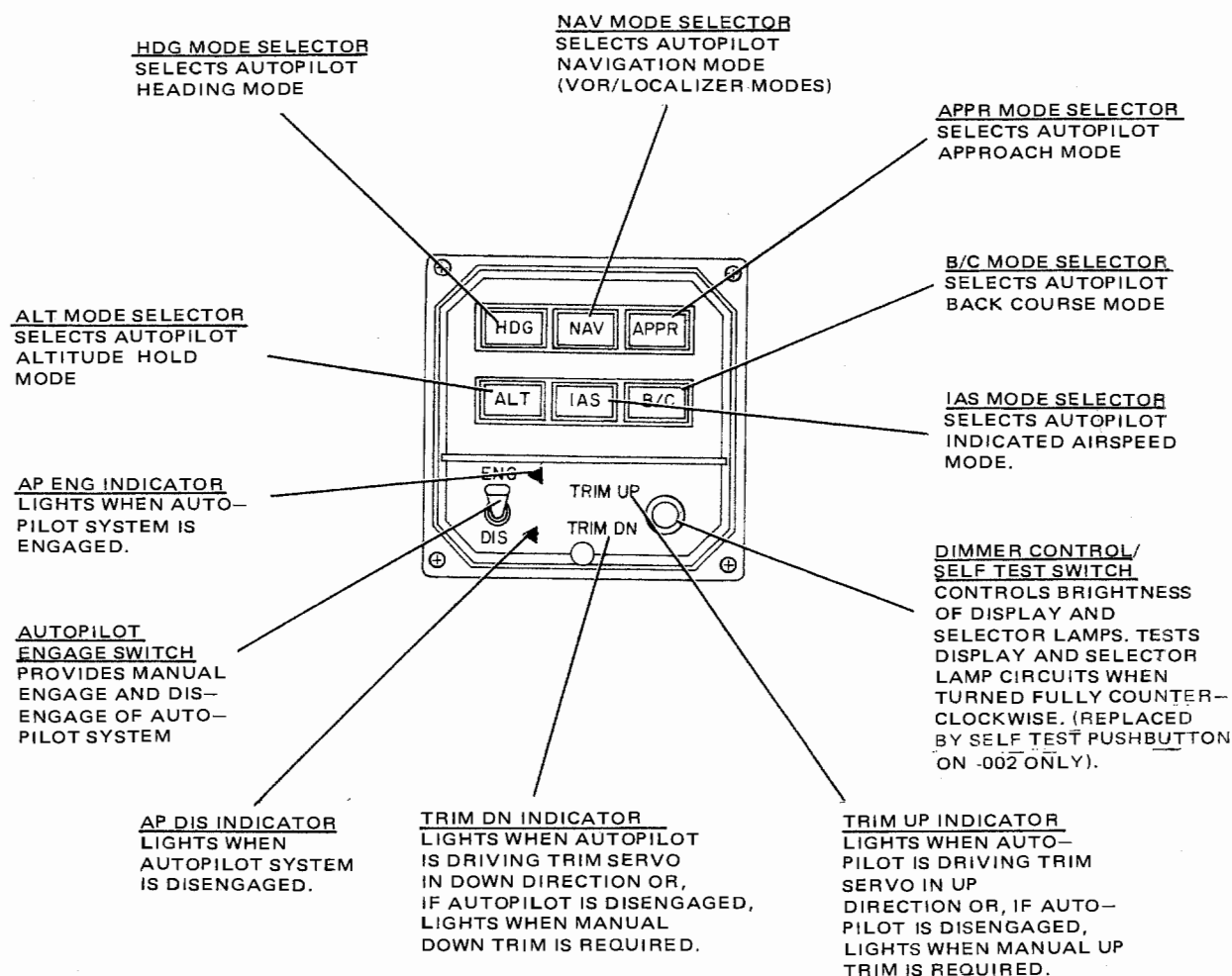
AIRCRAFT SYMBOL  
FIXED BAR  
SYMBOLIZES AIRCRAFT  
WINGS.

PITCH ATTITUDE  
TAPE  
INDICATES AIR-  
CRAFT PITCH  
ATTITUDE IN  
DEGREES WITH  
RESPECT TO AIR-  
CRAFT SYMBOL.

QUICK ERECT  
KNOB  
SPRING LOADED  
CONTROL FOR  
QUICK MANUAL  
ERECTION OF  
VERTICAL GYRO  
(329A-3/4 ONLY).

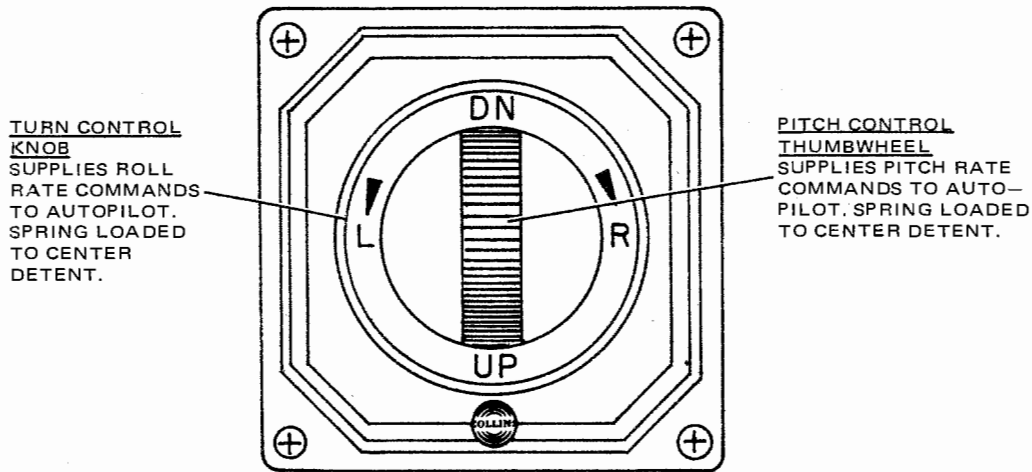
TP3-5791-019

FD-106P/PV Flight Directors, Controls and Indicators  
Figure 8



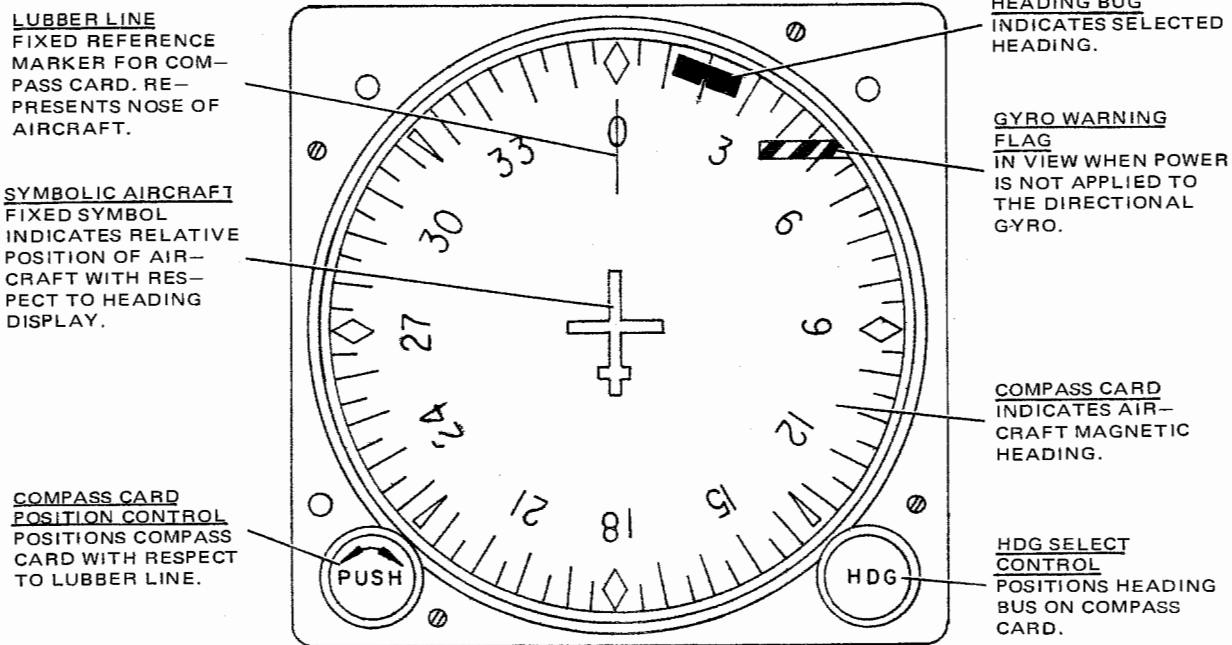
TP3-5623-019

913K-1/1A Computer/Control and 614E-42/42A Mode Selector, Controls and Indicators  
Figure 9



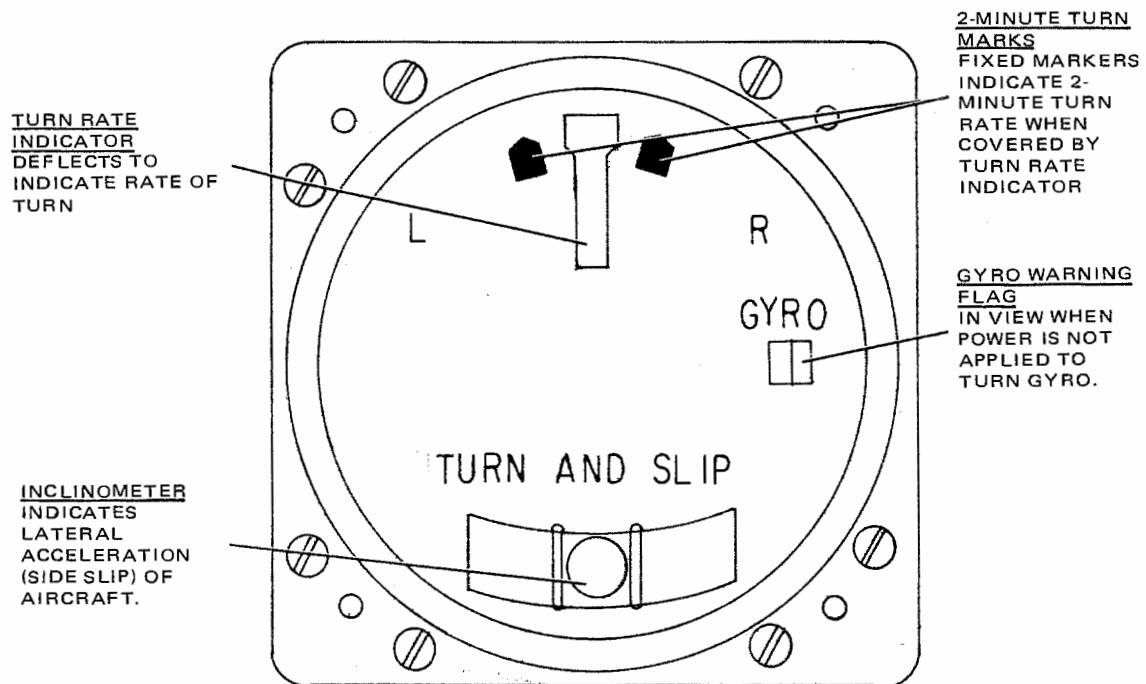
TP3-5545-019

614E-41/41A Pitch/Turn Control, Controls and Indicators  
Figure 10



TP3-5790-019

331P-1/1V Directional Gyro Indicator, Controls and Indicators  
Figure 11



TP3-5792-019

329T-1 Turn and Slip Indicator, Controls and Indicators  
Figure 12



# Collins AP-106/AP-107 Flight Control System



Rockwell  
International

installation

Collins General Aviation Division

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# installation

## 1. GENERAL

This installation section provides procedures for installing the various units of the Low Profile Flight Control System. Detailed system interconnect diagrams are provided to illustrate the wiring required for several of the many possible system configurations. Outline and mounting diagrams are provided for all units in the system. Panel mockup cutout illustrations are provided for each panel mounted unit to facilitate panel layout.

### **Note**

The information and instructions provided in this section are Rockwell-Collins recommendations and do not necessarily correspond with any actual aircraft installation and wiring. This section cannot be used in place of a supplemental type certificate (STC) or type certificate (TC).

## 2. UNPACKING PROCEDURE

Unpack the equipment carefully and inspect each unit for possible shipping damage. If damage exists, promptly file a claim with the transportation company and save all shipping containers and packing materials as proof of shipping damage. Check the equipment received against the packing list to ensure that all the equipment has been received.

## 3. SYSTEM CABLING

The aircraft wiring harness should be prepared in accordance with the interconnect wiring diagrams, figures 3 through 16, listed below:

| FIGURE NO | SYSTEM INTERCONNECT                                |
|-----------|----------------------------------------------------|
| 3         | AP-106, FD-112C/V, and PN-101 3-axis system        |
| 4         | AP-107, FD-106P/PV, and MCS-107/107V 3-axis system |

| FIGURE NO | SYSTEM INTERCONNECT                                                                           |
|-----------|-----------------------------------------------------------------------------------------------|
| 5         | AP-106, FD-106P/PV, and PN-101 3-axis system                                                  |
| 6         | AP-107, FD-106P/PV, and MCS-107/107V 2-axis system                                            |
| 7         | AP-106, FD-106P/PV, and MCS-107/107V 3-axis system with bootstrapped 331A-3G Course Indicator |
| 8         | AP-106, FD-108X, and PN-101 3-axis system                                                     |
| 9         | AP-107, FD-112C/V, and PN-101 3-axis system                                                   |
| 10        | AP-107, FD-106P/PV, MCS-107/107V, VIR-351, GLS-350, and IND-351C 2-axis system                |
| 11        | AP-107, FD-106P/PV, MCS-107/107V, VIR-351, GLS-350, and IND-351C 3-axis system                |
| 11A       | AP-106, FIS-84, and PN-101 3-axis system                                                      |
| 12        | 454N-3 and AP-106/107 system                                                                  |
| 13        | 454N-2 and AP-106/107 system                                                                  |
| 13A       | 454N-2D and AP-106/107 system                                                                 |
| 14        | Yaw damper system                                                                             |
| 15        | Elevator trim system                                                                          |
| 16        | AP-106/107 annunciator unit                                                                   |
| 16A       | 562C-13/13A and 614E-42/42A remote installation                                               |

Equipment connectors and mating connectors are listed in table 1 and on the outline and mounting diagrams for each unit, figures 17 through 46. Observe the following precautions during preparation of the wiring harness:

- Bond and shield all parts of the aircraft electrical system, such as generator and ignition system.
- Keep the wiring harness away from aircraft wiring carrying heavy current, pulsed data, and other interference sources.

Table 1. Equipment Mating Connectors.

| EQUIPMENT TYPE                          | MATING CONNECTOR |                                                                                           |                                                                                                   |
|-----------------------------------------|------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|                                         | REF DES          | MFG TYPE NO                                                                               | COLLINS PART NO                                                                                   |
| FD-112C                                 | J1               | PT06A-22-55S(SR)                                                                          | 371-6225-000                                                                                      |
|                                         | J2               | PT06A-20-41S(SR)                                                                          | 371-6200-000                                                                                      |
| FD-112V                                 | J1               | PT06A-22-55S(SR)                                                                          | 371-6625-000                                                                                      |
|                                         | J2               | PT06A-20-41S(SR)                                                                          | 371-6200-000                                                                                      |
| 161H-1                                  | J1               |                                                                                           | 618-5793-001                                                                                      |
| 323A-2G                                 |                  |                                                                                           | Screw terminal                                                                                    |
| 323A-5                                  | J1               | Amphenol 126-223                                                                          | 372-2186-000                                                                                      |
| 327C-3                                  |                  |                                                                                           | Solder lugs                                                                                       |
| 328A-3G                                 | J1               | DPA-32-33S-3                                                                              | 370-2072-000                                                                                      |
| 329A-3                                  | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
| 329A-3V                                 | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
| 329A-4                                  | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
|                                         | J2               | Amphenol 126-196                                                                          | *372-1536-000                                                                                     |
| 329A-4V                                 | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
|                                         | J2               | Amphenol 126-196                                                                          | *372-1536-000                                                                                     |
| 329T-1                                  | J1               | Amphenol 57-30240                                                                         | 372-2155-000                                                                                      |
| 331H-3G                                 | J1               | PT06A-22-55S(SR)                                                                          | 371-6225-000                                                                                      |
| 331P-1                                  | J1               | Amphenol 165-10                                                                           | 371-1064-000                                                                                      |
|                                         | J2               | Amphenol 126-223                                                                          | 372-2186-000                                                                                      |
|                                         | J3               | Amphenol 165-34                                                                           | 371-0377-010                                                                                      |
| 331P-1V                                 | J1               | Amphenol 165-10                                                                           | 371-1064-000                                                                                      |
|                                         | J2               | Amphenol 126-223                                                                          | 372-2186-000                                                                                      |
| 332D-11/11A                             |                  | MS3116E-18-32S                                                                            | 371-2242-000                                                                                      |
| 332D-12/12A                             | J1               | PT06A-12-10S(SR)                                                                          | 371-6411-000                                                                                      |
| 332E-4                                  | J1               | MS3106A-20-33S                                                                            | 357-5290-010                                                                                      |
| 334C-9/9A/11                            | J1               | PT01A-14-19S(SR)                                                                          | 371-2536-000                                                                                      |
| 334D-6                                  | J1               | PT01A-14-19S(SR)                                                                          | 371-2536-000                                                                                      |
| 390R-18 (See 161H-1)                    |                  |                                                                                           |                                                                                                   |
| 590A-6                                  | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
| 590B-3                                  | J1               | PT06A-8-4S(SR)                                                                            | 371-6234-000                                                                                      |
| 614E-41/41A                             | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
| 913K-1                                  | J1               | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
|                                         | J2               | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
| 913K-1A                                 | J1               | Amphenol 57-30361-396                                                                     | 372-2280-010                                                                                      |
|                                         | J2               | Amphenol 57-30362-396                                                                     | 372-2280-020                                                                                      |
| 562C-13                                 | J1               | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
|                                         | J2               | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
|                                         | J13              | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
| 562C-13A                                | J1               | Amphenol 57-30361-396                                                                     | 372-2280-010                                                                                      |
|                                         | J2               | Amphenol 57-30362-396                                                                     | 372-2280-020                                                                                      |
|                                         | J13              | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
| 614E-42/42A                             | J13              | Amphenol 57-30360-396                                                                     | 372-2156-000                                                                                      |
| Annunciator units<br>(AP-106 or AP-107) | J1               | Cannon DAC-15S-FO, with (2)<br>D110278, (1) DC20961 and (15)<br>D110238-5 or 030-1935-000 | 371-0922-020, with (2) 371-0040-070, (1)<br>371-0184-000 and (15) 371-0946-060 or<br>371-0946-040 |
| 959A-1                                  | J1               | Amphenol 126-222                                                                          | 372-2186-010 or *372-1539-000                                                                     |
| 998E-1                                  | J1               | Positronics MD37-F20-J-VL                                                                 |                                                                                                   |
| 699K-2                                  | P1               | MS3102R32-13S                                                                             | 357-3679-260                                                                                      |

Table 1. Equipment Mating Connectors (Cont).

| EQUIPMENT TYPE                                                         | MATING CONNECTOR |                                                                               |                                                                          |
|------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|
|                                                                        | REF DES          | MFG TYPE NO                                                                   | COLLINS PART NO                                                          |
| 454N-2                                                                 | P1               | Cannon DBM-25S with (2) D20-419-16, and (1) Cannon DB24-659 or Cinch DB20-962 | 371-0221-000 with (2) 371-0040-010, and (1) 371-0146-000 or 371-0185-000 |
| 454N-2D                                                                | P1               | Cannon DCM-37S with (2) D20-419-16, and (1) Cannon DC24-660 or Cinch DC20-963 | 371-0222-000 with (2) 371-0040-010, and (1) 371-0147-000 or 371-0186-000 |
| 454N-3                                                                 | J1               | Cannon DDM-50S with (2) D20-420-12, and (1) Cannon DD24-661 or Cinch DD20-964 | 371-0181-000 with (2) 371-0040-040, and (1) 371-0148-000 or 371-0187-000 |
| *Must also use shell, Collins part no 372-1115-000 (Amphenol 126-834). |                  |                                                                               |                                                                          |

- c. Avoid excessive cable lengths, but allow sufficient length for equipment removal.
- d. Use #24 AWG wire, thermosplastic insulated, unless otherwise specified on the interconnect diagrams.
- e. Read all notes on the interconnect diagrams before installing the wiring harness.
- f. After installation of the wiring harness, verify its integrity with continuity and ground checks.
- g. Before installation of any equipment, close the aircraft circuit breakers and verify power is available only on the proper pins. Refer to figures 3 through 16.
- h. Use of a +28-Vdc converter is permissible provided the negative output terminal of the converter is connected directly to the power ground bus in the aircraft.

#### 4. INSTALLATION AND REMOVAL PROCEDURES

##### 4.1 FD-112C/V Flight Director Indicator

###### 4.1.1 Location

The FD-112C/V contains the attitude and course indicators for the system and should be mounted on the flight instrument panel where it is close to and slightly below the pilot's line of vision. The unit must be easily accessible to the pilot.

The FD-112C/V can be mounted from either the front or rear of the flight instrument panel and is secured by four 8-32 screws, one in each corner. Refer to figures 17 and 18 for the FD-112C and FD-112V out-

line and mounting dimensions and to figure 47 for a mockup panel cutout illustration.

###### 4.1.2 Installation

- a. Prepare the flight instrument panel for mounting the FD-112C/V in accordance with the panel cutout detail shown in figure 17 or 18.
- b. Connect the system interconnect cables to the two electrical connectors on the rear of the FD-112C/V.
- c. Slide the FD-112C/V into the instrument panel from the rear and secure with four 8-32 screws, one in each corner.

###### 4.1.3 Removal

- a. Remove the four screws, one in each corner, that secure the FD-112C/V to the instrument panel.
- b. Slide the FD-112C/V out of the instrument panel from the front or rear.
- c. Disconnect the interconnecting cable.

##### 4.2 FD-106P/PV Flight Director

###### 4.2.1 Location

The FD-106P/PV contains the attitude indicator for the system and should be mounted on the flight instrument panel where it is close to and slightly below the pilot's line of vision.

The FD-106P/PV is mounted from the rear of the flight instrument panel and is secured by four (329A-

3/3V) or three (329A-4/4V) 6-32 screws, one in each corner. Refer to figures 19, 20, 21, and 22 for the outline and mounting dimensions of the 329A-3/3V and 329A-4/4V respectively. Figure 48 is a mockup panel cutout illustration for the 329A-3/3V/4/4V.

#### 4.2.2 Installation

- Prepare the flight instrument panel for mounting in accordance with the panel cutout detail shown on figure 19, 20, 21, or 22.
- Connect the interconnect cables to the electrical connectors on the rear of the unit (one connector on the 329A-3/3V or two connectors on the 329A-4/4V).
- Connect the panel lighting wires with quick-connect terminals.
- On vacuum-powered units, connect the inlet and outlet vacuum lines to the 1/4-18 ANPT connectors on the rear of the unit.
- Slide the unit into the flight instrument panel from the rear and secure with three or four 6-32 screws, as required, in each corner.

#### 4.2.3 Removal

- Remove the three or four screws, one in each corner, that secure the unit to the flight instrument panel.
- Slide the unit out of the instrument panel from the rear.
- Disconnect the interconnect cables and panel lighting wires (and vacuum lines if vacuum powered).

### 4.3 913K-1/1A Computer/Control

#### 4.3.1 Location

The 913K-1/1A contains the operating controls and indicators for the system and should be mounted on the flight instrument panel in clear view and easily accessible by both the pilot and copilot. Refer to figures 23 and 49 for outline and mounting dimensions and mockup panel cutout illustrations for the 913K-1/1A. The unit can be mounted from the front or rear of the panel. Refer to figures 24 and 25 for outline and mounting dimensions of the remote mounted 913K-1/1A (614E-42/42A and 562C-13/13A).

#### 4.3.2 Strapping Options

The strapping options provided in the 913K-1/1A Computer/Control are listed in table 2. These options

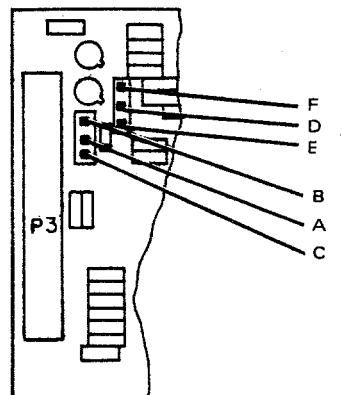
are selected internal to the 913K-1/1A and must be installed prior to installing the 913K-1/1A in the aircraft. The options required for a particular aircraft installation are determined by the other equipment used in the installation; however, these strapping options do not affect the system interconnect wiring data provided in figures 3 through 16.

Table 2. 913K-1/1A Strapping Options.

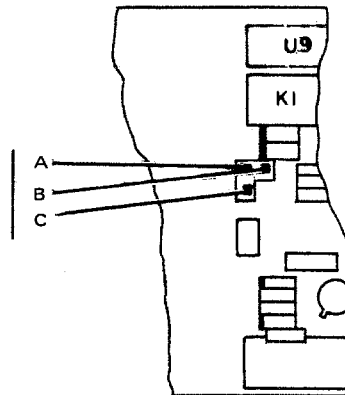
| STRAPPING OPTION                                           | STRAPPING PINS   | CIRCUIT CARD |
|------------------------------------------------------------|------------------|--------------|
| Ac middle marker signal                                    | A to B           | A1           |
| Dc middle marker signal                                    | A to C           | A1           |
| With IAS switch (AP-106)                                   | D to E           | A1           |
| Without IAS switch (AP-107)                                | D to F           | A1           |
| Positive logic localizer frequency signal                  | A to C           | A3           |
| Negative logic localizer frequency signal                  | A to B           | A3           |
| MONITOR DISENGAGE =<br>COMP MON + RADIO<br>MON (K-1 SB 12) | A to B           | A2 (K-1A)    |
| MONITOR DISENGAGE<br>COMP MON                              | A to C           | A2 (K-1A)    |
| NO NAV FLAG                                                | D to E           | A3 (K-1A)    |
| EXT NAV FLAG<br>(K-1 SB 12)                                | D to F           | A3 (K-1A)    |
| Long trim delay<br>(K-1 SB 3)                              | A to B<br>D to E | A4 (K-1A)    |
| Short trim delay                                           | B to C<br>E to F | A4 (K-1A)    |
| 4.7°/second roll<br>command knob rate<br>(K-1 SB 4)        | H to J           | A4 (K-1A)    |
| 10.3°/second roll<br>command knob rate                     | H to G           | A4 (K-1A)    |
| EXT NAV CAPT                                               | A to B           | A5 (K-1A)    |
| ALL ANGLE NAV<br>CAPT                                      | B to C           | A5 (K-1A)    |
| GA from APPR/BC                                            | D to E           | A5 (K-1A)    |
| GA from any LAT mode<br>(K-1 SB 16)                        | E to F           | A5 (K-1A)    |

Use the following procedure to select the desired strapping options in the 913K-1/1A.

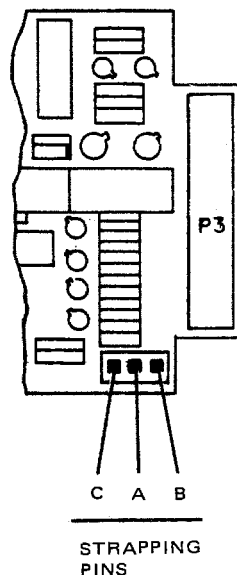
- Remove the dust cover from the 913K-1/1A.
- Remove rear interconnect circuit card A10 from the circuit card assembly.
- Remove the desired circuit card from the circuit card assembly.
- Refer to figure 1 for 913K-1 or figure 2 for 913K-1A and install the desired strapping options on the circuit card by connecting the appropriate strapping pins with strapping connectors, Collins part number 367-1508-010.
- Replace the circuit card in the circuit card assembly.
- Repeat steps c through e until all circuit cards are properly strapped.
- Replace rear interconnect circuit card A10.
- Replace dust cover.



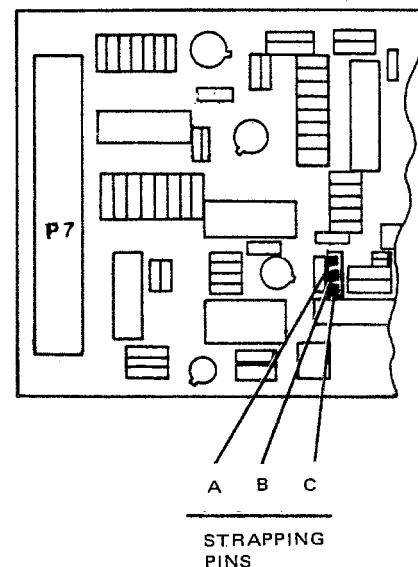
913K-1 CIRCUIT CARD A1



913K-1 CIRCUIT CARD A3



161H-1 CIRCUIT CARD A4



161H-1 CIRCUIT CARD A5

TP4-0499-019

913K-1 and 161H-1 Strapping Pin Location Diagram  
Figure 1



### 4.3.3 Installation

#### Warning

The gain of the 913K-1/1A must be adjusted after testing and before operation of the flight control system in the aircraft. Either the gain adjustment procedure provided in the 913K-1/1A maintenance section (523-0764810) or the Low Profile Flight Control System maintenance section (523-0764808) can be used to perform this preflight adjustment. Failure to perform one of these procedures can cause improper operation of the flight control system.

- a. Prepare the flight instrument panel for installation in accordance with the panel cutout detail shown in figure 23.

#### Caution

Do not interchange mating connectors J1 and J2 when connecting the 913K-1 to the aircraft interconnect cable. Possible damage can occur to the unit if J1 and J2 are reversed.

- b. Connect the system interconnect cable to the two electrical connectors on the rear of the 913K-1/1A.
- c. Slide the 913K-1/1A into the flight instrument panel from the rear and secure with four 8-32 screws, one in each corner.

### 4.3.4 Remote Installation (614E-42/42A and 562C-13/13A)

- a. Prepare the 913K-1A for remote mounting with modification kit CPN 621-0990-001 and the instructions supplied with it.
- b. Prepare the flight instrument panel for installation of the 614E-42/42A in accordance with the panel cutout detail shown in figure 24.
- c. Prepare a one-to-one cable of adequate length to connect P13 on the 614E-42/42A with P13 on the 562C-13/13A.
- d. Slide the 614E-42/42A into the flight instrument panel and secure with four 8-32 screws.
- e. Prepare the airframe for mounting the 991L-1 Mount in accordance with figure 25 and secure the mount with four 8-32 screws.
- f. Connect the system interconnect cable to P1 and P2 on the rear of the 562C-13/13A, and connect the 614E-42/42A interconnect cable to P13 on the front.

#### Caution

During the following step, the 562C-13/13A must be mounted with the circuit cards in the vertical position to ensure proper convection cooling of the unit.

- g. Place the 562C-13/13A in the 991L-1 Mount and secure with straps and turnlock or screw fasteners provided.

### 4.3.5 Removal

- a. Remove the four screws, one in each corner, that secure the 913K-1/1A or 614E-42/42A to the instrument panel and slide it out of the panel.
- b. Disconnect the system interconnect cable from the rear connectors on the 913K-1/1A.
- c. Remove the 562C-13/13A by loosening the two turnlock or screw fasteners holding the straps that secure the unit to the mount. The interconnect cables can then be disconnected from the front and rear of the unit.

### 4.4 614E-41/41A Pitch/Turn Control

#### 4.4.1 Location

Mount the 614E-41/41A in the aircraft control pedestal or flight instrument panel so that both the pilot and copilot have easy access to the control. Refer to figures 26 and 50 for outline and mounting dimensions and mockup panel cutout illustrations of the 614E-41/41A.

#### 4.4.2 Installation

- a. Prepare the instrument panel for installation in accordance with the panel cutout detail shown in figure 26.
- b. Connect the system interconnect cable to the rear connector of the 614E-41/41A.
- c. Slide the 614E-41/41A into the instrument panel from the rear and secure with four 6-32 screws, one in each corner.

#### 4.4.3 Removal

- a. Remove the four screws, one in each corner, securing the 614E-41/41A to the instrument panel and slide it out of the panel from the rear.
- b. Disconnect the system interconnect cable from the rear connector on the 614E-41/41A.

### 4.5 329T-1 Turn and Slip Indicator

#### 4.5.1 Location

The 329T-1 should be mounted on the flight instrument panel where it is in clear view of the pilot and copilot. The 329T-1 is mounted from the rear of the instrument panel by four 6-32 screws, one in each of

four corners. Refer to figures 29 and 52 for the outline and mounting dimensions and mockup panel cutout illustrations of the 329T-1.

#### 4.5.2 Installation

##### **Warning**

The gain of the 329T-1 must be adjusted after testing and before operation of the flight control system in the aircraft. Either the gain adjustment procedure provided in the 329T-1 maintenance section (523-0764818) or the Low Profile Flight Control System maintenance section (523-0764808) can be used to perform this preflight adjustment. Failure to perform one of these procedures can cause improper operation of the flight control system.

- a. Prepare the instrument panel for mounting in accordance with the panel cutout detail shown in figure 29.
- b. Connect the interconnect cable to the electrical connector on the rear of the 329T-1.
- c. Connect the panel lighting wires with quick-connect terminals.
- d. Slide the 329T-1 into the rear of the flight instrument and secure with three 6-32 screws.

#### 4.5.3 Removal

- a. Remove the four screws securing the 329T-1 to the instrument panel and remove the unit from the rear of the panel.
- b. Disconnect the system interconnect cable and panel lighting wires from the 329T-1.

#### 4.6 331P-1/1V Directional Gyro Indicator

##### 4.6.1 Location

The 331P-1/1V should be mounted on the flight instrument panel where it is in clear view of the pilot and copilot. The 331P-1/1V is mounted from the rear of the panel by three 6-32 screws, one in each of three corners. Refer to figures 30, 31, and 51 for the outline and mounting dimensions and mockup panel cutout illustrations for the 331P-1 and 331P-1V.

##### 4.6.2 Installation

- a. Prepare the flight instrument panel for mounting the 331P-1/1V in accordance with the panel cutout detail shown on figures 30 or 31.

- b. On 331P-1V, connect the inlet and outline vacuum lines to the 1/4-18 ANPT connectors on the rear of the unit.
- c. Connect the interconnect cables to the electrical connectors on the rear of unit (two connectors on the 331P-1V and three connectors on the 331P-1).
- d. Connect the panel lighting wires with quick-connect terminals.
- e. Slide the 331P-1/1V into the rear of the instrument panel and secure with three 6-32 screws.

#### 4.6.3 Removal

- a. Remove the three screws securing the 331P-1/1V to the instrument panel and remove the unit from the rear of the panel.
- b. Disconnect the interconnect cables and panel lighting wires from the 331P-1/1V.
- c. On 331P-1V, disconnect the inlet and outlet vacuum lines from the rear of the 331P-1V.

#### 4.7 327C-3 Slaving Indicator

##### 4.7.1 Location

The 327C-3 should be mounted on the flight instrument panel in the vicinity of the 331P-1/1V in clear view of the pilot and copilot. The 327C-3 is mounted from the front of the instrument panel in a 1-inch diameter panel cutout. Refer to figures 32 and 53 for the outline and mounting dimensions and mockup panel cutout illustrations.

##### 4.7.2 Installation

- a. Prepare the flight instrument panel for mounting the 327C-3 by cutting a 1-inch-diameter hole at the desired location.
- b. Slide the 327C-3 into the front of the flight instrument panel and secure with the 1-inch mounting nut.
- c. Observe polarity of the two gyro slaving wires and connect to the proper screw terminals on the rear of the 327C-3 with ring-type terminal lugs.

##### 4.7.3 Removal

- a. Disconnect the two gyro slaving wires from the rear of the 327C-3.
- b. Remove the 1-inch mounting nut securing the 327C-3 to the instrument panel and slide the unit out of the front of the panel.



### 4.8 323A-5 Flux Detector

#### 4.8.1 Location

Use extreme care when choosing the location for the 323A-5 as the location has a great effect on the magnetic heading accuracy. The outer wing or rear fuselage usually provide the best mounting areas. Avoid moving controls, cables, navigation lights, and other sources of variable magnetic fields. The 323A-5 must be accessible for calibration of the system (paragraph 5). Refer to figure 33 for the outline and mounting dimensions of the 323A-5.

#### 4.8.2 Installation

- a. Prepare the mounting location using the panel cutout detail shown in figure 33.

#### Note

Use only nonmagnetic brackets and mounting hardware.

- b. Place the 323A-5 in the panel cutout and secure with three 4-40 brass binder-head screws and brass locknuts.
- c. Connect the 323A-5 pendant cable to the system interconnect cable.

#### 4.8.3 Removal

- a. Disconnect the 323A-5 pendant cable from the system interconnect cable.
- b. Remove the three brass screws securing the 323A-5 to the airframe and remove from the panel cutout.

### 4.9 161H-1 Gain Programmer

#### 4.9.1 Location

The 161H-1 is normally mounted with a 390R-18 Mounting Kit in the radio equipment rack. Refer to paragraph 4.10 for the procedure used to install the 390R-18. Refer to figure 34 for outline and mounting dimensions of the 161H-1.

#### 4.9.2 Strapping Options

The two strapping options provided in the 161H-1 Gain Programmer are listed in table 3. These options are selected internal to the 161H-1 and must be installed prior to installing the 161H-1

in the aircraft. The options required for a particular aircraft installation are determined by the other equipment used in the installation. However, these strapping options do not affect the system interconnect wiring data provided in figures 3 through 16.

Use the following procedure to select the desired strapping options in the 161H-1.

- a. Remove the dust cover from the 161H-1.
- b. Remove backplane circuit card A1 from the chassis.
- c. Remove circuit card A4 (center card) from the chassis. Tag rear end of card to ensure proper reassembly.
- d. Refer to table 3 and figure 1 and select the desired options by connecting the appropriate strapping pins with a strapping connector, Collins part number 367-1508-010.
- e. Replace circuit card A4 in the chassis.
- f. Replace backplane circuit card A1.
- g. Replace dust cover.

Table 3. 161H-1 Strapping Options.

| STRAPPING<br>OPTION                          | STRAPPING<br>PINS | CIRCUIT<br>CARD |
|----------------------------------------------|-------------------|-----------------|
| Positive logic<br>localizer frequency signal | A to C            | A4              |
| Negative logic<br>localizer frequency signal | A to B            | A4              |
| Collins ALT-50<br>radio altimeter<br>signal  | A to B            | A5              |
| ARINC radio<br>altimeter<br>signal           | B to C            | A5              |

#### 4.9.3 Installation

#### Warning

The gain of the 161H-1 must be adjusted after testing and before operation of the flight control system in the aircraft. Either the gain adjustment procedure provided in

the 161H-1 maintenance section (523-0764811) or the Low Profile Flight Control System maintenance section (523-0764808) can be used to perform this preflight adjustment. Failure to perform one of these procedures can cause improper operation of the flight control system.

- a. Slide the 161H-1 into the 390R-18 Mounting Kit until the connector is properly engaged.
- b. Tighten the retainer nut on the front of the mount to secure the 161H-1 to the mount.

#### **4.9.4 Removal**

- a. Loosen the retainer nut that secures the 161H-1 to the 390R-18 Mounting Kit.
- b. Pull the 161H-1 straight out of the mount.

#### **4.10 390R-18 Mounting Kit**

The 390R-18 Mounting Kit and connector kit, Collins part number 618-5793-001, are used to mount the 161H-1 Gain Programmer to the airframe or in a radio equipment rack. Install the mounting kit and connector kit in accordance with the procedure provided with the mounting kit. Refer to figure 35 for the outline and mounting dimensions of the 390R-18.

#### **4.11 590A-6 Altitude Controller**

##### **4.11.1 Location**

Mount the 590A-6 directly to the airframe in any convenient location. The static air line must originate at the static port and cannot exceed 20 feet (6.09 m) for 1/4-inch (0.635-cm) inside diameter tubing. All static air line connectors must have an inside diameter equal to that of the tubing. If the static pressure varies with the pitch attitude of the aircraft, the static port must be located so that a pitch-down attitude results in an increase in static pressure. Refer to figure 36 for the outline and mounting dimensions of the 590A-6.

##### **4.11.2 Installation**

- a. Set the 590A-6 in the selected mounting position and secure with four 10-24 screws.
- b. Connect the static air line to the static port on the 590A-6.
- c. Connect the interconnect cable to the electrical connector on the 590A-6.

##### **4.11.3 Removal**

- a. Disconnect the interconnect cable from the 590A-6.
- b. Disconnect the static air line from the 590A-6.
- c. Remove the four screws that secure the 590A-6 to the airframe.

#### **4.12 590B-3 Airspeed Sensor**

##### **4.12.1 Location**

Mount the 590B-3 directly to the airframe in a convenient location. The static and pitot air lines must not exceed 20 feet (6.09 m) for 1/4-inch (0.635-cm) id tubing. All static and pitot air line connectors must have an inside diameter equal to that of the tubing. If the static pressure varies with the pitch attitude of the aircraft, the static port must be located so that a pitch-down attitude results in an increase in the static pressure. Refer to figure 37 for the outline and mounting dimensions of the 590B-3.

##### **4.12.2 Installation**

- a. Set the 590B-3 in the selected mounting position and secure with four screws.
- b. Connect the static and pitot air lines to the respective ports on the 590B-3.
- c. Connect the interconnect cable to the electrical connector on the 590B-3.

##### **4.12.3 Removal**

- a. Disconnect the interconnect cable from the 590B-3.
- b. Disconnect the static and pitot air lines from the 590B-3.
- c. Remove the four screws that secure the 590B-3 to the airframe.

#### **4.13 332D-11/11A Vertical Reference**

##### **4.13.1 Location**

Mount the 332D-11/11A solidly to the aircraft frame as close as possible to the center of gravity of the aircraft. The arrow on the side of the unit must point in the direction of flight of the aircraft. Shim the vertical reference as necessary to ensure that it is level when the aircraft is in a normal level flight attitude. Refer to figure 41 for the outline and mounting dimensions of the 332D-11/11A.

#### 4.13.2 Installation

- Place the 332D-11/11A over its mounting holes with the arrow pointing in the direction of flight.
- Add shims as necessary to ensure that the 332D-11/11A is level with respect to the normal level flight attitude of the aircraft.
- Secure the unit to the airframe with three 10-32 screws and #10 split lockwashers.
- Connect the interconnect cable to the electrical connector on the 332D-11/11A.

#### 4.13.3 Removal

- Disconnect the interconnect cable from the 332D-11/11A.
- Remove the four screws that secure the 332D-11/11A to the airframe. Note the location of any shims used to level the 332D-11/11A and save for reinstallation of the unit.
- Remove the 332D-11/11A from the airframe.

#### 4.14 332D-12/12A Vertical Reference

##### 4.14.1 Location

Mount the 332D-12/12A solidly to the aircraft frame as close as possible to the center of gravity of the aircraft. The arrow on the side of the unit must point in the direction of flight of the aircraft. Shim the vertical reference as necessary to ensure that it is level when the aircraft is in a normal level flight attitude. Refer to figures 38 and 39 for the outline and mounting dimensions of the 332D-12 and 332D-12A.

Gyro transformer assembly, CPN 629-0055-001, is required if the 332D-12/12A is used with a stabilized radar system requiring 50-mV/degree pitch and roll data. Refer to figure 40 for the outline and mounting dimensions of the gyro transformer assembly.

##### 4.14.2 Installation

- Place the 332D-12/12A over its mounting holes with the arrow pointing in the direction of flight.
- Add shims as necessary to ensure that the 332D-12/12A is level with respect to the normal level flight attitude of the aircraft.
- Secure the unit to the airframe with four 8-32 screws and #8 split lockwashers.
- Connect the interconnect cable to the electrical connector on the 332D-12/12A.
- If the 332D-12/12A is vented to the cabin, install an air filter in the vent line as described in figure 38 or 39.

#### 4.14.3 Removal

- Disconnect the interconnect cable and vent line from the 332D-12/12A.
- Remove the four screws that secure the 332D-12/12A to the airframe. Note the location of any shims used to level the 332D-12/12A and save for reinstallation of the unit.
- Remove the 332D-12/12A from the airframe.

#### 4.15 334C-9/C-9A/C-11 Primary Servo/334D-6 Trim Servo

##### 4.15.1 Location

Primary and trim servo placement is determined by the airframe requirements. Refer to figures 42 and 43 for the outline and mounting dimensions of the primary and trim servos with capstan drive. Refer to figure 44 for the outline and mounting dimensions of the trim servo with pulley drive.

##### 4.15.2 Installation of Servo Mount

- Remove the servo from its mount by removing the four 10-32 locknuts and sliding the servo out of the mount.
- Refer to the system maintenance section (Collins part number 523-0764808) and perform the servo and capstan clutch adjustment procedures.

#### Warning

The servo adjustment procedure must be performed prior to installation of the servos in the aircraft. Failure to perform these adjustment procedures can result in hazardous operation of the aircraft.

- Position the servo mount in the airframe and secure with four 10-32 locknuts.
- Connect the aircraft control cable to the capstan (or through the pulleys if pulley drive). Use cable clamps listed in table 4 as required. Adjust the cables for the required tension and run-in by moving the control surfaces from limit to limit. Recheck the tension of both the primary and bridle cables and repeat run-in until tension rechecks satisfactorily.

Table 4. Servo Cable Clamps.

| CABLE CLAMP<br>(COLLINS PART NO) | CABLE DIAMETER<br>(in (mm)) |             |
|----------------------------------|-----------------------------|-------------|
|                                  | PRIMARY                     | BRIDLE      |
| 992-0045-001                     | .063 (1.59)                 | .063 (1.59) |
| 992-0045-002                     | .094 (2.39)                 | .063 (1.59) |
| 992-0045-003                     | .125 (3.18)                 | .063 (1.59) |
| 992-0045-004                     | .156 (3.96)                 | .063 (1.59) |
| 992-0045-005                     | .188 (4.78)                 | .063 (1.59) |

#### 4.15.3 Installation of Servo

##### Caution

Use care to avoid damaging the servo gears when sliding the servo into the servo mount.

- Slide the servo into the servo mount and secure with four 10-32 locknuts.
- Connect the servo pendant cable connector to the interconnect cable connector.

#### 4.15.4 Removal of Servo

- Disconnect the servo pendant cable from the interconnect cable.
- Remove the four 10-32 locknuts securing the servo to the servo mount and carefully remove the servo from the mount.

#### 4.15.5 Removal of Servo Mount

- Disconnect the aircraft control cable from the capstan or pulley drive.
- Remove the four 10-32 locknuts securing the mount to the airframe and lift the mount from the airframe.

#### 4.16 PN-101 Pictorial Navigation System

Install the units of the PN-101 Pictorial Navigation System in accordance with the procedures given in the PN-101 Pictorial Navigation System Instruction Book, Collins part number 523-0755824.

#### 4.17 AP-106/107 Annunciator Units

##### 4.17.1 Location

The AP-106/107 Annunciator Units provide visual indicators for the various autopilot operating modes

and should be mounted on the flight instrument panel or eyebrow panel in clear view of the pilot and copilot. Refer to figures 27 and 28 for outline and mounting dimensions of the AP-106 and AP-107 Annunciator Units respectively. Figure 54 is a full-size mockup cutout illustration that can be used for either annunciator unit during mockup layout.

##### 4.17.2 Installation

- Prepare the flight instrument panel or eyebrow panel for installation in accordance with the panel cutout detail shown in figure 27 (AP-106) or figure 28 (AP-107).
- Connect the system interconnect cable to the electrical connector on the rear of the unit.
- Slide the annunciator unit into the panel and secure with four screws, one in each corner.

##### 4.17.3 Removal

- Remove the four screws that secure the annunciator unit to the panel and slide the unit out of the panel.
- Disconnect the system interconnect cable from the rear of the unit.

#### 4.18 Individual Annunciator Lamp Assemblies

Annunciator lamp assemblies, CPN 262-1439-010, -020, -030, -040, -050, are visual indicators for the various autopilot operating modes and can be installed as required on the flight instrument panel or eyebrow panel in clear view of the pilot and copilot. Refer to figure 46 for outline and mounting information and an illustration of the annunciator legends provided with each part number. (CPN 262-1439-050 is provided with blank legends.)

#### 4.19 454N Series Circuit Cards

The 454N Series Circuit Cards are normally mounted in the 991X-1 Universal Card Holder in the radio equipment rack (paragraph 4.20). Refer to the 991X-1 Universal Card Holder assembly instructions (CPN 523-0766453) for instructions on installing the circuit cards in the 991X-1.

#### 4.20 991X-1 Universal Card Holder

The 991X-1 Universal Card Holder is used to mount any of the 454N series of circuit cards. The 991X-1 is normally located in the radio equipment rack. The 991X-1 is available in various statuses for mounting

either one or two circuit cards of differing heights. Refer to figure 45 for an outline and mounting diagram of the 991X-1.

#### 4.21 998E-1 Annunciator Adapter

The 998E-1 Annunciator Adapter is normally mounted in the 991X-1 Universal Card Holder, CPN 622-2745-XXX. Refer to the 991X-1 Universal Card Holder assembly instructions (CPN 523-0766453) for instructions on installing the adapter in the card holder.

### 5. POSTINSTALLATION TESTS

After all cabling has been installed and checked and the equipment has been mounted in the aircraft, perform the following test procedures to verify that the equipment has been connected with proper phasing between the gyros, servos, flight director, and autopilot. The tests must be performed using the aircraft power supplies.

After the postinstallation tests have been performed satisfactorily, perform the alignment/adjustment procedures and system performance test procedures given in the Low Profile Flight Control System maintenance section, Collins part number 523-0764808.

#### 5.1 Test Equipment

- a. A vacuum source is required to energize any vacuum-driven gyros that may be used in the system.
- b. A pneumatic source capable of supplying vacuum to the static system and pressure to the pitot system is required to simulate altitudes up to 10,000 feet and airspeed up to 150 knots.
- c. A VOR/LOC ramp test set is required to simulate a 2-dot left of course and on-course localizer signal.

#### 5.2 Test Procedures

##### 5.2.1 Navigation Receiver Loading Check

Refer to the applicable system interconnect diagram, and determine the number of loads connected to the VOR/LOC and GS outputs of the navigation receiver. Adjust the VOR/LOC and GS loads as required to ensure proper matching of the system loads to the particular navigation receiver used.

##### 5.2.2 Flight Director Tests

- a. Apply power to the Low Profile Flight Control System, and observe that the HEADING

flag disappears from view within 1.5 minutes and that the ATT flag disappears from view within 3 minutes.

- b. Observe that the attitude display indicates the aircraft pitch and roll attitude and that the compass card indicates the magnetic heading of the aircraft.

#### Note

Steps c through e apply only to the FD-112C/V Flight Directors and PN-101 Compass System.

- c. Remove the mounting screws securing the vertical gyro to the airframe, and tilt the vertical gyro to simulate a noseup attitude. Verify that the attitude display indicates a noseup attitude.
- d. Tilt the vertical gyro to simulate a right bank, and verify that the attitude display indicates a right bank.

#### Note

Do not remount the vertical gyro at this time.

- e. Remove the mounting screws securing the compass gyro, and turn the gyro clockwise about its vertical axis to simulate a right turn. Observe that the compass card turns counterclockwise to indicate the new position of the gyro. Replace the compass gyro and secure with the mounting screws.

##### 5.2.3 Autopilot Tests

- a. Engage the autopilot system by pushing up momentarily on the 913K-1/1A ENG/DIS switch.
- b. Tilt the vertical gyro to simulate a noseup attitude, and observe that the control column moves forward and pitch command bar moves down. Tilt the vertical gyro to a nosedown attitude, and observe that the control column moves backward and pitch command bar moves up.
- c. Rotate the vertical gyro to simulate a right roll, and observe that the control wheel rotates counterclockwise and roll command bar moves to the left. Rotate the vertical gyro to simulate a left roll, and observe that the control wheel rotates clockwise and the roll command bar moves to the right.
- d. With the vertical gyro level, rotate the PITCH control on the 614E-41/41A forward and then backward, and observe that the control column moves forward and then backward.
- e. With the vertical gyro level, turn the TURN control of the 614E-41/41A to the right and then to the

left, and observe that the control wheel rotates to the right and then to the left. Return the control wheel to the center position.

- f. Push the control column forward and hold. After approximately 3 seconds, the trim system should trim up, and the TRIM UP annunciator on the 913K-1/1A should light while the trim servo is operating. Repeat for the opposite direction (trim down).
- g. Return the control column to the center position, and operate the manual trim switches while observing the aircraft trim surfaces to verify proper phasing of the manual trim switches.
- h. Press the HDG button on the 913K-1/1A, and move the heading bug on the course indicator to the left and then to the right of center. Observe that the control wheel turns to the left and then to the right.
- i. Connect a vacuum source to the static system of the aircraft, and set for a simulated 10,000-foot altitude. Engage the autopilot and push the ALT mode pushbutton on the 913K-1/1A. Reset the vacuum source at 9,900 feet, and observe that the elevators move to a pitch-up position. Disengage the autopilot and remove the vacuum source from the aircraft.

**Note**

Omit step j if the IAS mode is not provided in the autopilot system being tested.

- j. Connect a pressure source to the pitot system of the aircraft, and set for a simulated 150 knots indicated airspeed. Engage the autopilot and push the IAS mode pushbutton on the 913K-1/1A. Reset the pressure source at 140 knots, and observe that the elevators move to a pitch-down position. Disengage the autopilot and remove the pressure source from the aircraft.

**Note**

Steps k and l apply only to 3-axis systems.

- k. Remove the 329T-1 Turn and Slip Indicator from the instrument panel, and rotate it clockwise about its vertical axis to simulate a right turn. The rudder should deflect to the left (left rudder pedal moves forward). Replace the 329T-1 in the instrument panel.
- l. Tilt the vertical gyro quickly to simulate a left roll. The rudder should move to the

left and then wash out to center when viewed from the rear. Repeat for a right roll; the rudder should move to the right and then wash out to center. Replace the vertical gyro and secure with the mounting screws.

**Note**

Steps m, n, and o apply only to autopilot systems that are used with flight directors with command bars and course indicators with a lateral deviation bar.

- m. Select a local VOR station on the navigation receiver, and rotate the course arrow until the lateral deviation bar is in line with the course arrow and TO/FROM pointer is pointing in the same direction as the course arrow. Rotate the course arrow toward the vertical down position, and verify that the lateral deviation bar moves toward the top of the unit.
- n. Select a localizer station on the navigation receiver, and push the NAV mode pushbutton on the 913K-1/1A. If the NAV CAP annunciator does not light, slowly rotate the course arrow until it lights, and then set the course arrow at the vertical up position (under the lubber line). If the DR annunciator lights, allow it to go out before continuing with the test. With the course arrow under the lubber line, verify that the roll command bar is deflected to the same side that the lateral deviation bar is deflected. Upon completion of this step, push the NAV mode pushbutton on the 913K-1/1A.
- o. Turn the DME on standby or off, and select a local VOR station on the navigation receiver. Adjust the course arrow to obtain a half-scale deflection of the lateral deviation bar. Turn on the DME, and verify that the deviation bar moves toward the course arrow. Turn the DME on standby or off after completing this step.

**Note**

Step p does not need to be performed if steps m, n, and o were performed on the autopilot.

- p. Set up and adjust the VOR/LOC test set for a 2-dot, left-of-course localizer signal. Set the course arrow on the course indicator under the lubber line, and select the VOR/LOC test set frequency on the navigation receiver. Engage the autopilot

and push the NAV mode pushbutton on the 913K-1/1A. Observe that the control wheel rotates clockwise. Upon completion of this step, push the NAV mode pushbutton and disengage the autopilot.

q. Perform the alignment/adjustment procedures and the system performance tests given in the Low Profile Flight Control System maintenance section, Collins part number 523-0764808.

**INTERCONNECT DIAGRAM CHANGES**

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                 | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-----------------------------------------------------------------------------------------------|------------------|-------------|
| A1                      | Connected ALT ANNUN GND connection from 161H-1 J1-55 (was 161H-1 J1-49).                      |                  | 7 Sep 73    |
| A2                      | Added APPR ANNUN GND from 161H-1 J1-49.                                                       |                  | 7 Sep 73    |
| A3                      | Added DEAD REC ANNUN GND from 161H-1 J1-25.                                                   |                  | 7 Sep 73    |
| B1                      | Added relay K1, K2, and K3.                                                                   |                  | 1 Jan 74    |
| B2                      | Changed manual trim engage switch from spst to a solenoid held switch.                        |                  | 1 Jan 74    |
| B3                      | Added Collins part number for yaw damper switch.                                              |                  | 1 Jan 74    |
| B4                      | Changed manual trim resistor from 8 $\Omega$ , 12.5 W to 50 $\Omega$ , 75 W.                  |                  | 1 Jan 74    |
| B5                      | Added AP DISENGAGE connections to J1-S and 26 V ac connections to J1-F on all primary servos. |                  | 1 Jan 74    |
| B6                      | Added HDG FLAG between FD-112 J1-K and 328A-3G J1-25.                                         |                  | 1 Jan 74    |
| B7                      | Reversed SLAVING SYNCHRO H and C at 328A-3G J1-11 and J1-12.                                  |                  | 1 Jan 74    |
| B8                      | Added connections to FD-112V J2-N and J2-R.                                                   |                  | 1 Jan 74    |
| B9                      | Reversed RADIO ALT +UP AND +DN connections at FD-112V J2-M and J2-L.                          |                  | 1 Jan 74    |

AP-106, FD-112C/V, and PN-101 3-Axis System, Interconnect Diagram  
Figure 3 (Sheet A)



## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                    | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------------------------------------------------|------------------|-------------|
| B10                     | Added RNAV SYSTEM connections to 913K-1 J2-32.                                                   |                  | 1 Jan 74    |
| Notes 7 thru 12         | Added.                                                                                           |                  | 1 Jan 74    |
| C1                      | Replaced 913K-1 circuit breaker (3A) and 161H-1 circuit breaker (2A) with a single breaker (5A). |                  | 15 May 74   |
| C2                      | Revised 913K-1 and 161H-1 shields and twisted pairs (see note 14).                               |                  | 15 May 74   |
| C3                      | Replaced aileron and elevator servo circuit breakers (3A each) with a single breaker (5A).       |                  | 15 May 74   |
| C4                      | Added isolation diode (1N645) in AP DISENGA+ line to trim servo.                                 |                  | 15 May 74   |
| C5                      | Added connections from FD-112 J1-S, V to relay K3.                                               |                  | 15 May 74   |
| C6                      | Changed +13-V dc power for 590A-6 (J1-A, B) from 913K-1 J2-2, 8 to 161H-1 J1-60, 4.              |                  | 15 May 74   |
| Note 10                 | Restated.                                                                                        |                  | 15 May 74   |
| Notes 13 thru 16        | Added.                                                                                           |                  | 15 May 74   |
| D1                      | Changed manual trim resistor from 50 $\Omega$ , 75 W to 50 $\Omega$ , 25 W.                      |                  | 15 Oct 74   |
| Notes 4, 11, 14         | Restated.                                                                                        |                  | 15 Oct 74   |
| Note 12                 | Deleted.                                                                                         |                  | 15 Oct 74   |
| Note 6                  | Added 334C-9A and new statuses of 334C-9.                                                        |                  | 15 Oct 74   |

AP-106, FD-112C/V, and PN-101 3-Axis System, Interconnect Diagram  
Figure 3 (Sheet B)

INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                                                                                   | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| E1                      | Added RNAV CMD inputs from RNAV system to 913K-1 J1-28, 35.                                                                                                     |                  | 15 Mar 75   |
| E2                      | Revised manual trim solenoid switch connections.                                                                                                                |                  | 15 Mar 75   |
| E3                      | Added LINEAR DEV ANNUN GND from 161H-1 J1-6.                                                                                                                    |                  | 15 Mar 75   |
| F1                      | Reversed REL BRG X and Y connections at FD-112V J2-P, S.                                                                                                        |                  | 11 Jul 75   |
| F2                      | Removed GYRO MON+ (ATTD FLAG) connecting to 913K-1 J2-4 and connected to 161H-1 J1-56. Added connections between 161H-1 J1-59 (PROC ATTD FLAG) and 913K-1 J2-4. |                  | 11 Jul 75   |
| F3                      | Changed 334C-( ) PROG AIL CMD- connections from 161H-1 COM to 913K-1 COM (connected at 161H-1 J1-52).                                                           |                  | 11 Jul 75   |
| F4                      | Changed 334C-( ) PROG RUD CMD- connections from 161H-1 COM to 329T-1 RUD CMD- (connected at 161H-1 J1-20).                                                      |                  | 11 Jul 75   |
| Note 6                  | Restated.                                                                                                                                                       |                  | 11 Jul 75   |
| Note 12                 | Added.                                                                                                                                                          |                  | 11 Jul 75   |
| H1                      | Revised cable shields between 329T-1 and rudder servo.                                                                                                          |                  | 15 Jul 76   |
| Notes 14, 15, 16        | Restated.                                                                                                                                                       |                  | 15 Jul 76   |

AP-106, FD-112C/V, and PN-101 3-Axis System, Interconnect Diagram  
Figure 3 (Sheet C)

INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                        | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------------------------------------|------------------|-------------|
| J1                      | Added NAV FLAG LL connections for 913K-1A.                                           |                  | 1 Mar 77    |
| J2                      | Added ENG ANNUN GND connection for 913K-1A.                                          |                  | 1 Mar 77    |
| Notes 2, 14             | Restated.                                                                            |                  | 1 Mar 77    |
| Note 6                  | Added 334C-11.                                                                       |                  | 1 Mar 77    |
| L1                      | Changed radio altimeter analog nomenclature from RADIO ALT +UP/+DN to RADIO ALT +/-. |                  | 1 Jul 78    |
| Note 14                 | Restated.                                                                            |                  | 1 Jul 78    |
| Note 17                 | Added.                                                                               |                  | 1 Jul 78    |
| M1                      | Replaced 332D-12 Vertical Gyro with 332D-11( ) Vertical Reference.                   |                  | 27 Jun 84   |
| Notes 4, 6              | Restated.                                                                            |                  | 27 Jun 84   |

AP-106, FD-112C/V, and PN-101 3-Axis System, Interconnect Diagram  
Figure 3 (Sheet D)



## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                  | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|------------------------------------------------------------------------------------------------|------------------|-------------|
| A1                      | Added jumper between 913K-1/1A J2-24, 26, 34, and 36.                                          |                  | 7 Sep 73    |
| Notes 2, 3              | Restated.                                                                                      |                  | 7 Sep 73    |
| B1                      | Added relays K1, K2, and K3.                                                                   |                  | 1 Jan 74    |
| B2                      | Changed manual trim engage switch from spst to a solenoid held switch.                         |                  | 1 Jan 74    |
| B3                      | Added Collins part number for yaw damper switch.                                               |                  | 1 Jan 74    |
| B4                      | Changed manual trim resistor from 8 $\Omega$ , 12.5 W to 50 $\Omega$ , 75 W.                   |                  | 1 Jan 74    |
| B5                      | Added AP DISENGAGE connections to J1-S, and 26-V ac connections to J1-F on all primary servos. |                  | 1 Jan 74    |
| B6                      | Added shields to all wires connected to 590A-6.                                                |                  | 1 Jan 74    |
| B7                      | Added 1-A fuse in 26-V ac bus to 331P-1/1V.                                                    |                  | 1 Jan 74    |
| B8                      | Added 0.25-A fuse in 115-V ac bus to 331P-1/1V.                                                |                  | 1 Jan 74    |
| B9                      | Changed 913K-1/1A/FD-106 fuse from 0.5 to 2.5 A.                                               |                  | 1 Jan 74    |
| B10                     | Added 0.25-A fuse in 115-V ac bus to FD-106.                                                   |                  | 1 Jan 74    |
| B11                     | Added RNAV MON+ connections to 913K-1/1A J2-32.                                                |                  | 1 Jan 74    |
| Notes 6 thru 10         | Added.                                                                                         |                  | 1 Jan 74    |

AP-107, FD-106P/PV and MCS-107/107V 3-Axis System, Interconnect Diagram  
Figure 4 (Sheet A)

# INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|----------------------------------------------------------------------------------------------|------------------|-------------|
| C1                      | Revised 913K-1/1A and 329T-1 shields and twisted pairs (see note 12).                        |                  | 15 May 74   |
| C2                      | Replaced aileron and elevator servo circuit breakers (3 A each) with a single breaker (5 A). |                  | 15 May 74   |
| C3                      | Added isolation diode in AP DISENGA+ line to trim servo.                                     |                  | 15 May 74   |
| Note 10                 | Restated.                                                                                    |                  | 15 May 74   |
| Notes 11 thru 14        | Added.                                                                                       |                  | 15 May 74   |
| D1                      | Changed manual trim resistor from 50 $\Omega$ , 75 W to 50 $\Omega$ , 25 W.                  |                  | 15 Oct 74   |
| D2                      | Added relay K4.                                                                              |                  | 15 Oct 74   |
| Notes 4, 9, 12          | Restated.                                                                                    |                  | 15 Oct 74   |
| Note 5                  | Added 334C-9A and new statuses of 334C-9.                                                    |                  | 15 Oct 74   |
| Note 10                 | Deleted.                                                                                     |                  | 15 Oct 74   |
| Note 15                 | Added.                                                                                       |                  | 15 Oct 74   |
| E1                      | Added shields to TRIM CMD connections to ELEV servo.                                         |                  | 15 Mar 75   |
| E2                      | Revised manual trim solenoid switch connections.                                             |                  | 15 Mar 75   |
| E3                      | Added RNAV CMD inputs from RNAV system to 913K-1/1A J1-28, 35.                               |                  | 15 Mar 75   |
| Note 5                  | Restated.                                                                                    |                  | 11 Jul 75   |

AP-107, FD-106P/PV and MCS-107/107V 3-Axis System, Interconnect Diagram  
Figure 4 (Sheet B)

**INTERCONNECT DIAGRAM CHANGES**

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                  | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|------------------------------------------------------------------------------------------------|------------------|-------------|
| Note 16                 | Added.                                                                                         |                  | 11 Jul 75   |
| J1                      | Added diode between FD-106 J2-B and J2-F.                                                      |                  | 1 Mar 77    |
| J2                      | Revised cable shields between 329T-1 and rudder servo, and between 913K-1/1A and NAV receiver. |                  | 1 Mar 77    |
| J3                      | Added NAV FLAG LL connections for 913K-1A.                                                     |                  | 1 Mar 77    |
| J4                      | Added 913K-1A annunciator connections.                                                         |                  | 1 Mar 77    |
| Notes 2, 12, 13         | Restated.                                                                                      |                  | 1 Mar 77    |
| Note 5                  | Added 334C-11.                                                                                 |                  | 1 Mar 77    |
| Note 12                 | Restated.                                                                                      |                  | 1 Jul 78    |
| Notes 4, 5              | Restated.                                                                                      |                  | 27 Jun 84   |

AP-107, FD-106P/PV and MCS-107/107V 3-Axis System, Interconnect Diagram  
Figure 4 (Sheet C)





## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                       | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-----------------------------------------------------------------------------------------------------|------------------|-------------|
| A1                      | Connected ALT ANNUN GND connection from 161H-1 J1-55 (was 161H-1 J1-49).                            |                  | 7 Sep 73    |
| A2                      | Added APPR ANNUN GND from 161H-1 J1-49.                                                             |                  | 7 Sep 73    |
| A3                      | Added DEAD REC ANNUN GND from 161H-1 J1-25.                                                         |                  | 7 Sep 73    |
| Notes 2, 3              | Restated.                                                                                           |                  | 7 Sep 73    |
| B1                      | Added relay K1, K2, and K3.                                                                         |                  | 1 Jan 74    |
| B2                      | Changed manual trim engage switch from spst to a solenoid held switch.                              |                  | 1 Jan 74    |
| B3                      | Added Collins part number for yaw damper switch.                                                    |                  | 1 Jan 74    |
| B4                      | Changed manual trim resistor from 8 $\Omega$ , 12.5 W to 50 $\Omega$ , 75 W.                        |                  | 1 Jan 74    |
| B5                      | Added AP DISENGAGE connections to J1-S and 26-V ac connections to J1-F on all primary servos.       |                  | 1 Jan 74    |
| B7                      | Reversed SLAVING SYNCHRO H and C at 328A-3G J1-11 and J1-12.                                        |                  | 1 Jan 74    |
| B10                     | Added RNAV SYSTEM connections to 913K-1 J2-32.                                                      |                  | 1 Jan 74    |
| Notes 6 thru 11         | Added.                                                                                              |                  | 1 Jan 74    |
| C1                      | Replaced 913K-1 circuit breaker (3 A) and 161H-1 circuit breaker (2 A) with a single breaker (5 A). |                  | 15 May 74   |

AP-106, FD-106P/PV and PN-101 3-Axis System, Interconnect Diagram  
Figure 5 (Sheet A)

# INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|----------------------------------------------------------------------------------------------|------------------|-------------|
| C2                      | Revised 913K-1 and 161H-1 shields and twisted pairs (see note 13).                           |                  | 15 May 74   |
| C3                      | Replaced aileron and elevator servo circuit breakers (3 A each) with a single breaker (5 A). |                  | 15 May 74   |
| C4                      | Added isolation diode (1N645) in AP DISENGA+ line to trim servo.                             |                  | 15 May 74   |
| C6                      | Changed +13-V dc power for 590A-6 (J1-A, B) from 913K-1 J2-2, 8 to 161H-1 J1-60, 4.          |                  | 15 May 74   |
| Notes 12 thru 16        | Added.                                                                                       |                  | 15 May 74   |
| D1                      | Changed manual trim resistor from 50 $\Omega$ , 75 W to 50 $\Omega$ , 25 W.                  |                  | 15 Oct 74   |
| D2                      | Added relay K4.                                                                              |                  | 15 Oct 74   |
| Notes 4, 10, 13         | Restated.                                                                                    |                  | 15 Oct 74   |
| Note 11                 | Deleted.                                                                                     |                  | 15 Oct 74   |
| Note 5                  | Added 334C-9A and new statuses of 334C-9.                                                    |                  | 15 Oct 74   |
| Note 17                 | Added.                                                                                       |                  | 15 Oct 74   |
| E1                      | Added RNAV CMD inputs from RNAV system to 913K-1 J1-28, 35.                                  |                  | 15 Mar 75   |
| E2                      | Revised manual trim solenoid switch connections.                                             |                  | 15 Mar 75   |
| E3                      | Added LINEAR DEV ANNUN GND from 161H-1 J1-6.                                                 |                  | 15 Mar 75   |

AP-106, FD-106P/PV and PN-101 3-Axis System, Interconnect Diagram  
Figure 5 (Sheet B)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                                                                                   | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| F2                      | Removed GYRO MON+ (ATTD FLAG) connecting to 913K-1 J2-4 and connected to 161H-1 J1-56. Added connections between 161H-1 J1-59 (PROC ATTD FLAG) and 913K-1 J2-4. |                  | 11 Jul 75   |
| F3                      | Changed 334C-( ) PROG AIL CMD-connections from 161H-1 COM to 913K-1 COM (connected at 161H-1 J1-52).                                                            |                  | 11 Jul 75   |
| F4                      | Changed 334C-( ) PROG RUD CMD-connections from 161H-1 COM to 329T-1 RUD CMD- (connected at 161H-1 J1-20).                                                       |                  | 11 Jul 75   |
| Note 5                  | Restated.                                                                                                                                                       |                  | 11 Jul 75   |
| Note 11                 | Added.                                                                                                                                                          |                  | 11 Jul 75   |
| J1                      | Revised cable shields between 329T-1 and rudder servo, and between 913K-1/1A and NAV receiver.                                                                  |                  | 1 Mar 77    |
| J2                      | Added diode between FD-106 J2-B and J2-F.                                                                                                                       |                  | 1 Mar 77    |
| J3                      | Added NAV FLAG LL connections for 913K-1A.                                                                                                                      |                  | 1 Mar 77    |
| J4                      | Added ENG ANN GND connection for 913K-1A.                                                                                                                       |                  | 1 Mar 77    |
| Notes 2, 13, 14, 15     | Restated.                                                                                                                                                       |                  | 1 Mar 77    |
| Note 5                  | Added 334C-11.                                                                                                                                                  |                  | 1 Mar 77    |
| K1                      | Added HDG FLAG (-) connection for 331A-3G.                                                                                                                      |                  | 7 Apr 78    |
| Note 18                 | Added.                                                                                                                                                          |                  | 7 Apr 78    |

AP-106, FD-106P/PV and PN-101 3-Axis System, Interconnect Diagram  
Figure 5 (Sheet C)

**INTERCONNECT DIAGRAM CHANGES**

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                        | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------------------------------------|------------------|-------------|
| L1                      | Changed radio altimeter analog nomenclature from RADIO ALT +UP/+DN to RADIO ALT +/-. |                  | 1 Jul 78    |
| Note 13                 | Restated.                                                                            |                  | 1 Jul 78    |
| Notes 4, 5              | Restated.                                                                            |                  | 27 Jun 84   |

AP-106, FD-106P/PV, and PN-101 3-Axis System, Interconnect Diagram  
Figure 5 (Sheet D)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                  | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|------------------------------------------------------------------------------------------------|------------------|-------------|
| A1                      | Added jumper between 913K-1/1A J2-24, 26, 34, and 36.                                          |                  | 7 Sep 73    |
| Notes 2, 3              | Restated.                                                                                      |                  | 7 Sep 73    |
| B1                      | Added relays K2 and K3.                                                                        |                  | 1 Jan 74    |
| B2                      | Changed manual trim engage switch from spst to a solenoid held switch.                         |                  | 1 Jan 74    |
| B3                      | Added RNAV MON+ connections to 913K-1/1A J2-32.                                                |                  | 1 Jan 74    |
| B4                      | Changed manual trim resistor from 8 $\Omega$ , 12.5 W to 50 $\Omega$ , 75 W.                   |                  | 1 Jan 74    |
| B5                      | Added AP DISENGAGE connections to J1-S, and 26-V ac connections to J1-F on all primary servos. |                  | 1 Jan 74    |
| B6                      | Added shields to all wires connected to 590A-6.                                                |                  | 1 Jan 74    |
| B7                      | Added 1-A fuse in 26-V ac bus to 331P-1/1V.                                                    |                  | 1 Jan 74    |
| B8                      | Added 0.25-A fuse in 115-V ac bus to 331P-1/1V.                                                |                  | 1 Jan 74    |
| B9                      | Changed 913K-1/1A/FD-106 fuse from 0.5 to 2.5 A.                                               |                  | 1 Jan 74    |
| B10                     | Added 0.25-A fuse in 115-V ac bus to FD-106.                                                   |                  | 1 Jan 74    |
| Notes 6 thru 8          | Added.                                                                                         |                  | 1 Jan 74    |
| C1                      | Revised 913K-1/1A shields and twisted pairs (see note 10).                                     |                  | 15 May 74   |

AP-107, FD-106P/PV, and MCS-107/107V 2-Axis System, Interconnect Diagram  
Figure 6 (Sheet A)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|----------------------------------------------------------------------------------------------|------------------|-------------|
| C2                      | Replaced aileron and elevator servo circuit breakers (3 A each) with a single breaker (5 A). |                  | 15 May 74   |
| C3                      | Added isolation diode in AP DISENGA+ line to trim servo.                                     |                  | 15 May 74   |
| Notes 9 thru 12         | Added.                                                                                       |                  | 15 May 74   |
| D1                      | Changed manual trim resistor from 50 $\Omega$ , 75 W to 50 $\Omega$ , 25 W.                  |                  | 15 Oct 74   |
| D2                      | Added 36.5-k $\Omega$ , 0.25-W load resistor to FD-106 J1-A and J1-E.                        |                  | 15 Oct 74   |
| Notes 4, 10             | Restated.                                                                                    |                  | 15 Oct 74   |
| Note 8                  | Deleted.                                                                                     |                  | 15 Oct 74   |
| Note 5                  | Added 334C-9A and new statuses of 334C-9.                                                    |                  | 15 Oct 74   |
| E1                      | Added shields to TRIM CMD connections to ELEV servo.                                         |                  | 15 Mar 75   |
| E2                      | Revised manual trim solenoid switch connections.                                             |                  | 15 Mar 75   |
| E3                      | Added RNAV CMD inputs from RNAV system to 913K-1/1A J1-28, 35.                               |                  | 15 Mar 75   |
| Note 5                  | Restated.                                                                                    |                  | 11 Jul 75   |
| Note 13                 | Added.                                                                                       |                  | 11 Jul 75   |
| J1                      | Added diode between FD-106 J2-B and J2-F.                                                    |                  | 1 Mar 77    |
| J2                      | Revised cable shields between 913K-1/1A and NAV receiver.                                    |                  | 1 Mar 77    |

AP-107, FD-106P/PV, and MCS-107/107V 2-Axis System, Interconnect Diagram  
Figure 6 (Sheet B)

**INTERCONNECT DIAGRAM CHANGES**

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-----------------------------------------------|------------------|-------------|
| J3                      | Added NAV FLAG LL connections for 913K-1A.    |                  | 1 Mar 77    |
| J4                      | Added 913K-1A annunciator ground connections. |                  | 1 Mar 77    |
| J5                      | Added relay K4.                               |                  | 1 Mar 77    |
| Notes 2, 10, 11         | Restated.                                     |                  | 1 Mar 77    |
| Note 5                  | Added 334C-11.                                |                  | 1 Mar 77    |
| Note 10                 | Restated.                                     |                  | 1 Jul 78    |
| Notes 4, 5              | Restated.                                     |                  | 27 Jun 84   |

AP-107, FD-106P/PV, and MCS-107/107V 2-Axis System, Interconnect Diagram  
Figure 6 (Sheet C)





## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                  | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|------------------------------------------------------------------------------------------------|------------------|-------------|
| B1                      | Added relays K1, K2, and K3.                                                                   |                  | 1 Jan 74    |
| B2                      | Changed manual trim engage switch from spst to a solenoid held switch.                         |                  | 1 Jan 74    |
| B3                      | Added Collins part number for yaw damper switch.                                               |                  | 1 Jan 74    |
| B4                      | Changed manual trim resistor from 8 $\Omega$ , 12.5 W to 50 $\Omega$ , 75 W.                   |                  | 1 Jan 74    |
| B5                      | Added AP DISENGAGE connections to J1-S, and 26-V ac connections to J1-F on all primary servos. |                  | 1 Jan 74    |
| B6                      | Added shields to all wires connected to 590A-6.                                                |                  | 1 Jan 74    |
| B7                      | Added 1-A fuse in 26-V ac bus to 331P-1/1V.                                                    |                  | 1 Jan 74    |
| B8                      | Added 0.25-A fuse in 115-V ac bus to 331P-1/1V.                                                |                  | 1 Jan 74    |
| B9                      | Changed 913K-1/1A/FD-106 fuse from 0.5 to 2.5 A.                                               |                  | 1 Jan 74    |
| B10                     | Added 0.25-A fuse in 115-V ac bus to FD-106.                                                   |                  | 1 Jan 74    |
| B11                     | Added RNAV MON+ connections to 913K-1/1A J2-32.                                                |                  | 1 Jan 74    |
| B12                     | Changed 913K-1 HDG ERR connections from 331P-1/1V J2-A, B to 331A-3G J1-A, B.                  |                  | 1 Jan 74    |
| Notes 6 thru 11         | Added.                                                                                         |                  | 1 Jan 74    |

AP-106, FD-106P/PV, and MCS-107/107V 3-Axis System With Bootstrapped  
 331A-3G Course Indicator, Interconnect Diagram  
 Figure 7 (Sheet A)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                          | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------------------------------------------------------|------------------|-------------|
| C1                      | Replaced 913K-1/1A circuit breaker (3 A) and 161H-1 circuit breaker (2 A) with a single breaker (5 A). |                  | 15 May 74   |
| C2                      | Changed +13-V dc power for 590A-6 (J1-A, B) from 913K-1/1A J2-2, 8 to 161H-1 J1-60, 4.                 |                  | 15 May 74   |
| C3                      | Replace aileron and elevator servo circuit breakers (3 A each) with a single breaker (5 A).            |                  | 15 May 74   |
| C4                      | Added isolation diode (1N645) in AP DISENGA+ line to trim servo.                                       |                  | 15 May 74   |
| C5                      | Revised 913K-1/1A and 161H-1 shields and twisted pairs (note 13).                                      |                  | 15 May 74   |
| Notes 12 thru 16        | Added.                                                                                                 |                  | 15 May 74   |
| D1                      | Changed manual trim resistor from 50 $\Omega$ , 75 W to 50 $\Omega$ , 25 W.                            |                  | 15 Oct 74   |
| D2                      | Added relay K4.                                                                                        |                  | 15 Oct 74   |
| Notes 4, 10, 13         | Restated.                                                                                              |                  | 15 Oct 74   |
| Note 5                  | Added 334C-9A and new statuses of 334C-9.                                                              |                  | 15 Oct 74   |
| Note 11                 | Deleted.                                                                                               |                  | 15 Oct 74   |
| Note 17                 | Added.                                                                                                 |                  | 15 Oct 74   |
| E1                      | Added RNAV CMD inputs from RNAV system to 913K-1/1A.                                                   |                  | 15 Mar 75   |
| E2                      | Revised manual trim solenoid switch connections.                                                       |                  | 15 Mar 75   |

AP-106, FD-106P/PV, and MCS-107/107V 3-Axis System With Bootstrapped  
331A-3G Course Indicator, Interconnect Diagram  
Figure 7 (Sheet B)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                                                                                           | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| E3                      | Added LINEAR DEV ANNUN GND connection for 161H-1.                                                                                                                       |                  | 15 Mar 75   |
| F1                      | Changed 334C-( ) PROG AIL CMD-connections from 161H-1 COM to 913K-1/1A COM (connected at 161H-1 J1-52).                                                                 |                  | 11 Jul 75   |
| F2                      | Removed GYRO MON+ (ATTD FLAG) connection to 913K-1/1A J2-4 and reconnected to 161H-1 J1-56. Added connections between 161H-1 J1-59 (PROC ATTD FLAG) and 931K-1/1A J2-4. |                  | 11 Jul 75   |
| F3                      | Changed 334C-( ) PROG RUD CMD-connections from 161H-1 COM to 913K-1/1A COM (connected at 161H-1 J1-20).                                                                 |                  | 11 Jul 75   |
| Note 5                  | Restated.                                                                                                                                                               |                  | 11 Jul 75   |
| Note 11                 | Added.                                                                                                                                                                  |                  | 11 Jul 75   |
| J1                      | Added NAV FLAG LL connections for 913K-1A.                                                                                                                              |                  | 1 Mar 77    |
| J2                      | Revised cable shields between 913K-1/1A and NAV receiver.                                                                                                               |                  | 1 Mar 77    |
| J3                      | Added diode between FD-106 J2-B and J2-F.                                                                                                                               |                  | 1 Mar 77    |
| J4                      | Revised cable shields between 329T-1 and rudder servo.                                                                                                                  |                  | 1 Mar 77    |
| J5                      | Added ENG ANNUN GND connection for 913K-1A.                                                                                                                             |                  | 1 Mar 77    |
| Notes 2, 13, 14, 15     | Restated.                                                                                                                                                               |                  | 1 Mar 77    |
| Note 5                  | Added 334C-11.                                                                                                                                                          |                  | 1 Mar 77    |

AP-106, FD-106P/PV, and MCS-107/107V 3-Axis System With Bootstrapped  
 331A-3G Course Indicator, Interconnect Diagram  
 Figure 7 (Sheet C)

**INTERCONNECT DIAGRAM CHANGES**

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                        | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------------------------------------|------------------|-------------|
| L1                      | Changed radio altimeter analog nomenclature from RADIO ALT +UP/+DN to RADIO ALT +/-. |                  | 1 Jul 78    |
| Note 13                 | Restated.                                                                            |                  | 1 Jul 78    |
| Notes 4, 5              | Restated.                                                                            |                  | 27 Jun 84   |

AP-106, FD-106P/PV, and MCS-107/107V 3-Axis System With Bootstrapped  
331A-3G Course Indicator, Interconnect Diagram  
Figure 7 (Sheet D)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                               | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-------------------------------------------------------------------------------------------------------------|------------------|-------------|
| C1                      | Replaced 913K-1/1A circuit breaker (3 A) and 161H-1 circuit breaker (2 A) with a single breaker (5 A).      |                  | 15 May 74   |
| C2                      | Connected 331A-6P J2-40 to 26-V ac 913K-1/1A circuit breaker.                                               |                  | 15 May 74   |
| C3                      | Replaced aileron and elevator servo circuit breakers (3 A each) with a single breaker (5 A).                |                  | 15 May 74   |
| C4                      | Added isolation diode (1N645) in AP DISENGA+ line to trim servo.                                            |                  | 15 May 74   |
| C5                      | Removed 331A-6P J2-1, 2, 3 from J2-17, 18, 19 and connected to J2-37, 38, 39 and J1-9, 10, 11 respectively. |                  | 15 May 74   |
| Notes 13 thru 17        | Added.                                                                                                      |                  | 15 May 74   |
| D1                      | Changed manual trim resistor from 50 $\Omega$ , 75 W to 50 $\Omega$ , 25 W.                                 |                  | 15 Oct 74   |
| D2                      | Removed 331A-6P J2-15 from 328A-3G J1-5 and connected to 26-V ac 913K breaker.                              |                  | 15 Oct 74   |
| Notes 6 and 17          | Interchanged.                                                                                               |                  | 15 Oct 74   |
| Note 12                 | Replaced by new note.                                                                                       |                  | 15 Oct 74   |
| Note 14                 | Restated.                                                                                                   |                  | 15 Oct 74   |
| E1                      | Added RNAV CMD inputs from RNAV system to 913K-1/1A J1-28, 35.                                              |                  | 15 Mar 75   |
| E2                      | Revised manual trim solenoid switch connections.                                                            |                  | 15 Mar 75   |
| E3                      | Added LINEAR DEV ANNUN GND from 161H-1 J1-6.                                                                |                  | 15 Mar 75   |

AP-106, FD-108X, and PN-101 3-Axis System, Interconnect Diagram  
Figure 8 (Sheet A)

INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                                                                                       | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| E4                      | Revised servo amplifier connections between 331A-6P J2 and 328A-3G J1.                                                                                              |                  | 15 Mar 75   |
| F1                      | Connected 331A-6P J2-30 to +28 V dc 913K breaker.                                                                                                                   |                  | 11 Jul 75   |
| F2                      | Remove GYRO MON+ (ATTD FLAG) connecting to 913K-1/1A J2-4 and connected to 161H-1 J1-56. Added connection between 161H-1 J1-59 and 913K-1/1A J2-4 (PROC ATTD FLAG). |                  | 11 Jul 75   |
| F3                      | Changed 334C-( ) PROC AIL CMD-connection from 161H-1 COM to 913K-1/1A COM (connected at 161H-1 J1-52).                                                              |                  | 11 Jul 75   |
| F4                      | Changed 334C-( ) PROC RUD CMD-connection from 161H-1 COM to 329T-1 RUD CMD- (connected at 161H-1 J1-20).                                                            |                  | 11 Jul 75   |
| F5                      | Added relay K4.                                                                                                                                                     |                  | 11 Jul 75   |
| Notes 18, 19            | Added.                                                                                                                                                              |                  | 11 Jul 75   |
| H1                      | Revised shield grounding requirements.                                                                                                                              |                  | 15 Jul 76   |
| Note 12                 | Deleted.                                                                                                                                                            |                  | 15 Jul 76   |
| Notes 15, 16            | Restated.                                                                                                                                                           |                  | 15 Jul 76   |
| J1                      | Added ENG ANNUN GND connection from 913K-1A.                                                                                                                        |                  | 1 Mar 77    |
| J2                      | Interchanged 329B-7R J1-m and J1-n for proper phase.                                                                                                                |                  | 1 Mar 77    |
| J3                      | Added NAV FLAG LL connections for 913K-1A.                                                                                                                          |                  | 1 Mar 77    |

AP-106, FD-108X, and PN-101 3-Axis System, Interconnect Diagram  
Figure 8 (Sheet B)

## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                        | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------------------------------------|------------------|-------------|
| Notes 2, 14             | Restated.                                                                            |                  | 1 Mar 77    |
| Note 6                  | Was note 17. Added 334C-11.                                                          |                  | 1 Mar 77    |
| Note 12                 | Was note 19.                                                                         |                  | 1 Mar 77    |
| Note 17                 | Was note 6.                                                                          |                  | 1 Mar 77    |
| L1                      | Changed radio altimeter analog nomenclature from RADIO ALT +UP/+DN to RADIO ALT +/-. |                  | 1 Jul 78    |
| Note 14                 | Restated.                                                                            |                  | 1 Jul 78    |
| Note 19                 | Added.                                                                               |                  | 1 Jul 78    |
| M1                      | Replaced 332D-12 Vertical Gyro with 332D-11( ) Vertical Reference.                   |                  | 27 Jun 84   |
| Notes 4, 6              | Restated.                                                                            |                  | 27 Jun 84   |

AP-106, FD-108X, and PN-101 3-Axis System, Interconnect Diagram  
Figure 8 (Sheet C)





## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                                 | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|---------------------------------------------------------------------------------------------------------------|------------------|-------------|
| E1                      | Added jumper between 913K-1 J2-24, 26, 34, and 36.                                                            |                  | 15 Mar 75   |
| E2                      | Added RNAV CMD connections between 913K-1 and RNAV system.                                                    |                  | 15 Mar 75   |
| E3                      | Revised manual trim solenoid switch connections.                                                              |                  | 15 Mar 75   |
| Note 6                  | Restated.                                                                                                     |                  | 11 Jul 75   |
| Note 11                 | Added.                                                                                                        |                  | 11 Jul 75   |
| J1                      | Corrected shield connections between 913K-1, FD-112C/V and NAV receiver, and between 329T-1 and 334C-9/9A/11. |                  | 1 Mar 77    |
| J2                      | Added NAV FLAG connections to 913K-1A.                                                                        |                  | 1 Mar 77    |
| J3                      | Added 913K-1A annunciator connections.                                                                        |                  | 1 Mar 77    |
| J4                      | Corrected radio altimeter connections to FD-112C/V.                                                           |                  | 1 Mar 77    |
| Notes 2, 6, 13, 14      | Restated.                                                                                                     |                  | 1 Mar 77    |
| L1                      | Changed radio altimeter analog nomenclature from RADIO ALT +UP/+DN to RADIO ALT +/-.                          |                  | 1 Jul 78    |
| Note 13                 | Restated.                                                                                                     |                  | 1 Jul 78    |
| Note 15                 | Added.                                                                                                        |                  | 1 Jul 78    |
| M1                      | Replaced 332D-12 Vertical Gyro with 332D-11( ) Vertical Reference.                                            |                  | 27 Jun 84   |
| Notes 4, 6              | Restated.                                                                                                     |                  | 27 Jun 84   |

AP-107, FD-112C/V, and PN-101 3-Axis System, Interconnect Diagram  
Figure 9 (Sheet A)



## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|-----------------------------------------------|------------------|-------------|
| J1                      | Added NAV FLAG LL connections for 913K-1A.    |                  | 1 Mar 77    |
| J2                      | Added diode between FD-106 J2-B and J2-F.     |                  | 1 Mar 77    |
| J3                      | Added 913K-1A annunciator connections.        |                  | 1 Mar 77    |
| Notes 2, 8, 9           | Restated.                                     |                  | 1 Mar 77    |
| Note 5                  | Added 334C-11.                                |                  | 1 Mar 77    |
| Note 8                  | Restated.                                     |                  | 1 Jul 78    |
| Notes 4, 5              | Restated.                                     |                  | 27 Jun 84   |

AP-107, FD-106P/PV, MCS-107/107V, VIR-351, GLS-350,  
and IND-351C 2-Axis System, Interconnect Diagram  
Figure 10 (Sheet A)



## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE          | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|--------------------------------------------------------|------------------|-------------|
| J1                      | Added NAV FLAG LL connections for 913K-1A.             |                  | 1 Mar 77    |
| J2                      | Added diode between FD-106 J2-B and J2-F.              |                  | 1 Mar 77    |
| J3                      | Revised cable shields between 329T-1 and rudder servo. |                  | 1 Mar 77    |
| J4                      | Added 913K-1A annunciator connections.                 |                  | 1 Mar 77    |
| Notes 2, 10, 11         | Restated.                                              |                  | 1 Mar 77    |
| Note 1                  | Added 334C-11.                                         |                  | 1 Mar 77    |
| Note 10                 | Restated.                                              |                  | 1 Jul 78    |
| Notes 1, 4              | Restated.                                              |                  | 27 Jun 84   |

AP-107, FD-106P/PV, MCS-107/107V, VIR-351, GLS-350,  
and IND-351C 3-Axis System, Interconnect Diagram  
Figure 11 (Sheet A)



## INTERCONNECT DIAGRAM CHANGES

| REVISION IDENTIFICATION | DESCRIPTION OF REVISION AND REASON FOR CHANGE                                                                                                                                                                                                                       | SERVICE BULLETIN | EFFECTIVITY |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| A1                      | Changed the 328A-3G circuit breaker to 4A.                                                                                                                                                                                                                          |                  | 27 Jun 84   |
| A2                      | Rewired HSI-84 J2-15 and 16 to 328A-3G J1-5 and 4. The wire to 328A-3G J1-5 is new.                                                                                                                                                                                 |                  | 27 Jun 84   |
| B1                      | Added note 20 and revised the HSI-84 display dimming circuit to cover -01X status units.                                                                                                                                                                            |                  | 27 Jun 84   |
| B2                      | Added note 21 to specify compass flag wiring to REU-84( ).                                                                                                                                                                                                          |                  | 27 Jun 84   |
| B3                      | Added note 22 and deleted TEST connection to DME.                                                                                                                                                                                                                   |                  | 27 Jun 84   |
| C1                      | Rewired REU-84A J1-W to +28 V DC BUS through HSI 1A fuse. Rewired REU-84A J1-j to HSI-84 J1-47 and to +28 V DC BUS through added NAV 1A fuse.                                                                                                                       |                  | 27 Jun 84   |
| C2                      | Rewired HSI-84 J2-11, -13, -14, -21, and 328A-3G J1-6, -7, -8, -9, using two shielded pairs instead of a 4-conductor shielded cable.                                                                                                                                |                  | 27 Jun 84   |
| C3                      | For the ADI-84A, changed J1-LL to J1-w, J1-e to J1-v, J1-KK to J1-u, and J1-c to J1-t. Added jumpers from J1-FF to J1-LL and from J1-JJ to J1-KK and added note 23. This provides buffered differential inputs for the pitch and roll command bar servo amplifiers. | ADI-84A<br>SB 3  | 27 Jun 84   |
| D1                      | Replaced 332D-12 Vertical Gyro with 332D-11( ) Vertical Reference.                                                                                                                                                                                                  |                  | 27 Jun 84   |
| Note 6                  | Added new statuses of 332C-9A and 334C-11.                                                                                                                                                                                                                          |                  | 27 Jun 84   |

AP-106, FIS-84, and PN-101 3-Axis System, Interconnect Diagram  
Figure 11A (Sheet A)



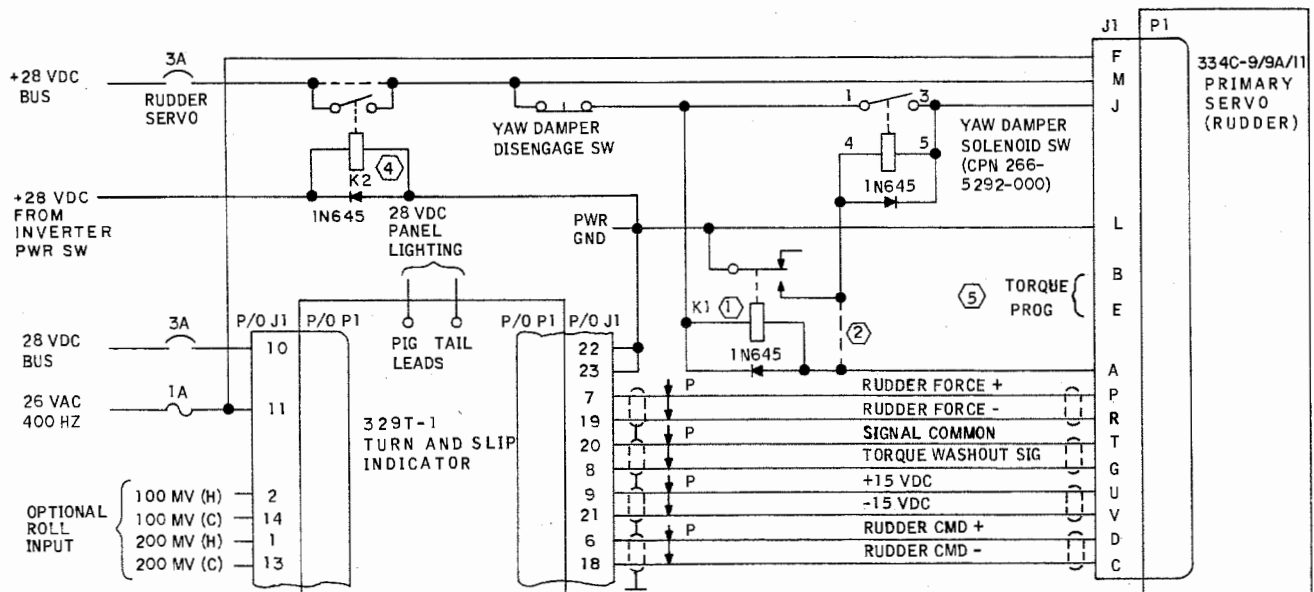


**INTERCONNECT DIAGRAM CHANGES**

| REVISION<br>IDENTIFICATION | DESCRIPTION OF REVISION<br>AND REASON FOR CHANGE                                                                                            | SERVICE<br>BULLETIN | EFFECTIVITY                      |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------------|
|                            | <p>Corrected nomenclature on wire connected to 454N-2 P1-21.</p> <p>Replaced 332D-12 Vertical Gyro with 332D-11 ( ) Vertical Reference.</p> |                     | <p>1 Jul 78</p> <p>27 Jun 84</p> |

*454N-2 and AP-106/107 System, Interconnect Diagram  
Figure 13 (Sheet A)*





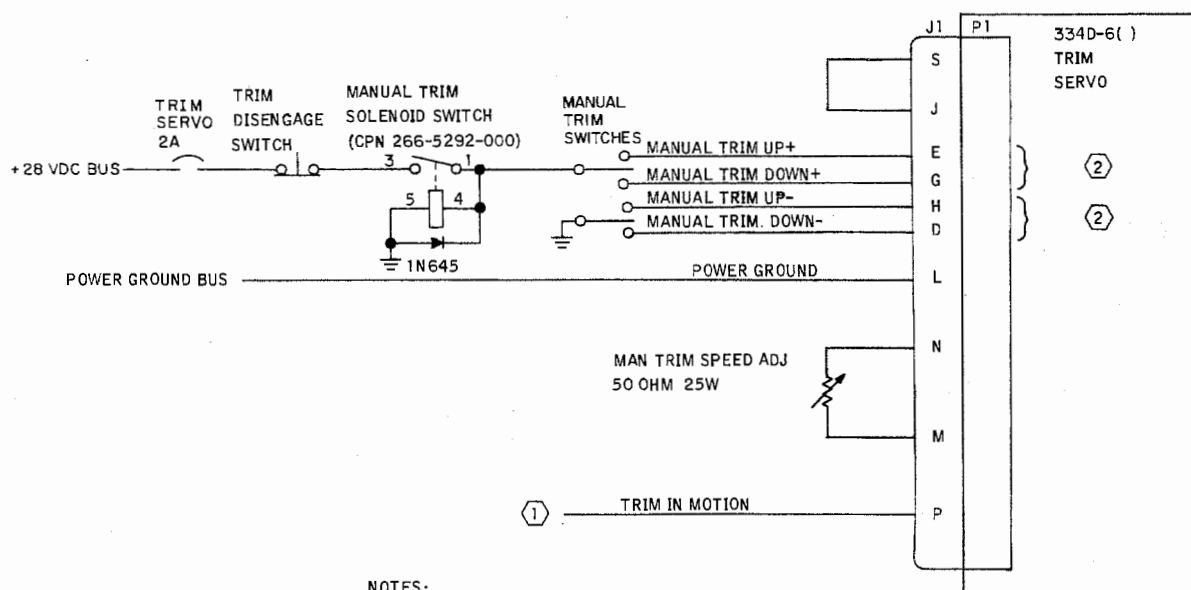
NOTES:

- ① THE COIL OF RELAY K1 MUST NOT DRAW MORE THAN 75 MADC.
- ② IF YAW DAMPER SOLENOID SWITCH DOES NOT DRAW MORE THAN 75 MADC, RELAY K1 CAN BE ELIMINATED AND THE SOLENOID SWITCH CONNECTED AS SHOWN BY THE DASHED LINE.
- ③ ALL WIRES CARRYING 28 VDC, 26V 400 HZ AND POWER GND WIRES MUST BE SIZE 22 AWG IF LESS THAN 20 FEET IN LENGTH OR 20 AWG IF MORE THAN 20 FEET. ALL OTHER WIRES MAY BE SIZE 24 AWG.
- ④ IF 334C-9A SERVO IS USED OR IF 26 VAC AIRCRAFT POWER IS CONTROLLED BY THE 28 VDC POWER SWITCH, RELAY K2 CAN BE ELIMINATED AND THE DC SERVO POWER CONNECTED AS SHOWN BY THE DASHED LINE.
- ⑤ SERVO TORQUE PROGRAMMING INPUTS J1-B AND J1-E MUST BOTH BE OPEN OR GROUNDED FOR NORMAL TORQUE AND HAVE +28 V DC APPLIED FOR HIGH TORQUE.

TP3-5748-013

Yaw Damper System, Interconnect Diagram

Figure 14



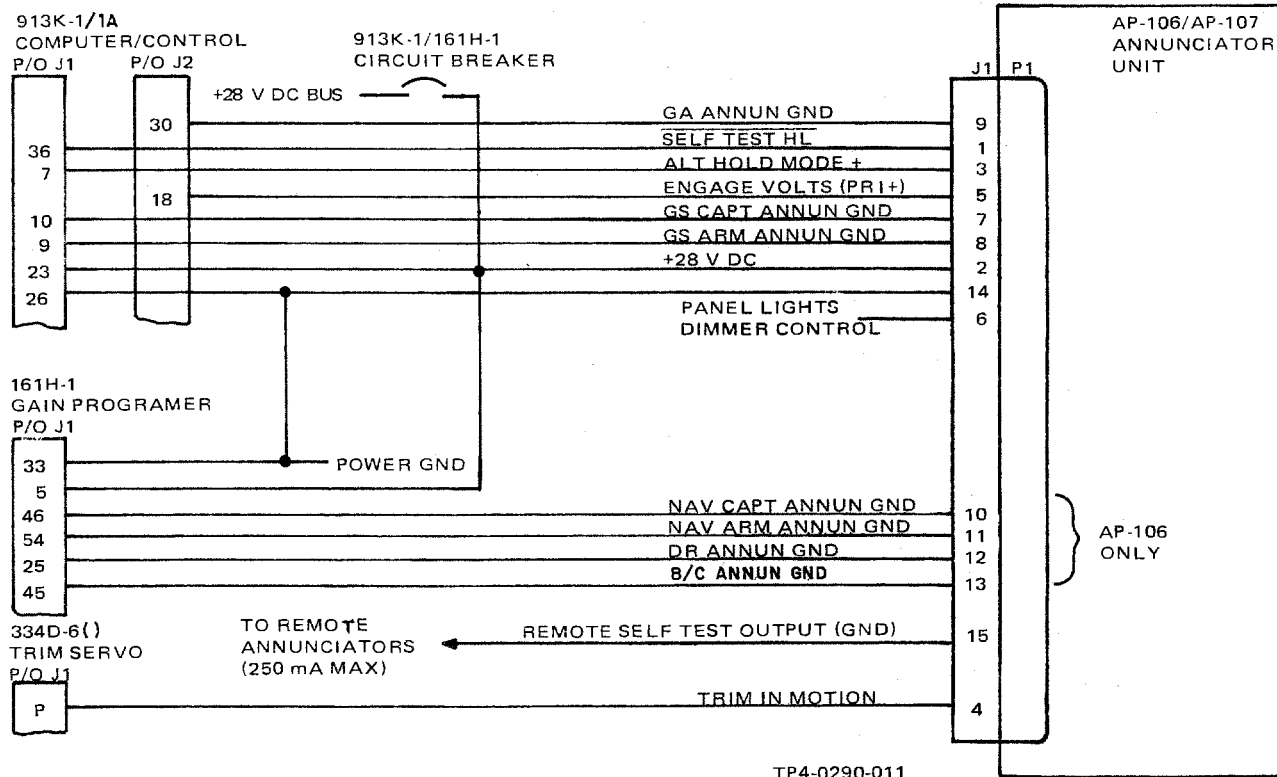
NOTES:

- ① CONNECT TO VISUAL OR AURAL WARNING DEVICE IN COCKPIT.
- ② CONNECT AS SHOWN FOR CW ROTATION OF CAPSTAN (WHEN VIEWED FROM CAPSTAN END) WITH MANUAL TRIM UP APPLIED. IF REVERSE ROTATION IS DESIRED, INTERCHANGE EACH PAIR OF WIRES NOTED.

TP3-5749-013

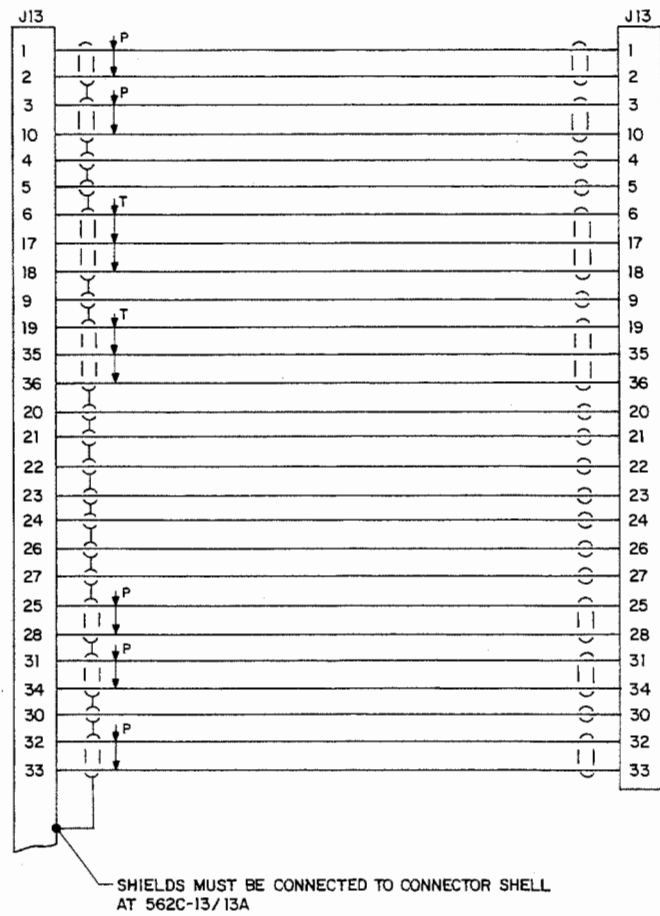
Elevator Trim System, Interconnect Diagram

Figure 15



AP-106/AP-107 Annunciator Unit, Interconnect Diagram  
Figure 16

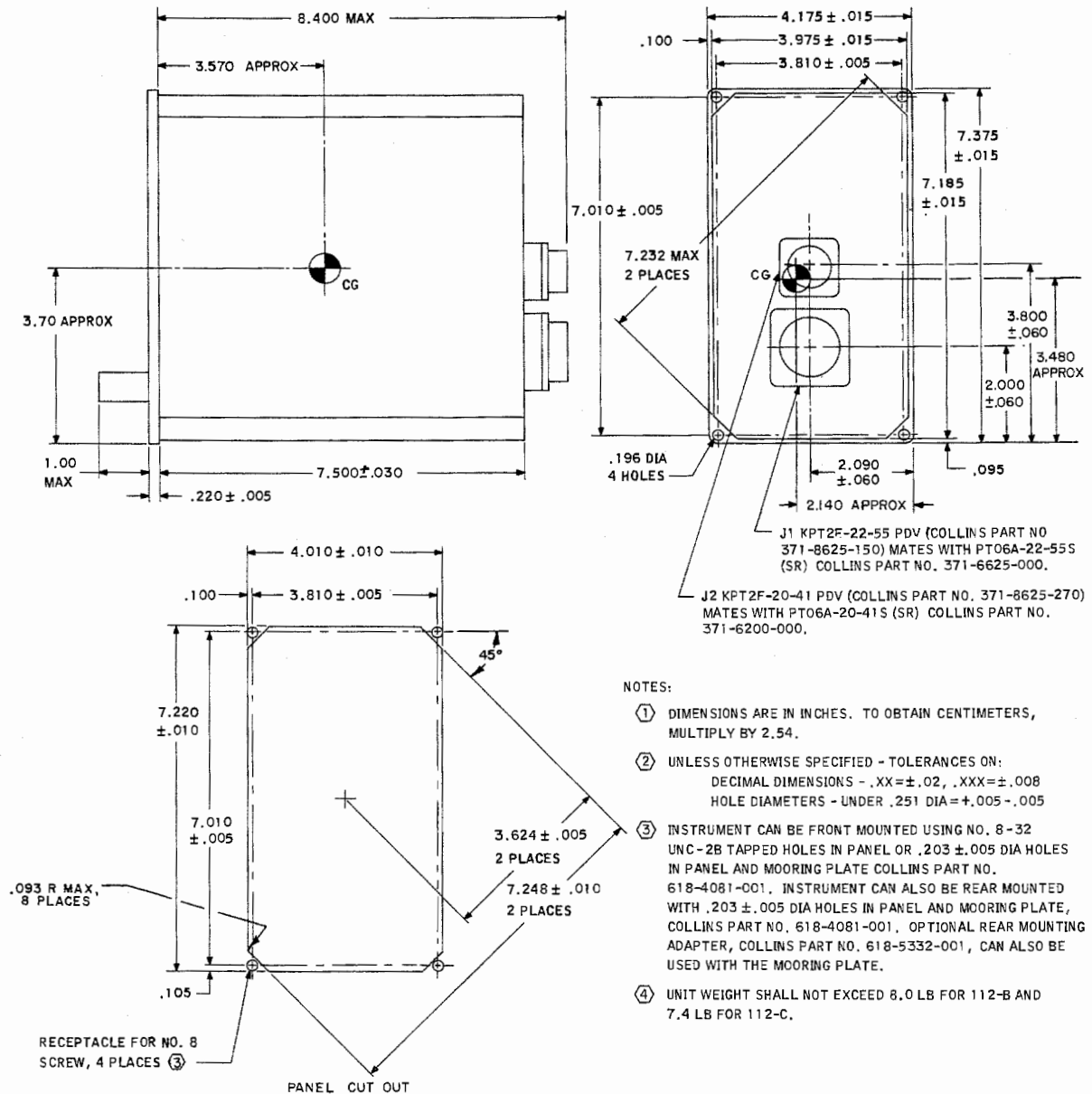
614E-42/42A



TP6-3393-013

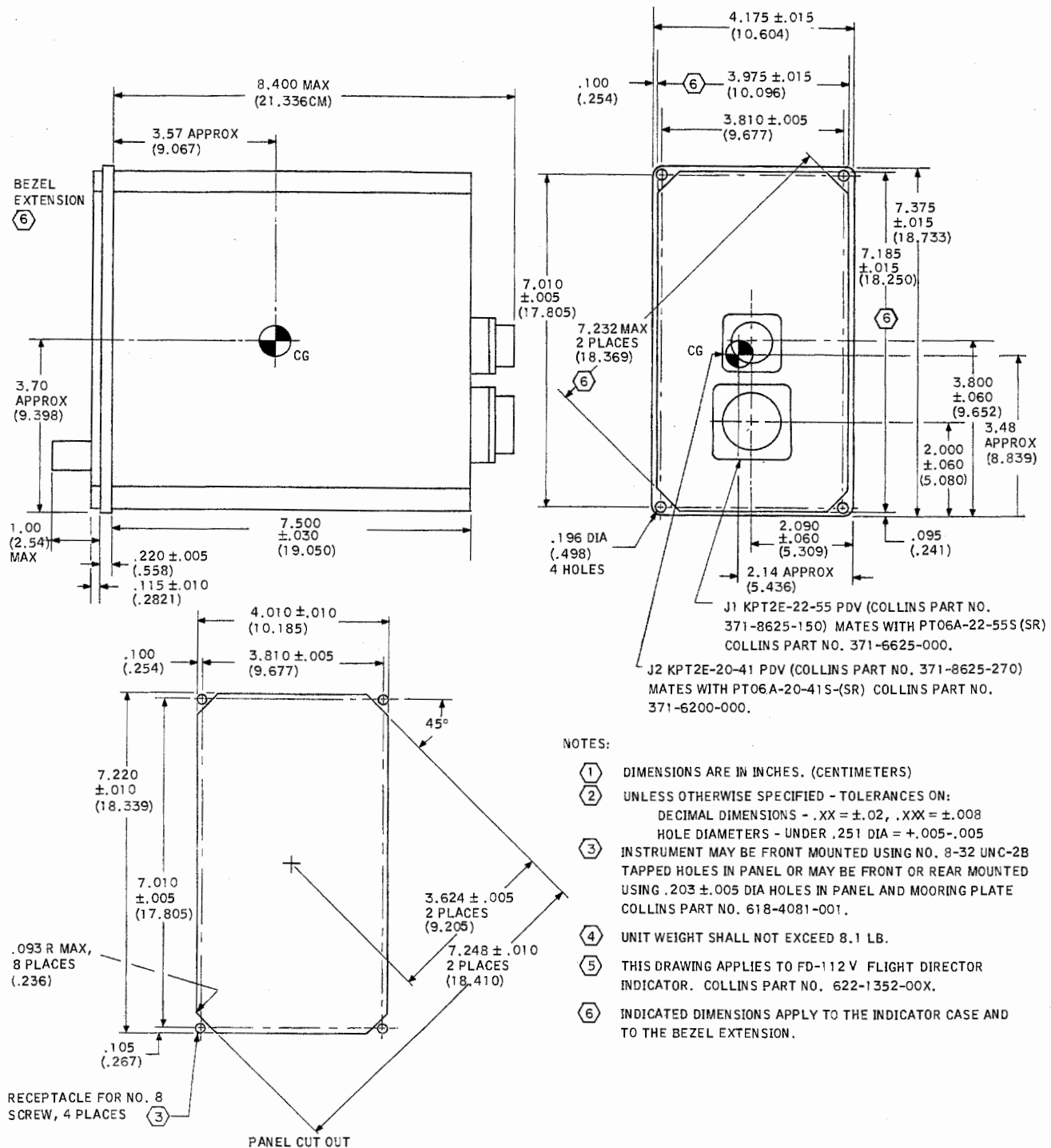
562C-13/13A and 614E-42/42A Remote Installation,  
Interconnect Diagram  
Figure 16A





TP3-2258-014  
621-3047-001

FD-112C Flight Director Indicator, Outline and Mounting Diagram  
Figure 17



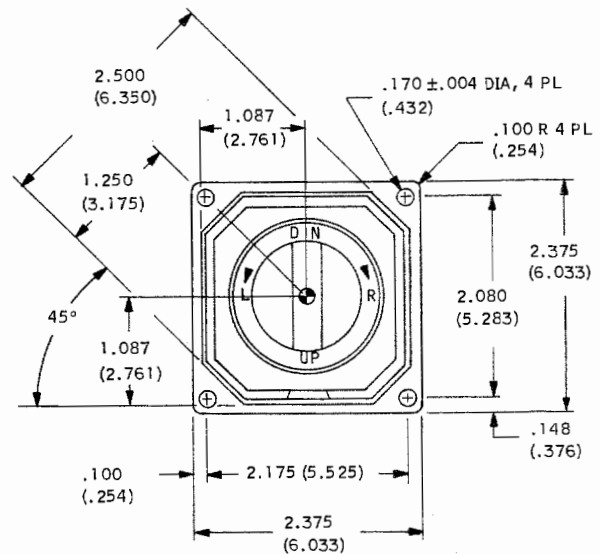
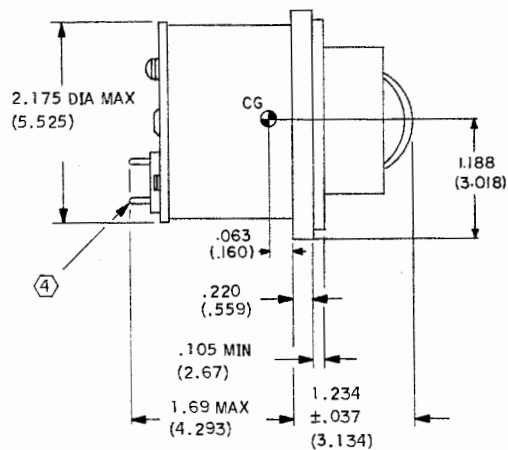
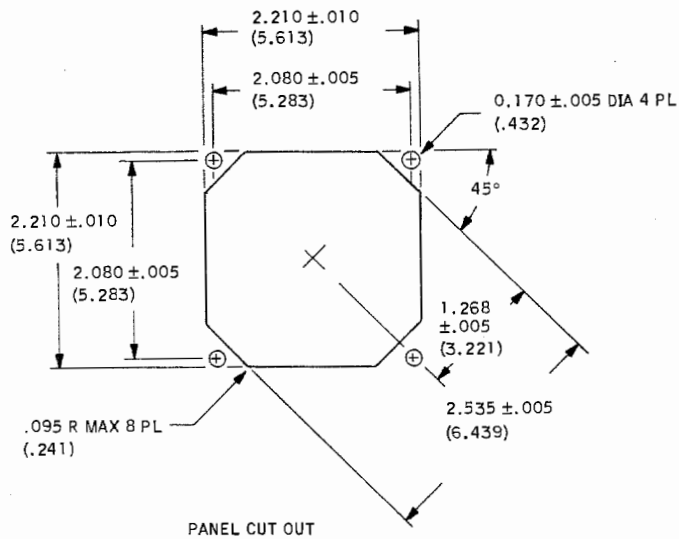
NOTES:

- (1) DIMENSIONS ARE IN INCHES. (CENTIMETERS)
- (2) UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
HOLE DIAMETERS - UNDER .251 DIA = +.005-.005
- (3) INSTRUMENT MAY BE FRONT MOUNTED USING NO. 8-32 UNC-2B TAPPED HOLES IN PANEL OR MAY BE FRONT OR REAR MOUNTED USING .203 ±.005 DIA HOLES IN PANEL AND MOORING PLATE COLLINS PART NO. 618-4081-001.
- (4) UNIT WEIGHT SHALL NOT EXCEED 8.1 LB.
- (5) THIS DRAWING APPLIES TO FD-112 V FLIGHT DIRECTOR INDICATOR. COLLINS PART NO. 622-1352-00X.
- (6) INDICATED DIMENSIONS APPLY TO THE INDICATOR CASE AND TO THE BEZEL EXTENSION.

TP3-6489-014

FD-112V Flight Director Indicator, Outline and Mounting Diagram  
Figure 18





NOTES:

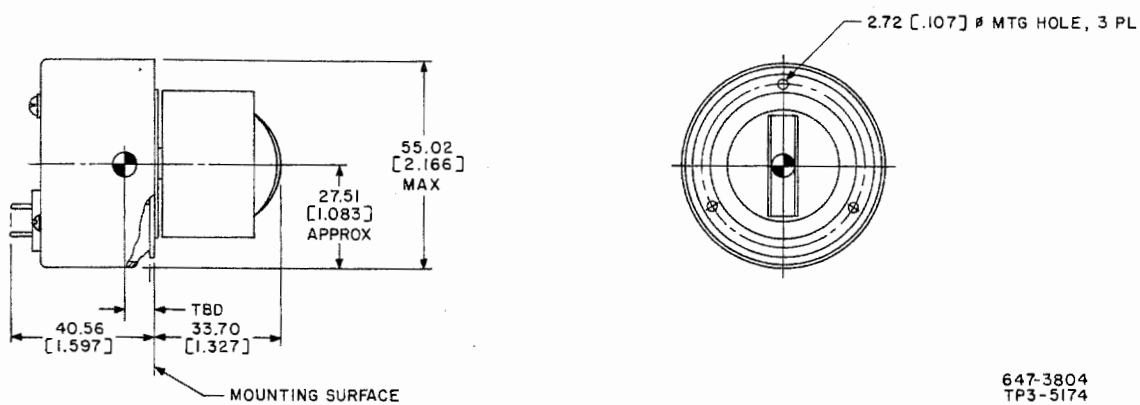
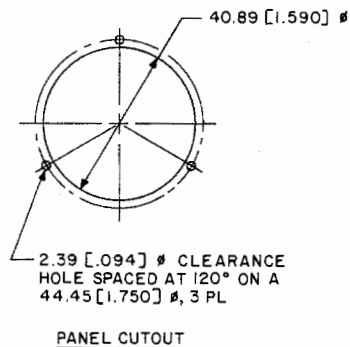
- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
HOLE DIAMETERS - UNDER .251 DIA = +.005 -.005  
.251 TO .500 DIA = +.006 -.005  
OVER .500 DIA = +.008 -.005  
ANGLES = ±1.0°
- ③ WEIGHT: 0.3 lb (0.14 kg)
- ④ CONNECTOR: AMPHENOL 126-219 OR EQUAL (COLLINS PART NO. 372-1538-000).  
LOCK: AMPHENOL 126-1069 OR EQUAL (COLLINS PART NO. 372-1126-000).  
MATING CONNECTOR: AMPHENOL 126-222 OR EQUAL (COLLINS PART NO. 372-1539-000).  
MATING SHIELD: AMPHENOL 126-834 OR EQUAL (COLLINS PART NO. 372-1115-000).
- ⑤ THIS DRAWING APPLICABLE TO 622-1210-001 AND 622-3246-001.
- ⑥ Ⓢ DENOTES CENTER OF GRAVITY.

647-3804  
TP3-5174

614E-41/41A Pitch/Turn Control (622-1210-001  
and 622-3246-001), Outline and  
Mounting Diagram  
Figure 26

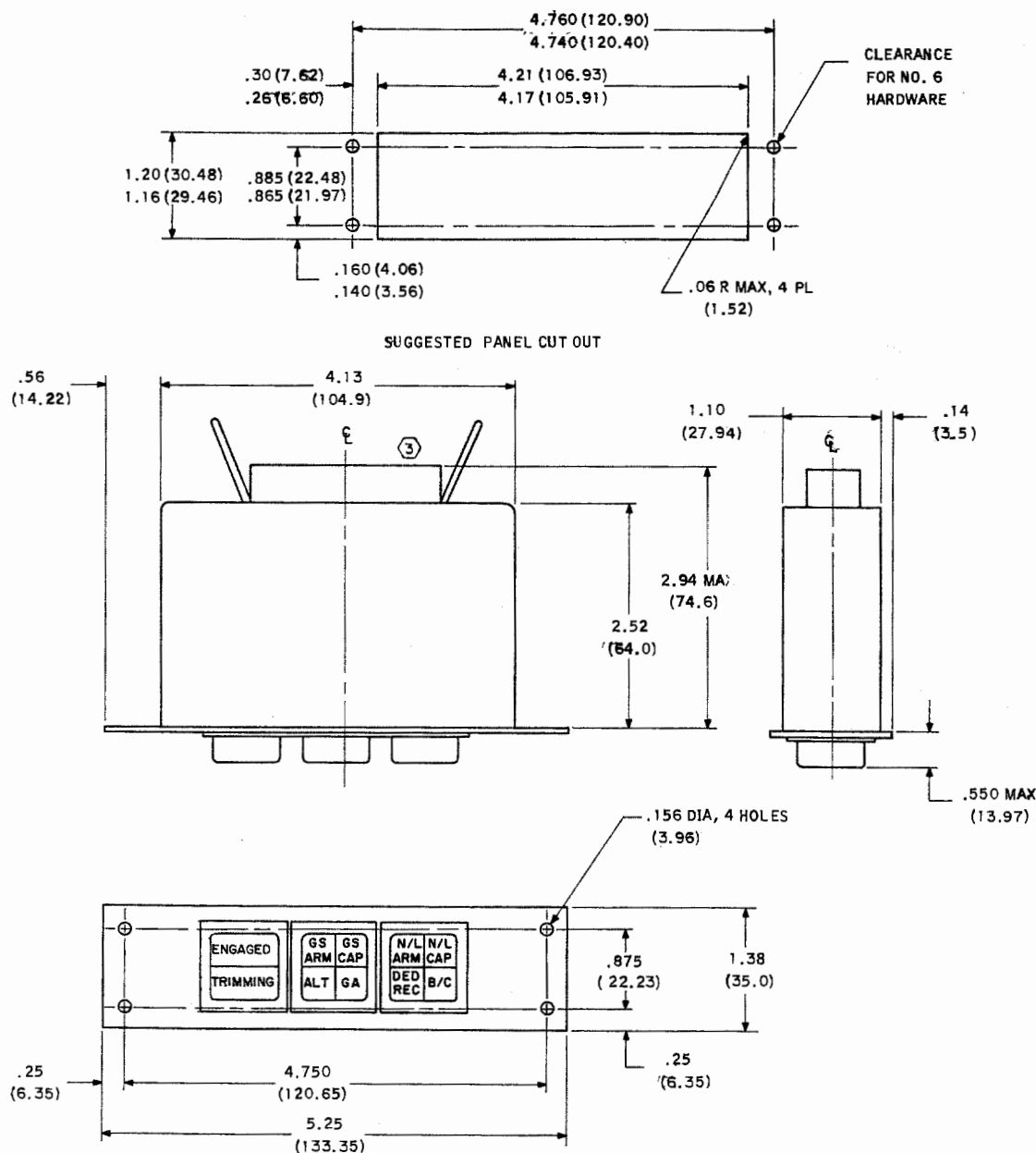
NOTES:

- ① DIMENSIONS ARE IN MILLIMETRES [INCHES].
- ② UNLESS OTHERWISE SPECIFIED TOLERANCE ON:  
 DECIMAL DIMENSIONS- .XX=  $\pm .02$ , .XXX=  $\pm .008$   
 HOLE DIAMETERS- UNDER .251 =  $+.005$ - $.005$   
                                           .251 TO .500 =  $+.006$ - $.005$   
                                           OVER .500 =  $+.008$ - $.005$   
 ANGLES -  $\pm 1.0^\circ$
- ③ WEIGHT: 0.09 Kg C.2LB3.
- ④ CONNECTOR INFO: AMPHENOL 126-219 OR EQUAL (CPN 372-1538-000).  
 LOCK: AMPHENOL 126-1069 OR EQUAL (CPN 372-1126-000).  
 MATING CONNECTOR: AMPHENOL 126-222 OR EQUAL (CPN 372-1539-000).  
 MATING SHIELD: AMPHENOL 126-834 OR EQUAL (CPN 372-1115-000).
- ⑤ THIS DRAWING APPLICABLE TO 622-1210-002 AND 622-3246-002.
- ⑥  $\bullet$  DENOTES CENTER OF GRAVITY.



647-3804  
TP3-5174

614E-41/41A Pitch/Turn Control (622-1210-002  
and 622-3246-002), Outline  
and Mounting Diagram  
Figure 26A



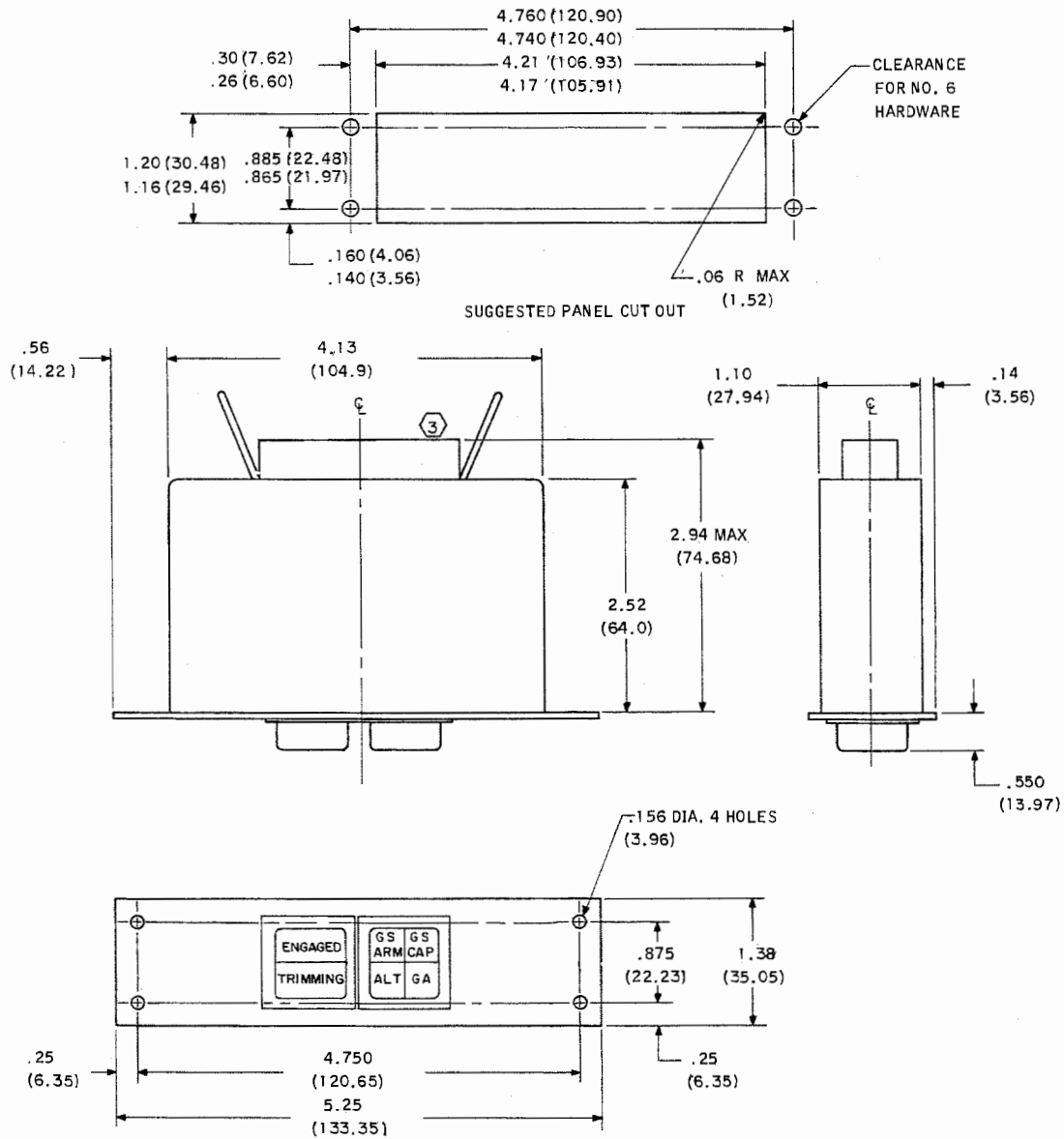
NOTES:

- ① DIMENSIONS ARE IN INCHES (MILLIMETERS)
- ② WEIGHT: 8 OZ (0.23 kg)
- ③ CONNECTOR: CANNON DAM-15P (COLLINS PART NO. 371-0169-000) WITH CANNON D110277 SPRING LATCH (COLLINS PART NO. 371-0040-090)  
 MATING CONNECTOR: CANNON SHELL NO. DAC-15S-FO (COLLINS PART NO. 371-0922-020) WITH (2) CANNON LATCHING DISC ASSEMBLIES D110278 (COLLINS PART NO. 371-0040-070), CANNON CRIMP SOCKET CONTACTS D110238-5 OR 030-1935-000 (COLLINS PART NO. 371-0946-060 OR 371-0946-040) AND CANNON JUNCTION SHELL DC20961 (COLLINS PART NO. 371-0184-000) OR EQUIVALENT.

TP3-9072-014

AP-106 Annunciator Unit, Outline and  
Mounting Diagram  
Figure 27





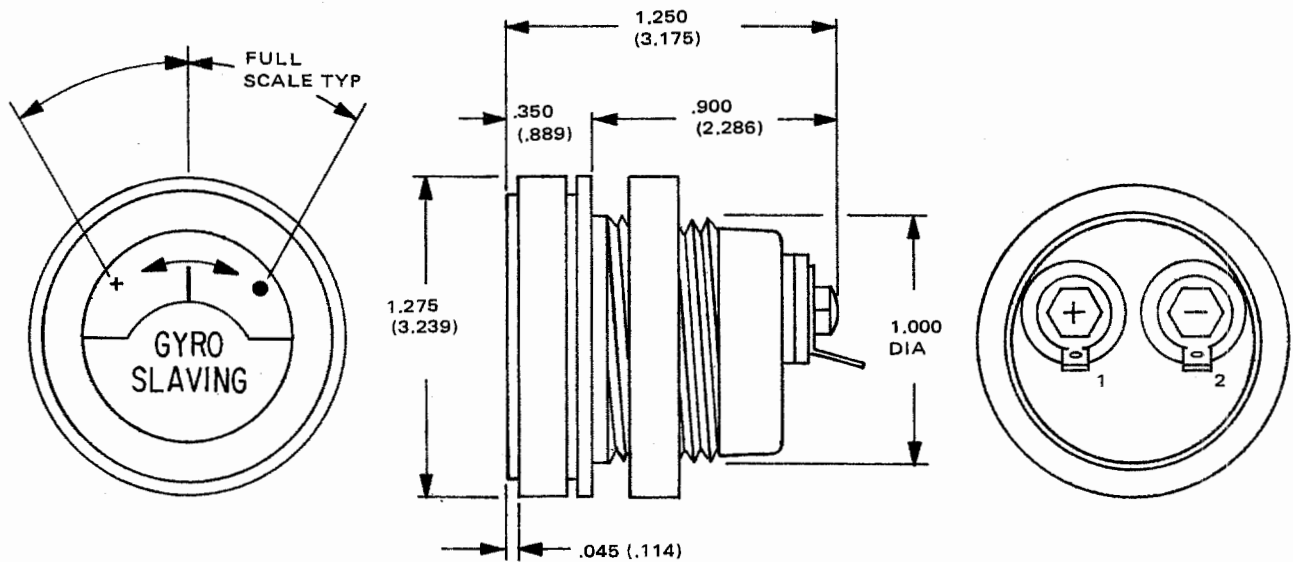
NOTES:

- ① DIMENSIONS ARE IN INCHES (MILIMETERS)
- ② WEIGHT: 7 OZ (0.20 kg)
- ③ CONNECTOR: CANNON DAM-15P (COLLINS PART NO. 371-0169-000) WITH CANNON D110277 SPRING LATCH (COLLINS PART NO. 371-0040-090)
- MATING CONNECTOR: CANNON SHELL NO. DAC-15S-F0 (COLLINS PART NO. 371-0922-020) WITH (2) CANNON LATCHING DISC ASSEMBLIES D110278 (COLLINS PART NO. 371-0040-070), CANNON CRIMP SOCKET CONTACTS D110238-5 OR 030-1935-000 (COLLINS PART NO. 371-0946-060 OR 371-0946-040) AND CANNON JUNCTION SHELL DC20961 (COLLINS PART NO. 371-0184-000) OR EQUIVALENT.

TP3-9071-014

AP-107 Annunciator Unit, Outline and  
Mounting Diagram  
Figure 28





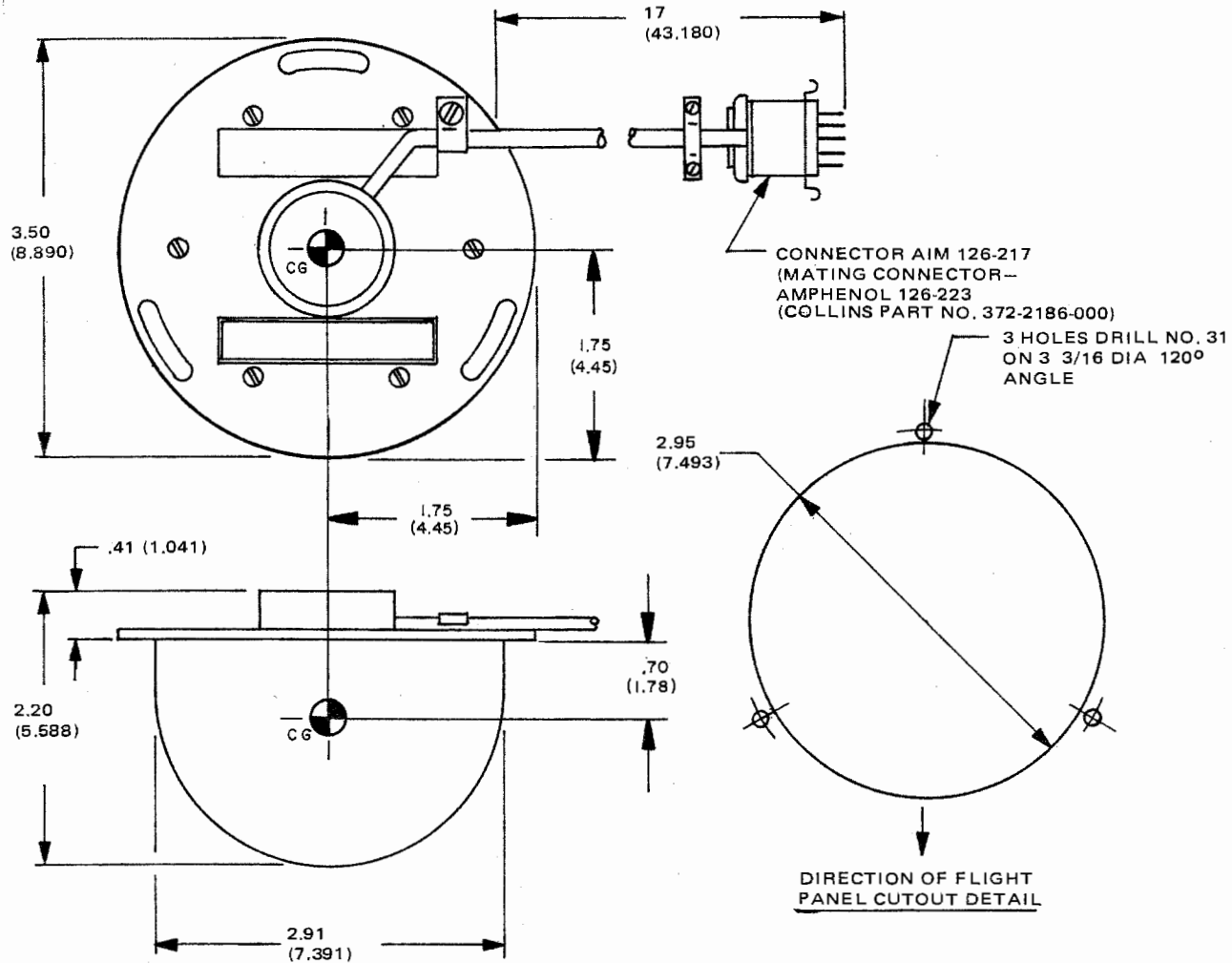
- 1 ALL DIMENSIONS ARE IN INCHES (CENTIMETERS).  
 DECIMAL DIMENSIONS: .XX =  $\pm .02$ , .XXX =  $\pm .008$   
 HOLE DIAMETERS:  
 UNDER .251 DIA =  $+.005 - .005$   
 .251 TO .500 DIA =  $+.006 - .005$   
 OVER .500 DIA =  $+.008 - .005$   
 ANGLES:  $\pm 1.0^\circ$ .

- 2 1 INCH DIAMETER PANEL CUTOUT REQUIRED FOR MOUNTING.

- 3 WEIGHT: 0.5 LB (0.23 KG).

TP3-5480-012

327C-3 Slaving Indicator, Outline and Mounting Diagram  
 Figure 32



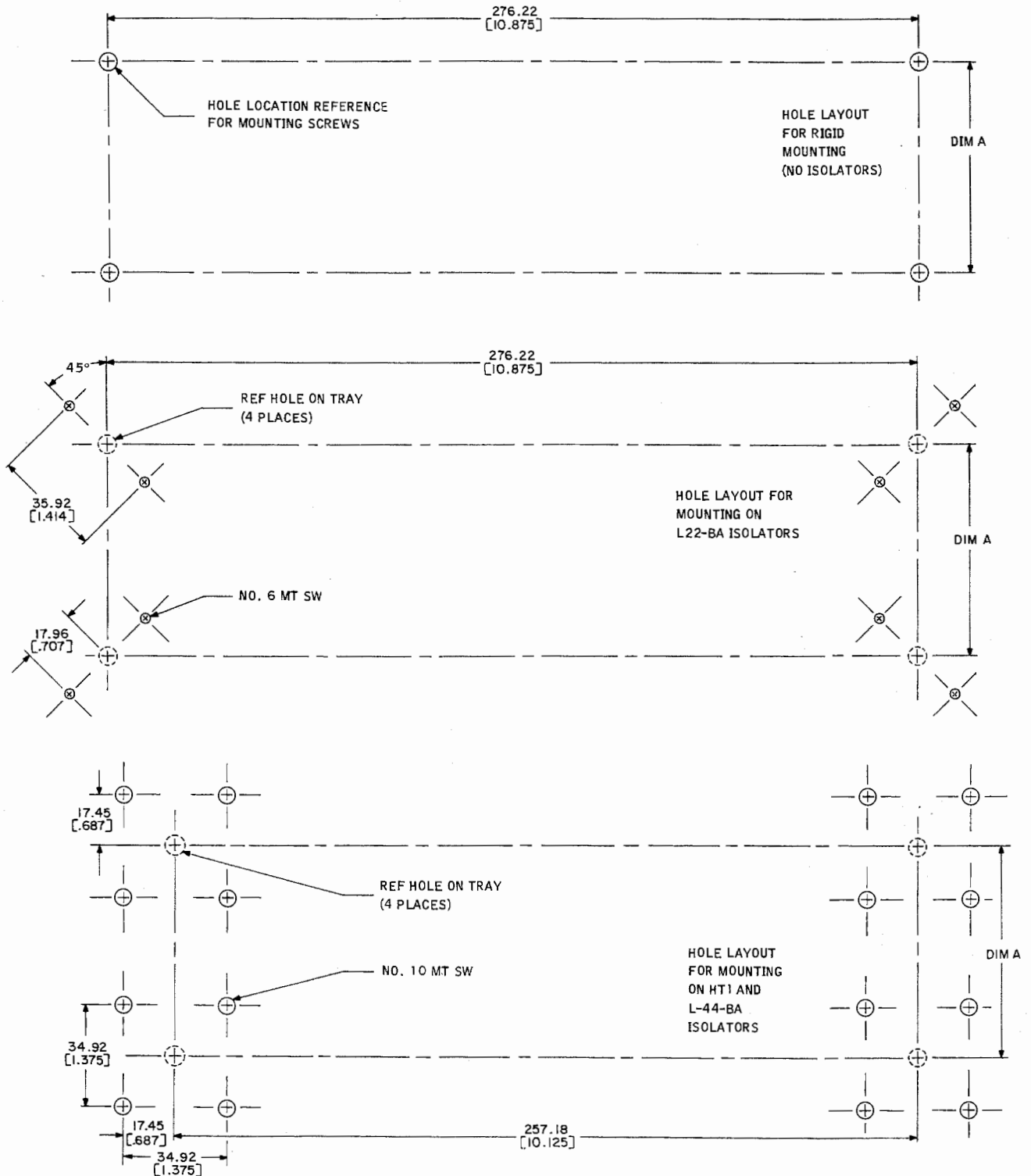
NOTES:

- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② TOLERANCES ON:  
 DECIMAL DIMENSIONS: .XX =  $\pm .02$ , .XXX =  $\pm .008$   
 HOLE DIAMETERS:  
 UNDER .251 DIA =  $+.005 - .005$   
 .251 TO .500 DIA =  $+.006 - .005$   
 OVER .500 DIA =  $+.008 - .005$   
 ANGLES:  $\pm 1.0^\circ$ .
- ③ WEIGHT: 1 LB (0.46 KG)
- ④ INSTALL WITH NON-MAGNETIC BRACKETS AND HARDWARE.
- ⑤ MOUNTING FLANGE TO BE PARALLEL TO HORIZONTAL AXIS OF AIRCRAFT.
- ⑥ INSTALL CLEAR OF MOVING CONTROLS, CABLES, AND OTHER VARIABLE MAGNETIC FIELDS.
- ⑦ ATTACH WITH 4-40 BRASS BINDER HEAD SCREWS AND BRASS LOCK NUTS.

TP3-5493-013

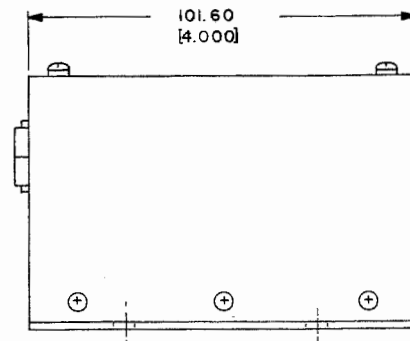
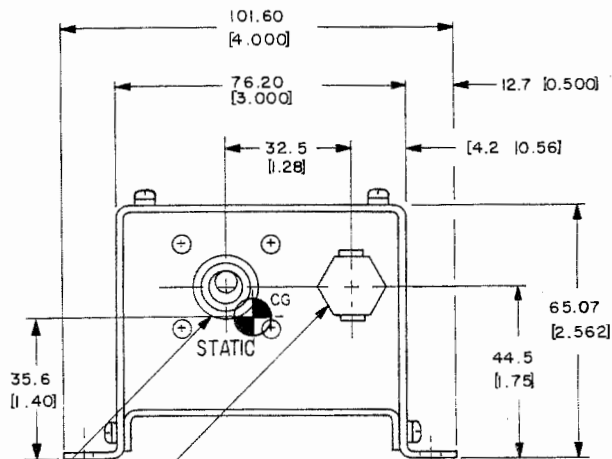
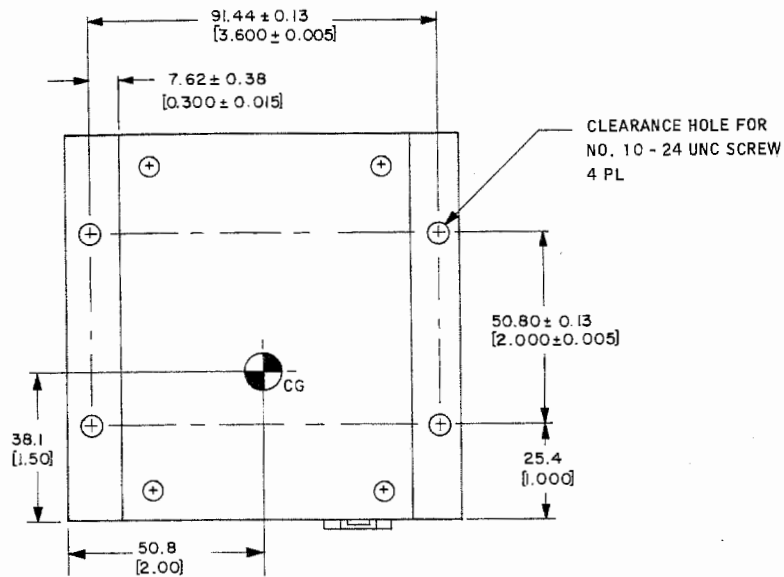
323A-5 Flux Detector, Outline and Mounting Diagram  
Figure 33





641-1962  
TP3-4602-024

390R-18/19/20 Universal Mount,  
Outline and Mounting Diagram  
Figure 35 (Sheet 2)



CONNECTOR: AMPHENOL 126-219  
MATING CONNECTOR: AMPHENOL 126-222  
(COLLINS PART NO. 372-2186-010)

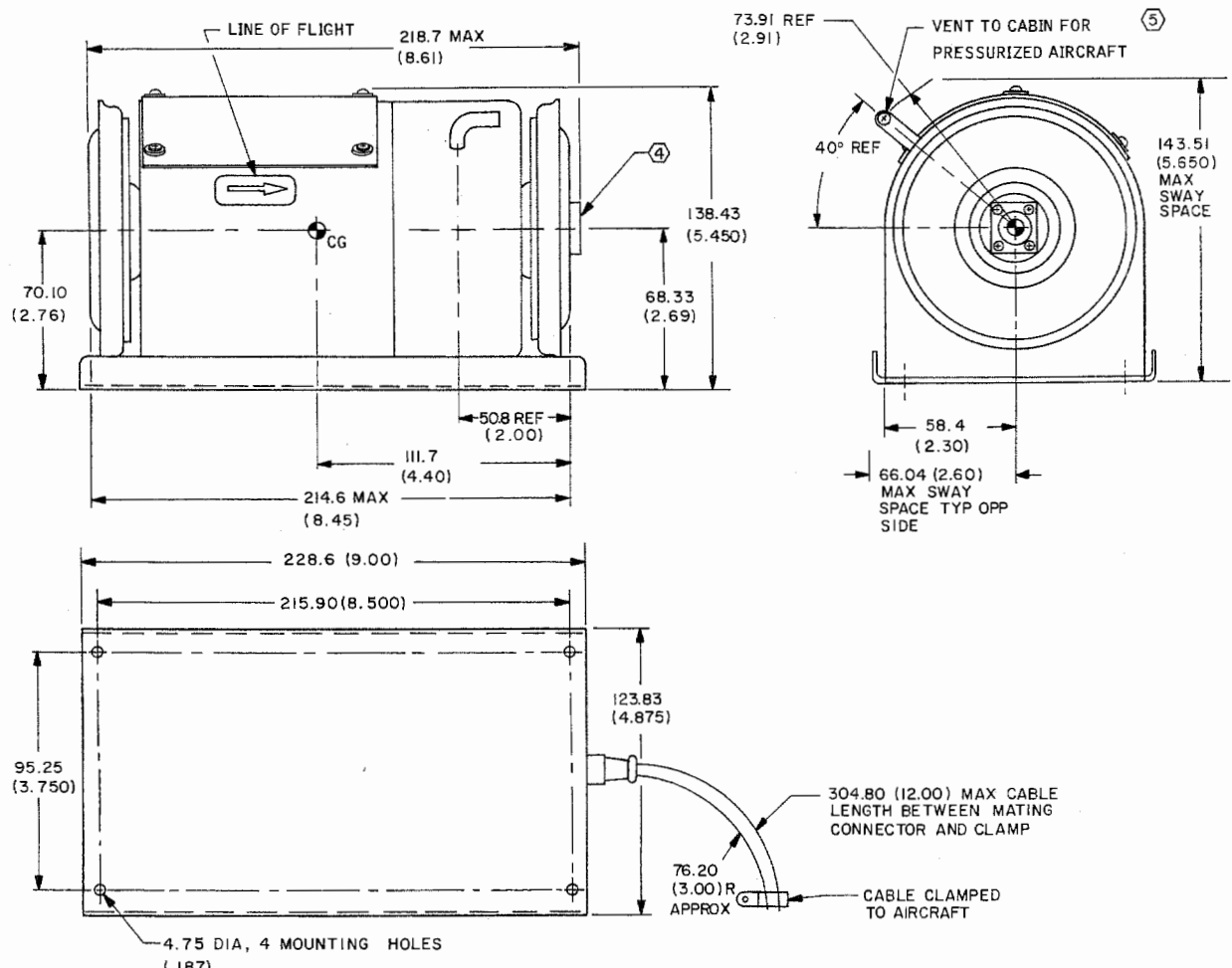
PORT PER MS33649-6

NOTES:

- ① DIMENSIONS ARE MILLIMETRES [INCHES].
- ② WEIGHT: 0.36 KG [0.8 LB].

TP3-5492-014

590A-6/6A Altitude Control, Outline and Mounting Diagram  
Figure 36



NOTES:

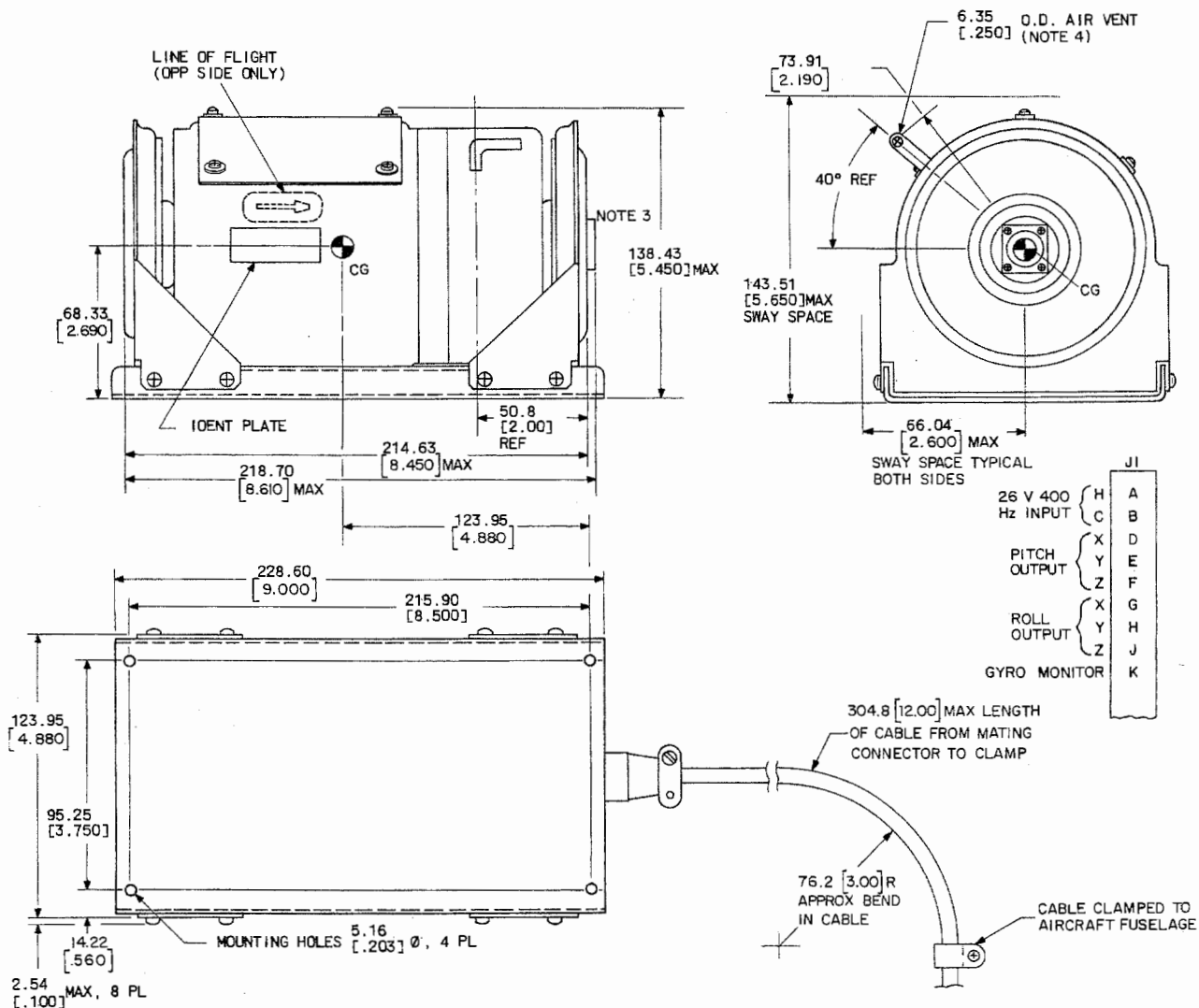
- ① DIMENSIONS ARE MILLIMETERS.  
DIMENSIONS IN ( ) ARE INCHES.
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX =  $\pm 0.5 (.02)$ , XXX =  $\pm 0.20 (.008)$   
HOLE DIAMETERS - UNDER 6.38 (.251) DIA =  $+0.13 (.005) - 0.13 (.005)$   
6.38 (.251) TO 12.70 (.500) DIA =  $+0.15 (.006) - 0.13 (.005)$   
OVER 12.70 (.500) DIA =  $+0.20 (.008) - 0.13 (.005)$   
ANGLES =  $\pm 1.0^\circ$
- ③ WEIGHT: 1.72 KG (3.8 LB)
- ④ CONNECTOR: BENDIX PART NO. PT02A-12-IOP(SR) COLLINS PART NO. 371-2156-000. MATES WITH BENDIX PART NO. PT06A-12-IOS(SR) COLLINS PART NO. 371-6411-000.
- ⑤ USE FOLLOWING FILTER ON AIR VENT:  
AIR FILTER SILENCER, FS TYPE 4-44 SERIES, MODEL F02, 1/4 INCH PIPE SIZE. IF CABIN IS NON PRESSURIZED, USE 4 FT MIN OF 0.25 I.D. HOSE BETWEEN GYRO AND FILTER.
- ⑥ GYRO MUST BE SHIMMED AS REQUIRED FOR LEVEL FLIGHT ATTITUDE.

TP3-5187-014

332D-12 Vertical Gyro, Outline and Mounting Diagram  
Figure 38

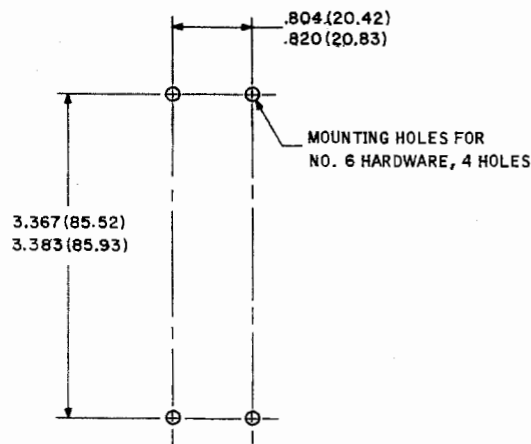
NOTES:

- 1 DIMENSIONS ARE IN MILLIMETRES [INCHES].
- 2 WEIGHT 1.91 kg (4.2 LB).
- 3 CONNECTOR BENDIX PART NO. PT02A12-10P COLLINS PART NO. 371-2156-000  
MATES WITH BENDIX PART NO. PT06A12-10SR COLLINS PART NO. 371-6411-000.
- 4 THE AIR VENT MUST BE CONNECTED TO CABIN PRESSURE THROUGH AIR FILTER SILENCER  
FS TYPE 4-44 SERIES, MODEL FO 2, 0.25 PIPE SIZE. IF CABIN IS NON PRESSURIZED,  
USE 1.22 METRES [4 FT.] MIN OF 0.25 I.D. HOSE BETWEEN GYRO AND FILTER DESCRIBED ABOVE.
- 5 GYRO MUST BE SHIMMED AS REQUIRED FOR LEVEL FLIGHT ATTITUDE.

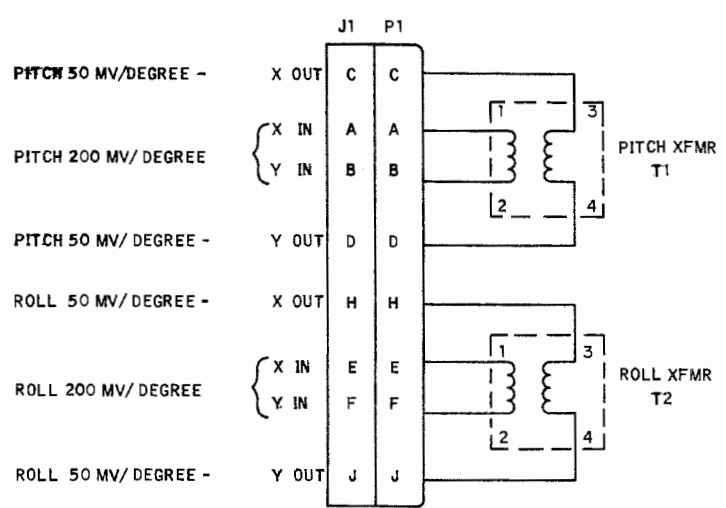


TP4-9595-014

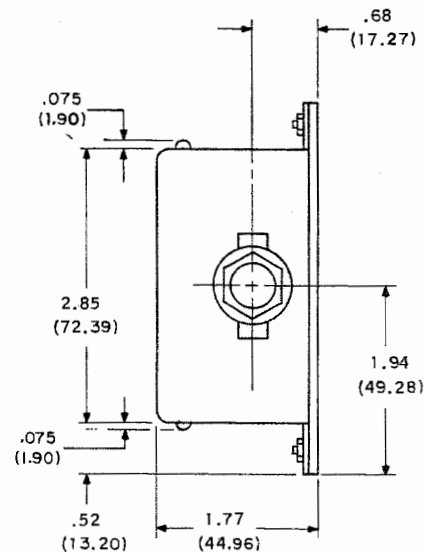
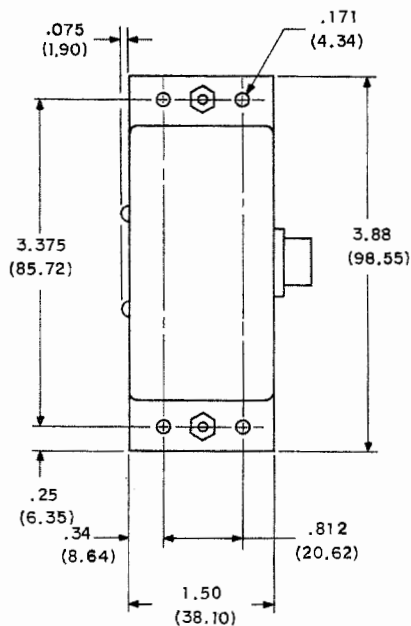
332D-12A Vertical Gyro, Outline and Mounting Diagram  
Figure 39



SUGGESTED MOUNTING LAYOUT



GYRO TRANSFORMER SCHEMATIC DIAGRAM



NOTES:

- ① DIMENSIONS ARE IN INCHES (MILLIMETERS).
- ② WEIGHT
- ③ CONNECTOR: AMPHENOL 126-219 (COLLINS PART NO. 372-1538-000 AND 372-1126-000).  
MATING CONNECTOR: AMPHENOL 126-222 (COLLINS PART NO. 372-1539-000 AND 372-1115-000)  
(INCLUDED WITH UNIT).

TP3-9074-014

Gyro Transformer Assembly, Outline and Mounting Diagram  
Figure 40





**ADDENDUM 2**

**TO**

**COLLINS AP-106/AP-107 FLIGHT CONTROL SYSTEMS  
INSTRUCTION BOOK**

**PART NUMBER 523-0764802-00211A, 2ND EDITION, DATED 27 JUNE 1984**

Insert this addendum sheet facing page 113/114  
of the Installation Section (523-0764806-005118)

**Add Mounting Hardware Torque Requirement**

On Figure 41, 332D-11( ) Vertical Reference, Outline and Mounting Diagram, the instructions on an unnumbered note at the right hand side of the drawing reads:

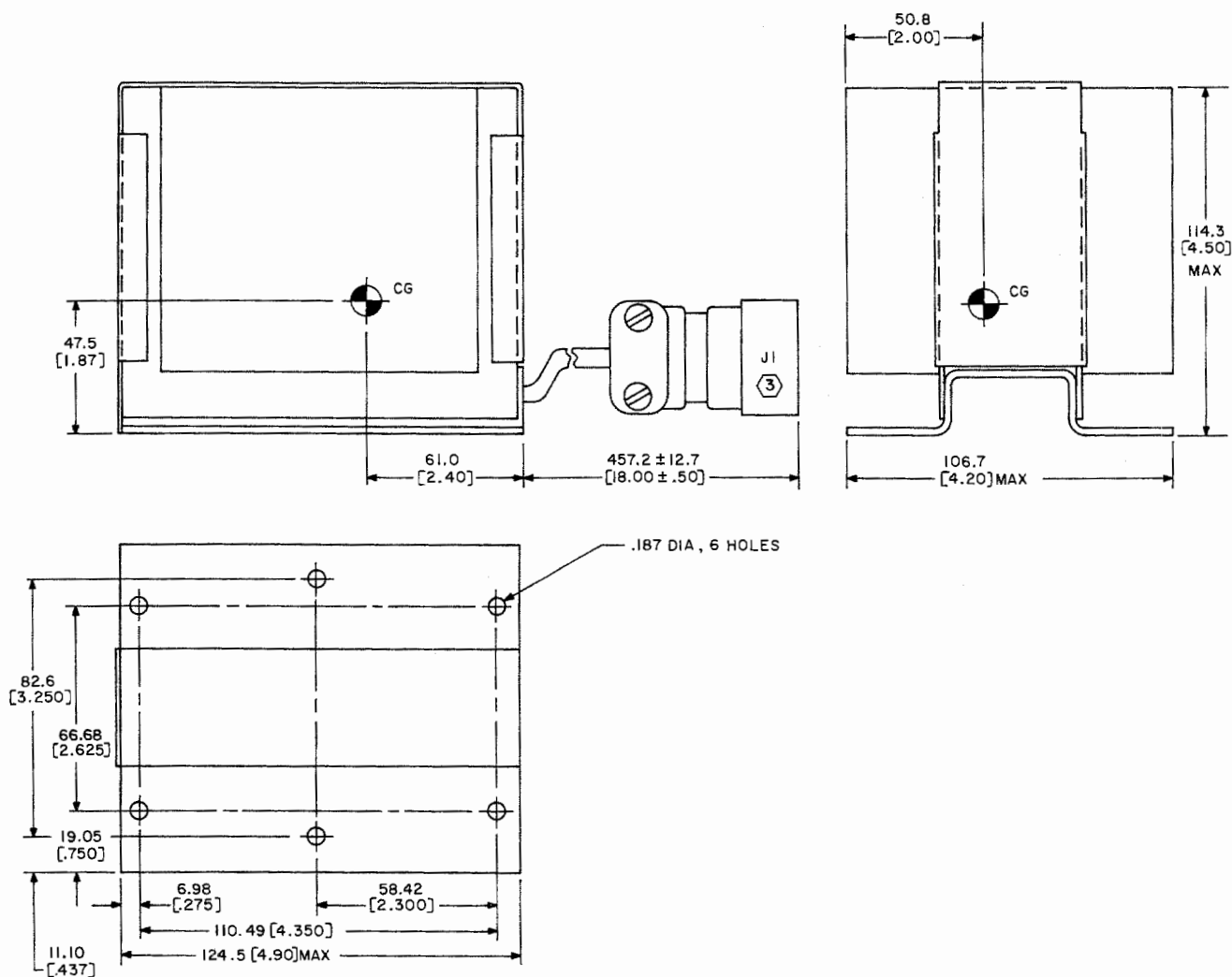
**MOUNTING DIMENSIONS  
FOR 3 NO. 10-32UNF-2A  
SCREWS (MOUNTING  
HARDWARE NOT FURNISHED)**

This note is changed to add a recommended tightening torque and will be included in the next revision of the manual. The new note reads:

**MOUNTING DIMENSIONS  
FOR 3 NO. 10-32UNF-2A  
SCREWS (MOUNTING  
HARDWARE NOT FURNISHED)  
RECOMMENDED TIGHTENING  
TORQUE IS 3 TO 4 FOOT-POUNDS  
[4.07 TO 5.42 NEWTON-METERS]**

**USE TORQUE WRENCH WITH  
SUITABLE SCALING TO READ 3-4 FT-LBS.**





⑤ THIS DRAWING APPLIES TO 699K-1 TRIM ADAPTER, COLLINS PART NUMBER 622-0080-00X AND TO 699K-2 TRIM ADAPTER, COLLINS PART NUMBER 622-1816-00X.

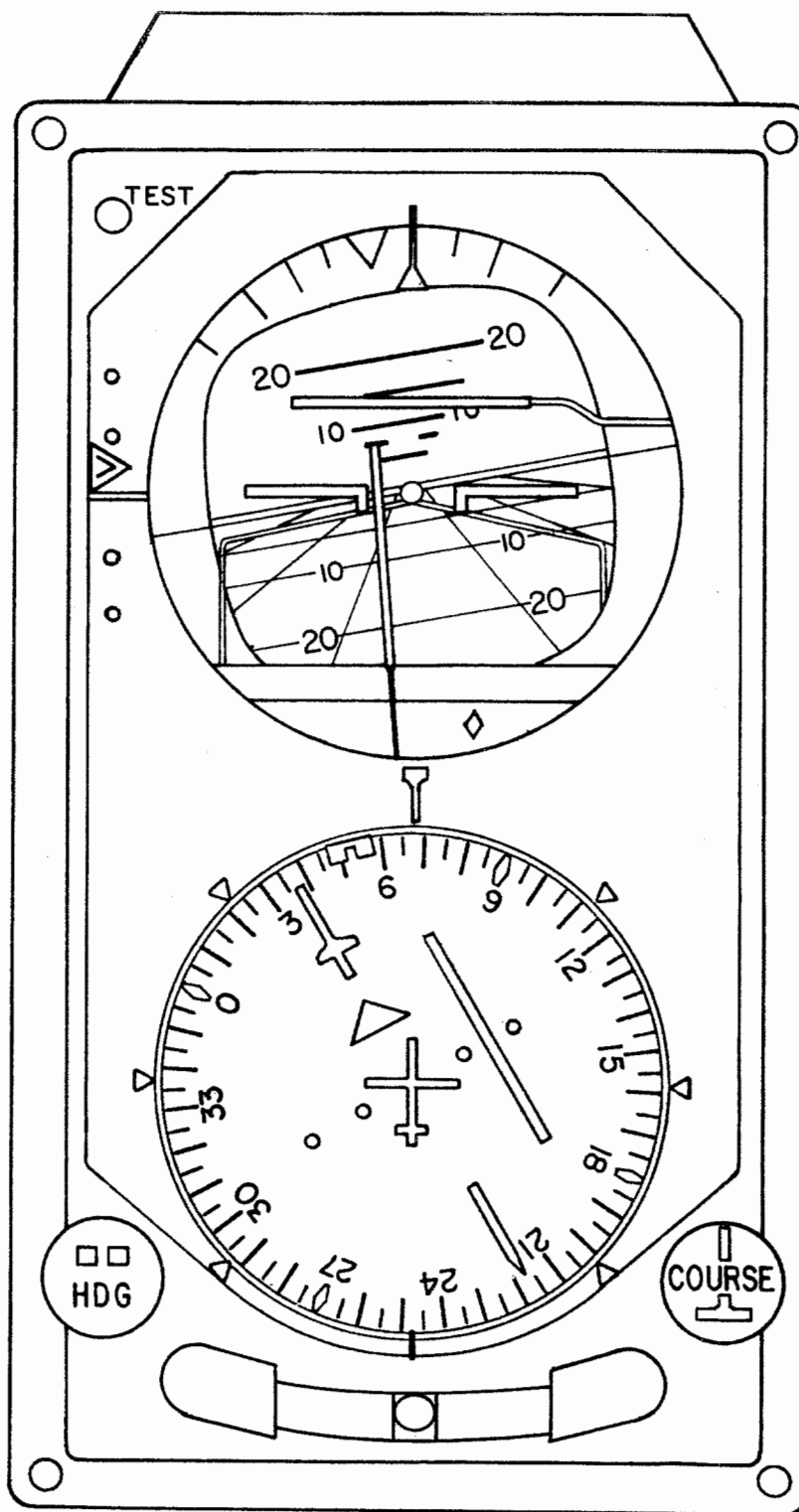
NOTES:

- ① DIMENSIONS ARE IN [INCHES] MILLIMETRES.
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ± .02, .XXX = ± .008  
HOLE DIAMETERS - UNDER .251 DIA = +.005 - .005  
.251 TO .500 DIA = +.006 - .005  
OVER .500 DIA = +.008 - .005  
ANGLES = ± 1.0°
- ③ MS3106R32-13P OR EQUIVALENT (CPN 357-5299-310)  
MATES WITH MS3102R32-13S (CPN 357-3679-260)
- ④ WEIGHT: [3 LBS.] 1.36 Kg MAX.

TP2-7033-014

699K-2 Trim Adapter, Outline and Mounting Diagram  
Figure 44D

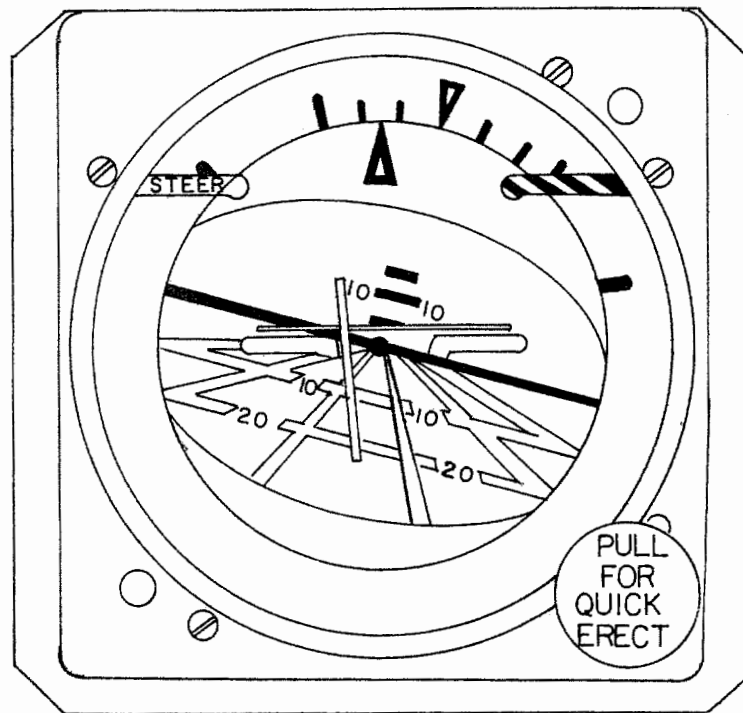




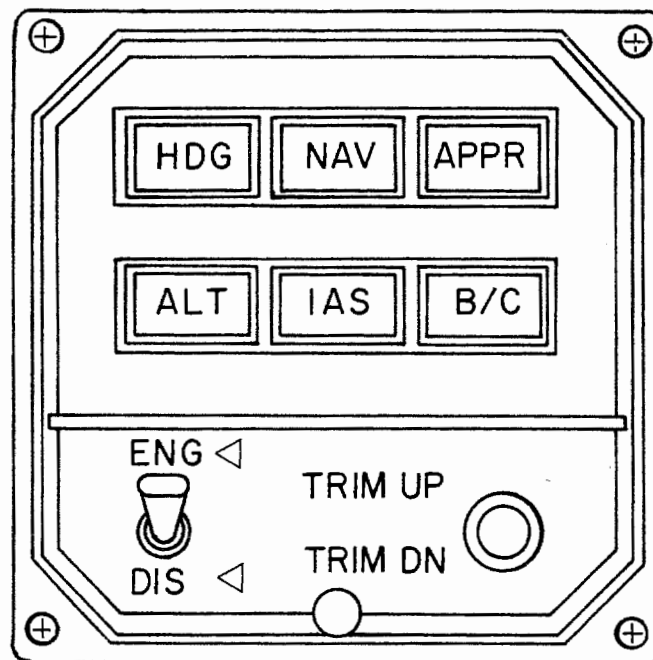
TP3-2506-019

FD-112C/V Flight Director Indicator, Panel Mockup Cutout  
Figure 47





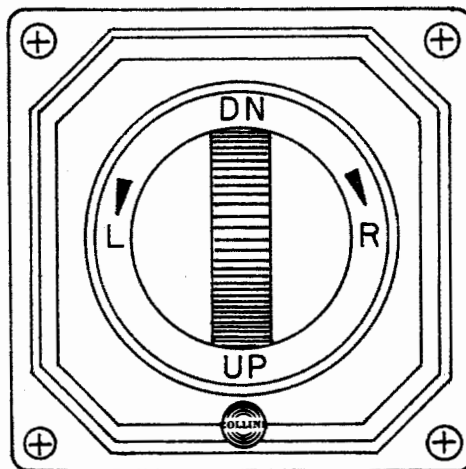
FD-106P/PV Flight Director, Panel Mockup Cutout  
Figure 48



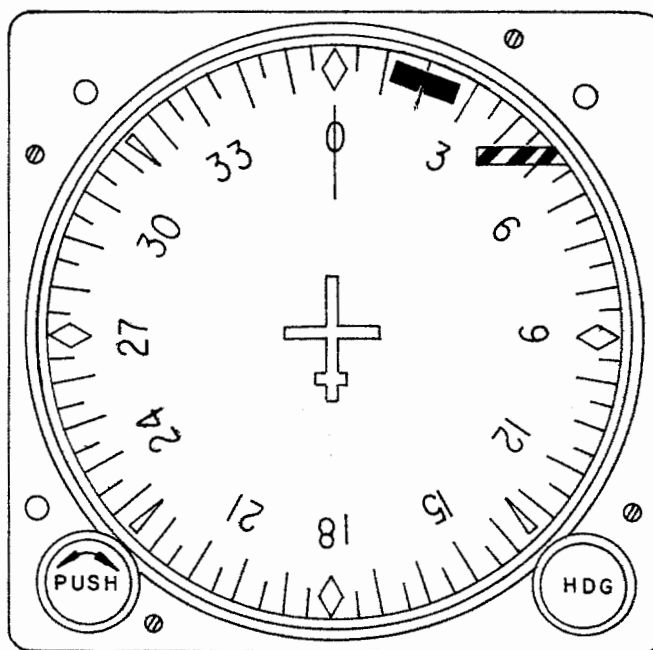
TP3-5691-019

913K-1/1A Computer/Control and 614E-42/42A Mode Selector, Panel Mockup Cutout  
Figure 49





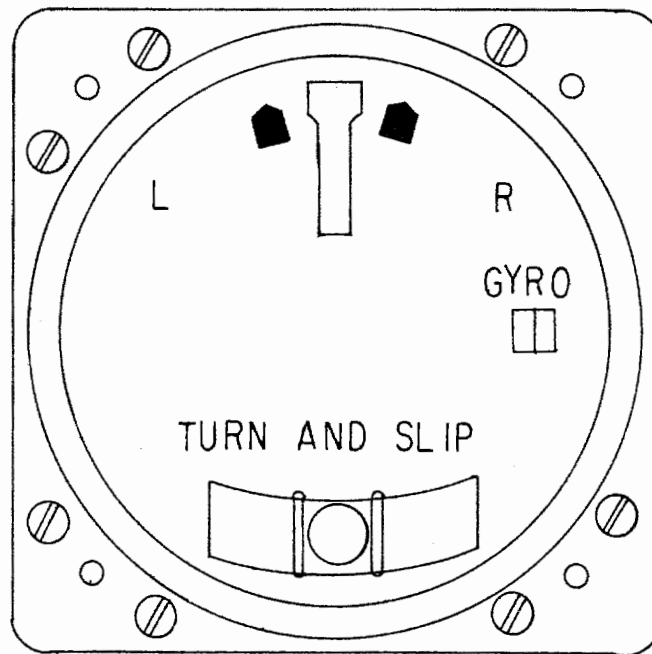
614E-41/41A Pitch/Turn Control, Panel Mockup Cutout  
Figure 50



331P-1/1V Directional Gyro Indicator, Panel Mockup Cutout  
Figure 51







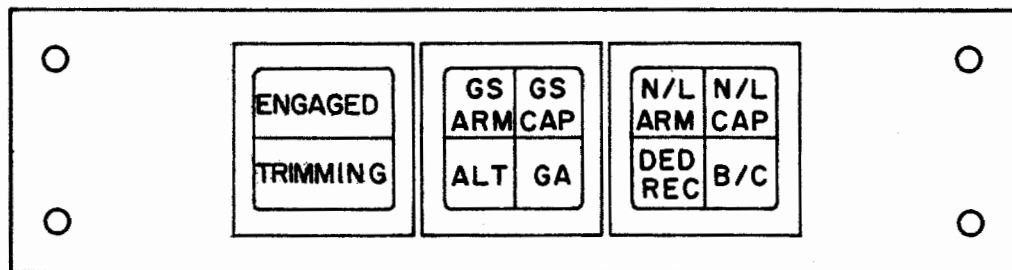
*329T-1 Turn and Slip Indicator, Panel Mockup Cutout  
Figure 52*



TP3-5793-019

*327C-3 Slaving Indicator, Panel Mockup Cutout  
Figure 53*





TP4-0292-011

*AP-106 Annunciator Unit, Panel Mockup Cutout  
Figure 54*





Rockwell  
International

# Collins AP-106/AP-107 Flight Control System

**maintenance**

Collins General Aviation Division

523-0764808-003118

3rd Edition, 27 June 1984

Printed in USA

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**NOTICE:** This section replaces second edition dated 1 March 1978.

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## Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.  
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
AND ENTER DATE INSERTED AND INITIALS.

[illegible]

# maintenance

## 1. GENERAL

This system maintenance section provides procedures for adjusting and testing the operation of the AP-106/AP-107 Flight Control System in the aircraft. Adjustment procedures include alignment procedures for the PN-101 and MCS-107/107V Magnetic Compass Systems and gain adjustment procedures for the AP-106/107 Autopilot Systems. The test procedures provide fault isolation down to a replaceable unit or subsystem of the flight control system. Any units that may be faulty can be further tested or repaired by using the procedures given in the associated unit maintenance or unit repair sections of this instruction book.

### Note

All NAV and COMM receivers and other equipment associated with the flight control system must be checked and proved operational prior to performing the procedures given in this section.

## 2. TEST EQUIPMENT AND POWER REQUIREMENTS

### 2.1 Test Equipment

Table 1 lists the test equipment required to perform the AP-106/AP-107 Flight Control System test and

Table 1. Test Equipment Required.

| EQUIPMENT                                                           | MANUFACTURER AND PART NUMBER                | FUNCTION                                                                |
|---------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------|
| 972S-1 Autopilot Ramp Test Set (with Service Bulletins 1 through 5) | Collins part no 622-1626-001                | Facilitate testing and adjustment of autopilot on board aircraft.       |
| 479S-4A ILS Signal Generator                                        | Collins part no 622-1101-001                | Provide 2-dot off-course and on-course localizer and glideslope signals |
| Vacuum source                                                       |                                             | Energize vacuum driven gyros if used in system                          |
| 960M-2 Torque Tester                                                | Collins part no 622-2094-001                | Measure output torque of 334C-9/9A                                      |
| 960M-3 Torque Tester                                                | Collins part no 622-2741-001                | Measure output torque of 334C-9/9A/11                                   |
| 972S-3 Servo Test Set                                               | Collins part no 622-2562-001                | Apply power and stimulus to primary servo                               |
| Multimeter                                                          | Simpson model 260                           | Measure ac and dc voltages                                              |
| Dc voltmeter                                                        | 0 to 30 V dc, 1% accuracy                   | Measure dc voltages                                                     |
| Capstan test fixture                                                | Collins part no 621-9185-001                | Measure output torque of servo capstan                                  |
| Torque wrench                                                       | 5.65 to 0 to 5.65 N·m (50 to 0 to 50 lb·in) | Measure servo capstan torque                                            |

alignment procedures. Equivalent test equipment can be substituted for that listed.

## **2.2 Power Requirements**

All power required to perform the system tests is provided by the aircraft in which the system is installed, except for a vacuum source required to drive any vacuum driven gyros that may be used in the flight control system.

## **3. TESTING/TROUBLESHOOTING**

### **3.1 Test Setup**

Connect the 972S-1 Autopilot Ramp Test Set to the AP-106/AP-107 Flight Control System as shown in figure 1.

**Note**

Ensure that all aircraft power to the flight control system is turned off prior to connecting the test set to the system.

- a. Remove the system interconnect cable from P1 and P2 of the 913K-1/1A or 562C-13/13A, and connect to J101 and J102 of the test set.

- b. Connect P101 and P102 of the test set to P1 and P2, respectively, of the 913K-1/1A or 562C-13/13A.
- c. If the flight control system includes a 161H-1, remove the system interconnect cable from P1 of the 161H-1 and connect to J104 of the test set. An extender cable may be required for this connection.
- d. Connect P104 of the test set to P1 of the 161H-1.
- e. If the flight control system includes a 329T-1, remove the system interconnect cable from P1 of the 329T-1 and connect to J103 of the test set.
- f. Connect P103 of the test set to P1 of the 329T-1.

### **3.2 Test Procedures**

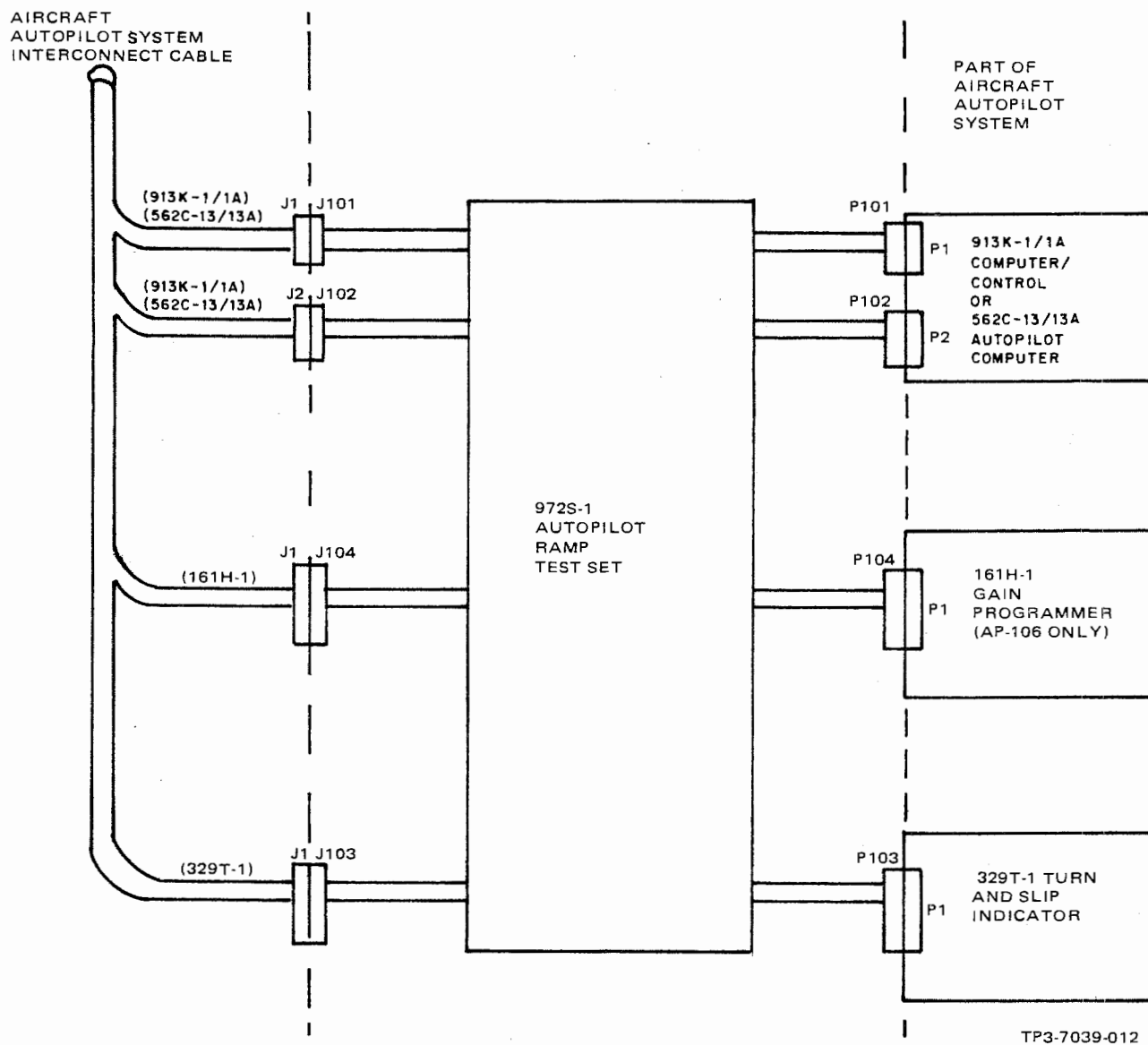
#### **3.2.1 AP-106/107 Autopilot Test Procedure**

Perform the test procedures given in table 2 or table 3 to check the operation of the AP-107 or AP-106 Autopilot Systems respectively.

**Note**

All references to the 913K-1/1A are equally applicable to the 562C-13/13A when used with the 614E-42/42A.





AP-106/AP-107 Flight Control System, Test Setup  
Figure 1

Table 2. AP-107 Autopilot Test Procedure.

| TEST   | PROCEDURE                                                                                                                                                                                                                                                                                                                                         | 972S-1 TEST SET                                |                                   | DESIRED RESULTS                                                                                                                                              | TROUBLESHOOTING INSTRUCTIONS                                              |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|        |                                                                                                                                                                                                                                                                                                                                                   | SWITCH                                         | POSITION                          |                                                                                                                                                              |                                                                           |
| 1      | PRETEST PROCEDURE                                                                                                                                                                                                                                                                                                                                 |                                                |                                   |                                                                                                                                                              |                                                                           |
| 1.1    | Initial 972S-1 switch settings.                                                                                                                                                                                                                                                                                                                   | 28 VDC<br>AC SIGNAL<br>DC SIGNAL<br>All others | OFF<br>FIXED 0<br>FIXED +<br>NORM |                                                                                                                                                              |                                                                           |
| 1.2    | Connect test set to system as indicated in figure 1, and apply power to the flight control system and all associated equipment.<br><br><div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 10px auto;">Note</div><br>Unless otherwise specified all voltages are measured with respect to the SIG COM NO. 1 test jack. |                                                |                                   |                                                                                                                                                              |                                                                           |
| 2      | SELF TEST                                                                                                                                                                                                                                                                                                                                         |                                                |                                   |                                                                                                                                                              |                                                                           |
| 2.1    | Set ENG/DIS switch on 913K-1/1A at DIS position. Turn dimmer control on 913K-1/1A fully ccw but not to the self-test (click) position. If any of the mode pushbuttons on the 913K-1/1A are lit, push the lighted buttons once to turn them off.                                                                                                   | 28 VDC                                         | ON                                | All mode pushbuttons off (not lit).<br><br>All annunciators off except DIS annunciator. (All system annunciators connected to 913K-1/1A should also be off.) | Replace 913K-1/1A.                                                        |
| 2.2    | Turn dimmer control ccw to the self test (click) position.                                                                                                                                                                                                                                                                                        |                                                |                                   | All mode annunciator lamps on. (All system annunciators connected to 913K-1/1A should also light.)                                                           | Replace any defective lamps. If lamp is not defective, replace 913K-1/1A. |
| 2.3    | Turn dimmer control cw out of self test position.                                                                                                                                                                                                                                                                                                 |                                                |                                   | All mode and annunciator lamps go out except DIS annunciator.                                                                                                | Replace 913K-1/1A.                                                        |
| 2.4    | Push 913K-1/1A HDG mode pushbutton.                                                                                                                                                                                                                                                                                                               |                                                |                                   | HDG pushbutton lights.                                                                                                                                       | Replace 913K-1/1A.                                                        |
| 2.5    | Turn dimmer control cw to limit.                                                                                                                                                                                                                                                                                                                  |                                                |                                   | HDG pushbutton and DIS annunciator get dimmer as control is tuned cw.                                                                                        | Replace 913K-1/1A.                                                        |
| (Cont) | Push 913K-1/1A HDG mode pushbutton.                                                                                                                                                                                                                                                                                                               |                                                |                                   | HDG pushbutton goes out.                                                                                                                                     |                                                                           |

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                                                                                                                   | 972S-1 TEST SET |                        | DESIRED RESULTS                                                                                                                                                                                                                  | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                                                                             | SWITCH          | POSITION               |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                  |
| 2.5<br>(Cont) | Reset dimmer control at maximum ccw position, but do not enter self test position.                                                                                                                                                          |                 |                        |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                  |
| 3             | ENGAGE LOGIC TESTS                                                                                                                                                                                                                          |                 |                        |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                  |
| 3.1           | Measure voltage at both SVO ENG test jacks.                                                                                                                                                                                                 |                 |                        | 0 $\pm$ 0.1 Vdc (DIS annunciator should be lit.)                                                                                                                                                                                 | Replace 913K-1/1A.                                                                                                                                                                                               |
| 3.2           | Momentarily set 913K-1/1A ENG/DIS switch at ENG, and measure voltage at both SVO ENG test jacks.                                                                                                                                            |                 |                        | +25 Vdc minimum. ENG annunciator lights and DIS annunciator goes out.                                                                                                                                                            | Check for +25-Vdc min at ATTD FLAG test jack. If abnormal, check vertical gyro. If normal, measure dc voltage at J9. If voltage is more than 0.5 Vdc, check trim servo. If less than 0.5 Vdc, replace 913K-1/1A. |
| 3.3           | Set 913K-1/1A ENG/DIS switch at DIS and then back to center position.<br><br>Push 913K-1/1A NAV mode pushbutton and ALT mode pushbutton.<br><br>Momentarily set 913K-1/1A ENG/DIS switch at ENG.<br><br>Push 913K-1/1A NAV mode pushbutton. |                 |                        | ENG annunciator goes out and DIS annunciator lights.<br><br>NAV and ALT mode pushbuttons light.<br><br>NAV mode pushbutton stays lit and ALT pushbutton goes out. ENG annunciator lights.<br><br>All mode pushbuttons are unlit. | Replace 913K-1/1A.                                                                                                                                                                                               |
| 3.4           | Momentarily push AP disengage pushbutton on control wheel.                                                                                                                                                                                  |                 |                        | DIS annunciator lights and ENG annunciator goes out.                                                                                                                                                                             | Check AP disengage switch and replace if defective.                                                                                                                                                              |
| 3.5           | Momentarily set 913K-1/1A ENG/DIS switch at ENG.                                                                                                                                                                                            | ATTD FLAG       | OFF, then back to NORM | ENG annunciator lights.<br><br>DIS annunciator lights and ENG annunciator goes out.                                                                                                                                              | Replace 913K-1/1A.                                                                                                                                                                                               |

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                              | 972S-1 TEST SET |          | DESIRED RESULTS                                                                                                                 | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                     |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                        | SWITCH          | POSITION |                                                                                                                                 |                                                                                                                                                                                                  |
| 3.6  | Momentarily set 913K-1/1A ENG/DIS switch at ENG.<br><br>Close manual trim engage switch and momentarily push manual trim up switches.                                                                  |                 |          | ENG annunciator lights.<br><br>DIS annunciator lights and ENG annunciator goes out.                                             | Measure dc voltage at J9 while manual trim switches are held in up position. If voltage is $+28 \pm 2$ Vdc replace 913K-1/1A. If voltage is abnormal, check trim servo and manual trim switches. |
| 3.7  | Momentarily set 913K-1/1A ENG/DIS switch at ENG.<br><br>Push and hold SYNC pushbutton on control wheel, and measure dc voltage at left SVO ENGA test jack.<br><br>Release SYNC pushbutton.             |                 |          | ENG annunciator lights.<br><br>$0 \pm 2$ Vdc.                                                                                   | Measure dc voltage at J10 while SYNC pushbutton is pushed. If voltage is $+28 \pm 2$ Vdc, replace 913K-1/1A. If voltage is abnormal, replace SYNC pushbutton.                                    |
| 4    | CONTROL WHEEL STEERING MODE TESTS                                                                                                                                                                      |                 |          |                                                                                                                                 |                                                                                                                                                                                                  |
| 4.1  | Set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position. Check controls for freedom of movement.                                                                              |                 |          | DIS annunciator is lit. Controls are free to move (all servos are disengaged).                                                  | Replace 913K-1/1A.                                                                                                                                                                               |
| 4.2  | Engage autopilot (momentarily set ENG/DIS switch on 913K-1/1A at ENG position), and check controls for freedom of movement.                                                                            |                 |          | ENG annunciator lights and controls resist movement (servos engaged).                                                           | If all controls are free to move, repeat test 3.2. If only one control is free to move, check the corresponding servo for faulty engaged circuit or clutch.                                      |
| 4.3  | Press and hold the CWS (sync) pushbutton on the control wheel and check the controls for freedom of movement.<br><br>Manually set the controls at the neutral position and release the CWS pushbutton. |                 |          | Ailerons, elevators and trim should be free to move but rudder should continue to resist movement while CWS pushbutton is held. | Check CWS pushbutton and replace if defective. If not defective, replace 913K-1/1A.                                                                                                              |
| 4.4  | Rotate the pitch control on the 614E-41/41A to the UP position and then to the DN position while observing the elevators.                                                                              |                 |          | Elevators move to up position and then to down position.                                                                        | Check for pitch signal at J26 on test set. If abnormal, replace 614E-41/41A. If normal, check for elevator command signal at 913K-1 ELEV CMD jack. If                                            |

(Cont)

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                                                                                                                 | 972S-1 TEST SET |          | DESIRED RESULTS                                                                                                                                                     | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                                                                                                                                                                                                            |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                                                                           | SWITCH          | POSITION |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4.4<br>(Cont) |                                                                                                                                                                                                                                           |                 |          |                                                                                                                                                                     | normal, replace elevator servo. If abnormal, replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                         |
| 4.5           | Rotate the roll control on the 614E-41/41A to the R position and then to the L position while observing the ailerons.                                                                                                                     |                 |          | Ailerons move to the right bank position and then to the left bank position.                                                                                        | Check for roll signal at J24 on test set. If abnormal, replace 614E-41/41A. If normal, check for aileron command signal at 913K-1 AIL CMD jack. If normal, replace aileron servo. If abnormal, replace 913K-1/1A.                                                                                                                                                                                       |
| 4.6           | Push autopilot disengage pushbutton on control wheel.                                                                                                                                                                                     |                 |          | DIS annunciator lights.                                                                                                                                             | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                      |
| 5             | HEADING MODE TESTS                                                                                                                                                                                                                        |                 |          |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                         |
| 5.1           | Verify that the DG (directional gyro) is slaved and adjust the HDG knob to position the heading bug under the lubber line. Push the HDG mode pushbutton on the 913K-1/1A once and momentarily set the ENG/DIS switch at the ENG position. |                 |          | HDG mode pushbutton and ENG annunciator light.                                                                                                                      | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                      |
| 5.2           | Adjust the HDG knob to move the heading bug 10 degrees to the right and then 10 degrees to the left of the lubber line while observing the control wheel.                                                                                 |                 |          | Control wheel should move to the right and then to the left. (On flight directors with command bars, the command bars should command a right and then a left roll.) | If no response, check for approximately 2 Vac at HDG test jacks when HDG bug is set 10 degrees to right of lubber line. If 2 Vac is measured, replace 913K-1/1A. If HDG signal is absent, check compass system. If command bars are not operating, verify 0 $\pm$ 1.5 V dc (K-1) or $\pm$ 2 $\pm$ 1.5 V dc (K-1A) at J22 on 972S-1. If normal, replace flight director. If abnormal, replace 913K-1/1A. |
| 5.3           | Push HDG mode pushbutton on 913K-1/1A, and verify voltage at J22 on 972S-1.                                                                                                                                                               |                 |          | +15 V dc minimum. (No mode pushbuttons are lit.)                                                                                                                    | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                      |
| 6             | ALTITUDE HOLD MODE TESTS                                                                                                                                                                                                                  |                 |          |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                         |
| 6.1           | Push HDG and ALT mode pushbuttons on 913K-1/1A.                                                                                                                                                                                           |                 |          | HDG and ALT mode pushbuttons light.                                                                                                                                 | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                      |

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                          | 972S-1 TEST SET                                              |                                                       | DESIRED RESULTS                                                                                                                          | TROUBLESHOOTING INSTRUCTIONS |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
|      |                                                                                                                                                                                    | SWITCH                                                       | POSITION                                              |                                                                                                                                          |                              |
| 6.2  | Observe elevators.                                                                                                                                                                 | DC SIGNAL switch<br>ALT/IAS                                  | - / FIXED<br>TEST                                     | Elevators move to a pitch down position (control column moves forward).                                                                  | Replace 913K-1/1A.           |
| 6.3  | Observe elevators.                                                                                                                                                                 | DC SIGNAL switch                                             | + / FIXED                                             | Elevators move to a pitch up position.                                                                                                   | Replace 913K-1/1A.           |
| 6.4  | Push HDG and ALT mode pushbuttons on 913K-1/1A.                                                                                                                                    | ALT/IAS                                                      | NORM                                                  | HDG and ALT mode pushbuttons are not lit.                                                                                                | Replace 913K-1/1A.           |
| 7    | NAVIGATION MODE TESTS                                                                                                                                                              |                                                              |                                                       |                                                                                                                                          |                              |
| 7.1  | Ensure that a valid VOR or LOC station is not selected or the navigation receiver is turned off and set the test set switches and controls. Push NAV mode pushbutton on 913K-1/1A. | 913K-1 COURSE DATUM<br>AC SIGNAL switch<br>AC SIGNAL control | TEST<br>VAR<br>Adjust for 0 Vac at COURSE DATUM jacks | NAV mode pushbutton is lit.                                                                                                              | Replace 913K-1/1A.           |
| 7.2  | Observe ailerons.                                                                                                                                                                  | 913K-1 VOR/LOC DEV                                           | TEST                                                  | Ailerons move to left bank position.                                                                                                     | Replace 913K-1/1A.           |
| 7.3  | Observe ailerons.                                                                                                                                                                  | DC SIGNAL switches                                           | - / FIXED                                             | Ailerons move to right bank position.                                                                                                    | Replace 913K-1/1A.           |
| 7.4  | Observe ailerons as AC SIGNAL control is rotated.                                                                                                                                  | 913K-1 VOR/LOC DEV<br>AC SIGNAL control                      | NORM<br>Rotate cw and then ccw from 0 Vac position    | Ailerons move to left bank position and then to right bank position as AC SIGNAL control is rotated cw and then ccw from 0 Vac position. | Replace 913K-1/1A.           |
| 7.5  | Observe ailerons.                                                                                                                                                                  | AC SIGNAL control                                            | Adjust for 0 Vac at COURSE DATUM jacks                | Ailerons return to neutral position.                                                                                                     | Replace 913K-1/1A.           |
| 7.6  | Push NAV mode pushbutton on 913K-1/1A.                                                                                                                                             | 913K-1 COURSE DATUM<br>DC SIGNAL switches                    | NORM<br>+ / FIXED                                     | NAV mode pushbutton is not lit.                                                                                                          | Replace 913K-1/1A.           |

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST   | PROCEDURE                                                                                                                                                                 | 972S-1 TEST SET                                                      |                                                               | DESIRED RESULTS                                                                                                                          | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                      |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |                                                                                                                                                                           | SWITCH                                                               | POSITION                                                      |                                                                                                                                          |                                                                                                                                                                   |
| 8      | APPROACH MODE TEST                                                                                                                                                        |                                                                      |                                                               |                                                                                                                                          |                                                                                                                                                                   |
| 8.1    | Ensure that a VOR/LOC station is not selected, and set test set switches and controls.<br><br>Push APPR mode pushbutton.                                                  | 913K-1 COURSE DATUM<br><br>AC SIGNAL switch<br><br>AC SIGNAL control | TEST<br><br>VAR<br><br>Adjust for 0 Vac at COURSE DATUM jacks | APPR mode push-button is lit.                                                                                                            | Replace 913K-1/1A.                                                                                                                                                |
| 8.2    | Observe ailerons.                                                                                                                                                         | 913K-1 VOR/LOC DEV                                                   | Test                                                          | Ailerons move to left bank position.                                                                                                     | Replace 913K-1/1A.                                                                                                                                                |
| 8.3    | Observe ailerons.                                                                                                                                                         | DC SIGNAL switches                                                   | -/FIXED                                                       | Ailerons move to right bank position.                                                                                                    | Replace 913K-1/1A.                                                                                                                                                |
| 8.4    | Observe ailerons.                                                                                                                                                         | 913K-1 VOR/LOC DEV<br><br>AC SIGNAL control                          | NORM<br><br>Rotate cw and then ccw from 0 Vac position        | Ailerons move to left bank position and then to right bank position as AC SIGNAL control is rotated cw and then ccw from 0 Vac position. | Replace 913K-1/1A.                                                                                                                                                |
| 8.5    | Observe ailerons.                                                                                                                                                         | AC SIGNAL control                                                    | Adjust for 0 Vac at COURSE DATUM jacks                        | Ailerons return to neutral positions.                                                                                                    | Replace 913K-1/1A.                                                                                                                                                |
| 8.6    | Select a valid localizer station on the navigation receiver. (Verify that GS FLAG annunciator is lit.) Connect a jumper between the 913K-1 VOR/LOC DEV jacks on test set. |                                                                      |                                                               | GS ARM annunciator lights within 15 seconds.                                                                                             | Check for NLT +18 Vdc at J13 on test set. If normal, replace 913K-1/1A. If abnormal, verify that valid localizer station has been selected and is being received. |
| 8.7    |                                                                                                                                                                           | DC SIGNAL control<br><br>DC SIGNAL switch                            | Rotate cw to stop<br><br>VAR                                  | GS CAP annunciator is lit.                                                                                                               | Check for NLT +300 mVdc at GS FLAG jacks. If normal, replace 913K-1/1A. If abnormal, verify that valid GS station has been selected and is being received.        |
| (Cont) |                                                                                                                                                                           | 913K-1 GS DEV                                                        | TEST                                                          |                                                                                                                                          |                                                                                                                                                                   |

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                       | 972S-1 TEST SET                                                                              |                                                               | DESIRED RESULTS                                                                                      | TROUBLESHOOTING INSTRUCTIONS |
|---------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------|
|               |                                                                                                                                 | SWITCH                                                                                       | POSITION                                                      |                                                                                                      |                              |
| 8.7<br>(Cont) |                                                                                                                                 | DC SIGNAL control                                                                            | Rotate ccw past center position                               |                                                                                                      |                              |
| 8.8           | Observe elevators.                                                                                                              | DC SIGNAL control                                                                            | Rotate cw from center position                                | Elevators move to pitch up position.                                                                 | Replace 913K-1/1A.           |
| 8.9           | Observe elevators.                                                                                                              | DC SIGNAL control                                                                            | Rotate ccw from center position                               | Elevators move to pitch down position.                                                               | Replace 913K-1/1A.           |
| 8.10          | Observe elevators.                                                                                                              | DC SIGNAL control                                                                            | Adjust for 0 Vdc at 913K-1 GS DEV jacks                       | Elevators move to neutral position.                                                                  | Replace 913K-1/1A.           |
| 8.11          | Observe ailerons.                                                                                                               | AC SIGNAL control                                                                            | Rotate cw and then ccw from 0 Vac position                    | Ailerons move to left bank position and then to right bank position as AC SIGNAL control is rotated. | Replace 913K-1/1A.           |
| 8.12          | Push APPR mode pushbutton on 913K-1/1A.<br><br>Remove jumper from 913K-1 VOR/LOC DEV jacks.                                     | 913K-1 GS DEV<br><br>913K-1 COURSE DATUM<br><br>AC SIGNAL switches<br><br>DC SIGNAL switches | NORM<br><br>NORM<br><br>0°/FIXED<br><br>+ /FIXED              | APPR mode pushbutton and GS CAP annunciator are not lit.                                             | Replace 913K-1/1A.           |
| 9             | BACK-COURSE AND GO-AROUND MODE TESTS                                                                                            |                                                                                              |                                                               |                                                                                                      |                              |
| 9.1           | Ensure that a VOR station is selected.<br><br>Set test set switches and controls.<br><br>Push B/C mode pushbutton on 913K-1/1A. | 913K-1 COURSE DATUM<br><br>AC SIGNAL switch<br><br>AC SIGNAL control                         | TEST<br><br>VAR<br><br>Adjust for 0 Vac at COURSE DATUM jacks | B/C mode pushbutton remains unlit.                                                                   | Replace 913K-1/1A.           |



Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST              | PROCEDURE                                                                       | 972S-1 TEST SET                                                             |                                                                                                                                      | DESIRED RESULTS                                                                                                                                                                                             | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                                                                 | SWITCH                                                                      | POSITION                                                                                                                             |                                                                                                                                                                                                             |                                                                                                                                                                            |
| 9.2               | Select a valid localizer station and push the B/C mode pushbutton on 913K-1/1A. |                                                                             |                                                                                                                                      | B/C mode pushbutton is lit.                                                                                                                                                                                 | Check for NLT +18 Vdc at J13 on test set. If normal, replace 913K-1/1A.<br><br>If abnormal, verify that a valid localizer station has been selected and is being received. |
| 9.3               | Observe ailerons.                                                               | 913K-1<br>VOR/LOC<br>DEV                                                    | TEST                                                                                                                                 | Ailerons move to right bank position.                                                                                                                                                                       | Replace 913K-1/1A.                                                                                                                                                         |
| 9.4               | Push GA pushbutton and observe ailerons and elevators.                          |                                                                             |                                                                                                                                      | Ailerons return to neutral position and elevators move to pitch up position.<br><br>GA annunciator is lit and B/C mode pushbutton is not lit.                                                               | Replace 913K-1/1A.                                                                                                                                                         |
| 9.5               | Observe ailerons.                                                               | DC SIGNAL<br>switch<br><br>DC SIGNAL<br>control<br><br>AC SIGNAL<br>control | VAR<br><br>Adjust for<br>0 Vdc at<br>913K-1<br>VOR/LOC<br>DEV jacks.<br><br>Rotate cw<br>and then<br>ccw from<br>center<br>position. | Ailerons remain at neutral position.                                                                                                                                                                        | Replace 913K-1/1A.                                                                                                                                                         |
| 9.6               | Push B/C mode pushbutton on 913K-1/1A and observe ailerons.                     | AC SIGNAL<br>control                                                        | Rotate cw<br>and then<br>ccw from<br>center<br>position                                                                              | B/C mode pushbutton is lit and GA annunciator is not lit.<br><br>Ailerons move to right bank position and then to left bank position and AC SIGNAL control is rotated cw and then ccw from center position. | Replace 913K-1/1A.                                                                                                                                                         |
| 9.7<br><br>(Cont) | Push B/C mode pushbutton on 913K-1/1A.                                          | 913K-1<br>COURSE<br>DATUM                                                   | NORM                                                                                                                                 | B/C mode pushbutton is not lit.                                                                                                                                                                             | Replace 913K-1/1A.                                                                                                                                                         |

Table 2. AP-107 Autopilot Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                      | 972S-1 TEST SET                                                                    |                                      | DESIRED RESULTS                                                                                 | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                | SWITCH                                                                             | POSITION                             |                                                                                                 |                                                                                                                                                                                                             |
| 9.7<br>(Cont) |                                                                                                                                                | 913K-1<br>VOR/LOC<br>DEV<br><br>AC SIGNAL<br>switches<br><br>DC SIGNAL<br>switches | NORM<br><br>0°/FIXED<br><br>+/-FIXED |                                                                                                 |                                                                                                                                                                                                             |
| 10            | AUTOPILOT TRIM TESTS                                                                                                                           |                                                                                    |                                      |                                                                                                 |                                                                                                                                                                                                             |
| 10.1          | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                                   |                                                                                    |                                      | ENG annunciator on 913K-1/1A is lit.                                                            |                                                                                                                                                                                                             |
| 10.2          | Rotate ELEV FORCE control on test set counterclockwise from center position.                                                                   | ELEV<br>FORCE<br>switch                                                            | TEST                                 | TRIM UP annunciator on 913K-1/1A flashes on and off, and trim servo operates in up direction.   | If TRIM annunciator does not flash, replace 913K-1/1A. If TRIM annunciator flashes but servo does not operate, perform test 11 to check trim servo. If trim servo is operating properly, replace 913K-1/1A. |
| 10.3          | Rotate ELEV FORCE control on test set clockwise from center position.                                                                          |                                                                                    |                                      | TRIM DN annunciator on 913K-1/1A flashes on and off, and trim servo operates in down direction. | Same as test 10.2.                                                                                                                                                                                          |
| 10.4          | Momentarily set ENG/DIS switch on 913K-1/1A at DIS and then back to the center off position.                                                   | ELEV<br>FORCE<br>switch                                                            | NORM                                 | DIS annunciator on 913K-1/1A is lit.                                                            |                                                                                                                                                                                                             |
| 11            | TRIM SERVO TEST<br>(Perform this test only when a defect is indicated during test 10.)                                                         |                                                                                    |                                      |                                                                                                 |                                                                                                                                                                                                             |
| 11.1          | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position. Set test set switches and observe trim surfaces. | SVO ENGA<br><br>TRIM UP                                                            | TEST<br><br>TEST                     | Trim surfaces move to trim up position.                                                         | Replace trim servo.                                                                                                                                                                                         |
| 11.2          | Set test set switches and observe trim surfaces.                                                                                               | TRIM UP<br><br>TRIM DOWN                                                           | NORM<br><br>TEST                     | Trim surfaces move to trim down position.                                                       | Replace trim servo.                                                                                                                                                                                         |
| 11.3          |                                                                                                                                                | TRIM DOWN<br><br>SVO ENGA                                                          | NORM<br><br>NORM                     |                                                                                                 |                                                                                                                                                                                                             |

Table 3. AP-106 Autopilot Test Procedure.

| TEST   | PROCEDURE                                                                                                                                                                                                                                                                                                                              | 972S-1 TEST SET                                |                                   | DESIRED RESULTS                                                                                                                                                         | TROUBLESHOOTING INSTRUCTIONS                                                                                                            |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|        |                                                                                                                                                                                                                                                                                                                                        | SWITCH                                         | POSITION                          |                                                                                                                                                                         |                                                                                                                                         |
| 1      | PRETEST PROCEDURE                                                                                                                                                                                                                                                                                                                      |                                                |                                   |                                                                                                                                                                         |                                                                                                                                         |
| 1.1    | Initial 972S-1 switch settings.                                                                                                                                                                                                                                                                                                        | 28 VDC<br>AC SIGNAL<br>DC SIGNAL<br>All others | OFF<br>FIXED 0<br>Fixed +<br>NORM |                                                                                                                                                                         |                                                                                                                                         |
| 1.2    | Connect test set to system as indicated in figure 1, and apply power to the flight control system and all associated equipment.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>Unless otherwise specified, all voltages are measured with respect to the SIG COM NO. 1 test jack. |                                                |                                   |                                                                                                                                                                         |                                                                                                                                         |
| 2      | SELF TEST                                                                                                                                                                                                                                                                                                                              |                                                |                                   |                                                                                                                                                                         |                                                                                                                                         |
| 2.1    | Set ENG/DIS switch on 913K-1/1A at DIS position. Turn dimmer control on 913K-1/1A fully ccw but not to the self-test (click) position. If any of the mode pushbuttons on the 913K-1/1A are lit, push the lighted buttons once to turn them off.                                                                                        | 28 VDC                                         | ON                                | All mode pushbuttons off (not lit).<br><br>All annunciators off except DIS annunciator. (All system annunciators connected to 913K-1/1A and 161H-1 should also be off.) | Replace 913K-1/1A.<br><br>(If any annunciators connected to the 161H-1 remain lit, replace 161H-1.)                                     |
| 2.2    | Turn dimmer control ccw to the self test (click) position.                                                                                                                                                                                                                                                                             |                                                |                                   | All mode and annunciator lamps on. (All system annunciators connected to 913K-1/1A and 161H-1 should also light.)                                                       | Replace any defective lamps. If lamp is not defective, replace 913K-1/1A (or 161H-1 if failing annunciator is connected to the 161H-1). |
| 2.3    | Turn dimmer control cw out of self test position.                                                                                                                                                                                                                                                                                      |                                                |                                   | All mode and annunciator lamps go out except DIS annunciator.                                                                                                           | Replace 913K-1/1A.                                                                                                                      |
| 2.4    | Push 913K-1/1A HDG mode pushbutton.                                                                                                                                                                                                                                                                                                    |                                                |                                   | HDG pushbutton lights.                                                                                                                                                  | Replace 913K-1/1A.                                                                                                                      |
| 2.5    | Turn dimmer control cw to limit.                                                                                                                                                                                                                                                                                                       |                                                |                                   | HDG pushbutton and DIS annunciator get dimmer as control is turned cw.                                                                                                  | Replace 913K-1/1A.                                                                                                                      |
| (Cont) | Push 913K-1/1A HDG mode pushbutton.                                                                                                                                                                                                                                                                                                    |                                                |                                   | HDG pushbutton goes out.                                                                                                                                                |                                                                                                                                         |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                                                                                                                  | 972S-1 TEST SET |                       | DESIRED RESULTS                                                                                                                                                                                                                  | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                         |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                                                                            | SWITCH          | POSITION              |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                      |
| 2.5<br>(Cont) | Reset dimmer control at maximum ccw position, but do not enter self test position.                                                                                                                                                         |                 |                       |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                      |
| 3             | ENGAGE LOGIC TESTS                                                                                                                                                                                                                         |                 |                       |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                      |
| 3.1           | Measure voltage at both SVO ENG test jacks.                                                                                                                                                                                                |                 |                       | 0 $\pm$ 0.1 Vdc (DIS annunciator should be lit).                                                                                                                                                                                 | Replace 913K-1/1A.                                                                                                                                                                                                   |
| 3.2           | Momentarily set 913K-1/1A ENG/DIS switch at ENG and measure voltage at both SVO ENG test jacks.                                                                                                                                            |                 |                       | +25 Vdc minimum. ENG annunciator lights and DIS annunciator goes out.                                                                                                                                                            | Check for +28 $\pm$ 2 Vdc at ATTD FLAG test jack. If abnormal, check vertical gyro. If normal, measure dc voltage at J9. If voltage is more than 0.5 Vdc, check trim servo. If less than 0.5 Vdc, replace 913K-1/1A. |
| 3.3           | Set 913K-1/1A ENG/DIS switch at DIS and then back to center position.<br><br>Push 913K-1/1A NAV mode pushbutton and ALT mode pushbutton<br><br>Momentarily set 913K-1/1A ENG/DIS switch at ENG.<br><br>Push 913K-1/1A NAV mode pushbutton. |                 |                       | ENG annunciator goes out and DIS annunciator lights.<br><br>NAV and ALT mode pushbuttons light.<br><br>NAV mode pushbutton stays lit and ALT pushbutton goes out. ENG annunciator lights.<br><br>All mode pushbuttons are unlit. | Replace 913K-1/1A.                                                                                                                                                                                                   |
| 3.4           | Momentarily push AP disengage pushbutton on control wheel.                                                                                                                                                                                 |                 |                       | DIS annunciator lights and ENG annunciator goes out.                                                                                                                                                                             | Check AP disengage switch and replace if defective.                                                                                                                                                                  |
| 3.5           | Momentarily set 913K-1/1A ENG/DIS switch at ENG.                                                                                                                                                                                           | ATTD FLAG       | OFF then back to NORM | ENG annunciator lights.<br><br>DIS annunciator lights and ENG annunciator goes out.                                                                                                                                              | Replace 913K-1/1A.                                                                                                                                                                                                   |
| 3.6           | Momentarily set 913K-1/1A ENG/DIS switch at ENG.<br><br>Close manual trim engage switch and momentarily push manual trim up switches.                                                                                                      |                 |                       | ENG annunciator lights.<br><br>DIS annunciator lights and ENG annunciator goes out.                                                                                                                                              | Measure dc voltage at J9 while manual trim switches are held in up position. If voltage is +28 $\pm$ 2 V dc, replace 913K-1/1A. If voltage is abnormal, check trim servo and manual trim switches.                   |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                     | 972S-1 TEST SET |          | DESIRED RESULTS                                                                                                                 | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                                                                                                                             |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                               | SWITCH          | POSITION |                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |
| 3.7  | <p>Momentarily set 913K-1/1A ENG/DIS switch at ENG.</p> <p>Push and hold SYNC pushbutton on control wheel, and measure dc voltage at left SVO ENGA test jack.</p> <p>Release SYNC pushbutton.</p>             |                 |          | <p>ENG annunciator lights.</p> <p>0 <math>\pm</math> 2 Vdc.</p>                                                                 | Measure dc voltage at J10 while SYNC pushbutton is pushed. If voltage is +28 $\pm$ 2 V dc, replace 913K-1/1A. If voltage is abnormal, replace SYNC pushbutton.                                                                                                                                                           |
| 4    | CONTROL WHEEL STEERING MODE TESTS                                                                                                                                                                             |                 |          |                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |
| 4.1  | Set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position. Check controls for freedom of movement.                                                                                     |                 |          | DIS annunciator is lit. Controls are free to move (all servos are disengaged).                                                  | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                       |
| 4.2  | Engage autopilot (momentarily set ENG/DIS switch on 913K-1/1A at ENG position), and check controls for freedom of movement.                                                                                   |                 |          | ENG annunciator lights and controls resist movement (servos engaged).                                                           | If all controls are free to move, repeat test 3.2. If only one control is free to move, check the corresponding servo for faulty engaged circuit or clutch.                                                                                                                                                              |
| 4.3  | <p>Press and hold the CWS (sync) pushbutton on the control wheel and check the controls for freedom of movement.</p> <p>Manually set the controls at the neutral position and release the CWS pushbutton.</p> |                 |          | Ailerons, elevators and trim should be free to move but rudder should continue to resist movement while CWS pushbutton is held. | Check CWS pushbutton and replace if defective. If not defective, replace 913K-1/1A.                                                                                                                                                                                                                                      |
| 4.4  | Rotate the pitch control on the 614E-41/41A to the UP position and then to the DN position while observing the elevators.                                                                                     |                 |          | Elevators move to up position and then to down position.                                                                        | Check for pitch signal at J26 on test set. If abnormal, replace 614E-41/41A. If normal, check for elevator command signal at 161H-1 ELEV CMD jack. If normal, replace elevator servo. If abnormal, check for elevator command signal at 913K-1 ELEV CMD jack. If normal, replace 161H-1. If abnormal, replace 913K-1/1A. |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                 | 972S-1 TEST SET |          | DESIRED RESULTS                                                                                                                                                     | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                                                                                                                                                                                                       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                           | SWITCH          | POSITION |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.5  | Rotate the roll control on the 614E-41/41A to the R position and then to the L position while observing the ailerons.                                                                                                                     |                 |          | Ailerons move to the right bank position and then to the left bank position.                                                                                        | Check for roll signal at J24 on test set. If abnormal, replace 614E-41/41A. If normal, check for aileron command signal at 161H-1 AIL CMD jack. If normal, replace aileron servo. If abnormal, check for aileron command signal at 913K-1 AIL CMD jack. If normal, replace 161H-1. If abnormal, replace 913K-1/1A.                                                                                 |
| 4.6  | Push autopilot disengage pushbutton on control wheel.                                                                                                                                                                                     |                 |          | DIS annunciator lights.                                                                                                                                             | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                 |
| 5    | HEADING MODE TESTS                                                                                                                                                                                                                        |                 |          |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 5.1  | Verify that the DG (directional gyro) is slaved and adjust the HDG knob to position the heading bug under the lubber line. Push the HDG mode pushbutton on the 913K-1/1A once and momentarily set the ENG/DIS switch at the ENG position. |                 |          | HDG mode pushbutton and ENG annunciator light.                                                                                                                      | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                 |
| 5.2  | Adjust the HDG knob to move the heading bug 10 degrees to the right and then 10 degrees to the left of the lubber line while observing the control wheel.                                                                                 |                 |          | Control wheel should move to the right and then to the left. (On flight directors with command bars, the command bars should command a right and then a left roll.) | If no response, check for approximately 2 Vac at HDG test jacks when HDG bug is set 10 degrees to right of lubber line. If 2 Vac is measured, replace 913K-1/1A. If HDG signal is absent, check compass system. If command bars are not operating, verify 0 $\pm$ 1.5 V dc (K-1) or +2 $\pm$ 1.5 V dc (K-1A) at J22 on 972S-1. If normal, replace flight director. If abnormal, replace 913K-1/1A. |
| 5.3  | Push HDG mode pushbutton on 913K-1/1A, and verify voltage at J22 on 972S-1.                                                                                                                                                               |                 |          | +15 V dc minimum. (No mode pushbuttons are lit.)                                                                                                                    | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                 |
| 6    | ALTITUDE HOLD MODE TESTS                                                                                                                                                                                                                  |                 |          |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6.1  | Push HDG and ALT mode pushbuttons on 913K-1/1A.                                                                                                                                                                                           |                 |          | HDG and ALT mode pushbuttons light.                                                                                                                                 | Replace 913K-1/1A.                                                                                                                                                                                                                                                                                                                                                                                 |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                   | 972S-1 TEST SET                                      |                                                          | DESIRED RESULTS                                                      | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                  |
|------|---------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                             | SWITCH                                               | POSITION                                                 |                                                                      |                                                                                                                                                                               |
| 6.2  | Observe elevators.                                                                          | DC SIGNAL switches<br>ALT ERROR                      | -/FIXED<br>TEST                                          | Elevators move to pitch up position (control column moves rearward). | Set DC SIGNAL +/- switch at opposite position and ALT/IAS switch at TEST, and then check for desired result.<br><br>If normal, replace 161H-1. If abnormal replace 913K-1/1A. |
| 6.3  | Observe elevators.                                                                          | DC SIGNAL switches                                   | + /FIXED                                                 | Elevators move to pitch down position.                               |                                                                                                                                                                               |
| 6.4  | Push HDG and ALT mode pushbuttons on 913K-1/1A.                                             | ALT ERROR<br>ALT/IAS<br>DC SIGNAL switches           | NORM<br>NORM<br>+ /FIXED                                 | HDG and ALT mode pushbuttons are not lit.                            | Replace 913K-1/1A.                                                                                                                                                            |
| 7    | INDICATED AIRSPEED HOLD MODE TESTS                                                          |                                                      |                                                          |                                                                      |                                                                                                                                                                               |
| 7.1  | Push HDG mode pushbutton on 913K-1/1A.                                                      | DC SIGNAL switch<br><br>IAS<br><br>DC SIGNAL control | VAR<br><br>TEST<br><br>Adjust for +1.00 Vdc at IAS jacks | HDG mode pushbutton is lit.                                          | Replace 913K-1/1A.                                                                                                                                                            |
| 7.2  | Push SYNC (CWS) pushbutton on control wheel and then push IAS mode pushbutton on 913K-1/1A. |                                                      |                                                          | HDG and IAS mode pushbuttons are lit.                                | Replace 913K-1/1A.                                                                                                                                                            |
| 7.3  | Adjust DC SIGNAL control for +2.00 Vdc and observe elevators.                               | DC SIGNAL control                                    | Adjust for +2.00 Vdc at IAS jacks                        | Elevators move to pitch up position.                                 | Check for NLT +1.00 Vdc at 913K-1 ALT/IAS jacks on test set. If normal, replace 913K-1/1A. If abnormal, replace 161H-1.                                                       |
| 7.4  | Adjust DC SIGNAL control for 0 Vdc and observe elevators.                                   | DC SIGNAL control                                    | Adjust for 0.0 Vdc at IAS jacks                          | Elevators move to pitch down position.                               | Check for NLT -1.00 Vdc at 913K-1 ALT/IAS jacks on test set. If normal, replace 913K-1/1A. If abnormal, replace 161H-1.                                                       |
| 7.5  | Push HDG and IAS mode pushbutton on 913K-1/1A.                                              | IAS<br>DC SIGNAL switches                            | NORM<br>+ /FIXED                                         | HDG and IAS mode pushbuttons are not lit.                            | Replace 913K-1/1A.                                                                                                                                                            |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                               | 972S-1 TEST SET                                                                                 |                                                                                  | DESIRED RESULTS                                                                                                                                                                                                                                                                                                                                                                                                                                            | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                           |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                         | SWITCH                                                                                          | POSITION                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                        |
| 8    | NAVIGATION MODE TEST                                                                                                                                                                    |                                                                                                 |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                        |
| 8.1  | Ensure that a valid VOR or LOC station is not selected or that the navigation receiver is turned off and set the test set switches and controls. Push NAV mode pushbutton on 913K-1/1A. | 161H-1 COURSE DATUM<br><br>913K-1 COURSE DATUM<br><br>AC SIGNAL switch<br><br>AC SIGNAL control | TEST<br><br>TEST<br><br>VAR<br><br>Adjust for 0 Vac at 161H-1 COURSE DATUM jacks | NAV mode pushbutton and NAV ARM annunciator are lit.                                                                                                                                                                                                                                                                                                                                                                                                       | Replace 913K-1/1A.                                                                                                                                                                                     |
| 8.2  | Observe ailerons.                                                                                                                                                                       | 161H-1 VOR/LOC DEV                                                                              | TEST                                                                             | Ailerons do not change positions.                                                                                                                                                                                                                                                                                                                                                                                                                          | Replace 161H-1.                                                                                                                                                                                        |
| 8.3  | Set test set switches and controls and then slowly rotate DC SIGNAL control cw and then ccw while observing ailerons.                                                                   | DC SIGNAL switch<br><br>DC SIGNAL control<br><br>NAV FLAG                                       | VAR<br><br>Midrange<br><br>TEST                                                  | NAV CAP annunciator lights. Ailerons move to right bank position and then to left bank position as DC SIGNAL control is rotated cw and then ccw from center position.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>Note</b></div><br><br>If DR annunciator lights, DC SIGNAL control was rotated too rapidly. Allow time for DR annunciator to go out and then continue test by rotating DC SIGNAL control slowly. | Set 913K-1 VOR/LOC DEV switch on test set at TEST and rotate DC SIGNAL control cw and turn ccw. If ailerons move to left, then to right bank position, replace 161H-1. If abnormal, replace 913K-1/1A. |
| 8.4  | Observe ailerons as AC SIGNAL control is rotated.                                                                                                                                       | DC SIGNAL control<br><br>AC SIGNAL control                                                      | Midrange<br><br>Rotate cw and then ccw from 0-Vac position                       | Ailerons move to left bank position and then to right bank position as AC SIGNAL control is rotated cw and then ccw from 0-Vac position.                                                                                                                                                                                                                                                                                                                   | Replace 913K-1/1A.                                                                                                                                                                                     |



Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                 | 972S-1 TEST SET                                                                                                               |                                                                      | DESIRED RESULTS                                                                                                                                                                                                                                   | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                           | SWITCH                                                                                                                        | POSITION                                                             |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                         |
| 8.5  | Observe ailerons.                                                                                                                                                         | AC SIGNAL control                                                                                                             | Adjust for 0 Vac at 161H-1 COURSE DATUM jacks                        | Ailerons return to neutral position.                                                                                                                                                                                                              | Replace 913K-1/1A.                                                                                                                                                                                      |
| 8.6  | Select a valid VOR station with DME on the navigation receiver. Slowly rotate DC SIGNAL control to ccw limit and measure voltage at 913K-1 VOR/LOC DEV jacks on test set. | DC SIGNAL control                                                                                                             | Slowly rotate to ccw limit                                           | Record voltage for comparison during test 8.7. (Voltage may be zero if aircraft is within 15 miles of VOR/DME station.)                                                                                                                           |                                                                                                                                                                                                         |
| 8.7  | Observe voltage at 913K-1 VOR/LOC DEV jacks on test set when DME switch is set at TEST.                                                                                   | DME                                                                                                                           | TEST                                                                 | Voltage should be greater than that measured during test 8.6.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>Note</b> </div> If DR annunciator lights, wait for it to go out before measuring the voltage. | If voltage is the same during tests 8.6 and 8.7, check for +28 Vdc at J18 on the test set. If normal, replace 161H-1. If abnormal verify that DME receiver is operational and receiving a valid signal. |
| 8.8  | Push NAV mode pushbutton on 913K-1/1A.                                                                                                                                    | DME<br><br>161H-1 VOR/LOC DEV<br><br>161H-1 COURSE DATUM<br><br>NAV FLAG<br><br>913K-1 COURSE DATUM<br><br>DC SIGNAL switches | NORM<br><br>NORM<br><br>NORM<br><br>NORM<br><br>NORM<br><br>+/-FIXED | NAV mode pushbutton is not lit.                                                                                                                                                                                                                   | Replace 913K-1/1A.                                                                                                                                                                                      |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                 | 972S-1 TEST SET                                                                                 |                                                                                  | DESIRED RESULTS                                                                                                                          | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                      |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                           | SWITCH                                                                                          | POSITION                                                                         |                                                                                                                                          |                                                                                                                                                                   |
| 9    | APPROACH MODE TEST                                                                                                                                                        |                                                                                                 |                                                                                  |                                                                                                                                          |                                                                                                                                                                   |
| 9.1  | Ensure that radio altimeter is off. Ensure that a VOR/LOC station is not selected, and set test set switches and controls.<br><br>Push APPR mode pushbutton.              | 913K-1 COURSE DATUM<br><br>161H-1 COURSE DATUM<br><br>AC SIGNAL switch<br><br>AC SIGNAL control | TEST<br><br>TEST<br><br>VAR<br><br>Adjust for 0 Vac at 161H-1 COURSE DATUM jacks | APPR mode pushbutton and NAV ARM annunciator are lit.                                                                                    | Replace 913K-1/1A.                                                                                                                                                |
| 9.2  | Observe ailerons.                                                                                                                                                         | 161H-1 VOR/LOC DEV                                                                              | TEST                                                                             | Ailerons do not change.                                                                                                                  | Replace 161H-1.                                                                                                                                                   |
| 9.3  | Set test set switches and controls and then slowly rotate DC SIGNAL control cw while observing ailerons.                                                                  | DC SIGNAL switch<br><br>DC SIGNAL control<br><br>NAV FLAG                                       | VAR<br><br>Midrange<br><br>TEST                                                  | NAV CAP annunciator lights and ailerons move to right bank position.                                                                     | Replace 161H-1.                                                                                                                                                   |
| 9.4  | Observe ailerons.                                                                                                                                                         | DC SIGNAL control<br><br>AC SIGNAL control                                                      | Midrange<br><br>Rotate cw and then ccw from 0-Vac position                       | Ailerons move to left bank position and then to right bank position as AC SIGNAL control is rotated cw and then ccw from 0-Vac position. | Replace 913K-1/1A.                                                                                                                                                |
| 9.5  | Observe ailerons.                                                                                                                                                         | AC SIGNAL control                                                                               | Adjust for 0 Vac at 161H-1 COURSE DATUM jacks                                    | Ailerons return to neutral positions.                                                                                                    | Replace 913K-1/1A.                                                                                                                                                |
| 9.6  | Select a valid localizer station on the navigation receiver. (Verify that GS FLAG annunciator is lit.) Connect a jumper between the 161H-1 VOR/LOC DEV jacks on test set. |                                                                                                 |                                                                                  | GS ARM annunciator lights within 15 seconds.                                                                                             | Check for NLT +18 Vdc at J13 on test set. If normal, replace 913K-1/1A. If abnormal, verify that valid localizer station has been selected and is being received. |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                   | 972S-1 TEST SET     |                                            | DESIRED RESULTS                                                                                                                           | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                                                    |
|------|---------------------------------------------------------------------------------------------|---------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                             | SWITCH              | POSITION                                   |                                                                                                                                           |                                                                                                                                                                                                                                                 |
| 9.7  |                                                                                             | DC SIGNAL control   | Rotate cw to stop                          | GS CAP annunciator is lit.                                                                                                                | Repeat test with 913K-1 GS DEV switch set at TEST. If desired result is normal, replace 161H-1. If abnormal, check for NLT +300 mV at GS FLAG jacks. If normal, replace 913K-1/1A. If abnormal, verify that valid GS station is being received. |
|      |                                                                                             | DC SIGNAL switch    | VAR                                        |                                                                                                                                           |                                                                                                                                                                                                                                                 |
|      |                                                                                             | 161H-1 GS DEV       | TEST                                       |                                                                                                                                           |                                                                                                                                                                                                                                                 |
|      |                                                                                             | DC SIGNAL control   | Rotate ccw past center position            |                                                                                                                                           |                                                                                                                                                                                                                                                 |
| 9.8  | Observe elevators.                                                                          | DC SIGNAL control   | Rotate cw from center position             | Elevators move to pitch up position.                                                                                                      | Repeat test with 913K-1 GS DEV switch set at TEST. If desired result is normal, replace 161H-1. If abnormal, replace 913K-1/1A.                                                                                                                 |
| 9.9  | Observe elevators.                                                                          | DC SIGNAL control   | Rotate ccw from center position            | Elevators move to pitch down position.                                                                                                    |                                                                                                                                                                                                                                                 |
| 9.10 | Observe elevators.                                                                          | DC SIGNAL control   | Adjust for 0 Vdc at 161H-1 GS DEV jacks    | Elevators move to neutral position.                                                                                                       | Replace 913K-1/1A.                                                                                                                                                                                                                              |
| 9.11 | Observe ailerons.                                                                           | AC SIGNAL control   | Rotate cw and then ccw from 0 Vac position | Ailerons move to left bank position and then to right bank position as AC SIGNAL control is rotated cw and then ccw from center position. | Replace 913K-1/1A.                                                                                                                                                                                                                              |
| 9.12 | Push APPR mode pushbutton on 913K-1/1A.<br><br>Remove jumper from 161H-1 VOR/LOC DEV jacks. | 161H-1 GS DEV       | NORM                                       | APPR mode pushbutton and GS CAP annunciator are not lit.                                                                                  | Replace 913K-1/1A.                                                                                                                                                                                                                              |
|      |                                                                                             | 161H-1 COURSE DATUM | NORM                                       |                                                                                                                                           |                                                                                                                                                                                                                                                 |
|      |                                                                                             | 913K-1 COURSE DATUM |                                            |                                                                                                                                           |                                                                                                                                                                                                                                                 |
|      |                                                                                             | AC SIGNAL switches  | 0° / FIXED                                 |                                                                                                                                           |                                                                                                                                                                                                                                                 |
|      |                                                                                             | DC SIGNAL switches  | + / FIXED                                  |                                                                                                                                           |                                                                                                                                                                                                                                                 |
| 9.13 | Measure voltage at 913K-1 GS DEV jacks on test set.                                         | 161H-1 GS DEV       | TEST                                       | Record for comparison in test 9.15.                                                                                                       | Replace 161H-1.                                                                                                                                                                                                                                 |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                         | 972S-1 TEST SET                                                                     |                                                                      | DESIRED RESULTS                                      | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                   | SWITCH                                                                              | POSITION                                                             |                                                      |                                                                                                                                                                     |
| 9.14 | Turn on radio altimeter and measure voltage at 913K-1 GS DEV jacks.                                               |                                                                                     |                                                                      | 0 $\pm$ 20 mVdc.                                     | Check for NLT +25 Vdc at J20 on test set. If normal, replace 161H-1. If abnormal, check radio altimeter for proper operation.                                       |
| 9.15 | Measure voltage at 913K-1 GS DEV jacks.                                                                           | RAD ALT                                                                             | TEST                                                                 | Same as test 9.13 $\pm$ 10%.                         | Replace 161H-1.                                                                                                                                                     |
| 9.16 | Turn off radio altimeter.                                                                                         | RAD ALT<br>161H-1 GS DEV<br>NAV FLAG                                                | NORM<br>NORM<br>NORM                                                 |                                                      |                                                                                                                                                                     |
| 10   | BACK-COURSE AND GO-AROUND MODE TESTS                                                                              |                                                                                     |                                                                      |                                                      |                                                                                                                                                                     |
| 10.1 | Ensure that a VOR station is selected. Set test set switches and controls. Push B/C mode pushbutton on 913K-1/1A. | 913K-1 COURSE DATUM<br>161H-1 COURSE DATUM<br>AC SIGNAL switch<br>AC SIGNAL control | TEST<br>TEST<br>VAR<br>Adjust for 0 Vac at 161H-1 COURSE DATUM jacks | B/C mode pushbutton remains unlit.                   | Replace 913K-1/1A.                                                                                                                                                  |
| 10.2 | Select a valid localizer station and push the B/C mode pushbutton on 913K-1/1A.                                   |                                                                                     |                                                                      | B/C mode pushbutton and NAV ARM annunciator are lit. | Check for NLT +18 Vdc at J13 on test set. If normal, replace 913K-1/1A. If abnormal, verify that a valid localizer station has been selected and is being received. |
| 10.3 | Set test set switches and controls and then slowly rotate DC SIGNAL control fully ccw.                            | DC SIGNAL control<br>DC SIGNAL switch<br>161H-1 VOR/LOC DEV                         | Fully cw<br>VAR<br>TEST                                              | NAV CAP annunciator lights.                          | Replace 161H-1.                                                                                                                                                     |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                   | 972S-1 TEST SET                                                                                                              |                                                                                                 | DESIRED RESULTS                                                                                                                                                                                                                     | TROUBLESHOOTING INSTRUCTIONS |
|------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
|      |                                                                                             | SWITCH                                                                                                                       | POSITION                                                                                        |                                                                                                                                                                                                                                     |                              |
| 10.4 | Observe ailerons.                                                                           |                                                                                                                              |                                                                                                 | Ailerons move to right bank position.                                                                                                                                                                                               | Replace 913K-1/1A.           |
| 10.5 | Push GA pushbutton and observe ailerons and elevators.                                      |                                                                                                                              |                                                                                                 | Ailerons return to neutral position and elevators move to pitch up position.<br><br>Only GA annunciator is lit.                                                                                                                     | Replace 913K-1/1A.           |
| 10.6 | Observe ailerons.                                                                           | DC SIGNAL control<br><br>AC SIGNAL control                                                                                   | Adjust for 0 Vdc at 913K-1 VOR/LOC DEV jacks<br><br>Rotate cw and then ccw from center position | Ailerons remain at neutral position.                                                                                                                                                                                                | Replace 913K-1/1A.           |
| 10.7 | Push B/C mode pushbutton on 913K-1/1A and observe ailerons as AC SIGNAL control is rotated. | AC SIGNAL control                                                                                                            | Rotate cw and then ccw from center position                                                     | B/C mode pushbutton and NAV CAP annunciator are lit and GA annunciator is not lit.<br><br>Ailerons move to right bank position and then to left bank position as AC SIGNAL control is rotated cw and then ccw from center position. | Replace 913K-1/1A.           |
| 10.8 | Push B/C mode pushbutton on 913K-1/1A.                                                      | 161H-1 COURSE DATUM<br><br>913K-1 COURSE DATUM<br><br>913K-1 VOR/LOC DEV<br><br>AC SIGNAL switches<br><br>DC SIGNAL switches | NORM<br><br>NORM<br><br>NORM<br><br>0° / FIXED<br><br>+ / FIXED                                 | B/C mode pushbutton is not lit.                                                                                                                                                                                                     | Replace 913K-1/1A.           |

Table 3. AP-106 Autopilot Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                      | 972S-1 TEST SET       |              | DESIRED RESULTS                                                                                 | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                                                                |
|------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                | SWITCH                | POSITION     |                                                                                                 |                                                                                                                                                                                                             |
| 11   | AUTOPILOT TRIM TESTS                                                                                                                           |                       |              |                                                                                                 |                                                                                                                                                                                                             |
| 11.1 | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                                   |                       |              | ENG annunciator on 913K-1/1A is lit.                                                            | Replace 913K-1/1A.                                                                                                                                                                                          |
| 11.2 | Rotate ELEV FORCE control on test set counterclockwise from center position.                                                                   | ELEV FORCE switch     | TEST         | TRIM UP annunciator on 913K-1/1A flashes on and off, and trim servo operates in up direction.   | If TRIM annunciator does not flash, replace 913K-1/1A. If TRIM annunciator flashes but servo does not operate, perform test 12 to check trim servo. If trim servo is operating properly, replace 913K-1/1A. |
| 11.3 | Rotate ELEV FORCE control on test set clockwise from center position.                                                                          |                       |              | TRIM DN annunciator on 913K-1/1A flashes on and off, and trim servo operates in down direction. |                                                                                                                                                                                                             |
| 11.4 | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position.                                                  | ELEV FORCE switch     | NORM         | DIS annunciator on 913K-1/1A is lit.                                                            | Replace 913K-1/1A.                                                                                                                                                                                          |
| 12   | TRIM SERVO TEST<br>(Perform this test only when a defect is indicated during test 10.)                                                         |                       |              |                                                                                                 |                                                                                                                                                                                                             |
| 12.1 | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position. Set test set switches and observe trim surfaces. | SVO ENGA<br>TRIM UP   | TEST<br>TEST | Trim surfaces move to trim up position.                                                         | Replace trim servo.                                                                                                                                                                                         |
| 12.2 | Set test set switches and observe trim surfaces.                                                                                               | TRIM UP<br>TRIM DOWN  | NORM<br>TEST | Trim surfaces move to trim down position.                                                       | Replace trim servo.                                                                                                                                                                                         |
| 12.3 |                                                                                                                                                | TRIM DOWN<br>SVO ENGA | NORM<br>NORM |                                                                                                 |                                                                                                                                                                                                             |

### 3.2.2 Yaw Damper System Test Procedure

To test the yaw damper system, remove the 329T-1 Turn and Slip Indicator from the instrument panel and connect it to the 972S-1 Autopilot Ramp Test Set as described in paragraph 3.1, and perform the test procedure given in table 4.

### 3.2.3 Elevator Trim System Test Procedure

Perform the following procedure to test the elevator trim system without the AP-106 or AP-107 Autopilot System.

- a. Turn on aircraft power and engage manual trim solenoid switch.
- b. Set manual trim switches for trim up and observe that the trim surfaces move in the proper direction.
- c. Set manual trim switches for trim down and observe that the trim surfaces move in the proper direction.
- d. Hold manual trim switches in down position and push trim disengage switch and observe that trim system disengages.
- e. Turn off aircraft power.

### 3.2.4 FD-112C/V Flight Director Test Procedure

- a. Apply power to the AP-106/AP-107 Flight Control System, the navigation and glideslope receivers, and the radio altimeter.
- b. Set the 28 VDC power switch on the test set at ON.
- c. Observe that the HEADING flag on the flight director disappears from view within 1.5 minutes. If a fault is indicated, check the compass system power and the compass system for defects.
- d. Observe that the ATT flag disappears from view within 3 minutes. If a fault is indicated, check for +25.2 to +30.8 Vdc at 913K-1 ATTD FLAG test jack on the test set. If voltage is correct, replace flight director. If voltage is not correct, check 332D-12/12A Vertical Gyro.
- e. If a radio altimeter and FD-112V are used in the system, the RAD ALT flag on the FD-112V should disappear from view within 2 minutes. If a fault is indicated, check for +25.2 to +30.8 Vdc at test jack J14 on the test set. If voltage is correct, replace FD-112V. If voltage is not correct, check radio altimeter.
- f. Observe that the attitude indicator shows aircraft pitch and roll attitude. If a fault is indicated, check the 332D-12/12A Vertical Gyro (paragraph 3.2.5)

and determine if the 332D-12/12A is operating properly.

- g. Select HDG mode by pushing HDG mode pushbutton on 913K-1/1A. Adjust HDG knob on flight director to position heading bug 10 degrees to the right of the lubber line, and observe that the roll command bar deflects to the right.
- h. Reposition the heading bug 10 degrees to the left of the lubber line and observe that the roll command bar deflects to the left.
- i. Position the heading bug under the lubber line and observe that the roll command bar is centered.
- j. On the 972S-1 Autopilot Test Set, set the AC SIGNAL switches at 0° and FIXED, set the 913K-1 PITCH switch at TEST and observe that the pitch command bar deflects downward.
- k. Set the 0°/180° AC SIGNAL switch at 180° and observe that the pitch command bar deflects upward. Reset 913K-1 PITCH switch at NORM and push HDG mode pushbutton on the 913K-1/1A.
- l. Observe that the compass card in the course indicator shows the aircraft's magnetic heading. If a fault is indicated, check the compass system and determine if it is operating properly.
- m. Push the TEST pushbutton on the flight director and observe the following.
  1. The ATT flag comes into view.
  2. The attitude display indicates an additional 8 to 12 degrees of pitch-up and 8 to 12 degrees of roll right from the normal attitude observed during step f.
- n. Release the TEST pushbutton and observe that the ATT flag disappears from view and that the attitude display returns to normal indications observed during step f.
- o. Select a local VOR station or a simulated VOR signal, and observe that the NAV warning flag disappears from view.
- p. With the COURSE select control, rotate the course arrow until the to/from pointer indicates to and the lateral deviation bar centers in line with the course arrow.
- q. With respect to the lubber line, the course arrow should indicate relative bearing of the VOR station from the aircraft. If a simulated VOR signal is used, the course arrow should indicate the heading selected on the VOR simulator.
- r. Rotate the course arrow clockwise 90 degrees and observe that the lateral deviation bar displays a right-of-course indication.
- s. Rotate the course arrow clockwise an additional 90 degrees and observe that the lateral deviation bar is centered and the to/from pointer indicates from.

Table 4. Yaw Damper System Test Procedure.

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                                                      | 972S-1 TEST SET |          | DESIRED RESULTS                                                                                 | TROUBLESHOOTING INSTRUCTIONS                                                                                                                                              |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                                                                | SWITCH          | POSITION |                                                                                                 |                                                                                                                                                                           |
| 1    | 329T-1 TURN AND SLIP INDICATOR TESTS                                                                                                                                                                                                                                                                                                           |                 |          |                                                                                                 |                                                                                                                                                                           |
| 1.1  | Apply power to the yaw damper system and the 913K-1/1A and 161H-1 if used in the autopilot system.                                                                                                                                                                                                                                             | 28 VDC          | ON       | Red gyro warning flag on front of 329T-1 goes out of view.                                      | Check for +26 to +30 Vdc at red 28 VDC test jack on test set. If correct, replace 329T-1. If incorrect check 329T-1 circuit breaker.                                      |
| 1.2  | Set the yaw damper engage switch at the engaged position.                                                                                                                                                                                                                                                                                      |                 |          | Rudder controls resist movement.                                                                | Check rudder servo circuit breaker, yaw damper engage switch and yaw damper disengage switch for open circuit. If all right, check rudder servo and replace if defective. |
| 1.3  | Push and release autopilot disengage pushbutton (or yaw damper disengage pushbutton).                                                                                                                                                                                                                                                          |                 |          | Rudder controls are free to move.                                                               | Replace disengage switch.                                                                                                                                                 |
| 1.4  | Set ENG/DIS switch on 913K-1/1A at ENG position and then back to center position.<br><br><div style="border: 1px solid black; padding: 2px; width: fit-content;">Note</div><br>If yaw damper system is installed in an aircraft without an autopilot system, set the yaw damper engage switch at the engaged position and proceed to test 1.5. |                 |          | Rudder controls resist movement.                                                                | Check for +26 to +30 Vdc at red SVO ENGA test jack. If correct, replace rudder servo. If incorrect, replace 913K-1/1A.                                                    |
| 1.5  | Observe position of rudder surface with yaw damper engaged.                                                                                                                                                                                                                                                                                    |                 |          | Rudder surface is in center (neutral) position.                                                 | Check for 0 Vdc at 329T-1 RUD CMD test jack. If correct, check rudder control cables for proper tension and adjustment. If voltage is incorrect, replace 329T-1.          |
| 1.6  | Rotate 329T-1 in clockwise direction (viewed from top) and observe rudder surface.                                                                                                                                                                                                                                                             |                 |          | Rudder surface deflects to left when viewed from the rear and then returns to neutral position. | Perform either test 2 or 3 as applicable to the particular system under test.                                                                                             |



Table 4. Yaw Damper System Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                  | 972S-1 TEST SET                                   |                             | DESIRED RESULTS                                                                                                                                          | TROUBLESHOOTING INSTRUCTIONS                                                  |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                            | SWITCH                                            | POSITION                    |                                                                                                                                                          |                                                                               |
| 1.7  | Rotate 329T-1 in counterclockwise direction and observe rudder surface.<br><br><div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 10px auto;"> <b>Note</b> </div> Perform tests 1.8 and 1.9 if a 332D-12/12A is used in the system; tests 1.8a and 1.9a if a 329A-( ) is used. |                                                   |                             | Rudder surface deflects to the right and then returns to neutral position.                                                                               | Perform either test 2 or 3 as applicable to the particular system under test. |
| 1.8  | Set test set switches while observing rudder surface.                                                                                                                                                                                                                                                      | AC SIGNAL<br>ROLL<br>332D-12                      | 0/FIXED<br>TEST             | Rudder surface deflects to left when viewed from the rear and then returns to neutral position.                                                          | Perform either test 2 or 3 as applicable to the particular system under test. |
| 1.9  | Set test set switch while observing rudder surface.                                                                                                                                                                                                                                                        | AC SIGNAL                                         | 180/FIXED                   | Rudder surface deflects to right and then returns to neutral.                                                                                            | Perform either test 2 or 3 as applicable to the particular system under test. |
| 1.8a | Set test set switches while observing rudder surface.                                                                                                                                                                                                                                                      | AC SIGNAL<br>ROLL 329A                            | 0/FIXED<br>TEST             | Rudder surface deflects to left when viewed from rear and then returns to neutral.                                                                       | Perform either test 2 or 3 as applicable to the particular system under test. |
| 1.9a | Set test set switch while observing rudder surface.                                                                                                                                                                                                                                                        | AC SIGNAL                                         | 180/FIXED                   | Rudder surface deflects to right and then returns to neutral.                                                                                            | Perform either test 2 or 3 as applicable to the particular system under test. |
| 1.10 | Reset test set switches.                                                                                                                                                                                                                                                                                   | AC SIGNAL<br><br>ROLL<br>332D-12<br><br>ROLL 329A | 0/FIXED<br>NORM<br><br>NORM | If tests 1.1 thru 1.9 were completed satisfactorily, the yaw damper system is operating properly and the remaining tests in this table are not required. |                                                                               |
| 2    | RUDDER SERVO TESTS FOR SYSTEMS WITHOUT THE 161H-1 GAIN PROGRAMMER                                                                                                                                                                                                                                          |                                                   |                             |                                                                                                                                                          |                                                                               |
| 2.1  | Measure ac voltage at J32 (red) test jack on test set.                                                                                                                                                                                                                                                     |                                                   |                             | 24 to 28 Vac.                                                                                                                                            | Check 329T-1 26-Vac fuse and aircraft power circuit.                          |
| 2.2  | Measure dc voltage at J33 (orange) test jack on test set.                                                                                                                                                                                                                                                  |                                                   |                             | +14.25 to +15.75 Vdc.                                                                                                                                    | Replace rudder servo.                                                         |

Table 4. Yaw Damper System Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                              | 972S-1 TEST SET                              |                              | DESIRED RESULTS                   | TROUBLESHOOTING INSTRUCTIONS                         |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------|-----------------------------------|------------------------------------------------------|
|      |                                                                                                                                                                        | SWITCH                                       | POSITION                     |                                   |                                                      |
| 2.3  | Measure dc voltage at J34 (yellow) test jack on test set.                                                                                                              |                                              |                              | -14.25 to -15.75 Vdc.             | Replace rudder servo.                                |
| 2.4  | Set test set switches and observe rudder surface.                                                                                                                      | DC SIGNAL<br>329T-1 RUD<br>CMD               | + / FIXED<br>TEST            | Rudder surface deflects to left.  | Replace rudder servo.                                |
| 2.5  | Set test set switch and observe rudder surface.                                                                                                                        | DC SIGNAL                                    | - / FIXED                    | Rudder surface deflects to right. | Replace rudder servo.                                |
| 2.6  | Reset test set switches.<br><br>If tests 2.1 thru 2.5 are completed satisfactorily but any of tests 1.6 thru 1.9 failed, the 329T-1 is defective and must be replaced. | 329T-1 RUD<br>CMD<br><br>DC SIGNAL<br>28 VDC | NORM<br><br>+ / FIXED<br>OFF |                                   |                                                      |
| 3    | RUDDER SERVO TESTS FOR SYSTEMS WITH THE 161H-1 GAIN PROGRAMMER                                                                                                         |                                              |                              |                                   |                                                      |
| 3.1  | Measure ac voltage at J32 (red) test jack on test set.                                                                                                                 |                                              |                              | 24 to 28 Vac.                     | Check 329T-1 26-Vac fuse and aircraft power circuit. |
| 3.2  | Measure dc voltage at J33 (orange) test jack on test set.                                                                                                              |                                              |                              | +14.25 to +15.75 Vdc.             | Replace rudder servo.                                |
| 3.3  | Measure dc voltage at J34 (yellow) test jack on test set.                                                                                                              |                                              |                              | -14.25 to -15.75 Vdc.             | Replace rudder servo.                                |
| 3.4  | Set test set switches and observe rudder surface.                                                                                                                      | DC SIGNAL<br>161H-1 RUD<br>CMD               | + / FIXED<br>TEST            | Rudder surface deflects to left.  | Replace rudder servo.                                |
| 3.5  | Set test set switch and observe rudder surface.                                                                                                                        | DC SIGNAL                                    | - / FIXED                    | Rudder surface deflects to right. | Replace rudder servo.                                |
| 3.6  | Set test set switches and observe rudder surface.                                                                                                                      | 161H-1 RUD<br>CMD<br><br>329T-1 RUD<br>CMD   | NORM<br><br>TEST             | Rudder surface deflects to right. | Replace 161H-1.                                      |
| 3.7  | Set test set switch and observe rudder surface.                                                                                                                        | DC SIGNAL                                    | + / FIXED                    | Rudder surface deflects to left.  | Replace 161H-1.                                      |

Table 4. Yaw Damper System Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                              | 972S-1 TEST SET              |                 | DESIRED RESULTS | TROUBLESHOOTING INSTRUCTIONS |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------|------------------------------|
|      |                                                                                                                                                                        | SWITCH                       | POSITION        |                 |                              |
| 3.8  | Reset test set switches.<br><br>If tests 3.1 thru 3.7 are completed satisfactorily but any of tests 1.6 thru 1.9 failed, the 329T-1 is defective and must be replaced. | 329T-1 RUD CMD<br><br>28 VDC | NORM<br><br>OFF |                 |                              |

- t. Rotate the course arrow clockwise an additional 90 degrees and observe that the lateral deviation bar displays a left-of-course indication.

**Note**

The following procedures must be performed using a VOR/LOC ramp test set.

- u. Set up and adjust the VOR/LOC ramp test set for a 2-dot, left-of-course localizer signal.
- v. Set the course arrow on the FD-112C/V under the lubber line.
- w. Select the VOR/LOC ramp test set localizer frequency on the navigational receiver. Observe that the NAV warning flag disappears from view and that the lateral deviation bar displays a 2-dot, left-of-course indication.
- x. Adjust the VOR/LOC ramp test set for a 2-dot, right-of-course localizer signal.
- y. Observe that the FD-112C/V lateral deviation bar displays a 2-dot, right-of-course indication.
- z. Adjust the VOR/LOC ramp test set for a 2-dot, below-glideslope signal.
- aa. Observe that the GS warning flag on the FD-112C/V disappears from view and that the glideslope deviation pointer displays a 2-dot, below-glideslope indication.
- ab. Adjust the VOR/LOC ramp test set for a 2-dot, above-glideslope signal.
- ac. Observe that the FD-112C/V glideslope deviation pointer displays a 2-dot, above-glideslope indication.

### 3.2.5 332D-12/12A Vertical Gyro Test Procedure

- a. Remove the four 8-32 screws securing the 332D-12/12A to the airframe. Note the position of any shims used to level the 332D-12/12A.
- b. Apply power to the 332D-12/12A and FD-112C/V.
- c. Observe that the ATT flag on the FD-112C/V disappears from view within 3 minutes.
- d. Tilt the 332D-12/12A to simulate a right bank position, and observe that a right bank position is shown on the attitude display.
- e. Repeat step d to simulate a left bank position.
- f. Tilt the 332D-12/12A to simulate a pitch-up position, and observe that a pitch-up position is shown on the attitude display.
- g. Repeat step f to simulate a pitch-down position.
- h. Remove power applied to the 332D-12/12A and FD-112C/V, and remount the 332D-12/12A to the airframe with the four 8-32 screws and any shims removed during step a.

### 3.2.6 FD-106P/PV Flight Director (329A-( )) Test Procedure

- a. Connect the AP-106/AP-107 Flight Control System to the 972S-1 Autopilot Ramp Test Set as described in paragraph 3.1
- b. Apply power to the AP-106/AP-107 Flight Control System.

**Note**

If an FD-106PV Flight Director (329A-3V/4V) is used in the system, an external vacuum source is required to energize the vacuum driven gyro.

- c. Observe that the gyro warning flag (329A-3/4 only) disappears from view when power is applied to the flight director.
- d. Observe that the attitude display shows the aircraft pitch and roll attitude.

**Note**

The following tests apply only to flight directors with command bars (329A-4 and 329A-4V).

- e. Observe that the STEER flag disappears from view when the 28 VDC power switch on the test set is set at ON.
- f. On the test set, set the AC SIGNAL switch at VAR and the 913K-1 ROLL switch at TEST. Observe that the roll command bar on the flight director moves to the right and then to the left when the AC SIGNAL control on the test set is rotated clockwise and then counterclockwise from the center position. Reset the 913K-1 ROLL switch at NORM.
- g. Set the 913K-1 PITCH switch on the test set at TEST. Observe that the pitch command bar moves below and then above the aircraft reference when the AC SIGNAL control on the test set is rotated clockwise and then counterclockwise from the center position. Reset the 913K-1 PITCH switch at NORM.

### 3.2.7 454N-3 Trim Servo Monitor Test Procedure

- a. Apply power to the AP-106/AP-107 Flight Control System and engage the autopilot.
- b. Hold the 454N-3 TEST switch at position 1, and push the control column forward. The autopilot should disengage within 6 seconds.
- c. Release the 454N-3 TEST switch and engage the autopilot.
- d. Hold the 454N-3 TEST switch at position 1, and pull the control column rearward. The autopilot should disengage within 6 seconds.
- e. Release the 454N-3 TEST switch and engage the autopilot.
- f. Hold the 454N-3 TEST switch at position 2 while pushing the control column forward and selecting down trim. The autopilot should disengage within 0.6 second.
- g. Release the 454N-3 TEST switch and engage the autopilot.
- h. Hold the 454N-3 TEST switch at position 2 while pulling the control column rearward and selecting up trim. The autopilot should disengage within 0.6 second.
- i. Remove power applied to flight control system.

## 4. ALIGNMENT/ADJUSTMENT

**Warning**

The following alignment/adjustment procedure must be performed whenever the applicable equipment is installed or replaced in the aircraft.

The gain adjustment procedures given in the following paragraphs must be performed when the system is installed (or a unit of the system is replaced) in the aircraft and periodically thereafter to ensure that the gain of the system is set for the flight characteristics of the particular type of aircraft. Since gain settings for each particular type of aircraft are unique to that type of aircraft, the gain settings are not specified in this procedure. These specific gain settings are provided in Service Information Letters that are written for each type of aircraft in which the AP-106/AP-107 Flight Control System has been certified. These Service Information Letters are referred to in the procedures when the gain setting is unique to a particular type of aircraft.

### 4.1 913K-1/1A Computer/Control and 562C-13/13A Autopilot Computer Gain Adjustment Procedures

Refer to table 5 for the gain adjustment procedures for the -001 status of the 913K-1/1A Computer/Control and 562C-13/13A Autopilot Computer using the 972S-1 Autopilot Ramp Test Set.

**Note**

All statuses of the 913K-1/1A and 562C-13/13A except the -001 status are factory adjusted for a particular aircraft and do not require adjustment after installation in the aircraft.

### 4.2 Yaw Damper System Adjustment Procedure

Refer to table 6 for the adjustment procedure for the yaw damper system.

### 4.3 161H-1 Gain Programmer Adjustment Procedure

Refer to table 7 for the adjustment procedure for the 161H-1 Gain Programmer and figure 2 for the location of the 161H-1 gain adjustment controls.

**Note**

The 913K-1/1A gain adjustment procedures, paragraph 4.1, should be performed prior to performing the 161H-1 adjustment procedures.



ADDENDUM 1  
TO  
VOLUME I  
OF  
COLLINS AP-106/AP-107 FLIGHT CONTROL SYSTEMS INSTRUCTION BOOK  
523-0764802-00211A

Insert this addendum facing page 31 of the  
AP-106/AP-107 Maintenance Section, 523-0764808-003118

This addendum provides additional information to the ADJUSTMENT INSTRUCTIONS column in test 1.2 of table 5. Test 1.2 is shown below with the added information.

| TEST | PROCEDURE                                                                                                                                           | 972S-1 TEST SET |          | DESIRED RESULTS | ADJUSTMENT INSTRUCTIONS                                                                                                                                                                                                                                                                                                                                         |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                     | SWITCH          | POSITION |                 |                                                                                                                                                                                                                                                                                                                                                                 |
| 1.2  | If not done previously, connect test set to system as indicated in figure 1. Apply power to the flight control system and all associated equipment. |                 |          |                 | <p>Adjust 26-V ac aircraft power for 26.00 <math>\pm</math> 0.26 V ac between J31 and J41 (NO 1 SIG COM) on 972S-1 Test Set.</p> <div style="border: 1px solid black; padding: 2px; text-align: center; margin: 10px 0;">Note</div> <p>Failure to adjust the ac aircraft power will result in improper adjustment of the ac gain controls in the 913K-1/1A.</p> |

Table 5. 913K-1/1A Gain Adjustment Procedures.

| TEST | PROCEDURE                                                                                                                                               | 972S-1 TEST SET                                                  |                                                            | DESIRED RESULTS                                                                                                   | ADJUSTMENT INSTRUCTIONS                                                                      |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|      |                                                                                                                                                         | SWITCH                                                           | POSITION                                                   |                                                                                                                   |                                                                                              |
| 1    | PRETEST PROCEDURE                                                                                                                                       |                                                                  |                                                            |                                                                                                                   |                                                                                              |
| 1.1  | Initial 972S-1 switch settings.                                                                                                                         | 28 VDC<br>AC SIGNAL switches<br>DC SIGNAL switches<br>All others | OFF<br>VAR<br>VAR +<br>NORM                                | <b>Note</b><br>Unless otherwise specified, all voltages are measured with respect to the SIG COM NO. 1 test jack. |                                                                                              |
| 1.2  | If not done previously, connect test set to system as indicated in figure 1, and apply power to the flight control system and all associated equipment. |                                                                  |                                                            |                                                                                                                   |                                                                                              |
| 2    | ROLL GAIN AND TRIM                                                                                                                                      |                                                                  |                                                            |                                                                                                                   |                                                                                              |
| 2.1  | Push HDG mode pushbutton on 913K-1/1A. Adjust HDG bug for 0.00 V ac at HDG jacks on test set and verify that compass is not slaving.                    |                                                                  |                                                            | HDG mode pushbutton on 913K-1/1A is lit.                                                                          |                                                                                              |
| 2.2  | Connect jumper wire across 913K-1 ROLL jacks on test set and measure voltage at J28 (roll steer) on test set.                                           | 28 VDC<br>913K-1 ROLL                                            | ON<br>TEST                                                 | Refer to particular aircraft service information letter for desired result.                                       | Adjust ROLL TRIM control (A2R9) on 913K-1/1A for desired result.                             |
| 2.3  | Remove jumper wire from 913K-1 ROLL jacks on test set. Measure voltage at J28 on test set.                                                              | AC SIGNAL control                                                | Adjust cw from center for 1.00 V ac at 913K-1 ROLL jacks.  | Refer to particular aircraft service information letter for desired results.                                      | Adjust ROLL GAIN control (A2R5) on 913K-1/1A for desired result.                             |
| 2.4  | Measure voltage at J28 on test set.                                                                                                                     | AC SIGNAL control                                                | Adjust ccw from center for 1.00 V ac at 913K-1 ROLL jacks. | Same value as test 2.3 but with opposite polarity.                                                                | Adjust ROLL TRIM control (A2R9) on 913K-1/1A to reduce the error by 1/2 and repeat test 2.3. |
| 2.5  | Push HDG mode pushbutton on 913K-1/1A.                                                                                                                  |                                                                  |                                                            | HDG mode pushbutton is not lit.                                                                                   |                                                                                              |
| 3    | ROLL HOLD DRIFT                                                                                                                                         |                                                                  |                                                            |                                                                                                                   |                                                                                              |
| 3.1  | On 913K-1A, rotate AIL CMD GAIN control (A4R36) to ccw stop.                                                                                            |                                                                  |                                                            |                                                                                                                   |                                                                                              |

Table 5. 913K-1/1A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                                         | 972S-1 TEST SET   |                                                            | DESIRED RESULTS                                                             | ADJUSTMENT INSTRUCTIONS                                                                                              |
|------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                   | SWITCH            | POSITION                                                   |                                                                             |                                                                                                                      |
| 3.2  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                      | AC SIGNAL control | Adjust for 0 V ac at 913K-1 ROLL jacks.                    | ENG annunciator on 913K-1/1A is lit.                                        |                                                                                                                      |
| 3.3  | Push SYNC (CWS) pushbutton and then measure the change in voltage over a 60-second period at J28 (K-1) or J43 (K-1A) on test set. |                   |                                                            | Not more than 10-mV dc in 60 seconds.                                       | Adjust ROLL HOLD DRIFT control (A4R10) on 913K-1/1A for desired result.                                              |
| 3.4  | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position.                                     | 913K-1 ROLL       | NORM                                                       | DIS annunciator on 913K-1/1A is lit.                                        |                                                                                                                      |
| 4    | ROLL COMMAND GAIN                                                                                                                 |                   |                                                            |                                                                             |                                                                                                                      |
| 4.1  | Push APPR mode pushbutton on 913K-1/1A and then push go-around pushbutton. Delay 10 seconds minimum, then proceed to test 4.2.    |                   |                                                            | Go-around annunciator should light when go-around pushbutton is pushed.     |                                                                                                                      |
| 4.2  | Measure voltage at 913K-1 AIL CMD jack on test set.                                                                               | AC SIGNAL control | Adjust cw from center for 1.00 V ac at 913K-1 ROLL jacks.  | Refer to particular aircraft service information letter for desired result. | Adjust AIL CMD GAIN control (A4R36) on 913K-1/1A for desired result.                                                 |
| 4.3  | Measure voltage at 913K-1 AIL CMD jack on test set.                                                                               | AC SIGNAL control | Adjust ccw from center for 1.00 V ac at 913K-1 ROLL jacks. | Same value as test 4.2 but with opposite polarity.                          | If not within limits, readjust AIL CMD GAIN control and repeat tests 4.2 and 4.3 until both tests are within limits. |
| 5    | ROLL RATE                                                                                                                         |                   |                                                            |                                                                             |                                                                                                                      |
| 5.1  | Connect a jumper wire between TP3 and TP4 on 913K-1/1A. Measure voltage at 913K-1 AIL CMD jack on test set.                       | AC SIGNAL control | Adjust cw from center for 1.00 V ac at 913K-1 ROLL jacks.  | Refer to particular aircraft service information letter for desired result. | Adjust ROLL RATE GAIN control (A4R31) on 913K-1/1A for desired result.                                               |



Table 5. 913K-1/1A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                           | 972S-1 TEST SET          |                                                            | DESIRED RESULTS                                                                                                                                                                    | ADJUSTMENT INSTRUCTIONS                                                                                                |
|------|-----------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                     | SWITCH                   | POSITION                                                   |                                                                                                                                                                                    |                                                                                                                        |
| 5.2  | Measure voltage at 913K-1 AIL CMD jack on test set.                                                 | AC SIGNAL control        | Adjust ccw from center for 1.00 V ac at 913K-1 ROLL jacks. | Same value at test 5.1 but with opposite polarity.                                                                                                                                 | If not within limits, readjust ROLL RATE GAIN control and repeat tests 5.1 and 5.2 until both tests are within limits. |
| 5.3  | Push APPR mode push-button on 913K-1/1A twice and remove jumper wire from TP3 and TP4 on 913K-1/1A. |                          |                                                            | Go-around annunciator and all mode pushbuttons are unlit.                                                                                                                          |                                                                                                                        |
| 6    | HEADING GAIN (200 mV/degree heading source)                                                         |                          |                                                            |                                                                                                                                                                                    |                                                                                                                        |
| 6.1  | Push HDG mode push-button on 913K-1/1A and measure voltage at TP5 (roll command) on 913K-1/1A.      | HDG<br>AC SIGNAL control | TEST<br>Adjust cw from center for 2.00 V ac at HDG jacks.  | Refer to particular aircraft service information letter for desired result.<br><br><div>Note</div><br>Desired result for 913K-1A is one-half of value specified in SIL for 913K-1. | Adjust HDG ANLG control (A2R36) on 913K-1/1A for desired result.                                                       |
| 6.2  | Measure voltage at TP5 on 913K-1/1A.                                                                | AC SIGNAL control        | Adjust ccw from center for 2.00 V ac at HDG jacks.         | Same value as test 6.1 but with opposite polarity.                                                                                                                                 | Readjust HDG ANLG control and repeat tests 6.1 and 6.2 until both tests are within limits.                             |
| 6.3  |                                                                                                     | HDG                      | NORM                                                       |                                                                                                                                                                                    |                                                                                                                        |
| 6a   | HEADING GAIN (300 mV/degree heading source)                                                         |                          |                                                            |                                                                                                                                                                                    |                                                                                                                        |
| 6a.1 | Push HDG mode push-button on 913K-1/1A and measure voltage at TP5 (roll command) on 913K-1/1A.      | HDG<br>AC SIGNAL control | TEST<br>Adjust cw from center for 3.00 V ac at HDG jacks.  | Refer to particular aircraft service information letter for desired result.<br><br><div>Note</div><br>Desired result for 913K-1A is one-half of value specified in SIL for 913K-1. | Adjust HDG ANLG control (A2R36) on 913K-1/1A for desired result.                                                       |

Table 5. 913K-1/1A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                                          | 972S-1 TEST SET   |                                                      | DESIRED RESULTS                                                             | ADJUSTMENT INSTRUCTIONS                                                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|      |                                                                                                                                    | SWITCH            | POSITION                                             |                                                                             |                                                                                               |
| 6a.2 | Measure voltage at TP5 on 913K-1/1A.                                                                                               | AC SIGNAL control | Adjust ccw from center for 3.00 V ac at HDG jacks.   | Same value as test 6a.1 but with opposite polarity.                         | Readjust HDG ANLG control and repeat tests 6a.1 and 6a.2 until both tests are within limits.  |
| 6a.3 |                                                                                                                                    | HDG               | NORM                                                 |                                                                             |                                                                                               |
| 7    | PITCH HOLD DRIFT                                                                                                                   |                   |                                                      |                                                                             |                                                                                               |
| 7.1  | Connect jumper wire across PITCH jacks on test set. Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                   | PITCH             | TEST                                                 | ENG annunciator on 913K-1/1A is lit.                                        |                                                                                               |
| 7.2  | Push SYNC (CWS) pushbutton and then measure the change in voltage over a 60-second period at J29 (pitch steer) on test set.        |                   |                                                      | Not more than 10-mV dc change in 60 seconds.                                | Adjust PITCH HOLD DRIFT ADJ control (A1R84) on 913K-1/1A for desired result.                  |
| 7.3  | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position. Remove jumper wire from PITCH jacks. |                   |                                                      | DIS annunciator on 913K-1/1A is lit.                                        |                                                                                               |
| 8    | PITCH ANALOG                                                                                                                       |                   |                                                      |                                                                             |                                                                                               |
| 8.1  | Set AC SIGNAL control for 0 V ac and push SYNC (CWS) pushbutton.                                                                   | AC SIGNAL control | Adjust for 0 V ac at PITCH jacks.                    |                                                                             |                                                                                               |
| 8.2  | Measure voltage at J29 on test set.<br><i>start 1.4</i>                                                                            | AC SIGNAL control | Adjust cw from center for 1.00 V ac at PITCH jacks.  | Refer to particular aircraft service information letter for desired result. | Adjust PITCH ANLG control (A2R20) on 913K-1/1A for desired result.                            |
| 8.3  | Set AC SIGNAL control for 0 V ac and push SYNC (CWS) pushbutton.                                                                   | AC SIGNAL control | Adjust for 0 V ac at PITCH jacks.                    |                                                                             |                                                                                               |
| 8.4  | Measure voltage at J29 on test set.                                                                                                | AC SIGNAL control | Adjust ccw from center for 1.00 V ac at PITCH jacks. | Same value as test 8.1 but with opposite polarity.                          | Readjust PITCH ANLG control and repeat tests 8.1 thru 8.4 until both tests are within limits. |
| 9.   | ELEV COMMAND GAIN                                                                                                                  |                   |                                                      |                                                                             |                                                                                               |
| 9.1  | Set PITCH voltage at 0 V ac and then push SYNC (CWS) pushbutton.                                                                   | AC SIGNAL control | Adjust for 0 V ac at PITCH jacks.                    |                                                                             |                                                                                               |

Table 5. 913K-1/1A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                    | 972S-1 TEST SET      |                                                      | DESIRED RESULTS                                                              | ADJUSTMENT INSTRUCTIONS                                                                                     |
|------|--------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
|      |                                                                                                              | SWITCH               | POSITION                                             |                                                                              |                                                                                                             |
| 9.2  | Measure voltage at 913K-1 ELEV CMD jack on test set.                                                         | AC SIGNAL control    | Adjust cw from center for 1.00 V ac at PITCH jacks.  | Refer to particular aircraft service information letter for desired results. | Adjust ELEV CMD GAIN control (A1R38) on 913K-1/1A for desired result.                                       |
| 9.3  | Measure voltage at 913K-1 ELEV CMD jack on test set.                                                         | AC SIGNAL control    | Adjust ccw from center for 1.00 V ac at PITCH jacks. | Same value as test 9.2 but with opposite polarity.                           | Readjust ELEV CMD GAIN control and repeat tests 9.2 and 9.3 until both tests are within limits.             |
| 10   | PITCH RATE GAIN                                                                                              |                      |                                                      |                                                                              |                                                                                                             |
| 10.1 | Connect a jumper wire between TP1 and TP2 on 913K-1/1A. Measure voltage at 913K-1 ELEV CMD jack on test set. | AC SIGNAL control    | Adjust cw from center for 1.00 V ac at PITCH jacks.  | Refer to particular aircraft service information letter for desired result.  | Adjust PITCH RATE GAIN control (A1R45) on 913K-1/1A for desired result.<br>8.87 -8.40                       |
| 10.2 | Measure voltage at 913K-1 ELEV CMD jack on test set.                                                         | AC SIGNAL control    | Adjust ccw from center for 1.00 V ac at PITCH jacks. | Same value as test 10.1 but with opposite polarity.                          | Readjust PITCH RATE GAIN control and repeat tests 10.1 and 10.2 until both tests are within limits.<br>-7.9 |
| 10.3 | Remove jumper wire from TP1 and TP2 on 913K-1/1A.                                                            |                      |                                                      |                                                                              |                                                                                                             |
| 11   | GO-AROUND PITCH-UP                                                                                           |                      |                                                      |                                                                              |                                                                                                             |
| 11.1 | Push APPR mode push-button on 913K-1/1A and then push go-around pushbutton.                                  | AC SIGNAL control    | Adjust for 0 V ac at PITCH jacks.                    | Go-around annunciator is lit.                                                |                                                                                                             |
| 11.2 | Measure voltage at J29 on test set.                                                                          |                      |                                                      | Refer to particular aircraft service information letter for desired result.  | Adjust GO AROUND PITCH UP control (A1R29) on 913K-1/1A for desired result.                                  |
| 11.3 | Push APPR mode push-button on 913K-1/1A twice.                                                               |                      |                                                      | Go-around annunciator and all mode push-buttons are unlit.                   |                                                                                                             |
| 12   | UP ELEVATOR                                                                                                  |                      |                                                      |                                                                              |                                                                                                             |
| 12.1 | Set test set switches and controls and then push SYNC (CWS) push-button on control wheel.                    | 913K-1 ROLL<br>PITCH | TEST<br>NORM                                         |                                                                              |                                                                                                             |

Table 5. 913K-1/1A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                           | 972S-1 TEST SET                  |                                                                                                                    | DESIRED RESULTS                                                                                   | ADJUSTMENT INSTRUCTIONS                                                                       |
|------|-------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|      |                                                                                     | SWITCH                           | POSITION                                                                                                           |                                                                                                   |                                                                                               |
| 12.2 | Measure voltage at 913K-1 ELEV CMD jack on test set.<br><i>START 75</i>             | AC SIGNAL control                | Adjust ccw from center for 5.00 V ac at 913K-1 ROLL jacks.                                                         | Refer to particular aircraft service information letter for desired result.                       | Adjust UP ELEV control (A1R3) on 913K-1/1A for desired result.                                |
| 12.3 |                                                                                     | 913K-1 ROLL                      | NORM                                                                                                               |                                                                                                   |                                                                                               |
| 13   | VERTICAL GAIN                                                                       |                                  |                                                                                                                    |                                                                                                   |                                                                                               |
| 13.1 | Set PITCH signal at 0 V ac and then push HDG and ALT mode pushbuttons on 913K-1/1A. | PITCH<br>AC SIGNAL control       | TEST<br>Adjust for 0 V ac at PITCH jacks.                                                                          | HDG and ALT mode pushbuttons on 913K-1/1A are lit.                                                |                                                                                               |
| 13.2 | Measure voltage at J29 on test set.                                                 | ALT/IAS<br>DC SIGNAL control     | TEST<br>Adjust for +1.00 V dc at ALT/IAS jacks.                                                                    | Refer to particular aircraft service information letter for desired result.<br><i>Start - 547</i> | Adjust VERT GAIN control (A1R83) on 913K-1/1A for desired result.                             |
| 13.3 | Measure voltage at J29 on test set.                                                 | DC SIGNAL control                | Adjust for -1.00 V dc at ALT/IAS jacks.                                                                            | Same value as in test 13.2 but with opposite polarity.                                            | Readjust VERT GAIN control and repeat tests 13.2 and 13.3 until both tests are within limits. |
| 13.4 |                                                                                     | PITCH<br>ALT/IAS                 | NORM<br>NORM                                                                                                       |                                                                                                   |                                                                                               |
| 14   | AUTOPILOT TRIM GAIN                                                                 |                                  |                                                                                                                    |                                                                                                   |                                                                                               |
| 14.1 | Set MAX DUTY CYCLE control (A4R11) on 913K-1/1A at max clockwise position.          | ELEV FORCE<br>ELEV FORCE control | TEST<br>Adjust for value given in service information letter for particular aircraft. Measure at ELEV FORCE jacks. |                                                                                                   |                                                                                               |
| 14.2 | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position and measure trim speed. |                                  |                                                                                                                    | Refer to particular aircraft service information letter for desired result.                       | Adjust TRIM GAIN control (A4R107) on 913K-1/1A for desired result.                            |

Table 5. 913K-1/1A Gain Adjustment Procedures.

| TEST | PROCEDURE                                                                                                                                                                                                                                                                            | 972S-1 TEST SET          |                                                                                                            | DESIRED RESULTS                                                             | ADJUSTMENT INSTRUCTIONS                                                |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                      | SWITCH                   | POSITION                                                                                                   |                                                                             |                                                                        |
| 14.3 | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position then back to center position.                                                                                                                                                                                            |                          |                                                                                                            |                                                                             |                                                                        |
| 15   | AUTOPILOT TRIM DUTY CYCLE                                                                                                                                                                                                                                                            |                          |                                                                                                            |                                                                             |                                                                        |
| 15.1 |                                                                                                                                                                                                                                                                                      | ELEV<br>FORCE<br>control | Adjust for value given in service information letter for particular aircraft. Measure at ELEV FORCE jacks. |                                                                             |                                                                        |
| 15.2 | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position and measure trim speed.                                                                                                                                                                                                  |                          |                                                                                                            | Refer to particular aircraft service information letter for desired result. | Adjust MAX DUTY CYCLE control (A4R11) on 913K-1/1A for desired result. |
| 15.3 | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position.                                                                                                                                                                                        | ELEV<br>FORCE            | NORM                                                                                                       |                                                                             |                                                                        |
| 16   | POSTADJUSTMENT PROCEDURE<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>Note</b> </div><br><br>If 161H-1 and/or 329T-1 adjustment procedures are to be performed, the postadjustment procedure given here need not be performed at this time. |                          |                                                                                                            |                                                                             |                                                                        |
| 16.1 |                                                                                                                                                                                                                                                                                      | 28 VDC                   | OFF                                                                                                        |                                                                             |                                                                        |
| 16.2 | Disconnect the 913K-1/1A from test set and reinstall in the aircraft.                                                                                                                                                                                                                |                          |                                                                                                            |                                                                             |                                                                        |

Table 6. Yaw Damper System Adjustment Procedure.

| TEST | PROCEDURE                                                                                                                                               | 972S-1 TEST SET                                                          |                                                                                   | DESIRED RESULTS                                                                                                                     | ADJUSTMENT INSTRUCTIONS                                                                        |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                         | SWITCH                                                                   | POSITION                                                                          |                                                                                                                                     |                                                                                                |
| 1    | PRETEST PROCEDURE                                                                                                                                       |                                                                          |                                                                                   |                                                                                                                                     |                                                                                                |
| 1.1  | Initial 972S-1 Test Set switch positions.                                                                                                               | 28 VDC<br>AC SIGNAL switches<br>DC SIGNAL switches<br>All other switches | OFF<br>0/VAR<br>+/-FIXED<br>NORM                                                  |                                                                                                                                     |                                                                                                |
| 1.2  | If not done previously, connect the 329T-1 to the test set as shown in figure 1. Apply power to the flight control system and all associated equipment. |                                                                          |                                                                                   | <b>Note</b><br>Unless otherwise specified, all voltages are to be measured with respect to the NO. 1 COM test jack on the test set. |                                                                                                |
| 2    | RUDDER COMMAND GAIN (systems using 332D-11( ) or 200 mV/degree)                                                                                         |                                                                          |                                                                                   |                                                                                                                                     |                                                                                                |
| 2.1  | Measure voltage at 329T-1 RUD CMD jack on test set.                                                                                                     | 28 VDC<br>ROLL 332D-12<br>AC SIGNAL control<br>HIGH PASS                 | ON<br>TEST<br>Adjust cw from center for 5.00 Vac at ROLL 332D-12 jacks<br>DISABLE | Refer to particular aircraft Service Information Letter for desired result.                                                         | Adjust RUD CMD GAIN control on 329T-1 for desired result.                                      |
| 2.2  | Measure voltage at 329T-1 RUD CMD jack on test set.                                                                                                     | AC SIGNAL control                                                        | Adjust ccw from center for 5.00 Vac at ROLL 332D-12 jacks                         | Same value as test 2.1 but with opposite polarity.                                                                                  | Readjust RUD CMD GAIN control and repeat tests 2.1 and 2.2 until both tests are within limits. |
| 2.3  | Delay 20 seconds minimum and measure voltage at 329T-1 RUD CMD jack on test set.                                                                        | HIGH PASS                                                                | NORM                                                                              | Voltage drops to 0 ±100 mV dc.                                                                                                      | If abnormal, replace 329T-1.                                                                   |

Table 6. Yaw Damper System Adjustment Procedure (Cont).

| TEST | PROCEDURE                                                                        | 972S-1 TEST SET                                           |                                                                                        | DESIRED RESULTS                                                             | ADJUSTMENT INSTRUCTIONS                                                                                                   |
|------|----------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                  | SWITCH                                                    | POSITION                                                                               |                                                                             |                                                                                                                           |
| 2a   | RUDDER COMMAND GAIN (Systems using 329A-( ) or 100 mV/degree)                    |                                                           |                                                                                        |                                                                             |                                                                                                                           |
| 2a.1 | Measure voltage at 329T-1 RUD CMD jack on test set.                              | 28 VDC<br>ROLL 329A<br>AC SIGNAL control<br><br>HIGH PASS | ON<br>TEST<br><br>Adjust cw from center for 2.50 Vac at ROLL 329A jacks<br><br>DISABLE | Refer to particular aircraft Service Information Letter for desired result. | Adjust RUD CMD GAIN control on 329T-1 for desired result.                                                                 |
| 2a.2 | Measure voltage at 329T-1 RUD CMD jack on test set.                              | AC SIGNAL control                                         | Adjust ccw from center for 2.50 Vac at ROLL 329A jacks                                 | Same value as the 2a.1 but with opposite polarity.                          | Readjust RUD CMD GAIN control and repeat tests 2a.1 and 2a.2 until both tests are within limits.<br><br><i>2v not 1-v</i> |
| 2a.3 | Delay 20 seconds minimum and measure voltage at 329T-1 RUD CMD jack on test set. | HIGH PASS                                                 | NORM                                                                                   | Voltage drops to 0 ±100 mV dc.                                              | If abnormal, replace 329T-1.                                                                                              |
| 3    | POSTADJUSTMENT PROCEDURE                                                         |                                                           |                                                                                        |                                                                             |                                                                                                                           |
| 3.1  |                                                                                  | 28 VDC<br>ROLL 329A<br>ROLL 332D-12                       | OFF<br>NORM<br>NORM                                                                    |                                                                             |                                                                                                                           |
| 3.2  | Disconnect the 329T-1 from the test set and reinstall in the aircraft.           |                                                           |                                                                                        |                                                                             |                                                                                                                           |

Table 7. 161H-1 Adjustment Procedure.

| TEST | PROCEDURE                                                                                                                                                             | 972S-1 TEST SET                                                                      |                                                                     | DESIRED RESULTS                                                                                                                   | ADJUSTMENT INSTRUCTIONS                                   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
|      |                                                                                                                                                                       | SWITCH                                                                               | POSITION                                                            |                                                                                                                                   |                                                           |
| 1    | PRETEST PROCEDURE                                                                                                                                                     |                                                                                      |                                                                     |                                                                                                                                   |                                                           |
| 1.1  | Initial 972S-1 Test Set switch positions                                                                                                                              | 28 VDC<br><br>AC SIGNAL switches<br><br>DC SIGNAL switches<br><br>All other switches | OFF<br><br>0/VAR<br><br>+/VAR<br><br>NORM                           | <div>Note</div><br><br>Unless otherwise specified, all voltages are measured with respect to NO. 2 COM test jack on the test set. |                                                           |
| 1.2  | If not done previously, connect the 161H-1 and 913K-1/1A to the test set as shown in figure 1. Apply power to the flight control system and all associated equipment. |                                                                                      |                                                                     |                                                                                                                                   |                                                           |
| 2    | AILERON PROGRAMMER GAIN                                                                                                                                               |                                                                                      |                                                                     |                                                                                                                                   |                                                           |
| 2.1  | Measure voltage at 161H-1 AIL CMD jack on test set.                                                                                                                   | 28 VDC<br><br>IAS<br><br>913K-1 AIL CMD<br><br>DC SIGNAL control                     | ON<br><br>TEST<br><br>TEST<br><br>Adjust for +6.50 Vdc at IAS jacks | Refer to particular aircraft Service Information Letter for desired result.                                                       | Adjust AIL control on front of 161H-1 for desired result. |
| 2.2  |                                                                                                                                                                       | 913K-1 AIL CMD                                                                       | NORM                                                                |                                                                                                                                   |                                                           |
| 3    | ELEVATOR PROGRAMMER GAIN                                                                                                                                              |                                                                                      |                                                                     |                                                                                                                                   |                                                           |
| 3.1  | Measure voltage at 161H-1 ELEV CMD jack on test set.                                                                                                                  | 913K-1 ELEV CMD<br><br>DC SIGNAL control                                             | TEST<br><br>Adjust for +6.50 Vdc at IAS jacks.                      | Refer to particular aircraft Service Information Letter for desired result.                                                       | Adjust ELE control on front of 161H-1 for desired result. |
| 3.2  |                                                                                                                                                                       | 913K-1 ELEV CMD                                                                      | NORM                                                                |                                                                                                                                   |                                                           |



Table 7. 161H-1 Adjustment Procedure (Cont).

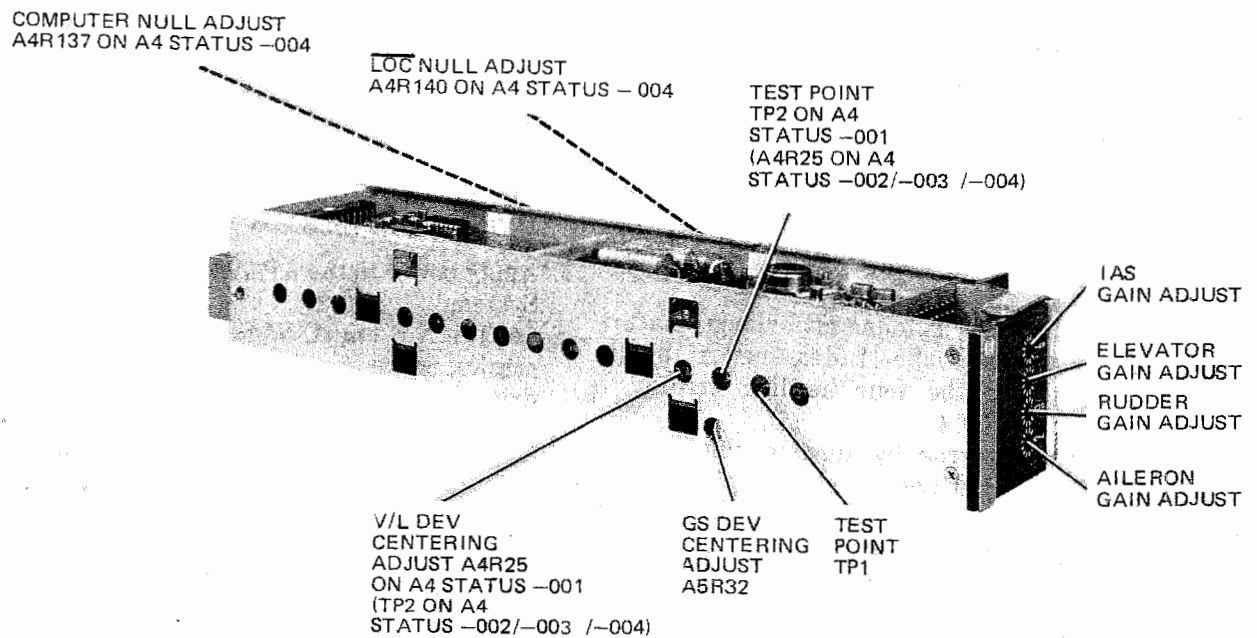
| TEST | PROCEDURE                                                                                                                                                                                                                                                                                               | 972S-1 TEST SET                               |                                                        | DESIRED RESULTS                                                             | ADJUSTMENT INSTRUCTIONS                                                           |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                         | SWITCH                                        | POSITION                                               |                                                                             |                                                                                   |
| 4    | RUDDER PROGRAM-MER GAIN                                                                                                                                                                                                                                                                                 |                                               |                                                        |                                                                             |                                                                                   |
| 4.1  | Measure voltage at 161H-1 RUD CMD jack on test set.                                                                                                                                                                                                                                                     | 329T-1<br>RUD CMD<br><br>DC SIGNAL<br>control | TEST<br><br>Adjust for<br>+6.50 Vdc<br>at IAS<br>jacks | Refer to particular aircraft Service Information Letter for desired result. | Adjust RUD control on front of 161H-1 for desired result.                         |
| 4.2  |                                                                                                                                                                                                                                                                                                         | 329T-1<br>RUD CMD                             | NORM                                                   |                                                                             |                                                                                   |
| 5    | INDICATED AIRSPEED GAIN                                                                                                                                                                                                                                                                                 |                                               |                                                        |                                                                             |                                                                                   |
| 5.1  | Push SYNC (CWS) pushbutton.                                                                                                                                                                                                                                                                             | DC SIGNAL<br>control                          | Adjust for<br>+4.00 Vdc<br>at IAS<br>jacks             |                                                                             |                                                                                   |
| 5.2  | Push IAS mode pushbutton on 913K-1.                                                                                                                                                                                                                                                                     |                                               |                                                        |                                                                             |                                                                                   |
| 5.3  | Measure voltage at 913K-1 ALT/IAS jacks on test set.                                                                                                                                                                                                                                                    | DC SIGNAL<br>control                          | Adjust for<br>+4.65 Vdc<br>at IAS<br>jacks             | Refer to particular aircraft Service Information Letter for desired result. | Adjust IAS control on front of 161H-1 for desired result.                         |
| 5.4  |                                                                                                                                                                                                                                                                                                         |                                               | IAS                                                    | NORM                                                                        |                                                                                   |
| 6    | VOR/LOC DEVIATION CENTERING (Without SB 10)                                                                                                                                                                                                                                                             |                                               |                                                        |                                                                             |                                                                                   |
| 6.1  | Connect jumper wire between 161H-1 VOR/LOC DEV jacks on test set. Push NAV mode pushbutton on 913K-1/1A and verify NAV CAPT. Connect jumper wire between 913K-1 COURSE DATUM jacks and another jumper wire between 913K-1 ROLL jacks on test set. Measure voltage at J28 and No. 1 SIG COM on test set. |                                               |                                                        | 0 $\pm$ 5 mV dc                                                             | Adjust V/L DEV CENTERING control (A4R25) on the top of 161H-1 for desired result. |
| 6.2  | Remove jumper wires from test set.                                                                                                                                                                                                                                                                      |                                               |                                                        |                                                                             |                                                                                   |

Table 7. 161H-1 Adjustment Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                           | 972S-1 TEST SET |          | DESIRED RESULTS    | ADJUSTMENT INSTRUCTIONS                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|--------------------|-----------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                     | SWITCH          | POSITION |                    |                                                                                   |
| 6a   | LOC NULL, COMPUTER NULL and LOC NULL (With SB 10)                                                                                                                                                                                                                                                                                                                                                                                   |                 |          |                    |                                                                                   |
| 6a.1 | Select a valid localizer station on the navigation receiver. Connect a jumper between the 161H-1 VOR/LOC DEV jacks on the test set. Push APPR mode push-button on 913K-1/1A. Connect a jumper between 913K-1 COURSE DATUM jacks and another jumper between 913K-1 ROLL jacks on the test set. Verify that either the GS ARM or GS CAPT annunciator is lit. Measure voltage between TP2 on 161H-1 and NO 1 SIG COM jack on test set. |                 |          | 0 $\pm$ 1.5 mV dc  | Adjust LOC NULL control (A4R25) on the top of 161H-1 for desired result.          |
| 6a.2 | Measure voltage at 913K-1 VOR/LOC DEV jacks on the test set.                                                                                                                                                                                                                                                                                                                                                                        |                 |          | 0 $\pm$ 1.5 mV dc  | Adjust COMPUTER NULL control (A4R137) on the bottom of 161H-1 for desired result. |
| 6a.3 | Select a VOR station on the navigation radio. Push APPR mode push-button on 913K-1/1A (APPR mode off). Delay 10 seconds minimum and then measure voltage between TP2 on 161H-1 and NO. 1 SIG COM jack on test set.                                                                                                                                                                                                                  |                 |          | 0 $\pm$ 1.5 mV dc  | Adjust LOC NULL control (A4R140) on the bottom of 161H-1 for desired result.      |
| 6a.4 | Remove jumper wires from test set.                                                                                                                                                                                                                                                                                                                                                                                                  |                 |          |                    |                                                                                   |
| 7    | GLIDESLOPE DEVIATION CENTERING                                                                                                                                                                                                                                                                                                                                                                                                      |                 |          |                    |                                                                                   |
| 7.1  | Turn off power to radio altimeter. Connect jumper wire between 161H-1 GS DEV jacks on test set. Connect jumper wire between 913K-1 PITCH jacks on test set. Push APPR mode push-button on 913K-1/1A and verify GS CAPT. Measure voltage at J29 and NO. 1 SIG COM on test set.                                                                                                                                                       |                 |          | 0 $\pm$ 0.050 V dc | Adjust GS DEV CENTERING control (A5R32) on the top of 161H-1 for desired result.  |

*Table 7. 161H-1 Adjustment Procedure (Cont).*

| TEST | PROCEDURE                                                                             | 972S-1 TEST SET |          | DESIRED RESULTS | ADJUSTMENT INSTRUCTIONS |
|------|---------------------------------------------------------------------------------------|-----------------|----------|-----------------|-------------------------|
|      |                                                                                       | SWITCH          | POSITION |                 |                         |
| 7.2  | Remove jumper wires from test set.                                                    |                 |          |                 |                         |
| 8    | POSTADJUSTMENT PROCEDURE                                                              |                 |          |                 |                         |
| 8.1  | Disconnect the 161H-1 and 913K-1/1A from the test set and re-install in the aircraft. | 28 VDC          | OFF      |                 |                         |



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*161H-1 Gain Programmer, Adjustment Locations  
Figure 2*

#### 4.4 PN-101 Compass System Alignment Procedure

- a. Apply power to the AP-106/AP-107 Flight Control System

**Note**

If a compensator is installed on the flux detector, zero the N-S and E-W screws.

- b. Taxi the aircraft to an area away from any magnetic disturbances, such as power lines, metal buildings, underground plumbing, etc. The area must have provisions to determine the aircraft's actual magnetic heading at the four cardinal headings.
- c. Taxi the aircraft to a northerly heading.
- d. Determine the aircraft's actual magnetic heading, and compare it to the indicated heading on the compass card.
- e. Determine the heading error by subtracting the smaller heading from the larger. Assign a plus to the result if the indicated heading is larger, or a minus if the actual heading is larger. (Example: If actual heading = 001, and indicated heading = 003, then heading error = +2 degrees.)

**Note**

Heading error can never be more than 180 degrees. If the heading error calculated in step e is more than  $\pm 180$  degrees, subtract the error from 360 degrees and change the sign. (Example: A calculated heading error of -357 degrees = +003 degrees.)

- f. Repeat steps d and e at each of the other three cardinal headings.
- g. After the heading error is found at each cardinal heading, determine the index error by algebraically adding the four heading errors, then divide the sum by 4.
- h. Remove the index error by turning the flux detector the number of degrees obtained in step g. Turn the flux detector clockwise if the index error is minus, or counterclockwise if it is plus. (Example: Remove +2 degrees index error by turning the flux detector 2 degrees counterclockwise.)

**Note**

After the index error is removed, the flux detector compensator may be adjusted to

remove single-cycle error caused by fixed magnetic disturbances in the aircraft. Make compensator adjustments in small increments, and allow time for the compass card to stop slaving between each adjustment. Make adjustments with a non-magnetic screwdriver (brass, aluminum, etc).

- i. Taxi the aircraft as close as possible to a magnetic north heading.
- j. Determine the actual magnetic heading, then slowly adjust the flux detector compensator N-S screw until the compass card slaves to the actual magnetic heading.
- k. Taxi the aircraft as close as possible to a magnetic east heading.
- l. Determine the actual magnetic heading, then slowly adjust the flux detector compensator E-W screw until the compass card slaves to the actual magnetic heading.
- m. Taxi the aircraft as close as possible to a magnetic south heading.
- n. Determine the actual magnetic heading, and compare it to the indicated heading on the compass card. By slowly adjusting the flux detector compensator N-S screw, remove half the difference between the two headings.
- o. Taxi the aircraft as close as possible to a magnetic west heading.
- p. Determine the actual magnetic heading, and compare it to the indicated heading on the compass card. By slowly adjusting the flux detector compensator E-W screw, remove half the difference between the two headings.

#### 4.5 MCS-107/107V Magnetic Compass System Alignment Procedure

- a. Apply power to the AP-106/AP-107 Flight Control System.
- b. Set the N-S and E-W flux detector compensator screws, on the rear of the 339P-1/1V, at 0 (screwdrivers slots are in the horizontal plane).
- c. Taxi the aircraft to an area away from any magnetic disturbances, such as power lines, metal buildings, underground plumbing, etc. The area must have provisions to determine the aircraft actual magnetic heading at the four cardinal headings.
- d. Taxi the aircraft to a northerly heading.
- e. Determine the aircraft's actual magnetic heading, and compare it to the indicated heading on the compass card.
- f. Determine the heading error by subtracting the smaller heading from the larger. Assign a plus to

the result if the indicated heading is larger, or a minus if the actual heading is larger. (Example: If actual heading = 001, and indicated heading = 003, then heading error = +2 degrees.)

**Note**

Heading error can never be more than 180 degrees. If the heading error calculated in step f is more than +180 degrees, subtract the error from 360 degrees and change the sign. (Example: A calculated heading error of -357 degrees = +003 degrees.)

- g. Repeat steps e and f at each of the other three cardinal headings.
- h. After the heading error is found at each cardinal heading, determine the index error by algebraically adding the four heading errors, then divide the sum by 4.
- i. Remove the index error by turning the flux detector the number of degrees obtained in step h. Turn the flux detector clockwise if the index error is minus, or counterclockwise if it is plus. (Example: Remove +2 degrees index error by turning the flux detector 2 degrees counterclockwise.)

**Note**

After the index error is removed, the flux detector compensator may be adjusted to remove single-cycle error caused by fixed magnetic disturbances in the aircraft. Make compensator adjustments in small increments, and allow time for the compass card to stop slaving between each adjustment. Make adjustments with a non-magnetic screwdriver (brass, aluminum, etc).

- j. Taxi the aircraft as close as possible to a magnetic north heading.
- k. Determine the actual magnetic heading, then slowly adjust the flux detector compensator N-S screw until the compass card slaves to the actual magnetic heading.
- l. Taxi the aircraft as close as possible to a magnetic east heading.
- m. Determine the actual magnetic heading, then slowly adjust the flux detector compensator E-W screw until the compass card slaves to the actual magnetic heading.
- n. Taxi the aircraft as close as possible to a magnetic south heading.

- o. Determine the actual magnetic heading, and compare it to the indicated heading on the compass card. By slowly adjusting the flux detector compensator N-S screw, remove half the difference between the two headings.

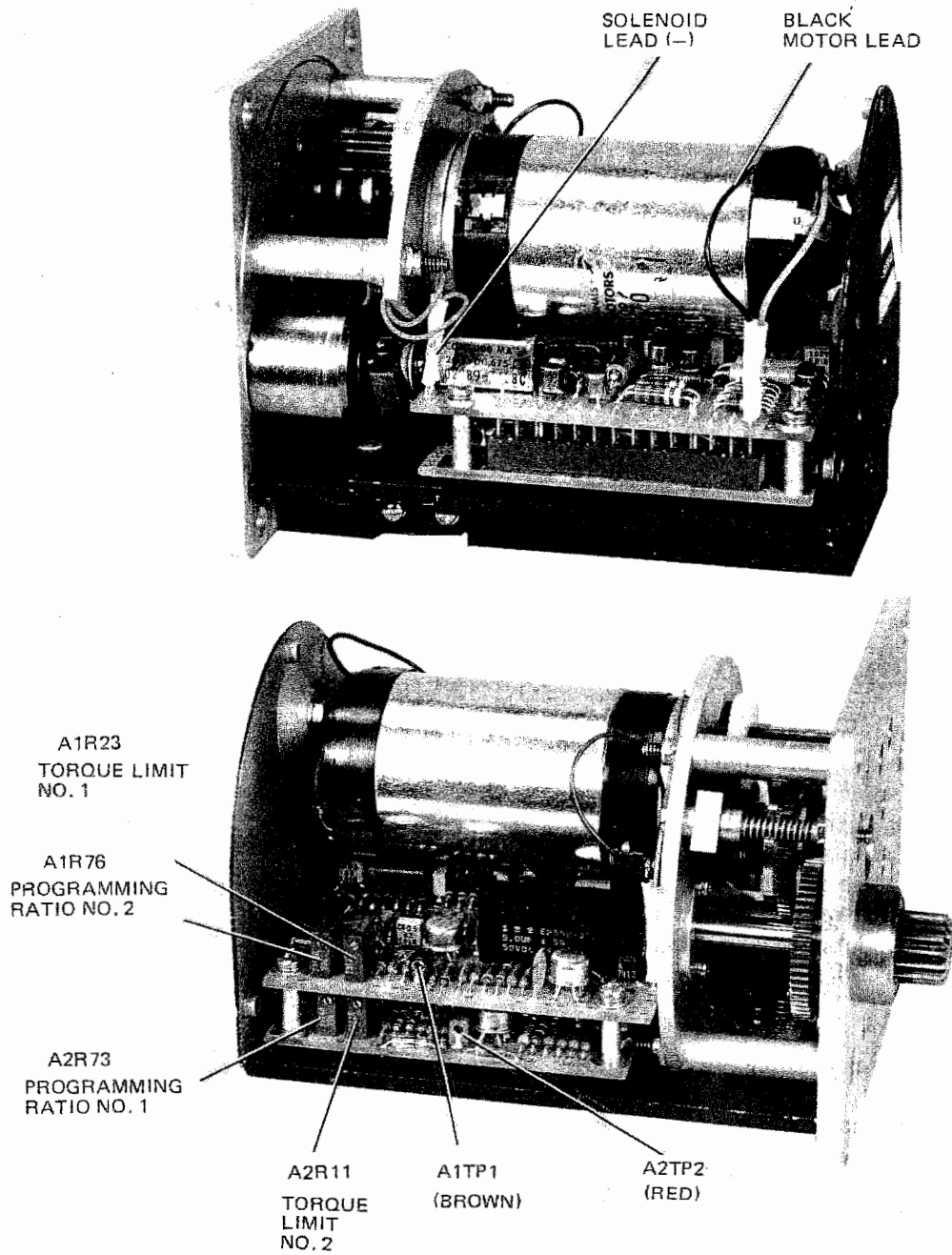
#### 4.6 334C-9A Primary Servo Adjustment Procedure

Adjust the 334C-9A Primary Servos with the test equipment listed in table 1 and the following procedure:

- a. Remove the four locknuts and washers securing the capstan to the servo and remove the capstan.
- b. Remove the three screws securing the dust cover to the servo and remove the dust cover.
- c. Refer to figure 3; disconnect the negative lead of the solenoid from the negative solenoid pin on circuit card A1 and connect it to the gray solenoid lead on the test set. Connect the blue solenoid lead on the test set to the negative solenoid pin on circuit card A1.
- d. Connect P1 on the servo to J1 on the test set.
- e. Set the switches on the test set as follows:

| <u>SWITCH</u>      | <u>POSITION</u> |
|--------------------|-----------------|
| 15 VDC LOAD        | LCL             |
| TORQUE PROGRAMMING | LO              |
| MOTOR CURRENT      | NORM            |
| SOLENOID           | NORM            |
| POSITION           | OPEN            |
| WASHOUT DISABLE    | OPEN            |
| TORQUE MEASURE     | RELEASE         |
| DC POWER           | OFF             |
| AC POWER           | OFF             |
| ENGAGE             | NORM            |
| SERVO COMMAND      |                 |
| EXT/LCL            | LCL             |
| FXD/OFF/VAR        | FXD             |
| REV/NORM           | NORM            |
| FORCE              | WASHOUT         |

- f. Apply power to the 972S-3 Servo Test Set with one of the following three options:
  1. Connect J4 on the 972S-3 Servo Test Set to a 115-V ac, 400-Hz,  $\pm 10$ -percent source, and connect jacks M(+) and L(-) on the front of the test set to a +28-V dc,  $\pm 10$ -percent source.
  2. Connect P1 on the 972S-3 Servo Test Set to the 334C-9 Primary Servo connector on the 972S-2 Autopilot Bench Test Set, and set the following switches on the 972S-2.



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*334C-9A and 334C-11 Primary Servos With -002 A1 and A2 Boards,  
Test Point and Adjustment Locations  
Figure 3*

| <u>SWITCH</u> | <u>POSITION</u> |
|---------------|-----------------|
| 115 VAC POWER | ON              |
| 28 VDC POWER  | ON              |
| 334C-9 POWER  | ON              |

3. Connect P1 on the 972S-3 Servo Test Set to the appropriate servo mating connector on the aircraft, and apply power to the autopilot system on the aircraft.

- g. Refer to figure 4 or figure 5; mount the servo on the 960M-2/3 Torque Tester and secure with at least two of the four mounting nuts.
- h. Install the proper weights on the torque bar to obtain the torque setting specified in the applicable aircraft service information letter (SIL).
- i. Set DC POWER switch at ON.
- j. Set AC POWER switch at either 115 (972S-3 connected to 115 V ac) or at 26 (972S-3 connected to 972S-2 or aircraft).
- k. Set TORQUE MEASURE switch at TORQUE.
- l. Verify the following voltage levels:

| <u>TEST POINT</u> | <u>VOLTAGE LIMITS</u> |
|-------------------|-----------------------|
| M, L              | +25.2 to +30.8 V dc   |
| F, T              | 23.4 to 28.6 V ac     |
| U, SIG COM        | +12.3 to +16.5 V dc   |
| V, SIG COM        | -12.3 to -16.5 V dc   |

- m. Set TORQUE MEASURE switch at RELEASE.
- n. Set potentiometer A2R11 fully clockwise.

**Note**

During the following steps, the TORQUE MEASURE switch must be switched in the following sequence with the switch held in each position for at least 2 seconds:

| <u>SWITCH POSITION</u> | <u>REMARKS</u>                                                                             |
|------------------------|--------------------------------------------------------------------------------------------|
| RELEASE                | Eliminates backdrive on motor.                                                             |
| WASHOUT                | Servo force signal reverse drives position integrator to eliminate residual motor current. |
| TORQUE                 | Applies servo command to servo; measure torque at this time, then continue sequence.       |

| <u>SWITCH POSITION</u> | <u>REMARKS</u> |
|------------------------|----------------|
|------------------------|----------------|

WASHOUT

RELEASE

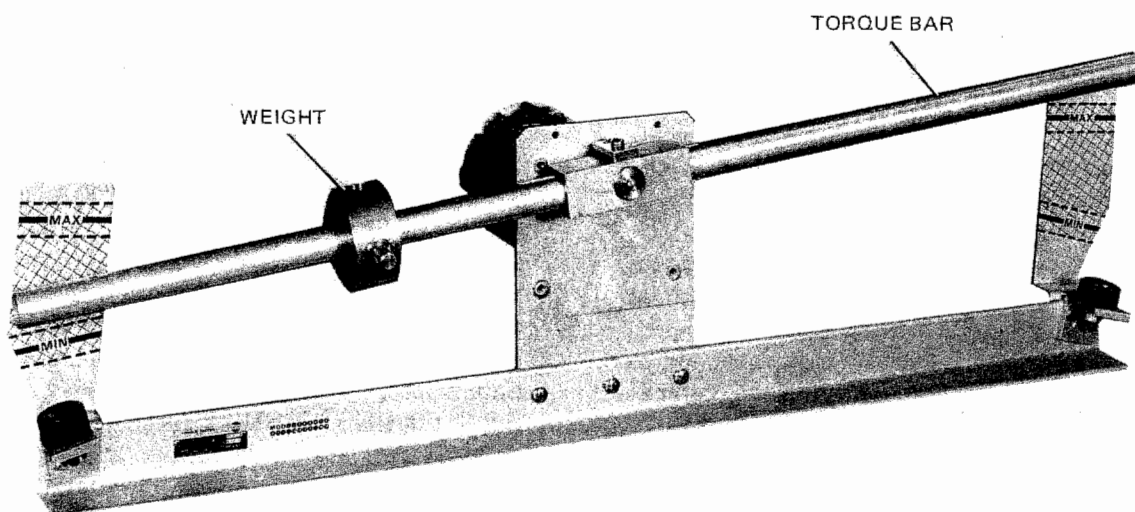
Make adjustments as required. (Repeat sequence to verify each adjustment.)

- o. Alternately adjust A1R23 (figure 3), and set TORQUE MEASURE switch at TORQUE until the torque bar is repeatedly deflected to the MIN/MAX (1 percent) range on the 960M-2/3 indices.
- p. Set TORQUE MEASURE switch at TORQUE; verify that AP DISENGAGE annunciator is lit and that ENGAGE and YAW DAMP ENGAGE annunciators are not lit.
- q. Set TORQUE MEASURE switch at RELEASE.
- r. Adjust A2R11 for a dc voltage at A2TP2 (red)/SIG COM that is equal to the dc voltage measured at A1TP1 (brown)/SIG COM. Record the dc voltage measured at A1TP1 (brown)/SIG COM for use in step y.
- s. Sequence TORQUE MEASURE switch and verify torque adjustment. If necessary, adjust A1R23 and A2R11 incrementally to obtain the desired torque (repeated deflection of torque bar into the MIN/MAX range on the 960M-2/3 indices) while maintaining approximately equal voltages at A1TP1 and A2TP2.

**Note**

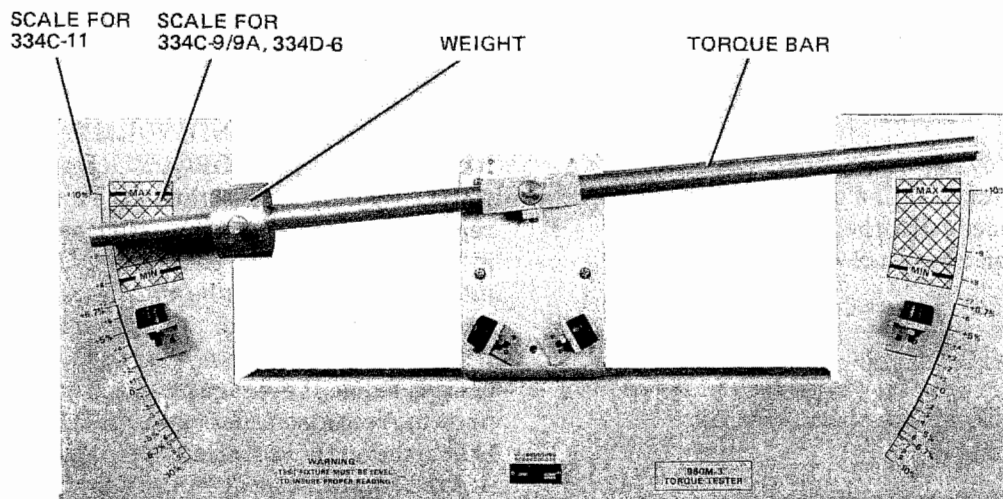
The TORQUE MEASURE switch should be sequenced at least six times to ensure accurate measurement of the torque setting.

- t. Set SERVO COMMAND NORM/REV switch at REV. Sequence the TORQUE MEASURE switch while adjusting the weight on the torque bar until repeatable indications are obtained within the MIN/MAX limits on the 960M-2/3 indices. The measured torque must be within  $\pm 8$  percent of the desired value, and the average of the torque in both directions should be within  $\pm 3$  percent of the desired value. If average torque is greater than  $\pm 3$  percent, readjust A1R23 and A2R11 to distribute the symmetry variation on each side of the desired value. Repeat step with SERVO COMMAND NORM/REV switch set at NORM. Symmetry variations greater than  $\pm 8$  percent of the desired torque indicate that the servo is defective and must be repaired.
- u. Verify monitor voltage as follows:
  - 1. Set TORQUE MEASURE switch at TORQUE and FORCE switch at SHORT.
  - 2. Measure dc voltage between MONITOR P and REF (14V) test jacks. If voltage is not within 0



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*960M-2 Torque Tester With 334C-9/9A Servo Installed  
Figure 4*



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*960M-3 Torque Tester With 334C-11 Servo Installed  
Figure 5*



- ±1 V dc, make small adjustments to A1R23 and A2R11 to bring the voltage within limits. Verify that AP DISENGAGE annunciator is not lit.
- 3. Set FORCE switch at WASHOUT and TORQUE MEASURE switch at RELEASE.
- 4. Set SERVO COMMAND NORM/REV switch at REV, TORQUE MEASURE switch at TORQUE, and FORCE switch at SHORT.
- 5. Repeat step 2.
- 6. Set FORCE switch at WASHOUT, TORQUE MEASURE switch at RELEASE, and SERVO COMMAND NORM/REV switch at NORM.
- v. Repeat steps t and u as required until all steps are within limits.

**Note**

Steps w through ac are applicable to torque programmable servos only (Collins part number 622-2366-003, -004, -009, -010).

- w. Set the TORQUE PROGRAMMING CH1 and CH2 switches at HI and the SERVO COMMAND NORM/REV switch at NORM.
- x. Install and adjust weight on the torque bar to obtain the high torque setting specified in the applicable SIL. (If the high torque setting is not specified, set the weight for 128 percent of the low torque value.)
- y. Set A1R76 and A2R73 for a dc voltage at A1TP1 and A2TP2 that is equal to the dc voltage measured in step r times the ratio of high torque (SIL) to normal torque (SIL).
- z. Monitor the voltage at A1TP1 and A2TP2, and repeatedly set the TORQUE MEASURE switch at TORQUE while adjusting A1R76 and A2R73 in increments until repeatable indications are obtained within the MIN/MAX limits on the 960M-2/3. The difference between the voltages at A1TP1 and A2TP2 must be kept at a minimum.
- aa. Set SERVO COMMAND NORM/REV switch at REV. Sequence the TORQUE MEASURE switch while adjusting the weight on the torque bar until repeatable indications are obtained within the MIN/MAX limits. The measured torque must be within ±8 percent of the desired value and the average of the torque in both directions should be within ±3 percent of the desired value. If average torque is greater than ±3 percent, readjust A1R76 and A2R73 to distribute the symmetry variation on each side of the desired value. Repeat step with SERVO COMMAND NORM/REV switch set at NORM.

- ab. Reset TORQUE PROGRAMMING CH1 and CH2 switches at LO.
- ac. Set TORQUE MEASURE switch at RELEASE and POWER switches at OFF.
- ad. Reconnect negative lead of solenoid to solenoid pin on circuit card A1.
- ae. Set DC POWER switch at ON, AC POWER switch at 115 or 26, and SERVO FORCE switch at WASHOUT.
- af. Cycle the TORQUE MEASURE switch, and verify proper operation for both normal and reverse servo commands. Verify that AP DISENGAGE and ENGAGE annunciators do not light and that the YAW DAMP ENGAGE annunciator remains lit throughout this step.
- ag. Set ENGAGE switch at OFF, and verify that AP DISENGAGE and ENGAGE annunciators do not light and that the YAW DAMP ENGAGE annunciator remains lit.
- ah. Remove servo from 960M-2/3 Torque Tester. Set ENGAGE switch at NORM, WASHOUT DISABLE switch at GND, and TORQUE MEASURE switch at TORQUE. Repeatedly switch SERVO COMMAND REV/NORM switch between REV and NORM and verify quick response of servo and that engage solenoid does not drop out at any time.
- ai. Set POWER switches at OFF, and disconnect the servo from the test set.
- aj. Install the servo side cover and secure with the three screws removed during step b.

**4.7 334C-11 Primary Servo Adjustment Procedure**

Adjust the 334C-11 Primary Servos with the test equipment listed in table 1 and the following procedure:

- a. Remove the four locknuts and washers securing the capstan to the servo and remove the capstan.
- b. Remove the three screws securing the dust cover to the servo and remove the dust cover.
- c. Refer to figure 3 or 6; disconnect the negative lead of the solenoid from the negative solenoid pin on circuit card A1 and connect it to the gray solenoid lead on the test set. Connect the blue solenoid lead on the test set to the negative solenoid pin on circuit card A1.
- d. Lift the green generator lead from the pin on circuit card A1.
- e. Connect P1 on the servo to J1 on the test set.
- f. Set the switches on the test set as follows.

| <u>SWITCH</u>      | <u>POSITION</u> | <u>TEST POINT</u>                           | <u>VOLTAGE LIMITS</u> |
|--------------------|-----------------|---------------------------------------------|-----------------------|
| 15 VDC LOAD        | LCL             | U, SIG COM                                  | +12.3 to +16.5 V dc   |
| TORQUE PROGRAMMING | LO              | V, SIG COM                                  | -12.3 to -16.5 V dc   |
| MOTOR CURRENT      | NORM            |                                             |                       |
| SOLENOID           | NORM            |                                             |                       |
| POSITION           | OPEN            | n. Set TORQUE MEASURE switch at RELEASE.    |                       |
| WASHOUT DISABLE    | OPEN            | o. Set potentiometer A2R11 fully clockwise. |                       |
| TORQUE MEASURE     | RELEASE         |                                             |                       |
| DC POWER           | OFF             |                                             |                       |
| AC POWER           | OFF             |                                             |                       |
| ENGAGE             | NORM            |                                             |                       |
| SERVO COMMAND      |                 |                                             |                       |
| EXT/LCL            | LCL             |                                             |                       |
| FXD/OFF/VAR        | FXD             |                                             |                       |
| REV/NORM           | NORM            |                                             |                       |
| FORCE              | WASHOUT         |                                             |                       |

**Note**

During the following steps, the TORQUE MEASURE switch must be switched in the following sequence with the switch held in WASHOUT position for at least 5 seconds.

| <u>SWITCH</u> | <u>POSITION</u> | <u>REMARKS</u>                                                                             |
|---------------|-----------------|--------------------------------------------------------------------------------------------|
|               | RELEASE         | Eliminates backdrive on motor.                                                             |
|               | WASHOUT         | Servo force signal reverse drives position integrator to eliminate residual motor current. |
|               | TORQUE          | Applies servo command to servo; measure torque at this time, then resume sequence.         |
|               | WASHOUT         |                                                                                            |
|               | RELEASE         | Make adjustments as required. (Repeat sequence to verify each adjustment.)                 |

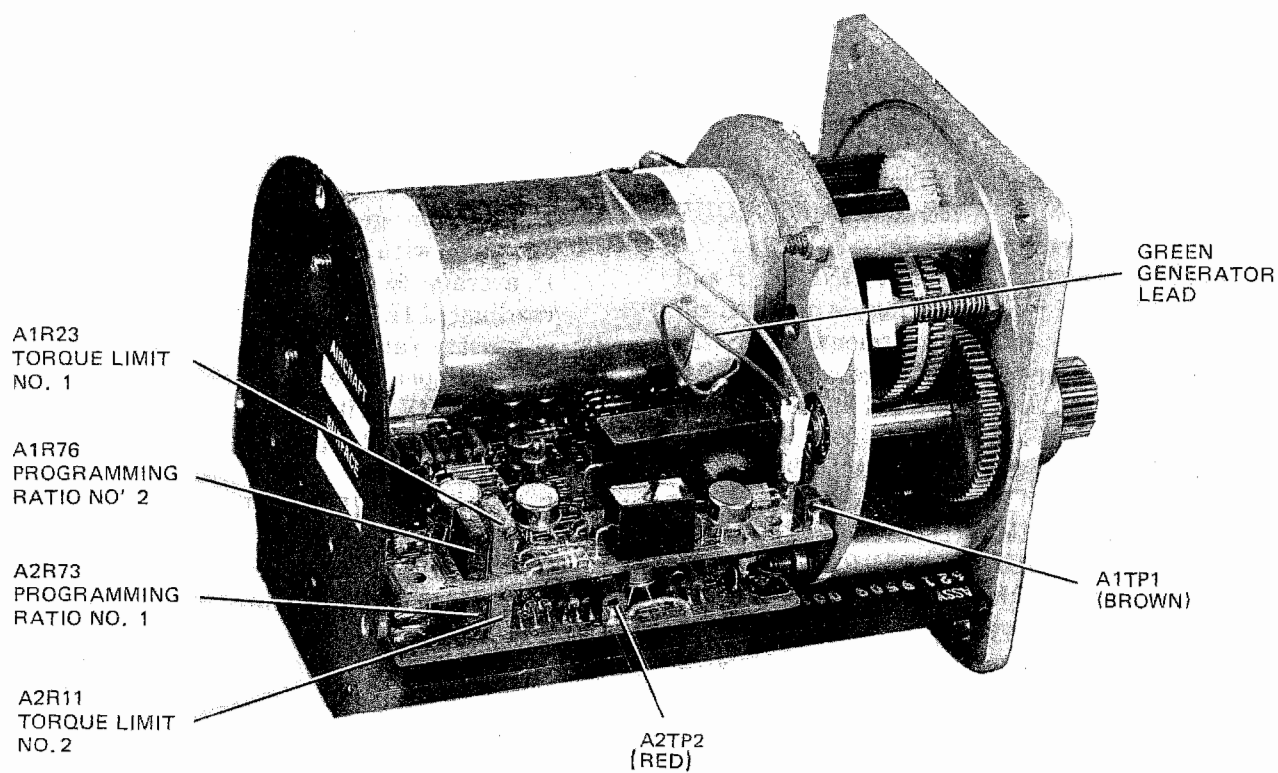
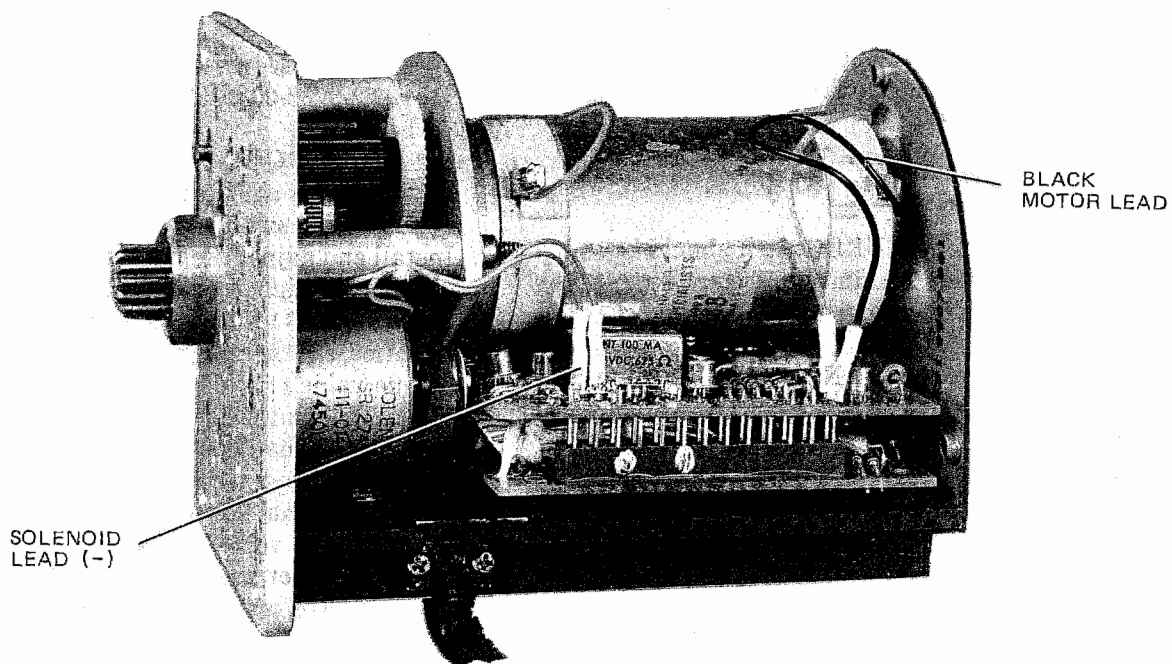
- g. Apply power to the 972S-3 Servo Test Set with one of the following three options:
1. Connect J4 on the 972S-3 Servo Test Set to a 115-V ac, 400-Hz,  $\pm 10$ -percent source, and connect jacks M(+) and L(-) on the front of the test set to a +28-V dc,  $\pm 10$ -percent source.
  2. Connect P1 on the 972S-3 Servo Test Set to the 334C-9 Primary Servo connector on the 972S-2 Autopilot Bench Test Set, and set the following switches on the 972S-2:

| <u>SWITCH</u> | <u>POSITION</u> |
|---------------|-----------------|
| 115 VAC POWER | ON              |
| 28 VDC POWER  | ON              |
| 334C-9 POWER  | ON              |

3. Connect P1 on the 972S-3 Servo Test Set to the appropriate servo mating connector on the aircraft, and apply power to the autopilot system on the aircraft.
- h. Refer to figure 5; mount the servo on the 960M-3 Torque Tester and secure with at least two of the four mounting nuts.
- i. Install the proper weights on the torque bar to obtain the torque setting specified in the applicable aircraft service information letter (SIL).
- j. Set DC POWER switch at ON.
- k. Set AC POWER switch at either 115 (972S-3 connected to 115 V ac) or at 26 (972S-3 connected to 972S-2 or aircraft).
- l. Set TORQUE MEASURE switch at TORQUE.
- m. Verify the following voltage levels:

| <u>TEST POINT</u> | <u>VOLTAGE LIMITS</u> |
|-------------------|-----------------------|
| M, L              | +25.2 to +30.8 V dc   |
| F, T              | 23.4 to 28.6 V ac     |

- p. Alternately adjust A1R23 (figure 6), and set TORQUE MEASURE switch at TORQUE until the torque bar is repeatedly deflected into the  $\pm 1$  percent range on the 960M-3 indices, or into the  $\pm 3$ -percent range with an average of 1 percent for six consecutive times.
- q. Set TORQUE MEASURE switch at TORQUE; verify that AP DISENGAGE annunciator is lit and that ENGAGE and YAW DAMP ENGAGE annunciators are not lit.
- r. Set TORQUE MEASURE switch at RELEASE.
- s. Adjust A2R11 for a dc voltage at A2TP2 (red)/SIG COM that is equal to the dc voltage measured at A1TP1 (brown)/SIG COM. Record the dc voltage measured at A1TP1 (brown)/SIG COM for use in step z.
- t. Sequence the TORQUE MEASURE switch and verify torque adjustment. Torque bar should



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*334C-11 Primary Servo With -003 A1 and A2 Boards, Test Point and Adjustment Locations  
Figure 6*

deflect into the  $\pm 3$ -percent range on 960M-3 indices with an average within  $\pm 1$  percent for six consecutive times. If necessary, adjust A1R23 and A2R11 incrementally to obtain the desired torque while maintaining approximately equal voltages at A1TP1 and A2TP2.

**Note**

The TORQUE MEASURE switch should be sequenced at least six times to ensure accurate measurement of the torque setting.

- u. Set SERVO COMMAND NORM/REV switch at REV. Sequence the TORQUE MEASURE switch while adjusting the weight on the torque bar until repeatable indications are obtained within the  $\pm 1$ -percent range on the 960M-3 indices or into the  $\pm 3$ -percent range with an average of  $\pm 1$ -percent for six consecutive times. The measured torque must be within  $\pm 8$  percent of the value established in step t. The average of the measured torque in both directions should be within  $\pm 3$  percent of the desired value. If the average torque is greater than  $\pm 3$  percent, readjust A1R23 and A2R11 to distribute the symmetry variation on each side of the desired value. Repeat step with SERVO COMMAND NORM/REV switch set at NORM. Symmetry variations greater than  $\pm 8$  percent of the desired torque indicate that the servo is defective and must be repaired.
- v. Verify monitor voltage as follows:
  1. Set TORQUE MEASURE switch at TORQUE and FORCE switch at SHORT.
  2. Measure dc voltage between MONITOR P and REF (14V) test jacks. If voltage is not within 0  $\pm 1$  V dc, make small adjustments to A1R23 and A2R11 to bring the voltage within limits. Verify that AP DISENGAGE annunciator is not lit.
  3. Set FORCE switch at WASHOUT and TORQUE MEASURE switch at RELEASE.
  4. Set SERVO COMMAND NORM/REV switch at REV, TORQUE MEASURE switch at TORQUE, and FORCE switch at SHORT.
  5. Repeat step 2 above.
  6. Set FORCE switch at WASHOUT, TORQUE MEASURE switch at RELEASE, and SERVO COMMAND NORM/REV switch at NORM.
- w. Repeat steps u and v as required until all steps are within limits.

**Note**

Steps x thru ac are applicable to torque programmable servos only (Collins part number 622-2733-003, -004, -007, and -008).

- x. Set the TORQUE PROGRAMMING CH1 and CH2 switches at HI and the SERVO COMMAND NORM/REV switch at NORM.
- y. Install and adjust the weight on the torque bar to obtain the high torque setting specified in the applicable SIL. (If the high torque setting is not specified, set the weight for 128 percent of the low torque value.)
- z. Set A1R76 and A2R73 for a dc voltage at A1TP1 and A2TP2 that is equal to the dc voltage measured in step s times the ratio of high torque (SIL) to normal torque (SIL).
- aa. Monitor the voltage at A1TP1 and A2TP2, and repeatedly set the TORQUE MEASURE switch at TORQUE while adjusting A1R76 and A2R73 in increments until repeatable indications are obtained within the MIN/MAX limits on the 960M-2/3. The difference between the voltages at A1TP1 and A2TP2 must be kept at a minimum.
- ab. Set SERVO COMMAND NORM/REV switch at REV. Sequence the TORQUE MEASURE switch while adjusting the weight on the torque bar until repeatable indications are obtained within the MIN/MAX limits. The measured torque must be within  $\pm 8$  percent of the desired value and the average of the torque in both directions should be within  $\pm 3$  percent of the desired value. If average torque is greater than  $\pm 3$  percent, readjust A1R76 and A2R73 to distribute the symmetry variation on each side of the desired value. Repeat step with SERVO COMMAND NORM/REV switch set at NORM.
- ac. Reset TORQUE PROGRAMMING CH1 and CH2 switches at LO.
- ad. Set TORQUE MEASURE switch at RELEASE and POWER switches at OFF.
- ae. Reconnect negative lead of solenoid to solenoid pin on circuit card A1, and reconnect green generator lead to pin on circuit card A1.
- af. Set DC POWER switch at ON, AC POWER switch at 115 or 26, and SERVO FORCE switch at WASHOUT.
- ag. Cycle the TORQUE MEASURE switch, and verify proper operation for both normal and reverse

servo commands. Verify that AP DISENGAGE and ENGAGE annunciators do not light and that the YAW DAMP ENGAGE annunciator remains lit throughout this step.

- ah. Set ENGAGE switch at OFF, and verify that AP DISENGAGE and ENGAGE annunciators do not light and that the YAW DAMP ENGAGE annunciator remains lit.
- ai. Remove servo from 960M-3 Torque Tester. Set ENGAGE switch at NORM, WASHOUT DISABLE switch at GND, and TORQUE MEASURE switch at TORQUE. Repeatedly switch SERVO COMMAND REV/NORM switch between REV and NORM and verify quick response of servo and that engage solenoid does not drop out at any time.
- aj. Set POWER switches at OFF, and disconnect the servo from the test set.
- ak. Install the servo side cover, and secure with the three screws removed during step b.

#### ■ **4.8 Servo Capstan Pinion Torque Adjustment Procedure**

Perform the following procedure to adjust the pinion torque of the capstan clutch in all 334C-9/9A/11 and 334D-6/6A servos.

- a. Remove the capstan from the servo by removing the four nuts and washers securing it to the servo mounting plate.
- b. Remove the capstan cable guard by removing the screw securing it to the capstan.
- c. Refer to figure 7 and mount the capstan on the capstan test fixture (Collins part number 621-9185-001) with the four nuts and washers removed during step a.

- d. Secure the capstan with a  $\frac{3}{16}$ -inch-diameter rod and a 1-inch, 10-32 UNF threaded post (Collins part number 540-9734-003) screwed on one of the capstan mounting bolts as shown in figure 7.

#### **Note**

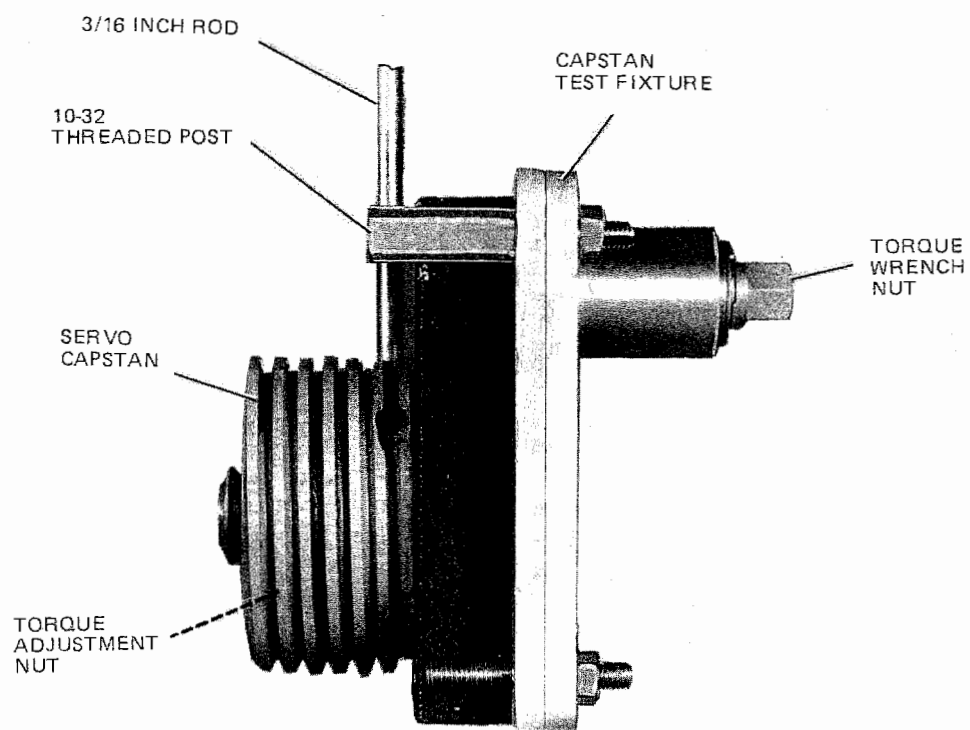
A spanner wrench can be used to secure the pulley drive capstan.

- e. Apply torque (with torque wrench) to nut on back of capstan test fixture, and measure pinion torque required to cause capstan clutch to slip. Measure torque in both directions and use the average value.
- f. Refer to the applicable aircraft service information letter (SIL) and determine proper torque setting. If torque is too high, loosen  $\frac{3}{4}$  x 16 nut on front of capstan to reduce torque and repeat step e. If torque is too low, tighten  $\frac{3}{4}$  x 16 nut and repeat step e.
- g. Repeat steps e and f until torque is within specified limits.

#### **Note**

If torque cannot be adjusted within specified limits, return capstan to nearest authorized Rockwell-Collins Repair Center for repair.

- h. Remove capstan from capstan test fixture and replace capstan cable guard.
- i. Remount capstan on servo and secure with the four nuts and washers removed during step a.



TP3-9157-017

*Capstan Test Fixture With Servo Capstan Installed*  
*Figure 7*



**Rockwell  
International**

# **Collins 913K-1/1A Computer/Control**

**maintenance**

Collins General Aviation Division

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## Record of Revisions

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|        |               |                   |                                   |        |               |                   |                    |
|        |               |                   |                                   |        |               |                   |                    |



## 1. GENERAL

This maintenance section provides a go/no-go test and gain adjustment procedures for the 913K-1/1A Computer/Control, the 562C-13/13A Autopilot Computer, and the 614E-42/42A Mode Selector. The 562C-13/13A and the 614E-42/42A must be connected by a one-to-one cable or be reassembled as a 913K-1/1A for testing.

### Caution

Do not connect a 614E-42/42A (-002) to a 562C-13/13A other than (-002). Other 562C-13/13A's will apply +28 V dc to the 5-V panel lights in the 614E-42/42A and cause them to fail.

All references to the 913K-1/1A in this section apply also to the reassembled 562C-13/13A and 614E-42/42A. If the unit fails any portion of the test, or cannot be adjusted, remove the unit from service and refer to the applicable repair section (523-0764834 or 523-0766939) in volume III.

## 2. TEST EQUIPMENT AND POWER REQUIREMENTS

The test equipment listed in table 1 is required to perform the procedures given in this section.

The +28-V dc test set power must be adjustable and capable of being set to within  $\pm 0.5$  V dc with a 3-A

capacity. The 115-V ac, 400-Hz power must be adjustable to provide  $26 \pm 0.26$ -V ac, 400  $\pm 40$ -Hz power measured at the 913K POWER 26 VAC fuse.

## 3. TESTING

### 3.1 General

The 972S-2 Autopilot Test Set is capable of testing the 913K-1/1A independent of other units in the AP-106/AP-107 Flight Control System. All 913K-1/1A power requirements for this test are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

### Warning

The gain of the 913K-1/1A must be adjusted after testing and before operation of the flight control system in the aircraft. Either the gain adjustment procedure provided in paragraph 4 in this section or in the AP-106/AP-107 Flight Control System maintenance section (523-0764808) can be used to perform this preflight adjustment. Failure to perform one of these procedures can cause improper operation of the flight control system.

Table 1. Test Equipment Required.

| EQUIPMENT                       | MANUFACTURER AND PART NUMBER                                                                                                                                                                                                                                                                                                        | POWER REQUIREMENTS       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 972S-2 Autopilot Bench Test Set | Collins part number 622-1668-001 with SB 1, 2, 3, and 5.<br><br><div style="border: 1px solid black; padding: 5px; display: inline-block;">Note</div><br><br>SB 4 also must be installed in the 972S-2, and a 5-V dc, 700-mA power supply is required to perform the dimmer test, on the 913K-1/1A with part number ending in -002. | 115 V ac 400 Hz; 28 V dc |
| Digital voltmeter               | Fluke Model 8000A or equivalent.                                                                                                                                                                                                                                                                                                    | 115 V ac 60 Hz           |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure.

| TEST   | PROCEDURE                     | 972S-2 TEST SET          |                    | DESIRED RESULTS                                                                                                                                                                                                                            |
|--------|-------------------------------|--------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |                               | SWITCH                   | POSITION           |                                                                                                                                                                                                                                            |
| 1      | INITIAL TEST SETUP PROCEDURES |                          |                    |                                                                                                                                                                                                                                            |
| 1.1    | POWER section                 | 115 VAC<br>28 VDC        | OFF<br>OFF         | <div>Caution</div> <p>To prevent damaging the 913K-1/1A during the following tests, do not insert test probes more than 1/4 inch into the 913K-1/1A test jacks or short the test jacks to the cover while making voltage measurements.</p> |
|        | 614E-41 section               | P/R SEL<br>IN/OUT        | OFF<br>913         |                                                                                                                                                                                                                                            |
|        | 590A-6 section                | POWER<br>SYS<br>HOLD OUT | SYS<br>913K<br>SYS |                                                                                                                                                                                                                                            |
|        | Autopilot section             | MDL MKR                  | OFF                |                                                                                                                                                                                                                                            |
|        |                               | LOC LOGIC                | - (minus)          |                                                                                                                                                                                                                                            |
|        |                               | RADIO ALT MON            | OFF                |                                                                                                                                                                                                                                            |
|        |                               | ANAV MON                 | OFF                |                                                                                                                                                                                                                                            |
|        |                               | SELF TEST                | OFF                |                                                                                                                                                                                                                                            |
|        |                               | HDG MODE                 | 913K               |                                                                                                                                                                                                                                            |
|        |                               | NAV MODE                 | 913K               |                                                                                                                                                                                                                                            |
|        |                               | APPR MODE                | 913K               |                                                                                                                                                                                                                                            |
|        |                               | BC MODE                  | 913K               |                                                                                                                                                                                                                                            |
|        |                               | IAS MODE                 | 913K               |                                                                                                                                                                                                                                            |
|        |                               | ALT MODE                 | 913K               |                                                                                                                                                                                                                                            |
|        |                               | 913K POWER               | OFF                |                                                                                                                                                                                                                                            |
|        |                               | GYRO MON                 | LCL                |                                                                                                                                                                                                                                            |
|        |                               | ATTD FLAG                | OFF                |                                                                                                                                                                                                                                            |
|        |                               | TRIM DSENGA              | 334D-6             |                                                                                                                                                                                                                                            |
|        |                               | NAV CAPT                 | 161H               |                                                                                                                                                                                                                                            |
|        |                               | GS FLAG                  | OFF                |                                                                                                                                                                                                                                            |
|        |                               | NAV FLAG                 | OFF                |                                                                                                                                                                                                                                            |
|        |                               | ANAV/ALT HOLD            | ALT HOLD           |                                                                                                                                                                                                                                            |
|        |                               | TRACK                    | 913K (OFF)         | <p>This switch is provided only on test sets with SB 4 installed.</p>                                                                                                                                                                      |
|        |                               | PITCH DATA               | 329A               |                                                                                                                                                                                                                                            |
|        |                               | PITCH SOURCE             | OFF                |                                                                                                                                                                                                                                            |
|        |                               | ROLL-2 DATA              | 329A               |                                                                                                                                                                                                                                            |
|        |                               | ROLL-2 SOURCE            | OFF                |                                                                                                                                                                                                                                            |
|        |                               | SERVO FORCE              | SVO                |                                                                                                                                                                                                                                            |
|        |                               | VOR/LOC DEV              | 161H               |                                                                                                                                                                                                                                            |
|        |                               | GS DEV                   | 161H               |                                                                                                                                                                                                                                            |
|        |                               | SERVO INPUT CMD          |                    |                                                                                                                                                                                                                                            |
|        |                               | AILERON                  | 913K               |                                                                                                                                                                                                                                            |
|        |                               | ELEV                     | 913K               | <div>Note</div> <p>When testing a 913K-1A, set 913K switch at -1A. If testing a -002 status unit, set 913K switch at -002.</p>                                                                                                             |
|        |                               | 913K DIMMER              | HI                 |                                                                                                                                                                                                                                            |
|        | 334D-6 section                | AP TRIM SELECT           | 913K               |                                                                                                                                                                                                                                            |
|        | 329A section                  | IND                      | 913K               |                                                                                                                                                                                                                                            |
|        | 334C-9 section                | 913K                     |                    | <p>This switch is provided only on test sets with both SB 4 and 5 installed.</p>                                                                                                                                                           |
| (Cont) |                               |                          |                    |                                                                                                                                                                                                                                            |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                                                                                                                                                                                                                 | 972S-2 TEST SET                                                                                |                                                                     | DESIRED RESULTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                                                                                                                                                                           | SWITCH                                                                                         | POSITION                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1.1<br>(Cont) | 331P section<br><br>RAMP section                                                                                                                                                                                                                                                                                                          | HDG SEL<br><br>ON/OFF<br>PITCH ROLL<br>VOLTS/SEC<br><br>All other switches<br><br>All controls | EXT<br><br>OFF<br>OFF<br>OFF<br><br>Does not matter<br><br>Midrange |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1.2           | Connect the 913K-1/1A to the 913K-1/1A cable on the 972S-2 Autopilot Bench Test Set.                                                                                                                                                                                                                                                      |                                                                                                |                                                                     | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div> <p>Unless specified otherwise, all voltages are measured with respect to the COM-1 test jack.</p> <p>Throughout this test procedure, the GO AROUND ARM annunciator on the test set should light whenever either the APPR or B/C (also the NAV or HDG if SB 16 is installed) mode pushbuttons on the 913K-1 are lit. With the 913K-1A, the GO AROUND ARM annunciator on the test set should be lit whenever the POWER indicators are lit.</p> <p>The HDG mode pushbuttons on 913K-1 with SB 1 and 913K-1A also will light when another lateral mode is selected and the NAV CAPT annunciator on the test set is not lit.</p> |
| 2.            | SELF-TEST CHECKS                                                                                                                                                                                                                                                                                                                          |                                                                                                |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2.1           | <p>If any of the mode pushbuttons on the 913K-1/1A are lit, push the lighted buttons once to turn them off. Momentarily set the ENG/DIS switch on the 913K-1/1A at the DIS position and then back to the center position.</p> <p>On 913K-1/1A (except -002), turn dimmer control fully ccw but not to the self-test (click) position.</p> | <p>POWER<br/>115 VAC<br/>28 VDC</p> <p>913K POWER<br/>ATTD FLAG</p>                            | <p>ON<br/>ON</p> <p>ON<br/>SYS</p>                                  | <p>All mode pushbuttons and annunciations on the 913K-1/1A are unlit except the DIS annunciator. All annunciators on the test set are unlit except the DIS and POWER Indicators (and GO AROUND ARM annunciator if 913K-1A is being tested).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                | 972S-2 TEST SET |          | DESIRED RESULTS                                                                                                                                                                                                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                          | SWITCH          | POSITION |                                                                                                                                                                                                                                                                            |
| 2.2  | On 913K-1/1A (except -002), turn dimmer control fully ccw to the self-test (click) position.<br><br>On 913K-1/1A (-002), push and hold TEST pushbutton.                                                                                                  |                 |          | All mode pushbuttons and annunciators on 913K-1/1A light. GO-AROUND ANNUN and GLIDESLOPE ARM and CAPT annunciators on the test set light.<br><br>If testing a 913K-1A, the following annunciators on the test set will also light: ENGAGE, NAV ARM and CAPT, and ALT MODE. |
| 2.3  | On 913K-1/1A (except -002), turn dimmer control cw out of self-test position.<br><br>On 913K-1/1A (-002), release TEST pushbutton.                                                                                                                       |                 |          | All mode pushbuttons and annunciators except DIS annunciator on 913K-1/1A and POWER indicators on test set are unlit.                                                                                                                                                      |
| 3    | DIMMER CONTROL TEST<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>The 913K-1/1A (-002) must have a +5-V dc source connected to J203(+) and J204(-) on the rear of the 972S-2 to perform this test. |                 |          |                                                                                                                                                                                                                                                                            |
| 3.1  | Push HDG mode pushbutton on 913K-1/1A.                                                                                                                                                                                                                   |                 |          | HDG mode pushbutton lights.                                                                                                                                                                                                                                                |
| 3.2  | On 913K-1/1A (except -002), slowly rotate dimmer control on 913K-1/1A to maximum cw position.<br><br>On 913K-1/1A (-002), set 913K DIMMER switch on test set at LO.                                                                                      |                 |          | HDG mode pushbutton and DIS annunciator get dimmer.                                                                                                                                                                                                                        |
| 3.3  | Push HDG mode pushbutton on 913K-1/1A. On 913K-1/1A (except -002), reposition dimmer control to full ccw position but not to self-test position.<br><br>On 913K-1/1A (-002), set 913K DIMMER switch on test set at HI.                                   |                 |          | HDG mode pushbutton is unlit.                                                                                                                                                                                                                                              |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                                                             | 972S-2 TEST SET |          | DESIRED RESULTS                                                                                                                                                                                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                                                                       | SWITCH          | POSITION |                                                                                                                                                                                                                            |
| 4    | B/C MODE AND LOCALIZER<br>FREQUENCY LOGIC STRAP<br>TEST<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>Note</b> </div><br><br>This test determines<br>whether the LOC FREQ<br>LOGIC signal in the 913K-1/<br>1A is strapped for positive<br>or negative logic while<br>checking the B/C mode logic<br>circuit. |                 |          |                                                                                                                                                                                                                            |
| 4.1  | Push the B/C mode pushbutton on 913K-1/1A.                                                                                                                                                                                                                                                                                                            |                 |          | If B/C mode pushbutton lights, either LOC FREQ LOGIC signal is strapped for negative logic or 913K-1/1A is defective -- proceed to test 4.3 to determine which. If B/C mode pushbutton is unlit, proceed to test 4.2.      |
| 4.2  | Push the B/C mode pushbutton on 913K-1/1A.                                                                                                                                                                                                                                                                                                            | LOC LOGIC       | + (plus) | If B/C mode pushbutton lights and was unlit during test 4.1, B/C mode circuit is good and LOC FREQ LOGIC signal is strapped for positive logic. Proceed to test 4.4.                                                       |
| 4.3  | Push the B/C mode pushbutton on 913K-1/1A.                                                                                                                                                                                                                                                                                                            |                 |          | If B/C mode pushbutton is unlit but lit during test 4.1, LOC FREQ LOGIC signal is strapped for negative logic. Proceed to test 5. If B/C mode pushbutton is lit during both tests 4.1 and 4.3, the 913K-1/1A is defective. |
| 4.4  | Push the B/C mode pushbutton on 913K-1/1A.                                                                                                                                                                                                                                                                                                            |                 |          | B/C mode pushbutton is unlit.                                                                                                                                                                                              |
| 5    | ENGAGE LOGIC TESTS                                                                                                                                                                                                                                                                                                                                    |                 |          |                                                                                                                                                                                                                            |
| 5.1  | Measure voltage at STR FLAG jack (329A section).                                                                                                                                                                                                                                                                                                      |                 |          | 913K-1: +26.5 to +34.5 V dc<br>913K-1A: +23.5 to +31.5 V dc                                                                                                                                                                |
| 5.2  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                                                                                                                                                                                                                                          |                 |          | ENG annunciator on 913K-1/1A lights and DIS is unlit. ENGAGE PRIM and RUD (also ENGAGE for 913K-1A) annunciators on test set light.                                                                                        |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                | 972S-2 TEST SET |                                              | DESIRED RESULTS                                                                                                                                        |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                          | SWITCH          | POSITION                                     |                                                                                                                                                        |
| 5.3  |                                                                                                                                                                          | SYNC pushbutton | Push and hold                                | ENGAGE PRIM (and ENGAGE for 913K-1A) annunciator on test set is unlit while SYNC pushbutton is being pushed.                                           |
|      |                                                                                                                                                                          | SYNC pushbutton | Release                                      | ENGAGE PRIM (and ENGAGE for 913K-1A) annunciator on test set lights.                                                                                   |
| 5.4  | Set ENG/DIS switch on 913K-1/1A at DIS position.                                                                                                                         |                 |                                              | DIS annunciator on 913K-1/1A lights. ENG annunciator on 913K-1/1A and ENGAGE PRIM AND RUD (and ENGAGE for 913K-1A) annunciators on test set are unlit. |
| 5.5  | Set ENG/DIS switch on 913K-1/1A at center position. Push NAV and then ALT mode pushbuttons on 913K-1/1A.                                                                 |                 |                                              | NAV and ALT mode pushbuttons light.                                                                                                                    |
| 5.6  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                                                             |                 |                                              | Only NAV mode pushbutton and ENG annunciator are lit on 913K-1/1A.                                                                                     |
| 5.7  | Push NAV mode pushbutton on 913K-1/1A.                                                                                                                                   |                 |                                              | All mode pushbuttons on 913K-1/1A are unlit.                                                                                                           |
| 5.8  |                                                                                                                                                                          | TRIM DSENGA     | Momentarily set at LCL, then back to 334D-6. | On 913K-1/1A, only DIS annunciator is lit.                                                                                                             |
| 5.9  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                                                             |                 |                                              | On 913K-1/1A, only ENG annunciator is lit.                                                                                                             |
| 5.10 |                                                                                                                                                                          | ATTD FLAG       | Set at OFF then back to SYS.                 | On 913K-1/1A, only DIS annunciator is lit.                                                                                                             |
| 6    | BASIC PITCH MODE OPERATIONAL TESTS                                                                                                                                       |                 |                                              |                                                                                                                                                        |
| 6.1  | Push HDG mode pushbutton on 913K-1/1A.                                                                                                                                   | PITCH SOURCE    | LCL                                          | HDG mode pushbutton on 913K-1/1A is lit.                                                                                                               |
|      | Observe voltage at SERVO INPUT CMD ELEV test jack when PITCH control is rotated first clockwise and then counterclockwise from center position.                          | PITCH control   | Rotate cw then ccw.                          | Voltage is positive when PITCH control is rotated cw and negative when rotated ccw.                                                                    |
| 6.2  | Observe voltage at COMMAND BAR PITCH test jack in 329A section of test set when PITCH control is rotated first clockwise and then counterclockwise from center position. | PITCH control   | Rotate cw then rotate ccw.                   | Voltage is negative when PITCH control is rotated cw and positive when rotated ccw.                                                                    |



Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                       | 9 72S-2 TEST SET                                                              |                                                                             | DESIRED RESULTS                                                                                                  |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                 | SWITCH                                                                        | POSITION                                                                    |                                                                                                                  |
| 7    | ALT AND IAS HOLD MODE OPERATIONAL TESTS                                                                                                                                                                                                         |                                                                               |                                                                             |                                                                                                                  |
| 7.1  | Measure voltage at COMMAND BAR PITCH test jack while rotating ANAV/ALT HOLD control clockwise and then counterclockwise from center position.                                                                                                   | SYNC pushbutton<br><br>HOLD OUT (590A-6 section)<br><br>ANAV/ALT HOLD control | Push and release<br><br>LCL<br><br>Rotate cw then ccw from center position. | 0 $\pm$ 0.04 V dc.                                                                                               |
| 7.2  | Push HDG and then ALT mode pushbuttons on 913K-1/1A.                                                                                                                                                                                            |                                                                               |                                                                             | HDG and ALT mode push-buttons light.                                                                             |
| 7.3  | Observe voltage at COMMAND BAR PITCH test jack while rotating ANAV/ALT HOLD control clockwise and then counterclockwise from center position.                                                                                                   | ANAV/ALT HOLD control                                                         | Rotate cw then ccw from center position.                                    | Voltage is negative when ANAV/ALT HOLD control is rotated cw and positive when rotated ccw from center position. |
| 7.4  |                                                                                                                                                                                                                                                 | SYNC pushbutton                                                               | Push and release                                                            | ALT mode pushbutton on 913K-1/1A goes out and voltage at COMMAND BAR PITCH test jack drops to 0 $\pm$ 0.07.      |
| 7.5  | Push IAS mode pushbutton on 913K-1/1A.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>If IAS mode is not provided in 913K-1/1A under test, omit remainder of test and proceed to test 7.7. |                                                                               |                                                                             | HDG and IAS mode push-buttons are lit.                                                                           |
| 7.6  | Observe voltage at COMMAND BAR PITCH test jack while rotating ANAV/ALT HOLD control clockwise and then counterclockwise from center position.                                                                                                   | ANAV/ALT HOLD control                                                         | Rotate cw then ccw from center position.                                    | Voltage is negative when ANAV/ALT HOLD control is rotated cw and positive when rotated ccw from center position. |
| 7.7  | Push HDG mode pushbutton on 913K-1/1A.                                                                                                                                                                                                          | HOLD OUT (590A-6 section)                                                     | SYS                                                                         | All mode pushbuttons are unlit.                                                                                  |
| 8    | GO-AROUND MODE TESTS                                                                                                                                                                                                                            |                                                                               |                                                                             |                                                                                                                  |
| 8.1  | Push APPR mode pushbutton on 913K-1/1A.                                                                                                                                                                                                         |                                                                               |                                                                             | APPR mode pushbutton on 913K-1/1A and GO AROUND ARM annunciator on test set are lit.                             |



Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST   | PROCEDURE                                                   | 972S-2 TEST SET      |                                                     | DESIRED RESULTS                                                                                                                                                                                                                                                                     |
|--------|-------------------------------------------------------------|----------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |                                                             | SWITCH               | POSITION                                            |                                                                                                                                                                                                                                                                                     |
| 8.2    |                                                             | GA pushbutton        | Push and release                                    | GO-AROUND ANNUN is lit and APPR mode pushbutton and GO AROUND ARM (913K-1 only) annunciator are unlit.                                                                                                                                                                              |
| 8.3    | Observe polarity of voltage at COMMAND BAR PITCH test jack. |                      |                                                     | Negative dc voltage                                                                                                                                                                                                                                                                 |
| 8.4    | Push NAV mode pushbutton on 913K-1/1A.                      |                      |                                                     | NAV mode pushbutton is lit and GO AROUND ANNUN is unlit.                                                                                                                                                                                                                            |
| 8.5    |                                                             | GA pushbutton        | Push and release                                    | 913K-1 without SB 16, 913K-1A (-001, -003, -004 with A5 D-E strap): NAV mode pushbutton is lit and GO AROUND annunciator is not lit.<br><br>913K-1 with SB 16, 913K-1A (-001, -002, -007, -010 with A5 E-F strap): NAV mode pushbutton is not lit and GO AROUND annunciator is lit. |
| 8.6    | Push NAV mode pushbutton on 913K-1/1A.                      |                      |                                                     | All mode pushbuttons and test set annunciators are unlit.                                                                                                                                                                                                                           |
| 9      | GLIDESLOPE TESTS                                            |                      |                                                     |                                                                                                                                                                                                                                                                                     |
| 9.1    | Push APPR mode pushbutton on 913K-1/1A.                     | NAV CAPT<br>NAV FLAG | LCL<br>FXD                                          | APPR mode pushbutton on 913K-1/1A is lit and GLIDESLOPE ARM annunciator on test set lights within 10 $\pm$ 2 seconds after NAV CAPT is set at LCL.                                                                                                                                  |
| 9.2    |                                                             | LOC LOGIC            | - (pos strap)<br>+ (neg strap)                      | GLIDESLOPE ARM annunciator is unlit.                                                                                                                                                                                                                                                |
| 9.3    |                                                             | LOC LOGIC            | + (pos strap)<br>- (neg strap)                      | GLIDESLOPE ARM annunciator is lit.                                                                                                                                                                                                                                                  |
| 9.4    |                                                             | GS DEV control       | Adjust for -30 mV dc at GS DEV test jacks.          |                                                                                                                                                                                                                                                                                     |
| (Cont) |                                                             | FLAG control         | Adjust for less than +200 mV dc at FLAG test jacks. | GLIDESLOPE ARM annunciator is lit.<br>GLIDESLOPE CAPT annunciator is unlit.                                                                                                                                                                                                         |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                    | 972S-2 TEST SET                                                    |                                                   | DESIRED RESULTS                                                                                                                                                                                                                                                 |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                              | SWITCH                                                             | POSITION                                          |                                                                                                                                                                                                                                                                 |
| 9.4<br>(Cont) |                                                                                                                                              | GS DEV switch<br>GS FLAG switch                                    | 913K<br>ON                                        |                                                                                                                                                                                                                                                                 |
| 9.5           |                                                                                                                                              | FLAG control                                                       | Adjust for +290<br>mV dc at FLAG<br>test jacks.   | GLIDESLOPE ARM<br>annunciator is unlit.<br>GLIDESLOPE CAPT<br>annunciator is lit.                                                                                                                                                                               |
| 9.6           | Push ALT and IAS (if used) mode<br>pushbuttons on 913K-1/1A.                                                                                 |                                                                    |                                                   | Neither ALT nor IAS<br>mode pushbuttons light.                                                                                                                                                                                                                  |
| 9.7           |                                                                                                                                              | SYNC pushbutton                                                    | Push and release                                  | APPR mode pushbutton on<br>913K-1/1A and GLIDE-<br>SLOPE CAPT annunciator<br>on test set remain lit.                                                                                                                                                            |
| 9.8           |                                                                                                                                              | GS DEV control                                                     | Adjust for -150<br>mV dc at GS<br>DEV test jacks. | GLIDESLOPE CAPT<br>annunciator remains lit.                                                                                                                                                                                                                     |
| 9.9           | Delay 60 seconds, and then<br>measure voltage at COMMAND<br>BAR PITCH test jack.                                                             |                                                                    |                                                   | +1.2 to +1.5 V dc                                                                                                                                                                                                                                               |
| 9.10          | Measure voltage at COMMAND<br>BAR PITCH test jack.                                                                                           | MDL MKR                                                            | AC                                                | +0.4 to +0.5 V dc                                                                                                                                                                                                                                               |
| 9.11          | Push APPR mode pushbutton on<br>913K-1/1A.                                                                                                   | MDL MKR<br>NAV CAPT<br>GS FLAG switch<br>NAV FLAG<br>GS DEV switch | OFF<br>161H<br>OFF<br>OFF<br>161H                 | APPR mode pushbutton on<br>913K-1/1A and GLIDE-<br>SLOPE CAPT annunciator<br>on test set are unlit.                                                                                                                                                             |
| 10            | BASIC ROLL MODE<br>OPERATIONAL TESTS                                                                                                         |                                                                    |                                                   |                                                                                                                                                                                                                                                                 |
| 10.1          | Momentarily set ENG/DIS<br>switch on 913K-1/1A at ENG<br>position.                                                                           |                                                                    |                                                   | ENG annunciator on<br>913K-1/1A and ENGAGE<br>annunciators on test set<br>are lit.                                                                                                                                                                              |
| 10.2          | Push the SYNC pushbutton and<br>then measure the change in volt-<br>age at SERVO INPUT CMD<br>AILERON test jack over a 60-<br>second period. | SYNC pushbutton                                                    | Push and release                                  | Not more than $\pm 45$ mV<br>dc voltage change over a<br>60-second period.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>ROLL HOLD DRIFT<br>control A4R10 may be<br>adjusted to obtain<br>desired result. |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                               | 972S-2 TEST SET                                                           |                                                                                            | DESIRED RESULTS                                                                                                                                                    |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                         | SWITCH                                                                    | POSITION                                                                                   |                                                                                                                                                                    |
| 10.3 | Observe the voltage at the SERVO INPUT CMD AILERON test jack when the P/R CMD control (614E-41 section) is rotated clockwise and then counterclockwise from the center position.        | P/R SEL<br>(614E-41 section)<br><br>P/R CMD control                       | LT/RT<br><br>Rotate cw and then ccw from center position.                                  | Voltage is positive when P/R CMD control is rotated cw and negative when rotated ccw from center position.                                                         |
| 10.4 | Push HDG pushbutton on 913K-1/1A.<br><br>Observe voltage at COMMAND BAR ROLL test jack when the ROLL-2 control is rotated clockwise and then counterclockwise from the center position. | P/R SEL<br><br>SYNC pushbutton<br><br>ROLL-2 SOURCE<br><br>ROLL-2 control | OFF<br><br>Push and release<br><br>LCL<br><br>Rotate cw and then ccw from center position. | HDG mode pushbutton lights.<br><br>Voltage is positive when ROLL-2 control is rotated cw and negative when rotated ccw from center position.                       |
| 10.5 | Observe voltage at SERVO INPUT CMD ELEV test jack when ROLL-2 control is rotated clockwise and then counterclockwise from center position.                                              | ROLL-2 control                                                            | Rotate cw and then ccw from center position.                                               | Voltage is positive for both cw and ccw rotation of ROLL-2 control.<br><br><div>Note</div><br>Voltage may be negative when ROLL-2 control is near center position. |
| 10.6 |                                                                                                                                                                                         | DSENGA pushbutton                                                         | Push and release                                                                           | DIS annunciator on 913K-1/1A is lit and ENGAGE annunciators on test set are unlit.                                                                                 |
| 11   | HEADING MODE OPERATIONAL TEST                                                                                                                                                           |                                                                           |                                                                                            |                                                                                                                                                                    |
| 11.1 |                                                                                                                                                                                         | ROLL-2 SOURCE                                                             | OFF                                                                                        |                                                                                                                                                                    |
| 11.2 | Observe voltage at COMMAND BAR ROLL test jack when the HDG COURSE SIM control is rotated clockwise and then counterclockwise from the center position.                                  | HDG SEL<br>(331P section)<br><br>HDG COURSE SIM control                   | LCL<br><br>Rotate cw and then ccw from center position.                                    | Voltage is negative when HDG COURSE SIM control is rotated cw and positive when rotated ccw from center position.                                                  |
| 12   | NAV AND ANAV MODE OPERATIONAL TESTS                                                                                                                                                     |                                                                           |                                                                                            |                                                                                                                                                                    |
| 12.1 |                                                                                                                                                                                         | HDG COURSE SIM control<br><br>NAV CAP                                     | Rotate cw from center for 4.00 V ac at HDG COURSE SIM test jacks.<br><br>LCL               | 913K-1: HDG mode pushbutton is unlit.<br><br>913K-1A: NAV CAPT annunciator on test set lights.                                                                     |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST                            | PROCEDURE                                                                                                                                                                                                                            | 972S-2 TEST SET                                        |                                                                                                                     | DESIRED RESULTS                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|                                 |                                                                                                                                                                                                                                      | SWITCH                                                 | POSITION                                                                                                            |                                                                                                      |
| 12.2                            | Push NAV mode pushbutton on 913K-1/1A and delay 10 seconds (913K-1) or 15 seconds (913K-1A). Measure and record voltage at COMMAND BAR ROLL test jack.                                                                               |                                                        |                                                                                                                     | -1.4 to -6.4 V dc<br><br>NAV mode pushbutton is lit and HDG mode pushbutton is not lit on 913K-1/1A. |
| 12.3                            | Measure voltage at TRACK test jack.                                                                                                                                                                                                  |                                                        |                                                                                                                     | -1.5 to +1.5 V dc                                                                                    |
| 12.4                            | Measure voltage at TRACK test jack. (If testing 913K-1A, delay 15 seconds before measurement.)                                                                                                                                       | HDG SEL<br>(331P section)                              | EXT                                                                                                                 | 913K-1: +15.0 to +20.0 V dc<br>913K-1A: +24.0 to +31.0 V dc                                          |
| 12.5                            |                                                                                                                                                                                                                                      | HDG SEL<br><br>LOC LOGIC<br><br>HDG COURSE SIM control | LCL<br><br>- (pos strap)<br>+ (neg strap)<br><br>Rotate ccw from center for 4.00 V ac at HDG COURSE SIM test jacks. |                                                                                                      |
| 12.6                            | Connect DVM TO COMMAND BAR ROLL test jack.                                                                                                                                                                                           | HDG SEL                                                | EXT                                                                                                                 | Allow voltage to stabilize at $0 \pm 0.15$ V dc before proceeding.                                   |
| 12.7                            | Observe voltage at COMMAND BAR ROLL test jack.                                                                                                                                                                                       | HDG SEL                                                | LCL                                                                                                                 | Voltage goes positive and then begins very slow decay toward zero.                                   |
| 12.8                            | Observe voltage at COMMAND BAR ROLL test jack.                                                                                                                                                                                       | HDG SEL<br><br>LOC LOGIC                               | EXT<br><br>+ (pos strap)<br>- (neg strap)                                                                           | Allow voltage to stabilize at $0 \pm 0.15$ V dc before proceeding.                                   |
| 12.9                            | Observe voltage at COMMAND BAR ROLL test jack.                                                                                                                                                                                       | HDG SEL                                                | LCL                                                                                                                 | Voltage goes positive and then begins slow decay toward zero.                                        |
| 12.10<br>(913K-1 without SB 11) | Observe voltage at COMMAND BAR ROLL test jack after a 10-second delay.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>Do not perform this test on 913K-1A or 913K-1 with SB 11. | ANAV MON<br><br>LOC LOGIC                              | ON<br><br>- (pos strap)<br>+ (neg strap)                                                                            | +1.4 to +6.4 V dc                                                                                    |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST                                               | PROCEDURE                                                                                                                                                                                                                        | 972S-2 TEST SET                                                                                  |                                                                                                                    | DESIRED RESULTS                                                 |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                                                    |                                                                                                                                                                                                                                  | SWITCH                                                                                           | POSITION                                                                                                           |                                                                 |
| 12.11                                              | Push NAV mode pushbutton on 913K-1/1A.                                                                                                                                                                                           | HDG SEL<br><br>ANAV MON<br>NAV CAPT<br>VOR/LOC DEV control<br><br>NAV CAPT                       | EXT<br><br>OFF<br>161H<br>Adjust for +30 mV dc at VOR/LOC DEV test jacks.<br><br>LCL                               | NAV mode pushbutton on 913K-1/1A is unlit.                      |
| 12.12                                              | On 913K-1A only, ground TP7. Push NAV mode pushbutton on 913K-1/1A and measure voltage at TP5 (green) on 913K-1/1A.                                                                                                              | VOR/LOC DEV switch                                                                               | 913K                                                                                                               | 913K-1: +1.726 to +2.026 V dc<br>913K-1A: +0.875 to +1.125 V dc |
| 12.13                                              | Reset VOR/LOC DEV control for -30 mV dc and measure voltage at TP5 on 913K-1/1A after 30 seconds.                                                                                                                                | VOR/LOC DEV control                                                                              | Adjust for -30 mV dc                                                                                               | 913K-1: -1.726 to -2.026 V dc<br>913K-1A: -0.875 to -1.125 V dc |
| 12.14<br>913K-1<br>without<br>SB 11<br>only        | Measure voltage at TP5 on 913K-1.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>Do not perform this test if SB 11 has been installed in a 913K-1, or if testing a 913K-1A. | ANAV MON                                                                                         | ON                                                                                                                 | -1.726 to -2.026 V dc                                           |
| 12.15                                              | Observe voltage at TP5 on 913K-1/1A.                                                                                                                                                                                             | LOC LOGIC                                                                                        | + (pos strap)<br>- (neg strap)                                                                                     | Voltage decays to less than 1 V dc.                             |
| 12.16<br>913K-1<br>with<br>SB 11<br>and<br>913K-1A | Measure voltage at TP5 on 913K-1/1A.                                                                                                                                                                                             | LOC LOGIC<br><br>ANAV MON<br>VOR/LOC DEV switch<br>ANAV/ALT HOLD switch<br>ANAV/ALT HOLD control | - (pos strap)<br>+ (neg strap)<br><br>ON<br>161H<br>ANAV<br><br>Adjust for +2.00 V dc at ANAV/ALT HOLD test jacks. | 913K-1: -2.133 to -2.373 V dc<br>913K-1A: -1.068 to -1.188 V dc |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST                                               | PROCEDURE                                                                                                                                                                        | 972S-2 TEST SET                                                                                 |                                                                                   | DESIRED RESULTS                                                                                        |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|                                                    |                                                                                                                                                                                  | SWITCH                                                                                          | POSITION                                                                          |                                                                                                        |
| 12.17<br>913K-1<br>with<br>SB 11<br>and<br>913K-1A | Measure voltage at TP5 on 913K-1/1A.                                                                                                                                             | ANAV MON                                                                                        | OFF                                                                               | 0 $\pm$ 60 mV dc                                                                                       |
| 12.18                                              | Remove ground from TP7 on 913K-1A.                                                                                                                                               | VOR/LOC DEV switch<br><br>ANAV MON<br><br>NAV CAPT<br><br>LOC LOGIC<br><br>ANAV/ALT HOLD switch | 161H<br><br>OFF<br><br>161H<br><br>+ (pos strap)<br>- (neg strap)<br><br>ALT HOLD |                                                                                                        |
| 13                                                 | BACK COURSE MODE TESTS                                                                                                                                                           |                                                                                                 |                                                                                   |                                                                                                        |
| 13.1                                               | Push B/C mode pushbutton on 913K-1/1A.                                                                                                                                           |                                                                                                 |                                                                                   | B/C mode pushbutton is lit. GO AROUND ARM is lit.                                                      |
| 13.2                                               | Measure the time required for the TRACK voltage to switch from 0 to +17.5 $\pm$ 2.5 V dc (913K-1) or 28 $\pm$ 4 V dc (913K-1A). Begin timing when NAV CAPT switch is set to LCL. | NAV CAPT                                                                                        | LCL                                                                               | Voltage at TRACK test jack should switch between 7 and 13 seconds after NAV CAPT switch is set at LCL. |
| 13.3                                               |                                                                                                                                                                                  | VOR/LOC DEV control                                                                             | Adjust for +60 mV dc at VOR/LOC DEV test jacks.                                   |                                                                                                        |
| 13.4                                               | Measure voltage at COMMAND BAR ROLL test jack.                                                                                                                                   | VOR/LOC DEV switch                                                                              | 913K                                                                              | +1.34 to +1.64 V dc after 10 seconds.                                                                  |
| 13.5                                               | Measure voltage at COMMAND BAR ROLL test jack.                                                                                                                                   | NAV CAPT<br><br>GA pushbutton                                                                   | 161H<br><br>Push and release                                                      | 0 $\pm$ 0.1 V dc<br><br>GO AROUND ANNUN is lit and B/C mode pushbutton is unlit.                       |
| 13.6                                               | Observe voltage at COMMAND BAR ROLL test jack when HDG COURSE SIM control is rotated to either side of center position.                                                          | VOR/LOC DEV switch<br><br>HDG SEL<br><br>HDG COURSE SIM control                                 | 161H<br><br>LCL<br><br>Rotate to either side of center position.                  | 0 $\pm$ 0.1 V dc                                                                                       |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                | 972S-2 TEST SET                                                 |                                                                                          | DESIRED RESULTS                                                                                                                                                                                                               |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                          | SWITCH                                                          | POSITION                                                                                 |                                                                                                                                                                                                                               |
| 13.7 | Push B/C mode pushbutton on 913K-1/1A and observe voltage of COMMAND BAR ROLL test jack when HDG COURSE SIM control is rotated clockwise and then counterclockwise from center position. | NAV CAPT<br><br>HDG COURSE SIM control                          | LCL<br><br>Rotate cw and then ccw from center position.                                  | B/C mode pushbutton is lit. GO AROUND ANNUN is unlit.<br><br>Voltage is positive when HDG COURSE SIM control is rotated cw and negative when rotated ccw from center position.                                                |
| 13.8 | Push B/C mode pushbutton on 913K-1/1A.                                                                                                                                                   | NAV CAPT<br><br>HDG SEL<br><br>LOC LOGIC                        | 161H<br><br>EXT<br><br>- (pos strap)<br>+ (neg strap)                                    | B/C mode pushbutton is unlit.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>B/C mode pushbutton will stay lit if LOC LOGIC is reset before pushing B/C mode pushbutton. |
| 14   | APPROACH MODE OPERATIONAL TEST                                                                                                                                                           |                                                                 |                                                                                          |                                                                                                                                                                                                                               |
| 14.1 | Push APPR mode pushbutton on 913K-1/1A.                                                                                                                                                  | NAV CAPT                                                        | LCL                                                                                      | APPR mode pushbutton on 913K-1/1A is lit.                                                                                                                                                                                     |
|      | Delay 15 seconds minimum before performing test 14.2.                                                                                                                                    | VOR/LOC DEV control                                             | Adjust for +30 mV dc at VOR/LOC DEV test jacks.                                          |                                                                                                                                                                                                                               |
| 14.2 | Observe voltage at TP5 on 913K-1/1A when VOR/LOC DEV switch is set at 913K.                                                                                                              | VOR/LOC DEV switch                                              | 913K                                                                                     | 913K-1: +1.84 to +2.14 V dc<br>913K-1A: +0.92 to +1.07 V dc                                                                                                                                                                   |
| 14.3 |                                                                                                                                                                                          | VOR/LOC DEV switch<br><br>HDG SEL<br><br>HDG COURSE SIM control | 161H<br><br>LCL<br><br>Rotate cw from center for 4.00 V ac at HDG COURSE SIM test jacks. |                                                                                                                                                                                                                               |
| 14.4 | Observe voltage at TP5 on 913K-1/1A.                                                                                                                                                     | HDG SEL                                                         | EXT                                                                                      | Allow voltage to stabilize at $0 \pm 0.1$ V dc before proceeding.                                                                                                                                                             |
| 14.5 | Observe voltage at TP5 on 913K-1/1A.                                                                                                                                                     | HDG SEL                                                         | LCL                                                                                      | Voltage goes positive then begins slow decay toward zero.                                                                                                                                                                     |

Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).

| TEST  | PROCEDURE                                      | 972S-2 TEST SET                                                                                     |                                                                                                                       | DESIRED RESULTS                                                                                                                |
|-------|------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|       |                                                | SWITCH                                                                                              | POSITION                                                                                                              |                                                                                                                                |
| 14.6  |                                                | NAV CAPT<br>HDG SEL<br>LOC LOGIC<br>GS FLAG<br>FLAG control<br>GS DEV<br>GS DEV control<br>NAV CAPT | 161H<br>EXT<br>+ (pos strap)<br>- (neg strap)<br>ON<br>Adjust for +300 mV dc.<br>913K<br>Adjust for -10 mV dc.<br>LCL | GS CAPT annunciator on test set lights within 12 seconds (913K-1) or 20 seconds (913K-1A) after NAV CAPT switch is set at LCL. |
| 14.7  | Measure voltage at COMMAND BAR ROLL test jack  | VOR/LOC DEV switch<br>VOR/LOC DEV control                                                           | 913K<br>Adjust for +150 mV dc                                                                                         | -1.98 to -2.44 V dc                                                                                                            |
| 14.8  |                                                | VOR/LOC DEV switch<br>HDG SEL<br>HDG COURSE SIM control                                             | 161H<br>LCL<br>Rotate cw from center for 6.0 V ac at HDG COURSE SIM test jacks.                                       |                                                                                                                                |
| 14.9  | Observe voltage at COMMAND BAR ROLL test jack. | HDG SEL                                                                                             | EXT                                                                                                                   | Allow voltage to stabilize at $0 \pm 0.10$ V dc before proceeding.                                                             |
| 14.10 | Observe voltage at COMMAND BAR ROLL test jack. | HDG SEL                                                                                             | LCL                                                                                                                   | Voltage goes negative and then decays to $0 \pm 0.10$ V dc.                                                                    |
| 14.11 |                                                | ROLL DATA-2 switch (329T-1 section)<br>ROLL-2 control                                               | SIM<br>Rotate cw from center for 1 V ac at ROLL DATA-2 test jacks in 329T-1 section.                                  |                                                                                                                                |



*Table 2. 913K-1/1A and 562C-13/13A Go/No-Go Test Procedure (Cont).*

| TEST  | PROCEDURE                                                                              | 972S-2 TEST SET     |                                                 | DESIRED RESULTS                                                             |
|-------|----------------------------------------------------------------------------------------|---------------------|-------------------------------------------------|-----------------------------------------------------------------------------|
|       |                                                                                        | SWITCH              | POSITION                                        |                                                                             |
| 14.12 | Observe voltage at COMMAND BAR ROLL test jack when ROLL-2 SOURCE switch is set at LCL. | ROLL-2 SOURCE       | LCL                                             | Voltage goes positive then begins slow decay toward zero.                   |
| 14.13 | Push APPR mode pushbutton on 913K-1/1A.                                                | LOC LOGIC           | - (pos strap)<br>+ (neg strap)                  |                                                                             |
|       |                                                                                        | GS FLAG             | OFF                                             |                                                                             |
|       |                                                                                        | GS DEV              | 161H                                            |                                                                             |
|       |                                                                                        | NAV CAPT            | 161H                                            |                                                                             |
|       |                                                                                        | ROLL-2 SOURCE       | OFF                                             |                                                                             |
|       |                                                                                        | HDG SEL             | EXT                                             |                                                                             |
| 15    | TRIM SYSTEM TESTS                                                                      |                     |                                                 |                                                                             |
| 15.1  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                           | SERVO FORCE switch  | LCL                                             | ENG annunciator on 913K-1/1A is lit.                                        |
| 15.2  |                                                                                        | SERVO FORCE control | Adjust for +8.0 V dc at SERVO FORCE test jacks. | TRIM DN annunciator on 913K-1/1A flashes on and off.                        |
| 15.3  |                                                                                        | SERVO FORCE control | Adjust for -8.0 V dc at SERVO FORCE test jacks. | TRIM UP annunciator on 913K-1/1A flashes on and off.                        |
| 15.4  |                                                                                        | DSENGA pushbutton   | Push and release                                | TRIM UP annunciator stops flashing and DIS annunciator on 913K-1/1A is lit. |
| 16    | POSTTEST PROCEDURE                                                                     |                     |                                                 |                                                                             |
| 16.1  |                                                                                        | SERVO FORCE switch  | SVO                                             |                                                                             |
|       |                                                                                        | 913K POWER          | OFF                                             |                                                                             |
|       |                                                                                        | 28 VDC POWER        | OFF                                             |                                                                             |
|       |                                                                                        | 115 VAC POWER       | OFF                                             |                                                                             |
| 16.2  | Disconnect 913K-1/1A from 972S-2 connector cables.                                     |                     |                                                 |                                                                             |

#### 4. GAIN ADJUSTMENT PROCEDURE

The gain adjustment procedures provided in table 3 permit setting the gain of all circuits in the 913K-1/1A (except the trim gain and duty cycle for the 913K-1/1A -001 units) for a particular aircraft before installation in the aircraft. This procedure can be performed instead of the postinstallation adjustment procedures (except trim gain and duty cycle for the 913K-1/1A -001 units) given in the AP-106/AP-107 Flight Control System maintenance section (523-0764808).

The gain of the 913K-1/1A must be adjusted before operating the flight control system in the aircraft to ensure that the gain of the system is set for the flight characteristics of the particular aircraft. Since the gain settings are unique for each particular aircraft, the gain settings of the 913K-1/1A -001 units are not specified in this procedure, but are specified in service information letters that are written for each aircraft in which the AP-106/AP-107 Flight Control System has been certified. These service information letters (SIL's) are referred to in the procedures where the gain setting is unique to a particular aircraft.

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures.

| TEST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PROCEDURE                                                                                                                                                                       | 972S-2 TEST SET                                               |                                                                 | DESIRED RESULTS                                                                                                                                      | ADJUSTMENT INSTRUCTIONS                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                 | SWITCH                                                        | POSITION                                                        |                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PRETEST PROCEDURE                                                                                                                                                               |                                                               |                                                                 |                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |
| <div style="text-align: center;"><b>Note</b></div> <p>All references to 913K-1/1A are applicable to 562C-13/13A and 614E-42/42A.</p> <p>The 562C-13/13A must be connected with a one-to-one cable to a 614E-42/42A to perform the following adjustments.</p> <div style="text-align: center;"><b>Caution</b></div> <p>Do not connect a 614E-42/42A (-002) to a 562C-13/13A other than (-002). Other 562C-13/13A's will apply +28 V dc to the 5-V panel lights in the 614E-42/42A and cause them to fail.</p> |                                                                                                                                                                                 |                                                               |                                                                 |                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |
| 1.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Perform the initial test setup procedure given in test 1 of table 2. Connect the 913K-1/1A connectors on test set to unit to be adjusted.                                       | POWER<br>115 VAC<br>28 VDC<br><br>913K POWER<br><br>ATTD FLAG | ON<br>ON<br><br>ON<br><br>SYS                                   | <div style="text-align: center;"><b>Note</b></div> <p>Unless otherwise specified, all voltages are measured with respect to the COM-1 test jack.</p> | <div style="text-align: center;"><b>Note</b></div> <p>The +28-V dc test set power must be adjusted to +28 <math>\pm</math>0.5 V dc. The 115-V ac, 400-Hz power must be adjusted to provide 26 <math>\pm</math>0.26 V ac, 400 <math>\pm</math>40 Hz at the 26 VAC 913K POWER fuse.</p> |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ROLL GAIN AND TRIM                                                                                                                                                              |                                                               |                                                                 |                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |
| 2.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Push HDG mode push-button on 913K-1/1A.<br><br>Connect jumper wire across ROLL-2 jacks on test set and measure voltage at COMMAND BAR-ROLL jack on 913K-1 or at TP3 on 913K-1A. | ROLL-2<br>SOURCE                                              | OFF                                                             | 0 $\pm$ 20 mV dc                                                                                                                                     | Adjust ROLL TRIM control (A2R9) on 913K-1/1A for desired result.                                                                                                                                                                                                                      |
| 2.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remove jumper wire from ROLL-2 jacks on test set. Measure voltage at COMMAND BAR-ROLL jack.                                                                                     | ROLL-2<br>SOURCE<br><br>ROLL-2<br>control                     | LCL<br><br>Adjust cw from center for 1.00 V ac at ROLL-2 jacks. | Refer to table 4.                                                                                                                                    | Adjust ROLL GAIN control (A2R5) on 913K-1/1A for desired result.                                                                                                                                                                                                                      |

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                                                                       | 972S-2 TEST SET |                                                       | DESIRED RESULTS                                                   | ADJUSTMENT INSTRUCTIONS                                                                      |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                 | SWITCH          | POSITION                                              |                                                                   |                                                                                              |
| 2.3  | Measure voltage at COMMAND BAR-ROLL jack.                                                                                                                       | ROLL-2 control  | Adjust ccw from center for 1.00 V ac at ROLL-2 jacks. | Same value as test 2.2 but with opposite polarity.                | Adjust ROLL TRIM control (A2R9) on 913K-1/1A to reduce the error by 1/2 and repeat test 2.2. |
| 2.4  | Push HDG mode pushbutton on 913K-1/1A.                                                                                                                          |                 |                                                       | No mode pushbuttons are lit.                                      |                                                                                              |
| 3    | ROLL HOLD DRIFT (status -001 only)                                                                                                                              |                 |                                                       |                                                                   |                                                                                              |
| 3.1  | On 913K-1A rotate the AIL CMD GAIN control (A4R36) ccw to stop.                                                                                                 |                 |                                                       |                                                                   |                                                                                              |
| 3.2  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                                                                    | ROLL-2 control  | Adjust for 0 V ac at ROLL-2 jacks.                    | ENG annunciator on 913K-1/1A is lit.                              |                                                                                              |
| 3.3  | Push SYNC pushbutton and then measure the change in voltage over a 60-second period at COMMAND BAR-ROLL jack for 913K-1 or SERVO INPUT CMD-AILERON for 913K-1A. |                 |                                                       | Not more than 10 mV dc in 60 seconds.                             | Adjust ROLL HOLD DRIFT control (A4R10) on 913K-1/1A for desired result.                      |
| 3.4  | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position.                                                                   | ROLL-2 SOURCE   | OFF                                                   | DIS annunciator on 913K-1/1A is lit.                              |                                                                                              |
| 4    | ROLL COMMAND GAIN                                                                                                                                               |                 |                                                       |                                                                   |                                                                                              |
| 4.1  | Push APPR mode pushbutton on 913K-1/1A and then push GA pushbutton. Delay 10 seconds minimum, then proceed to test 4.2.                                         | GA pushbutton   | Push and release                                      | GO AROUND ANNUN should light when go-around pushbutton is pushed. |                                                                                              |
| 4.2  | Measure voltage at SERVO INPUT CMD, AILERON jack.<br><br>Record value (X) for test 5.1.                                                                         | ROLL-2 control  | Adjust ccw from center for 1.00 V ac at ROLL-2 jacks. | Refer to table 4.                                                 | Adjust AIL CMD GAIN control (A4R36) on 913K-1/1A for desired result.                         |

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                             | 972S-2 TEST SET                                      |                                                           | DESIRED RESULTS                                                                                                                                                                                             | ADJUSTMENT INSTRUCTIONS                                                 |
|------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|      |                                                                                                                       | SWITCH                                               | POSITION                                                  |                                                                                                                                                                                                             |                                                                         |
| 5    | ROLL RATE                                                                                                             |                                                      |                                                           |                                                                                                                                                                                                             |                                                                         |
| 5.1  | Connect a jumper wire between TP3 and TB4 on 913K-1/1A. Measure voltage at SERVO INPUT CMD, AILERON jack.             | ROLL-2 control                                       | Adjust ccw from center for 1.00 V ac at ROLL-2 jacks.     | Add value (X) recorded in test 4.2 to the value listed in table 4.                                                                                                                                          | Adjust ROLL RATE GAIN control (A4R31) on 913K-1/1A for desired result.  |
| 5.2  | Push APPR mode pushbutton on 913K-1/1A twice and remove jumper wire from TP3 and TP4 on 913K-1/1A.                    |                                                      |                                                           | GO-AROUND ANNUN and all mode pushbuttons are unlit.                                                                                                                                                         |                                                                         |
| 6    | ROLL HOLD DRIFT (All statuses except -001)                                                                            |                                                      |                                                           |                                                                                                                                                                                                             |                                                                         |
| 6.1  | Momentarily set ENG/DIS switch on 913K-1/1A at ENG position.                                                          | ATTD FLAG<br><br>ROLL-2 control                      | SYS<br><br>Adjust for 0 V ac at ROLL-2 jacks.             | ENG annunciator on 913K-1/1A is lit.                                                                                                                                                                        |                                                                         |
| 6.2  | Push SYNC pushbutton and then measure the change in voltage over a 60-second period at SERVO INPUT CMD-AILERON jacks. |                                                      |                                                           | Refer to table 4.                                                                                                                                                                                           | Adjust ROLL HOLD DRIFT control (A4R10) on 913K-1/1A for desired result. |
| 6.3  | Momentarily set ENG/DIS switch on 913K-1/1A at DIS position and then back to center position.                         | ROLL-2 SOURCE                                        | OFF                                                       | DIS annunciator on 913K-1/1A is lit.                                                                                                                                                                        |                                                                         |
| 7    | HEADING GAIN (200 mV/degree heading source)                                                                           |                                                      |                                                           |                                                                                                                                                                                                             |                                                                         |
| 7.1  | Push HDG mode pushbutton on 913K-1/1A and measure voltage at TP5 (roll command) on 913K-1/1A.                         | HDG SEL (331P section)<br><br>HDG COURSE SIM control | LCL<br><br>Adjust for +2.00 V ac at HDG COURSE SIM jacks. | Refer to table 4.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>Desired result for 913K-1A (-001) is 1/2 of value specified in SIL for 913K-1 (-001). | Adjust HDG ANLG control (A2R36) on 913K-1/1A for desired result.        |

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                                                                                        | 972S-2 TEST SET                                            |                                                                        | DESIRED RESULTS                                                                                                                                                                                                        | ADJUSTMENT INSTRUCTIONS                                                                                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                  | SWITCH                                                     | POSITION                                                               |                                                                                                                                                                                                                        |                                                                                                         |
| 7.2  | Measure voltage at TP5 on 913K-1/1A.                                                                                                                                             | HDG COURSE<br>SIM control                                  | Adjust for<br>-2.00 V ac<br>at HDG<br>COURSE<br>SIM jacks.             | Same values as test<br>7.1 but with oppo-<br>site polarity.                                                                                                                                                            | Readjust HDG ANLG con-<br>trol and repeat tests 7.1<br>and 7.2 until both tests<br>are within limits.   |
| 7.3  |                                                                                                                                                                                  | HDG SEL                                                    | EXT                                                                    |                                                                                                                                                                                                                        |                                                                                                         |
| 7a   | HEADING GAIN (300<br>mV/degree heading<br>source)                                                                                                                                |                                                            |                                                                        |                                                                                                                                                                                                                        |                                                                                                         |
| 7a.1 | Push HDG mode push-<br>button on 913K-1/1A<br>and measure voltage at<br>TP5 (roll command)<br>on 913K-1/1A.                                                                      | HDG SEL<br>(331P section)<br><br>HDG COURSE<br>SIM control | LCL<br><br>Adjust on<br>+(plus) side<br>of center<br>for 3.00<br>V ac. | Refer to SIL.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br><br>Desired result<br>for 913K-1A<br>(-001) is 1/2 of<br>value specified<br>in SIL for<br>913K-1 (-001). | Adjust HDG ANLG con-<br>trol (A2R36) on 913K-1/<br>1A for desired result.                               |
| 7a.2 | Measure voltage at TP5<br>on 913K-1/1A.                                                                                                                                          | HDG COURSE<br>SIM control                                  | Adjust on<br>- (minus)<br>side of<br>center for<br>3.00 V ac.          | Same value as test<br>7a.1 but with<br>opposite polarity.                                                                                                                                                              | Readjust HDG ANLG con-<br>trol and repeat tests<br>7a.1 and 7a.2 until both<br>tests are within limits. |
| 7a.3 |                                                                                                                                                                                  | HDG SEL                                                    | EXT                                                                    |                                                                                                                                                                                                                        |                                                                                                         |
| 8    | PITCH HOLD DRIFT                                                                                                                                                                 |                                                            |                                                                        |                                                                                                                                                                                                                        |                                                                                                         |
| 8.1  | Push HDG mode push-<br>button on 913K-1/1A.<br>Connect jumper wire<br>across PITCH jacks<br>on test set. Momen-<br>tarily set ENG/DIS<br>switch on 913K-1/1A<br>at ENG position. | PITCH<br>SOURCE                                            | OFF                                                                    | ENG annunciator<br>and HDG mode<br>pushbutton on<br>913K-1/1A are lit.                                                                                                                                                 |                                                                                                         |
| 8.2  | Push SYNC pushbutton<br>and then measure the<br>change in voltage over<br>a 60-second period at<br>COMMAND BAR-<br>PITCH jack.                                                   |                                                            |                                                                        | Not more than 20-<br>mV dc change in<br>60 seconds.                                                                                                                                                                    | Adjust PITCH HOLD<br>DRIFT ADJ control<br>(A1R84) on 913K-1/1A<br>for desired result.                   |
| 8.3  | Momentarily set ENG/<br>DIS switch on 913K-1/1A<br>at DIS position and then<br>back to center position.<br>Remove jumper wire<br>from PITCH jacks.                               |                                                            |                                                                        | DIS annunciator on<br>913K-1/1A is lit.                                                                                                                                                                                |                                                                                                         |

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                              | 972S-2 TEST SET                   |                                                                 | DESIRED RESULTS                                                     | ADJUSTMENT INSTRUCTIONS                                                                      |
|------|--------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|      |                                                                                                        | SWITCH                            | POSITION                                                        |                                                                     |                                                                                              |
| 9    | PITCH ANALOG                                                                                           |                                   |                                                                 |                                                                     |                                                                                              |
| 9.1  | Measure voltage at COMMAND BAR-PITCH jack.                                                             | PITCH SOURCE<br><br>PITCH control | LCL<br><br>Adjust ccw from center for 1.00 V ac at PITCH jacks. | Refer to table 4.                                                   | Adjust PITCH ANLG control (A2R20) on 913K-1/1A for desired result.                           |
| 9.2  | Measure voltage at COMMAND BAR-PITCH jack.                                                             | PITCH control                     | Adjust cw from center for 1.00 V ac at PITCH jacks.             | Same value as test 9.1 but with opposite polarity.                  | Readjust PITCH ANLG control and repeat tests 9.1 and 9.2 until both tests are within limits. |
| 9.3  | Push HDG mode push-button on 913K-1/1A.                                                                |                                   |                                                                 | HDG mode push-button is unlit.                                      |                                                                                              |
| 10   | ELEV COMMAND GAIN                                                                                      |                                   |                                                                 |                                                                     |                                                                                              |
| 10.1 | Set PITCH voltage at 0 V ac and then push SYNC pushbutton                                              | PITCH control                     | Adjust for 0 V ac at PITCH jacks.                               |                                                                     |                                                                                              |
| 10.2 | Measure voltage at SERVO INPUT CMD ELEV jack.<br><br>Record value (Y) for test 11.1.                   | PITCH control                     | Adjust cw from center for 1.00 V ac at PITCH jacks.             | Refer to table 4.                                                   | Adjust ELEV CMD GAIN control (A1R38) on 913K-1/1A for desired result.                        |
| 11   | PITCH RATE GAIN                                                                                        |                                   |                                                                 |                                                                     |                                                                                              |
| 11.1 | Connect a jumper wire between TP1 and TP2 on 913K-1/1A. Measure voltage at SERVO INPUT CMD, ELEV jack. | PITCH control                     | Adjust cw from center for 1.00 V ac at PITCH jacks.             | Add value (Y) recorded in test 10.2 to the value listed in table 4. | Adjust PITCH RATE GAIN control (A1R45) on 913K-1/1A for desired result.                      |
| 11.2 | Remove jumper wire from TP1 and TP2 on 913K-1/1A.                                                      |                                   |                                                                 |                                                                     |                                                                                              |
| 12   | GO-AROUND PITCH-UP                                                                                     |                                   |                                                                 |                                                                     |                                                                                              |
| 12.1 | Push APPR mode push-button on 913K-1/1A and then push GA push-button.                                  | PITCH control                     | Adjust for 0 V ac at PITCH jacks.                               | GO-AROUND ANNUN lights.                                             |                                                                                              |

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                       | 972S-2 TEST SET                   |                                                                                 | DESIRED RESULTS                                        | ADJUSTMENT INSTRUCTIONS                                                                       |
|------|-------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|      |                                                 | SWITCH                            | POSITION                                                                        |                                                        |                                                                                               |
| 12.2 | Measure voltage at COMMAND BAR-PITCH jack.      |                                   |                                                                                 | Refer to table 4.                                      | Adjust GO AROUND PITCH UP control (A1R29) on 913K-1/1A for desired result.                    |
| 12.3 | Push APPR mode push-button on 913K-1/1A twice.  | PITCH SOURCE                      | OFF                                                                             | GO-AROUND ANNUN and all mode pushbuttons are unlit.    |                                                                                               |
| 13   | UP ELEVATOR                                     |                                   |                                                                                 |                                                        |                                                                                               |
| 13.1 |                                                 | ROLL-2 SOURCE<br>SYNC             | LCL<br>Push and release                                                         |                                                        |                                                                                               |
| 13.2 | Measure voltage at SERVO INPUT CMD-ELEV jack.   | ROLL-2 control                    | Adjust ccw from center for 5.00 V ac at ROLL-2 jacks (2.5 V ac for status -011) | Refer to table 4.                                      | Adjust UP ELEV control (A1R3) on 913K-1/1A for desired result.                                |
| 13.3 |                                                 | ROLL-2 SOURCE                     | OFF                                                                             |                                                        |                                                                                               |
| 14   | VERTICAL GAIN                                   |                                   |                                                                                 |                                                        |                                                                                               |
| 14.1 | Push HDG and ALT mode pushbuttons on 913K-1/1A. |                                   |                                                                                 | HDG and ALT mode pushbuttons on 913K-1/1A are lit.     |                                                                                               |
| 14.2 | Measure voltage at COMMAND BAR-PITCH jack.      | HOLD OUT<br>ANAV/ALT HOLD control | LCL<br>Adjust for +1.00 V dc at ANAV/ALT HOLD jacks.                            | Refer to table 4.                                      | Adjust VERT GAIN control (A1R83) on 913K-1/1A for desired result.                             |
| 14.3 | Measure voltage at COMMAND BAR-PITCH jack.      | ANAV/ALT HOLD control             | Adjust for -1.00 V dc at ANAV/ALT HOLD jacks.                                   | Same value as in test 14.2 but with opposite polarity. | Readjust VERT GAIN control and repeat tests 14.2 and 14.3 until both tests are within limits. |
| 14.4 |                                                 | HOLD OUT                          | SYS                                                                             |                                                        |                                                                                               |

Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                             | 972S-2 TEST SET                               |                                     | DESIRED RESULTS                           | ADJUSTMENT INSTRUCTIONS                                                 |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------|-------------------------------------------|-------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                       | SWITCH                                        | POSITION                            |                                           |                                                                         |
| 15   | <p>TRIM GAIN AND DUTY CYCLE</p> <div style="border: 1px solid black; padding: 2px; margin: 10px 0;"> <p><b>Note</b></p> </div> <p>If testing a 913K-1/1A -001 unit, do NOT perform this test. Proceed to test 16.</p> |                                               |                                     |                                           |                                                                         |
| 15.1 | <p>On 913K-1/1A, set MAX DUTY CYCLE control A4R111 at max CW position.</p> <p>Momentarily set ENG/DIS switch on 913K-1/1A at ENG (up) position.</p>                                                                   |                                               |                                     |                                           |                                                                         |
| 15.2 | Adjust SERVO FORCE control for -3.00 V dc (-2.5 V dc for status -012 and -3.5 V dc for status -016) at jacks above control. Delay 33 seconds minimum.                                                                 | SERVO FORCE                                   | LCL                                 | TRIM UP annunciator on 913K-1/1A flashes. |                                                                         |
| 15.3 | Measure duty cycle of signal at AP TRIM UP jacks.                                                                                                                                                                     |                                               |                                     | Refer to table 4.                         | Adjust TRIM GAIN control (A4R107) on 913K-1/1A for desired result.      |
| 15.4 | <p>Adjust SERVO FORCE control for -24.0 V dc at jacks above control.</p> <p>Measure duty cycle of signal at AP TRIM UP jacks.</p>                                                                                     |                                               |                                     | Refer to table 4.                         | Adjust MAX DUTY CYCLE control (A4R111) on 913K-1/1A for desired result. |
| 15.5 |                                                                                                                                                                                                                       | <p>SERVO FORCE</p> <p>DSENGA pushbutton</p>   | <p>SVO</p> <p>Push and release.</p> |                                           |                                                                         |
| 16   | POSTADJUSTMENT PROCEDURE                                                                                                                                                                                              |                                               |                                     |                                           |                                                                         |
| 16.1 |                                                                                                                                                                                                                       | <p>913K POWER</p> <p>POWER 115 VAC 28 VDC</p> | <p>OFF</p> <p>OFF</p> <p>OFF</p>    |                                           |                                                                         |



Table 3. 913K-1/1A and 562C-13/13A Gain Adjustment Procedures (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 972S-2 TEST SET |          | DESIRED RESULTS | ADJUSTMENT INSTRUCTIONS |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|-------------------------|
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SWITCH          | POSITION |                 |                         |
| 16.2 | <p>Disconnect the 913K-1/1A from test set and install in the aircraft</p> <div style="border: 1px solid black; padding: 2px; margin: 10px 0;"> <p><b>Warning</b></p> </div> <p>If testing a 913K-1/1A -001 unit, the autopilot trim gain and trim duty cycle must be adjusted in the aircraft with the 972S-1 Autopilot Ramp Test Set before flying the aircraft with the autopilot engaged. Failure to perform this adjustment can cause improper operation of the autopilot trim circuit.</p> |                 |          |                 |                         |





Rockwell  
International

# Collins 161H-1 Gain Programmer

**maintenance**

Collins General Aviation Division

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ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
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## 1. GENERAL

This maintenance section provides a go/no-go test and a gain adjustment procedure for the 161H-1 Gain Programmer. If the 161H-1 fails any portion of the test or cannot be adjusted, remove the unit from service and refer to the 161H-1 Gain Programmer repair section (523-0764838) of volume II.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 autopilot test set is capable of testing the 161H-1 independent of other units in the AP-106/AP-107 Flight Control System. All 161H-1 power requirements for this test are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

#### **Warning**

The gain of the 161H-1 must be adjusted after testing and prior to operation of the flight control system in the aircraft. The

gain adjustment procedure provided either in paragraph 4 in this section or in the AP-106/AP-107 Flight Control System maintenance section (523-0764808) can be used to perform this preflight adjustment. Failure to perform one of these procedures can cause improper operation of the flight control system.

## 4. GAIN ADJUSTMENT PROCEDURE

The gain adjustment procedure provided in table 3 permits setting the gain of the programmable circuits in the 161H-1 for a particular aircraft prior to installation in the aircraft. This procedure can be performed instead of the postinstallation gain adjustment procedure given in the AP-106/AP-107 Flight Control System maintenance section (523-0764808).

The gain of the 161H-1 must be adjusted prior to operating the flight control system in the aircraft to ensure that the gain of the system is set for the flight characteristics of the particular aircraft. Since gain settings are unique for each particular aircraft they are specified, not in this procedure, but in Service Information Letters that are written for each aircraft in which the AP-106/AP-107 Flight Control System has been certified. These Service Information Letters (SIL's) are referred to in the procedure where the gain setting is unique to a particular aircraft. Location of the 161H-1 adjustment controls is shown in figure 1.

Table 1. Test Equipment Required.

| EQUIPMENT                        | MANUFACTURER AND PART NUMBER     | POWER REQUIREMENTS        |
|----------------------------------|----------------------------------|---------------------------|
| 972S-2 Test Set, Autopilot-Bench | Collins part number 622-1668-001 | 115 V ac, 400 Hz; 28 V dc |
| Digital voltmeter                | Fluke model 8000A                | 115 V ac, 60 Hz           |

Table 2. 161H-1 Go/No-Go Test Procedure.

| TEST   | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                | 972S-2 TEST SET                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                       | DESIRED RESULTS |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SWITCH                                                                                                                                                                                                                                                                                                           | POSITION                                                                                                                                                                                              |                 |
| 1.     | PRETEST PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                       |                 |
| 1.1    | Remove dust cover from 161H-1. Verify and record circuit card A4 and A5 strapping. Replace dust cover.                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                       |                 |
| 1.2    | Set test set switches as follows:<br><br>Power section<br><br>590B-3 section<br>590A-6 section<br>590A-6 section<br>Autopilot section<br><br><div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 10px auto;">Note</div><br>The position of the LOC LOGIC switch on the test set is determined by the strapping used on circuit card A4. (The strap position is visible through the ventilation holes in the top of the unit.) | 115 VAC<br>28 VDC<br><br>IAS<br>SYS<br>HOLD OUT<br>161H POWER<br>DME FLAG<br>TRACK<br>ANAV/ALT HOLD<br>LOC LOGIC<br>(A4 A to C)<br>(A4 A to B)<br>RADIO ALT MON<br>ANAV MON<br>SELF TEST<br>HDG MODE<br>NAV MOD<br>APPR MODE<br>BC MODE<br>IAS MODE<br>ALT MODE<br>NAV CAPT<br>NAV FLAG<br>VOR/LOC DEV<br>GS DEV | OFF<br>OFF<br><br>161H<br>913K<br>SYS<br>OFF<br>OFF<br>913K (OFF)<br>ALT HOLD<br><br>- (minus)<br>+ (plus)<br>OFF<br>OFF<br>LCL<br>913K<br>913K<br>913K<br>913K<br>913K<br>LCL<br>OFF<br>913K<br>913K |                 |
| (Cont) |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                       |                 |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                 | 972S-2 TEST SET                                                                                                                                                                 |                                                                                                                        | DESIRED RESULTS                                                                                                                                                                                                                                |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                           | SWITCH                                                                                                                                                                          | POSITION                                                                                                               |                                                                                                                                                                                                                                                |
| 1.2<br>(Cont) | Part of 331P section<br><br>Switches not mentioned are not applicable to the 161H-1.                                                      | ATTD FLAG<br><br>GYRO MON<br><br>SERVO<br>INPUT<br>CMD<br><br>AILERON<br><br>ELEV<br><br>RUDDER<br><br>RADIO<br>ALTITUDE<br><br>DME SIG<br><br>HDG SEL<br><br>Other<br>switches | OFF<br><br>329A<br><br><br><br>913K<br><br>913K<br><br>329T<br><br>OFF<br><br>OFF<br><br>EXT<br><br>Does not<br>matter |                                                                                                                                                                                                                                                |
| 1.3           | Connect 972S-2 cable marked 161H-1 to P1 at rear of unit to be tested.                                                                    |                                                                                                                                                                                 |                                                                                                                        |                                                                                                                                                                                                                                                |
| 1.4           | Apply power.                                                                                                                              | 115 VAC<br><br>28 VDC<br><br>161H<br>POWER                                                                                                                                      | ON<br><br>ON<br><br>ON                                                                                                 |                                                                                                                                                                                                                                                |
| 1.5           | When adjusting a given control knob, connect meter to the test jacks directly above the specified control to achieve the desired voltage. |                                                                                                                                                                                 |                                                                                                                        | <div>Caution</div><br>To prevent damaging the 161H-1 during the following tests, do not insert test probes more than 1/4-inch into TP1 or TP2, and do not allow the test probe to touch the chassis when measuring the voltages at this point. |
| 2.            | ANNUNCIATOR TEST                                                                                                                          |                                                                                                                                                                                 |                                                                                                                        |                                                                                                                                                                                                                                                |
| 2.1           | Observe 161H-1 mode annunciators.                                                                                                         | SELF TEST                                                                                                                                                                       | OFF                                                                                                                    | All 161H-1 annunciators on 972S-2 light: NAV ARM, NAV CAPT, HDG, NAV, APPR, BC, IAS, ALT, DR, (and LIN DEVN, if SB 3 is installed).                                                                                                            |
| 2.2           | Observe 161H-1 mode annunciators.                                                                                                         | SELF TEST                                                                                                                                                                       | LCL                                                                                                                    | All 161H-1 annunciators on 972S-2 go out.                                                                                                                                                                                                      |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST                    | PROCEDURE                                                                                                | 972S-2 TEST SET           |                     | DESIRED RESULTS                     |
|-------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------------|-------------------------------------|
|                         |                                                                                                          | SWITCH                    | POSITION            |                                     |
| 3.                      | MODE TESTS                                                                                               |                           |                     |                                     |
| 3.1                     | Set ANAV/ALT HOLD control fully ccw (maximum negative voltage).<br><br>Observe ALT MODE annun on 972S-2. | HOLD OUT (590A-6 section) | LCL                 |                                     |
|                         |                                                                                                          | ALT MODE                  | LCL                 | ALT MODE annun lights.              |
|                         |                                                                                                          | ALT MODE                  | 913K                | ALT MODE annun goes out.            |
| 3.2                     | Observe IAS MODE annun on 972S-2.                                                                        | IAS MODE                  | LCL                 | IAS MODE annun lights.              |
|                         |                                                                                                          | IAS MODE                  | 913K                | IAS MODE annun goes out.            |
| 3.3                     | Observe BC MODE annun on 972S-2.                                                                         | BC MODE                   | LCL                 | BC MODE and NAV ARM annun light.    |
|                         |                                                                                                          | BC MODE                   | 913K                | BC MODE and NAV ARM annun go out.   |
| 3.4                     | Observe APPR MODE annun on 972S-2.                                                                       | APPR MODE                 | LCL                 | APPR MODE and NAV ARM annun light.  |
|                         |                                                                                                          | APPR MODE                 | 913K                | APPR MODE and NAV ARM annun go out. |
| 3.5                     | Observe NAV MODE annun on 972S-2.                                                                        | NAV MODE                  | LCL                 | NAV MODE and NAV ARM annun light.   |
|                         |                                                                                                          | NAV MODE                  | 913K                | NAV MODE and NAV ARM annun go out.  |
| 3.6                     | Observe HDG MODE annun on 972S-2.                                                                        | HDG MODE                  | LCL                 | HDG MODE annun lights.              |
|                         |                                                                                                          | HDG MODE                  | 913K                | HDG MODE annun goes out.            |
| 3.7<br>(with SB 3 only) | Observe LIN DEVN annun on 972S-2.                                                                        | DME FLAG                  | 28V (with-out SB 1) | LIN DEVN annun lights.              |
|                         |                                                                                                          |                           | 7V (with SB 1)      |                                     |
|                         |                                                                                                          | ANAV MON                  | ON                  | LIN DEVN annun goes out.            |
|                         |                                                                                                          | ANAV MON                  | OFF                 | LIN DEVN annun lights.              |
|                         |                                                                                                          | LOC FREQ                  |                     | LIN DEVN annun goes out.            |
|                         |                                                                                                          | (A4 A to C)               | + (plus)            |                                     |
|                         |                                                                                                          | (A4 A to B)               | - (minus)           |                                     |
|                         |                                                                                                          | LOC FREQ                  |                     | LIN DEVN annun lights.              |
|                         |                                                                                                          | (A4 A to C)               | - (minus)           |                                     |
|                         |                                                                                                          | (A4 A to B)               | + (plus)            |                                     |
|                         |                                                                                                          | DME FLAG                  | OFF                 | LIN DEVN annun goes out.            |



Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                 | 972S-2 TEST SET                                                                                               |                                       | DESIRED RESULTS                                       |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                           | SWITCH                                                                                                        | POSITION                              |                                                       |
| 4.   | GS DEV TESTS                                                                                                                                                                                                                                                                                              |                                                                                                               |                                       |                                                       |
| 4.1  | Set GS DEV control for 0 V dc.<br>Measure voltage at GS DEV-913K jack.                                                                                                                                                                                                                                    | HOLD OUT<br>(590A-6<br>section)<br><br>GS DEV                                                                 | SYS<br><br>161H                       | 0 $\pm$ 5 mV dc at GS DEV-913K(H)/<br>COM 2(C) jacks. |
| 4.2  | Set GS DEV control for +100 mV dc.<br>Measure voltage at GS DEV-913K jack.                                                                                                                                                                                                                                |                                                                                                               |                                       | +90 to +110 mV dc at GS<br>DEV-913K(H)/COM 2(C).      |
| 4.3  | Set RADIO ALTITUDE control for +1.2<br>V dc.<br>Measure voltage at GS DEV-913K jack.                                                                                                                                                                                                                      | RADIO ALT<br>MON<br><br>RADIO<br>ALTITUDE                                                                     | ON<br><br>ON                          | 0 $\pm$ 6 mV dc at GS DEV-913K(H)/<br>COM 2(C).       |
| 4.4  |                                                                                                                                                                                                                                                                                                           | RADIO<br>ALTITUDE<br><br>RADIO ALT<br>MON<br><br>GS DEV                                                       | OFF<br><br>OFF<br><br>913K            |                                                       |
| 5.   | IAS/ALT MODE TESTS                                                                                                                                                                                                                                                                                        |                                                                                                               |                                       |                                                       |
| 5.1  | Rotate IAS gain control on front of<br>161H-1 until screwdriver slot is aligned<br>midway between scale marks 5 and 6.<br><br>Set IAS SIM control for +6.5 V dc and<br>ANAV/ALT HOLD control for +4.0 V dc.<br><br>Delay 5 seconds minimum.<br><br>Measure and record sync voltage at<br>ALT ERROR jacks. | IAS (590B-3<br>section)<br><br>SYS (590A-6<br>section)<br><br>HOLD OUT<br>(590A-6<br>section)<br><br>IAS MODE | LCL<br><br>161H<br><br>LCL<br><br>LCL | 0 $\pm$ 0.4 V dc.                                     |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST                   | PROCEDURE                                                                                                                                                                                                                                                       | 972S-2 TEST SET                                          |                     | DESIRED RESULTS        |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------|------------------------|
|                        |                                                                                                                                                                                                                                                                 | SWITCH                                                   | POSITION            |                        |
| 5.2                    | Reset IAS SIM control for +7.5 V dc.<br>Delay 5 seconds minimum.<br>Measure voltage at ALT ERROR jacks and subtract sync voltage (test 5.1) to obtain desired results.                                                                                          |                                                          |                     | +2.48 to +3.68 V dc.   |
| 5.3<br>(with-out SB 4) | Set ANAV/ALT HOLD control for +2.0 V dc and measure voltage of ALT ERROR jacks.                                                                                                                                                                                 | IAS MODE                                                 | 913K                | -1.85 to -2.15 V dc.   |
| 5.3<br>(with SB 4)     | Set ANAV/ALT HOLD control for +2.5 V dc and measure voltage at ALT ERROR jacks.                                                                                                                                                                                 | IAS MODE                                                 | 913K                | -0.42 to -0.60 V dc.   |
| 5.4                    |                                                                                                                                                                                                                                                                 | IAS (590B-3 section)<br>SYS (590A-6 section)<br>HOLD OUT | 161H<br>913K<br>SYS |                        |
| 6.                     | SERVO GAIN PROGRAMMING TESTS                                                                                                                                                                                                                                    |                                                          |                     |                        |
| 6.1                    | Set the RUD, AIL, and ELE controls on the front of the 161H-1 at midrange (screwdriver slot vertical).<br><br>Set RUDDER SERVO INPUT CMD control for 0.00 V dc.<br><br>Set IAS SIM control for +13.0 V dc and measure the voltage at 161H CMD OUTPUTS-RUD jack. | IAS (590B-3 section)<br>RUDDER SERVO INPUT CMD           | LCL<br>LCL          | 0 $\pm$ 25 mV dc.      |
| 6.2                    | Set AIL SERVO INPUT CMD control for 0.00 V dc and measure the voltage of 161H CMD OUTPUTS AIL jack.                                                                                                                                                             |                                                          |                     | 0 $\pm$ 25 mV dc.      |
| 6.3                    | Set ELEV SERVO INPUT CMD control for 0.00 V dc and measure the voltage at 161H CMD OUTPUTS - ELEV jack.                                                                                                                                                         |                                                          |                     | 0 $\pm$ 25 mV dc.      |
| 6.4                    | Set RUDDER SERVO INPUT CMD control for +2.0 V dc and measure voltage at 161H CMD OUTPUTS - RUD jack.                                                                                                                                                            |                                                          |                     | +0.954 to +1.434 V dc. |
| 6.5<br><br>(Cont)      |                                                                                                                                                                                                                                                                 | RUDDER SERVO INPUT CMD<br><br>AILERON SERVO INPUT CMD    | 329T<br><br>LCL     |                        |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST                           | PROCEDURE                                                                                                                                                    | 972S-2 TEST SET                                                                             |                                                                        | DESIRED RESULTS                                                                                                                                                                             |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                |                                                                                                                                                              | SWITCH                                                                                      | POSITION                                                               |                                                                                                                                                                                             |
| 6.5<br>(Cont)                  | Set AILERON SERVO INPUT CMD control for +2.0 V dc and measure voltage at 161H CMD OUTPUTS AIL jack.                                                          |                                                                                             |                                                                        | +0.954 to +1.434 V dc.                                                                                                                                                                      |
| 6.6                            | Set ELEV SERVO INPUT CMD control for +2.0 V dc and measure voltage at 161H CMD OUTPUTS - ELEV jack.                                                          | AILERON<br>SERVO<br>INPUT CMD<br><br>ELEV<br>SERVO<br>INPUT CMD                             | 913K<br><br>LCL                                                        | +0.954 to +1.434 V dc.                                                                                                                                                                      |
| 6.7                            |                                                                                                                                                              | ELEV<br>SERVO<br>INPUT CMD<br><br>IAS (590B-3<br>section)                                   | 913K<br><br>161H                                                       |                                                                                                                                                                                             |
| 7.                             | V/L DEVIATION TESTS                                                                                                                                          |                                                                                             |                                                                        |                                                                                                                                                                                             |
| 7.1<br>(with-<br>out<br>SB 10) | Set VOR/LOC DEV control for 0 V dc.<br><br>Set DME SIG control for +2.5 V dc.<br><br>Delay 15 seconds minimum and then measure voltage at 913K V/L DEV jack. | DME FLAG<br><br>VOR/LOC<br>DEV<br><br>DME SIG                                               | 7V (with<br>SB 1)<br><br>28V (with-<br>out SB 1)<br><br>161H<br><br>ON | 0 $\pm$ 5 mV dc. (If out of tolerance, adjust V/L DEV CENTERING control (A4R25) on top of 161H-1).                                                                                          |
| 7.1<br>(with<br>SB 10)         | Set VOR/LOC DEV control for 0.0 V dc.<br><br>Measure the voltage at V/L DEV 913K/COM 2 jacks.                                                                | APPR MODE<br><br>TRACK<br><br>VOR/LOC<br>DEV<br><br>LOC LOGIC<br>(A4 A to C)<br>(A4 A to B) | LCL<br><br>LCL (ON)<br><br>161H<br><br>+ (plus)<br>- (minus)           | 0 $\pm$ 1.5 mV dc at UUT TP2/COM 2 jacks. (If out of tolerance, adjust V/L DEV CENTERING control (A4R25) on top of 161H-1).<br><br>0 $\pm$ 1.5 mV dc. (If out of tolerance, adjust A4R137). |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

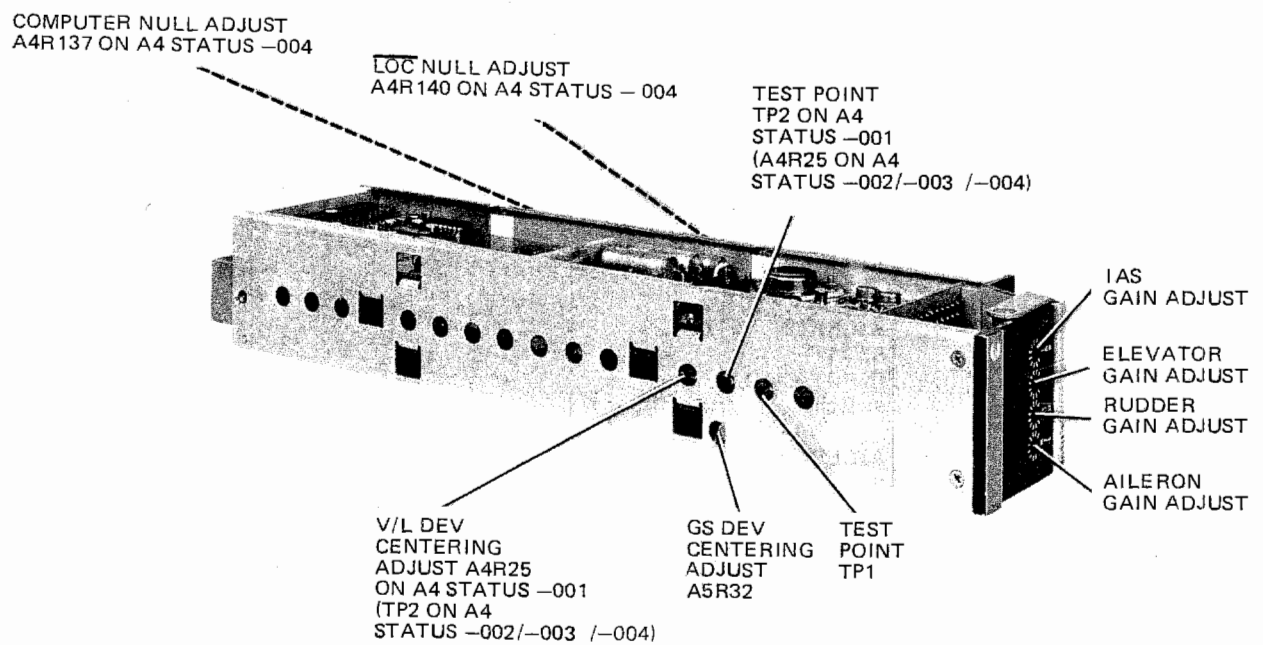
| TEST              | PROCEDURE                                                                                                                                                             | 972S-2 TEST SET                                                                                          |                                                                                                                    | DESIRED RESULTS                                                      |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
|                   |                                                                                                                                                                       | SWITCH                                                                                                   | POSITION                                                                                                           |                                                                      |
| 7.1<br>(Cont)     | Delay 10 seconds minimum and measure the voltage at UUT TP2/COM 2 jacks.                                                                                              | APPR MODE<br><br>LOC LOGIC<br>(A4 A to C)<br>(A4 A to B)<br><br>TRACK<br><br>DME FLAG<br><br><br>DME SIG | 913K<br><br>- (minus)<br>+ (plus)<br><br>913K (OFF)<br><br>7V (with SB 1)<br><br>28V (with-<br>out SB 1)<br><br>ON | 0 $\pm$ 1.5 mV dc. (If out of tolerance, adjust A4R140 very slowly). |
| 7.2               | Set DME SIG control for +6.0 V dc.<br><br>Set VOR/LOC DEV control for +60 mV dc.<br><br>Delay 15 seconds minimum and then measure voltage at V/L DEV - TO INST jacks. |                                                                                                          |                                                                                                                    | +116 to +136 mV dc.                                                  |
| 7.3               | Set VOR/LOC DEV control for +100 mV dc.<br><br>Delay 2 seconds minimum and then measure voltage at V/L DEV jack.                                                      | LOC LOGIC<br>(A4 A to C)<br>(A4 A to B)<br><br>APPR MODE                                                 | + (plus)<br>- (minus)<br><br>LCL                                                                                   | +93 to +107 mV dc.                                                   |
| 7.4<br><br>(Cont) | Set DME SIG control for +0.6 V dc and VOR/LOC DEV control for +60 mV dc (+120 mV dc if SB 7 is installed).<br><br>Delay 15 seconds minimum.                           | LOC LOGIC<br>(A4 A to C)<br>(A4 A to B)<br><br>VOR/LOC DEV                                               | - (minus)<br>+ (plus)<br><br>913K                                                                                  |                                                                      |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                                                                           | 972S-2 TEST SET                                                                               |                                          | DESIRED RESULTS                                                  |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------|
|               |                                                                                                                                                                                     | SWITCH                                                                                        | POSITION                                 |                                                                  |
| 7.4<br>(Cont) | Measure voltage at 161H-1 TP2 exactly 10 seconds after TRACK switch and VOR/LOC DEV switch are set at LCL and 161H simultaneously.                                                  | TRACK<br>VOR/LOC DEV                                                                          | LCL (ON)<br>161H                         | -1.50 to -1.84 V dc.<br>(-2.00 to -2.40 V dc at 30 seconds.)     |
| 7.5           |                                                                                                                                                                                     | TRACK<br>APPR MODE<br>VOR/LOC DEV<br>DME SIG<br>DME FLAG                                      | 913K (OFF)<br>913K<br>913K<br>OFF<br>OFF |                                                                  |
| 8.            | OVERSTATION SENSOR TEST                                                                                                                                                             |                                                                                               |                                          |                                                                  |
| 8.1           | Set VOR/LOC DEV control for -110 mV dc.<br><br>Measure time required for DR annun to light and then go out after VOR/LOC DEV switch is set at 161H.                                 | TRACK<br>VOR/LOC DEV                                                                          | LCL (ON)<br>161H                         | DR annun lights within 3 seconds and goes out within 45 seconds. |
| 8.2           |                                                                                                                                                                                     | TRACK<br>VOR/LOC DEV                                                                          | 913K (OFF)<br>913K                       |                                                                  |
| 9.            | NAV ARM/NAV CAPT TEST                                                                                                                                                               |                                                                                               |                                          |                                                                  |
| 9.1           | Set VOR/LOC DEV control for +30 mV dc.<br><br>Set IAS SIM control for 0 V dc (ccw).<br><br>Set HDG COURSE SIM control for 0 $\pm$ 50 mV ac.<br><br>Set FLAG control for +350 mV dc. | VOR/LOC DEV<br><br>IAS (590B-3 section)<br>HDG SEL (331P section)<br>NAV FLAG<br><br>NAV MODE | 161H<br><br>LCL<br>LCL<br>VAR<br><br>LCL | NAV MODE and NAV ARM annunciators light.                         |

Table 2. 161H-1 Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                         | 972S-2 TEST SET                                                                       |                                    | DESIRED RESULTS                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------|
|      |                                                                                                                                                   | SWITCH                                                                                | POSITION                           |                                            |
| 9.2  | Delay 10 seconds minimum.<br><br>Increase HDG COURSE SIM control slowly cw until NAV CAP annunciator on test set lights and then measure voltage. |                                                                                       |                                    | 5.65 to 7.65 V ac at HDG COURSE SIM jacks. |
| 9.3  | Set HDG COURSE SIM control for 0 V ac.                                                                                                            |                                                                                       |                                    | NAV CAPT annun remains lit.                |
| 9.4  |                                                                                                                                                   | NAV MODE<br>NAV FLAG<br>VOR/LOC DEV<br>IAS (590B-3 section)<br>HDG SEL (331P section) | 913K<br>OFF<br>913K<br>161H<br>EXT |                                            |
| 10.  | ATTITUDE FLAG TEST                                                                                                                                |                                                                                       |                                    |                                            |
| 10.1 | Measure voltage at ATTD FLAG test jack.                                                                                                           | ATTD FLAG<br>GYRO MON                                                                 | 161H<br>LCL                        | +23 to +31 V dc.                           |
| 10.2 | Measure voltage at ATTD FLAG test jack.                                                                                                           | GYRO MON                                                                              | 329A                               | Not more than +3.5 V dc.                   |
| 10.3 |                                                                                                                                                   | ATTD FLAG                                                                             | OFF                                |                                            |
| 11.  | POSTTEST PROCEDURE                                                                                                                                |                                                                                       |                                    |                                            |
| 11.1 |                                                                                                                                                   | 161H POWER<br>POWER<br>115 VAC<br>28 VDC                                              | OFF<br><br>OFF<br>OFF              |                                            |
| 11.2 | Disconnect the 161H-1 from the test set cable.                                                                                                    |                                                                                       |                                    |                                            |



TP3-7803-017

161H-1 Gain Programmer, Location of Adjustment Controls  
Figure 1

Table 3. 161H-1 Adjustment Procedure.

| TEST | PROCEDURE                                                 | 972S-2 TEST SET                                                                                                                           |                                                                        | DESIRED RESULTS                                                                                                               | ADJUSTMENT INSTRUCTIONS                                    |
|------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|      |                                                           | SWITCH                                                                                                                                    | POSITION                                                               |                                                                                                                               |                                                            |
| 1.   | PRETEST PROCEDURE                                         |                                                                                                                                           |                                                                        |                                                                                                                               |                                                            |
| 1.1  | Perform the pretest procedure given in test 1 of table 2. | POWER<br><br>115 VAC<br><br>28 VDC<br><br>161H POWER                                                                                      | ON<br><br>ON<br><br>ON                                                 | <div>Note</div><br>Unless otherwise specified, all voltages are measured with respect to the COM-2 test jack on the test set. |                                                            |
| 2.   | AILERON PROGRAM-MER GAIN                                  |                                                                                                                                           |                                                                        |                                                                                                                               |                                                            |
| 2.1  | Measure voltage at 161H CMD OUTPUTS - AIL jack.           | IAS (590B-3 section)<br><br>IAS SIM control (590B-3 section)<br><br>AILERON SERVO INPUT CMD switch<br><br>AILERON SERVO INPUT CMD control | LCL<br><br>Adjust for +6.5 V dc<br><br>LCL<br><br>Adjust for +6.5 V dc | Refer to particular aircraft service information letter for desired results.                                                  | Adjust AIL control on front of 161H-1 for desired results. |
| 2.2  |                                                           | AILERON SERVO INPUT CMD                                                                                                                   | 913K                                                                   |                                                                                                                               |                                                            |
| 3.   | ELEVATOR PROGRAM-MER GAIN                                 |                                                                                                                                           |                                                                        |                                                                                                                               |                                                            |
| 3.1  | Measure voltage at 161H CMD OUTPUTS - ELEV jack           | ELEV SERVO INPUT CMD switch<br><br>ELEV SERVO INPUT CMD control                                                                           | LCL<br><br>Adjust for +6.5 V dc                                        | Refer to particular aircraft service information letter for desired results.                                                  | Adjust ELE control on front of 161H-1 for desired results. |



Table 3. 161H-1 Adjustment Procedure (Cont).

| TEST | PROCEDURE                                             | 972S-2 TEST SET                           |                          | DESIRED RESULTS                                                                      | ADJUSTMENT INSTRUCTIONS                                          |
|------|-------------------------------------------------------|-------------------------------------------|--------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------|
|      |                                                       | SWITCH                                    | POSITION                 |                                                                                      |                                                                  |
| 3.2  |                                                       | ELEV<br>SERVO<br>INPUT CMD<br>switch      | 913K                     |                                                                                      |                                                                  |
| 4.   | RUDDER PROGRAM-<br>MER GAIN                           |                                           |                          |                                                                                      |                                                                  |
| 4.1  | Measure voltage at 161H<br>CMD OUTPUTS - RUD<br>jack. | RUDDER<br>SERVO<br>INPUT CMD<br>switch    | LCL                      | Refer to particular air-<br>craft service information<br>letter for desired results. | Adjust RUD control on<br>front of 161H-1 for<br>desired results. |
|      |                                                       | RUDDER<br>SERVO<br>INPUT CMD<br>control   | Adjust for<br>+6.5 V dc  |                                                                                      |                                                                  |
| 4.2  |                                                       | RUDDER<br>SERVO<br>INPUT CMD<br>switch    | 329T                     |                                                                                      |                                                                  |
| 5.   | INDICATED AIRSPEED<br>GAIN                            |                                           |                          |                                                                                      |                                                                  |
| 5.1  | Measure voltage at ALT<br>ERROR jacks.                | SYS (590A-6<br>section)                   | 161H                     | Refer to particular air-<br>craft service information<br>letter for desired results. | Adjust IAS control on<br>front of 161H-1 for<br>desired results. |
|      |                                                       | IAS (590B-3<br>section)                   | LCL                      |                                                                                      |                                                                  |
|      |                                                       | IAS SIM<br>control<br>(590B-3<br>section) | Adjust for<br>+4.00 V dc |                                                                                      |                                                                  |
|      |                                                       | IAS MODE                                  | LCL                      |                                                                                      |                                                                  |
|      |                                                       | IAS SIM<br>control                        | Adjust for<br>+4.65 V dc |                                                                                      |                                                                  |
| 5.2  |                                                       | SYS (590A-6<br>section)                   | 913K                     |                                                                                      |                                                                  |
|      |                                                       | IAS (590B-3<br>section)                   | 161H                     |                                                                                      |                                                                  |
|      |                                                       | IAS MODE                                  | 913K                     |                                                                                      |                                                                  |

Table 3. 161H-1 Adjustment Procedure (Cont).

| TEST                                                                | PROCEDURE                                                                                                                                                             | 972S-2 TEST SET                                                                                   |                                                                      | DESIRED RESULTS | ADJUSTMENT INSTRUCTIONS                                                           |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------|
|                                                                     |                                                                                                                                                                       | SWITCH                                                                                            | POSITION                                                             |                 |                                                                                   |
| 6.<br>(with-<br>out<br>SB 10)                                       | VOR/LOC DEVIATION<br>CENTERING                                                                                                                                        |                                                                                                   |                                                                      |                 |                                                                                   |
| <div>Note</div> <p>Test 6 does not apply if SB 10 is installed.</p> |                                                                                                                                                                       |                                                                                                   |                                                                      |                 |                                                                                   |
| 6.1                                                                 | <p>Set VOR/LOC DEV control for 0.00 V dc.</p> <p>Set DME SIG control for +2.5 V dc.</p> <p>Delay 15 seconds minimum.</p> <p>Measure voltage at 913K V/L DEV jack.</p> | <p>DME FLAG</p> <p>VOR/LOC DEV</p> <p>DME SIG</p>                                                 | <p>28 V</p> <p>161H</p> <p>ON</p>                                    | 0 ±5 mV dc.     | Adjust V/L DEV CENTERING control (A4R25) on the top of 161H-1 for desired result. |
| 6.2                                                                 |                                                                                                                                                                       | <p>DME FLAG</p> <p>DME SIG</p> <p>VOR/LOC DEV</p>                                                 | <p>OFF</p> <p>OFF</p> <p>913K</p>                                    |                 |                                                                                   |
| 6a.<br>(with<br>SB 10<br>only)                                      | LOC NULL, COMPUT-<br>ER NULL, and<br>LOC NULL                                                                                                                         |                                                                                                   |                                                                      |                 |                                                                                   |
| 6a.1                                                                | <p>Set VOR/LOC DEV control for 0 V dc.</p>                                                                                                                            | <p>APPR MODE</p> <p>TRACK</p> <p>VOR/LOC DEV</p> <p>LOC LOGIC<br/>(A4 A to C)<br/>(A4 A to B)</p> | <p>LCL</p> <p>LCL (ON)</p> <p>161H</p> <p>+ (plus)<br/>- (minus)</p> |                 |                                                                                   |
| (Cont)                                                              |                                                                                                                                                                       |                                                                                                   |                                                                      |                 |                                                                                   |

Table 3. 161H-1 Adjustment Procedure (Cont).

| TEST           | PROCEDURE                                                                              | 972S-2 TEST SET                                                                                |                                              | DESIRED RESULTS    | ADJUSTMENT INSTRUCTIONS                                                           |
|----------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------|-----------------------------------------------------------------------------------|
|                |                                                                                        | SWITCH                                                                                         | POSITION                                     |                    |                                                                                   |
| 6a.1<br>(Cont) | Measure voltage at UUT TP2/COM 2 jacks.                                                |                                                                                                |                                              | 0 $\pm$ 1.5 mV dc. | Adjust LOC NULL control (A4R25) on the top of 161H-1 for desired result.          |
| 6a.2           | Measure the voltage at V/L DEV 913K/COM 2 jacks.                                       |                                                                                                |                                              | 0 $\pm$ 1.5 mV dc. | Adjust COMPUTER NULL control (A4R137) on the bottom of 161H-1 for desired result. |
| 6a.3           | <p>Delay 10 seconds minimum.</p> <p>Measure the voltage at UUT TP2/COM 2 jacks.</p>    | <p>APPR<br/>MODE</p> <p>LOC LOGIC</p> <p>(A4 A to C) - (minus)</p> <p>(A4 A to B) + (plus)</p> | <p>913K</p> <p>- (minus)</p> <p>+ (plus)</p> | 0 $\pm$ 1.5 mV dc. | Adjust LOC NULL control (A4R140) on the bottom of 161H-1 for desired result.      |
| 6a.4           |                                                                                        | <p>TRACK</p> <p>VOR/LOC<br/>DEV</p>                                                            | <p>913K<br/>(OFF)</p> <p>913K</p>            |                    |                                                                                   |
| 7.             | GLIDESLOPE DEVIATION CENTERING                                                         |                                                                                                |                                              |                    |                                                                                   |
| 7.1            | <p>Set GS DEV control for 0.00 V dc.</p> <p>Measure voltage at GS DEV - 913K jack.</p> | GS DEV                                                                                         | 161H                                         | 0 $\pm$ 5 mV dc.   | Adjust GS DEV CENTERING control (A5R32) on the top of 161H-1 for desired result.  |
| 7.2            |                                                                                        | GS DEV                                                                                         | 913K                                         |                    |                                                                                   |

Table 3. 161H-1 Adjustment Procedure (Cont).

| TEST | PROCEDURE                                      | 972S-2 TEST SET                                         |                               | DESIRED RESULTS | ADJUSTMENT INSTRUCTIONS |
|------|------------------------------------------------|---------------------------------------------------------|-------------------------------|-----------------|-------------------------|
|      |                                                | SWITCH                                                  | POSITION                      |                 |                         |
| 8.   | POSTTEST PROCEDURE                             |                                                         |                               |                 |                         |
| 8.1  |                                                | 161H<br>POWER<br><br>POWER<br><br>115 VAC<br><br>28 VDC | OFF<br><br><br>OFF<br><br>OFF |                 |                         |
| 8.2  | Disconnect the 161H-1 from the test set cable. |                                                         |                               |                 |                         |

# Collins 614E-41/41A

## Pitch/Turn Control



**Rockwell  
International**

**maintenance**

Collins General Aviation Division

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# maintenance

## 1. GENERAL

This maintenance section provides a functional go/no-go test for the 614E-41/41A Pitch/Turn Control. If the 614E-41/41A fails any portion of the test, refer to the 614E-41/41A Pitch/Turn Control repair section, Collins part number 523-0764842.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 Autopilot Test Set is capable of testing the 614E-41/41A Pitch/Turn Control independent of other units in the AP-106/AP-107 Flight Control System. All pitch/turn control power requirements for this test are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                            | MANUFACTURER AND PART NUMBER | POWER REQUIREMENTS      |
|--------------------------------------|------------------------------|-------------------------|
| 972S-2 Test Set<br>Autopilot - Bench | Collins 622-1668-001         | 115 Vac, 400 Hz; 28 Vdc |
| Digital Voltmeter                    | Fluke 8000A or equivalent    | 115 Vac, 60 Hz          |

Table 2. Go/No-Go Test Procedure.

| TEST                      | PROCEDURE                                                            | 972S-2 TEST SET   |            | DESIRED RESULTS                                                                                                      |
|---------------------------|----------------------------------------------------------------------|-------------------|------------|----------------------------------------------------------------------------------------------------------------------|
|                           |                                                                      | SWITCH            | POSITION   |                                                                                                                      |
| 1. Mechanical positioning | Rotate pitch and turn controls to each limit and release.            |                   |            | Each control rotates approximately 30° each side of center, returning to the center (detent) position when released. |
| 2. Setup                  |                                                                      |                   |            |                                                                                                                      |
| 2.1                       | Set 614E-41/41A test switches.                                       | IN/OUT<br>P/R SEL | LCL<br>OFF |                                                                                                                      |
| 2.2                       | Connect pitch/turn control to test set 614E-41/41A connecting cable. |                   |            |                                                                                                                      |
| 2.3                       | Apply power.                                                         | 115 VAC<br>28 VDC | ON<br>ON   |                                                                                                                      |

Table 2. Go/No-Go Test Procedure (Cont).

| TEST                   | PROCEDURE                                                                                                             | 972S-2 TEST SET   |            | DESIRED RESULTS                                                                                                                                                  |
|------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |                                                                                                                       | SWITCH            | POSITION   |                                                                                                                                                                  |
| 3. Pitch control test  |                                                                                                                       |                   |            |                                                                                                                                                                  |
| 3.1                    | Insert red (high) voltmeter lead in P (red) test point. Insert black (low) voltmeter lead in COM (black) test point.  |                   |            |                                                                                                                                                                  |
| 3.2                    | Rotate pitch control slowly toward the maximum UP position. At maximum UP, hold control and record voltmeter reading. |                   |            | a. Observe green UP/DN light comes on as control leaves detent position. Voltage increases smoothly and linearly with control movement.<br>b. -4.0 to -7.0 V dc. |
| 3.3                    | Release control.                                                                                                      |                   |            | Control returns to detent position. UP/DN light goes out.                                                                                                        |
| 3.4                    | Rotate pitch control slowly toward the maximum DN position. At maximum DN, hold control and record voltmeter reading. |                   |            | a. See 3.2.a.<br>b. +4.0 to +7.0 V dc.                                                                                                                           |
| 3.5                    | Repeat 3.3.                                                                                                           |                   |            |                                                                                                                                                                  |
| 4. Roll control test   |                                                                                                                       |                   |            |                                                                                                                                                                  |
| 4.1                    | Remove red (high) voltmeter lead from P test point and insert in R (red) test point.                                  |                   |            |                                                                                                                                                                  |
| 4.2                    | Rotate turn control slowly toward the maximum L position. At maximum L, hold control and record voltmeter reading.    |                   |            | a. Observe green LT/RT light comes on as control leaves detent position. Voltage increases smoothly and linearly with control movement.<br>b. +4.0 to +7.0 V dc. |
| 4.3                    | Release control.                                                                                                      |                   |            | Control returns to detent position. LT/RT light goes out.                                                                                                        |
| 4.4                    | Rotate turn control slowly toward the maximum R position. At maximum R, hold control and record voltmeter reading.    |                   |            | a. See 4.2.a.<br>b. -4.0 to -7.0 V dc.                                                                                                                           |
| 4.5                    | Repeat 4.3.                                                                                                           |                   |            |                                                                                                                                                                  |
| 5. Post test procedure | Disconnect the 614E-41/41A from the test set.                                                                         | 115 VAC<br>28 VDC | OFF<br>OFF |                                                                                                                                                                  |





**Rockwell  
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# **Collins 334C-9/9A/11 Primary Servo**

Collins General Aviation Division

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# maintenance

## 1. GENERAL

This maintenance section provides a go/no-go test for the 334C-9/9A/11 Primary Servo. If the 334C-9/9A/11 fails any portion of the test, remove the unit from service and refer to the 334C-9/9A/11 Primary Servo repair section (523-0764846) of the 334C-9/9A/11 Primary Servo/334D-6( ) Trim Servo Instruction Book (523-0767823).

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-3 test set is capable of testing the 334C-9/9A/11 independent of other units in the AP-106/AP-107 Flight Control System. All 334C-9/9A/11 power requirements are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT               | MANUFACTURER AND PART NUMBER                                                                                                                    | POWER REQUIREMENTS        |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 972S-3 Test Set, Servo  | Collins part number 622-2562-001                                                                                                                | 115 V ac, 400 Hz; 28 V dc |
| Digital voltmeter       | Fluke model 8000A or equivalent                                                                                                                 | 115 V ac, 60 Hz           |
| Capstan angle indicator | No specific angle indicator suggested. Minimum specifications are 1° resolution, 1° accuracy.                                                   |                           |
| Stopwatch               | No specific stopwatch suggested. Minimum specifications are 0- to 120-s range, 0.5-s resolution.                                                |                           |
| Torque tester           | 960M-2, Collins part number 622-2094-001 (use with 334C-9/9A)<br><br>or<br><br>960M-3, Collins part number 622-2741-001 (use with 334C-9/9A/11) |                           |

Table 2. 334C-9/9A/11 Go/No-Go Test Procedure.

| TEST     | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                            | 972S-3 TEST SET                                                                                                                                                                                                                                                                |                                                                                                                                                                                      | DESIRED RESULTS                                                           |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|          |                                                                                                                                                                                                                                                                                                                                                                                      | SWITCH                                                                                                                                                                                                                                                                         | POSITION                                                                                                                                                                             |                                                                           |
| 1. Setup |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      |                                                                           |
| 1.1      | <p>Position test set switches.</p> <p>Connect 28-V dc power to 28 VDC pin M (+) (334C-9/9A) or N (+) (C-11), pin L (-). Connect 26-V ac, 400-Hz power to front panel, or connect J4 to 115-V ac, 400-Hz power.</p> <p><b>Note</b></p> <p>The +28-V dc supply must be <math>\pm 1\%</math>, and the 26-V ac supply must be <math>\pm 1\%</math> with 400 Hz <math>\pm 5\%</math>.</p> | <p>POWER DC</p> <p>POWER AC</p> <p>15 VDC LOAD</p> <p>TORQUE PROGRAMMING</p> <p>CH 1</p> <p>CH 2</p> <p>POSITION</p> <p>WASHOUT DISABLE</p> <p>TORQUE MEASURE</p> <p>ENGAGE</p> <p>COMMAND</p> <p>EXT/LCL</p> <p>REV/NORM</p> <p>FXD/VAR</p> <p>Potentiometer</p> <p>FORCE</p> | <p>OFF</p> <p>OFF</p> <p>LCL</p> <p></p> <p>LO</p> <p>LO</p> <p>OPEN</p> <p>OPEN</p> <p>RELEASE</p> <p>OFF</p> <p></p> <p>LCL</p> <p>NORM</p> <p>OFF</p> <p>Midrange</p> <p>NORM</p> |                                                                           |
| 1.2      | Manually turn the 334C-9/9A/11 servo capstan clockwise and then counter-clockwise.                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      | Capstan rotates in both directions smoothly, easily, and with no binding. |
| 1.3      | Connect 334C-9/9A/11 Primary Servo to the 972S-3 Test Set.                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      |                                                                           |

Table 2. 334C-9/9A/11 Go/No-Go Test Procedure (Cont).

| TEST             | PROCEDURE                                                                                                                          | 972S-3 TEST SET              |                                                      | DESIRED RESULTS                                                                                                                                                                                      |
|------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                                                                                                                                    | SWITCH                       | POSITION                                             |                                                                                                                                                                                                      |
| 1.4              | Apply test set power.                                                                                                              | POWER DC                     | ON                                                   | 334C-9A/11 only: motor must not run with ac power off.                                                                                                                                               |
|                  |                                                                                                                                    | POWER AC                     | 115 or 26, depending on ac power applied to test set |                                                                                                                                                                                                      |
| 1.5              | When adjusting the COMMAND potentiometer, connect meter to the OUT jacks, pin C (+) and pin D (-), to achieve the desired voltage. | ENGAGE<br>TORQUE<br>MEASURE  | NORM<br><br>TORQUE                                   |                                                                                                                                                                                                      |
| 2. Feedback gain |                                                                                                                                    |                              |                                                      |                                                                                                                                                                                                      |
| 2.1              | Adjust COMMAND potentiometer to 0 V dc.                                                                                            | COMMAND                      | VAR                                                  |                                                                                                                                                                                                      |
| 2.2              | Mount capstan angle indicator. Position capstan to 0.                                                                              | WASHOUT<br>DISABLE<br>ENGAGE | GND<br><br>OFF                                       |                                                                                                                                                                                                      |
| 2.3              | Adjust COMMAND potentiometer to +10 V dc.                                                                                          | ENGAGE                       | NORM                                                 | -001, -003, -005, -007, -009 unit:<br>capstan rotates 94° to 128° cw<br><br>-002, -004, -006, -008, -010 unit:<br>capstan rotates 35° to 48° ccw                                                     |
| 2.4              | Adjust COMMAND potentiometer to 0 V dc.                                                                                            |                              |                                                      | -001, -003, -005, -007, -009 unit:<br>capstan rotates to 0 ±10° (rotating ccw)<br>-002, -004, -006, -008, -010 unit:<br>capstan rotates to 0 ±5° (rotating cw)                                       |
| 2.5              | Adjust COMMAND potentiometer to -10 V dc                                                                                           |                              |                                                      | -001, -003, -005, -007, -009 unit:<br>capstan rotates 94° to 128° ccw<br>-002, -004, -006, -008, -010 unit:<br>capstan rotates 35° to 48° cw                                                         |
| 3. Washout       |                                                                                                                                    |                              |                                                      |                                                                                                                                                                                                      |
| 3.1              | Adjust COMMAND potentiometer to +5 V dc.<br><br>Measure time for capstan to complete two revolutions.                              | WASHOUT<br>DISABLE           | OPEN                                                 | -001, -003, -005, -007, -009 unit:<br>33 to 45 s (rotating cw)<br>-002, -004, -006, -008, -010 unit:<br>88 to 119 s (rotating cw)<br><br>Observe that capstan follows input smoothly without jitter. |

Table 2. 334C-9/9A/11 Go/No-Go Test Procedure (Cont).

| TEST                         | PROCEDURE                                                                                                                                                                                                                                            | 972S-3 TEST SET      |                                                                 | DESIRED RESULTS                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------|----------|-------------------------------------------|----------------------------------------|---------------------------------------|
|                              |                                                                                                                                                                                                                                                      | SWITCH               | POSITION                                                        |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| 3.2                          | Adjust COMMAND potentiometer to -5 V dc. Measure time for capstan to complete two revolutions.                                                                                                                                                       |                      |                                                                 | -001, -003, -005, -007, -009 unit:<br>33 to 45 s (rotating ccw)<br><br>-002, -004, -006, -008, -010 unit:<br>88 to 119 s (rotating cw)<br><br>Observe that capstan follows input smoothly without jitter. |         |                              |          |                                           |                                        |                                       |
| 3.3                          | Remove capstan angle indicator.                                                                                                                                                                                                                      | ENGAGE               | OFF                                                             |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| 4. Torque                    |                                                                                                                                                                                                                                                      |                      |                                                                 |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| 4.1                          | Remove power from the test set.                                                                                                                                                                                                                      | POWER DC<br>POWER AC | OFF<br>OFF                                                      |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| 4.2                          | Remove capstan from servo-drive unit, and mount the servo-drive unit to the 960M-2/3 Torque Tester.<br><div>Note</div> <p>The 960M-2 can be used with the 334C-9/9A but not the 334C-11. The 960M-3 can be used with the 334C-9/9A/11.</p>           |                      |                                                                 |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| 4.3                          | Apply power to the test set.                                                                                                                                                                                                                         | POWER DC<br>POWER AC | ON<br><br>115 or 26, depending on ac power applied to test set. |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| 4.4                          | Install weights on the torque bar according to the table below.<br><table><tr><th>UNIT</th><th>TORQUE</th></tr><tr><td>-001, -003, -005, -007, -009</td><td>4 lb·in</td></tr><tr><td>-002, -004, -006, -008, -010</td><td>12 lb·in</td></tr></table> | UNIT                 | TORQUE                                                          | -001, -003, -005, -007, -009                                                                                                                                                                              | 4 lb·in | -002, -004, -006, -008, -010 | 12 lb·in | FORCE<br><br><br><br>ENGAGE<br><br>ENGAGE | WASHOUT<br><br><br><br>NORM<br><br>OFF | Verify that the clutch does not slip. |
| UNIT                         | TORQUE                                                                                                                                                                                                                                               |                      |                                                                 |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| -001, -003, -005, -007, -009 | 4 lb·in                                                                                                                                                                                                                                              |                      |                                                                 |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |
| -002, -004, -006, -008, -010 | 12 lb·in                                                                                                                                                                                                                                             |                      |                                                                 |                                                                                                                                                                                                           |         |                              |          |                                           |                                        |                                       |

Table 2. 334C-9/9A/11 Go/No-Go Test Procedure (Cont).

| TEST                 | PROCEDURE                                                                                  | 972S-3 TEST SET      |            | DESIRED RESULTS |
|----------------------|--------------------------------------------------------------------------------------------|----------------------|------------|-----------------|
|                      |                                                                                            | SWITCH               | POSITION   |                 |
| 5. Disconnect<br>5.1 | Remove power from test set.                                                                | POWER DC<br>POWER AC | OFF<br>OFF |                 |
| 5.2                  | Disconnect unit from test set and from torque tester. Install capstan to servo-drive unit. |                      |            |                 |





# Collins 334D-6( )

## Trim Servo



**Rockwell  
International**

**maintenance**

Collins General Aviation Division

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# maintenance

## 1. GENERAL

This maintenance section provides a go/no-go test for the 334D-6( ) Trim Servo. If the 334D-6( ) fails any portion of the test, remove the unit from service and refer to the 334D-6( ) Trim Servo repair section (523-0771905) of the 334C-9/9A/11 Primary Servo/334D-6( ) Trim Servo Instruction Book (523-0767823).

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 Autopilot Test Set is capable of testing the 334D-6( ) independent of other units in the AP-106/AP-107 Flight Control System. All 334D-6( ) power requirements are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                         | MANUFACTURER AND PART NUMBER                                                                               | POWER REQUIREMENTS                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 972S-2 Test Set Autopilot - Bench | Collins part number 622-1668-001                                                                           | 115 V ac, 400 Hz; 28 V dc ( $\pm 1\%$ ) |
| Stopwatch                         | No specific stopwatch suggested. Minimum specifications are 0- to 180-second range; 0.5-second resolution. |                                         |

Table 2. 334D-6( ) Go/No-Go Test Procedure.

| TEST     | PROCEDURE                   | 972S-2 TEST SET  |          | DESIRED RESULTS |
|----------|-----------------------------|------------------|----------|-----------------|
|          |                             | SWITCH           | POSITION |                 |
| 1. Setup | Position test set switches. | 115 V AC         | OFF      |                 |
| 1.1      |                             | 28 V DC          | OFF      |                 |
|          |                             | 334D-6 POWER     | OFF      |                 |
|          |                             | MNL TRIM         | OFF      |                 |
|          |                             | AP TRIM - SELECT | 913K     |                 |
|          |                             | AP TRIM - LOCAL  | OFF      |                 |
|          |                             | ENGAGE           | 913K     |                 |
|          |                             | LCL ENGA         | OFF      |                 |

Table 2. 334D-6( ) Go/No-Go Test Procedure (Cont).

| TEST              | PROCEDURE                                                                                                                         | 972S-2 TEST SET                                             |                          | DESIRED RESULTS                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                                                                                                                   | SWITCH                                                      | POSITION                 |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1.2               | Manually turn the 334D-6( ) servo capstan cw and then ccw.                                                                        |                                                             |                          | Capstan rotates in both directions smoothly, easily, and with no binding.                                                                                                                                                                                                                                                                                                                                                       |
| 1.3               | Connect 334D-6( ) Trim Servo to the 972S-2.                                                                                       |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1.4               | Apply power.                                                                                                                      | 115 V AC                                                    | ON                       |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   |                                                                                                                                   | 28 V DC                                                     | ON                       |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   |                                                                                                                                   | 334D-6 POWER                                                | ON                       |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2. Manual trim    |                                                                                                                                   |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2.1               | Measure time for capstan to rotate 10 revolutions (2 revolutions for 334D-6, -009). Rotation must be cw viewed from capstan end.  | MNL TRIM<br>LCL ENGA                                        | UP<br>LO                 | 334D-6 (-001, -002, -006, -008),<br>334D-6A (-001),<br>334D-6B (-001),<br>334D-6C (-001):<br>38 to 61 seconds.<br><br>334D-6 (-003, -004, -005),<br>334D-6A (-002),<br>334D-6B (-002),<br>334D-6C (-002):<br>106 to 162 seconds.<br><br>334D-6 (-009):<br>47 to 64 seconds<br>(two revolutions).<br><br>TRIM MOTION annunciator on only while capstan in motion.<br><br>ENGAGE annunciator on.<br><br>AP DSENGA annunciator on. |
| 2.2               | Measure time for capstan to rotate 10 revolutions (2 revolutions for 334D-6, -009). Rotation must be ccw viewed from capstan end. | MNL TRIM                                                    | DN                       | See test 2.1.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3. Autopilot trim |                                                                                                                                   |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3.1               | Measure time for capstan to rotate 10 revolutions (2 revolutions for 334D-6, -009). Rotation must be cw viewed from capstan end.  | MNL TRIM<br>AP TRIM - SELECT<br>LCL ENGA<br>AP TRIM - LOCAL | OFF<br>LCL<br>NORM<br>UP | 334D-6 (-001, -002, -006, -008),<br>334D-6A (-001),<br>334D-6B (-001),<br>334D-6C (-001):<br>38 to 61 seconds.<br><br>334D-6 (-003, -004, -005),<br>334D-6A (-002),<br>334D-6B (-002),<br>334D-6C (-002):<br>106 to 162 seconds.<br><br>334D-6 (-009):<br>47 to 64 seconds<br>(two revolutions).                                                                                                                                |
| (Cont)            |                                                                                                                                   |                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 2. 334D-6( ) Go/No-Go Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                                                         | 972S-2 TEST SET                     |                   | DESIRED RESULTS                                                                                                          |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                   | SWITCH                              | POSITION          |                                                                                                                          |
| 3.1<br>(Cont) |                                                                                                                                   |                                     |                   | TRIM MOTION annunciator on only while capstan in motion.<br><br>ENGAGE annunciator on.<br><br>AP DSENGA annunciator out. |
| 3.2           | Manual override.                                                                                                                  | MNL TRIM                            | DN                | Capstan rotation must immediately change to ccw.<br><br>AP DSENGA annunciator on.                                        |
| 3.3           | Measure time for capstan to rotate 10 revolutions (2 revolutions for 334D-6, -009). Rotation must be ccw viewed from capstan end. | MNL TRIM<br>AP TRIM - LOCAL         | OFF<br>DN         | See test 3.1.                                                                                                            |
| 3.4           | Manual override.                                                                                                                  | MNL TRIM                            | UP                | Capstan rotation must immediately change to cw.<br><br>AP DSENGA annunciator on.                                         |
| 4. Disconnect |                                                                                                                                   |                                     |                   |                                                                                                                          |
| 4.1           | Remove test set power.                                                                                                            | 115 V AC<br>28 V DC<br>334D-6 POWER | OFF<br>OFF<br>OFF |                                                                                                                          |
| 4.2           | Disconnect 334D-6( ) from 972S-2.                                                                                                 |                                     |                   |                                                                                                                          |





**Rockwell  
International**

**maintenance**

Collins General Aviation Division

523-0764816-004118

4th Edition, 27 June 1984

# 590A-6/6A

## Altitude Control

Printed in USA

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[illegible]



# maintenance

## 1. GENERAL

This maintenance section provides a go/no-go test for the 590A-6/6A Altitude Control. If the 590A-6/6A fails any portion of the test, return the unit for repair to Conrac Corporation, Instrument Controls Division, 1600 South Mountain Avenue, Duarte, California 91010.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 test set is capable of testing the 590A-6/6A independent of other units in the AP-106/AP-107 Flight Control System. All 590A-6/6A power requirements are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                       | MANUFACTURER AND PART NUMBER     | POWER REQUIREMENTS      |
|---------------------------------|----------------------------------|-------------------------|
| 972S-2 Test Set Autopilot-Bench | Collins part number 622-1688-001 | 115 Vac, 400 Hz; 28 Vdc |
| Air data test panel             | ADT-12-13281 or equivalent       | 115 Vac, 400 Hz         |
| Digital voltmeter               | Fluke Model 8000A or equivalent  | 115 Vac, 60 Hz          |

Table 2. 590A-6/6A Go/No-Go Test Procedure.

| TEST | PROCEDURE                                                                     | 972S-2 TEST SET                                                        |                                                                  | DESIRED RESULTS |
|------|-------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------|-----------------|
|      |                                                                               | SWITCH                                                                 | POSITION                                                         |                 |
| 1.   | PRETEST PROCEDURE                                                             |                                                                        |                                                                  |                 |
| 1.1  | Position test set switches as follows:<br>Power section<br><br>590A-6 section | 115 V AC<br>28 V DC<br>POWER<br>SYS<br><br>HOLD<br>OUT<br>MODE<br>HOLD | OFF<br>OFF<br>SYS<br>Not<br>significant<br>LCL<br><br>LCL<br>SYN |                 |
| 1.2  | Connect 590A-6/6A Altitude Control to test set 590A-6/6A connecting cable.    |                                                                        |                                                                  |                 |

Table 2. 590A-6/6A Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                             | 972S-2 TEST SET                  |                       | DESIRED RESULTS                                                                                                  |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                       | SWITCH                           | POSITION              |                                                                                                                  |
| 1.3  | <div>Caution</div> <p>Do not apply pressure to the instrument static port.</p> <p>Connect air data test panel vacuum hose to 590A-6/6A Static Port.</p>                                               |                                  |                       | <div>Caution</div> <p>Set air data test panel for zero altitude.</p>                                             |
| 1.4  | <p>Apply test set power.</p> <p>Apply 590A-6/6A power.</p> <p>Apply power to air data test panel.</p>                                                                                                 | 115 V AC<br>28 V DC<br>POWER     | ON<br>ON<br>LCL       |                                                                                                                  |
| 2.   | SENSITIVITY TEST                                                                                                                                                                                      |                                  |                       |                                                                                                                  |
| 2.1  | Adjust the air data test panel altitude control for an altitude of 0 feet.                                                                                                                            |                                  |                       | +6.52 to +7.96 V dc at PRESS test jacks.                                                                         |
| 2.2  | Adjust the air data test panel altitude control for an altitude of 45,000 feet.                                                                                                                       |                                  |                       | +0.94 to +1.16 V dc at PRESS test jacks.                                                                         |
| 3.   | ALTITUDE HOLD TEST                                                                                                                                                                                    |                                  |                       |                                                                                                                  |
| 3.1  | Adjust the air data test panel altitude control for an altitude of 0 feet.                                                                                                                            |                                  |                       |                                                                                                                  |
| 3.2  | Select altitude hold mode.                                                                                                                                                                            | HOLD                             | HOLD                  | -125 to +125 mV dc at HOLD OUT test jacks (record value for test 3.3). If out of tolerance, adjust R27 for null. |
| 3.3  | <p>Adjust the air data test panel altitude control for an altitude of 100 feet.</p> <p>Measure voltage at HOLD OUT test jacks and then subtract null voltage (test 3.2) to obtain desired result.</p> |                                  |                       | -0.8 to -1.20 V dc                                                                                               |
| 4.   | POSTTEST PROCEDURE                                                                                                                                                                                    |                                  |                       |                                                                                                                  |
| 4.1  | <p>Turn off air data test panel power.</p> <p>Remove 590A-6/6A power.</p> <p>Remove test set power.</p>                                                                                               | POWER<br><br>115 V AC<br>28 V DC | SYS<br><br>OFF<br>OFF |                                                                                                                  |
| 4.2  | <p>Remove vacuum hose from 590A-6/6A.</p> <p>Remove test set cable from 590A-6/6A.</p>                                                                                                                |                                  |                       |                                                                                                                  |



**Rockwell  
International**

# **590B-3 Indicated Airspeed Sensor**

**maintenance**

Collins General Aviation Division

Printed in USA

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# maintenance

## 1. GENERAL

This maintenance section provides a go/no-go test for the 590B-3 Indicated Airspeed Sensor. If the 590B-3 fails any portion of the test, return the unit for repair to Conrac Corporation, Instrument Controls Division, 1600 South Mountain Avenue, Duarte, California 91010.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 test set is capable of testing the 590B-3 independent of other units in the AP-106/AP-107 Flight Control System. All 590B-3 power requirements are provided by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                          | MANUFACTURER AND PART NUMBER     | POWER REQUIREMENTS      |
|------------------------------------|----------------------------------|-------------------------|
| 972S-2 Test Set<br>Autopilot-Bench | Collins part number 622-1688-001 | 115 Vac, 400 Hz; 28 Vdc |
| Air data test<br>panel             | ADT-12-13281 or equivalent       | 115 Vac, 400 Hz         |
| Digital voltmeter                  | Fluke model 8000A or equivalent  | 115 Vac, 60 Hz          |

Table 2. 590B-3 Go/No-Go Test Procedures.

| TEST | PROCEDURE                                                                                                     | 972S-2 TEST SET |          | DESIRED RESULTS |
|------|---------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|
|      |                                                                                                               | SWITCH          | POSITION |                 |
| 1.   | PRETEST PROCEDURE                                                                                             |                 |          |                 |
| 1.1  | Position switches/controls.<br><br>Test set.<br><br>Set air data test panel for 0<br>knot indicated airspeed. | IAS             | LCL      |                 |
| 1.2  | Connect 590B-3 Indicated Airspeed<br>Sensor to test set 590B-3 connecting<br>cable.                           |                 |          |                 |

Table 2. 590B-3 Go/No-Go Test Procedures (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                      | 972S-2 TEST SET   |            | DESIRED RESULTS                                                                           |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|-------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                | SWITCH            | POSITION   |                                                                                           |
| 1.3  | Connect the air data test panel pressure connection to 590B-3 PITOT PORT.                                                                                                                                                      |                   |            |                                                                                           |
| 1.4  | Apply test set power.                                                                                                                                                                                                          | 28 VDC<br>115 VAC | ON<br>ON   |                                                                                           |
| 1.5  | Apply power to air data test panel.                                                                                                                                                                                            |                   |            |                                                                                           |
| 2.   | OUTPUT TEST                                                                                                                                                                                                                    |                   |            |                                                                                           |
| 2.1  | Adjust the air data test panel air-speed control for 100 knots.                                                                                                                                                                |                   |            | 0 to +0.6 V dc at OUTPUT test jack.                                                       |
| 2.2  | <div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>Caution</b></div><br>Do not exceed 350 knots airspeed.<br><br>Adjust the air data test panel air-speed control for 300 knots indicated airspeed. |                   |            | Voltage increases smoothly and linearly with pressure change.<br><br>+11.4 to +12.6 V dc. |
| 3.   | POSTTEST PROCEDURE                                                                                                                                                                                                             |                   |            |                                                                                           |
| 3.1  | Reset air data test panel for 0 knot airspeed.                                                                                                                                                                                 |                   |            |                                                                                           |
| 3.2  | Turn off air data test panel power.                                                                                                                                                                                            |                   |            |                                                                                           |
| 3.3  | Turn off test set power.                                                                                                                                                                                                       | 115 VAC<br>28 VDC | OFF<br>OFF |                                                                                           |
| 3.4  | Remove air data test panel hose from 590B-3.<br><br>Remove test set cable from 590B-3.                                                                                                                                         |                   |            |                                                                                           |



**Rockwell  
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**maintenance**

**329T-1**

# **Turn and Slip Indicator**

Collins General Aviation Division

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# maintenance

## 1. GENERAL

This maintenance section provides a functional go/no-go test and adjustment procedure for the 329T-1 Turn and Slip Indicator. Should the 329T-1 fail any portion of the test, return the unit for repair to one of the authorized service centers listed in table 4.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 Autopilot Test Set is capable of testing the 329T-1 Turn and Slip Indicator independent of other units in the AP-106/AP-107 Flight Control System. All 329T-1 power requirements for this test are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

#### **Warning**

The gain of the 329T-1 must be adjusted after testing and before operation of the yaw damper system in the aircraft. Either the

gain adjustment procedure provided in paragraph 4 in this section or in the AP-106/AP-107 Flight Control System maintenance section (523-0764808) can be used to perform this preflight adjustment. Failure to perform one of these procedures can cause improper operation of the yaw damper system.

## 4. GAIN ADJUSTMENT PROCEDURE

The gain adjustment procedure provided in table 3 permits setting the gain of the 329T-1 for a particular aircraft prior to installation in the aircraft. This procedure can be performed instead of the postinstallation adjustment procedure given in the AP-106/AP-107 Flight Control System maintenance section (523-0764808).

The gain of the 329T-1 must be adjusted before operating the yaw damper system in the aircraft to ensure that the gain of the system is set for the flight characteristics of the particular aircraft. Since the gain setting is unique for each particular type of aircraft, the gain setting is not specified in this procedure, but is specified in service information letters (SIL's) that are written for each aircraft in which the AP-106/AP-107 Flight Control System has been certified. These service information letters are referred to in the procedure where the gain setting is unique to a particular aircraft.

Table 1. Test Equipment Required.

| EQUIPMENT                       | MANUFACTURER AND PART NUMBER     | POWER REQUIREMENTS       |
|---------------------------------|----------------------------------|--------------------------|
| 972S-2 Autopilot Bench Test Set | Collins part number 622-1668-001 | 115 V ac 400 Hz, 28 V dc |
| Digital voltmeter (dvm)         | Fluke Model 8000A or equivalent  | 115 V ac 60 Hz           |

Table 2. Go/No-Go Test Procedure.

| TEST              | PROCEDURE                                                                                                                                                                                                                                                                                                                                          | 972S-2 TEST SET                                                                                                                                                                                                             |                                                                                                                            | DESIRED RESULTS                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
|                   |                                                                                                                                                                                                                                                                                                                                                    | SWITCH                                                                                                                                                                                                                      | POSITION                                                                                                                   |                                                              |
| 1. Setup          |                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                             |                                                                                                                            |                                                              |
| 1.1               | <p>Autopilot section</p> <p>334C-9 PRIMARY SERVO section</p> <p>329A HORIZONTAL REFERENCE INDICATOR section</p> <p>329T-1 SLIP &amp; TURN INDICATOR section</p> <p>Test set power</p>                                                                                                                                                              | <p>ROLL-2 SOURCE<br/>SERVO FORCE<br/>SERVO INPUT<br/>CMD RUDDER</p> <p>EXT CMD</p> <p>ATTD</p> <p>POWER<br/>HI-PASS<br/>TRIM-OUT<br/>±15 VDC SOURCE<br/>ROLL DATA-2<br/>ROLL DATA-1</p> <p>POWER<br/>115 VAC<br/>28 VDC</p> | <p>OFF<br/>LCL<br/>329T</p> <p>OFF</p> <p>LCL</p> <p>OFF<br/>NORM<br/>LCL<br/>LCL<br/>332D<br/>329A</p> <p>OFF<br/>OFF</p> |                                                              |
| 2. Hookup         |                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                             |                                                                                                                            |                                                              |
| 2.1               | <p>Connect 329T-1 indicator to the 329T-1 connecting cable on the test set.</p> <p>Apply power.</p>                                                                                                                                                                                                                                                | <p>POWER<br/>115 VAC<br/>28 VDC</p>                                                                                                                                                                                         | <p>ON<br/>ON</p>                                                                                                           | <p>Note red GYRO warning flag on indicator.</p>              |
| 2.2               | <p><b>Caution</b></p> <p>Do not connect 5-V dc lighting pigtails on 329T-1 (Collins part number 270-2424-020) to the 28 V LTG posts.</p> <p>Connect the 329T-1 (Collins part number 270-2424-010 only) 28-V lighting pigtails to the 28 V LTG posts.</p> <p>Rotate the RUD CMD GAIN control on the rear of the 329T-1 to the full cw position.</p> | <p>329T-1 POWER</p>                                                                                                                                                                                                         | <p>ON</p>                                                                                                                  | <p>GYRO warning flag retracts. Indicator light comes on.</p> |
| 3. Rudder Command |                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                             |                                                                                                                            |                                                              |
| 3.1               | <p>Connect voltmeter to the autopilot SERVO INPUT CMD RUDDER test points.</p>                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                             |                                                                                                                            | <p>0 ±50 mV dc</p>                                           |
| 3.2               | <p>Rotate the instrument ccw (left turn) and monitor the output voltage polarity.</p>                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                             |                                                                                                                            | <p>Negative dc voltage</p>                                   |
| 3.3               | <p>Rotate the instrument cw (right turn) and monitor the output voltage polarity.</p>                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                             |                                                                                                                            | <p>Positive dc voltage</p>                                   |

Table 2. Go/No-Go Test Procedure (Cont).

| TEST     | PROCEDURE                                                                                                                                            | 972S-2 TEST SET                                         |                                                                    | DESIRED RESULTS                                                                                    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|          |                                                                                                                                                      | SWITCH                                                  | POSITION                                                           |                                                                                                    |
| 3.4      | Rotate the RUD CMD GAIN control on the rear of the 329T-1 to the full ccw position.<br><br>Measure dc voltage at SERVO INPUT CMD RUDDER test points. | ROLL DATA-1<br>HI-PASS<br>ROLL DATA-1<br>+/- control    | LCL<br>DSBL<br>Adjust ccw for 2.5 V ac at ROLL DATA-1 test points. | Reference-1 (Record this voltage).                                                                 |
| 3.5      | Measure dc voltage at SERVO INPUT CMD RUDDER test points.                                                                                            | ROLL DATA-1<br>+/- control                              | Adjust cw for 2.5 V ac at ROLL DATA-1 test points.                 | Reference-2 (Record this voltage).                                                                 |
| 3.6      | Add reference-1 to the reference-2 voltage and divide by two.                                                                                        |                                                         |                                                                    | +555 to +679 mV dc                                                                                 |
| 3.7      | Measure the ac voltage at the ROLL TP test points.                                                                                                   |                                                         |                                                                    | 616 to 754 mV ac                                                                                   |
| 3.8      | Connect dvm to SERVO INPUT CMD RUDDER test points and record dc voltage.                                                                             |                                                         |                                                                    | Reference-2 (Same as test 3.5).                                                                    |
| 3.9      | Continue to monitor the voltmeter and disengage washout disable. Time voltage change from the instant the switch is set at NORM.                     | HI-PASS                                                 | NORM                                                               | After 3 seconds: 36.9% of reference-2, $\pm 70$ mV dc.<br><br>After 30 seconds: +25 mV dc maximum. |
| 4. Force |                                                                                                                                                      |                                                         |                                                                    |                                                                                                    |
| 4.1      | Measure the voltage at the TRIM OUT and COM 1 test points.                                                                                           | ROLL DATA-1<br>SERVO FORCE control (auto-pilot section) | 329A<br>Adjust for 0 $\pm 50$ mV dc at FORCE test points.          | 0 $\pm 30$ mV dc                                                                                   |
| 4.2      | Measure the voltage at the TRIM OUT and COM 1 test points.                                                                                           | SERVO FORCE control (auto-pilot section)                | Adjust for +14 V dc at FORCE test points.                          | Without SB 3: -0.63 to -0.77 V dc.<br><br>With SB 3: -4.18 to -5.12 V dc.                          |

Table 2. Go/No-Go Test Procedure (Cont).

| TEST                  | PROCEDURE                                                                                                                                                                                   | 972S-2 TEST SET                            |                                           | DESIRED RESULTS                                                       |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------|
|                       |                                                                                                                                                                                             | SWITCH                                     | POSITION                                  |                                                                       |
| 4.3                   | Measure the voltage at the TRIM OUT and COM 1 test points.                                                                                                                                  | SERVO FORCE control (auto-pilot section)   | Adjust for -14 V dc at FORCE test points. | Without SB 3: +0.63 to +0.77 V dc.<br>With SB 3: +4.18 to +5.12 V dc. |
| 5. Monitor            | Measure the voltage at the MON and COM 1 test points.                                                                                                                                       |                                            |                                           | +0.5 V dc maximum                                                     |
| 6. Posttest Procedure | If 329T-1 is to be adjusted for a particular aircraft, proceed to table 3 and perform the procedure given.<br><br>If 329T-1 is not to be adjusted, remove the test set cable from the unit. | 329T-1 POWER<br>POWER<br>115 VAC<br>28 VDC | OFF<br><br>OFF<br>OFF                     |                                                                       |

Table 3. 329T-1 Adjustment Procedure.

| TEST | PROCEDURE                                                                           | 972S-2 TEST SET                                               |                                                                                | DESIRED RESULTS                                                                                                                      | ADJUSTMENT INSTRUCTIONS                                   |
|------|-------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
|      |                                                                                     | SWITCH                                                        | POSITION                                                                       |                                                                                                                                      |                                                           |
| 1    | PRETEST PROCEDURE                                                                   |                                                               |                                                                                |                                                                                                                                      |                                                           |
| 1.1  | Perform the test setup procedure given in test 1 of table 2.                        |                                                               |                                                                                |                                                                                                                                      |                                                           |
| 1.2  | If not done previously, connect the 329T-1 to the connecting cable on the test set. | POWER<br>115 VAC<br>28 VDC<br>329T-1 POWER                    | ON<br>ON<br>ON                                                                 | <b>Note</b><br><br>Unless otherwise specified, all voltages are to be measured with respect to the COM 1 test point on the test set. | GYRO warning flag retracts.                               |
| 2    | RUDDER COMMAND GAIN (Systems using 332D-12) (200 mV/degree)                         |                                                               |                                                                                |                                                                                                                                      |                                                           |
| 2.1  | Measure voltage at autopilot SERVO INPUT CMD-RUDDER test points.                    | HI-PASS<br>ROLL DATA-2<br>ROLL-2 control (auto-pilot section) | DSBL<br>SIM<br>Adjust cw from center for 5.00 V ac at ROLL DATA-2 test points. | Refer to particular aircraft service information letter for desired result.                                                          | Adjust RUD CMD GAIN control on 329T-1 for desired result. |

Table 3. 329T-1 Adjustment Procedure (Cont).

| TEST | PROCEDURE                                                            | 972S-2 TEST SET                                           |                                                                                        | DESIRED RESULTS                                                              | ADJUSTMENT INSTRUCTIONS                                                                          |
|------|----------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|      |                                                                      | SWITCH                                                    | POSITION                                                                               |                                                                              |                                                                                                  |
| 2.2  | Measure voltage at autopilot SERVO INPUT CMD-RUDDER test points.     | ROLL-2 control (auto-pilot section)                       | Adjust ccw from center for 5.00 V ac at ROLL DATA-2 test points.                       | Same value as test 2.1 but with opposite polarity.                           | Readjust RUD CMD GAIN control and repeat tests 2.1 and 2.2 until both tests are within limits.   |
| 2a   | RUDDER COMMAND GAIN (Systems using 329A-( )) (100 mV/degree)         |                                                           |                                                                                        |                                                                              |                                                                                                  |
| 2a.1 | Measure voltage at autopilot SERVO INPUT CMD-RUDDER test points.     | HI-PASS<br><br>ROLL DATA-1<br><br>ROLL DATA-1 +/- control | DSBL<br><br>LCL<br><br>Adjust cw from center for 2.50 V ac at ROLL DATA-1 test points. | Refer to particular aircraft service information letter for desired results. | Adjust RUD CMD GAIN control on 329T-1 for desired results.                                       |
| 2a.2 | Measure voltage at autopilot SERVO INPUT CMD-RUDDER test points.     | ROLL DATA-1 +/- control                                   | Adjust ccw from center for 2.50 V ac at ROLL DATA-1 test points.                       | Same value as the 2a.1 but with opposite polarity.                           | Readjust RUD CMD GAIN control and repeat tests 2a.1 and 2a.2 until both tests are within limits. |
| 3    | POSTADJUSTMENT PROCEDURE                                             |                                                           |                                                                                        |                                                                              |                                                                                                  |
| 3.1  |                                                                      | 329T-1 POWER<br><br>POWER<br>115 VAC<br>28 VDC            | OFF<br><br>OFF<br>OFF                                                                  |                                                                              |                                                                                                  |
| 3.2  | Disconnect the 329T-1 from the test set and install in the aircraft. |                                                           |                                                                                        |                                                                              |                                                                                                  |

Table 4. Authorized Service Centers.

| UNITED STATES OF AMERICA                                                                                          |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <u>ALASKA</u>                                                                                                     | Smith's Industries, Inc.<br>14180 Roosevelt Boulevard<br>Clearwater, Florida 33520                        |
| Alaskan Aircraft Equipment Supply, Inc.<br>4707 Spenard Drive<br>International Airport<br>Anchorage, Alaska 99503 | <u>ILLINOIS</u>                                                                                           |
| <u>ARIZONA</u>                                                                                                    | Airesearch Aviation Co.<br>Capital Airport<br>Springfield, Illinois 62707                                 |
| Cutter Aviation, Inc.<br>P.O. Box 20306<br>Phoenix, Arizona 85036                                                 | Joliet Avionics, Inc.<br>DuPage County Airport<br>West Chicago, Illinois 60185                            |
| <u>CALIFORNIA</u>                                                                                                 | WSM Aero Instruments, Inc.<br>2100 East Pleasant Street<br>DeKalb, Illinois 60115                         |
| A.I.R. Corporation<br>401 McCormick Street<br>San Leandro, California 94577                                       | <u>INDIANA</u>                                                                                            |
| Airstream Instrument Labs, Inc.<br>3605 East Spring<br>Long Beach, California 90806                               | South Bend Aero Service, Inc.<br>1614 North Ryer Street<br>South Bend, Indiana 46628                      |
| A. Biederman, Inc.<br>1045 Air Way<br>Glendale, California 91201                                                  |                                                                                                           |
| Otto's Instrument Service, Inc.<br>Ontario International Airport<br>Ontario, California 91761                     | <u>MICHIGAN</u>                                                                                           |
| West Air Instrument Service<br>1611 McKinley Way<br>LaVerne, California 91750                                     | Metro Aircraft Supply<br>2135 Airport Road<br>Pontiac, Michigan 48054                                     |
| <u>COLORADO</u>                                                                                                   | <u>MINNESOTA</u>                                                                                          |
| Combs-Gates Denver, Inc.<br>Hangar 1<br>Stapleton International Airport<br>Denver, Colorado 80207                 | Williams Instrument Service Corporation<br>8001 Lea Road<br>Minneapolis, Minnesota 55438                  |
| <u>GEORGIA</u>                                                                                                    | <u>NEW JERSEY</u>                                                                                         |
| Barfield Instrument Corporation<br>1478 Central Avenue<br>East Point, Georgia 30344                               | Consolidated Instrument Co., Inc.<br>Teterboro Airport<br>Teterboro, New Jersey 07068                     |
| <u>FLORIDA</u>                                                                                                    | <u>NEW YORK</u>                                                                                           |
| Aero Systems<br>Miami International Airport<br>P.O. Box 522221<br>Miami, Florida 33152                            | Aero Instruments and Avionics<br>5 Ward Road<br>North Tonawanda, New York 14120                           |
| Barfield Instrument Corporation<br>4101 N.W. 29th Street<br>Miami, Florida 33142                                  | Hermetic Aircraft Instrument Corporation<br>200 Marine Street<br>Farmingdale, Long Island, New York 11735 |
|                                                                                                                   | AAR Technical Service Center<br>25 Buena Vista Avenue<br>Long Island, New York 11559                      |

Table 4. Authorized Service Centers (Cont).

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><u>NEBRASKA</u></p> <p>Duncan Aviation<br/>Instrument Division<br/>P.O. Box 81887<br/>Lincoln, Nebraska 68501</p> <p><u>OREGON</u></p> <p>Western Skyways<br/>Portland/Troutdale Airport<br/>Troutdale, Oregon 97060</p> <p><u>PENNSYLVANIA</u></p> <p>Olmsted Instrument Company<br/>28 Fourth Street<br/>Harrisburg International Airport<br/>Middletown, Pennsylvania 17057</p> <p><u>TEXAS</u></p> <p>Castleberry Instruments &amp; Avionics<br/>Tims Airpark<br/>817 Dessau Road, Route 3<br/>Austin, Texas 78753</p> <p>Executive Instruments<br/>P.O. Box 216<br/>4141 Lindberg<br/>Addison, Texas 75001</p> <p>Instrument Specialties Company, Inc.<br/>P.O. Box 365<br/>1110 Stanley<br/>Euless, Texas 76039</p> <p>Masco Service Corporation<br/>9731 Denton Drive<br/>Dallas, Texas 75220</p> <p><u>WASHINGTON</u></p> <p>American Instruments, Inc.<br/>7001 Perimeter Road<br/>Boeing Field<br/>Seattle, Washington 98108</p> | <p><u>AUSTRALIA</u></p> <p>Airborne Accessories (Pty) Ltd.<br/>Building 107, Bankstown Airport<br/>Bankstown, N.S.W. 2200<br/>Australia</p> <p>N.I.C. Instrument Co.<br/>Matthews Avenue<br/>Airport West<br/>Victoria, 3042, Australia</p> <p>Skycom Electronics Pty., Ltd.<br/>Hangar 4, Archerfield Airport<br/>P.O. Box 168<br/>Rocklea, Queensland 4106<br/>Australia</p> <p><u>BRAZIL</u></p> <p>Aeronal Revisora de Instrumentos<br/>Aeronauticos Ltda.<br/>Av. Washington Luiz, 558<br/>Sao Paulo, S.P., Brasil</p> <p>"OLDI" Industrial Comercio de Instrumentos<br/>e Pecas de Avioes Ltda.<br/>Avenida Cruzeiro do Sul, 3573<br/>CEP 02031<br/>Santana<br/>Sao Paulo, S.P., Brasil</p> <p>Varig S.A. VIA &amp; AO Aerea Rio Grandense<br/>Aeroporto Salgado Filho<br/>Caixa Postal 234<br/>90 000 Porto Alegre, RS, Brasil</p> <p><u>CANADA</u></p> <p>Airborne Precision Instruments Ltd.<br/>Field Aviation Hangar<br/>International Airport<br/>Calgary, Alberta T2P 2G3<br/>Canada</p> <p>Aviation Electric Ltd., Pacific Division<br/>4820 Hoffar Street<br/>International Airport South<br/>Richmond, B.C. V7B 1B2<br/>Canada</p> <p>Bristow Instruments, Ltd.<br/>Hangar 6A<br/>25 Airport Road<br/>Edmonton Municipal Airport<br/>Edmonton, Alberta T5G 2Z3<br/>Canada</p> <p>Pacific Avionics<br/>530 Airport Road South<br/>Vancouver, B.C. V7H 1V4 Canada</p> |
| <p><u>AFRICA</u></p> <p>Autair Helicopters (Africa) Ltd.<br/>P.O. Box 990<br/>Lusaka, Republic of Zambia</p> <p>Instrumentation Ltd.<br/>P.O. Box 44356<br/>Wilson Airport<br/>Nairobi, Kenya</p> <p>Placo Limited<br/>Rand Airport<br/>Box 4155, Germiston South<br/>Republic of South Africa</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Table 4. Authorized Service Centers (Cont).

|                                                                                                        |                                                                                                              |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| CANADA (Cont)                                                                                          | ITALY                                                                                                        |
| Wright Instruments, Ltd.<br>2762 Slough Street<br>Mississauga, Ontario L4T 1G3<br>Canada               | O.S.A. Fileti<br>Viale di Villa Pamphili 15<br>Rome, Italy                                                   |
| DENMARK                                                                                                | JAPAN                                                                                                        |
| Avia Radio<br>Hangar 141<br>Copenhagen Airport<br>DK-2791, Dragoer, Denmark                            | Jupiter Corporation<br>3-17-4 Minami Aoyama<br>Minator-Ku<br>Tokyo, Japan                                    |
| ENGLAND                                                                                                | SWEDEN                                                                                                       |
| C.S.E. (Aircraft Services) Limited<br>Oxford Airport<br>Kidlington, Oxford, England                    | Dehnisch Flyplaninstrumentverkstad<br>Bromma Airport<br>S 161 10 Bromma<br>Stockholm, Sweden                 |
| FieldTech Limited<br>Heathrow Airport, London<br>Hounslow, Middlesex, England                          | SWITZERLAND                                                                                                  |
| Pandect Instrument Laboratories Ltd.<br>Wellington Road<br>High Wycombe, Bucks, England                | Air Maintenance SA<br>Neuchatel Airport<br>2013 Colombier<br>Neuchatel, Switzerland                          |
| FRANCE                                                                                                 | Flight Components AG<br>Flughafenstrasse 22<br>CH-8302 Kloten<br>Switzerland                                 |
| Avia Service<br>2, Rue de Mondorff<br>Rodemack 57570<br>Chattenom, France                              | Limess Aviation AG<br>Flughafenstrasse 22<br>CH-8302 Kloten<br>Switzerland                                   |
| Rousseau Aviation<br>B. P. 124<br>Dinard, France                                                       | Merag<br>Lanzenen 12<br>3800 Interlaken<br>Switzerland                                                       |
| GERMANY                                                                                                | SINGAPORE                                                                                                    |
| LFE Avionic Services<br>Luftfahrtelektronik Hamburg<br>2 Hamburg 63 Flughafen<br>Hamburg, West Germany | Singapore Electronic & Engineering (Private) Ltd.<br>Naval Base<br>Sembawang<br>P.O. Box 16<br>Singapore, 27 |
| DLE Luftfahrtelektronik Service GmbH<br>7570 Baden-Baden<br>Flugplatz Baden-Oos<br>West Germany        |                                                                                                              |
| WDL Werfbertrieb<br>Essen-Mulheim Airport<br>433 Mulheim/Ruhr<br>West Germany                          |                                                                                                              |



# 329A-3/3V/4/4V Horizon Reference Indicator



Rockwell  
International

**maintenance**

Collins General Aviation Division

Printed in USA

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NOTICE: This section replaces fourth edition dated 1 March 1980.

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## Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.  
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
AND ENTER DATE INSERTED AND INITIALS.

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|        |               |                   |                    |        |               |                   |                    |

## maintenance

### 1. General

This maintenance section provides a go/no-go test for the 329A-3/3V/4/4V Horizon Reference Indicator. If the 329A fails any portion of the test, return the unit for repair to one of the authorized service centers listed in table 3.

### 2. Test Equipment Required

The test equipment listed in table 1 is required to perform the procedures given in this section.

### 3. Testing

#### 3.1 General

The 972S-2 autopilot test set is capable of testing the 329A-3/3V/4/4V Horizon Reference Indicator independent of other units in the AP-106/AP-107 Flight Control System. All power requirements for this test are provided by the 972S-2 Test Set, except the vacuum source required to drive the gyro in the 329A-3V and 329A-4V.

#### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                       | MANUFACTURER AND PART NUMBER                                                                     | POWER REQUIREMENTS        |
|---------------------------------|--------------------------------------------------------------------------------------------------|---------------------------|
| 972S-2 Test Set Autopilot-Bench | Collins 622-1688-001                                                                             | 115 V ac, 400 Hz, 28 V dc |
| Digital voltmeter               | Fluke model 8000A                                                                                | 115 V ac, 60 Hz           |
| Dual trace oscilloscope         | Tektronix 545A or equivalent                                                                     | 115 V ac, 60 Hz           |
| Vacuum source (-3V or -4V only) | Specifications: 4.5 to 5.2 inches of mercury, air consumption 2.2 cubic feet per minute maximum. |                           |

Table 2. 329A-3/3V/4/4V Go/No-Go Test Procedure.

| TEST          | PROCEDURE                                                                                                                                                                          | 972S-2 TEST SET                                                                          |                                                                   | DESIRED RESULTS                                                                                                                                                                                                                                                                                                                           |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                    | SWITCH                                                                                   | POSITION                                                          |                                                                                                                                                                                                                                                                                                                                           |
| 1.            | PRETEST PROCEDURE                                                                                                                                                                  |                                                                                          |                                                                   |                                                                                                                                                                                                                                                                                                                                           |
| 1.1           | POWER section<br><br>Spin motor control section.<br><br>329A section.                                                                                                              | 115 VAC<br>28 VDC<br><br>PWR<br>MOTOR<br>VOLT<br><br>POWER<br>IND<br>STR<br>FLAG<br>ATTD | OFF<br>OFF<br><br>NORM<br>NORM<br><br>OFF<br>LCL<br>IN<br><br>LCL |                                                                                                                                                                                                                                                                                                                                           |
| 1.2           | Connect the 329A to the 329A cable on the 972S-2 Test Set. Connect 329A lighting pigtails to the 28V LTG posts.<br><br>For 329A-3V/4V, connect to vacuum source.                   |                                                                                          |                                                                   |                                                                                                                                                                                                                                                                                                                                           |
| 1.3           | POWER section<br><br><br>329A section.                                                                                                                                             | 115 VAC<br><br><br>28 VDC<br>POWER<br>STR<br>FLAG                                        | ON<br><br><br>ON<br>ON<br>OUT                                     | Gyro flag goes out of sight and GYRO MON indicator on test set lights when testing 329A-3/4.<br><br>Instrument light comes on.<br><br>Steering flag goes out of sight.                                                                                                                                                                    |
| 2.            | ATTITUDE TEST                                                                                                                                                                      |                                                                                          |                                                                   |                                                                                                                                                                                                                                                                                                                                           |
| 2.1           | Manually rotate the 329A about the roll and pitch axis.                                                                                                                            |                                                                                          |                                                                   | Observe that roll and pitch cards maintain roll and pitch reference.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>Note</b></div><br>For 329A with part no 270-2426-005, -006, -007, or -008, pitch null occurs at approximately 8 degrees pitch-down attitude (front of 329A elevated 8 degrees). |
| 2.2           | Connect oscilloscope as follows:<br><br>a. Apply 26 VAC REF from the 331P section to input A and external trigger input.<br><br>b. Apply output of PITCH jack (orange) to input B. |                                                                                          |                                                                   |                                                                                                                                                                                                                                                                                                                                           |
| 2.3<br>(Cont) | Adjust the B trace deflection by rotating the 329A about the pitch axis.                                                                                                           |                                                                                          |                                                                   | The B trace is out of phase with the A trace in a pitch-up attitude (rear of 329A elevated above null position).                                                                                                                                                                                                                          |

Table 2. 329A-3/3V $\frac{1}{4}$ /4V Go/No-Go Test Procedure (Cont).

| TEST          | PROCEDURE                                                                                        | 972S-2 TEST SET                |                       | DESIRED RESULTS                                                                                                                                                                                    |
|---------------|--------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                  | SWITCH                         | POSITION              |                                                                                                                                                                                                    |
| 2.3<br>(Cont) |                                                                                                  |                                |                       | The B trace is in phase with the A trace in a pitch-down attitude (front of 329A elevated above null position).                                                                                    |
| 2.4           | Remove the oscilloscope B trace input from the PITCH jack and connect to the ROLL jack (orange). |                                |                       |                                                                                                                                                                                                    |
| 2.5           | Adjust the B trace deflection by rotating the 329A about the roll axis.                          |                                |                       | Null occurs when the roll card is centered.<br><br>The B trace is out of phase with the A trace in a roll right attitude.<br><br>The B trace is in phase with the A trace in a roll left attitude. |
| 3.            | PITCH COMMAND BAR TEST                                                                           |                                |                       |                                                                                                                                                                                                    |
| 3.1           | Adjust COMMAND BAR-PITCH control for 0 V dc at the PITCH/COM jacks.                              |                                |                       | Pitch command bar centers.                                                                                                                                                                         |
| 3.2           | Adjust the COMMAND BAR-PITCH control for -2 V dc at the PITCH/COM jacks.                         |                                |                       | Pitch command bar deflects up.                                                                                                                                                                     |
| 3.3           | Adjust the COMMAND BAR-PITCH control for +2 V dc at the PITCH/COM jacks.                         |                                |                       | Pitch command bar deflects down.                                                                                                                                                                   |
| 4.            | ROLL COMMAND BAR TEST                                                                            |                                |                       |                                                                                                                                                                                                    |
| 4.1           | Adjust COMMAND BAR-ROLL control for 0 V dc at the ROLL/COM jacks.                                |                                |                       | Roll command bar centers.                                                                                                                                                                          |
| 4.2           | Adjust the COMMAND BAR-ROLL control for -2 V dc at the ROLL/COM jacks.                           |                                |                       | Roll command bar deflects left.                                                                                                                                                                    |
| 4.3           | Adjust the COMMAND BAR-ROLL control for +2 V dc at the ROLL/COM jacks.                           |                                |                       | Roll command bar deflects right.                                                                                                                                                                   |
| 5.            | POSTTEST PROCEDURE                                                                               |                                |                       |                                                                                                                                                                                                    |
| 5.1           | 329A section<br><br>POWER section                                                                | POWER<br><br>115 VAC<br>28 VDC | OFF<br><br>OFF<br>OFF |                                                                                                                                                                                                    |
| 5.2           | Disconnect 329A from test set connecting cable.                                                  |                                |                       |                                                                                                                                                                                                    |

Table 3. Authorized Service Centers.

|                                                                                                                    |                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| UNITED STATES OF AMERICA                                                                                           |                                                                                                           |
| <u>ALASKA</u>                                                                                                      | Smith's Industries, Inc.<br>14180 Roosevelt Boulevard<br>Clearwater, Florida 33520                        |
| Alaskan Aircraft Equipment Supply, Inc.<br>4707 Spendard Drive<br>International Airport<br>Anchorage, Alaska 99503 | <u>ILLINOIS</u><br><br>Airesearch Aviation Co.<br>Capital Airport<br>Springfield, Illinois 62707          |
| <u>ARIZONA</u>                                                                                                     | Joliet Avionics, Inc.<br>DuPage County Airport<br>West Chicago, Illinois 60185                            |
| Cutter Aviation, Inc.<br>P.O. Box 20306<br>Phoenix, Arizona 85036                                                  | WSM Aero Instruments, Inc.<br>2100 East Pleasant Street<br>DeKalb, Illinois 60115                         |
| <u>CALIFORNIA</u>                                                                                                  | <u>INDIANA</u>                                                                                            |
| A.I.R. Corporation<br>401 McCormick Street<br>San Leandro, California 94577                                        | South Bend Aero Service, Inc.<br>1614 North Ryer Street<br>South Bend, Indiana 46628                      |
| Airstream Instrument Labs, Inc.<br>3605 East Spring<br>Long Beach, California 90806                                | <u>MICHIGAN</u>                                                                                           |
| A. Biederman, Inc.<br>1045 Air Way<br>Glendale, California 91201                                                   | Metro Aircraft Supply<br>2135 Airport Road<br>Pontiac, Michigan 48054                                     |
| Otto's Instrument Service, Inc.<br>Ontario International Airport<br>Ontario, California 91761                      | <u>MINNESOTA</u>                                                                                          |
| West Air Instrument Service<br>1611 McKinley Way<br>LaVerne, California 91750                                      | Williams Instrument Service Corporation<br>8001 Lea Road<br>Minneapolis, Minnesota 55438                  |
| <u>COLORADO</u>                                                                                                    | <u>NEW JERSEY</u>                                                                                         |
| Combs-Gates Denver, Inc.<br>Hangar 1<br>Stapleton International Airport<br>Denver, Colorado 80207                  | Consolidated Instrument Co., Inc.<br>Teterboro Airport<br>Teterboro, New Jersey 07068                     |
| <u>GEORGIA</u>                                                                                                     | <u>NEW YORK</u>                                                                                           |
| Barfield Instrument Corporation<br>1478 Central Avenue<br>East Point, Georgia 30344                                | Aero Instruments and Avionics<br>5 Ward Road<br>North Tonawanda, New York 14120                           |
| <u>FLORIDA</u>                                                                                                     | Hermetic Aircraft Instrument Corporation<br>200 Marine Street<br>Farmingdale, Long Island, New York 11735 |
| Aero Systems<br>Miami International Airport<br>P.O. Box 522221<br>Miami, Florida 33152                             | AAR Technical Service Center<br>25 Buena Vista Avenue<br>Long Island, New York 11559                      |
| Barfield Instrument Corporation<br>4101 N.W. 29th Street<br>Miami, Florida 33142                                   |                                                                                                           |

Table 3. Authorized Service Centers (Cont).

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><u>NEBRASKA</u></p> <p>Duncan Aviation<br/>Instrument Division<br/>P.O. Box 81887<br/>Lincoln, Nebraska 68501</p> <p><u>OREGON</u></p> <p>Western Skyways<br/>Portland/Troutdale Airport<br/>Troutdale, Oregon 97060</p> <p><u>PENNSYLVANIA</u></p> <p>Olmsted Instrument Company<br/>28 Fourth Street<br/>Harrisburg International Airport<br/>Middletown, Pennsylvania 17057</p> <p><u>TEXAS</u></p> <p>Castleberry Instruments &amp; Avionics<br/>Tims Airpark<br/>817 Dessau Road, Route 3<br/>Austin, Texas 78753</p> <p>Executive Instruments<br/>P.O. Box 216<br/>4141 Lindberg<br/>Addison, Texas 75001</p> <p>Instrument Specialties Company, Inc.<br/>P.O. Box 365<br/>1110 Stanley<br/>Euless, Texas 76039</p> <p>Masco Service Corporation<br/>9731 Denton Drive<br/>Dallas, Texas 75220</p> <p><u>WASHINGTON</u></p> <p>American Instruments, Inc.<br/>7001 Perimeter Road<br/>Boeing Field<br/>Seattle, Washington 98108</p> | <p><u>AUSTRALIA</u></p> <p>Airborne Accessories (Pty) Ltd.<br/>Building 107, Bankstown Airport<br/>Bankstown, N.S.W. 2200<br/>Australia</p> <p>N.I.C. Instrument Co.<br/>Matthews Avenue<br/>Airport West<br/>Victoria, 3042, Australia</p> <p>Skycom Electronics Pty., Ltd.<br/>Hangar 4, Archerfield Airport<br/>P.O. Box 168<br/>Rocklea, Queensland 4106<br/>Australia</p>                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><u>BRAZIL</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Aeronal Revisora de Instrumentos<br/>Aeronauticos Ltda.<br/>Av. Washington Luiz, 558<br/>Sao Paulo, S.P., Brasil</p> <p>"OLDI" Industrial Comercio de Instrumentos<br/>e Pecas de Avioes Ltda.<br/>Avenida Cruzeiro do Sul, 3573<br/>CEP 02031<br/>Santana<br/>Sao Paulo, S.P., Brasil</p> <p>Varig S.A. VIA &amp; AO Aerea Rio Grandense<br/>Aeroporto Salgado Filho<br/>Caixa Postal 234<br/>90 000 Porto Alegre, RS, Brasil</p>                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><u>CANADA</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p><u>AFRICA</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>Airborne Precision Instruments Ltd.<br/>Field Aviation Hangar<br/>International Airport<br/>Calgary, Alberta T2P 2G3<br/>Canada</p> <p>Aviation Electric Ltd., Pacific Division<br/>4820 Hoffer Street<br/>International Airport South<br/>Richmond, B.C. V7B 1B2<br/>Canada</p> <p>Bristow Instruments, Ltd.<br/>Hangar 6A<br/>25 Airport Road<br/>Edmonton Municipal Airport<br/>Edmonton, Alberta T5G 2Z3<br/>Canada</p> <p>Pacific Avionics<br/>530 Airport Road South<br/>Vancouver, B.C. V7H 1V4 Canada</p> |
| <p>Autair Helicopters (Africa) Ltd.<br/>P.O. Box 990<br/>Lusaka, Republic of Zambia</p> <p>Instrumentation Ltd.<br/>P.O. Box 44356<br/>Wilson Airport<br/>Nairobi, Kenya</p> <p>Placo Limited<br/>Rand Airport<br/>Box 4155, Germiston South<br/>Republic of South Africa</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Table 3. Authorized Service Centers (Cont).

| CANADA (Cont)                                                                                          | ITALY                                                                                                        |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Wright Instruments, Ltd.<br>2762 Slough Street<br>Mississauga, Ontario L4T 1G3<br>Canada               | O.S.A. Fileti<br>Viale di Villa Pamphili 15<br>Rome, Italy                                                   |
| DENMARK                                                                                                | JAPAN                                                                                                        |
| Avia Radio<br>Hangar 141<br>Copenhagen Airport<br>DK-2791, Dragoer, Denmark                            | Jupitor Corporation<br>3-17-4 Minami Aoyama<br>Minato-Ku<br>Tokyo, Japan                                     |
| ENGLAND                                                                                                | SWEDEN                                                                                                       |
| C.S.E. (Aircraft Services) Limited<br>Oxford Airport<br>Kidlington, Oxford, England                    | Dehnisch Flyplaninstrumentverkstad<br>Bromma Airport<br>S 161 10 Bromma<br>Stockholm, Sweden                 |
| FieldTech Limited<br>Heathrow Airport, London<br>Hounslow, Middlesex, England                          | SWITZERLAND                                                                                                  |
| Pandect Instrument Laboratories Ltd.<br>Wellington Road<br>High Wycombe, Bucks, England                | Air Maintenance SA<br>Neuchatel Airport<br>2013 Colombier<br>Neuchatel, Switzerland                          |
| FRANCE                                                                                                 | Flight Components AG<br>Flughafenstrasse 22<br>CH-8302 Kloten<br>Switzerland                                 |
| Avia Service<br>2, Rue de Mondorff<br>Rodemack 57570<br>Chattenom, France                              | Limess Aviation AG<br>Flughafenstrasse 22<br>CH-8302 Kloten<br>Switzerland                                   |
| Rousseau Aviation<br>B. P. 124<br>Dinard, France                                                       | Merag<br>Lanzenen 12<br>3800 Interlaken<br>Switzerland                                                       |
| GERMANY                                                                                                | SINGAPORE                                                                                                    |
| LFE Avionic Services<br>Luftfahrtelektronik Hamburg<br>2 Hamburg 63 Flughafen<br>Hamburg, West Germany | Singapore Electronic & Engineering (Private) Ltd.<br>Naval Base<br>Sembawang<br>P.O. Box 16<br>Singapore, 27 |
| DLE Luftfahrtelektronik Service GmbH<br>7570 Baden-Baden<br>Flugplatz Baden-Oos<br>West Germany        |                                                                                                              |
| WDL Werfbertrieb<br>Essen-Mulheim Airport<br>433 Mulheim/Ruhr<br>West Germany                          |                                                                                                              |



# 331P-1/1V

## Directional Gyro Indicator



**Rockwell  
International**

**maintenance**

Collins General Aviation Division

523-0764820-004118

4th Edition, 27 June 1984

Printed in USA

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## Record of Revisions

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ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
AND ENTER DATE INSERTED AND INITIALS.

[illegible]

# maintenance

## 1. GENERAL

This maintenance section provides a go/no-go test for the 331P-1/1V Directional Gyro Indicator. If the 331P-1/1V fails any portion of the test, return the unit for repair to one of the authorized service centers listed in table 3.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 autopilot test set, with the aid of a 323A-5 Flux Detector, is capable of testing the 331P-1/1V Directional Gyro Indicator independent of the remaining units in the low-profile flight control system. All 331P-1/1V and 323A-5 electrical power requirements for this test are supplied by the test set. The vacuum source for the 331P-1V unit is not supplied by the 972S-2.

### 3.2 Test Procedure

Perform the procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                        | MANUFACTURER AND PART NUMBER                                                                                   | POWER REQUIREMENTS        |
|----------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------|
| 972S-2 Test Set, Autopilot-Bench | Collins 622-1688-001                                                                                           | 115 V ac, 400 Hz; 28 V dc |
| Digital voltmeter                | Fluke model 8000A or equivalent                                                                                | 115 V ac, 60 Hz           |
| Vacuum source (331P-1V only)     | Specifications: vacuum source 4.5 to 5.2 inches of mercury, air consumption 2.2 cubic feet per minute maximum. |                           |
| 323A-5 Flux Detector             | Collins 270-2425-030                                                                                           |                           |

Table 2. 331P-1/1V Go/No-Go Test Procedure.

| TEST | PROCEDURE                          | 972S-2 TEST SET                        |                          | DESIRED RESULTS |
|------|------------------------------------|----------------------------------------|--------------------------|-----------------|
|      |                                    | SWITCH                                 | POSITION                 |                 |
| 1.   | PRETEST PROCEDURE                  |                                        |                          |                 |
| 1.1  | Initial test set switch positions: |                                        |                          |                 |
|      | Power section                      | 115 VAC<br>28 VDC                      | OFF<br>OFF               |                 |
|      | SPIN MOTOR CONTROL section         | POWER<br>VAR OUT<br>MOTOR<br>VOLT      | NORM<br>331P<br>NORM     |                 |
|      | 331P section                       | POWER<br>HDG SEL<br>HDG LOAD<br>327C-3 | OFF<br>LCL<br>LCL<br>LCL |                 |

Table 2. 331P-1/1V Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 972S-2 TEST SET                        |                            | DESIRED RESULTS                                                                                                                                                                                                                                                                                                                               |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SWITCH                                 | POSITION                   |                                                                                                                                                                                                                                                                                                                                               |
| 1.2  | <p>Connect the 323A-5 Flux Detector to the 323A-5 cable on the test set. Position the flux detector with the mounting flange horizontal and the flat side facing up.</p> <p><b>Note</b></p> <p>A convenient mount can be made from a small box with a 3-inch diameter hole in the top for the 323A-5.</p>                                                                                                                                                                                                                                                                                                                    |                                        |                            |                                                                                                                                                                                                                                                                                                                                               |
| 1.3  | <p>Connect the 331P-1/1V to the 331P cable on the test set.</p> <p>Connect the 331P-1/1V lighting pigtails to the 28V LTG posts on the test set.</p> <p>Connect the 331P-1V to the vacuum source.</p>                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                            |                                                                                                                                                                                                                                                                                                                                               |
| 1.4  | <p>Apply power as follows:</p> <p>POWER section</p> <p>331P section</p> <p>Apply power to the vacuum source (331P-1V only).</p> <p><b>Note</b></p> <p>Delay 3 minutes minimum before continuing with next test.</p>                                                                                                                                                                                                                                                                                                                                                                                                          | <p>115 VAC<br/>28 VDC</p> <p>POWER</p> | <p>ON<br/>ON</p> <p>ON</p> | <p>Gyro flag disappears from view (331P-1 only). Instrument light comes on.</p>                                                                                                                                                                                                                                                               |
| 1.5  | <p>Push and turn the PUSH knob to set the zero mark on the compass card under the lubber line.</p> <p>Orient the forward index line on the flux detector toward north while monitoring the dc voltage at the SLAVE IND jacks on the test set. If the voltage is positive, rotate the flux detector clockwise to obtain <math>0 \pm 200</math> mV dc. If the voltage is negative, rotate the flux detector counterclockwise.</p> <p><b>Note</b></p> <p>The flux detector is influenced by stray magnetic fields. Therefore the apparent north obtained in this step may deviate from true north by a considerable amount.</p> |                                        |                            | <p>The zero on the compass card is aligned under the lubber line and the dc voltage at the SLAVE IND jacks is <math>0 \pm 200</math> mV dc.</p> <p><b>Note</b></p> <p>Once the above alignment has been achieved, do not change the position of either the 323A-5 or the 331P-1/1V unless instructed to do so during the following tests.</p> |

Table 2. 331P-1/1V Go/No-Go Test Procedure (Cont).

| TEST              | PROCEDURE                                                                                                                                                               | 972S-2 TEST SET                |                       | DESIRED RESULTS                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                                                                                                                                                                         | SWITCH                         | POSITION              |                                                                                                                                               |
| 2.                | HEADING TEST                                                                                                                                                            |                                |                       |                                                                                                                                               |
| 2.1               | Measure the voltage at the 26 VAC REF jacks.                                                                                                                            |                                |                       | 26 V ac. If measured voltage differs from nominal, the desired results in steps 2.2 thru 2.4 must be adjusted proportional to the difference. |
| 2.2               | Adjust HDG knob to align the heading select bug with the lubber line.                                                                                                   |                                |                       | 200 mV ac maximum at HEADING jacks (orange/white).                                                                                            |
| 2.3               | Adjust HDG knob to position heading select bug at 030°.                                                                                                                 |                                |                       | 5.6 to 6.2 V ac at HEADING jacks (orange/white).                                                                                              |
| 2.4               | Adjust HDG knob to position heading select bug at 330°.                                                                                                                 |                                |                       | 5.6 to 6.2 V ac at HEADING jacks (orange/white).                                                                                              |
| 3.                | SLAVING TEST                                                                                                                                                            |                                |                       |                                                                                                                                               |
| 3.1               | Reset heading select bug at 0°. With PUSH knob, set compass card at 030° and measure time required for compass card to rotate to 020° position.                         |                                |                       | 2 to 8 minutes.                                                                                                                               |
| 3.2               | Set compass card at 330° and measure time required for compass card to rotate to 340° position.                                                                         |                                |                       | 2 to 8 minutes.                                                                                                                               |
| 4.                | GYRO MOTOR TEST                                                                                                                                                         |                                |                       |                                                                                                                                               |
| 4.1<br><br>(Cont) | Set SPIN MOTOR CONTROL section switches.<br><br>Set MOTOR ADJUST control for 92 V ac between the right MON jack and the COM jack. Measure ac voltage between MON jacks. | POWER<br>MOTOR VOLT            | MON<br>VAR            | 1.25 V ac maximum.                                                                                                                            |
| 5.                | POSTTEST PROCEDURE                                                                                                                                                      |                                |                       |                                                                                                                                               |
| 5.1               | 331P section<br><br>POWER section                                                                                                                                       | POWER<br><br>115 VAC<br>28 VDC | OFF<br><br>OFF<br>OFF |                                                                                                                                               |
| 5.2               | Disconnect the 331P-1/1V from the test set cable.                                                                                                                       |                                |                       |                                                                                                                                               |

Table 3. Authorized Service Centers.

|                                                                                                                   |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| UNITED STATES OF AMERICA                                                                                          |                                                                                                           |
| <u>ALASKA</u>                                                                                                     | Smith's Industries, Inc.<br>14180 Roosevelt Boulevard<br>Clearwater, Florida 33520                        |
| Alaskan Aircraft Equipment Supply, Inc.<br>4707 Spenard Drive<br>International Airport<br>Anchorage, Alaska 99503 | <u>ILLINOIS</u>                                                                                           |
| <u>ARIZONA</u>                                                                                                    | Airesearch Aviation Co.<br>Capital Airport<br>Springfield, Illinois 62707                                 |
| Cutter Aviation, Inc.<br>P.O. Box 20306<br>Phoenix, Arizona 85036                                                 | Joliet Avionics, Inc.<br>DuPage County Airport<br>West Chicago, Illinois 60185                            |
| <u>CALIFORNIA</u>                                                                                                 | WSM Aero Instruments, Inc.<br>2100 East Pleasant Street<br>DeKalb, Illinois 60115                         |
| A.I.R. Corporation<br>401 McCormick Street<br>San Leandro, California 94577                                       | <u>INDIANA</u>                                                                                            |
| Airstream Instrument Labs, Inc.<br>3605 East Spring<br>Long Beach, California 90806                               | South Bend Aero Service, Inc.<br>1614 North Ryer Street<br>South Bend, Indiana 46628                      |
| A. Biederman, Inc.<br>1045 Air Way<br>Glendale, California 91201                                                  | <u>MICHIGAN</u>                                                                                           |
| Otto's Instrument Service, Inc.<br>Ontario International Airport<br>Ontario, California 91761                     | Metro Aircraft Supply<br>2135 Airport Road<br>Pontiac, Michigan 48054                                     |
| West Air Instrument Service<br>1611 McKinley Way<br>LaVerne, California 91750                                     | <u>MINNESOTA</u>                                                                                          |
| <u>COLORADO</u>                                                                                                   | Williams Instrument Service Corporation<br>8001 Lea Road<br>Minneapolis, Minnesota 55438                  |
| Combs-Gates Denver, Inc.<br>Hangar 1<br>Stapleton International Airport<br>Denver, Colorado 80207                 | NEW JERSEY                                                                                                |
| <u>GEORGIA</u>                                                                                                    | Consolidated Instrument Co., Inc.<br>Teterboro Airport<br>Teterboro, New Jersey 07068                     |
| Barfield Instrument Corporation<br>1478 Central Avenue<br>East Point, Georgia 30344                               | <u>NEW YORK</u>                                                                                           |
| <u>FLORIDA</u>                                                                                                    | Aero Instruments and Avionics<br>5 Ward Road<br>North Tonawanda, New York 14120                           |
| Aero Systems<br>Miami International Airport<br>P.O. Box 522221<br>Miami, Florida 33152                            | Hermetic Aircraft Instrument Corporation<br>200 Marine Street<br>Farmingdale, Long Island, New York 11735 |
| Barfield Instrument Corporation<br>4101 N.W. 29th Street<br>Miami, Florida 33142                                  | AAR Technical Service Center<br>25 Buena Vista Avenue<br>Long Island, New York 11559                      |

Table 3. Authorized Service Centers (Cont).

|                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNITED STATES OF AMERICA (Cont)                                                                                                                                                                                                                                                                                                                                                                 | Placo Limited<br>Rand Airport<br>Box 4155, Germiston South<br>Republic of South Africa                                                                                                                                                                                                                                                                                                                          |
| <u>NEBRASKA</u><br><br>Duncan Aviation<br>Instrument Division<br>P.O. Box 81887<br>Lincoln, Nebraska 68501                                                                                                                                                                                                                                                                                      | AUSTRALIA                                                                                                                                                                                                                                                                                                                                                                                                       |
| <u>OREGON</u><br><br>Western Skyways<br>Portland/Troutdale Airport<br>Troutdale, Oregon 97060                                                                                                                                                                                                                                                                                                   | Airborne Accessories (Pty) Ltd.<br>Building 107, Bankstown Airport<br>Bankstown, N.S.W. 2200<br>Australia                                                                                                                                                                                                                                                                                                       |
| <u>PENNSYLVANIA</u><br><br>Olmsted Instrument Company<br>28 Fourth Street<br>Harrisburg International Airport<br>Middletown, Pennsylvania 17057                                                                                                                                                                                                                                                 | N.I.C. Instrument Co.<br>Matthews Avenue<br>Airport West<br>Victoria, 3042, Australia                                                                                                                                                                                                                                                                                                                           |
| <u>TEXAS</u><br><br>Castleberry Instruments & Avionics<br>Tims Airpark<br>817 Dessau Road, Route 3<br>Austin, Texas 78753<br><br>Executive Instruments<br>P.O. Box 216<br>4141 Lindberg<br>Addison, Texas 75001<br><br>Instrument Specialties Company, Inc.<br>P.O. Box 365<br>1110 Stanley<br>Euless, Texas 76039<br><br>Masco Service Corporation<br>9731 Denton Drive<br>Dallas, Texas 75220 | Skycom Electronics Pty., Ltd.<br>Hangar 4, Archerfield Airport<br>P.O. Box 168<br>Rocklea, Queensland 4106<br>Australia                                                                                                                                                                                                                                                                                         |
| <u>WASHINGTON</u><br><br>American Instruments, Inc.<br>7001 Perimeter Road<br>Boeing Field<br>Seattle, Washington 98108                                                                                                                                                                                                                                                                         | BRAZIL                                                                                                                                                                                                                                                                                                                                                                                                          |
| AFRICA                                                                                                                                                                                                                                                                                                                                                                                          | Aeronal Revisora de Instrumentos<br>Aeronauticos Ltda.<br>Av. Washington Luiz, 558<br>Sao Paulo, S.P., Brasil<br><br>"OLDI" Industrial Comercio de Instrumentos<br>e Pecas de Avioes Ltda.<br>Avenida Cruzeiro do Sul, 3573<br>CEP 02031<br>Santana<br>Sao Paulo, S.P., Brasil<br><br>Varig S.A. VIA & AO Aerea Rio Grandense<br>Aeroporto Salgado Filho<br>Caixa Postal 234<br>90 000 Porto Alegre, RS, Brasil |
| Autair Helicopters (Africa) Ltd.<br>P.O. Box 990<br>Lusaka, Republic of Zambia<br><br>Instrumentation Ltd.<br>P.O. Box 44356<br>Wilson Airport<br>Nairobi, Kenya                                                                                                                                                                                                                                | CANADA                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                 | Airborne Precision Instruments Ltd.<br>Field Aviation Hangar<br>International Airport<br>Calgary, Alberta T2P 2G3<br>Canada<br><br>Aviation Electric Ltd., Pacific Division<br>4820 Hoffar Street<br>International Airport South<br>Richmond, B.C. V7B 1B2<br>Canada                                                                                                                                            |

Table 3. Authorized Service Centers (Cont).

|                                                                                                                                |                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| CANADA (Cont)                                                                                                                  | WDL Werfbertrieb<br>Essen-Mulheim Airport<br>433 Mulheim/Ruhr<br>West Germany                                |
| Bristow Instruments, Ltd.<br>Hangar 6A<br>25 Airport Road<br>Edmonton Municipal Airport<br>Edmonton, Alberta T5G 2Z3<br>Canada | ITALY                                                                                                        |
| Pacific Avionics<br>530 Airport Road South<br>Vancouver, B.C. V7H 1V4 Canada                                                   | O.S.A. Fileti<br>Viale di Villa Pamphili 15<br>Rome, Italy                                                   |
| Wright Instruments, Ltd.<br>2762 Slough Street<br>Mississauga, Ontario L4T 1G3<br>Canada                                       | JAPAN                                                                                                        |
|                                                                                                                                | Jupiter Corporation<br>3-17-4 Minami Aoyama<br>Minato-Ku<br>Tokyo, Japan                                     |
| DENMARK                                                                                                                        | SWEDEN                                                                                                       |
| Avia Radio<br>Hangar 141<br>Copenhagen Airport<br>DK-2791, Dragoer, Denmark                                                    | Dehnisch Flyplaninstrumentverkstad<br>Bromma Airport<br>S 161 10 Bromma<br>Stockholm, Sweden                 |
| ENGLAND                                                                                                                        | SWITZERLAND                                                                                                  |
| C.S.E. (Aircraft Services) Limited<br>Oxford Airport<br>Kidlington, Oxford, England                                            | Air Maintenance SA<br>Neuchatel Airport<br>2013 Colombier<br>Neuchatel, Switzerland                          |
| FieldTech Limited<br>Heathrow Airport, London<br>Hounslow, Middlesex, England                                                  | Flight Components AG<br>Flughafenstrasse 22<br>CH-8302 Kloten<br>Switzerland                                 |
| Pandect Instrument Laboratories Ltd.<br>Wellington Road<br>High Wycombe, Bucks, England                                        | Limes Aviation AG<br>Flughafenstrasse 22<br>CH-8302 Kloten<br>Switzerland                                    |
| FRANCE                                                                                                                         | Merag<br>Lazenen 12<br>3800 Interlaken<br>Switzerland                                                        |
| Avia Service<br>2, Rue de Mondorff<br>Rodemack.57570<br>Chattenom, France                                                      | SINGAPORE                                                                                                    |
| Rousseau Aviation<br>B.P. 124<br>Dinard, France                                                                                | Singapore Electronic & Engineering (Private) Ltd.<br>Naval Base<br>Sembawang<br>P.O. Box 16<br>Singapore, 27 |
| GERMANY                                                                                                                        |                                                                                                              |
| LFE Avionics Services<br>Luftfahrtelektronik Hamburg<br>2 Hamburg 63 Flughafen<br>Hamburg, West Germany                        |                                                                                                              |
| DLE Luftfahrtelektronik Service GmbH<br>7570 Baden-Baden<br>Flugplatz Baden-00s<br>West Germany                                |                                                                                                              |





**Rockwell  
International**

**maintenance**

Collins General Aviation Division

523-0764821-004118

4th Edition, 27 June 1984

# 323A-5 Flux Detector

Printed in USA

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**NOTICE:** This section replaces third edition dated 1 March 1980.

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## Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.  
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
AND ENTER DATE INSERTED AND INITIALS.

[illegible]

# maintenance

## 1. GENERAL

This maintenance section provides a go/no-go test for the 323A-5 Flux Detector. If the 323A-5 fails any portion of the test, contact Aviation Instrument Manufacturing Corp., 817 Dessau Rd., Austin, Texas 78753 for authorization to return for repair.

## 2. TEST EQUIPMENT REQUIRED

Test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                            | MANUFACTURER AND PART NUMBER    | POWER REQUIREMENTS      |
|--------------------------------------|---------------------------------|-------------------------|
| 972S-2 Test Set, Autopilot Bench     | Collins 622-1668-001            | 28 Vdc; 115 Vac, 400 Hz |
| 331P-1/1V Directional Gyro Indicator | Collins 270-2425-010/020        |                         |
| Digital voltmeter                    | Fluke model 8000A or equivalent | 115 Vac, 60 Hz          |

Table 2. 323A-5 Go/No-Go Test Procedure.

| TEST | PROCEDURE                                                                                                                                                                                                                                                        | 972S-2 TEST SET                |                               | DESIRED RESULTS |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------|
|      |                                                                                                                                                                                                                                                                  | SWITCH                         | POSITION                      |                 |
| 1.   | PRETEST PROCEDURE                                                                                                                                                                                                                                                |                                |                               |                 |
| 1.1  | Position 331P section switches.                                                                                                                                                                                                                                  | 327C-3<br>HDG LOAD<br>HDG SEL  | LCL<br>LCL<br>Not significant |                 |
| 1.2  | Position SPIN MOTOR CONTROL section switches.                                                                                                                                                                                                                    | POWER<br>VAR OUT<br>MOTOR VOLT | NORM<br>331P<br>NORM          |                 |
| 1.3  | Connect 323A-5 Flux Detector to the test set 323A-5 connecting cable.                                                                                                                                                                                            |                                |                               |                 |
| 1.4  | Connect 331P-1/1V Directional Gyro Indicator to test set 331P-1/1V connecting cables.<br><br><div style="border: 1px solid black; padding: 2px; display: inline-block;">Note</div><br>For 331P-1V only: connect vacuum source to the directional gyro indicator. |                                |                               |                 |

Table 2. 323A-5 Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                 | 972S-2 TEST SET                |                       | DESIRED RESULTS                                                                    |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|------------------------------------------------------------------------------------|
|      |                                                                                                                                                           | SWITCH                         | POSITION              |                                                                                    |
| 1.5  | Apply power<br>POWER section<br><br>331P section                                                                                                          | 115 VAC<br>28 VDC<br><br>POWER | ON<br>ON<br><br>ON    |                                                                                    |
| 1.5a | 331P-1V only: vacuum source<br><br><div>Caution</div><br>Delay 3 minutes minimum before continuing.                                                       | POWER                          | ON                    |                                                                                    |
|      | <div>Note</div><br>The 323A-5 will be influenced by stray magnetic fields. Isolate, to the extent possible, the 323A-5 from wires carrying heavy current. |                                |                       |                                                                                    |
| 1.6  | Orient the forward index of the 323A-5 to north.                                                                                                          |                                |                       |                                                                                    |
| 1.7  | Use the PUSH knob to fast slave the compass card to 0°.                                                                                                   |                                |                       | Align 0° on compass card with the lubber line.                                     |
| 2.   | TEST                                                                                                                                                      |                                |                       |                                                                                    |
| 2.1  | Adjust PUSH knob to rotate compass card 30° minimum in a cw direction.                                                                                    |                                |                       | Compass card will slave in the ccw direction at a rate of 3° per 54 to 66 seconds. |
| 2.2  | Adjust PUSH knob to rotate compass card 30° minimum in a ccw direction.                                                                                   |                                |                       | Compass card will slave in a cw direction at a rate of 3° per 54 to 66 seconds.    |
| 3.   | POSTTEST PROCEDURE                                                                                                                                        |                                |                       |                                                                                    |
| 3.1  | 331P section<br><br>POWER section                                                                                                                         | POWER<br><br>115 VAC<br>28 VDC | OFF<br><br>OFF<br>OFF |                                                                                    |
| 3.2  | Disconnect the 323A-5 and 331P-1/1V from the test setup.                                                                                                  |                                |                       |                                                                                    |

# 327C-3

## Slaving Indicator



Rockwell  
International

**maintenance**

Collins General Aviation Division

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**NOTICE:** This section replaces second edition dated 1 March 1980.

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## Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.  
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,  
AND ENTER DATE INSERTED AND INITIALS.

[illegible]

# maintenance

## 1. GENERAL

This maintenance section provides a functional go/no-go test for the 327C-3 Slaving Indicator. If the 327C-3 fails any portion of the test, it is defective and must be replaced.

## 2. TEST EQUIPMENT REQUIRED

The test equipment listed in table 1 is required to perform the procedures given in this section.

## 3. TESTING

### 3.1 General

The 972S-2 autopilot test set is capable of testing the 327C-3 Slaving Indicator independent of other units in the AP-106/AP-107 Flight Control System. All 327C-3 power requirements for this test are supplied by the test set.

### 3.2 Test Procedures

Perform the test procedures given in table 2.

Table 1. Test Equipment Required.

| EQUIPMENT                        | MANUFACTURER AND PART NUMBER     | POWER REQUIREMENTS      |
|----------------------------------|----------------------------------|-------------------------|
| 972S-2 Test Set, Autopilot-Bench | Collins part number 622-1668-001 | 115 Vac, 400 Hz; 28 Vdc |
| Digital voltmeter                | Fluke model 8000A or equivalent  | 115 Vac, 60 Hz          |

Table 2. Go/No-Go Test Procedure.

| TEST | PROCEDURE                                                                                                                                                                                                                                           | 972S-2 TEST SET |          | DESIRED RESULTS                                                                                     |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------------------------------------------------------------------------------------------|
|      |                                                                                                                                                                                                                                                     | SWITCH          | POSITION |                                                                                                     |
| 1.   | PRETEST PROCEDURE                                                                                                                                                                                                                                   |                 |          |                                                                                                     |
|      | <div>Caution</div> <p>The upper range of the variable dc source provided for this test exceeds full scale deflection of the slaving indicator. Damage to the slaving indicator is possible if the following procedure is not strictly followed.</p> |                 |          |                                                                                                     |
| 1.1  | Set 329A test switch.                                                                                                                                                                                                                               | IND             | LCL      | <div>Note</div> <p>The COMMAND BAR PITCH LCL serves only as a variable dc source for this test.</p> |
| 1.2  | Apply power.                                                                                                                                                                                                                                        | 115 VAC         | ON       |                                                                                                     |

Table 2. Go/No-Go Test Procedure (Cont).

| TEST | PROCEDURE                                                                                                                                                                                                                          | 972S-2 TEST SET |          | DESIRED RESULTS |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|-----------------|
|      |                                                                                                                                                                                                                                    | SWITCH          | POSITION |                 |
| 2.   | SLAVING INDICATOR TEST                                                                                                                                                                                                             |                 |          |                 |
| 2.1  | Connect red (high) voltmeter lead to COMMAND BAR PITCH (red) test point. Connect black (low) voltmeter lead to COMMAND BAR COM (black) test point.                                                                                 |                 |          |                 |
| 2.2  | Adjust PITCH POT for null.                                                                                                                                                                                                         |                 |          | 0 V dc          |
| 2.3  | Remove voltmeter leads from COMMAND BAR test points. Connect slaving indicator positive (+) terminal to COMMAND BAR PITCH (red) test point. Connect slaving indicator negative (-) terminal to COMMAND BAR COM (black) test point. |                 |          |                 |
| 2.4  | Rotate PITCH POT in a cw direction for full scale (.) deflection of slaving indicator. Measure voltage applied to indicator.                                                                                                       |                 |          | +5 V dc         |
| 2.5  | Rotate PITCH POT in a ccw direction for full scale (+) deflection of slaving indicator. Measure voltage applied to indicator.                                                                                                      |                 |          | -5 V dc         |
| 3.   | POSTTEST PROCEDURE                                                                                                                                                                                                                 |                 |          |                 |
| 3.1  | Remove power.                                                                                                                                                                                                                      | 115 VAC         | OFF      |                 |
| 3.2  | Disconnect 327C-3 from test set.                                                                                                                                                                                                   |                 |          |                 |
|      |                                                                                                                                                                                                                                    |                 |          |                 |



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June 20/90

**REVISION NO. 1  
TO  
AP-106 SERVICE INFORMATION LETTER 5-81**

Attached is a revised issue of AP-106 Service Information Letter 5-81 titled, "System Installation in the Piper PA-42 Cheyenne-3 Aircraft", originally dated July 1, 1981.

The purpose of this revision is to add an output voltage on the RUD PROGRAMMER GAIN A6R2 Function Adjust during 161H-1 calibration and to correct the "measure at" test jack for the Roll Hold Drift A4R10 during 562C-13A calibration.

Black bars in the margin indicate where the changes are made. This revised issue completely replaces the original.

Publications Department



**AP-106 FLIGHT CONTROL SYSTEM**

162869

**REVISION NO. 1  
TO  
SERVICE INFORMATION LETTER 5-81****SYSTEM INSTALLATION IN THE PIPER PA-42 CHEYENNE-3 AIRCRAFT**

This service information letter contains the calibration, strapping, and installation information necessary to install an AP-106 Autopilot System in the Piper PA-42 Aircraft. Additional information for calibrating, strapping, and installation is contained in Volume 1 of the AP-106 Flight Control System Instruction Book and in the installation drawing information associated with the factory TC.

**EQUIPMENT LIST**

| UNIT     | COLLINS<br>PART NUMBER | FUNCTION            | LOCATION<br>IN AIRCRAFT |
|----------|------------------------|---------------------|-------------------------|
| 334C-11  | 622-2733-001           | Aileron Servo       | AFT Floorboard          |
| 334C-11  | 622-2733-001           | Elevator Servo      | AFT Floorboard          |
| 334C-11  | 622-2733-002           | Rudder Servo        | AFT Floorboard          |
| 334D-6   | 622-0965-008           | Trim Servo          | AFT Fuselage            |
| 562C-13A | 622-3595-001           | Computer            | AFT Floorboard          |
| 614E-41A | 622-3246-001           | Pitch/Turn Control  | Pedestal                |
| 614E-42A | 622-3891-001           | Control             | Pedestal                |
| 590A-6   | 229-9015-010           | Altitude Control    | Nose Compartment        |
| 590B-3   | 229-9016-010           | Airspeed Sensor     | Nose Compartment        |
| 329T-1   | 270-2424-010           | Turn and Slip       | Instrument Panel C.P.   |
| 161H-1   | 622-1036-001           | Programmer          | Nose Compartment        |
| 454N-2D  | 622-5375-004           | Pitch Monitor       | AFT Floorboard          |
| 998E-1   | 622-4217-001           | Annunciator Adapter | AFT Floorboard          |
| 454N-3   | 622-2814-001           | Trim Monitor        | AFT Floorboard          |

**Note**

Read entire service information letter and Volume 1 of the AP-106/107 Flight Control Instruction book, system maintenance section on 913K-1A/562C-13A adjustment procedure before making any adjustments.

## SERVICE INFORMATION LETTER 5-81

### PIPER PA-42 AIRCRAFT

#### SERVO TORQUES

Nominal pinion output torques as measured using 960M-3 balance beam and the procedures described in the instruction book.

|             |
|-------------|
| <b>Note</b> |
|-------------|

Capstan output torque will be 5 times greater.

Aileron: 10.0 lb•in

Elevator: 6.3 lb•in

Rudder: 23.2 lb•in

#### CAPSTAN SLIP CLUTCH TORQUES

Nominal slip clutch torques as measured using Capstan Test Fixture and the procedures described in the instruction book.

|             |
|-------------|
| <b>Note</b> |
|-------------|

Capstan output torque will be 5 times greater.

Aileron: 14.0 lb•in

Elevator: 9.0 lb•in

Rudder: 32.0 lb•in

#### SERVO BRIDLE CABLE TENSIONS

Aileron: 15 ±3 lb

Elevator: 15 ±3 lb

Rudder: 15 ±3 lb

Trim: 14 ±2 lb

#### AIRCRAFT PRIMARY CONTROL CABLES

Refer to appropriate aircraft service manual.

## SERVICE INFORMATION LETTER 5-81

### PIPER PA-42 AIRCRAFT

#### 562C-13A CALIBRATION

##### Note

Use 972S-1 Test Set and AP-106/107 Flight Control System Instruction Book, Volume 1, system maintenance section on the 913K-1A, 562C-13A, 329T-1 and 161H-1 gain adjustment procedures.

##### Caution

Prevent equipment damage by not inserting probes more than 1/4 inch into test jacks or by not shorting against case.

##### Note

ROLL TRIM, ROLL GAIN, HDG ANLG, and PITCH ANLG entries below may be readjusted under simulated or actual flight conditions for more refined calibrations.

| ADJUST                             | INPUT  | OUTPUT<br>200mV/DEG VG   | MEASURE AT   |
|------------------------------------|--------|--------------------------|--------------|
| ROLL TRIM A2R9                     | 0 V ac | 0 $\pm$ 0.1 V dc         | 972S-1 J28   |
| ROLL GAIN A2R5                     | 1 V ac | 0.75 $\pm$ 0.075 V dc    | 972S-1 J28   |
| ROLL HOLD DRIFT A4R10              | 0 V ac | 10 mV/min max            | 972S-1 J43   |
| AIL CMD GAIN A4R36                 | 1 V ac | 1.9 V dc $\pm$ 0.19 V dc | 972S-1 J43   |
| ROLL RATE GAIN A4R31               | 1 V ac | 2.5 V dc $\pm$ 0.2 V dc  | 972S-1 J43   |
| HDG ANLG A2R36:<br>(200 mV/deg DG) | 2 V ac | 1.0 $\pm$ 0.1 V dc       | 562C-13A TP5 |
| (300 mV/deg DG)                    | 3 V ac | 1.0 $\pm$ 0.1 V dc       |              |
| PITCH HOLD DRIFT A1R84             | 0 V ac | 10 mV/min max            | 972S-1 J29   |
| ELEV CMD GAIN A1R38                | 1 V ac | 3.5 V dc $\pm$ 0.3 V dc  | 972S-1 J61   |
| PITCH RATE GAIN A1R45              | 1 V ac | 3.9 V dc $\pm$ 0.3 V dc  | 972S-1 J61   |
| GO AROUND PITCH UP A1R29           | 0 V ac | 1.3 V dc $\pm$ 0.1 V dc  | 972S-1 J29   |
| UP ELEV A1R3                       | 5 V ac | 0.3 V dc $\pm$ 0.03 V dc | 972S-1 J61   |
| VERT GAIN A1R83                    | 1 V dc | 0.4 V dc $\pm$ 0.04 V dc | 972S-1 J29   |

# SERVICE INFORMATION LETTER 5-81

## PIPER PA-42 AIRCRAFT

| FUNCTION ADJUST            | INPUT    | OUTPUT<br>200 mV/DEG VG         |
|----------------------------|----------|---------------------------------|
| MANUAL ELECTRIC TRIM SPEED |          | 6 sec/rev of trim wheel         |
| TRIM GAIN A4R107           | 2.0 V dc | 52 sec/rev of trim wheel        |
| MAX DUTY CYCLE A4R11       | 20 V dc  | 8 sec/rev $\pm 1$ of trim wheel |

### Note

1. Verify that excessive drag does not exist in the aircraft manual trim system before checking manual electric and autopilot trim speeds.
2. Aircraft dc bus voltage must be  $27.5 \pm 1.0$  V dc when checking manual electric and autopilot trim speeds.
3. Always verify manual electric trim speed prior to adjusting autopilot trim gain and autopilot trim duty cycle.

### 329T-1 CALIBRATION

| FUNCTION ADJUST | INPUT    | OUTPUT<br>200 mV/DEG VG | MEASURE AT |
|-----------------|----------|-------------------------|------------|
| RUD CMD GAIN    | 5 V ac   | 2.0 V dc                | 972S-1 J54 |
| 329T-1 R16      | 2.5 V ac | 1.0 V dc                |            |

### 161H-1 CALIBRATION

| FUNCTION ADJUST          | INPUT              | OUTPUT<br>200 mV/DEG VG | MEASURE AT        |
|--------------------------|--------------------|-------------------------|-------------------|
| AIL PROGRAMMER GAIN A6R1 | 6.5 V dc           | 5.0 V dc $\pm 0.5$ V dc | 972S-1 J60        |
| ELE PROGRAMMER GAIN A6R3 | 6.5 V dc           | 5.0 V dc $\pm 0.5$ V dc | 972S-1 J80        |
| RUD PROGRAMMER GAIN A6R2 | 6.5 V dc           | 5.0 V dc $\pm 0.5$ V dc | 972S-1 J59        |
| AIS GAIN A6R4            | $\Delta 0.65$ V dc | 2.5 V dc                | 872S-1 J66 to J67 |
| V/L DEV CENTERING A4R25  | 0 V dc             | 0 $\pm 0.005$ V dc      | 972S-1 J48 to J49 |
| GS DEV CENTERING A5R32   | 0 V dc             | 0 $\pm 0.005$ V dc      | 972S-1 J46 to J47 |

## SERVICE INFORMATION LETTER 5-81

### PIPER PA-42 AIRCRAFT

#### SERVO CONNECTIONS

| FUNCTION             | 329T-1 | 562C-13A | 161H-1 | SERVO    |
|----------------------|--------|----------|--------|----------|
|                      |        |          |        | Aileron  |
| AILERON COMMAND      |        |          | J1-52  | C        |
| AILERON COMMAND      |        |          | J1-51  | D        |
|                      |        |          |        | Elevator |
| ELEVATOR COMMAND     |        |          | J1-29  | C        |
| ELEVATOR COMMAND     |        |          | J1-31  | D        |
| ELEVATOR FORCE(TRIM) |        | J2-11    |        | P        |
| ELEVATOR FORCE(TRIM) |        | J2-12    |        | R        |
|                      |        |          |        | Rudder   |
| RUDDER COMMAND       |        |          | J1-20  | C        |
| RUDDER COMMAND       |        |          | J1-23  | D        |
|                      |        |          |        | Trim     |
| ELEC TRIM + UP       |        |          |        | G        |
| ELEC TRIM - UP       |        |          |        | D        |
| ELEC TRIM + DN       |        |          |        | E        |
| ELEC TRIM - DN       |        |          |        | H        |

**Note**

For additional information, refer to the installation drawings.

#### REQUIRED SERVICE BULLETINS:

329T-1 Service Bulletin No. 2  
562C-13A Service Bulletin No. 1  
334C-11 Service Bulletin No. 1  
334D-6 Service Bulletin No. 3,5,6,8,9  
162H-1 Service Bulletin No. 1-3,5,6,8-12,14  
590A-6 Service Bulletin No. 1-4  
454N-3 Service Bulletin No. 1-3  
614E-41A Service Bulletin No.1

**Note**

Other service bulletins contain desirable modifications. For further information refer to other service bulletins on the respective units.

# **SERVICE INFORMATION LETTER 5-81**

## **PIPER PA-42 AIRCRAFT**

### **SPECIAL NOTES**

#### **562C-13A STRAPPING:**

Short Trim Delay strap A4, B-C, E-F  
Slow Roll Rate strap A4, H-J  
External NAV Capture strap A5, A-B  
Go Around From APPR/BC strap A5, D-E  
Normal Monitor strap A2, A-C

For ac middle marker strap A1, A-B  
For dc middle marker strap A1, A-C  
To enable IAS mode (AP-106) strap A1, D-E  
For +28 V dc LOC freq logic strap A3, A-C  
For negative ground LOC strap A3, A-B  
No NAV Flag strap A3, D-E

#### **161H-1 STRAPPING:**

For use with ALT-50 Radio Altimeter strap 161H-1, A5, A-B  
For use with AL-101 Radio Altimeter strap 161H-1, A5, B-C  
For negative ground LOC freq logic strap 161H-1, A4, A-B



**Rockwell-  
Collins****SERVICE INFORMATION LETTER**

Collins General Aviation Division/Rockwell International

161026

## AP-106 LOW PROFILE FLIGHT CONTROL SYSTEM

## SERVICE INFORMATION LETTER 2-83

SYSTEM INSTALLATION IN THE SWEARINGEN SA-227AT AND  
SA-227AC MERLIN IV/METRO III AIRCRAFT

This service information letter contains the calibration, strapping, and installation information necessary to install an AP-106 Autopilot System in the SA-227AT and SA-227AC Merlin IV/Metro III aircraft. Additional information for calibration, strapping, and installation is contained in Volume I of the AP-106/107 Flight Control System instruction book and in the installation drawing information associated with the Supplemental Type Certification Numbers for the SA-227AT/Merlin IV (STC SA1684CE) and SA-227AC Metro III (STC SA1683CE).

EQUIPMENT LIST

| <u>UNIT</u> | <u>COLLINS<br/>PART NUMBER</u> | <u>FUNCTION</u>    | <u>LOCATION IN AIRCRAFT</u>     |
|-------------|--------------------------------|--------------------|---------------------------------|
| 334C-9A     | 622-2366-002                   | Aileron Servo      | FS 355 Under center floor-board |
| 334C-11     | 622-2733-009                   | Elevator Servo     | FS 552 Rear Equipment Shelf Aft |
| 334C-9A     | 622-2366-002                   | Rudder Servo       | FS 600 Aft Fuselage             |
| 699K-2      | 622-1816-001                   | Trim Adapter       | FS 69 Nose                      |
| 913K-1A     | 622-3202-016                   | Computer           | FS 80 Instrument Panel          |
| 614E-41A    | 622-3246-001                   | Pitch/Turn Control | FS 90 Pedestal                  |
| 590A-6      | 229-9015-010                   | Altitude Control   | FS 69 Nose                      |
| 590B-3      | 229-9016-010                   | Airspeed Sensor    | FS 69 Nose                      |
| 329T-1      | 270-2424-010                   | Turn and Slip      | FS 90 Instrument Panel          |
| 161H-1      | 622-1036-001                   | Programmer         | FS 23 Nose Radio Rack           |
| 332D-11T    | 622-4565-001                   | Vertical Gyro      | FS 23 Nose Radio Rack           |
|             | FD-112V/AP-106                 | Drawing Index      | 992-1444-001                    |
|             | FIS-84/AP-106                  | Drawing Index      | 992-1442-001                    |
|             | FIS-70/AP-106                  | Drawing Index      | 992-1443-001                    |

NOTE: Read entire service information letter and Volume I of the AP-106/107 Flight Control System instruction book system maintenance section on 913K-1, 329T-1, and 161H-1 gain adjustment procedure before making any adjustments.



## SERVICE INFORMATION LETTER 2-83

SERVO TORQUES

Nominal pinion output torques as measured using 960M-3 balance beam and procedures described in the Instruction Book.

|                                 | <u>PINION TORQUE</u> | <u>CAPSTAN OUTPUT TORQUE</u> |
|---------------------------------|----------------------|------------------------------|
| Aileron Servo - 334C-9A/-002 =  | 27 in lb             | 135.0 in lb                  |
| Elevator Servo - 334C-11/-009 = | 10.6 in lb           | 26.5 in lb                   |
| Rudder Servo - 334C-9A/-002 =   | 20 in lb             | 100.0 in lb                  |

CAPSTAN SLIP CLUTCH TORQUES

Nominal slip clutch torques as measured using Capstan Test Fixture and the procedures described in the Instruction Book.

|                | <u>PINION TORQUE</u> | <u>CAPSTAN OUTPUT TORQUE</u> |
|----------------|----------------------|------------------------------|
| Aileron        | 35 $\pm$ 2 in lb     | 175 $\pm$ 10 in lb           |
| *Elevator (4") | 18 $\pm$ 2 in lb     | 45 $\pm$ 5 in lb             |
| Rudder         | 35 $\pm$ 2 in lb     | 175 $\pm$ 10 in lb           |

\*Requires capstan fixture 634-2830-001

SERVO BRIDLE CABLE TENSIONS

|          |               |
|----------|---------------|
| Aileron  | 55 $\pm$ 3 lb |
| Elevator | 27 $\pm$ 3 lb |
| Rudder   | 35 $\pm$ 3 lb |

PRIMARY CONTROL CABLES

Refer to Fairchild Swearingen Maintenance Manual, Section 27.

BRIDLE @ 21 now 30

ELEVATOR LH CABLE 35  
RH CABLE 40

INDICATED  
W/ BRIDLE  
ATTACHED



## SERVICE INFORMATION LETTER 2-83

ATTN out of GAIN

913K-1A CALIBRATION (CPN 622-3202-016)

NOTE: Use 972S-1 Test Set and AP-106/107 Flight Control System Instruction Book, Volume 2, System Maintenance Section on 913K-1A, 329T-1, and 161H-1 Gain Adjustment Procedures.

CAUTION: PREVENT EQUIPMENT DAMAGE BY INSERTING PROBES MORE THAN 1/4 INCH INTO 913K-1A TEST JACKS AND DO NOT SHORT PROBES AGAINST CASE.

NOTE: Roll Trim, Roll Gain, and Pitch Analog entries below may be readjusted, if required, under simulated or actual flight conditions for more refined calibration. Proper calibration is obtained with 26 VAC input to the AP-106 as measured on 972S-1 Test Set.

| <u>FUNCTION<br/>ADJUST</u>                          | <u>INPUT</u> | <u>OUTPUT</u>                                    | <u>MEASURED AT</u> |
|-----------------------------------------------------|--------------|--------------------------------------------------|--------------------|
| Roll Trim<br>A2R9                                   | 0 V ac       | $0 \pm 0.50$ V dc                                | 972S-1 J28         |
| Roll Gain<br>A2R5                                   | 1.0 V ac     | $0.75 \pm 0.50$ V dc                             | 972S-1 J28         |
| Roll Hold Drift<br>A4R10                            | 0 V ac       | Not more than<br>50 mV dc/Minute                 | 972S-1 J43         |
| Ail Cmd Gain<br>A4R36                               | 1.0 V ac     | $6.30 \pm 0.200$ V dc                            | 972S-1 J43         |
| Roll Rate Gain<br>A4R31                             | 1.0 V ac     | Ail Cmd Gain Volts<br>plus $1.90 \pm 0.100$ V dc | 972S-1 J43         |
| Hdg Analog<br>A2R36<br>200 or 300 mV/<br>Degree CDI | 2.0 V ac     | $1.25 \pm 0.10$ V dc<br><br>(See Note No. 4)     | 913K-1A TP5        |
| Pitch Hold Drift<br>A2R84                           | 0 V ac       | Not more than<br>10 mV dc/Minute                 | 972S-1 J29         |
| Pitch Analog<br>A2R20                               | 1.0 V ac     | $0.75 \pm 0.050$ V dc                            | 972S-1 J29         |

12/04/83

Select  
WDG

J29  
J28



## SERVICE INFORMATION LETTER 2-83

| <u>FUNCTION</u><br><u>ADJUST</u> | <u>INPUT</u> | <u>OUTPUT</u>                                    | <u>MEASURED AT</u> |
|----------------------------------|--------------|--------------------------------------------------|--------------------|
| Elev Cmd Gain<br>A1R38           | 1.0 V ac     | 5.55 $\pm$ 0.200 V dc                            | 972S-1 J61         |
| Pitch Rate Gain<br>A1R45         | 1.0 V ac     | Elev Cmd Gain Volt-<br>age plus 3.15 $\pm$ 0.100 | 972S-1 J61         |
| Go-Around Pitch Up<br>A1R29      | 0 V ac       | 1.14 $\pm$ 0.100 V dc<br>7° Up                   | 972S-1 J29         |
| Up Elev<br>A1R3                  | 5.0 V ac     | 0.150 $\pm$ 0.050 V dc                           | 972S-1 J61         |
| Vert Gain<br>A1R83               | 1.0 V dc     | 0.610 $\pm$ 0.050 V dc                           | 972S-1 J29         |

AUTOPILOT TRIM

| <u>FUNCTION</u>         | <u>INPUT</u> | <u>OUTPUT</u>                                                       |
|-------------------------|--------------|---------------------------------------------------------------------|
| Trim Gain<br>A4R107     | 3.5 V dc     | 4°/Min<br>(150 $\pm$ 3 seconds<br>stop-to-stop)<br>Pitch Trim Wheel |
| Max Duty Cycle<br>A4R11 | 20 V dc      | 19°/Min<br>(32 $\pm$ 2 seconds<br>stop-to-stop)<br>Pitch Trim Wheel |

- NOTES: 1. Verify the Manual Electric Trim speed stop-to-stop time prior to setting autopilot trim speeds. Manual Electric Trim speed is approximately 28°/min @ 22 sec Stop-to-Stop.
2. Aircraft dc bus voltage must be 28  $\pm$  0.5 V dc when checking manual electrical and autopilot trim speeds.
3. Always verify manual electric trim speed Stop-to-Stop, prior to adjusting autopilot trim gain and max duty cycle.
4. Hdg Analog calibration is the same with either 200 or 300 mV/degree HDG/CD source. Resistors are installed in the interconnect to compensate for differences in HDG/CD Analogs.





## SERVICE INFORMATION LETTER 2-83

329T-1 CALIBRATION

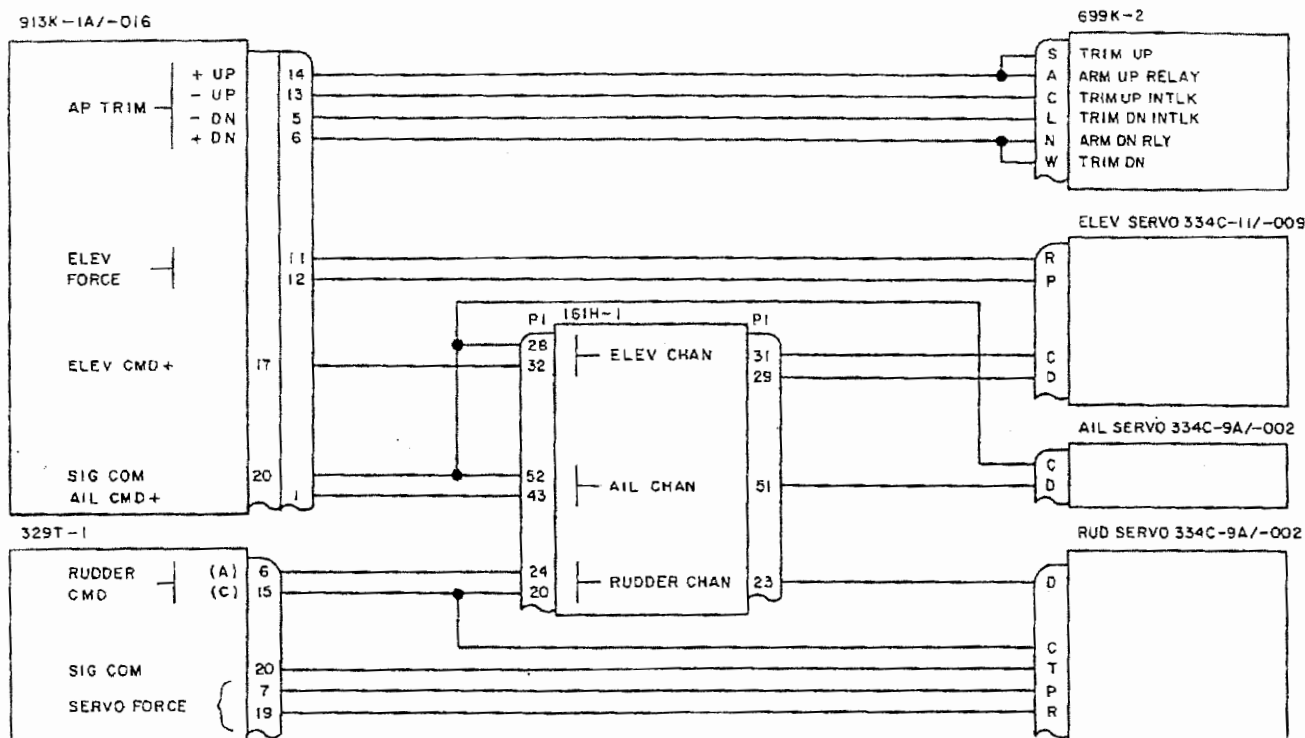
| <u>FUNCTION</u><br><u>ADJUST</u> | <u>INPUT</u> | <u>OUTPUT</u>       | <u>MEASURED AT</u> |
|----------------------------------|--------------|---------------------|--------------------|
| Rudder Cmd Gain<br>329T-1 R16    | 5.0 V ac     | $2.3 \pm 0.20$ V dc | 972S-1 J54         |

161H-1 CALIBRATION ✓

| <u>FUNCTION</u><br><u>ADJUST</u> | <u>INPUT</u>       | <u>OUTPUT</u>                   | <u>MEASURED AT</u>       |
|----------------------------------|--------------------|---------------------------------|--------------------------|
| Ail Programmer Gain<br>A6R1      | 6.5 V dc           | Max CW                          | 972S-1 J60               |
| Elev Programmer<br>Gain A6R3     | 6.5 V dc           | $5.20 \pm 0.100$ V dc           | 972S-1 J80               |
| Rudder Programmer<br>Gain A6R2   | 6.5 V dc           | Max CW                          | 972S-1 J59               |
| IAS Gain<br>A6R4                 | $\Delta 0.65$ V dc | $2.437$ V dc<br>$\pm 0.10$ V dc | 972S-1 J66/67            |
| Loc Null<br>A4R14D               | 0                  | $0 \pm 0.005$ V dc              | 161H-1 TP2/<br>Sig Com 2 |
| Comp Null<br>A4TP137             | 0                  | $0 \pm 0.005$ V dc              | 972S-1 J48/J49           |
| Loc Null<br>A4R14D               | 0                  | $0 \pm 0.005$ V dc              | 161H-1 TP2/<br>Sig Com 2 |
| CS Dev<br>Centering              | 0                  | $0 \pm 0.005$ V dc              | 972S-1 J46/47            |



## SERVICE INFORMATION LETTER 2-83



System Interconnect Information

913K-1A CPN 622-3202-016 STRAPPING

| CARD | JUMPER | OPTION                |
|------|--------|-----------------------|
| A1   | A to C | D.C. Marker           |
| A1   | D to E | IAS Hold Enable       |
| A2   | A to C | Mon Diseng = Comp Mon |
| A3   | A to B | Neg Loc Logic         |
| A3   | D to E | No Nav Flag           |
| A4   | B to C | Short Trim Delay      |
| A4   | E to F | Short Trim Delay      |
| A4   | H to J | Slow Roll Knob Rate   |
| A5   | A to B | External Nav Cap      |
| A5   | D to E | G.A. from Appr and BC |

NOTE: 913K-1A -016 status defines desired strapping as listed above.

161H-1 STRAPPING

| CARD | JUMPER | OPTION              |
|------|--------|---------------------|
| A4   | E to F | Loc Trip Point      |
| A4   | A to B | Neg Loc Logic       |
| A5   | A to B | ALT-50/55 Radio Alt |



## SERVICE INFORMATION LETTER 2-83

STC CERTIFICATION REQUIRED SERVICE BULLETINS

|              |                      |
|--------------|----------------------|
| 329T-1       | SB 1, 2              |
| 913K-1A/-016 | None                 |
| 334C-9A      | SB 1                 |
| 334C-11      | SB 1                 |
| 699K-2       | SB 1,2,3             |
| 161H-1       | SB 1-3, 6,8,12,14,16 |
| 590A-6       | SB 1-4               |
| 590B-3       | None                 |

NOTE: Other service bulletins contain desirable modifications for certain installations. For further information, refer to other service bulletins on the respective units.



# SERVICE INFORMATION LETTER

Collins General Aviation Division/Rockwell International

163181

## GENERAL AVIATION EQUIPMENT

### SERVICE INFORMATION LETTER 1-91

#### GENERAL PROCEDURE FOR INSTALLING AND SETTING BRIDLE CABLES

The following procedure assumes that the aircraft manufacturers approved maintenance manual or STC holders installation data is available and that cable tensions, slip clutch settings, and other critical information is included.

1. Inspect bridle cables in accordance with FAA document AC-43.13-1A chapter 4 to be sure they are in serviceable condition.
2. Verify the capstan slip clutch has been set in accordance with approved data.
3. Install and safety wire bridle cables on to capstan drum, properly wrap cables onto drum and install cable guard at the proper orientation.
4. Verify primary aircraft cables are properly set.
5. Mount capstan in the aircraft, route and secure bridle cables to control attach points in accordance with installation instructions.

If bridle cables are attached to the primary aircraft cables with cable clamps then:

- A. Extend bridle cable turnbuckle to its maximum extension and loosely install cable clamps being careful that the cables are routed properly in cable clamp grooves.

Remove lubricant and corrosion protection from primary aircraft cable where cable clamp will be located in accordance with AC-43.13-1A chapter 4 paragraph 198.2.C.

- B. Position cable clamps in accordance with installation instructions. Tighten one cable clamp in position, slide the other clamp by hand to tighten the bridle cable and tighten in position.
- C. Check that all cables are routed properly in the clamp grooves and torque clamp bolts to the specified torque.
- D. Apply Inspectors Lacquer (Torque Paint) to the junction of the cable clamp and the aircraft cable opposite the servo so that any slippage can be easily detected.





# SERVICE INFORMATION LETTER

Collins General Aviation Division/Rockwell International

6. Adjust bridle cable tension to approximately maximum value, engage autopilot and run aircraft controls from stop to stop several times (overpowering the servo) to seat bridle cables in capstan drum grooves and other points of contact.

An alternate means of seating the cables is to apply alternating lateral pressure by hand to the bridle cables (being careful not to apply too much force) with the controls moved to opposite stops.

7. Re-adjust cable tension to the nominal value listed in the installation data, and repeat step 6. If the cable tension remains nominal, safety wire the tensioning device and cable clamp bolts and go to step 8, if not repeat step 6 until it does.

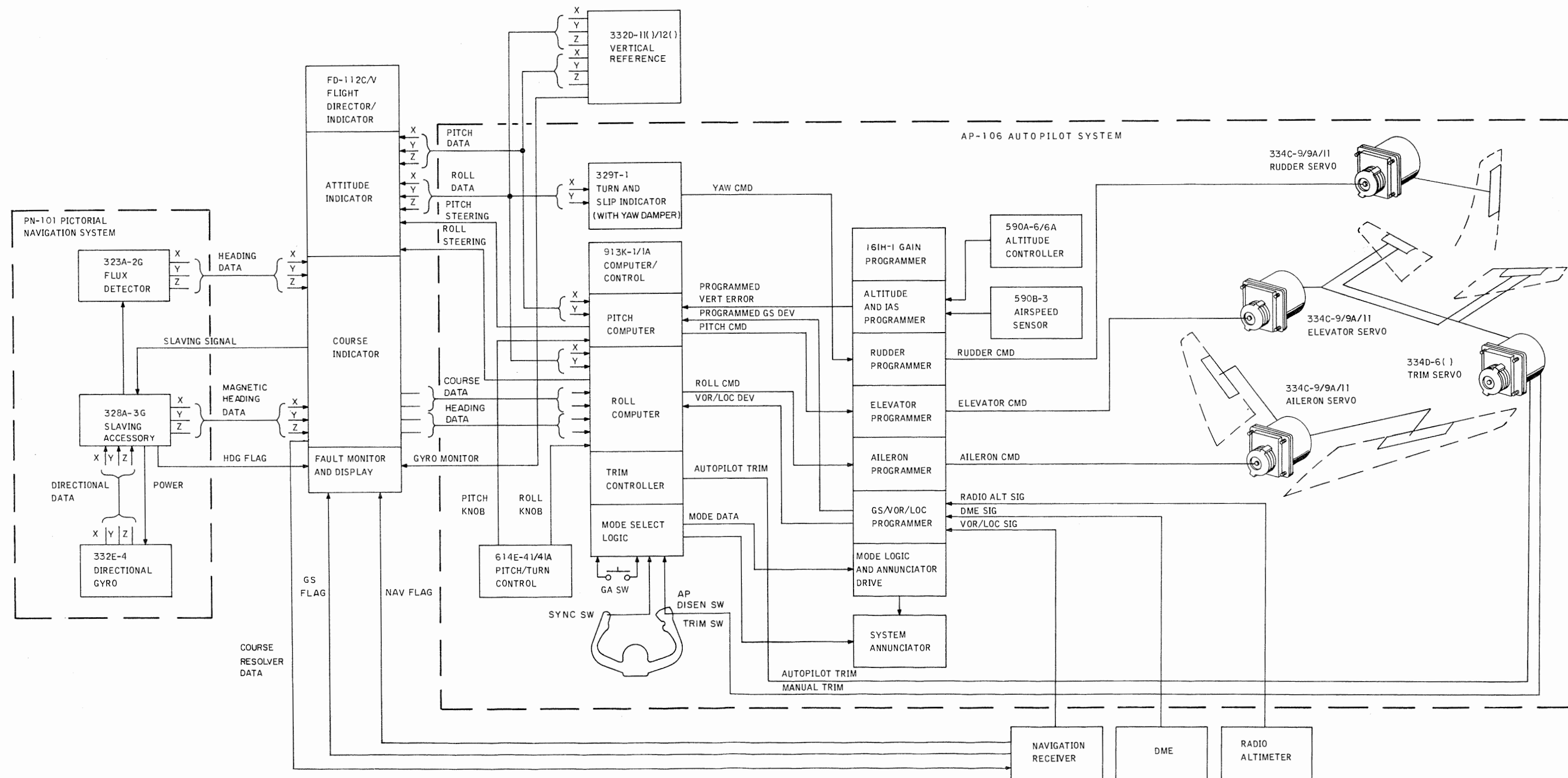
|             |
|-------------|
| <b>Note</b> |
|-------------|

Care must be taken when using a cable tensiometer that the cable being tested is placed in the middle of the tools working surfaces, the tool is set gently, the tool is adjusted to the proper size cable and that no external loads are applied by the tool.

It is best to take several readings until consistent readings are obtained.

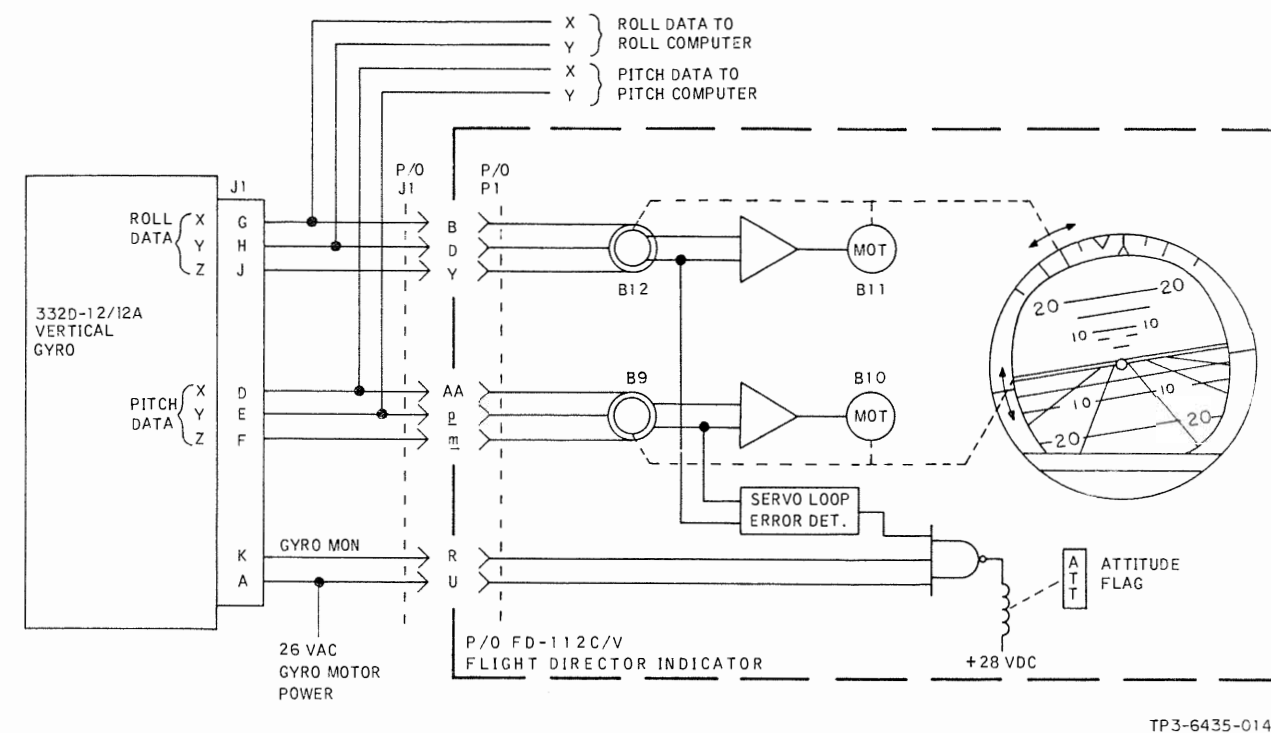
8. Operate the aircraft controls and if practical the autopilot controls through full range of travel while checking for any binding, interference or misalignment.
9. Re-check the installation to be sure that all safety devices are secure and cable guards, fairleads, and keepers are in proper position and not rubbing on any moving parts. Survey the area for misplaced tools, hardware, or any other foreign items and secure the area.
10. Re-check cable tensions after the first few hours of operation.





TP3-5535-014

AP-106 Flight Control System With FD-112C/V and  
PN-101, Functional Block Diagram  
Figure 2



*Attitude Indicator and Vertical Gyro, Functional Block Diagram*  
Figure 3

The pitch computer receives pitch data from the vertical gyro and pitch/turn control, and vertical error and glideslope data from the gain programmer. This data is used to generate the pitch command applied to the elevator programmer. The pitch computer also generates a pitch steering signal that is applied to the flight director to position the pitch command bar.

The roll computer receives roll data from the vertical gyro and pitch/turn control, heading and course data from the flight director, and VOR/LOC data from the gain programmer to generate the roll command and roll steering signal. The roll command is applied to the aileron programmer to control the ailerons, and the steering signal is applied to the flight director to position the roll command bar.

The trim controller determines when the elevator servo is holding force (aircraft out of trim) and generates appropriate trim commands to cause the trim servo to relieve the force held by the elevator servo (autopilot engaged). The trim controller also lights the out-of-trim indicators on the front of the 913K-1/1A or 614E-42/42A whenever the trim servo is driven by the trim controller with the autopilot engaged, or when the

aircraft must be manually trimmed with the autopilot disengaged.

The mode selection logic consists of the mode selection indicator switches, autopilot engage/disengage switch, and associated logic circuits required to control the overall operation of the autopilot system.

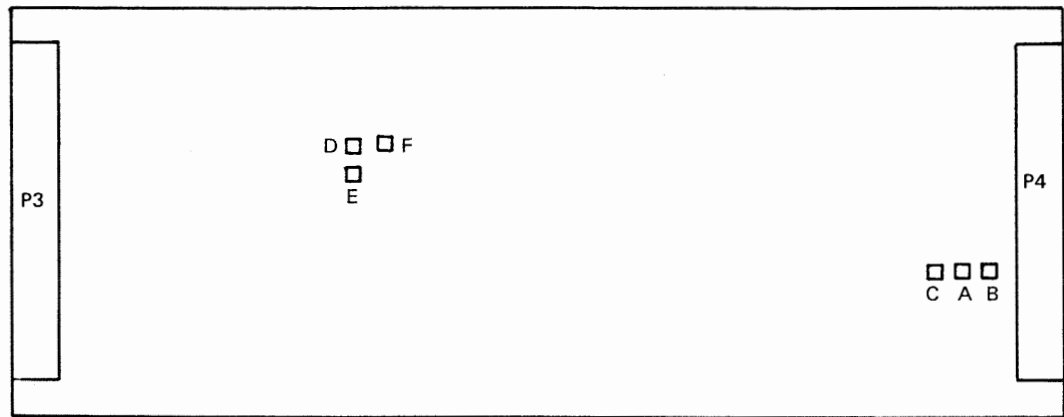
### 5.1.3.2 161H-1 Gain Programmer

The 161H-1 consists of five gain programming sections and a mode logic and remote annunciator drive section.

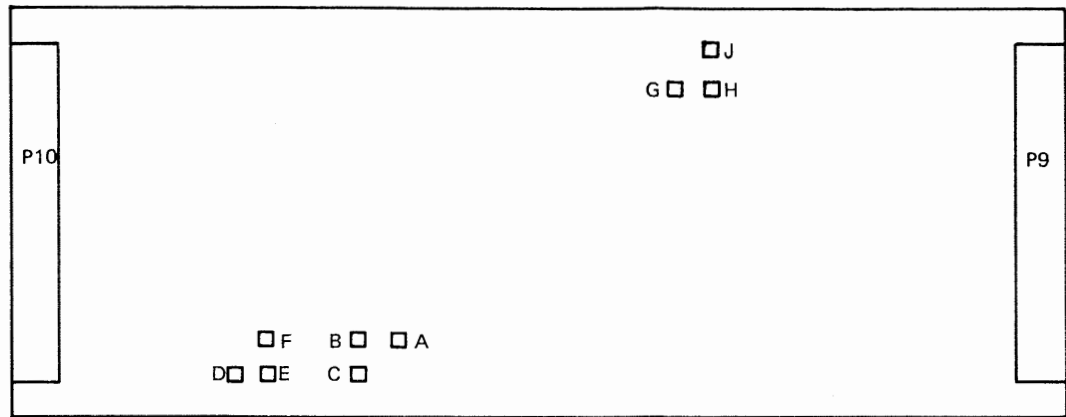
The rudder, elevator, and aileron programming sections provide IAS gain programming of the three basic autopilot command signals before they are applied to their respective servos.

The altitude and IAS programmer provides IAS gain programming of the altitude error signal from the altitude controller. This section also contains the IAS hold mode circuits.

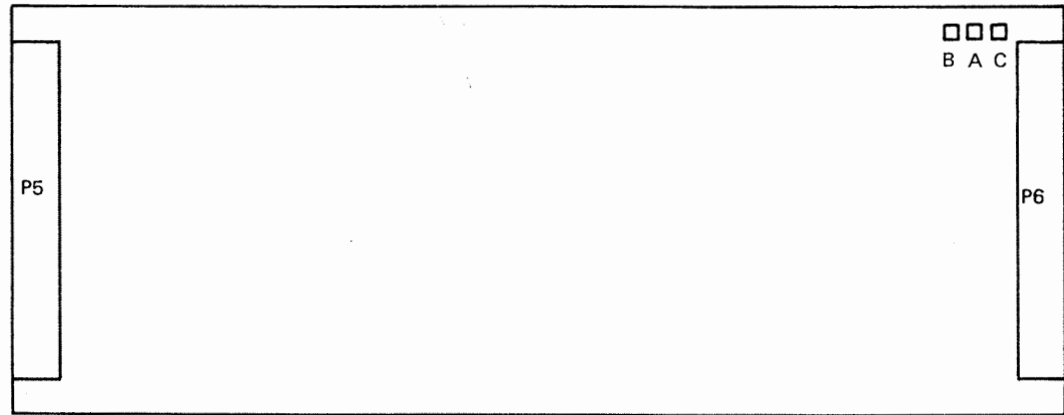
The GS/VOR/LOC programmer provides radio altitude programming of the glideslope signal, all angle adaptive capture for VOR and LOC, and DME programming of the VOR signal with over-station smoothing.



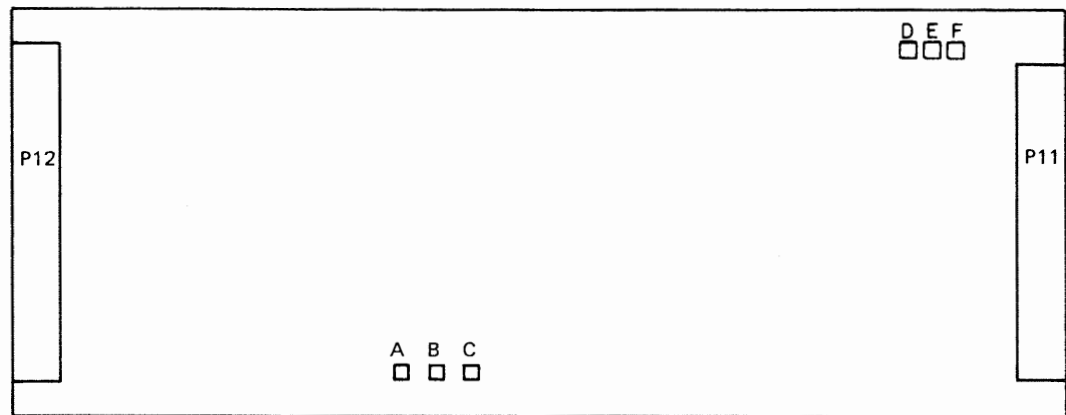
A1 CIRCUIT CARD (601-4751-002)



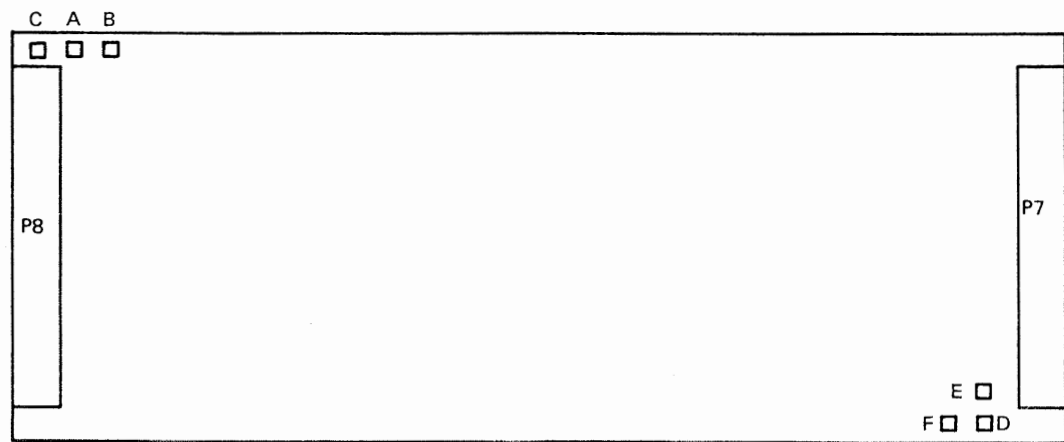
A4 CIRCUIT CARD (601-4754-003)



A2 CIRCUIT CARD (601-4752-002)



A5 CIRCUIT CARD (601-4755-003)

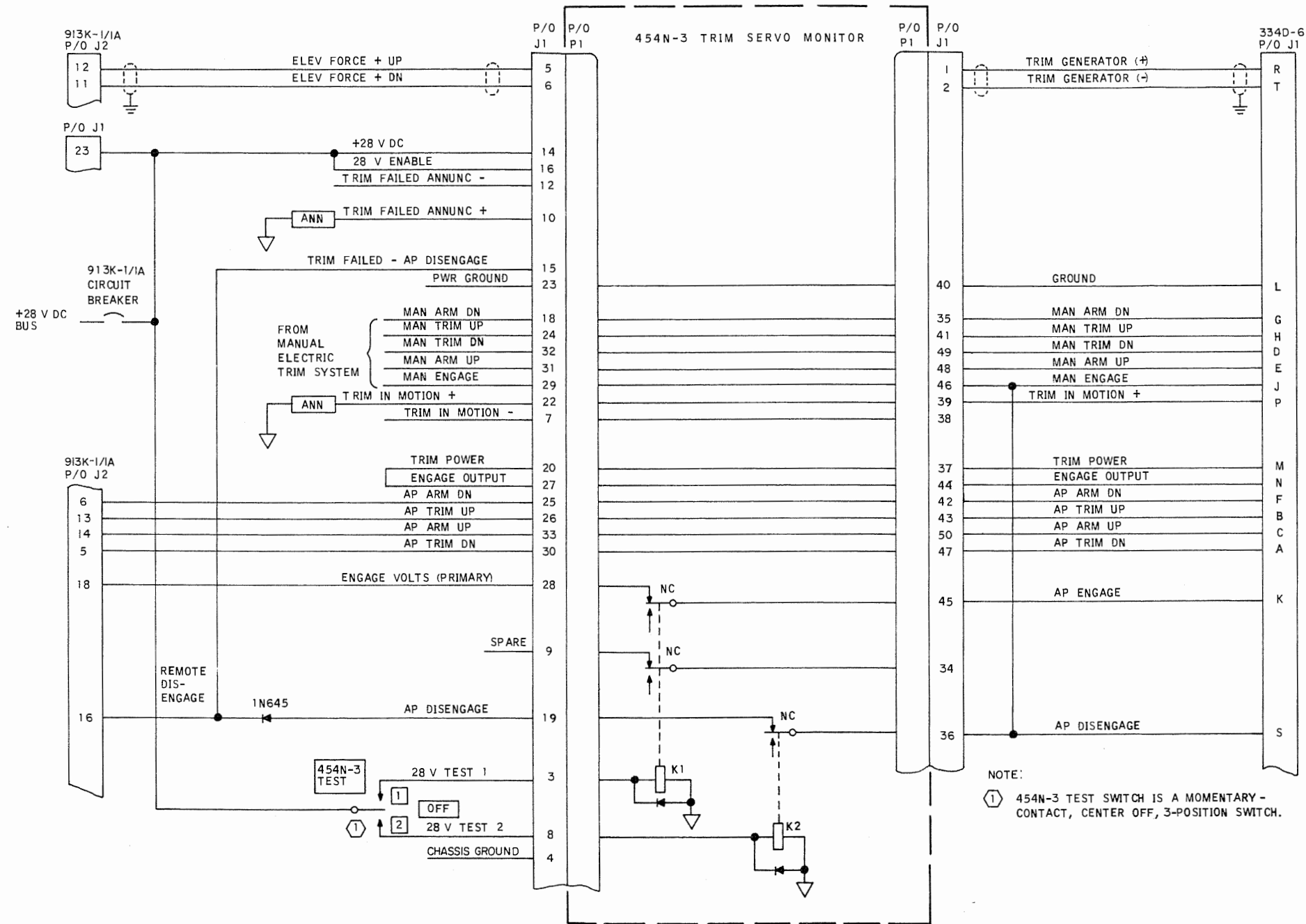


A3 CIRCUIT CARD (601-4753-003)

TP5-0365-013

913K-1A Strapping Pin Location Diagram  
Figure 2





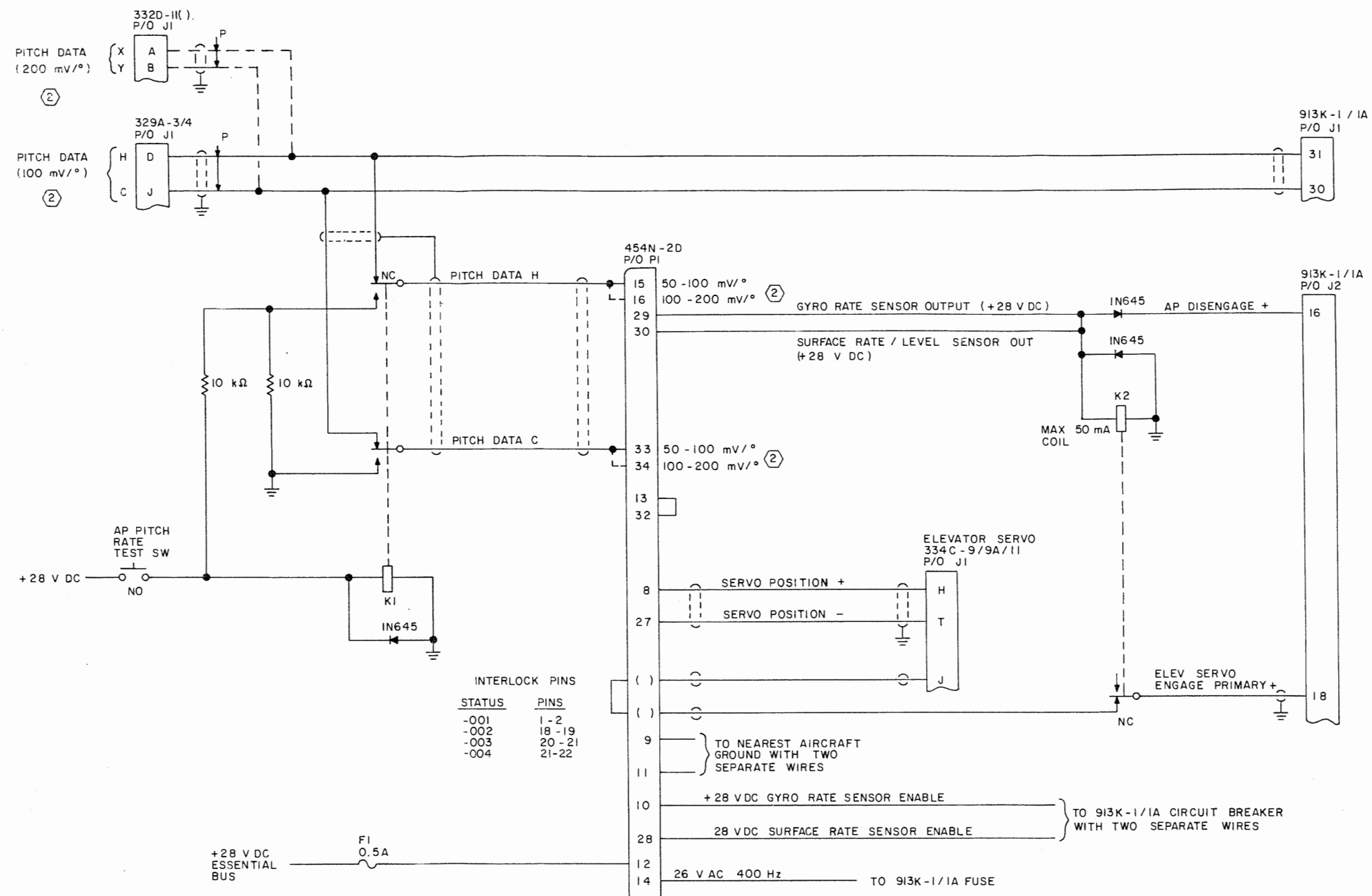
635-0214  
TP4-4239-014

454N-3 and AP-106/107 System Interconnect Diagram  
Figure 12





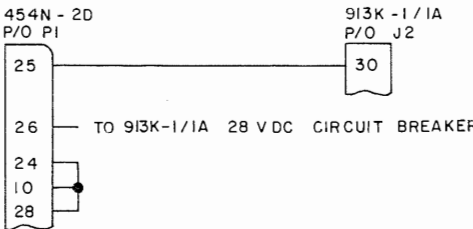




- NOTES:
- (1) UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS.
  - (2) IF VERTICAL GYRO PROVIDS LESS THAN 100 mV/°, CONNECT TO 454N-2D TROUGH K1 AS SHOWN BY SOLID CONNECTIONS. IF VERTICAL GYRO PROVIDS MORE THAN 100 mV/°, CONNECT TO 454N-2D TROUGH K1 AS SHOWN BY DASHED CONNECTIONS.
  - (3) IF COUPLED GO-AROUND IS DESIRED, THE FOLLOWING CONNECTIONS MUST BE MADE.

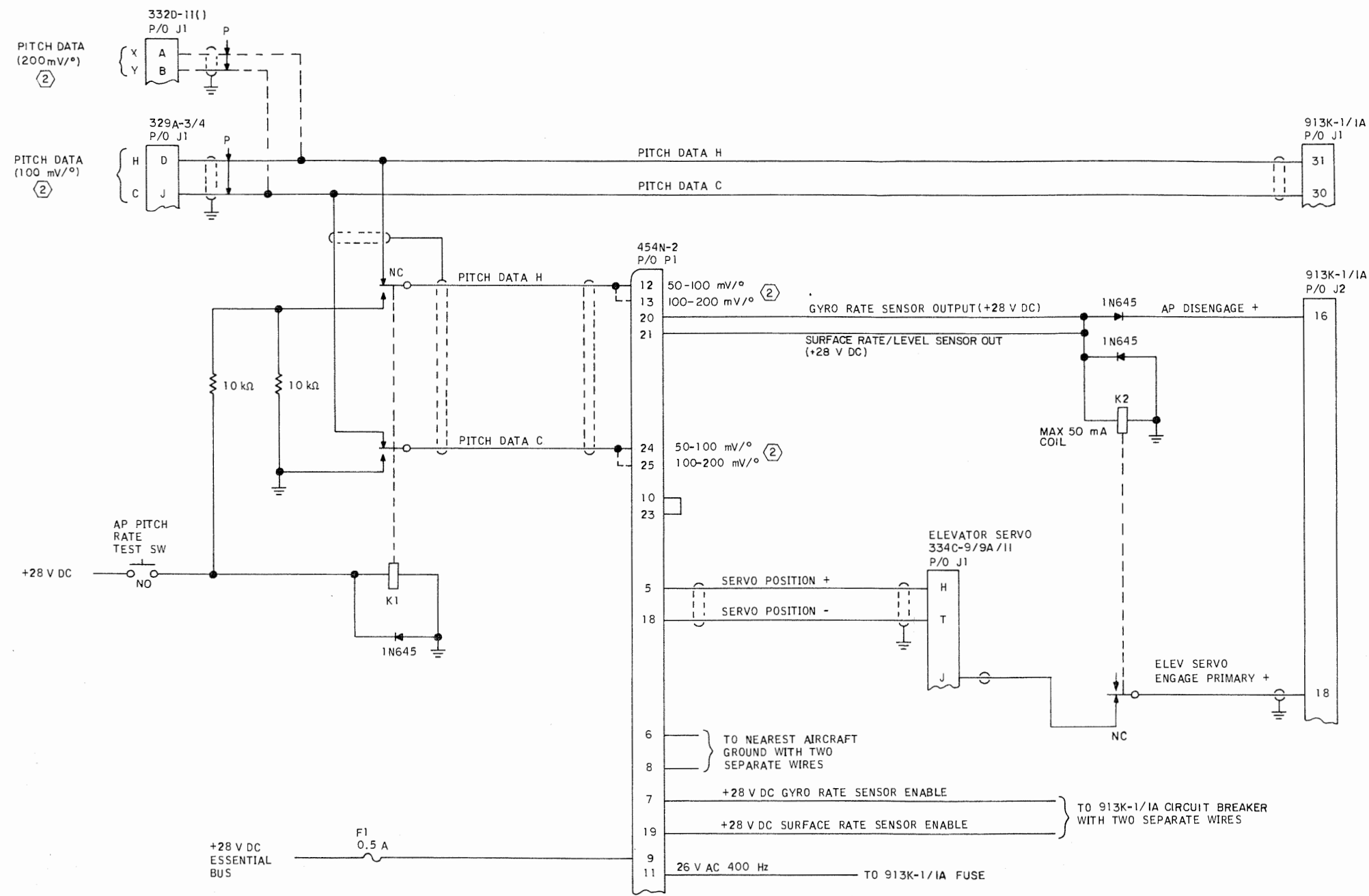
GND DISABLE ACTIVATE

DISABLE LOGIC OUT  
+28 V DC GYRO RATE SENSOR ENABLE  
+28 V DC SURFACE RATE SENSOR ENABLE



TP6-1034-014

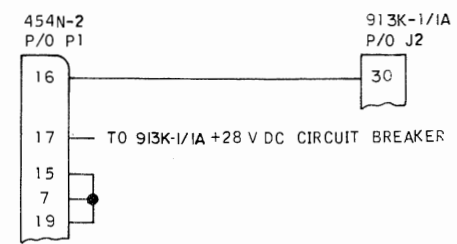
454N-2D and AP-106/107 System, Interconnect Diagram  
Figure 13A



- NOTES:
- ① UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS.
  - ② IF VERTICAL GYRO PROVIDES LESS THAN 100 mV/°, CONNECT TO 454N-2 THROUGH K1 AS SHOWN BY SOLID CONNECTIONS.  
IF VERTICAL GYRO PROVIDES MORE THAN 100 mV/°, CONNECT TO 454N-2 THROUGH K1 AS SHOWN BY DASHED CONNECTIONS.
  - ③ IF COUPLED GO-AROUND IS DESIRED, THE FOLLOWING CONNECTIONS MUST BE MADE.

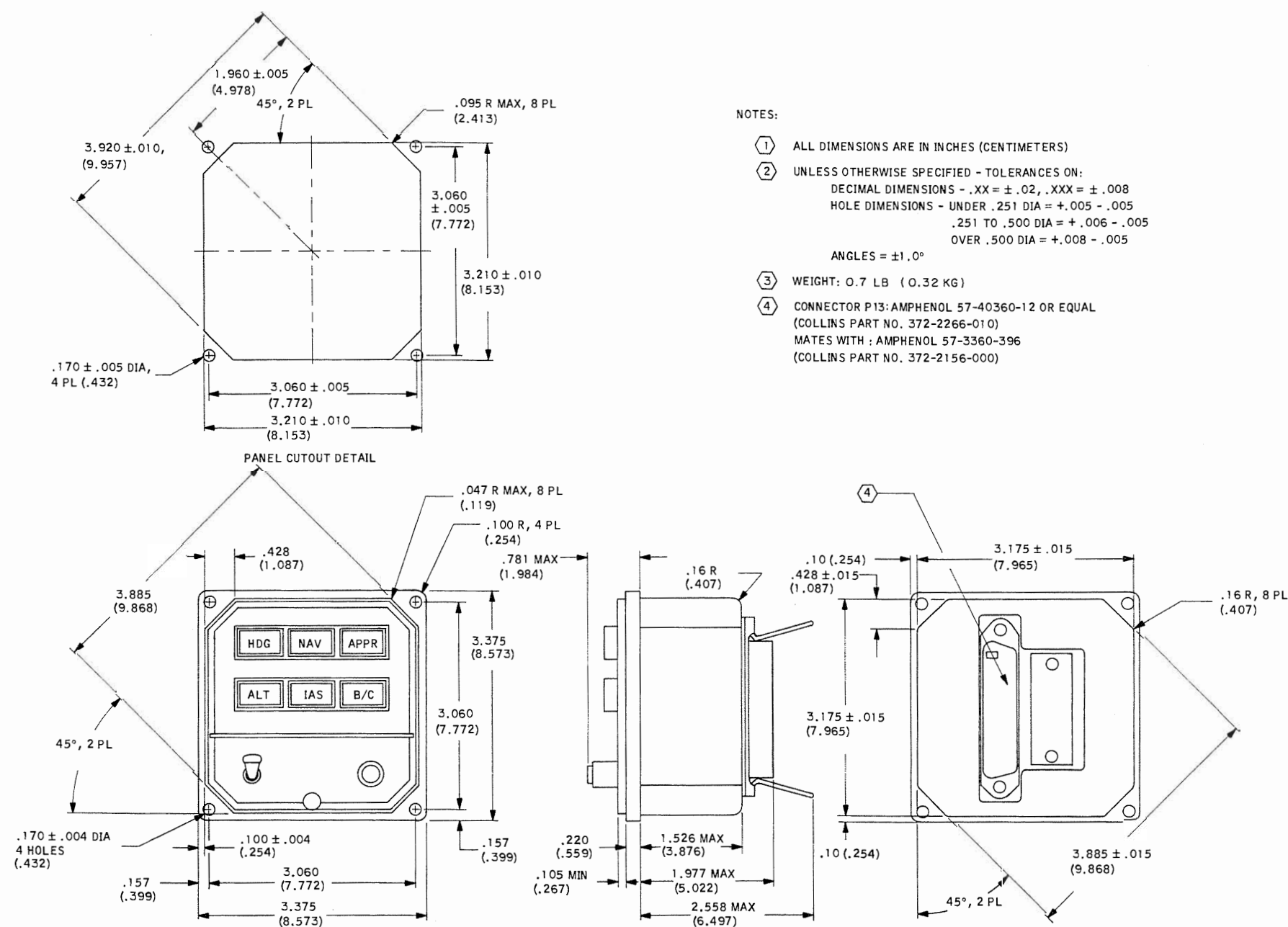
GND DISABLE ACTIVATE

DISABLE LOGIC OUT  
+28 V DC GYRO RATE SENSOR ENABLE  
+28 V DC SURFACE RATE SENSOR ENABLE



TP4-3917-014

454N-2 and AP-106/117 System, Interconnect Diagram  
Figure 13

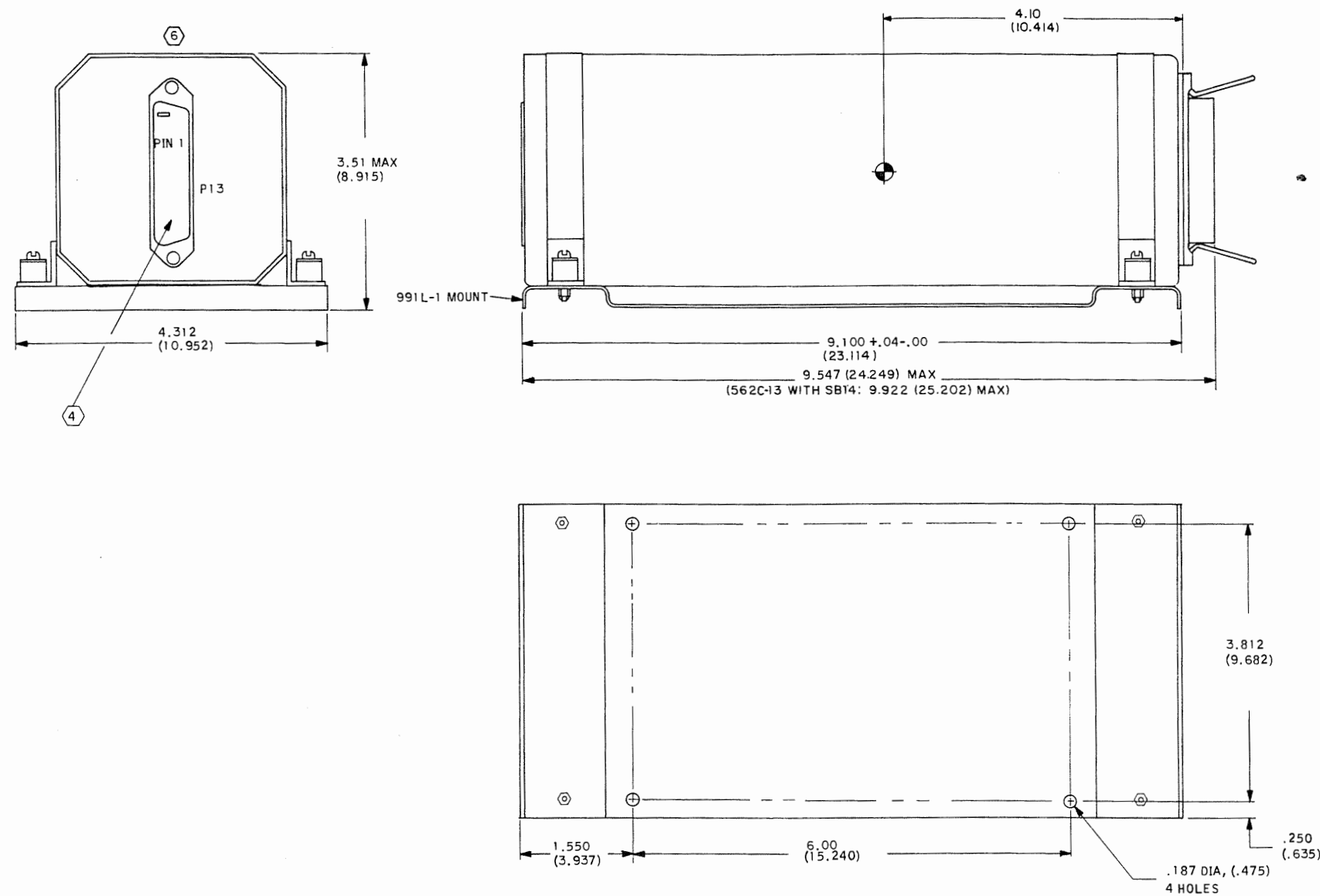


NOTES:

- ① ALL DIMENSIONS ARE IN INCHES (CENTIMETERS)
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS -  $.XX = \pm .02$ ,  $.XXX = \pm .008$   
HOLE DIMENSIONS - UNDER  $.251 \text{ DIA} = +.005 - .005$   
 $.251 \text{ TO } .500 \text{ DIA} = +.006 - .005$   
OVER  $.500 \text{ DIA} = +.008 - .005$   
ANGLES =  $\pm 1.0^\circ$
- ③ WEIGHT: 0.7 LB (0.32 KG)
- ④ CONNECTOR P13: AMPHENOL 57-40360-12 OR EQUAL  
(COLLINS PART NO. 372-2266-010)  
MATES WITH: AMPHENOL 57-3360-396  
(COLLINS PART NO. 372-2156-000)

614E-42/42A Control Head, Outline and Mounting Diagram  
Figure 24





NOTES:

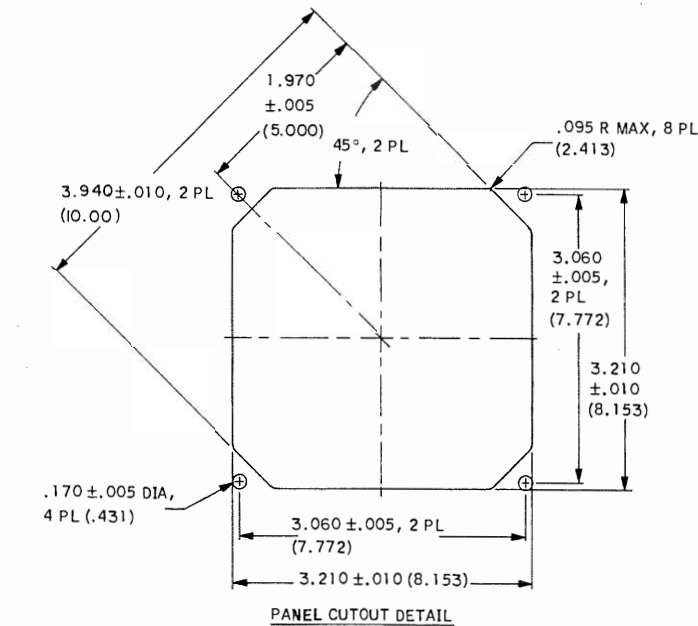
- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
HOLE DIAMETERS - UNDER .251 DIA = +.005 - .005  
.251 TO .500 DIA = +.006 - .005  
OVER .500 DIA = +.008 - .005  
ANGLES - ±1.0
- ③ WEIGHT: 562C-13/13A 2.3 LB (1.05 KG)  
991L-1 0.35 LB (0.16 KG)  
562C-13 WITH SB14: 2.55 LB (1.16 KG)
- ④ CONNECTOR P13: AMPHENOL 57-40360-396  
(COLLINS PART NO. 372-2152-000)  
MATES WITH: AMPHENOL 57-30360-396  
(COLLINS PART NO. 372-2156-000)
- ⑤ 562C-13  
CONNECTORS P1 AND P2 : AMPHENOL 57-40360-12  
(COLLINS PART NO. 372-2266-010)  
MATES WITH: AMPHENOL 57-30360-396  
(COLLINS PART NO. 372-2156-000)  
562C-13A  
CONNECTOR P1: AMPHENOL 57-40361-12  
(COLLINS PART NO. 372-2266-070)  
MATES WITH: AMPHENOL 57-30361-396  
(COLLINS PART NO. 372-2280-010)  
562C-13A  
CONNECTOR P2: AMPHENOL 57-40362-12  
(COLLINS PART NO. 372-2266-080)  
MATES WITH: AMPHENOL 57-30362-396  
(COLLINS PART NO. 372-2280-020)
- ⑥ UNIT MUST BE MOUNTED WITH THE CIRCUIT CARDS IN THE VERTICAL POSITION TO ENSURE PROPER COOLING.

TP3-6379-014

562C-13/13A Electronic Unit With 991L-1 Mount,  
Outline and Mounting Diagram  
Figure 25

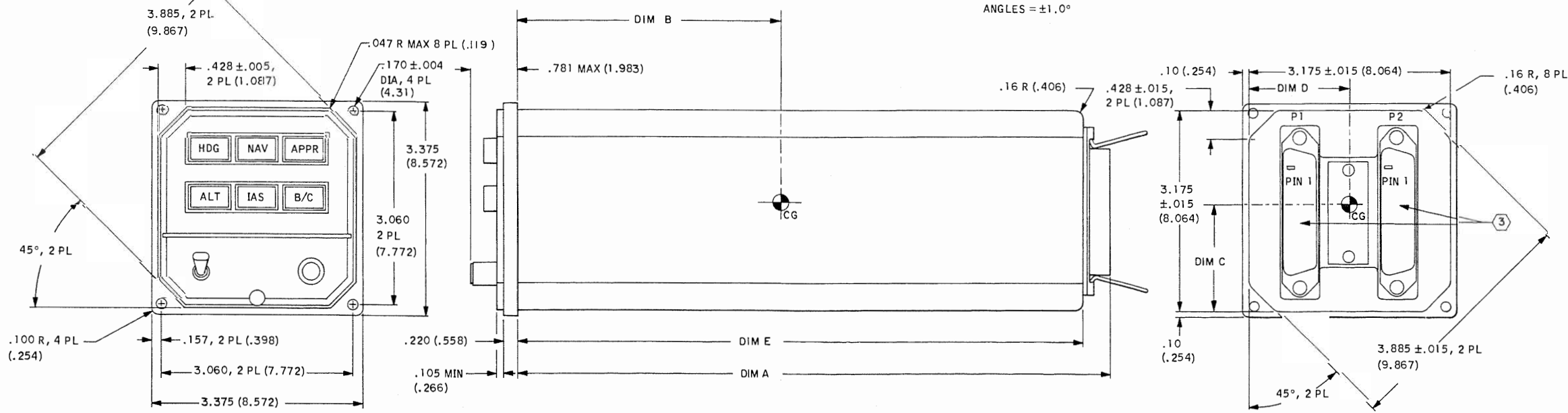






| EQUIPMENT TYPE NO. | CPN                      | WEIGHT LBS (kg) | DIM A            | DIM B      | DIM C     | DIM D     | DIM E            | CONNECTOR P1                          | P1 MATING CONNECTOR                    | CONNECTOR P2                          | P2 MATING CONNECTOR                    |
|--------------------|--------------------------|-----------------|------------------|------------|-----------|-----------|------------------|---------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|
| 913K-1             | 622-0966-001 (W SB 14)   | 3.0             | 9.75 (24.8) MAX  |            |           |           | 9.00 (22.86) MAX | AMPHENOL 57-40360-12 CPN 372-2266-010 | AMPHENOL 57-30360-396 CPN 372-2156-000 | SAME AS P1                            | SAME AS P1 MATING CONNECTOR            |
| 913K-1             | 622-0966-001 (W/O SB 14) | 2.75            | 9.375 (23.8) MAX | 4.2 (10.7) | 1.7 (4.3) | 1.6 (4.1) | 9.00 (22.86) MAX |                                       |                                        |                                       |                                        |
| 913K-1             | 622-0966-002             | 2.75            | 9.375 (23.8) MAX | 4.2 (10.7) | 1.7 (4.3) | 1.6 (4.1) | 9.00 (22.86) MAX |                                       |                                        |                                       |                                        |
| 913K-1A            | 622-3202-001             | 2.6             | 9.375 (23.8) MAX | 4.2 (10.7) | 1.7 (4.3) | 1.6 (4.1) | 9.00 (22.86) MAX | AMPHENOL 57-40361-12 CPN 372-2266-070 | AMPHENOL 57-30361-396 CPN 372-2280-010 | AMPHENOL 57-40362-12 CPN 372-2266-080 | AMPHENOL 57-30362-396 CPN 372-2280-020 |

- NOTES:
- ① ALL DIMENSIONS ARE IN INCHES (CENTIMETERS).
  - ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
HOLE DIAMETERS - UNDER .251 DIA = +.005 -.005  
.251 TO .500 DIA = +.006 -.005  
OVER .500 DIA = +.008 -.005  
ANGLES = ±1.0°



A

TP3-5173-014

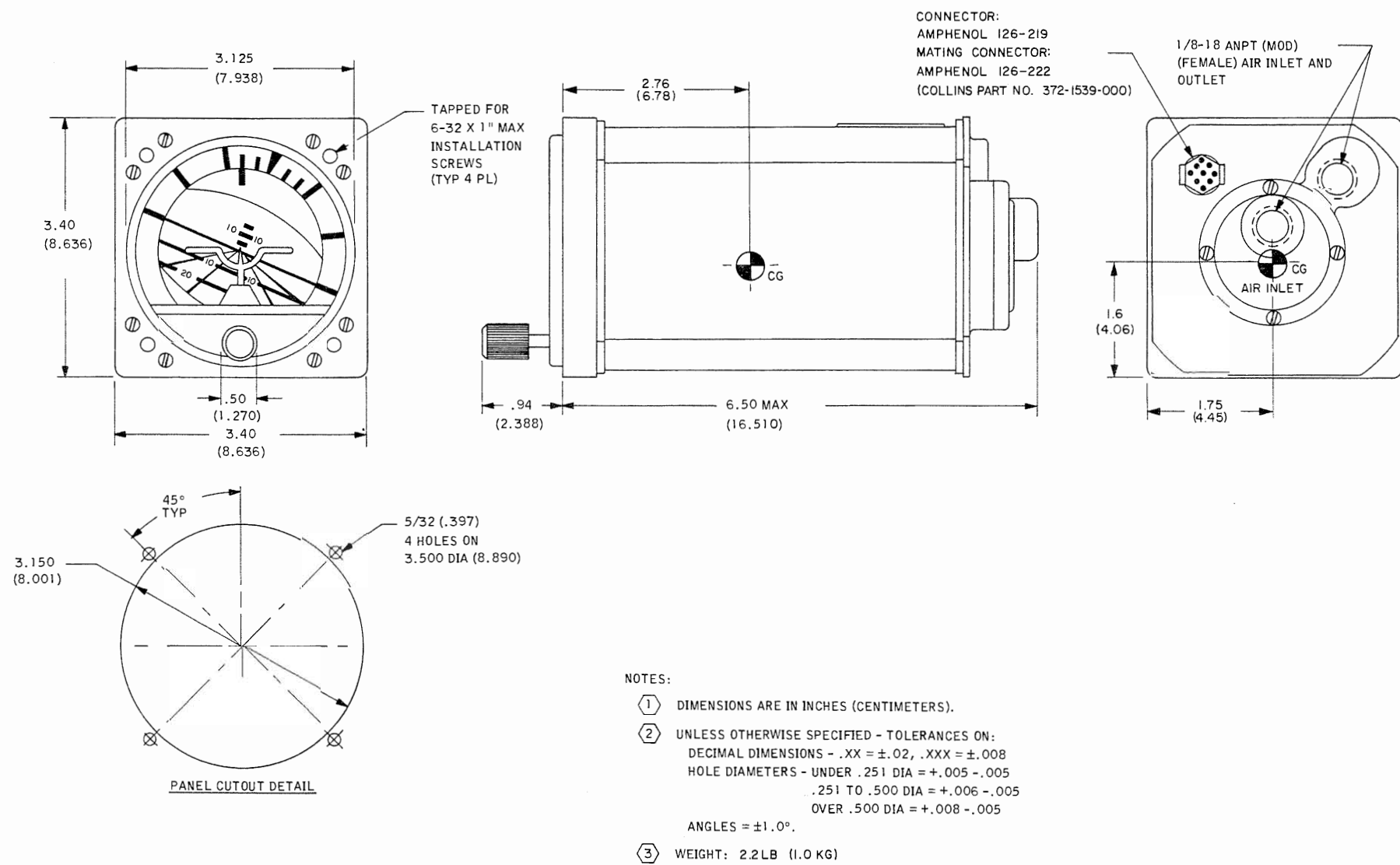
913K-1/1A Computer/Control, Outline and Mounting Diagram  
Figure 23



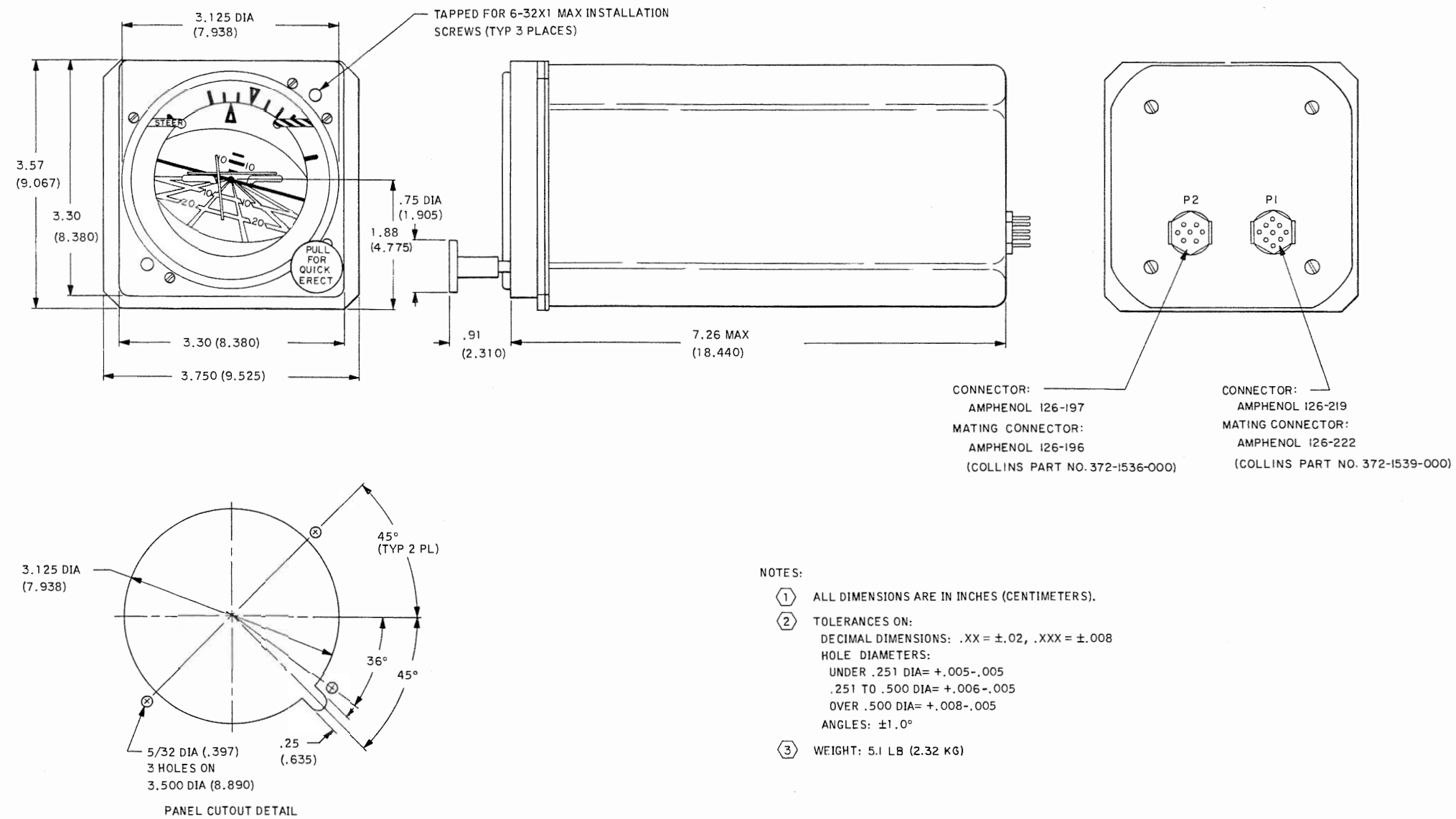










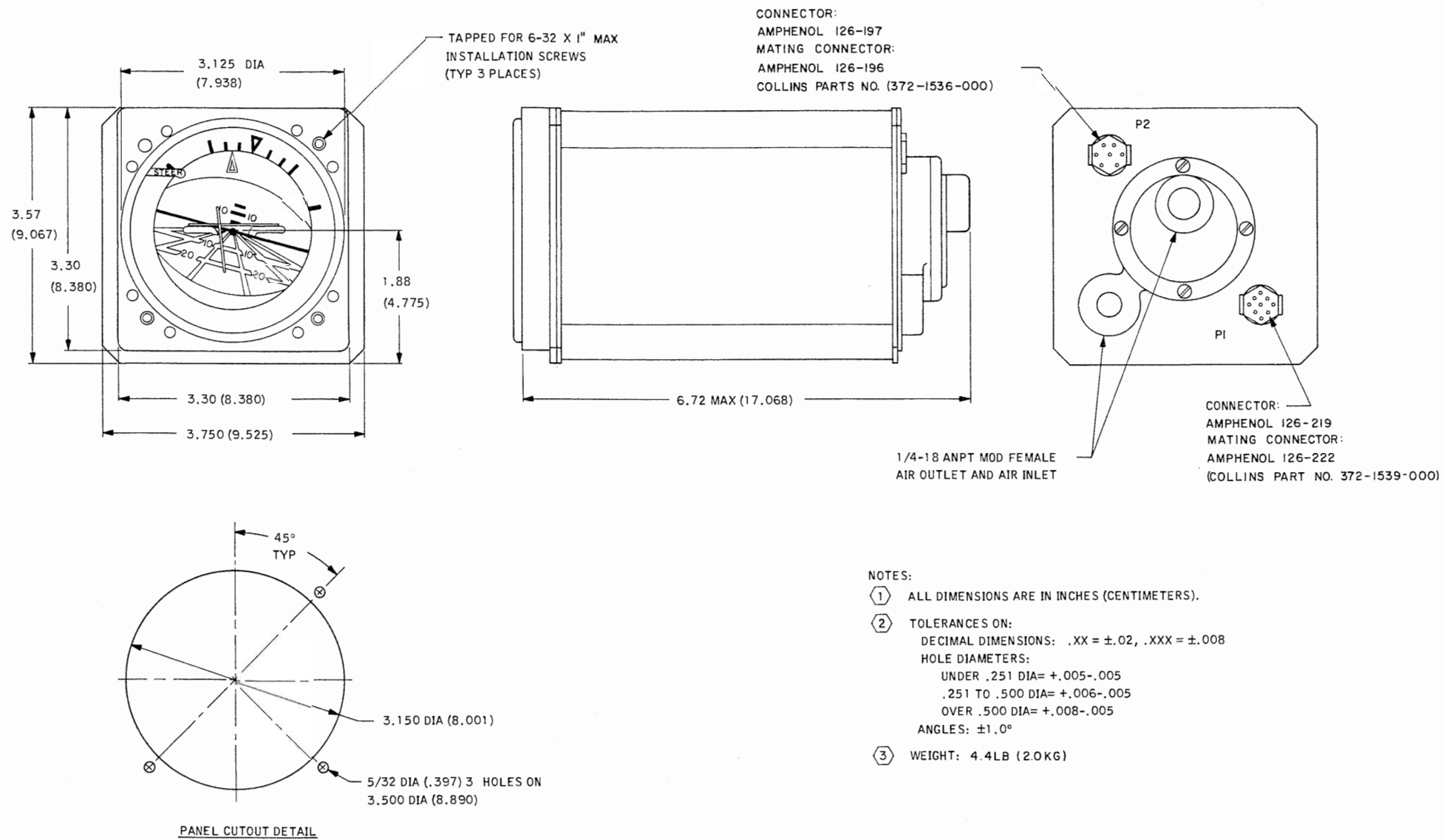


TP3-5419-014

329A-4 Horizon Reference Indicator, Outline and Mounting Diagram  
Figure 21





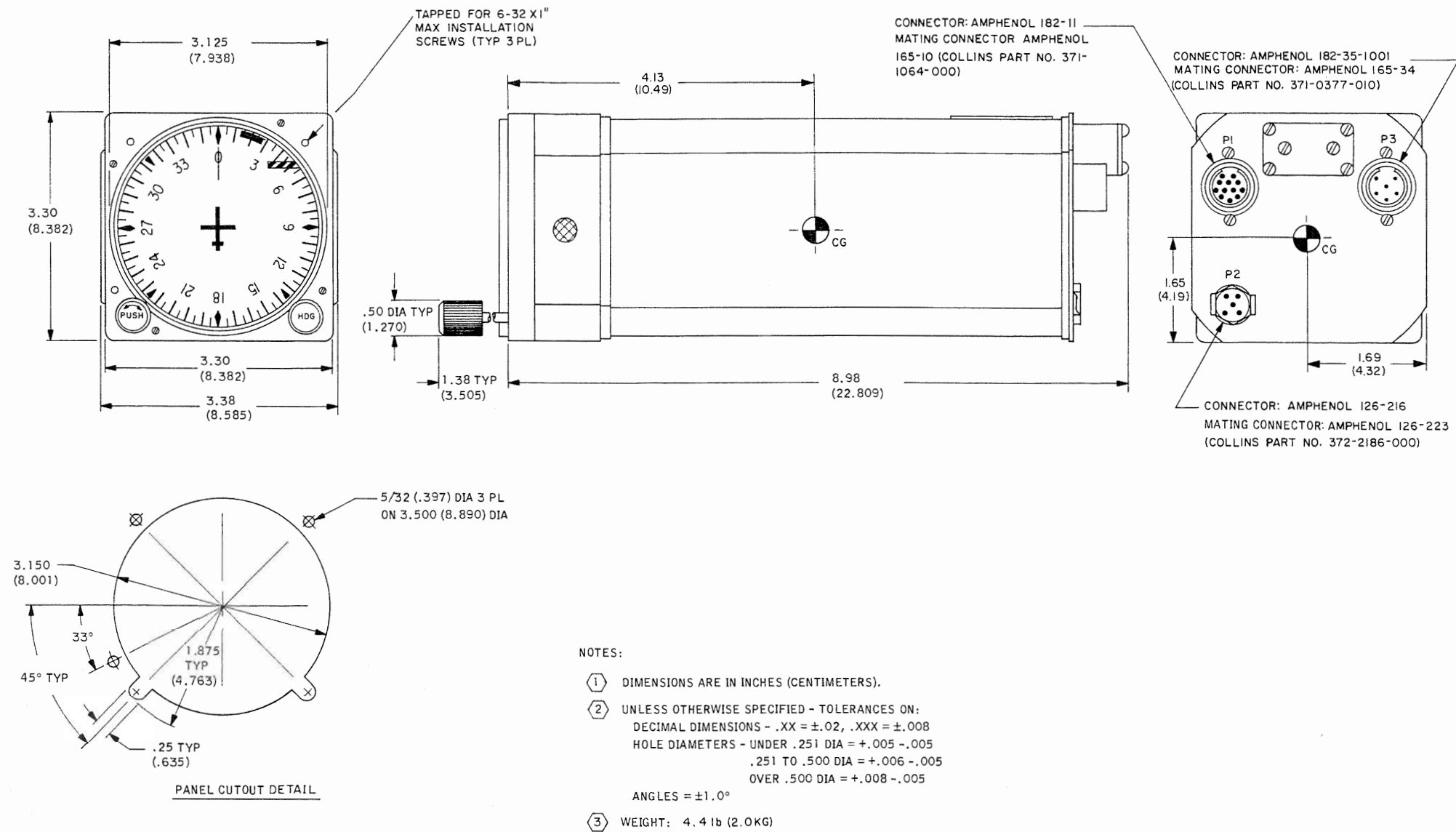


TP3-5420-014

329A-4V Horizon Reference Indicator, Outline and Mounting Diagram  
Figure 22



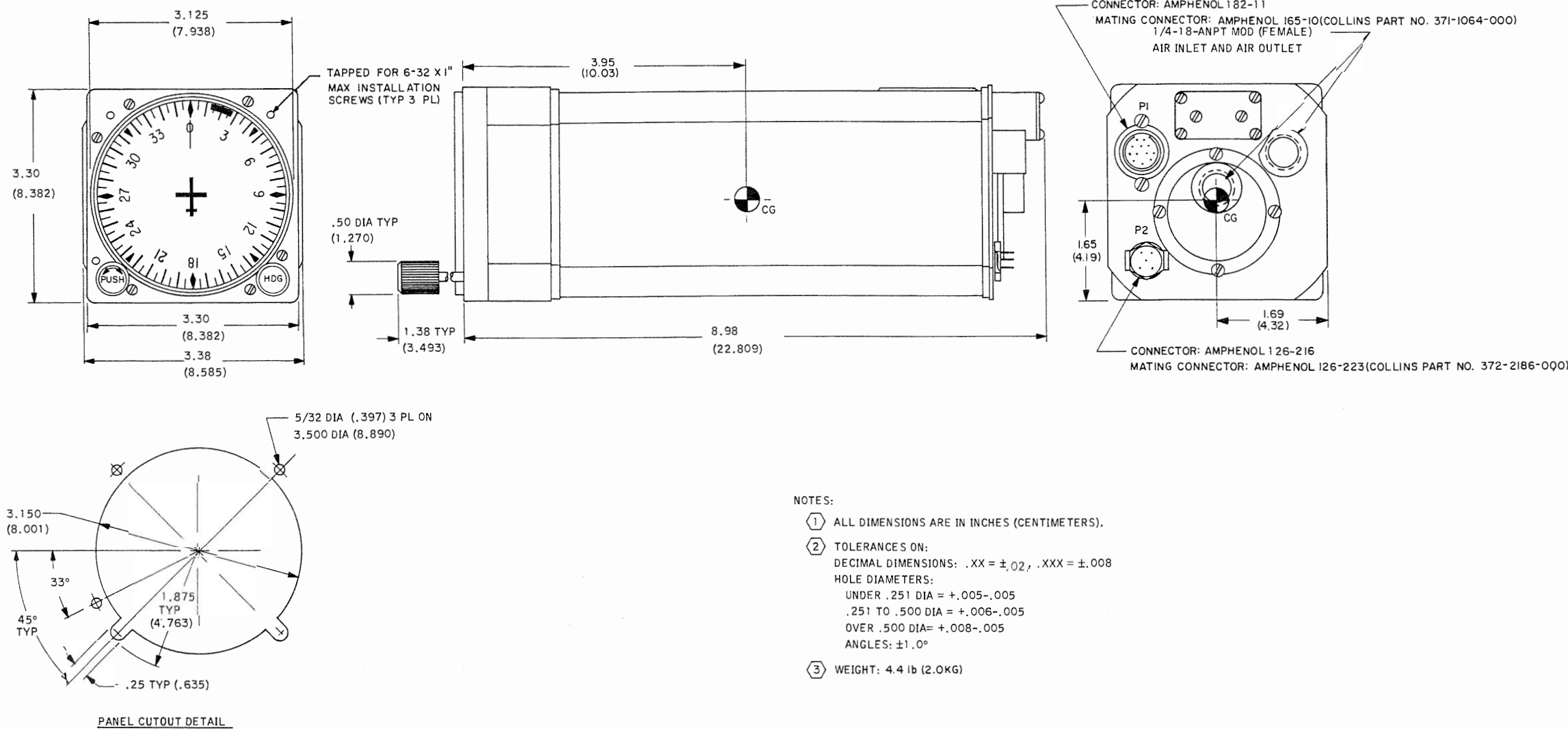




TP3-5418-014

331P-1 Directional Gyro Indicator, Outline and Mounting Diagram  
Figure 30

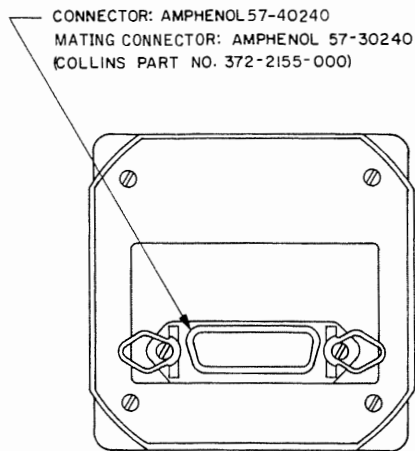
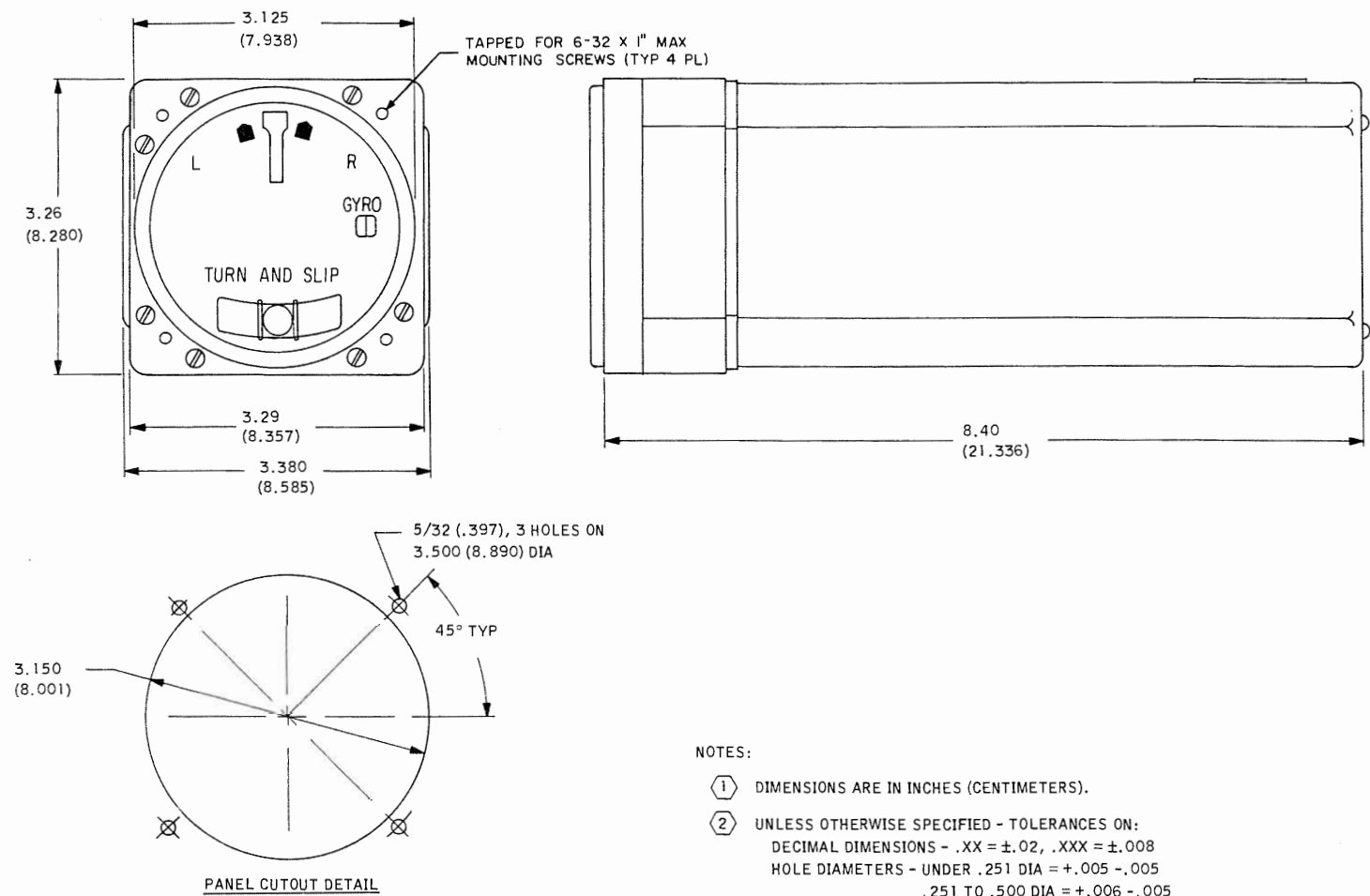




TP3-5417-014

331P-1V Directional Gyro Indicator, Outline and Mounting Diagram  
Figure 31





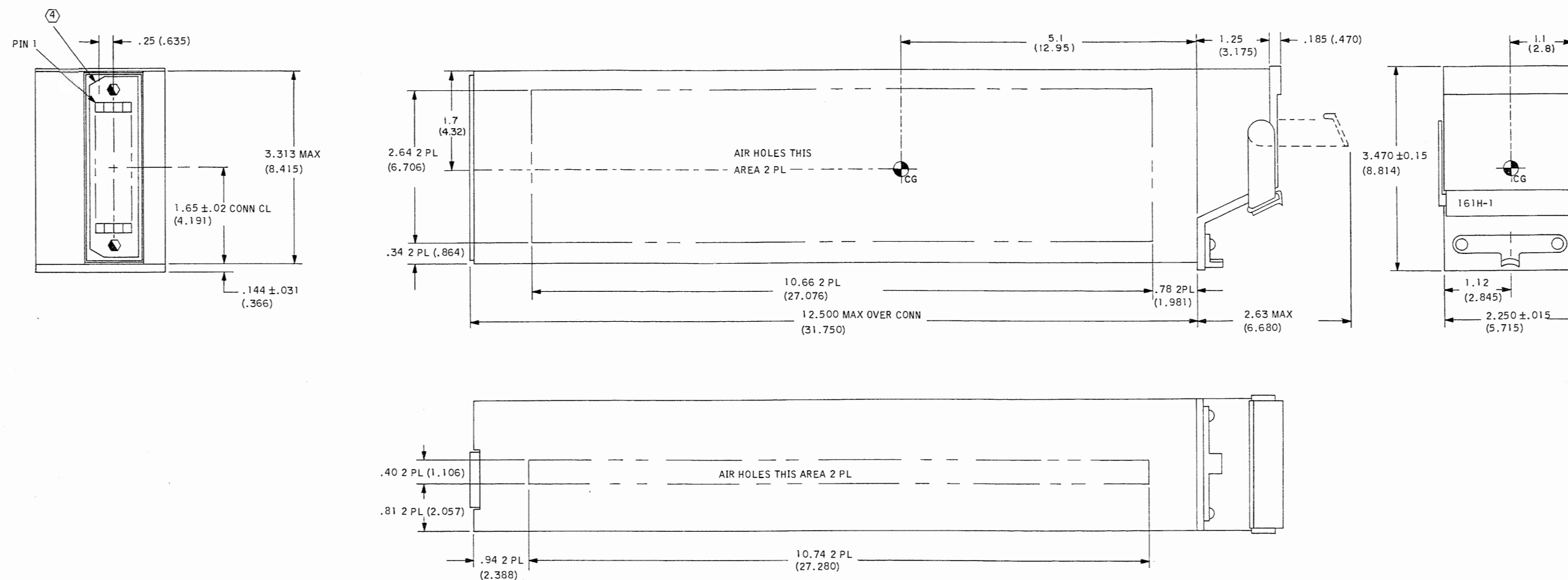
- NOTES:
- 1 DIMENSIONS ARE IN INCHES (CENTIMETERS).
  - 2 UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX =  $\pm .02$ , .XXX =  $\pm .008$   
HOLE DIAMETERS - UNDER .251 DIA =  $+.005 - .005$   
.251 TO .500 DIA =  $+.006 - .005$   
OVER .500 DIA =  $+.008 - .005$   
ANGLES =  $\pm 1.0^\circ$
  - 3 WEIGHT: 2.3 lb (1.04 KG)

TP3-5479-014

329T-1 Turn and Slip Indicator, Outline and Mounting Diagram  
Figure 29





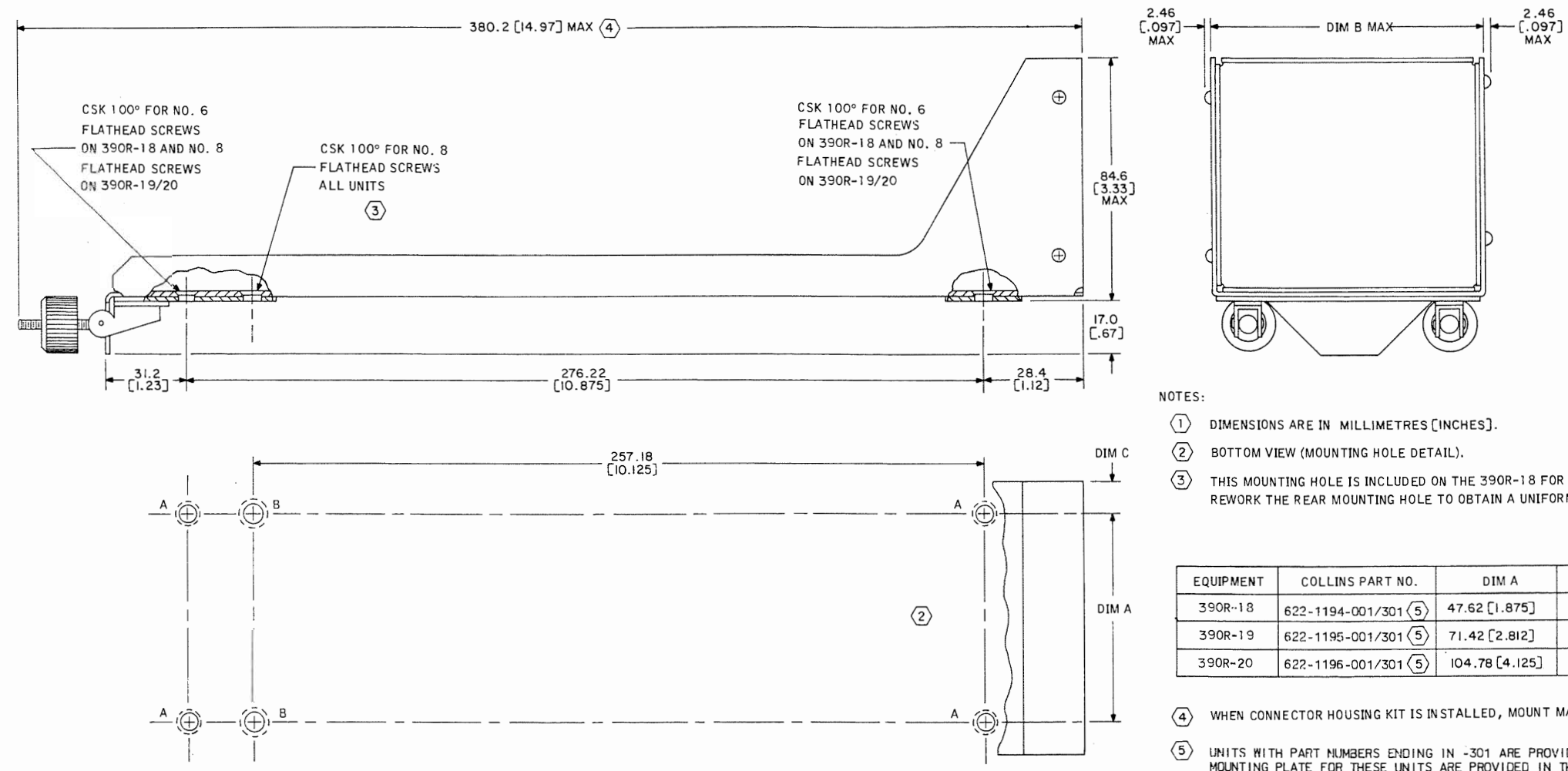


NOTES:

- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
 DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
 HOLE DIAMETERS - UNDER .251 DIA = +.005 -.005  
 .251 TO .500 DIA = +.006 -.005  
 OVER .500 DIA = +.008 -.005  
 ANGLES = ±1.0°
- ③ WEIGHT: 2.2 lb (1.00KG)
- ④ REAR CONNECTOR TYPE:  
 COLLINS PART NO. 618-3897-001  
 MATING CONNECTOR TYPE:  
 COLLINS PART NO. 618-5793-001



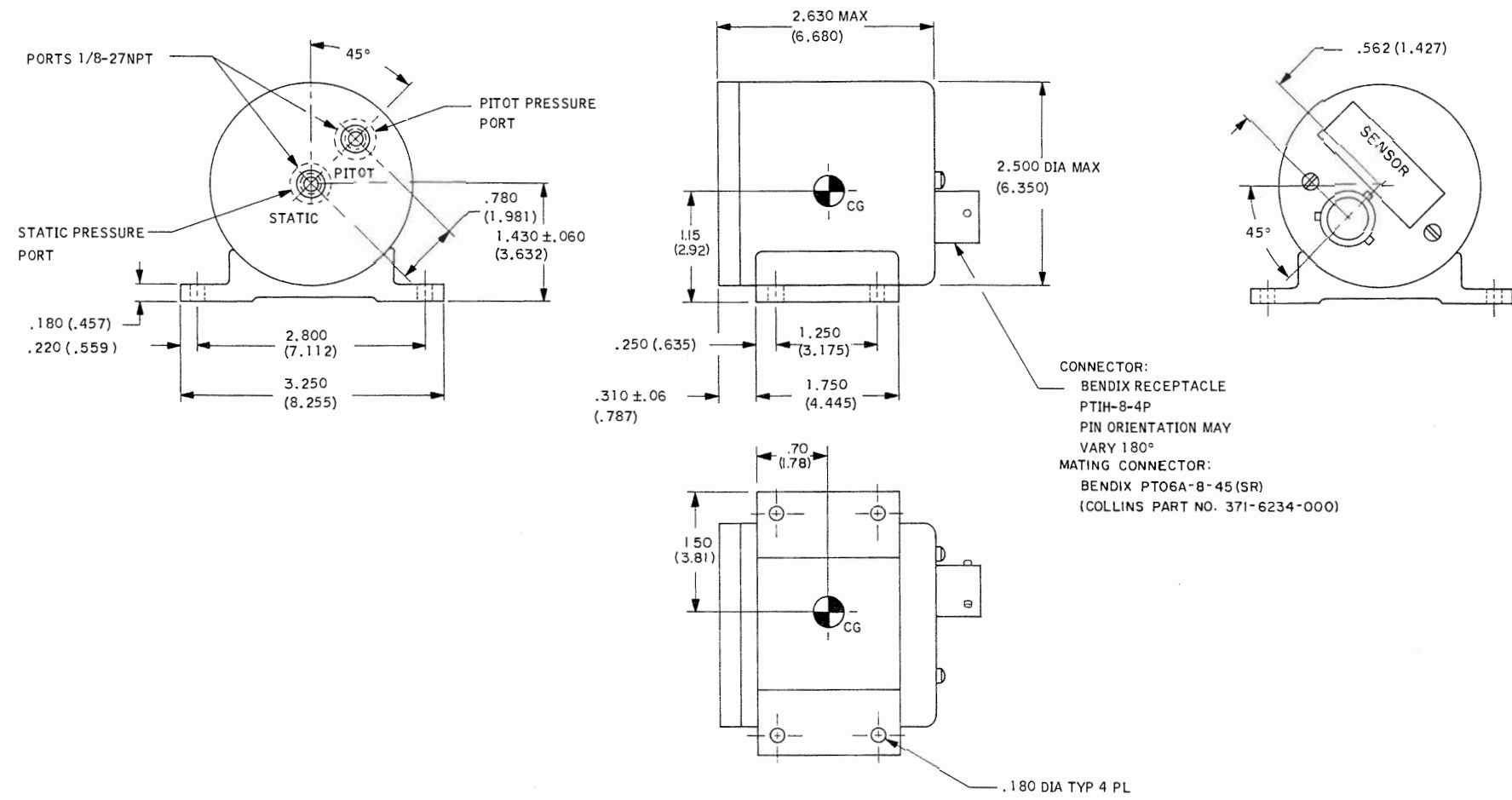




| EQUIPMENT | COLLINS PART NO.     | DIM A          | DIM B        | DIM C      | WEIGHT Kg [LBS] |
|-----------|----------------------|----------------|--------------|------------|-----------------|
| 390R-18   | 622-1194-001/301 (5) | 47.62 [1.875]  | 63.0 [2.48]  | 7.6 [.30]  | 0.4 [.18]       |
| 390R-19   | 622-1195-001/301 (5) | 71.42 [2.812]  | 96.3 [3.79]  | 12.4 [.49] | 0.5 [.23]       |
| 390R-20   | 622-1196-001/301 (5) | 104.78 [4.125] | 129.8 [5.11] | 12.4 [.49] | 0.5 [.23]       |

390R-18/19/20 Universal Mount, Outline and Mounting Diagram  
Figure 35 (Sheet 1 of 2)

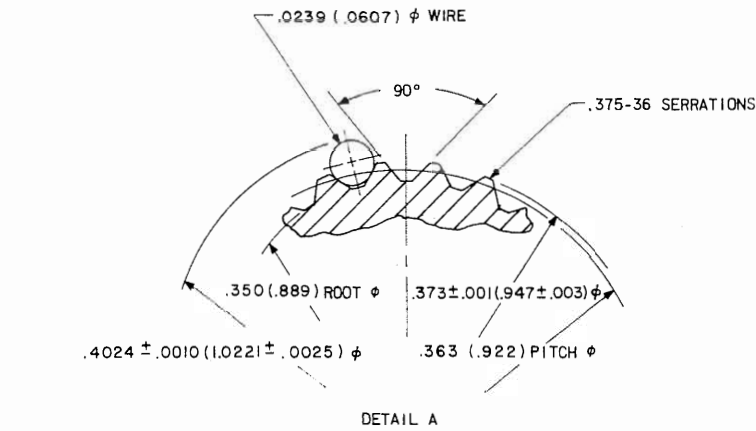




- NOTES:
- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
  - ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
 DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
 HOLE DIAMETERS - UNDER .251 DIA = +.005 -.005  
 .251 TO .500 DIA = +.006 -.005  
 OVER .500 DIA = +.008 -.005  
 ANGLES = ±1.0°
  - ③ WEIGHT: 0.5 lb (0.23KG)

590B-3 Indicated Airspeed Sensor, Outline and Mounting Diagram  
 Figure 37



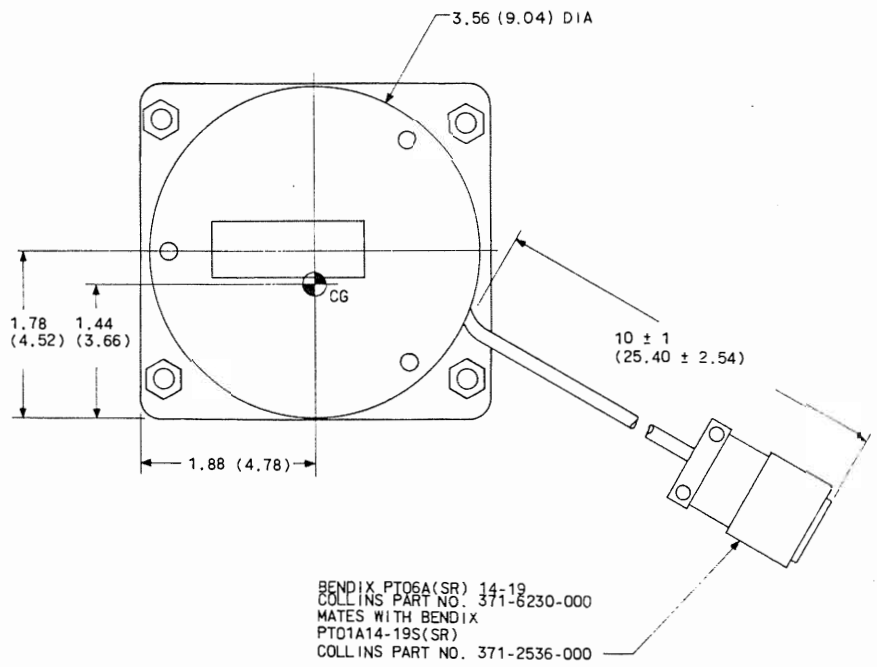
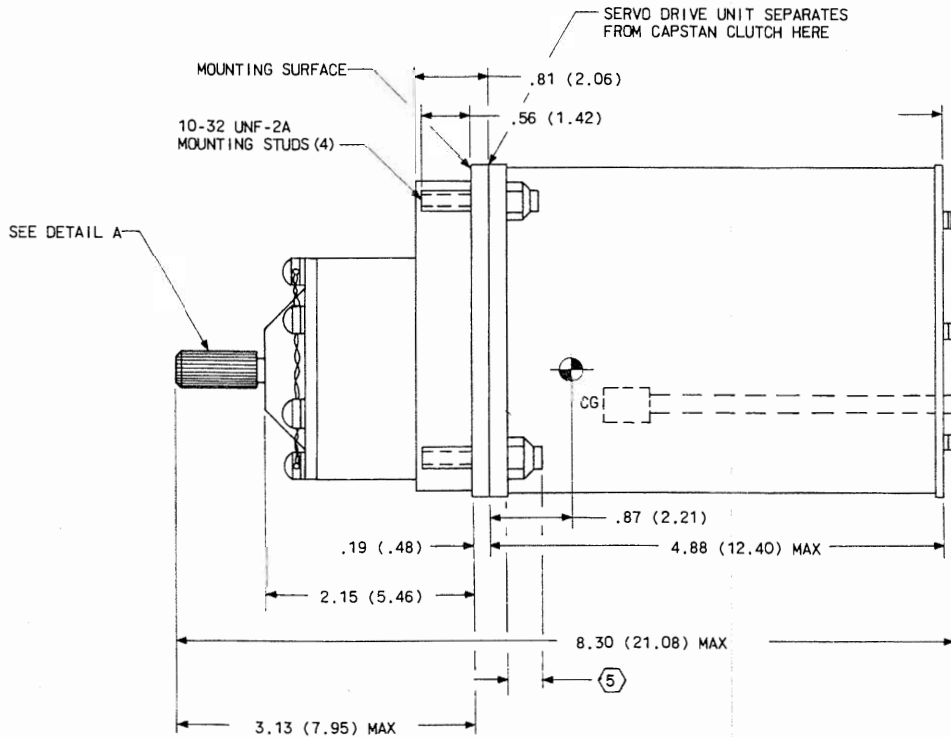
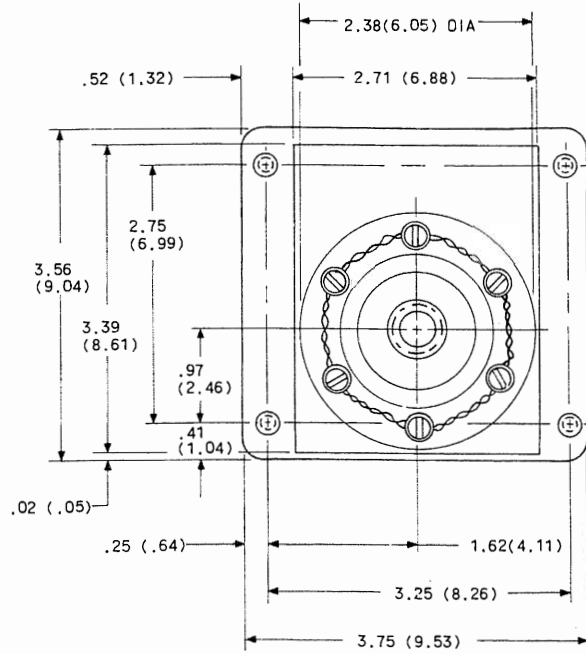


NOTES:

- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ± .02, .XXX = ± .008  
HOLE DIAMETERS - UNDER .251 DIA = + .005 - .005  
.251 TO .500 DIA = + .006 - .005  
OVER .500 DIA = + .008 - .005
- ANGLES = ± 1.0°
- ③ 0.75 IN (1.91) CLEARANCE REQUIRED TO REMOVE SERVO FROM MOUNT.
- ④ WEIGHT:  
SERVO: 2.3 LB (1.04 KG)  
MOUNT: 1.5 LB (0.68 KG)

- ⑤ MOUNTING BOLTS CAN BE MACHINED TO .225 (0.572) MINIMUM. MOUNTING NUTS (CPN 333-1422-070) AND LIQUID LOCK (CPN 005-2308-010) MAY BE SUBSTITUTED FOR MOUNTING NUTS (CPN 333-0385-000) AND FLAT WASHERS. THIS MODIFICATION SHOULD BE USED ONLY WHEN SPACE RESTRICTIONS PREVENT USE OF THE UNMODIFIED SERVO.
- ⑥ CLUTCH TORQUE ADJUSTMENT CAN BE READJUSTED TO MEET SPECIFIC INSTALLATION REQUIREMENTS.

| SERVO (CPN)                  | CLUTCH, CAPSTAN (CPN) | CLUTCH TORQUE                     |                                   | SERVO DRIVE (CPN) |
|------------------------------|-----------------------|-----------------------------------|-----------------------------------|-------------------|
|                              |                       | FACTORY SETTING                   | ADJUSTMENT RANGE                  |                   |
| 334D-6C TRIM<br>622-5082-001 | 634-0214-001          | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 45 TO 75 LB IN<br>(5.0 TO 8.5 Nm) | 618-5999-009      |
| 334D-6C TRIM<br>622-5082-002 | 634-0214-001          | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 45 TO 75 LB IN<br>(5.0 TO 8.5 Nm) | 618-5999-011      |



623-6043-001

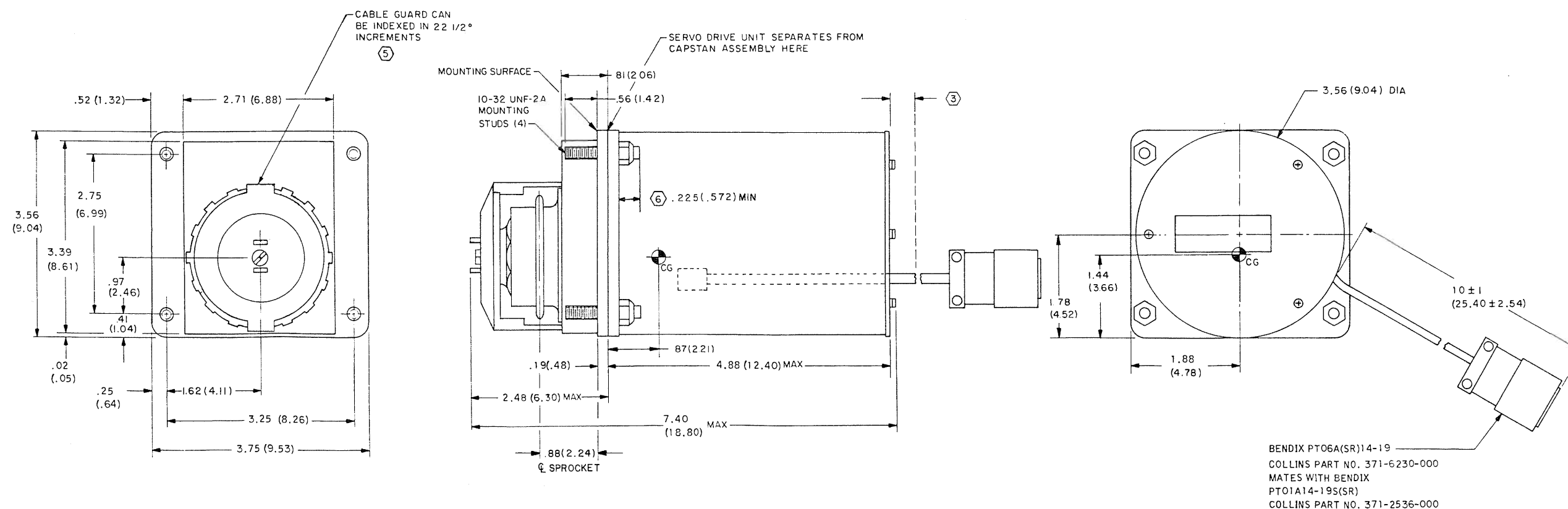
334D-6C Trim Servo With Spline Drive,  
Outline and Mounting Diagram  
Figure 44C

NOTES:

- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX =  $\pm .02$ , .XXX =  $\pm .008$   
HOLE DIAMETERS - UNDER .251 DIA =  $\pm .005$  - .005  
.251 TO .500 DIA =  $\pm .006$  - .005  
OVER .500 DIA =  $\pm .008$  - .005  
ANGLES =  $\pm 1.0^\circ$
- ③ 0.75 IN (1.91) CLEARANCE REQUIRED TO REMOVE SERVO FROM MOUNT.
- ④ WEIGHT:  
SERVO: 2.3 LB (1.04 KG)  
MOUNT: 1.5 LB (0.68 KG)
- ⑤ CAPSTAN GUARD LEGS MAY BE REPOSITIONED PER INSTALLATION REQUIREMENTS. CENTER CAPSTAN GUARD MACHINE SCREW TO BE SAFELY WIRED. CHECK TO INSURE THAT CAPSTAN ROTATES FREELY.

- 6 MOUNTING BOLTS CAN BE MACHINED TO .225 (0.572) MINIMUM. MOUNTING NUTS (CPN 333-1422-070) AND LIQUID LOCK (CPN005-2308-010) MAY BE SUBSTITUTED FOR MOUNTING NUTS (CPN 333-0385-000) AND FLAT WASHERS. THIS MODIFICATION SHOULD BE USED ONLY WHEN SPACE RESTRICTIONS PREVENT USE OF THE UNMODIFIED SERVO.
- 7 CLUTCH TORQUE ADJUSTMENT CAN BE READJUSTED TO MEET SPECIFIC INSTALLATION REQUIREMENTS.

| SERVO (CPN)                  | CLUTCH,CAPSTAN<br>(CPN) | CLUTCH TORQUE                     |                                   | SERVO DRIVE<br>(CPN) | OUTPUT SPROCKET INFORMATION                        |
|------------------------------|-------------------------|-----------------------------------|-----------------------------------|----------------------|----------------------------------------------------|
|                              |                         | FACTORY SETTING                   | ADJUSTMENT RANGE                  |                      |                                                    |
| 334D-6B TRIM<br>622-5026-001 | 634-1143-001            | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 45 TO 75 LB IN<br>(5.0 TO 8.5 Nm) | 618-5999-009         | AMERICAN STANDARD TOOTH FORM<br>25 PITCH, 26 TOOTH |
| 334D-6B TRIM<br>622-5026-002 | 634-1143-002            | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 45 TO 75 LB IN<br>(5.0 TO 8.5 Nm) | 618-5999-010         | AMERICAN STANDARD TOOTH FORM<br>25 PITCH, 26 TOOTH |



623-6043-001

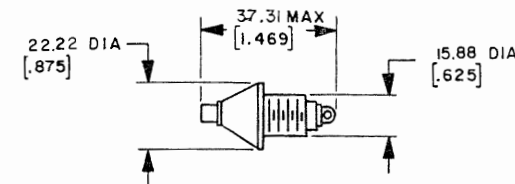
334D-6B Trim Servo With Sprocket Drive,  
Outline and Mounting Diagram  
Figure 44B



NOTES:

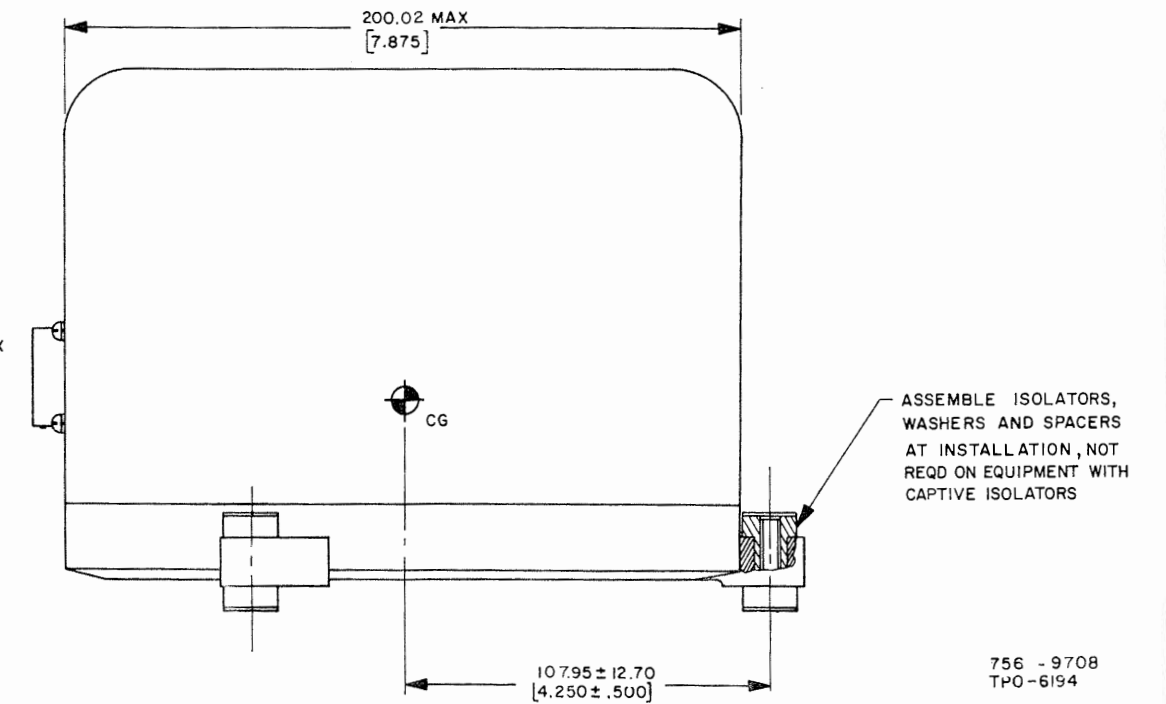
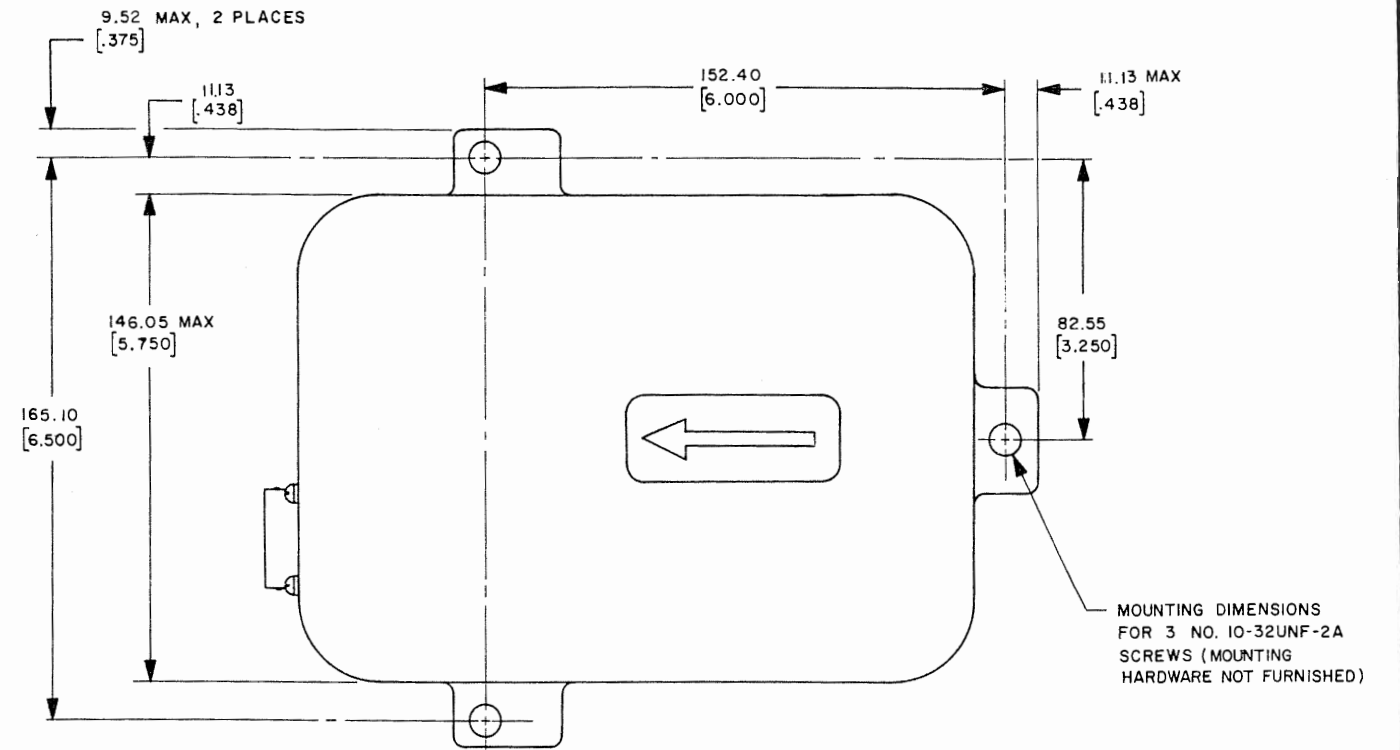
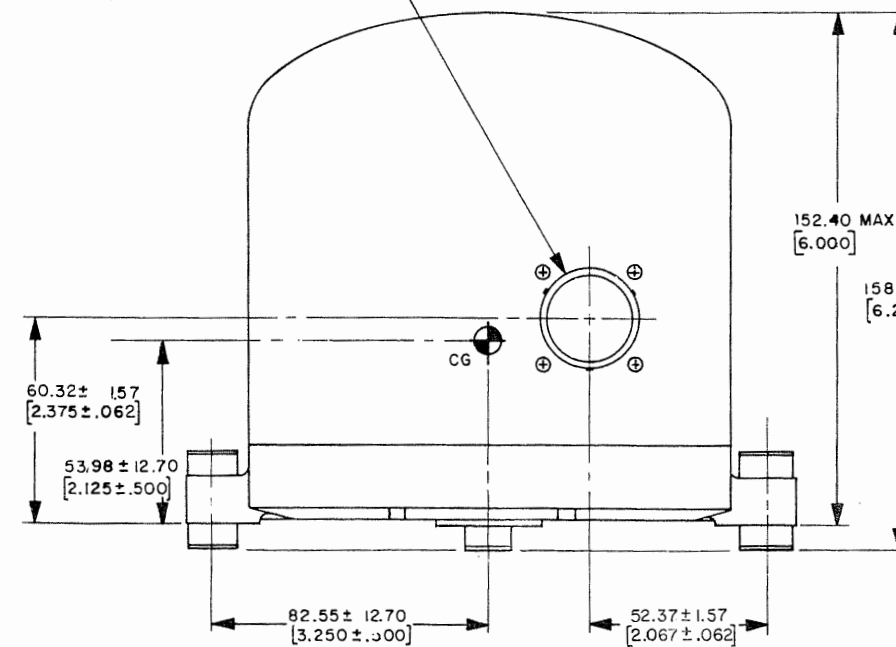
- ① ALL DIMENSIONS ARE IN MILLIMETRES [INCHES].
- ② WEIGHT- 3.3 Kg [7.2 LB] MAX
- ③ ALLOW 3.18 [1.25] SWAY SPACE ON ALL SIDES
- ④ THIS DRAWING IS APPLICABLE TO THE FOLLOWING EQUIPMENT:

332D-II CPN 522-3985-001  
 332D-IIA CPN 792-6694-001/002  
 332D-IIB CPN 622-4488-001  
 332D-IIT CPN 622-4565-001  
 332D-IIV CPN 622-4424-001



FAST ERECTION SWITCH  
 PROVIDED WITH ONLY 332D-IIA,  
 CPN 792-6694-002

CONNECTOR MS3112E-18-32P  
 COLLINS PART NO. 371-6606-000  
 MATES WITH MS3116E-18-32S  
 COLLINS PART NO. 371-2242-000

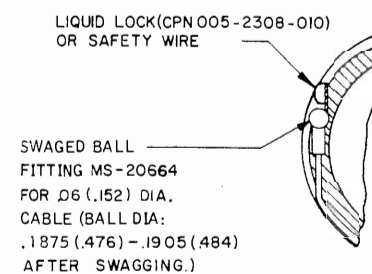


756 - 9708  
 TPO-6194

332D-11( ) Vertical Reference, Outline  
 and Mounting Diagram  
 Figure 41







DETAIL A  
(TYP 2PL)

NOTES:

- ① DIMENSIONS ARE IN INCHES. (CENTIMETERS)
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS -  $.XX = \pm .02$ ,  $.XXX = \pm .008$   
HOLE DIAMETERS - UNDER  $.251 \text{ DIA} = +.005 \text{ } -.005$   
 $.251 \text{ TO } .500 \text{ DIA} = +.006 \text{ } -.005$   
OVER  $.500 \text{ DIA} = +.008 \text{ } -.005$   
ANGLES  $= \pm 1.0^\circ$

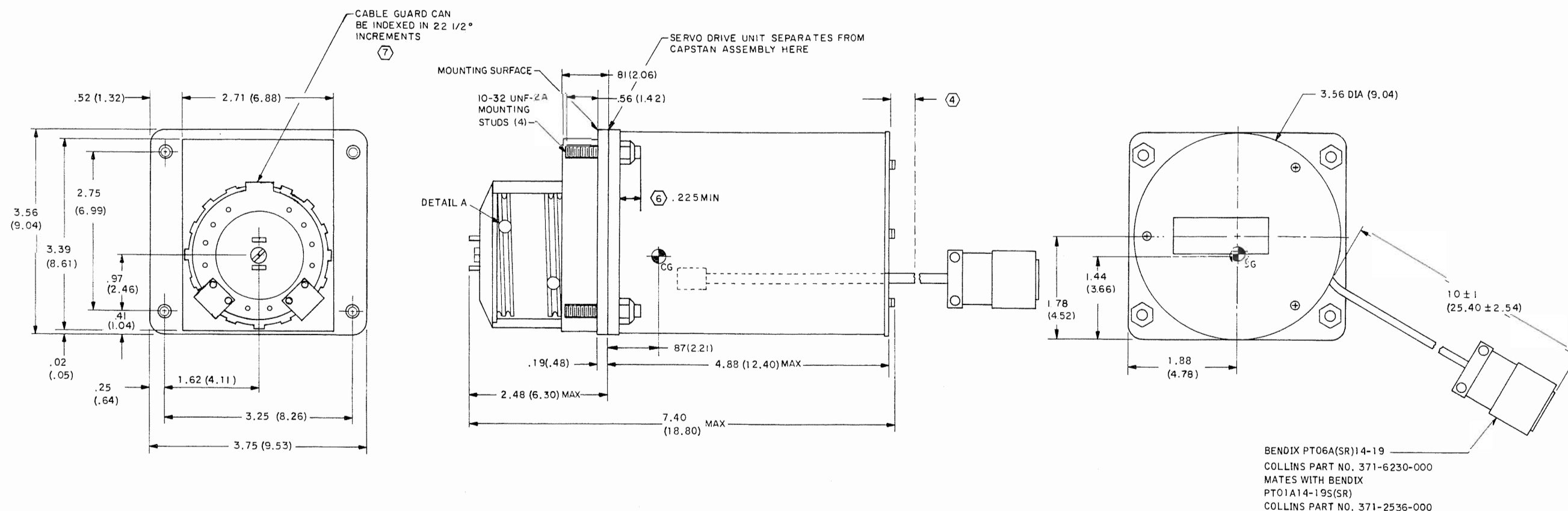
| CAPSTAN DATA  |               |             |                        |
|---------------|---------------|-------------|------------------------|
| PITCH DIA     | OUTSIDE DIA   | CABLE DIA   | MAX CABLE TRAVEL       |
| 2.000 (5.080) | 2.125 (5.398) | .06 (.1524) | 24.000 (60.960) INCHES |

- ④ 0.75 IN (1.91) CLEARANCE REQUIRED TO REMOVE SERVO FROM MOUNT.

| 5 WEIGHT |                  | 334C-9           | 334D-6 |
|----------|------------------|------------------|--------|
| SERVO    | 2.4 LB (1.09 KG) | 2.3 LB (1.04 KG) |        |
| MOUNT    | 1.3 LB (.59 KG)  | 1.3 LB (.59 KG)  |        |

- 6 MOUNTING BOLTS CAN BE MACHINED TO .225,(0.572) MINIMUM. MOUNTING NUTS(CPN 333-1422-070) AND LIQUID LOCK (CPN 005-2308-010) MAY BE SUBSTITUTED FOR MOUNTING NUTS (CPN 333-0385-000) AND FLAT WASHERS. THIS MODIFICATION SHOULD BE USED ONLY WHEN SPACE RESTRICTIONS PREVENT USE OF THE UNMODIFIED SERVO.
- 7 CAPSTAN GUARD LEGS MAY BE REPOSITIONED PER INSTALLATION REQUIREMENTS. CENTER CAPSTAN GUARD MACHINE SCREW TO BE SAFETY WIRED. CHECK TO INSURE THAT CAPSTAN ROTATES FREELY.
- 8 CAPSTAN TORQUE ADJUSTMENT, CAN BE READJUSTED TO MEET SPECIFIC INSTALLATION REQUIREMENTS.

| SERVO (CPN)                                  | CAPSTAN (CPN) | CAPSTAN TORQUE                        |                                     |
|----------------------------------------------|---------------|---------------------------------------|-------------------------------------|
|                                              |               | FACTORY SETTING                       | ADJUSTMENT RANGE                    |
| 334D-6 TRIM<br>(622-0965-001/003)            | 618-5973-001  | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm)     | 20 TO 75 LB IN<br>(2.3 TO 8.5 Nm)   |
| 334C-9 PRIMARY<br>(622-0964-001/003/<br>005) | 618-5973-002  | 23 TO 27 LB IN<br>(2.6 TO 3.0 Nm)     | 20 TO 75 LB IN<br>(2.3 TO 8.5 Nm)   |
| 334C-9 PRIMARY<br>(622-0964-002/004)         | 618-5973-003  | 57.5 TO 67.5 LB IN<br>(6.5 TO 7.6 Nm) | 50 TO 180 LB IN<br>(5.6 TO 20.2 Nm) |



623-6043  
TP3-3759-014

334C-9 Primary Servo and 334D-6 Trim Servo With  
Capstan Drive, Outline and Mounting Diagram  
Figure 42

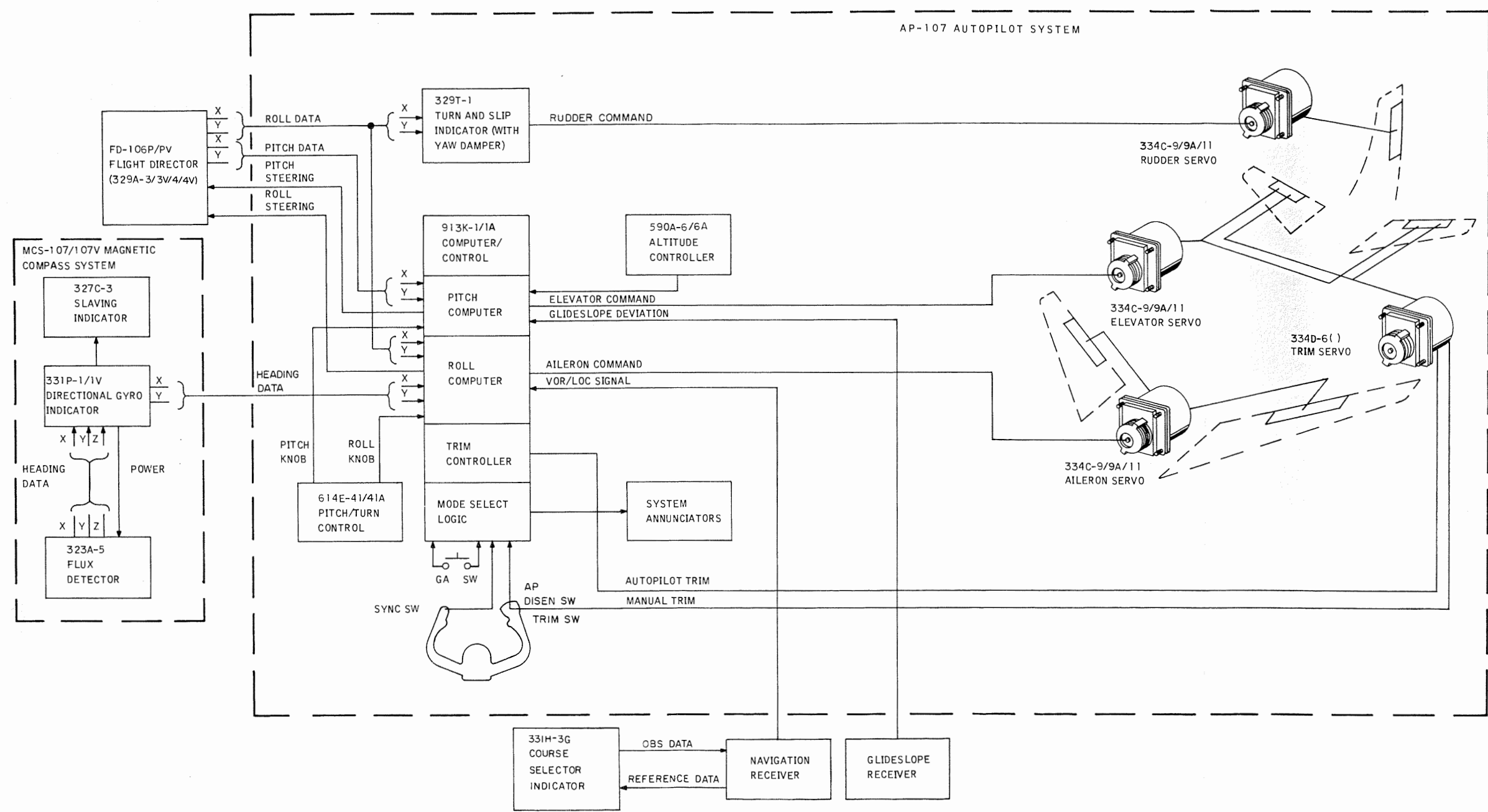




Table 4. Gain Adjustment Values.

| TEST<br>NUMBER | 913K-1/1A/562C-13/13A STATUS |                   |                   |                   |                   |                   |                   |                   |
|----------------|------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                | -001                         | -002              | -003              | -004              | -005              | -006              | -007              | -008              |
| 2.2            | Refer to SIL                 | +769 ±120 mV dc   | +750 ±120 mV dc   | +660 ±120 mV dc   | +900 ±120 mV dc   |                   | +780 ±120 mV dc   | +2000 ±120 mV dc  |
| 4.2            | Refer to SIL                 | +1.32 ±0.10 V dc  | +2.00 ±0.15 V dc  | +1.40 ±0.10 V dc  | +4.30 ±0.15 V dc  |                   | +1.90 ±0.10 V dc  | +9.65 ±0.10 V dc  |
| 5.1            | Refer to SIL                 | X+100 ±150 mV dc  | X+450 ±150 mV dc  | X+600 ±100 mV dc  | X+1000 ±150 mV dc |                   | X+310 ±150 mV dc  | X+100 ±150 mV dc  |
| 6.2            | See test 3.                  | ±25 mV dc/min     | ±40 mV dc/min     | ±32 mV dc/min     | ±40 mV dc/min     |                   | ±36 mV dc/min     | ±40 mV dc/min     |
| 7.1            | Refer to SIL                 | +1000 ±75 mV dc   | +1000 ±75 mV dc   | +1000 ±75 mV dc   | +1400 ±75 mV dc   |                   | +1500 ±75 mV dc   | +1050 ±75 mV dc   |
| 9.1            | Refer to SIL                 | +706 ±120 mV dc   | +750 ±120 mV dc   | +890 ±120 mV dc   | +700 ±120 mV dc   |                   | +769 ±120 mV dc   | +1500 ±120 mV dc  |
| 10.2           | Refer to SIL                 | +1.94 ±0.12 V dc  | +3.00 ±0.17 V dc  | +1.30 ±0.12 V dc  | +2.60 ±0.17 V dc  |                   | +1.26 ±0.12 V dc  | +3.80 ±0.17 V dc  |
| 11.1           | Refer to SIL                 | Y+1.07 ±0.15 V dc | Y+400 ±150 mV dc  | Y+500 ±150 mV dc  | Y+400 ±150 mV dc  |                   | Y+270 ±100 mV dc  | Y+400 ±150 mV dc  |
| 12.2           | Refer to SIL                 | -1200 ±90 mV dc   | -1400 ±100 mV dc  | -1200 ±90 mV dc   | -1400 ±100 mV dc  |                   | -1200 ±90 mV dc   | -1050 ±75 mV dc   |
| 13.2           | Refer to SIL                 | +330 ±25 mV dc    | +115 ±12 mV dc    | +200 ±20 mV dc    | +190 ±20 mV dc    |                   | +60 ±6 mV dc      | +160 ±20 mV dc    |
| 14.2           | Refer to SIL                 | -470 ±30 mV dc    | +700 ±50 mV dc    | +530 ±35 mV dc    | -740 ±50 mV dc    |                   | +460 ±30 mV dc    | +750 ±50 mV dc    |
| 15.3           | Refer to SIL                 | 43 ±6%            | 55 ±6%            | 31 ±4%            | 30 ±4%            |                   | 12 ±4%            | 30 ±9%            |
| 15.4           | Refer to SIL                 | 100%              | 85 ±9%            | 55 ±6%            | 71±9%             |                   | 54 ±6%            | 30 ±9%            |
|                | -009                         | -010              | -011              | -012              | -013              | -014              | -015              | -016              |
| 2.2            | +750 ±120 mV dc              | +780 ±120 mV dc   | +1600 ±120 mV dc  | +750 ±120 mV dc   | +750 ±120 mV dc   | +750 ±120 mV dc   | +750 ±120 mV dc   | +750 ±120 mV dc   |
| 4.2            | +2.00 ±0.15 V dc             | +190 ±0.10 V dc   | +4.50 ±0.15 V dc  | +4.56 ±0.10 V dc  | +3.80 ±0.30 V dc  | +3.80 ±0.38 V dc  | +4.30 ±0.30 V dc  | +6.30 ±0.20 V dc  |
| 5.1            | X+2.00 ±0.15 V dc            | X+310 ±150 mV dc  | X+1.50 ±0.15 V dc | X+1.69 ±0.10 V dc | X+600 ±300 mV dc  | X+4.40 ±0.60 V dc | X+1.00 ±0.30 V dc | X+1.90 ±0.30 V dc |
| 6.2            | ±40 mV dc/min                | ±36 mV dc/min     | ±40 mV dc/min     | ±75 mV dc/min     | ±22 mV dc/min     | ±44 mV dc/min     | ±40 mV dc/min     | ±50 mV dc/min     |
| 7.1            | +1000 ±75 mV dc              | +1500±75 mV dc    | +1000 ±75 mV dc   | +1000 ±75 mV dc   | +1500 ±75 mV dc   | +1000 ±75 mV dc   | +1000 ±75 mV dc   | +1250 ±90 mV dc   |
| 9.1            | +750 ±120 mV dc              | +769 ±120 mV dc   | +1500 ±120 mV dc  | +750 ±120 mV dc   | +750 ±120 mV dc   | +750 ±120 mV dc   | +750 ±120 mV dc   | +750 ±120 mV dc   |
| 10.2           | +3.00 ±0.17 V dc             | +1.26 ±0.12 V dc  | +5.00 ±0.17 V dc  | +5.27 ±0.17 V dc  | +3.25 ±0.17 V dc  | +3.25 ±0.17 V dc  | +2.60 ±0.17 V dc  | +5.55 ±0.225 V dc |
| 11.1           | Y+1000 ±150 mV dc            | Y+270 ±100 mV dc  | Y+1000 ±150 mV dc | Y+480 ±150 mV dc  | Y+350 ±150 mV dc  | Y+350 ±150 mV dc  | Y+400 ±150 mV dc  | Y+3.15 ±0.30 V dc |
| 12.2           | -1000 ±75 mV dc              | -1200 ±90 mV dc   | -1000 ±75 mV dc   | -470 ±50 mV dc    | -1500 ±100 mV dc  | -1500 ±100 mV dc  | -1400 ±100 mV dc  | -1140 ±100 mV dc  |
| 13.2           | +140 ±20 mV dc               | +60 ±6 mV dc      | +500 ±50 mV dc    | +580 ±75 mV dc    | +200 ±22 mV dc    | +200 ±22 mV dc    | +190 ±20 mV dc    | +150 ±20 mV dc    |
| 14.2           | -550 ±35 mV dc               | -460 ±30 mV dc    | +700 ±50 mV dc    | +510 ±40 mV dc    | -600 ±35 mV dc    | -600 ±35 mV dc    | +740 ±50 mV dc    | +610 ±35 mV dc    |
| 15.3           | 57 ±6%                       | 12 ±4%            | 30 ±4%            | 30 ±4%            | 45 ±6%            | 40 ±6%            | 50 ±4%            | 38 ±4%            |
| 15.4           | 89 ±9%                       | 54 ±6%            | 55 ±6%            | 32 ±6%            | 85 ±9%            | 70 ±9%            | 87 ±9%            | 88 ±9%            |

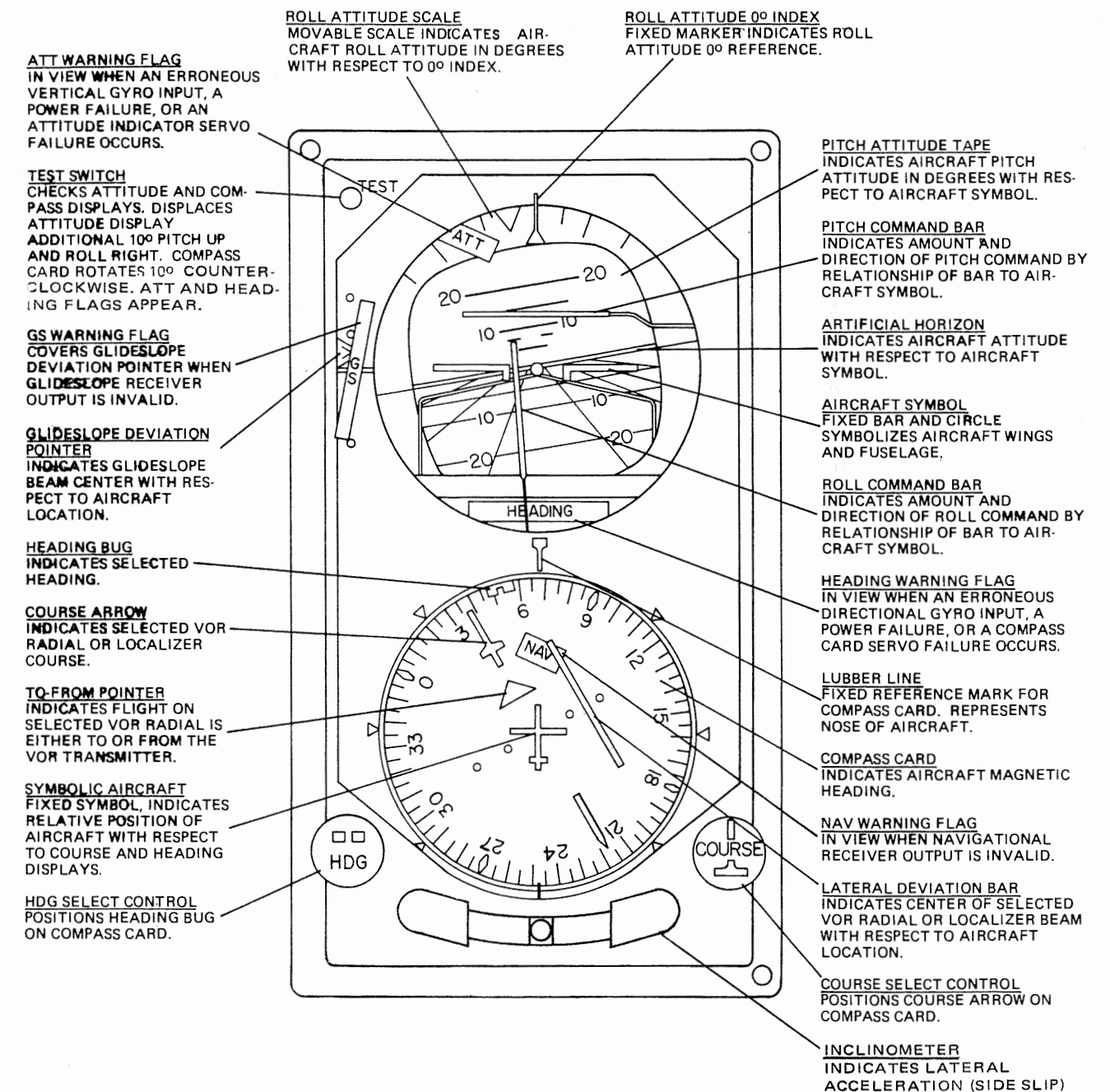




TP3-5539-014

AP-107 Flight Control System With FD-106P/PV and MCS-107/107V, Functional Block Diagram  
Figure 3





TP3-2505-011

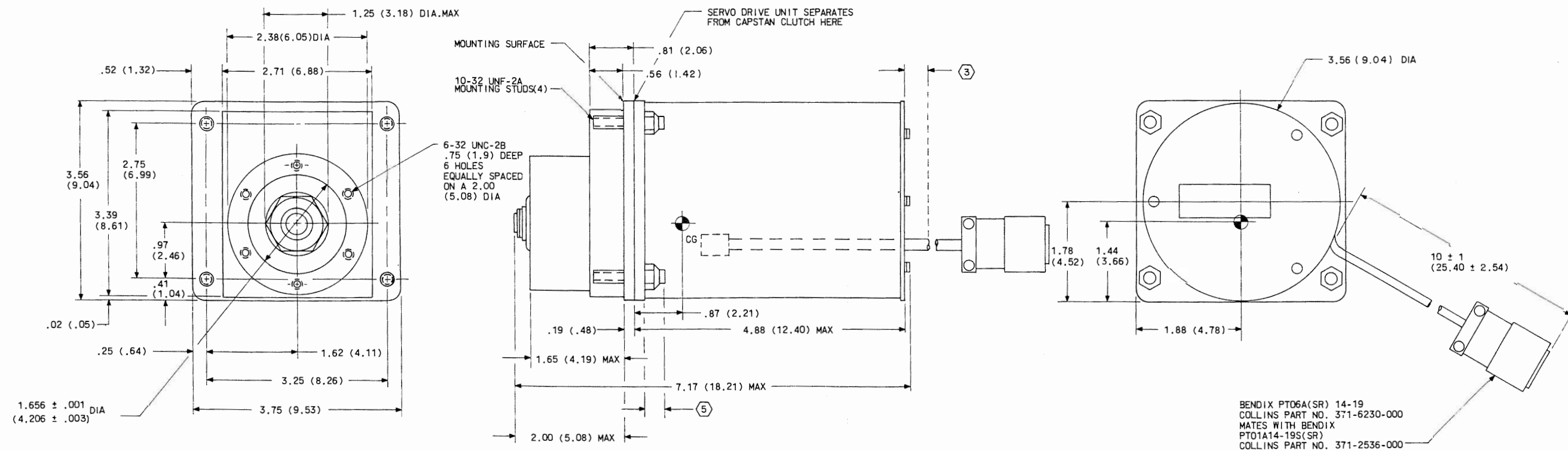
FD-112C Flight Director Indicator, Controls and Indicators  
Figure 6

NOTES:

- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX =  $\pm .02$ , .XXX =  $\pm .008$   
HOLE DIAMETERS - UNDER .251 DIA =  $+.005$  - .005  
.251 TO .500 DIA =  $+.006$  - .005  
OVER .500 DIA =  $+.008$  - .005  
  
ANGLES =  $\pm 1.0^\circ$
- ③ 0.75 IN (1.91) CLEARANCE REQUIRED TO REMOVE SERVO FROM MOUNT.
- ④ WEIGHT:  
SERVO: 2.3 LB (1.04 KG)  
MOUNT: 1.3 LB (0.59 KG)

- 5 MOUNTING BOLTS CAN BE MACHINED TO .225 (0.572) MINIMUM. MOUNTING NUTS (CPN 333-1422-070) AND LIQUID LOCK (CPN 005-2308-010) MAY BE SUBSTITUTED FOR MOUNTING NUTS (CPN 333-0385-000) AND FLAT WASHERS. THIS MODIFICATION SHOULD BE USED ONLY WHEN SPACE RESTRICTIONS PREVENT USE OF THE UNMODIFIED SERVO.
- 6 CLUTCH TORQUE ADJUSTMENT CAN BE READJUSTED TO MEET SPECIFIC INSTALLATION REQUIREMENTS.

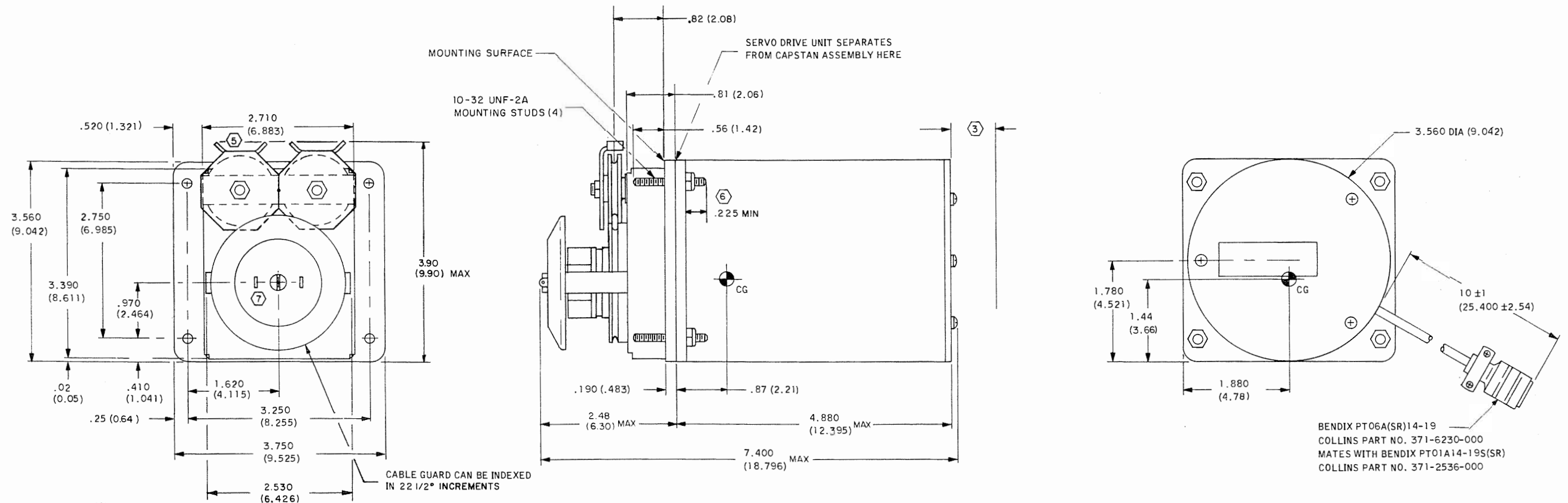
| SERVO (CPN)                  | CLUTCH, CAPSTAN (CPN) | CLUTCH TORQUE                     |                                   | SERVO DRIVE (CPN) |
|------------------------------|-----------------------|-----------------------------------|-----------------------------------|-------------------|
|                              |                       | FACTORY SETTING                   | ADJUSTMENT RANGE                  |                   |
| 3340-6A TRIM<br>622-3260-001 | 629-7949-001          | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 45 TO 75 LB IN<br>(5.0 TO 8.5 Nm) | 618-5999-009      |
| 3340-6A TRIM<br>622-3260-002 | 629-7949-001          | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 45 TO 75 LB IN<br>(5.0 TO 8.5 Nm) | 618-5999-010      |



623-6043-001

334D-6A Trim Servo With Flange Drive  
Outline and Mounting Diagram  
Figure 44A





NOTES:

- ① DIMENSIONS ARE IN INCHES (CENTIMETERS).
- ② UNLESS OTHERWISE SPECIFIED - TOLERANCES ON:  
DECIMAL DIMENSIONS - .XX = ±.02, .XXX = ±.008  
HOLE DIAMETERS - UNDER .251 DIA = +.005 - .005  
.251 TO .500 DIA = +.006 - .005  
OVER .500 DIA = +.008 - .005  
ANGLES = ±1.0°
- ③ 0.750 IN (1.905) CLEARANCE REQUIRED TO REMOVE SERVO FROM MOUNT.
- ④ WEIGHT:  
SERVO: 2.3 LB (1.04 KG)  
MOUNT: 1.4 LB. (0.63 KG)

⑤

| CAPSTAN DATA |                  |                        |
|--------------|------------------|------------------------|
|              | OUTSIDE DIAMETER | INSIDE GROOVE DIAMETER |
| DRIVE PULLEY | 2.125 (5.398)    | 1.839 (4.671)          |
| IDLER PULLEY | 1.25 (3.175)     | .97 (2.464)            |

CABLE DIAMETER:  
CPN 622-0965-002/004 REQUIRES .06 (0.15) DIA CABLE  
CPN 622-0965-005/006 REQUIRES NYLON COATED .06 (0.15) DIP  
CABLE WITH TOTAL DIA OF .094 (0.242) NOMINAL.

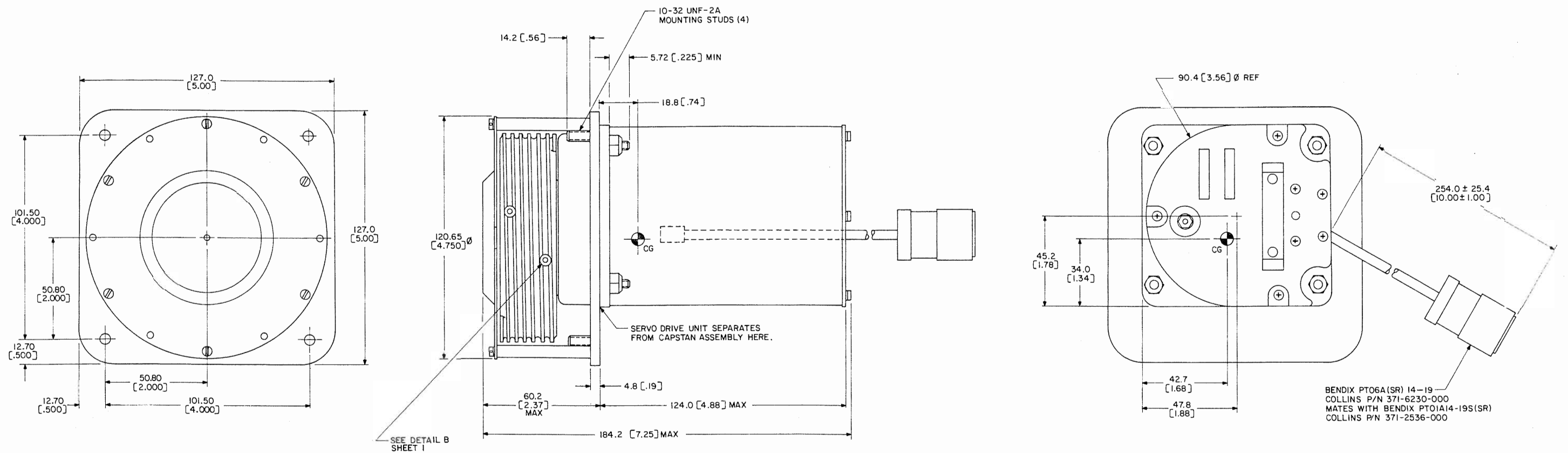
- ⑥ MOUNTING BOLTS CAN BE MACHINED TO .225 (0.572) MINIMUM MOUNTING NUTS (CPN 333-1422-070) AND LIQUID LOCK (CPN 005-2308-010) MAY BE SUBSTITUTED FOR MOUNTING NUTS (CPN 333-0385-000) AND FLAT WASHERS. THIS MODIFICATION SHOULD BE USED ONLY WHEN SPACE RESTRICTIONS PREVENT USE OF THE UNMODIFIED SERVO.
- ⑦ AFTER INSTALLATION SAFETY WIRE THESE SCREWS.
- ⑧ CAPSTAN TORQUE CAN BE ADJUSTED TO MEET SPECIFIC INSTALLATION REQUIREMENTS:

|                                                             | CAPSTAN             | CAPSTAN TORQUE                    |                                   |
|-------------------------------------------------------------|---------------------|-----------------------------------|-----------------------------------|
|                                                             | COLLINS PART NUMBER | FACTORY SETTING                   | ADJUSTMENT RANGE                  |
| 334D-6 TRIM SERVO<br>(622-0965-002/004/<br>005/006/008/009) | 618-5957-001/002    | 55 TO 65 LB IN<br>(6.2 TO 7.3 Nm) | 20 TO 75 LB IN<br>(2.3 TO 8.5 Nm) |

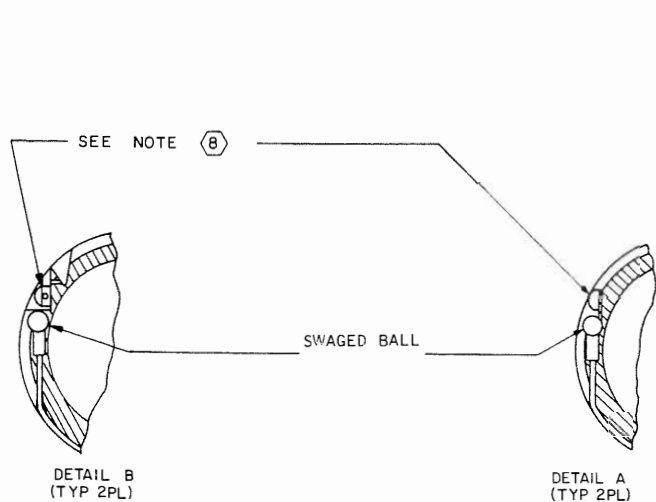
BENDIX PT06A(SR)14-19  
COLLINS PART NO. 371-6230-000  
MATES WITH BENDIX PT01A14-19S(SR)  
COLLINS PART NO. 371-2536-000

623-6043  
TP3-5638-014

334D-6 Trim Servo With Pulley Drive, Outline and  
Mounting Diagram  
Figure 44



334C-9A/C-11 Primary Servo, Outline and  
Mounting Diagram  
Figure 43 (Sheet 2)



NOTES:

- ① DIMENSIONS ARE IN MILLIMETERS [INCHES]  
② CAPSTAN DATA

| 334C-9A                     | 334C-11                     | PITCH DIA     | OUTSIDE DIA    | CABLE DIA  | MAX CABLE TRAVEL | CABLE BALL ENDS | SH |
|-----------------------------|-----------------------------|---------------|----------------|------------|------------------|-----------------|----|
| 622-2366-001,-002,-003,-004 | 622-2733-001,-002,-003,-004 | 50.80 [2.00]  | 53.975 [2.125] | 1.52 [.06] | 609.6 [24.00]    | PER MS-20664-2  | 1  |
| 622-2366-007,-008,-009,-010 | 622-2733-005,-006,-007,-008 | 50.80 [2.00]  | 53.975 [2.125] | 2.38 [.09] | 381.0 [15.00]    | PER MS-20664-3  | 1  |
|                             | 622-2733-009                | 101.60 [4.00] | 104.78 [4.125] | 1.52 [.06] | 914.4 [36.00]    | PER MS-20664-2  | 2  |

- ③ 19.05 [.75] CLEARANCE REQUIRED TO REMOVE SERVO FROM MOUNT.

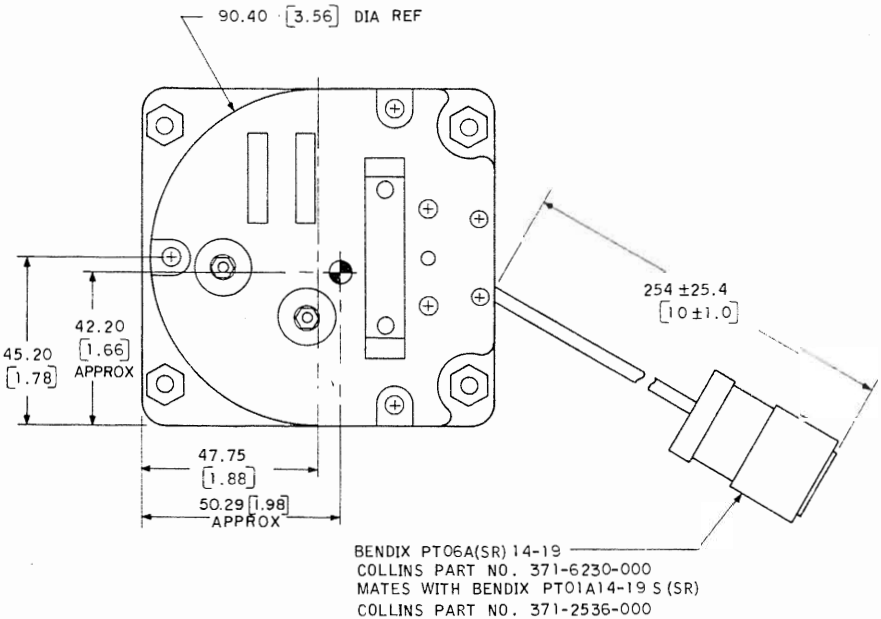
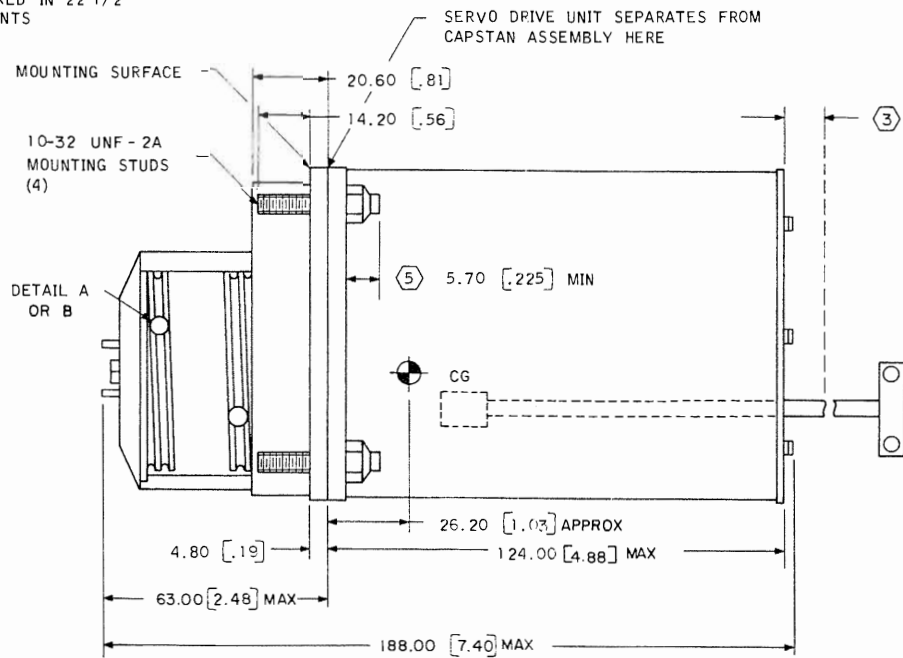
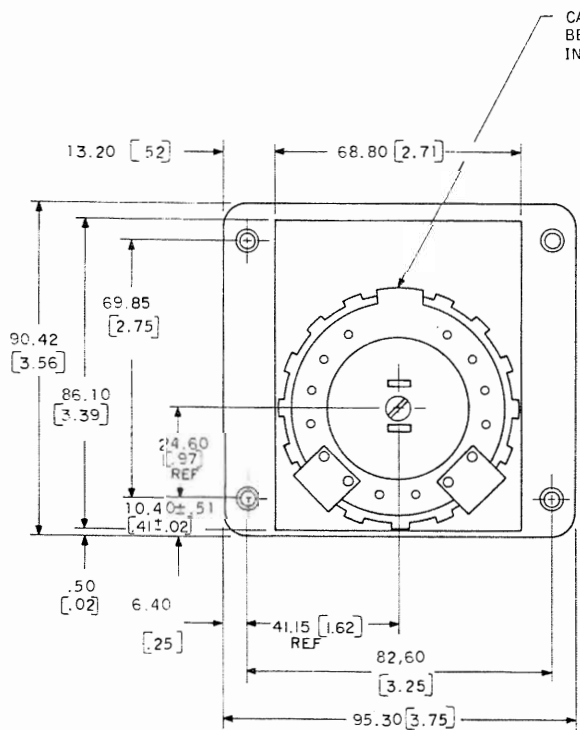
- ④ APPROX WEIGHT 334C-9A/C-11

|              |                  |
|--------------|------------------|
| SERVO        | 1.09 KG (2.4 LB) |
| MOUNT        | .68 KG (1.5 LB)  |
| MOUNT (-009) | 1.09 KG (2.4 LB) |

- ⑤ MOUNTING BOLTS CAN BE MACHINED TO 5.72 [225] MINIMUM MOUNTING NUTS (CPN 333-1422-070) AND LIQUID LOCK (CPN 005-2308-010) MAY BE SUBSTITUTED FOR MOUNTING NUTS (CPN 333-0385-000) AND FLAT WASHERS. THIS MODIFICATION SHOULD BE USED ONLY WHEN SPACE RESTRICTIONS PREVENT USE OF THE UNMODIFIED SERVO.
- ⑥ CAPSTAN GUARD LEGS MAY BE REPOSITIONED PER INSTALLATION REQUIREMENTS. CENTER CAPSTAN GUARD MACHINE SCREW TO BE SAFETY WIRED. CHECK TO INSURE THAT CAPSTAN ROTATES FREELY.
- ⑦ CAPSTAN TORQUE ADJUSTMENTS CAN BE READJUSTED TO MEET SPECIFIC INSTALLATION REQUIREMENTS.
- ⑧ SCREWS TO BE LIQUID LOCKED USING CPN 005-2308-010. ALSO SAFETY WIRE CAPSTANS PROVIDED WITH SAFETY WIRE LOCKING HOLES.

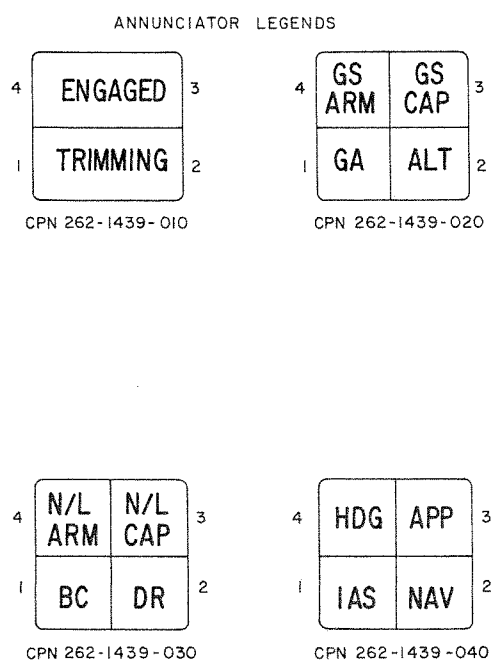
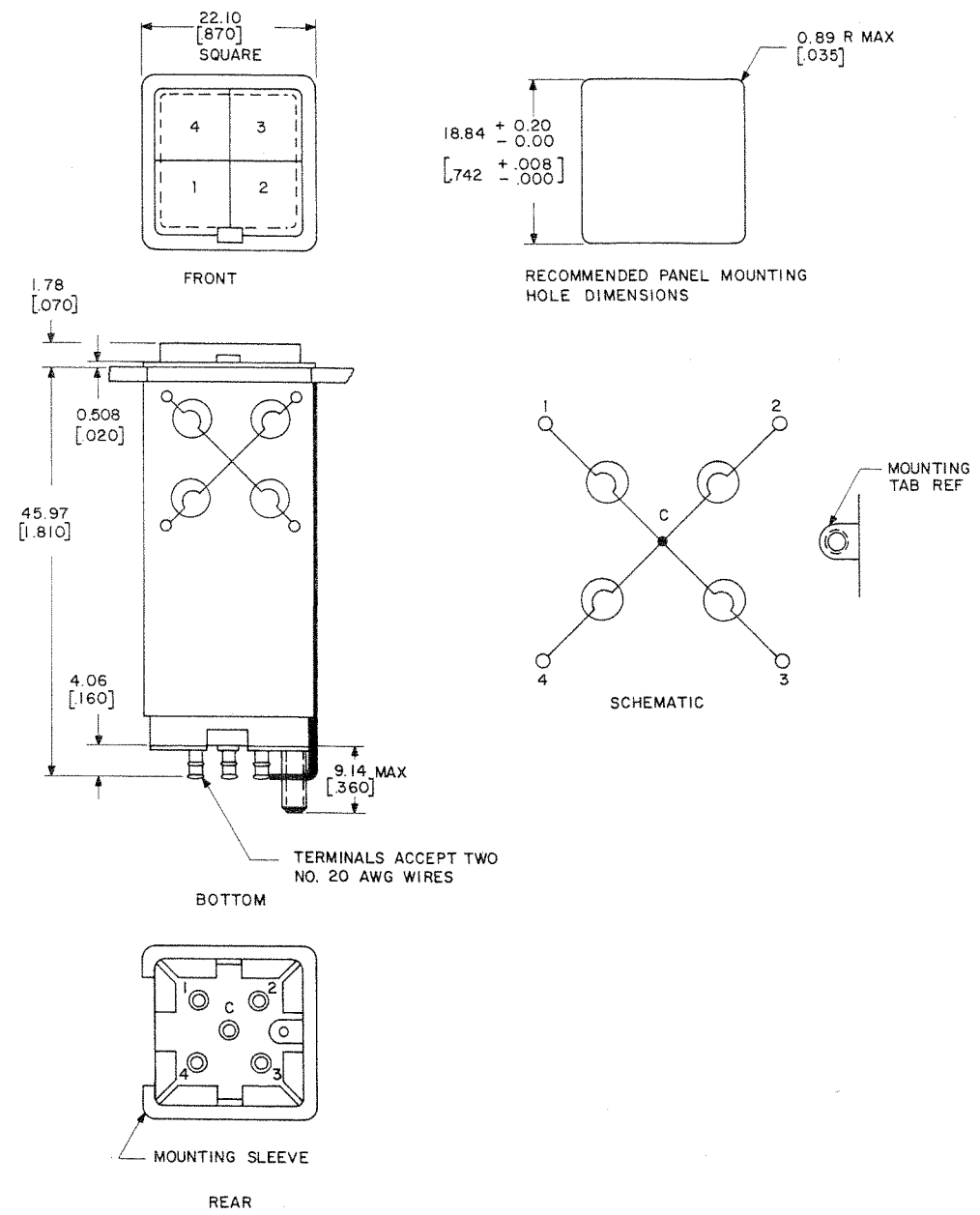
| 334C-9A<br>PRIMARY SERVO (CPN)         | CAPSTAN (CPN)                | CAPSTAN TORQUE     |              | SH |
|----------------------------------------|------------------------------|--------------------|--------------|----|
|                                        |                              | FACTORY SETTING    | ADJ RANGE    |    |
| 622-2366-001,-003<br>622-2366-007,-009 | 618-5973-002<br>618-5973-006 | 23 TO 27 LB IN     | 20-75 LB IN  | 1  |
| 622-2366-002,-004<br>622-2366-008,-010 | 618-5973-003<br>618-5973-005 | 57.5 TO 67.5 LB IN | 50-180 LB IN | 1  |
|                                        |                              |                    |              |    |

| 334C-11<br>PRIMARY SERVO (CPN)          | CAPSTAN (CPN)                | CAPSTAN TORQUE     |                 | SH |
|-----------------------------------------|------------------------------|--------------------|-----------------|----|
|                                         |                              | FACTORY SETTING    | ADJ RANGE       |    |
| 622-2733-001,-003,<br>622-2733-005,-007 | 618-5973-002<br>618-5973-006 | 23 TO 27 LB IN     | 20 TO 75 LB IN  | 1  |
| 622-2733-002,-004,<br>622-2733-006,-008 | 618-5973-003<br>618-5973-005 | 57.5 TO 67.5 LB IN | 50 TO 180 LB IN | 1  |
| 622-2733-009                            | 629-6724-001                 | 70-90 LB IN        | 20-170 LB IN    | 2  |



334C-9A/C-11 Primary Servo, Outline and Mounting Diagram  
Figure 43 (Sheet 1 of 2)

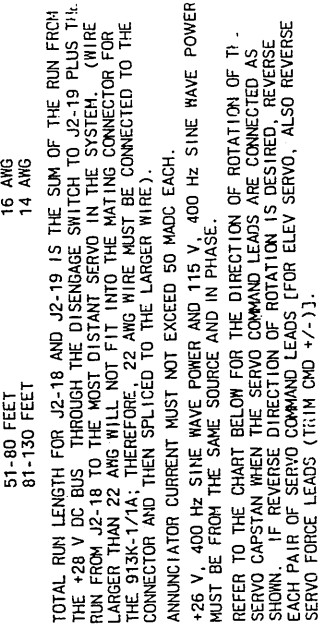




NOTE:  
DIMENSIONS ARE IN MILLIMETRES [INCHES].

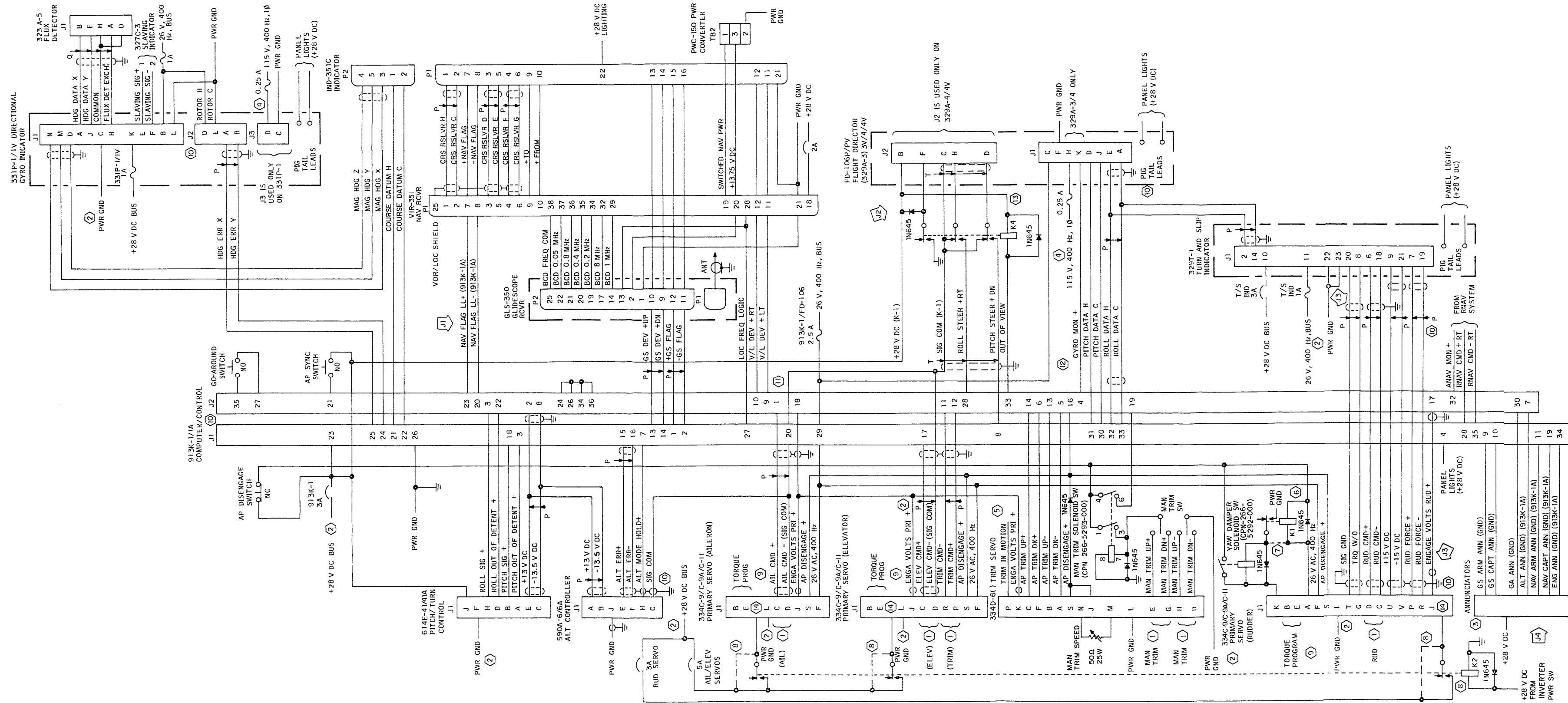






| SERVO<br>FUNCTION | SERVO COLLINS PART NUMBER                            |                                                          | AIRCRAFT<br>COMMAND    | CARSTEN ROTATION<br>(VIEWED FROM CAPSTAN) |
|-------------------|------------------------------------------------------|----------------------------------------------------------|------------------------|-------------------------------------------|
|                   | 334C-9A                                              | 334C-11                                                  |                        |                                           |
| AILERON           | 622-2366-001/003/007/009<br>622-2366-002/004/008/010 | 622-2733-001/003/005/007/009<br>622-2733-002/004/006/008 | LEFT BANK<br>LEFT BANK | CW<br>CCW                                 |
| ELEVATOR          | 622-2366-001/003/007/009<br>622-2366-002/004/008/010 | 622-2733-001/003/005/007/009<br>622-2733-002/004/006/008 | PITCH UP<br>PITCH UP   | CW<br>CCW                                 |
| RUDDER            | 622-2366-001/003/007/009<br>622-2366-002/004/008/010 | 622-2733-001/003/005/007/009<br>622-2733-002/004/006/008 | LEFT TURN<br>LEFT TURN | CW<br>CCW                                 |
| ELEV TRIM         | ALL 334D-6(1)                                        |                                                          | TRIM DOWN              | CCW                                       |

AP-107, FD-106P/PV, MCS-107/107V, VIR-351, GLS-350, and  
IND-351C 2-Axis System, Interconnect Diagram  
Figure 10



NOTES:  
(1) REFER TO THE CHART BELOW FOR THE DIRECTION OF ROTATION OF THE SERVO CAPSTAN WHEN THE SERVO COMMAND LEADS ARE CONNECTED AS SHOWN. IF REVERSE DIRECTION OF ROTATION IS DESIRED, REVERSE EACH PAIR OF SERVO COMMAND LEADS (FOR ELEV SERVO, ALSO REVERSE TRIM CMD +/- LEADS).

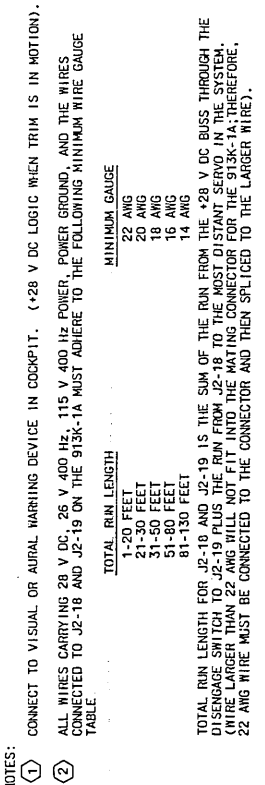
| SERVO FUNCTION | SERVO COLLINS PART NUMBER | AIRCRAFT COMMAND             | CAPSTAN ROTATION (VIEWED FROM CAPSTAN) |
|----------------|---------------------------|------------------------------|----------------------------------------|
| AILERON        | 334C-9A                   | 622-2366-001/003/007/009     | LEFT BANK                              |
|                |                           | 622-2366-002/004/006/010     | RIGHT BANK                             |
|                |                           | 622-2733-001/003/005/007/009 | PITCH UP                               |
|                |                           | 622-2733-002/004/006/010     | PITCH DOWN                             |
| ELEVATOR       |                           | 622-2366-001/003/007/009     | LEFT TURN                              |
|                |                           | 622-2366-002/004/006/010     | RIGHT TURN                             |
|                |                           | 622-2733-001/003/005/007/009 | ROLL UP                                |
|                |                           | 622-2733-002/004/006/010     | ROLL DOWN                              |
| RUDDER         |                           | 622-2366-001/003/007/009     | LEFT TURN                              |
|                |                           | 622-2366-002/004/006/010     | RIGHT TURN                             |
|                |                           | 622-2733-001/003/005/007/009 | ROLL UP                                |
|                |                           | 622-2733-002/004/006/010     | ROLL DOWN                              |
| ELEV TRIM      |                           | 622-2366-001/003/007/009     | LEFT TURN                              |
|                |                           | 622-2366-002/004/006/010     | RIGHT TURN                             |
|                |                           | 622-2733-001/003/005/007/009 | ROLL UP                                |
|                |                           | 622-2733-002/004/006/010     | ROLL DOWN                              |

(2) ALL WIRES CARRYING 28 V DC, 26 V, 400 Hz, 115 V, 400 Hz POWER, POWER GROUND, AND THE WIRES CONNECTED TO J2-18 AND J2-19 ON THE 913K-1/1A MUST ADHERE TO THE FOLLOWING MINIMUM WIRE GAUGE TABLE.

| TOTAL RUN LENGTH | MINIMUM GAUGE |
|------------------|---------------|
| 1-20 FEET        | 22 AWG        |
| 21-30 FEET       | 20 AWG        |
| 31-40 FEET       | 18 AWG        |
| 41-50 FEET       | 16 AWG        |
| 51-60 FEET       | 14 AWG        |
| 61-70 FEET       | 12 AWG        |
| 71-80 FEET       | 10 AWG        |
| 81-90 FEET       | 8 AWG         |
| 91-100 FEET      | 6 AWG         |

(3) ANNUNCIATOR CURRENT MUST NOT EXCEED 50 MADC EACH.  
(4) 26 V, 400 Hz SINE-WAVE POWER AND 115 V, 400 Hz SINE-WAVE POWER MUST BE FROM SAME SOURCE AND IN PHASE.  
(5) CONNECT TO VISUAL OR AURAL WARNING DEVICE IN COCKPIT. (+28 V DC LOGIC WHEN TRIM IS IN MOTION).  
(6) THE COIL OF RELAY K1 MUST NOT DRAW MORE THAN 75 MADC. RELAY K1 CAN BE ELIMINATED AND THE SOLENOID SWITCH CONNECTED AS SHOWN BY THE DASHED LINE.  
(7) IF YAW DAMPER SOLENOID SWITCH DOES NOT DRAW MORE THAN 75 MADC, RELAY K1 CAN BE ELIMINATED AND THE SOLENOID SWITCH CONNECTED AS SHOWN BY THE DASHED LINE.  
(8) IF 334C-9A SERVOS ARE USED OR IF AIRCRAFT 26 V AC POWER IS CONTROLLED BY THE 28 V DC POWER SWITCH, RELAY K2 CAN BE ELIMINATED AND THE DC SERVO POWER CONNECTED AS SHOWN BY THE DASHED LINES.  
(9) SERVO TORQUE PROGRAMMING INPUTS, J1-B AND J1-E MUST BOTH BE OPEN OR GROUND FOR NORMAL TORQUE AND HAVE +28 V DC APPLIED FOR HIGH TORQUE.  
(10) ALL CABLE SHIELDS MUST BE GROUND AT THE SOURCE END TO THE IR RESPECTIVE CABLE CONNECTOR SHELL. THE CONNECTOR SHELL MUST THEN BE CONNECTED TO THE NEAREST AIRCRAFT GROUND POINT. (WIRE FROM 334C-6/6A/6B/6C/6D/6E/6F/6G/6H/6I/6J/6K/6L/6M/6N/6O/6P/6Q/6R/6S/6T/6U/6V/6W/6X/6Y/6Z/6AA/6AB/6AC/6AD/6AE/6AF/6AG/6AH/6AI/6AJ/6AK/6AL/6AM/6AN/6AO/6AP/6AQ/6AR/6AS/6AT/6AU/6AV/6AW/6AX/6AY/6AZ/6BA/6BB/6BC/6BD/6BE/6BF/6BG/6BH/6BI/6BJ/6BK/6BL/6BM/6BN/6BO/6BP/6BQ/6BR/6BS/6BT/6BU/6BV/6BW/6BX/6BY/6BZ/6CA/6CB/6CC/6CD/6CE/6CF/6CG/6CH/6CI/6CJ/6CK/6CL/6CM/6CN/6CO/6CP/6CQ/6CR/6CS/6CT/6CU/6CV/6CW/6CX/6CY/6CZ/6DA/6DB/6DC/6DD/6DE/6DF/6DG/6DH/6DI/6DJ/6DK/6DL/6DM/6DN/6DO/6DP/6DQ/6DR/6DS/6DT/6DU/6DV/6DW/6DX/6DY/6DZ/6EA/6EB/6EC/6ED/6EE/6EF/6EG/6EH/6EI/6EJ/6EK/6EL/6EM/6EN/6EO/6EP/6EQ/6ER/6ES/6ET/6EU/6EV/6EW/6EX/6EY/6EZ/6FA/6FB/6FC/6FD/6FE/6FF/6FG/6FH/6FI/6FJ/6FK/6FL/6FM/6FN/6FO/6FP/6FQ/6FR/6FS/6FT/6FU/6FV/6FW/6FX/6FY/6FZ/6GA/6GB/6GC/6GD/6GE/6GF/6GG/6GH/6GI/6GJ/6GK/6GL/6GM/6GN/6GO/6GP/6GQ/6GR/6GS/6GT/6GU/6GV/6GW/6GX/6GY/6GZ/6HA/6HB/6HC/6HD/6HE/6HF/6HG/6HH/6HI/6HJ/6HK/6HL/6HM/6HN/6HO/6HP/6HQ/6HR/6HS/6HT/6HU/6HV/6HW/6HX/6HY/6HZ/6IA/6IB/6IC/6ID/6IE/6IF/6IG/6IH/6II/6IJ/6IK/6IL/6IM/6IN/6IO/6IP/6IQ/6IR/6IS/6IT/6IU/6IV/6IW/6IX/6IY/6IZ/6JA/6JB/6JC/6JD/6JE/6JF/6JG/6JH/6JI/6JJ/6JK/6JL/6JM/6JN/6JO/6JP/6JQ/6JR/6JS/6JT/6JU/6JV/6JW/6JX/6JY/6JZ/6KA/6KB/6KC/6KD/6KE/6KF/6KG/6KH/6KI/6KJ/6KK/6KL/6KM/6KN/6KO/6KP/6KQ/6KR/6KS/6KT/6KU/6KV/6KW/6KX/6KY/6KZ/6LA/6LB/6LC/6LD/6LE/6LF/6LG/6LH/6LI/6LJ/6LK/6LL/6LM/6LN/6LO/6LP/6LQ/6LR/6LS/6LT/6LU/6LV/6LW/6LX/6LY/6LZ/6MA/6MB/6MC/6MD/6ME/6MF/6MG/6MH/6MI/6MJ/6MK/6ML/6MM/6MN/6MO/6MP/6MQ/6MR/6MS/6MT/6MU/6MV/6MW/6MX/6MY/6MZ/6NA/6NB/6NC/6ND/6NE/6NF/6NG/6NH/6NI/6NJ/6NK/6NL/6NM/6NN/6NO/6NP/6NQ/6NR/6NS/6NT/6NU/6NV/6NW/6NX/6NY/6NZ/6OA/6OB/6OC/6OD/6OE/6OF/6OG/6OH/6OI/6OJ/6OK/6OL/6OM/6ON/6OO/6OP/6OQ/6OR/6OS/6OT/6OU/6OV/6OW/6OX/6OY/6OZ/6PA/6PB/6PC/6PD/6PE/6PF/6PG/6PH/6PI/6PJ/6PK/6PL/6PM/6PN/6PO/6PP/6PQ/6PR/6PS/6PT/6PU/6PV/6PW/6PX/6PY/6PZ/6QA/6QB/6QC/6QD/6QE/6QF/6QG/6QH/6QI/6QJ/6QK/6QL/6QM/6QN/6QO/6QP/6QQ/6QR/6QS/6QT/6QU/6QV/6QW/6QX/6QY/6QZ/6RA/6RB/6RC/6RD/6RE/6RF/6RG/6RH/6RI/6RJ/6RK/6RL/6RM/6RN/6RO/6RP/6RQ/6RR/6RS/6RT/6RU/6RV/6RW/6RX/6RY/6RZ/6SA/6SB/6SC/6SD/6SE/6SF/6SG/6SH/6SI/6SJ/6SK/6SL/6SM/6SN/6SO/6SP/6SQ/6SR/6SS/6ST/6SU/6SV/6SW/6SX/6SY/6SZ/6TA/6TB/6TC/6TD/6TE/6TF/6TG/6TH/6TI/6TJ/6TK/6TL/6TM/6TN/6TO/6TP/6TQ/6TR/6TS/6TT/6TU/6TV/6TW/6TX/6TY/6TZ/6UA/6UB/6UC/6UD/6UE/6UF/6UG/6UH/6UI/6UJ/6UK/6UL/6UM/6UN/6UO/6UP/6UQ/6UR/6US/6UT/6UU/6UV/6UW/6UX/6UY/6UZ/6VA/6VB/6VC/6VD/6VE/6VF/6VG/6VH/6VI/6VJ/6VK/6VL/6VM/6VN/6VO/6VP/6VQ/6VR/6VS/6VT/6VU/6VV/6VW/6VX/6VY/6VZ/6WA/6WB/6WC/6WD/6WE/6WF/6WG/6WH/6WI/6WJ/6WK/6WL/6WM/6WN/6WO/6WP/6WQ/6WR/6WS/6WT/6WU/6WV/6WW/6WX/6WY/6WZ/6XA/6XB/6XC/6XD/6XE/6XF/6XG/6XH/6XI/6XJ/6XK/6XL/6XM/6XN/6XO/6XP/6XQ/6XR/6XS/6XT/6XU/6XV/6XW/6XX/6XY/6XZ/6YA/6YB/6YC/6YD/6YE/6YF/6YG/6YH/6YI/6YJ/6YK/6YL/6YM/6YN/6YO/6YP/6YQ/6YR/6YS/6YT/6YU/6YV/6YW/6YX/6YY/6YZ/6ZA/6ZB/6ZC/6ZD/6ZE/6ZF/6ZG/6ZH/6ZI/6ZJ/6ZK/6ZL/6ZM/6ZN/6ZO/6ZP/6ZQ/6ZR/6ZS/6ZT/6ZU/6ZV/6ZW/6ZX/6ZY/6ZZ/7AA/7AB/7AC/7AD/7AE/7AF/7AG/7AH/7AI/7AJ/7AK/7AL/7AM/7AN/7AO/7AP/7AQ/7AR/7AS/7AT/7AU/7AV/7AW/7AX/7AY/7AZ/7BA/7BB/7BC/7BD/7BE/7BF/7BG/7BH/7BI/7BJ/7BK/7BL/7BM/7BN/7BO/7BP/7BQ/7BR/7BS/7BT/7BU/7BV/7BW/7BX/7BY/7BZ/7CA/7CB/7CC/7CD/7CE/7CF/7CG/7CH/7CI/7CJ/7CK/7CL/7CM/7CN/7CO/7CP/7CQ/7CR/7CS/7CT/7CU/7CV/7CW/7CX/7CY/7CZ/7DA/7DB/7DC/7DD/7DE/7DF/7DG/7DH/7DI/7DJ/7DK/7DL/7DM/7DN/7DO/7DP/7DQ/7DR/7DS/7DT/7DU/7DV/7DW/7DX/7DY/7DZ/7EA/7EB/7EC/7ED/7EE/7EF/7EG/7EH/7EI/7EJ/7EK/7EL/7EM/7EN/7EO/7EP/7EQ/7ER/7ES/7ET/7EU/7EV/7EW/7EX/7EY/7EZ/7FA/7FB/7FC/7FD/7FE/7FF/7FG/7FH/7FI/7FJ/7FK/7FL/7FM/7FN/7FO/7FP/7FQ/7FR/7FS/7FT/7FU/7FV/7FW/7FX/7FY/7FZ/7GA/7GB/7GC/7GD/7GE/7GF/7GG/7GH/7GI/7GJ/7GK/7GL/7GM/7GN/7GO/7GP/7GQ/7GR/7GS/7GT/7GU/7GV/7GW/7GX/7GY/7GZ/7HA/7HB/7HC/7HD/7HE/7HF/7HG/7HH/7HI/7HJ/7HK/7HL/7HM/7HN/7HO/7HP/7HQ/7HR/7HS/7HT/7HU/7HV/7HW/7HX/7HY/7HZ/7IA/7IB/7IC/7ID/7IE/7IF/7IG/7IH/7II/7IJ/7IK/7IL/7IM/7IN/7IO/7IP/7IQ/7IR/7IS/7IT/7IU/7IV/7IW/7IX/7IY/7IZ/7JA/7JB/7JC/7JD/7JE/7JF/7JG/7JH/7JI/7JJ/7JK/7JL/7JM/7JN/7JO/7JP/7JQ/7JR/7JS/7JT/7JU/7JV/7JW/7JX/7JY/7JZ/7KA/7KB/7KC/7KD/7KE/7KF/7KG/7KH/7KI/7KJ/7KK/7KL/7KM/7KN/7KO/7KP/7KQ/7KR/7KS/7KT/7KU/7KV/7KW/7KX/7KY/7KZ/7LA/7LB/7LC/7LD/7LE/7LF/7LG/7LH/7LI/7LJ/7LK/7LL/7LM/7LN/7LO/7LP/7LQ/7LR/7LS/7LT/7LU/7LV/7LW/7LX/7LY/7LZ/7MA/7MB/7MC/7MD/7ME/7MF/7MG/7MH/7MI/7MJ/7MK/7ML/7MM/7MN/7MO/7MP/7MQ/7MR/7MS/7MT/7MU/7MV/7MW/7MX/7MY/7MZ/7NA/7NB/7NC/7ND/7NE/7NF/7NG/7NH/7NI/7NJ/7NK/7NL/7NM/7NN/7NO/7NP/7NQ/7NR/7NS/7NT/7NU/7NV/7NW/7NX/7NY/7NZ/7OA/7OB/7OC/7OD/7OE/7OF/7OG/7OH/7OI/7OJ/7OK/7OL/7OM/7ON/7OO/7OP/7OQ/7OR/7OS/7OT/7OU/7OV/7OW/7OX/7OY/7OZ/7PA/7PB/7PC/7PD/7PE/7PF/7PG/7PH/7PI/7PJ/7PK/7PL/7PM/7PN/7PO/7PP/7PQ/7PR/7PS/7PT/7PU/7PV/7PW/7PX/7PY/7PZ/7QA/7QB/7QC/7QD/7QE/7QF/7QG/7QH/7QI/7QJ/7QK/7QL/7QM/7QN/7QO/7QP/7QQ/7QR/7QS/7QT/7QU/7QV/7QW/7QX/7QY/7QZ/7RA/7RB/7RC/7RD/7RE/7RF/7RG/7RH/7RI/7RJ/7RK/7RL/7RM/7RN/7RO/7RP/7RQ/7RR/7RS/7RT/7RU/7RV/7RW/7RX/7RY/7RZ/7SA/7SB/7SC/7SD/7SE/7SF/7SG/7SH/7SI/7SJ/7SK/7SL/7SM/7SN/7SO/7SP/7SQ/7SR/7SS/7ST/7SU/7SV/7SW/7SX/7SY/7SZ/7TA/7TB/7TC/7TD/7TE/7TF/7TG/7TH/7TI/7TJ/7TK/7TL/7TM/7TN/7TO/7TP/7TQ/7TR/7TS/7TT/7TU/7TV/7TW/7TX/7TY/7TZ/7UA/7UB/7UC/7UD/7UE/7UF/7UG/7UH/7UI/7UJ/7UK/7UL/7UM/7UN/7UO/7UP/7UQ/7UR/7US/7UT/7UU/7UV/7UW/7UX/7UY/7UZ/7VA/7VB/7VC/7VD/7VE/7VF/7VG/7VH/7VI/7VJ/7VK/7VL/7VM/7VN/7VO/7VP/7VQ/7VR/7VS/7VT/7VU/7VV/7VW/7VX/7VY/7VZ/7WA/7WB/7WC/7WD/7WE/7WF/7WG/7WH/7WI/7WJ/7WK/7WL/7WM/7WN/7WO/7WP/7WQ/7WR/7WS/7WT/7WU/7WV/7WW/7WX/7WY/7WZ/7XA/7XB/7XC/7XD/7XE/7XF/7XG/7XH/7XI/7XJ/7XK/7XL/7XM/7XN/7XO/7XP/7XQ/7XR/7XS/7XT/7XU/7XV/7XW/7XX/7XY/7XZ/7YA/7YB/7YC/7YD/7YE/7YF/7YG/7YH/7YI/7YJ/7YK/7YL/7YM/7YN/7YO/7YP/7YQ/7YR/7YS/7YT/7YU/7YV/7YW/7YX/7YY/7YZ/7ZA/7ZB/7ZC/7ZD/7ZE/7ZF/7ZG/7ZH/7ZI/7ZJ/7ZK/7ZL/7ZM/7ZN/7ZO/7ZP/7ZQ/7ZR/7ZS/7ZT/7ZU/7ZV/7ZW/7ZX/7ZY/7ZZ/8AA/8AB/8AC/8AD/8AE/8AF/8AG/8AH/8AI/8AJ/8AK/8AL/8AM/8AN/8AO/8AP/8AQ/8AR/8AS/8AT/8AU/8AV/8AW/8AX/8AY/8AZ/8BA/8BB/8BC/8BD/8BE/8BF/8BG/8BH/8BI/8BJ/8BK/8BL/8BM/8BN/8BO/8BP/8BQ/8BR/8BS/8BT/8BU/8BV/8BW/8BX/8BY/8BZ/8CA/8CB/8CC/8CD/8CE/8CF/8CG/8CH/8CI/8CJ/8CK/8CL/8CM/8CN/8CO/8CP/8CQ/8CR/8CS/8CT/8CU/8CV/8CW/8CX/8CY/8CZ/8DA/8DB/8DC/8DD/8DE/8DF/8DG/8DH/8DI/8DJ/8DK/8DL/8DM/8DN/8DO/8DP/8DQ/8DR/8DS/8DT/8DU/8DV/8DW/8DX/8DY/8DZ/8EA/8EB/8EC/8ED/8EE/8EF/8EG/8EH/8EI/8EJ/8EK/8EL/8EM/8EN/8EO/8EP/8EQ/8ER/8ES/8ET/8EU/8EV/8EW/8EX/8EY/8EZ/8FA/8FB/8FC/8FD/8FE/8FF/8FG/8FH/8FI/8FJ/8FK/8FL/8FM/8FN/8FO/8FP/8FQ/8FR/8FS/8FT/8FU/8FV/8FW/8FX/8FY/8FZ/8GA/8GB/8GC/8GD/8GE/8GF/8GG/8GH/8GI/8GJ/8GK/8GL/8GM/8GN/8GO/8GP/8GQ/8GR/8GS/8GT/8GU/8GV/8GW/8GX/8GY/8GZ/8HA/8HB/8HC/8HD/8HE/8HF/8HG/8HH/8HI/8HJ/8HK/8HL/8HM/8HN/8HO/8HP/8HQ/8HR/8HS/8HT/8HU/8HV/8HW/8HX/8HY/8HZ/8IA/8IB/8IC/8ID/8IE/8IF/8IG/8IH/8II/8IJ/8IK/8IL/8IM/8IN/8IO/8IP/8IQ/8IR/8IS/8IT/8IU/8IV/8IW/8IX/8IY/8IZ/8JA/8JB/8JC/8JD/8JE/8JF/8JG/8JH/8JI/8JJ/8JK/8JL/8JM/8JN/8JO/8JP/8JQ/8JR/8JS/8JT/8JU/8JV/8JW/8JX/8JY/8JZ/8KA/8KB/8KC/8KD/8KE/8KF/8KG/8KH/8KI/8KJ/8KK/8KL/8KM/8KN/8KO/8KP/8KQ/8KR/8KS/8KT/8KU/8KV/8KW/8KX/8KY/8KZ/8LA/8LB/8LC/8LD/8LE/8LF/8LG/8LH/8LI/8LJ/8LK/8LL/8LM/8LN/8LO/8LP/8LQ/8LR/8LS/8LT/8LU/8LV/8LW/8LX/8LY/8LZ/8MA/8MB/8MC/8MD/8ME/8MF/8MG/8MH/8MI/8MJ/8MK/8ML/8MM/8MN/8MO/8MP/8MQ/8MR/8MS/8MT/8MU/8MV/8MW/8MX/8MY/8MZ/8NA/8NB/8NC/8ND/8NE/8NF/8NG/8NH/8NI/8NJ/8NK/8NL/8NM/8NN/8NO/8NP/8NQ/8NR/8NS/8NT/8NU/8NV/8NW/8NX/8NY/8NZ/8OA/8OB/8OC/8OD/8OE/8OF/8OG/8OH/8OI/8OJ/8OK/8OL/8OM/8ON/8OO/8OP/8OQ/8OR/8OS/8OT/8OU/8OV/8OW/8OX/8OY/8OZ/8PA/8PB/8PC/8PD/8PE/8PF/8PG/8PH/8PI/8PJ/8PK/8PL/8PM/8PN/8PO/8PP/8PQ/8PR/8PS/8PT/8PU/8PV/8PW/8PX/8PY/8PZ/8QA/8QB/8QC/8QD/8QE/8QF/8QG/8QH/8QI/8QJ/8QK/8QL/8QM/8QN/8QO/8QP/8QQ/8QR/8QS/8QT/8QU/8QV/8QW/8QX/8QY/8QZ/8RA/8RB/8RC/8RD/8RE/8RF/8RG/8RH/8RI/8RJ/8RK/8RL/8RM/8RN/8RO/8RP/8RQ/8RR/8RS/8RT/8RU/8RV/8RW/8RX/8RY/8RZ/8SA/8SB/8SC/8SD/8SE/8SF/8SG/8SH/8SI/8SJ/8SK/8SL/8SM/8SN/8SO/8SP/8SQ/8SR/8SS/8ST/8SU/8SV/8SW/8SX/8SY/8SZ/8TA/8TB/8TC/8TD/8TE/8TF/8TG/8TH/8TI/8TJ/8TK/8TL/8TM/8TN/8TO/8TP/8TQ/8TR/8TS/8TT/8TU/8TV/8TW/8TX/8TY/8TZ/8UA/8UB/8UC/8UD/8UE/8UF/8UG/8UH/8UI/8UJ/8UK/8UL/8UM/8UN/8UO/8UP/8UQ/8UR/8US/8UT/8UU/8UV/8UW/8UX/8UY/8UZ/8VA/8VB/8VC/8VD/8VE/8VF/8VG/8VH/8VI/8VJ/8VK/8VL/8VM/8VN/8VO/8VP/8VQ/8VR/8VS/8VT/8VU/8VV/8VW/8VX/8VY/8VZ/8WA/8WB/8WC/8WD/8WE/8WF/8WG/8WH/8WI/8WJ/8WK/8WL/8WM/8WN/8WO/8WP/8WQ/8WR/8WS/8WT/8WU/8WV/8WW/8WX/8WY/8WZ/8XA/8XB/8XC/8XD/8XE/8XF/8XG/8XH/8XI/8XJ/8XK/8XL/8XM/8XN/8XO/8XP/8XQ/8XR/8XS/8XT/8XU/8XV/8XW/8XX/8XY/8XZ/8YA/8YB/8YC/8YD/8YE/8YF/8YG/8YH/8YI/8YJ/8YK/8YL/8YM/8YN/8YO/8YP/8YQ/8YR/8YS/8YT/8YU/8YV/8YW/8YX/8YY/8YZ/8ZA/8ZB/8ZC/8ZD/8ZE/8ZF/8ZG/8ZH/8ZI/8ZJ/8ZK/8ZL/8ZM/8ZN/8ZO/8ZP/8ZQ/8ZR/8ZS/8ZT/8ZU/8ZV/8ZW/8ZX/8ZY/8ZZ/9AA/9AB/9AC/9AD/9AE/9AF/9AG/9AH/9AI/9AJ/9AK/9AL/9AM/9AN/9AO/9AP/9AQ/9AR/9AS/9AT/9AU/9AV/9AW/9AX/9AY/9AZ/9BA/9BB/9BC/9BD/9BE/9BF/9BG/9BH/9BI/9BJ/9BK/9BL/9BM/9BN/9BO/9BP/9BQ/9BR/9BS/9BT/9BU/9BV/9BW/9BX/9BY/9BZ/9CA/9CB/9CC/9CD/9CE/9CF/9CG/9CH/9CI/9CJ/9CK/9CL/9CM/9CN/9CO/9CP/9CQ/9CR/9CS/9CT/9CU/9CV/9CW/9CX/9CY/9CZ/9DA/9DB/9DC/9DD/9DE/9DF/9DG/9DH/9DI/9DJ/9DK/9DL/9DM/9DN/9DO/9DP/9DQ/9DR/9DS/9DT/9DU/9DV/9DW/9DX/9DY/9DZ/9EA/9EB/9EC/9ED/9EE/9EF/9EG/9EH/9EI/9EJ/9EK/9EL/9EM/9EN/9EO/9EP/9EQ/9ER/9ES/9ET/9EU/9EV/9EW/9EX/9EY/9EZ/9FA/9FB/9FC/9FD/9FE/9FF/9FG/9FH/9FI/9FJ/9FK/9FL/9FM/9FN/9FO/9FP/9FQ/9FR/9FS/9FT/9FU/9FV/9FW/9FX/9FY/9FZ/9GA/9GB/9GC/9GD/9GE/9GF/9GG/9GH/9GI/9GJ/9GK/9GL/9GM/9GN/9GO/9GP/9GQ/9GR/9GS/9GT/9GU/9GV/9GW/9GX/9GY/9GZ/9HA/9HB/9HC/9HD/9HE/9HF/9HG/9HH/9HI/9HJ/9HK/9HL/9HM/9HN/9HO/9HP/9HQ/9HR/9HS/9HT/9HU/9HV/9HW/9HX/9HY/9HZ/9IA/9IB/9IC/9ID/9IE/9IF/9IG/9IH/9II/9IJ/9IK/9IL/9IM/9IN/9IO/9IP/9IQ/9IR/9IS/9IT/9IU/9IV/9IW/9IX/9IY/9IZ/9JA/9JB/9JC/9JD/9JE/9JF/9JG/9JH/9JI/9JJ/9JK/9JL/9JM/9JN/9JO/9JP/9JQ/9JR/9JS/9JT/9JU/9JV/9JW/9JX/9JY/9JZ/9KA/9KB/9KC/9KD/9KE/9KF/9KG/9KH/9KI/9KJ/9KK/9KL/9KM/9KN/9KO/9KP/9KQ/9KR/9KS/9KT/9KU/9KV/9KW/9KX/9KY/9KZ/9LA/9LB/9LC/9LD/9LE/9LF/9LG/9LH/9LI/9LJ/9LK/9LL/9LM/9LN/9LO/9LP/9LQ/9LR/9LS/9LT/9LU/9LV/9LW/9LX/9LY/9LZ/9MA/9MB/9MC/9MD/9ME/9MF/9MG/9MH/9MI/9MJ/9MK/9ML/9MM/9MN/9MO/9MP/9MQ/9MR/9MS/9MT/9MU/9MV/9MW/9MX/9MY/9MZ/9NA/9NB/9NC/9ND/9NE/9NF/9NG/9NH/9NI/9NJ/9NK/9NL/9NM/9NN/9NO/9NP/9NQ/9NR/9NS/9NT/9NU/9NV/9NW/9NX/9NY/9NZ/9OA/9OB/9OC/9OD/9OE/9OF/9OG/9OH/9OI/9OJ/9OK/9OL/9OM/9ON/9OO/9OP/9OQ/9OR/9OS/9OT/9OU/9OV/9OW/9OX/9OY/9OZ/9PA/9PB/9PC/9PD/9PE/9PF/9PG/9PH/9PI/9PJ/9PK/9PL/9PM/9PN/9PO/9PP/9PQ/9PR/9PS/9PT/9PU/9PV/9PW/9PX/9PY/9PZ/9QA/9QB/9QC/9QD/9QE/9QF/9QG/9QH/9QI/9QJ/9QK/9QL/9QM/9QN/9QO/9QP/9QQ/9QR/9QS/9QT/9QU/9QV/9QW/9QX/9QY/9QZ/9RA/9RB/9RC/9RD/9RE/9RF/9RG/9RH/9RI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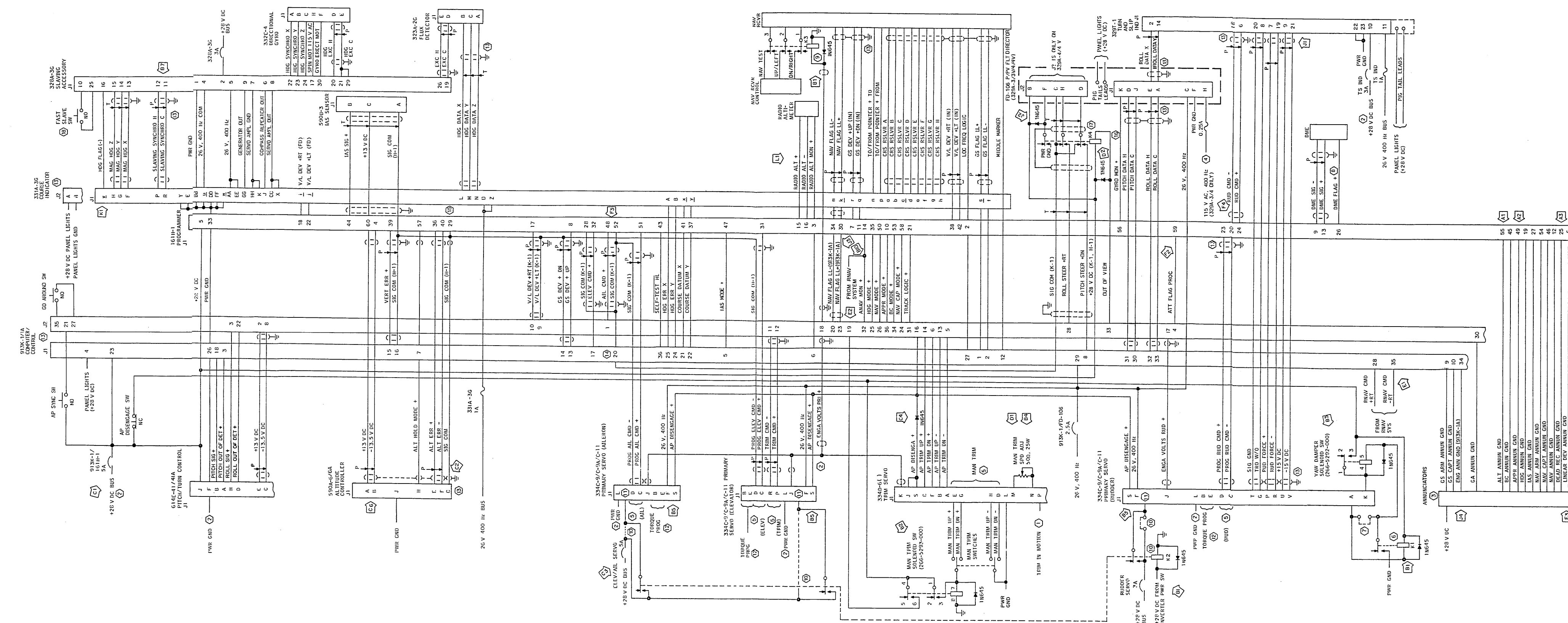




| Servo Function | 334C-9A                                              | 334C-11                                                  | Aircraft Command       | Capstan Rotation (Viewed From Capstan) |
|----------------|------------------------------------------------------|----------------------------------------------------------|------------------------|----------------------------------------|
| AILERON        | 622-2366-001/003/007/009<br>622-2366-002/004/006/010 | 622-2735-001/003/005/007/009<br>622-2735-002/004/006/008 | LEFT BANK<br>LEFT TURN | CCW<br>CCW                             |
| ELEVATOR       | 622-2366-001/003/007/009<br>622-2366-002/004/006/010 | 622-2735-001/003/005/007/009<br>622-2735-002/004/006/008 | PITCH UP<br>PITCH UP   | CCW<br>CCW                             |
| RUDDER         | 622-2366-001/003/007/009<br>622-2366-002/004/006/010 | 622-2735-001/003/005/007/009<br>622-2735-002/004/006/008 | LEFT TURN<br>LEFT TURN | CCW<br>CCW                             |
| ELEVATOR TRIM  | ALL 334D-6 ( )                                       |                                                          | TRIM DOWN              | CCW                                    |

THE COIL OF RELAY K1 MUST NOT DRAW MORE THAN 75 mA DC.  
IF YAW DAMPER SOLENOID SWITCH DOES NOT DRAW MORE THAN 75 mA DC, RELAY K1 CAN BE ELIMINATED AND THE FLAG 0 SWITCH CONNECTED AS SHOWN BY THE DASHED LINE.  
THE DNE FLAG 0 SIGNAL APPLIED TO 161H-1J1-26 MUST BE OPENED INSTEAD OF THE DNE IS NOT CONTROLLED BY THE NAVIGATION RECEIVER SUPPLYING THE AUTOLOTT. THIS OCCURS WITH DNE HOLD OR DNE TRANSFER TO NAVIGATION AREA NO.2.

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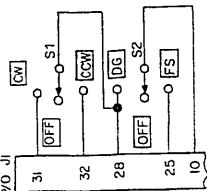
- NOTES:
1. CONNECT TO VISUAL OR AURAL WARNING DEVICE IN COCKPIT. (+28 V DC LOGIC WHEN TRIM IS IN MOTION.)
  2. ALL WIRES CARRYING +28 V DC, 26 V 400 Hz, 115V 400 Hz POWER, POWER GROUND, AND THE WIRES CONNECTED TO J1-18 AND J1-19 ON THE 913K-1/1A MUST ADHERE TO THE FOLLOWING MINIMUM WIRE GAUGE TABLE.

| MINIMUM WIRE GAUGE |            |
|--------------------|------------|
| WIRE LENGTH        | WIRE GAUGE |
| 1 - 20 FEET        | 22 AWG     |
| 21 - 30 FEET       | 20 AWG     |
| 31 - 50 FEET       | 18 AWG     |
| 51 - 100 FEET      | 16 AWG     |
| 101 - 150 FEET     | 14 AWG     |

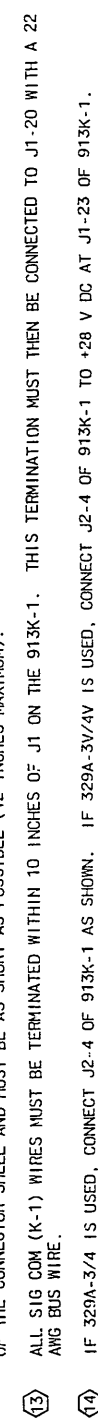
3. TOTAL WIRE LENGTH FOR THE 18 AND 20 AWG WIRES MUST NOT EXCEED 500 FT. THE 18 AWG WIRE MUST BE CONNECTED TO THE COIL OF RELAY K1. THE 20 AWG WIRE MUST BE CONNECTED TO THE COIL OF RELAY K2. THE 16 AWG WIRE MUST BE CONNECTED TO THE COIL OF RELAY K3. THE 14 AWG WIRE MUST BE CONNECTED TO THE COIL OF RELAY K4.
4. 28 V 400 Hz SINE-WAVE POWER AND 115 V 400 Hz SINE-WAVE POWER MUST BE FROM SAME SOURCE AND IN PHASE.
5. REFER TO THE CHART BELOW FOR THE DIRECTION OF ROTATION OF THE SERVO CUSTIAN WHEN THE SERVO COMMAND SIGNAL IS APPLIED. IF THE DIRECTION OF ROTATION IS NOT AS DESIRED, REVERSE EACH PAIR OF SERVO COMMAND LEADS (FROM ELEVATOR, RUDDER, AND TRIM) TO THE SERVO MOTOR.

| SERVO    | SERVO COLLINS PART NUMBER | AIRCRAFT COMMAND | CAPTAIN ROTATION (VIEWED FROM CAPTAIN) |
|----------|---------------------------|------------------|----------------------------------------|
| ATTILION | 622-2346-001/003/007/009  | LEFT BANK        | CCW                                    |
| ELEVATOR | 622-2346-001/003/007/009  | LEFT BANK        | CCW                                    |
| RUDDER   | 622-2346-001/003/007/009  | PITCH UP         | CCW                                    |
| ELEVATOR | 622-2346-001/003/007/009  | PITCH UP         | CCW                                    |
| RUDDER   | 622-2346-001/003/007/009  | LEFT TURN        | CCW                                    |
| ELEVATOR | 622-2346-001/003/007/009  | LEFT TURN        | CCW                                    |
| RUDDER   | 622-2346-001/003/007/009  | TRIM DOWN        | CCW                                    |

6. THE COIL OF RELAY K1 MUST NOT DRAW MORE THAN 75 mA DC.
7. IF YAW DAMPER SOLENOID SWITCH DOES NOT DRAW MORE THAN 75 mA DC, RELAY K1 CAN BE ELIMINATED AND THE SOLENOID SWITCH CONNECTED AS SHOWN BY THE DASHED LINES.
8. THE DIE FLAP + SIGNAL APPLIED TO 16H-1 J1-26 MUST BE OPENED WHENEVER THE DIE IS NOT CONTROLLED BY THE NAVIGATION RECEIVER SUPPLYING THE AUTOPILOT. THIS OCCURS WITH DIE HOLD OR DIE TRANSFER TO NAVIGATION RADIO NO. 2.
9. IF 334C-9A, C-11 SERVO IS USED, THE NAV SELF TEST WHEN THE AUTOPILOT IS ENGAGED.
10. RELAY K4 IS REQUIRED TO DISABLE THE NAV SELF TEST WHEN THE AUTOPILOT IS ENGAGED.
11. CAN BE ELIMINATED AND THE DC SERVO POWER CONNECTED AS SHOWN BY THE DASHED LINES.
12. CONNECT +28 V DC SERVO POWER AS FOLLOWS:
13. SERVO TORQUE PROGRAMMING INPUTS, J1-8 AND J1-9 MUST BE OPEN OR GROUND FOR NORMAL TORQUE AND HAVE +28 V DC APPLIED FOR HIGH TORQUE.
14. ALL WIRE GAUGES MUST BE GRADUATED AT THE SOURCE END TO THEIR RESPECTIVE CABLE CONNECTOR SHELL. THE CONNECTOR SHELL MUST THEN BE CONNECTED TO THE NEAREST AIRCRAFT GROUND. ON THE 913K-1/1A, THE AIRCRAFT GROUND CONNECTION MUST BE AS SHOWN IN THE WIRE GAUGE TABLE. THE 18 AWG WIRE MUST BE CONNECTED TO THE NEAREST AIRCRAFT GROUND. THE 20 AWG WIRE MUST BE CONNECTED TO THE NEAREST AIRCRAFT GROUND. THE 16 AWG WIRE MUST BE CONNECTED TO THE NEAREST AIRCRAFT GROUND. THE 14 AWG WIRE MUST BE CONNECTED TO THE NEAREST AIRCRAFT GROUND.
15. ALL SIG CON (H-V) WIRES MUST BE TERMINATED WITHIN 10 INCHES OF J1 ON THE 913K-1. THIS TERMINATION MUST THEN BE CONNECTED TO J1-20 WITH A 22 AWG BUS WIRE.
16. IF 334C-9A, C-11 SERVO IS USED, CONNECT J1-56 OF 16H-1 AS SHOWN. IF 334C-9A/4V IS USED, CONNECT J1-56 OF 16H-1 TO 28 V DC AT J1-5 OF 16H-1.
17. THE COIL OF RELAY K4 MUST NOT DRAW MORE THAN 50 mA DC.
18. IF 334C-9A/4V IS USED, BULLETIN NO. 12, THE FOLLOWING FAST SLAVE/GO MODE SWITCH CIRCUIT CAN BE USED IN PLACE OF THE FAST SLAVE SWITCH SHOWN.

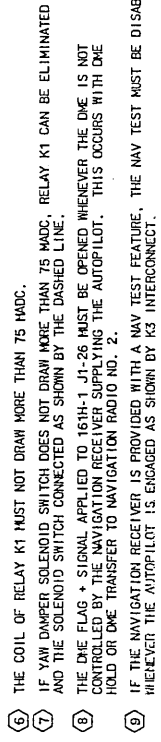


AP-106, FD-106P/PV, and PN-101 3-Axis System, Interconnect Diagram  
Figure 5

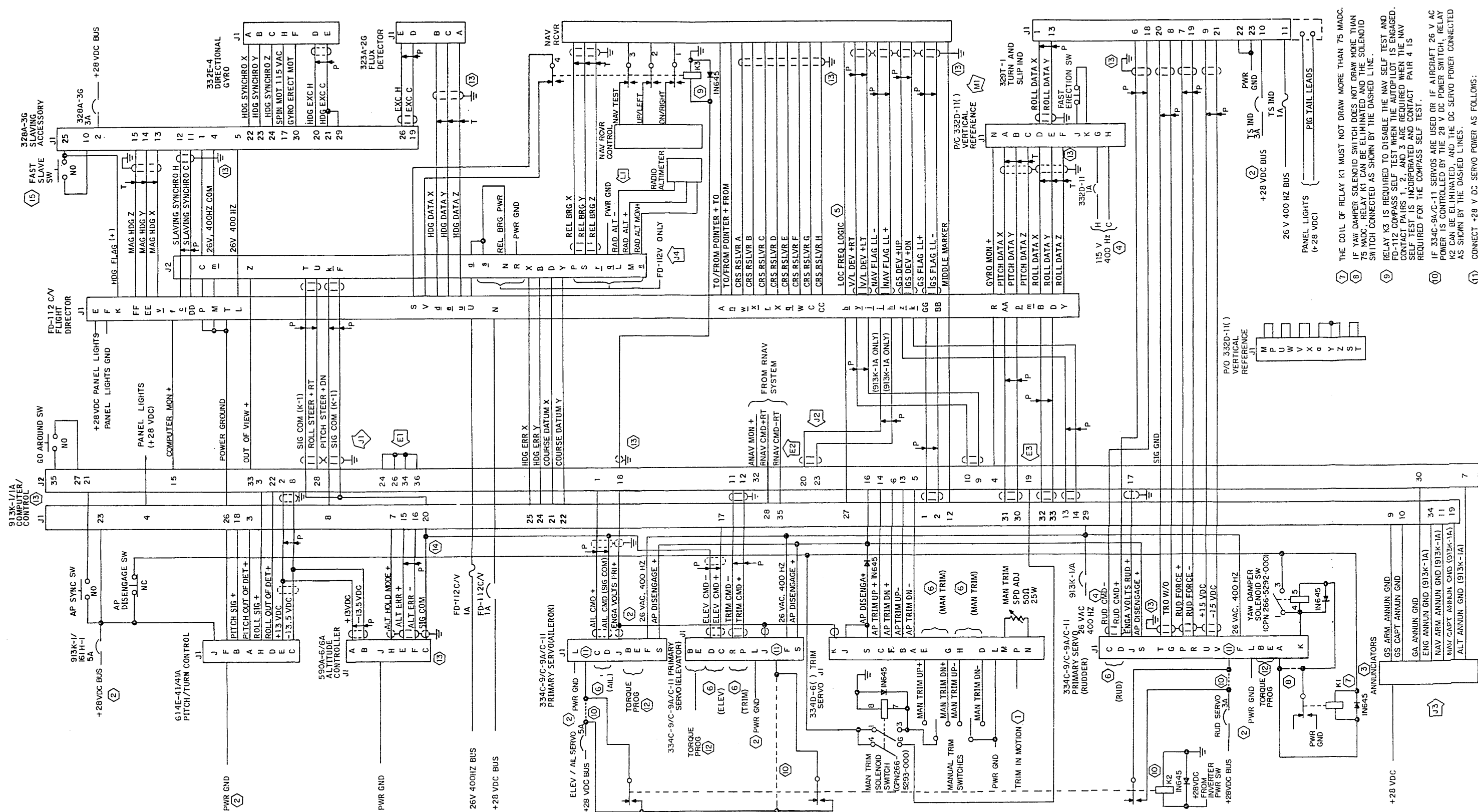


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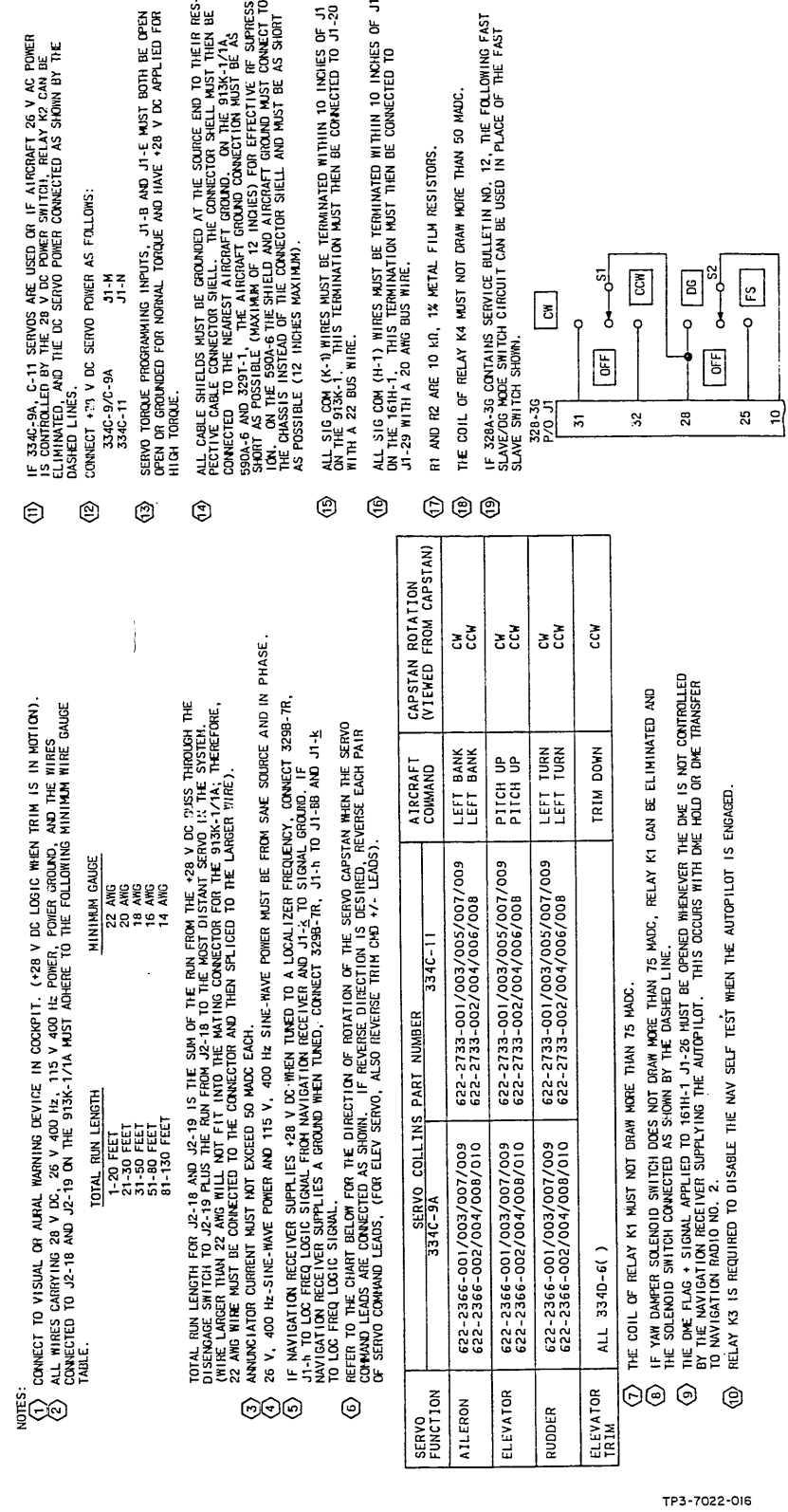
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- NOTES:
- CONNECT TO VISUAL OR AURAL WARNING DEVICE IN COCKPIT. (+28 V DC LOGIC WHEN TRIM IS IN MOTION).
  - ALL WIRES CARRYING 28 V DC, 26 V 400 Hz, 115 V 400 Hz POWER, POWER GROUND, AND THE WIRES CONNECTED TO J2-18 AND J2-19 ON THE 913K-1/1A MUST ADHERE TO THE FOLLOWING MINIMUM WIRE GAUGE TABLE.
- | MINIMUM WIRE GAUGE |               |
|--------------------|---------------|
| TOTAL RUN LENGTH   | MINIMUM GAUGE |
| 1 - 20 FEET        | 22 AWG        |
| 21 - 30 FEET       | 20 AWG        |
| 31 - 40 FEET       | 18 AWG        |
| 41 - 50 FEET       | 16 AWG        |
| 51 - 60 FEET       | 14 AWG        |
| 61 - 70 FEET       | 12 AWG        |
| 71 - 80 FEET       | 10 AWG        |
| 81 - 90 FEET       | 8 AWG         |
| 91 - 100 FEET      | 6 AWG         |
- TOTAL RUN LENGTH FOR J2-18 AND J2-19 IS THE SUM OF THE RUN FROM THE +28 V DC BUSES THROUGH THE DISENGAGE SWITCH TO J2-19 PLUS THE RUN FROM J2-18 TO THE MOST DISTANT SERVO IN THE SYSTEM. (WIRE LARGER THAN 22 AWG WILL NOT FIT INTO THE WIRING CONNECTOR FOR THE 913K-1/1A; THEREFORE, 22 AWG WIRE MUST BE CONNECTED TO THE CONNECTOR AND THEN SPLICED TO THE LARGER WIRE.)
- ANNUNCIATOR CURRENT MUST NOT EXCEED 50 MADC EACH.
  - 26 V, 400 Hz SINE-WAVE POWER AND 115 V, 400 Hz SINE-WAVE MUST BE FROM SAME SOURCE AND IN PHASE.
  - USE FD-112 J1-B. IF THE NAVIGATION RECEIVER SUPPLIES +28 V DC WHEN TUNED TO A LOCALIZER FREQUENCY.
  - IF THE RECEIVER SUPPLIES A GROUND WHEN TUNED USE J1-H.
  - REFER TO THE CHART BELOW FOR THE DIRECTION OF ROTATION OF THE SERVO CAPSTAN WHEN THE SERVO COMMAND LEADS ARE CONNECTED AS SHOWN. IF THE REVERSE DIRECTION OF ROTATION IS DESIRED, REVERSE EACH PAIR OF SERVO COMMAND LEADS (FOR ELEV SERVO, ALSO REVERSE TRIM CMD +/- LEADS).

| SERVO     | SERVO COLLINS PART NUMBER | AIRCRAFT COMMAND             | CAPSTAN ROTATION (VIEWED FROM CAPSTAN) |
|-----------|---------------------------|------------------------------|----------------------------------------|
| AILERON   | 622-2366-001/003/007/009  | 622-2733-001/003/005/007/009 | LEFT BANK                              |
| ELEVATOR  | 622-2366-002/004/008/010  | 622-2733-002/004/006/008     | LEFT BANK                              |
| RUDDER    | 622-2366-001/003/007/009  | 622-2733-001/003/005/007/009 | PITCH UP                               |
| ELEV TRIM | 622-2366-002/004/008/010  | 622-2733-002/004/006/008     | PITCH UP                               |
|           | 622-2366-001/003/007/009  | 622-2733-001/003/005/007/009 | LEFT TURN                              |
|           | 622-2366-002/004/008/010  | 622-2733-002/004/006/008     | LEFT TURN                              |
|           | ALL 334D-61               |                              | TRIM DOWN                              |

AP-107, FD-112C/V, and PN-101 3-Axis System, Interconnect Diagram Figure 9



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