

MOONEY**M20 SERIES**

SERVICE AND MAINTENANCE MANUAL

APPLICABLE TO THE FOLLOWING AIRCRAFT**RANGER**

MODEL	SERIAL NUMBER
1968 M20C	680001 thru 680198
1969 M20C	690001 thru 690098
1970 M20C	700001 thru 700091
1971 M20C	20-0001 thru 20-0009
1974 M20C	20-0010 thru 20-0046
1975 M20C	20-1147 thru 20-1185
1976 M20C	20-1186 thru 20-1239
1978 M20C	20-1240 thru 20-1258

CHAPARRAL

MODEL	SERIAL NUMBER
1969 M20E	690001 thru 690073
1970 M20E	700001 thru 700061
1971 M20E	21-0001 thru 21-0023
1974 M20E	21-0024 thru 21-0060
1975 M20E	21-1161 thru 21-1180

EXECUTIVE

MODEL	SERIAL NUMBER
1968 M20F	680001 thru 680206
1969 M20F	690001 thru 690092
1970 M20F	700001 thru 700072
1971 M20F	22-0001 thru 22-0012
1974 M20F	22-0013 thru 22-0078
1975 M20F	22-1179 thru 22-1305
1976 M20F	22-1306 thru 22-1438

STATESMAN

MODEL	SERIAL NUMBER
1968 M20G	680001 thru 680164
1969 M20G	690001 thru 690020
1970 M20G	700001 thru 700006

201

MODEL	SERIAL NUMBER
1977 M20J	24-0001 thru 24-0083, 24-0085 thru 24-0377
1978 M20J	24-0084, 24-0378 thru 24-0757
1979 M20J	24-0764 thru 24-0900
1980 M20J	24-0901 thru 24-1037
1981 M20J	24-1038 thru 24-1213
1982 M20J	24-1214 thru 24-1326
1983 M20J	24-1327 thru 24-1417
1984 M20J	24-1418 thru 24- TBA

MOONEY AIRCRAFT CORPORATION**P.O. BOX 72 KERRVILLE, TEXAS 78028**

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Foreword

All information and illustrations in this manual are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice. Every effort has been made to present the material in a clear and convenient manner to enable you to use the manual as a ready reference. Your cooperation in reporting presentation and content recommendations is solicited.

SECTION I. GENERAL INFORMATION

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1-1. AIRCRAFT DESCRIPTION. The M20 series aircraft are four-place high-performance single-engine low-wing monoplanes. The all-metal airframe has a tubular-steel cabin frame covered with nonstructural aluminum skins, a semi-monocoque aft fuselage, and a full-cantilever laminar-flow wing. Control surfaces have extruded-spar construction with stressed skins riveted to the spars and ribs. Dual control wheels accompany the conventional flight controls. The pilot's rudder pedals have toe brakes linked to individual

hydraulic cylinders that supply pressure to the hydraulic disc brakes on each main gear wheel. Removable co-pilot rudder pedals are standard equipment. The tricycle landing gear, having a steerable nose wheel controlled by rudder pedal action, is fully retractable. The wide-span trailing-edge wing flaps are hydraulically actuated on 1968 models. All 1969 and later models have electrically operated wing flaps. For stabilizer trim, the entire empennage pivots around its attaching points.

1-2. ENGINE

AIRCRAFT MODEL	M20C & G	M20E & F	M20J
ENGINE MFR	LYCOMING	LYCOMING	LYCOMING
ENGINE MODEL	O-360-A1D	IO-360-A1A	10-360-A1B6D or 10-360-A3B6D *
NO. CYLINDERS	4	4	4
RATED HP	180	200	200
RPM	2700	2700	2700
MIN FUEL OCTANE	100 or 100 LL	100 or 100 LL	100 or 100 LL
FUEL CAPACITY (US GAL)	52	64 M20 F 52 M20E	64

*Effective 78J Model and earlier M20J models with SB M20-206 compliance.

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AIRCRAFT MODEL	M20C & G		M20E & F		M20J	
FUEL PRESSURE PSI	MIN 0.5	MAX 8.0	MIN ^① * 14	MAX ^① * 30	MIN ^① *14	MAX ^① * 30
OIL CAPACITY (QTS)	8		8		8	
MIN SAFE OIL LEVEL (QTS)	2		2		2	
MAX OIL CONS. (QPH)	.80		.89		.89	
INLET OIL TEMP AT AMBIENT AIR TEMP OF:	DESIRED	MAX	DESIRED	MAX	DESIRED	MAX
Above 60°F	180°F	245°F	180°F	245°F	180°F	245°F
30° to 90°F	180°F	245°F	180°F	245°F	180°F	245°F
0° to 70°F	170°F	225°F	170°F	225°F	170°F	225°F
Below 10°F	160°F	210°F	160°F	210°F	160°F	210°F
OIL PRESSURE	MIN	MAX	MIN	MAX	MIN	MAX
NORMAL PRESS. (PSI)	60	90	60	90	60	90
START & WARMUP (PSI)		100		100		100
MAX CHT	500°F		475°F		475°F	

1-3. PROPELLER

Aircraft Model	M20C & G	M20E & F	M20J	M20J Optional
Prop. Mfr.	Hartzell	Hartzell	McCauley	Hartzell
Type	Constant Speed	Constant Speed	Constant Speed	Constant Speed
Model	HC2YK-1BF ^②	HC2YK-1BF ^②	B2D34C212 ^③	HC-C2YK-1BF ^⑥
Blade	F7666A-2 ^②	F7666A-2 ^②	78CDA-4 ^④	F7666A-3Q ^⑥
Pitch Angle (High)	29° + 2° @ 30 In. Sta.	29° + 2° @ 30 In. Sta.	27.5 + .2° @ 30 In. Sta. ^⑤	29.3° to 31.3°
Pitch Angle (Low)	13° + 0° @ 30 In. Sta.	14° + 0° @ 30 In. Sta.	14.0 + .2° @ 30 In. Sta.	14.1° ± .1°
Diameter	74 In. Max., 73 In. Min.	74 In. Max., 73 In. Min.	74 In. Max., 73 In. Min.	73 In.
Governor	Edo-Aire (Garwin-Weston) or Hartzell	Edo-Aire (Garwin-Weston) or Hartzell	McCauley (C290D5/T17)	McCauley

① INLET TO FUEL INJECTOR

② Prior to 1975 models, model designation was HC2YK-1B and blade designation was 7666A-2.

③ B2D34C214 Effective 78J Model production and replacement on prior S/N's.

④ 90DHB-16E Effective 78J Model (Low pitch: 13.9 ± .2°, High pitch: 33° ± .5°)

⑤ 29.5 ± .5 Effective after S.B. 198

⑥ M20J S/N 24-1038 & ON.

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1-4. AIRFRAME.	M20C & E	M20F	M20G	M20J
1. Dimensions:				
a. Wing span	35' 0"	35' 0"	35' 0"	35' 0"-36'1"***
b. Fuselage length	23' 2"	24' 0"	24' 0"	24' 8"
c. Tail height	8' 4"	8' 4"	8' 4"	8' 4"
d. Stabilizer span	11' 9"	11' 9"	11' 9"	11' 9"
2. Areas:				
a. Wing (SQ FT)	166.93	166.93	166.93	166.93-168.42**
b. Ailerons (SQ FT)	11.4	11.4	11.4	11.4
c. Flaps (SQ FT)	17.9	17.9	17.9	17.9
d. Vertical fin (SQ FT)	7.9	7.9	7.9	7.9
e. Rudder (SQ FT)	6.25	6.25	6.25	6.25
f. Horizontal stabilizer (SQ FT)	21.5	21.5	21.5	21.5
g. Elevators (SQ FT)	12.0	12.0	12.0	12.0
3. Weights and Loadings:	M20C	M20E	M20F	M20G
a. Approximate empty weight (LBS) . . .	1525	1600	1645	1593
b. Gross weight (LBS)	2575	2575	2740	2525
c. Useful load (LBS)	1050	975	1095	932
d. Wing loading (LBS/SQ FT)	15.4	15.4	16.4	15.1
e. Power loading (LBS/HP)	14.3	12.9	13.7	14.0
4. Wings:				
a. Airfoil at wing root	NAC 63 ₂ - 215	NAC 63 ₂ - 215	NAC 63 ₂ - 215	NAC 63 ₂ - 215
b. Airfoil at wing tip	NAC 64 ₁ - 412	NAC 64 ₁ - 412	NAC 64 ₁ - 412	NAC 64 ₁ - 412
c. Mean aerodynamic chord (IN. at wing STA 93.83	59.18	59.18	59.18	59.18
d. Center-of-gravity range (% MAC) . .	15 to 26.8%	13.4 to 28.7%	12.4 to 28.7%	13.4 to 28.7%
e. Geometric twist (DEG)	-1° 30'	-1° 30'	-1° 30'	-1° 30'
f. Incidence angle (DEG) from wing STA 20. to wing tip	2° 30'	2° 30'	2° 30'	2° 30'
g. Dihedral angle (DEG)	5° 30'	5° 30'	5° 30'	5° 30'
h. Aspect ratio	7.338	7.338	7.338	7.338
i. Taper ratio	1.935	1.935	1.935	1.935
5. Fuselage:				
a. Cabin Dimensions:				
(1) Height (IN.)	44.5	44.5	44.5	44.5
(2) Width (IN.)	41*	41*	41*	43.5
(3) Length (IN.)	104	114	114	114
(4) Cabin door width (IN.)	29	29	29	29
(5) Cabin door height (IN.)	35	35	35	35
b. Baggage Compartment:				
(1) MAX loading (LBS)	120	120	120	120
(2) Baggage space (CU FT)	15	18.6	18.6	18.6
(3) Baggage door width (IN.)	17	17	17	17
(4) Baggage door height (IN.)	20.5	20.5	20.5	20.5
(5) Hat rack capacity (LBS)	10	10	10	10
c. Landing Gear (Standard 1968 M20C, F, & G)				
(1) Type	Tricycle Retract- able	Tricycle Retract- able	Tricycle Retract- able	

*1975 Models S/N 20-1157 & On }
 21-1171 & On } Width is 43.5 In.
 22-1224 & On }

** 1981 & On M20J Only

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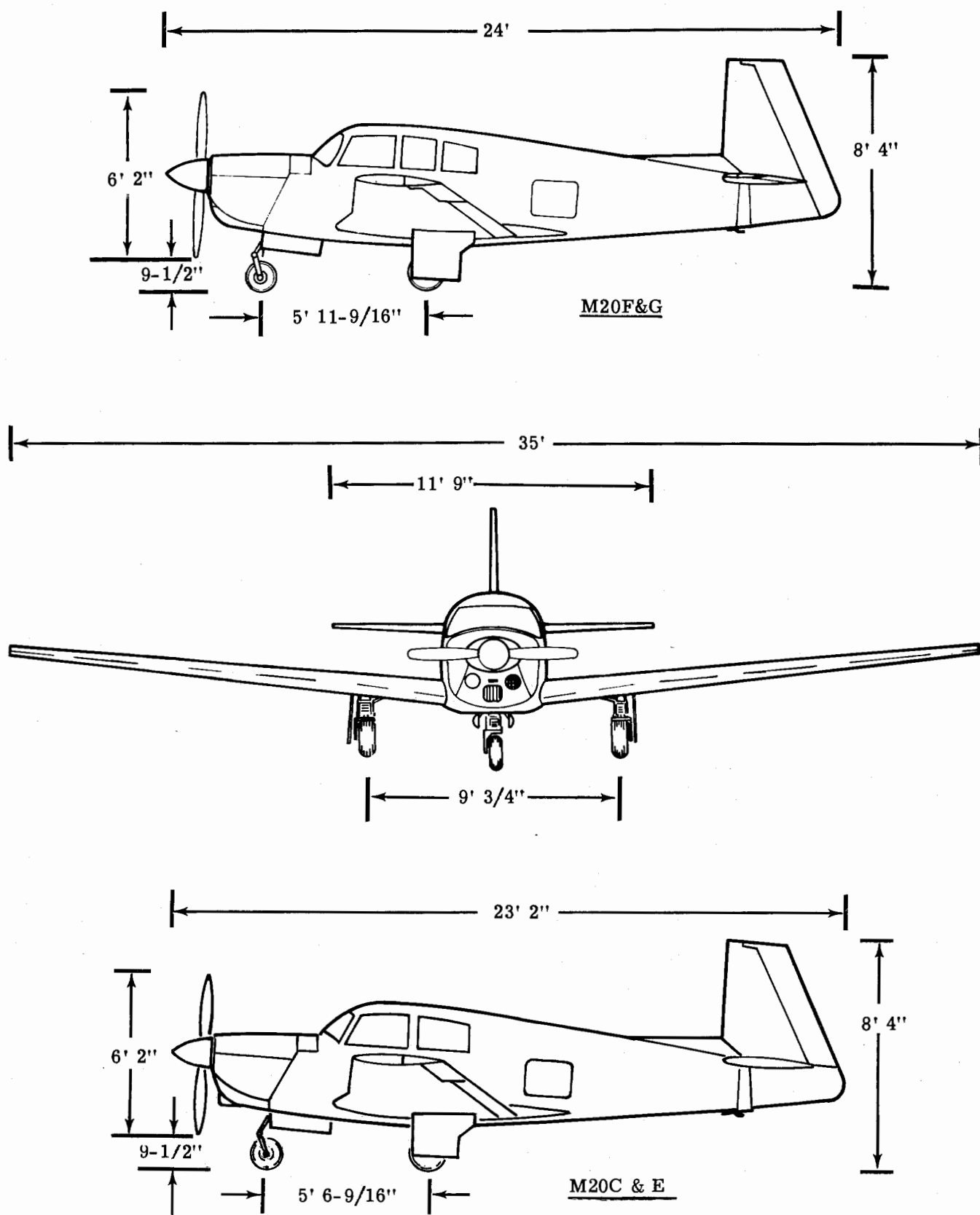


Figure 1-1. Principal Aircraft Dimensions M20 C, E, F & G.

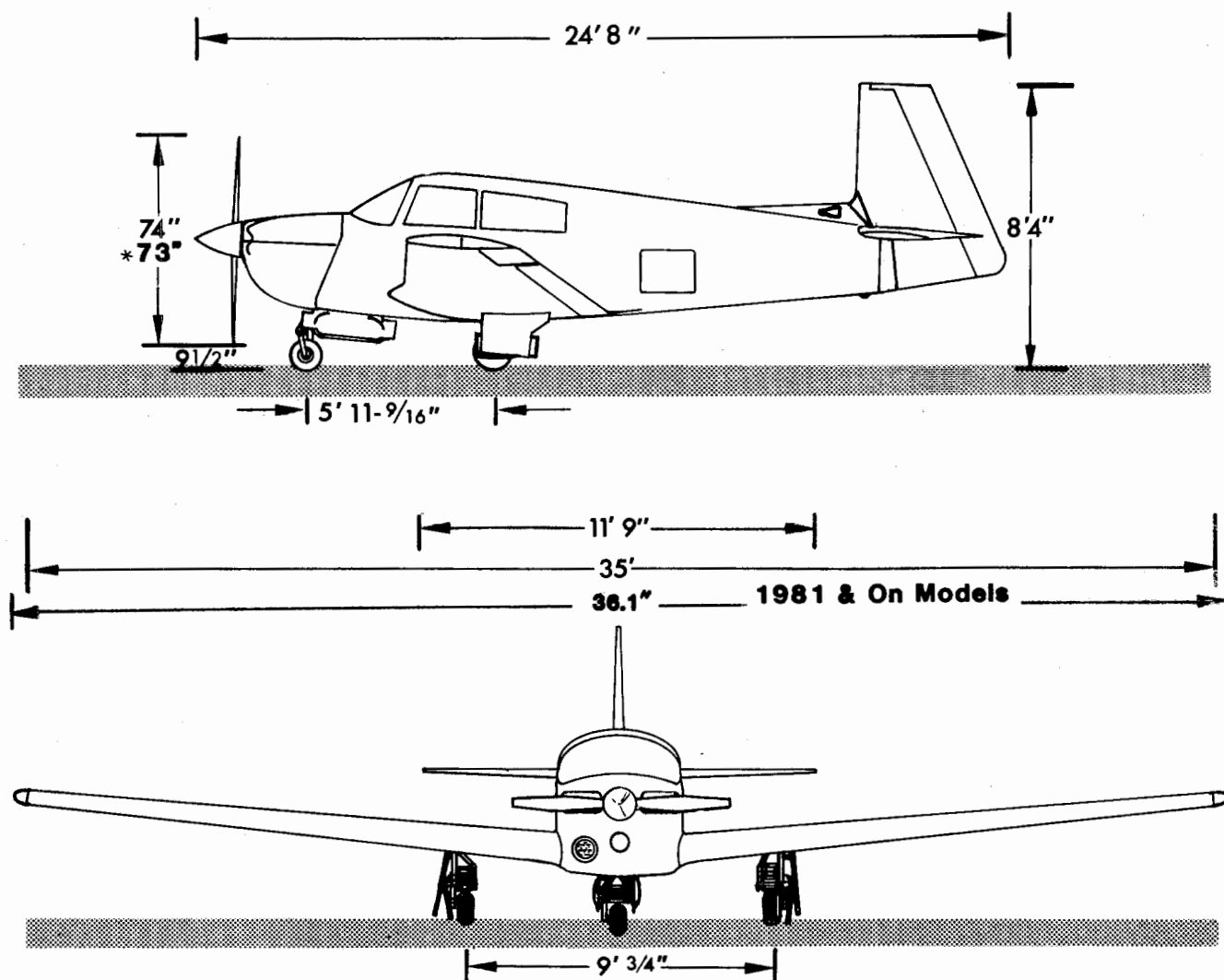


Figure 1-2. Principal Aircraft Dimensions M20 J.

* Optional Hartzell HC-C2YK-1BF propeller with F7666A-3Q blade.

1-4 AIRFRAME (continued)

	M20C & E	M20F	M20G	M20J
(2) Operation	Manual	Manual	Manual	N/A
(3) Wheel track (FT)	9' 3/4"	9' 3/4"	9' 3/4"	N/A
(4) Wheel base (FT)	5' 6 9/16"	5' 11 9/16"	5' 11 9/16"	N/A
(5) Tire size--nose (6-ply rating)	5:00 x 5	5:00 x 5	5:00 x 5	N/A
(6) Tire size--main (6-ply rating)	6:00 x 6	6:00 x 6	6:00 x 6	N/A
(7) Tire pressure--nose (PSI)	30	49	49	N/A
(8) Tire pressure--main (PSI)	30	30	30	N/A

d. Electrical Landing Gear (Optional 1968 Models; Standard 1969 & on, C, E, F, G, & J):

(1) Type	Tricycle Retract- able	Tricycle Retract- able	Tricycle Retract- able	Tricycle Retract- able
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1-4 AIRFRAME (continued)

	M20C & E	M20F	M20G	M20J
(2) Operation	Electrical	Electrical	Electrical	Electrical
(3) Wheel track (FT)	9' 3/4"	9' 3/4"	9' 3/4"	9' 3/4"
(4) Wheel base (FT)	5' 6 9/16	5' 11 9/16"	5' 11 9/16"	5' 11 9/16"
(5) Tire size--nose (6-ply rating)	5:00 x 5	5:00 x 5	5:00 x 5	5:00 x 5
(6) Tire size--main (6-ply rating)	6:00 x 6	6:00 x 6	6:00 x 6	6:00 x 6
(7) Tire pressure--nose (PSI)	30	49	49	49
(8) Tire pressure--main (PSI)	30	30	30	30

1-5. LANDING GEAR SYSTEM. The gear system has been modified to reduce operating forces. (Mooney distributors stock retrofit retraction kits for models not covered in this manual.) The manual system, as well as the electric landing gear system, has a steerable nose wheel. Single-disc self-adjusting hydraulic brakes are featured on the main gear. The hydraulic brake reservoir also furnishes fluid for the hydraulic flap system on 1968 models. Gear position lights and a warning horn are standard equipment. Bungee springs that preload the retraction mechanism in an overcenter position hold the gear down. An air-pressure actuated safety-switch in the pitot system or squat switch in the electrical system prevents electric gear retraction on takeoff until a safe flying speed is attained. A gear-throttle warning horn sounds when the throttle is set for 12 IN. Hg with the landing gear up. The electric gear retraction system has a manual override system connected to the gear actuator that permits manual lowering of the gear in the event of an electrical malfunction.

1-6. FLIGHT CONTROL SYSTEMS. The dual flight control systems can be operated from either the pilot or co-pilot seat. All flight controls are conventional in operation, using push-pull tubes to link the control surfaces to the control wheels and rudder pedals.

Formica guide blocks maintain control tube alignment and dampen vibration. An interconnect bungee spring mechanism links the aileron and rudder systems to assist in control coordination. The co-pilot's rudder pedals are removable. The trim system sets the stabilizer angle of attack.

1-7. WING FLAP SYSTEM. (1968 MODELS)

A hand-operated hydraulic pump operates the flap actuating cylinder. A valve, operated by an airfoil-shaped control on the instrument panel, controls the flaps and releases hydraulic pressure at a slow rate as air pressures and retraction springs raise the flaps. The hydraulic fluid reservoir is common to both the flap and brake systems.

WING FLAP SYSTEM (1969 and on).

Wing flaps on these models are electrically actuated and are controlled by a spring-loaded up-off-on switch on the engine control pedestal. The 1975 models have a three position switch to pre-select flap settings.

1-8. POSITIVE CONTROL SYSTEM. (thru mid 1977 models) The Mooney Positive Control (P.C.) system is a dual-axis flight control aid. P.C. is a vacuum pump powered lateral stability control system that provides a high degree of roll and yaw stability. The system is super-imposed on the manual flight control systems and consists of a gyro sense element in the turn coordinator that meters vacuum pressure to cylinder-piston servo units. The servos are linked to the aileron and rudder bell cranks. Positive Control operates from takeoff through landing and is controlled by a cutoff button on the pilot's control wheel. The button operates a relay which supplies vacuum to the gyro sense element. Depressing the cutoff button relieves all servo vacuum and renders the system inoperative. The system can be overpowered with little effort and with no damage to the aircraft or P.C. system components.

1-9. ELECTRIC POWER SYSTEM. The master switch and power relay control the electrical power system, comprised of a 50-AMP 12-volt generator or a 60-AMP 12-volt alternator, a voltage regulator, and a 35-AMP HR battery. Alternator systems have an overvoltage protective relay and overvoltage annunciator light. All 1969 thru 1974 models have automatic annunciator light dimming systems.

Circuit breakers or circuit breaker switches protect the electrical wiring and equipment from overloads. Standard electrical equipment includes: a 250-watt landing light, navigation lights, interior lights, gear and stall warning systems, an electrical boost pump, and an electric starter, electric gear retraction system with manual override.

1-10. INSTRUMENTS. All flight instruments are in the shock-mounted flight panel. Engine instruments are in the co-pilot's panel. The pitot system provides air pressure to operate the airspeed indicator. The instrument static-pressure system has two static-air pickup ports--one on each side of the tailcone--that open to the atmosphere. The instrument panel lighting system has manual dimming mechanisms.

1-11. CABIN HEATING & VENTILATING SYSTEMS. The heater muff encasing the exhaust muffler is the cabin heat source. Hot air from the heater muff mixed with ambient air controls cabin temperature. A manually operated overhead airscoop provides additional cool-air ventilation. Air routed from the cabin heater duct system to nozzles at the windshield base defrosts the windshield.

1-12. FUEL SYSTEM. The fuel system has sealed, integral wing tanks in the forward, in-

board section of each wing. Vents at the aft, outboard corner of each tank vent downward through the lower wing surface. These tank vents are designed as a tube-within-a-tube to help prevent freezing. Fuel sump drains are at the lowest point in each tank; the fuel selector valve drain is at the lowest point in the fuel system. The emergency electric fuel pump is in the bottom left forward section of the fuselage just aft of the firewall. The engine-driven fuel pump mounts on the engine crankcase. Fuel quantity transmitters in each tank are wired to fuel quantity gages in the engine cluster gage. The master switch, left side of the pilot's panel, turns on the fuel quantity indicating systems.

NOTE: 78J Model - A low fuel warning annunciator light for each tank is activated when useable fuel quantity goes below 3 gallons.

SECTION II. GROUND HANDLING, SERVICING & INSPECTION

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2-1. GROUND HANDLING.

2-2. TOWING. Use a towbar for moving the aircraft. The towbar attaches to the nose gear crossbar. One man can move the aircraft providing the ground surface is relatively smooth and the tires are properly inflated.

When no towbar is available, or when assistance in moving the aircraft is required, push by hand: (1) on the wing leading edges, (2) on the wing tips, and (3) on the inboard portion of propeller blades adjacent to the propeller hub. Towing by tractor or other powered equipment is not recommended.

CAUTION: Exercise care not to turn the nose wheel past its normal swivel angle of 14° either side of center. Exceeding the turn limits shown on the turn indicator may cause structural damage.

2-3. WARMUP & TAXIING. Before attempting to warmup or taxi the aircraft, ground personnel should be checked out by qualified pilots or other responsible personnel.

1. Start and warmup engine. (Refer to Owners Manual.)

2. Taxi forward a few feet and check brake effectiveness.

3. While taxiing, make shallow turns to test nose gear steering.

4. Check operation of gyro instruments and turn coordinator during turns.

5. Check P.C. system operation for proper control reaction during turns.

6. Check engine instruments for sluggish response to engine control movements.

2-4. PARKING & MOORING. When parking the aircraft, place wheel chocks fore and aft of the main wheels. The parking brakes may be used for short-duration parking.

CAUTION: Do not set parking brakes when they are overheated or when cold weather could freeze moisture and slush accumulation in the brake mechanism. Do not set parking brakes when aircraft is tied down.

For maximum protection, hangar the aircraft during severe weather and high winds. When mooring the aircraft out of doors:

1. Head aircraft into the wind.

2. Place chocks fore and aft of each main wheel.

3. Drive stakes in ground approximately three feet outboard of each main gear and to either side of tailskid.

4. Install tiedown rings in wing receptacles outboard of each main gear. Tie a 600-pound tensile strength rope to each wing tiedown ring and anchor to ground stake. Allow a little slack in each tiedown rope.

5. Tie the center of a rope to tail skid tiedown ring and anchor rope ends to ground stakes at either side of tail.

6. For additional security, attach a rope to the nose gear and anchor to a ground stake.

7. Lock controls by looping right front seat safety belt through the control wheel and drawing belt snug.

2-5. OUTDOOR STORAGE. Outdoor storage requires adequate mooring and tiedown facilities. The following precautionary measures are recommended for keeping the aircraft serviceable and ready-to-fly.

1. Refer to paragraph 2-4 for mooring instructions.

2. To maintain an oil film on internal engine parts, frequently pull the propeller through. Run engine for 15 minutes at 1500 RPM (or until oil temperature normalizes) once every seven days.

3. After engine run, pressurize the fuel system (turn boost pump on), push mixture control to RICH, and open throttle half way to fill the fuel injector or carburetor with fuel.

4. Keep fuel tanks filled at least one-half full to minimize moisture condensation. Keep battery fully charged.

5. Install protective covers over pitot head, engine cowl openings, static ports, etc.

6. Maintain a good wax finish on all exterior surfaces.

2-6. PROLONGED STORAGE. If the aircraft is to be stored for an extended period of time, the following steps are recommended for protection:

1. Refer to paragraph 2-4 for mooring instructions.

2. Run engine (minimum of 15 minutes at 1500 RPM) until oil temperature reaches normal operating range.

3. Drain engine oil sump and refill the sump with a preservative oil (Socony Aurex 901 or equivalent) preheated between 200°F and 220°F.

4. Start engine and run at 1000 RPM for five minutes.

5. Shut down engine and remove spark plugs.

6. While motoring engine with starter, spray each cylinder (through spark plug holes) with approximately two ounces of hot preservative oil.

CAUTION: Do not exceed starter operating limits when motoring engine.

7. When all cylinders have been sprayed, position propeller horizontally and respray each cylinder without moving propeller.

8. Attach a warning tag to one of the blades stating that propeller is not to be rotated.

9. Install dehydrator plugs in spark plug holes.

10. Cap ignition harness leads.

11. Drain preservative oil from sump.
12. Attach a warning tag to the throttle control in cockpit stating that engine has no lubricating oil.
13. Drain all fuel from fuel injector or carburetor; then, pump flushing oil into the fuel injector or carburetor at five PSI until injector or carburetor is full. Drain the carburetor after flushing; do not drain the injector after flushing.
14. Lubricate aircraft in accordance with instructions given in the Lubrication Guide.
15. Tape or cover all openings.
16. Remove battery, charge fully, and store in a cool place.
17. Raise aircraft to remove weight from the tires, and block up the wheels.

CAUTION: If weight is not removed from tires, rotate wheels to a new position at least once each 30 days to prevent flat-spotting the tires.

2-7. RETURNING TO SERVICE. If the aircraft has been stored for an extended period of time, it is advisable to perform a 50-hour periodic inspection after completion of the following preliminary steps:

1. Remove blocks from wheels. Check tire inflation.
2. Check and install battery.
3. Remove tape and covers from openings.
4. Remove warning placards.
5. Clean or replace engine oil filter (optional equipment).
6. Clean engine oil suction and pressure screens.
7. Clean and check oil pressure relief valve.
8. Clean and check oil temperature bypass valve.
9. Fill engine sump with proper grade of lubricating oil.
10. Clean and reinstall engine air-inlet filter.
11. Clean and regap spark plugs.
12. Remove dehydrator plugs and install spark plugs.
13. Check and reconnect ignition harness.
14. M20E, F & J: Check and clean fuel injector nozzles and screens. Drain oil from fuel injector.
15. Check fuel tank vents for obstruction, and drain sumps to remove moisture and sediment.
16. Complete 50-hour and preflight inspections.

2-8. EMERGENCY PROCEDURES.

1. Engine Fire During Starting.
 - a. Continue cranking engine with starter.

- b. Set mixture control at IDLE CUTOFF.
- c. Turn fuel selector handle to OFF.
- d. Open throttle to full throttle.
- e. Push cabin heat control to OFF.
- f. Close cowl flaps (M20E, F & J).
- g. If fire is not extinguished, proceed as follows:

- (1) Turn electrical switches off.
- (2) Discharge fire extinguisher into engine compartment through nose cowl openings.
- (3) Call for fire-fighting equipment.

2. Fuselage or Wheel Well Fire. **In case of fire in wheel well (or in the cabin or fuselage area),** turn all fuel, electrical, and ignition controls to the OFF position **before** evacuating the aircraft to extinguish the flames.

3. Electrical Fire. Circuit breakers (or circuit-breaker switches), that automatically interrupt the flow of power when an overload or short circuit occurs, protect all electrical circuits (except the ignition-starter circuits). In the event of an electrical fire, immediately turn off the master switch and the alternator field switch. Make sure that only a fire extinguisher approved for electrical fires is used.

2-9. JACKING. When it is necessary to raise the aircraft off the ground:

CAUTION: Do not raise the aircraft on jacks out of doors when wind velocity is over 10 MPH.

1. Install jack points in tiedown mounting holes outboard of each main gear.
2. Use standard aircraft jacks at both wing hoist points (wing tiedown eyebolt receptacles) outboard of the main gears. While holding jack point in place, raise jack to firmly contact jack point.
3. Raise aircraft, keeping wings as nearly level as possible.
4. Secure safety locks on each jack.
5. Use a yoke-frame jack under propeller to lift the nose.

CAUTION: When lowering aircraft on jacks, bleed off pressure on all jacks simultaneously and evenly to keep aircraft level as it is lowered.

NOTE: Individual wheels may be raised without raising the entire aircraft. Wheels not being raised should be chocked fore and aft.

2-10. **LEVELING.** Place a spirit level on the skin line or leveling screws above the tail cone access door when leveling the aircraft longitudinally. Level the aircraft by increasing or decreasing air pressure in the nose wheel tire. Front seats must be in the forward position and adjustable rear seat backs must be in full upright position when weighing.

2-11. **WEIGHT & BALANCE.** To weigh the aircraft, select a level work area and:

1. Check for installation of all equipment as listed in the Weight & Balance Record.

2. Ground aircraft and drain fuel tanks per Section 2-15, paragraph 2.

3. Add unusable fuel to each tank as follows: M20C, E, G - 0.57 Gal. (3.4 LB); M20F & J - 1.25 Gal. (7.5 LB).

4. Fill oil to capacity (8 qts)

5. Position a 2000-pound capacity scale under each of the three wheels.

6. Level aircraft as described in paragraph 2-10 and center nose wheel.

7. Weigh the aircraft.

8. Find reference point by dropping a plumb bob from center of nose gear trunion (retracting pivot axis) to the floor. Mark the point of intersection.

9. Locate center line of wheel axles in the same manner.

10. Measure the horizontal distance from the reference point to main wheel axle center line. Measure horizontal distance from center line of nose wheel axle to center line of main wheel axles.

11. Record weights and measurements, and compute basic weight and CG as follows:

Center-of-Gravity Computation Formula:

$$L_M = \frac{(W_N)(L_{N/M})}{WT} \quad L_{C/G} = L_{M/R} - L_M \text{ (M20 C \& E)}$$

$$L_{C/G} = L_{M/R} - 5 - L_M \text{ (M20F, G \& J)}$$

a. CG Forward of Main Wheels (all models):

LBS	x	IN.	/	LBS	=	IN.
Weight of Nose		Distance Between Main and Nose Wheel Axle Centers		Total Weight of Air- craft		CG Forward of Main Wheels
(W _N)		(L _{N/M})		(W _T)		(L _M)

b. CG Aft of Datum (Station 0), M20C & E:

IN.	-	IN.	=	IN.
Distance from Center Nose Gear Trunion to Center of Main Wheel Axles (Horizontal)		Result of Computation Above (a.)		CG (FUS STA) Distance Aft of Datum (Empty Weight CG)
(L _{M/R})		(L _M)		(L _{C/G})

c. CG Aft of Datum (Station 0), M20F, G & J:

IN.	-	5 IN.	-	IN.	=	IN.
Distance from Center Nose Gear Trunion to Center of Main Wheel Axles (Horizontal)		Distance from Nose Gear Trunion to Datum		Result of Computation Above (a.)		CG (FUS STA) Distance Aft of Datum (Empty Weight CG)
(L _{M/R})		Constant		(L _M)		(L _{C/G})

NOTE: Empty weight includes unusable fuel and undrainable oil and is computed with gear down and flaps up.

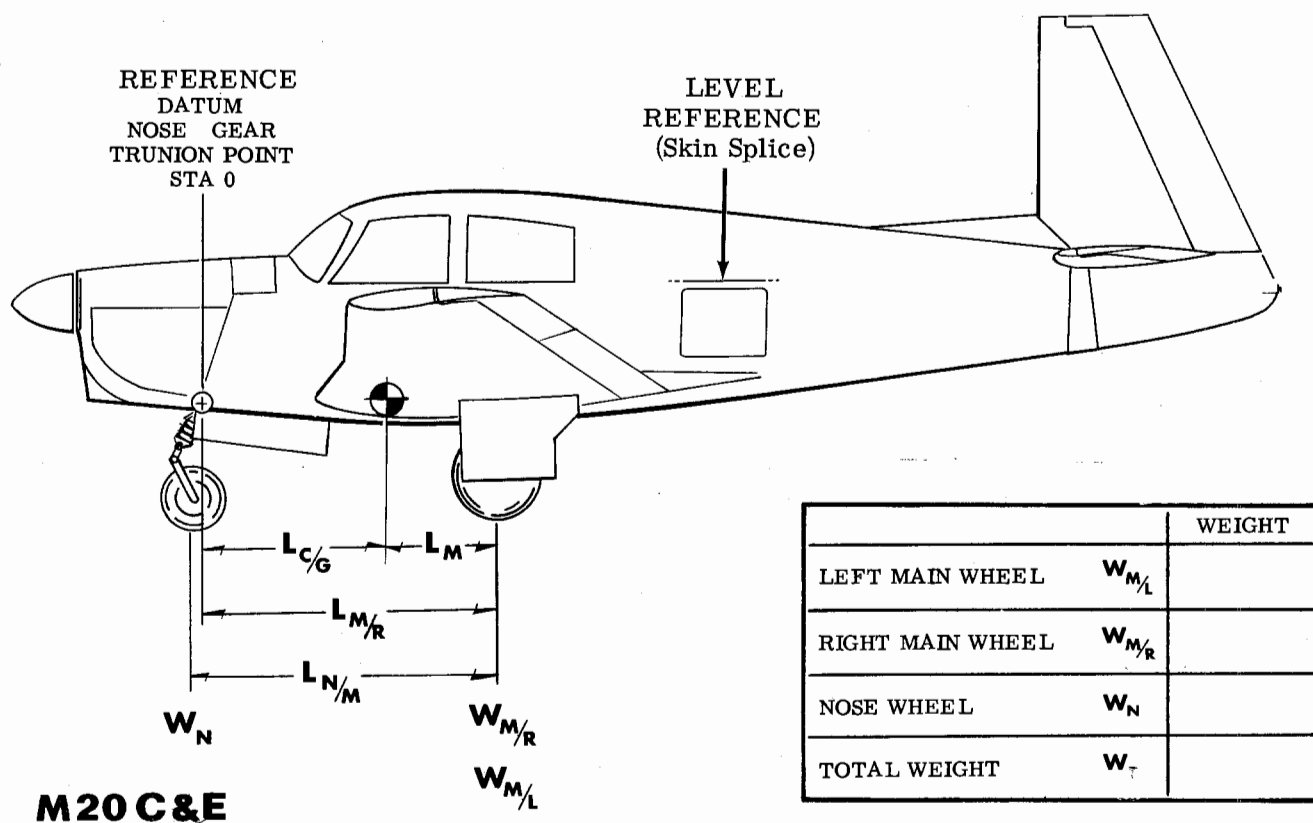
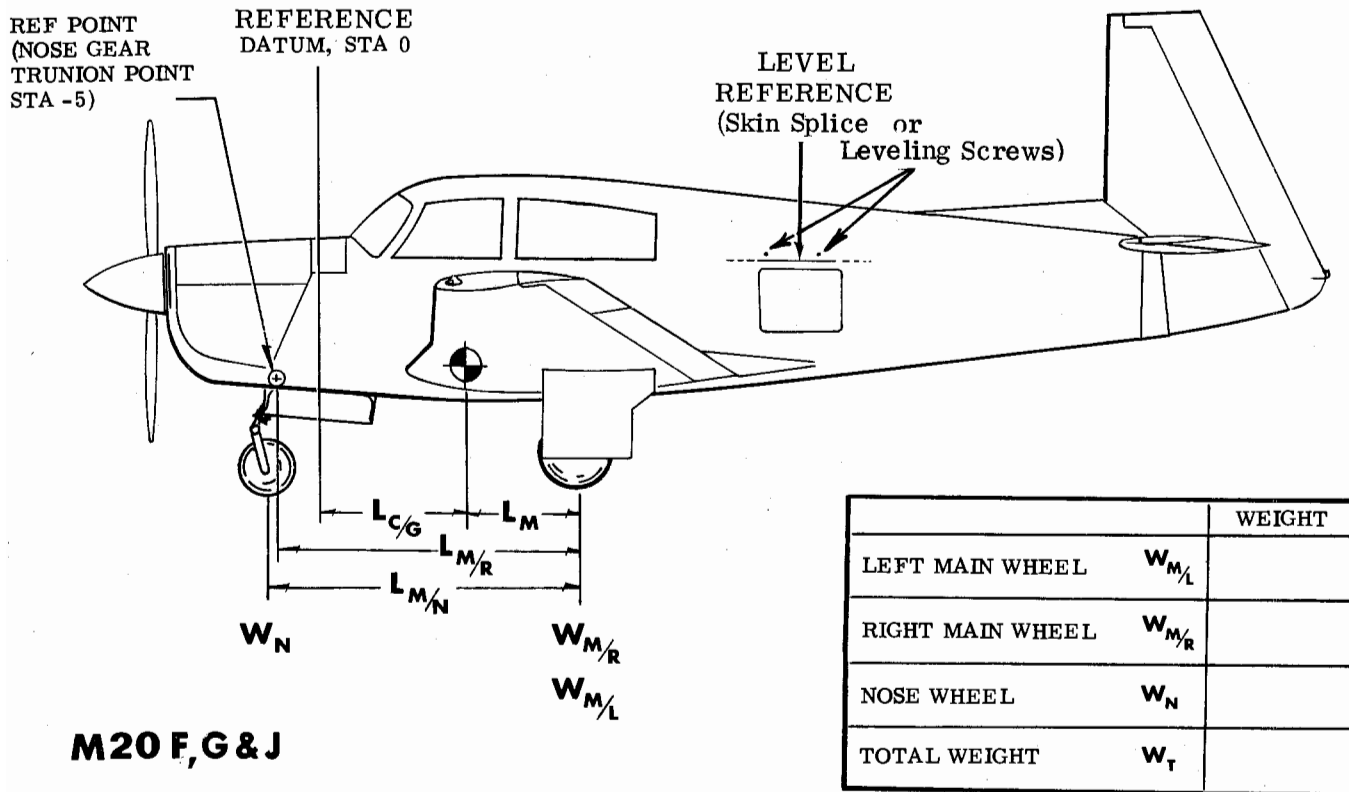


Figure 2-1. Weight & Balance Diagram

2-12. SERVICING.

2-13. SERVICING INTERVALS. The specified servicing intervals (paragraphs 2-16 thru 2-22) are considered adequate to meet average requirements under normal operating conditions. It is advisable, however, to shorten service and maintenance intervals when operating under abnormal environmental conditions, such as extreme temperature ranges, dusty atmospheric conditions, high humidity and moisture, unimproved airport facilities, or unusual operating requirements.

2-14. FUEL TANKS. Keep fuel tanks at least half filled to minimize condensation and moisture accumulation in the tanks. In the M20F and M20J model, a visual 25-gallon fuel level indicator is installed in each tank and may be viewed through the filler opening. (Fuel capacity is given in Section I.)

WARNING: Ground the aircraft and fuel service vehicle. Ground servicing nozzle to wing. Permit no smoking or open flame within 50 feet of aircraft or vehicle.

WARNING: Each fuel tank is vented to the atmosphere at its outboard aft corner; vent openings are on the lower wing surface. Check vents for obstruction before each flight.

2-15. FUEL DRAINS. A fuel-drain valve, flush with the skin surface, is located in the aft in-board corner of each tank to provide for drainage of moisture and sediment. Use the small plastic cup furnished with the loose equipment to drain the fuel sumps. Drain wing tank and selector valve sumps before the first flight of the day and after each fuel service.

WARNING: After servicing the aircraft with fuel, wait at least five minutes for moisture and sediment to settle before draining and checking both the fuel tank sumps and the fuel selector-valve drain.

1. Fuel Selector Drain. The fuel selector valve is at the lowest point in the fuel system and has a drain valve operated by a control on the floor in the cabin. To drain the fuel selector valve:

a. Switch fuel selector valve handle to L and pull fuel drain valve control ring for 10 seconds.

b. Switch fuel selector valve handle to R and pull fuel drain valve control ring for 10 seconds.

c. After draining, be sure fuel drain valve control is returned to the closed position and

the valve is not leaking outside the aircraft.

WARNING: During cold weather operation, frequently check fuel selector drain for ice formation.

2. Defueling. Fuel tanks may be drained by pumping fuel out with the electric boost pump or by siphoning fuel through the filler ports.

WARNING: Allow no smoking or open flame within 50 feet of the defueling area. Ground the aircraft and fuel container during all defueling operations.

To defuel the aircraft:

a. Disconnect fuel line at electric boost pump outlet fitting.

b. Connect to output fitting a flexible line that will reach fuel receptacle.

c. Turn fuel selector valve to the tank to be drained, and remove filler cap from fuel filler port.

d. Turn on boost pump until tank is empty. Repeat steps c. and d. to drain other tank.

e. To completely drain fuel system also drain wing sumps and the fuel selector valve sump until fuel stops running.

NOTE: On those aircraft fitted with removable tank quick drains it is only necessary to remove the drain in order to defuel.

NOTE: 78J Model - The gascolator (fuel drain) is separate from the fuel selector. The fuel selector is located aft of the console on the floor and the gascolator is located to the left of the fuel selector. Separation of the gascolator and fuel selector does not change fuel drain procedures.

2-16. **ENGINE OIL.** Check engine oil level after engine has been stopped long enough for oil to drain back into sump. The oil filler cap access door is located in the top cowling. Any lubricating oil, either straight mineral or compounded, must conform with Lycoming Specification No. 301F to be acceptable for use in Lycoming engines. Engine oil viscosity requirements are shown on page 2-18.

CAUTION: The terms "detergent", "additive," and "compounded" used in this manual are intended to refer to a class of aviation engine lubricating oils to which certain substances have been added to improve them for aircraft use. These terms do not refer to such materials commonly known as "top cylinder lubricant", "dopes", and "carbon remover" which are sometimes added to fuel or oil. These products may damage the engine and therefore, should not be used. Under no circumstances should automotive oil be used, since such oils could cause engine damage.

1. **Oil Recommendations for New-Engine or Newly Overhauled Engine Break-in.** New or newly overhauled engines should be operated on aviation grade straight mineral oil during the first 25 hours of operation or until oil consumption has stabilized. The aircraft is delivered from Mooney with straight mineral oil of the correct viscosity.

2. **Oil Changing Recommendations.** The oil sump is equipped with a quick-drain fitting. On aircraft NOT equipped with an external oil filter, change oil and clean oil suction screen at 50-hour intervals. On aircraft equipped with an external oil filter, the engine oil change intervals may be extended to 100-hour intervals providing the external filter element is changed AT 50-HOUR INTERVALS. If an engine has been operating on straight mineral oil for several hundred hours, a change to additive oil should be undertaken with caution. If the engine is in an extremely dirty condition, the switch to additive oil should be deferred until after engine has been overhauled. When changing from straight mineral oil to additive or compounded oil, after several hundred hours of operation on straight mineral oil, take the following precautionary steps:

- a. Do not mix additive oil and straight mineral oil. Drain straight mineral oil from engine, clean screens or change filter, if equipped, and fill with additive oil.
- b. Do not operate engine longer than five hours before again changing oil.
- c. Check oil suction screen or oil filter, if equipped, for evidence of sludge or plugging.

Change oil and clean oil suction screen or replace oil filter element (if equipped) every 10 hours if sludge is evident. Resume normal oil drain periods after sludge conditions improve.

NOTE: During periods of prolonged operation in dusty areas or in cold climates, or when flights have been of short duration with prolonged idling time, change oil and filter element each 25 hours, or more often when conditions warrant.

2-17. **INDUCTION AIR FILTER.** The importance of keeping the induction air filter clean cannot be emphasized. A clean filter promotes fuel economy and longer engine life. The dry-type filter can usually be washed six to eight times before replacement is necessary. Replace the induction air filter every 500 hours or at one-year intervals, whichever occurs first.

1. To clean the dry-type induction air filter (M20E, F & J only):

- a. Remove filter element.
- b. Direct a jet of air against down or clean side of filter (opposite to normal airflow). Keep air nozzle at least two inches from filter element. Cover entire filter area with air jet.

CAUTION: Do not use a compressor unit with a nozzle pressure greater than 100 PSI.

- c. After cleaning, inspect filter and gasket for damage. Discard a ruptured filter or broken gasket.

NOTE: If filter shows an accumulation of carbon, soot, or oil, continue with cleaning steps d. through g.

- d. Soak filter in nonsudsing detergent for 15 minutes; then agitate filter back and forth for two to five minutes to free filter element of deposits.

NOTE: A Donaldson D-1400 Filter Cleaner is recommended. Do not use solvents.

- e. Rinse filter element with a stream of clear water until rinse water is clear.
- f. Dry filter thoroughly. Do not use a light bulb or air heated above 180°F for filter drying.
- g. Inspect for damage and ruptures by holding filter before a light bulb. If damage is evident, replace filter with a new one.

NOTE: M20E, F & J only -- Check induction air door through lower front cowling opening for good working order, and check alternate air door inside the lower cowling at the induction air box for proper operation. The alternate air should just start to open when a force of 3 to 4 pounds is applied.

h. Reinstall filter in aircraft making sure of proper sealing and security.

2. To clean the Air-Maze oil-type filter (M20 C & G only):

- a. Remove filter.
- b. Wash in solvent (PS-661 or equivalent).
- c. Dip filter in SAE 60 oil.
- d. Allow surplus oil to drain off.
- e. Reinstall air filter.

(Procedures as outlined in MIL-F-7194).

2-18. BATTERY. Service the battery with distilled water to maintain electrolyte above plates. After adding water in freezing weather, charge battery long enough to mix electrolyte and water. Keep battery electrolyte above a specific gravity of 1.225 to avoid freezing. To service the battery:

1. Remove battery box cover. Check electrolyte and service battery as required.
2. Check battery box for corrosion and spilled electrolyte. To clean cables, terminals, and battery box, use a solution of bicarbonate of soda and clean water to neutralize corrosion and spilled electrolyte.

CAUTION: When cleaning, do not allow bicarbonate of soda to enter battery cells-- permanent damage will result if soda mixes with the electrolyte.

3. Rinse battery with clear water, and wipe clean with a dry cloth.
4. To retard corrosion, coat terminals with petroleum jelly after cleaning and tightening them.
5. Check battery, ram air and vent tubes for obstruction, line kinks, holes, etc.

2-19. TIRES & WHEELS. Keep the tires at recommended air pressure (Refer to paragraph 1-4, page 1-6).

1. Check tires for wear, cuts, and bruises.
2. Check valve stems for evidence of tire slippage or pulling.
3. Check wheels for damage.

2-20. HYDRAULIC RESERVOIR. Frequently check the hydraulic reservoir for proper fluid level. See Pg. 2-16 for locations.

CAUTION: Do not fill reservoir while parking brake is set, or on models equipped with hydraulic flaps, with the flaps extended. (Hydraulic flaps are installed on 1968 and earlier models).

Use only hydraulic fluid (red), per specification MIL-H-5606. Do not fill reservoir above two inches below filler port.

2-21. HYDRAULIC BRAKE. Bleeding.

CAUTION: Fluid in the wheel cylinders or flap actuating system may be under high pressure due to expansion. Therefore, be sure parking brakes and flaps are released prior to beginning hydraulic system servicing.

For best results, use a hydraulic pressure service unit (pressure pot) to back bleed the system through the wheel cylinder bleeder valves.

1. Remove hydraulic fluid reservoir filler cap, and install a suitable fitting for attaching a flexible drain line to a filler port.
2. Immerse open end of drain line in a hydraulic fluid container.
3. Attach pressurized hydraulic fluid service unit to wheel cylinder bleeder valve and open valve. On aircraft with dual brakes, prior to 1978 models, depress brake pedals being bled.
4. Feed fluid from service unit into brake system. Check for air bubbles at end of drain line immersed in fluid. On aircraft with dual brakes, prior to 1978 models, depress co-pilot's brake pedal to reposition brake shuttle valve.
5. When fluid flow is clear of air bubbles, close wheel cylinder bleeder valve and remove service line.
6. To bleed opposite brake, repeat steps 3. through 5.

NOTE: Brake pedals may need to be depressed in order for fluid to bleed back into reservoir.

7. Remove drain line from reservoir.
8. Lower fluid level in reservoir to two inches below filler port.
9. Reinstall filler plug.
10. Check brake linings for excessive wear and proper installation. Refer to Section 5-11 for Brake Removal and Inspection Procedures.
11. Depress brake pedals to check for sponginess. Resistance should be solid when brake pedals are depressed.

2-22. CLEANING. Cleanliness is a major pre-requisite to adequate inspection and maintenance of an aircraft. Cleanliness enhances the appearance of an aircraft and reduces the probability of corrosion.

2-23. EXTERIOR.

1. Before washing aircraft exterior, cover brake discs, pitot head, and static ports.
2. Flush away loose dirt and mud.
3. Wash exterior with a mild aircraft detergent in cool water, and a soft cleaning cloth or chamois. Rinse away soap film.

CAUTION: Do not use so called "mild" household detergents to wash aircraft exterior. Such detergents may damage finish and corrode aluminum skins.

CAUTION: Do not apply wax or use pre-wax cleaners during initial paint curing period. Use only mild aircraft detergent and cool water when washing exterior during the first 90 days after new aircraft delivery or after repainting.

4. To remove heavy oxidation film, use a pre-wax cleaner.

5. Apply an exterior-finish wax recommended for protection of urethane enamel. Apply a heavy coating of wax to leading edges of wings, empennage, and nose section to reduce drag and abrasion.

CAUTION: When fuel, hydraulic fluid, or other fluid containing dye is spilled on painted surfaces, remove it at once to prevent staining. Flush away spilled battery electrolyte immediately with water. Treat the area with bicarbonate of soda solution followed by thorough washing with a mild aircraft detergent solution.

2-24. WINDSHIELDS, WINDOWS & DOORS.

1. Flush windshield and windows with water prior to wiping. Never wipe while dry.

2. Remove grease or oil with a soft cloth saturated in kerosene.

CAUTION: Never use gasoline, benzene, carbon tetrachloride, acetone, fire extinguisher fluid, de-icer fluid, lacquer thinner, or household window cleaning sprays on windows or windshields. Such solvents will soften or craze the plexiglas surface.

3. Clean windows and windshields with an antistatic plexiglas cleaner.

4. Check door seals for damage that could cause leakage.

5. Check cabin and baggage door mechanism for good working order.

NOTE: Minor scratches or abrasions may be polished out using plexiglas resurfacing kits available from aircraft accessory suppliers.

2-25. **ENGINE COMPARTMENT.** Accumulation of dirt and oil within the engine compartment creates a fire hazard and hampers inspection.

1. Wash down engine cowling and engine compartment using a nonflammable solvent.

2. Dry engine cowling and engine compartment after washing.

2-26. **CABIN INTERIOR.** Use normal household cleaning practices for routine interior care.

1. Frequently vacuum seats, rugs, upholstery panels, and headliners to remove surface dust and dirt.

2. Clean leather or vinyl upholstery and panels with a mild aircraft detergent. Clean with a slightly damp cloth, and dry with a soft cloth.

NOTE: Foam-type shampoos and cleaners for vinyl, leather, and plastic materials can be used to remove stains and to condition the entire interior. Spray-on dry cleaners are also recommended.

CAUTION: Never apply furniture polish to interior furnishings. Most polishes contain solvents harmful to vinyl. Do not use alcohol or strong solvents on interior plastics. When using commercial cleaning and finishing compounds, carefully follow the manufacturer's instructions. Never saturate fabrics with a solution which could damage the backing and padding materials. To minimize wetting of carpets, keep foam as dry as possible and rub in circles. Use a vacuum cleaner to remove foam. Do not allow carpets to remain damp; dry them thoroughly.

2-27. INSPECTION.

2-28. **INSPECTION INTERVALS.** Perform 25-, 50-, or 100-hour inspections of the aircraft and engine at recommended intervals as outlined in the following paragraphs.

2-29. **CHECK POINTS.** The general points to be covered during inspection are grouped in accordance with the nature and function of the items discussed.

1. **MOVING PARTS** shall be inspected and checked as applicable for: proper operation, security of attachment, sealing, cleanliness, lubrication, servicing, safetying, adjustment, tension, travel, condition of hinges, binding, excessive wear, cracking, corrosion, deformation, and any other apparent damage.

2. **METAL PARTS** shall be inspected and checked as applicable for: security of attachment, condition of finish and sealant, distortion, fatigue cracks, welding cracks, corrosion, and any other apparent damage.

3. **FUEL, AIR & HYDRAULIC OIL LINES & HOSES** shall be inspected as applicable for:

cracks, dents, kinks, deterioration, obstruction, chaffing, improper bend radius, and insecure installation. Pressure test fuel and oil lines for leaks.

4. **ELECTRICAL WIRING** shall be checked as applicable for: loose, corroded, or broken terminals; chaffed, broken, or worn insulation; insecure installation; heat deterioration; and any other apparent damage.

5. **BOLTS & NUTS** in critical areas shall be checked for: fretting, wear, damage, stretch, proper torque, and safetying.

6. **FILTERS & SCREENS** shall be removed, cleaned, and inspected for contamination or damage that would require replacement

2-30. AIRCRAFT FILE INSPECTION. Aircraft 100-hour and annual inspections cover, in addition to examining the aircraft proper, a review of the status of compliance with current Federal Aviation Regulations. This review includes inspection of the approved Owners Manual, Aircraft Log Book, Engine Log Book, Registration Certificate, Airworthiness Certificate, Weight & Balance Record, Lycoming service information, Aircraft Radio Station License (if applicable), FAA Airworthiness Directives, and Mooney service documents.

2-31. ENGINE FUNCTIONAL CHECK. Prior to a scheduled 100-hour or annual inspection, and/or 25 hours after installation of a new or overhauled engine, wash down the engine and engine components. Then perform an engine runup in accord with the procedure recommended in the Owners Manual. Make a record of all malfunctions and abnormalities. After the engine runup, complete a differential (hot engine) compression check. To verify correction of malfunctions and abnormalities, perform a second engine runup and a flight test after completing the inspection.

2-32. FIRST 25-HOUR INSPECTION. The 25-hour inspection consists of a visual inspection of the propeller, engine, and aircraft general condition, including a preflight inspection as outlined in the Owners Manual. The inspection does not require a removal of access panels or disassembly of components; however, it should include completion of all lubrication and service requirements. The inspection should

be extensive enough to detect any damage or maladjustment which might jeopardize flight safety. After the first 25 hours of new or overhauled engine operation, refer to paragraph 2-33 for the recommended engine inspection.

1. Visually inspect propeller, spinner, and engine cowling; open cowling.

2. Inspect and clean induction air filter if aircraft has been operating under dusty conditions.

3. Inspect engine compartment for evidence of fuel, oil, or exhaust leaks.

4. Check security and condition of equipment installed on engine.

5. Inspect fuselage, wing, and empennage for external evidence of damage while paying particular attention to scratches and dents.

6. Inspect windshields and windows for crazing, cracks, and scratches.

7. Check control systems for binding, excessive freeplay, and damage.

8. Check pitot and static systems for possible obstructions.

9. Inspect aircraft exterior for security of bolts, screws, etc.

10. Check and service battery.

2-33. 50-HOUR INSPECTION. The 50-hour inspection includes all requirements for the 25-hour inspection, plus the necessary removal of inspection doors, panels, or fairings. After the first 25 hours of operating time, a new, remanufactured, or newly overhauled engine should be given a 50-hour inspection including replacement of the lubricating oil.

1. Engine.

a. Drain engine oil sump.

b. Remove and clean pressure and suction oil strainer; reinstall strainer and plug. Safety wire strainer plug.

c. Remove and replace the optional full-flow oil filter cartridge.

d. Drain and clean fuel strainer.

e. Remove and clean fuel injector fuel strainer or carburetor bowl drain.

f. Service engine oil sump with proper type, grade, and amount of lubricating oil.

g. Inspect engine intake and exhaust systems for evidence of leakage and looseness.

h. Check spark plug elbows and shielding nuts for security.

i. Check cylinders for evidence of overheating.

j. Check baffles for secure anchorage, close fit around cylinders, and freedom from cracks.

k. Check engine controls for full travel, freedom of movement, and security.

1. Visually check fuel and oil lines for security of connections and evidence of leakage or damage.

m. Visually inspect induction air system; check operation of unfiltered and alternate-air doors on M20E, F & J only (refer to para 2-17). Check operation of carburetor air box (M20C & G only).

2. Propeller.

a. Check propeller and spinner for general condition, looseness, and oil leakage.

b. Inspect blades for nicks and cracks. Repair prior to next flight.

3. Cabin.

a. Check brake and parking brake control systems for proper operation and fluid level.

b. Check trim systems for free operation and travel.

c. Check cabin and baggage doors for damage, proper operation, and sealing.

d. Check cabin, instrument, position, anti-collision, and landing lights.

e. Check fuel selector valve, gascolator and boost pump for proper operation.

f. Check oxygen system (if installed).

4. Landing Gear.

a. Check tires for cuts, blisters, wear, and inflation.

b. Check shock discs for proper extension at aircraft static weight.

c. Check hydraulic brakes for wear, warpage and proper installation.

5. Wings.

a. Check surfaces and tips for damage.

b. Check ailerons, aileron attachments, and bell cranks for damage and proper operation.

c. Check flaps and attachments for damage and proper operation.

d. Lubricate controls if necessary.

6. Fuselage and Empennage.

a. Check stabilizer, elevators, fin, and rudder for damage and proper attachment.

b. Lubricate controls if necessary.

2-34. 100-HOUR INSPECTION (or ANNUAL). The 100-hour (or annual) inspection is a thorough searching inspection of the entire aircraft. Preparation for the inspection includes the removal of fuselage, wing, and empennage inspection doors, cover plates, and fairings at all systems attach, hinge, and bearing locations (including wing and empennage to fuselage mating points). Operating limit replacement and special testing

of components is to be included at this interval when applicable. Comply with applicable FAA Directives, AD Notes, and applicable Mooney and Vendor mandatory Service Bulletins and Instructions. Check for aircraft conformance to FAA Specification 2A3.

2-35. SCOPE OF 100-HOUR (OR ANNUAL) INSPECTION. Recommended 100-hour and special inspection requirements are outlined in the following paragraphs.

2-36. ENGINE INSPECTION. Prior to the inspection, remove the engine cowl and propeller spinner. Wash down the engine and engine compartment. Then perform an engine runup in accord with the procedure recommended in the Owners Manual. To verify correction of malfunctions and abnormalities, perform a second engine runup and flight test after the 100-hour inspection.

1. Complete a differential (hot engine) compression check; clean and gap or replace spark plugs if necessary.

2. Inspect engine for evidence of fuel and oil leakage. Inspect oil cooler.

3. Drain engine oil sump; remove, clean, and inspect oil suction and pressure screens and reinstall; remove full-flow oil filter element (if installed), replace with new element and reinstall; check crank case breather for obstruction. Safety wire installations.

4. Refill engine oil sump with the proper type, grade, and quantity of lubricating oil.

5. Remove and inspect fuel injector or carburetor screens; drain carburetor; reinstall screens, and inspect fuel injector or carburetor and all fuel line connections for security and condition.

6. Remove and inspect fuel selector valve or gascolator strainer, reinstall strainer, and lubricate detent track, ball and spring disc. Inspect fuel lines and connections; pressure check fuel system with mixture control at IDLE CUTOFF.

7. Inspect all air ducting and connections in the heating and induction air systems for leaks. Remove and clean induction air filter. Leak check all exhaust manifold connections and engine exhaust manifolds.

8. Check magnetos for grounding and synchronization; check magneto points for condition, clearance, and timing. Inspect distributor block for erosion and cracks. Check cam follower felt for proper lubrication, and remove excessive oil from breaker compartment.

9. Check baffles for secure anchorage, cracks, holes, deformation, and for close fit around cylinders. Check cylinders for burned paint and cracked or broken fins.

10. Check engine and propeller controls for

free operation, proper lubrication, full travel, and security of attachment.

11. Inspect tubular engine mount for cracks; bolts and rubber mounts for security and condition.

12. Check battery cables, electrical wiring, and ignition harness for condition, secure anchorage, loose terminals, and burned or chafed insulation.

13. Inspect battery, battery box, and vent system for condition and corrosion. Check blast tube for obstruction. Flush battery box and battery case if necessary.

NOTE: Battery box located in tailcone of M20J.

14. Inspect accessory case, hoses, firewall and fittings for security and damage.

15. Check generator or alternator drive belt for condition and proper tension. Check starter installation for security. Check starter drive and drive gear condition. Lubricate drive if necessary.

16. Inspect and reinstall cowling. Check cowl flaps for operation, condition, and proper opening.

17. Inspect landing light for security and condition.

2-37. PROPELLER INSPECTION.

1. Remove spinner.

2. Check security of propeller installation.

3. Check hub bolts for security and damage.

4. Inspect hub parts and blades for cracks and nicks. Repair prior to next flight.

5. Check high and low blade angles.

6. Check for loss of grease, and lubricate as required by appropriate manufacturers handbook.

7. Inspect spinner and bulkhead for cracks and condition.

8. Check spinner bulkhead for correct interference fit with propeller cylinder. (Use Teflon tape to obtain fit).

2-38. LANDING GEAR & RETRACTION SYSTEM INSPECTION.

1. Check tires for proper inflation, cuts, blisters, slippage, and heavy wear.

2. Check wheels for cracks, distortion, misalignment, corrosion, bolt failure. Check condition of felt seals and bearings and repack bearings at 250 hr. intervals.

3. Check brakes for warping and wear.

4. Check hydraulic reservoir for proper fluid level.

5. Check hydraulic brake lines and hoses for leakage, dents, cracks, chaffing, kinks, and security of anchorage.

6. Check parking brake system for proper engagement and spring release.

7. Jack aircraft as recommended in paragraph 2-9.

8. Check nose gear for cleanliness and damage. Check nose gear retraction tube bungees for sheared or broken roll pins.

9. Check nose wheel steering mechanism for adjustment, alignment, corrosion, and lubrication.

10. Check main gear for cleanliness and damage.

11. Check landing gear retraction linkage, bell cranks, pivots, and bearings for wear, damage, distortion, misalignment, corrosion, cleanliness, and lubrication.

12. On aircraft equipped with electric gear check the landing gear actuator for security of mounting, cleanliness, and indication of overheating or damage. Lubricate actuator ball screw with recommended lubricant. See note. *

a. After 500 hours of operation and each 200 hours thereafter: See note.*

(1) Remove the actuator from the aircraft.

(2) Remove the end cap and wipe excess grease from gears.

(3) Visually inspect gears for wear as follows:

With open end of actuator toward you, rotate jack screw shaft counter clockwise to remove all slack from ring and worm gears. Make an index mark on one gear tooth and on the inside of housing. Turn jack screw shaft clockwise until ring gear contacts worm gear and check index marks.

Visible wear or backlash of 1/2 tooth or more requires immediate replacement of gears.

ALTERNATE PROCEDURE: (Dukes or I.T.T. actuators) Measure backlash by using a .025" diameter wire or .025" thick shim as a feeler gage. If feeler can be inserted between gear teeth, replace gears.

Repeat above procedure after rotating the ring gear thru 90°; 180°; and 270°.

(4) Repack gear box with recommended lubricant.

(5) Reinstall end cap and resafety.

(6) Refer to Page 5-2, Section 5-6 paragraph 3 for proper actuator adjustment and reinstallation instructions.

* Does not apply to aircraft with Avionics Products actuator.

13. Perform retraction test through at least two trouble-free cycles. Check for:
 - Proper limit switch adjustments.
 - Position indicator adjustment and operation.
 - Excessive friction or binding.
 - Nose and main gear preload. (Ref para. 5-6 or 5-7)
 - Main and nose gear door-to-jam rigging.
14. Operate landing gear emergency extension mechanism through at least one full extension (electric gear only).
15. Check drive connector at actuator and check disengage arm travel (electric gear only).

CAUTION: Do not retract gear manually--use the electric gear retraction system. Do not operate gear electrically with emergency system engaged.

16. Check gear-down safety switch for damage, proper operation, security of mounting, and adjustment (electric gear only).
17. Check warning system for proper operation.

2-39. FUEL SYSTEM INSPECTION.

1. Inspect fuel tank exterior for evidence of fuel seepage and stain.
2. Drain tank and inspect tank interior when seepage is evident in a closed area.
3. Check fuel tank drains for leakage, sediment, and water contamination.
4. Check fuel-tank vents for obstruction.
5. Check fuel selector valve for proper tank selection, smooth operation, and leakage in OFF position.
6. Check fuel selector drain, if equipped, for leakage; check sump for sediment and water or other contamination.
7. Check boost pump for leaks, security of mounting, adequate fuel pressure, switch operation, and condition of wiring and electrical connections.
8. Check fuel quantity gages and transmitters for security of mounting and condition of wiring and electrical connections.
9. Check fuel tank filler port for cleanliness, cap security, and condition of servicing placard.

2-40. EXTERIOR INSPECTION

1. Inspect fuselage exterior surfaces for corrosion, damage, loose or popped rivets, dents, cans, scratches, cracks, and deteriorated paint.

2. Inspect windshields and windows for cracks, crazing, scratches, condition of seals, and security of installation.

3. Inspect wings, flaps, and ailerons for corrosion, damage, loose or popped rivets, dents, scratches, cracks, condition of attaching points, lubrication, freedom of operation, free-play, travel, and secure balance weight attachment.

4. Inspect empennage for corrosion, damage, loose or popped rivets, free-play, dents, scratches, cracks, condition and lubrication of hinge points, attachment of balance weights, and freedom of operation.

5. Inspect cabin door and door frames for damage, corrosion, nicks, dents, hinge security, and lubrication.

6. Inspect cabin door lock mechanism for lubrication and proper engagement.

7. Inspect the baggage door and baggage compartment for damage, corrosion, warpage, hinge security, condition of door frame and door seals, condition and operation of door locking mechanism, and condition of cargo tiedowns.

8. Inspect overhead ventilating system drain line for obstruction.

9. Inspect the alignment and lubrication of overhead vent push-pull cable for smooth operation.

2-41. INTERIOR INSPECTION

1. Inspect seats, seat tracks, and upholstery for cleanliness and mounting security; check seats for condition and operation of position locks; inspect seat structure for cracks, deformation, corrosion, and mechanism lubrication.

2. Inspect safety belts and attaching brackets for cleanliness, condition, latch operation, and security of attachment.

2-42. INTERNAL INSPECTION.

1. Open access panels and inspection doors, and remove fairings as required.

2. Inspect wing attaching bolts for proper torque and safetying and evidence of damage or corrosion.

3. Inspect forward side of firewall for damage.

4. Inspect ribs and stringers for cracks and evidence of damage or corrosion.

5. Check spars for damage, distortion, cracks, and corrosion.

6. Check wires, lines, and ducts for security, damage, interference, chaffing, and bonding.

7. Check wing interior for foreign material, corrosion, and evidence of fuel leakage.

2-43. FLIGHT CONTROL INSPECTION.

1. Inspect control column and control wheels for full travel, proper rigging, free-play, binding, security of mounting, proper lubrication, and direction of control surface movement with relation to control movement.

2. Inspect elevator system linkage for rigging, travel, stop and bungee adjustment, condition of bearings and bell cranks, security of mounting, damage, corrosion, and proper relation to control movement.

3. Inspect aileron system linkage for damage, corrosion, lubrication, rigging, travel, stop adjustment, condition of bell cranks, pivots, rod-end bearings, and link bolt security.

4. Inspect rudder system linkage for damage, corrosion, lubrication, security of attaching points, rudder-aileron interconnect and bungee adjustment, and security of link bolts and rod end bearings; check for free movement of toe-brake pedals and proper rudder and nose wheel travel.

5. Inspect stabilizer trim control system for security and proper adjustment, shaft and stop nuts-for rigging, trim control wheel for smooth operation, universal joints for free-play and good working order, screw threads for lubrication, linkage for corrosion, and guide blocks for insecurity and excessive wear.

6. Inspect flap system for rigging, travel, and stop adjustment; flap position indicator for proper indication; actuator, push-pull rods, interconnects, and bell cranks for corrosion, security, and lubrication.

NOTE: All control rigging checks should be made with the aircraft jacked and leveled and with the landing gear retracted.

NOTE: Some elevator trim tubes have poly tape wrapped at bulkhead penetrations. If tape shows signs of wear, re-rap (1/2 lap) tube with 2" wide Y9265 Polyurethane tape. Trim tubes without tape which show signs of abrading grommet should be wrapped. See SB M20-185.

2-44. INSTRUMENT INSPECTION.

1. Inspect all instrument wiring and plumbing for condition and proper connections.

2. Clean and inspect vacuum filter. Replace filter if necessary.

3. Check vacuum regulator at vacuum manifold. Check operation of high-and low-vacuum warning lights or vacuum gage.

4. Inspect all instruments for proper pointer indication, range and limit markings, condition of indicator markings, cracked or loose glass, slippage marks, and security of installation.

5. Check compass for proper lighting, compensation, security of mounting, liquid leakage, and discoloration. Swing compass at annual inspection and after any new equipment has been installed.

6. Inspect altimeter for scale error, discolored markings, proper pointer readings, setting knob freedom, and synchronization of barometric scale with reference markers.

7. Inspect flight panel for security of mounting, condition of shock mounts, freedom from interference with structure, and condition of ground straps.

8. Inspect pitot head for port obstruction; check lines for cracks, dents, kinks, proper bend radius, and security of anchorage. Drain system and check for leaks.

9. Inspect static ports for obstruction and aerodynamic smoothness at port installations. Inspect lines for bends, cracks, dents, kinks, and security of anchorage. Drain system and check for leaks. Check alternate static pressure source located under left flight panel.

10. Inspect P.C. system lines for leaks, kinks, and cracks; cutoff valve for proper operation; servo piston seals for condition and leakage; bell cranks and linkage for security and lubrication.

2-45. ELECTRICAL FUNCTIONAL TEST.

1. Check operation of navigation lights.

2. Check operation of landing light.

3. Check operation of dome light and cigar lighters.

4. Check operation of anticollision lights.

5. Check operation of instrument and placard lights. Check rheostat.

6. Check operation of pitot head heater.

7. Check operation of cluster gage.

8. Check operation of fuel gages.

9. Check operation of annunciator light dimming system and press-to-test switch.

10. Check operation of ignition switch, starting vibrator, and starter solenoid.

11. Flight check operation of landing gear position lights and warning horn.

12. Flight check operation of stall warning horn.

2-46. POST-INSPECTION FLIGHT TEST.

Flight test the aircraft to verify correction of all malfunctions and abnormalities. Make proper entries in aircraft log book.

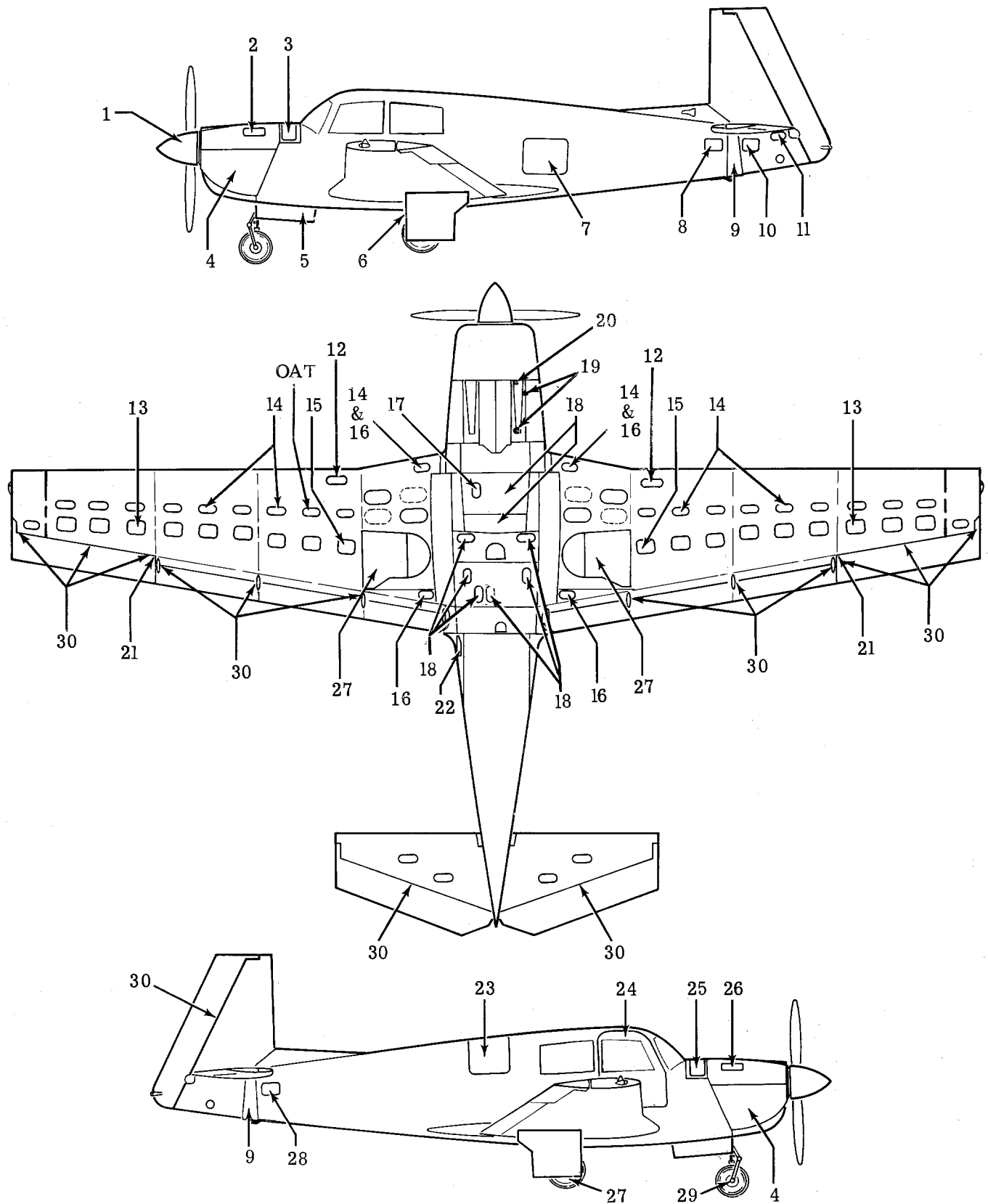


Figure 2-2. Service, Lubrication & Inspection Access Guide

MOONEY M20 SERIES SERVICE & MAINTENANCE MANUAL

ACCESS COVER IDENTIFICATION, LUBRICATION AND SERVICE GUIDE

ITEM NO.	ITEM DESCRIPTION	LUBRICATION SYMBOL *	INTERVAL (HRS)
1	Propeller	○	100
	Starter Drive	⊗	20
2	Battery (M20C & G)		
3	Flight Instruments		
	Positive Control Pilot Valve		
	Vacuum Regulator		
	Turn Coordinator		
	Vacuum Filters--Replace at		500
	Hydraulic Reservoir (M20C, E, F, G)	○	50
	Control System Adjustment :		
	Control Column Bearing Ball/ Block	■/⊕	100
	Rod-End Bearings	■	100
	Universal Joints	▲	100
	Bell Cranks	▲	100
4	Engine Cowling		
5	Nose Gear Grease Fittings	⦿	100
	Retraction Tube	■	100
	Bell Cranks	▲	100
	Bungees	▲	100
	Shock Absorber	■	100
	Gear Door Rod-End Bearings	■	50
6	Main Gear Grease Fittings	⦿	100
	Retraction Tube Rod-End Bearings	■	100
	Bell Cranks	▲	100
	Bungees	▲	100
	Gear Door Rod-End Bearings	■	50
	Electric Gear Actuator Gear Box **	⦿	200
	Electric Gear Actuator Ball Screw **	⦿	100
7	Elevator & Rudder Controls:		
	Control Tube Rod-End Bearings	■	100
	Bell Cranks	▲	100
	P.C. Servos.		
	Battery (M20E, F & J)		
	Battery Relay (M20E, F & J).		
	Retractable Step	■	100
	Stabilizer Trim Control Shaft:		
	Universal Joints	▲	100
	Guide Blocks	●	100
	Hydraulic Reservoir (M20J)	○	50
8	Elevator & Rudder Controls:		
	Control Tube Rod-End Bearings	■	100
	Bell Cranks	▲	100
	Stabilizer Trim Jack Screw	●	100
9	Empennage Attach Points	⊙	100
	Stabilizer Trim Attach Point	⊙	100

*See last page of section for lubrication symbol legend.

**No periodic lubricant on Avionics Products #102000-1. If necessary to relubricate use Aeroshell 22, Mobil 28 or MIL-G- 81322 ONLY.

MOONEY M20 SERIES SERVICE & MAINTENANCE MANUAL

ITEM NO.	ITEM DESCRIPTION	LUBRICATION SYMBOL*	INTERVAL (HRS)
10	Elevator & Rudder Controls: Control Tube Rod-End Bearings	■	100
	Trim Assist Bungee Attach Point	▲	100
11	Elevator & Rudder Controls: Control Tube Rod-End Bearings	■	100
	Trim Assist Bungees	▲	100
	Elevator Down Springs	▲	100
12	Aileron Control Tube Guide Blocks (M20F & J).....	●	100
13	Aileron Controls: Control Tube Rod-End Bearings	■	100
	Bell Cranks	▲	100
	P.C. Servos		
14	Aileron Control Tube Guide Blocks	●	100
15	Main Gear Retraction Spring	▲	100
16	Wing Attach Points.	⊙	100
	Control Tube Guide Blocks	●	100
17	Hydraulic Flap Pump & Linkage	▲	100
	Stabilizer Trim Screw & Stops	●	100
	Indicator Adjustment Point.		
	Stabilizer Trim Chain & Gears	■	100
18	Elevator & Rudder Controls: Control Tube Rod-End Bearings	■	100
	Bell Cranks	▲	100
	Guide Blocks	●	100
	Hydraulic Flap Cylinder Rod-End Bearing	▲	100
	Flap Indicator Cable	▲	100
	Electric Flap Actuator Gear Box	✱	500
	Electric Flap Actuator Ball Screw	✱	100
19	Electric Boost Pump.		
	Fuel Selector Valve Detent Track & Ball	▲	100
20	Control Systems: Control Tube Rod-End Bearings	■	100
	Control Yoke (Lower Section).....	▲	100
	Nose Gear Steering Link	■	100
	Rudder Pedal Cross Shaft	▲	100
	Rudder-Aileron Bungee	▲	100
	Hydraulic Brake Cylinder Pedal Linakage	▲	100
21	Aileron Control Tube Rod-End Bearings	■	100
	Outboard Flap Stops.		
22	Retractable Step	■	100
23	Baggage Compartment Door: Hinges	▲	100
	Latches	△	100
	Seals	⊙	100

*See last page of section for lubrication symbol legend.

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ITEM NO.	ITEM DESCRIPTION	LUBRICATION SYMBOL	INTERVAL (HRS)
24	Cabin Door.		
	Hinges	▲	100
	Latches	△	100
	Seals	⊙	100
	Hold-Open Arm	■	100
25	Engine Instruments. Radios.		
26	Oil Dip Stick, Oil Filler Tube	⊞	AR
27	Wheels & Brakes:		
	Wheel Bearings	□	250
	Brake Pressure Plate Anchor Bolts	■	50
28	Elevator & Rudder Control Stops.		
29	Nose Wheel:		
	Wheel Bearings	□	250
	Shock Absorber	■	100
30	Control Surface Hinges	▲	100

LUBRICATION SYMBOL LEGEND

SYMBOL	MIL. SPEC. NO.	DESCRIPTION
▲	MIL-L-7870	Low Temperature Oil (General Purpose)
●		MIL-G-7711 or MIL-G-81322 Grease
□	MIL-L-3545	Grease (High Temperature)
⬡		MIL-G-23827 or Hartzell DG Grease (Hartzell propellers only. McCauley propellers do not require any lubrication).
○	MIL-H-5606	Hydraulic Fluid (Red)
⊞		Graphite & Kerosene
●		Graphite & MIL-G-3278 Grease or MIL-G-23827
⊕		Powdered Graphite
■		Teflon Spray (Tri-Flow)
△		Stick Lubricant (Door Ease or Equivilent)
★		Standard Oil Aviation Grease No. 5 With 10% by Volume Molybdenum Disulfide or MIL-G-23827 AM1
☆		Lubriplate 630AA (10% by Volume Molybdenum Disulfide Mixture Permissible)
⊙		Inspection
⊖		Seal Dressing
⊞		Avco Lycoming Spec - No. 301F - Any brand name oil conforming to MIL-L-6082, straight mineral oil, or MIL-L-22851, compounded type oil, is approved when used per following viscosity chart:

MOONEY **M20 SERIES** SERVICE & MAINTENANCE MANUAL

VISCOSITY CHART

Average Ambient Air Temperature

Above 80°F
Above 60°F
30° to 90°F
0° to 70°F

0° to 90°F
Below 10°F

MIL-L-6082

SAE 60
SAE 50
SAE 40
SAE 30

SAE 20

MIL-22851

SAE 60
SAE 40 or SAE 50
SAE 40
SAE 30, SAE 40 or
SAE 20W-40
SAE 20W-50
SAE 30 or SAE 20W-30

SECTION III. POWER PLANT

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3-1. **ENGINE COWLING.** The engine cowling is in four sections on the M20C, E, F & G and two sections on the M20J. A bottom cowl carries the induction air filter and air duct, the power boost ram-air duct (M20E & F), the oil cooler, the landing light, and the cowl flaps. The lower cowl contains the ram-air inlet, landing light and cowl flaps on the M20J. Quick-disconnect fasteners attach the cowling panels. The top cowl section joins to the lower section at the nose ring and the side cowl panels. Both battery and oil filler access doors are in

the M20C & G top cowling section; only an oil filler access door is in the M20E, F & J top cowling section.

3-2. **ENGINE COWLING CLEANING, INSPECTION & REPAIR.** Clean the cowl by spraying with solvent (PS-661 or equivalent) and wiping clean. After cleaning, inspect the cowling for dents, cracks, and loose fasteners. Repair defects.

MOONEY M20 SERIES SERVICE & MAINTENANCE MANUAL

AIRCRAFT MODEL	M20C & G	M20 E & F	M20J
ENGINE MFR	LYCOMING	LYCOMING	LYCOMING
ENGINE MODEL	O-360-A1D	IO-360-A1A	IO-360-A1B6D ***
BHP (rated MAX) @ RPM	180 2700	200 2700	200 2700
NO. CYLINDERS	4	4	4
DISPLACEMENT (Cu. In.)	361.0	361.0	361.0
BORE (Inches)	5.125	5.125	5.125
STROKE (Inches)	4.375	4.375	4.375
COMPRESSION RATIO	8.5:1	8.7:1	8.7:1
MAGNETOS Manufacturer Model	SCINTILLA R-S4LN-204 L-S4LN-200	SCINTILLA R-S4LN-204 L-S4LN-200	SCINTILLA D4LN-2021 D4LN-3021
ADVANCE BTC**	25° **	25° **	25° **
VALVE ROCKER CLEARANCE (Hydraulic Tappets Collapsed)	.028 to .080	.028 to .080	.028 to .080
RIGHT MAG FIRES Top Plugs Bottom Plugs	R bank L bank	R bank L bank	R bank L bank
LEFT MAG FIRES Top Plugs Bottom Plugs	L bank R bank	L bank R bank	L bank R bank
FIRING ORDER	1-3-2-4	1-3-2-4	1-3-2-4
CARBURETOR OR FUEL INJECTOR Manufacturer Model	MARVEL- SCHREBLER MA-4-5	BENDIX RSA-5ADI	BENDIX RSA-5ADI
OIL CAPACITY (QTS)	8	8	8
OIL VISCOSITY RECOMMENDATIONS (See Section II Page 2-19/2-20 BLANK)	AVERAGE AMBIENT AIR TEMPERATURE Above 60°F 30° to 90°F 0° to 70°F Below 10°F	SINGLE VISCOSITY GRADES * SAE 50 SAE 40 SAE 30 SAE 20	MULTI-VISCOSITY GRADES * SAE 40 or 50 SAE 40 SAE30, SAE40 or 20W-40 SAE30, SAE20W-30
ALTERNATOR	PRESTOLITE 12 V 60 AMP	PRESTOLITE 12 V 60 AMP	PRESTOLITE 12V 60 AMP
STARTER	12V	12V	12V
SPARK PLUG GAP Fine Wire Massive	.015 to .018 IN. .018 to .022 IN.	.015 to .018 IN. .018 to .022 IN.	.015 to .018
MAX CYLINDER HEAD TEMP	500°F	475°F	475°F
START & WARMUP OIL PRESSURE Maximum Minimum	100 PSI 25 PSI	100 PSI 25 PSI	100 PSI 25 PSI
NORMAL OIL PRESSURE Maximum Minimum	90 PSI 60 PSI	90 PSI 60 PSI	90 PSI 60 PSI

3-4. ENGINE TROUBLE SHOOTING. The following table outlines the more common engine maintenance problems and their likely remedies. For more detailed trouble shooting and repair information, consult the engine or component manufacturer's overhaul and inspection manuals.

TROUBLE	PROBABLE CAUSE	REMEDY
Engine will not start.	No fuel.	Check fuel system for leaks. Fill fuel tanks. Clean lines, strainers, and fuel valves.
	Overpriming.	Unload engine with standard clearing procedure.
	Incorrect throttle setting.	Open throttle 1/4.
	Defective spark plugs.	Clean and adjust or replace spark plugs.
	Defective ignition wire.	Check with tester and replace defective wires.
	Improper magneto operation.	Clean points. Check timing.
	Internal failure.	Check oil screens for metal particles; if found, remove foreign material and overhaul engine.
Engine does not idle properly.	Incorrect idle mixture.	Adjust mixture control.
	Incorrect idle speed.	Adjust idle speed.
	Induction system leak.	Tighten all connections and replace any defective parts. Clean injector nozzles.
Low power and uneven running.	Mixture too rich as indicated by sluggish running. (Extremely rich mixtures are indicated by black exhaust smoke.)	Readjust fuel injector. Replace carburetor.
	Mixture too lean as indicated by overheating and backfiring.	Check fuel lines for restrictions. Readjust mixture. Clean injector nozzles. Replace carburetor.
	Leak in induction system.	Tighten all connections and replace defective parts.
	Defective spark plugs.	Clean and gap or replace spark plugs.
	Improper fuel.	Drain and fill tanks with recommended grade of fuel.

ENGINE TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine does not develop full power.	Magneto breaker points not working properly.	Clean points and check timing.
	Defective ignition wire.	Check with tester and replace defective wires.
	Defective spark plug terminal connectors.	Check and replace connectors if required.
	Leak in induction system.	Tighten all connections and replace defective parts.
	Partial clogging of injector nozzle or fuel screens.	Clean nozzle or fuel screens.
	Throttle lever out of adjustment.	Check throttle linkage travel.
Rough running engine.	Improper fuel flow.	Check strainers. Check flow at fuel injector or carburetor.
	Restriction in air scoop.	Examine air scoop and remove obstruction.
	Faulty ignition.	Check ignition system.
	Cracked engine mount.	Replace or repair mount.
	Partial clogging of injector nozzles or fuel screens.	Clean nozzles or fuel screens.
	Defective mount bushing.	Replace bushing.
Low oil pressure.	Uneven compression.	Check compression.
	Damaged, out of track, or unbalanced propeller.	Check propeller, track, and balance.
	Insufficient oil.	Fill sump with oil and inspect screen and filter for metal particles after running engine. If particles found overhaul engine.
	Stuck relief valve.	Check and replace if necessary.
	Air lock or dirt in relief valve.	Remove and clean oil relief valve.
	Dirty oil strainers.	Remove and clean strainers.
	High oil temperature.	See "High Oil Temperature" in Trouble column below.

ENGINE TROUBLE SHOOTING (CONT.)

TROUBLE	PROBABLE CAUSE	REMEDY
High oil temperature.	Defective pressure gage.	Replace gage.
	Obstruction in oil pump intake passage.	Check for obstruction.
	Defective pressure transducer.	Replace transducer. (Do not over torque fittings).
	Insufficient oil supply.	Fill sump with oil of recommended grade and inspect engine for metal particles in screen and filter after running engine. If particles found overhaul engine.
	Low grade of oil.	Drain and fill sump with oil conforming to specifications.
	Stuck thermostatic valve.	Check and replace as necessary.
	Clogged oil lines or strainers.	Clean oil lines and strainers.
	Excessive blow-by.	Check compression. Check for worn or stuck rings.
	Oil cooler restriction.	Check and replace.
Excessive oil consumption.	Failing bearings.	Check oil strainers for metal particles; if found, remove foreign material and overhaul engine.
	Defective temperature gage.	Replace gage.
	Low grade of oil.	Drain and fill sump with oil conforming to specifications.
	Failing bearings.	Check sump for metal particles.
	Worn rings.	Install new rings.
	Improper piston ring installation.	Install new rings.
	Failure of rings to seat.	Use mineral-base oil. Climb to cruise altitude at full power and operate at 75 percent power with high oil temperature until oil consumption stabilizes.

3-5. PROPELLER REMOVAL & INSTALLATION.**NOTE**

Metal propeller repair first involves evaluating the damage and determining whether the repair will be major or minor. Federal Aviation Regulations, Part 43 (FAR 43) and Federal Aviation Agency Advisory Circular No. 43.13 (FAA AC 43.13), define major and minor repairs, alterations and who may accomplish them. When making repairs or alterations to a propeller FAR 43, FAA AC No. 43.13 and the propeller manufacturer's instructions must be observed.

(See Avco Lycoming Service and Maintenance Instructions)

1. REMOVAL

- a. Remove spinner dome.
- b. Remove safety wire and loosen bolts attaching propeller to engine crankshaft, about 1/4-inch and pull propeller forward.

NOTE

Bolts will have to be backed out evenly so that propeller may be pulled forward (approximately 1/4-inch at a time) until all bolts are disengaged from the engine crankshaft flange. As the propeller is separated from the engine crankshaft, oil will drain from the propeller and engine crankshaft cavities.

- c. Pull propeller from engine crankshaft.
- d. If necessary to remove the aft spinner bulkhead, remove bolts, washers and nuts attaching bulkheads to the starter ring gear support.

NOTE

After removal of the propeller, the starter ring gear support assembly may be removed from the engine crankshaft to allow easier access of the aft spinner bulkhead attaching bolts. Loosen alternator adjusting arm and disengage alternator drive pulley belt from pulley on aft face of starter ring gear support assembly.

2. INSTALLATION.

- a. If aft spinner bulkhead was removed, reinstall on ring gear support, using bolts, nuts and washers in the reverse order of removal.
- b. If starter ring gear support and aft spinner bulkhead were removed, clean mating surfaces of support assembly and engine crankshaft flange.
- c. Place alternator drive belt in the pulley groove of the starter ring gear support. Fit

starter ring gear over propeller flange bushings on crankshaft.

NOTE

Make sure the bushing hole in the ring gear support, that bears the identification "O", is assembled at the "O" identified crankshaft flange bushing. This bushing is marked "O" by an etching on the crankshaft flange next to the bushing. The starter ring gear must be located correctly to assure proper alignment of the timing marks on the ring gear.

- d. Clean propeller hub cavity and mating surfaces of propeller hub and ring gear support.
- e. Lightly lubricate a new O-ring and the crankshaft pilot with clean engine oil and install O-ring in the propeller hub.
- f. Align propeller mounting bolts with proper holes in engine crankshaft flange and slide propeller carefully over crankshaft pilot until bolts can be started in crankshaft flange bushing.
- g. Tighten bolts evenly and work propeller aft on crankshaft flange. Tighten bolts to 55-65 FT-LBS on McCauley propellers and 60 - 70 FT-LBS on Hartzell propellers:
- h. Install safety wire through roll pins safetying bolts in pairs.
- i. Adjust alternator drive belt tension as outlined in paragraph 3-18.
- j. Install spinner dome making sure fiber washers are installed under all screws.

3-6. NOT USED.

3-7. ENGINE REMOVAL. To assist in reinstallation, identify and tag each part as it is removed. Plug or cap all lines, hoses, and fittings as they are disconnected.

1. Make sure that all cockpit switches are off.
2. Turn fuel selector valve off.
3. Remove engine cowl and baffles.
4. Disconnect battery ground cable.
5. Remove propeller (Refer to paragraph 3-5).
6. Drain engine oil sump.
7. Disconnect the following:
 - a. Vacuum line.
 - b. Landing light wires.
 - c. Cabin heat ducts (at engine).
 - d. Fuel vent line.
 - e. Tachometer drive shaft.
 - f. Oil temperature bulb.
 - g. Oil pressure line.
 - h. Manifold pressure line.
 - i. Cylinder head temperature bulb.

8. Disconnect the following control linkage:

- a. Throttle control.
- b. Propeller governor control.
- c. Mixture control.
- d. M20E, F & J cowl flap controls.

9. Disconnect ignition switch wires from magnetos.

WARNING: Ground magneto breaker points.

10. Disconnect engine ground strap.
11. Disconnect voltage regulator wires.
12. Disconnect generator (or alternator) and starter wires.
13. Disconnect heater muff and exhaust tail pipe.
14. Disconnect fuel line at engine fuel pump.
15. Shore up fuselage at tail skid using shoring stand to prevent tail from dropping.
16. Attach an A-frame with a hoist to lifting eyes at top of crankcase. Slightly lift engine to relieve weight from engine mounts. Remove engine mounting bolts. Note sequence of washers on rubber biscuits as well as the orientation of the biscuits.

17. Slowly slide engine forward. Be sure that all lines, hoses, and wires are free.

3-8. ENGINE INSPECTION & REPAIR. For specific engine inspection and overhaul instructions, consult engine manufacturer's overhaul manual and service instructions.

3-9. ENGINE INSTALLATION. Reverse the engine removal procedure for reinstallation.

1. Engine installation torque values are as follows:

- a. Spark Plugs --- 360 to 420 IN-LBS.
- b. Hose Clamps --- 10 to 20 IN-LBS.
- c. Engine Shock Mount Bolts --- 450 to 500 IN-LBS.
- d. 1/4 inch Upper Engine Mount to Fuselage Bolts --- 50 to 70 IN-LBS.
- f. #10-32 Lower Engine Mount Attach Block to Fuselage --- 20 to 25 IN-LBS.

NOTE: M20E, F & J - Make sure the J7763-1 Lord mounts (load bearing) are positioned aft on upper ring and forward on lower.

2. Reinspect to see that:

- a. Propeller and spinner are properly safetied.
- b. Engine mounting bolts are properly torqued.
- c. Engine controls are properly rigged and safetied. (Recheck rod-ends for proper thread-grip length.)
- d. Oil drain plugs are tightened and safetied.

- e. Oil sump is filled to eight quarts.
- f. Spark plugs are tight and ignition harness is properly installed.
- g. Magneto ground wires are properly installed and safetied.

h. Alternator or generator drive belt is tight.

- i. Oil temperature bulb is tight and safetied.
- j. Oil pressure relief valve plug is safetied.
- k. Cylinder head temperature connection is secure.

- l. Tachometer drive is secure.
- m. Starter cable connection is secure.
- n. Alternator wiring is secure.
- o. Exhaust system is secure.
- p. Vacuum lines and connections are secure.
- q. Fuel connections are tight and pressure

checked.

- r. Manifold pressure lines are tight.
- s. Oil pressure lines are tight and pressure

checked.

t. Oil pressure transducer is positioned correctly so no interference with any part of engine installation.

u. Fuel injection lines are tight and pressure checked (M20E, F & J).

v. Oil filter (optional equipment, exceptiond M20J) is installed and secure.

w. Induction manifolds are secure.

x. All lines, hoses, and wires are properly anchored.

y. Induction air filter is installed and secure.

z. Heat shrouds and baffling are installed and secure.

aa. Engine nacelle area is free of loose objects, tools, etc.

bb. Cowling is installed and secure.

cc. Cowl flap control rods are connected (M20E, F & J).

3-10. ENGINE GROUND OPERATION CHECK-OUT.

1. Prestarting Procedure (with aircraft headed into wind):

- a. Turn off ignition switch.
- b. Check magneto grounds.
- c. Check engine oil level.
- d. Check fuel quantity.
- e. Operate all controls through full range to check for binding and cushion.
- f. Check baffles and cowling for security.
- g. Open cowl flaps to check their operation.
- h. Drain fuel sumps and fuel selector drain; check for sediment and water.

i. Place wheel chocks and set parking brake.

2. Starting Procedure:

- a. Set propeller governor control at full RPM
- b. Turn fuel valve on.
- c. Set mixture control at: IDLE-CUTOFF (M20E, F & J), FULL RICH (M20C & G).

d. Turn boost pump on.

e. M20C & G--pump throttle twice, then leave 1/8 open.

M20E, F & J--open throttle 1/4. push mixture control toward FULL RICH for 3 to 5 seconds; then return to IDLE-CUTOFF.

f. Engage starter switch after clearing prop. When engine starts, advance mixture to full rich.

g. Set throttle for idle at 900 to 1000 RPM for one minute; then, advance throttle slowly to 1200 RPM for engine warmup.

h. Check oil pressure. If no oil pressure is indicated within 30 seconds, shutdown engine and trouble shoot oil system.

3. Ground Run and Warmup. Always head the aircraft into the wind during warmup. Always select the minimum blade-angle setting, high RPM, when ground running the engine. Never idle for extended periods at low RPM (low RPM will foul spark plugs). Always operate with the mixture control at FULL RICH, and maintain RPM in the 1000 to 1200 RPM range during warmup and ground run.

a. Warmup engine until temperature indications are normal. Monitor cylinder head and oil temperature instruments for over-temperature.

b. Check magnetos at 1900-2000 RPM with propeller at minimum blade angle. Switch ignition-starter switch from BOTH to LEFT to check mag drop. Switch back to BOTH until RPM returns to normal. Switch from BOTH to RIGHT and check mag drop. Return switch to BOTH. Mag drop should not exceed 175 RPM on either magneto (drop should be within 50 RPM of each other). A smooth drop off past normal is usually a sign of too lean or too rich mixture.

3-11. ENGINE INDUCTION SYSTEM MAINTENANCE. Ram air enters through a port in the lower cowl and is ducted to the fuel injector or carburetor. The M20E, F & J unfiltered ram air control moves a two-position door in the ram-air duct to permit the selection of filtered or unfiltered direct ram air. A spring-loaded valve in the M20E, F & J induction system intake duct permits alternate air to enter the engine from within the engine cowl; a dry-type, panel air filter mounts in the air intake duct. The air filter used on the M20C & G induction systems is an oil-type (Air-Maze) filter. Filter maintenance is directly related to engine wear; therefore, the filter should be removed and cleaned

every 25 hours or more frequently under dry and dusty operating conditions. Replace the filter after 500 operating hours or once each year, whichever occurs first.

1. Clean the dry-type induction air filter with compressed air; clean the oil-type filter by washing the element in a solvent and coating the filter with a light film of lubricating oil (Ref. to paragraph 2-17.). Replace the filter if it has a damaged housing, torn element, or damaged gaskets.

2. Reverse the air filter removal procedure for reinstallation. Make certain that the filter is tightly sealed and securely fastened in place.

3-12. FUEL INJECTION SYSTEM MAINTENANCE (M20E, F & J). The fuel injection system consists of the following major components: (1) the fuel injector assembly comprised of the servo regulator, fuel control, and airflow sensing system; (2) the flow divider; and (3) the four air bleed nozzles. The fuel injection system operates by measuring airflow through the throttle body of the servo valve regulator control and using this measurement to operate a servo valve within the control. This regulated pressure controls the distributor valve which schedules fuel flow in proportion to airflow.

3-13. FUEL INJECTOR IDLE SPEED & MIXTURE ADJUSTMENT (M20E, F & J).

1. For operation in normal or low ambient temperature conditions, adjust idle and mixture as follows:

a. Start engine and warm up in the usual manner until oil and cylinder head temperatures are normal.

b. Check magnetos; if mag drop is normal, proceed with idle adjustment.

c. Close throttle to IDLE. If RPM changes appreciably after making idle mixture adjustment during succeeding steps, readjust idle speed to desired RPM.

NOTE: Idle mixture must be adjusted with fuel boost pump on.

d. When idling speed has stabilized, pull mixture control smoothly and steadily toward IDLE CUTOFF, and observe tachometer for an RPM change during leaning process. Care must be exercised to return the mixture control to FULL RICH before RPM can drop to where engine cuts out. An increase of more than 50 RPM while leaning indicates an excessively rich mixture. An immediate decrease in RPM (if not preceded by a momentary increase) indicates idle mixture is too lean.

e. If above check indicates that mixture is

too lean or too rich, turn idle mixture adjustment in direction required for correction.

- f. Repeat step d. to check new position.
- g. Make additional adjustments and checks as required.

NOTE: Each time idle speed mixture adjustment is changed, runup to 2000 RPM to clear engine before proceeding with step d. Allowance should be made for weather and field altitude when adjusting idle mixture.

NOTE: If above procedures do not result in stabilized idle speed, check idle linkage for looseness.

2. For operation in high ambient temperature conditions, adjust idle and mixture as follows:

- a. Adjust idle to 700-750 RPM, or as high as practical.
- b. In the cool of the morning, adjust mixture to provide a 50 RPM rise when the mixture control is slowly pulled to IDLE CUTOFF.
- c. Maintain cooling airflow by keeping engine RPM as high as practical during ground runup.

3-14. CARBURETOR IDLE SPEED & MIXTURE ADJUSTMENT (M20C & G). Factory-calibrated carburetor jets control the operating mixture. The carburetor can be adjusted only for idle mixture and speed. To adjust the idle mixture and speed:

1. Warm the engine to normal operating temperatures.
2. Set the throttle stop screw so that the engine idles at 550 RPM.
3. Turn idle mixture adjusting screw toward RICH until engine "rolls" from rich mixture.
4. Turn idle mixture adjusting screw toward LEAN until the engine "lags" and runs unevenly.
5. Turn adjusting screw back toward RICH, stopping at a mixture setting just below the point at which the engine begins to "roll" as noted in step 3.
6. Check idle RPM and adjust as required.

3-15. MAGNETO INSPECTION, MAINTENANCE, INSTALLATION & TIMING. Refer to engine and magneto manufacturers Service Manual for magneto inspection, maintenance, installation and timing.

3-16. NOT USED.

3-17. IGNITION SYSTEM TROUBLE SHOOTING.

1. Hard Starting. - M20C, E & F.
 - a. Low voltage at vibrator input. Check voltage between vibrator input and ground while operating starter (eight volts minimum).
 - b. Inoperative or defective vibrator. If no buzzing is heard, check switch and retard circuits for open condition. Check for good ground connections.
 - c. M20J - Assure that impulse coupling is operating.
2. Engine Roughness.
 - a. Try new spark plugs.
 - b. Check plug leads for deterioration.
 - c. Check magneto contact points for burning and dirt accumulation.
3. Magneto Drop Out of Limits.
 - a. Check magneto-to-engine timing.
 - b. Inspect contact breaker points for proper clearances.
 - c. Check spark plugs and leads.

3-18. CHARGING SYSTEM MAINTENANCE. The alternator or generator drive belt should be adjusted so that a load of 14 lbs. pull (new belt) and 10 lbs. pull (old belt), applied at right angles to the belt span at mid-point, will cause a deflection of .31 to .37 inches. An alternate method of drive belt adjustment is to attain the following torque when rotating generator or alternator pulley:

New Belt	3/8" wide	11 to 13 ft lbs torque
Old Belt	3/8" wide	7 to 9 ft lbs torque
New Belt	1/2" wide	13 to 15 ft lbs torque
Old Belt	1/2" wide	9 to 11 ft lbs torque

A new belt should be adjusted at 25 hours after installation and at each 100-hour period thereafter.

3-19. STARTER SYSTEM MAINTENANCE. The engine has a 12-volt auto-engage starter with a solenoid-operated switch. The drive ratio of the starter drive pinion to the crankshaft is 16.556:1.

1. Starter Removal and Installation.
 - a. Tag and remove electrical wiring.
 - b. Loosen and remove the three 5/16-inch nuts and the 5/16-inch cap screw.
 - c. Remove starter and starter-drive assemblies
 - d. Reverse the starter removal procedure for reinstallation. Recheck torque, security, and safetying.
2. Starter Maintenance.
 - a. Check brushes for wear. (Replace if worn to 1/2 of original length.)
 - b. Check commutator for cleanliness, burrs, and out-of-round condition.

- c. Check brush springs for 32 to 40 ounce tension.
- d. Check electrical leads for security and condition of wire.
- e. Lubricate starter drive with a mixture of graphite and kerosene.

NOTE: Do not use heavy oil or grease on starter drive.

CAUTION: Do not operate starter in excess of 30 seconds without allowing cooling time before re-engaging.

- 3-20. ENGINE MIXTURE CONTROL RIGGING.**
1. Disconnecting Mixture Control.
 - a. Remove cotter key.
 - b. Remove nut, bolt, and two washers from clevis and mixture control arm.
 2. Connecting Mixture Control. Reverse disconnecting procedure to reconnect mixture control.
 3. Adjusting Mixture Control Arm.
 - a. Loosen lock nut on control rod end and adjust control arm rod as required.
 - b. Check for full travel.
 - c. Check for proper thread grip.

3-21. STARTER TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Starter will not operate.	Defective master switch or circuit.	Check and repair.
	Defective solenoid switch.	Check and repair.
	Defective starter.	Remove and repair or replace.
Starter motor runs but will not crank engine.	Damaged pinion gear or crankshaft gear.	Remove and replace.
	Dirty starter drive.	Clean and lubricate with graphite and kerosene.
Starter drags.	Low battery charge.	Check and recharge.
	Relay or solenoid contacts burned or dirty.	Remove and replace.
	Defective power cable.	Remove and replace.
	Worn or dirty commutator.	Turn down commutator.
Noisy starter.	Worn starter drive pinion.	Remove and replace starter drive.
	Worn or broken teeth on crankshaft gear.	Check teeth and replace gear if damaged.

3-22. PROPELLER GOVERNOR CONTROL RIGGING.

1. Disconnecting Propeller Governor Control.

a. Remove cotter pin, nut, bolt, and washers from rod end at propeller governor control arm.

b. Remove bracket installed with propeller governor mounting bolts.

2. Connecting Propeller Governor Control.

a. Disconnect control rod end from governor arm. Adjust control arm spring to minimum tension which will return control arm to maximum RPM.

b. Push propeller control in cockpit full forward. Then pull control back approximately 1/8 inch for cushion and lock in this position.

c. Place governor control arm against high RPM stop screw (325° from governor centerline)

d. Adjust control rod end to coincide with the governor arm.

e. Attach control rod end to governor arm and safety.

f. Operate the control and check for full travel of control arm in both directions (70° from HIGH RPM to MIN RPM stop).

NOTE: When control rigging is complete, check controls in cockpit to be sure there is still a 1/8-inch cushion between control knobs or levers and their mounting piece or stops on control panel. Controls should not bottom on mount pieces or stops in the cabin when pushed full forward.

CAUTION: Recheck safety, security, and thread grip on all engine controls after adjustment, rigging, or assembly.

NOTE: 1/8-inch cushion applies to vernier controls measured between knob and mounting nut.

3-23. PROPELLER GOVERNOR TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Leakage:		
Between control shaft and head.	Damaged O-ring.	Replace with new O-ring.
Between head and body.	Damaged head and body gasket.	Replace gasket.
Between relief valve plug and body.	Damaged relief valve plug gasket.	Replace gasket.
	Loose relief valve plug.	Retighten plug.
Between body and base.	Damaged body and base gasket.	Replace gasket.
Between governor base and engine mounting pad.	Damaged governor mounting gasket.	Replace gasket.
	Loose governor attaching nuts.	Retighten nuts.
	Warped engine mounting pad.	Consult engine manual.
Inability to attain takeoff RPM during static ground run.	Wrong high-RPM governor setting.	Reset governor external high-RPM adjustment screw.
	Incorrect system rigging.	Adjust control system.
	Low engine power.	Consult engine manual.
	Erroneous reading tachometer or manifold pressure gage.	Calibrate or replace instruments.

(Cont. on next page)

MOONEY M20 SERIES SERVICE & MAINTENANCE MANUAL

PROPELLER GOVERNOR TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
RPM will not stabilize.	Sticky pilot valve.	Remove head and clean pilot valve with crocus cloth. Main- tain sharp pilot valve land corners. Check for straight- ness of pilot valve; if bent, replace valve.
	Sludge in governor pilot valve or relief valve.	Disassemble and clean.
	Burrs on pilot valve lands.	Disassemble and clean with crocus cloth.
	Backlash in governor control system.	Rerig or adjust control sys- tem.
	Short control lever making fine speed adjustments im- possible.	Rerig control system.
	Sticky relief valve.	Inspect for burrs, and clean.
	Erroneous reading tacho- meter.	Calibrate or replace instru- ment.
	Excessive oil leakage in en- gine transfer seal.	Refer to engine manual.
	High propeller friction.	Lubricate bearings. Check piston seal friction.
	Governor function upset by malfunctioning engine.	Repair engine for smooth operation.
Excessive overspeeding on takeoff.	Air trapped in propeller.	Cycle propeller from MIN to MAX pitch several times to purge air.
	Sticky pilot valve.	Remove head and pilot valve. Clean away sludge and varnish. Check speeder spring ends for proper setting.
	Bent pilot valve.	Remove head and replace pilot valve.
	Excessive internal leakage in governor.	Check rigging and make neces- sary part replacements.
	Wrong governor setting.	Reset governor. Use test rig if available.
	Too rapid throttle opening.	Advance throttle evenly and slowly.

(Cont. on next page.)

PROPELLER GOVERNOR TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Inability to attain positive high pitch.	Damaged or wrong gasket between governor base and engine mounting pad.	Install correct new gasket.
	Sticky governor pilot or relief valve.	Disassemble, clean, and check for burrs. Replace bent pilot valves.
	Erroneous reading tachometer or manifold pressure gage.	Calibrate or replace instrument.
	High-RPM screw adjusted too far in, causing restricted arm travel.	Remove control arm and rotate one serration clockwise. Back out high-RPM screw to required maximum RPM. (One turn equals 27 RPM.)
Surging.	Incompatibility between blade twisting moments and governor relief valve pressure.	Adjust propeller spring forces to give nearly the same increasing and decreasing pitch rates.
	Excessive propeller blade-seat friction.	Examine propeller hub for cause of friction.

3-24. ENGINE COWL FLAP RIGGING.

M20E, & F Cowl Flaps:

1. Adjust left cowl flap so that the inboard trailing edge of the flap is .25 inches below the

cowl flap rail in the closed position.

2. Rig right cowl flap to match left flap in the closed position.

3. Check for 2.0 inches minimum opening in extended position.

M20J Cowl Flaps

1. Adjust both the left and right cowl flaps so that in the closed position the outboard trailing edges are flush with the lower engine cowlings.

NOTE: During operations at higher than NASA Standard Day temperatures, cowl flaps may be rigged to have a maximum .50 inch gap in the closed position.

3-25. ENGINE LUBRICATION SYSTEM MAINTENANCE. The engine lubrication system is a full-pressure, wet-sump system with a gear-driven pump. An oil cooler attaches to the lower left cowl on the M20C, E, F & G models and to the firewall on the M20J model. Oil screens are located in the rear end of the oil sump. (Oil pressure; 60 PSI MIN, 90 PSI MAX, 25 PSI at IDLE, 100 PSI MAX during engine warmup).

1. Filter and Screen Servicing.
 - a. Optional Oil Filter Removal and Installation.
 - (1) Loosen center stud.
 - (2) Remove oil filter from oil filter adapter.
 - (3) Replace oil filter cartridge and gaskets.

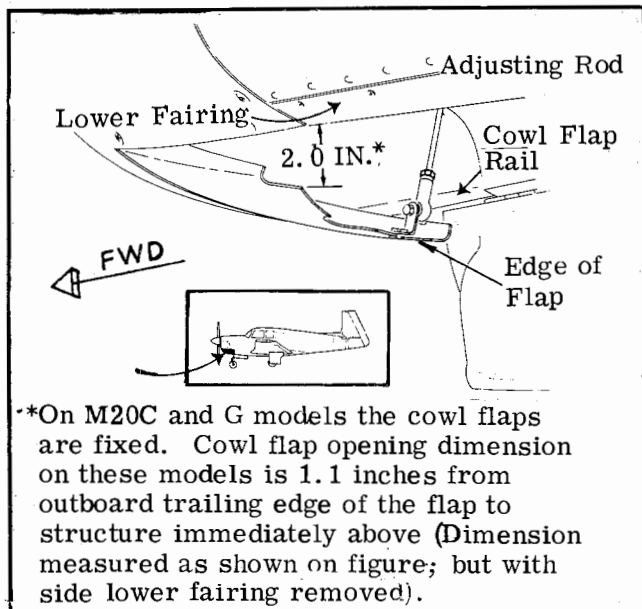


Figure 3-1. Engine Cowl Flap Rigging

(4) Reverse removal procedure for reinstallation.

b. Oil Screen Removal and Installation.

(1) Remove oil screen plugs at rear of crankcase.

(2) Remove oil screen and O-ring.

(3) Clean oil screens and inspect for distortion or fraying; replace screens if damaged.

(4) Replace O-ring if damaged or deteriorated.

NOTE: M20J has spin-on filter as standard equipment. Remove old filter and replace with new filter after light film of oil has been spread on gasket. Tighten to a torque of 18 - 20 ft. lbs.

2. Oil Pressure Relief Valve. The oil pressure relief valve maintains oil pressure within specified limits. The valve is not adjustable; however, the addition of a maximum of three (Avco Lycoming P/N STD 425) washers under the cap will increase pressure. Using a spacer (Lycoming P/N 73629 or 73630) under the cap decreases pressure. The oil relief valve should be disassembled, inspected, and cleaned when excessive fluctuations in oil pressure are noted.

3. Oil Cooler Thermostatic Bypass Valve. The oil cooler thermostatic bypass valve or vernatherm valve is not adjustable. This valve allows oil to bypass the oil cooler when the cooler becomes obstructed or when oil congeals in the cooler due to low ambient temperatures.

SECTION IV. FUEL SYSTEM

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4-1. DESCRIPTION. Internally sealed, integral fuel tanks are in the forward inboard sections of the wings. Fuel feeds from either tank to a valve through a gascolator integral with valve or separate with a low-point drain. From the valve, fuel feeds from either tank to the emergency pump, then to the engine-driven fuel pump and to the carburetor or fuel

injector system on the engine. Fuel quantity indicators are electrically operated with transmitters located in each tank. Visual fuel level indicators in the M20F & J at the 25-gallon level in each tank, can be seen through the filler ports. Optional visual fuel quantity gauges are located on the wing and may be used for partial fuel loads as necessary.

4-2. FUEL SYSTEM TROUBLE SHOOTING. When trouble shooting, check from the power supply to the suspect item. If trouble is not located, proceed to check the item itself. If necessary, remove the item and install an identical unit, tested and known to be in good condition.

TROUBLE	PROBABLE CAUSE	REMEDY
Fuel gage not indicating.	Broken wire.	Check and repair.
	Faulty transmitting unit.	Replace.
	Open circuit breaker.	Check and reset.
Fuel gage indicates full when tanks are not full.	Incomplete ground.	Check ground connection at transmitter.
No fuel pressure indication.	Tank empty.	Check and service tank.

FUEL SYSTEM TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Fuel pressure low or surging.	Defective fuel pump.	Check pump for proper pressure buildup. Check for obstruction in boost pump screen. Check engine fuel pump and check valve.
	Open fuel line.	Repair or replace line.
	Obstruction in inlet side of pump. Faulty engine pump.	Check and clear fuel lines. Replace or rebuild pump. Check fuel lines and connection for leakage or damage.

4-3. FUEL SELECTOR VALVE REMOVAL & INSTALLATION FOR M20 SERIES (PRE 1978).

The fuel selector valve is below the left floorboard just aft of the firewall.

1. Disconnect right and left inlet lines at valve body.
2. Disconnect outlet line at valve body.
3. Remove clevis pin from valve control linkage.
4. Loosen set screw on fuel valve drain control.
5. Remove bolts from supporting bracket at floorboard and beam.
6. Reverse the selector valve removal procedure for reinstallation. Pressure check fuel system for leaks after installation.

NOTE: It is recommended that the fuel selector valve be replaced each 500 hours of operation or if the valve becomes difficult to operate.

4-5. SELECTOR VALVE & GASCOLATOR SCREENS. Fuel selector and drain valve screen or gascolator screen should be cleaned every 50 hours. Both valves are safety wired, (notice should be taken of exact wiring technique before removal) and upon completion, rewiring should be identical to original installation. To clean fuel selector screen, (a) Remove left hand exhaust cavity, (b) Turn selector valve to off position, (c) Remove AN-3 bolt from center of bottom of valve, (d) Remove bowl and clean, (e) Reverse process to re-install taking care not to damage O-rings seal. (Torque AN-3 bolt 15 to 20 inch pounds per Service Bulletin M20-200).

4-4. FUEL SELECTOR VALVE REMOVAL & INSTALLATION FOR M20J 1978 & ON.

The fuel selector valve is located aft of the console below the floorboard.

1. Drain both fuel tanks.
2. Disconnect right and left inlet lines at valve body.
3. Disconnect outlet line at valve body.
4. Remove handle above floorboard in fuel selector pan.
5. Remove screws mounting valve to the tubular structure.
6. Remove valve.
7. Reverse the selector valve removal procedure for reinstallation. Pressure check fuel system for leaks after installation.

1978 Model & On: Gascolator screen removal and cleaning; (a) Remove belly skin just aft of nose wheelwell, (b) Turn selector valve to off position, (c) Remove safety wire on bottom nut and remove nut, (d) Remove sump and screen by pulling down, (e) Clean screen and reverse process to reinstall. Take care not to damage O-rings, (q) Lubricate O-rings with clean engine oil before installing. (Torque 15 to 20 inch pounds per Service Bulletin M20-200)

(h) Safety wire exactly as original installation.

4-6 FUEL BOOST PUMP REMOVAL & INSTALLATION.

1. Emergency Electric Boost Pump Removal.

- a. Remove electrical leads.
- b. Disconnect inlet and outlet fuel lines.
- c. Remove fuel pump.

2. Reverse the removal procedure for re-installation.

NOTE: Refer to S.B. M20-222 (latest revision) when replacing Fuel Boost Pump. (A.D. 80-13-03).

CAUTION: Do not run pump dry for more than 15 seconds.

CAUTION: On M20E, F & J aircraft prior to checking boost pump operation or pressure checking fuel system, be sure that mixture control is in IDLE CUTOFF position to prevent engine flooding.

4-7 FUEL INJECTION SYSTEM (M20E, F & J). The Bendix RSA-5AD1 fuel injection system measures airflow and uses an airflow signal in a stem-type regulator to convert the air pres-

sure into a fuel pressure. This fuel pressure (fuel pressure differential), when applied across the fuel metering section of the fuel injector (jetting system), makes fuel flow proportional to airflow. The injection system is comprised of the injector, flow divider, air-bleed nozzles, and associated lines and fittings.

CAUTION: Fluid can easily enter the air section of the injector through the impact tubes or the annular groove around the venturi. For this reason, a protective covering should be installed on the induction air intake when performing engine maintenance, such as washing down the engine and induction air ducts or when injecting preservative oil into the engine and fuel injector prior to storing or shipping.

NOTE: When the aircraft will not be flown for a period of time, pressurize the fuel system once every seven to ten days. Move the mixture control to rich and the throttle to one half open to completely fill the injector with fuel.

4-8. **ENGINE PRIMING (M20E, F & J).** The Lycoming fuel injection controls do not include an engine primer. Fuel will be sprayed into the intake manifolds whenever there is pressure in the fuel system and the mixture control is open. It is necessary, therefore, to exercise caution when operating the boost pump to be sure that the mixture control is in the IDLE CUTOFF position.

4-9. **CARBURETOR (M20C & G).** The Marvel-Schebler model MA-4-5 carburetor is a single-barrel float type with a manual altitude mixture control and idle-cutoff. The carburetor is mounted on the bottom of the engine oil sump in the standard updraft position. Vaporized fuel absorbs heat from the oil sump, cooling the oil and vaporizing the fuel evenly.

4-10. **FUEL SYSTEM DRAINS.** Fuel drains are installed in the inboard corners of the wing tanks and at the fuel selector valve, (or gascolator, 78J) lowest point in the fuel system. The engine manifold and engine-driven fuel pump drains connect at a juncture on the right side of the engine. A single drain line dumps fuel overboard below the cowling. Tank drains are recessed and spring loaded with an O-ring seal at the lower flange upon which the valve seats.

4-11. **FUEL VENTS.** Fuel vents on the outboard rear corners of both fuel tanks allow for overflow and tank ventilation. Vents should be checked frequently for obstruction. To check fuel tank vents:

1. Block entire fuel tank vent by slipping a short length of rubber hose over tube end projecting below wing lower surface.
2. Remove fuel tank filler cap. Blow gently into rubber hose. Air should be felt coming out of filler port.
3. If stoppage is found, clear vent prior to flight, since fuel starvation could result from vent stoppage.

4-12. **FUEL QUANTITY INDICATING SYSTEM.** The fuel quantity indicating system has fuel quantity transmitters in each wing tank. The transmitters are electrically connected to the fuel gages in the engine cluster gage.

1. Fuel Quantity Transmitter Removal.
 - a. Drain fuel from tank.
 - b. Remove transmitter wires.
 - c. Remove the six screws attaching transmitter to doubler.
 - d. Remove transmitter.
2. For reinstallation, reverse the fuel quantity transmitter removal procedure.

4-13. **FUEL TANK FIELD REPAIR.** This paragraph outlines the procedures recommended for repair of the integral fuel tanks. Tank repairs should not be attempted until these instructions are fully understood.

1. Approved Materials.
 - a. Sealants.

WARNING: Sealants are safe only when handled with reasonable care. Avoid ingestion and all contact with the body, especially with open breaks in the skin. Wash hands before eating or smoking. If accelerator contacts the skin, flush area with warm water.

- (1) Brush sealant--PR1422-A-1/2, A2 or CS3204 A-1/2, A2 (MIL-S-8802 Class A).
- (2) Filletting compound--PR1422 B-1/2, B2 or CS3204 B-1/2, B2 (MIL-S-8802, Class B).
- (3) Removable access panel sealant--PR1403-G-B2.
- (4) Protective sealant--PR 1005-L (MIL-S-4383B).
- b. Gloves--Polyethylene.
- c. Metal cleaning solvent--Turco 657 wipe solvent.
- d. Cheese cloth.
- e. Turco leak detector or bubble fluid.
- f. Methyl ethyl ketone (thinner for PR 1005-L).

NOTE: Approved materials may be obtained from your local Mooney distributor. Sealants may be obtained from Products Research Co. at the following address: 5454 San Fernando Rd. Glendale, California 91209; or Chem Seal Co. at the following address: 11120 Sherman Way, Sun Valley, California 91352.

2. Handling and Mixing Sealants.
 - a. Sealant Material Characteristics.
 - (1) Application life is the time that the

mixed compound remains suitable for application. Application life ratings are always based on standard conditions of 75°F and 50 percent relative humidity. For every 10°F rise in temperature, application life is reduced by half; for every 10°F drop in temperature, application

life is doubled. High humidity at the time of mixing slightly reduces the sealant application life.

(2) Maximum unopened container life, with sealant at 85°F, is six months.

(3) Sealant application life, tack-free curing time, and curing rates are as follows:

(a) PR1422 or CS3204 Brush Sealant

Class A	Tack-Free Time (HOURS)	Cure Rate (HOURS)	Application Life (HOURS)
PR1422 A-1/2	10	30	1/2
PR1422 A-2	36	72	2
CS3204 A-1/2	8	30	1/2
CS3204 A-2	24	72	2

(b) PR1422 or CS3204 Filletting Compound (and on wing walk access panels)

Class B	Tack-Free Time (HOURS)	Cure Rate (HOURS)	Application Life (HOURS)
PR1422 B-1/2	10	45	1/2
PR1422 B-2	36	72	2
CS3204 B-1/2	8	30	1/2
CS3204 B-2	24	72	2
CS3204 B-4	36	76	4

(c) PR1403-G-B2 Access Door Sealant (except on wing walk access panels)

Class B	Tack-Free Time (HOURS)	Cure Rate (HOURS)	Application Life (HOURS)
B-2	10	48	2

b. Sealant Mixing.

(1) For best results, use kits with proper proportions of base compound and accelerator.

(2) To avoid excessive air entrapment, slowly stir accelerator into base compound. Continue mixing for seven to ten minutes. Scrape sides and bottom of container to include all compound in mixture and to insure uniform blending. Scrape mixing paddle on edge of container to remove unmixed compound. Be sure to use all of the accelerator.

(3) Place a small amount of mixture on a clean strip of aluminum and spread sealant. Visually examine sealant film to determine whether accelerator is visible in particle form. If particles of accelerator are visible, continue

mixing operation. If coarse particles of accelerator persist after mixing thoroughly, reject the mixed batch.

3. Cleaning Surfaces to be Sealed.

a. Clean metal surfaces to be sealed with Turco 657 Wipe Solvent or Methyl Ethyl Ketone.

b. Allow cleaned surface to dry five to ten minutes before sealant application.

NOTE: Apply sealant as soon as possible after cleaning. Store and handle parts in a manner that will prevent finger prints, dust, dirt, or other foreign substances from accumulating on surfaces to be sealed.

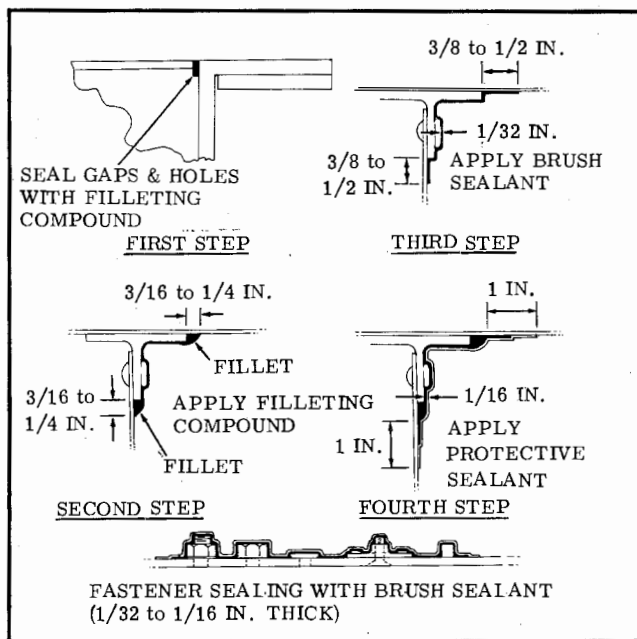


Figure 4-1. Fuel Tank Sealing

4. Sealant Application. When sealant has been removed to facilitate tank repairs, reseal tank as follows:

a. Fillet Sealing.

(1) Be certain that the surface to be sealed is totally clean and free from oil, grime, finger prints, etc.

(2) Refer to Figure 4-1 for typical fillet size.

(3) Join fillets laid on intersection joints to produce a continuous fillet.

(4) Seal all difficult and hard-to-reach areas first to preclude the possibility of their being overlooked or improperly sealed.

b. Filleting Compound Application.

(1) Use a spatula or an extrusion gun with a 1/8- to 1/4-inch nozzle opening for laying fillets at edges of all seams. When using an extrusion gun, hold gun perpendicular to seam so that extruded sealant will pack tightly.

(2) Use a spatula to pack sealant firmly in place while working out air pockets. Shape each fillet evenly.

c. Brush Sealing.

(1) Brush sealant (PR1422 or CS3204 A-1/2 or A-2) over all seams, rivets, nuts, and bolts. A one-inch stiff-bristle brush is recommended for sealant application. Force sealant into all gaps with brush strokes parallel to seams. Use a circular brush action to deposit an even coating

of sealant around rivets, nuts, and bolts. Coating should be approximately 1/32-inch thick. Use considerable brush action to force sealant into all small crevices and to obtain good adhesion. Air pockets under the sealant, that will open up in the form of holes or voids soon after application, will result from improper application. To repair holes or voids, press sealant in place using a spatula.

(2) When the edge of a flange protrudes 0.040 inch or less, or where the seam can not be clearly defined, apply two 1/32-inch brush coats. Allow the first coat to cure about four hours or until it becomes rubbery before applying the second coat. The second coat should overlap the edges of the first coat by about 1/4 inch.

d. Protective Sealant.

(1) Using short, even strokes, brush on a smooth and continuous coat of PR 1005-L over sealant. The protective sealant coat should extend one inch beyond edge of the filleting compound.

(2) Allow first protective coat to cure 20 minutes at 75°F, or until tack-free; then apply a second brush coat of PR 1005-L. Make every effort to obtain a completely bubble-free, continuous top coat. Do not rebrush over areas, as doing so will only cause dragging and will break coating continuity.

e. Upper Wing Tank Access Panel Sealing.

(1) Apply a coat of access door sealant (PR1403-G-B2) to either faying surface using a short stiff bristle brush, spatula, or extrusion gun. If an extrusion gun is used, smooth the sealant with a brush or spatula. Cover the entire faying surface with a sealant coat of sufficient thickness (1/32 to 1/16 inch) to assure extrusion along the edges of the faying surface when the mating parts are assembled. Access panels in wing walk area should be sealed with PRC1422, Class B, filleting compound.

(2) Assemble parts immediately after application of sealant and tighten screws to obtain as near as possible a metal-to-metal contact.

(3) Remove the extruded sealant from the wing surface after installing the fasteners.

4-14. FUEL TANK LEAK REPAIR.

1. Leak Description. It is necessary to periodically inspect the fuel tanks. Inspection is particularly important in confined areas of the aircraft that are not exposed to the airstream. Identification and classification of fuel leaks that occur in both confined and open areas is neces-

sary to differentiate between those leaks that require repair before flight and those which do not constitute a flight hazard. The size of the wetted area around a leak is an indication of the leak intensity. All fuel leaks must be recorded by describing the location and intensity of the leak in the aircraft log book.

2. Classification of Leaks as to Intensity and Location.

a. Intensity Classification.

- (1) Stain--A slow fuel leak that tends to evaporate as soon as it is exposed to air.
- (2) Seep--A fuel leak that reappears shortly after area is wiped clean.
- (3) Heavy Seep--A fuel leak that reappears immediately after area is wiped clean.
- (4) Running Leak--A fuel leak that flows steadily.

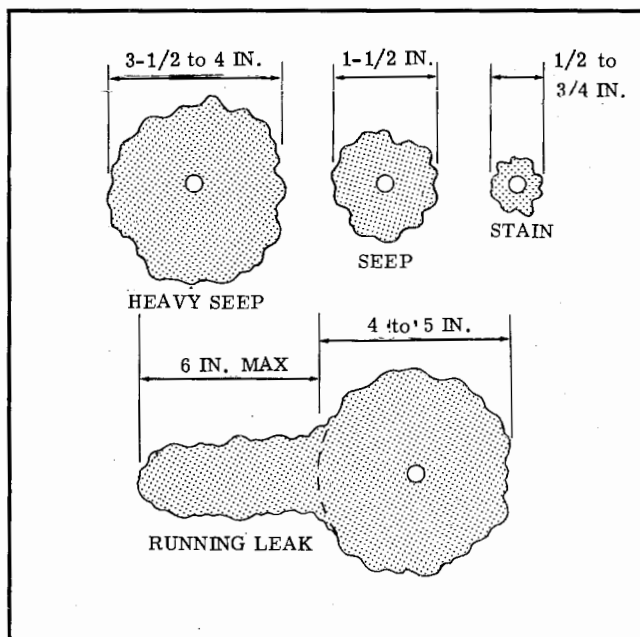


Figure 4-2. Fuel Leak Classification

b. Location Classification.

- (1) Slow-to-heavy seeps occurring in open areas, such as wing surfaces exposed to the airstream, are leaks which do not constitute a flight hazard and need not be repaired prior to flight, providing the condition causing the leak cannot result in a leak of greater intensity during flight. Seeps considered permissible for flight must be frequently inspected to insure that no increase in intensity has occurred.

- (2) A running leak and any leak in a confined area that is not exposed to the airstream should be repaired before the next flight.

3. Leak Detection.

- a. External Leak Detection after Refueling. To be able to trace a leak from where it appears on an outer tank or wing skin to its true source inside the tank, the exact point where fuel is escaping from tank must be determined.

- (1) Use compressed air to blow and evaporate fuel from seams and crevices of leak area. Attempt to define exact point where fuel is escaping from tank.

- (2) Small seep leaks can be traced with raw edges of torn paper. The fuzzy edge absorbs fluid and gives a good visual indication of fuel presence when brought in contact with suspected leak points.

- (3) After tracing leak to its exterior source, mark location and drain fuel tank.

- b. Internal Leak Detection. To make a permanent repair, it is very important that the true source of the interior leak be located. The fuel tank is a network of seams, and fuel may flow through or along a seam or from one seam to another. Fuel may also channel a few inches or several feet to where it appears on external skin surface.

- (1) Enter tank through inspection access panels and inspect sealant in general area of outside leak point. Look first for bare seams, rivets, and bolts in difficult-to-seal areas. Inspect sealant for blisters, pin holes, cracks, splits, and loss of adhesion. Mark all flaws with masking tape.

- (2) Test each flaw from inside tank using compressed filtered air at 20 to 30 PSI. Hold air nozzle against flaw and closely check outside leak point for evidence of fuel.

- (3) After testing each flaw from inside tank as outlined above, and if no leak source can be discovered, apply bubble fluid to exterior and again apply air pressure to flaws from inside tank.

- (4) If above tests fail to locate leak source, apply air pressure (10 PSI MAX) to external leak point after removing all traces of fuel from tank and applying bubble fluid to tank interior seams.

4. Leak Repair.

- a. Temporary Repair of Fastener Leaks. Generally, all leaks in enclosed areas and running leaks in open areas constitute a flight hazard.

ard. Fastener leaks of this category may be temporarily repaired by applying a sealant fillet over fastener head on fuel tank exterior. For a temporary repair to be satisfactory, structural integrity must be retained in leak area. To make a temporary fastener-leak repair:

(1) Remove enough fuel from tank to drop fuel level below leaking fasteners.

(2) Clean fastener head and adjacent surface with Turco 657 Wipe Solvent or M.E.K. and dry thoroughly. Fastener head and adjacent metal must be entirely free from paint, dirt, and oil.

(3) Apply a 1/8-inch thick coat of PR 1422 or CS3204 B-1/2 or B-2 over head and around fastener.

(4) Allow sealant to cure until firm and rubbery.

(5) Refill tank and examine repair periodically. If leak recurs, sealant must be removed and area recleaned prior to making another temporary repair.

b. Permanent Leak Repair. If leak source is found to be around a rivet or threaded fastener, the repair procedure shall be to restrike rivet or retorquer fastener to maximum permitted torque value. Any one rivet may be restruck only one time. If leak continues, replace the rivet.

(1) Repair any sealant damage due to restriking or retorquing a fastener.

(2) Remove sealant in immediate area of leak source using a sharp non-metallic tool. A chisel-shaped formica tool is recommended. Scarf or taper ends of existing sealant so that new sealant can form a continuous and smooth tiedown.

(3) Thoroughly clean repair area using Turco 657 Wipe Solvent or M.E.K. Wash one small area at a time. To prevent redistribution of oil and dirt on surface, dry with a clean cloth before solvent evaporates. Always pour solvent onto wash cloth to prevent contami-

nation of solvent supply; do not dip cloth into solvent.

(4) Thoroughly dry clean area by flowing filtered air over immediate area until there is no possibility of solvent or fuel entrapment under adjacent sealant.

(5) Apply sealant as required for repair (See Figure 4-1.). Repaired fillets must be blended into existing fillets with a spatula or an appropriate tool.

(6) Allow all repaired sealant to cure tack-free and apply two brush coats of PR 1005-L to repair area (Refer to paragraph 4-11.).

5. Soapless Bubble Fluid Formula Preparation.

a. Materials.

(1) Three ounces of either sodium bichromate, potassium chromate, or potassium dichromate.

(2) Three and one-quarter ounces Thickening Wax (Carbo Wax 1500).

(3) Thirteen ounces Alkaryl Sufonate wetting agent.

(4) Distilled water.

b. Solution Preparation.

(1) Mix one of the compounds listed in item (1) above with one cup distilled water.

(2) Mix item (2) above with one cup distilled water.

(3) Mix item (3) above with four to four and one half gallons distilled water until wetting agent dissolves completely.

(4) Mix the three ingredients [(1), (2) & (3)] together and add enough distilled water to make five gallons of solution.

NOTE: Amount of each ingredient may be reduced for a smaller quantity of solution. Solution life is about one week.

CAUTION: Soapless bubble fluid is slightly corrosive and must be completely removed by washing freely with water followed by scrubbing.

SECTION V. LANDING GEAR

PARA.	PAGE	PARA.	PAGE
5-1.	Description	5-17.	Nose Wheel
5-2.	Main Gear Removal	5-18.	Electric Gear Safety Devices
5-3.	Main Gear Instl	5-19.	Landing Gear Warning System
5-4.	Nose Gear Removal	5-20.	Airspeed Safety Switch
5-5.	Nose Gear Instl	5-21.	Landing Gear Actuator, P/N 102000 Clutch Replacement, Kit #A10-85
5-6.	Electric Gear System Rigging (Not Avionic Products Actuator)	5-22.	Landing Gear Actuator, P/N 102000 Recoiler Springs/Cable & Drum Assy. Replacement
5-7.	Disengage Rigging (Emergency Gear Extension, other than Avionic Products Actuator)	5-23.	Squat Switch Adjustment
5-8.	Gear Rigging Procedure (1978 J Model Avionic Products Actuator)	5-24.	Manual Emergency Gear Extension System (Pre 1978 Electric Gear Models)
5-9.	Emergency Gear Extension System Rigging	5-25.	Manual Emergency Gear Extension System (1978 and Later Models)
5-10.	Manual Gear System Rigging	5-26.	Electric Gear System Trouble Shooting
5-11.	Main Gear Door Rigging	5-27.	Nose Gear Steering and Tracking
5-12.	Nose Gear Door Rigging		5-18 BLANK
5-13.	Nose Gear Steering System		
5-14.	Brake System		
5-15.	Landing Gear Shock Inspection		
5-16.	Main Wheels		

5-1. DESCRIPTION. The standard (all models to 1969) landing gear is manually operated. 1969 and later models are electrically operated. The gear legs are constructed of chrome-molybdenum tubular steel, heat-treated for greater strength and wear resistance. Rubber discs in the gear leg assemblies absorb the shock of taxiing and landing. Main gear attaching points have metal bushings imbedded in the gear mounting box attached to the wing spar. The nose gear mounts in the cabin tubular steel frame. Main gear wheels have hydraulic disc brakes.

5-2. MAIN GEAR REMOVAL.

1. Raise aircraft on jacks (refer to paragraph 2-9).
2. Unlock and move gear lever to partially retract gear on manual gear systems. On all electrically operated systems partially retract the gear by operating the emergency gear extension mechanism.
CAUTION: On 1977 and prior electric gear equipped aircraft do not fully retract gear using the emergency gear extension system. Partial retraction using the emergency gear extension system is permissible only when removing or rigging the gear. Do not operate gear electrically with emergency extension system engaged.
3. Disconnect gear door links and brake lines. Cap all lines and fittings.
4. Remove gear door and mud guard.
5. Detach main gear retracting tube (F),

Figure 5-5, from retracting truss (G), and remove bolts (H) from retracting truss mounting block.

6. Remove grease fittings from forward gear support trunnion-shaft bearing.
7. Retract the gear by hand until a 2 inch thick wood block (C), Fig. 5-1 can be inserted as shown to hold gear in retracted position.
a. Remove cotter key and nut at spring

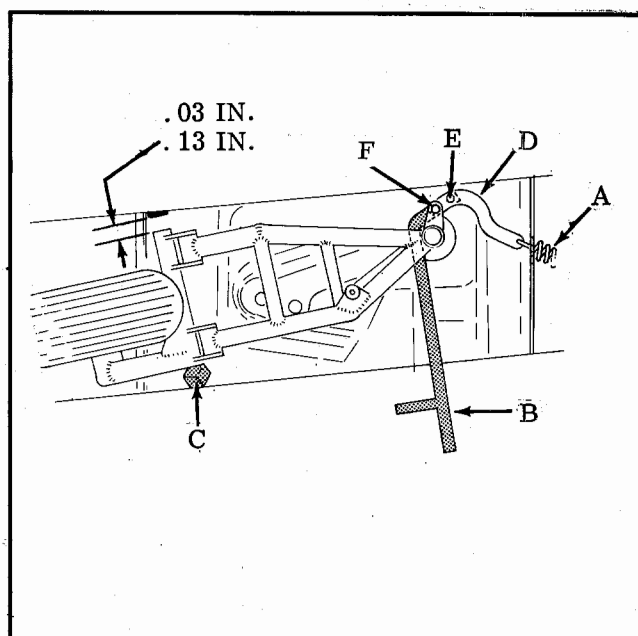


Figure 5-1. Gear Retraction Spring Removal

connecting link (F) Figure 5-1.

b. Remove gear retraction spring (A) at (F) Figure 5-1, by attaching spring installation tool (B), P/N GSE 030012, (old P/N was 8186) using an AN3-12A bolt (E).

8. Extend gear three to four inches from down-lock position and secure.

9. Remove six mounting bolts from rear gear trunnion shaft mounting block assembly at stub spar.

10. Slide out aft bearing block.

11. Slide front bearing block aft and remove.

12. Slide gear assembly aft until clear of front bearing, and carefully remove gear assembly from wing.

13. Identify all components removed, and DO NOT intermix right and left gear components.

14. DO NOT attempt to repair any heat treated component of main landing gear assembly.

5-3. MAIN GEAR INSTALLATION.

1. Lubricate wheel bearings, retraction linkage, and fore and aft trunnion bearings prior to installation (Refer to page 2-18 for recommended lubricants.)

2. Installation of main gear is the exact reversal of the main gear removal procedure.

3. Temporarily attach gear door link rods to gear leg brackets.

4. Retract gear while checking for binding in door linkage and proper contact of gear door edges with wing. DO NOT make final gear door adjustments until gear has been rigged.

5-4. NOSE GEAR REMOVAL.

1. Raise aircraft on jacks (Refer to paragraph 2-9).

2. Remove exhaust cavity fairings.

3. Partially retract gear as described by Section 5-2 paragraph 2.

4. Bend firewall flange as necessary for access to gear mounting bolts.

5. Disconnect link (A) on nose gear truss assy (Figure 5-2).

6. Disconnect nose gear steering horn link B (Figure 5-2).

7. Remove left and right gear mounting bolts D and E (Figure 5-2) from tubular structure and nose gear truss assy.

8. Carefully remove nose gear assembly.

9. DO NOT attempt to repair any heat treated component of nose landing gear assembly.

5-5. NOSE GEAR INSTALLATION.

1. Lubricate wheel bearings, retraction linkage and left and right mount bearings.

2. Install gear in reverse order of removal procedure.

5-6. ELECTRIC GEAR SYSTEM RIGGING (Not Avionic Product Actuator).

1. Raise aircraft on jacks (refer to paragraph 2-9), and remove belly access panels.

2. Partially retract gear (Refer to paragraph 5-2, item 2). Disconnect main gear retraction tubes (L), Figure 5-3 at inboard bellcranks (M). Loosen locknuts (E). Disconnect nose gear retraction tubes (F), Figure 5-2 at the retraction bellcrank (F) Figure 5-4.

Disconnect nose gear and main gear door links. Check gear for binding at pivot points while moving gear legs by hand. Lubricate retraction system as indicated on page 2-16.

3. Adjust Heim end bearing on actuator stud so that the Heim threaded end is 7.50 inches $\pm$.125 inch from the far end of ball nut C (Fig. 5-4). NOTE: Heim bearing is locked in position with a set screw extending into a slot in the actuator stud. Set screw must be removed prior to making any adjustment.

CAUTION: Adjust Heim end only - Do not loosen actuator set screw or locknut and attempt to adjust actuator stud.

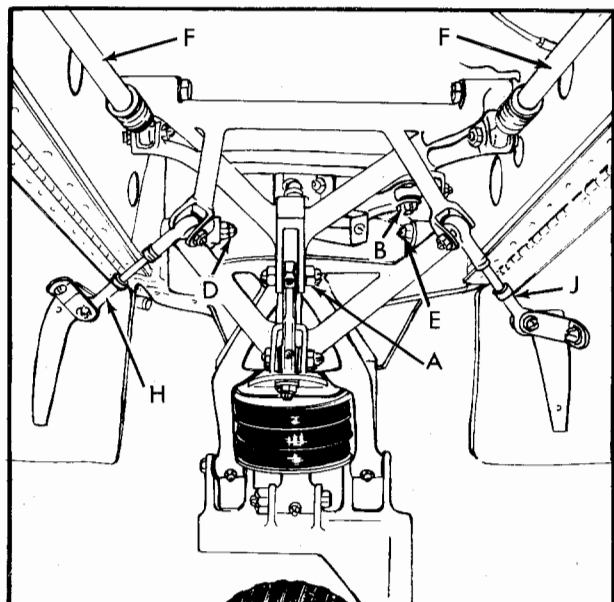


Figure 5-2. Nose Gear Retraction Tube Adjustment Points

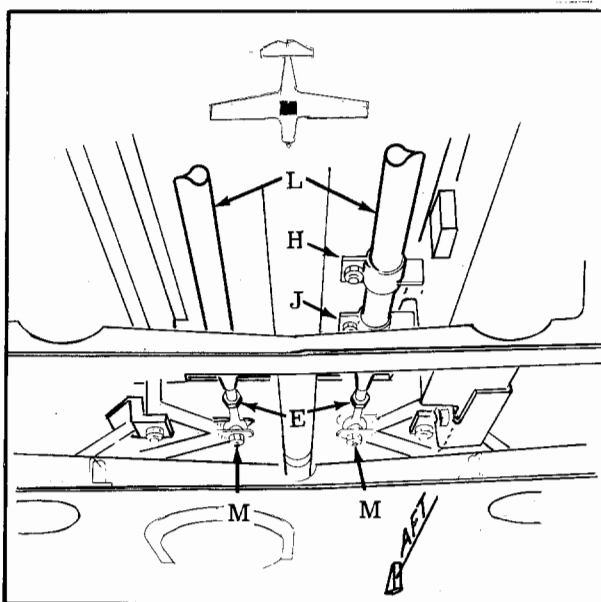


Figure 5-3. Main Gear Retraction Tube Adjustment Points (Electric Gear)

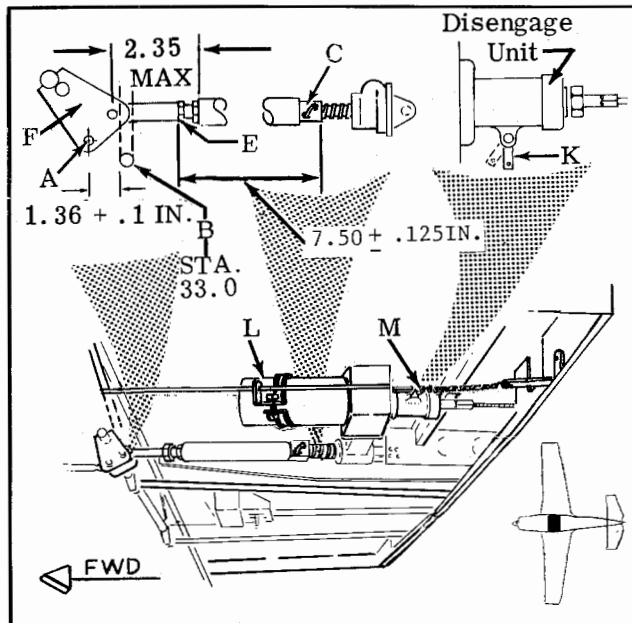


Figure 5-4. Electric Gear Actuator Adjustments (Other than Avionic Products Actuator).

Check the distance from the Heim bearing centerline to the face of the actuator. Dimension must not exceed 2.35 inches, readjust making sure that 7.50 dimension is within the $\pm .125$ tolerance. Align slot in actuator stud with setscrew in Heim bearing shank. Loctite Heim bearing setscrew and secure. Tighten locknut. Rotate actuator barrel until ball return (or returns) on ball nut C is facing actuator motor. Reattach Heim to bellcrank.

NOTE: When installing heim bearing end in the bellcrank, position it freely so there will be no lateral bind on the jack screw. Place one AN960-716L washer next to the ball joint, (can be placed on either side) and shim remaining space with AN960-616 washers. This installation will prevent heim bearing from twisting too far, yet provide adequate movement.

NOTE: Previous installation may have contained one large AN960-916 washer next to the ball joint. This washer must not be reinstalled, the AN 960-716L smaller and thinner washer described above is used as a replacement.

4. Position retraction bellcrank F (Fig. 5-4) so that center of forward hole A in left outboard arm of the bellcrank is $1.36 \pm .1$ inches from forward face of truss B at FUS. STA. 33.0 (Fig. 5-4). This can be accomplished by engaging the emergency gear extension system hand crank and turning to position the bellcrank.

5. With bellcrank in position (Ref. Para 4) and gears fully extended and overcenter, adjust main gear retraction tube rod ends E (Fig. 5-3) and nose gear retraction tube at rod ends (F).

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Fig. 5-11 so that tubes can be slipped in place with zero preload. Reattach ends of retraction tubes at the bellcrank and slip bolts in place.

6. Disconnect electrical power from landing gear actuator by pulling circuit breaker. Make sure landing gear warning light circuit breaker is pushed in.

7. With bellcrank, retraction tubes, and the gear positioned as indicated in step 5, set down-limit switch striker arm (J) Fig. 5-3 so that gear-down light switch is just closed and green gear-down light is on. Secure striker arm in position.

8. Use manual crank to partially retract gear. Screw rod end (E) Fig. 5-3 on aft end of each main gear retracting tube, out two full turns, then slip attaching bolts back in place.

9. Manually extend gear; stop extension just as green gear-down light comes on.

10. Check preload torque on each main gear per step 19 on page 5-6.

Check bungee springs are not "bottomed" out. Torque difference between each gear should not be more than 25 IN. LBS. If torque is not within limits, repeat steps 8 and 9 to adjust rod ends one-half turn in or out as required.

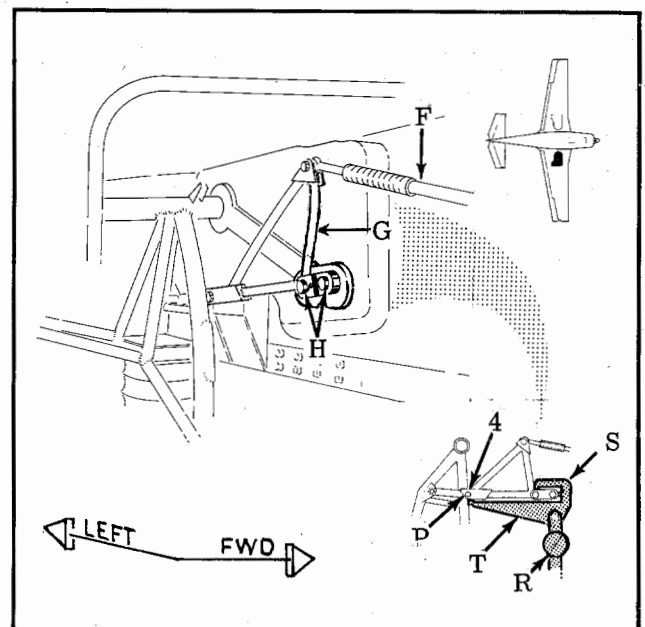


Figure 5-5. Main Gear Rigging Tool Application

11. Manually retract gear; stop retraction just as green gear-down light goes out.

12. Check preload torque on main gear retracting links using a torque wrench. Acceptable values are 210 to 280 IN. LBS.

13. Partially retract gear with manual crank, screw in each nose gear retraction tube rod end one full turn, then slip attaching bolts back in place.

14. Check length of nose gear bungee (G) Fig. 5-11 spring in each tube and then extend gear manually, stopping just as green gear-down light comes on.

15. Check length of nose gear bungee springs in gear-extended position. Nose gear bungee spring deflection from zero load condition (step 14) must be .030 to .070 inch for each bungee. (.010 to .030 inch for M20J with Dukes Actuator.) (P/N 1057-00-5G)

Recheck main gear preload torque value. If nose gear bungee spring deflection and/or main gear preload torque is not within prescribed limits, adjust retraction tube rod ends in increments of 1/2 turn as required. Use manual crank during readjustment, and stop extension just as gear-down light comes on. (When step 15 is complete, the retraction system is rigged for the gear-down-and-locked position with allowance for actuator overrun after cutoff.)

16. Disengage manual crank and reconnect landing gear system circuit breaker.

17. Leave all gear doors disconnected, and run gear up electrically (refer to para. 5-18) until main gear each side is .13 to .03 inches from bumper pads (see Fig. 5-1). Position gear-up limit switch striker arm (H) Fig. 5-3 so that the switch is just closed and the red in-transit light goes out. Secure striker arm in position. The gear is now properly rigged in the gear-up position with allowance for overrun after cutoff.

18. Extend gear to down-and-locked position. Adjust gear doors. (Refer to para. 5-12 and 5-13 for rigging gear doors.)

19. Cycle the retraction system electrically through at least five trouble-free test operations. Manually extend gear, stop extension just as green light comes on, and check main gear preload torque and nose gear bungee deflection for limits specified in steps 10 and 15. If values are within limits specified, the retraction system is properly rigged and ready for use. If preload and/or deflection is not within limits, readjust retraction tube rod ends as required, and repeat test operations.

NOTE: Check main gear preload torque and/or nose gear bungee deflection after extending the gear manually and stopping just as the gear-down light comes on. Gear preload, after electric extension, may vary due to inconsistency in actuator overrun; there-

fore, the gear must be only manually extended during all rigging checks. Rigging values after electric extension may exceed the minimum values obtained after manual extension.

20. When gear rigging is completed, check over center locks on all gears to ascertain that none of the down lock bungee springs have compressed to solid height and have no remaining deflection. If any bungee has reached solid height, readjust system and/or replace bungee springs.

WARNING: Lack of compliance with Mooney mandatory Service Bulletin No. 20-177 may result in unsatisfactory electrical extension of the electric gear.

5-7. DISENGAGE RIGGING (Emergency Gear Extension) (Other than Avionic Products Actuator).

Rigging of Manual Emergency Landing Gear Disengage Unit as Follows (Ref. Fig. 5-4):

1. With aircraft on jacks, insure that disengage operating handle in the cabin is in the full forward position and that the cable is inserted thru hole in existing bolt attached to (K).

2. With unit (K) in full engaged position (K full aft) and existing bolt (M) inserted thru disengage arm, apply approximately 5 lbs. pull to cable to remove slack.

3. Tighten nut (M), readjust wire stops (L) and connect spring.

4. Turn crank to assure full engagement.

5. Move disengage operating handle to full aft position and operate hand crank to assure full disengagement.

6. Rigging is now complete.

5-8. GEAR RIGGING PROCEDURE-M20J 1978 & on (Avionic Products 102000 Actuator Only).

1. Jack aircraft and remove 3 belly access panels #310235, #310124, and 310125 located consecutively just aft of the nose wheel well.

2. Position retraction bellcrank so that center of forward hole in left outboard arm of the bellcrank is 1.56 in. (Approx.) from forward face of truss at Fus. Sta. 33.0 (See Fig. 5-6).

NOTE: This is a starting point only. This dimension may vary to permit retraction tubes to connect with zero preload.

3. With the bellcrank in position, turn ball nut until Heim aligns with hole in bellcrank. Install connecting bolt.

4. Hold bellcrank in position with all gears fully extended. Adjust rod ends on main and nose gear retraction tubes so that tubes can be slipped in place with zero preload. (Attach forward end of each retraction tube, and slip bolt in place at aft attach point.)

5. Disconnect electrical power from landing gear actuator by pulling circuit breaker. Make sure landing gear warning light circuit breaker is pushed in.

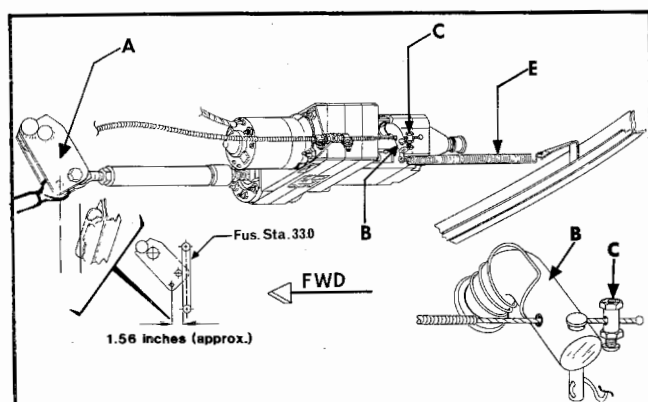


Figure 5-6. ELECTRIC GEAR ACTUATOR ADJUSTMENTS

6. With bellcrank, retraction tubes, and the gear positioned as indicated in step 4, set down-limit switch striker arm so that gear-down light switch is just closed and green gear-down light is on. Secure striker arm in position.

7. Partially retract the gear (use master switch to control motor). Screw rod end, on aft end of each main gear retracting tube, out two full turns, then slip attaching bolts back in place.

8. Manually extend gear; (See para. 5-24, pg. 5-14) stop extension just as green gear-down light comes on.

9. Check preload torque on each main gear by following instructions on page 5-6 step 18. If torque is not within limits, repeat steps 7 and 8 to adjust rod ends one-half turn in or out as required.

10. Partially retract gear, screw in each nose gear retraction tube rod end one full turn, then slip attaching bolts back in place.

11. Check length of nose gear bungee spring in each tube and then extend gear manually, stopping just as a green gear-down light comes on.

12. Check length of nose gear bungee springs in gear-extended position (See Fig. 5-7). Nose gear bungee spring deflection from zero load condition (Step 10) must be .030 to .070 in. for each bungee (for J model only). Recheck main gear preload torque value. If nose gear bungee spring deflection and/or main gear preload torque is not within prescribed limits, adjust retraction tube rod ends in increments of 1/2 turn as required. Use manual extension during readjustment, and stop extension just as gear-down light comes on.

(When Step 12 is complete, the retraction system is rigged for the gear down-and-locked position with allowance for actuator overrun after cutoff).

13. Reset landing gear system circuit breaker and disengage manual system.

14. Leave all gear doors disconnected, and run gear up electrically until main gears are .03 in. min. from bumper pads. Position gear-up limit switch striker arm so that switch is just closed, and red gear unsafe light is off. Secure striker arm in position. The gear is now properly rigged in the gear-up position with allowance for actuator overrun after cutoff.

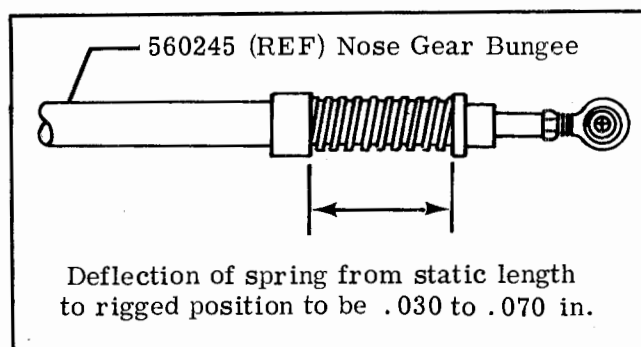


Figure 5-7. NOSE GEAR BUNGEE SPRING

15. Electrically extend gear to down-and-locked position. Adjust gear doors (refer to main door and nose gear door rigging procedures).

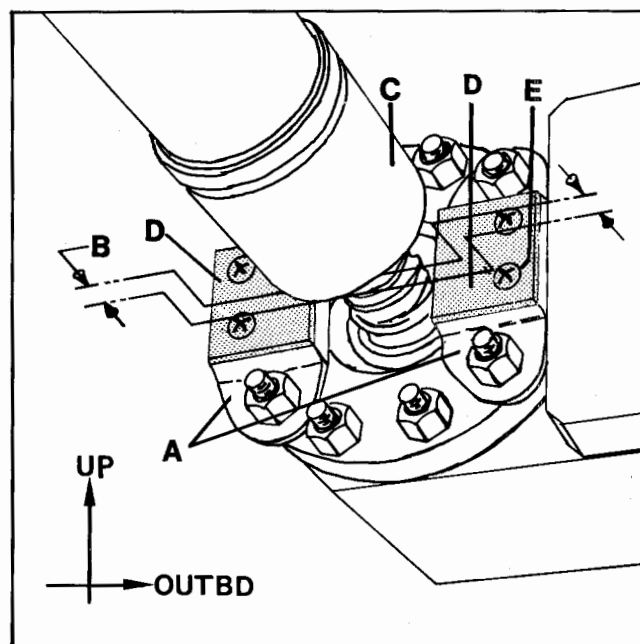


Figure 5-8. MECHANICAL DOWN STOP

16. Adjust the mechanical down and up stop per the following instructions and Fig. 5-8 and 5-9. Effective M20J S/N 24-0084 and S/N 24-0378 and on.

A. 560252-1, 560252-3, 560252-5, 560252-7, 560252-9. Use one down stop on each side as required (Pick up exist HDW) (Fig. 5-8).

B. With gear fully extended, select down stop of proper thickness to give .050 - .100 clearance between down stop and end of ball nut (Fig. 5-8).

NOTE: Use 1 to 4 560252-11 shims with 560252-9 stop to achieve proper clearance as an alternate for 560252-1, -3, -5 and -7.

C. Actuator Ball Nut (Fig. 5-8).

D. 560252-11 shim (use with 560252-9 only, max. of 4) (Fig. 5-8).

E. AN515-6R4 Screw * (Fig. 5-8).

AN936A6 Lock Washer

(Type 2 plc) (use with 560252-9 only)

*Use .063 longer screws with each additional shim. (Secure screw with Blue Locktite #83-31 grade C).

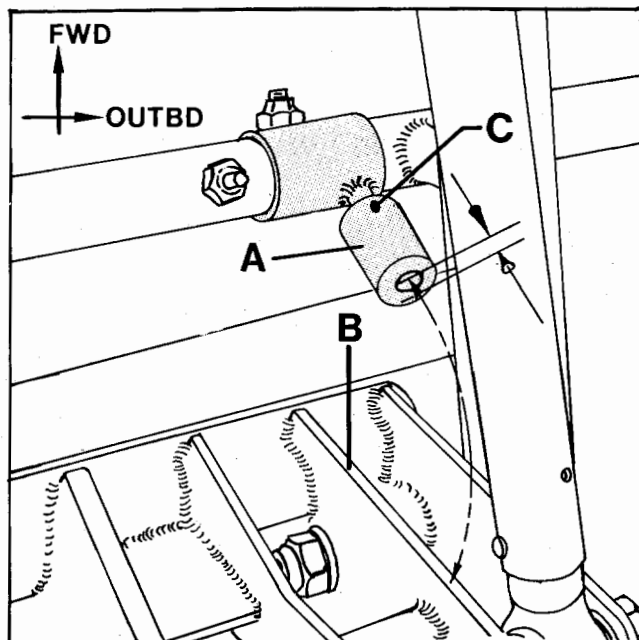


Figure 5-9. MECHANICAL UP STOP

With gear fully retracted, adjust stop for .050-.070 clearance between up stop (A) and retracting truss (B), then tighten set screw (C). (Fig. 5-9)

17. Cycle the retraction system electrically through at least five trouble-free test operations. Manually extend gear, stop extension just as green light comes on, and recheck main gear preload torque and nose gear bungee deflection for limits specified in steps 9 and 12. If preload and/or deflection is not within limits, readjust retraction tube rod ends as required, and repeat test operations.

NOTE: Check main gear preload torque and/or nose gear bungee deflection after extending the gear manually and stopping just as the gear-down light comes on. Gear preload, after electric extension, may vary due to inconsistency in actuator overrun; therefore, the gear must be only manually extended during all rigging checks. Rigging values after electric extension will always exceed minimum values obtained after manual extension but must be checked in accordance with step 18.

18. When gear rigging is completed, electrically extend the gear and check overcenter locks on all gears to ascertain that none of the down lock bungee springs have compressed to solid height (resulting in no remaining deflection). The main gear preload torque should not exceed 325 in. lb. using a torque wrench after electrical extension.

19. (a) Place rigging tool (T), P/N GSE030007, Fig. 5-5 page 5-3, on retraction truss.

(b) Hold the tool stationary by placing thumb on rear end of tool (S) and pressing forward.

(c) Place index finger on joint (4), and apply force to torque wrench (R) attached to rigging tool, and take a torque reading the instant the joint (4) begins to move. Torque reading should be 240 to 280 inch lbs.

(d) Upon release of force, truss must snap back to full overcenter position and should bear tight against retracting link at contact (P).

5-9. EMERGENCY GEAR EXTENSION SYSTEM - RIGGING.

1. Insert cable thru hole in actuator disengage arm, B, Fig. 5-6.

2. With red lever in full disengaged position (down and latched) push actuator disengage arm, (B), to full forward position and apply approx. 5 lbs. pull to cable to remove slack.

3. Install D222 wire stop, (C), tighten nut and connect spring, (E), to clevis pin (D).

4. Lift red lever and pull "T" handle aside, re-engage red lever. Check manual extension system to verify it is fully disengaged by pulling "T" handle; no resistance should be felt.

5. Move red lever to full up position and operate "T" handle to verify manual extension system is engaged.

6. Replace "T" handle under red lever and return red lever to disengage position, (down and latched). Manual extension system is now rigged.

5-10. MANUAL GEAR SYSTEM RIGGING.

The overcenter configuration of the retraction linkage holds the gear down-and-locked. Improper gear rigging can result in gear collapse during landing or taxiing.

1. Raise aircraft on jacks (Refer to paragraph 2-9) and remove belly access panels.

a. Disconnect all gear door links.

b. Disengage gear handle and loosely tie gear lever near down lock block.

CAUTION: Do not remove gear legs until retraction tubes have been disconnected.

c. Disconnect main gear retraction tubes (L) Fig. 5-10, at inboard retraction bellcranks (M).

d. Loosen locknuts (1), Figure 5-10 on rod end bearings.

e. Disconnect nose gear retraction tubes (F) Fig. 5-2 and 5-11, at aft rod end bearing attaching to bellcrank. Loosen locknut (F) Figure 5-11.

- f. Check all gears for binding at pivot points while moving gear legs by hand.
- g. Lubricate retraction system as indicated on page 2-16.
- h. Move retraction lever to gear-down-position and lock handle in downlock.
- i. Check retraction truss link for foreign matter at contact points (N & P), Figure 5-12 and 5-5.
- j. Place all gears in down-and-locked position.
- k. Install C-clamps on joints (3 & 4) Figure 5-12 and 5-5.
- l. Adjust main gear retraction tubes so that the bolts can be inserted through left and right rod end bearings previously disconnected by steps c & e. This adjustment will give you a zero preload in the system with gear retraction lever in gear-down-and-lock.
- m. Shorten nose gear retraction tubes two turns, and lengthen main gear retraction tubes 2 to 2 1/2 turns. Tighten rod end lock nuts (1) & (F), Figure 5-10 and 5-11.

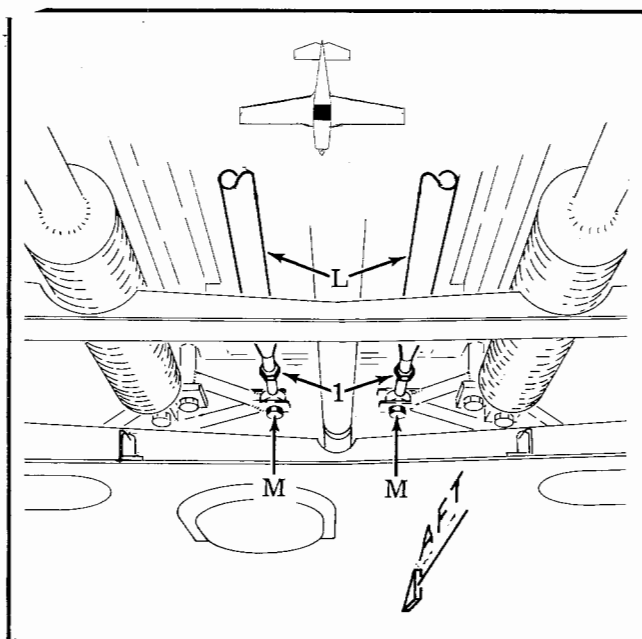


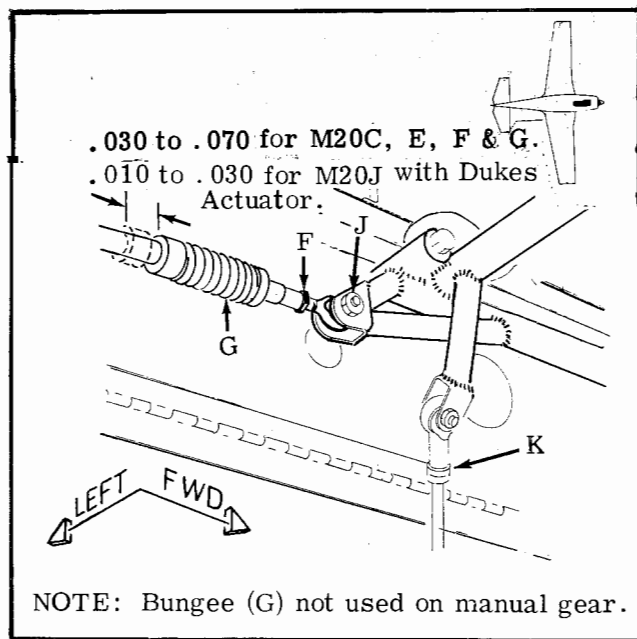
Figure 5-10. Main Gear Retraction Tube Adjustment Points (Manual Gear)

- n. Remove retraction lever handle from gear-down-lock and connect retraction tubes at rod end bearings to the retraction bellcrank.
- o. Return retraction lever handle to gear-down-lock.

2. Retraction system preload inspection.

a. Nose gear preload test.

- (1) Place rigging tool (Q), P/N GSE 030008, Figure 5-12 on retraction link with



NOTE: Bungee (G) not used on manual gear.

Figure 5-11. Nose Gear Retraction Tube Adjustment Point.

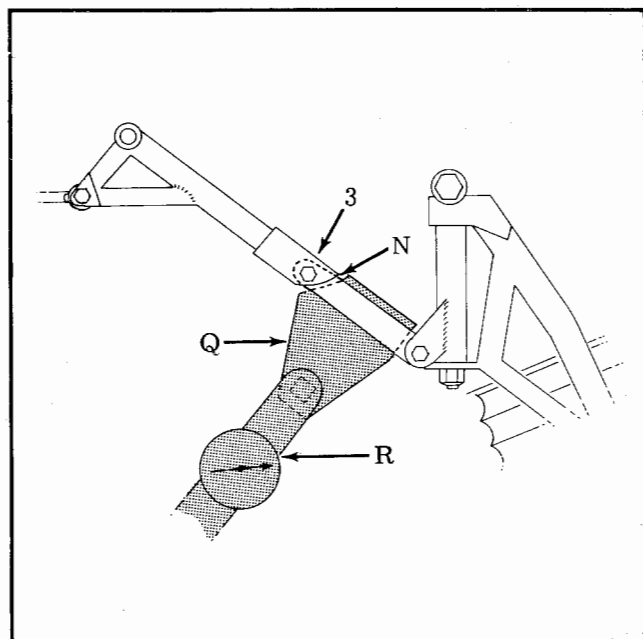


Figure 5-12. Nose Gear Rigging Tool Application (Manual Gear Only)

sloped edge facing aft. Hold tool firmly against retraction link and apply a torque wrench (R) to the tool.

- (2) Place index finger on joint (3), Figure 5-12, pull torque wrench aft and read torque value the instant movement is felt at joint. Movement should be visible at retraction link (N). Take torque reading when joint (3) has moved .005 to .010 inch. Torque reading must be 100 to 130 inch-pounds.

(3) Release force on torque wrench; retraction truss should snap back to full over-center (3/16 inch) and bear tight against retraction link at contact point (N), Figure 5-12.

(4) Check for retraction truss movement by pulling down on truss. If movement is detected, increase preload on retraction tubes.

(5) Adjust eccentric bushings (J), Fig. 5-7, as required to obtain the proper gear-up travel and gear door rigging.

CAUTION: Nose gear down-lock rigging must be rechecked for proper preload after adjusting eccentric bushings.

b. Main gear preload test.

(1) Place rigging tool (T), P/N GSE 030007, Figure 5-5 on retraction truss.

(2) Hold the tool stationary by placing thumb on rear end of tool (S) and pressing forward.

(3) Place index finger on joint (4), and apply force to a torque wrench (R) attached to rigging tool, and take a torque reading the instant that joint (4) begins to move. Movement should be 240 to 280 inch-pounds.

(4) Upon release of force, truss must snap back to full overcenter position (3/16 inch) and should bear tight against retraction link at contact (P).

(5) Check for retraction truss movement by pulling down on truss. If movement is detected, increase preload in retraction tubes.

(6) Repeat steps 1 through 5 to test opposite main gear preload.

NOTE: Torque readings for right and left gear should register within 25 inch-pounds of each other.

CAUTION: DO NOT attempt to rig the gear to increase or decrease gear-up-travel.

c. Retraction system preload adjustment.

(1) When preload torque readings fall outside of tolerance limits, make adjustments by changing retraction tube lengths. (Refer to rigging instructions above for tube adjustments.) Be sure that both nose gear retraction tubes carry the same preload.

(2) All retraction tubes connect to the gear retraction lever; therefore, when adjusting retraction tube for one gear, recheck the other retraction tube preload. Adjust tubes until retraction tube preloads for both main gears are within 25 inch-pounds of each other.

NOTE: When setting retraction tube preload, it is very important that each gear move freely on its pivot points. One stiff gear will greatly affect the amount of effort required in operating the gear. Stiff gear retraction systems require torquing to the higher torque units, while free-moving systems may be rigged at the lower torque limits.

(3) Upon completion of the preload adjustments when all gear components are within tolerance limits, make final check of the force required to place the gear lever handle in the gear down lock. If excessive force is required to move the retraction lever the final one or two inches, the system preload may be reduced slightly within prescribed torque limits. Check for and correct any binding in the retraction lever handgrip, since a bind in the handle may make locking difficult.

d. Extend gear to down and locked position and adjust gear doors per paragraphs 5-11 and 5-12.

5-11. MAIN GEAR DOOR RIGGING.

1. Raise aircraft on jacks (refer to paragraph 2-9).

NOTE: Gear system must be properly rigged prior to gear door rigging.

2. Check main gear up against bumper pads. (See Electric Gear System Rigging, Section 5-6 Item 17).

3. **M20J Only.** Inboard gear doors are fitted on all M20J aircraft. Normally once the doors are installed at the factory no further adjustment should be required. However, should the inboard doors be removed for any reason the following rigging procedure should be used:

A. Disconnect main gear doors at the forward and aft linkages.

B. Raise gear electrically to the full up position.

C. Forward leading edge and aft trailing edge should be tight against the wing skin and fair with the aft bubble fairing. Spacers A (Figure 5-13) should be added or removed as required to obtain a good fit with no binding or distortion with the gear in the UP position. AN 960-10 washers may be used as spacers.

4. Check that the forward edge of main gear doors are faired with wing skin/wheel well opening and that there is no binding or distortion where links attach to door.

5. If adjustments are required, adjust main gear door rod ends at forward or aft linkages as required. Extend gear to adjust links, then retract to check adjustment.

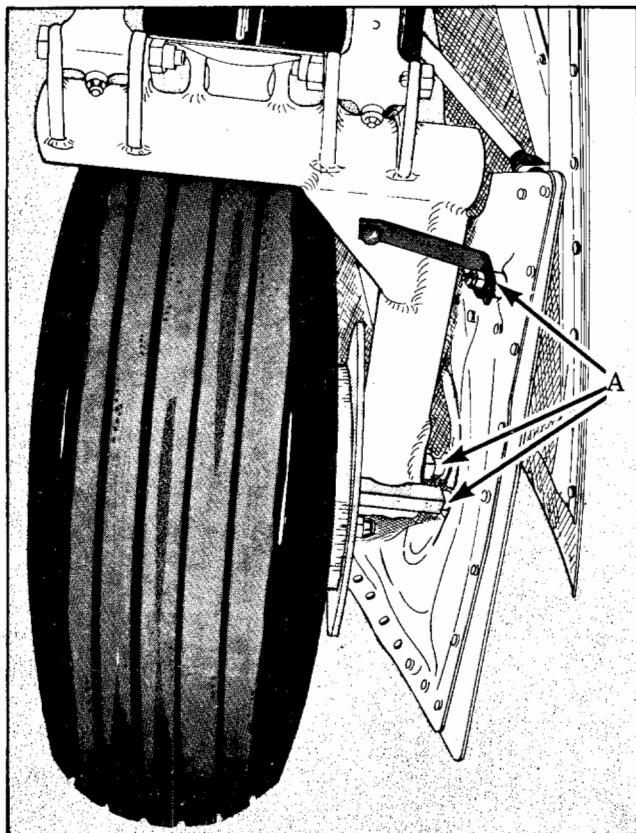


Figure 5-13 . Inboard Gear Door Adjustment Points (M20J Only)

5-12. NOSE GEAR DOOR RIGGING.

1. Raise aircraft on jacks. (Refer to paragraph 2-9).

NOTE: Gear system must be properly rigged prior to gear door rigging.

2. Adjust gear door link rods (H and J Fig.5-2) to obtain proper door fit when closed.
3. To increase or decrease nose gear-up travel in wheelwell, adjust eccentrics on trunion bearings (J), Fig. 5-7 as required.

CAUTION: Nose gear down-locked rigging must be rechecked after any adjustment to nose wheel eccentrics.

4. Readjust nose gear door linkage as required after eccentrics have been moved.

5-13. NOSE GEAR STEERING SYSTEM.

The nose gear steering system consists of a steering horn on the gear leg linked to the rudder pedals by push-pull tubes and bellcranks. Gear retraction system automatically disengages the steering mechanism from the nose wheel. (Paragraph 6-5 outlines the nose gear steering rigging.) A centering cam aligns the nose wheel for entry into the wheelwell.

5-14. BRAKE SYSTEM.

1. Brake removal for lining inspection and/or replacement.
 - a. Jack aircraft as described in paragraph 2-9.
 - b. Remove safety wire and two (2) AN-4H-17A bolts attaching back lining plate assembly to brake cylinder assembly. (Remove inboard gear doors on M20J models.)
 - c. Visually inspect linings for wear and brake disc for warpage. Brake linings should be replaced when they are worn to a minimum thickness of 1/8 inch. If lining replacement is necessary proceed with steps d. thru o. Otherwise reassemble in reverse sequence of disassembly.
 - d. Disconnect and cap hydraulic line at brake cylinder assembly and remove.
 - e. Remove pressure plate assembly by sliding it off the anchor bolts. Note the condition of the anchor bolts. If they are nicked or gouged they should be sanded smooth to prevent binding with the pressure plate or torque plate. When the anchor bolts are replaced they should be pressed out. New ones can be installed by tapping them in place with a soft hammer.
 - f. Drill out rivets attaching linings to back lining plate and the pressure plate. Remove piston assembly and "O" ring. It is permissible to use compressed air applied to the brake line fitting to remove the piston from the brake cylinder.
 - g. Clean parts in cleaning solvent (Federal Specification PS-661 or equivalent) and dry with oil-free compressed air.
 - h. Replace linings with Cleveland 66-30 linings using Cleveland #561-2 rivets. Rivets must be rolled to obtain proper fit between rivet shank and hole. (A brake lining rivet setting kit, No. 561, may be obtained from your local Mooney Service Center).
 - i. Inspect brake cylinder bore for scoring. A scored cylinder may cause the "O" ring to leak or cause rapid wear of the "O" ring. A scored brake cylinder should be replaced.
 - j. Replace AN6230-2 "O" ring with a new one. Do not reuse the old "O" ring.
 - k. Lubricate cylinder and piston with MIL-H-5606 red hydraulic fluid and assemble components with care to prevent damage to the "O" ring.
 - l. Service and inspect main wheels as described in paragraph 5-16. Inspect torque plate assy making sure the .125 thickness is toward brake cylinder assy (outboard). If thicker .250 protrusion is outboard, remove

torque plate from axle mounting flange and install as shown by Figure 5-10.

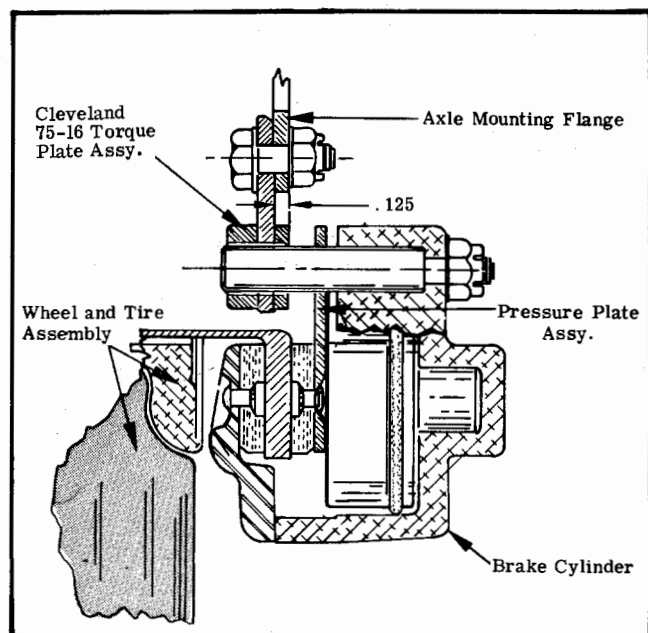


Figure 5-14. Torque Plate Assy Correctly Installed with Relation to Brake Cylinder

m. Reassemble brake cylinder assembly and back lining plate assembly onto the airplane in the reverse sequence of disassembly.

n. Bleed hydraulic system as described in Section 2-21.

o. Remove aircraft from jacks.

2. Shuttle valve removal and testing (optional dual brake system.)

a. Disconnect inlet lines from master cylinders and cap line ends.

b. Disconnect outlet line leading to brake cylinder and cap line end.

c. To test valve operation, seat shuttle valve by applying 1500 PSI hydraulic pressure to one inlet port with outlet plugged.

d. Apply pressure to opposite port. Shuttle valve should unseat at 15 to 50 PSI.

e. Repeat step C and D to test opposite port.

f. Reinstall shuttle valve in reverse sequence of removal.

g. Bleed brake system.

3. Master cylinder removal and disassembly.

a. Disconnect hydraulic cylinder from toe pedal.

b. Disconnect and cap hydraulic lines.

c. Disconnect hydraulic cylinder from bracket and remove cylinder.

d. To disassemble master cylinder:

(1) Unscrew and remove rod end bearing and nut from piston rod.

(2) Remove snap ring and lift out complete piston rod assembly.

(3) Remove piston top, O-ring packings, and brass washer from piston rod assembly.

(4) Disassemble piston rod assembly by removing cotter pin, valve stop, and spring washer. Valve assembly will fall out when cotter pin is removed.

NOTE: DO NOT attempt to remove O-ring packing under valve head. If valve or packing is faulty, replace the valve assembly.

(5) Remove O-ring packing from piston. Do not unscrew piston from push rod. Replace entire piston rod assembly if faulty.

(6) Remove spring from cylinder.

(7) Clean all parts with cleaning solvent (Federal Specification No. PS-661).

(8) Inspect cylinder for cracks, scoring, or grooves in bore.

(9) Inspect piston for damaged valve seat, nicks and scratches.

(10) Inspect valve for damage.

(11) Inspect push rod for scoring, grooves, nicks and scratches.

(12) Inspect piston return spring for permanent set and proper length (3-3/16 IN. MIN.: 3-5/16 IN. MAX.).

(13) Replace all faulty parts.

(14) Reassemble in reverse sequence of disassembly. Immerse all parts in hydraulic brake fluid prior to reassembly.

f. Reinstall master cylinder in reverse sequence of removal.

g. Bleed brake system.

4. Parking brake valve removal and disassembly.

a. Disconnect parking brake control at parking brake valve arm.

b. Disconnect and cap hydraulic lines.

c. Remove hydraulic reservoir and parking brake valve.

d. Separate brake valve from hydraulic reservoir.

e. To disassemble parking brake valve.

(1) Remove rivets attaching valve arm to valve body and valve stem.

(2) Remove spacer, valve seat, and gasket.

(3) Withdraw valve stem assembly and remove O-ring packing from valve body.

(4) Clean all parts with cleaning solvent (Federal Specification No. PS-661).

(5) Inspect valve stem for nicks, scratches, burrs, and grooves.

(6) Inspect valve seat for nicks, scratches, and scoring.

(7) Inspect all threads for damage.

- (8) Replace O-ring packing.
- (9) Replace valve seat gasket.
- (10) Reassemble brake valve in reverse sequence of disassembly.
- (11) Install brake valve on hydraulic reservoir.
- (12) Reinstall hydraulic reservoir and connect lines and brake control.
- (13) Bleed system and service hydraulic reservoir with hydraulic fluid as described in paragraph 2-20.

5-15. LANDING GEAR SHOCK DISC INSPECTION.

1. Aircraft with full fuel load and weight on landing gear.

a. Main gear shock discs.

(1) Check gap between retaining collar (A) Figure 5-15 and top retaining plate (B). Allowable gap is 0.00 to 0.43 inches for M20C and G, 0.00 to 0.60 inches for M20 E, F, and J.

(2) Replace discs when gap exceeds the tolerance. Use a shock disc replacement tool (C), P/N GSE 030011, (old P/N ME 121), to remove and install main gear shock discs.

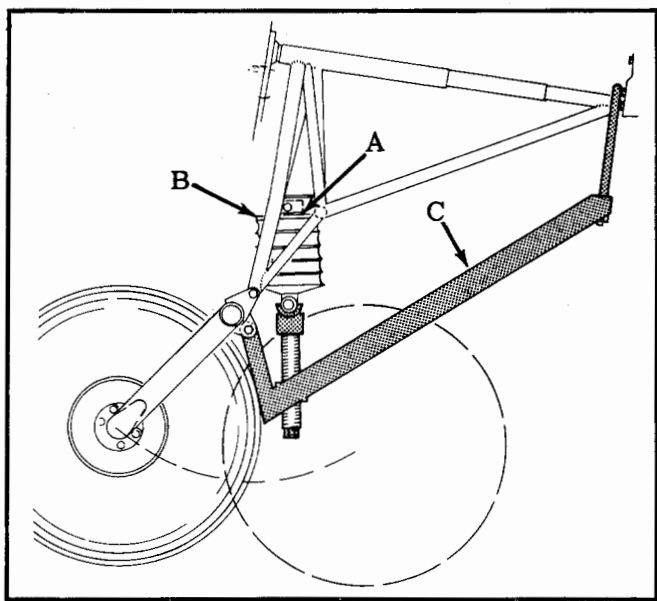


Figure 5-15. Main Gear Shock Disc Replacement Tool Application.

2. Nose gear shock discs.

a. Check for gap between retaining collar (D), Figure 5-16 and top retaining plate (E). Top retaining plate must be in contact with retaining collar.

b. Replace shock discs if gap is found. Use shock disc replacement tool (F),

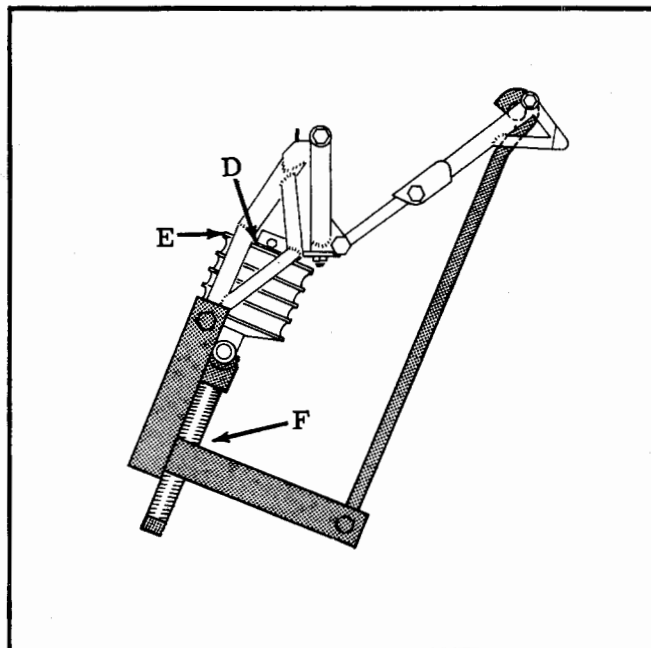


Figure 5-16. Nose Gear Shock Disc Replacement

P/N GSE 030010, (old P/N ME120), to remove and install nose gear shock discs.

(1) Raise aircraft on jacks with shocks fully extended.

(2) Inspect nose and main gear shocks for evidence of gap between retaining collar and retaining plate. The disc preload must be great enough to maintain complete wheel extension during retraction.

(3) Replace shock discs that have lost resilience.

(4) Inspect retaining collar and bolt for deformation, wear, and cracks.

(5) Replace defective bolt and collar.

CAUTION: Both collar and bolt must be replaced when one or the other is defective.

(6) Inspect nose gear snubber for proper shock absorbing action. Replace snubber when effectiveness is impaired--the unit is sealed and cannot be repaired.

5-16. MAIN WHEELS. The main wheels have standard brand, 6:00 x 6, six-ply rated tires with standard tubes. To remove main wheels:

1. Detach dust shield by removing its three screws and washers.

2. Remove wheel by removing cotter key and nut from axle.

3. Slide wheel off axle.

4. Remove snap ring, grease seal rings, and felt seals.

5. Remove bearings.
6. Completely deflate tire.

WARNING: Do not loosen wheel half retaining nuts before tire is completely deflated. Failure to observe this warning may result in bodily injury.

7. Remove nuts, washers, and wheel half retaining bolts; separate halves, and remove tire and tube.

NOTE: Bearing cups are shrink fitted; do not remove them unless necessary for replacement.

8. Clean all wheel parts thoroughly in cleaning fluid (Federal Specification PS-661). Exercise special care in cleaning bearing cones and felt rings to insure thorough cleaning.

9. Inspect all parts for cracks, corrosion, or evidence of wear.

10. Inspect bearing cups and replace if cups are damaged or worn. If necessary to remove bearing cups, heat wheel in boiling water for at least 30 minutes. Then remove cup by tapping evenly. To install cup, heat wheel half again and then cool cup with dry ice. Position cup and tap lightly to insure proper seating.

11. Polish small burrs or nicks out of wheel halves with No. 400 grit sandpaper, clean thoroughly, and refinish protective coating as required.

12. Replace bearing cones that show signs of wear or bearing fretting.

13. Repack wheel bearings and lubricate seals with grease. Install bearings, closure rings, and felt seals in wheel halves. Secure with snap rings.

14. Position tire on one wheel half; then position other wheel half in tire.

15. Install brake disc and wheel half retaining bolts, washers, and nuts.

16. Tighten nuts evenly and torque to 90 inch-pounds.

CAUTION: Uneven or improper torque may cause bolt or wheel failure.

17. Inflate tire to 30 PSI.
18. Install wheel assembly, washer, and axle nut. Tighten axle nut until bearing binds slightly, back nut off to nearest castellation, and install cotter pin.

NOTE: When properly installed, the wheel will turn with a slight resistance.

19. Install dust shield.
20. Remove aircraft from jacks.

5-17. NOSE WHEEL. The standard brand, tube-type, 5:00 x 5 nose wheel tire is six-ply rated.

1. Nose Wheel Removal.
 - a. Remove cotter key, nut, and washer from axle.
 - b. Remove nose wheel.
2. Installation is in reverse sequence of removal.
3. Nose Wheel Disassembly.
 - a. Completely deflate tire by removing valve core.
 - b. Remove nuts, washers, and thru-bolts from wheel.
 - c. Separate wheel halves, and remove tire and tube. Refer to paragraph 5-13 Items 8 thru 14 for wheel inspection.
 - d. Reassemble nose wheel in reverse sequence of removal. Tighten thru-bolt nuts evenly and torque to 90 inch-pounds. Inflate tire to 49 PSI. (M20F, G & J). Tire pressure for M20C & E is 30 PSI.

5-18. ELECTRIC GEAR SAFETY DEVICES.

The gear switch operates the landing gear actuator relay. Pulling the wheel-shaped knob out and moving it to the upper detent raises the gear. However, an airspeed safety switch, or a squat switch effective with aircraft serial numbers 700055C & on, 700035E & on, 700038F & on, is incorporated in the electrical system to prevent landing gear retraction while on the ground. To allow electric gear retraction on aircraft having an airspeed safety switch with the aircraft on jacks; attach a 12-inch length of 3/8 inch pliable rubber hose (surgical tubing) over the pitot head, and pinch the open end with a large cotter pin; twist the tubing with the cotter pin until the compressed air within the twisted tube actuates the airspeed pressure switch. Maintain pressure on the switch until retraction is complete. To adjust the airspeed switch or the squat switch refer to paragraphs 5-20 and 5-23.

The up-limit switch will stop the gear in its retracted position. Moving the control knob to its lower detent lowers the gear. The down limit switch will stop the gear actuating motor when the proper force is exerted to hold the gears in the down-and-locked position. Refer to paragraphs 5-6 items 7 and 17 for proper limit switch rigging. The gear down-and-locked position is indicated by:

1. Illumination of the green gear down annunciator light.
2. The warning horn will not sound with the throttle retarded below 1200 RPM (10 IN. Hg.).

3. The indicator marks will be aligned on the visual gear-position indicator.

CAUTION: When running gear up or down electrically do not use circuit breaker as a switch. Partial retraction or extension may be accomplished electrically as follows:

1. Place master switch in OFF position.
2. Move gear switch to GEAR UP or GEAR DOWN as desired.
3. Momentarily actuate master switch until gear is in desired position.

5-19. LANDING GEAR WARNING SYSTEM.

The landing gear warning system consists of: (1) landing gear position lights (amber gear-up and green gear-down), and (2) a warning horn actuated by the throttle control when the gear is not down-and-locked and the throttle is set at 10 inches or less of manifold pressure. The gear-up limit switch or safety lock operates the gear-up light; the gear-down limit switch or safety lock operates the gear-down light. The 1975 and later models have a green "Gear Down" light, and a red "In Transit" or "Gear Unsafe" light; all gear lights are off when gear is fully retracted. Check warning horn for volume in flight periodically.

NOTE: For Manual Gear Systems adjust the micro-switch to close the circuit for the gear warning light if the handle is more than 1/8 inch down from the maximum top position in the handle latch. Bend the micro-switch arm if necessary for proper adjustment.

5-20. AIRSPEED SAFETY SWITCH ADJUSTMENT. The airspeed safety switch, located inside the cabin, is mounted to the tubular structure to the left and above the pilot's left knee. The airspeed safety switch is incorporated into the electrical system to prevent landing gear retraction while on the ground and at airspeeds below 75 MPH. To bench test and adjust airspeed safety switch:

1. Using a water manometer to measure pressure, gradually apply air pressure to inlet at cap.
2. Connect an ohmmeter between micro-switch leads.
3. Gradually increase the pressure to 2.774 inches of water until diaphragm movement closes microswitch.
4. Slowly decrease pressure until micro-switch opens.
5. Adjust switch body until switch closes at an increased pressure of 2.416 to 3.158 inches of water (75+5 MPH).
6. Secure setting with a setscrew.
7. Repeat step 5 five times; microswitch

must open and close each time as specified.

8. Increase pressure to 30 inches. No external leakage can be permitted.

9. Reinstall air switch in pitot system and apply pressure to pitot head. Note airspeed indicator readings when microswitch closes. If airspeed readings do not indicate approximately 75+5 MPH readjust switch to obtain proper switch closing airspeed.

NOTE: 78 J Model airspeed switch adjustment, located on the back of the airspeed indicator should be set at 2.774 inches of water (75 MPH). Tolerances can be 3.158 inches of water (80 MPH) to 2.416 inches of water (70 MPH).

5-21. LANDING GEAR ACTUATOR P/N 102000, CLUTCH SPRING REPLACEMENT, KIT #A10-85.

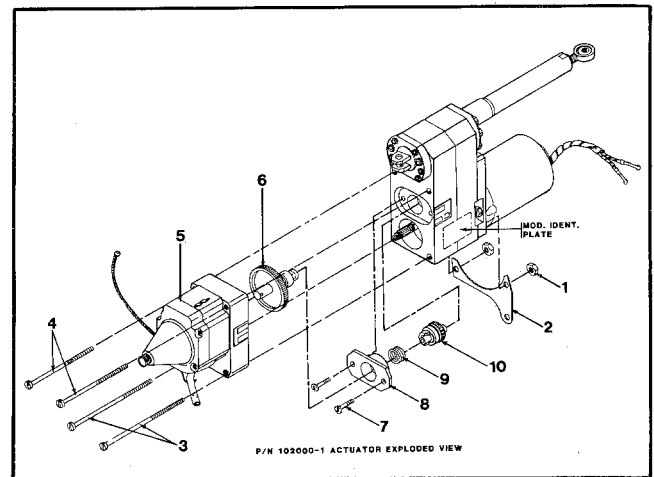


Figure 5-17. Landing Gear Actuator Clutch

1. Remove two nuts, item 1. Note position of cable support bracket, item 2, and remove.
2. Remove two long screws, item 3.
3. Remove two short screws, item 4.
4. Remove recoiler assembly, item 5.
5. Remove clutch spring, item 9, and gear, item 6, from housing by rotating gear and pulling with slight to moderate pressure.

CAUTION: Use extreme care to prevent ball bearing from dropping out of recoiler assembly, avoid damage to gear and do not allow dirt to enter clutch housing bore.

After disassembly, clean clutch gear thoroughly.

Discard removed screws.

6. See 5-22 Procedures prior to reassembly.

ASSEMBLY

1. Lubricate gear and new clutch spring thoroughly with lube supplied.
2. Using gear to rotate spring, insert clutch spring into bore until fully seated.

NOTE: Be sure spring is all the way in and seated around cam.

3. Reinstall recoiler assembly making sure to fully seat gear, bearing, and gear tang into manual drive slot of recoiler assembly.

4. Apply Loctite Grade A (Catalog Number 88-31, not supplied in kit) to four new screws, item 3 & 4, supplied, and install taking care to use the two longest screws in the bottom holes.

NOTE: Torque to approximately 10-12 in. pounds.

5. Reinstall cable support bracket and retaining nuts.

6. Retest unit for proper electrical and mechanical operation.

7. Install modification plate adjacent to I.D. plate (first 1000 hrs. only). Mark the first block of mod. plate with the figure "1" using metal stamp or etching tool. Mark each succeeding clutch spring replacement with the next consecutive number.

5-22. LANDING GEAR ACTUATOR, P/N 102000 RECOILER SPRINGS/CABLE AND DRUM ASSY REPLACEMENT.

1. Carefully separate the Pulley Housing from the Recoiler Assembly. Retain pulley on shaft.

2. Slide the pulley drum and cable off shaft.

3. Remove the two (2) recoiler springs, and two (2) of the three (3) spring spacers leaving the third spacer in housing. Be certain that spacer is in place before installation of two (2) new recoiler springs and previously removed spacers.

4. Install new recoiler springs placing a spacer between each spring and over top spring. **IMPORTANT** - Recheck proper installation of springs.

OBSERVATION: When looking at Recoiler Assembly with pulley shaft end toward you, the spring tabs in the housing slot should curve to the RIGHT as shown in Figure 5-18.

5. Inspect cable for sheathing damage. Replace cable if sheathing is cut or stripped. Measure overall cable length prior to reassembly. Cable length should be $31\frac{1}{2}'' + 1\frac{1}{2}''$ long.

6. Slide drum onto shaft and be certain that spring detent on drum engages both recoiler springs by slightly rocking drum end.

7. When full engagement is obtained, wrap cable around drum in a clockwise direction - leaving 2'' to 5'' of cable free of drum.

8. Align slot in Pulley Housing with cable and slide Pulley Housing over Cable and Drum Assembly.

9. Holding the housings together, pull properly aligned cable several times to ensure

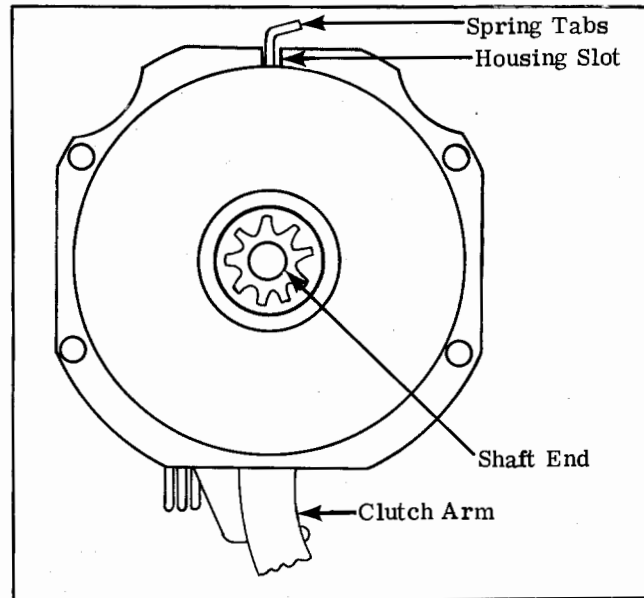


Figure 5-18. LANDING GEAR ACTUATOR RECOILER ASSEMBLY

the absence of binding conditions. Measure cable length from side of housing. At full extend, the length of cable should be 29'' minimum. In retracted position, cable length should be 5'' to 8'' long.

NOTE: Cable length in retract position may be adjusted shorter or longer by holding clutch with the finger of one hand (to prevent shaft rotation), and then with the other hand, rotating Pulley Housing one (1) full turn CW (to shorten) or CCW (to lengthen). Retention of clutch with finger will not allow pretensioning of springs. Slight spring tension should be noted starting at 8'' to 10''.

10. Attach Clutch Recoiler Assembly to Actuator Gear Housing with the four (4) screws removed in Para. 5-21.

5-23. **SQUAT SWITCH ADJUSTMENT.** The squat switch, located on the left main gear, is incorporated into the electrical system to prevent landing gear retraction while the aircraft is on the ground.

Adjustment of the squat switch is accomplished as follows:

1. Raise aircraft on jacks.
2. Remove safety wire from adjustment nuts on switch.
3. Adjust switch body until switch just closes.
4. Check switch by slowly lowering aircraft to the ground. Switch should now be open.
5. Resafety adjustment nuts.

5-24. **MANUAL EMERGENCY GEAR EXTENSION SYSTEM.** (Pre 1978 Electric Gear Models) The emergency manual override system may

be used to extend the gear. The override system has a flexible shaft geared to the landing gear actuator driven by a hand crank on the left side of the cabin panel. To manually extend the gear:

1. Pull landing gear circuit breaker.
2. Move landing gear control switch to DOWN position.
3. Push crank engage handle forward to engage drive mechanism.
4. Crank handle clockwise to lower gear. The gear is down and locked when green down-gear indicator light is on and when the lines on the visual gear position indicator on the floorboard are aligned.

CAUTION: DO NOT retract gear manually; use electrical system to retract gear. Do not operate gear electrically with hand crank engaged.

CAUTION: To prevent partial engagement and subsequent damage to drive spline on flexible shaft, check disengage arm (K),

Figure 5-4. This is covered under disengage rigging. (Page 5-4).

5-25... MANUAL EMERGENCY GEAR EXTENSION SYSTEM - (1978 and Later Models).

The manual emergency gear extension override system is used to extend the gear only. The override system is built into the electrical gear actuator unit located beneath the pilot seat under the floorboard. The controls are in the floorboard aft and between the front seats. To manually extend the gear:

1. Pull landing gear circuit breaker.
2. Move landing gear control switch to DOWN position.
3. Push latch forward with right thumb.
4. Pull lever back and upward (engaging manual emergency gear).
5. Pull T handle up and return to original position and continue until green down-gear indicator light is on and/or the lines on the visual gear position indicator on floor aft of console are aligned when viewed from directly above the indicator.

5-26. ELECTRIC GEAR SYSTEM TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Gear will retract but red indicator light (press-to-test) will not illuminate. (Pre 1975 models)	Lamp burned out in red indicator light. Broken wire in indicator-light circuit. Gear-up limit switch inoperative or out of rig.	Replace burned out lamp. Check indicator-light circuit and gear-up limit switch.
Incomplete retraction. Gear retracts to an intermediate position and stops short.	Bind in gear retraction system because gear is out of rig. Malfunction in gear electrical circuit, inoperative actuating motor, or weak battery.	Refer to landing gear rigging procedure. Examine all movable parts for proper lubrication and freedom from binding. Check for actuator worm gear binding and lubricate as needed. Any malfunction can cause the landing gear circuit breaker to trip; therefore, check electric circuit for loose connection, broken wires, or defective relay switches. Recharge battery if necessary.
Gear will not retract at 70 to 80 MPH IAS.	1) Insufficient airspeed, pressure switch inoperative, or circuit breaker tripped. 2) Squat switch not properly rigged. 3) Cold weather- Refer to SB-M20-196	1) Check pitot tube and line for obstructions. Examine pressure switch for proper adjustment and operation. Reset circuit breaker. 2) Adjust and check squat switch operation.
Gear will extend but green indicator-light (press-to-test) will not illuminate.	Lamp burned out in green indicator-light circuit. Down-limit switch is inoperative.	Replace burned out lamp. Check indicator-light circuit and/or down-limit switch.
Actuating motor extends gear to an intermediate position and stops.	Same causes as listed with "Incomplete Retraction" above.	Same remedies as listed with "Incomplete Retraction" above.
Gear will extend manually, but green indicator light (press-to-test) will not illuminate.	Gear switch is not in DOWN position. Lamp burned out in green indicator light.	Place gear switch in DOWN position. Replace burned out lamp.
Manual System will not lower gear.	1) Drive connector is out of rig. 2) Sheared female spline in drive connector. 3) Manual engage arm improperly rigged. 4) Avionic Products Actuator internal clutch spring broken.	1) Adjust control cable tension at drive-connector. 2) Replace drive connector assembly if female spline is stripped. 3) Rerig manual engage arm. 4) Replace spring.

5-27 NOSE GEAR STEERING AND TRACKING.

1. Level aircraft as described in Section 2-10.
2. Center nose wheel.
3. Place plumb line over and forward of nose gear trunnion (See Figure 5-19) part number 540001-503.
4. Measure forward from aft edge of plumb line to axle center line. Modification of nose wheel location should be accomplished if axle position, forward of plumb line, exceeds .06 in.
5. Add S.B. 20-202-3 spacer under 510027 collar to reposition the axle if required.
6. Run gear through up/down cycle. Check nose gear door and wheel well tire clearances. Re-rig if required.

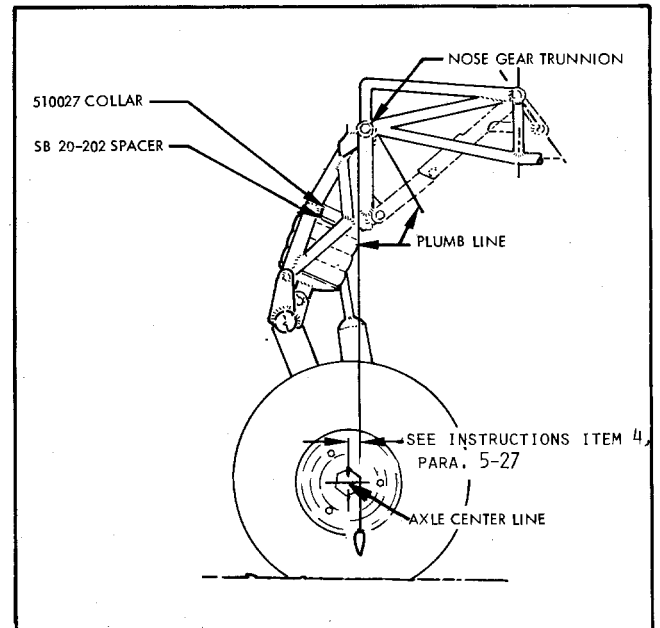


Figure 5-19. NOSE WHEEL LOCATION

SECTION VI. FLIGHT CONTROLS

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6-1. DESCRIPTION. The aircraft has dual flight controls and can be flown from either the pilot or co-pilot seat. Dual pairs of foot pedals control the rudder and nose wheel steering mechanisms. The co-pilot pedals are removable. Push-pull tubes, rather than the conventional cable systems, actuate the all-metal flight control surfaces. Rod-end bearings are used throughout the flight control systems. These bearings are simple and require little maintenance other than occasional lubrication. Specially designed aluminum-alloy extrusions, that permit flush skin attachment, form the leading edges of the rudder and elevators. All 1968 models have a hydraulic actuating system that controls the wing flaps. Beginning in 1969, electrically actuated wing flap systems are installed on all models. Longitudinal pitch trim is achieved through a trim control system that pivots the entire empennage around the tail cone attachment points.

6-2. AILERON SYSTEM.

1. Ailerons. The ailerons are of all-metal construction with beveled trailing edges. Three hinges of machined, extruded aluminum attach the ailerons to the aft wing spar outboard of the wing flaps. The ailerons link to the control wheel through push-pull tubes and bell cranks. Lead counterweights static balance the ailerons.

2. Aileron Removal and Installation.

a. Remove control tube attaching bolt, nut, and washer at aileron horn.

b. Remove bolts, nuts, and washers from the three attaching hinges.
c. Remove aileron by pulling it straight aft.
d. Reinstall aileron in reverse sequence of removal.
e. Recheck bolts for security and safety.

3. Aileron Rigging and Control Adjustment.

a. Use a straight edge (A), Figure 6-1, to align control wheels in accordance with step b.
b. For models M20C, E, F & G adjust control tube (B) linking control column bell cranks to rotating shaft (C) at rod ends (1) until both control wheels are level.

On M20J models adjust control tube (B) linking control wheel shaft (C) at rod ends (5). Clamp or otherwise secure control wheels in the level position until steps c thru e are completed.

c. Adjust control tube (D) at rod end (2) so that aileron center bell crank (E) is 1/16 inch left of center facing forward. (Fig. 6-1)

d. Adjust aileron control tubes (F) by removing bolt, nut & washer (4) Figure 6-1 and loosening locknut (6) Figure 6-2. The aileron control tube (F) can then be rotated clockwise or counterclockwise so that the center of the outboard bolt (K) Figure 6-2 is 4.3 inches from spar web (M). Replace bolt, nut and washer (4) Fig. 6-1 and recheck 4.3 inch dimension.

e. Adjust aileron push-pull tube (J) at rod end (7) so that aileron (in neutral position) is 0° to -2° down (with no additional tolerance) as

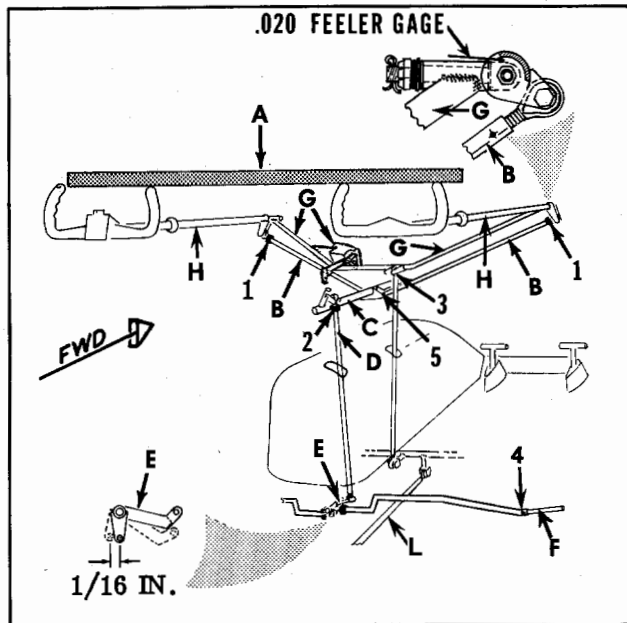


Figure 6-1. Aileron & Elevator Control Wheel Rigging

measured with travel board at wing station indicated on travel board GSE 030003.

f. Remove clamps from control wheels, then adjust aileron stops (8) so that down travel is $80^{\circ} \pm 10^{\circ}$. Aileron up travel may vary from $12-1/2^{\circ}$ to 17° (with no additional tolerance). ($12\ 1/2$ to $14\ 1/2$ 1981 A/C).

NOTE: The above aileron rigging and adjustment instructions apply to both the left and right ailerons.

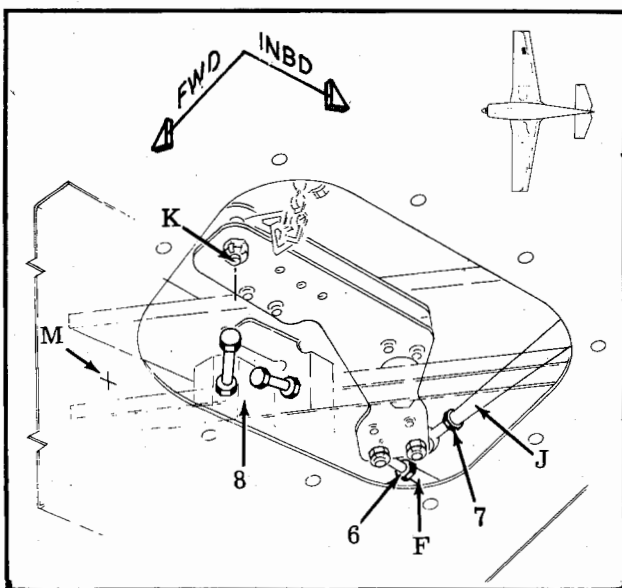


Figure 6-2. Aileron Stop Adjustments

Rigging is now complete for all M20C, E, F & G models. Proceed to step g. for M20J models.

g. M20J only - Rotate the left control wheel clockwise until the ailerons contact the aileron stops (8) Fig. 6-2. Adjust control tube (B) at rod end (5) by loosening the lock nut and turning tube clockwise or counterclockwise to attain .020 maximum clearance as shown by Figure 6-1. Secure locknut and recheck .020 dimension. Repeat the operation on right control wheel by turning wheel counterclockwise until ailerons contact the stops, then proceed as described for the left control wheel. Rigging is now complete.

6-3. ELEVATOR SYSTEM.

1. Elevators. Elevator construction is essentially the same as that of the ailerons. Both elevators attach to the stabilizer at four hinge points. Push-pull tubes and bell cranks link the elevators to the control yoke. Lead counterweights static balance the elevators.

2. Elevator Removal and Installation.

a. Remove push-pull control tube and bungee assist attachments by taking off all attaching bolts, nuts, and washers.

b. Remove bolts, nuts, and washers from the four attaching hinges.

c. Remove elevator to the rear.

d. Install elevators in reverse sequence of removal. Recheck attaching bolts for security and safety.

NOTE: Elevator bellcrank, aft tailcone, should be modified per S.I. M20-44.

3. Elevator Rigging and Adjustment.

a. Adjust rod end bearing (3), Figure 6-1,

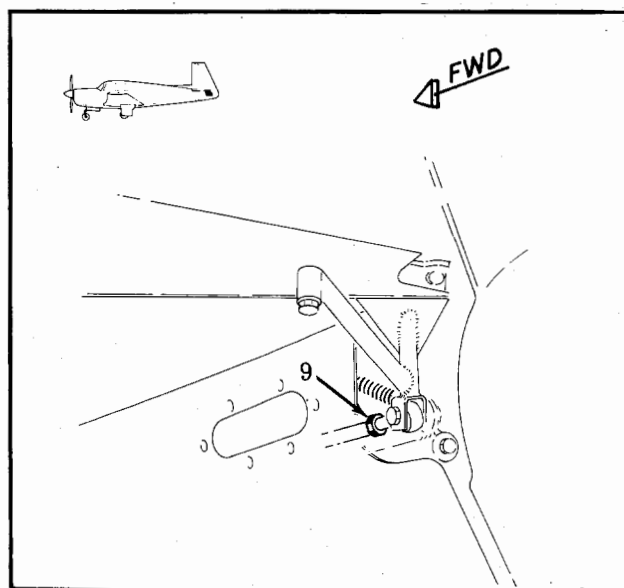


Figure 6-3. Elevator Horn Adjustment

at control yoke (G) for control shaft (H) clearance from firewall and control yoke (G) clearance from fuselage structure.

b. Level aircraft per paragraph 2-10 and set control column in neutral with stabilizer parallel to center line of aircraft.

NOTE: Measure elevator travel from 0° stabilizer thrust line with travel board centered on rivet line at stabilizer sta. indicated on travel board GSE 030004 and with stabilizer at 0° aircraft thrust line (See Figure 6-7).

c. M20C & E to 690000: Set stops (P), Figure 6-4, in empennage stinger for elevator uptravel of $24^{\circ}+1^{\circ}$ and down travel of $10-1/2^{\circ}+1^{\circ}$ and F & G uptravel of $22^{\circ}+2^{\circ}$ and downtravel of $22^{\circ}+2^{\circ}$.

All aircraft Serial No. 690001 and on: All elevators have $22^{\circ}+2^{\circ}$ uptravel and $22^{\circ}+2^{\circ}$ downtravel.

NOTE: Elevator bellcrank, aft tailcone, should be modified per S.I. M20-44.

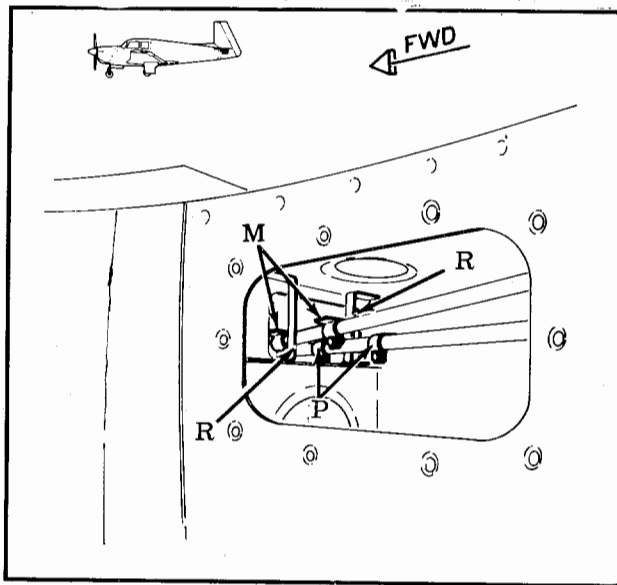


Figure 6-4. Rudder & Elevator Stop Adjustment

NOTE: Adjust rod end bearings of control tube (L), Figure 6-1, at rear tail cone bulkhead, at elevator horn rod end (9), Figure 6-3, or as last resort at main spar adjustable rod end bearing to obtain additional elevator travel.

d. After stops are set rotate elevators thru full range of travel to assure solid contact with stops and that nuts and bolts heads clear stop limiter. Stop limiter may be bent to obtain correct movement (R), Figure 6-4.

e. Rotate trim full down to check clearance of control tube at stub spar. Adjust rod end bearing at rear tail cone bulkhead if needed for clearance. Recheck elevator up and down travel.

f. Rotate trim full up to check that up stop makes solid contact on stop limiter.

g. Retighten all jam nuts, attach bolts and secure as necessary; recheck all control tube clearances and travel limits.

4. Trim Assist Bungee Rigging. Bungee units in the elevator control systems assist in stabilizer trim adjustment.

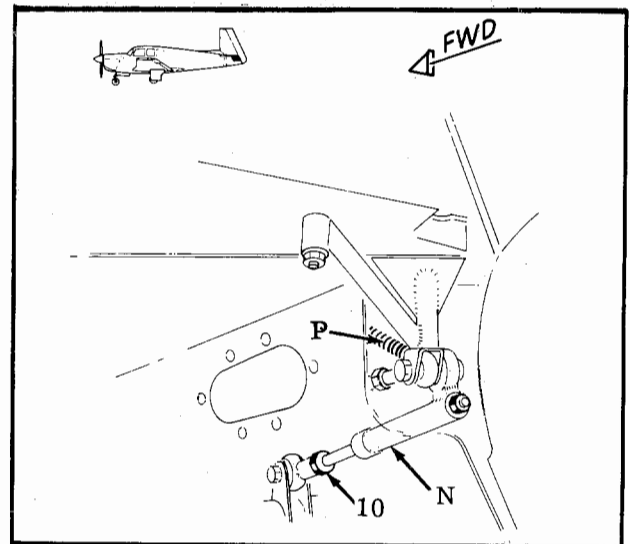


Figure 6-5. Trim Assist Bungee Rigging.

NOTE: Negative stabilizer ($-^{\circ}$) settings mean that stabilizer leading edge is moved down relative to the thrust line.

M20C & E:

a. Set stabilizer to $-3-1/2^{\circ}$ position.

b. Adjust trim assist bungees (N), Figure 6-5, at rod-end bearing (10) for elevator up angle of $19^{\circ}+1/2^{\circ}$ (1968 Models), $10^{\circ}+1^{\circ}$ (1969 Models & on).

M20F, G & J:

a. Set stabilizer to -3° position.

b. Adjust trim assist bungees (N), Figure 6-5, at rod-end bearing (10) for elevator up angle of $19^{\circ}+1^{\circ}$

NOTE: Rig trim assist bungees before installation of elevator extension springs (P), Figure 6-5, on M20F, G & J models. Elevator extension springs are not used on M20C & E models.

c. Install elevator extension springs (P), Fig. 6-5, (M20F, G & J models only)

6-4. STABILIZER TRIM SYSTEM. To provide pitch trim control, the entire empennage pivots around its main hinge points. The system consists of a manually operated actuator that operates a series of torque tubes and universal joints connected to a jack screw on the aft tail cone bulkhead.

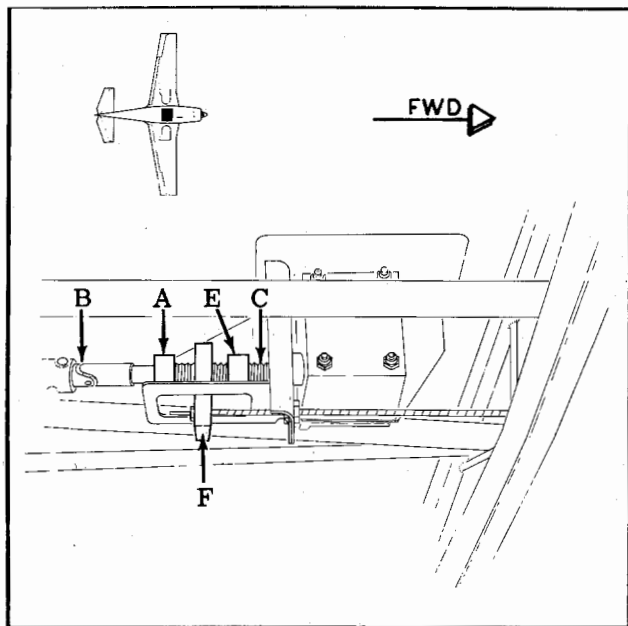


Figure 6-6. Trim Control Actuator Rigging

1. Nose Down Stabilizer Trim Control Rigging and Adjustment
 - a. Loosen setscrew in stop (A) Figure 6-6 and turn stop (A) clockwise or counterclockwise to align aft edge of stop (A) with last thread of trimscrew (C) Figure 6-6. Tighten setscrew and turn trim control wheel to full NOSE DOWN position (trim screw nut (F) against stop (A)).
 - b. Disconnect torque shaft (B) from trim screw (C), Figure 6-6.
 - c. Turn disconnected torque shaft (B) clockwise or counterclockwise until horizontal stabilizer as measured using the travel board as shown by Figure 6-7 is within the following limits.

NOTE: Positive (+°) stabilizer degrees mean that stabilizer leading edge is moved up relative to thrust line.

M20C & E to 690000: +1/2° to +1°
 M20C & E 690001 and later: +1° to +2-1/2°
 M20F, G & J 680001 and later: +1/2° to +1°

- d. Connect torque shaft (B) to trim screw (C) Figure 6-6. NOSE DOWN stabilizer trim control rigging is now complete.
2. Nose Up Stabilizer Trim Control Rigging and Adjustment
 - a. Loosen setscrew in stop (E) and turn stop on threaded shaft to move it toward the trim screw gear box. Turn trim control wheel toward NOSE UP position until horizontal stabilizer is within the following limits:

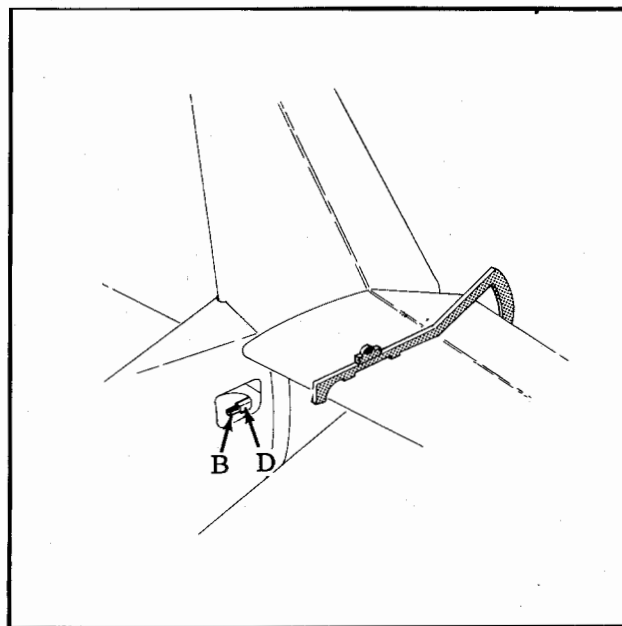


Figure 6-7. Stabilizer Trim Adjustment

NOTE: Negative stabilizer (-°) settings mean that stabilizer leading edge is moved down relative to thrust line.

M20C & E to 690000: -4-1/2° to -5°
 M20C & E 690001 and later: -5-1/4° to -5-3/4°
 M20F, G & J 680001 and later: -5-1/4° to -5-3/4°

- b. Rotate stop (E), Figure 6-6 clockwise or counterclockwise to make contact with trim screw nut (F). Tighten setscrew. NOSE UP stabilizer trim control rigging is now complete.

3. Stabilizer Trim Indicator Rigging.

Set horizontal stabilizer to the angle of incidence indicated in the chart below. Adjust trim indicator cable at (F) Figure 6-6 to set indicator in the cabin to the center of the takeoff range mark.

Angle of Incidence	Model and Serial No.
-3.5° to -4.0°	680001 F thru 680206 680001 G thru 680164
-.25° to -.75°	680001 C thru 680198C
-2.0° to -2.5°	690001 F later 690001 G later 24-0001 J & later
-1.25° to -1.75°	690001 C & later 690001 E & later

4. Allowable free play limits.

- a. Fore and aft movement at stab. tip
.24 inches.
- b. Vertical movement at stab. tip -
.20 inches.

6-5. RUDDER SYSTEM.

1. Rudder. The rudder attaches to the aft vertical fin spar at four hinge points. Push-pull tubes and bellcranks link the rudder to the rudder pedals.

2. Rudder Removal and Installation.

- Detach rudder push-pull tube from rudder horn.
- Remove attaching hardware at rudder hinges.
- Remove rudder by pulling it straight aft.
- Install rudder in reverse sequence of removal.

NOTE: If replacing rudder, it may be necessary to trim metal from lower rudder extension for clearance of trim assist bungees when nose down trim is selected.

Recheck attaching bolts for security and safety.

NOTE: Rudder bellcrank, aft tailcone, should be modified per SI M20-44.

3. Rudder Rigging and Adjustment.

- Raise aircraft nose. (A propeller yoke jack may be used.)
- Set stabilizer trim control in neutral position (stabilizer parallel with aircraft center line).

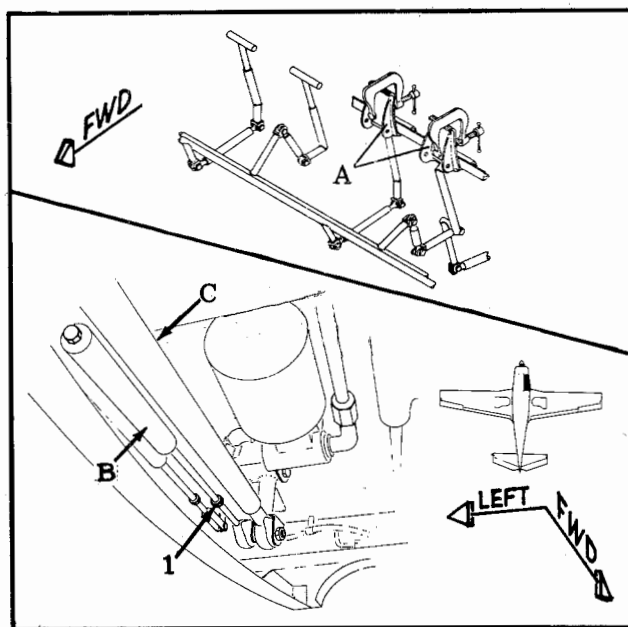


Figure 6-8. Rudder Pedal Alignment

- Clamp pilot's rudder pedals (A), Figure 6-8, in neutral position.
- Adjust nose wheel steering interconnect linkage (1), Figure 6-9, to center nose wheel.
- Adjust trim assist bungee (B), Figure 6-8, at rod-end bearing adjustment (1) in left exhaust cavity to neutral (zero spring travel).

Effective on aircraft serial numbers 680179C, 680171F and 680163G trim assist bungee is no longer used.

f. Adjust control tube (C) at rear tail cone bulkhead bellcrank, Figure 6-10, and set rudder by adjusting control tube (D), Figure 6-11, at rod end bearing (2) 1° to the right.

g. Unclamp rudder pedals.

NOTE: Rudder bellcrank, aft tailcone, should be modified per S.I. M20-44.

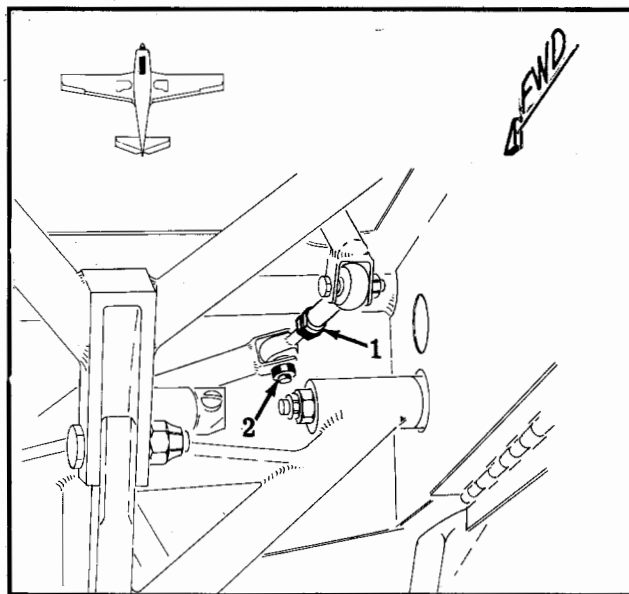


Figure 6-9. Nose Gear Steering Linkage Adjustment

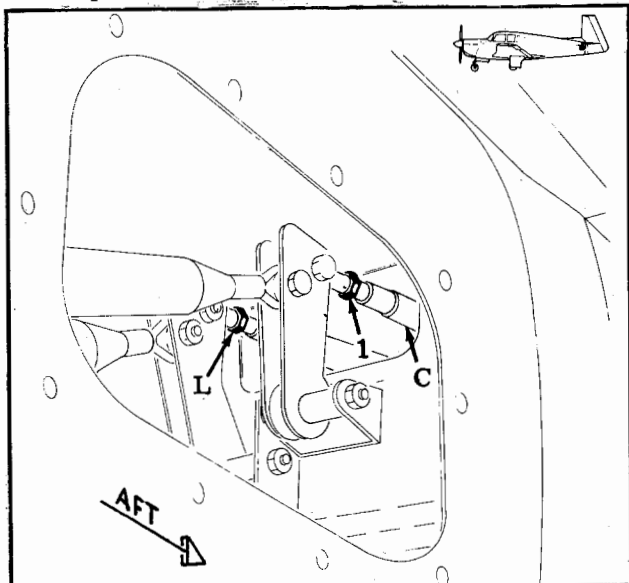


Figure 6-10. Rudder & Elevator Travel Adjustment

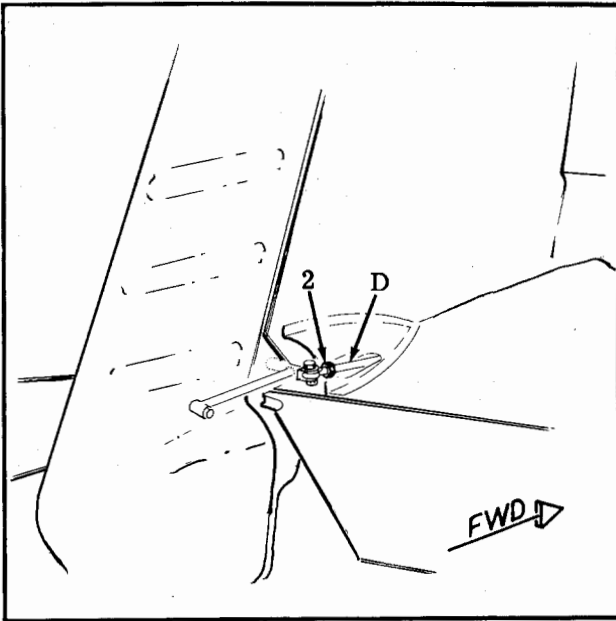


Figure 6-11. Rudder Horn Adjustment

h. Adjust rudder stops (M), Figure 6-4, so that rudder travel is $23^{\circ} + 10^{\circ}$ right and left.

NOTE: Measure rudder travel with travel board on rivet line at station indicated on travel board GSE 030005, and with longitudinal trim (stabilizer) set in the 0° position.

4. Allowable Free-Play Limits. Allowable vertical movement at rudder trailing edge is 0.16 inch.

6-6. WING FLAP SYSTEM.

1. Push-pull tubes and bellcranks interconnect the flaps. A hand-operated hydraulic pump and actuating cylinder with a relief valve comprise the flap operating system on 1968 models. Wing flaps are electrically operated for all 1969 and on models. Lubricate the electric flap actuator gear box and ball screw at intervals with lubricants prescribed by Section II.

2. Wing Flap Removal and Installation.

- Remove wing flap hinge fairing to expose flap push-pull tube.
- Remove bolt, nut, and washer from flap-actuating attachment.
- Remove bolts, nuts, and washers at flap hinge points.
- Remove flap by pulling it down and aft.
- Install wing flaps in reverse sequence of removal. Recheck security and safety of attaching bolts.

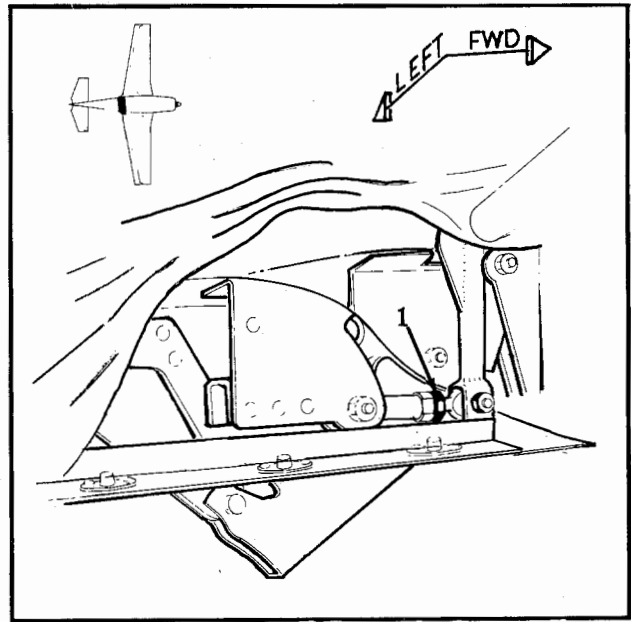


Figure 6-12. Wing Flap Adjustment

3. Wing Flap Rigging and Adjustment

NOTE: Flap deflections are to be measured with travel board GSE 030003 at the station indicated on the travel board.

- Adjust right and left inboard linkage at rod-end bearing (1), Figure 6-12, to obtain a flap deflection of $33^{\circ} + 2^{\circ}$; set flap outboard travel stops (not illustrated). On 1975 models equipped with flap pre-select position switch, adjust position control micro switch until it just deactuates.

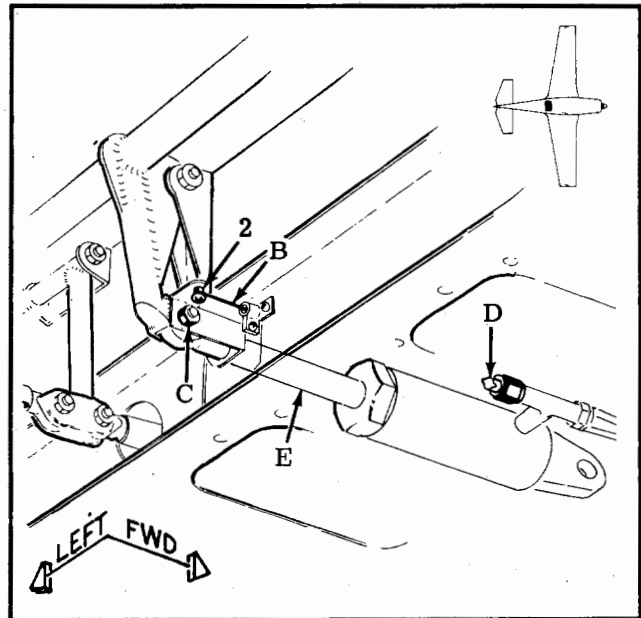


Figure 6-13. Wing Flap Indicator Adjustment

NOTE: Hydraulic Flap Actuator shown; electric flap indicator adjustment is similar.

2. Retract flaps to $15^{\circ} \pm 1^{\circ}$, and set flap position indicator cable (B) at attachment screw (2), Figure 6-13, to TAKEOFF position as shown on position indicator in cabin. (3) on 1975 models equipped with flap pre-select switch adjust position control micro switch until it just deactuates.
3. Retract flaps to $0^{\circ} \pm 2^{\circ}$; set outboard stops that flap aligns with aileron in neutral position. 1975 models equipped with flap pre-select position control micro switch until it just actively actuates.

Hydraulic Flap System Bleeding. When operation becomes erratic or when repairs require replacement of actuating components, it is necessary to bleed the hydraulic flap system. The results are achieved with the use of clean hydraulic fluid from a hydraulic fluid system bleeder (pressure pot) pressurized with air to approximately 35 to 40 pounds.

1. Remove hydraulic fluid reservoir vent cap and install pressure pot service line.
2. Disconnect hydraulic cylinder piston rod from jack shaft at (C), Figure 6-13.
3. Open bleed valve (D) in hydraulic cylinder fitting.
4. Pump cylinder piston shaft (E) and observe fluid flow from bleeder valve into catch pan.
5. When fluid clears of bubbles and runs transparent, expell air from cylinder by pushing piston to bottom.
6. Pull piston rod to re-extend piston.
7. Repeat steps e. and f. until all trace of air is removed from expelled fluid.
8. Close bleed valve and reconnect cylinder piston rod.
9. Remove pressure pot service line and drain excess fluid from reservoir through side fitting to re-establish proper fluid level.

CONTROL SURFACE STATIC BALANCING.
When repairing or repainting the control surfaces they must be rebalanced within the limits given below. Reference should be made to Figure 6-14 for a typical static balance check setup.

NOTE: All control surfaces should be stripped before repainting.

Ailerons - All M20C, E, F, G & J 680001 & later

NOTE: Maximum and minimum static unbalance moments apply only to ailerons that have been painted.

Maximum allowable static unbalance: 8.00 inch/pounds (.625 pounds or 10.00 ounces at 12.80 inches aft of hinge line).

Minimum allowable static unbalance: 5.25 inch/pounds (.41 pounds or 6.55 ounces at 12.80 inches aft of hinge line).

M20D, S/N 101 thru 260, P/N 230000.
M20E, S/N 101 - 399, 401 - 469.
M20C, S/N 1940 - 2741, 2743 - 2806.

Maximum allowable static unbalance: 9.6 inch/pounds (.753 lb. or 12 ounces at 12.80 inches aft of hinge line).

Minimum allowable static unbalance: 6.27 inch/pounds (.49 pounds or 7.9 ounces at 12.80 inches aft of hinge line).

2. Elevators

NOTE: Maximum and minimum static unbalance moments apply only to elevators that have been painted. Unbalance as referred to in this manual actually means underbalanced or trailing edge heavy.

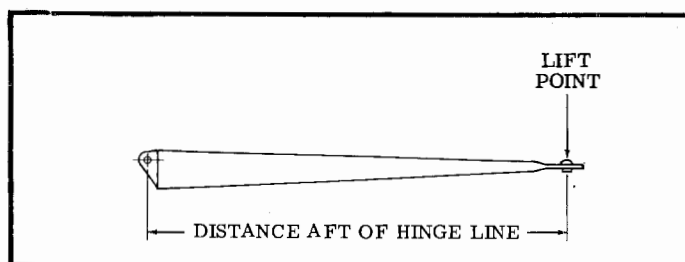


Figure 6-14. Control Surface Static Balance Diagram.

M20C 680001 thru 680180:

Maximum allowable static unbalance moment: 15.5 inch/pounds (1.22 pounds or 19.5 ounces at 12.75 inches aft of hinge line).

Minimum allowable static unbalance moment: 12.80 inch/pounds (1.01 pounds or 16.1 ounces at 12.75 inches aft of hinge line).

M20C 680181 thru 680198:

Maximum allowable static unbalance moment: 15.5 inch/pounds (1.22 pounds or 19.5 ounces at 12.75 inches aft of hinge line).

Minimum allowable static unbalance moment: 14.00 inch/pounds (1.10 pounds or 17.6 ounces at 12.75 inches aft of hinge line).

M20C & E 690001 & later
M20F & G 680001 & later
M20J 24-0001 & later

Maximum allowable static unbalance moment: 16.75 inch/pounds (1.30 pounds or 20.8 ounces at 12.87 inches aft of hinge line).

Minimum allowable static unbalance moment: 14.00 inch/pounds (1.09 pounds or 17.4 ounces at 12.87 inches aft of hinge line).

3. Rudder

NOTE: Maximum and minimum static unbalance moments apply only to rudders that are painted and have the taillight assemblies installed.

M20C 680001 thru 680198:

Maximum allowable static unbalance moment: 6.9 inch/pounds (.57 pounds or 9.1 ounces

at 12.12 inches aft of hinge line).

Minimum allowable static unbalance moment:
5.25 inch/pounds (.43 pounds or 6.9 ounces
at 12.12 inches aft of hinge line).

M20C 690001 thru 700091
M20E 690001 thru 700061
M20F 680001 thru 700072
M20G 680001 thru 700006

Maximum allowable static unbalance moment:
18.0 inch/pounds (1.47 pounds or 23.7 ounces
at 12.12 inches aft of hinge line).

Minimum allowable static unbalance moment:
13.0 inch/pounds (1.07 pounds or 17.3 ounces
at 12.12 inches aft of hinge line).

M20C 20-0001 thru 20-0009
M20E 21-0001 thru 21-0023
M20F 22-0001 thru 22-0012

Maximum allowable static unbalance moment:
20.3 inch/pounds (1.67 pounds or 26.8 ounces
at 12.12 inches aft of hinge line).

Minimum allowable static unbalance moment:
17.8 inch/pounds (1.47 pounds or 23.5 ounces
at 12.12 inches aft of hinge line).

M20C 20-0010 and later
M20E 21-0024 and later
M20F 22-0013 and later
M20J 24-0001 and later

Maximum allowable static unbalance moment:
18.0 inch/pounds (1.47 pounds or 23.7 ounces
at 12.12 inches aft of hinge line)

Minimum allowable static unbalance moment:
13.0 inch/pounds (1.07 pounds or 17.3 ounces
at 12.12 inches aft of hinge line).

6-8. CONTROL SURFACE TRAILING EDGE

TRIMMING. A special pair of wide-nose vice-grip pliers are to be used to bend the trailing edges as necessary (See Figure 6-15.) To correct for a left wing-heavy condition, bend down right aileron trailing edge; to correct for a right wing-heavy condition, bend down left aileron trailing edge. The rudder trailing edge may be trimmed right or left as required.

NOTE: The aileron trailing edge must not be bent up under any circumstance. All open-head rivets must be replaced after trimming aileron or rudder trailing edge.

6-9. POSITIVE CONTROL SYSTEM DESCRIPTION. The P.C. system is a pneumatically-operated two-axes automatic-control mechanism

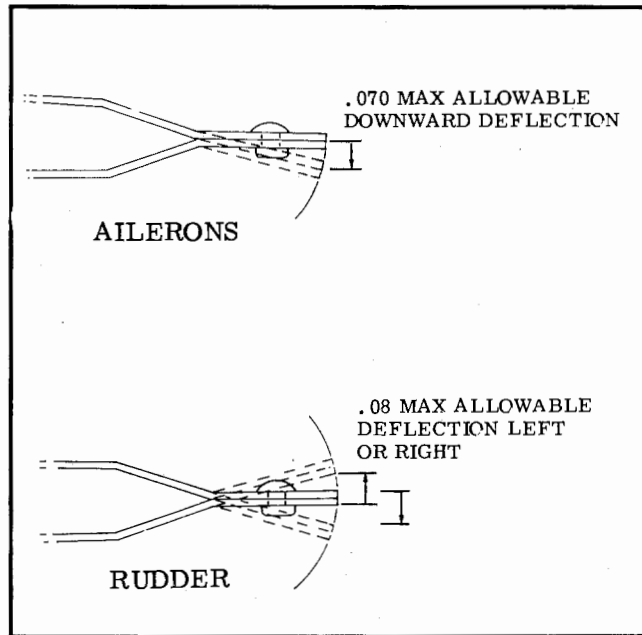


Figure 6-15. Trailing Edge Trimming

that senses both roll and yaw in flight. The engine-driven vacuum pump is the power source. The P.C. system consists basically of a gyro-sense element in the turn coordinator, which meters vacuum to cylinder-piston servos. The system has four servo units: one servo attaches to each outboard aileron bell crank and two attach to the rudder control tubes in the tail cone. A pushbutton disconnect valve in the pilot's control wheel operates a pneumatic relay, supplying vacuum to the gyro-sense element. 1975 & on models have an electrically operated valve controlled by a momentary type switch on the control wheel. Depressing the pushbutton relieves all servo vacuum and the system immediately becomes inoperative.

Releasing the pushbutton reactivates the system. The turn coordinator tilted-axes gyro-rotor is the roll and yaw sense element in the P.C. system. This tilted rotor permits a part of the rolling rate and a part of the yawing rate to act on the sensitive gyro-rotor element, producing an output signal that feeds to a spool-sleeve rotary valve. The spool rotates inside the sleeve in response to both yawing and rolling rates, moving to a position between a vacuum supply port and one of the vacuum output ports. The other output port is then open to atmosphere, bleeding vacuum. A vacuum differential is thereby directed to the proper pneumatically operated servo to correct the original aircraft roll or yaw error. In straight wings-level flight the spool centers, vacuum differential is zero, and the servos balance right and left.

The aircraft must be rigged to fly wings-level with the turn coordinator centered and with the

P.C. system disengaged. A properly rigged and trimmed aircraft should hold an average heading over a fairly long period of time; however, P.C. cannot be expected to maintain an absolute pre-selected heading without a magnetic heading lock installation. The addition of an omni-coupler unit and a pitch and altitude control unit provides a three axes autopilot.

Maintenance and service instructions in this section of the manual pertain to the two-axes (roll and yaw) Positive Control system. Separate manuals deal with the Dynertial Pitch Control and the Magnetic Heading Lock units.

6-10. P.C. SYSTEM GROUND TESTING.

1. Check all vacuum lines for kinks and sharp bends.
2. Purge all lines of foreign material.

WARNING: Do not operate P.C. system if its lines are disconnected from its servo units. Do not release aircraft for flight with servo unit bibs capped or lines plugged. Expansion within servo cylinder may cause piston to block movement of ailerons when aircraft is flown to altitude.

3. Start engine and increase RPM to 1700 (or connect an outside vacuum source to engine side of vacuum regulator).
4. Perform primary vacuum test by installing vacuum gage (B), Figure 6-16, and adjusting vacuum regulator (A) to 4.75 ± 0.25 IN. Hg.

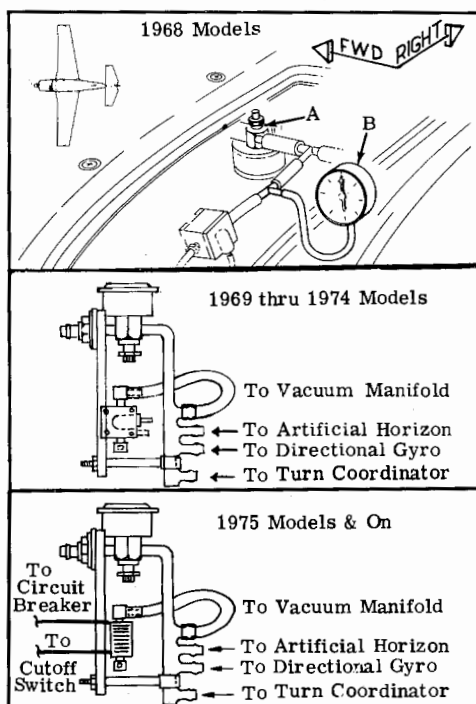


Figure 6-16. Primary Vacuum Test

5. To check cutoff valve operation on 1968 thru 1974 models, disconnect gray line (C), Figure 6-17, at pilot valve. Attach a T-fitting with a vacuum gage (B), to cutoff valve line.
6. Apply five inches of suction to open fitting end and hold. Cutoff valve should not leak more than two IN. Hg in 30 seconds.
7. Depress cutoff valve on control wheel. Vacuum should drop immediately. If drop is not prompt, check cutoff valve and tubing for restriction.

8. To check pilot valve operation on 1968 thru 1974 models, disconnect gray line (E), Figure 6-18, on sequenced vacuum side of pilot valve and connect a 0 to 10 IN. Hg vacuum gage (B). Apply vacuum and leave cutoff valve in normal position (closed); gage should read 4.0 + IN. Hg with primary vacuum at 5 IN. Hg as obtained in step 4. To check electric dump solenoid valve on 1975 models and on, disconnect black line (E), Figure 6-18, on sequenced vacuum side of electric dump valve and connect a 0 to 10 IN. Hg vacuum gage (B). Apply vacuum and leave cutoff switch in normal position; gage should read 4.0 + IN. Hg with primary vacuum at 5 IN. Hg as obtained in step 4.

9. Depress pushbutton on control wheel; the gage should drop to zero IN. Hg. If vacuum is not relieved and gage still indicates vacuum, pilot valve or electric dump solenoid valve (1975 & on models) is not shutting off completely and should be replaced.

10. Manually turn roll trim knob counter-clockwise as far as possible; control wheel should move to left. Turn roll trim knob clockwise as far as possible; control wheel should move to right.

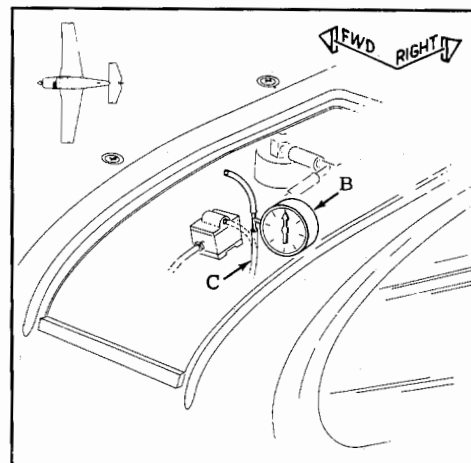


Figure 6-17. Cutoff Valve Test

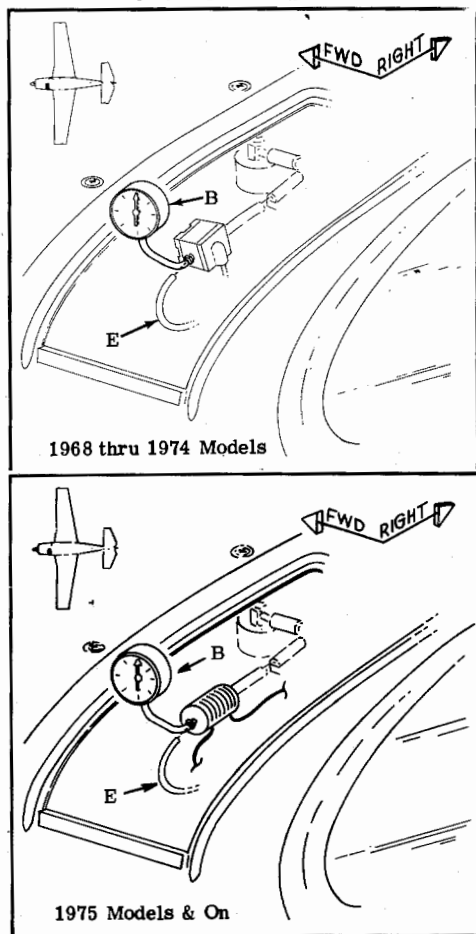


Figure 6-18. Pilot Valve Test

11. Center roll trim knob.

NOTE: If turn coordinator is removed (requiring removal of the roll-trim knob) and re-installed, knob should be centered with same degree of rotation right and left.

6-11. P.C. SYSTEM FLIGHT TESTING.

1. While taxiing, yaw aircraft to left; control wheel should turn to right. Yawing aircraft to right should cause control wheel to turn left. If phasing is reversed, red and green tubing at turn coordinator is reversed.

2. While aircraft is standing still, rotate control wheel against servo-force. Depress cutoff valve button; force required to overpower servos should be immediately relieved.

3. Climb to a safe altitude in smooth air and trim aircraft for straight-and-level flight at cruise configuration.

NOTE: If it is apparent that aircraft is not properly rigged, rerig control systems before continuing flight test.

4. Depress pushbutton cutoff valve; system should immediately become inoperative. Release button; system should re-engage.

5. Depress pushbutton and command a standard-rate turn. Release pushbutton; air-

craft should recover promptly and smoothly.

6. Repeat step 5. for opposite turn.

7. Fully deflect roll-trim knob to one side. Resulting turn should be approximately 1/4 of a standard-rate turn, and aircraft should recover when knob is returned to original position.

NOTE: The system may be overridden indefinitely with no resulting harm to either aircraft or P.C. system. Required overpowering forces should be light. A vacuum decrease will result in decreasing P.C. system responsiveness. Complete vacuum failure will render system inoperative with no adverse effect on aircraft airworthiness.

8. Upon completing flight test, make an entry in aircraft log to the effect that Positive Control system has been test flown and evaluated for proper function by an appropriately rated pilot. (Refer to FAR part 91.167A.)

6-12. P.C. SYSTEM MALFUNCTION ANALYSIS.

The following procedures may be followed as a step-by-step analysis of P.C. components directed toward pinpointing malfunctions.

1. Vacuum Settings:

- Start engine and increase RPM to 1700.
- Adjust vacuum regulator to obtain $4.75 \pm .25$

IN. Hg at vacuum regulator (Figure 6-16).

2. Vacuum Line and Servo Leak Test:

- Visually inspect all tubes for kinks, sharp bends, restrictions, and breaks.
- Disconnect tubing from back of turn coordinator and install vacuum-test gage (B), Figure 6-19, in open end of servo vacuum tubes (F), Figure 6-19, and (D), Figure 6-20.

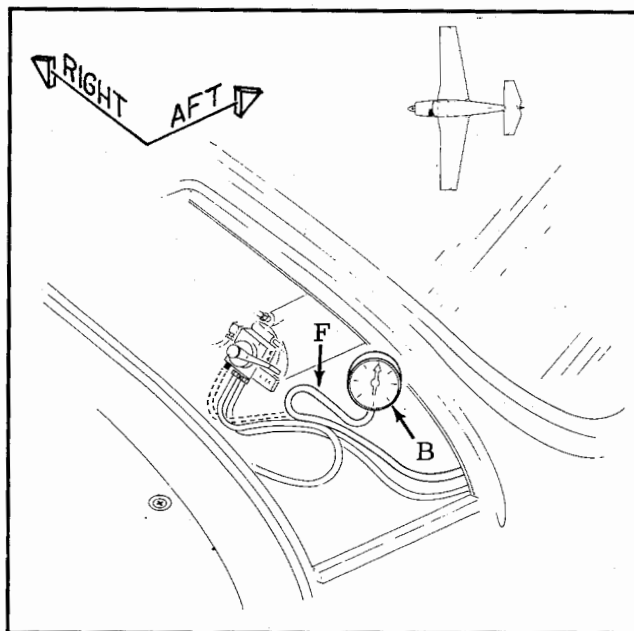


Figure 6-19. Left-Turn Servo Leak Test

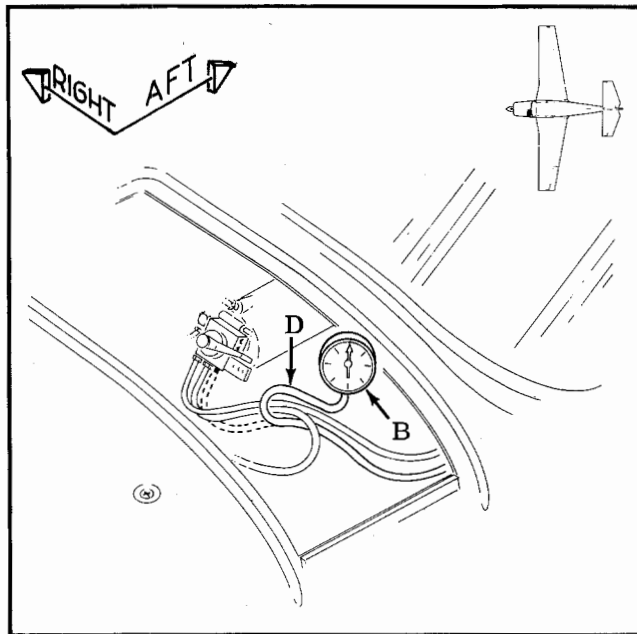


Figure 6-20. Right-Turn Servo Leak Test

c. Rotate controls to extend servo piston connected to tube in which vacuum gage is installed. Read vacuum gage. Firmly hold control to prevent piston movement; vacuum reading must remain constant. If vacuum drops, locate and repair leak. Repeat procedure until all servos have been tested.

d. Pressure leak test entire system following vacuum leak check by inserting a T-fitting in servo line and pressurizing line with two IN. Hg positive pressure.

e. Remove and plug tubes at roll-trim valve, check tubes for leaks, and remove plugs.

f. Reinstall all tubes making sure that all connections are tight and leak-free.

3. Gyro Operation Test:

a. Center roll-trim knob.

b. Disconnect red and green tubing from back of turn coordinator. Connect a 0-10-0 IN. Hg vacuum differential gage across the two bibs. Apply vacuum to P.C. system.

c. Yaw aircraft. Note pointer deflection on vacuum differential gage indicating rate of

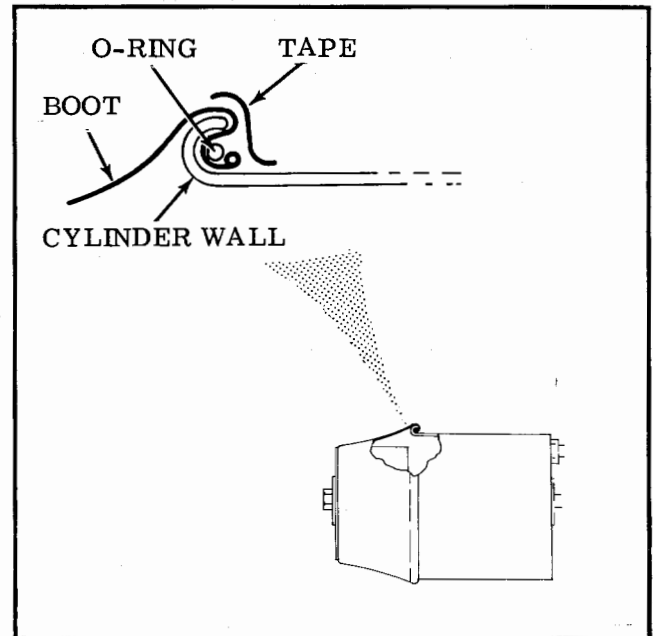


Figure 6-21. Servo Cylinder Seal Wrapping

turn coordinator gyro deflection. When aircraft stops yawing, gyro should come back to center within ± 0.2 IN. Hg as indicated on vacuum differential gage. Replace turn coordinator if it does not center within tolerance.

4. Installation Inspection:

a. Rotate control wheel and move rudder pedals. Servo attachments must be tight, and servo pistons must extend without stretching rubber seals. Inspect servo piston seals for deterioration and condition of tape around perimeter. If tape has deteriorated or if cylinder is leaking, retape seal to cylinder wall as shown in Figure 6-21 using Scotch #33 Electrical Tape.

b. Examine aircraft primary control system for friction in control linkage or hinges. Lubricate flight control systems as outlined in Section II.

c. Check chain links for twisting between servos and bell cranks.

d. Check tube routing and color coding.

6-13. P.C. SYSTEM TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Insufficient or excessive vacuum.	Faulty vacuum pump or regulator.	Check vacuum as described in paragraph 6-12. 1., and adjust vacuum if necessary.
	Dirty filter.	Clean or replace filter.

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P.C.SYSTEM TROUBLE SHOOTING (CCNT)

TROUBLE	PROBABLE CAUSE	REMEDY
Aircraft does not hold directional heading.	Faulty servo.	Perform servo leak test as described in paragraph 6-12. 2.
	Incorrect flight trim or basic aircraft rigging.	Adjust aircraft trim controls and P.C. roll-trim knob, or rerig aircraft.
	Excessive friction in system.	Examine primary control system to locate excessive friction. Lubricate all hinge points.
	Improper vacuum at valves and instruments.	Perform steps 6-12. 1. & 2., and adjust vacuum.
Aircraft recovers in one direction but not in other.	Faulty turn coordinator.	Perform step 6-12. 3.
	Restriction or leak in servo line.	Perform step 6-12. 2.
	Loose or disconnected servo link chain.	Perform step 6-12. 2.
Aircraft tends to roll to one side.	Faulty servo.	Perform step 6-12. 2.
	Leak or partial restriction in servo vacuum line.	Perform step 6-12. 2.
	Improper turn coordinator operation.	Perform step 6-12. 3.
Continuous control wheel oscillation in smooth air.	Faulty servo.	Perform step 6-12. 2.
	Vacuum setting too high.	Perform step 6-12. 1.
Slow turn recovery from one direction only.	Excessive friction in primary control systems.	Examine primary control system to locate excessive friction. Lubricate all hinge points.
	Leak or partial restriction in servo vacuum line.	Perform step 6-12. 2.
	Loose or disconnected servo link.	Perform step 6-12. 2.
	Faulty servo.	Perform step 6-12. 2.
Aircraft hunts in flight.	Servo vacuum line leaks or is partially obstructed.	Perform servo leak test as described in paragraph 6-12. 2
	Improper vacuum to valves and instruments.	Check vacuum as described in paragraph 6-12. 1., and adjust vacuum if necessary.

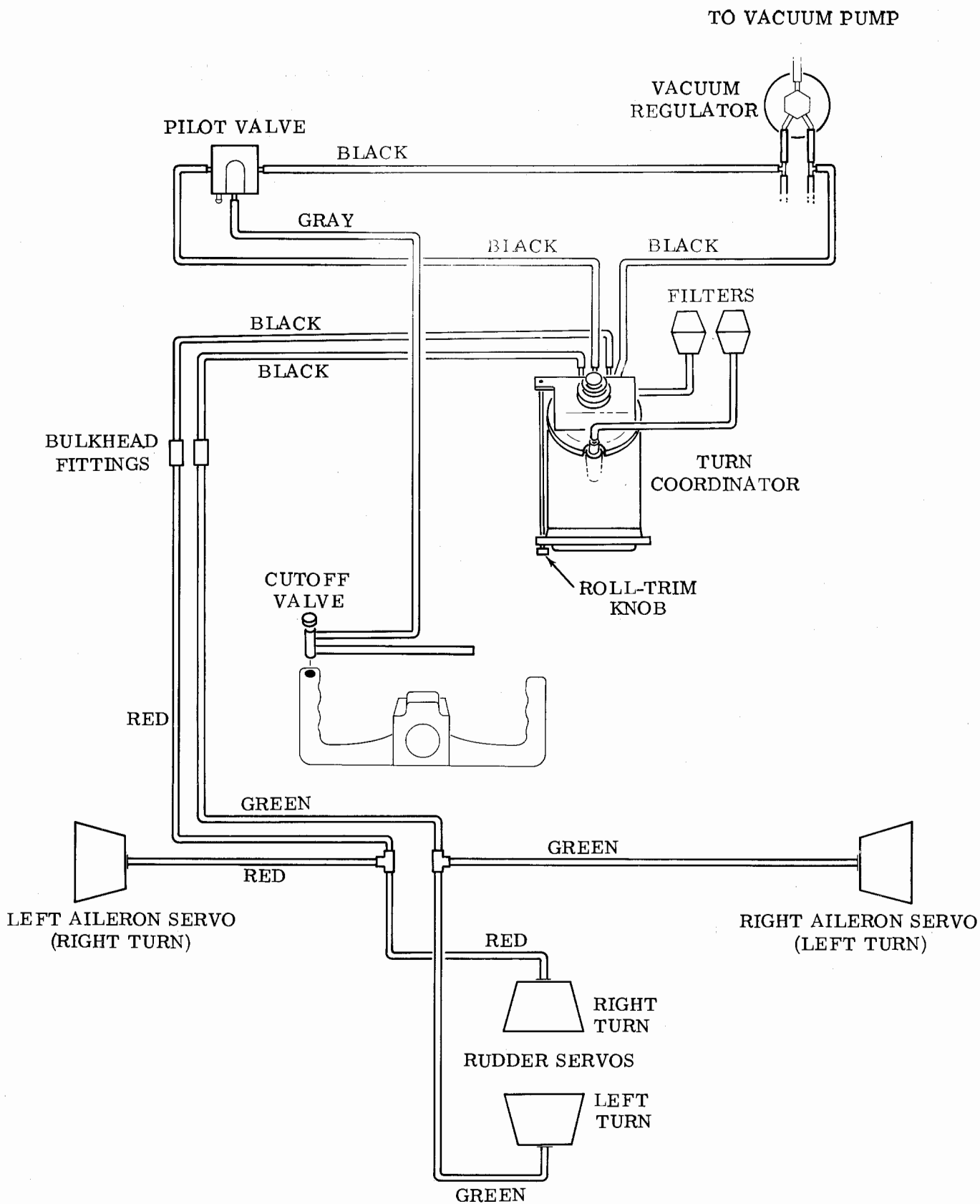


Figure 6-22. P.C. System Schematic
1968 thru 1974 Models

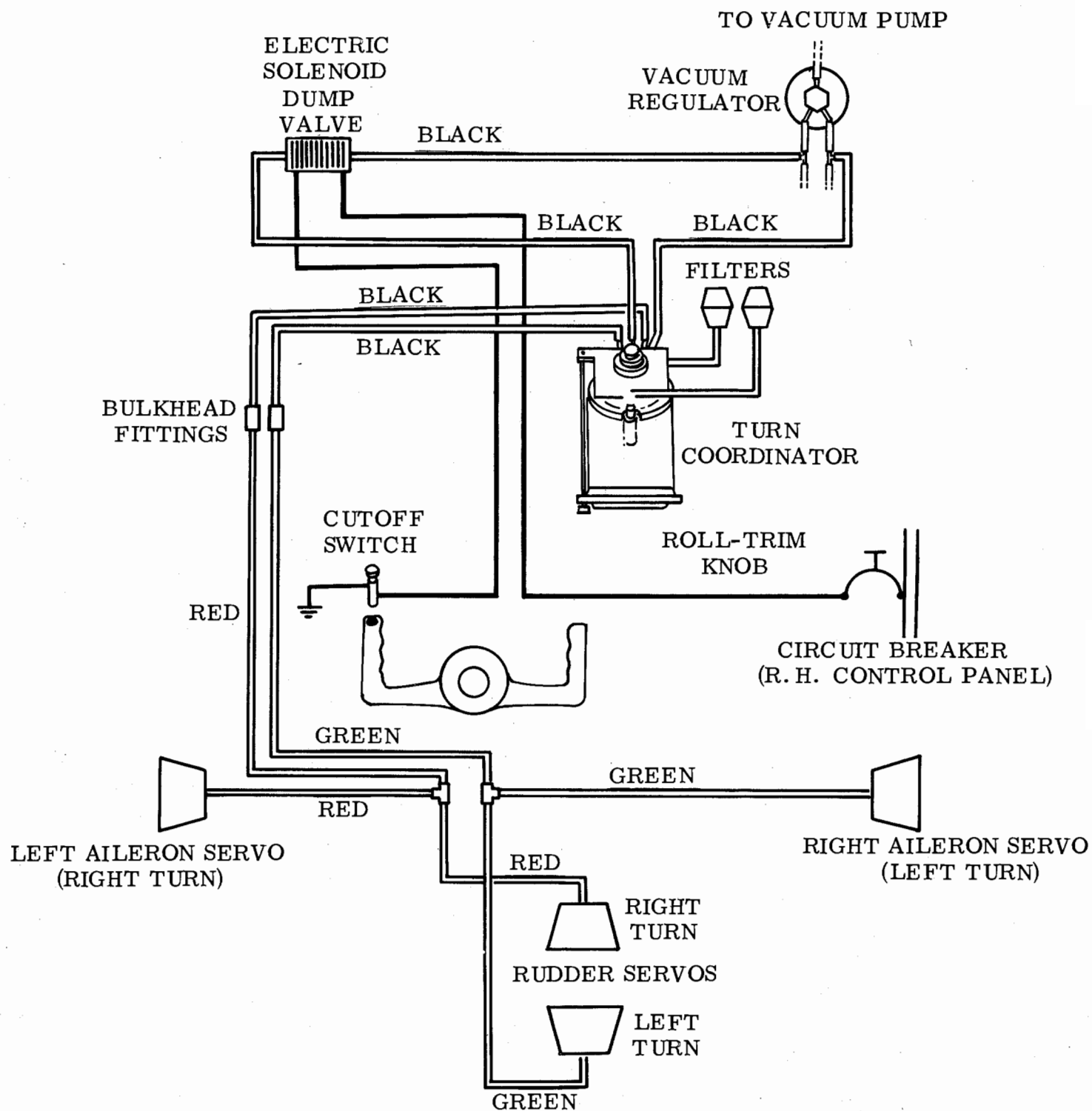


Figure 6-23. P.C. System Schematic
1975 Models & On

SECTION VII. INSTRUMENTS

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7-1. INSTRUMENT LOCATIONS. The instrument panel is designed to provide functional grouping of all flight, radio, and engine instruments. All flight instruments are grouped on the shock-mounted panel directly in front of the pilot. The radio control panel is at the center of the instrument panel.

CAUTION: Radio equipment requires stacking from the bottom up for proper support.

Power plant instruments are grouped on the co-pilot's panel. Flap and stabilizer position indicators are on the lower center console.

7-2. FLIGHT INSTRUMENTS. Flight instruments operate: (1) by air drawn into an evacuated case, (2) by barometric pressure or barometric-impact air pressure differences, (3) by variations in electric current due to mechanically varied resistance, or (4) by reference to the earth's magnetic field.

1. **Airspeed Indicator.** The airspeed indicator registers airspeed in miles per hour and/or

knots. The impact air pressure difference between the pitot tube and the static ports on each side of the tail cone operates the airspeed indicator. An optional electrically heated pitot head prevents ice obstruction in flight. The airspeed indicator dial markings are as follows:

M20C & E (1968)

Radial red line--189 MPH CAS.
Yellow arc--150 to 189 MPH CAS.
Green arc--70 to 150 MPH CAS.
White arc--63 to 125 MPH CAS.

M20C, E, F & G 1969 & ON:

Radial red line--200 MPH CAS.
Yellow arc--175 to 200 MPH CAS.
Green arc--70 to 175 MPH CAS.
White arc--63 to 125 MPH CAS.

M20J

Radial red line 225 MPH CAS. (195 KCAS)
Yellow arc 200-225 MPH CAS. (174-195 KCAS)
Green arc 68-200 MPH CAS. (59-174 KCAS)
White arc 61-125 MPH CAS. (53-109 KCAS)

2. Turn Coordinator. The turn coordinator is a gyro instrument that indicates control coordination and degree of bank. This instrument is simultaneously vacuum and electrically driven. (Pre 1975 models) 1975 and later models were electrically driven. Electrical power is supplied by an inverter installed on the left side of the fuselage forward of the instrument panel. The turn coordinator supplies vacuum inputs to the P.C. servos. Turning the roll-trim knob on the turn coordinator trims the ailerons.

3. Vertical Speed Indicator. The optional vertical speed indicator converts barometric pressure changes in the static vent lines to aircraft ascent or descent rate readings in feet per minute. This indicator has a single needle and two adjoining scales that read from 0 to 4000 feet per minute. The recessed, slotted screw at the lower left of the instrument case is used to "zero" the indicator when the aircraft is on the ground.

4. Directional Gyro Compass. This vacuum-operated instrument indicates the heading reference. The directional gyro rotor is air driven and rotates with its spin axis horizontal. The knob is used to reset basic directional heading. Vacuum pressure for satisfactory operation is $4.25 \pm .2$ to $5.0 \pm .2$. The vacuum system filters should be changed each 500 hours or at one-year intervals, whichever occurs first. (See Trouble Shooting Chart, paragraph 7-8, for maintenance instructions.)

5. Artificial Horizon. The vacuum-powered artificial horizon gyro indicates aircraft attitude relative to straight-and-level flight. Maintenance is similar to that required for the directional gyro compass.

6. Altimeter. The altimeter operates by absolute pressure, and converts barometric pressure to altitude reading in feet above mean sea level. The altimeter has a fixed dial with three pointers to indicate hundreds, thousands, and tens-of-thousands of feet. Barometric pressure is sensed through the static vents. A knob adjusts a movable dial, behind a small window in the face of the main dial, to indicate local barometric pressure and to correct the altimeter reading for prevailing conditions.

7. Clock. A conventional eight-day clock is installed in the pilot's control wheel. The knob at the lower left is used to set and wind the clock. 1975 and later models have clock mounted in left side of instrument panel and may be either mechanical or electrical.

8. Magnetic Compass. The magnetic compass dial is graduated in five-degree increments

and is encased in a liquid-filled glass and metal case. The unit mounts on the windshield center post above the instrument glare shield. The compass should be swung and compensated at each annual inspection and whenever new equipment is installed. To compensate for N-S deviation, adjust left screw; to compensate for E-W deviation, adjust right screw.

NOTE: Check for outside magnetic influences if excessive compensation is required.

9. Trim Indicator. This indicator is geared to the stabilizer trim control wheel and indicates stabilizer position relative to the aircraft thrust line.

10. Flap Position Indicator. This instrument indicates the degree of flap deflection from 0° to 33° , with a 15° takeoff setting. A cable attached to the flap actuator operates the flap-position indicator. (For adjustment and test, refer to paragraph 6-6.)

11. Prestall Warning System. The stall-warning switch, actuated by the stall-warning vane in the left wing leading edge, is set to trip at 5 to 10 MPH above stalling speed. Moving the switch in its mount adjusts its actuation.

NOTE: Do not attempt to adjust prestall-warning speed by bending the vane. This part has been heat treated and cannot be bent without damaging or breaking the vane.

7-3. POWER PLANT INSTRUMENTS. Power plant instruments operate electrically through variations in resistance caused by pressure or temperature changes, by variations in current output caused by varying engine RPM or alternator output, or by pressure from engine induction system.

1. Ammeter. (ALL MODELS)

- a. Range-- + 60 to - 60 AMPS.
- b. Tolerance-- ± 1.2 AMPS.

2. Fuel Pressure Gage.

M20C & G:

- a. Range--0 to 10 PSI.
- b. Radial red line (MIN)--0.5 PSI.
- c. Radial red line (MAX)--6.0 PSI.
- d. Green arc, wide--2.5 to 3.5 PSI.
- e. Green arc, narrow--0.5 to 6.0 PSI.

M20E, F & J:

- a. Range--0 to 80 PSI or 0 to 35 PSI.
- b. Green arc--14 to 30 PSI.
- c. Red line--(Maximum) 30 PSI.
- d. Red line--(Minimum) 14 PSI.

3. Oil Temperature Gage.

- Green arc--150° to 225° F.
- Red line--245° F.
- Tolerance-- $\pm 3^{\circ}$ F.

4. Oil Pressure Gage.

- Green arc--60 to 90 PSI.
- Yellow arc--(Idling range) 25 to 60 PSI.
- Yellow arc--(Starting & warmup) 90 to 100 PSI.
- Red line--25 PSI MIN, 100 PSI MAX.

5. Tachometer.

M20C & G:

- Narrow green arc--2300 to 2700 RPM.
- Wide green arc--2300 to 2500 RPM.
- Red arc--2000 to 2250 RPM.
- Red line--2700 RPM.

M20E & F:

- Narrow green arc--2500 to 2700 RPM.
- Wide green arc--2350 to 2500 RPM.
- Red arc--2100 to 2350 RPM.
- Red line--2700 RPM.

M20J: (77 Model)

- Narrow green arc--2500 to 2700 RPM.
- Wide green arc--1950 to 2500 RPM.
- Red line--2700 RPM.
- Yellow arc--1600 to 1950 RPM.

M20J (78 & On Model)

- Green arc 1950-2700 RPM.
- Red line 2700 RPM.
- Yellow arc 1500-1950 RPM.

6. Cylinder Head Temperature Gage.

M20C & G:

- Green arc--30° to 450° F.
- Red line--500° F.

M20E, F & J:

- Green arc--300° to 450° F.
- Red line--475° F.

7. Manifold Pressure Gauge

- Normal operating range 10.0 IN Hg to 40.0 IN. Hg.
- Red line 40.0 IN. Hg.

7-4. MISCELLANEOUS INSTRUMENTS.

1. Fuel Quantity Indicator. Two fuel quantity gages are on the co-pilot's instrument panel in the instrument cluster gage. These gages indicate pounds of fuel remaining. Each gage operates by the changes in resistance at transmitters located in the fuel tanks. (See paragraph 4-2 for adjustment and maintenance information.)

2. Exhaust Gas Temperature (Mixture) Indicator (if installed). A thermocouple, attached an exhaust stack, controls and is electrically connected to the EGT gage. As the exhaust

gas temperature rises, the thermocouple sends current through the field coils of the instrument, moving the pointer to indicate temperature rise.

3. Outside Air Temperature Gauge. Provides the pilot with the free stream outside air temperature in degrees centigrade.

7-5. VACUUM SYSTEM. The vacuum system powers the directional gyro, the artificial horizon, the P.C. system, and the retractable step. The system is comprised of a dry-air vacuum pump, a regulating valve, a manifold assembly with HI & LO switches, filters, and hoses leading to the instruments. Warning lights or a vacuum gage indicate high or low vacuum.

1. Vacuum Pump. The vacuum pump is a dry-air pump requiring no maintenance between engine overhauls. Replacement is recommended at engine overhaul.

CAUTION: Do not allow lubricants of any kind to enter the vacuum pump. Do not use thread lube on vacuum system fittings.

2. Vacuum Filter. Replacement of the vacuum filters is recommended at 500 hours or at one-year intervals, whichever occurs first. Under dusty operating condition, the vacuum filters should be replaced each 100 hours.

3. Vacuum Regulator Valve. The regulator valve is on the left firewall.

NOTE: Adjust vacuum regulator valve to 4.75 ± 0.25 IN. Hg at 1700 engine RPM.

7-6. PITOT & STATIC AIR PRESSURE SYSTEM. Static pressure instruments are extremely sensitive to pressure changes; therefore, the pitot and static system must be kept free from moisture and obstructions. Drain the pitot and static systems after humid or wet weather. If instrument operation is erratic or inoperative after draining:

- Remove lines from instruments.
- Cap instrument inlets.
- Clear lines with dry, low-pressure compressed air injected at instrument end of lines.
- Check pitot system.
 - Slip end of a short rubber hose over pitot head.
 - Close open end of hose; double and squeeze hose until airspeed indicator reads 150 MPH.
 - Clamp hose and hold for one minute.

d. If airspeed indicator falls more than 10 MPH, check system for leaks and tighten line fittings.

e. Repeat steps b., c., and d. until obtaining less than a 10 MPH indicator reading drop.

7-7. COMPASS TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive card error.	Compass not properly compensated.	Compensate instrument.
	External magnetic interference.	Locate magnetic interference and eliminate if possible.
Excessive card oscillation.	Improper instrument mounting.	Align instrument.
	Insufficient liquid.	Replace instrument.
Sluggish card.	Weak card magnets.	Replace instrument.
	Excessive pivot friction or broken jewel.	Replace instrument.
	Instrument too heavily compensated.	Correct excess compensation.
Liquid leakage.	Loose bezel screws.	Replace instrument.
	Broken cover glass.	Replace instrument.
	Defective sealing gaskets.	Replace instrument.
Discolored luminous markings or discolored damping liquid.	Age.	Replace instrument.
Defective light.	Burnt out lamp or broken circuit.	Check lamp or wiring continuity.

7-8. DIRECTIONAL GYRO TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive drift in either direction.	Dirty air filter (high vacuum indication).	Inspect filter. Replace if necessary.
	Excessive vibration.	Test with vibrometer. If amplitude is more than .004 inch, examine shock mountings to see if connections are pulling on instrument.

DIRECTIONAL GYRO TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Dial spins continuously in one direction.	Insufficient vacuum. If vacuum indication is below 4.25 IN. Hg, check as follows:	Correct for insufficient vacuum as follows:
	1. Vacuum regulating valve improperly adjusted.	1. Adjust vacuum regulating valve.
	2. Pump failure.	2. Repair or replace pump.
	3. Vacuum line kinked, leaking, or too long for its diameter.	3. Locate and if defective, replace or repair vacuum line. Check for collapsed inner wall of flexible hose
	Defective mechanism (worn or dirty pivots and bearings).	Replace instrument.
	Operating limits have been exceeded.	Reset the instrument with the aircraft in level flight.
	Defective mechanism.	Replace instrument.

7-9. GYRO-HORIZON TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Horizon bar does not respond.	Dirty air filter (high vacuum indication).	Examine filter and clean or replace if necessary.
	Insufficient vacuum resulting from the following:	Correct insufficient vacuum as follows:
	1. Vacuum regulating valve improperly adjusted.	1. Adjust valve.
	2. Faulty vacuum gage.	2. Check gage calibration.
	3. Pump failure.	3. Repair or replace pump.
	4. Vacuum line kinked, leaking, or too long for its diameter.	4. Locate and repair. Check for collapsed inner wall of flexible hose.
Horizon bar does not settle.	Defective mechanism.	Replace instrument.
	Insufficient vacuum.	Correct for insufficient vacuum as outlined above.

GYRO-HORIZON TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
	Excessive vibration.	Test with vibrometer. If amplitude is more than .004 inch, examine installation to determine whether flexible hose connections are restricting movement of instrument. Examine shock mountings and replace if necessary.
Horizon bar oscillates or vibrates excessively.	Excessive vacuum resulting from the following:	Correct for excessive vacuum as follows:
	1. Dirty air filter.	1. Examine filter and clean or replace if necessary.
	2. Vacuum regulating valve improperly adjusted.	2. Adjust valve.
	3. Defective mechanism.	3. Replace instrument.
	4. Excessive vibration.	4. Test with vibrometer. If amplitude is more than .004 inch, examine installation to determine whether flexible hose connections are restricting movement of instrument. Examine shock mountings and replace if necessary.

7-10. ALTIMETER TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Excess scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation.	Defective mechanism.	Replace instrument.
High reading,	Static pressure system leak.	Eliminate leak in static pressure system.
Setting knob is hard to turn.	Wrong lubricant or lack of lubrication.	Replace instrument.
Inner reference marker fails to move when setting knob is rotated.	Marker out of engagement.	Replace instrument.
Setting knob setscrew is loose or missing.	Excessive vibration.	Tighten instrument screw if loose. Replace instrument if screw is missing.

ALTIMETER TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Cracked or loose cover glass.	Excessive vibration.	Replace instrument.
Dull or discolored luminous markings.	Age.	Replace instrument.
Barometric scale and reference markers out of synchronization with pointers.	Shift in mechanism.	Reset pointers.
Barometric scale and reference markers are out of synchronization.	Slippage of mating parts.	Replace instrument.

7-11. AIRSPEED INDICATOR TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Static instrument pointers do not indicate properly.	Leak in instrument case or in static lines.	Check for leak and seal lines.
Instrument pointer oscillates.	Leak in instrument case or in pitot lines.	Check for leak and seal lines.

7-12. TURN COORDINATOR TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Pointer fails to respond.	Foreign matter lodged in instrument.	Replace instrument.
	No electric current or vacuum	Check voltage at instrument. Check vacuum system.
Bar does not set level.	Gimbal and rotor assembly out of balance.	Replace instrument.
	Bar incorrectly set on its staff.	Replace instrument.
Vibrating bar.	Gimbal and rotor assembly out of balance.	Replace instrument.

TURN COORDINATOR TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
	Pitted or worn pivots or bearings.	Replace instrument.
In low temperature, bar fails to respond or responds sluggishly and with insufficient deflection.	Oil has become too thick.	Replace instrument.
	Insufficient bearing clearance.	Replace instrument.
Bar sluggish in returning to level and does not set on level when stationary.	Oil or dirt between damping pistons and cylinders.	Replace instrument.
	Excessive clearance between rotor and rotor pivots.	Replace instrument.

7-13. RATE-OF-CLIMB INDICATOR TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Pointer does not set on zero.	Aging of diaphragm.	Turn setting knob to reset pointer at zero. Tap instrument while resetting.
Pointer fails to respond.	Obstruction in static line.	Disconnect all instruments connected to the static line. Check each individual instrument for leaks. Test lines for leaks.
Pointer oscillates.	Leaks in static line.	Disconnect all instruments connected to the static line. Check individual instruments and test installation for leaks.
	Defective mechanism.	Replace instrument.

7-14. MANIFOLD PRESSURE TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive error at existing barometric pressure.	Pointer shifted.	Replace instrument.
Excessive error when engine is running.	Line leaking.	Tighten line connections.
Sluggish or jerky pointer movement.	Improper damping adjustment.	Adjust damping screw.
Broken or loose cover glass.	Vibration or excessive pressure.	Replace glass and reseal case
Dull or discolored luminous markings.	Age.	Replace instrument.
Incorrect reading.	Moisture or oil in line.	Disconnect lines and purge with air.

7-15. TACHOMETER TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
No permanent or intermittent indicator reading.	Broken shaft.	Replace shaft.
	Faulty instrument.	Replace instrument.
Pointer oscillates excessively.	Rough spot on, or sharp bend in shaft.	Repair or replace shaft.
	Excessive friction in instrument.	Replace instrument.

7-16. HEATED PITOT TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Tube does not heat or clear itself of ice with switch on.	Switch circuit breaker out.	Reset circuit breaker.
	Open circuit.	Repair.
	Excessive voltage drop between battery and pitot head.	Check voltage at pitot head.
	Heating element burned out.	Replace pitot head.

SECTION VIII. DISASSEMBLY, CORROSION CONTROL & PAINTING

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8-1. GENERAL. This section of the manual discusses recommended procedures for disassembly of major airframe components, and the treatment of metal surfaces for corrosion control. Structural repair of Mooney all-metal aircraft must be acceptable to the FAA Administrator. Those who inspect or repair aircraft should consult FAR 43 (Maintenance, Preventive Maintenance, Rebuilding and Alteration) and subparts A, D and E of FAR 65 (Certification). AC 43.13-1 outlines inspection and repair practices acceptable to the FAA Administrator.

8-2. WING REMOVAL. The major subassemblies of the wing may be removed individually, or the wing may be removed as a unit. To remove a wing, a fuselage supporting cradle is needed.

1. Wing Removal.

- Remove wing-root fairings and bottom fuselage access panels.
- Drain all gasoline from fuel tanks.
- Drain brake lines and reservoir. Disconnect hydraulic lines at wing main spar.
- Remove front and rear seats. Remove the two inspection plates under rear seat area.

- Jack aircraft.
- Attach A-frame hoist to propeller.
- Disconnect or remove the following:
 - Two landing gear assist springs.
 - Flap hydraulic line at pump fitting.
 - Flap-indicator housing in cabin.
 - Aileron control tubes at inboard bell cranks.
- Trim control tube at station 59.3 and 94.5.
 - Main gear retraction tubes.
 - Rudder control tubes.
 - Elevator control tube.
 - Elevator and rudder push-pull tubes.
 - Floorboards at rear attach points.
 - Seat rails at rear attach points.
 - Belly skin stringer splice angles.
 - Airspeed indicator line, pitot lines, and pitot heater wires (if installed).
 - Hardware shown in Figure 8-1.

CAUTION: Have a suitable cradle ready to carry the fuselage before removing all mating hardware.

- Installation of the wing assembly is direct reversal of removal.

SEE TABLE FOR LENGTHS. IF NECESSARY, INSTALL SHIMS BETWEEN SHEAR FITTINGS AND NOT UNDER BOLT HEAD OR NUT.

AN4-4A BOLT (4)
AN960-416 WASHER (4)
AN363-428 NUT (4)
(TYPICAL BOTH SIDES--ACCESSIBLE INSIDE CABIN)

AN4-10A BOLT (3)--ACCESSIBLE THROUGH WHEELWELL
AN960-416 WASHER (3)
AN363-428 NUT (3)--ACCESSIBLE INSIDE CABIN
(TYPICAL BOTH SIDES)

AN4-20A BOLT (2)--ACCESSIBLE UNDER REAR SEATS
AN960-416 WASHER (2)
AN363-428 NUT (2)--ACCESSIBLE THROUGH WING BOTTOM ACCESS PANEL
(TYPICAL BOTH SIDES)

AN7H-16A BOLT--ACCESSIBLE THROUGH ACCESS COVER UNDER REAR SEAT.
SAFETY WIRE BOLT HEAD TO ADJACENT SPAR-WEB STIFFENER.
AN960-716L WASHER
(TYPICAL BOTH SIDES)

AN3-4A BOLT--ACCESSIBLE BY REMOVING TOP WING FAIRING
AN960-10 WASHER (8)
AN363-1032 NUT(8)--ACCESSIBLE THROUGH WHEELWELL
(TYPICAL BOTH SIDES)

SHIM DASH NO.	BOLT	NO. BOLTS REQD PER SHIM	WASHER	NO. WASHERS REQD PER SHIM	WASHER (ADDITIONAL)	NUT	NO. NUTS REQD PER SHIM
310136-7	AN4-5A	4	AN960-416L	8		AN363-428	4
310134-9	AN4-5A	4	AN960-416L	8		AN363-428	4
310134-11	AN4-5A	4	AN960-416L	8		AN363-428	4
310134-13	AN4-6A	4	AN960-416	8	AN960-416L	AN363-428	4
310134-15	AN4-6A	4	AN960-416	8		AN363-428	4
--	AN4-4A	4	AN960-416	4		AN363-428	4

AN6-16A BOLT
AN960-616 WASHER
AN363-624 NUT
110001-3 OR -5 SPACER (AR)
(TYPICAL BOTH SIDES--ACCESSIBLE INSIDE CABIN)

AN4-15A BOLT (5)--ACCESSIBLE INSIDE CABIN
AN960-416L WASHER (5)
AN960-416 WASHER (5)
AN363-428 NUT (5)--ACCESSIBLE BY REMOVING TOP WING FAIRING
(TYPICAL BOTH SIDES)

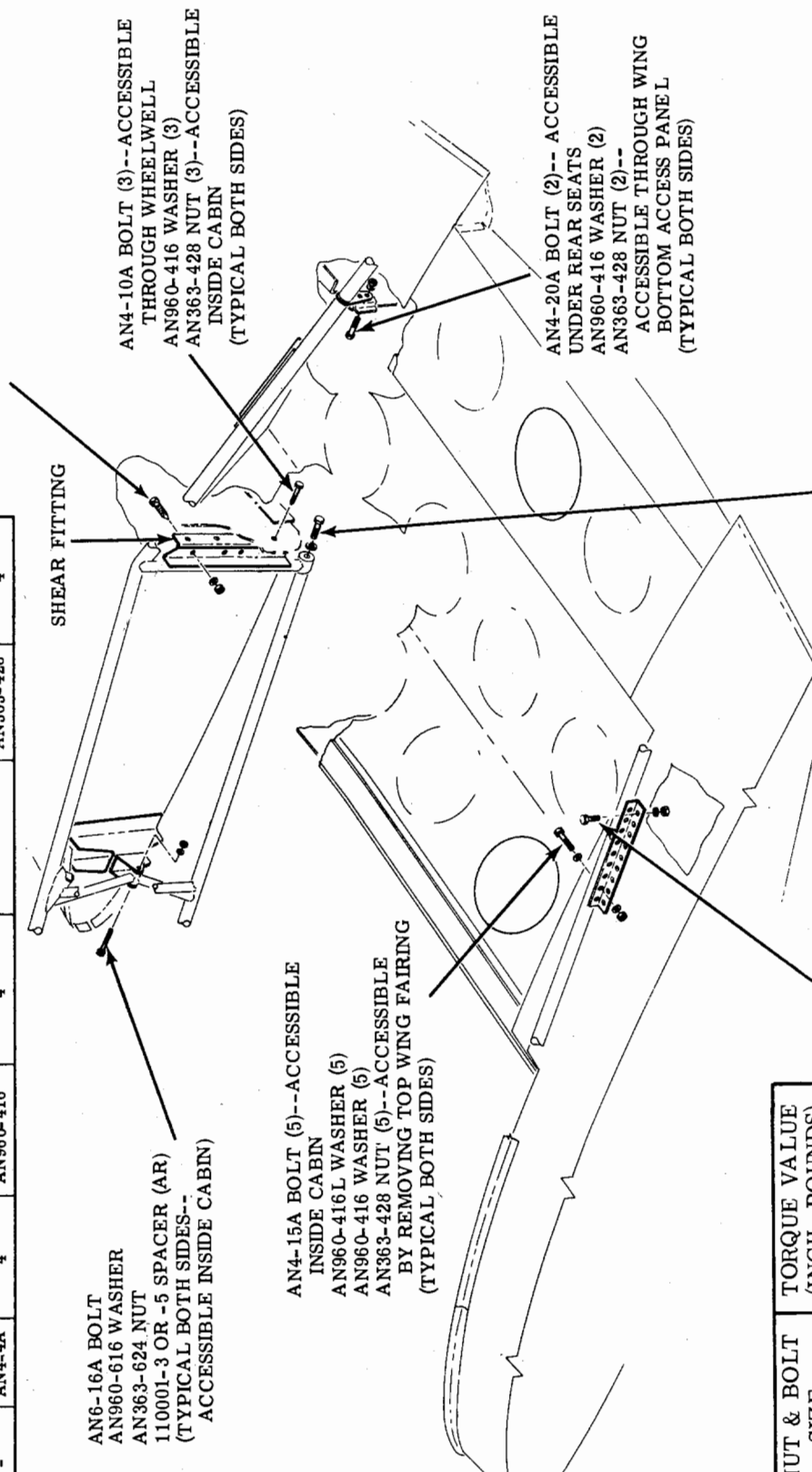
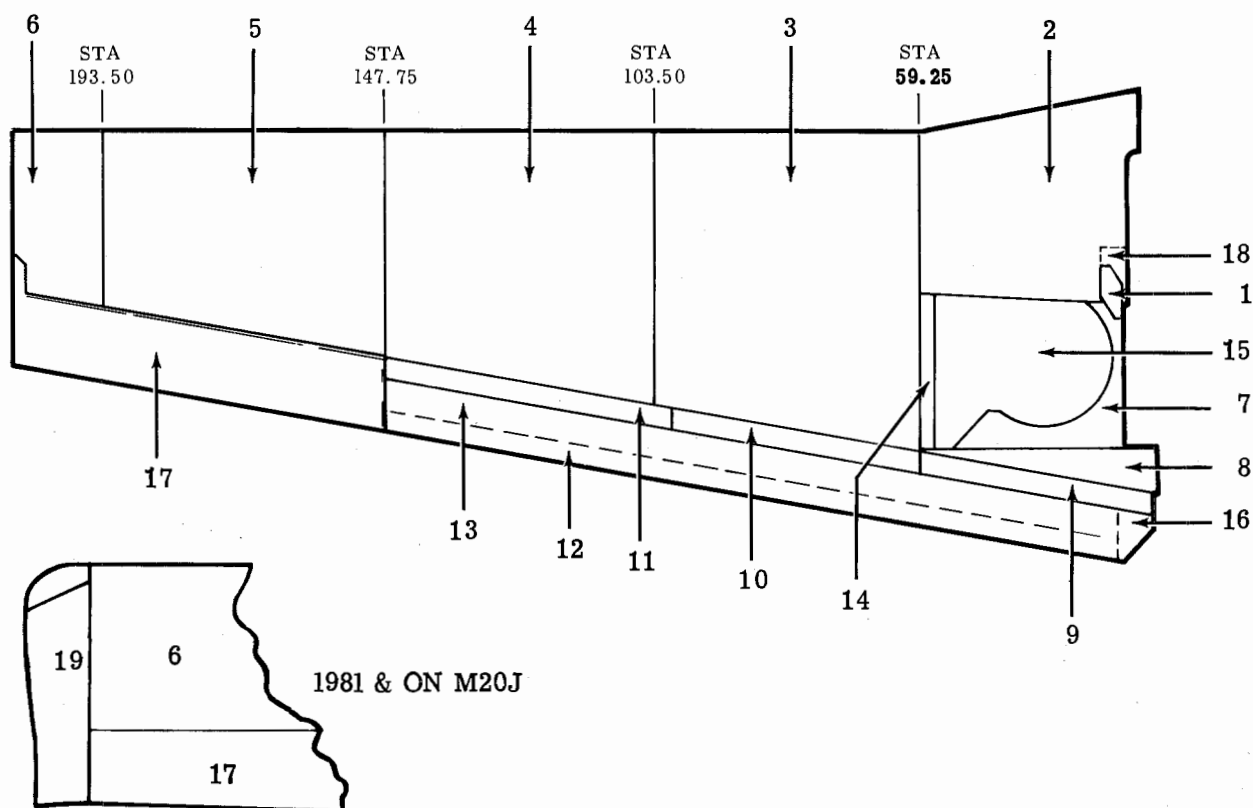


Figure 8-1. Wing Attaching Hardware

NUT & BOLT SIZE	TORQUE VALUE (INCH - POUNDS)
AN 3	20 - 25
AN 4	50 - 70
AN 6	100 - 140
AN 7	450 - 500

8-3. SKIN SPECIFICATIONS.



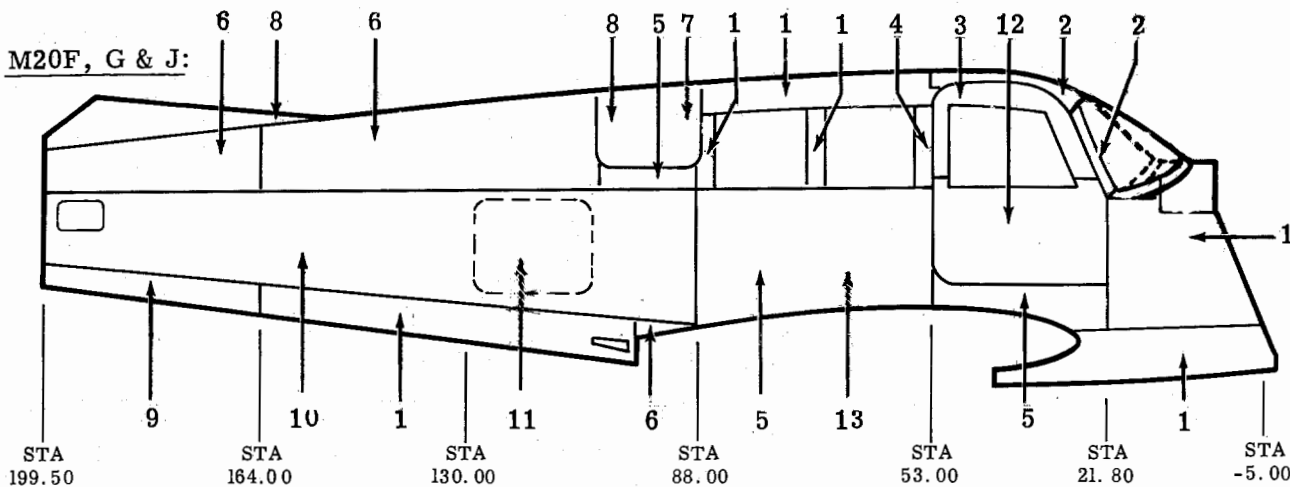
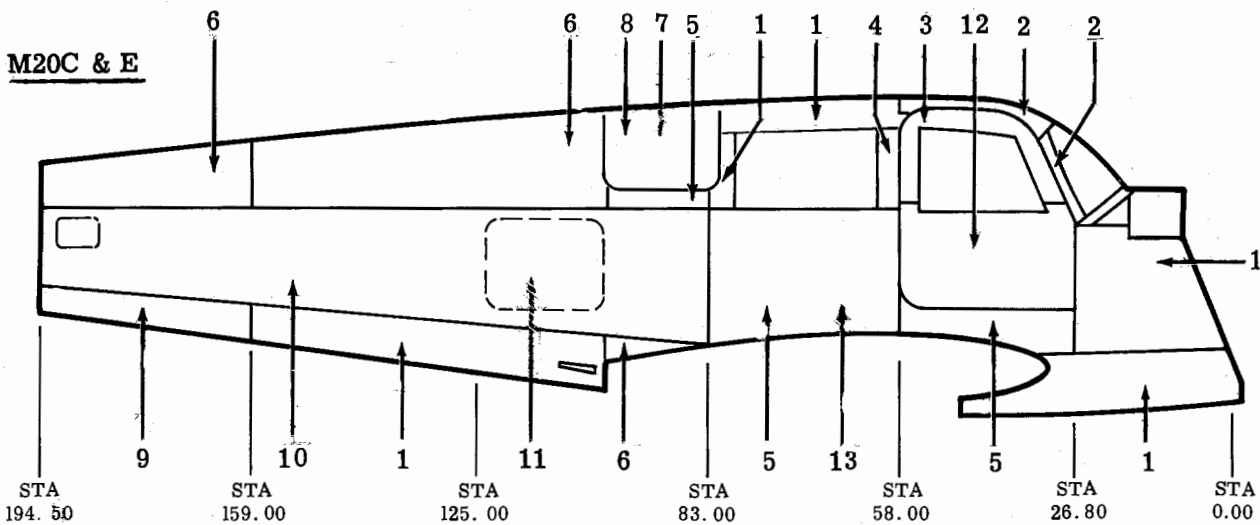
INDEX NO.	SKIN THICKNESS	MATERIAL			INDEX NO.	SKIN THICKNESS	MATERIAL						
1.	0.063	2024	T-3	CLAD	13.	0.020 (a)	2024	T-3	CLAD				
2.	0.050	2024	T-3	CLAD	14.	0.032	2024	T-3	CLAD				
3.	0.040	2024	T-3	CLAD	15.	0.040 (b)	2024	T-3	CLAD				
4.	0.032	2024	T-3	CLAD	16.	0.040 (d)	2024	T-3	CLAD				
5.	0.025	2024	T-3	CLAD	17.	0.016 (a)	2024	T-3	CLAD				
6.	0.025	2024	T-3	CLAD	18.	0.050 (b)	2024	T-3	CLAD				
7.	0.032	2024	T-3	CLAD	19.	Polyester Glass - Fiber Reinforced							
8.	0.040	2024	T-3	CLAD									
9.	0.025	2024	T-3	CLAD									
10.	0.025	2024	T-3	CLAD									
11.	0.025	2024	T-3	CLAD									
12.	0.025 (c)	2024	T-3	CLAD									

(a) Same thickness on top and bottom.

(b) Top of wing only.

(c) Top aft flap skin (hat section).

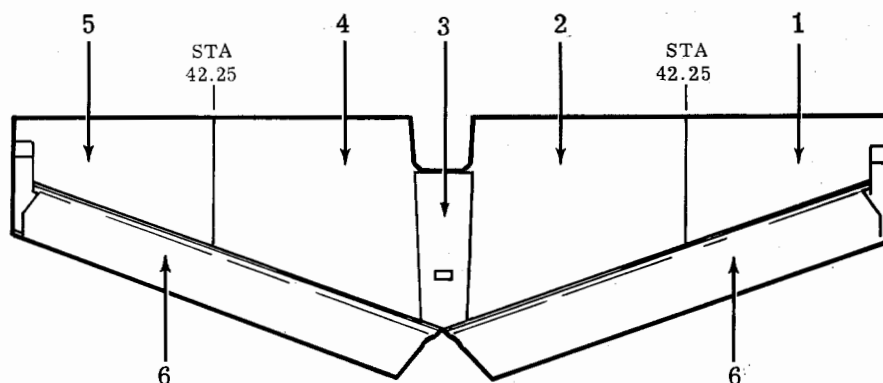
(d) Top inboard flap skin.



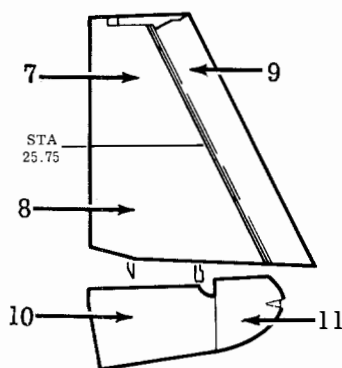
INDEX NO.	SKIN THICKNESS	MATERIAL
1.	0.025	2024 T-3 CLAD
2.	0.025 (e)	2024 -0 CLAD
3.	0.025(c)(b)	2024 T-4 CLAD
4.	0.025(d)	2024 T-3 CLAD
5.	0.025(b)	2024 T-3 CLAD
6.	0.020	2024 T-3 CLAD
7.	0.020(a)	2024 T-3 CLAD
8.	0.025(e)	2024 -0 CLAD
9.	0.025	2024 T-3 CLAD

INDEX NO.	SKIN THICKNESS	MATERIAL
10.	0.032	2024 T-3 CLAD
11.	0.032(a)	2024 T-3 CLAD
12.	0.032	2024 T-3 CLAD
13.	0.025(a)	2024 T-3 CLAD

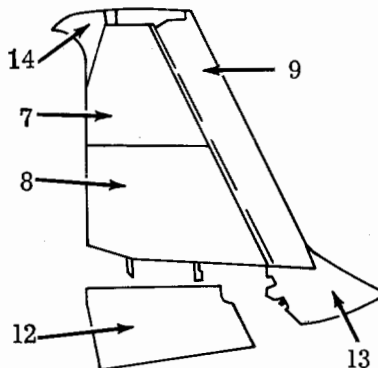
- (a) Left side only.
 (b) Right side only.
 (c) 0.032 can be used.
 (d) 2024 T-3 on right side.
 (e) Heat treated to T-42 condition after forming.



1968 M20C

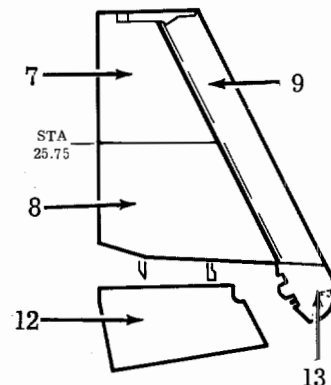


1971 M20C, E & F



1968 M20F & G;
1969 thru 1970 M20C, E, F & G

1974 & On M20C, E, & F
1976 & On M20J



INDEX NO.	SKIN THICKNESS	MATERIAL		
1.	0.025	2024	T-3	CLAD
2.	0.025	2024	T-3	CLAD
3.	0.025	2024	T-3	CLAD
4.	0.025	2024	T-3	CLAD
5.	0.025	2024	T-3	CLAD
6.	0.020	2024	T-3	CLAD
7.	0.025	2024	T-3	CLAD
8.	0.025	2024	T-3	CLAD

INDEX NO.	SKIN THICKNESS	MATERIAL		
9.	0.020	2024	T-3	CLAD
10.	0.025	2024	T-3	CLAD
11.	0.020 (a)	2024	0	CLAD
12.	0.020	2024	T-3	CLAD
13.	0.025 (a)	2024	-0	CLAD
14.	0.093	KYDEX 100		

(a) Heat treated to T-42 condition.

8-4. CORROSION DETECTION & PREVENTION. Most metallic fabrication materials are susceptible to corrosion. Corrosion may occur on aircraft in any climate, but it will be a problem more often in climates where the aircraft is exposed to salt air or high humidity, or where there are industrial contaminants in the atmosphere. The aircraft should be inspected frequently to detect and correct corrosion before serious damage occurs.

Any form of corrosion should be removed at once. If it is necessary to remove paint, only an approved aircraft paint remover such as El Dorado PR-3400, El Dorado Chemical Co., Inc, 6700 Lookout Road, P.O. Box 32101, San Antonio, TX 78216, should be used. Paint removing substances left in metal crevices will cause further corrosion. Turco 2662C or 3002 will remove corrosion and treat the metal surface in one application. This paragraph discussed corrosion types and their prevention along with suggested procedures for zinc chromating internal airframe surfaces.

1. Types of Corrosion. Corrosion normally appears in one or more of four forms. Each type of corrosion can be precluded or controlled by a preventative maintenance program.

a. Chemical Corrosion. Chemical corrosion normally occurs where battery acid or exhaust gases come in contact with metal surfaces. A few simple precautions will prevent chemical corrosion.

(1) Be sure battery vent is free from obstruction at all times.

(2) Repaint all scratches and worn spots found in areas painted with acid-resistant paint.

(3) If acid is spilled on metal surfaces, flush entire area with sodium bicarbonate and water. The solution should be rinsed away at once and the area dried by driving all water from crevices with an air hose before wiping surface dry with a clean cloth.

(4) Frequently clean exhaust gas deposits from metal surfaces.

b. Local-Cell Corrosion. On bare metal surfaces, in an early stage development, local-cell corrosion appears as a light, whitish powder deposit. Surface pits warn of advanced local-cell corrosion. On painted surfaces, the first indication of corrosion will be evidenced by paint blistering.

(1) Intergranular Corrosion - Selective attack along grain boundaries of metal alloys is referred to as intergranular corrosion. Aluminum alloys 2024 and 7075 are vulnerable to this type of attack. Aluminum extrusions may contain nonuniform areas, which in turn may result in galvanic attack along grain boundaries. This type of corrosion is difficult to detect in its original stages. When the attack is well advanced, the metal is usually blistered or delaminated. This is referred to as "exfoliation". It is very difficult to completely remove and stop this type of corrosion, and replacement of the affected part is recommended wherever possible.

c. Concentration Cell Corrosion. Corrosion forming under rivet heads, along faying surfaces, at skin to longeron contact surfaces and other similar areas is called concentration cell corrosion. Detection requires close inspection. Rivets must be removed and skin laps must be separated to remove concentration cell corrosion. Use aluminum wool soaked in solvent such as methylethyl-ketone to scour corrosion deposits from the surface before painting both faying surfaces with zinc chromate primer and reassembling.

d. Galvanic Corrosion. Dissimilar metals, such as stainless steel and aluminum, in contact with each other sometimes develop galvanic corrosion. To remedy this form of corrosion, separate the parts, remove the corrosion, and paint both surfaces with zinc chromate primer before reassembling.

2. Corrosion Prevention.

a. Thoroughly examine unpainted metal surfaces at inspections, and check corrosion when found. Carefully examine seams, lap joints, and crevices where moisture or dirt can collect. Areas exposed to exhaust gases require frequent inspection and cleaning.

b. Corrosion may attack metal even though the surface is painted. Inspect painted areas for a blistered or scaly appearance that warns of corrosion below the paint layer.

c. Use only aircraft detergents to wash the exterior airframe. Cover vent scoops when the aircraft is being washed. Rinse aircraft exterior after exposure to salt air or industrial fallout.

d. Since moisture promotes corrosion, thoroughly and frequently inspect areas where water is apt to collect. Use an air hose to drive water from crevices before wiping the exterior surface dry after washdown.

e. Hangar the aircraft when not in use.

f. If battery acid is spilled on any part of the aircraft, immediately wash the area with a solution of sodium bicarbonate in water. Rinse with water and dry with clean towels.

NOTE: Turco Products Technical Data Bulletin No. 184 outlines additional recommended procedures for corrosion control. Write Turco Products, Inc., P.O. Box 1055, Wilmington, California or FAA Advisory Circular 43-4 also addresses corrosion problems.

3. Zinc Chromating. Zinc chromating of internal airframe surfaces will retard corrosion, but will not eliminate the necessity for periodic inspections. The most likely areas for corrosion begin are in hidden crevices such as skin laps, under rivet heads or any opening where moisture can collect. Periodic inspection of these areas is most important so that any corrosion which may be present can be detected and treated in its very earliest stages.

When corrosion is detected, it should be treated as follows:

a. Remove all corrosion product (usually white or grey-white powder on aluminum) from the corroded area down to sound metal.

(1) If the base metal is aluminum, clean off the corrosion product by scrubbing with aluminum wool or a nonmetallic scouring pad such as the nylon pads made by the Carborundum Company, P.O. Box 477, Niagara Falls, N.Y. 14302.

(2) If the base metal is steel, remove the corrosion product with emery cloth (320 grit or finer) or steel wool.

(3) If the corrosion is too advanced to remove by the light mechanical cleaning methods of (1) or (2), refer to Advisory Circulars 43.13-1 and/or 43-4 for alternate methods of cleanup and repair.

(4) Chemical cleaning solutions should be used with extreme caution on both aluminum and steel parts. Such solutions are not recommended for use in areas where they cannot be easily and completely neutralized.

b. Wash all areas to be zinc chromated with cleaning solvent such as methylethylketone (MEK), Turco T-657 (Turco Products, Inc., 35 South Central Ave., Los Angeles, California), lacquer thinner, #3094 wash thinner (Enmar, Inc., 1000 North 10th and N.Y. Avenue, Wichita, Kansas) or similar solvents.

(1) To get a good clean surface for zinc chromate priming use a clean cloth or piece of cheesecloth and apply one of the solvents noted above. The surface should be wiped dry with a clean piece of clean cloth. Do not allow the solvent to dry on the cleaned area as it will re-deposit dissolved soil and grime upon evaporation.

CAUTION: Wipe solvents are generally flammable and toxic and should not be used without adequate ventilation and fire precautions.

c. Apply zinc chromate primer to cleaned area by spray or brush.

8-5. PAINTING. The exterior of all M20 Series aircraft are painted with acrylic enamel. When exposed to humid salt air or to an atmosphere having corrosive fallout, the aircraft should be hangared when not in use.

1. Paint Repairs.

a. Materials.

(1) Aluminum wool, nylon scouring pads, 320 grit or finer emery cloth or steel wool.

(2) Tack rags.

(3) Wipe solvents such as: methylethylketone, T-657 --- Turco Products, Inc., #3094 wash thinner --- Enmar, Inc., lacquer thinner or equivalent solvents.

(4) Body putty or aerodynamic filler such as: Flex-Bond --- Taylor & Art Plastics, or Flex --- 3M Co., Cuz polyester body filler #6372 --- NAPA (Martin Senour Paints).

(5) Compatible paints for the item (such as steel tubular structure or exterior skin) and for the year and model being repainted. (Refer to Mooney Parts Manual).

(6) Thinners which are compatible with the paints being used both for paint thinning and for burn-down thinners.

b. Cleaning Procedures.

(1) Remove all old loose paint by one of the following methods:

(a) On aluminum - for uniformity of finish appearance, the entire skin panel should be prepared for repainting. If the paint is in very bad condition or if a filler is to be used, remove all of the paint by use of lacquer thinner, MEK or similar solvent. (Alkaline paint strippers are not recommended.) The solvent should be wiped on and wiped off before it evaporates. If the solvent is allowed to evaporate, it will re-deposit the soils and paint that were being carried. Any scouring required should be done at this point. Scouring with nylon pads or aluminum wool may be done dry or wet with one of the wipe solvents listed above. After the old paint, grime, etc. has been loosened and removed, the scoured area should be wiped with a tack rag, and again cleaned with fresh wipe solvent. The part should

now be ready for priming and painting.

(b) On steel - Remove all grease, grime, loose paint, etc. by wiping with a wipe solvent and rags. Do not allow the wipe solvent to evaporate. Wipe it dry! Steel parts may be cleaned to bare metal by sanding with emery cloth or steel wool. If the parts are removable, they can be cleaned by sandblasting. Regardless of the scouring method all parts should be wiped with a tack rag and cleaned with fresh wipe solvent. The part should now be ready for priming and painting.

(c) Priming and Painting.

(1) On aluminum - Cleaned and dried surfaces to be painted should be coated with a wash primer such as MIL-C-8514 or MIL-P-15328. Read and follow the manufacturer's instructions carefully. The wash primer should be applied to attain a dry film thickness of 0.3 to 0.4 mils (a transparent film). A good primer coating is a must since the top coating can be only as good as the primer coat. As a general rule the wash primer should dry for at least one hour, but not more than four before application of the top coat. The primer coat can be dry-scuffed lightly with aluminum wool or nylon pad prior to top coat application. This will knock off overspray, etc. from primer application and give a higher gloss finish. As many coats of paint as desired may be applied. A higher gloss will be attained if the surface is scuffed lightly and tack rag cleaned between each coat.

(2) On steel - The same general procedure used on aluminum can be applied to steel. However, MIL-P-8585 primer or equivalent is recommended for the steel coat.

(d) Painting.

(1) Apply three coats of white base and/or color finish allowing three to five minutes between coats depending upon weather conditions. Allow five to ten minutes between coats in cold, dry weather; in humid weather, allow fifteen minutes between coats.

(2) Use a small round watercolor brush trimmed to a point for application of undiluted touch-up paint to small scratches and bare spots. Do not thin acid-resistant black paint or exterior finish touch-up paint for brush-on application.

CAUTION: All acrylic enamel paints have a tendency to "orange peel" when sprayed too close to the panel or when paint viscosity is too high. Addition of an equal part of burn-down thinner to thinned finish paint will eliminate orange peel effect due to improper thinning.

NOTE: Newer aircraft (1974 and on) are painted with Randolph Products acrylic enamel, DuPont acrylic enamel or Pratt & Lambert urethane enamel. Inquiries concerning application of these finishes should be addressed to the following:

Randolph Products Co.
P. O. Box 67
Carlstadt, New Jersey 07072
(201) 438-3700

E. I. DuPont De Nemours & Co.
8125 Kempwood
Houston, Texas 77055
(713) 467-4449

Pratt & Lambert
P. O. Box 2153
Wichita, Kansas 67201

SECTION IX. ELECTRICAL SYSTEM

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9-1. DESCRIPTION. A 12-volt generator with mechanical regulator or alternator with a transistorized voltage regulator and an overvoltage relay supplies electric power. A 12-volt 35-ampere-hour storage battery is installed in the tailcone (M20E, F & J) or in the left side of the engine compartment (M20C & G). The alternator or generator, during normal operation, supplies power in conjunction with the battery when the master switch is on. The circuit breaker panel is on the right sub-panel. The electrical system is capable of supplying current for simultaneous operation of multiple radios, an anticollision beacon, and navigation lights. A shunt-type ammeter mounts in the power plant instrument cluster.

9-2. POWER DISTRIBUTION SYSTEM. The power buss distributes direct current power to the electrical system from the alternator or generator and from the 12-volt battery through the battery relay. The negative battery lead attaches to a structural ground on the airframe. The master switch on the pilot's panel controls the battery relay that connects the positive battery lead to the main power bus bar. Turning

the master switch on closes the relay and supplies power to the aircraft electrical system.

CAUTION: Do not reset a circuit breaker after it has tripped a second time. If necessary to do so to locate the malfunction, be alert for a possible electrical fire. Breakers are of "Trip Free" type and cannot be held in the closed position.

1. Battery Removal.

- Turn master switch off.
- M20C & G: open left side engine cowl and remove battery box lid.

M20E, F&J: remove tail cone access cover and battery box lid.

- Disconnect battery cables. Remove battery from aircraft.

- Install battery in reverse sequence of removal. Use a voltmeter to check battery polarity before installation.

2. Battery Cleaning and Corrosion Removal.

- Mix one pound of baking soda in one gallon of water.
- Wash battery box and flush battery with

the mixture. Do not allow soda water to enter battery cells; permanent battery damage will result if soda mixes with electrolyte.

c. Rinse thoroughly with clear water and dry the area.

d. Test each cell with a temperature corrected hydrometer. Specific gravity should be 1.265 to 1.280 for a fully charged battery.

e. Check electrolyte level and maintain at 3/8 inch above plates.

f. Clean battery terminals with emery cloth, reinstall and tighten cables, and coat terminals and connectors with petroleum jelly to retard corrosion.

9-3. VOLTAGE REGULATOR MAINTENANCE.

The battery charging rate depends upon the battery condition and the voltage regulator setting. With all equipment turned off and the engine running at 2000 RPM or faster, the normal battery charging rate will be 5 to 35 amperes.

1. Excessively High Charging Rate. Check the following:

a. Fly aircraft for 15 to 20 minutes; charging rate should slowly drop to 10 amperes or less. A very low battery will take longer to show a drop in charging current.

b. Measure voltage with a voltmeter connected to the voltage regulator BAT terminal. At 80°F, voltage should be 13.8 to 14.8. Voltage will be higher if temperature is lower than 80°F, and lower if temperature is higher than 80°F. An excessively high voltage regulator setting will cause excessive battery heating and water loss.

2. Excessively Low Charging Rate. Check battery charging rate (normal rate is 5 to 10 amperes). The regulator should not be considered defective because of a low charging rate until:

a. A voltmeter check indicates that voltage at BAT terminal is below requirements.

b. A battery hydrometer check indicates that battery is not fully charged.

3. Hydrometer Reading. If battery electrolyte temperature is below 80°F, subtract four points from hydrometer reading for every 10°F below 80°F. If battery acid temperature is above 80°F, add four points to hydrometer reading for every 10°F above 80°F. Example:

Hydrometer reading = 1260

Battery electrolyte temperature = 30°F

$80^{\circ} - 30^{\circ} = 50^{\circ}$

$5 \times 4 = 20 \text{ points}$

Corrected reading $1260 - 20 = 1240$

Hydrometer Reading

Percent of Charge

1280	100
1250	75
1220	50
1190	25
1160	Very little useful capacity
1130 or below	Discharged

9-4. ALTERNATOR CHARGING SYSTEM MAINTENANCE.

1. Alternator System Servicing. When the ammeter shows a discharge at higher engine speeds, a charging system component (alternator, voltage regulator, drive belt, circuit breaker, or wiring) is malfunctioning. On-the-plane testing should indicate which component is faulty and needs to be removed from the aircraft for bench testing and repair or replacement.

The alternator charging system requires no special attention; however, improper maintenance procedures can damage the alternator and wiring. There are several precautions that must be observed when servicing the alternator system:

a. Be sure the master switch is off when repairing the alternator or voltage regulator.

b. When auxiliary power or a booster battery is used, be sure the cables are connected correctly--positive to positive and negative to negative.

c. When the battery is removed from the aircraft for charging, be sure that the charger is correctly connected. It is possible to reverse the polarity of a battery by connecting a charger backwards.

d. Be sure to check battery polarity by using a voltmeter prior to reinstallation in the aircraft.

e. Do not leave the master switch on when the aircraft is parked.

f. Use an auxiliary ground power unit when trouble shooting electrical accessory equipment or when performing electrical landing gear maintenance and retraction system testing.

2. Alternator System Inspection.

a. Check alternator circuit breaker on right side upholstery panel on 1968 models. Reset breaker if open. 1969 and later models have the circuit breaker on the main circuit breaker panel.

b. Check alternator field circuit breaker on main circuit breaker panel. Reset if open.

c. Inspect battery for corroded cable connections; remove and clean cable if corrosion is found.

- d. Check drive belt for proper tension and excessive glazing.
- e. Check charging system wiring connectors to sure they are clean and tight.
- f. Inspect alternator, voltage regulator, and ring for damage.
- g. Alternator Removal and Installation.
 - a. Alternator Removal.
 - (1) Turn master switch off before disconnecting alternator wiring.
 - (2) Remove attaching hardware and slip drive belt from pulley.
 - (3) Remove alternator.
 - b. Alternator Installation.
 - (1) Be sure master switch is turned off. Do not turn master switch on until all wiring connections have been secured.
 - (2) Install alternator attaching hardware; place drive belt on pulley and adjust belt tension.
 - (3) Connect alternator wiring and check ring connectors throughout system.

CAUTION: Do not attempt to polarize alternator. Alternator is polarized every time master switch is turned on.

5. WARNING CIRCUITS.

1. Landing Gear Position Lights and Warning Horn (Electric Gear). Red and green press-to-test landing gear position lights are on the left instrument panel. 1975 and later models have a green "gear down" and an amber "gear unsafe" annunciator light. The gear-down limit switch controls the green gear-down light; the gear-up limit switch controls the red gear-up light. The throttle control operates the landing gear warning horn when the master setting is reduced below 10 IN. Hg with the gear up. Check warning system during flight for proper operation.

2. Prestall Warning Circuit. The prestall warning horn has a high-frequency continuous tone that sounds when airspeed drops to 5 to 10 MPH IAS above stalling speed. A vane in the left wing leading edge actuates the prestall warning horn switch. (This vane is made of heat-treated steel, and any attempt to adjust switch operation by bending the vane will damage the vane).

3. Landing Gear Safety Switch (Electric Gear). An air pressure actuated landing gear safety switch is installed in the pitot system pressure line to prevent landing gear retraction until the aircraft attains a safe takeoff airspeed (effective with M20C [700055, M20E S/N 700035, M20F S/N 038, and M20G S/N 70007 and M20J models [24-0001 thru 24-0083, and 24-0085 thru 24-0377 a squat switch located on the left gear leg replaces the airspeed switch. The squat switch is replaced by an airspeed

safety switch located on the back of the airspeed indicator on all 1978 & later model aircraft and some late 1977 model aircraft.

4. High and Low Vacuum Warning Circuit. A switch in the vacuum system controls the high-vacuum and low-vacuum warning lights on the instrument panel. Vacuum below 4.25±0.2 IN. Hg (4.25 +.25 IN. Hg effective 1978 M20J & On) trips the low-vacuum switch to turn on the low-vacuum warning light. Vacuum above 5.0±0.2 IN. Hg (5.5±.2/-0 IN. Hg effective 1978 M20J & On) trips the high-vacuum switch to turn on the high-vacuum warning light. Eff: S/N 20-1167 thru 20-1185, 21-1180 only, 22-1242 thru 22-1305, the vacuum annunciators are combined into one light which flashes for low vacuum and illuminates steadily for high. Effective with 20-1186, 22-1306 and 24-0001 thru 24-0083 and 24-0085 thru 24-0377 a vacuum gage mounted above the radio panel is used in lieu of the high and low vacuum warning circuit.

5. Unfiltered Air Warning System (M20F). The unfiltered air warning light is on when the induction air selector is set so that ram air flows directly to the fuel injector intake and the landing gear control is in the gear-down position. The induction air selector control and the landing gear ram air warning switch turns on the unfiltered-air warning light.

6. Low Fuel Warning Circuits. The low fuel indicators will illuminate when a minimum of 2-1/2 gallons usable fuel remains in either left or right hand tank.

REPLACEMENT AND RECALIBRATION

When it becomes necessary to replace the annunciator panel for any reason other than "low fuel" warning malfunction, the following procedure should be used to set the "low fuel" warning circuits. The calibration transfer standard (I.A.I. P/N 500D0045) is required for this procedure. Adapters can be ordered through Mooney Marketing or Service Centers.

a. Remove glare shield, disconnect plug from rear of annunciator, remove annunciator front panel, and place "Norm-Cal" switch in "Cal" position.

b. Plug model TS201/231-001 (P/N 500D0045) calibration transfer standard on rear of old annunciator and reconnect harness plug.

c. Turn on master switch and turn right hand variable resistor on transfer standard slowly counter clockwise until right "low fuel" light just turns on. (If necessary turn variable resistor clockwise to extinguish fuel low light). (Do not adjust annunciator calibration screws). Repeat for left "low fuel".

d. Turn off master switch and remove old annunciator assy. After disconnection of harness and standard transfer unit.

e. Install new annunciator and connect calibration transfer standard to annunciator panel and harness plug. (Switch must be in "Cal" position).

f. Adjust left and right annunciator fuel calibration screws clockwise (not the adapter variable resistors) until "low fuel" lights just turn on. (If necessary turn annunciator calibration screw counterclockwise to extinguish "fuel low" light).

g. Remove calibration transfer standard, reconnect plug to annunciator panel; set switch to "Normal" position, install annunciator front panel and install glare-shield.

ALTERNATE METHOD

If calibration transfer standard, P/N 500D0045, is not available use the following method to calibrate "low fuel" warning:

a. Remove glareshield and remove annunciator assy.

b. Install and connect new annunciator assy leaving off front panel. (Set switch to "Cal").

c. Drain fuel from tanks and replace with unusable fuel plus 2-1/2 gallons in both tanks.

d. Turn on master switch and adjust calibration pots to position where "low fuel" lamps just turn on for left and right tanks.

e. Turn off master switch, set annunciator "Cal" switch to "Norm" position, install annunciator front and install glareshield.

f. Refuel aircraft.

CAUTION: Do not operate the starter in excess of 15 seconds or re-engage the starter without allowing it time to cool.

WARNING: Do not turn the propeller when the magnetos are not grounded. Ground the magneto points before removing switch wires or electrical plugs. All spark plug leads can be removed as an alternate safety measure.

2. Oil and Cylinder Head Temperature Gage Circuits. Both the oil and cylinder head temperature indicators operate electrically.

The oil temperature gage circuit has a resistance bulb in the oil sump. Changes in resistance caused by changes in oil temperature alter current flow rate, thereby varying the magnetic field in the indicator coils. The cylinder head temperature indicator connects to a tip-sensitive resistance bulb in a cylinder head. Increase or decrease in temperature causes an increase or decrease in bulb resistance, varying the magnetic field in the indicator coils.

3. Fuel Pressure Gage. The fuel pressure gage is of the direct reading type combined with the manifold pressure gage.

For 1978 M20J the Fuel Pressure Gage is an electrically operated gage located in the cluster. The Manifold Pressure Gage is a single direct reading instrument.

4. Exhaust Gas Temperature Indicator (Optional). A thermo-couple in the exhaust tailpipe operates the exhaust gas temperature indicator. For 1978 M20J the Exhaust Gas Temperature Gage is combined with the Outside Air Temperature gage in a single instrument.

5. Oil Pressure Circuit. The oil pressure instrument circuit is an electrical instrument used as a reference, with a transducer which varies resistance with pressure and sends a signal to the gauge.

9-7. LIGHTING CIRCUITS.

1. Navigation Lights. A circuit breaker switch on the flight panel controls the navigation lights.

2. Landing Light. A circuit breaker switch on the flight panel controls the landing light in the lower engine nacelle.

3. Cabin Lights. A switch in the dome light base controls the dome light. Some models have a three-position (Bright, OFF, DIM) rocker switch located in the head liner.

4. Anti-Collision Lights. A circuit breaker switch controls the optional rotating beacon light installed on the bottom of the fuselage. 1975 and later model aircraft have white wing tip anti-collision strobe lights.

9-6. POWER PLANT CIRCUITS

1. Starter-Ignition Circuit. The starter-ignition switch has five positions: OFF, R (right), L (left), BOTH, and START. In the OFF position both magnetos are grounded. At the R position the left magneto grounds. At the L position the right magneto grounds. At the BOTH position both magnetos are HOT and the ignition system is on.

On aircraft equipped with a starting vibrator (all M20C, E, F & G) turning the ignition switch to START and pushing in closes the starter solenoid, engages the starter, temporarily grounds the right magneto and connects the retard points in the left magneto to the battery-powered starting vibrator. At the low cranking speed of the engine, the vibrator provides a high energy spark to the left magneto retard points which fires the plugs. Turning the ignition switch to START and pushing in on aircraft equipped with an impulse coupled magneto (M20J) closes the starter solenoid, engages the starter and allows the impulse coupling to automatically retard the magneto until the engine is also at its retard firing position. The spring action of the impulse coupling is then released to spin the rotating magnet and produce the spark to fire the engine. After the engine starts, the impulse coupling flyweights do not engage due to centrifugal action. The coupling then acts as a straight drive and the magneto fires at the normal firing position of the engine. The starter-ignition switch is spring loaded to return from START to the BOTH position when released.

5. Instrument and Placard Lights. Rheostats control the panel, engine panel, overhead, radio, and placard lights. The flight panel instrument light rheostat controls the compass light. Lighting loads are controlled by transistors biased with manually controlled rheostats for 1969 models & on.

6. Test and Dimmer System. The warning light system incorporates press-to-test light fixtures. 1969 thru 1974 and 1976 and later models have a press-to-test switch on the pilot's panel. Instrument and Warning Lights are controlled by a transistor control box. 1975 models press-to-test switch is in the glareshield (refer to schematics).

CAUTION: Care must be exercised to prevent shorting light wires when installing or replacing instruments. Shorted wires will cause blown fuses or burned out transistors in the control box.

7. Baggage Compartment Light. A three position (Bright, OFF, DIM) rocker switch in headliner controls this dome light.

CAUTION: The cabin and baggage interior lights are not connected to master switch circuitry and can be operated with master switch in the off position. Care must be exercised to prevent leaving switch on and discharging battery.

9-8. LANDING GEAR CIRCUITS.

1. Limit switches and relays operate the landing gear actuator, a 12-volt DC reversible motor. A landing gear air pressure safety switch, actuated by pitot air pressure or a squat switch prevents landing gear retraction until a safe flying speed is attained. The landing gear control switch operates the actuator motor through the safety switch and relays. When the landing gear control switch is up and a safe flying speed has been attained, the safety switch closes to activate the control relay starting the actuator. As the gear reaches the up-and-locked position, a mechanical stop opens the limit switch and the actuator stops. When the landing gear control switch is placed in the down position, the gear motor down-relay closes and the actuator starts. When the gear reaches the down-and-locked position, the mechanical stop opens the limit switch and the actuator stops. The gear-up limit switch controls the landing gear up-position light on pre 1975 models. The

red light comes on when the gear is in the up position. The green light comes on when the gear reaches the down-and-locked position; the gear-down limit switch controls the green gear-down light. During gear retraction or extension, both red and green lights are out while the gear changes position. 1975 and later models have a red light for gear unsafe and no lights illuminate when gear is up. See Section 5 for squat switch information.

2. Gear Safety By-Pass Switch. The gear will not retract if airspeed above the set limit has not been attained when the gear handle is placed in the up position. A warning horn will sound and both "Gear Down" and "Gear Unsafe" lights will illuminate. Push and hold the red button switch beside the landing gear handle until the gear is up and both lights go out. Pull the circuit breaker "Gear Cont" to stop the warning horn. Reset circuit breaker.

9-9. FUEL SYSTEM CIRCUITS. The fuel system has an electric fuel pump. The fuel quantity indicating system is comprised of transmitters in each fuel tank and two fuel quantity gages in the instrument panel.

1. Fuel Pump Circuits. A switch on the panel operates the emergency fuel pump.

2. Fuel Quantity Gage Circuits. Fuel Level changes vary fuel quantity transmitter resistance that operates the fuel quantity gages. The master switch operates the fuel quantity indicating system.

9-10. MISCELLANEOUS CIRCUITS.

1. Turn Coordinator Circuit. The turn coordinator is a flight instrument operated by either an inverter that supplies 400-cycle AC power (Britian Products only) or 12 VDC.

2. Heated Pitot Tube (Optional). A circuit breaker switch controls the pitot tube heater.

3. Hour Meter (Optional). A vacuum switch on the vacuum manifold turns on the hour meter when the engine starts. On 1975 models the hour meter operates directly from the alternator "Aux." terminal through a fused wire.

4. Cigar Lighter. A cigar lighter is mounted in the right instrument panel.

9-11. BATTERY TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Discharged battery.	Battery worn out.	Replace battery.
	Improper charging rate setting.	Reset charging rate.
	Excessive discharging.	Turn off some equipment when alternator is not charging. Decrease starter usage by using external power whenever possible.
	Standing too long.	Remove and recharge battery.
	Equipment accidentally left on.	Remove and recharge battery.
	Impure electrolyte.	Replace battery.
	Short circuit (ground) in wiring.	Check wiring.
	Broken cell partitions.	Replace battery.
Short battery life.	Insufficient electrolyte.	Maintain electrolyte level.
	Heavy discharge.	Remove loads when alternator or generator is not charging.
	Sulfation due to disuse.	Long, slow charge for 60 to 100 hours at 1/2 of regular charging rate.
	Impure electrolyte.	Replace battery.
	Low charging rate.	Adjust voltage regulator.
Cracked cell jars.	Loose hold-down bracket.	Replace battery and secure firmly.
	Frozen battery.	Replace battery.
Compound on top of battery melts.	Charging rate too high.	Reduce charging rate by adjusting voltage regulator.

BATTERY TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Electrolyte runs out of vent plugs.	Too much water added to battery and charging rate too high.	Drain battery and keep at proper level; adjust voltage regulator.
Excessive corrosion inside container.	Spillage from overfilling.	Flush container with baking soda solution.
	Leaking or clogged vent lines.	Repair or clean vent lines.
	Charging rate too high.	Adjust voltage regulator.
Battery freezes.	Discharged battery.	Replace battery.
	Water added and battery not charged immediately.	Always recharge battery for 1/2 hour following addition of water in freezing weather.
Leaking battery case.	Frozen electrolyte.	Replace battery.
Reversed battery polarity.	Cables connected backwards on battery or charger.	Battery should be slowly discharged completely, then charged correctly and tested.
Excessive water consumption in all cells.	Charging rate too high.	Correct charging rate.
Excessive water consumption in one cell only.	Cracked jar.	Replace battery.

9-12. GENERATOR TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
Generator operating within rated speed range, but voltage output low.	Generator operating on residual	Check for loose or high-resistance connections; clean and tighten terminals.
	Loose or high-resistance electrical connections.	Clean and tighten all electrical connections.
	Excessively worn brushes.	When brush wears down to 1/2 inch, replace with new one. Do not use abrasives of any description to seat brushes.

GENERATOR TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
	Brushes binding in brush box.	Brushes should fit free without excessive side play in brush boxes. Wipe clean binding brushes and brush boxes with a cloth moistened in Varsol or unleaded gasoline.
	Excessive brush side play in brush box.	Replace brushes as outlined above.
	Brushes not properly seated.	Reseat brushes as outlined above.
	Low brush spring tension.	Brush spring should bear centrally on top of brushes, insuring full brush contact with face of commutators.
	Dirty commutator.	Clean commutator with a cloth moistened in Varsol or unleaded gasoline.
	Scored or pitted commutator.	Turn down or replace commutator.
	Shorted or open armature cells.	Replace generator or armature
	Improper voltage regulator operation.	Adjust or replace regulator.
Generator operating within rated speed range, but voltmeter indicates zero.	Wiring not properly connected.	See electrical system wiring diagram.
Generator operating within rated speed range, but voltage output is erratic.	Unstable voltage regulator operation. Same as listed with "Generator operating within rated speed range, but voltage output low." above.	Replace voltage regulator. Use remedy for "Generator operating within rated speed range, but voltage output low:" above.
Excessive sparking at generator brushes.	Same cause as listed with "Generator operating within rated speed range, but voltage output low." above.	Same remedies
Generator operating within rated speed range, but system ammeter or loadmeter reads off scale.	Generator field magnetized in wrong direction.	Flash field with a jumper wire on regulator between generator and battery.
System ammeter fluctuates excessively when indicating full-rated load.	Overloaded generating system.	Check system for excessive loads.

GENERATOR TROUBLE SHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
Burned-out ammeter or line fuse.	Improper operation of generator reverse-current relay.	Readjust relay to operate properly.
	Loose connections.	Tighten connections.
	Defective wiring.	Check wiring for shorts and repair --- replace ammeter.

9-13. ALTERNATOR SYSTEM - TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Alternator overcharges battery; battery uses excessive water.	Regulator faulty.	Check bus voltage with engine running. Voltage should agree with voltage vs temperature chart. Observe aircraft ammeter. Ammeter should indicate near zero after ten minutes of engine operation. Replace voltage regulator if defective.
ALT FIELD circuit breaker trips.	Circuit shorted in wiring.	Disconnect lead from pin A or 1 of regulator, and reset circuit breaker. If circuit trips, check wiring. Repair as required. If breaker does not trip, replace regulator. Reconnect lead to regulator. Set MASTER switch to ON and check for 12V at pin A or 2 of regulator. Repair wiring if no voltage is present.
ALT circuit breaker trips.	Short circuit in wiring.	Disconnect lead from + post of alternator, and reset ALT circuit breaker. If circuit breaker trips, check wiring between alternator and circuit breaker.
	Short circuit in alternator.	Reconnect lead to + post of alternator. WARNING: ENSURE THAT MAGNETO SWITCH IS OFF WHEN TURNING PROPELLER.

ALTERNATOR SYSTEM-TROUBLESHOOTING (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
ALT circuit breaker trips (Continued)	Short circuit in alternator (continued)	Rotate propeller by hand to rotate alternator through 360 degrees of travel. If circuit breaker trips replace alternator.
Alternator will not keep battery charged.	Battery malfunction.	1. Start engine and adjust for 1500 RPM. Ammeter should indicate a heavy charge rate with all electrical equipment turned off. Rate should taper off in 1 - 3 minutes. A voltage check at the bus should indicate a reading of 13.75 to 14.0 volts. If charge rate tapers off very quickly and voltage is normal, check battery for malfunction. If ammeter shows a low charge rate or any discharge rate, and voltage is low, proceed to step 3.
	Defective wiring.	2. Check voltage at A or 1 terminal of regulator with master switch closed. Meter should indicate bus voltage. If voltage is not present, check wiring between regulator and bus.
	Regulator faulty.	3. Remove connector from regulator and start engine. Momentarily jump the A & B or 1 & 2 pins together on the plug. Aircraft ammeter should show heavy rate of charge. If heavy charge rate is observed, replace regulator. If heavy charge rate is not observed, proceed to step 5.
	Defective wiring regulator to alternator.	4. Check resistance from "F ₂ " terminal of alternator to pin B or 2 of regulator plug. Normal indication is a very low resistance. If reading indicates no, or poor continuity, repair or replace wiring from regulator to alternator.
	Defective alternator.	5. Check resistance from F ₂ to F ₁ terminal of alternator. Normal indication is 3 - 4 ohms. If resistance is high or low, repair or replace alternator.

ALTERNATOR SYSTEM TROUBLESHOOTING (CONT.)

TROUBLE	PROBABLE CAUSE	REMEDY
Alternator will not keep battery charged. (Continued)	Defective alternator. (Continued)	6. Check resistance from F ₂ terminal of alternators to alternator case. Normal indication is high. If resistance is low repair or replace alternator.

9-14. STARTER TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Motor does not operate.	Low battery charge. Defective, improper, or loose wire connections. Binding, worn, or improperly seated brush, or brushes have excessive side play.	Check and recharge battery, if necessary. Refer to electrical wiring diagram and check all wiring. Brushes should fit free in brush boxes without excessive side play. Wipe clean binding brushes and brush boxes clean with a gasoline-moistened cloth. A new brush should be run-in until at least 50 percent seated; however, if facilities are not available for running-in brushes, seat brush by inserting a strip of No. .0000 sandpaper between brush and commutator with sanded side next to brush. Pull sandpaper in direction of rotation, being careful to keep it in same contour as commutator. CAUTION: Do not use coarse sandpaper or emery cloth. After seating, thoroughly clean brushes and commutator to prevent excessive wear. Keep

STARTER TROUBLE SHOOTING (CONT)

	Dirty commutator.	motor bearing free from sand or metal particles. If commutator is rough or dirty, smooth and polish with No. 0000 sandpaper. If too rough and pitted, remove commutator and turn down. Blow out all foreign material.
	Shorted, grounded, or open armature.	Remove and replace with an armature known to be in good working order.
	Grounded or open field circuit.	Test and repair circuit if possible or replace with new parts.
Slow cranking speed.	Worn, rough, or improperly lubricated motor or starter.	Disassemble, clean, inspect, and relubricate components, replacing ball bearing if worn.
	Same causes as listed with "Motor fails to operate."	Same remedies.
Excessive motor brush arcing.	Binding, worn, or improperly seated brush or brushes have excessive side play.	Repair as outlined above.
	Dirty, rough, pitted, or scored commutator.	Clean as outlined.
Excessive motor brush wear and arcing.	Rough or scored commutator.	Remove and turn down commutator on lathe.
	Armature assembly not concentric.	Reface commutator.

9-15. ELECTRICAL SYSTEM SCHEMATICS AND
HARDWARE LIST (1968)

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ELECTRICAL SYSTEMS SCHEMATIC NOTES.

All wire dash numbers in the following electrical system schematics carry the basic part number 800214. Underlined numbers refer to the item numbers in the electrical list.

1. All electrical wiring, assemblies, and installations must be in accord with FAR 43 and AC 43.13-1.
2. All splices must be "AMP" disconnect or equivalent.
3. All circuit breakers are trip-free.
4. All terminals are spec. AN 659 (or equivalent) or they must be soldered.
5. All terminals must be preinsulated or must be insulated with "Ampsulation" (or equivalent).
6. Wires without dash numbers are furnished by the manufacturer and are included with the equipment.
7. The symbol "F" indicates ground through the frame (no wires).
8. The symbol "  " indicates a knife disconnect.
9. "Not Used".
10. Optional equipment may be installed as required.
11.  Optional-equipment wire is installed in all aircraft, but is connected only when needed.

12. The following pairs of wires are twisted together counterclockwise with a minimum of three wraps per foot:

-085 & -086	-084 & -087	-083 & -088
-089 & -096	-090 & -095	-091 & -094
-092 & -093	-098 & -099	-050 & -114
-106 & -111	-107 & -110	-108 & -109
-139 & -138	-097 & -105	

14. The -022 wire connects to 810195-3 wire, and the shield connects to 810195 wire, effective S/N 680001 to 690001.
15. SAW-4204 solenoid and 1466 solenoid are completely interchangeable. SAW-4204 solenoid supersedes the 1466 solenoid.
16. The -011 wire shall be replaced by -147 wire, effective M20F, S/N 670363 to 690001.
17. The 507-3913 light and 39-14-373 light are completely interchangeable. The 507-3913 light supersedes the 39-14-373 light.
18. These wires attach to the same pins of plug 98 instead of plug 45, effective S/N 680001 to 690001.
19. GILL battery 6-GCBA-11 and REBAT battery R-35 are completely interchangeable.
20. When rheostat 101 (Figure 9-27) and control assembly 102 are not installed, wire -154 connects to wire -068 instead of wire -153 (as shown in Figure 9-8), and the other end of wire -154 connects to terminal #3 of terminal strip 78.
21. This schematic applies to installation of either item 114 or 115 (carburetor air temperature gage; see Figure 9-29).

Under the Mooney wiring system, a typical Wire Identification Number is 21PA03A18. This 9-character number is composed of five functional groups, each of which communicates certain specific information. These functional groups are as follows:

21 - first two numerals	- Aircraft Type
PA - first two letters	- Circuit Function
03 - second set of numerals	- Wire Sequence
A - single letter in the series	- Configuration
18 - last two numerals in the series	- Wire Size

CD	PC Dump
CF	Wing Flaps - Electric
CT	Trim

DA	Instruments - Ammeter
DB	Instruments - Turn Coordinator
DC	Instruments - Cylinder Head Temperature
DD	Instruments - Outside Air Temperature
DE	Instruments - Carburetor Air Temperature
DF	Instruments - Fuel Quantity
DG	Instruments - Cluster Gage
DH	Instruments - Oil Temperature
DJ	Instruments - Oil Pressure
DK	Instruments - Fuel Pressure
DL	Instruments - Tachometer

DM	Instruments - Hour Meter
DN	Instruments - Pressurization
DP	Instruments - Pitot Heat
DR	Instruments - Turbine Inlet Temperature
DS	Instruments - Compressor Discharge Temperature
DT	Instruments - Exhaust Gas Temperature
EG	Electric Gear - Gear Controls
EL	Lighting - Electroluminescence
ELT	Emergency Locator Transmitter
JM	Ignition - Magneto
JV	Ignition - Vibrator
LB	Lighting - Rotating Beacon (Anticollision Light)
LC	Lighting - Cabin Lights
LL	Lighting - Landing Lights
LN	Lighting - Navigation Lights
LP	Lighting - Instrument & Placard Lights
LS	Lighting - Instrument & Strobe Lights
LT	Lighting - Taxi Lights
MA	Miscellaneous - Auxiliary Power Plug
MB	Miscellaneous - Radio Circuits
MC	Miscellaneous - Cigar Lighter
MD	Miscellaneous - Clock Light
ME	Miscellaneous - Electric Clock
MM	Miscellaneous - Marker Beacon
MS	Miscellaneous - Radio Speaker
NF	Fuel - Fuel Pump
NP	Fuel - Primer
PA	Power - Alternator (Output & Control)
PB	Power - Battery (Output & Control)
PG	Power - Generator (Output & Control)
PS	Power - Starter (Input & Control)
VB	Vent Air Blower
WA	Warning System - Alternator - Voltage Warning
WB	Warning - Engine Boost
WE	Warning System - Gear Position Warning (Electric)
WF	Warning System - Fuel Pressure
WL	Warning System - Landing Light
WM	Warning System - Gear Position Warning (Manual)
WN	Warning System - Pressurization
WS	Warning System - Stall Warning
WT	Warning System - Press-to-Test
WV	Warning System - Vacuum Warning
WW	Warning System - Alternate Air
WD	Warning System - Starter Power

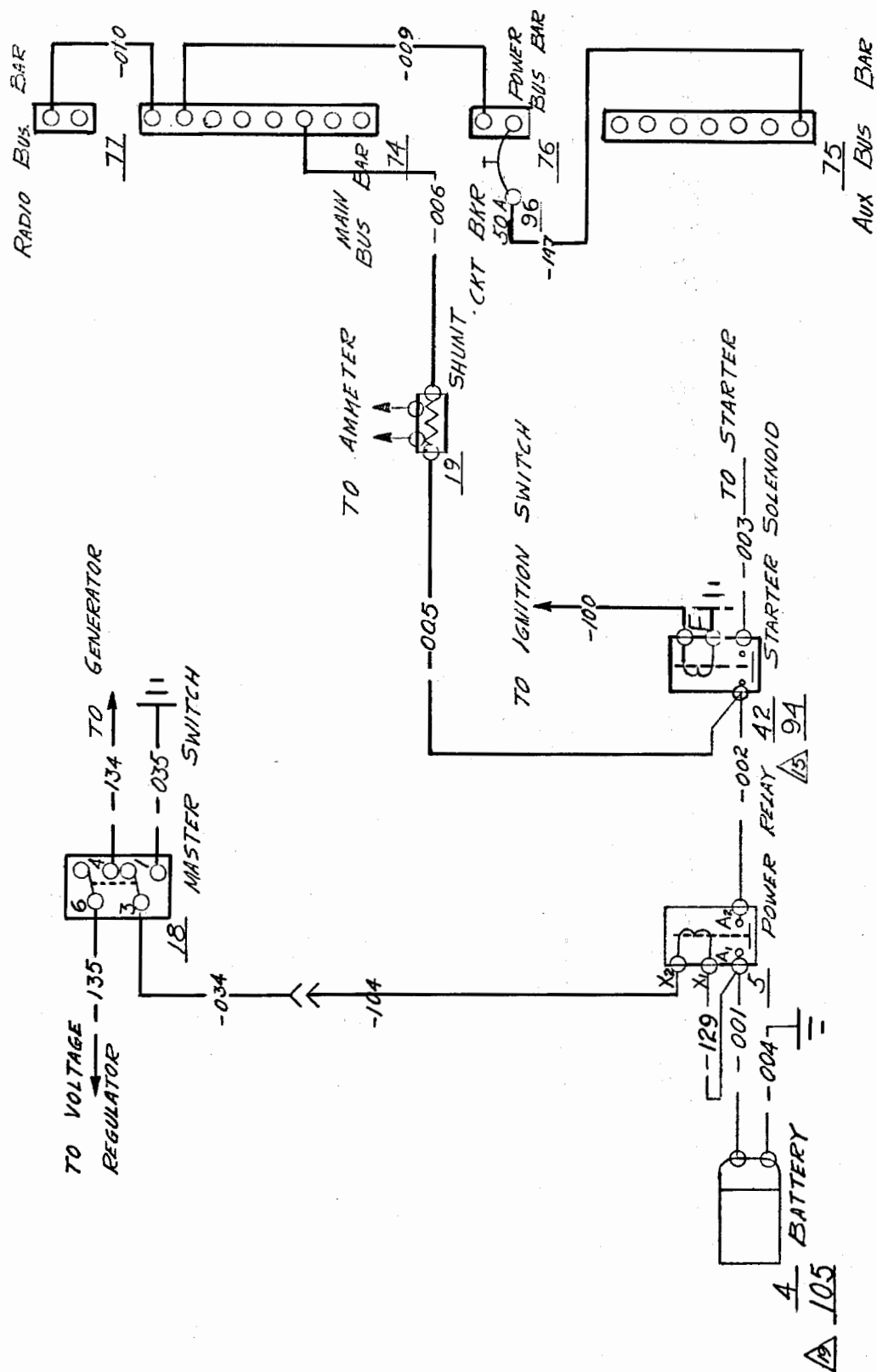


Figure 9-1. Battery & Bus Bars (M20F, 1968)

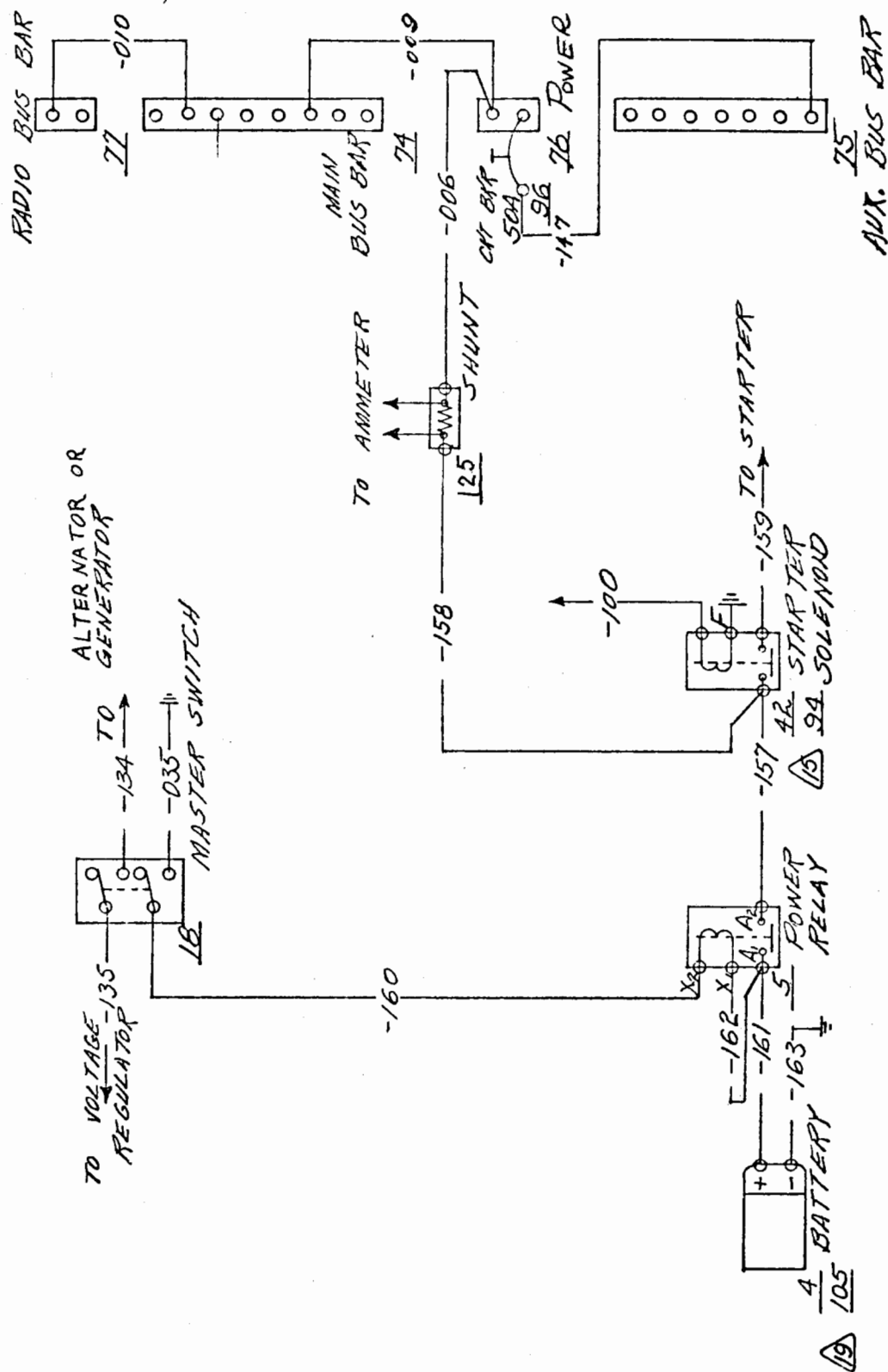


Figure 9-2. Battery & Bus Bars (M20C & G, 1968)

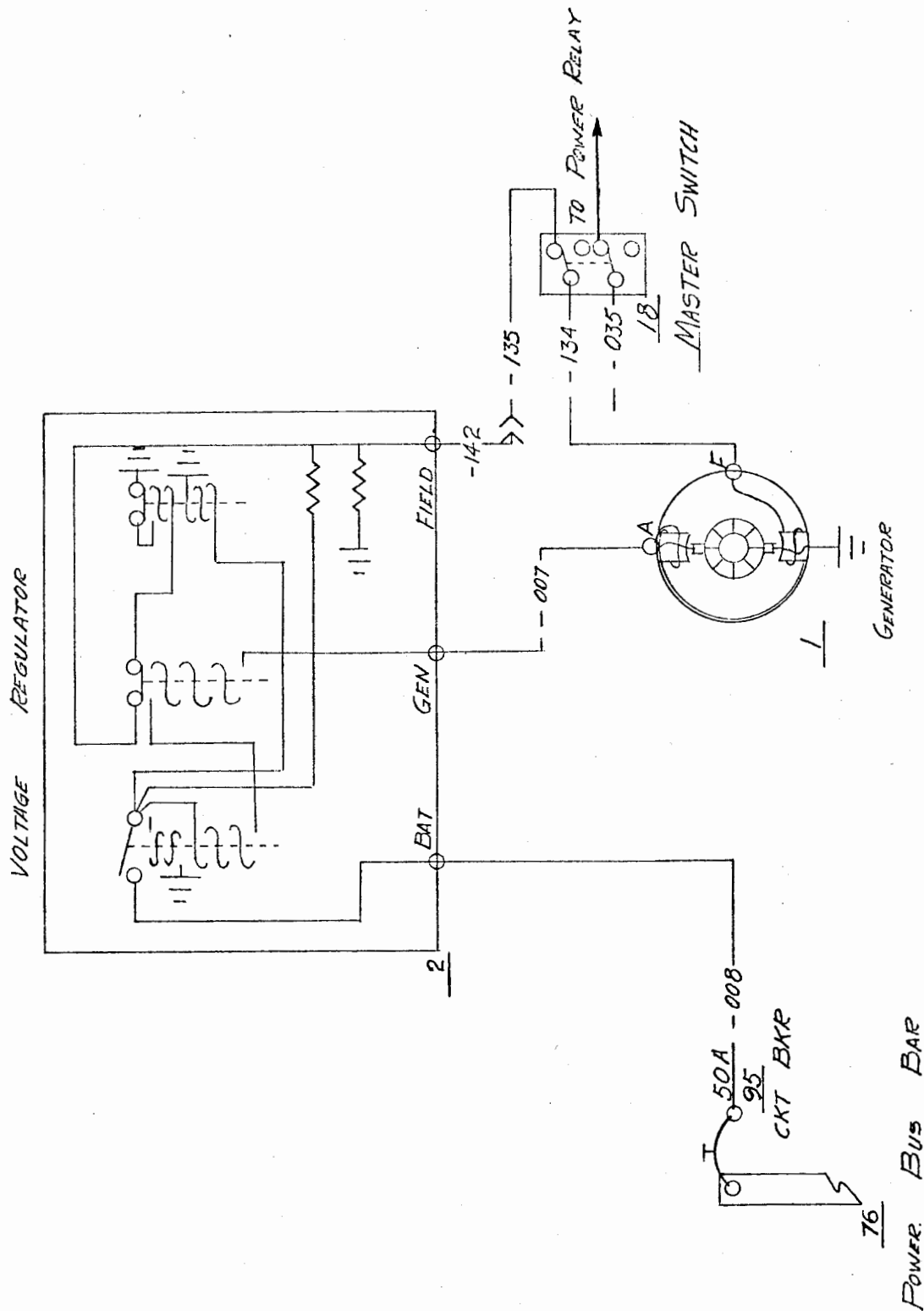


Figure 9-3. Generator & Voltage Regulator (1968)

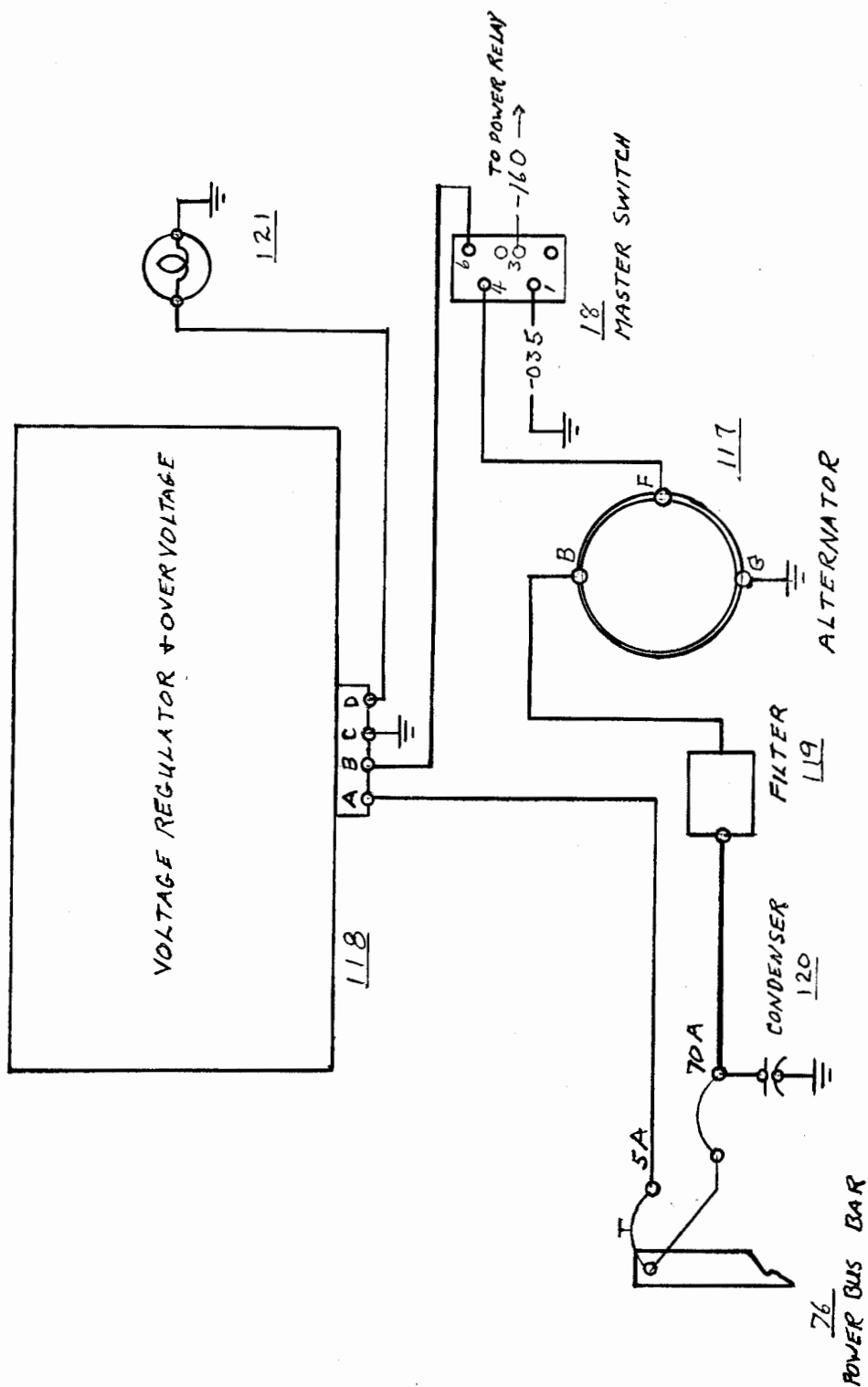
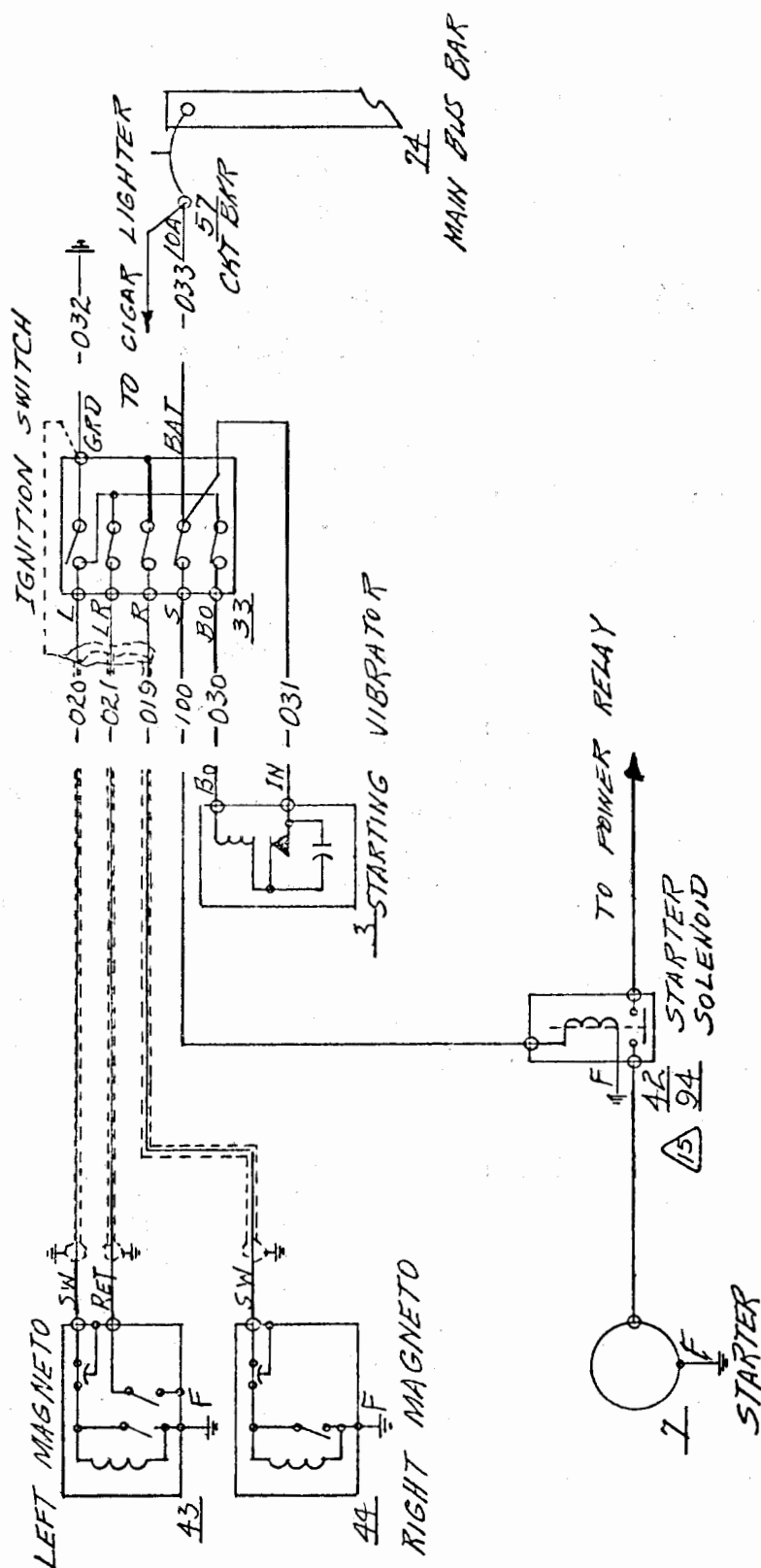


Figure 9-4. Alternator System (1968-1969)



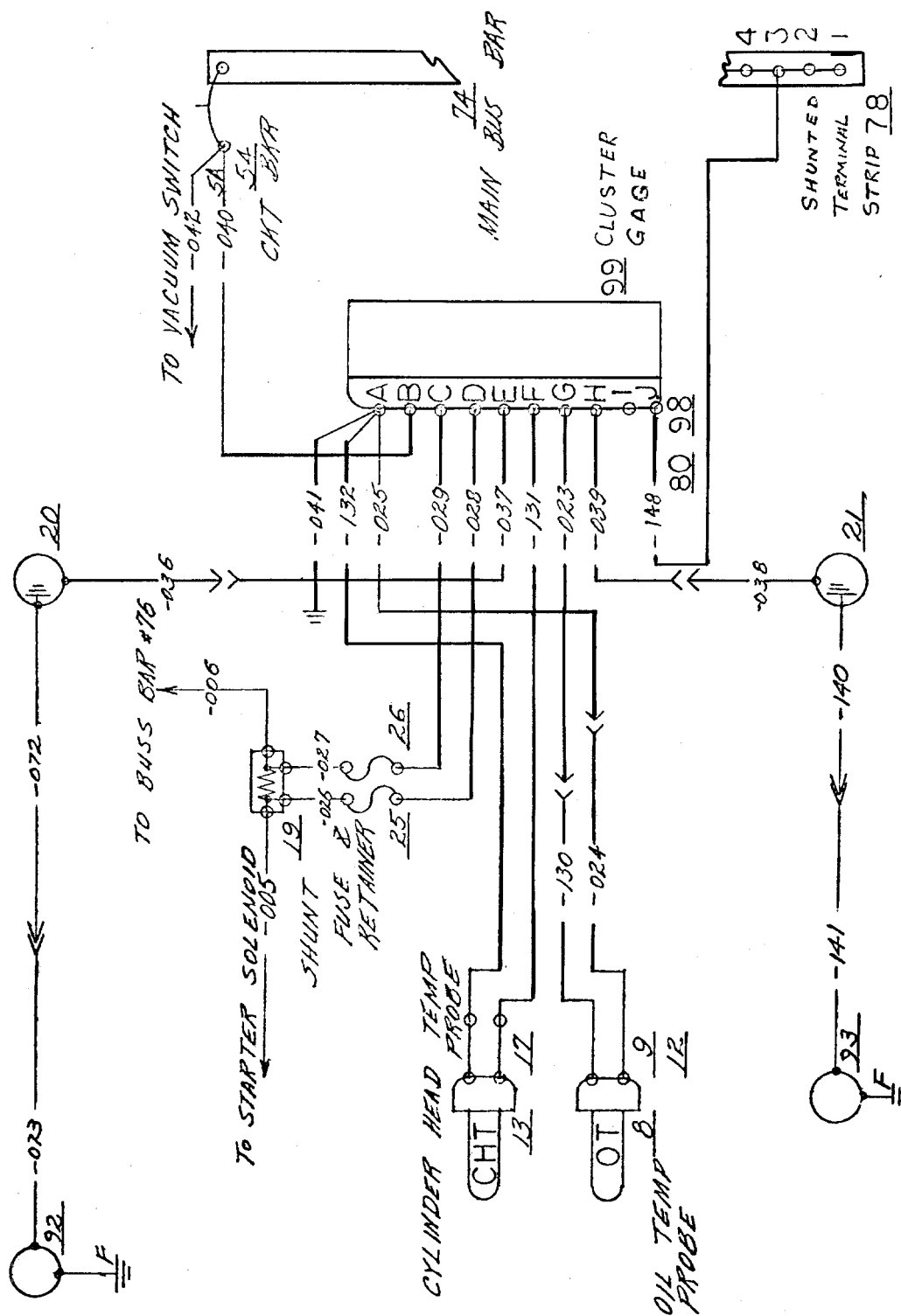


Figure 9-6. Cluster Gages (M20F, 1968)

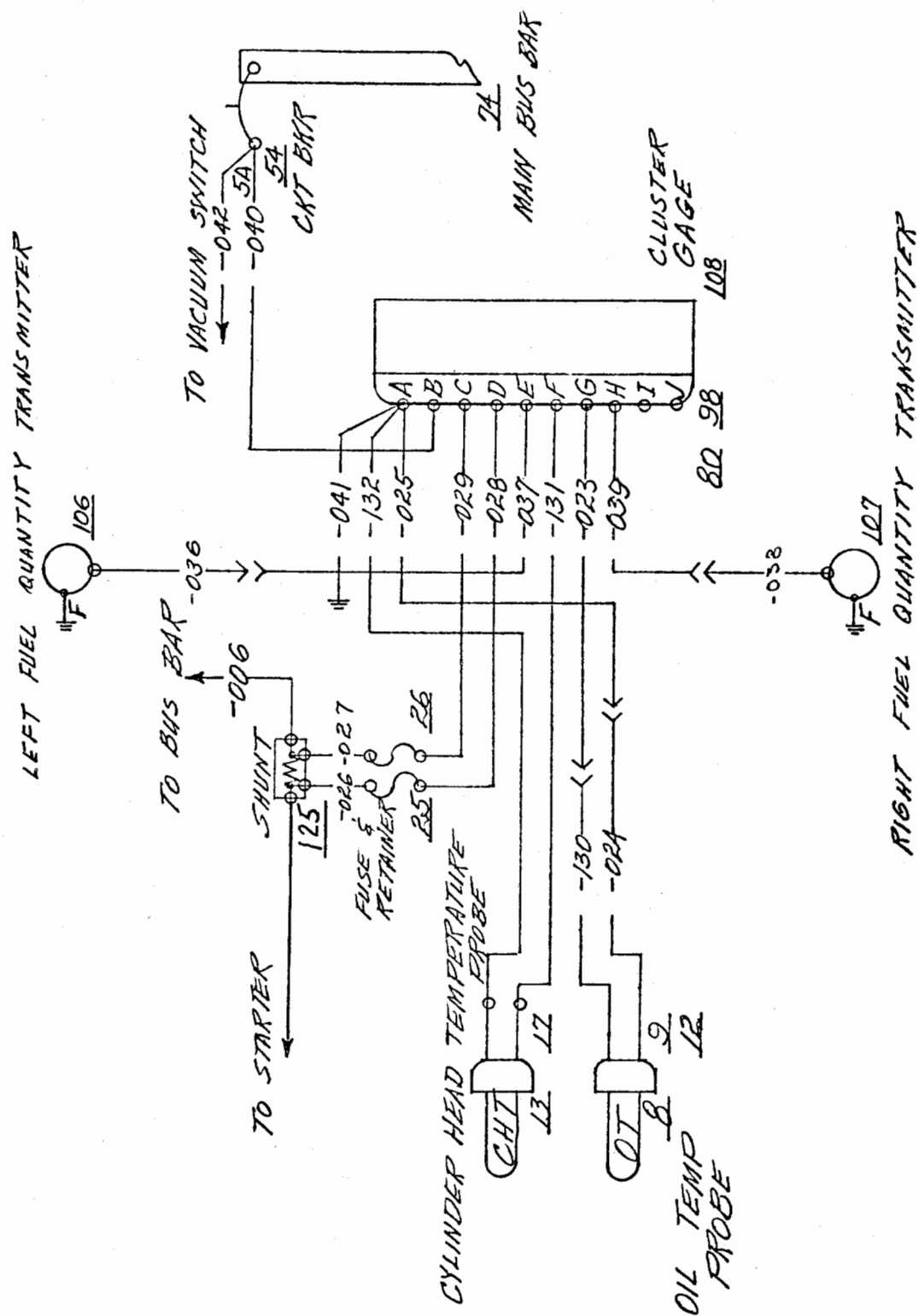


Figure 9-7. Cluster Gages (M20C & G, 1968)

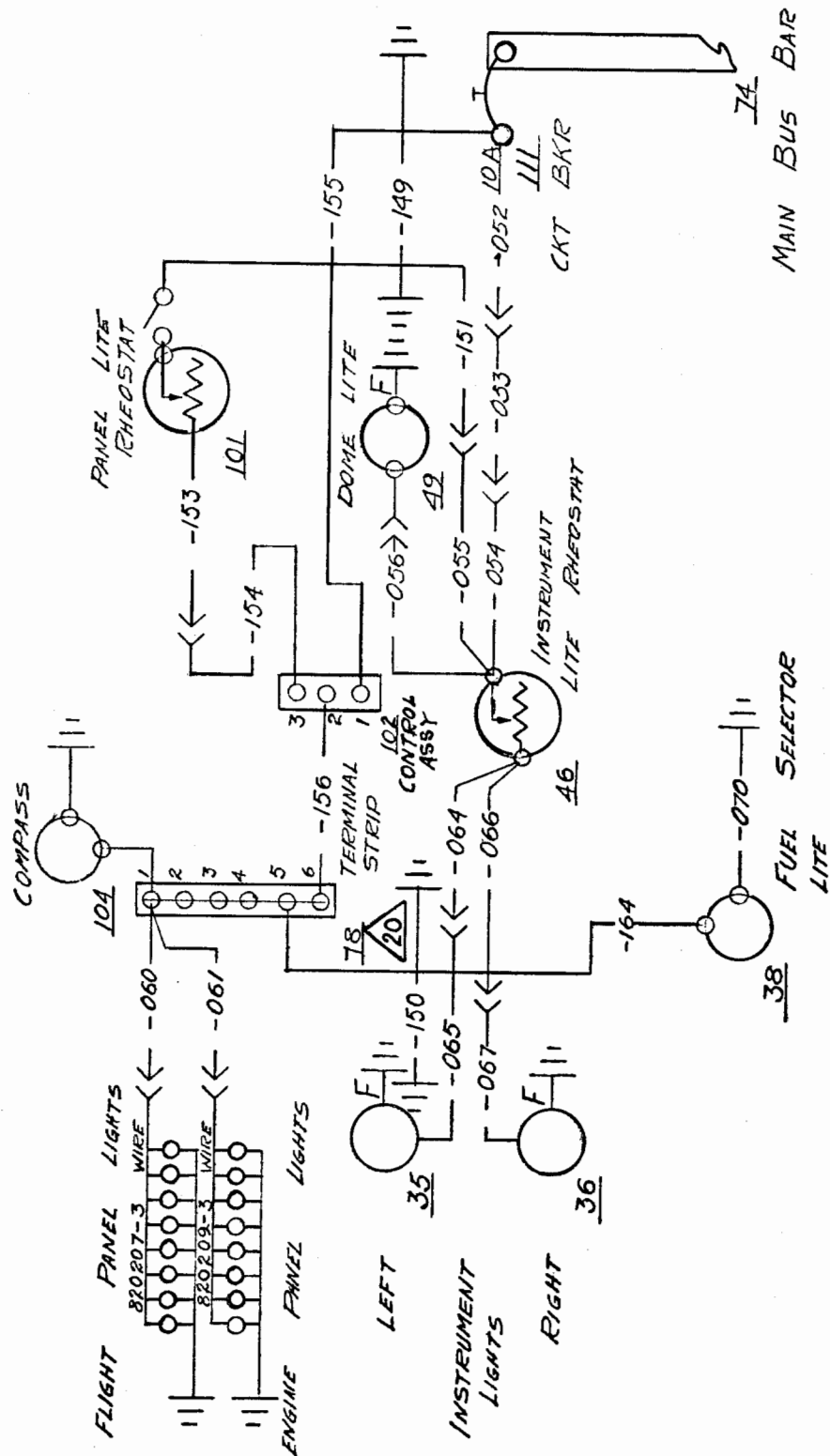


Figure 9-8. Instrument Lights (M20F, 1968)

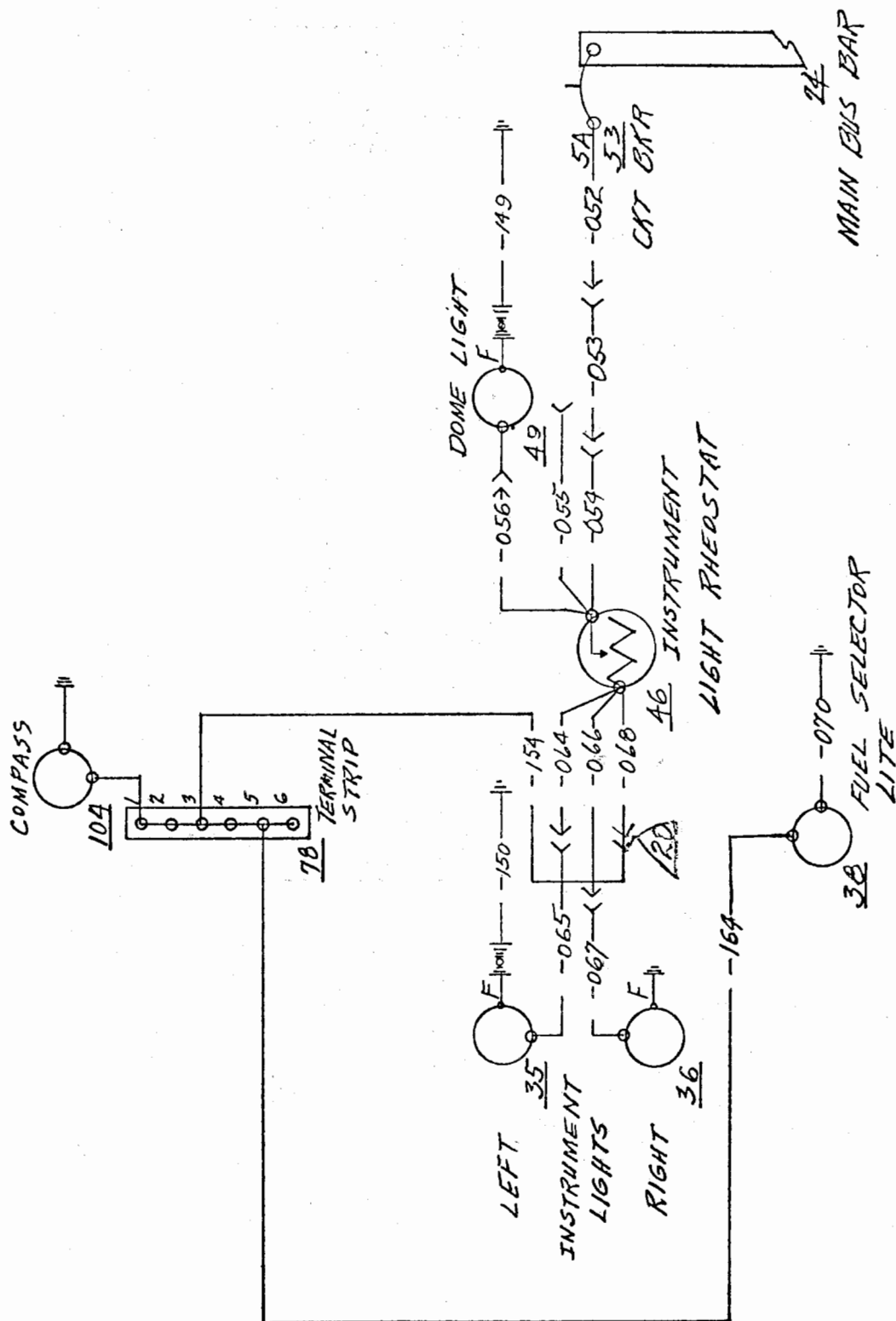


Figure 9-9. Instrument Lights (M20C & G, 1968)

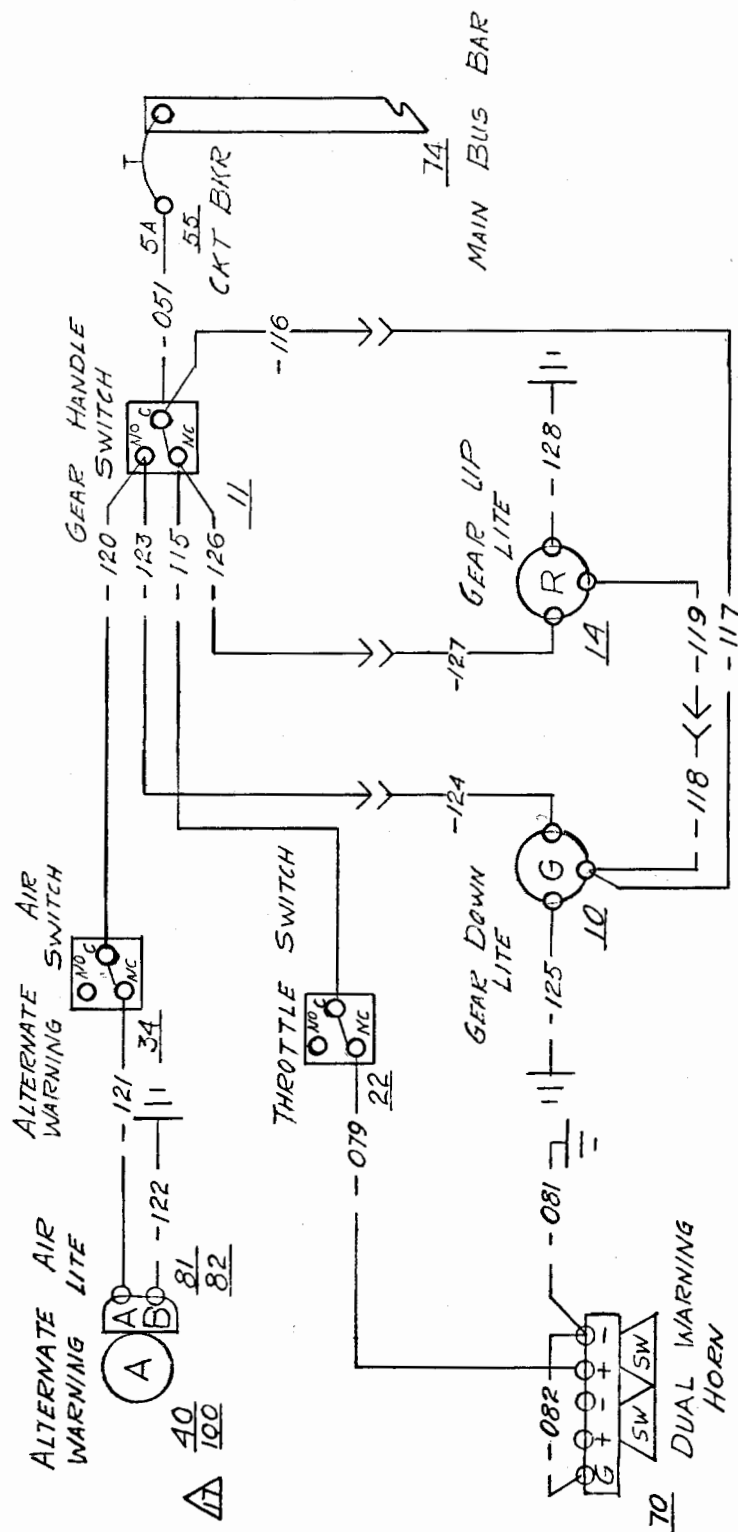
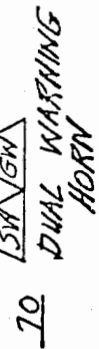


Figure 9-10. Gear Warning System (M20F, 1968)



9-26

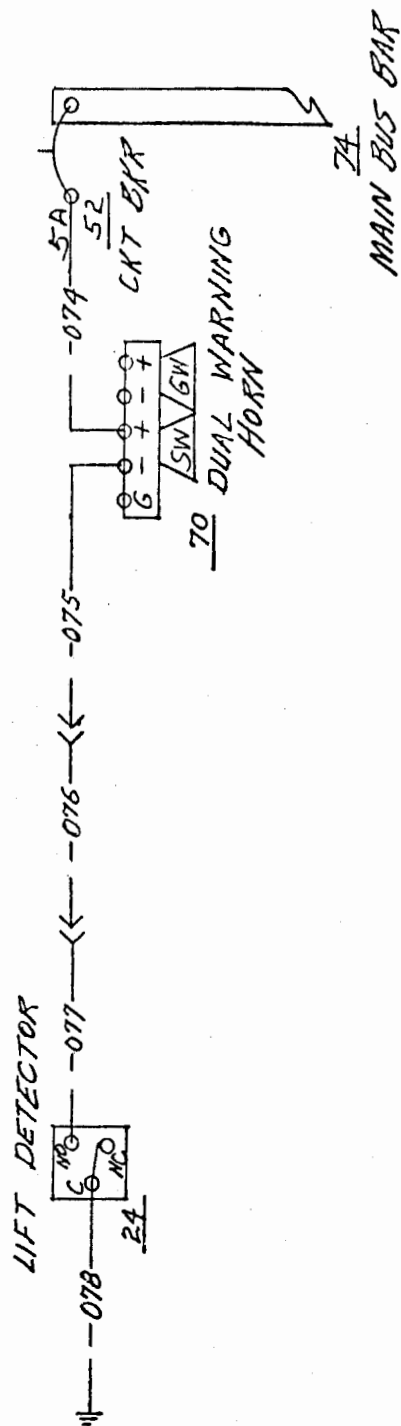
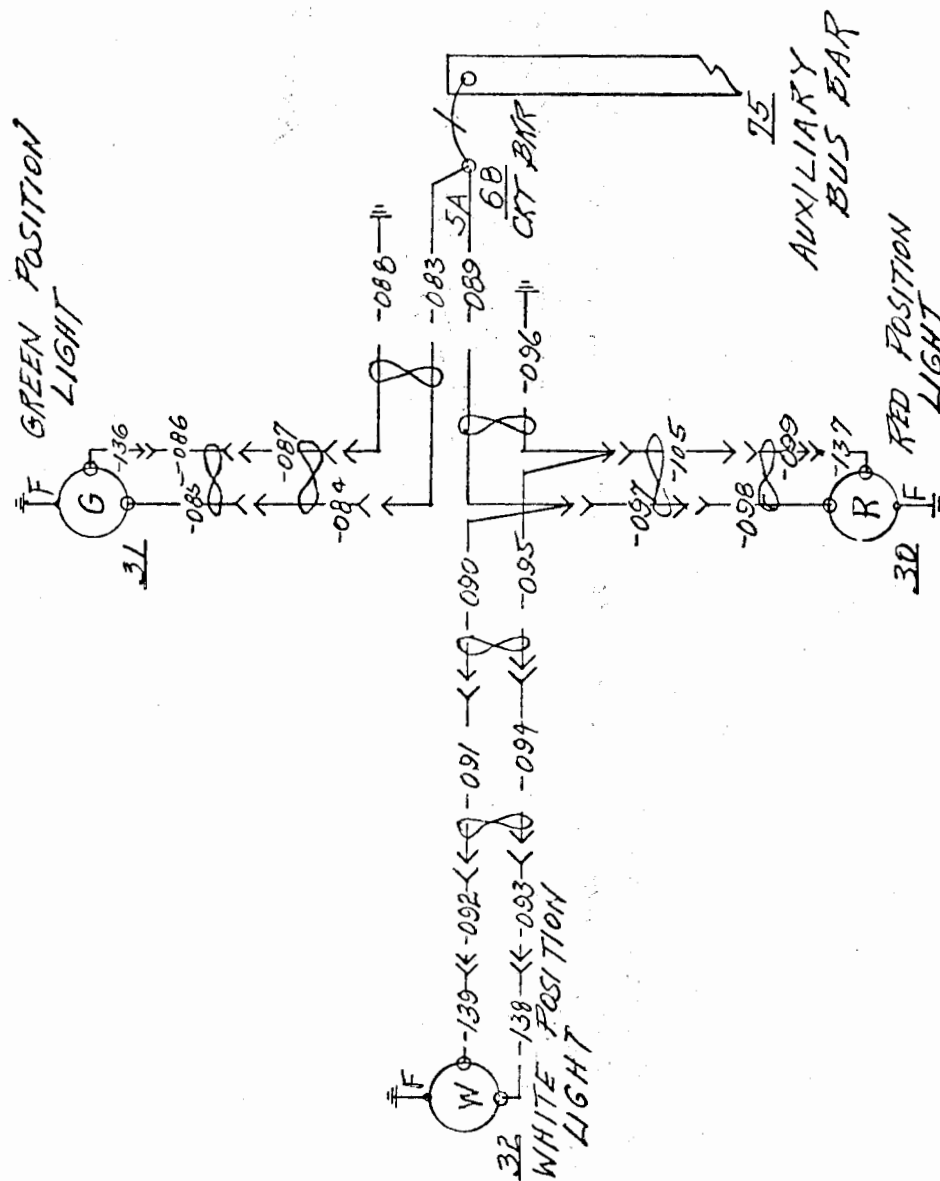


Figure 9-12. Stall Warning (1968)



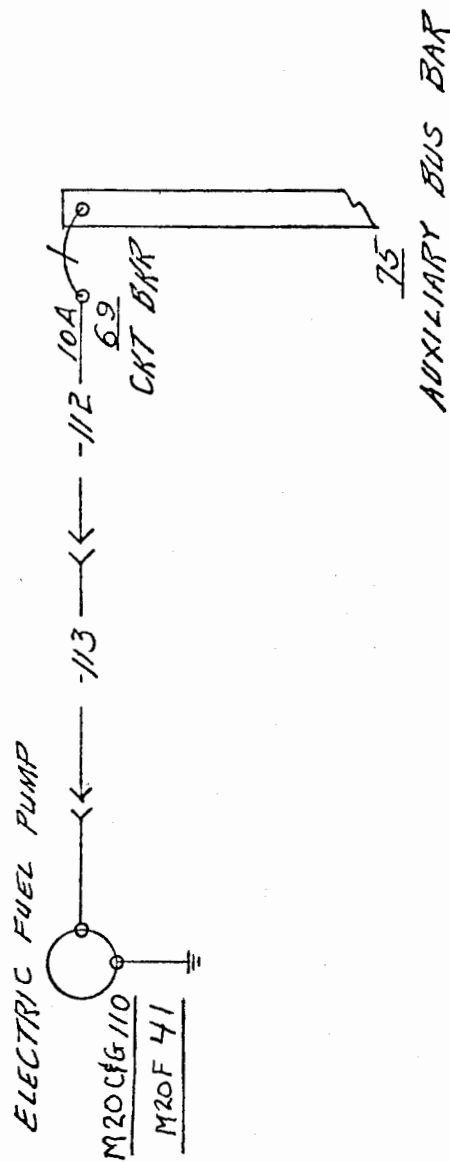
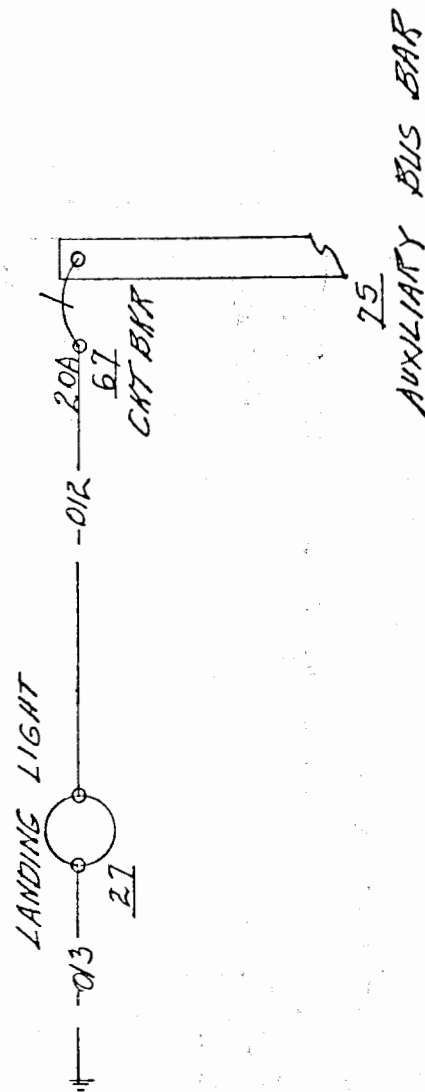


Figure 9-14. Electric Fuel Pump (1968)



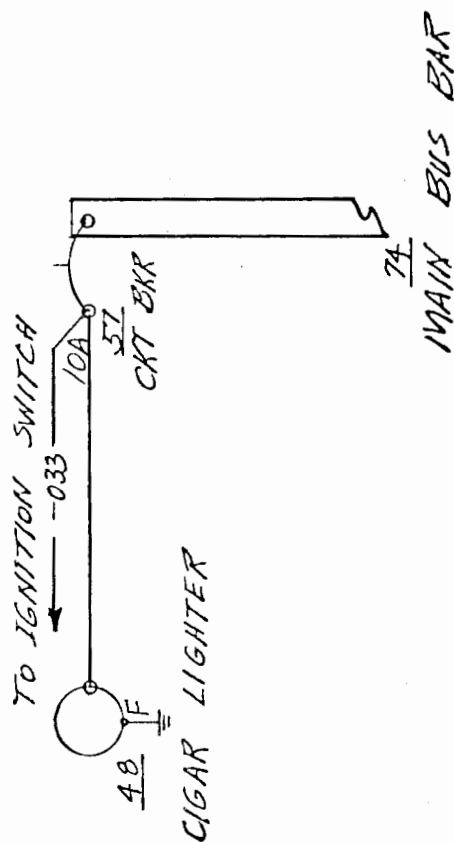
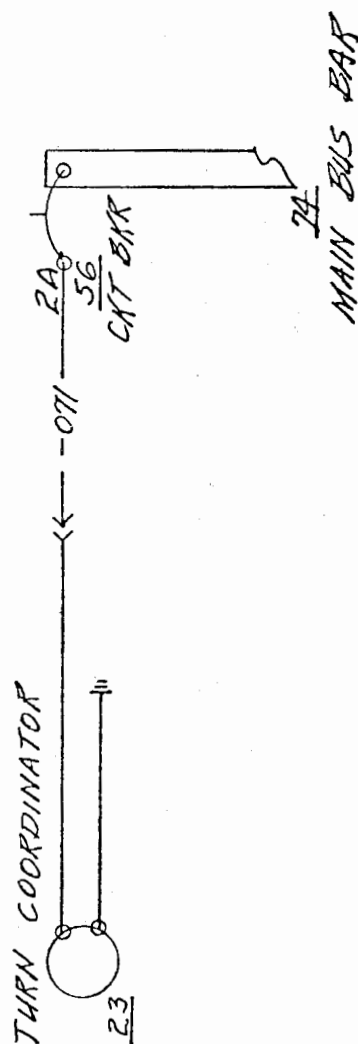


Figure 9-16. Cigar Lighter (1968)



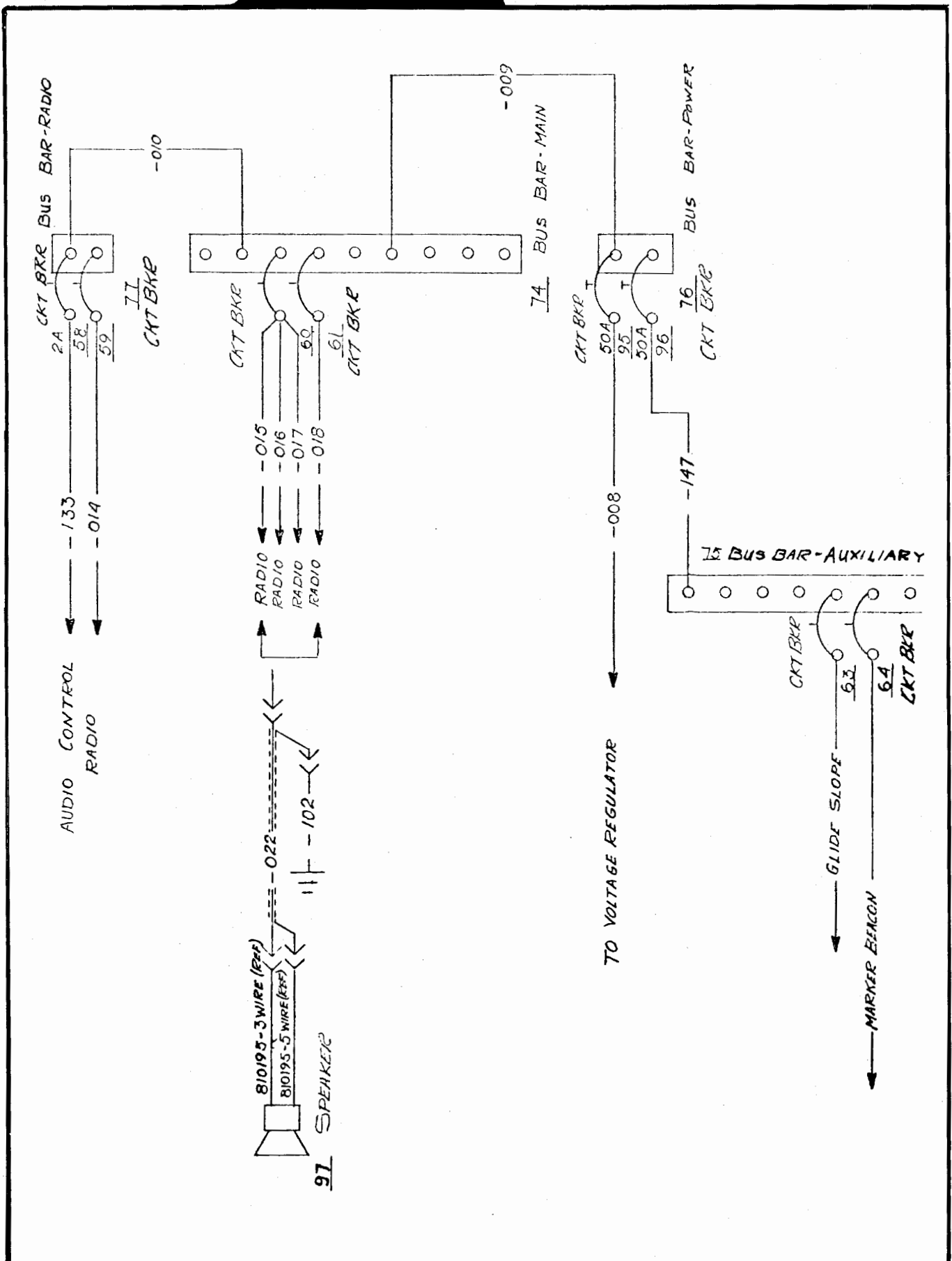
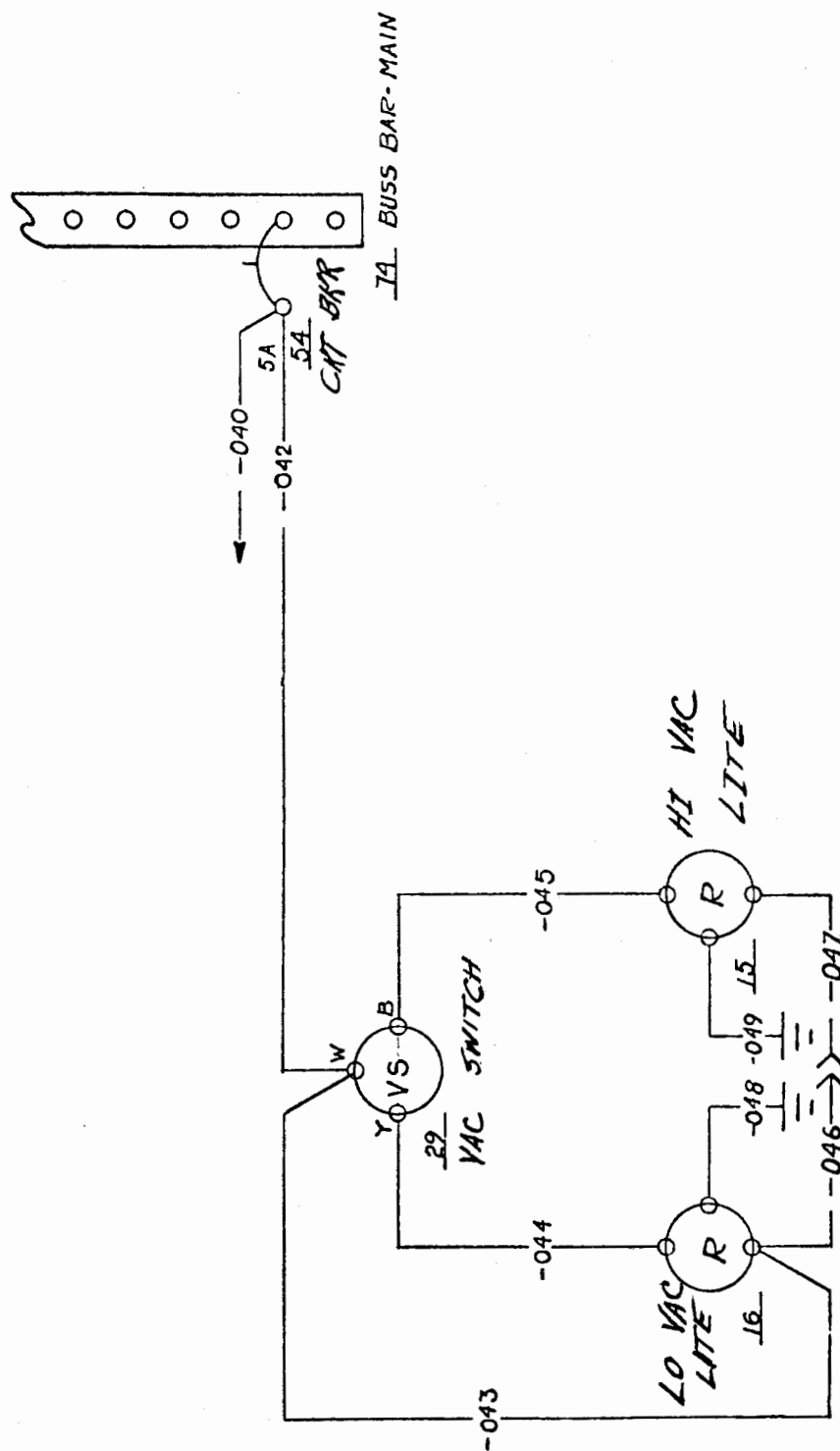


Figure 9-18. Circuit Breakers (1968)



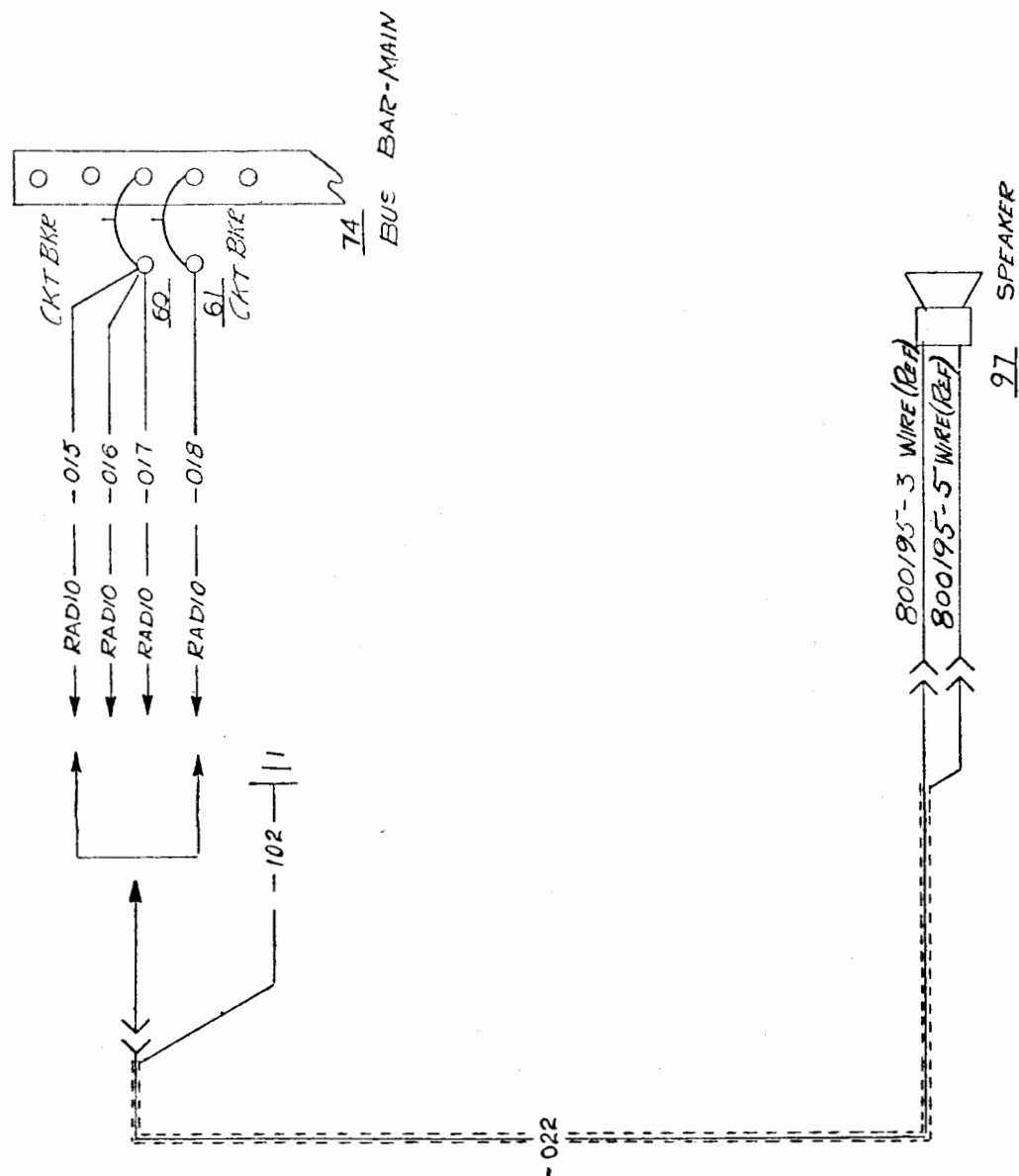


Figure 9-20. Radio Speaker (1968)

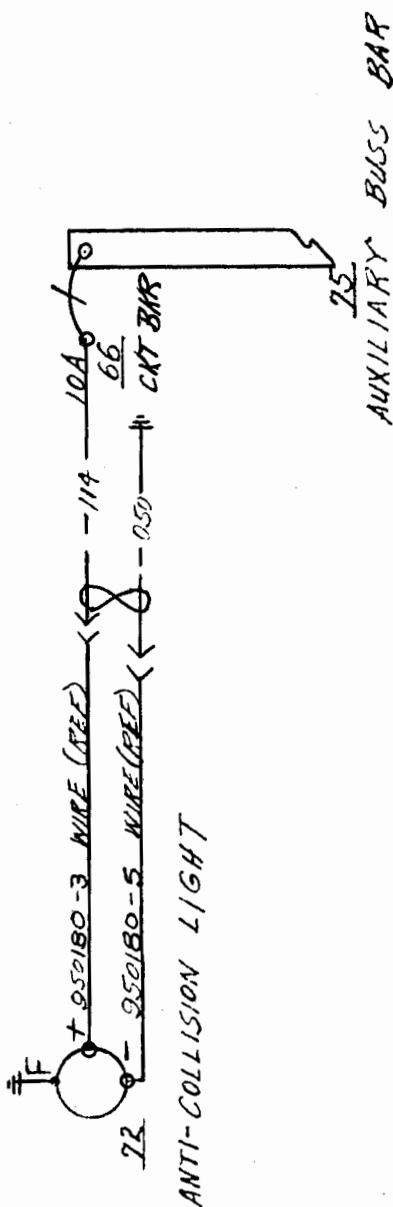


Figure 9-21. Anticollision Light (Optional)(1968)

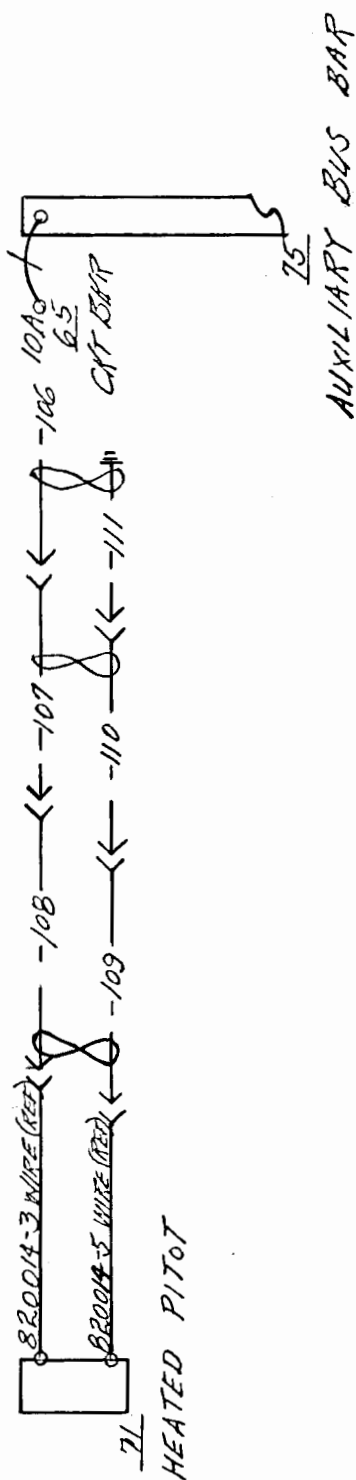


Figure 9-22. Heated Pitot (Optional) (1968)

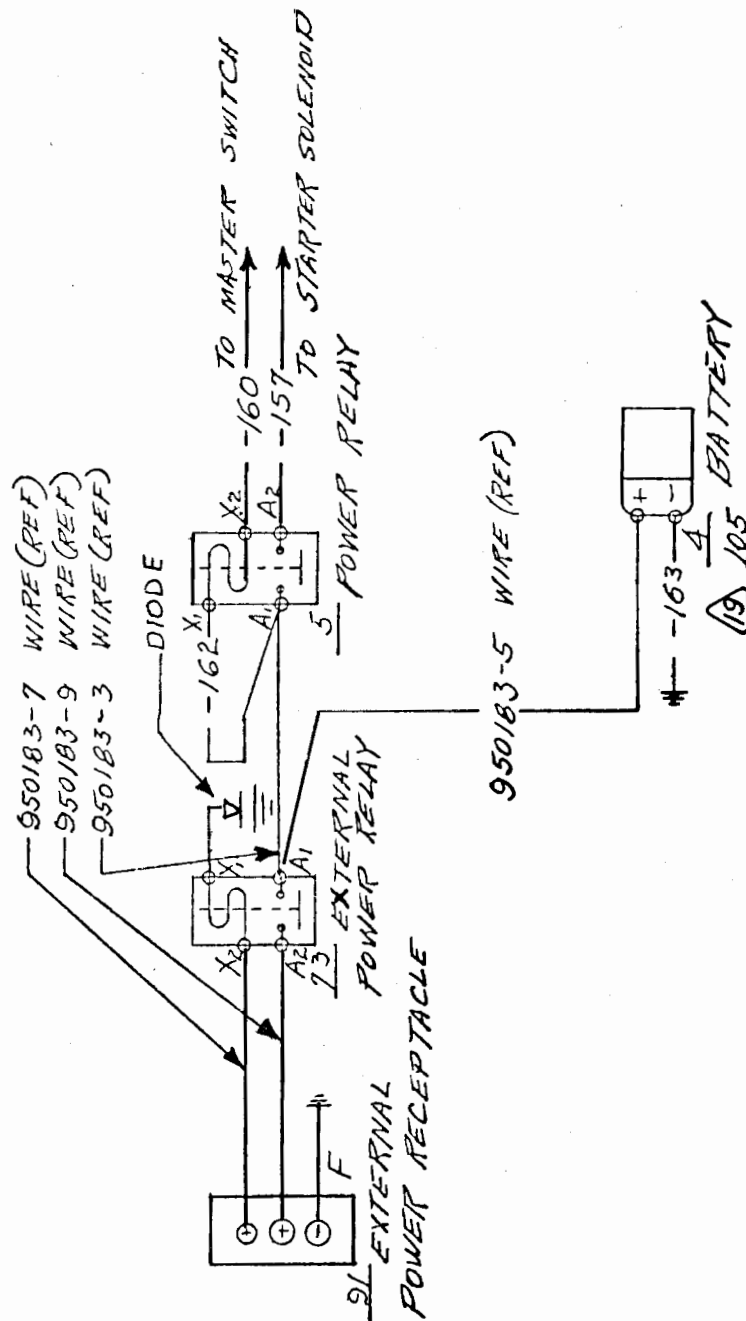


Figure 9-23. External Power Receptacle (Optional)(1968)

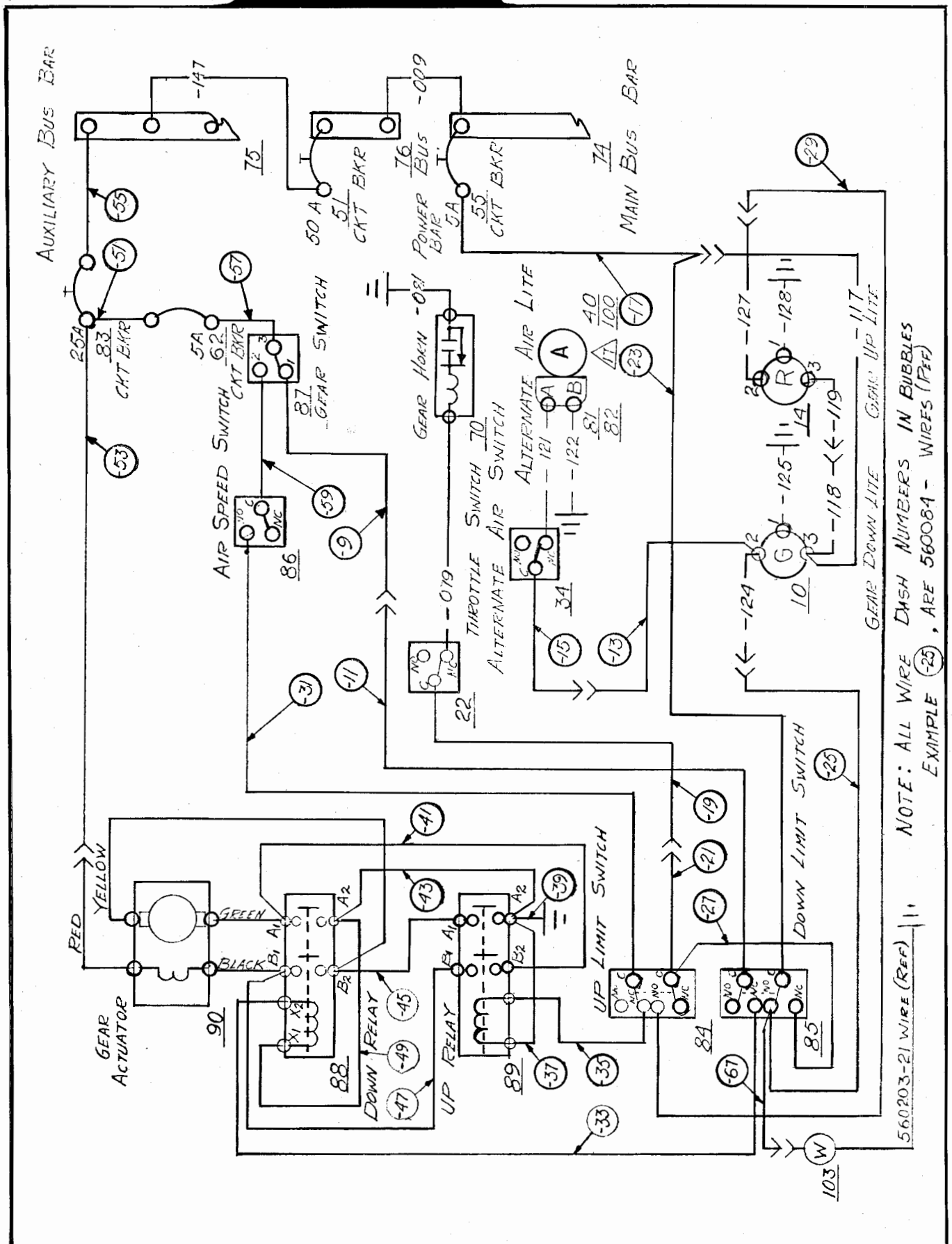


Figure 9-24. Electric Gear (M20F, 1968 Optional)

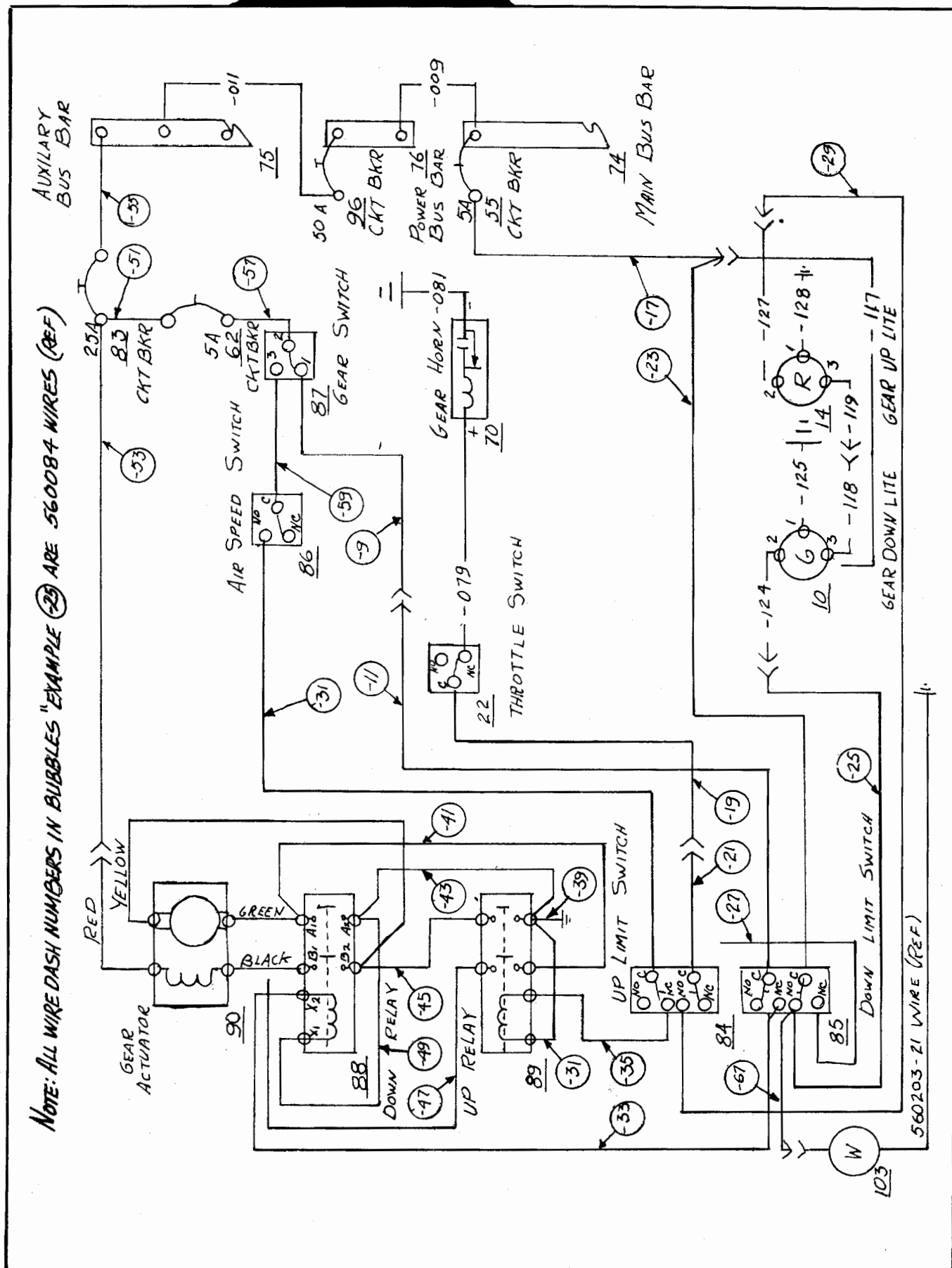


Figure 9-25. Electric Gear (M20C & G, Optional 1968)

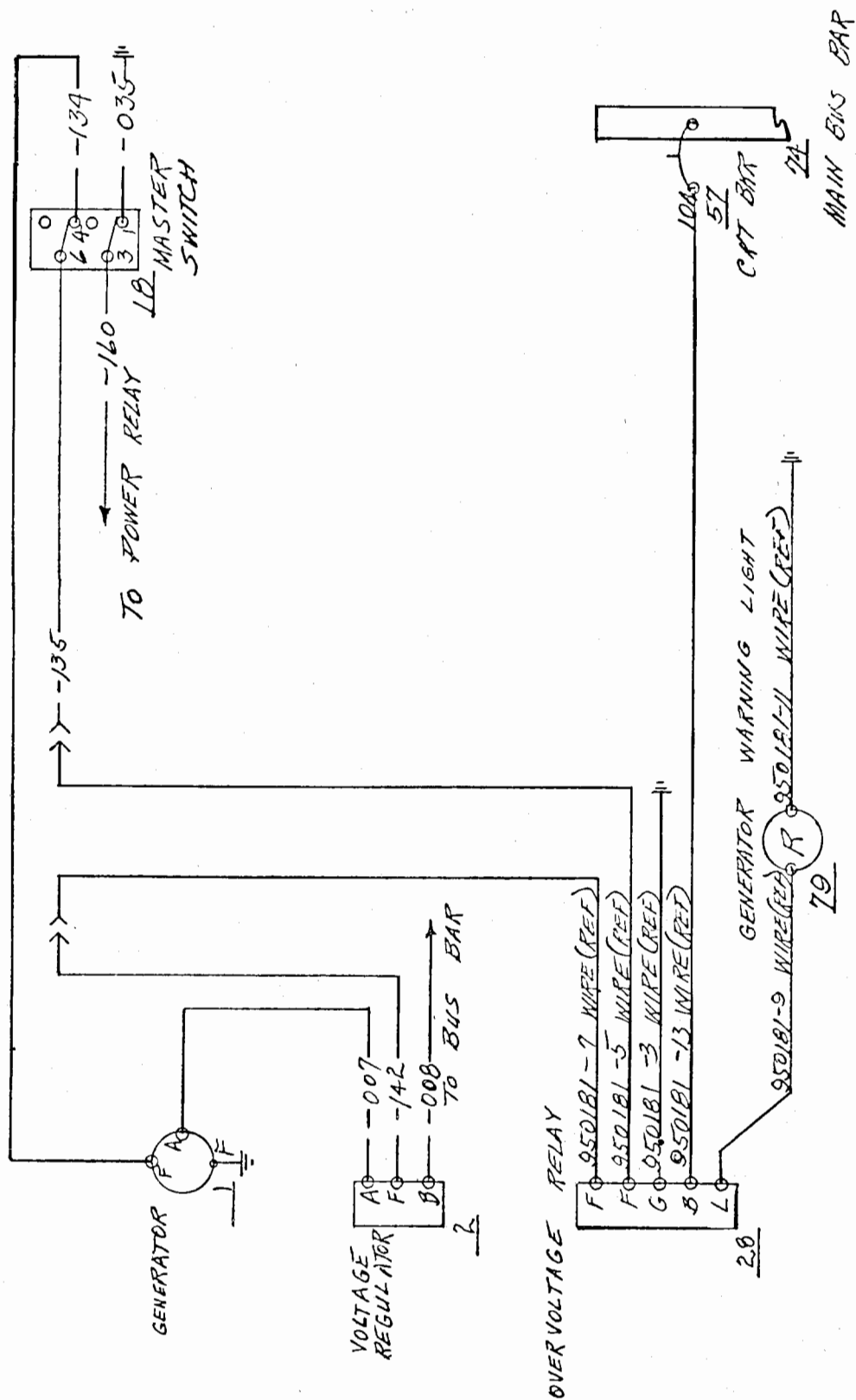


Figure 9-26. Overvoltage Relay (1968, Optional)

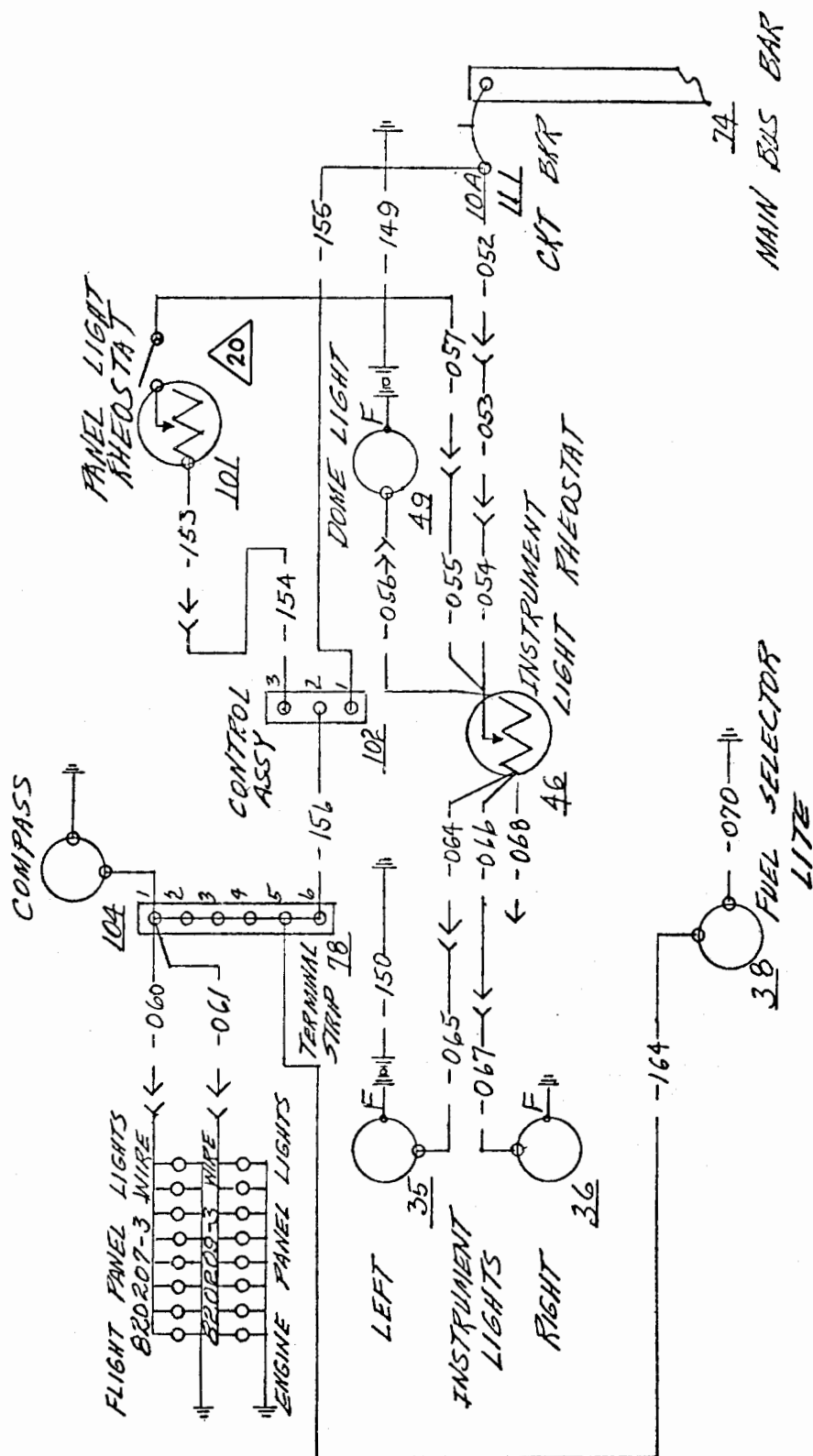


Figure 9-27. Instrument Lights (M20C & G, Optional 1968)

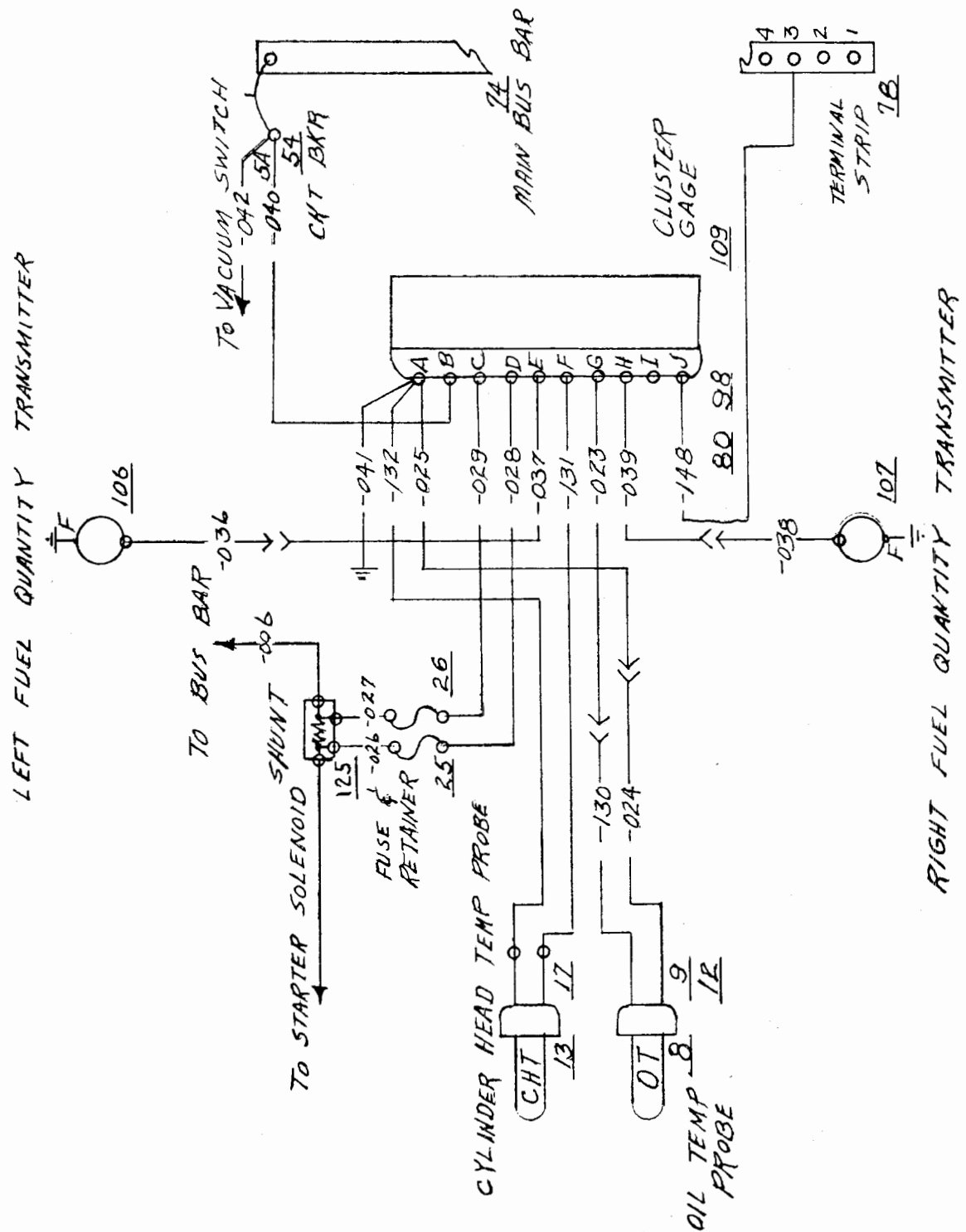


Figure 9-28. Cluster Gage (M20C & G, 1968 Optional)

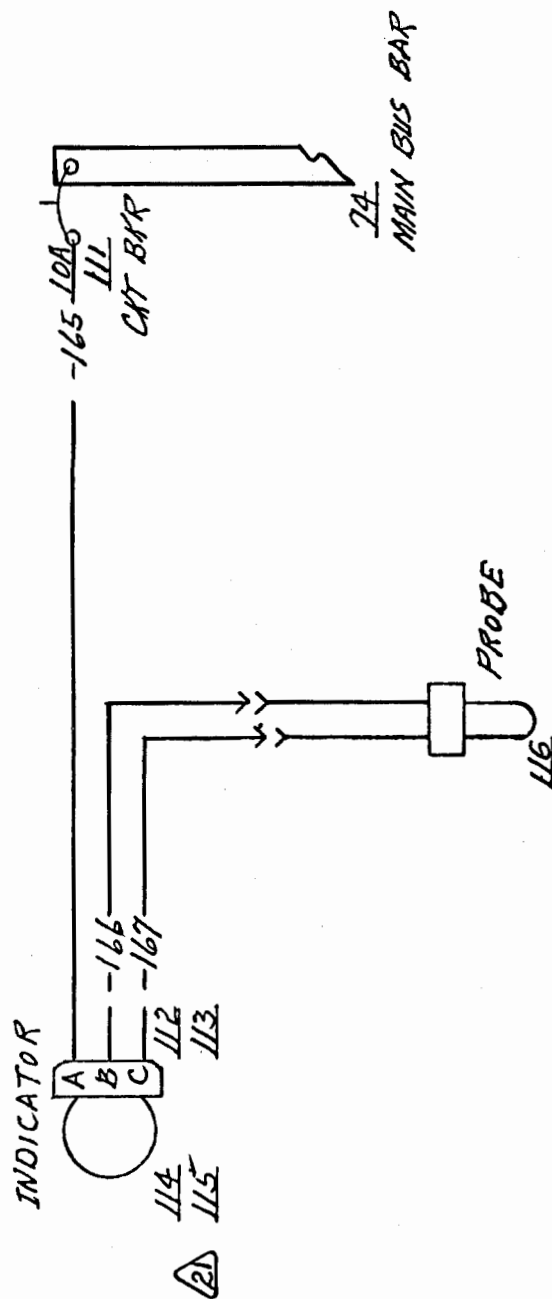


Figure 9-29. Carburetor Air Temperature Gage (M20C & G, 1968 Optional)

MOONEY M20 SERIES ELECTRICAL SYSTEM

TERMINAL CHART

WIRE SIZE	STUD SIZE	AN 659 DASH NO.	MS25036 DASH NO.	AMP NO. VINYL	AMP NO. NYLON	WIRE SIZE	STUD SIZE	AN 659 DASH NO.	MS25036 DASH NO.	AMP NO. VINYL	AMP NO. NYLON
22-16	2			320135		6	10	-30	-19	321298	
	4	-38	-48	31880	323758		1/4"	-9	-20	321598	
	6 SM		-1	31881			5/16"	-31	-21	33466	
	6 STD	-1	-2	31885	36151		3/8"	-10	-22	33467	
	8		-49	31890	320551		7/16"			320745	
	10	-2	-3	31891	36153		1/2"	-43		320344	
	1/4"		-50	31894	320571		5/8"			36809	
	5/16"		-4	31895	320572		3/4"			36810	
	3/8"	-25	-5	31897	320573						
	1/2"		-51			4	10	-44		33468	
	K.D.			32446	320555		1/4"	-11	-23	33469	
							5/16"	-32	-24	33470	
							3/8"	-12	-25	33471	
16-14	2			321008			7/16"			320743	
	4	-39	-52	32441	324159		1/2"	-45		35668	
	6 SM	-26	-6	32442			5/8"			35669	
	6 STD	-3	-7	31901	35157		3/4"			35670	
	8		-53	31902	320560						
	10 SM			322238	32855						
	10 STD	-4	-8	31903	320574	2	10	-46			
	1/4"		-54	31906	320563		1/4"	-13	-26	320383	
	5/16"		-9	31907	320575		5/16"	-47		322870	
	3/8"	-27	-10	31909	320564		3/8"	-14	-27	321600	
	1/2"		-55				7/16"	-48		320741	
	K.D.			32448	320566		1/2"	-33	-28	321602	
							5/8"			320754	
							3/4"			320755	
12-10	4			35148			7/8"			320756	
	6		-11	35149	320567						
	8		-56	35108	320568						
	10	-5	-12	35109	36161						
	1/4"		-57	35110	320569						
	5/16"	-6	-13	35111	320576						
	3/8"	-28	-14	35112	320577						
	1/2"		-58	35151							
	K.D.			35762	320620						
8	8	-40		32996							
	10	-7	-15	33460							
	1/4"	-41	-16	33461							
	5/16"	-8	-17	33462							
	3/8"	-29	-18	33463							
	1/2"	-42		35664							
	5/8"			35665							
	3/4"			35666							

ELECTRICAL EQUIPMENT LIST 1968

ITEM NO.	ITEM DESCRIPTION	AMPS	VOLTS	MANUFACTURER	PART NO.
1	GENERATOR	50	12	DELCO-REMY	1101915
2	REGULATOR, VOLTAGE			DELCO-REMY	1119224C
3	VIBRATOR, STARTER	2.75		GARWIN	31-324
4	BATTERY	35	12	REBAT	R-35
5	RELAY, POWER	0.67	12	CUTLER-HAMMER	6041H231
6	GAGE, CLUSTER	0.1	12	GARWIN MOONEY	22-169-07-1 660114
7	STARTER		12	PRESTOLITE	MZ4205
8	PROBE, OIL TEMP				AN5525-1
9	PLUG, OIL TEMP PROBE				MS3106A-125-35
10	LIGHT, GEAR DOWN WARNING	0.08	12	DIALCO	VM911M-3A
11	SWITCH, GEAR WARNING			MICRO	BZ-7RWTBO
12	CLAMP, CABLE, OIL TEMP PLUG				MS3057-4B
13	PROBE, CYLINDER HEAD TEMP				AN5546-1
14	LIGHT, GEAR UP WARNING	0.08	12	DIALCO	VM911M-2A
15	LIGHT, HIGH VACUUM WARNING	0.08	12	DIALCO	VM911M-2A
16	LIGHT, LOW VACUUM WARNING	0.08	12	DIALCO	VM911M-2A
17	ADAPTER, CYLINDER HEAD TEMP				AN4076-1
18	SWITCH, MASTER			MICRO	512TS1-2 MS35059-22
19	SHUNT			GARWIN	22-370-60
20	TRANSMITTER, FUEL QUANTITY, LH, IB			A-C	5642354
21	TRANSMITTER, FUEL QUANTITY, RH, IB			A-C	5641991
22	SWITCH, GEAR WARNING, THROTTLE, WITH ACTUATOR			MICRO MICRO	V3-1 JV-5
23	TURN COORDINATOR	0.75	12	BRITTIAN	820166
24	SWITCH, PRESTALL WARNING			SAFE FLIGHT MOONEY	C-46001 800218
25	FUSE & FUSE RETAINER			LITTELFUSE LITTELFUSE	311010 155020
26	FUSE & FUSE RETAINER			LITTELFUSE LITTELFUSE	311010 155020

ITEM NO.	ITEM DESCRIPTION	AMPS	VOLTS	MANUFACTURER	PART NO.
27	LIGHT, LANDING	250 W	12	G.E..OR EQUIV	4522
28	RELAY, OVER, VOLTAGE			RMB MOONEY	136-8 800165
29	SWITCH, HIGH & LOW VACUUM WARNING			GARWIN	22-1280-04
30	LIGHT, POSITION, RED	1.6	12	GRIMES MOONEY	A1285-R-12 800223-BASIC
31	LIGHT, POSITION, GREEN	1.6	12	GRIMES MOONEY	A1285-G-12 800223-501
32	LIGHT, POSITION, TAIL	1.6	12	GRIMES MOONEY	A2064-1777 800224
33	SWITCH, IGNITION & START			BENDIX	10-357210-1
34	SWITCH, ALTERNATE AIR WARNING			MICRO MICRO	V3-1 JV-5
35	LIGHT, PANEL, LH	0.63	12	GRIMES MOONEY	A1425A-1-12 919012-BASIC
36	LIGHT, PANEL, RH	0.63	12	GRIMES MOONEY	A1425A-1-12 919012-BASIC
37	COMPASS	0.08	12	AIRPATH	C-2350-DL-4VF
38	LIGHT, FUEL SELECTOR	0.08	12	DIALCO	203-1310-01117-201
39	SPEAKER			TRAMM	SP-1
40	LIGHT, ALT AIR WARNING	0.08	12	DIALCO	39-14-373
41	PUMP, ELECTRIC FUEL	5.0	12	DUKES	4140-00-19A
42	SOLENOID, STARTER	3.0	12	DELCO-REMY	001466
43	MAGNETO, LH			BENDIX	S4LN200
44	MAGNETO, RH			BENDIX	S4LN204
45	PLUG, CLUSTER GAGE				MS3106A-18-8S
46	RHEOSTAT, PANEL LIGHTS			OHNITE MOONEY	H-8-F2-352A 919006-1
47	RHEOSTAT, POST LIGHTS			OHMITE MOONEY	H-15-F2-352A 919006-501
48	LIGHTER, CIGAR	8.0	12	BALKAMP	4-2272
49	LIGHT, DOME	0.58	12	GRIMES	B-3555A-89
50	CIRCUIT BREAKER, GENERATOR	50		WOOD	109-250-101
51	CIRCUIT BREAKER, BUSS BAR	50		WOOD	109-250-101
52	CIRCUIT BREAKER, PRESTALL	5		KLIXON MOONEY	PSM-5N 919000-9
53	CIRCUIT BREAKER, INSTRU- MENT & DOME LIGHT	5		KLIXON MOONEY	PSM-5N 919000-9

ITEM NO.	ITEM DESCRIPTION	AMPS	VOLTS	MANUFACTURER	PART NO.
54	CIRCUIT BREAKER, CLUSTER GAGE	5		KLIXON MOONEY	PSM-5N 919000-9
55	CIRCUIT BREAKER, GEAR WARNING	5		KLIXON MOONEY	PSM-5N 919000-9
56	CIRCUIT BREAKER, TURN COORDINATOR	2		KLIXON MOONEY	PSM-2N 919000-9
57	CIRCUIT BREAKER, IGNITION & CIGAR LIGHTER	10		KLIXON MOONEY	PSM-10N 919000-13
 58	CIRCUIT BREAKER, AUDIO CONTROL	2		KLIXON MOONEY	PSM-2N 919000-5
 59	CIRCUIT BREAKER, RADIO			KLIXON MOONEY	PSM-N 919000-
 60	CIRCUIT BREAKER, RADIO			KLIXON MOONEY	PSM-N 919000-
 61	CIRCUIT BREAKER, RADIO			KLIXON MOONEY	PSM-N 919000-
 62	CIRCUIT BREAKER, GEAR CONTROLS	5		KLIXON MOONEY	PSM-5N 919000-9
 63	CIRCUIT BREAKER, GLIDE SCOPE SWITCH			KLIXON	D-7270-5-
 64	CIRCUIT BREAKER, MARKER BEACON SWITCH			KLIXON	D-7270-5-
 65	CIRCUIT BREAKER, HEATED PITOT SWITCH	10		KLIXON	D-7270-5-10
 66	CIRCUIT BREAKER, A-C LIGHT SWITCH	10		KLIXON	D-7270-5-10
 67	CIRCUIT BREAKER, LANDING LIGHT SWITCH	20		KLIXON	D-7270-5-20
 68	CIRCUIT BREAKER, POSITION LIGHT SWITCH	5		KLIXON	D-7270-5-5
 69	CIRCUIT BREAKER, FUEL PUMP SWITCH	10		KLIXON	D-7270-5-10
70	HORN, DUAL WARNING	0.4 0.3	12 12	SAFE FLIGHT MOONEY	283 800185
 71	PITOT, HEATED	8.0	12	AERO INSTR.	P. H. 502-12 AN 5812
 72	LIGHT, ANTI-COLLISION	6.62	12	GRIMES	D-7080-1-12

ITEM NO.	ITEM DESCRIPTION	AMPS	VOLTS	MANUFACTURER	PART NO.
10 73	RELAY, EXTERNAL POWER	0.69	12	COLE-HERSEE	24059
74	BUSS BAR, MAIN			MOONEY	800012-11
75	BUSS BAR, AUXILLIARY			MOONEY	800012-13
76	BUSS BAR, POWER			MOONEY	800012-7
10 77	BUSS BAR, RADIO			MOONEY	800012-7
78	TERMINAL STRIP, SHUNTED, LIGHTS			JOY MFG CO MOONEY	520077-251 919008
79	LIGHT, GENERATOR WARNING	0.08	12	SLOAN MOONEY	106S-R-F32 913067-BASIC
80	CLAMP, CABLE, CLUSTER GAGE PLUG				MS 3057-10B
81	CONNECTOR, ALTERNATE AIR LIGHT			DIALCO	7538-XP12
82	SPEED CLIP, ALTERNATE AIR LIGHT			DIALCO	7538-1PS1
10 83	CIRCUIT BREAKER, GEAR ACTUATOR	25		KLIXON	D7271-6-25
10 84	SWITCH, UP LIMIT, WITH ACTUATOR			MICRO MICRO	DT-2R-A7 MCD 2711
10 85	SWITCH, DOWN LIMIT, WITH ACTUATOR			MICRO MICRO	DT-2R-A7 MCD 2217
10 86	SWITCH, GEAR SAFETY			DUKES MOONEY	3203-00 950161
10 87	SWITCH, GEAR CONTROL			MICRO	1TL140-3D
10 88	RELAY, UP GEAR	0.50	12	CUTLER-HAMMER	6041H50A
10 89	RELAY, DOWN GEAR	0.50	12	CUTLER-HAMMER	6041H50A
10 90	ACTUATOR, LANDING GEAR		12	DUKES MOONEY	4196-00-1C 950158-503
10 91	RECEPTACLE, EXTERNAL POWER				AN2552-3A
92	TRANSMITTER, FUEL, LH, OB			MOONEY	610160
93	TRANSMITTER, FUEL, RH, OB			MOONEY	610161
15 94	STARTER SOLENOID	2.75	12	PRESTOLITE	SAW-4204
95	CIRCUIT BREAKER, GENERATOR	50		BRILES	BP1-50
96	CIRCUIT BREAKER, BUS BAR	50		BRILES	BP1-50

ITEM NO.	ITEM DESCRIPTION	AMPS	VOLTS	MANUFACTURER	PART NO.
97	SPEAKER			MOONEY	810195
98	PLUG, CLUSTER GAGE				MS3106A-18-15
99	CLUSTER GAGE				
 100	LIGHT, ALTERNATE AIR WARNING	0.08	12	DIALCO	507-3013
101	RHEOSTAT, 250 OHMS			MOONEY	919024
102	CONTROL ASSY, INSTRUMENT LIGHTS			MOONEY	800261
103	LIGHT WARNING, GEAR DOWN	0.08	12	MOONEY	919016
104	COMPASS			AIR PATH	
 105	BATTERY	35	12	GILL	6-GCAB-11
106	TRANSMITTER, FUEL QUANTITY, LH			AC	5642354
107	TRANSMITTER, FUEL QUANTITY, RH			AC	5641991
108	CLUSTER GAGE	0.1	12	GARWIN MOONEY	22-169-08-1 660124-501
109	CLUSTER GAGE			GARWIN MOONEY	22-169-08L 660124-BASIC
110	FUEL PUMP, ELECTRIC			DUKES	4140-00-21
111	CIRCUIT BREAKER, INSTRUMENT & DOME LIGHT	10		KLIXON MOONEY	PSM-10N 919000-13
 112	PLUG, C.A.T. INDICATOR				MS3106A-145-15
 113	CABLE CLAMP, C.A.T. INDICATOR PLUG				MS3057-6B
 114	INDICATOR, C.A.T.	0.15		GARWIN	22-995-04
 115	INDICATOR, C.A.T.	0.15		MOONEY	660014-5
 116	PROBE, C.A.T.			RICHTER	B-5
117	ALTERNATOR	60	12	PRESTOLITE	
118	VOLTAGE REGULATOR & OVERVOLTAGE RELAY		12	OECO	20082
119	FILTER			SPRAGUE	JN14-1356A
120	CONDENSER			SANGAMO	500-1041-01
121	OVERVOLTAGE WARNING LIGHT			SLOAN CO.	106S-R-F32

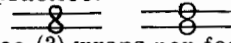
9-15. ELECTRICAL SYSTEM SCHEMATIC - 1969 thru 1974 MODELS
 "Applicable to the Following Aircraft"

M20C - 690001 C thru 20-0046
 M20E - 690001 E thru 21-0060
 M20F - 690001 F thru 22-0078
 M20G - 690001 G thru 700006G

Schematic	Description	PAGE	Schematic	Description	PAGE
	Electrical System Schematic Notes	9-52	LP-1A	Instrument & Placard Its.	9-82
CF-1	Wing Flaps & Controls	9-54	LP-1B	Instrument & Placard Its.	9-83
DA-1	Ammeter	9-55	LP-1.2	Instrument & Placard Its.	9-84
DB-1	Turn Coordinator	9-56	MA-1A	Aux. Pwr. Plug (Opt.) M20E & F	9-85
DC-1	Cylinder Head Temp.	9-57	MA-1B	Aux. Pwr. Plug (Opt.) M20C & G	9-86
DE-1	Carburetor Air Temp (C & G)	9-58	MB-1A	Radio Ckt. Bkrs. (Optional)	9-87
DF-1	Fuel Quantity (M20F)	9-59	MB-1B	Radio Ckt. Bkrs. (Optional)	9-88
DF-1.1	Fuel Quantity (M20C, E & G)	9-60	MC-1	Cigar Lighter	9-89
DG-1	Cluster Gage (M20F)	9-61	MD-1	Clock Light (Optional)	9-90
DG-1.1	Cluster Gage (M20E)	9-62	MM-1	Marker Beacon (Optional)	9-91
DG-1.2	Cluster Gage (M20C & G)	9-63	MS-1	Radio Speaker	9-92
DH-1	Oil Temperature	9-64	MS-2	Radio Speaker	9-93
DP-1	Pitot Heat	9-65	NF-1	Elec. Fuel Pump M20E & F	9-94
EG-1A	Electric Gear Controls	9-66	NF-1.1	Elec. Fuel Pump M20 C & G	9-95
EG-1B	Electric Gear Controls	9-67	PA-1	Alternator & Controls	9-96
EG-3A	Electric Gear Controls	9-68	PB-1	Battery & Controls	9-97
EG-3B	Electric Gear Controls	9-69	PB-2	Battery & Controls	9-98
EG-5A	Electric Gear Controls	9-70	PS-1	Starter & Controls	9-99
EG-5B	Electric Gear Controls	9-71	WA-1	Overvoltage Warning System	9-100
JM-1	Magnetos	9-72	WE-1	Gear Position Warning System	9-101
JV-1	Starting Vibrator	9-73	WE-3	Gear Position Warning System	9-102
LB-1	Anticollision Light	9-74	WE-4	Gear Position Warning System	9-103
LC-1	Cabin Lights (M20E & F)	9-75	WS-1	Stall Warning System	9-104
LC-1.1	Cabin Lights (M20C & G)	9-76	WW-1	Power Boost Warning System	9-105
LC-1.2	Cabin Lights (M20C & G) "Opt."	9-77	WW-2	Power Boost Warning System	9-106
LC-3.1	Baggage Compartment Light	9-78	WV-1	Hi/Lo Vac. Warning System	9-107
LC-3.2	Baggage Compartment Light	9-79		Terminal Chart	9-108
LL-1	Landing Lights	9-80		Electrical Equipment List	9-109
LN-1	Navigation Lights	9-81			

1969 THRU 1974 MODELS

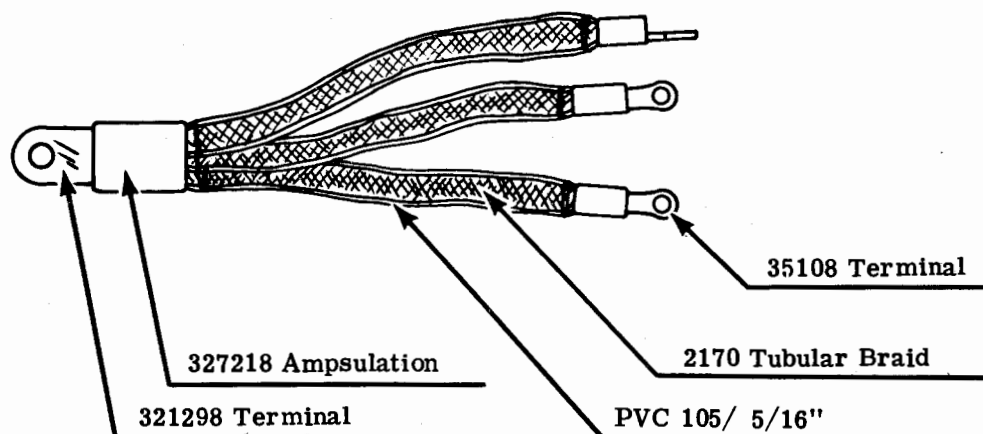
ELECTRICAL SYSTEM SCHEMATIC NOTES.

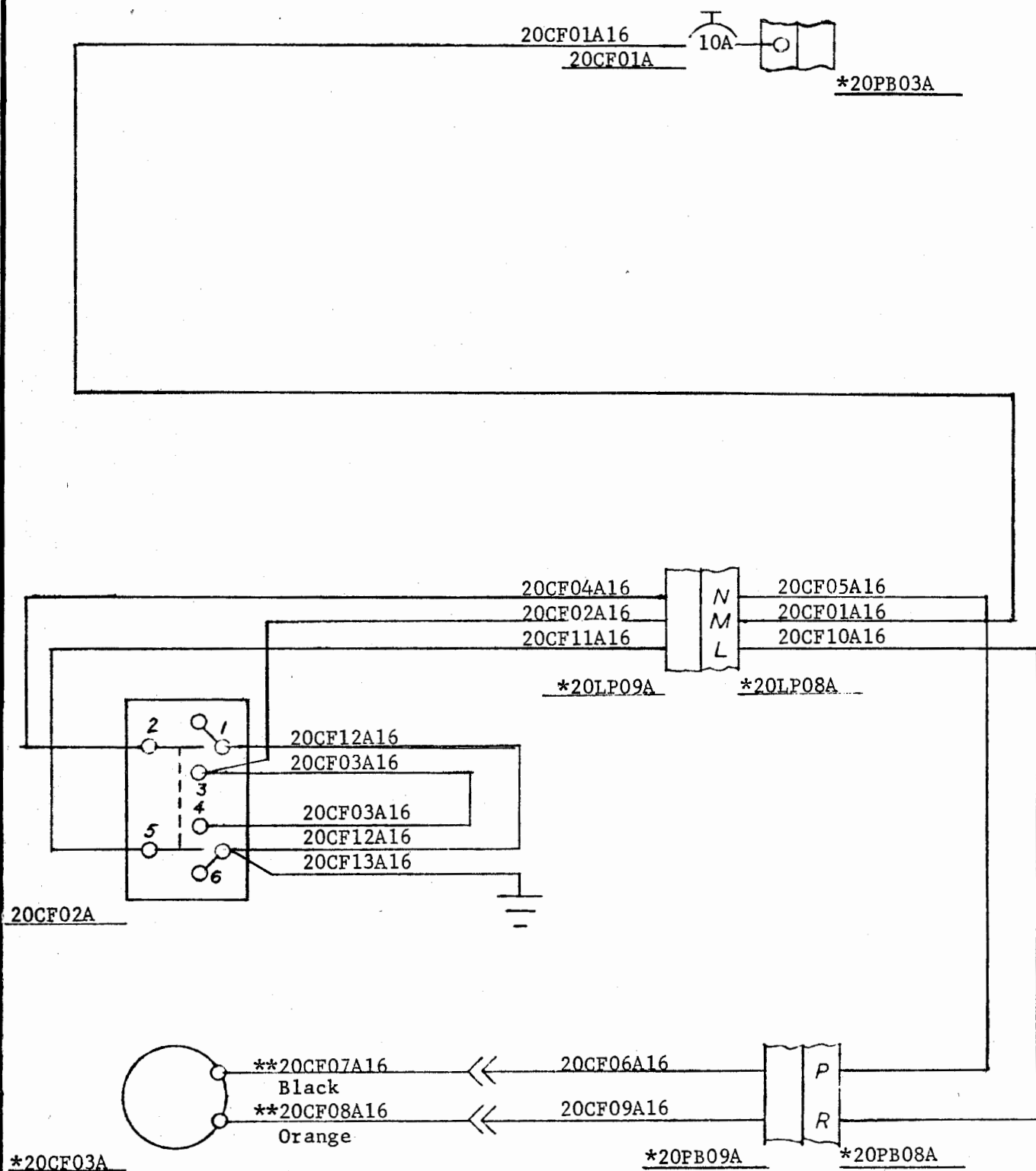
- Parts and wires for each model and serial no. aircraft to be purchased by schematics.
- An asterisk (*) before wire numbers and/or equipment list items denotes reference callout.
- A double asterisk (**) denotes wire furnished with equipment and serves as segmental wire for circuit, and need not be marked. Wire type not implied.
- Reference items in equipment list denotes items purchased and installed on other drawings.
- All electrical buildup, installation, wiring, soldering, and crimping, etc. to be in accord with good wiring practice.
- Wires denoted by  symbols to be twisted counterclockwise with a minimum of three (3) wraps per foot.
- "F" denotes ground through frame (no wires).
- All MIL Spec wire may be of any revision letter. Example, MIL-W-5086A may be MIL-W-5086 or MIL-W-5086B.
- All splices, amp knife disconnect or equivalent.
- All circuit breakers trip free type.
- All terminals AN659 or equivalent or soldered (Ref. Page 9-104).
- All terminals will be of preinsulated type or will be insulated with ampulation or equivalent.
- All knife disconnect splices to be insulated with PVC105 and securely string tied with airtex no. 417 cord.

14. All wire sizes are minimum sizes acceptable without written authorization. Wire terminals must change as per Page 9-104 when wire size changes.
15. When optional panel lighting is installed, cabin lights must be modified by disconnecting wire 20LC02A18 from 20LC03B18 and wires 20LP31A18 and 20LP32A18 from 20LP30A18 and reconnecting per Schematics .LC.1.2. Wire 20LP30A18 must be insulated with PVC tubing and string tied. See drawing 800301 for physical installation of switch 20LC01A.
16. An acceptable substitute for "Briles Products BP1" circuit breakers is the "Klixon No. 7274-11-" circuit breaker in 2, 5, and 10 amp sizes.
17. Klixon circuit breakers Model No. 7277-2-____ in sizes 1 thru 15 ampx are interchangeable with Arrow Hart circuit breakers Model No. BP1-____ in sizes 1 thru 15 amp. Mechanical Products, Inc., circuit breakers Model No. 700-001-____ (MS-25244) in sizes 5 thru 50 amps are interchangeable with Arrow Hart circuit breakers model #BP1-____ in sizes 5 thru 50 amps where additional height of MP breakers can physically be tolerated.

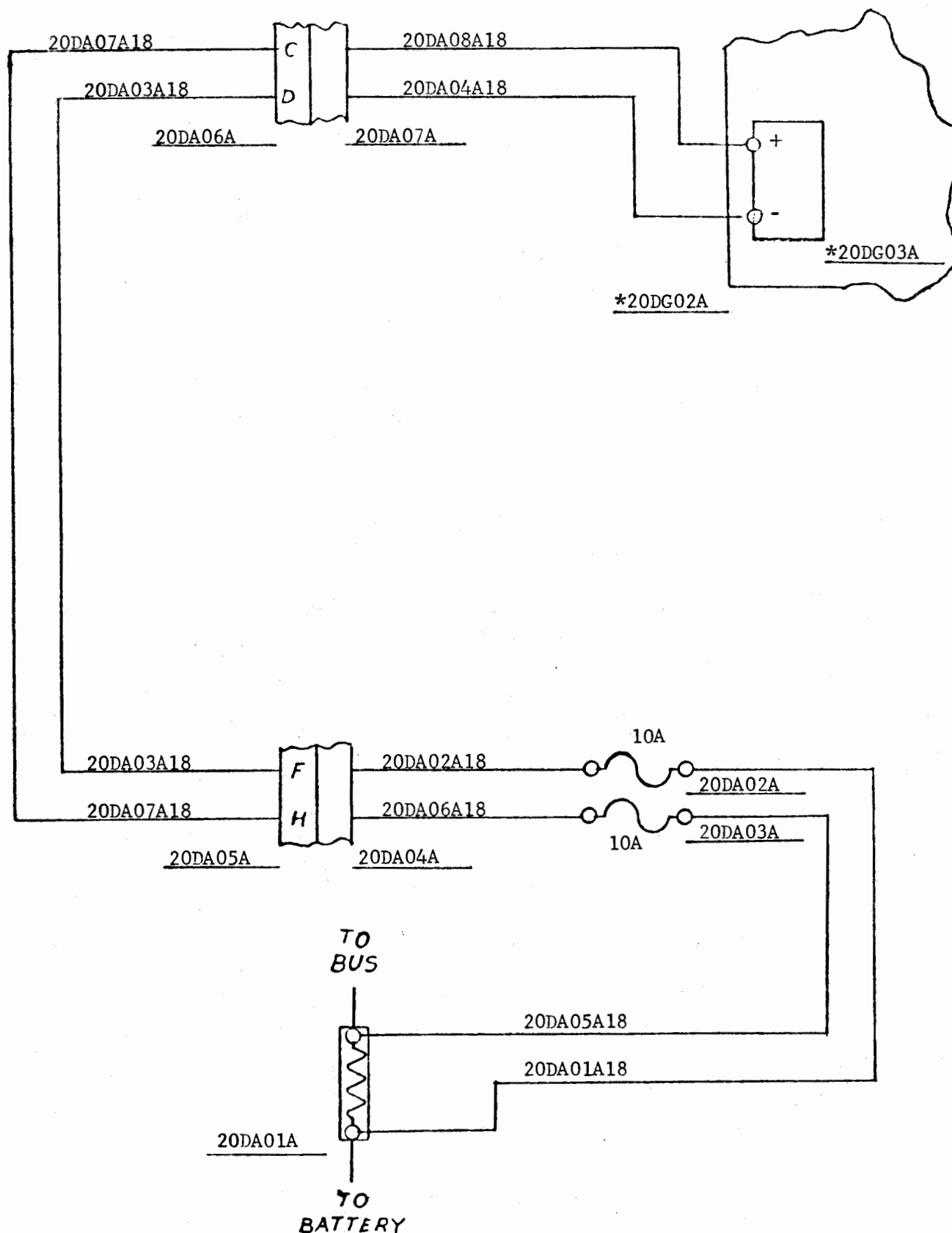
Use Klixon in ship sets thru 15 amp in conjunction with MP from 20 thru 50 amp where physical space permits. Otherwise use BP1 from 20 thru 50 amp. BP1 from 2 thru 15 amp may be used as an alternate if necessary.

Use 913054 bus bars as necessary for various configuration changes and manufacture interconnecting bus using no. 2170 tubular braid covered with PVC 105/5/16" (both Alpha Wire Co.) and terminated with AMP terminals of appropriate sizes.

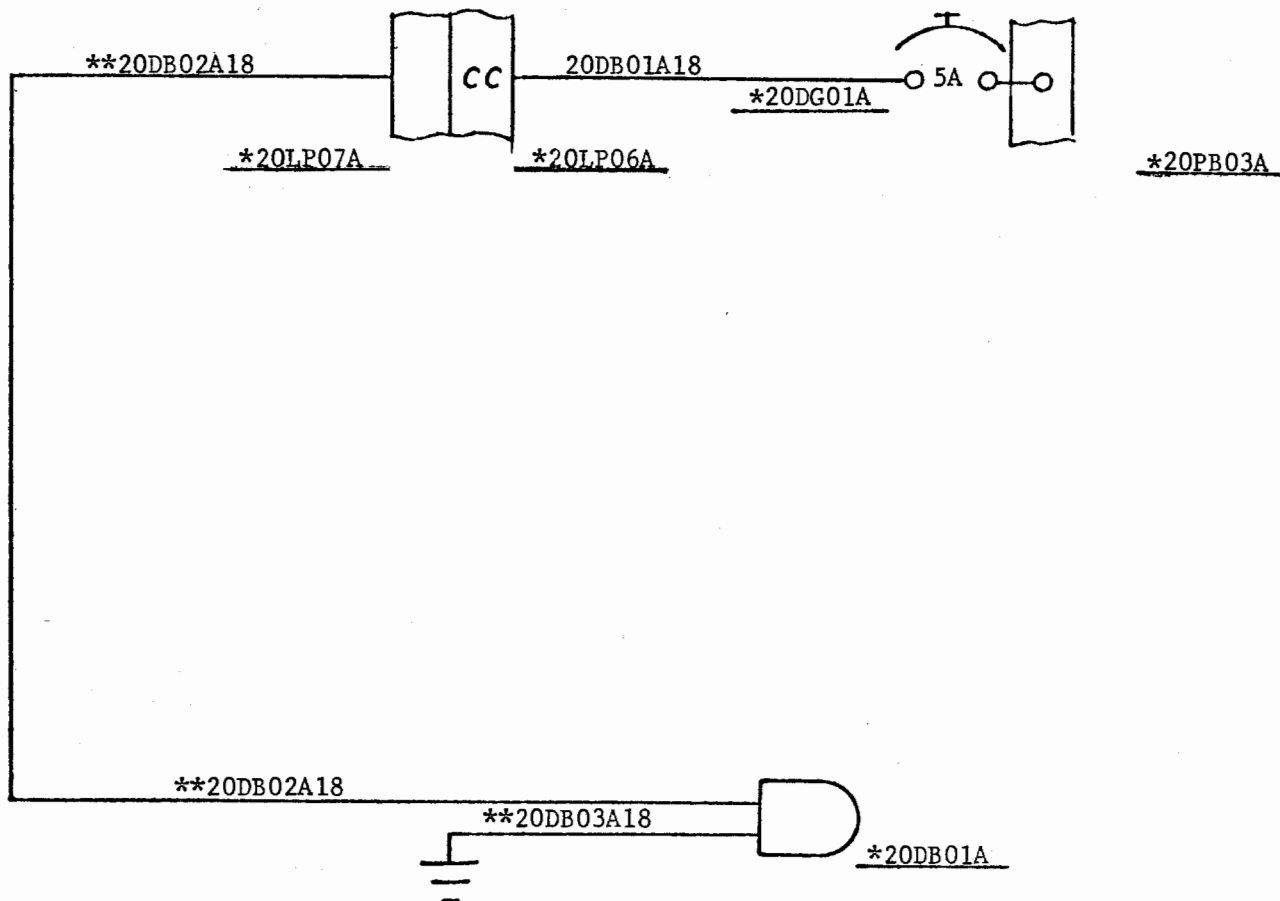


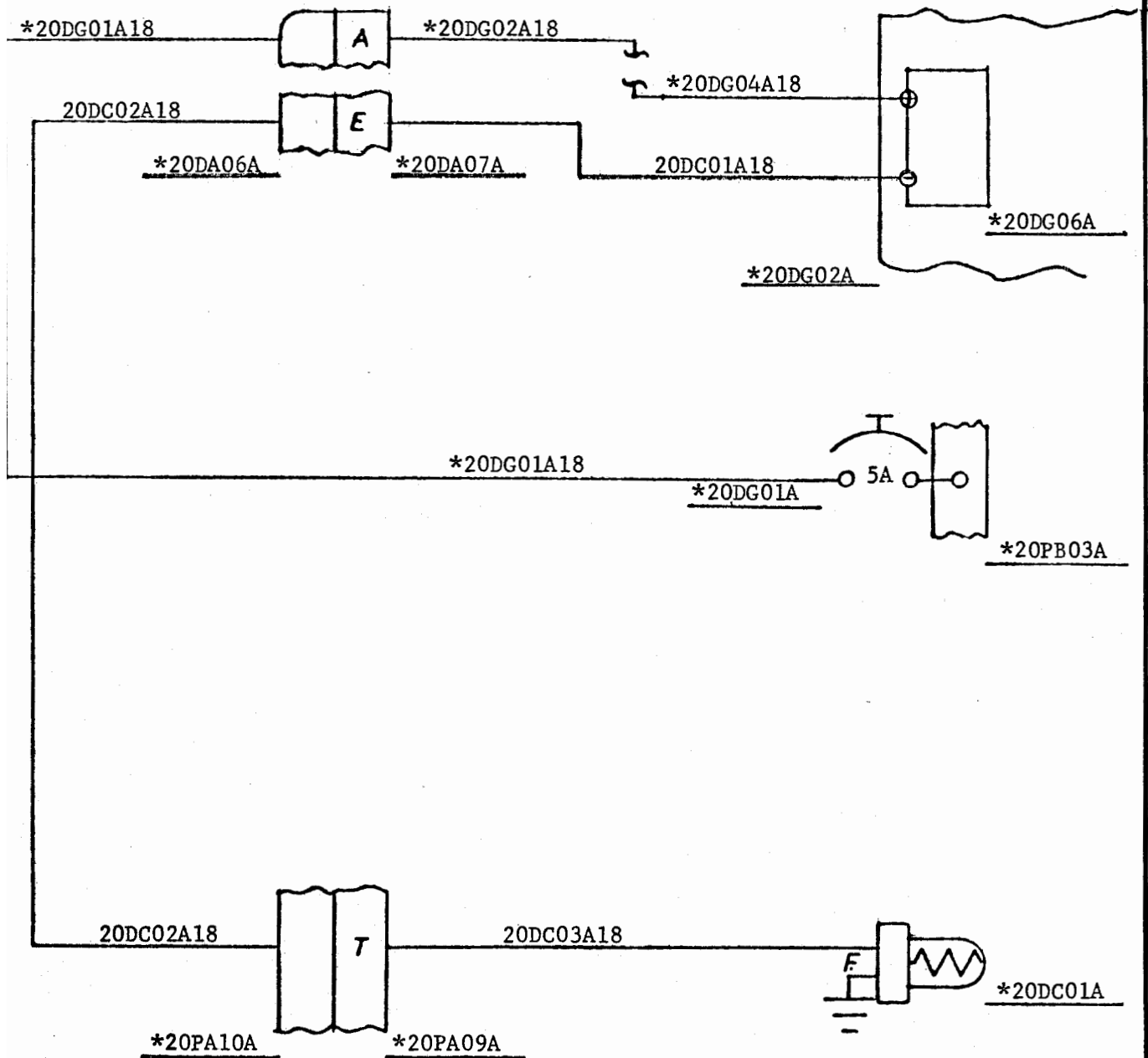


SCHEMATIC CF-1, WING FLAPS & CONTROLS (1969-1974)

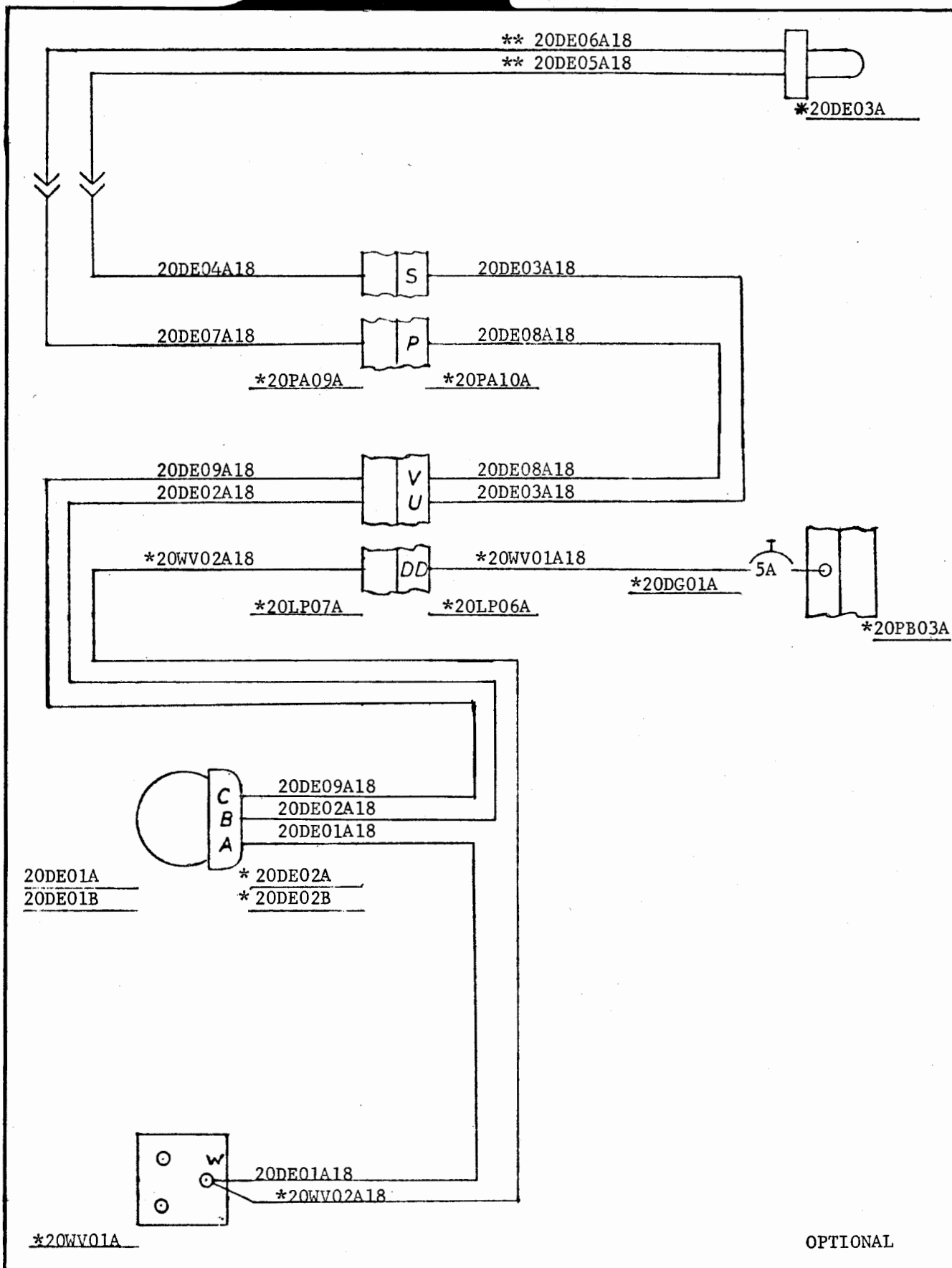


SCHEMATIC DA-1. AMMETER (1969-1974)

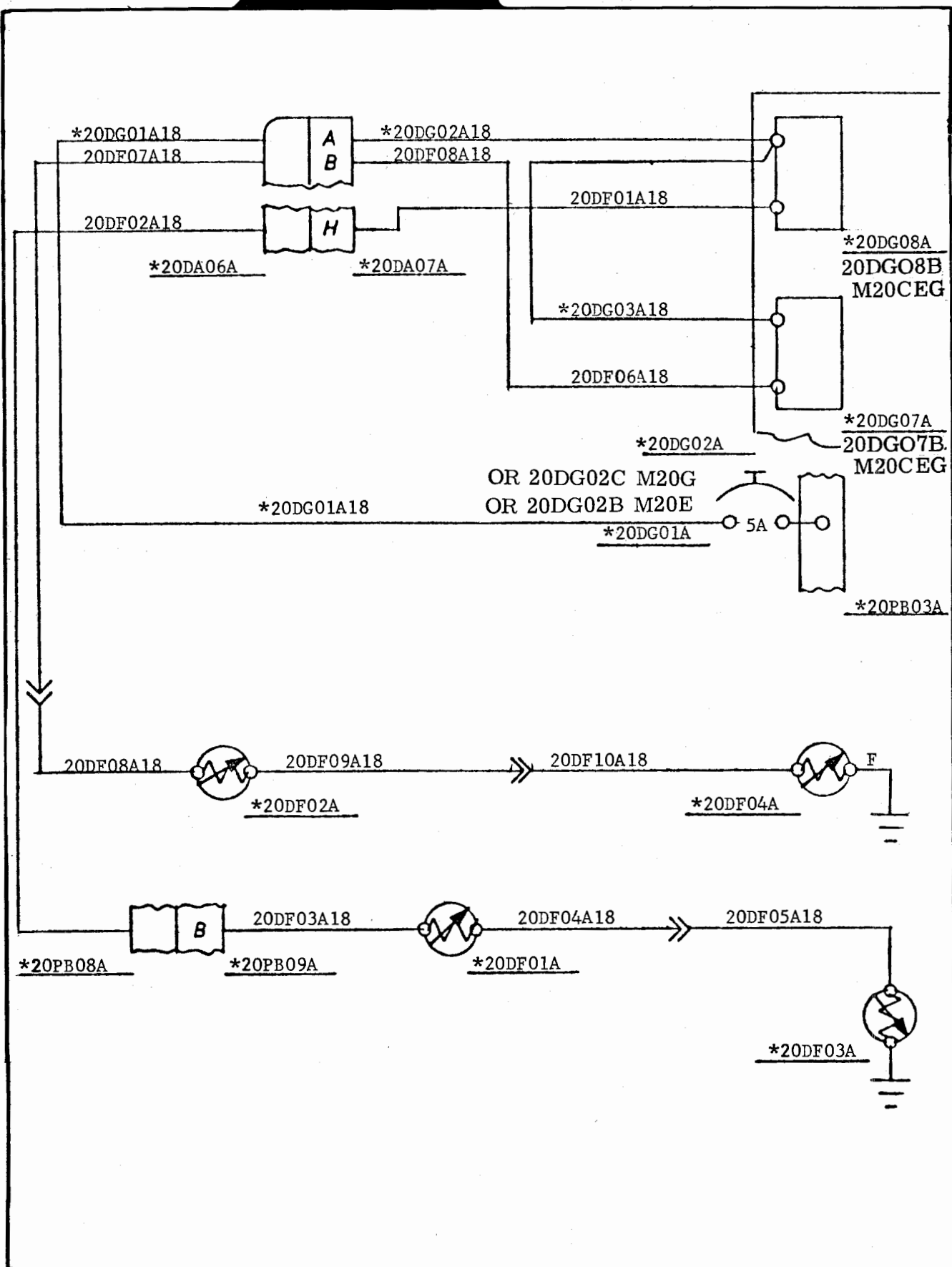




SCHEMATIC DC-1. CYLINDER HEAD TEMPERATURE (1969-1974)

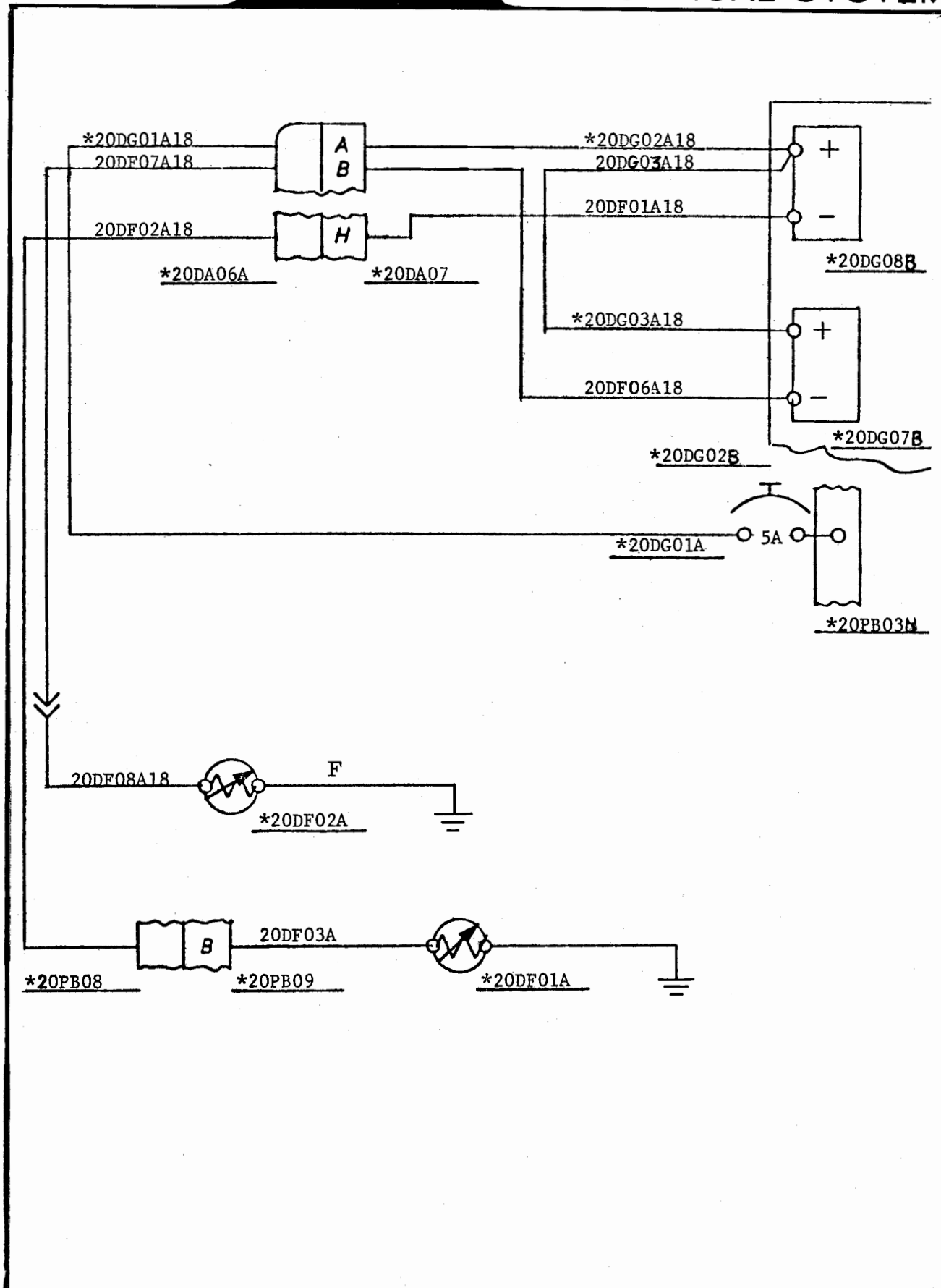


SCHEMATIC DE-1, CARBURETOR AIR TEMP (C & G) (1969-1974)

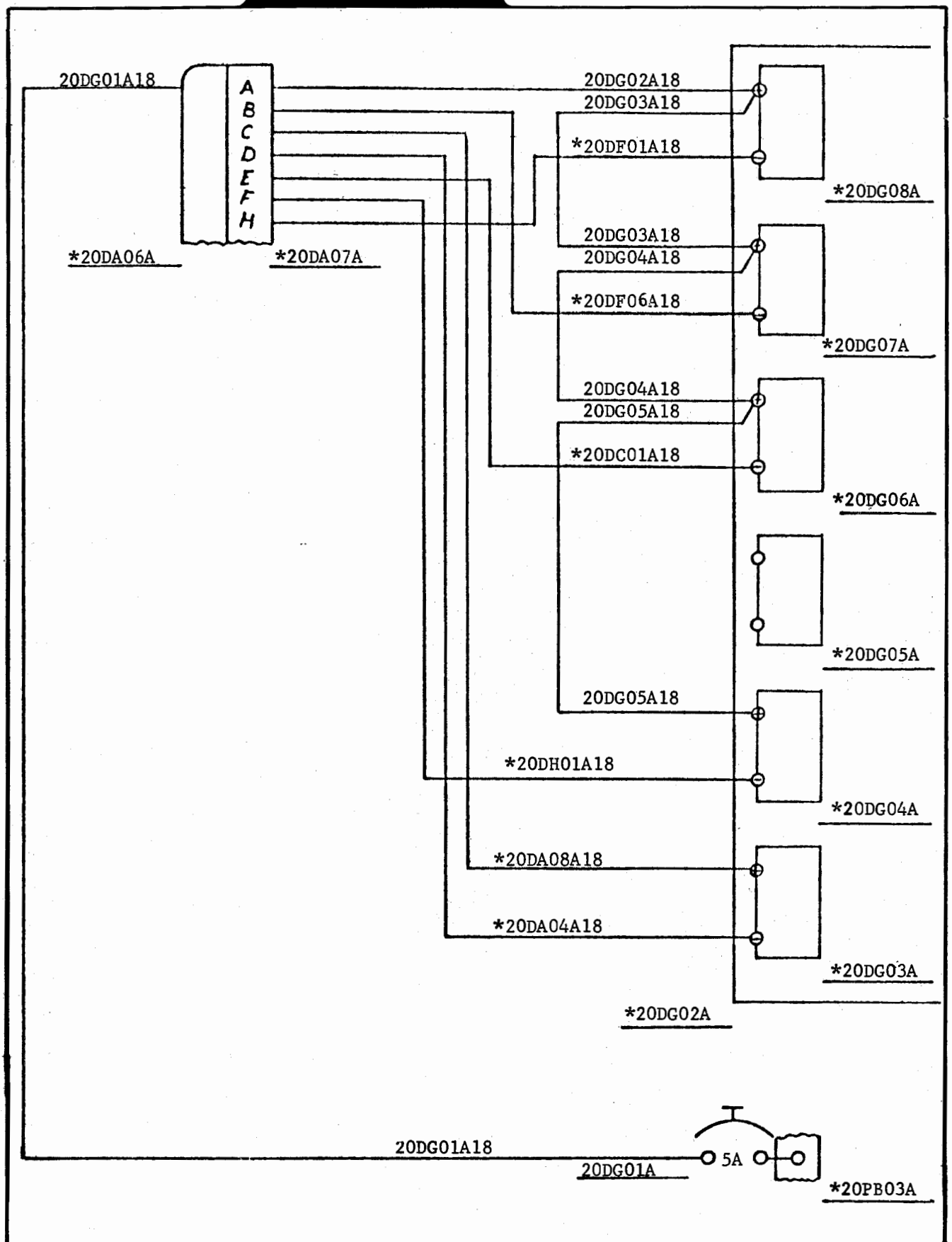


SCHEMATIC DF-1, FUEL QUANTITY (M20F)

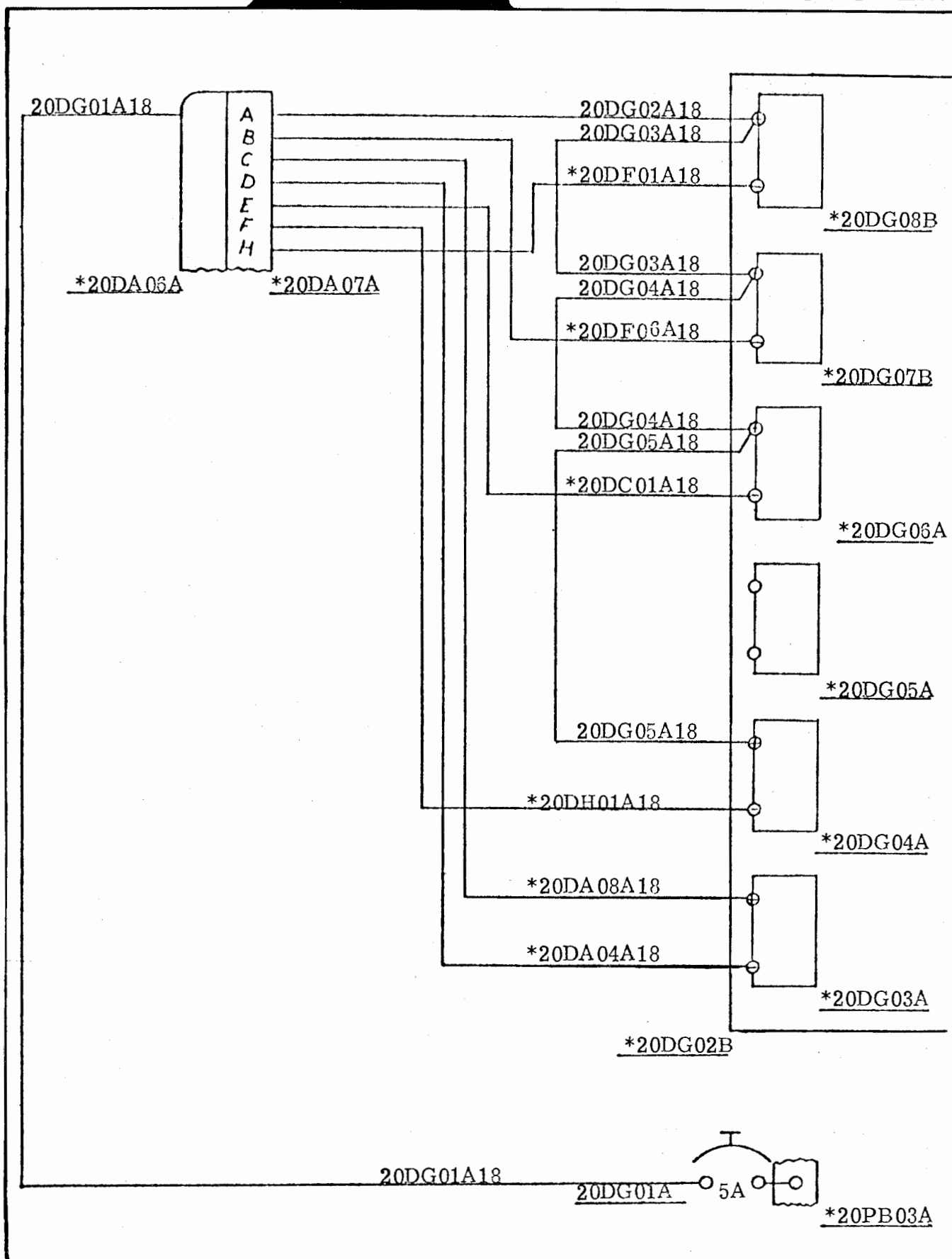
(1969-1974)



SCHEMATIC DF-1.1, FUEL QUANTITY (M20C, E & G) (1969-1974)



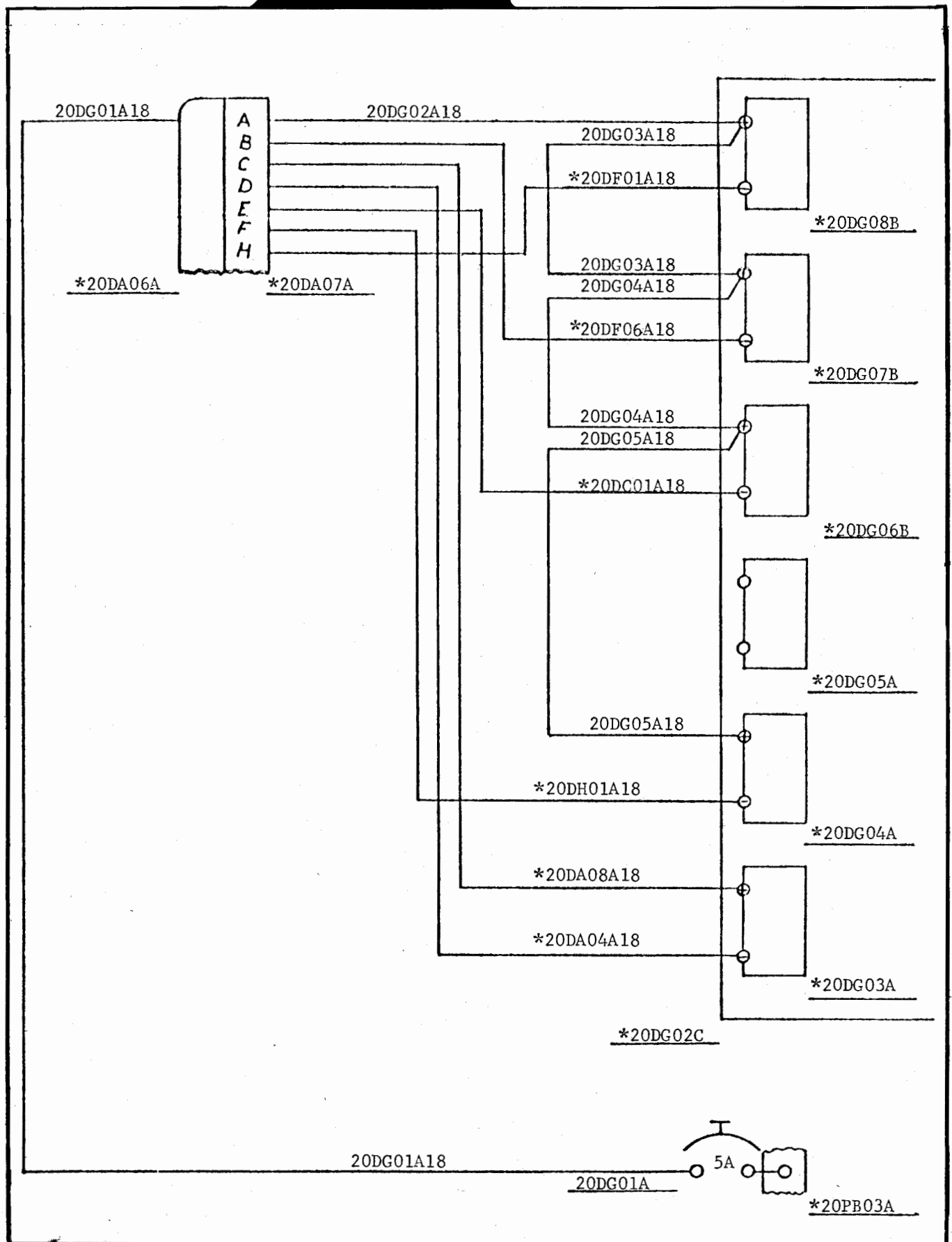
SCHEMATIC DG-1. CLUSTER GAGE, M20F (1969-1974)



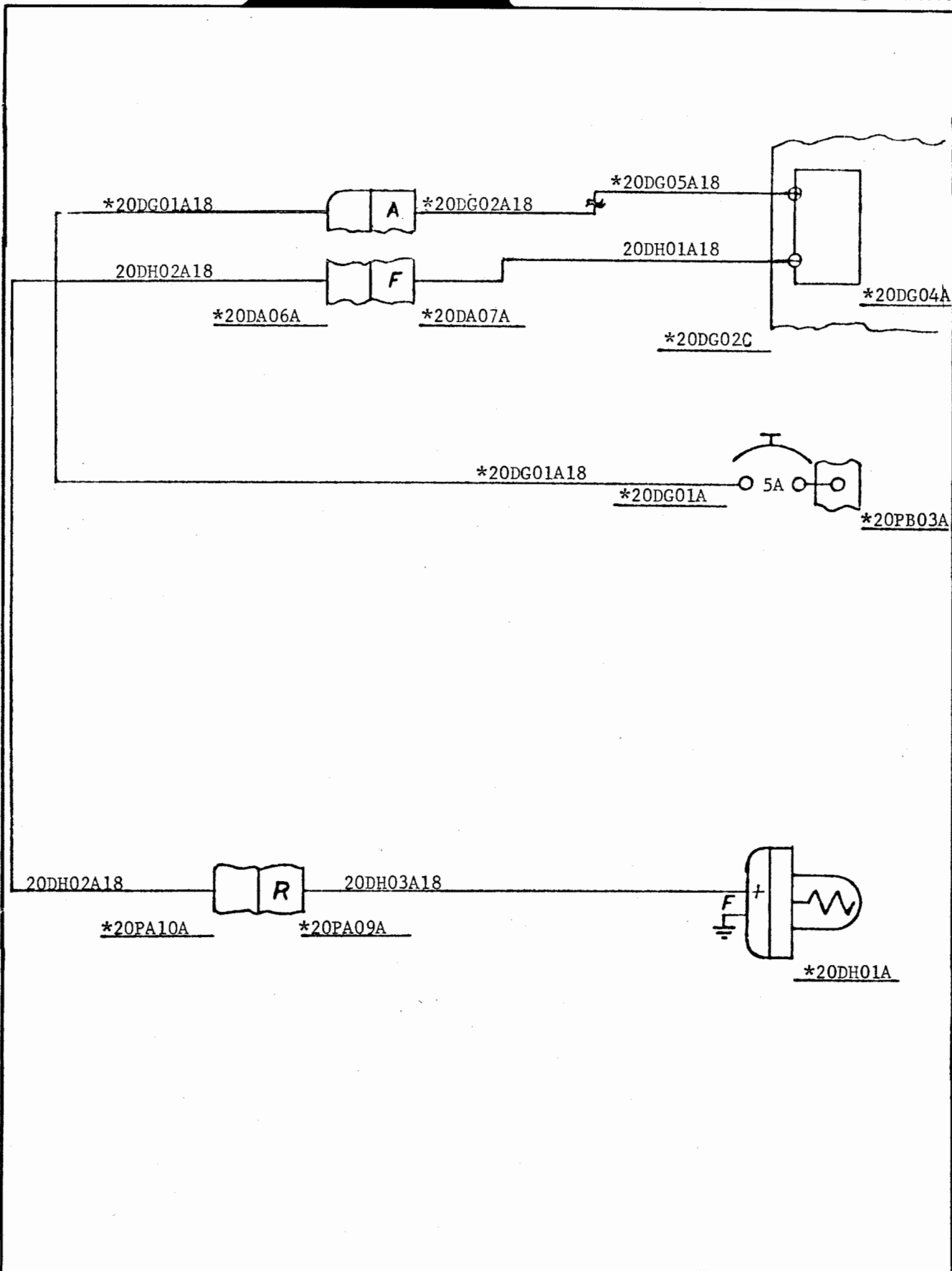
SCHEMATIC DG-1.1, CLUSTER GAGE (M20E) (1969-1974)

(1969-1974)

REV. D 8/1/81



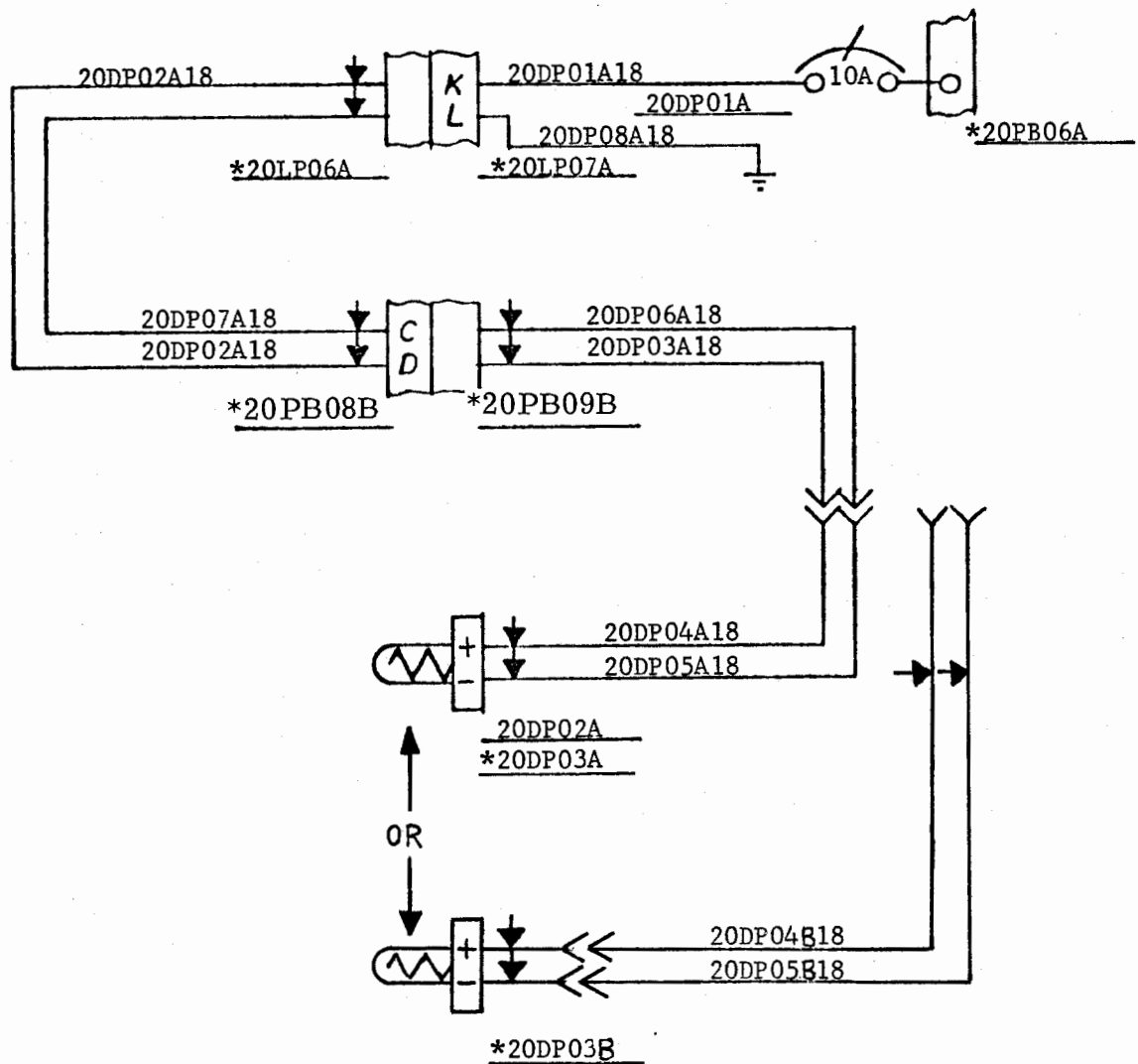
SCHEMATIC DG-1.2, CLUSTER GAGE (M20C & G) (1969-1974)

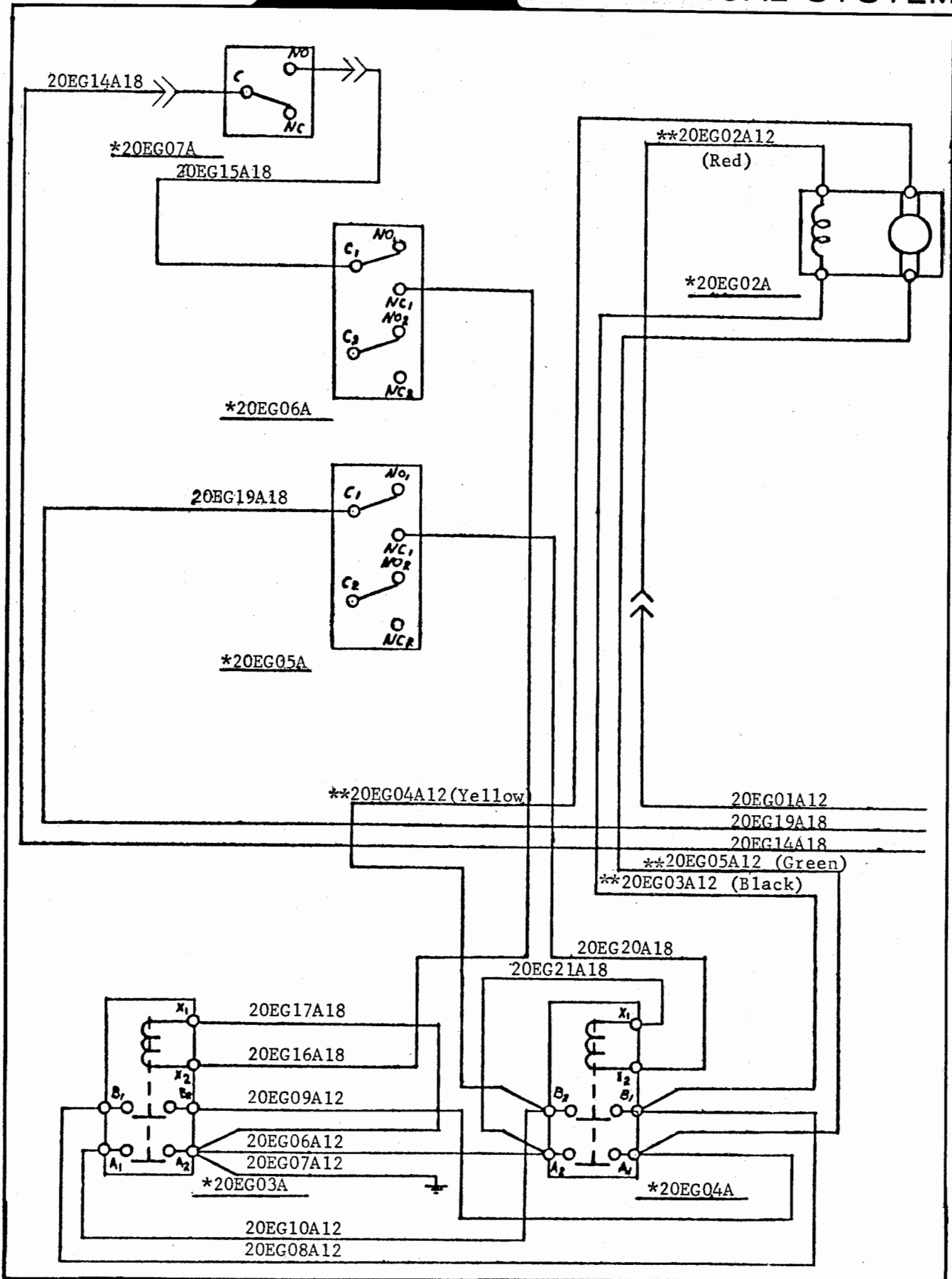


SCHEMATIC DH-1, OIL TEMPERATURE

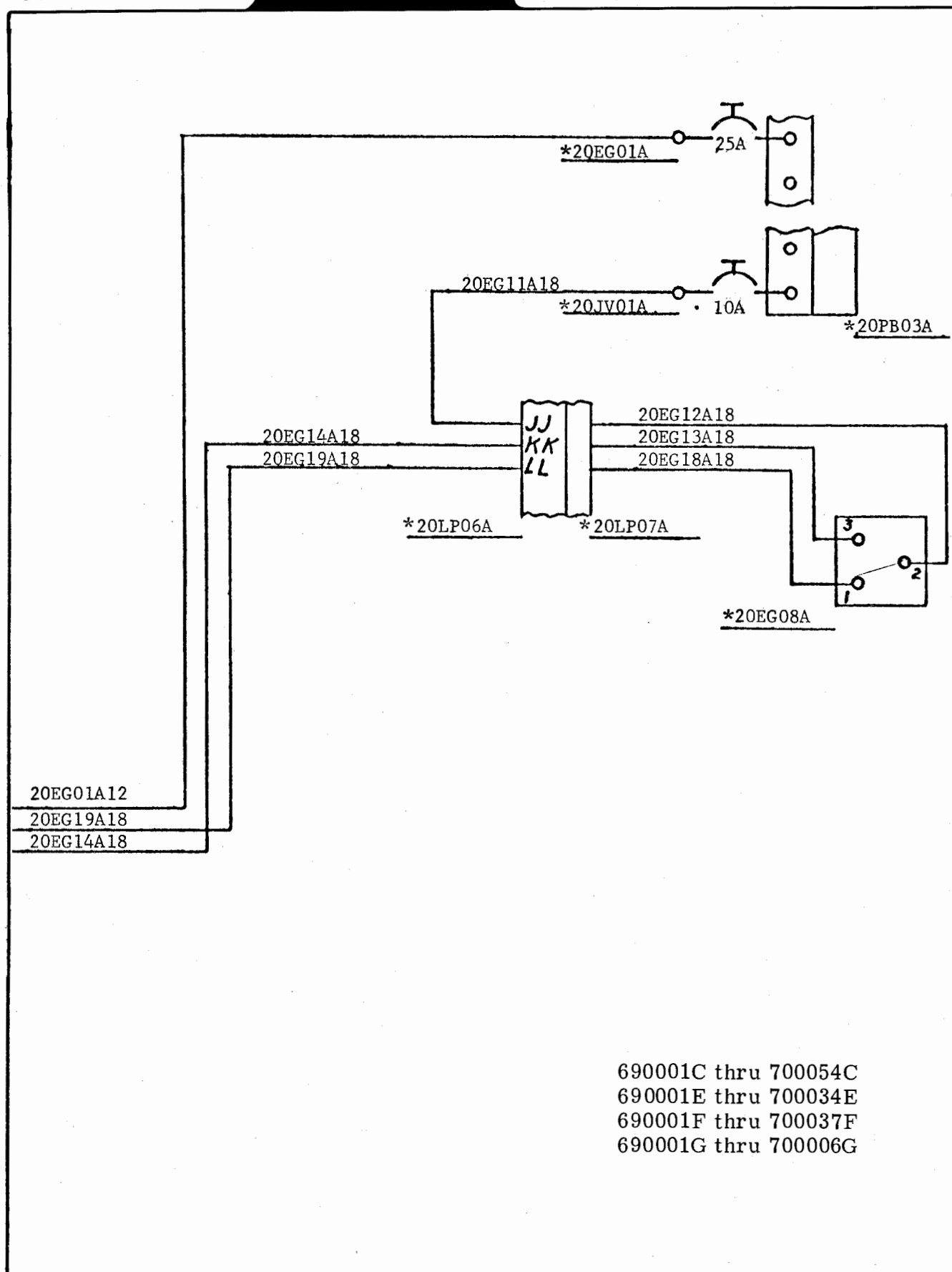
(1969-1974)

REV.D 8/1/81

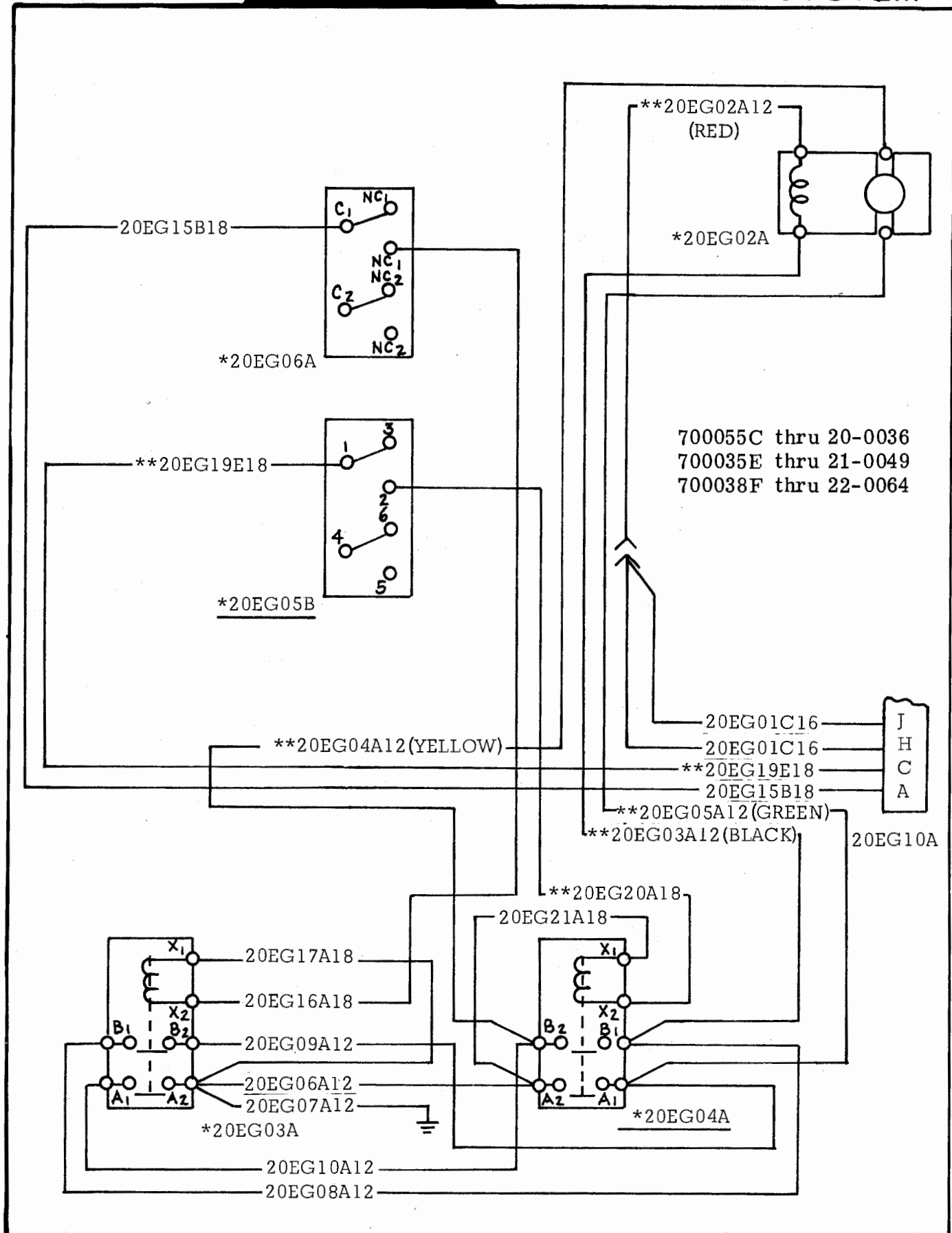




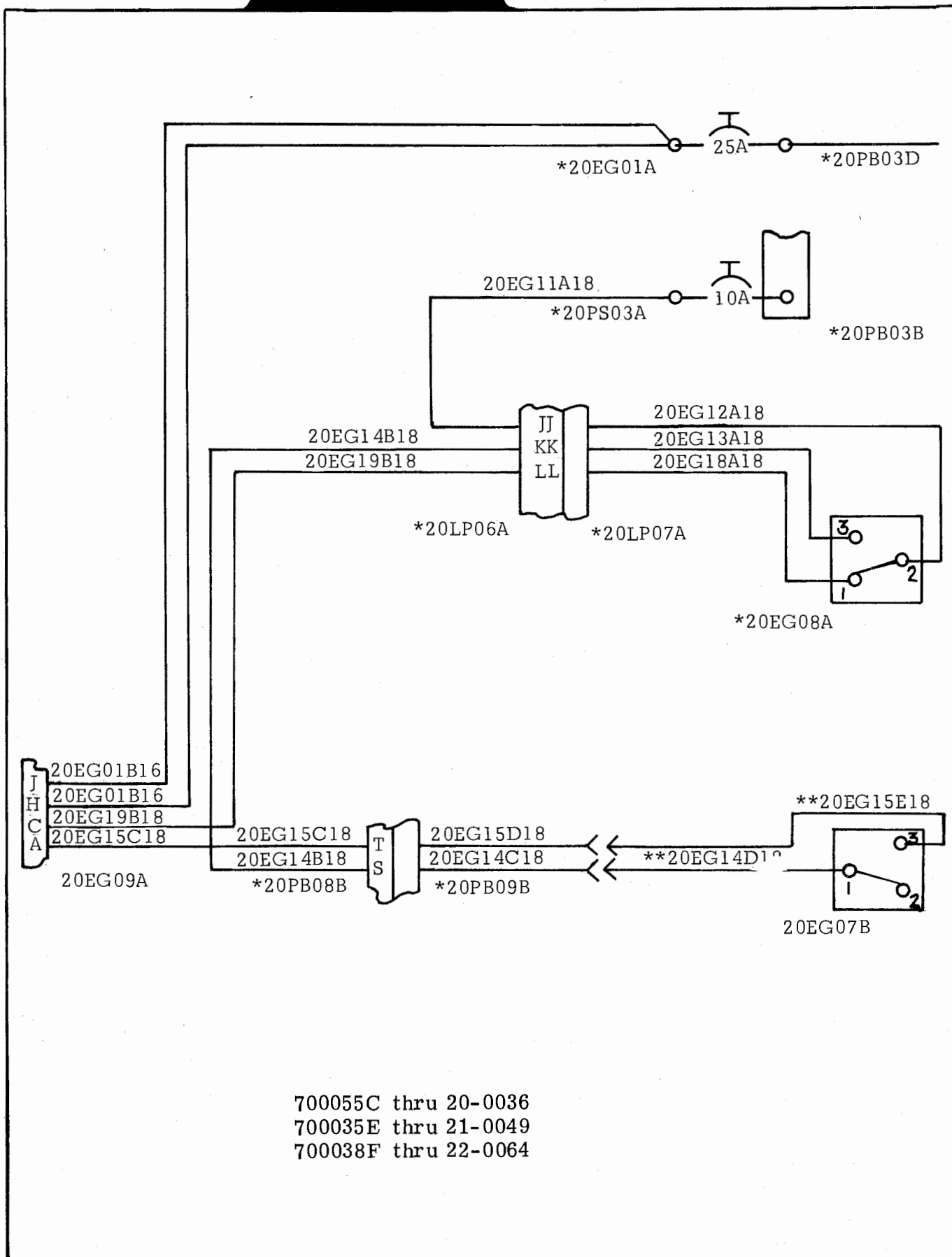
SCHEMATIC EG-1A, ELECTRIC GEAR CONTROLS (1969-1974)



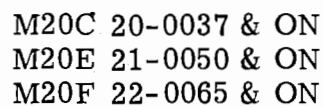
690001C thru 700054C
 690001E thru 700034E
 690001F thru 700037F
 690001G thru 700006G

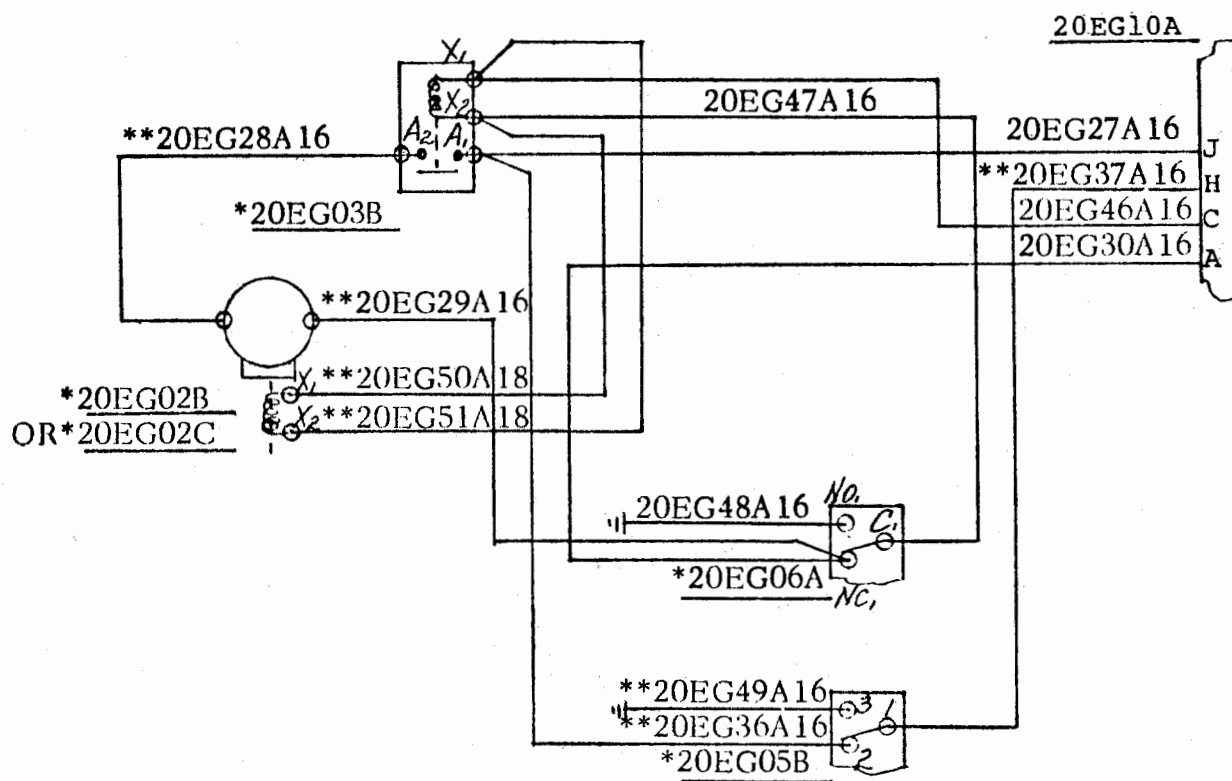


SCHEMATIC EG-3A, ELECTRIC GEAR CONTROLS (1970-1974)



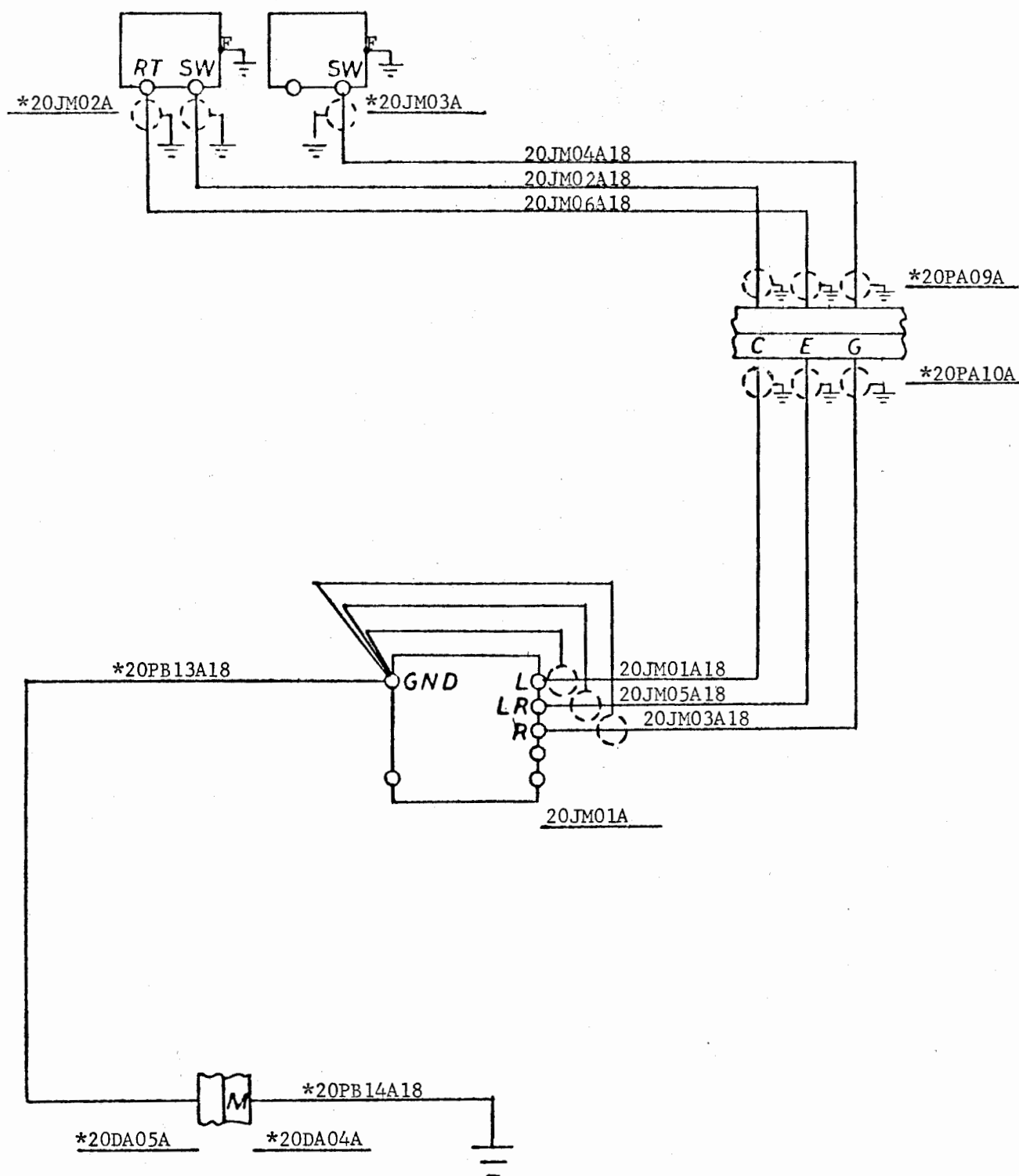
SCHEMATIC EG-3B, ELECTRIC GEAR (1970-1974)





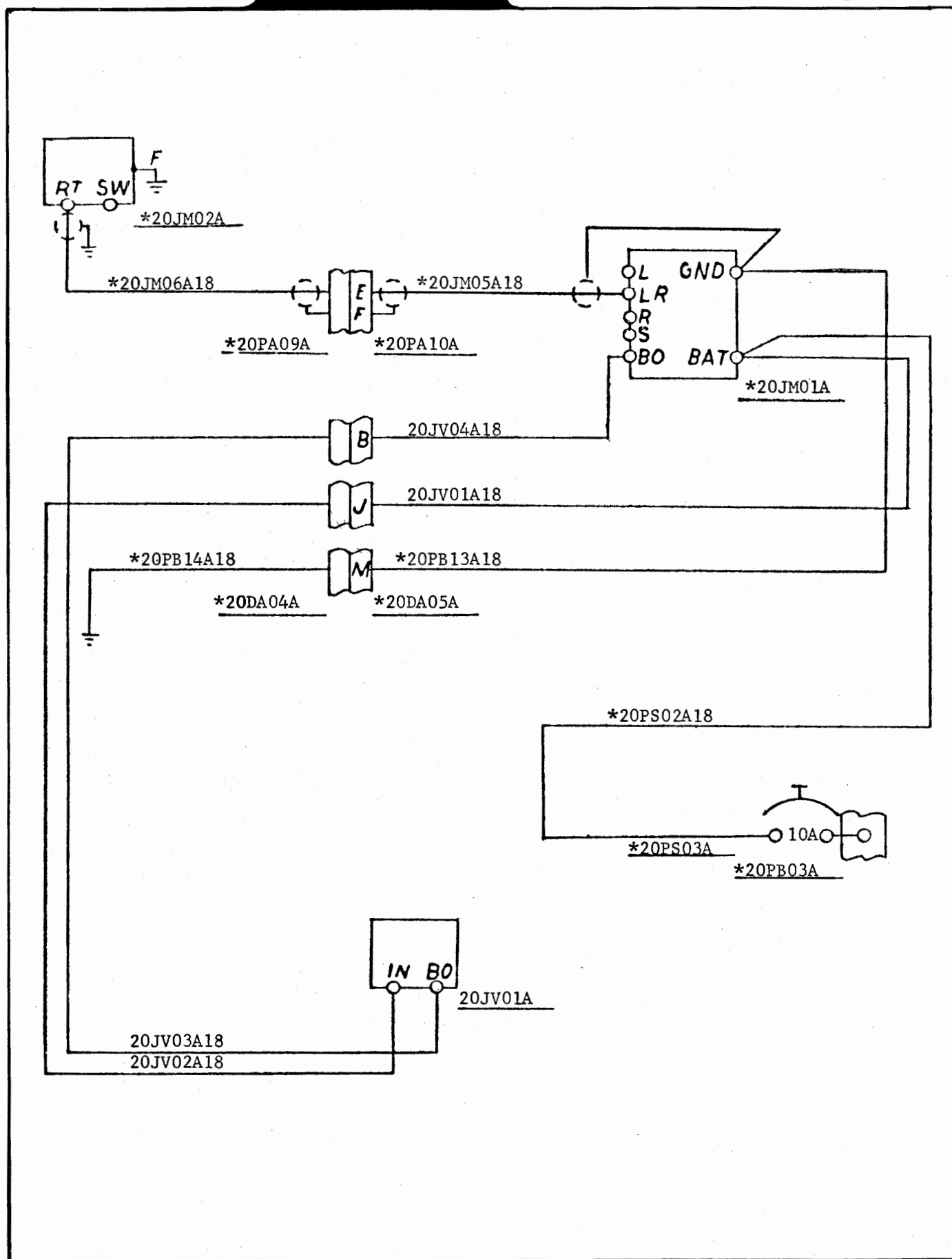
M20C 20-0037 & ON
 M20E 21-0050 & ON
 M20F 22-0065 & ON

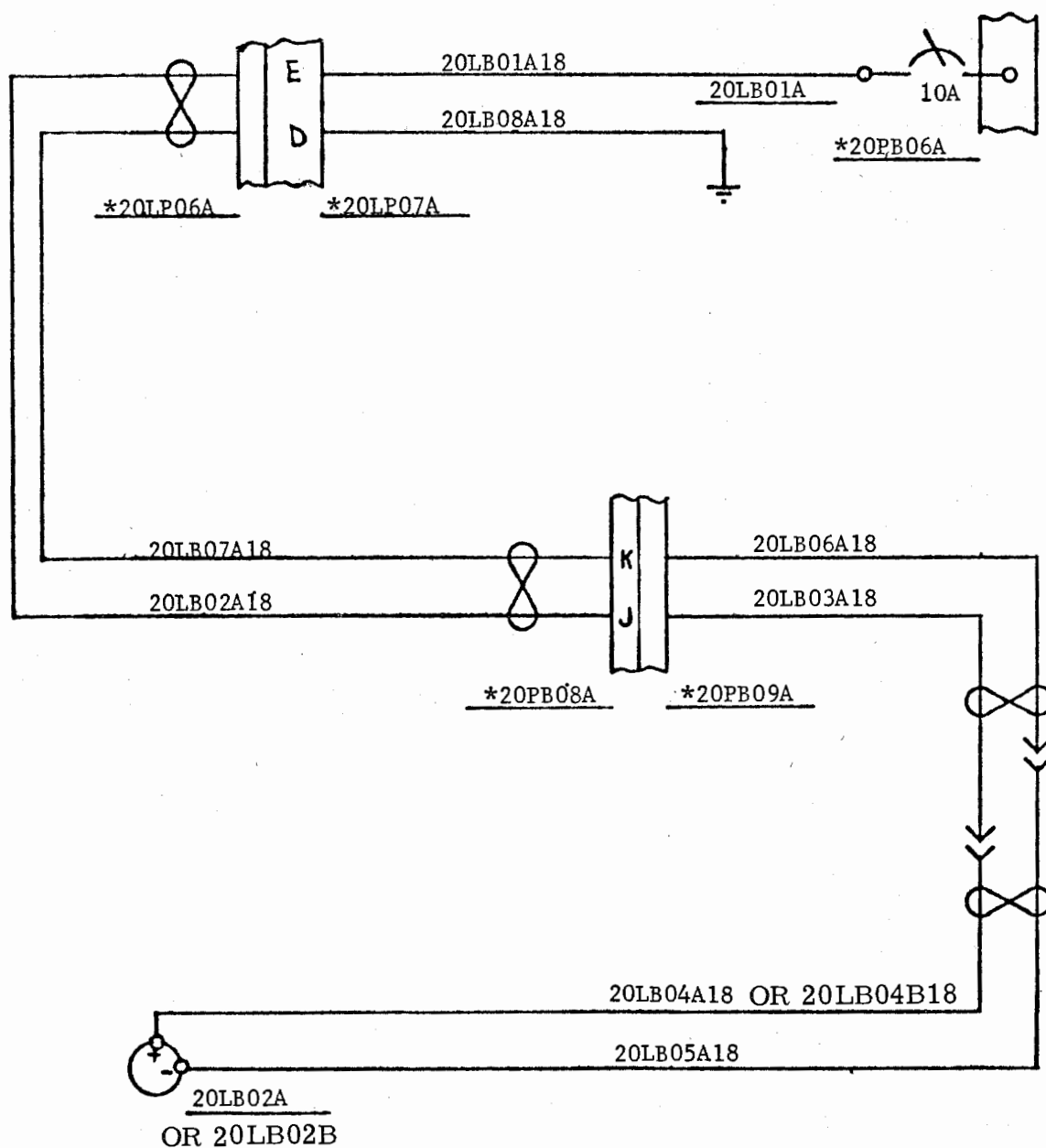
SCHEMATIC EG-5B, ELECTRIC GEAR CONTROLS (1974)



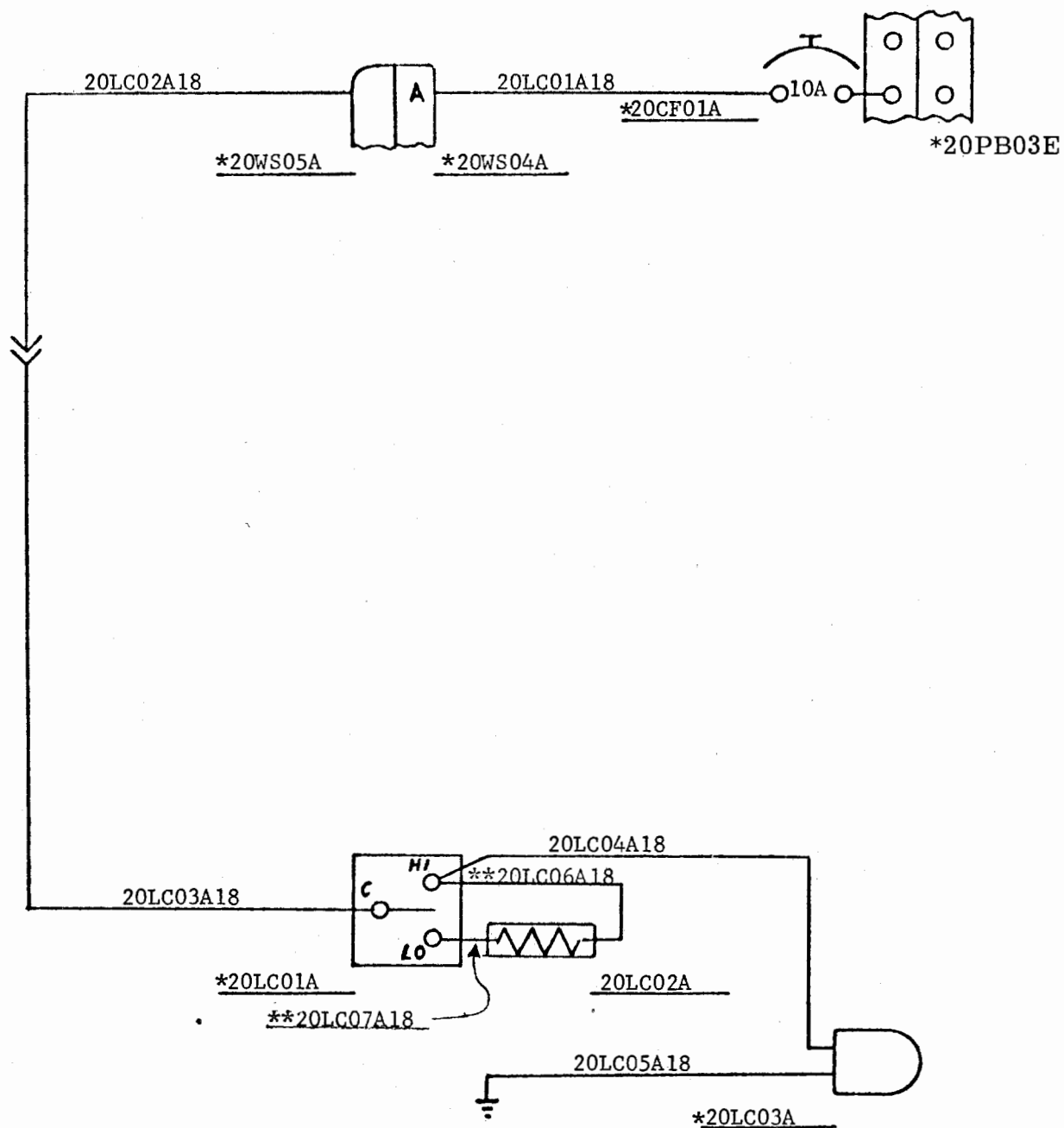
SCHEMATIC JM-1, MAGNETOS

(1969-1974)

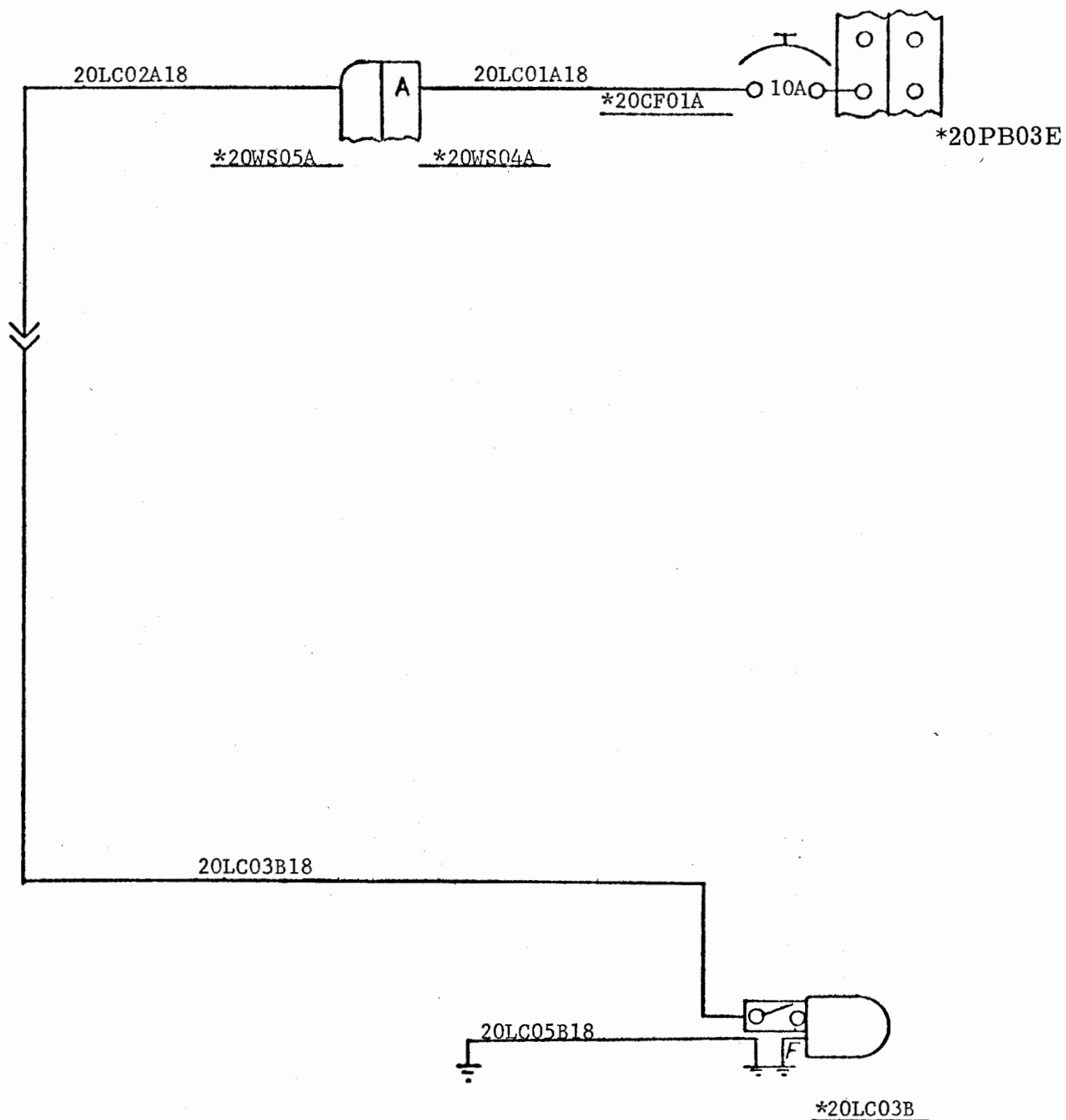


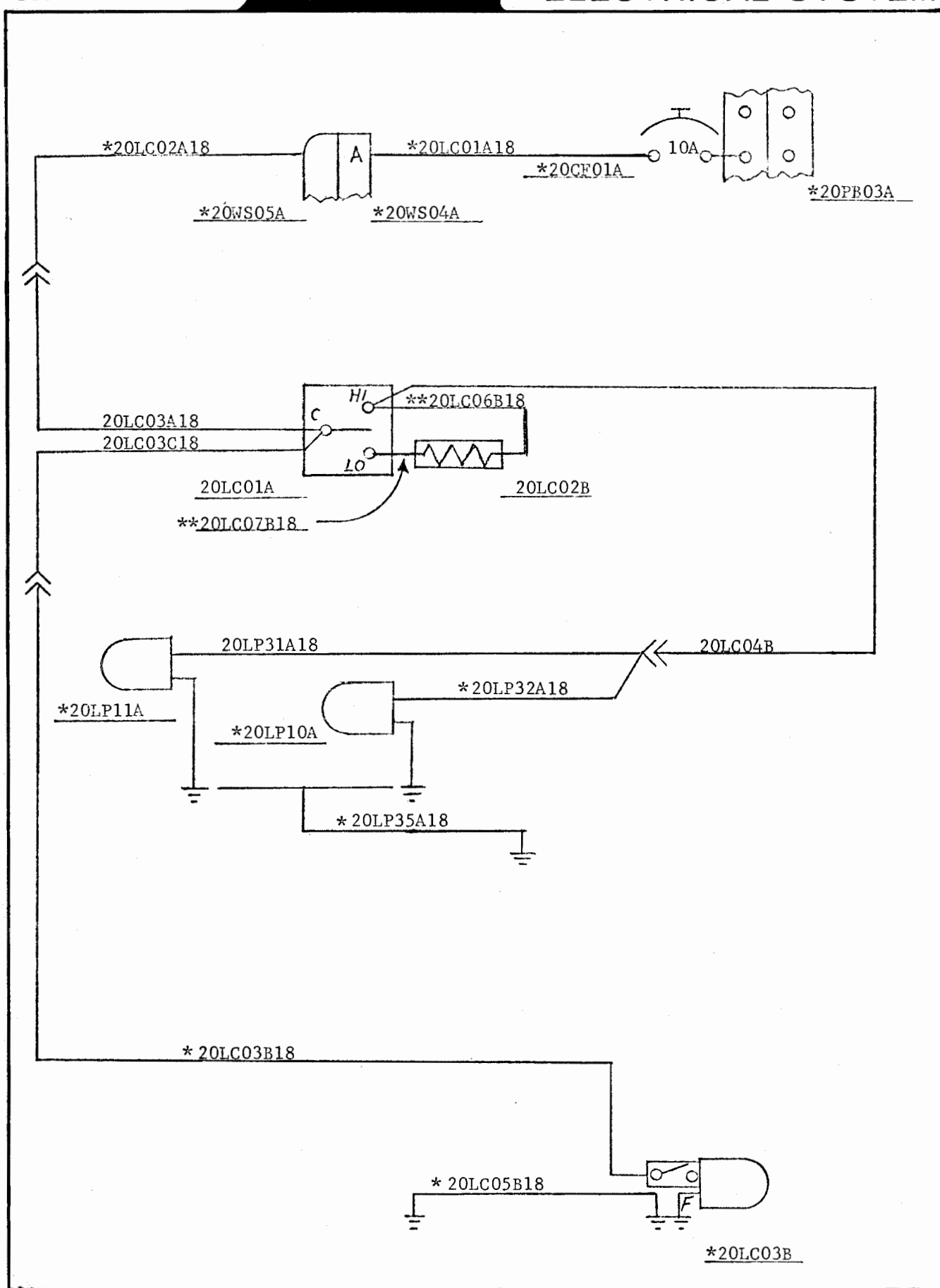


SCHEMATIC LB-1. ANTICOLLISION LIGHT (1969-1974)



SCHEMATIC LC-1. CABIN LIGHTS, M20 E&F (1969-1974)



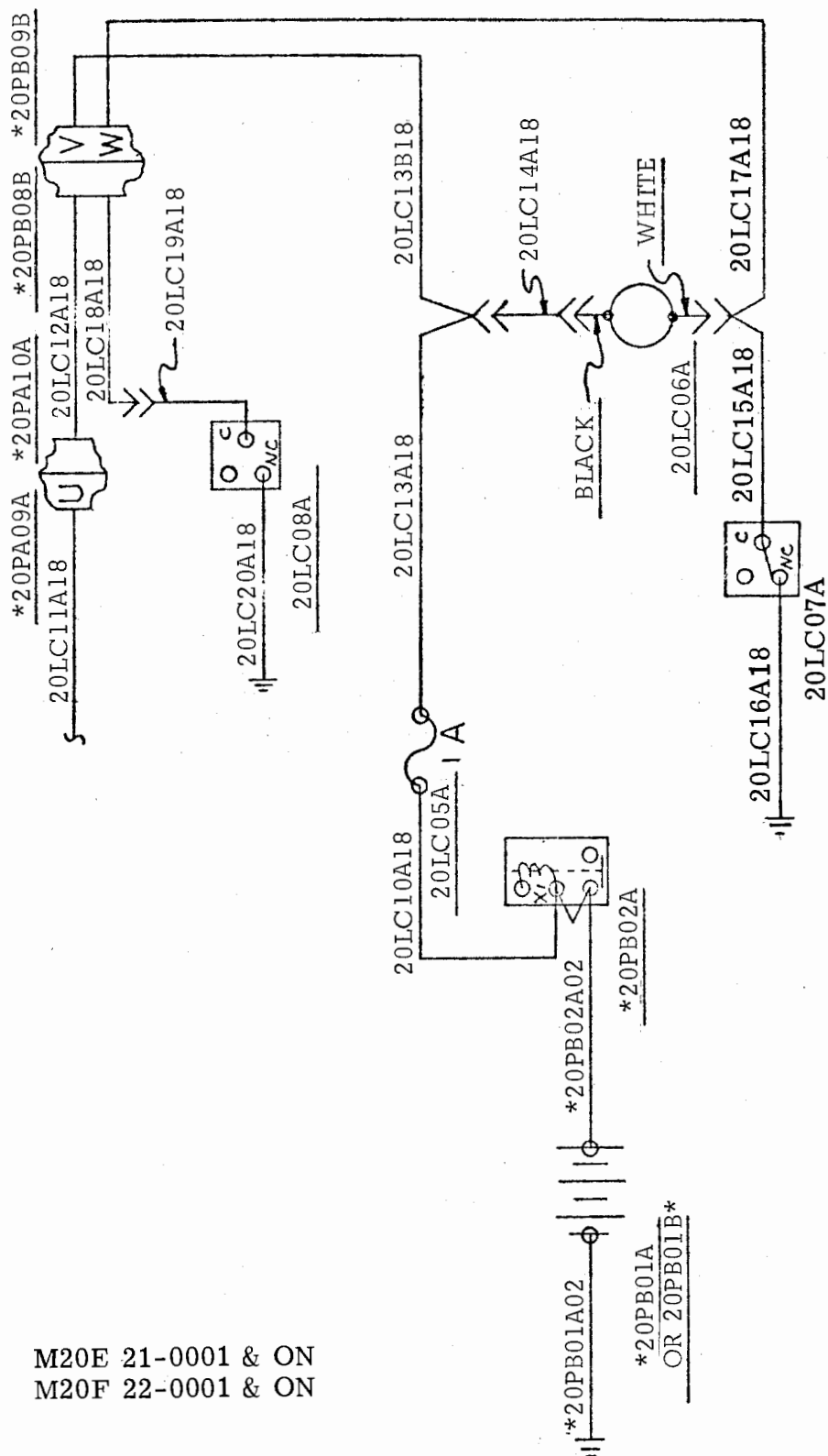


SCHEMATIC LC-1.2 CABIN LIGHTS, M20C&G (OPTIONAL)

REV. D 8/1/81⁵

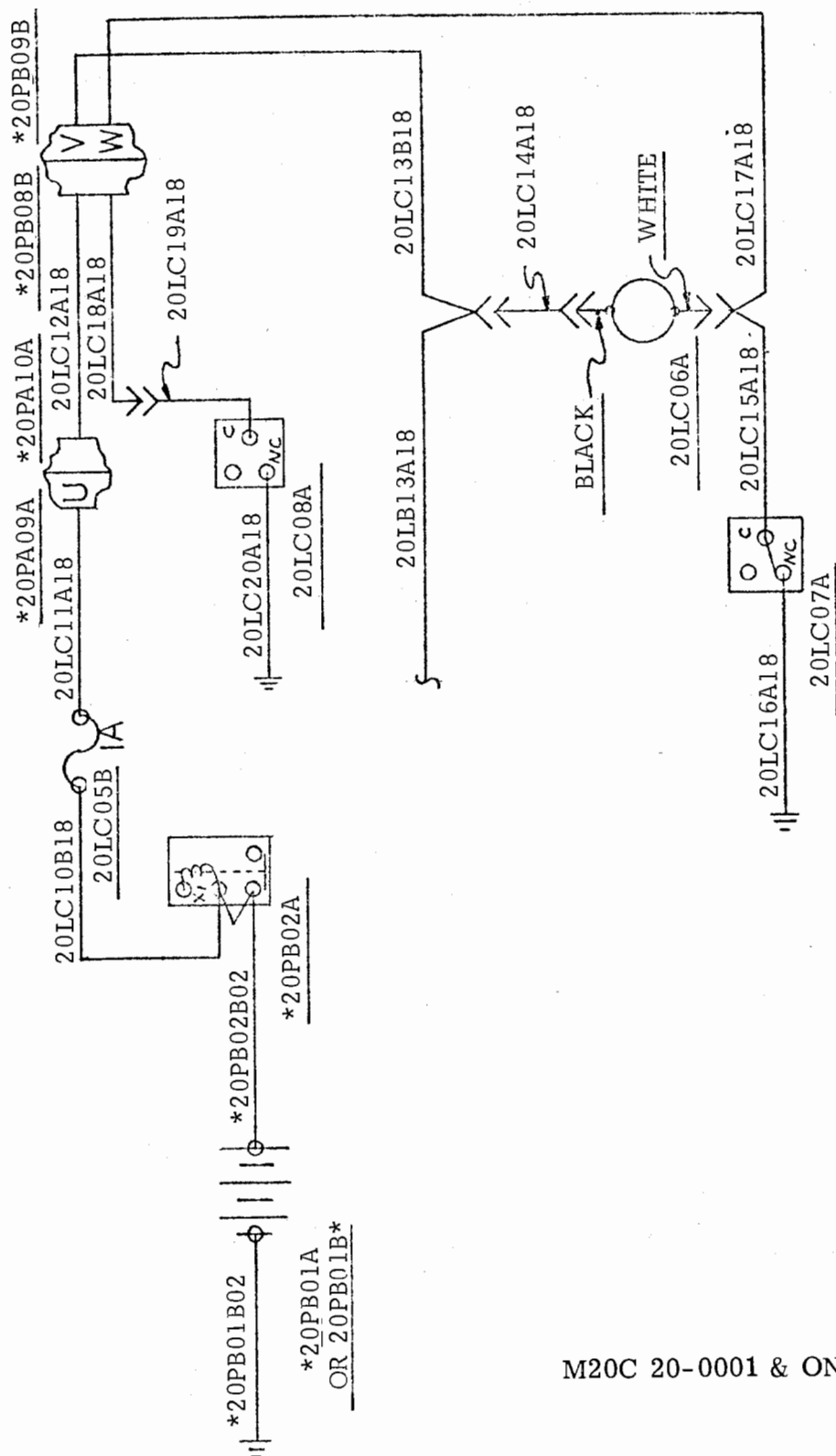
(1969-1974)

9-77

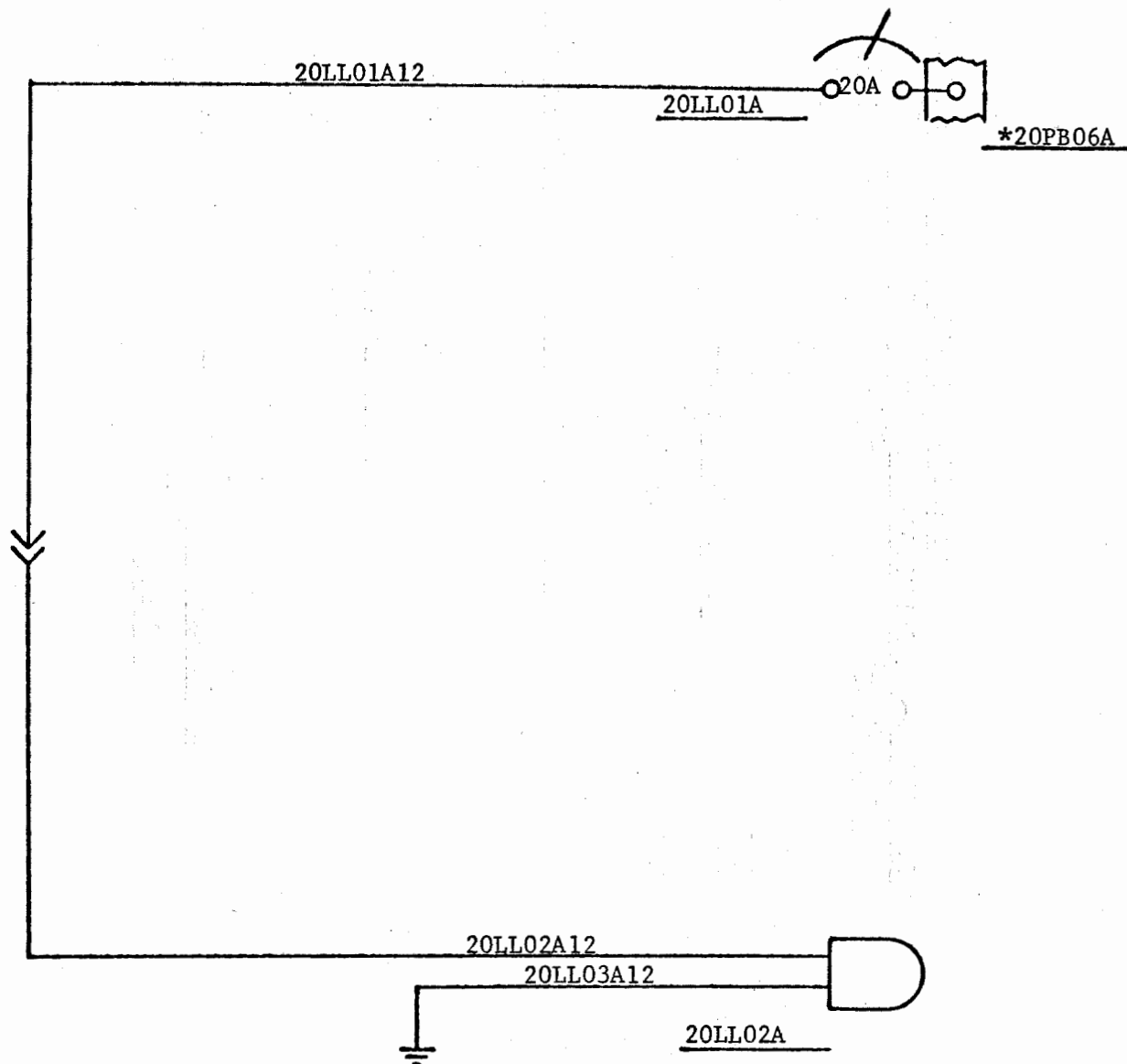


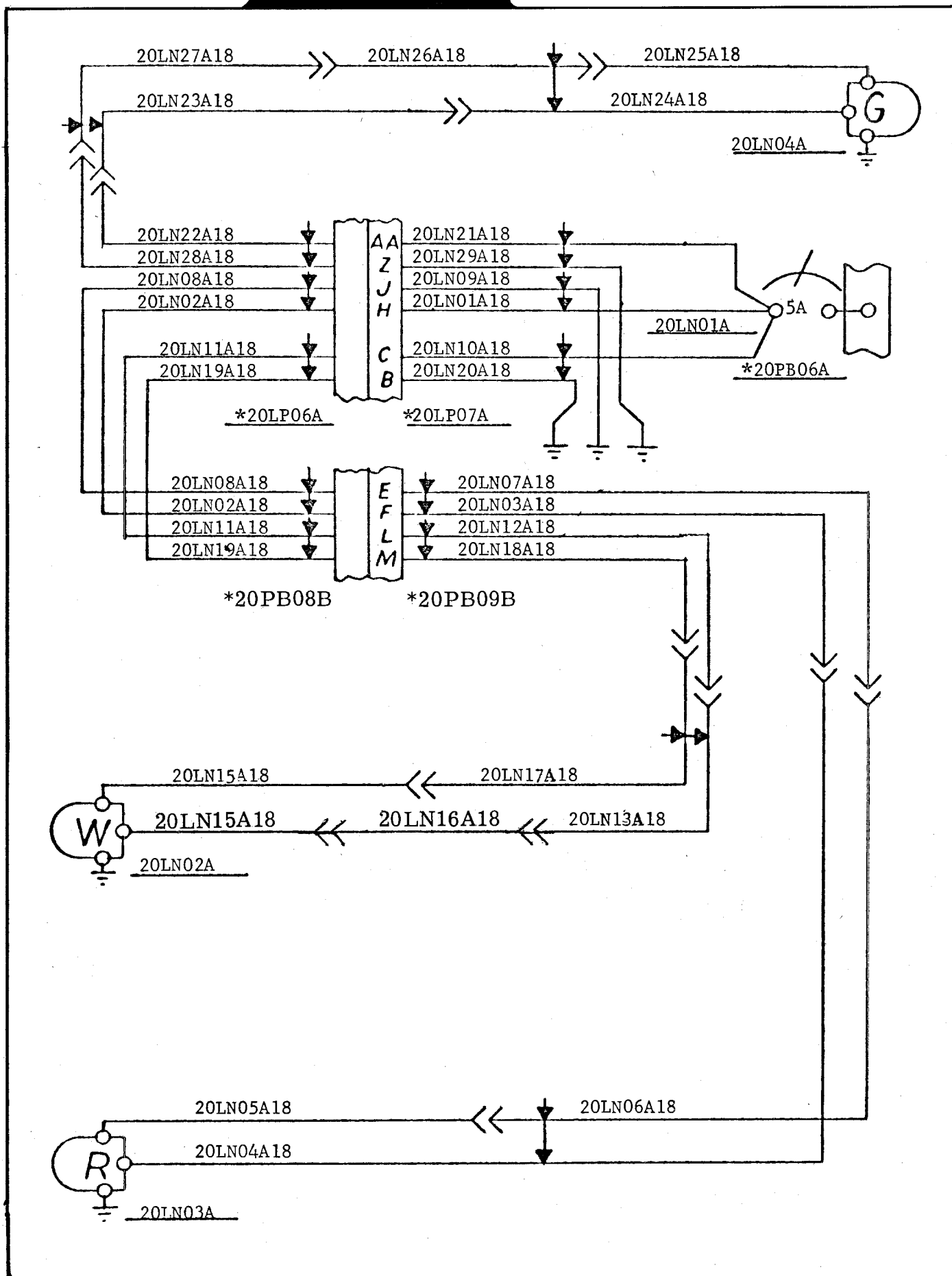
M20E 21-0001 & ON
M20F 22-0001 & ON

SCHEMATIC LC-3.1, BAGGAGE COMPARTMENT LIGHT (1971-1974)

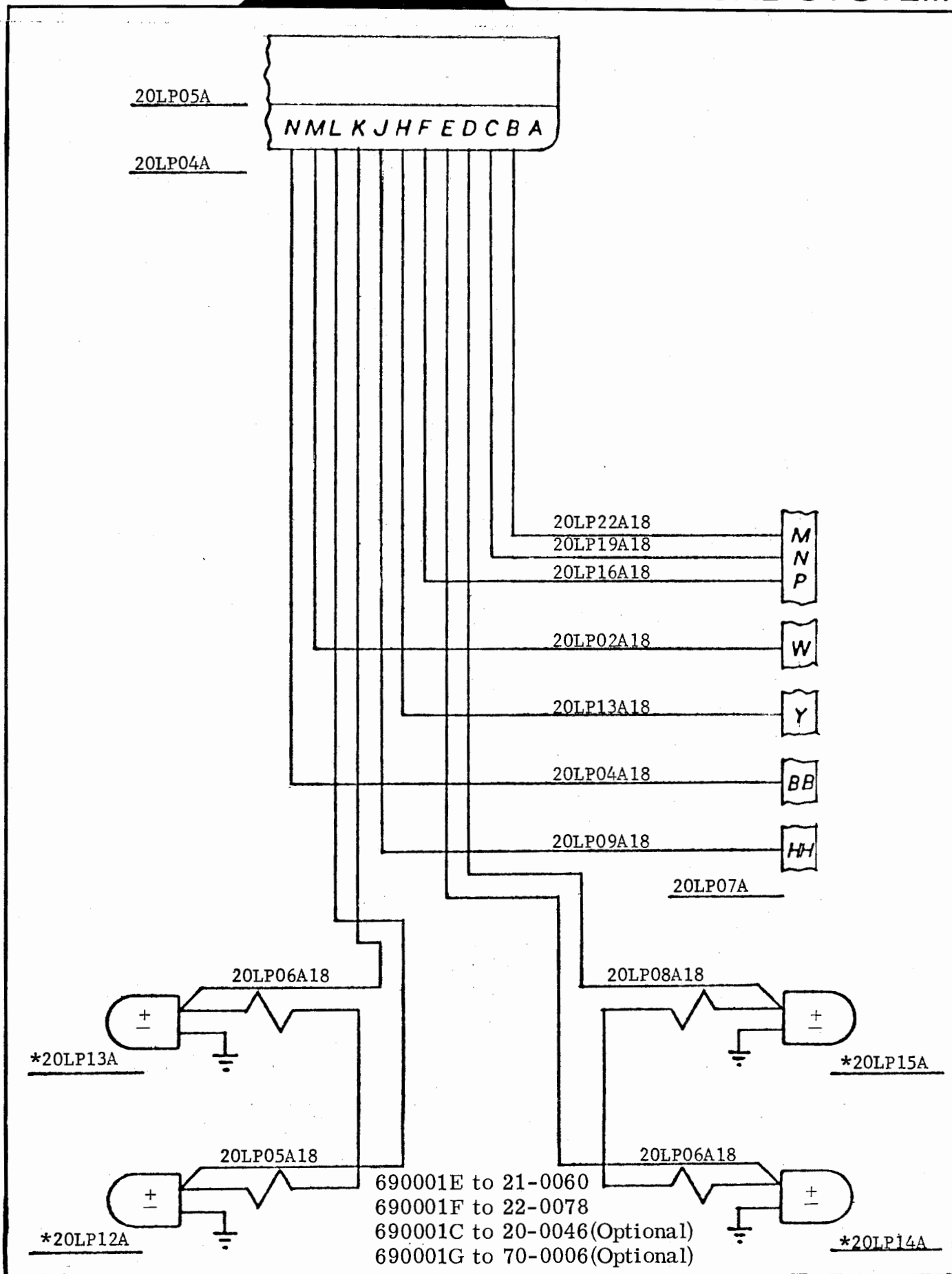


M20C 20-0001 & ON

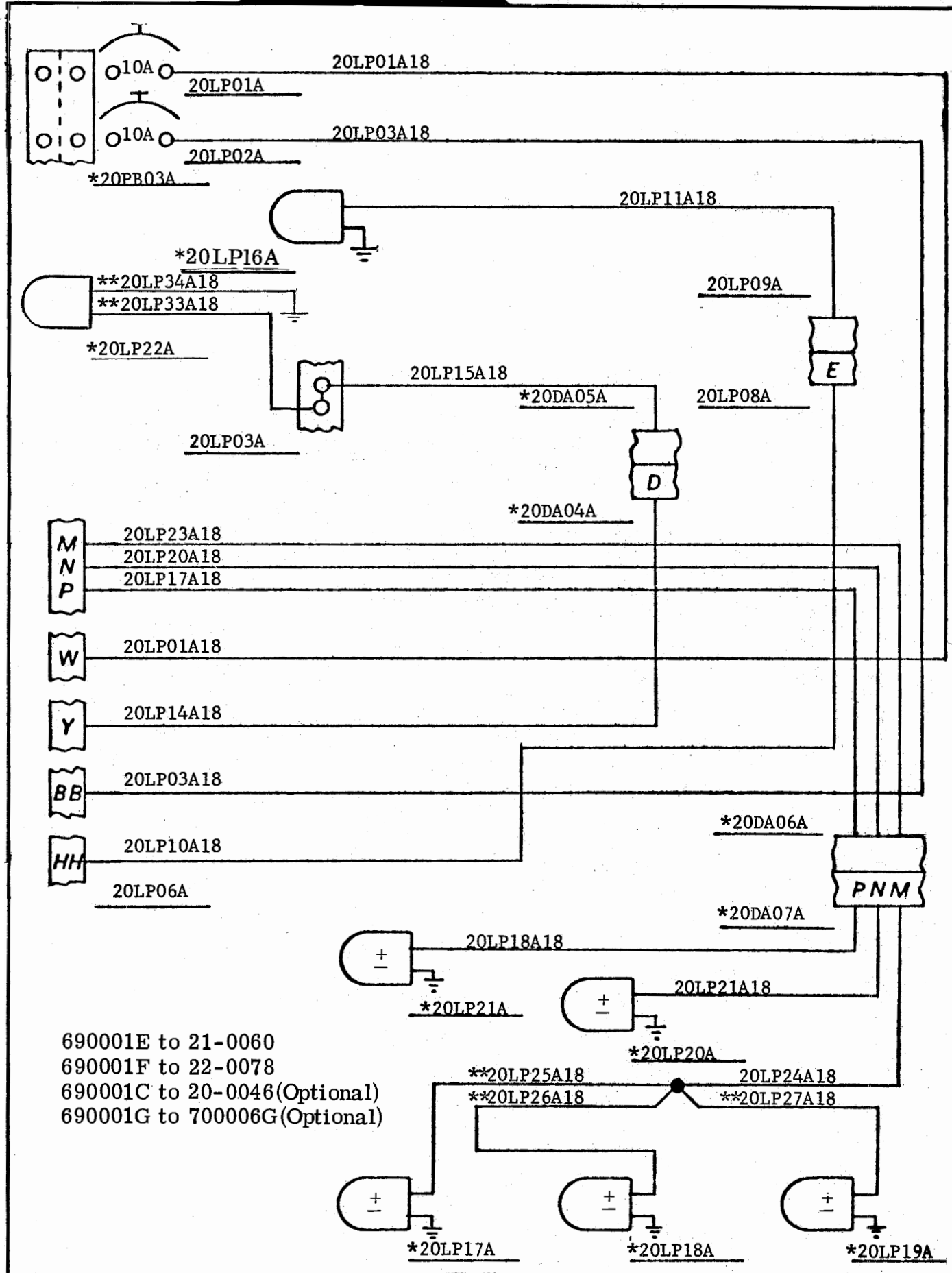


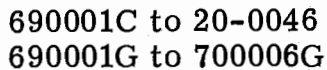


SCHEMATIC LN-1, NAVIGATION LIGHTS (1969-1974)

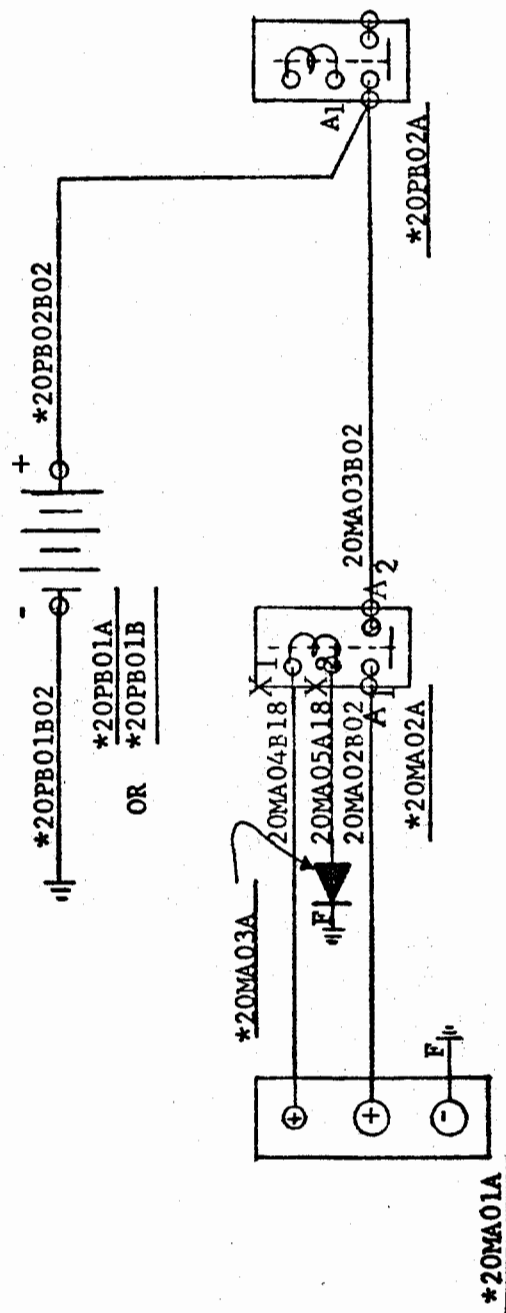


SCHEMATIC LP-1A. INSTRUMENT & PLACARD LIGHTS (1969-1974)

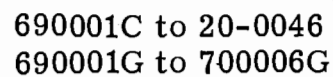


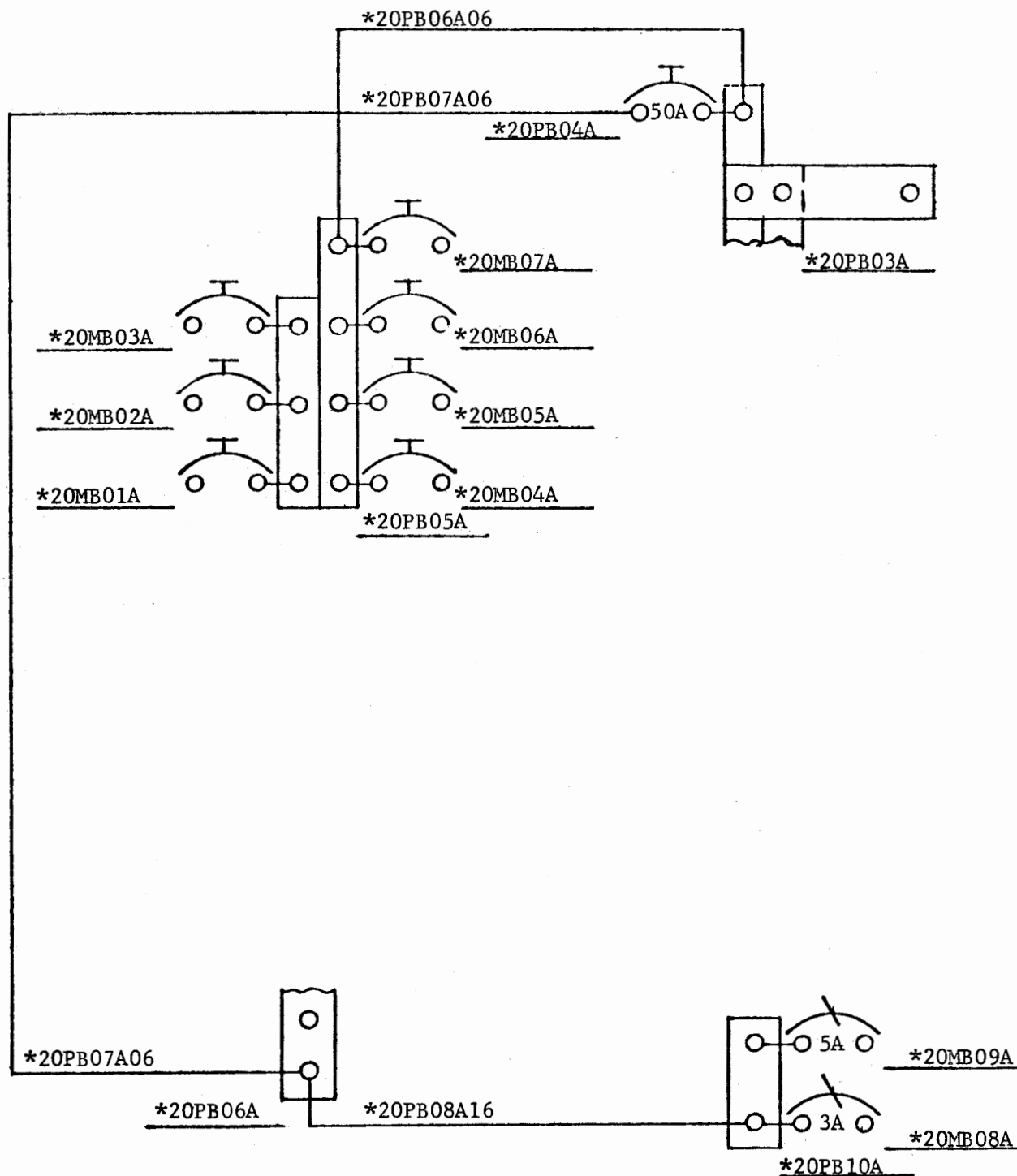


(1969-1974)



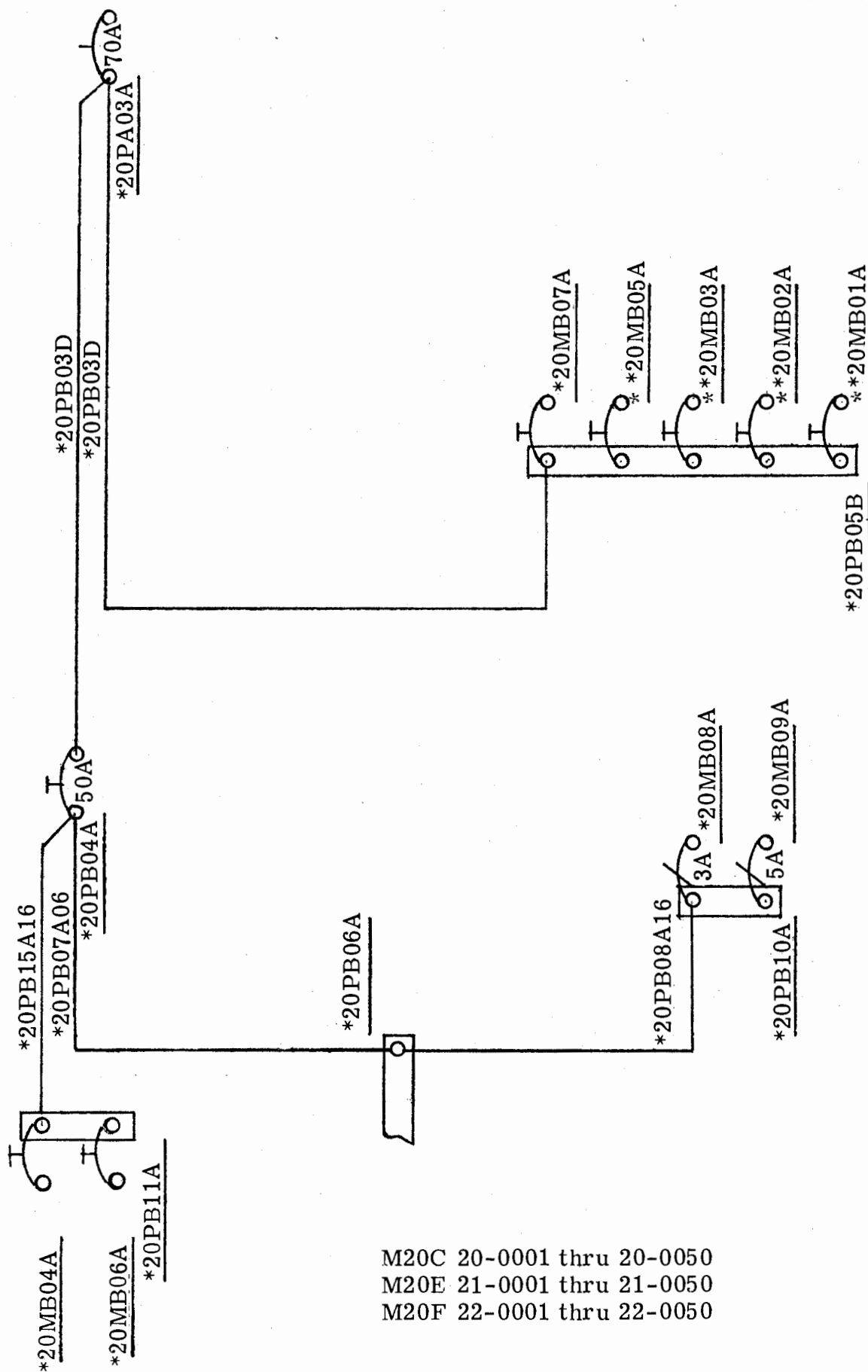
690025E thru 21-0060
690030F thru 22-0078

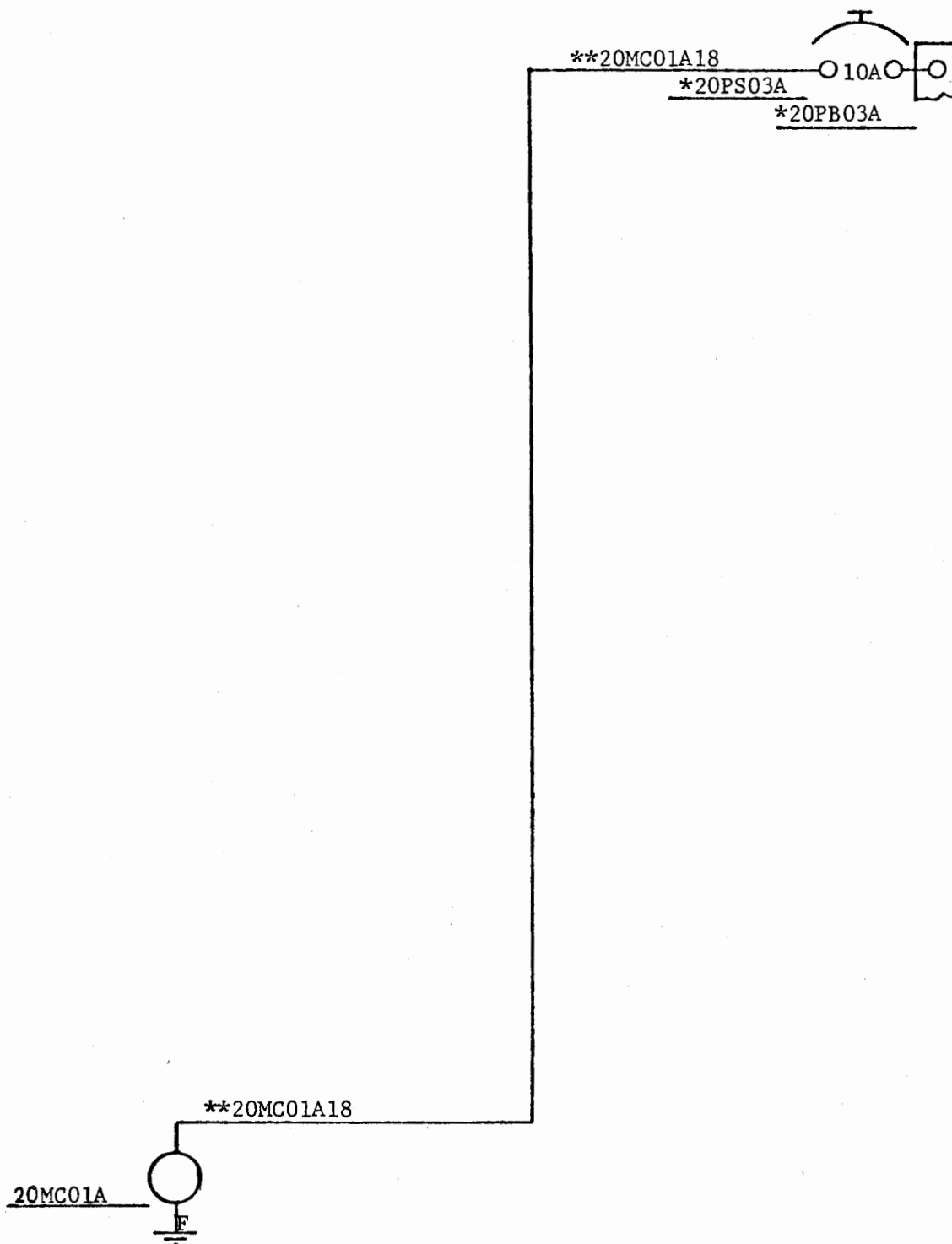


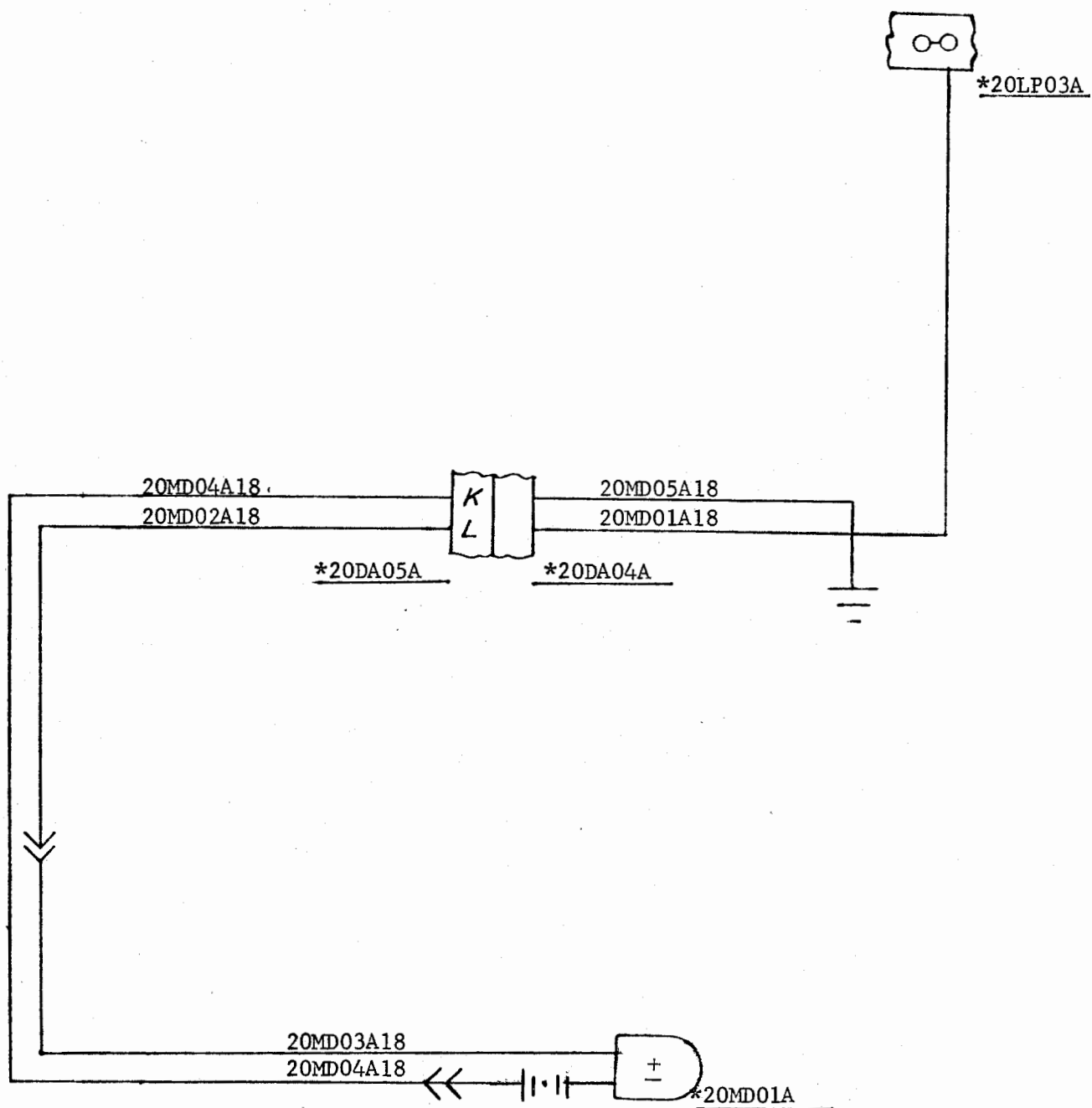


690001C to 20-0001
 690001E to 21-0001
 690001F to 22-0001
 690001G thru 700006G

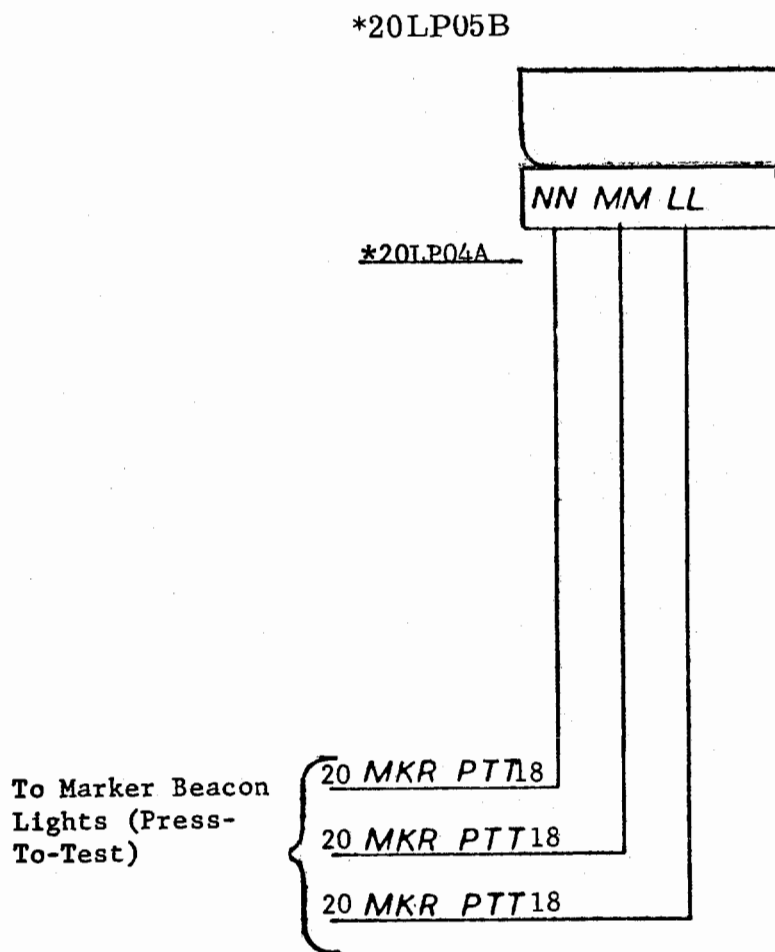
SCHEMATIC MB-1A, RADIO CIRCUIT BREAKERS (OPTIONAL)

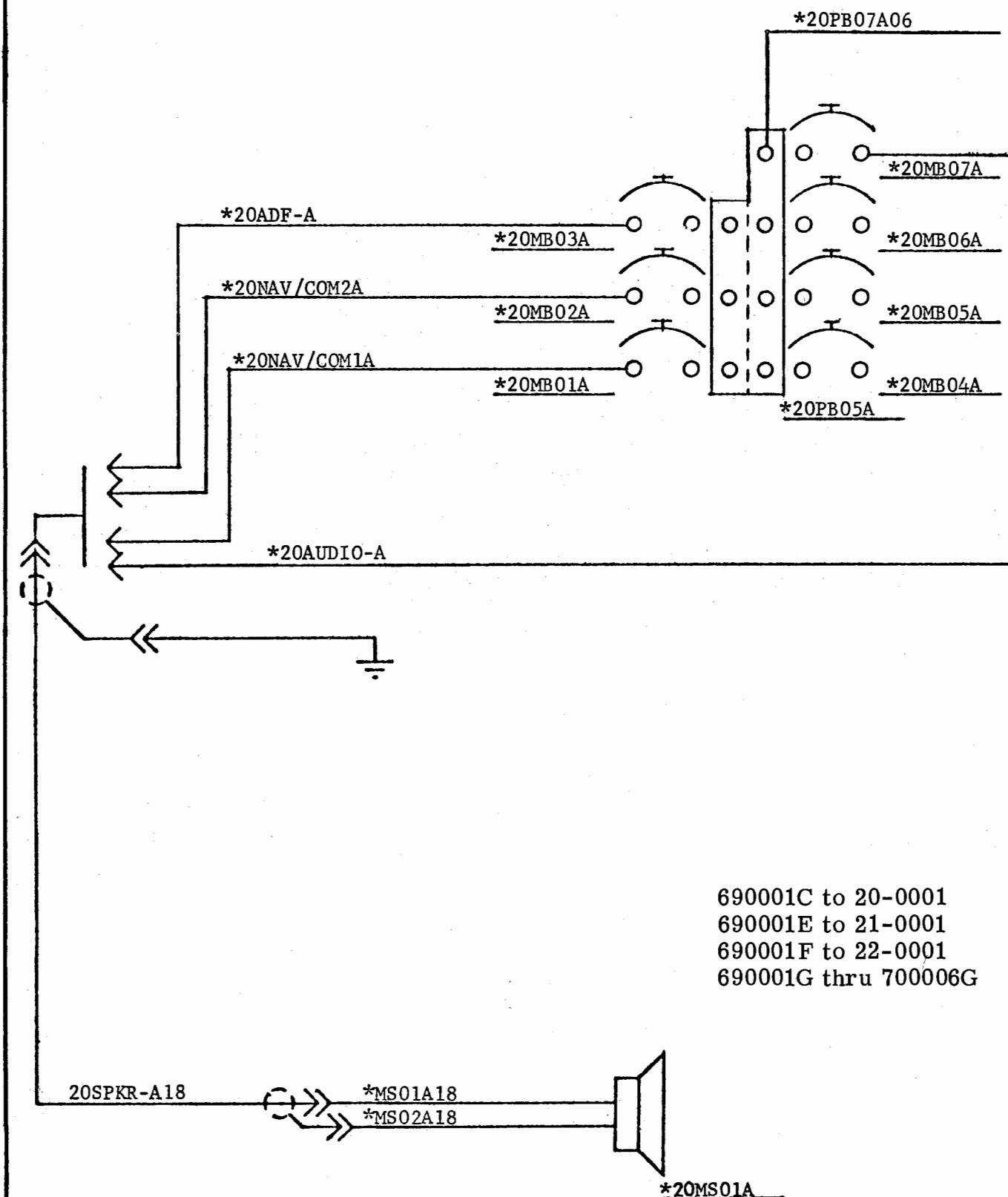




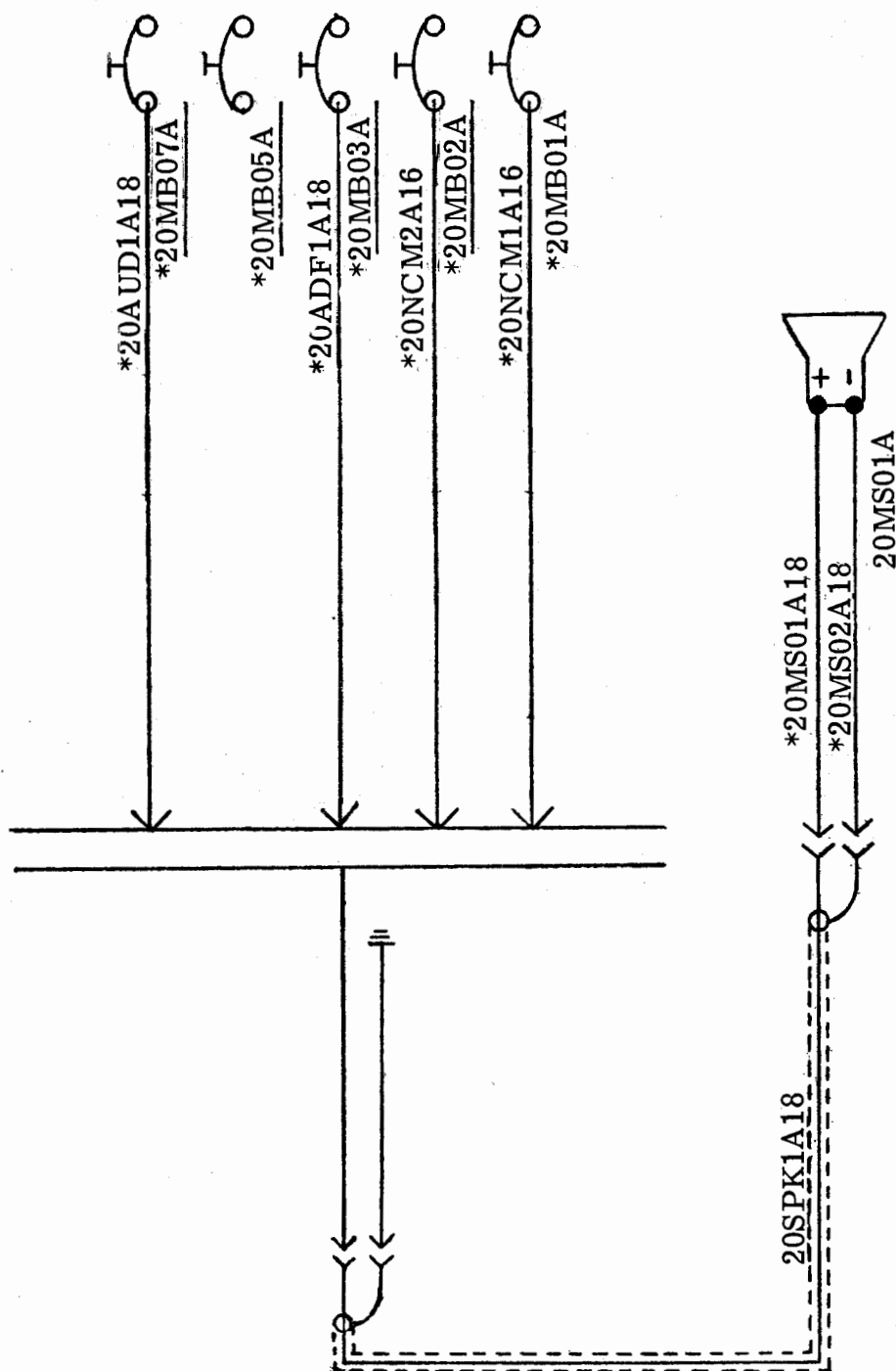


SCHEMATIC MD-1, CLOCK LIGHT (OPTIONAL) (1969-1974)

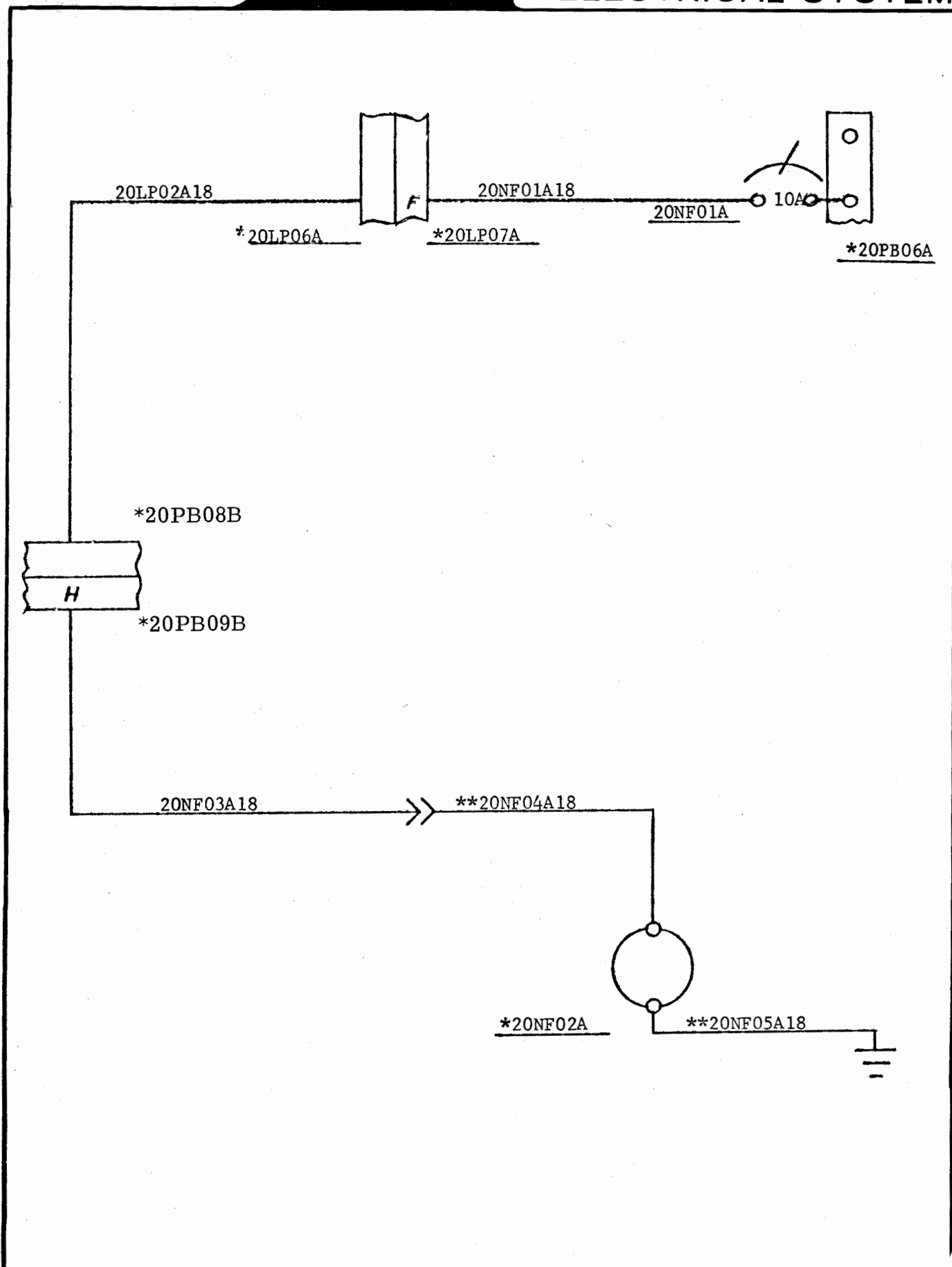


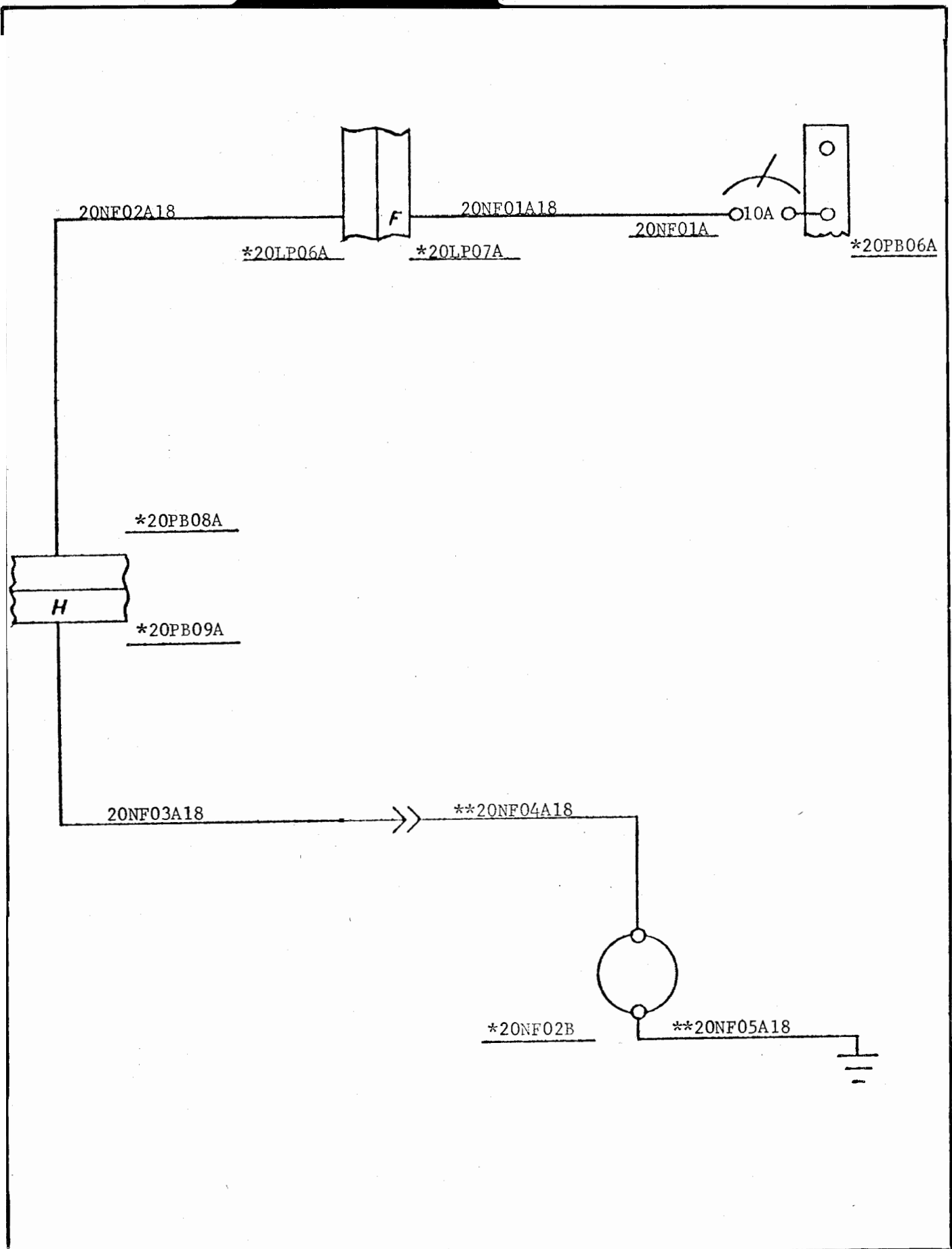


SCHEMATIC MS-1, RADIO SPEAKER (1969-1970)

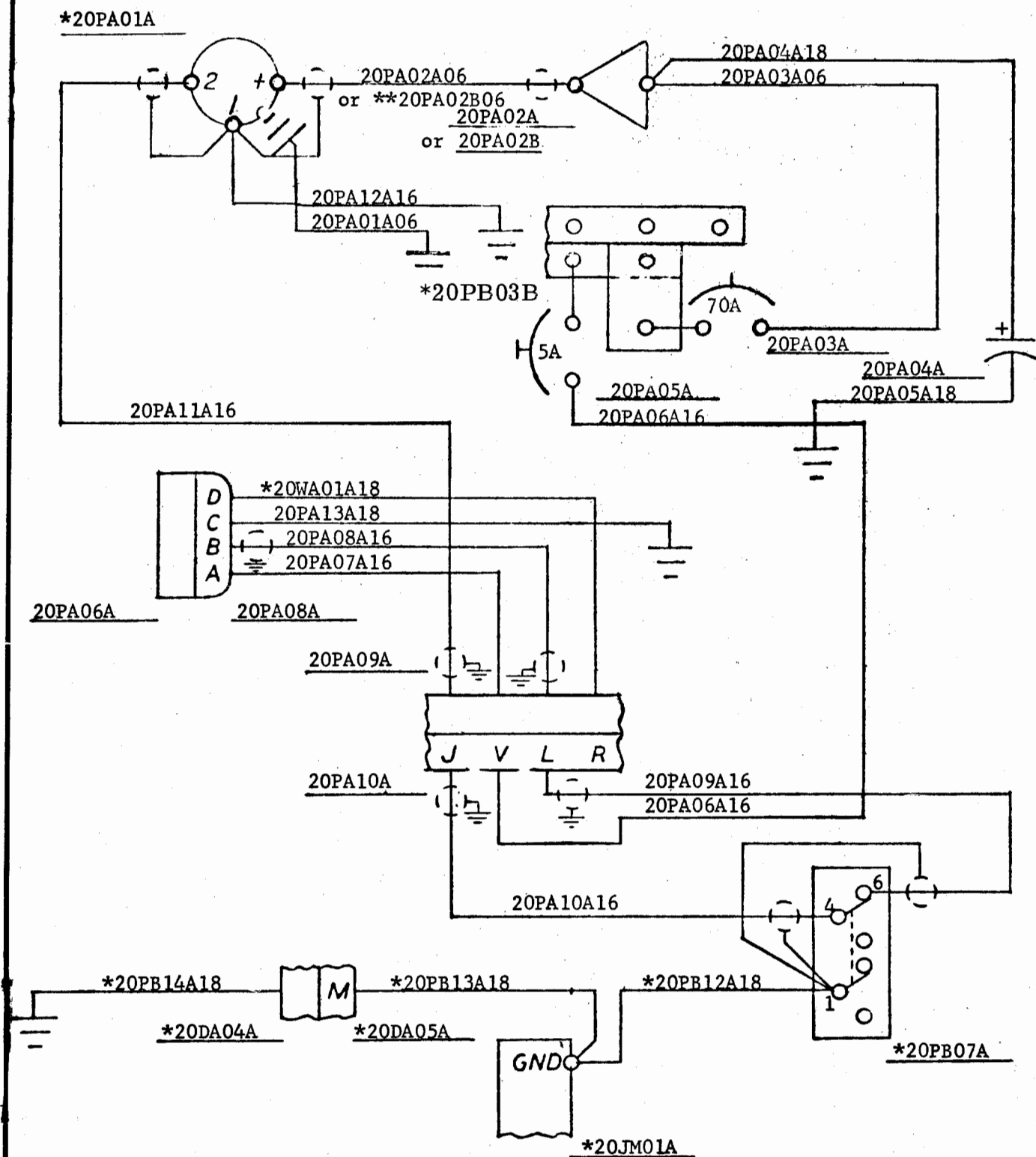


M20F 22-0001 thru 22-0050
M20E 21-0001 thru 21-0050
M20C 20-0001 thru 20-0050



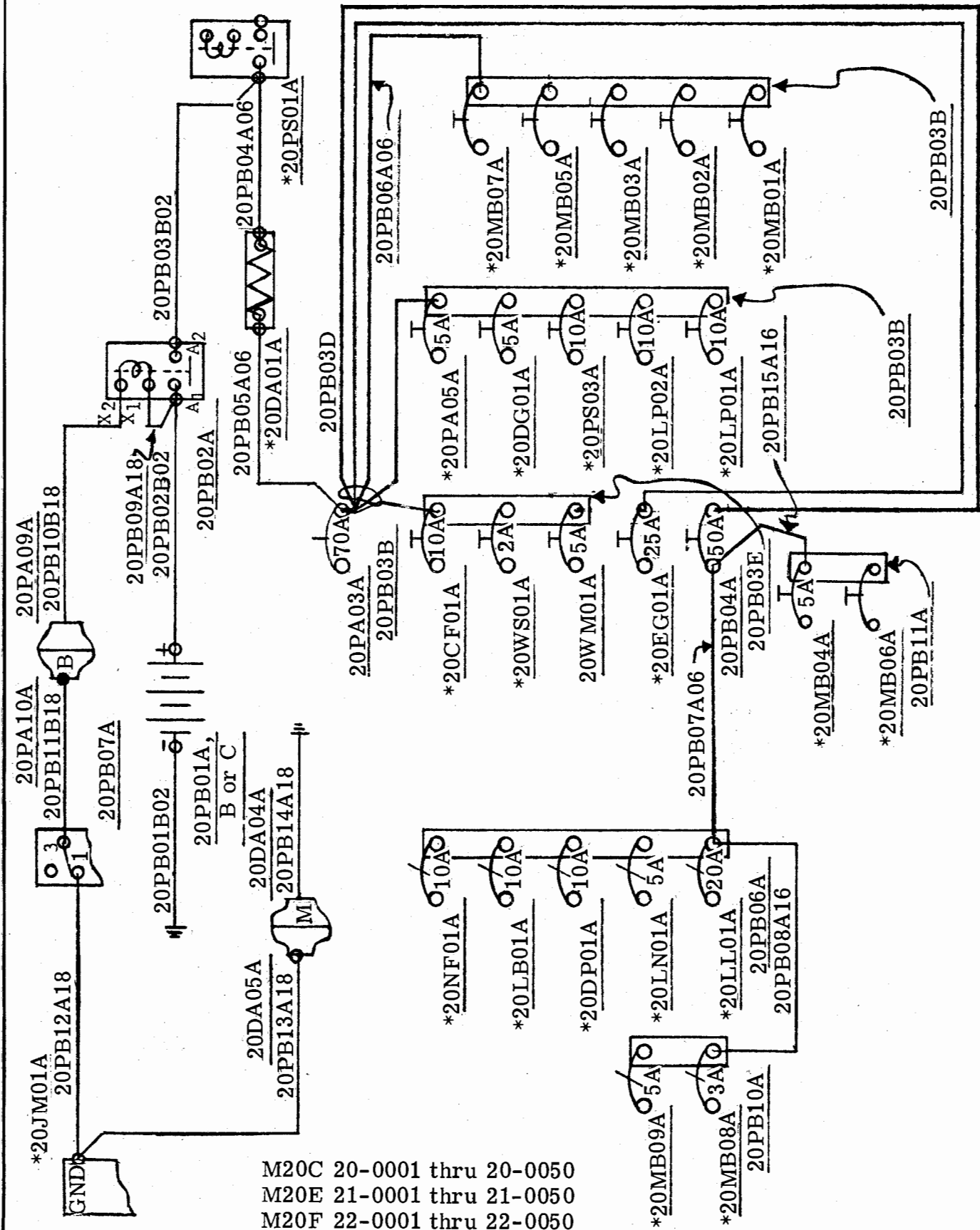


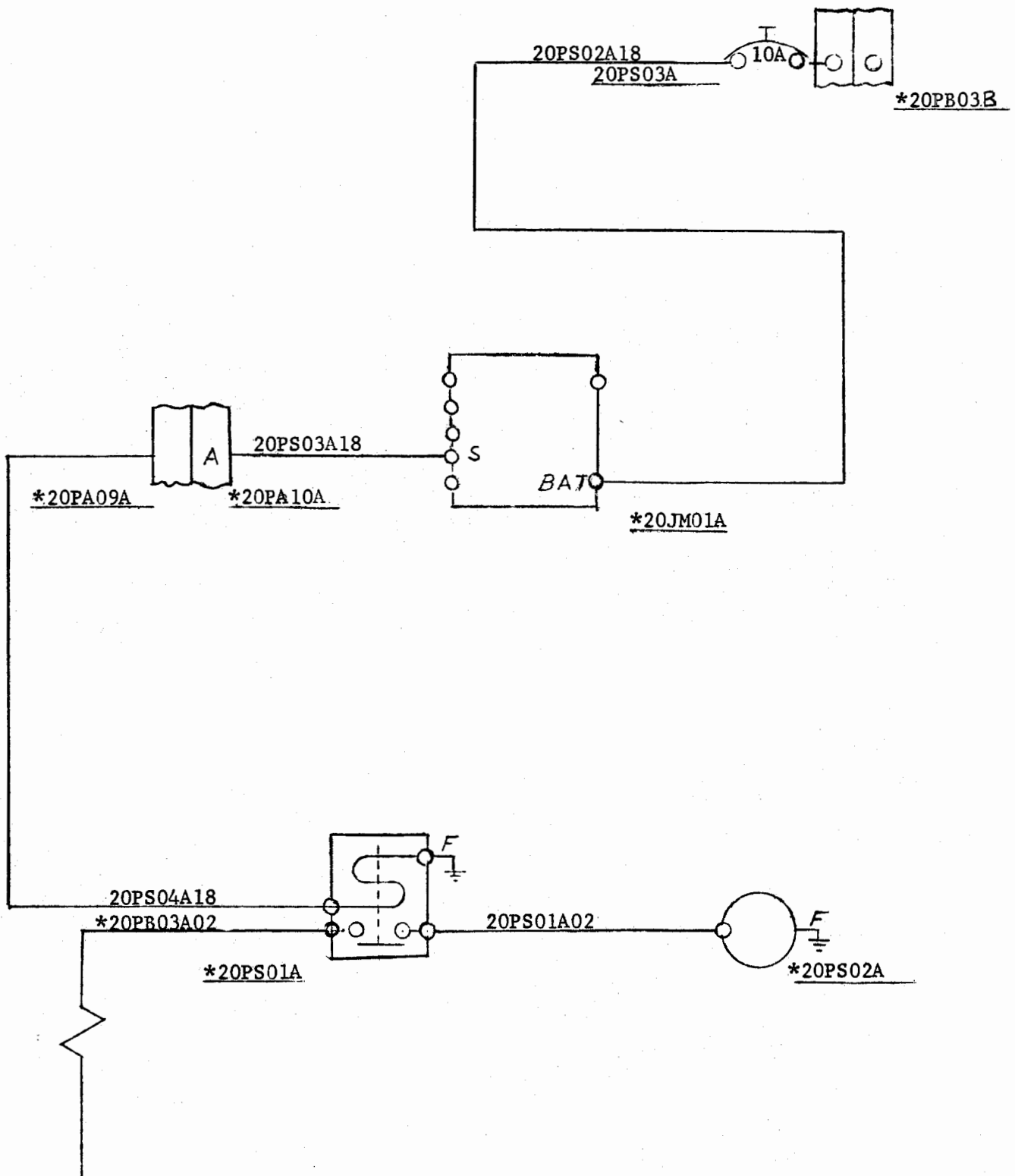
SCHEMATIC NF-1.1, ELEC. FUEL PUMP M20C & G (1969-1974)

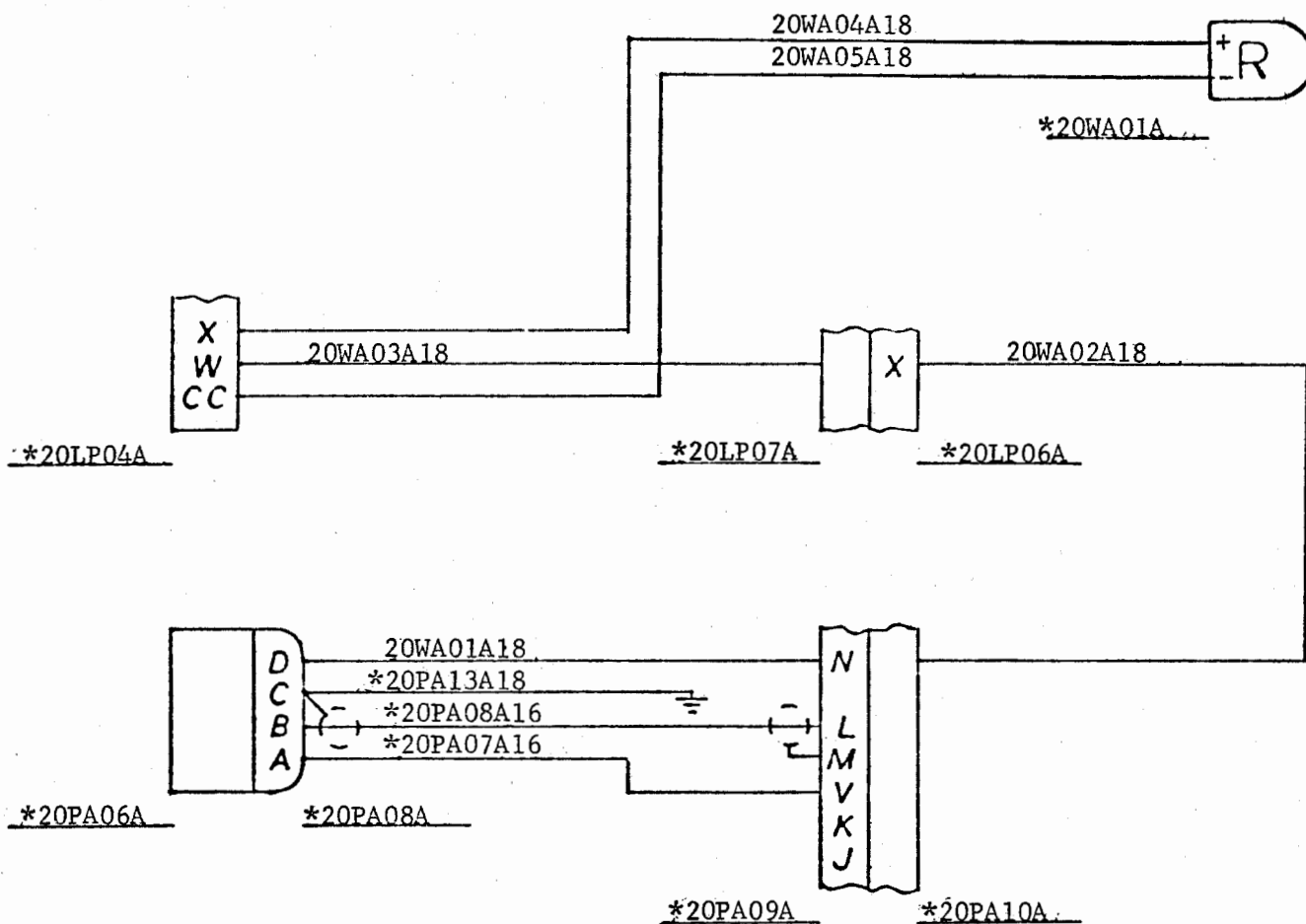


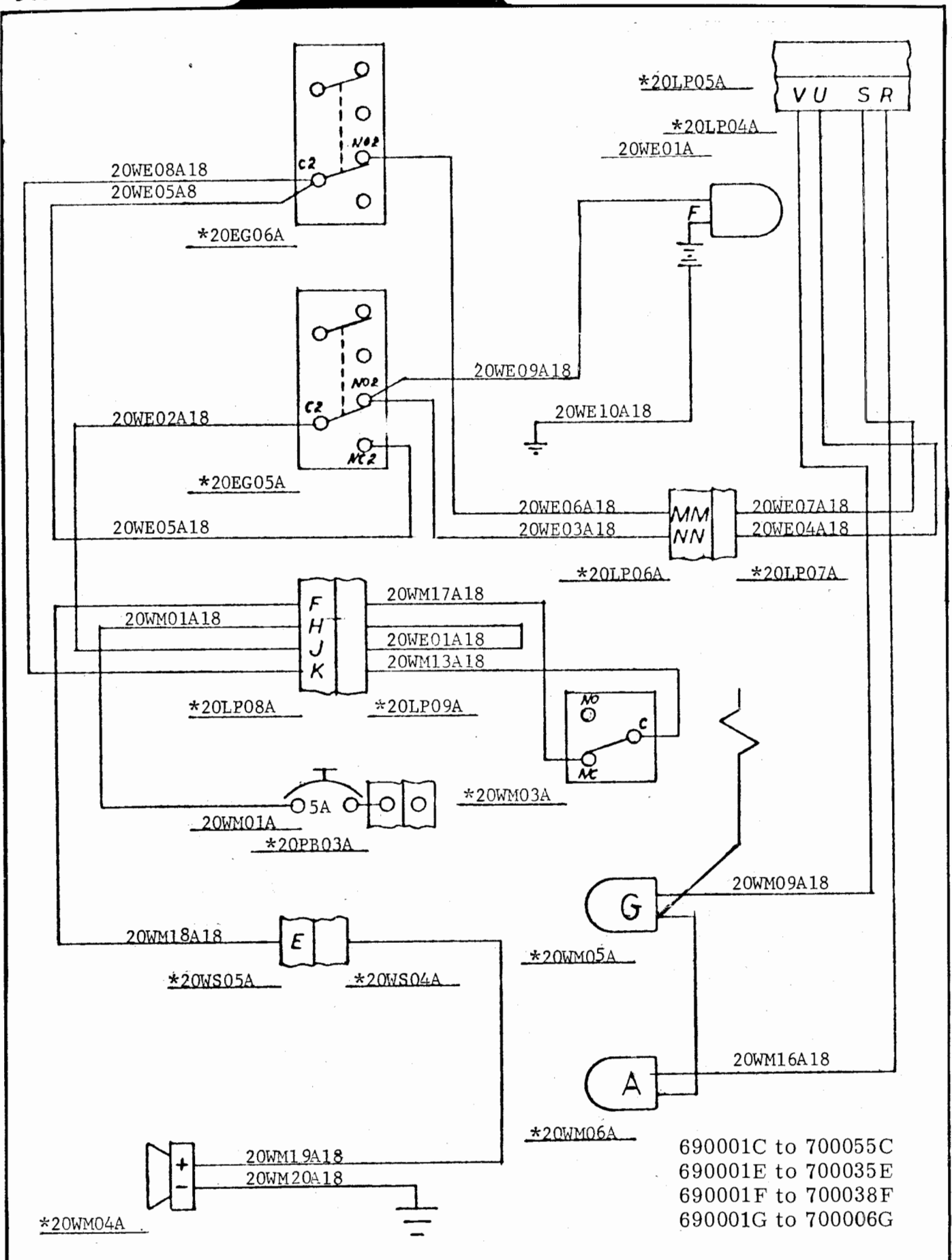
SCHEMATIC PA-1, ALTERNATOR & CONTROLS (1969-1974)



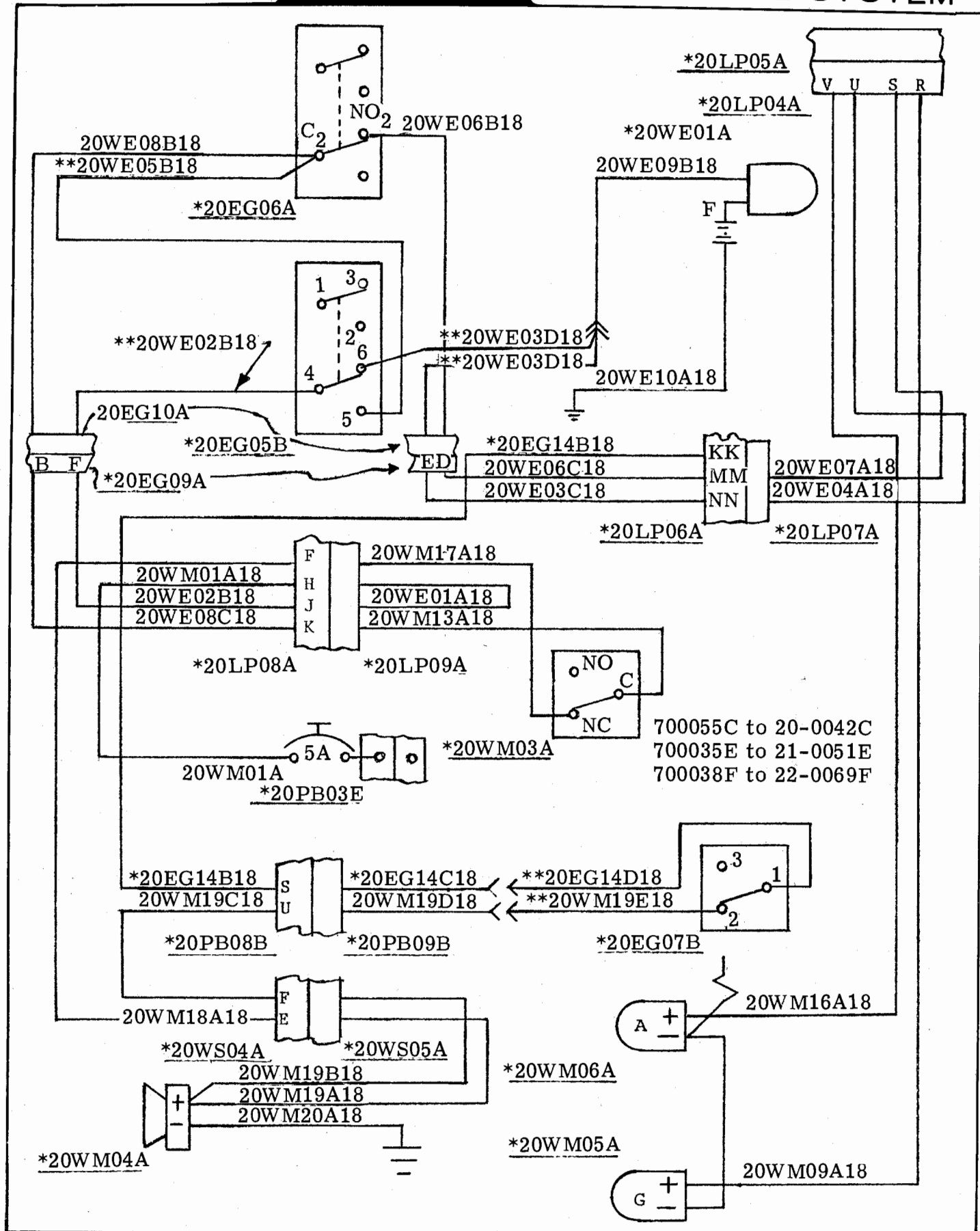




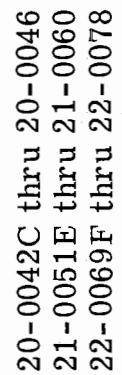


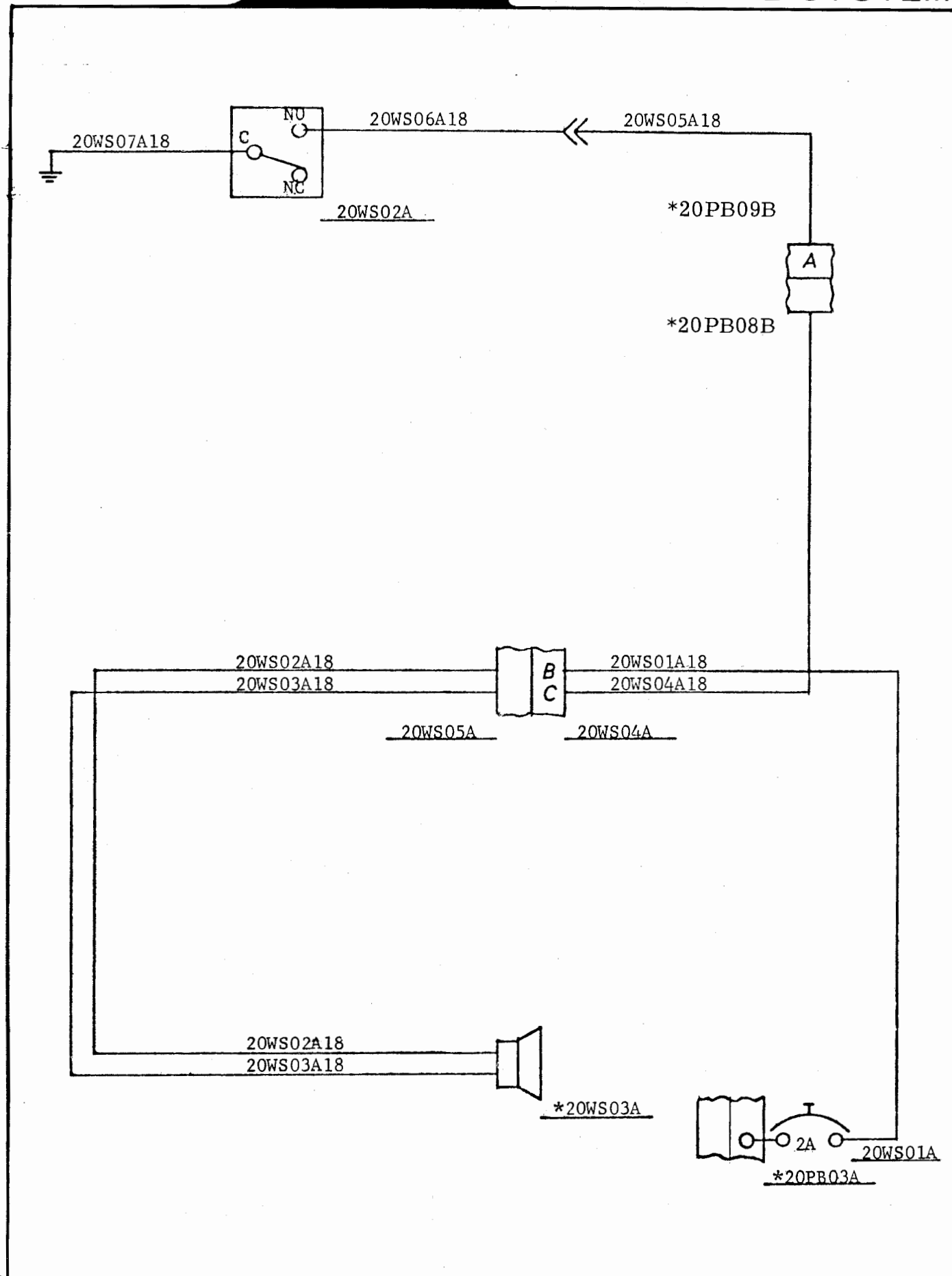


SCHEMATIC WE-1, GEAR POSITION WARNING SYSTEM (1969-1970)



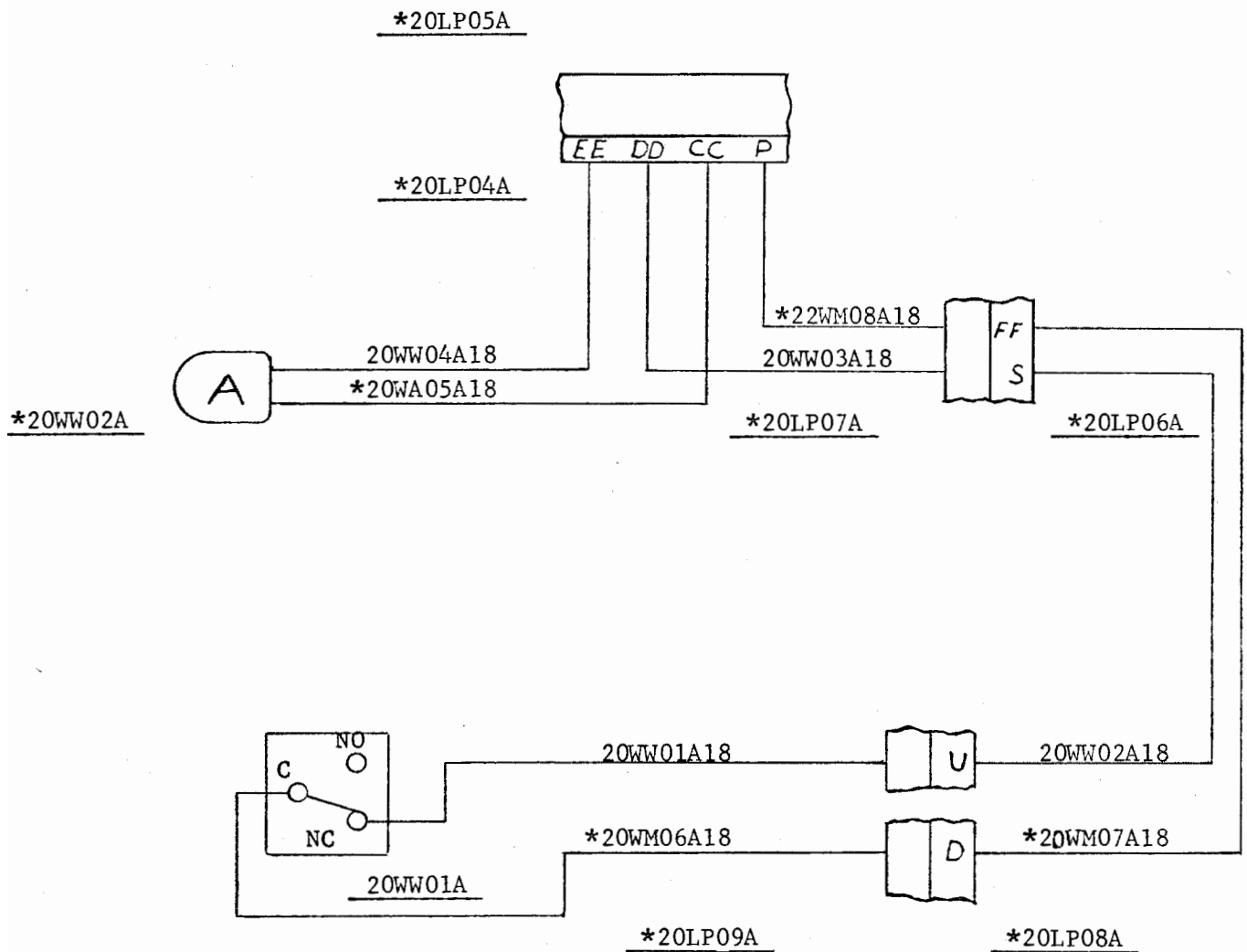
SCHEMATIC WE-3, GEAR POSITION WARNING SYSTEM (1970-1974)



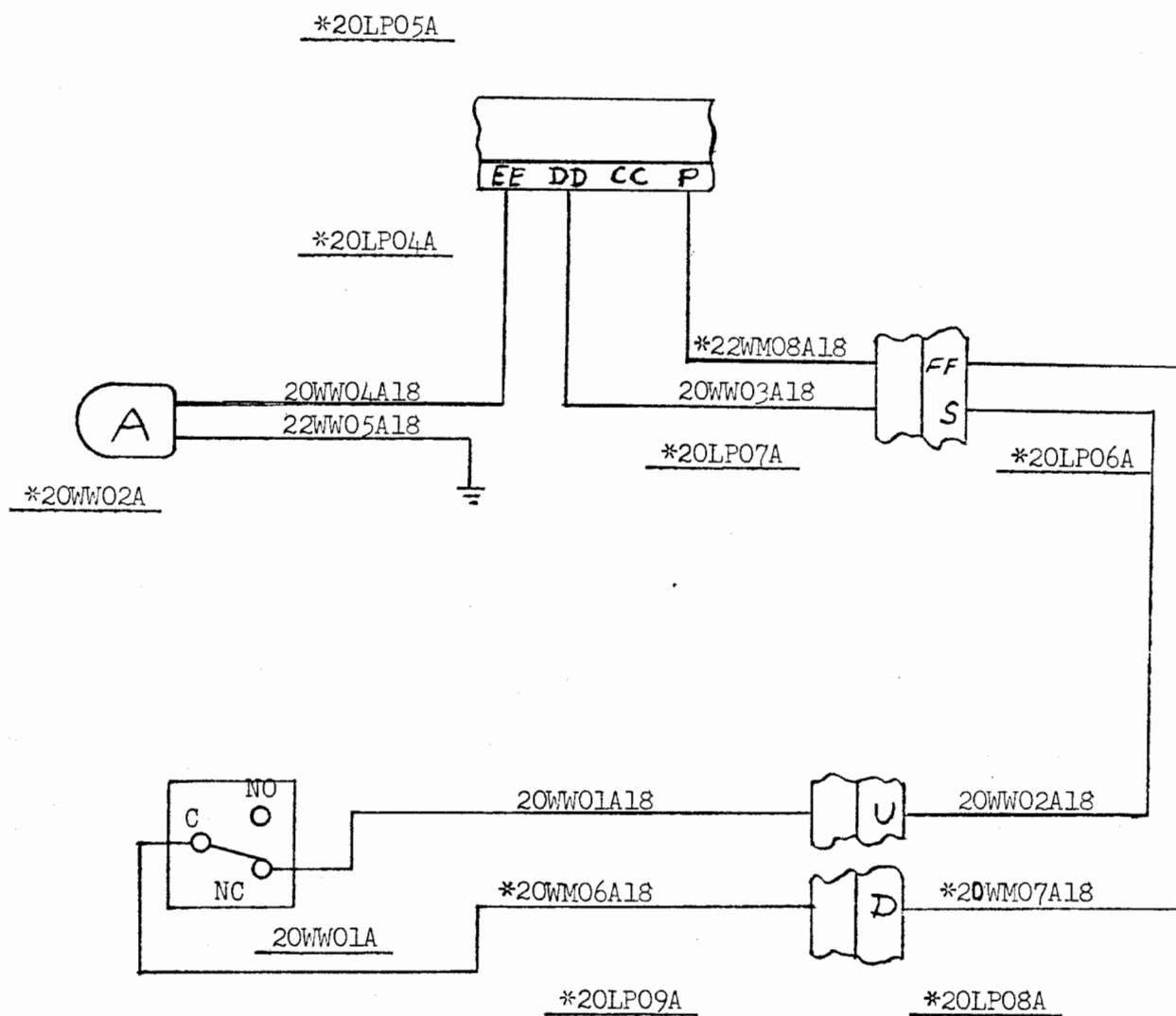


SCHEMATIC WS-1, STALL WARNING SYSTEM

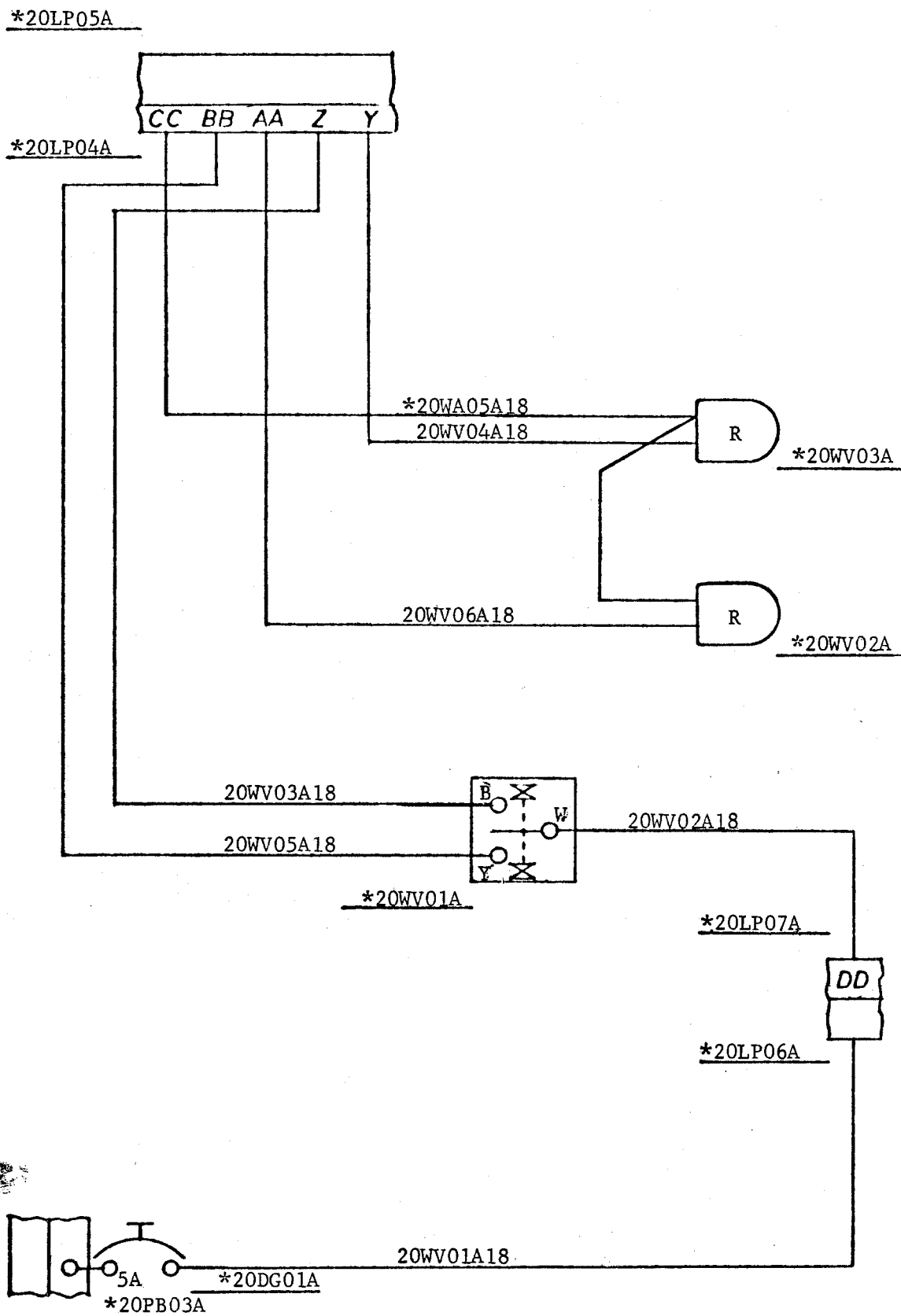
(1969-1974)



690001E to 690025E
690001F to 690030F



690001E to 21-0060
690001F to 22-0078



SCHEMATIC WV-1, HI/LO VAC. WARNING SYSTEM (1969-1974)

TERMINAL CHART 1969 thru 1974

WIRE SIZE	STUD SIZE	AN 659 DASH NO.	MS25036 DASH NO.	AMP NO. VINYL	AMP NO. NYLON	WIRE SIZE	STUD SIZE	AN 659 DASH NO.	MS25036 DASH NO.	AMP NO. VINYL	AMP NO. NYLON
22-16	2			320135		6	10	-30	-19	321298	324046
	4	-38	-48	31880	323758		1/4"	-9	-20	321598	324047
	6 SM		-1	31881			5/16"	-31	-21	33466	324048
	6 STD	-1	-2	31885	36151		3/8 "	-10	-22	33467	324049
	8		-49	31890	320551		7/16"			320745	328654
	10	-2	-3	31891	36153		1/2 "	-43		320344	
	1/4 "		-50	31894	320571		5/8 "			36809	
	5/16"		-4	31895	320572		3/4 "			36810	
	3/8 "	-25	-5	31897	320573						
	1/2 "		-51			4	10	-44		33468	324111
	K.D.			32446	320555		1/4 "	-11	-23	33469	324050
							5/16"	-32	-24	33470	324051
16-14	2			321008			3/8 "	-12	-25	33471	324052
	4	-39	-52	32441	324159		7/16"			320743	
	6 SM	-26	-6	32442			1/2 "	-45		35668	324114
	6 STD	-3	-7	31901	35157		5/8 "			35669	
	8		-53	31902	320560		3/4 "			35670	
	10 SM			322238	32855						
	10 STD	-4	-8	31903	320574	2	10	-46			
	1/4 "		-54	31906	320563		1/4 "	-13	-26	320383	324053
	5/16"		-9	31907	320575		5/16"	-47		322870	324112
	3/8 "	-27	-10	31909	320564		3/8 "	-14	-27	321600	324054
	1/2 "		-55				7/16"	-48		320741	
	K.D.			32448	320566		1/2 "	-33	-28	321602	324055
							5/8 "			320754	
12-10	4			35148			3/4 "			320755	
	6		-11	35149	320567		7/8 "			320756	
	8		-56	35108	320568						
	10	-5	-12	35109	36161						
	1/4 "		-57	35110	320569						
	5/16"	-6	-13	35111	320576						
	3/8 "	-28	-14	35112	320577						
	1/2 "		-58	35151							
	K.D.			35762	320620						
8	8	-40		32996							
	10	-7	-15	33460	324043						
	1/4 "	-41	-16	33461	324177						
	5/16"	-8	-17	33462	324044						
	3/8 "	-29	-18	33463	324045						
	1/2 "	-42		35664							
	5/8 "			35665							
	3/4 "			35666							

ELECTRICAL EQUIPMENT LIST- 1969 THRU 1974 MODELS

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 CF01A	Ckt. Bkr. - Flaps	Briles	BP1-10
20 CF02A	Switch	Micro	12TS147-70
20 CF03A	Actuator	Dukes	4354-00
20 DA01A	Shunt	Stewart Warner	SW-813489
20 DA02A	Fuse Retainer & Fuse (3AG-10 AMP)	Littelfuse	155020 311010
20 DA03A	Fuse Retainer & Fuse (3AG-10 AMP)	Littelfuse	155020 311010
20 DA04A	Receptacle	Mooney	930021-1
20 DA05A	Plug	Mooney	930021-2
20 DA06A	Plug	Mooney	930021-2
20 DA07A	Receptacle	Mooney	930021-1
20 DB01A	Turn Coordinator	Brittain	2900 or 2901
20 DB02A	Circuit Breaker	Briles	BP1-5
20 DC01A	Probe-Cylinder Head Temp.	Stewart Warner	SW333-B
20 DE01A	Indicator-Carb. Air Temp	Richter Aero Equipment	660014-5
20 DE02A	Plug-Carb. Air Temp/ Cable Clamp		MS-3106A-14- 1S/MS-3057-6B
20 DE03A	Probe-Carb. Air Temp	Richter Aero Equipment	B-5
20 DE01B	Indicator-Carb. Air Temp	Garwin, Inc.	22-995-04
20 DE02B	Plug-Carb. Air Temp/ Cable Clamp		MS-3106B-14S- 2S/MS-3057-6B
20 DF01A	Trans. - Fuel Qty. - Left Tank-Inboard	Stewart Warner	Q14438
20 DF02A	Trans. - Fuel Qty. - Right Tank-Inboard	Stewart Warner	Q14438
20 DF03A	Trans. - Fuel Qty. - Left Tank-Outboard	Stewart Warner	Q14439
20 DF04A	Trans. - Fuel Qty. - Right Tank-Outboard	Stewart Warner	Q14439
20 DG01A	Ckt. Bkr. - Gages & Vacuum Warning	Briles	BP1-5
20 DG02A	Gauge-Cluster "F"	Mooney	660148-Basic
20 DG03A	Ammeter "C-E-F"	Stewart Warner	440460
20 DG04A	Oil Temp "C-E-F"	Stewart Warner	442828
20 DG05A	Oil Press. "C-E-F"	Stewart Warner	444660
20 DG06A	Cyl. Head Temp "E-F"	Stewart Warner	442830
20 DG07A	R. Fuel Qty. "F"	Stewart Warner	441374

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 DG08A	L. Fuel Qty. "F"	Stewart Warner	441375
20 DG02B	Gauge-Cluster "E"	Mooney	660148-501
20 DG06B	Cyl. Head Temp "C"	Stewart Warner	442829
20 DG07B	R. Fuel Qty. "C-E"	Stewart Warner	441372
20 DG08B	L. Fuel Qty. "C-E"	Stewart Warner	441373

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 DG02C	Gage-Cluster	Mooney	660148-3
20 DH01A	Probe-Oil Temp.	Stewart Warner	362-CR
20 DP01A	Ckt. Bkr. -Heated Pitot	Mooney	930018-9
20 DP02A	Receptacle		AN3115-1
20 DP03A	Pitot-Heated	Aero Instruments	PH502-12
			AN 5812
20 DP03B	Pitot-Heated	AEL	4252936
20 EG01A	Ckt. Bkr. -Gear Act.	Briles	BP1-25
20 EG02A	Actuator	Mooney	950158-503
20 EG03A	Relay	Cutler-Hammer	6041-H50A
20 EG04A	Relay	Cutler-Hammer	6041-H50A
20 EG05A	Switch-Limit-Down	Micro	DT-2R-A7
	w/Actuator	Micro	MCD 2711
20 EG06A	Switch-Limit-Up	Micro	DT-2R-A7
	w/Actuator	Micro	MCD-2711
20 EG07A	Switch-Safety	Mooney	950161
20 EG08A	Switch-Control	Micro	1TL149-3D
20 EG09A	Plug-Electric Gear	Mooney	930021-1
20 EG10A	Receptacle-Elec. Gear	Mooney	930021-2
20 EG15A	Ckt. Bkr. -Gear Cont.	Briles	BP1-5
20 EG01B	Ckt. Bkr. -Gear Act.	Mechanical Products	700-001-15
20 EG02B	Actuator	Mooney	950222-1
20 EG02C	Actuator	Mooney	950222-501
20 EG03B	Relay	RBM	70-111221
20 EG05B	Switch-Limit-Down	Micro	1CH1-6
			(MS-24331-1)
20 EG08B	Switch-Control	Micro	2TL149-3D
20 JM01A	Switch-Ignition	Bendix	10-357210-9
20 JM02A	Magneto-Left	Bendix Scintilla	S4LN200
20 JM03A	Magneto-Right	Bendix Scintilla	S4LN204
20 JV01A	Vibrator-Starting	Bendix	10-176487-121
20 LB01A	Ckt. Bkr. -Anti-Collision Light	Mooney	930018-7
20 LB02A	Light-Anti-Collision	Grimes	D-7080-1-12
20 LB02B	Light-Anti-Collision	Whelen	WRML-12 and WRM-65 Adapt- or

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 LC01A	Switch-Dome Lt.	Cutler-Hammer	8144(BK-09)
20 LC02A	Resistor-10 Ohm, 5 Watt	Ohmite	4561
20 LC03A	Light-Dome with Lamp	Luminator G. E.	20145 1003
20 LC05A	Fuse Retainer Fuse (3AG-1)	Littelfuse	155020 311001
20 LC06A	Lamp/Light	G. E.	57 130258-1
20 LC07A	Bag. Door Switch/Act.	Microswitch	V3-1/JV-26
20 LC08A	Cabin Door Switch 1	Carling Elec.	P26L-1C
20 LC02B	Resistor-8 Ohm, 14 Watt	Ohmite	RW56V8R0
20 LC03B	Lt. -Dome w. Lamp	Grimes G. E.	B-3555A-89 89
20 LC05B	Fuse Retainer/ Fuse (3AG-1)	Littelfuse	155020 311001
20 LL01A	Ckt. Bkr. -Landing Lt.	Mooney	930018-3
20 LL02A	Light-Landing	G. E.	4522
20 LN01A	Ckt. Bkr. -Pos. Lts.	Mooney	930018-5
20 LN02A	Light-Position-Tail (White)	Grimes	A2064-1777
20 LN03A	Light-Position-Left (Red)	Grimes	A1285-R-12
20 LN04A	Light-Position-Right (Green)	Grimes	A1285-G-12
20 LP01A	Ckt. Bkr. -Instr. Lights	Briles	BP1-10
20 LP02A	Ckt. Bkr. -Instr. Lights	Briles	BP1-10
20 LP03A	Shunted Term. Strip	Mooney	800233
20 LP04A	Receptacle-Control Box	Mooney	930021-507
20 LP05A	Control Box	Mooney	800275-1
20 LP06A	Plug-Flight Panel	Mooney	930021-508
20 LP07A	Receptacle-Flt. Panel	Mooney	930021-507
20 LP08A	Plug-Lwr. Console	Mooney	930021-502
20 LP09A	Receptacle-Lwr. Console	Mooney	930021-501
20 LP10A	Overhead Spotlight	Grimes	A-1425A-2-12
20 LP11A	Overhead Spotlight	Grimes	A-1425A-2-12
20 LP12A	Panel Light-Flight	Sloan	855S-0-U
20 LP13A	Panel Light-Flight	Sloan	855S-0-U
20 LP14A	Panel Light-Flight	Sloan	855S-0-U
20 LP15A	Panel Light-Flight	Sloan	855S-0-U
20 LP16A	Console Light	Sloan	855S-0-PE
20 LP17A	Cluster Light Bult	Stewart Warner	427157 96196(57)

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 LP18A	Cluster Light Bulb	Stewart Warner	427157 96196(57)
20 LP19A	Cluster Light Bulb	Stewart Warner	427157 96196(57)
20 LP20A	Panel Light-Engine	Sloan	855S-0-U
20 LP21A	Panel Light-Engine	Sloan	855S-0-U
20 LP22A	Compass Light	G. E.	330
20 LP05B	Control Box	Mooney	800275-501
20 MA01A	Receptacle		AN 2552-3A
20 MA02A	Relay	Cole-Hersee	24059
20 MA03A	Diode	Sarkes Tarzian	10H3N
20 MB01A	Ckt. Bkr. -Nav/Com 1	Briles	BP1-
20 MB02A	Ckt. Bkr. -Nav/Com 2	Briles	BP1-
20 MB03A	Ckt. Bkr. -ADF	Briles	BP1-
20 MB04A	Ckt. Bkr. -DME	Briles	BP1-
20 MB05A	Ckt. Bkr. -Transponder	Briles	BP1-
20 MB06A	Ckt. Bkr. -VME	Briles	BP1-
20 MB07A	Ckt. Bkr. -Audio	Briles	BP1-2
20 MB08A	Ckt. Bkr. -MKR BCN	Mooney	930018-15
20 MB09A	Ckt. Bkr. -Glide Slope	Mooney	930018-13
20 MC01A	Cigar Lighter	Balkamp	4-2272
20 MD01A	Light-Clock	Mooney	919023-501
20 MS01A	Speaker	Mooney	810195
20 NF01A	Ckt. Bkr. -Fuel Pump	Mooney	930018-11
20 NF02A	Pump-Fuel Electric	Dukes	4140-00-19A
20 NF02B	Pump-Fuel Electric	Dukes	4140-00-21A
20 PA01A	Alternator	Prestolite	ALY-8403
20 PA02A	Filter	Elpac	27-3-99-01021
20 PA03A	Ckt. Bkr. -Alternator	Mechanical Products	1648-001-70
20 PA04A	Capacitor	Sangamo	500-1041-01
20 PA05A	Ckt. Bkr. -Alt. Field	Briles	BP1-5
20 PA06A	Regulator-Voltage	OEKO Corp.	20082
20 PA08A	Plug-Volt. Regulator with Cable Clamp		MS3106A-18-4S MS3057-10B
20 PA09A	Receptacle-Firewall with Cable Clamp		MS3100A-22-14P MS3057-12B
20 PA10A	Plug-Firewall with Cable Clamp		MS3106A-22-14S MS3057-12B
20 PA02B	Filter	Sprague	JN 14-1356A
20 PB01A	Battery	Gill	L-GCAB-11
20 PB02A	Relay-Power	Cutler-Hammer	6041 H 231
20 PB03A	Bus Bar - Main	Mooney	1 3
20 PB04A	Ckt. Bkr. -Aux. Bus Bar	Briles	BP1-50

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 PB05A	Bus Bar-Radio	Mooney	2 3
20 PB06A	Bus Bar-Aux.	Mooney	913054-505
20 PB07A	Master Switch	Micro	MS 35059-22
			512-TS1-2
20 PB08A	Plug-Left Wing	Mooney	930021-1
20 PB09A	Receptacle-Left Wing	Mooney	930021-2
20 PB10A	Bus Bar-Optional Aux.	Mooney	913054-1
20 PB10B	Bus Bar-Optional Aux.	Mooney	913054-517
20 PB01C	Battery-Teledyne Battery Products	Gill	PS6-11
20 PB05B	Bus Bar (2" of #2170 Braid & 2 #35109 Amp Terminals		3
20 PB01B	Battery	Prestolite	R-35
20 PB03B	Bus Bar - Main 2 ea.	Mooney	913054-541
20 PB03C	Bus Bar - Main	Mooney	913054-545
20 PB08B	Plug - Left Wing	Mooney	930021-501
20 PB09B	Receptacle-Left Wing	Mooney	930021-502
20 PB05C	Bus Bar-Radio	Mooney	913054-545
1	Consists of 913054-505, 913054-507, 800012-15, & 800012-17 Bus Bar.		
2	Consists of 913054-501, 913054-503, & two 800012-15 Bus Bars.		
3	20PB05A is replaced with a 913054-537 & 913054-539 bus bar with two jumpers (P/N 20PB05B) made of 2" ea. of #2170 tubular braid (Alpha Wire Co.) & 2 ea. #35109 amp terminals. 20PB03A-is re- placed with a 913054-539 & 913054-543 bus bar with three jumpers made of 2" ea. of #2170 tubular braid (Alpha Wire Co.) & 2 ea. #35109 amp terminals. (P/N 20PB05B)		
20 PB03D	Flex. Bus Bar Connector Consists of 4 pieces of #2170 tubular braid, respectively 3", 3", 3", & 5" crimped together in on3 #321298 terminal. One 3" in 35108 others in 35149 covered with insulation.		

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 PB03E	Bus Bar-Main	Mooney	913054-537
20 PB11A	Bus Bar-Opt. Radio	Mooney	913054-535
20 PL01A	Plug-Firewall/ Cable Clamp		MS3106A-22-14S MS3057-12B
20 PL02A	Plug-Ckt. Bkr.	Mooney	930021-506
20 PL03A	Plug-Flight Panel	Mooney	930021-508
20 PL05A	Plug-Elec. Gear	Amp	1-480285-0
20 PL06A	Plug-Mid L. Wing	Amp	1-480283-0
20 PL07A	Plug-Left Wing	Amp	1-480283-0
20 PL08A	Plug-Tailcone	Amp	1-480285-0
20 PL09A	Plug-Overhead Console	Amp	1-480270-0
20 PL10A	Plug-Lower Console	Amp	1-480283-0
20 PL11A	Plug-Cluster Gage	Amp	1-480285-0
20 PL12A	Plug-Firewall Junc.	Amp	1-480285-0
20 PL13A	Plug-Squat Switch	Amp	1-480303-0
20 PL14A	Plug-Volt. Regulator/ Cable Clamp		MS3106A-18-4S MS3057-10B
20 PL15A	Plug-Right Wing	Amp	1-480318-0
20 PL16A	Plug-Mid Right Wing	Amp	1-480318-0
20 PL17A	Plug-Right Nav Lt.	Amp	1-480318-0
20 PL18A	Plug-Heated Pitot	Amp	1-480318-0
20 PL19A	Plug-L. Nav Light	Amp	1-480318-0
20 PL20A	Plug-Speaker	Amp	1-480318-0
20 PL21A	Plug-Flap Actuator	Amp	1-480318-0
20 PL22A	Plug-Rotating Beacon	Amp	1-480318-0
20 PL23A	Plug-Empennage	Amp	1-480318-0
20 PL24A	Plug-Rear Nav Lt.	Amp	1-480318-0
20 PL25A	Plug-Map Light	Amp	1-480349-0
20 PL26A	Plug-Carb Air Temp	Amp	1-480318-0
20 PL27A	Plug-Gear Dn Light	Amp	1-480318-0
20 PL28A	Plug-T-C Inverter	Amp	1-480349-0
20 PL29A	Plug-Fuel Pump	Amp	1-480349-0
20 PL30A	Plug-Cigar Lighter	Amp	1-480349-0
20 PL31A	Plug - RIFT	Amp	1-480349-0
20 PL32A	Plug - ROFT	Amp	1-480349-0
20 PL33A	Plug - LOFT	Amp	1-480349-0
20 PL34A	Plug - Spot Lights	Amp	1-480318-0
20 PL35A	Plug - Dome Light	Amp	1-480349-0
20 PL36A	Plug-Eng. Panel Lts.	Amp	1-480318-0
20 PL37A	Plug-Clock Light	Amp	1-480318-0
20 PL38A	Plug-Carb. Air Temp Ind./Cable Clamp		MS-3106A-14S-1S MS-3057-6B
20 PL39A	Plug-Cabin Door Switch	Amp	1-480349-0
20 PL40A	Plug-Baggage Door Sw.	Amp	1-480318-0

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 PL41A	Plug-Baggage Lt.	Amp	1-480349-0
20 PL42A	Plug-Baggage Lt. Pwr.	Amp	1-480318-0
20 PL38B	Plug-Carb. Air Temp Ind./Cable Clamp		MS-3106B-14S-2S MS-3057-6B
20 PS01A	Solenoid-Starter	Prestolite	SAW 4204
20 PS02A	Starter	Prestolite	MZ4206
20 PS03A	Starter Solenoid- Ckt. Bkr.	Briles	BP1-10
20 RC32A	Receptacle - ROFT	Amp	1-480351-0
20 RC33A	Receptacle - LOFT	Amp	1-480351-0
20 RC34A	Receptacle - Spot Lts.	Amp	1-480319-0
20 RC35A	Receptacle - Dome Lt.	Amp	1-480351-0
20 RC36A	Receptacle - Eng. Panel Light	Amp	1-480319-0
20 RC37A	Receptacle-Clock Lt.	Amp	1-480319-0
20 RC39A	Receptacle-Cabin Door Switch	Amp	
20 RC40A	Receptacle-Baggage Door Switch	Amp	
20 RC41A	Receptacle-Baggage Lt.	Amp	
20 RC42A	Receptacle-Baggage Lt. Power	Amp	
20 RC01A	Receptacle-Firewall/ Cable Clamp		MS3100A-22-14P MS3057-12B
20 RC02A	Receptacle-Ckt. Bkrs.	Mooney	930021-507
20 RC02A	Receptacle-Flt. Panel	Mooney	930021-507
20 RC04A	Receptacle-Cont. Box	Mooney	930021-507
20 RC05A	Receptacle-Elec. Gear	Amp	1-480339-0
20 RC06A	Receptacle-Mid L. Wing	Amp	1-480345-0
20 RC07A	Receptacle-L. Wing	Amp	1-480345-0
20 RC08A	Receptacle-Tailcone	Amp	1-480339-0
20 RC09A	Receptacle-O. H. Con- sole	Amp	1-480340-0
20 RC10A	Receptacle-Lwr. Con- sole	Amp	1-480345-0
20 RC11A	Receptacle-Cluster Gage	Amp	1-480339-0
20 RC12A	Receptacle-Firewall Junction	Amp	1-480339-0
20 RC13A	Receptacle-Squat Sw.	Amp	1-480305-0
20 RC15A	Receptacle-R. Wing	Amp	1-480319-0
20 RC16A	Receptacle-Mid R. Wing	Amp	1-480319-0
20 RC17A	Receptacle-R. Nav Lt.	Amp	1-480319-0

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
20 RC18A	Receptacle-Heated Pitot	Amp	1-480319-0
20 RC19A	Receptacle-L. Nav Lt.	Amp	1-480319-0
20 RC20A	Receptacle-Speaker	Amp	1-480319-0
20 RC21A	Receptacle-Flap Act.	Amp	1-480319-0
20 RC22A	Receptacle-Rotating Beacon	Amp	1-480319-0
20 RC23A	Receptacle-Empennage	Amp	1-480319-0
20 RC24A	Receptacle-Rear Nav Light	Amp	1-480319-0
20 RC25A	Receptacle-Map Lt.	Amp	1-480351-0
20 RC26A	Receptacle-Carb Air Temp	Amp	1-480319-0
20 RC27A	Receptacle-Gear Dn Light	Amp	1-480319-0
20 RC28A	Receptacle-T-C Inverter	Amp	1-480351-0
20 RC29A	Receptacle-Fuel Pump	Amp	1-480351-0
20 RC30A	Receptacle-Cigar Lighter	Amp	1-480351-0
20 RC31A	Receptacle - RIFT	Amp	1-480351-0
20 WA01A	Light-Warning-Over-voltage	Sloan	855SI-0-U
20 WE01A	Light-Gear Position	Sloan	855S-0-U
20 WM01A	Ckt. Bkr. -Gear Warning	Briles	BP1-5
20 WS01A	Ckt. Bkr. -Stall Warning	Briles	BP1-2
20 WS02A	Switch-Pre Stall Warning	Safe Flight	C46001
20 WS03A	Stall-Horn	Mallory	SC628
20 WS04A	Plug	Mooney	930021-2
20 WS05A	Receptacle	Mooney	930021-1
20 WV01A	Switch-Warning-Hi & Lo Vac	Garwin	22-1280-04
20 WV02A	Light-Warning-Lo Vac	Sloan	855SI-0-U
20 WV03A	Light-Warning-Hi Vac	Sloan	855SI-0-U
20 WW01A	Switch-Warning-Alt. Air/Actuator	Micro	1SM1-T JS-220
20 WW02A	Light-Warning-Alt. Air	Sloan	855SI-0-U

9-17. ELECTRICAL SYSTEM SCHEMATICS AND
HARDWARE LIST (1975 and ON)

ELECTRICAL SCHEMATIC	MODEL	SERIAL NUMBER
SC1-800269L*	M20-C	20-1147 THRU 20-1172
	M20-E	21-1161 THRU 21-1180
	M20-F	22-1179 THRU 22-1272
SC1-800269L-1*	M20-C	20-1173 THRU 20-1185
	M20-F	22-1273 THRU 22-1305
SC1-800269L-2*	M20-C	20-1186 & ON
	M20-E	21-1181 & ON
	M20-F	22-1246, 22-1306 & ON
SC1-800269L-3*	M20J	24-0001 THRU 24-0377
800330 E1*	M20J	24-0378 THRU 24-0763
800330 E2*	M20J	24-0764 THRU 24-0900
800330 E3*	M20J	24-0901 THRU 24-0942
800330 E4*	M20J	24-0943 THRU 24-1037
800330 E5*	M20J	24-1038 & ON
*Located in the envelopes at the end of this chapter.		

ELECTRICAL SYSTEM HARDWARE LIST

ELECTRICAL SCHEMATIC	EQUIPMENT LIST
SC1-800269L	Page 9-121
SC1-800269L1	Page 9-121
SC1-800269L2	Page 9-121
SC1-800269L3	Page 9-121

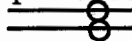
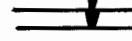
ELECTRICAL SYSTEM HARDWARE LIST (CONT.)

ELECTRICAL SCHEMATIC	EQUIPMENT LIST
800330 E1	Page 9-121
800330 E2	Page 9-137
800330 E3	Page 9-145
800330 E4	Page 9-153
800330 E5	Page 9-161
800330 E6	Page 9-169

ELECTRICAL SCHEMATIC NOTES.

Parts and wires for each model and serial number aircraft to be purchased by schematics.

All electrical build-up, installation, wiring, soldering, and crimping etc., to be in accord with good wiring practice.

Wires denoted by    symbols to be twisted counterclockwise with a minimum of three (3) wraps per foot.

"F" denotes ground through frame (no wires).

All splices, amp knife disconnect or equivalent.

All circuit breakers trip free type.

All terminals will be of pre-insulated type or will be insulated with ampsulation or equivalent.

All knife disconnect splices to be insulated with PVC105 and securely string tied with airtex #417 cord.

All wire sizes are minimum sizes acceptable. Wire terminals must change as per page 9-118 when wire size changes.

TERMINAL CHART 1975 & ON

WIRE SIZE	STUD SIZE	AN 659 DASH NO.	MS25036 DASH NO.	AMP NO. VINYL	AMP NO. NYLON	WIRE SIZE	STUD SIZE	AN 659 DASH NO.	MS25036 DASH NO.	AMP NO. VINYL	AMP NO. NYLON
22-16	2			320135		6	10	-30	-19	321298	324046
	4	-38	-48	31880	323758		1/4"	-9	-20	321598	324047
	6 SM		-1	31881			5/16"	-31	-21	33466	324048
	6 STD	-1	-2	31885	36151		3/8 "	-10	-22	33467	324049
	8		-49	31890	320551		7/16"			320745	328654
	10	-2	-3	31891	36153		1/2 "	-43		320344	
	1/4 "		-50	31894	320571		5/8 "			36809	
	5/16"		-4	31895	320572		3/4 "			36810	
	3/8 "	-25	-5	31897	320573		1/4 "	90°		35678	
	1/2 "		-51				10	90°		36405	
	K.D. B.C. CAP			32446	320555	4	10	-44		33468	324111
16-14	2			321008			1/4 "	-11	-23	33469	324050
	4	-39	-52	32441	324159		5/16"	-32	-24	33470	324051
	6 SM	-26	-6	32442			3/8 "	-12	-25	33471	324052
	6 STD	-3	-7	31901	35157		7/16"			320743	
	8		-53	31902	320560		1/2 "	-45		35668	324114
	10 SM			322238	32855		5/8 "			35669	
	10 STD	-4	-8	31903	320574	2	3/4 "			35670	
	1/4 "		-54	31906	320563		10	-46			
	5/16"		-9	31907	320575		1/4 "	-13	-26	320383	324053
	3/8 "	-27	-10	31909	320564		5/16"	-47		322870	324112
	1/2 "		-55				3/8 "	-14	-27	321600	324054
	K.D. B.C. CAP			32448	320566		7/16"	-48		320741	
12-10	4			35148	320562		1/2 "	-33	-28	321602	324055
	6		-11	35149	320567		5/8 "			320754	
	8		-56	35108	320568		3/4 "			320755	
	10	-5	-12	35109	36161		7/8 "			320756	
	1/4 "		-57	35110	320569						
	5/16"	-6	-13	35111	320576						
	3/8 "	-28	-14	35112	320577						
	1/2 "		-58	35151							
	K.D. B.C. CAP			35762	320620						
	10	90°		36974	320570						
8	8	-40		32996	324487						
	10	-7	-15	33460	324043						
	1/4 "	-41	-16	33461	324177						
	5/16"	-8	-17	33462	324044						
	3/8 "	-29	-18	33463	324045						
	1/2 "	-42		35664							
	5/8 "			35665							
	3/4 "			35666							
	10	90°		35743							

NOTE: The parts listed on this chart may be substituted by an equivalent part.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CD01A	Solenoid-PC Dump	Brittain	4085
21 CD02A	Switch-Pilot's Dump	Micro	111SM1-T
21 CD02B	Switch-Pilot's Dump	Cutler Hammer	SA31SDT12-2
21 CD03A	Switch-Co-pilot's Dump	Micro	111SM1-T
21 CD03A	Switch-P.C. On-Off (Alternate)	Alco	MST 215-N
21 CF01A	Ckt. Bkr. -Flap	Meriden or equivalent	AHW4-15
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF02A	Relay-Left	Magnecraft	W97CSX-1
21 CF03A	Relay-Right	Magnecraft	W97CSX-1
21 CF04A	Actuator-Flap	Commercial Acft. Products	D14500-36
21 CF05A	Switch-Limit-Down	Micro	V3L-3
21 CF06A	Switch-Limit-Up	Micro	V3L-3
21 CF07A	Switch-Limit-Take Off Down	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF08A	Switch-Limit-Take Off Up	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF09A	Switch-Control	Micro	2TL75-10
21 CF09B	Switch-Control	Cutler Hammer	8906K2876
21 CT01A	Circuit Breaker- Electric Trim	Mooney	930023-9
21 DA01A	Shunt	Empro or equivalent	MLA-60-50
21 DA01B	Shunt	Stewart Warner	SW-813489
21 DA01C	Shunt	Empro or equivalent	MLA-60-100
1 DA02A	Fuse	Littel Fuse	312010
-----	/Retainer	Littel Fuse	155020
1 DA02B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
1 DA03A	Fuse	Littel Fuse	311010
-----	/Retainer	Littel Fuse	155020
1 DA03B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN 42W
1 DA04A	Ammeter	Mooney	640281-509
1 DB01A	Circuit Breaker-T.C.	Meriden or equivalent	AHW4-2
1 DB01B	Circuit Breaker-T.C.	Klixon	7277-2-5
1 DB02A	Turn Coordinator	Brittain	604-200-200
21 DC01A	Probe - Cyl Head Temp	Stewart Warner or equiv.	SW 333-B

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.
FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 DC01B	Probe - Cyl Head Temp	Rochester	3080-00014
21 DD01A	Gauge-Outside Air Temp	Garwin	22-295
21 DD01B	Gauge - O. A. T.	Instrument & Flight Res.	IFR-11A
21 DD01C	Gauge - O. A. T./EGT	B & D Instruments	0203-005
21 DD02A	Plug - Gauge		MS 3106A-14S-2S
-----	/Cable Clamp		MS 3057-6B
21 DD02C	Plug/Cable Clamp	Amp	205838-1
			206062-1
21 DD03A	Probe - OAT		MS 28034-3
21 DD03B	Probe - OAT	Westberg	399W
21 DD03C	Probe - OAT	B & D Instruments	0203-100
21 DD04A	Plug - Probe		MS 3106A-12S-3S
-----	/Cable Clamp		MS 3057-4B
21 DE01A	Gauge-Carb. Air Temp	Mooney	660014-5
21 DE01B	Gauge-Carb. Air Temp	Garwin	22-995-04
21 DE02A	Plug-Gauge		MS 3106A-14S-1S
-----	/Cable Clamp		MS 3057-6B
21 DE02B	Plug-Gauge		MS 3106B-14S-2S
-----	/Cable Clamp		MS 3057-6B
21 DE03A	Probe-Carb. Air Temp	Richter Aero Equip.	B-5
21 DF01A	Transmitter-Left		
-----	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter-Left		
-----	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter-Right		
-----	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter-Right		
-----	Outboard Fuel	Mooney	610243-1
21 DG01A	Ckt. Bkr.-Cluster Gauge	Meriden or equivalent	AHW 4-2
21 DG01B	Ckt. Bkr.-Gages	Klixon	7277-2-2
21 DG02A	Cluster Gauge- "F&J"	Mooney	640281-503
21 DG02B	Cluster Gauge- "E"	Mooney	640281-505
21 DG02C	Cluster Gauge- "C"	Mooney	640281-501
21 DG02D	Cluster Gauge- "F"	Mooney	660148-501
21 DG02E	Cluster Gauge- "E"	Mooney	660148-3
21 DG02F	Cluster Gauge- "C"	Mooney	660148-Basic
21 DG02G	Cluster Gauge- "J"	Mooney	640281-507
21 DG03A	Ammeter- "C, E, F"		

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 DG04A	Gauge-Oil Temp"C, E, F"		
21 DG05A	Gauge-Oil Press"C, E, F"		
21 DG06A	Gauge-Cyl Head Temp-		
-----	"E, F"		
21 DG06B	Gauge-Cyl Head Temp-		
-----	"C"		
21 DG07A	Gauge-Right Fuel Qty.-		
-----	"F"		
21 DG07B	Gauge-Right Fuel Qty.-		
-----	"C, E"		
21 DG08A	Gauge-Left Fuel Qty.-		
-----	"F"		
21 DG08B	Gauge-Left Fuel Qty.-		
-----	"C, E"		
21 DH01A	Probe-Oil Temp	Stewart Warner or equiv.	362-CR
21 DH01B	Probe-Oil Temp	Rochester	3080-13
21 DJ01A	Transducer-Oil Press.	Rochester	3060-18
21 DK01A	Transducer-Fuel Press.	Rochester	3060-17
21 DP01A	Circuit Breaker-		
-----	Heated Pitot	Mooney	930023-5
21 DP02A	Heated Pitot	AEL or equivalent	4252936
21 DP02B	Heated Pitot	Aero Instr. (AN5812)	PH502-12
21 DP03B	Plug -Heated Pitot		AN3115-1
21 DT01A	Probe-E. G. T.	B & D Instr	0204-100
21 EG01A	Ckt. Bkr. -Electric Gear	Meriden or equivalent	AHW4-15
21 EG01B	Ckt. Bkr. -Electric Gear	Klixon or equivalent	7277-2-15
21 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
21 EG02A	Switch-Control	Micro	2TL149-3D
21 EG02B	Switch-Control-Gear	Cutler Hammer	8906K2875
21 EG03A	Switch-Limit-Up	Micro	DT-2R-A7
-----	/Actuator	Micro	MCD-2711
21 EG04A	Actuator-Gear	ITT	LA11C21101
21 EG04B	Actuator-Gear	Dukes	1057-00-1
21 EG04C	Actuator-Gear	Dukes	4196-00-1D
21 EG04D	Actuator-Gear	ITT	LA11C2115
21 EG04E	Actuator-Gear	ITT	LA11C2114
21 EG04F	Actuator-Gear	Dukes	1057-00-5E
21 EG04G	Actuator-Gear	Avionic Products	102000-1
21 EG05A	Relay-Gear	RBM	70-111221

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.
FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 EG05C ^①	Relay-Gear Up	Magnecraft	W97CSX-1
21 EG05D ^①	Relay-Gear Up	Cutler Hammer	6041H50A
21 EG05E	Relay-Gear Up	RBM	70-311221
21 EG06B	Switch-Safety-Airspeed	Whitman General	SK75-IN-K3L ^②
21 EG07A	Switch-Limit-Down	Micro	1CH1-6
21 EG08C ^①	Relay-Gear Down	Magnecraft	W97CSX-1
21 EG08D ^①	Relay-Gear Down	Cutler Hammer	6041H50A
21 EG08E	Relay-Gear Down	RBM	70-311221
21 EG09A	Ckt. Bkr.-Gear Act.	Mechanical Products	700-01-25
21 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
21 EG10A	Switch-Override	Cutler Hammer	SB1DDX492-2
21 ELT1A	ELT	Aircraft Products	ALERT-50
21 ELT1A	(Alternate)	Dorne & Margolin, Inc.	DM-ELT-6
21 ELT2A	Switch (Remote)	C & K	7201
21 ELT2A	(Remote)(Alternate)	Dorne & Margolin, Inc.	DM-U65-1 ^③
21 JM01A	Switch-Magneto	Bendix Scintilla	10-357290-17
21 JM01B	Switch-Magneto	Bendix Scintilla	10-357310-9
21 JM02A	Magneto-Left	Bendix Scintilla	S4LN200
21 JM02B	Magneto-Dual	Bendix-Scintilla	D4LN2021
21 JM03A	Magneto-Right	Bendix Scintilla	S4LN204
21 JV01A	Starting Vibrator	Bendix-Scintilla	10-176487-121
21 LB01A	Circuit Breaker-		
-----	Rotating Beacon	Mooney	930023-3
21 LB02A	Rotating Beacon	Whelen	WRM-12
-----	/Adapter	Whelen	WRM-65
21 LC01A	Fuse-(5 Amp-3AG		
-----	Slo-Blo)	Littel Fuse	313005
-----	Retainer	Littel Fuse	155020
			or 155120
21 LC02A	Light-Cabin-Overhead	Luminator	20145
-----	/Bulb	General Electric	1003
21 LC02B	Light-Cabin-Overhead	Grimes	B-3550
-----	/Bulb	General Electric	89
21 LC03A	Switch-Overhead		
-----	Cabin Lite	Cutler Hammer	8144(BK-09)

^① Discontinued Mid 77

^② Alternate L110-1-N-1 3L (88013-501)

^③ (C & K 7101)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LC04A -----	Resistor-Dimming (10 Ohm-5W)	Ohmite	4561
21 LC07A -----	Switch-Map Light- Pilot's	Cutler Hammer	SA25SCT12-3
-----	/Cap	Cutler Hammer	SW 53AA2
-----	/Face Nut	Cutler Hammer	15-1049-3
21 LC08A	Map Light-Pilot's Bulb	Sloan G. E.	855-SI-0-PE 330
21 LC09A -----	Switch-Map Light- Copilot's	Cutler Hammer	SA25SCT12-3
-----	/Cap	Cutler Hammer	SW53AA2
-----	/Face Nut	Cutler Hammer	15-1049-3
21 LC10A	Map Light-Copilot's/ Bulb	Sloan G. E.	855-SI-0-PE 330
21 LL01A	Ckt. Bkr. -Ldg. Lt.	Meriden or equivalent	AHW4-20
21 LL01B	Ckt. Bkr. -Ldg. Lt.	Mooney	930023-15
21 LL02A	Relay	Magnecraft	W89CQX-2
21 LL03A	Light-Landing	G. E. or equivalent	4522
21 LL04A -----	Switch-Landing Lt.	Cutler Hammer	SA25SCT12-3
-----	/Cap	Cutler Hammer	SW53AA2
-----	/Face Nut	Cutler Hammer	15-1049-3
21 LN01A	Ckt. Bkr. -Nav Lts.	Mooney	930023-1
21 LN02A	Pos. Lt. -Left (Red)	Grimes	A1285-R-12
21 LN02B	Pos. Lt. -Left (Red)	Whelen	W1285-PR (14 volts)
21 LN03A	Pos. Lt. -Rear (White)	Grimes	A2064-1777
21 LN03B	Pos. Lt. -Rear (White)	Whelen (Vert. Mount)	A480A (14 volts)
21 LN04A	Pos. Lt. -Right (Green)	Grimes	A1285-G-12
21 LN04B	Pos. Lt. -Right (Green)	Whelen	W1285-PG (14 volts)
21 LP01A	Ckt. Bkr. -Panel Lts.	Meriden or equivalent	AHW4-10
21 LP01B -----	Circuit Breaker- Panel Lights	Klixon or equivalent	7277-2-10
21 LP01C -----	Circuit Breaker - Instr Lights	Klixon	7277-2-5

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LP01D -----	Circuit Breaker - Radio Lights	Klixon	7277-2-5
21 LP02A	Ckt. Bkr. - Panel Lts.	Meriden or equivalent	AHW4-10
21 LP03A	Transistor-L. Lights	RCA	2N2016
21 LP03B	Transistor (Alternate)	Delco Radio	2N3079
21 LP03C	Transistor-Radio Lites	RCA	2N2016
21 LP04A	Transistor-Radio Lts.	RCA	2N2016
21 LP05A	Transistor-R. Lts.	RCA	2N2016
21 LP06A	Rheostat/Switch-L. Lights	Allen-Bradley	JS1N056P251MA
21 LP06B	Rheostat/Switch-Radio	Allen Bradley	JSIN056P251MA
21 LP06C	Rheostat/Switch-Radio	Allen Bradley	JSIN056P251MA
21 LP07A	Rheostat/Switch- Radio Lights	Allen-Bradley	JS1N056P251MA
21 LP08A	Rheostat/Switch- Right Lights	Allen-Bradley	JS1N056P251MA
21 LP09A -----	Switch-Red/White Lt. /Rocker	Micro Micro	8H2011 8Z0023
21 LP13A -----	Fuse-L. Lights /Holder	McGraw-Edison McGraw-Edison	FM01 -5A FHN42W
21 LP14A -----	Fuse-Radio Lights /Holder	McGraw-Edison	FM01 -5A FHN42W
21 LP15A -----	Fuse-R. Lights /Holder	McGraw-Edison McGraw-Edison	FM01-5A FHN42W
21 LP16A -----	Lts. -Glareshield- Right-Red /Holder (4 ea.)	G. E. or equivalent Herman H. Smith or equivalent	1836R 1930
21 LP17A -----	Lights-Glareshield- Left-Red /Holder (7 ea.)	G. E. or equivalent Herman H. Smith or equivalent	1836R 1930
21 LP18A -----	Lights-Glareshield- Right-White /Holder (4 ea.)	G. E. or equivalent Herman H. Smith or equivalent	1836 1930
21 LP18B -----	Lights-Glareshield /Holder (10 ea.)	General Electric Herman H. Smith	1816 1930

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LP18C	Lights-Glareshield	General Electric	1816
-----	/Holder (9 ea.)	Herman H. Smith	1930
21 LP19A	Lts.-Glareshield-L.-	G.E. or equivalent	1836
-----	White		
-----	/Holder (6 ea.)	Herman H. Smith or	1930
		equivalent	
21 LP20A	N# Light/2 ea. bulbs	Korry	250-650-5821-008
		General Electric	327
21 LP21A	Bulb-Compass Lt.	G.E. or equivalent	330
21 LP22A	Light-Console/Bulb	Sloan	855S-0-PE
		General Electric	330
21 LP22B	Light - Console	Western Indicator Co.	501-61K-11K3BP
-----	/Lamp	Western Indicator Co.	WI-7046
21 LP24A	Fuse(5 amp-3AG-Slo-	Littelfuse	313005
-----	Blo)		
-----	/Holder	Littelfuse	155020
21 LP25A	Resistor		100 Ohm 2W
21 LP25B	Resistor-Instr Lites	Ohmite	4599
21 LP25C	Resistor-Radio Lites	Ohmite	4599
21 LS01A	Circuit Bkt.-Strobe	Mooney	930023-7
	Lights		
21 LS02A	Pwr.Supply-L. Wing	Whelen	A490, T14
21 LS02B	Power Supply-L. Wing	Symbolic Displays	701295-3A
21 LS02C	Power Supply-L. Wing	Grimes	60-2250-1
21 LS03A	Strobe Lt.-L. Wing	Whelen	A429
21 LS03B	Strobe Light-L. Wing	Symbolic Displays	701303A
21 LS03C	Strobe Light-L. Wing	Grimes	30-0538-11
21 LS04A	Pwr.Supply-R. Wing	Whelen	A490, T14
21 LS04B	Power Supply - R. Wing	Symbolic Displays	701295-3A
21 LS04C	Power Supply - R. Wing	Grimes	60-2250-1
21 LS05A	Strobe Lt.-R. Wing	Whelen	A429
21 LS05B	Strobe Light - R. Wing	Symbolic Displays	701303A
21 LS05C	Strobe Light - R. Wing	Grimes	30-0538-11
21 MA01A	Receptacle		AN 2552-3A
21 MA02A	Relay	Cole Hersee	24059
21 MA03A	Diode	Sarkes Tarzian	10H3N
21 MB01A	Ckt.Bkr.-21COM-I	Meriden or equivalent	AHW4 - 
21 MB01B	Ckt.Bkr. 21 COM-I	Klixon or equivalent	7277-2- 

 Amperage rating is determined by particular unit installed.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 MB02A	Ckt. Bkr. -21NAV-I	Meriden or equivalent	AHW4 - 
21 MB02B	Ckt. Bkr. 21 NAV-I	Klixon or equivalent	7277-2- 
21 MB03A	Ckt. Bkr. -21COMII	Meriden or equivalent	AHW4
21 MB03B	Ckt. Bkr. 21 COM II	Klixon or equivalent	7277-2- 
21 MB04A	Ckt. Bkr. -21NAVII	Meriden or equivalent	AHW4 - 
21 MB04B	Ckt. Bkr. 21 NAV-II	Klixon or equivalent	7277-2- 
21 MB05A	Ckt. Bkr. -21XPN1A	Meriden or equivalent	AHW4 - 
21 MB05B	Ckt. Bkr. 21 XPN	Klixon or equivalent	7277-2- 
21 MB06A	Ckt. Bkr. -21AUD1A	Meriden or equivalent	AHW4 - 
21 MB06B	Ckt. Bkr. 21 AUD	Klixon or equivalent	7277-2- 
21 MB07A	Ckt. Bkr. -21ADF1A	Meriden or equivalent	AHW4 - 
21 MB07B	Ckt. Bkr. 21 ADF	Klixon or equivalent	7277-2- 
21 MB08A	Ckt. Bkr. -21DME1A	Meriden or equivalent	AHW4 - 
21 MB08B	Ckt. Bkr. 21 DME	Klixon or equivalent	7277-2- 
21 MB09A	Speaker-21MS01A	Mooney	810195
21 MB09B	Speaker	Mooney	810195-501
21 MB10A	Left Side-MIC-JAC-1	Switchcraft	C-128
-----	/Washers	Switchcraft	S-102B, S-1029
21 MB11A	Console-MIC-JAC-2	Switchcraft	C-128
-----	/Washers	Switchcraft	S-102B, S-1029
21 MB12A	Pilot's-MIC-KEY-1	Cutler Hammer	SA25SAT12-3
-----	/Cap	Cutler Hammer	SW53AA2
-----	/Face Nut	Cutler Hammer	15-1049-3
21 MB13A	Copilot's-MIC-KEY-2	Cutler Hammer	SA25SAT12-3
-----	/Cap	Cutler Hammer	SW53AA2
-----	/Face Nut	Cutler Hammer	15-1049-3
21 MB14A	L. Side-FONE-JAC-1	Switchcraft	C-11
21 MB15A	Console-FONE-JAC-2	Switchcraft	C-11
21 MB16A	Ckt. Bkr. -Autopilot	Meriden or equivalent	AHW4 
21 MB16B	Ckt. Bkr. -Autopilot	Klixon or equivalent	7277-2- 
21 MB17A	Switch-Radio Master	ALCO	MST215N
21 MB18A	Ckt. Bkr. -R-NAV	Klixon	7277-2- 
21 MB19A	Ckt. Bkr. HSI	Klixon	7277-2- 
21 MB20A	Ckt. Bkr. Encoder	Klixon	7277-2- 
21 MB21A	Ckt. Bkr. Fuel Flo	Klixon	7277-2- 
21 MB22A	Ckt. Bkr. Telephone	Klixon	7277-2- 
21 MB23A	Ckt. Bkr. VME	Klixon	7277-2- 
21 MC01A	Cigar Lighter	Mooney	800336-501

 Amperage rating is determined by particular unit installed.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 MC01B	Cigar Lighter	Mooney	800336-503
21 ME01A	Electric Clock	Borg Instr.	CA-7212
21 ME01B	Electric Clock (Opt.)	Borg Instr.	CA7616
21 NF01A	Ckt. Bkr. - Fuel Pump	Mooney	930023-11
21 NF02A	Fuel Pump "E-F-J"	Dukes	4140-00-19A
21 NF02B	Fuel Pump "C"	Dukes	4140-00-21A
21 PA01A	Ckt. Bkr. - Alt. FLD	Meriden or equivalent	AHW4-5
21 PA01B	Ckt. Bkr. - Alt. Fld.	Klixon	7277-2-5
21 PA02A	Alternator	Prestolite	ALY-8403 or 8420
21 PA02B	Alternator	Ford Motor Co.	DOFF-10300J
21 PA02C	Alternator	Lycoming	LW 15404
21 PA03A	Filter	Elpac	27-3-99-01021
21 PA03B	Filter	Sprague	JN-14-1356A
21 PA03C	Filter	Captor Corp.	A2637
21 PA03D	Filter	Captor Corp.	A2638
21 PA04A	Ckt. Bkr. - Alternator	Mechanical Products	1648-001-70
21 PA05A	Capacitor	Sangamo	500-1041-01
21 PA06A	Voltage Regulator	Oeco Corporation	20082
21 PA06A	Voltage Regulator	Electro Delta	VR-414
21 PA07A	Plug-Volt. Regulator		MS3106A-18-4S
-----	/Cable Clamp		MS3057-10B
21 PB01A	Battery	Gill	PS6-11
21 PB01B	Battery	Prestolite	R-35
21 PB02A	Relay-Battery	Cutler Hammer	6041-H-231
21 PB03A	Ckt. Bkr. - Aux. Bus.	Meriden or equivalent	AHW1-50
-----	Ckt. Bkr. - Aux. Bus.	Mechanical Products	700-001-50
21 PB04A	Relay-Radio	Magnecraft	W89CQX-2
21 PB05A	Switch-Master	Cutler Hammer	8911K828
21 PB06A	Ckt. Bkr. - Radio Relay	Mooney	930023-13
21 PB07A	Bus Bar-Main Flex		△5
21 PB07B	Bus Bar - Main Flex		△5
21 PB07C	Bus Bar - Main Flex #1		△5
21 PB07D	Bus Bar - Main Flex #2		△5
21 PB08A	Bus Bar-Radio Flex		△5
21 PB09A	Bus Bar-Auxiliary	Mooney	913127-9
21 PB09B	Bus Bar-Aux. #1	Mooney	913127-3
21 PB09C	Bus Bar-Aux. #2	Mooney	913127-3
21 PB09D	Bus Bar - Connect 1 & 2	Mooney	913127-11
21 PB09E	Bus Bar - Aux.	Mooney	913127-13
21 PB09F	Bus Bar - Aux.	Mooney	913127-23

△5 Manufacture using "Alpha Wire Co." #2170 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic pages PB. Cover braid with PVC-105/* tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 CONT.
FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER		PART NUMBER
21 PB10A	Bus Bar - Main #1	Mooney		913127-5
21 PB10B	Bus Bar - Main #1	Mooney		913127-17
21 PB10C	Bus Bar - Main #1	Mooney		913127-19
21 PB11A	Bus Bar - Main #2	Mooney		913127-5
21 PB11B	Bar - Main #2	Mooney		913127-19
21 PB12A	Bus Bar - Main #3	Mooney		913127-5
21 PB12B	Bus Bar - Radio #3	Mooney		913127-19
21 PB12C	Bus Bar - Main #3	Mooney		913127-1
21 PB12D	Bus Bar - Radio #3	Mooney		913127-3
21 PB13A	Bus Bar - Radio #1	Mooney		913127-5
21 PB13B	Bus Bar - Radio #1	Mooney		913127-19
21 PB14A	Bus Bar - Radio #2	Mooney		913127-5
21 PB14B	Bus Bar - Radio #2	Mooney		913127-19
21 PB15A	Diode - Radio Master	Sarkes Tarzian		F-4
21 PB16A	Bus Bar Main #1	Mooney		913127-3
21 PB20A	Jumper			
21 PB21A	Bus Bar - Radio Flex			
21 PL01A	Ckt. Bkr. Panel Plug	Amp	206070-1	206037-1
21 PL01B	Ckt. Bkr. Panel Plug	Amp	206138-1	206150-1
21 PL02A	Flt. Panel-#1 Plug	Amp	206070-1	206037-1
21 PL03A	Elec. Gear Plug	Amp	206070-1	206037-1
21 PL03B	Electric Gear Plug	Mooney		930021-1
21 PL04A	Left Wing Plug	Amp	206070-1	206037-1
21 PL04B	Left Wing Plug	Mooney		930021-1
21 PL05A	Left Wing Stub Plug	Amp	206070-1	206037-1
21 PL05B	Left Wing Stub Plug	Amp	206966-1	206708-1
21 PL06A	Squat Switch Plug	Amp	206062-1	206060-1
21 PL07A	Console-#1 Plug	Amp	206070-1	206037-1
21 PL07B	Console #1 Plug	Amp	206062-1	206060-1
21 PL08A	Headliner Plug	Amp	206070-1	206037-1
21 PL08B	Headliner Plug	Amp	206966-1	206708-1
21 PL09A	Firewall Plug		MS 3057-12B	MS3106A-22-14S
21 PL10A	Left Side Cabin-Middle Plug	Amp	206062-1	206060-1
21 PL11A	Flight Panel #2 Plug	Amp	206070-1	206037-1
21 PL11B	Flight Panel #2 Plug	Amp	206966-1	206708-1
21 PL12A	Glareshield Plug	Amp	206070-1	206037-1
21 PL12B	Annunciator Panel Plug	Amp	206062-1	206060-1
21 PL13A	Firewall Junc. Panel Plug	Amp	206070-1	206037-1

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 (CONT.)
FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PL13B	Accessory Panel Plug	Amp	206966-1 206708-1
21 PL14A	Left Side Cabin - Low Plug	Amp	206070-1 206037-1
21 PL14B	Left Side Panel Plug	Mooney	930021-1
21 PL15A	Electric Flaps Plug	Amp	206070-1 206037-1
21 PL16A	Console-#2 Plug	Amp	206070-1 206037-1
21 PL16B	Console Plug	Amp	206966-1 206708-1
21 PL17A	Relay Panel Plug	Amp	206070-1 206037-1
21 PL18A	Cluster Gauge Plug	Amp	206070-1 206037-1
21 PL18B	Cluster Gauge Plug	Amp	206966-1 206708-1
21 PL19A	Pilot's Wheel Plug	Amp	206062-1 206060-1
21 PL20A	Copilot's Wheel Plug	Amp	206062-1 206060-1
21 PL21A	Vac. Warning Switch Plug	Amp	206062-1 206060-1
21 PL22A	Radio Pwr. -Ckt. Bkr. Panel Plug	Amp	206070-1 206037-2
21 PL22B	Ckt. Bkr. Panel - Aux. Power Plug	Amp	206070-1 206037-2
21 PL23A	Radio Pwr. -Relay Panel Plug	Amp	206070-1 206037-2
21 PL24A	Cabin-Tail Cone Plug	Amp	206070-1 206037-1
21 PL24B	Cabin-Tailcone Plug	Amp	206966-1 206708-1
21 PL25A	Right Wing Plug	Amp	206070-1 206037-1
21 PL25B	Right Wing Plug	Amp	206062-1 206060-1
21 PL25C	Right Wing Plug	Amp	206966-1 206708-1
21 PL26A	Right Wing Stub Plug	Amp	206062-1 206060-1
21 PL27A	Trim Pos. Ind. Plug	Amp	206062-1 206060-1
21 PL28A	Pilot's Trim Plug	Amp	206062-1 206060-1
21 PL29A	Tail Plug	Amp	206062-1 206060-1
21 PL30A	Radios-Ckt. Bkr. Panel Plug	Amp	206070-1 206037-1
21 PL30B	Ckt. Bkr. Panel Plug-Opt.	Amp	206966-1 206708-1
21 PL31A	Radio Pkg. Cable Plug	Amp	206070-1 206037-1
21 PL32A	Transistors-Console	Amp	206070-1 206037-1
21 PL33A	Pwr. -Flt. Panel Plug	Amp	206070-1 206037-2
21 PL34A	Panel Light Control Plug	Amp	206062-1 206060-1
21 PL34B	Light Control Plug	Amp	206996-1 206708-1
21 PL35A	Gear Control Plug	Amp	206996-1 206708-1
21 PL35B	Gear Control Plug	Amp	206062-1 206060-1
21 PL36A	Gear Override Plug	Amp	206062-1 206060-1
21 PS01A	Ckt. Bkr. -Ignition	Meriden or equivalent	AHW4-10
21 PS01B	Ckt. Bkr. -Ignition	Klixon or equivalent	7277-2-10

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 (CONT.)

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PS02A	Switch-Starter Plug	Micro	2D72
-----	/Housing	Micro	2M1
-----	/Display Screen	Micro	2J5
-----	/Guard Ring	Micro	2K6
21 PS03A	Solenoid-Starter	Prestolite	SAZ-4201E
21 PS04A	Starter	Prestolite	MZ4206
21 PS04A	Starter (Alternate)	Prestolite	MZ4218
21 PS04A	Starter (Alternate)	Prestolite	MZ4222
21 RC01A	Ckt. Bkr. Panel		
	Receptacle	Amp	206070-1 206036-3
21 RC01B	Ckt. Bkr. Panel Rec.	Amp	206138-1 206151-1
21 RC02A	Flt. Panel #1 Receptacle	Amp	206070-1 206036-3
21 RC03A	Electric Gear Rec.	Amp	206070-1 206036-3
21 RC03B	Electric Gear Rec.	Mooney	930021-2
21 RC04A	Left Wing Rec.	Amp	206070-1 206036-3
21 RC04B	Left Wing Rec.	Mooney	930021-2
21 RC05A	Left Wing Stub Rec.	Amp	206070-1 206036-3
21 RC05B	Left Wing Stub Rec.	Amp	206966-1 206705-2
21 RC06A	Squat Switch Rec.	Amp	206062-1 206153-1
21 RC07A	Console #1 Rec.	Amp	206070-1 206036-3
21 RC07B	Console #1 Rec.	Amp	206062-1 206153-1
21 RC08A	Headliner Rec.	Amp	206070-1 206036-3
21 RC08B	Headliner Rec.	Amp	206966-1 206705-2
21 RC09A	Firewall Rec.	MS 3057-12B	MS3100A-22-14P
21 RC10A	L. Side Cabin-Middle		
	Receptacle	Amp	206062-1 206153-1
21 RC11A	Flight Panel - #2 Rec.	Amp	206070-1 206036-3
21 RC11B	Flight Panel #2 Rec.	Amp	206966-1 206705-2
21 RC12A	Glare Shield Rec.	Amp	206070-1 206036-3
21 RC13A	Firewall Junc. Panel		
	Receptacle	Amp	206070-1 206036-3
21 RC13B	Accessory Panel Rec.	Amp	206966-1 206705-2
21 RC14A	L. Side Cabin-Low Rec.	Amp	206070-1 206036-3
21 RC14B	Left Side Panel Rec.	Mooney	930021-2
21 RC15A	Electric Flaps-Rec.	Amp	206036-1
21 RC16A	Console-#2 Rec.	Amp	206070-1 206036-3
21 RC16B	Console Rec.	Amp	206966-1 206705-2
21 RC17A	Relay Panel-Rec.	Amp	206036-1
21 RC18A	Cluster Gauge-Rec.	Amp	206070-1 206036-3
21 RC18B	Cluster Gauge Rec.	Amp	206966-1 206705-2
21 RC19A	Pilot's Wheel-Rec.	Amp	206062-1 206153-1
21 RC20A	Copilot's Wheel-Rec.	Amp	206062-1 206153-1
21 RC21A	Vac. Warning Sw.-Rec.	Amp	206062-1 206153-1

	ITEM	DESCRIPTION
MOONEY	M20 SERIES	ELECTRICAL SYSTEM

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 (CONT.)
FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 RC22A	Radio Pwr. -Ckt Bkr. Panel - Receptacle	Amp	206070-1 206207-1
21 RC22B	Ckt. Bkr. Panel-		
-----	Aux. Power Rec.	Amp	206070-1 206036-2
21 RC23A	Radio Pwr. -Relay Panel - Receptacle	Amp	206036-2
21 RC24A	Cabin - Tail Cone Rec.	Amp	206070-1 206036-3
21 RC24B	Cabin-Tailcone Rec.	Amp	206966-1 206705-2
21 RC25A	Right Wing Rec.	Amp	206070-1 206036-3
21 RC25B	Right-Wing Rec.	Amp	206062-1 206153-1
21 RC26A	Right Wing Stub Rec.	Amp	206062-1 206153-1
21 RC27A	Trim Pos. Ind. Rec.	Amp	206062-1 206153-1
21 RC28A	Pilot's Trim Rec.	Amp	206062-1 206153-1
21 RC29A	Tail Receptacle	Amp	206062-1 206153-1
21 RC30A	Radios - Ckt. Bkr. Panel Receptacle	Amp	206070-1 206036-3
21 RC30B	Ckt. Bkr. Panel-Opt. Rec	Amp	206966-1 206705-2
21 RC31A	Radio Pkg. Cable Rec.	Amp	206070-1 206036-3
21 RC32A	Transistors - Console R	Amp	206070-1 206036-3
21 RC33A	Pwr. -Flt. Panel Rec.	Amp	206070-1 206207-1
21 RC34A	Panel-Light Control Rec.	Amp	206062-1 206153-1
21 RC34B	Light Control Rec.	Amp	206966-1 206705-2
21 RC35A	Gear Control Rec.	Amp	207008-1 206705-2
21 RC35B	Gear Control Rec.	Amp	206062-1 206153-1
21 WA01A	Light-Alt. Warning/ Bulb (2)	Korry General Electric	250-650-5821-003 330

21 WA02A	Rectifier	Sarkes Tarzian	F4
21 WA03A	Switch-Lo Voltage Detector	Electro Delta	LV 14
21 WA03B	Switch-Lo Voltage Detector	Electro Delta	LV 14F 6
21 WE01A	Ckt. Bkr. -Gear Warn- ing	Meriden or equivalent	AHW4-2
21 WE01B	Ckt. Bkr. -Gear Warning	Klixon or equivalent	7277-2-2
21 WE02A	Light-Gear Unsafe/ (2) Bulbs	Korry G. E.	250-650-5821-006 330
21 WE03A	Switch-Throttle /Actuator	Micro Micro	1SM1-T JS-221

21 WE03B	Switch-Throttle	Cutler Hammer	SS12ET10-102L3
21 WE03C	Switch-Throttle /Actuator	Micro Micro	V3-1 JV-5

6 21 WA03B may consist of a combination of Electro Delta #LV 14 and Electro Delta #FL 1 in lieu of Electro Delta #LV 14F.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 (CONT.)

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 WE04A	Horn-Gear Up Warn- ing	Mallory	SC628P
21 WE05A	Rectifier	Sarkes Tarzian	F4
21 WE06A	Light-Gear Position/ Bulb (1)	Sloan	855S-0-U
		G. E.	330
21 WE07A	Light-Gear Down/ Bulb (2)	Korrry	250-650-5821-007
		G. E.	330
21 WE08A	Diode-Gear Unsafe	Sarkes Tarzian	F 4
21 WE09A	Diode-Gear Down	Sarkes Tarzian	F 4
21 WE10A	Diode-Gear Horn	Sarkes Tarzian	F 4
21 WE11A	Resistor-Dimming		(50 ohm - 5 watt)
21 WE12A	Diode - Dimming	Sarkes Tarzian	F 4
21 WF01A	Light-Low Fuel Press.	Korrry	250-650-5821-004
	Light/ 2 ea. Lamps	G. E.	330
21 WF02A	Switch-Low Fuel Press. "E" & "F"	Marinair	17-200
21 WF02B	Switch-Low Fuel Press. "C"	Marinair	17-300
21 WF03A	Rectifier	Sarkes Tarzian	F 4
21 WF04A	Plug-Switch	Amphenol	126-223-1000
21 WL01A	Fuse	Littel Fuse	311001
-----	Retainer	Littel Fuse	155020
21 WL02A	Light-Landing Lt. Ind.	Korrry	250-650-5821-005
	Light 2 ea. lamps	G. E.	330
21 WL03A	Rectifier	Sarkes Tarzian	F4
21 WS01A	Ckt. Bkr. -Stall Horn	Meriden or equivalent	AHW4-2
21 WS01B	Ckt. Bkr. Stall Horn	Klixon or equivalent	7277-2-2
21 WS02A	Horn-Pre-Stall Warn- ing	Mallory	SC628
21 WS03A	Switch-Pre-Stall Warning	Safe Flight	C46001
21 WT01A	Switch-Press-to-Test	Alco	MSP205R
21 WT02A	Ckt. Bkr. Annunciator	Klixon or equivalent	7277-2-2
21 WT03A	Annunciator	IAI	500D0024
21 WT04A	Plug-Annunciator	Molex	09-50-3121
21 WV01A	Ckt. Bkr. -Vac. Warn.	Meriden or equivalent	AHW4-2
21 WV01B	Ckt. Bkr. -Vac. Warn.	Klixon or equivalent	7277-2-2
21 WV02A	Switch-Vac. Warn.	Garwin	22-1280-04
21 WV02B	Switch-Vac Warn-Lo	Whitman General	P118V-IN-K5L-1 
21 WV02C	Switch-Vac Warn-Hi	Whitman General	P118V-IN-K4L-2 
21 WV03A	Light-Low Vacuum	Korrry	250-650-5821-002
	Light /2 ea. lamp	G. E.	330

 Edo-Aire P/N 22-1280-04 Now Used

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1975 THRU 1978 (CONT.)

FOR SCHEMATIC SC1-800269L, L1, L2, L3 and 800330 E1

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 WV04A	Light-High Vacuum Light/2 ea. Lamp	Korry G. E.	250-650-5821-001 330
21 WV04B	Light-Vacuum Light/2 ea. Lamp	Korry General Electric	250-650-5821-009 330
21 WV05A	Rectifier-Lo	Sarkes Tarzian	F4
21 WV06A	Rectifier-Hi	Sarkes Tarzian	F4
21 WV07A	Switch-Vac. Lt. Flasher	Electro Delta	FL1
21 WW01A	Switch-Warn. -Alter- nate Air /Actuator	Micro Micro	V3-1 JV-5
21 WW02A	Light-Warning-Alter- nate Air /Cartridge Connector /Spee Clip	Dialight Dialight Dialight	39-14-373 7538-XP12 7538-XP51
21 WW02B	Light-Warning-Alter- nate Air Light/2 ea. Lamp	Korry G. E.	250-650-5821-010 330
21 WW03A	Diode	Sarkes Tarzian	F4

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CD02B	Switch-Pilot's Dump	Cutler Hammer	SA31SDT12-2
21 CD03A	Switch-Co-pilot's Dump	Micro	111SM1-T
21 CD03A	Switch-P.C. On-Off		
-----	(Alternate)	Alco	MST 215-N
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF04A	Actuator-Flap	Commercial	
-----		Acft. Products(Mooney)	D14500-36
-----			(750105-501)
21 CF05A	Switch-Limit-Take		
-----	Off Down	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF06A	Switch-Limit-Take		
-----	Off Up	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF09A	Switch-Control	Micro	2TL75-10
21 CT01A	Circuit Breaker-		
-----	Electric Trim	Mooney	930023-9
21 DA01C	Shunt	Empco or equivalent	MLA-60-100
21 DA02B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA03B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA04A	Ammeter	Mooney	640281-509
21 DB01B	Circuit Breaker-T.C.	Klixon	7277-2-5
21 DB02A	Turn Coordinator	Aerosonic	ANS50M
21 DC01B	Probe-Cyl. Head Temp.	Rochester	3080-00014
-----		(Mooney)	(880010-501)
21 DD01C	Gauge - O.A.T./EGT	B & D Instruments	0203-005
-----		(Mooney)	(880010-501)
21 DD02C	Plug/	Amp	205838-1
-----	Cable Clamp		206062-1
21 DD03C	Probe - O.A.T.	B & D Instruments	0203-100
-----		(Mooney)	(880004-501)
21 DF01A	Transmitter-Left		
-----	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter-Left		
-----	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter-Right		
-----	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter-Right		
-----	Outboard Fuel	Mooney	610243-1
21 DG01B	Ckt. Bkr.- Gages	Klixon	7277-2-2
21 DG02G	Cluster Gauge -"J"	Mooney	640281-511
21 DH01B	Probe-Oil Temp.	Rochester	3080-37
-----		(Mooney)	(880009-501)
21 DJ01A	Transducer-Oil Press.	Rochester	3060-18
-----		(Mooney)	(880008-501)
21 DK01A	Transducer-Fuel Press.	Rochester	3060-17
-----		(Mooney)	(880007-501)
21 DP01A	Circuit Breaker-		
-----	Heated Pitot	Mooney	930023-5
21 DP02B	Heated Pitot	Aero Instr. (AN5812)	PH502-12
21 DP03B	Plug - Heated Pitot		AN3115-1

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 DT01A	Probe - E.G.T.	B & D Instrument (Mooney)	0204-100 (880005-501)
21 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
21 EG02B	Switch-Control-Gear	Cutler Hammer	8906K2875
21 EG03A	Switch-Limit-Up	Micro	DT-2R-A7
-----	/Actuator	Micro	MCD-2711
21 EG04G	Actuator-Gear	Avionic Products	102000-1
21 EG05E	Relay-Gear Up	RBM	70-311221
21 EG06B	Switch-Safety-Airspeed	Whitman General	SK75-IN-K3L
21 EG07A	Switch-Limit-Down	Micro	1CH1-6
21 EG08E	Relay-Gear Down	RBM	70-311221
21 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
21 EG10A	Switch-Override	Cutler Hammer	SB1DDX492-2
21 ELT1A	ELT (Alternate)	Aircraft Products	ALERT-50
21 ELT1A	ELT	Dorn & Margolin, Inc.	DM-ELT-6
21 ELT2A	Switch (Remote) (ELT) (Alt)	C & K	7201
21 ELT2A	Switch, Remote ELT	Dorne & Margolin, Inc.	DM-U65-1
21 JM01B	Switch-Magneto	Bendix Scintilla	10-357310-9
21 JM02B	Magneto-Dual	Bendix Scintilla	D4LN2021
21 LB01A	Circuit Breaker-		
-----	Rotating Beacon	Mooney	930023-3
21 LB02A	Rotating Beacon	Whelen	WRM-12
-----	/Adapter	Whelen	WRM-65
21 LC01A	Fuse-(5 Amp-3AG		
-----	Slo-Blo)	Littel Fuse	313005
-----	Retainer	Littel Fuse	155020 or 155120
21 LC03B	Switch, Overhead Cabin		
-----	Lite, (Fwd)	Carling	TILC 64-IS-WH-FN
21 LC03C	Switch-Overhead		
-----	Cabin Lite, (Rear)	Carling	TILC 64-IS-WH-FN
21 LC04B/C	Resistor-Dimming		
-----	(10 Ohm-5W)	Dale	RH-10-5 OHM
21 LC11A	Lamp (F1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC12A	Lamp (F2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC13A	Lamp (F1-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC14A	Lamp (F2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC15A	Lamp (R1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC16A	Lamp (R2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC17A	Lamp (R1-L)	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC18A	Lamp (R2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930

⚠ Set for 75 MPH (+5.0) increasing actuation.
 $2.775" H_{20} \pm .384$

⚠ Alternate L110-1-N-K3L (880013-501)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LL01B	Ckt. Bkr.-Ldg. Lt.	Mooney	930023-15
21 LL03A	Light-Landing	General Electric or equivalent	4522
21 LN01A	Ckt. Bkr.-Nav. Lts.	Mooney	930023-1
21 LN02A	Pos. Lt.-Left (Red)	Grimes (Mooney)	A1285-R-12 (880022-501)
21 LN03A	Pos. Lt.-Rear (White)	Grimes	A2064-1777
21 LN04A	Pos. Lt.-Right (Green)	Grimes (Mooney)	A1285-G-12 (880022-503)
21 LP01C	Circuit Breaker-Instr. Lights	Klixon	7277-2-5
21 LP01D	Circuit Breaker-Radio Lights	Klixon	7277-2-5
21 LP03A	Transistor-Instr. Lites	RCA	2N2016
21 LP03C	Transistor-Radio Lites	RCA	2N2016
21 LP06A	Rheostat/Switch-Inst. Lights	Allen-Bradley	JS1N056P251MA
21 LP06C	Rheostat/Switch-Radio Lights	Allen Bradley	JS1N056P251MA
21 LP13A	Fuse-Inst. Lights /Holder	McGraw-Edison	FM01-5A
21 LP14A	Fuse-Radio Lights /Holder	McGraw-Edison	FHN42W
21 LP18D	Lights-Glareshield /Holder (10 ea.)	McGraw-Edison	FM01-5A
21 LP21A	Bulb-Compass Lt.	General Electric	FHN42W
21 LP22B	Light - Console /Lamp	General Electric or equivalent	1816
21 LP25B	Resistor-Instr. Lites	Herman H. Smith	1930
21 LP25C	Resistor-Radio Lites	Western Indicator Co.	330
21 LS01A	Circuit Bkt.-Strobe Lights	Western Indicator Co.	501-61K-11K3BP
21 LS02B	Power Supply Strobe L. Wing	Ohmite	WI-7046
21 LS03B	Strobe Light, L. Wing	Ohmite	4599
21 LS04B	Power Supply Strobe, R. Wing	Ohmite	4599
21 LS05B	Strobe Light - R. Wing	Mooney	930023-7
21 LS06A	Power Supply, Tail Strobe	Symbolic Displays (Mooney)	701295-3A (880018-501)
21 LS07A	Strobe, Tail Light	Symbolic Displays (Mooney)	701303A (880021-501)
21 MA01A	Receptacle	Symbolic Displays (Mooney)	701295-3A (880018-501)
21 MA02A	Relay	Symbolic Displays (Mooney)	701303A (880021-502)
21 MA03A	Diode	Mooney	880018-501
21 MB01B	Ckt. Bkr. COM-I	Mooney	880020-501
21 MB02B	Ckt. Bkr. NAV-I	Mooney	AN2552-3A
21 MB03B	Ckt. Bkr. COM-II	Cole Hersee	24059
21 MB04B	Ckt. Bkr. NAV-II	Sarkes Tarzian	10H3N
21 MB05B	Ckt. Bkr. XPN	Klixon or equivalent	7277-2
21 MB06B	Ckt. Bkr. AUD	Klixon or equivalent	7277-2

△ Amperage rating is determined by particular unit installed.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 MB07B	Ckt. Bkr. ADF	Klixon or equivalent	7277-2 ³
21 MB08B	Ckt. Bkr. DME	Klixon or equivalent	7277-2 ³
21 MB09B	Speaker	Mooney	810195-501
21 MB10A	Left Side-MIC-JAC-1	Switchcraft	C-128
-----	/Washers	Switchcraft	S-1028,S-1029
21 MB14A	L. Side-FONE-JAC-1	Switchcraft	C-11
21 MB16B	Ckt. Bkr.-Autopilot	Klixon or equivalent	7277-2 ³
21 MB18A	Ckt. Bkr. - R-NAV	Klixon	7277-2 ³
21 MB19A	Ckt. Bkr. HSI	Klixon	7277-2 ³
21 MB20A	Ckt. Bkr. Encoder	Klixon	7277-2 ³
21 MB21A	Ckt. Bkr. Fuel Flo	Klixon	7277-2 ³
21 MB22A	Ckt. Bkr. Telephone	Klixon	7277-2 ³
21 MC01B	Cigar Lighter	Mooney	800336-503
21 ME01A	Electric Clock	Borg Instr.	CA-7212
21 ME01B	Electric Clock (Opt.)	Borg Instr.	CA7616
21 NF01A	Ckt. Bkr.-Fuel Pump	Mooney	930023-11
21 NF02A	Fuel Pump	Dukes	1499-00-19
-----		(Mooney)	(610153-501)
21 PA01B	Ckt. Bkr.-Alt. Fld.	Klixon	7277-2-5
21 PA02C	Alternator	Lycoming	LW 15404
21 PA03A	Filter	Elpac	27-3-99-01021
21 PA03C	Filter	Captor Corp.	A2637
21 PA04A	Ckt. Bkr.-Alternator	Mechanical Products	1648-001-70
21 PA05A	Capacitor	Sangamo	500-1041-01
21 PA06A	Voltage Regulator	Electro Delta	VR-415D(Replaces Oeco 20082 & VR414)

21 PA07A	Plug-Volt. Regulator		MS3106A-18-4S
-----			24-0001 THRU 24-0860
-----	/Cable Clamp		MS3057-10B
-----			24-0001 THRU 24-0860
21 PA07B	Plug,Volt. Reg./	AMP	206060-1/
-----	Clamp		206062-1
21 PB01A	Battery (Alternate)	Gill	PS6-11
21 PB01B	Battery	Prestolite	R-35
21 PB02A	Relay-Battery	Cutler Hammer	6041-H-231
21 PB03A	Ckt. Bkr.-Aux. Bus.	Meriden or equivalent	AHW1-50
-----	Ckt. Bkr.-Aux. Bus.	Mechanical Products	700-001-50
21 PB04A	Relay-Radio	Magnecraft	W89CQX-2
-----			(24-0784 THRU 24-0786)
21 PB04B	Relay,Radio Master	Potter & Bromfield	MB 4413
-----			(24-0787 & ON)
21 PB05A	Switch-Master	Cutler Hammer	8911K828
21 PB06A	Ckt. Bkr.-Radio Relay	Mooney	930023-13 ⁴
21 PB07C	Bus Bar-Main Flex #1		⁴
21 PB07D	Bus Bar-Main Flex #2		⁴
21 PB09F	Bus Bar-Aux.	Mooney	913127-23
21 PB10C	Bus Bar-Main #1	Mooney	913127-19
21 PB11B	Bar-Main #2	Mooney	913127-19

³ Amperage rating is determined by particular unit installed.

⁴ Manufacture using "Alpha Wire Co." #2172 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PB12E	Bus Bar-Radio #3	Mooney	913127-19
-----			CUT TO SIZE
21 PB12F	Bus Bar-Radio #2	Mooney	913127-19
-----			CUT TO SIZE
21 PB13B	Bus Bar-Radio #1	Mooney	913127-19
21 PB14B	Bus Bar-Radio #2	Mooney	913127-19
21 PB15A	Diode-Radio Master	Sarkes Tarzian	F-4
21 PB16A	Bus Bar Main #1	Mooney	913127-3
21 PB20A	Jumper		
21 PB21A	Bus Bar-Radio Flex		

21 PL01B	Ckt. Bkr. Panel Plug/ Clamp	AMP	206150-1/ 206138-1
21 PL02A	Flt. Panel-#1 Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL03B	Electric Gear Plug	Mooney	930021-1
21 PL04B	Left Wing Plug	Mooney	930021-1
21 PL05B	Left Wing Stub Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL08A	Headliner Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL09A	Firewall Plug/ Clamp		MS3106A-22-14S/ MS3057-12B
21 PL11B	Flight Panel #2 Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL14B	Left Side Panel Plug	Mooney	930021-1
21 PL16B	Console Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL18B	Cluster Gauge Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL22B	Ckt. Bkr. Panel - Aux. Power Plug/Clamp	AMP	206037-2/ 206070-1
21 PL24C	Cabin-Tail Cone Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL25C	Right Wing Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL26B	Right Wing Nav Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL29A	Tail Plug/ Clamp	AMP	206060-1/ 206062-1
21 PL30B	Ckt. Bkr. Panel Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL31A	Radio Pkg. Cable Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL33A	Pwr.-Flt. Panel Plug/ Clamp	AMP	206037-2/ 206070-1
21 PL34B	Light Control Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL35B	Gear Control Plug/ Clamp	AMP	206060-1/ 206062-1



Manufacture using "Alpha Wire Co." #2172 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PL38A	Plug, ELT Switch/	AMP	206060-1/
-----	Clamp		206062-1
21 PL39A	Plug, Overhead Lite Rear/	AMP	206060-1/
-----	Clamp		206062-1
21 PS01B	Ckt. Bkr.-Ignition	Klixon or equivalent	7277-2-10
21 PS03A/B	Solenoid-Starter	Prestolite	SAZ-4201E
21 PS04A	Starter	Prestolite	MZ4206
21 PS04A	Starter (Alternate)	Prestolite	MZ4218
21 PS04A	Starter (Alternate)	Prestolite	MZ4222
21 RC01B	Ckt. Bkr. Panel Recpt/	AMP	206151-1/
-----	Clamp		206138-1
21 RC02A	Flt. Panel #1 Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC03B	Electric Gear Recpt.	Mooney	930021-2
21 RC04B	Left Wing Recpt.	Mooney	930021-2
21 RC05B	Left Wing Stub Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC08A	Headliner Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC09A	Firewall Recpt./		MS3100A-22-14P/
-----	Clamp		MS3057-12B
21 RC11B	Flight Panel #2 Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC14B	Left Side Panel Recpt	Mooney	930021-2
21 RC16B	Console Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC18B	Cluster Gauge Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC22B	Ckt. Bkr. Panel -		206036-2/
-----	Aux. Power Recpt./Clamp	AMP	206070-1
21 RC24C	Cabin - Tail Cone Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC25C	Right Wing Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC26B	Right Wing Stub Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC29A	Tail Receptacle/	AMP	206705-2/
-----	Clamp		206966-1
21 RC30B	Ckt. Bkr. Pnl., Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC31A	Radio Pkg. Cable Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC33A	Pwr.-Flt. Panel Recpt/	AMP	206207-1/
-----	Clamp		206070-1
21 RC34B	Light Control Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC35B	Gear Control Recpt/	AMP	206153-1/
-----	Clamp		206062-1
21 RC38A	Recpt., ELT Switch/	AMP	206153-1/
-----	Clamp		206062-1
21 RC39A	Recpt., Overhead Lite	AMP	206153-1/
-----	(Rear)/Clamp		206062-1
21 WE01B	Ckt. Bkr.-Gear Warning	Klixon or equivalent	7277-2-2

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E2

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 WE03C	Switch-Throttle	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 WE04A	Horn-Gear Up Warning	Mallory	SC628P
21 WE05A	Rectifier	Sarkes Tarzian	F4
21 WE06A	Light-Gear Position/	Sloan	855S-O-U
-----	Bulb (1)	General Electric	327
21 WE10A	Diode-Gear Horn	Sarkes Tarzian	F-4
21 WS01B	Ckt. Bkr. Stall Warning		
-----	Horn	Klixon or equivalent	7277-2-2
21 WS02A	Horn-Pre-Stall Warning	Mallory	SC628
21 WS03A	Switch-Pre-Stall		
-----	Warning	Safe Flight	C46001
21 WT02A	Ckt. Bkr. Annunciator	Klixon or equivalent	7277-2-2
21 WT03A	Annunciator/	IAI	500D0024
-----	Lamps		(CM7-7330)
21 WT04A	Plug-Annunciator Panel	Molex	09-50-3121
21 WV01B	Ckt. Bkr.-Vac. Warn.	Klixon or equivalent	7277-2-2
21 WV02A	Switch-Vac. Warn.	Garwin	22-1280-04-1
-----		(Mooney)	(880012-501)
21 WW01A	Switch-Warn.-Ram Air	Micro	V3-1
-----	/Actuator	Micro	JV-5

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF04A	Actuator-Flap	Commerical	
-----		Acft. Products	D14500-36
-----		(Mooney)	(750105-501)
21 CF05A	Switch-Limit-Take		
-----	Off Down	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF06A	Switch-Limit-Take		
-----	Off Up	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF09B	Switch-Control, Flap	Cutler-Hammer	8906K3149
21 CT01A	Circuit Breaker-		
-----	Electric Trim	Mooney	930023-9
21 DA01C	Shunt	Empro or equivalent	MLA-60-100
21 DA02B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA03B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA04A	Ammeter	Mooney	640281-509
21 DB01B	Circuit Breaker-T.C.	Klixon	7277-2-5
21 DB02A	Turn Coordinator	Aerosonic	ANS50M
21 DB03A	Plug, Turn Coordinator/		MS3106A-10SL-3S/
-----	Clamp		MS3057-4A or 4B
21 DC01B	Probe-Cyl. Head Temp.	Rochester	3080-00014
-----		(Mooney)	(880010-501)
21 DD01C	Gague - O.A.T./EGT	B & D Instruments	0203-005
-----		(Mooney)	(880010-501)
21 DD02C	Plug/	Amp	205838-1
-----	Cable Clamp		206062-1
21 DD03C	Probe - O.A.T.	B & D Instruments	0203-100
-----		(Mooney)	(880004-501)
21 DF01A	Transmitter-Left		
-----	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter-Left		
-----	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter-Right		
-----	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter-Right		
-----	Outboard Fuel	Mooney	610243-1
21 DG01B	Ckt. Bkr.-Gages	Klixon	7277-2-2
21 DG02G	Cluster Gauge-"J"	Mooney	640281-511
21 DH01B	Probe-Oil Temp.	Rochester	3080-37
-----		(Mooney)	(880009-501)
21 DJ01A	Transducer-Oil Press.	Rochester	3060-18
-----		(Mooney)	(880008-501)
21 DK01A	Transducer-Fuel Press.	Rochester	3060-17
-----		(Mooney)	(880007-501)
21 DP01A	Circuit Breaker-		
-----	Heated Pitot	Mooney	930023-5
21 DP02B	Heated Pitot	Aero Instr. (AN5812)	PH502-12
21 DP03B	Plug - Heated Pitot		AN3115-1
21 DT01A	Probe - E.G.T.	B & D Instrument	0204-100
-----		(Mooney)	(880005-501)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
21 EG02B	Switch-Control-Gear	Cutler Hammer	8906K2875
21 EG03A	Switch-Limit-Up	Micro	DT-2R-A7
-----	/Actuator	Micro	MCD-2711
21 EG04G	Actuator-Gear	Avionic Products	102000-1
21 EG05E	Relay-Gear Up	RBM	70-311221
21 EG06B	Switch-Safety-Airspeed	Whitman General	SK75-IN-K3L 1 2
21 EG07A	Switch-Limit-Down	Micro	1CH1-6
21 EG08E	Relay-Gear Down	RBM	70-311221
21 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
21 EG10A	Switch-Override	Cutler Hammer	SB1DDX492-2
21 ELT1A	ELT (Alternate)	Aircraft Products	ALERT-50
21 ELT1A	ELT	Dorne & Margolin, Inc.	DM-ELT-6
21 ELT2A	Switch(Remote) (ELT(Alt)	C & K	7201
21 ELT2A	Switch, Remote ELT	Dorne & Margolin, Inc.	DM-U65-1
21 JM01B	Switch-Magneto	Bendix Scintilla	10-357310-9
21 JM02B	Magneto-Dual	Bendix Scintilla	D4LN2021
21 LB01A	Circuit Breaker-		
-----	Rotating Beacon	Mooney	930023-3
21 LB02A	Rotating Beacon	Whelen	WRM-12
-----	/Adapter	Whelen	WRM-65
21 LC01A	Fuse-(5 Amp-3AG		
-----	Slo-Blo)	Littel Fuse	313005
-----	Retainer	Littel Fuse	155020 or 155120
21 LC03B	Switch,Overhead Cabin		
-----	Lite, (Fwd)	Carling	TILC 64-IS-WH-FN
21 LC03C	Switch-Overhead		
-----	Cabin Lite, (Rear)	Carling	TILC 64-IS-WH-FN
21 LC04B/C	Resistor-Dimming		
-----	(10 Ohm-5W)	Dale	RH-10-5 OHM
21 LC11A	Lamp (F1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC12A	Lamp (F2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC13A	Lamp (F1-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC14A	Lamp (F2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC15A	Lamp (R1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC16A	Lamp (R2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC17A	Lamp (R1-L)	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC18A	Lamp (R2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LL01B	Ckt. Bkr.-Ldg. Lt.	Mooney	930023-15
21 LL03A	Light-Landing	General Electric or	
-----		equivalent	4522
21 LN01A	Ckt. Bkr.-Nav Lts.	Mooney	930023-1

1 Set for 75 MPH (+5.0) increasing actuation.
2.775" H₂₀ ± .388

2 Alternate L110-1-N-K3L (880013-501)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LN02A	Pos. Lt.-Left (Red)	Grimes	A1285-R-12
-----		(Mooney)	(880022-501)
21 LN03A	Pos. Lt.-Rear (White)	Grimes	A2064-1777
21 LN04A	Pos. Lt.-Right (Green)	Grimes	A1285-G-12
-----		(Mooney)	(880022-503)
21 LP01C	Circuit Breaker-		
-----	Instr. Lights	Klixon	7277-2-5
21 LP01D	Circuit Breaker-		
-----	Radio Lights	Klixon	7277-2-5
21 LP03A	Transistor-Instr. Lites	RCA	2N2016
21 LP03C	Transistor-Radio Lites	RCA	2N2016
21 LP06A	Rheostat/Switch-Inst.		
-----	Lights	Allen-Bradley	JS1N056P251MA
21 LP06C	Rheostat/Switch-Radio		
-----	Lights	Allen-Bradley	JS1N056P251MA
21 LP13A	Fuse-Inst. Lights	McGraw-Edison	FM01-5A
-----	/Holder	McGraw-Edison	FHN42W
21 LP14A	Fuse-Radio Lights	McGraw-Edison	FM01-5A
-----	/Holder	McGraw-Edison	FHN42W
21 LP18E	Lights-Glareshield	Sloan	855S-9-I
-----	/Lamp (7 ea.)	General Electric	330
21 LP21A	Bulb-Compass Lt.	General Electric or	
-----		equivalent	330
21 LP22B	Light - Console	Western Indicator Co.	501-61K-11K3BP
-----	/Lamp	Western Indicator Co.	WI-7046
21 LP25B	Resistor-Instr. Lites	Ohmite	4599
			(24-0901 THRU 24-0926)
21 LP25C	Resistor-Radio Lites	Ohmite	4599
			(24-0901 THRU 24-0926)
21 LP25D	Resistor-Instr. Lites	Dale	RH-10-50 OHM
			(24-0927 & ON)
21 LP25E	Resistor-Radio Lites	Dale	RH-10-50 OHM
			(24-0927 & ON)
21 LP26A	Post Lite-Manifold Press/		
-----	Lamp	Grimes	A-8970B1/330
21 LP27A	Post Lite-Tachometer/	Grimes	A-8970B1/
-----	Lamp		330
21 LP28A	Post Lite-Clock/	Grimes	A-8970B1/
-----	Lamp		330
21 LP29A	Post Lite-O.A.T.	Grimes	A-8970B1/
-----			330
21 LS01A	Circuit Bkt.-Strobe	Mooney	930023-7
-----	Lights		
21 LS02B	Power Supply Strobe	Symbolic Displays	701295-3A
-----	L. Wing	(Mooney)	(880018-501)
21 LS02E	Pwr. Supply, Left Wing	Mooney	880028-505 (Alt)
21 LS02F	Cable, Pwr. Supply,		
-----	Left Wing	Mooney	880017-503 (Alt)
21 LS03B	Strobe Light, L. Wing	Symbolic Displays	701303A
-----		(Mooney)	(880021-501)
21 LS04B	Power Supply Strobe,	Symbolic Displays	701295-3A
-----	R. Wing	(Mooney)	(880018-501)
21 LS04E	Pwr. Supply, Right Wing	Mooney	880028-505

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LS04F	Cable,Pwr. Supply,		
-----	Right Wing	Mooney	880017-503
21 LS05B	Strobe Light-Right Wing	Symbolic Displays	701303A
-----		(Mooney)	(880021-502)
21 LS05C	Light, Right Wing	Mooney	880026-502 (Alt)
21 LS06A	Power Supply,Tail Strobe	Mooney	880018-501
21 LS06B	Pwr. Supply,Tail Strobe	Mooney	880028-505 (Alt)
21 LS06C	Cable,Tail Strobe Lite	Mooney	880017-505 (Alt)
21 LS07A	Strobe,Tail Light	Mooney	880020-501
21 LS07B	Strobe,Tail Light	Mooney	880020-501 (Alt)
21 MA01A	Receptacle		AN2552-3A
21 MA02A	Relay		24059
21 MA03A	Diode	Cole Hersee	10H3N
21 MB01B	Ckt. Bkr. COM-I	Sarkes Tarzian	7277-2- 
21 MB02B	Ckt. Bkr. NAV-I	Klixon or equivalent	7277-2- 
21 MB03B	Ckt. Bkr. Com-II	Klixon or equivalent	7277-2- 
21 MB04B	Ckt. Bkr. NAV-II	Klixon or equivalent	7277-2- 
21 MB05B	Ckt. Bkr. XPN	Klixon or equivalent	7277-2- 
21 MB06B	Ckt. Bkr. AUD	Klixon or equivalent	7277-2- 
21 MB07B	Ckt. Bkr. ADF	Klixon or equivalent	7277-2- 
21 MB08B	Ckt. Bkr. DME	Klixon or equivalent	7277-2- 
21 MB09B	Speaker	Mooney	810195-501
21 MB10A	Left Side-MIC-JAC-1	Switchcraft	C-128
-----	/Washers	Switchcraft	S-1028,S-1029
21 MB14A	L. Side-FONE-JAC-1	Switchcraft	C-11
21 MB16A	Ckt. Bkr.-Autopilot	Klixon or equivalent	7277-2- 
21 MB18A	Ckt. Bkr.-R-NAV	Klixon	7277-2- 
21 MB19A	Ckt. Bkr. HSI	Klixon	7277-2- 
21 MB20A	Ckt. Bkr. Encoder	Klixon	7277-2- 
21 MB21A	Ckt. Bkr. Fuel Flo	Klixon	7277-2- 
21 MB22A	Ckt. Bkr. Telephone	Klixon	7277-2- 
21 MC01B	Cigar Lighter	Mooney	800336-503
21 ME01A	Electric Clock	Borg Instr.	CA-7212
21 ME01B	Electric Clock (Opt.)	Borg Instr.	CA7616
21 NF01A	Ckt. Bkr.-Fuel Pump	Mooney	930023-11
21 NF02A	Fuel Pump	Dukes	1499-00-19
-----		(Mooney)	(610153-501)
21 PA01B	Ckt. Bkr.-Alt. Fld.	Klixon	7277-2-5
21 PA02C	Alternator	Lycoming	LW 15404
21 PA03C	Filter	Captor Corp.	A2637
21 PA04A	Ckt. Bkr. - Alternator	Mechanical Products	1648-001-70
21 PA05A	Capacitor	Sangamo	500-1041-01
21 PA06B	Voltage Regulator	Electro Delta	VR-415D
-----			(Replaces Oeco 20082, VR414 & VR415)
21 PA07B	Plug,Volt. Reg./	AMP	206060-1/
-----	Clamp		206062-1
21 PA08B	Recpt.,Volt. Reg./	AMP	206153-1/
-----	Clamp		206062-1
21 PB01A	Battery (Alt)	Gill	PS6-11
21 PB01B	Battery	Prestolite	R-35
21 PB02A	Relay-Battery,Master	Cutler Hammer	6041-H-231
21 PB03A	Ckt. Bkr.-Aux. Bus.	Meriden	AHW1-50

 Amperage rating is determined by particular unit installed.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PB03A	Ckt. Bkr.-Aux. Bus.	Mechanical Products	700-001-50
21 PB04B	Relay, Radio Master	Potter & Bromfield	MB 4413
21 PB05A	Switch-Master	Cutler Hammer	8911K828
21 PB06A	Ckt. Bkr.-Radio Relay	Mooney	930023-13
21 PB07C	Bus Bar-Main Flex #1		4
21 PB07D	Bus Bar-Main Flex #2		4
21 PB09F	Bus Bar-Aux. #1	Mooney	913127-23
21 PB09G	Bus Bar-Aux. #2	Mooney	913127-25
21 PB10C	Bus Bar-Main #1	Mooney	913127-19
21 PB11B	Bar-Main #2	Mooney	913127-19
21 PB12E	Bus Bar-Radio #3	Mooney	913127-19
			CUT TO SIZE
21 PB12F	Bus Bar-Radio #2	Mooney	913127-19
			CUT TO SIZE
21 PB13B	Bus Bar-Radio #1	Mooney	913127-19
21 PB14B	Bus Bar-Radio #2	Mooney	913127-19
21 PB15A	Diode-Radio Master	Sarkes Tarzian	F-4
21 PB21A	Bus Bar-Radio Flex		4
			(Use 1 braid only)
21 PL01B	Ckt. Bkr. Panel Plug/ Clamp	AMP	206150-1/ 206138-1
21 PL02A	Flt. Panel-#1 Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL03B	Electric Gear Plug	Mooney	930021-1
21 PL04B	Left Wing Plug	Mooney	930021-1
21 PL05B	Left Wing Stub Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL08A	Headliner Plug/ Clamp	AMP	206037-1 206070-1
21 PL09A	Firewall Plug/ Clamp		MS3106A-22-14S/ MS3057-12B
21 PL11B	Flight Panel #2 Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL14B	Left Side Panel Plug	Mooney	930021-1
21 PL16B	Console Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL18B	Cluster Gauge Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL22B	Ckt. Bkr. Panel- Aux. Power Plug/Clamp	AMP	206037-2/ 206070-1
21 PL24C	Cabin-Tail Cone Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL25C	Right Wing Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL26B	Right Wing Nav Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL29A	Tail Plug/ Clamp	AMP	206060-1/ 206062-1
21 PL29B	Plug,Pwr., Flt. Panel/ Clamp (Alternate)	AMP	206708-1/ 206966-1

4 Manufacture using "Alpha Wire Co." #2172 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PL31A	Radio Pkg. Cable Plug/	AMP	206037-1/
-----	Clamp		206070-1
21 PL33A	Plug Pwr.-Flt. Panel/	AMP	206037-2/
-----	Clamp		206070-1
21 PL34B	Light Control Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL35B	Gear Control Plug/	AMP	206060-1/
-----	Clamp		206062-1
21 PL38A	Plug,ELT Switch/	AMP	206060-1/
-----	Clamp		206062-1
21 PL39A	Plug,Overhead Lite Rear/	AMP	206060-1/
-----	Clamp		206062-1
21 PL41A	Plug, Glareshield/	AMP	206060-1/
-----	Clamp		206062-1
21 PS01B	Ckt. Bkr.-Ignition	Klixon or equivalent	7277-2-10
21 PS03A/B	Solenoid-Starter	Prestolite	SAZ-4201E
21 PS04A	Starter	Prestolite	MZ4206
21 PS04A	Starter (Alternate)	Prestolite	MZ4218
21 PS04A	Starter (Alternate)	Prestolite	MZ4222
21 RC01B	Ckt. Bkr. Panel Recpt.	AMP	206151-1/
-----	Clamp		206138-1
21 RC02A	Flt. Panel #1 Recpt./	AMP	206036-3/
-----	Clamp		206070-1
21 RC03B	Electric Gear Recpt.	Mooney	930021-2
21 RC04B	Left Wing Recpt.	Mooney	930021-2
21 RC05B	Left Wing Stub Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC08A	Headliner Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC09A	Firewall Recpt./		MS3100A-22-14P/
-----	Clamp		MS3057-12B
21 RC11B	Flight Panel #2 Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC14B	Left Side Panel Recpt.	Mooney	930021-2
21 RC16B	Console Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC18B	Cluster Gauge Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC22B	Ckt. Bkr. Panel		206036-2/
-----	Aux. Power Recpt./Clamp	AMP	206070-1
21 RC24C	Cabin-Tail Cone Recpt./	AMP	206036-3/
-----	Clamp		206070-1
21 RC25C	Right Wing Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC26B	Right Wing Stub Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC29A/B	Tail Receptacle/	AMP	206705-2/
-----	Clamp		206966-1
21 RC30B	Ckt. Bkr. Pnl., Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC31A	Radio Pkg. Cable Recpt/	AMP	206036-3
-----	Clamp		206070-1
21 RC33A	Pwr.-Flt. Panel Recpt/	AMP	206207-1/
-----	Clamp		206070-1

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1979 (CONT.)

FOR SCHEMATIC 800330 E3

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 RC34B	Light Control Recpt./	AMP	206705-2/
-----	Clamp		206966-1
21 RC35B	Gear Control Recpt./	AMP	206153-1/
-----	Clamp		206062-1
21 RC38A	Recpt., ELT Switch/	AMP	206153-1/
-----	Clamp		206062-1
21 RC39A	Recpt., Overhead Lite	AMP	206153-1/
-----	(Rear)/Clamp	AMP	206062-1
21 RC41A	Recpt. Glareshield/	AMP	206153-1/
-----	Clamp		206062-1
21 WE01B	Ckt. Bkr.-Gear Warning	Klixon or equivalent	7277-2-2
21 WE03C	Switch-Throttle	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 WE04A	Horn-Gear Up Warning	Mallory	SC628P
21 WE05A	Rectifier	Sarkes Tarzian	F4
21 WE06A	Light-Gear Position/	Sloan	855S-O-U
-----	Bulb (1)	General Electric	327
21 WE10A	Diode-Gear Horn	Sarkes Tarzian	F-4
21 WS01B	Ckt. Bkr. Stall Warning		
-----	Horn	Klixon or equivalent	7277-2-2
21 WS02A	Horn-Pre-Stall Warning	Mallory	SC628
21 WS03A	Switch-Pre-Stall		
-----	Warning	Safe Flight	C46001
21 WT02A	Ckt. Bkr. Annunciator	Klixon or equivalent	7277-2-2
21 WT03G	Annunciator/	Mooney	880025-501
-----	Lamps (8 ea.)	Chicago Minature	CM7-7330
21 WT04A	Plug-Annunciator Panel	Molex	09-50-3121
21 WV01B	Ckt. Bkr.-Vac. Warn.	Klixon or equivalent	7277-2-2
21 WV02A	Switch-Vac. Warn.	Garwin	22-1280-04-1
-----		(Mooney)	(880012-501)
21 WW01A	Switch-Warn.-Ram Air	Micro	V3-1
-----	/Actuator	Micro	JV-5

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF04A	Actuator-Flap	Commercial	
-----		Acft. Products	D14500-36
-----		(Mooney)	(750105-501)
21 CF05A	Switch-Limit-Take		
-----	Off Down	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF06A	Switch-Limit-Take		
-----	Off Up	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF09B	Switch-Control, Flap	Cutler-Hammer	8906K3149
21 CT01A	Circuit Breaker-		
-----	Electric Trim	Mooney	930023-9
21 DA01C	Shunt	Empco or equivalent	MLA-60-100
21 DA02B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA03B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA04A	Ammeter	Mooney	640281-509
21 DB01B	Circuit Breaker-T.C.	Klixon	7277-2-5
21 DB02A	Turn Coordinator	Aerosonic	ANS50M
21 DB03A	Plug, Turn Coordinator/		MS3106A-10SL-3S/
-----	Clamp		MS3057-4A or 4B
21 DC01B	Probe-Cyl. Head Temp.	Rochester	3080-00014
-----		(Mooney)	(880010-501)
21 DD01C	Gauge - O.A.T./EGT	B & D Instruments	0203-005
-----		(Mooney)	(880010-501)
21 DD02C	Plug/	AMP	205838-1
-----	Cable Clamp		206062-1
21 DD03C	Probe - O.A.T.	B & D Instruments	0203-100
-----		(Mooney)	(880004-501)
21 DF01A	Transmitter-Left		
-----	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter-Left		
-----	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter-Right		
-----	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter-Right		
-----	Outboard Fuel	Mooney	610243-1
21 DG01B	Ckt. Bkr. - Gages	Klixon	7277-2-2
21 DG02G	Cluster Gauge - "J"	Mooney	640281-511
21 DH01B	Probe-Oil Temp.	Rochester	3080-37
-----		(Mooney)	(880009-501)
21 DJ01A	Transducer-Oil Press.	Rochester	3060-18
-----		(Mooney)	(880008-501)
21 DK01A	Transducer-Fuel Press.	Rochester	3060-17
-----		(Mooney)	(880007-501)
21 DP01A	Circuit Breaker-		
-----	Heated Pitot	Mooney	930023-5
21 DP02B	Heated Pitot	Aero Instr. (AN5812)	PH502-12
21 DP03B	Plug - Heated Pitot		AN3115-1
21 DT01A	Probe - E.G.T.	B & D Instrument	0204-100
-----		(Mooney)	(880005-501)
21 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
21 EG02B	Switch-Control-Gear	Cutler Hammer	8906K2875

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 EG03A	Switch-Limit-Up	Micro	DT-2R-A7
-----	/Actuator	Micro	MCD-2711
21 EG04G	Actuator-Gear	Avionic Products	102000-1
21 EG05E	Relay-Gear Up	RBM	70-311221
21 EG06B	Switch-Safety-Airspeed	Whitman General	SK75-IN-K3L 1 2
21 EG07A	Switch-Limit-Down	Micro	1CH1-6
21 EG08E	Relay-Gear Down	RBM	70-311221
21 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
21 EG10A	Switch-Override	Cutler Hammer	SB1DDX492-2
21 EG11A	Diode, Up-Relay	Sarkes Tarzian	F4
21 EG12A	Diode, Down-Relay	Sarkes Tarzian	F4
21 ELT1A	ELT (Alternate)	Aircraft Products	ALERT-50
21 ELT1A	ELT	Dorne & Margolin, Inc.	DM-ELT-6
21 ELT2A	Switch (Remote) (ELT) (Alt)	C & K	7201
21 ELT2A	Switch, Remote ELT	Dorne & Margolin, Inc.	DM-U65-1
21 JM01B	Switch-Magneto	Bendix Scintilla	10-357310-9
21 JM02B	Magneto-Dual	Bendix Scintilla	D4LN2021
21 LB01A	Circuit Breaker-		
-----	Rotating Beacon	Mooney	930023-3
21 LB02A	Rotating Beacon	Whelen	WRM-12
-----	/Adapter	Whelen	WRM-65
21 LC01A	Fuse-(5 Amp-3AG		
-----	Slo-Blo)	Littel Fuse	313005
-----	Retainer	Littel Fuse	155020 or 155120
21 LC03B	Switch, Overhead Cabin		
-----	Lite, (Fwd)	Carling	TILC 64-IS-WH-FN
21 LC03C	Switch-Overhead		
-----	Cabin Lite, (Rear)	Carling	TILC 64-IS-WH-FN
21 LC04B/C	Resistor-Dimming		
-----	(10 Ohm-5W)	Dale	RH-10-5 OHM
21 LC11A	Lamp (F1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC12A	Lamp (F2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC13A	Lamp (F1-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC14A	Lamp (F2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC15A	Lamp (R1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC16A	Lamp (R2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC17A	Lamp (R1-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC18A	Lamp (R2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LL01B	Ckt. Bkr.-Ldg. Lt.	Mooney	930023-15

1 Set for 75 MPH (+5.0) increasing actuation.
 $2.775" H_{20} \pm .384$

2 Alternate L110-1-N-K3L (880013-501)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LL03A	Light-Landing	General Electric or equivalent	4522

21 LN01A	Ckt. Bkr.-Nav Lts.	Mooney	930023-1
21 LN02A	Pos. Lt.-Left (Red)	Grimes	A1285-R-12
-----		(Mooney)	(880022-501)
21 LN03A	Pos. Lt.-Rear (White)	Grimes	A2064-1777
21 LN04A	Pos. Lt.-Right (Green)	Grimes	A1285-G-12
-----		(Mooney)	(880022-503)
21 LP10C	Circuit Breaker-		
-----	Instr. Lights	Klixon	7277-2-5
21 LP01D	Circuit Breaker-		
-----	Radio Lights	Klixon	7277-2-5
21 LP03A	Transistor-Instr. Lights	RCA	2N2016
21 LP03C	Transistor-Radio Lights	RCA	2N2016
21 LP06A	Rheostat/Switch-Inst.		
-----	Lights	Allen-Bradley	JS1N056P251MA
21 LP06C	Rheostat/Switch-Radio		
-----	Lights	Allen-Bradley	JS1N056P251MA
21 LP13A	Fuse-Inst. Lights	McGraw-Edison	FM01-5A
-----	/Holder	McGraw-Edison	FHN42W
21 LP14A	Fuse-Radio Lights	McGraw-Edison	FM01-5A
-----	/Holder	McGraw-Edison	FHN42W
21 LP18E	Lights-Glareshield	Sloan	855S-9-I
-----	/Bulb (7 ea.)	General Electric	330
21 LP21A	Bulb-Compass Lt.	General Electric or equivalent	330

21 LP22B	Light - Console	Western Indicator Co.	501-61K-11K3BP
-----	/Lamp	Western Indicator Co.	WI-7046
21 LP25D	Resistor-Instr. Lites	Dale	RH-10-50 OHM
21 LP25E	Resistor-Radio Lites	Dale	RH-10-50 OHM
21 LP26A	Post Lite-Manifold Pres/	Grimes	A-8970B1/
-----	Lamp	General Electric	330
21 LP27A	Post Lite, Tachometer/	Grimes	A-8970B1/
-----	Lamp	General Electric	330
21 LP28A	Post Lite, Clock/	Grimes	A-8970B1/
-----	Lamp	General Electric	330
21 LP29A	Post Lite, O.A.T./	Grimes	A-8970B1/
-----	Lamp	General Electric	330
21 LS01A	Circuit Bkr.-Strobe	Mooney	930023-7
-----	Lights		
21 LS02B	Power Supply Strobe	Symbolic Displays	701295-3A
-----	L. Wing	(Mooney)	(880018-501)
21 LS02E	Pwr. Supply, Left Wing	Mooney	880028-505 (Alt)
21 LS02F	Cable, Pwr. Supply,		
-----	Left Wing	Mooney	880017-503 (Alt)
21 LS03B	Strobe Light, L. Wing	Symbolic Displays	701303A
-----		(Mooney)	(880021-501)
21 LS04B	Power Supply Strobe,	Symbolic Displays	701295-3A
-----	R. Wing	(Mooney)	(880018-501)
21 LS04E	Pwr. Supply, Rt. Wing	Mooney	880028-505 (Alt)
21 LS04F	Pwr. Supply, Rt. Wing	Mooney	880017-503 (Alt)
21 LS05B	Strobe Light - R. Wing	Symbolic Displays	701303A
-----		(Mooney)	(880021-502)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LS05C	Light, Rt. Wing (Alt)	Mooney	880026-502
21 LS06A	Power Supply, Tail Strobe	Mooney	880018-501
21 LS06B	Pwr. Supply, Tail (Alt)	Mooney	880028-505
21 LS06C	Cable, Tail Lite (Alt)	Mooney	880017-505
21 LS07A	Strobe, Tail Light	Mooney	880020-501
21 LS07B	Strobe, Tail Lite (Alt)	Mooney	880020-501
21 MA01A	Receptacle		AN2552-3A
21 MA02A	Relay		24059
21 MA03A	Diode	Cole Hersee	10H3N
21 MB01B	Ckt. Bkr. COM-I	Sarkes Tarzian	7277-2- ³
21 MB02B	Ckt. Bkr. NAV-I	Klixon or equivalent	7277-2- ³
21 MB03B	Ckt. Bkr. COM-II	Klixon or equivalent	7277-2- ³
21 MB04B	Ckt. Bkr. NAV-II	Klixon or equivalent	7277-2- ³
21 MB05B	Ckt. Bkr. XPN	Klixon or equivalent	7277-2- ³
21 MB06B	Ckt. Bkr. AUC	Klixon or equivalent	7277-2- ³
21 MB07B	Ckt. Bkr. ADF	Klixon or equivalent	7277-2- ³
21 MB08B	Ckt. Bkr. DME	Klixon or equivalent	7277-2- ³
21 MB09B	Speaker	Mooney	810195-501
21 MB10A	Left Side-MIC-JAC-1	Switchcraft	C-128
-----	/Washers	Switchcraft	S-1028, S-1029
21 MB14A	L. Side-FONE-JAC-1	Switchcraft	C-11
21 MB16B	Ckt. Bkr.-Autopilot	Klixon or equivalent	7277-2- ³
21 MB18A	Ckt. Bkr. - R-NAV	Klixon	7277-2- ³
21 MB19A	Ckt. Bkr. HSI	Klixon	7277-2- ³
21 MB20A	Ckt. Bkr. Encoder	Klixon	7277-2- ³
21 MB21A	Ckt. Bkr. Fuel Flo	Klixon	7277-2- ³
21 MB22A	Ckt. Bkr. Telephone	Klixon	7277-2- ³
21 MC01B	Cigar Lighter	Mooney	800336-503
21 ME01A	Electric Clock	Borg Instr.	CA-7212
21 ME01B	Electric Clock (Opt.)	Borg Instr.	CA7616
21 NF01A	Ckt. Bkr.-Fuel Pump	Mooney	930023-11
21 NF02A	Fuel Pump	Dukes	1499-00-19
-----		(Mooney)	(610153-501)
21 PA01B	Ckt. Bkr.-Alt. Fld.	Klixon	7277-2-5
21 PA02C	Alternator	Lycoming	LW 15404
21 PA03C	Filter	Captor Corp.	A2637
21 PA04A	Ckt. Bkr.-Alternator	Mechanical Products	1648-001-70
21 PA05A	Capacitor	Sangamo	500-1041-01
21 PA06C	Voltage Regulator	Electro Delta	VR-415D
-----			(Replaces oeco 20082, VR414 & VR415)
21 PA07A	Plug-Volt. Regulator		MS3106A-18-4S
-----	/Cable Clamp		MS3057-10B
21 PA07B	Plug, Volt. Reg./	AMP	206060-1/
-----	Clamp		206062-1
21 PA08B	Recpt., Volt. Reg./	AMP	206153-1/
-----	Clamp		206062-1
21 PB01A	Battery (Alternate)	Gill	PS6-11
21 PB01B	Battery	Prestolite	R-35
21 PB02A	Relay-Battery	Cutler Hammer	6041-H-231
21 PB03A	Ckt. Bkr.-Aux. Bus.	Meriden or	AHW1-50

³ Amperage rating is determined by particular unit installed.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 RC30B -----	Ckt. Bkr. Pnl., Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC31A -----	Radio Pkg. Cable Recpt/ Clamp	AMP	206036-3/ 206070-1
21 RC33A -----	Pwr.-Flt. Panel Recpt/ Clamp	AMP	206207-1/ 206070-1
21 RC34B -----	Light Control Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC35B -----	Gear Control Recpt/ Clamp	AMP	206153-1/ 206062-1
21 RC38A -----	Recpt., ELT Switch/ Clamp	AMP	206153-1/ 206062-1
21 RC39A -----	Recpt., Overhead Lite (Rear)/Clamp	AMP	206153-1/ 206062-1
21 RC41A -----	Recpt, Glareshield/ Clamp	AMP	206153-1/ 206062-1
21 EW01B	Ckt. Bkr.-Gear Warning	Klixon or equivalent	7277-2-2
21 WE03C -----	Switch-Throttle /Actuator	Micro Micro	V3-1 JV-5
21 WE04A	Horn-Gear Up Warning	Mallory	SC628P
21 WE05A	Rectivier	Sarkes Tarzian	F4
21 WE06A -----	Light-Gear Position/ Bulb (1)	Sloan General Electric	855S-O-U 327
21 WE10A	Diode-Gear Horn	Sarkes Tarzian	F-4
21 WS01B -----	Ckt. Bkr. Stall Warning Horn	Klixon or equivalent	7277-2-2
21 WS02A	Horn-Pre-Stall Warning	Mallory	SC628
21 WS03A -----	Switch-Pre-Stall Warning	Safe Flight	C46001
21 WT02A	Ckt. Bkr. Annunciator	Klixon or equivalent	7277-2-2
21 WT03G -----	Annunciator/ Lamps (8 ea.)	Mooney Chicago Minature	880025-501/ CM7-7330
21 WT04A	Plug-Annunciator Panel	Molex	09-50-3121
21 WV01B	Ckt. Bkr.-Vac. Warn.	Klixon or equivalent	7277-2-2
21 WV02A -----	Switch-Vac. Warn.	Garwin (Mooney)	22-1280-04-1 (880012-501)
21 WW01A -----	Switch-Warn.-Ram Air /Actuator	Micro Micro	V3-1 JV-5

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PB03A	Ckt. Bkr.-Aux. Bus.	Mechanical Products	700-001-50
21 PB04B	Relay, Radio Master	Potter & Bromfield	MB 4413
21 PB05A	Switch-Master	Cutler Hammer	8911K828
21 PB06A	Ckt. Bkr.-Radio Relay	Mooney	930023-13
21 PB07C	Bus Bar-Main Flex #1		4
21 PB07D	Bus Bar-Main Flex #2		4
21 PB09F	Bus Bar-Aux. #1	Mooney	913127-23
21 PB09G	Gus Bar-Aux. #2	Mooney	913127-25
21 PB10C	Bus Bar-Main #1	Mooney	913127-19
21 PB11B	Bar-Main #2	Mooney	913127-19
21 PB12E	Bus Bar-Radio #3	Mooney	913127-19
			CUT TO SIZE
21 PB12F	Bus Bar-Radio #2	Mooney	913127-19
21 PB13B	Bus Bar-Radio #1	Mooney	913127-19
21 PB14B	Bus Bar-Radio #2	Mooney	913127-19
21 PB15A	Diode-Radio Master	Sarkes Tarzian	F-4
21 PB21A	Bus Bar-Radio Flex		4
			(Use 1 braid only)
21 PB22A	Diode, Master Relay	Sarkes Tarzian	F4
21 PB23A	Diode, Radio Relay	Sarkes Tarzian	F4
21 PL01B	Ckt. Bkr. Panel Plug/ Clamp	AMP	206150-1/ 206138-1
21 PL02A	Flt. Panel-#1 Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL03B	Electric Gear Plug	Mooney	930021-1
21 PL04B	Left Wing Plug	Mooney	930021-1
21 PL05B	Left Wing Stub Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL08A	Headliner Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL09A	Firewall Plug/ Clamp		MS3106A-22-14S/ MS3057-12B
21 PL11B	Flight Panel #2 Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL14B	Left Side Panel Plug	Mooney	930021-1
21 PL16B	Console Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL18B	Cluster Gauge Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL22B	Ckt. Bkr. Panel - Aux. Power Plug/Clamp	AMP	206037-2/ 206070-1
21 PL24C	Cabin-Tail Cone Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL25C	Right Wing Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL26B	Right Wing Nav Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL29A	Tail Plug/ Clamp	AMP	206060-1/ 206062-1

4 Manufacture using "Alpha Wire Co." #2172 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1980 (CONT.)

FOR SCHEMATIC 800330 E4

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PL29B	Plug, Empennage/	AMP	206708-1/
-----	Clamp (Alt)		206966-1
21 PL30B	Ckt. Bkr. Panel Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL31A	Radio Pkg. Cable Plug/	AMP	206037-1/
-----	Clamp		206070-1
21 PL33A	Plug, Pwr.-Flt. Panel/	AMP	206037-2/
-----	Clamp		206070-1
21 PL34B	Light Control Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL35B	Gear Control Plug/	AMP	206060-1/
-----	Clamp		206062-1
21 PL38A	Plug, ELT Switch/	AMP	206060-1/
-----	Clamp		206062-1
21 PL39A	Plug, Overhead Lite Rear/	AMP	206060-1/
-----	Clamp		206062-1
21 PL41A	Plug, Glareshield/	AMP	206060-1/
-----	Clamp		206062-1
21 PS01B	Ckt. Bkr.-Ignition	Klixon or equivalent	7277-2-10
21 PS03A/B	Solenoid-Starter	Prestolite	SAZ-4201E
21 PS04A	Starter	Prestolite	MZ4206
21 PS04A	Starter (Alternate)	Prestolite	MZ4218
21 PS04A	Starter (Alternate)	Prestolite	MZ4222
21 RC01B	Ckt. Bkr. Panel Recpt/	AMP	206151-1/
-----	Clamp		206138-1
21 RC02A	Flt. Panel #1 Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC03B	Electric Gear Recpt.	Mooney	930021-2
21 RC04B	Left Wing Recpt.	Mooney	930021-2
21 RC05B	Left Wing Stub Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC08A	Headliner Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC09A	Firewall Recpt./		MS3100A-22-14P/
-----	Clamp		MS3057-12B
21 RC11B	Flight Panel #2 Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC14B	Left Side Panel Recpt	Mooney	930021-2
21 RC16B	Console Recpt/	AMP	206705-2
-----	Clamp		206966-1
21 RC18B	Cluster Gauge Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC22B	Ckt. Bkr. Panel -		206036-2/
-----	Aux. Power Recpt./Clamp	AMP	206070-1
21 RC24C	Cabin-Tail Cone Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC25C	Right Wing Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC26B	Right Wing Stub Recpt/	AMP	206705-2/
-----	Clamp		206966-1
21 RC29A/B	Tail Receptacle/	AMP	206705-2/
-----	Clamp		206966-1

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF04A	Actuator-Flap	Commercial	
-----		Acft. Products	D14500-36
-----		(Mooney)	(750105-501)
21 CF05A	Switch-Limit-Take		
-----	Off Down	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF06A	Switch-Limit-Take		
-----	Off Up	Micro	V3-1
-----	/Actuator	Micro	JV-5
21 CF09B	Switch-Control, Flap	Cutler-Hammer	8906K3149
21 CT01A	Circuit Breaker-		
-----	Electric Trim	Mooney	930023-9
21 DA01C	Shunt	Empro or equivalent	MLA-60-100
21 DA02B	Fuse	McGraw-Edison	FM01-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA03B	Fuse	McGraw-Edison	FM02-5A
-----	/Retainer	McGraw-Edison	FHN42W
21 DA04A	Ammeter	Mooney	640281-509
21 DB02A	Circuit Breaker-T.C.	Klixon	7277-2-5
21 DB02A	Turn Coordinator	Aerosonic	ANS50M
21 DB03A	Plug, Turn Coordinator/	Standards	MS3106A-10SL-3S/
-----	Clamp		MS3057-4A(or 4B)
21 DC01B	Probe-Cyl. Head Temp.	Rochester	3080-00014
-----		(Mooney)	(880010-501)
21 DD01C	Gauge - O.A.T./EGT	B & D Instruments	0203-005
-----		(Mooney)	(880010-501)
21 DD02C	Plug/	AMP	205838-1
-----	Cable Clamp		206062-1
21 DD03C	Probe - O.A.T.	B & D Instruments	0203-100
-----		(Mooney)	(880004-501)
21 DD04A	C.B., O.A.T.	Klixon	7277-2-2
21 DF01A	Transmitter-Left		
-----	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter-Left		
-----	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter-Right		
-----	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter-Right		
-----	Outboard Fuel	Mooney	610243-1
21 DG01B	Ckt. Bkr. - Gauges	Klixon	7277-2-2
21 DG02G	Cluster Gauge - "J"	Mooney	640281-511
21 DH01B	Probe-Oil Temp.	Rochester	3080-37
-----		(Mooney)	(880009-501)
21 DJ01A	Transducer-Oil Press.	Rochester	3060-18
-----		(Mooney)	(880008-501)
21 DK01A	Transducer-Fuel Press.	Rochester	3060-17
-----		(Mooney)	(880007-501)
21 DK01C	Transducer, Fuel Flow		
-----	(Opt.)	Mooney	880030-501
21 DK02B	Gauge, Fuel Flow (Opt)	Mooney	880031-501

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 DK03B	Plug, Fuel Flow (Opt)	Bendix	PT06A-15-15S (SR)
21 DK05A	Switch (Opt)	Alco	MST215N
21 DL01C	Tachometer, Elec.	Mooney	880002-503
21 DL02A	Plug, Tachometer/ Clamp	Standard	MS3106A-14S-5S/ MS3057-6A
21 DM01A	Hour Meter	Mooney	880035-503
21 DP01A	Circuit Breaker- Heated Pitot	Mooney	930023-5
21 DP02B	Heated Pitot	Aero Instr. (AN5812)	PH502-12
21 DP03B	Plug - Heated Pitot		AN3115-1
21 DT01A	Probe - E.G.T.	B & D Instrument (Mooney)	0204-100 (880005-501)
21 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
21 EG02B	Switch-Control-Gear	Cutler Hammer	8906K2875
21 EG03A	Switch-Limit-Up /Actuator	Micro	DT-2R-A7 MCD-2711
21 EG04G	Actuator-Gear	Avionic Products	102000-1
21 EG05E	Relay-Gear Up	RBM	70-311221
21 EG06C	Switch-Safety-Airspeed	Mooney	880013-503 1 2
21 EG07A	Switch-Limit-Down	Micro	1CH1-6
21 EG08E	Relay-Gear Down	RBM	70-311221
21 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
21 EG10A	Switch-Override	Cutler Hammer	SB1DDX492-2
21 EG11A	Diode, Up-Relay	Sarkes Tarzian	F4
21 EG12A	Diode, Down-Relay	Sarkes Tarzian	F4
21 ELT1A	ELT (Alternate)	Aircraft Products	ALERT-50
21 ELT1A	ELT	Dorne & Margolin, Inc.	DM-ELT-6
21 ELT2A	Switch (Remote) (ELT) (Alt)	C & K	7201
21 ELT2A	Switch, Remote ELT	Dorne & Margolin, Inc.	DM-U65-121
21 JM01B	Switch-Magneto	Bendix Scintilla	10-357310-9
21 JM02B	Magneto-Dual	Bendix Scintilla	D4LN2021
21 LB01A	Circuit Breaker- Rotating Beacon	Mooney	930023-3
21 LB02A	Rotating Beacon /Adapter	Whelen	WRM-12
21 LC01A	Fuse-(5 Amp-3AG Slo-Blo)	Whelen	WRM-65
21 LC03D	Switch, Overhead Cabin Lite, (Fwd)	Littel Fuse	313005
21 LC03E	Switch-Overhead Cabin Lite, (Rear)	Littel Fuse	155020 or 155120
21 LC04B/C	Resistor-Dimming (10 Ohm-5W)	Carling	TILC 64-IS-WH-FN
21 LC11A	Lamp (F1-R)/ Holder	Carling	TILC 64-IS-WH-FN
21 LC12A	Lamp (F2-R)/ Holder	Dale	RH-10-5 OHM
		General Electric	1816
		Herman H. Smith	1930
		General Electric	1816
		Herman H. Smith	1930

1 Set for 75 MPH (+5.0) increasing actuation.
2.775" H₂₀ ± .384

2 Alternate L110-1-N-K3L (880013-501)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LC13A	Lamp (F1-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC14A	Lamp (F2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC15A	Lamp (R1-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC16A	Lamp (R2-R)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC17A	Lamp (R1-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LC18A	Lamp (R2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LL01B	Ckt. Bkr.-Ldg. Lt.	Mooney	930023-15
21 LL03A	Light-Landing	General Electric or equivalent	4522
-----		Mooney	930023-1
21 LN01A	Ckt. Bkr.-Nav Lts.		
21 LP01C	Circuit Breaker-		
-----	Instr. Lights	Klixon	7277-2-5
21 LP01D	Circuit Breaker-		
-----	Radio Lights	Klixon	7277-2-5
21 LP03A	Transistor Instr. Lites	RCA	2N2016
21 LP03C	Transistor-Radio Lites	RCA	2N2016
21 LP06A	Rheostat/Switch-Inst.		
-----	Lights	Allen-Bradley	JS1N056P251MA
21 LP06C	Rheostat/Switch-Radio		
-----	Lights	Allen-Bradley	JS1N056P251MA
21 LP13A	Fuse-Inst. Lights	McGraw-Edison	FM01-5A
-----	/Holder	McGraw-Edison	FHN42W
21 LP14A	Fuse-Radio Lights	McGraw-Edison	FM01-5A
-----	/Holder	McGraw-Edison	FHN42W
21 LP18E	Lights-Glareshield	Sloan	855S-9-I
-----	/Bulb (7 ea.)	General Electric	330
21 LP21A	Bulb-Compass Lt.	General Electric or equivalent	330
21 LP22B	Light - Console	Western Indicator Co.	501-61K-11K3BP
-----	/Lamp	Western Indicator Co.	WI-7046
21 LP25D	Resistor-Instr. Lites	Dale	RH-10-50 OHM
21 LP25E	Resistor-Radio Lites	Dale	RH-10-50 OHM
21 LP26A	Post Light-Manifold	Grimes/	A-8970B1/
-----	Press/Lamp	General Electric	330
21 LP27A	Post Light, Tachometer/	Grimes	A-8970B1/
-----	Lamp	General Electric	330
21 LP28A	Post Lite, Clock/	Grimes/	A8970B1/
-----	Lamp	General Electric	330
21 LP29A	Post Lite, O.A.T./	Grimes/	A8970B1/
-----	Lamp	General Electric	330
21 LP30A	Light Holder, Oxygen/	Sloan/	855S-O-U/
-----	Lamp	General Electric	330
21 LS01A	Circuit Bkt.-Strobe	Mooney	930023-7
-----	Lights		
21 LS02B	Power Supply Strobe	Symbolic Displays	701295-3A
-----	L. Wing	(Mooney)	(880018-501)
21 LS03B	Strobe Light, L. Wing	Symbolic Displays	70130A
-----		(Mooney)	(880021-501)

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LS03D	Cable Assy-Left Wing	Symbolic Displays	702000-3
-----	Strobe	(Mooney)	(880017-501)
21 LS04B	Power Supply Strobe,	Symbolic Displays	701295-3A
-----	R. Wing	(Mooney)	(880018-501)
21 LS04D	Cable Assy-Rt. Wing,	Symbolic Displays	70-2000-3
-----	Strobe	(Mooney)	(880017-501)
21 LS04E	Pwr. Supply, Rt. Wing	Mooney	880028-505 (Alt)
21 LS04F	Pwr. Supply, Rt. Wing	Mooney	880017-503 (Alt)
21 LS05B	Strobe Light - R. Wing	Symbolic Displays	701303A
-----		(Mooney)	(880021-502)
21 LS06A	Power Supply,Tail Strobe	Mooney	880018-501
21 LS06D	Cable, Tail Lite	Mooney	880017-507
21 LS07A	Strobe, Tail Light	Mooney	880020-501
21 MA01A	Receptacle		AN2552-3A
21 MA02A	Relay	Cole Hersee	24059
21 MA03A	Diode	Sarkes Tarzian	10H3N
21 MB01B	Ckt. Bkr. COM-I	Klixon or equivalent	7277-2- 
21 MB02B	Ckt. Bkr. NAV-I	Klixon or equivalent	7277-2- 
21 MB03B	Ckt. Bkr. COM-II	Klixon or equivalent	7277-2- 
21 MB04B	Ckt. Bkr. NAV-II	Klixon or equivalent	7277-2- 
21 MB05B	Ckt. Bkr. XPN	Klixon or equivalent	7277-2- 
21 MB06B	Ckt. Bkr. AUD	Klixon or equivalent	7277-2- 
21 MB07B	Ckt. Bkr. ADF	Klixon or equivalent	7277-2- 
21 MB08B	Ckt. Bkr. DME	Klixon or equivalent	7277-2- 
21 MB09B	Speaker	Mooney	810195-501
21 MB09C	Speaker	ARA	6707001
21 MB10A	Left Side-MIC-JAC-1	Switchcraft	C-128
-----	/Washers	Switchcraft	S-1028,S-1029
21 MB14A	L. Side-FONE-JAC-1	Switchcraft	C-11
21 MB16B	Ckt. Bkr.-Autopilot	Klixon or equivalent	7277-2- 
21 MB18A	Ckt. Bkr.-R-NAV	Klixon	7277-2- 
21 MB19A	Ckt. Bkr. HSI	Klixon	7277-2- 
21 MB20A	Ckt. Bkr. Encoder	Klixon	7277-2- 
21 MB21A	Ckt. Bkr. Fuel Flo	Klixon	7277-2- 
21 MB22A	Ckt. Bkr. Telefone	Klixon	7277-2- 
21 MB23A	Ckt. Bkr. VME	Klixon	7277-2- 
21 MB24A	Ckt. Bkr. - FONE	Klixon	7277-2- 
21 MB25A	Ckt. Bkr. - Inverter	Klixon	7277-2- 
21 MB26A	Ckt. Bkr. - RMI	Klixon	7277-2- 
21 MB28A	Ckt. Bkr. - WX Radar	Mooney	930023-21
21 MB32A	Ckt. Bkr. - Color WX		
-----	Radar	Mooney	930023-25
21 MC01B	Cigar Lighter	Mooney	800336-503
21 ME01A	Electric Clock	Borg Instr.	CA-7212
21 ME01B	Electric Clock (Opt)	Borg Instr.	CA7616
21 NF01A	Ckt. Bkr.-Fuel Pump	Mooney	930023-11
21 NF02B	Fuel Pump	Dukes	1499-00-19
-----		(Mooney)	(610153-501)
21 PA01B	Ckt. Bkr.-Alt. Fld.	Klixon	7277-2-5
21 PA02C	Alternator	Lycoming	LW 15404
21 PA03C	Filter	Captor Corp.	A2637
21 PA04A	Ckt. Bkr.-Alternator	Mechanical Products	1648-001-70
21 PA05A	Capacitor	Sangamo	500-1041-01

 Amperage rating is determined by particular unit installed.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
1 PA06B	Voltage Regulator	Electro Delta	VR-415D (Replaces Oeco 20082, VR414 & VR415)
1 PA07B	Plug, Volt. Reg./	AMP	206060-1/
-----	Clamp		206062-1
1 PA08B	Recpt. Volt. Reg./	AMP	206153-1/
-----	Clamp		206062-1
1 PB01A	Battery (Alternate)	Gill	PS6-11
1 PB01B	Battery	Prestolite	R-35
1 PB02A	Relay-Battery	Cutler Hammer	6041-H-231
1 PB03A	Ckt. Bkr.-Aux. Bus.	Meriden (or)	AHW1-50
1 PB03A	Ckt. Bkr.-Aux. Bus.	Mechanical Products	700-001-50
1 PB04B	Relay, Radio Master	Potter & Bromfield	MB 4413
1 PB05A	Switch-Master	Cutler Hammer	8911K828
1 PB06A	Ckt. Bkr.-Radio Relay	Mooney	930023-13
1 PB07C	Bus Bar-Main Flex #1		4
1 PB07D	Bus Bar-Main Flex #2		4
1 PB09H	Bus Bar-Aux. #1	Mooney	913127-27
1 PB09J	Bus Bar-Aux #2	Mooney	913127-29
1 PB10C	Bus Bar-Main #1	Mooney	913127-19
1 PB11B	Bar-Main #2	Mooney	913127-19
1 PB12B	Bus Bar-Radio #3	Mooney	913127-19
1 PB13B	Bus Bar-Radio #1	Mooney	913127-19
1 PB14B	Bus Bar-Radio #2	Mooney	913127-19
1 PB14C	Bus Bar-Radio #3	Mooney	913127-19
1 PB15A	Diode-Radio Master	Sarkes Tarzian	F-4
1 PB21A	Bus Bar-Radio Flex		4
			(Use 1 braid only)
1 PB22A	Diode, Master Relay	Sarkes Tarzian	F-4
1 PB23A	Diode, Radio Relay	Sarkes Tarzian	F-4
1 PB24A	Shunt-Radio Relay	Kulka	600RJ-2
1 PB25A	Shunt-Radio Relay	Kulka	600RJ-2
1 PL01B	Ckt. Bkr. Panel Plug/	AMP	206150-1/
-----	Clamp		206138-1
1 PL02B	Flt. Panel-#1 Plug	Mooney	930021-505
1 PL03B	Electric Gear Plug	Mooney	930021-1
1 PL04B	Left Wing Plug	Mooney	930021-1
1 PL05C	Left Wing Stub Plug	Mooney	930021-1
1 PL08A	Headliner Plug/	AMP	206037-1/
-----	Clamp		206070-1
1 PL09A	Firewall Plug/		MS3106A-22-14S/
-----	Clamp		MS3057-12B
1 PL11B	Flight Panel #2 Plug/	AMP	206708-1/
-----	Clamp		206966-1
1 PL14C	Left Side Panel Plug	Mooney	930021-501
1 PL16A	Console Plug	AMP	206037-1
1 PL18B	Cluster Gauge Plug/	AMP	206708-1/
-----	Clamp		206966-1
1 PL22B	Ckt. Bkr. Panel -	AMP	206037-2/
-----	Aux. Power Plug/Clamp		206070-1

4 Manufacture using "Alpha Wire Co." #2171 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PL24C	Cabin-Tail Cone Plug/	AMP	206037-1/
-----	Clamp		206070-1
21 PL25C	Right Wing Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL26B	Right Wing Nav Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL29A	Tail Plug/	AMP	206060-1/
-----	Clamp		206062-1
21 PL29B	Plug, Empennage/	AMP	206708-1/
-----	Clamp (Alt)		206966-1
21 PL30B	Ckt. Bkr. Panel Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL31A	Radio Pkg. Cable Plug/	AMP	206037-1/
-----	Clamp		206070-1
21 PL33A	Pwr.-Flt. Panel Plug/	AMP	206037-2/
-----	Clamp		206070-1
21 PL34B	Light Control Plug/	AMP	206708-1/
-----	Clamp		206966-1
21 PL35B	Gear Control Plug/	AMP	206060-1/
-----	Clamp		206062-1
21 PL37A	Plug, Vac. Warn/	AMP	206060-1/
-----	Clamp		206062-1
21 PL38A	Plug, ELT Switch/	AMP	206060-1/
-----	Clamp		206062-1
21 PL39A	Plug, Overhead Lite Rear/	AMP	206060-1/
-----	Clamp		206062-1
21 PL41A	Plug, Glareshield/	AMP	206060-1/
-----	Clamp		206062-1
21 PL42A	Plug, Hour Meter/	AMP	206060-1/
-----	Clamp		206062-1
21 PL53C	Plug, Main Cable/	AMP	206037-1/
-----	Clamp		206070-1
21 PS01B	Ckt. Bkr.-Ignition	Klixon or equivalent	7277-2-10
21 PS03A/B	Solenoid-Starter	Prestolite	SAZ-4201E
21 PS04A	Starter	Prestolite	MZ4206
21 PS04A	Starter (Alternate)	Prestolite	MZ4218
21 PS04A	Starter (Alternate)	Prestolite	MZ4222
21 RC01B	Ckt. Bkr. Panel Recpt/	AMP	206151-1/
-----	Clamp		206138-1
21 RC02A	Flt. Panel #1 Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC03B	Electric Gear Recpt.	Mooney	930021-2
21 RC04B	Left Wing Recpt.	Mooney	930021-2
21 RC05C	Left Wing Stub Recpt/	Mooney	930021-2
-----	Clamp		
21 RC08A	Headliner Recpt/	AMP	206036-3/
-----	Clamp		206070-1
21 RC09A	Firewall Rept/		MS3100A-22-14P/
-----	Clamp		MS3057-12B
21 RC11B	Flight Panel #2 Recpt/	AMP	206705-2/
-----	Clamp		206966-1

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 RC14C	Left Side Panel Recpt	Mooney	930021-502
21 RC16A	Console Recpt/ Clamp	AMP	206036-3 206670-1
21 RC18B	Cluster Gauge Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC22B	Ckt. Bkr. Panel - Aux. Power Recpt/Clamp	AMP	206036-2/ 206070-1
21 RC24C	Cabin - Tail Cone Recpt/ Clamp	AMP	206036-3/ 206070-1
21 RC25C	Right Wing Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC26B	Right Wing Stub Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC29B	Tail Receptacle/ Clamp	AMP	206705-2/ 206966-1
21 RC30B	Ckt. Bkr. Pnl., Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC31A	Radio Pkg. Cable Recpt/ Clamp	AMP	206036-3/ 206070-1
21 RC33A	Pwr.-Flt. Panel/Recpt/ Clamp	AMP	206207-1/ 206070-1
21 RC34B	Light Control Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC35B	Gear Control Recpt/ Clamp	AMP	206153-1/ 206062-1
21 RC37A	Recpt., Vac. Warn. Clamp	AMP	206153-1/ 206062-1
21 RC38A	Recpt., ELT Switch/ Clamp	AMP	206153-1/ 206062-1
21 RC39A	Recpt., Overhead Lite (Rear)/Clamp	AMP	206153-1/ 206062-1
21 RC41A	Recpt., Glareshield/ Clamp	AMP	206153-1/ 206062-1
21 RC42A	Recpt., Hour Meter Clamp	AMP	206153-1/ 206062-1
21 RC53C	Recpt., Main Cable Ground/Clamp	AMP	206705-2/ 206966-1
21 WE01B	Ckt. Bkr.-Gear Warning	Klixon or equivalent	7277-2-2
21 WE03C	Switch-Throttle /Actuator	Micro Micro	V3-1 JV-5
21 WE04A	Horn-Gear Up Warning	Mallory	SC628P
21 WE05A	Rectifier	Sarkes Tarzian	F4
21 WE06A	Light-Gear Position/ Bulb (1)	Sloan General Electric	855S-O-U 327
21 WE10A	Diode-Gear Horn	Sarkes Tarzian	F-4
21 WS01B	Ckt. Bkr. Stall Warning Horn	Klixon or equivalent	7277-2-2
21 WS02A	Horn-Pre-Stall Warning	Mallory	SC628
21 WS03A	Switch-Pre-Stall Warning	Safe Flight	C46001
21 WT02A	Ckt. Bkr. Annunciator	Klixon or equivalent	7277-2-2

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1981 (CONT.)

FOR SCHEMATIC 800330 E5

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 WT03G -----	Annunciator/ Lamps (8 ea.)	Mooney Chicago Minature	880025-501 CM7-7330
21 WT04A	Plug-Annunciator Panel	Molex	09-50-3121
21 WV01B	Ckt. Bkr.-Vac. Warn.	Klixon or equivalent	7277-2-2
21 WV02A -----	Switch-Vac. Warn.	Garwin (Mooney)	22-1280-04-1 (880012-501)
21 WW01A -----	Switch-Warn. - Ram Air /Actuator	Micro Micro	V3-1 JV-5

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FOR SCHEMATIC 800330 E6

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF04A	Actuator-Flap	Commercial	
-----		Acft. Products	D14500-36
-----		(Mooney)	(750105-501)
21 CF05A	Switch-Limit-Take		
-----	Off Down	Micro	V3L-3 
-----	/Actuator	Micro	JV-5
21 CF06A	Switch-Limit-Take		
-----	Off Up	Micro	V3L-3 
-----	/Actuator	Micro	JV-5
21 CF09B	Switch-Control, Flap	Cutler-Hammer	8906K3149
21 CT01B	CB, Electric Trim	Mooney	930023-109
21 DA01C	Shunt	Empco or equivalent	MLA-60-100
21 DA04A	Ammeter	Mooney	640281-509
21 DB01B	CB, Turn Coord	Klixon	7277-2-5
21 DB02A	Circuit Breaker-T.C.	Klixon	7277-2-5
21 DB02A	Turn Coordinator	Aerosonic	ANS50M
21 DB03A	Plug, Turn Coordinator/	Standards	MS3106A-10SL-3S/
-----	Clamp		MS3057-4A(or 4B)
21 DC01B	Probe-Cyl. Head Temp.	Rochester	3080-00014
-----		(Mooney)	(880010-501)
21 DD01C	Gauge - O.A.T./EGT	B & D Instruments	0203-005
-----		(Mooney)	(880010-501)
21 DD02C	Plug/	AMP	205838-1
-----	Cable Clamp		206062-1
21 DD03C	Probe - O.A.T.	B & D Instruments	0203-100
-----		(Mooney)	(880004-501)
21 DD04A	C.B., O.A.T.	Klixon	7277-2-2
21 DF01A	Transmitter - Left		
-----	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter-Left		
-----	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter - Right		
-----	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter-Right		
-----	Outboard Fuel	Mooney	610243-1
21 DG01B	Ckt. Bkr. - Gauges	Klixon	7277-2-2
21 DG02G	Cluster Gauge - "J"	Mooney	640281-511
21 DH01B	Probe-Oil Temp.	Rochester	3080-37
-----		(Mooney)	(880009-501)
21 DJ01A	Transducer-Oil Press.	Rochester	3060-18
-----		(Mooney)	(880008-501)
21 DK01A	Transducer-Fuel Press.	Rochester	3060-17
-----		(Mooney)	(880007-501)
21 DK01C	Transducer, Fuel Flow		
-----	(Opt.)	Mooney	880030-501
21 DK02B	Gauge, Fuel Flow (Opt.)	Mooney	880031-501
21 DK03B	Plug, Fuel Flow (Opt.)	Bendix	PT06A-15-15S (SR)
21 DK05A	Switch (Opt.)	Alco	MST215N
21 DL01C	Tachometer, Elec.	Mooney	880002-503

 Alternate for V3L-3 is V3-1 switch with JV-5 actuator.

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1982

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ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 DL02A	Plug, Tachometer/ Clamp	Standard	MS3106A-14S-5S/ MS3057-6A
21 DM01B	Hour Meter	Mooney	880035-503
21 DP01B	CB Pitot Heat	Mooney	930023-105
21 DP02B	Heated Pitot	Aero Instr. (AN5812)	PH502-12
21 DP03B	Plug - Heated Pitot		AN3115-1
21 DT01A	Probe - E.G.T.	B & D Instrument (Mooney)	0204-101 (880005-501)
21 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
21 EG02B	Switch-Control-Gear	Cutler Hammer	8906K2875
21 EG03A	Switch-Limit-Up /Actuator	Micro Micro	DT-2R-A7 MCD-2711
21 EG04G	Actuator-Gear	Avionic Products	102000-2
21 EG05E	Relay-Gear Up	RBM	70-311221
21 EG06C	Switch-Safety-Airspeed	Mooney	880013-503
21 EG07A	Switch - Limit-Down	Micro	1CH1-6
21 EG08E	Relay-Gear Down	RBM	70311221
21 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
21 EG10A	Switch-Override	Cutler Hammer	SB1DDX492-2
21 EG11A	Diode, Up-Relay	Sarkes Tarzian	F-4
21 EG12A	Diode, Down-Relay	Sarkes Tarzian	F-4
21 ELT1A	ELT (Alternate)	Aircraft Products	ALERT-50
21 ELT1A	ELT	Dorne & Margolin, Inc	DM-ELT-6
21 ELT2A	Switch(Remote) (ELT) (ALT)	C & K	7201
21 ELT2A	Switch, Remote ELT	Dorne & Margolin, Inc.	DM-U65-121
21 JM01B	Switch-Magneto	Bendix Scintilla	10-357310-9
21 JM02B	Magneto-Dual	Bendix Scintilla	D4LN2021
21 LB01B	CB, Rotating Beacon	Mooney	930023-103
21 LB02A	Rotating Beacon /Adapter	Whelen Whelen	WRM-12 WRM-65
21 LC01A	Fuse-(5 Amp-3AG Slo-Blo)	Littel Fuse	313005
21 LC04B/C	Retainer Resistor-Dimming (10 Ohm-5W)	Littel Fuse Dale	155020 or 155120 RH-10-5 OHM
21 LC11A	Lamp (F1-R)/ Holder	General Electric Herman H. Smith	1816 1930
21 LC12A	Lamp (F2-R)/ Holder	General Electric Herman H. Smith	1816 1930
21 LC13A	Lamp (F1-L)/ Holder	General Electric Herman H. Smith	1816 1930
21 LC14A	Lamp (F2-L)/ Holder	General Electric Herman H. Smith	1816 1930
21 LC15A	Lamp (R1-R)/ Holder	General Electric Herman H. Smith	1816 1930
21 LC16A	Lamp (R2-R)/ Holder	General Electric Herman H. Smith	1816 1930
21 LC17A	Lamp (R1-L)/ Holder	General Electric Herman H. Smith	1816 1930

① Set for 75 MPH (+5.0) increasing actuation.
2.775" H₂₀ ± :³⁸⁴/₃₅₈

△2 Alternate L110-1N-K3L (880013-501)

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ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LC18A	Lamp (R2-L)/	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LL01C	CB, Landing Light	Mooney	930023-115
21 LL03A	Light-Landing	General Electric or equivalent	4522
-----		Mooney	930023-101
21 LN01B	CB, Position Lights		
21 LP01C	Circuit Breaker -	Klixon	7277-2-5
-----	Instr. Lights		
21 LP01D	Circuit Breaker-	Klixon	7277-2-5
-----	Radio Lights	Sloan	855S-9-I
21 LP18E	Lights-Glareshield	General Electric	330
-----	/Bulb (7 ea.)	General Electric or equivalent	330
21 LP21A	Bulb-Compass Lt.		
-----		Dialight/	270-1930-0171-702
21 LP22C	Light Holder Flap-	General Electric	370
-----	Trim 1 Lamp	Littell	15502 or 155120
21 LP24B	Fuse Holder Fuse,		313001
-----	Map Light	Grimes/	A-8970B1/
21 LP26A	Post Light-Manifold	General Electric	330
-----	Press/Lamp	Grimes	A-8970B1/
21 LP27A	Post Light, Tachometer/	General Electric	330
-----	Lamp	Grimes/	A8970B1
21 LP28A	Post Lite, Clock/	General Electric	330
-----	Lamp	Grimes/	A8970B1/
21 LP29A	Post Lite, O.A.T./	General Electric	330
-----	Lamp	Sloan/	855S-O-U/
21 LP30A	Light Holder, Oxygen/	General Electric	330
-----	Lamp	Grimes	A-8970B1
21 LP32A	Post Lite	Grimes	A-8970B1
21 LP34A	Post Lite	Grimes	A-8970B1
21 LP35A	Post Lite	Grimes	A-8970B1
21LP36A	Lamp, Cluster #1	G.E.	330 (Aviation Blue)
21LP37A	Lamp, Cluster #2	G.E.	330 (Aviation Blue)
21LP38A	Lamp, Cluster #3	G.E.	330 (Aviation Blue)
21LP39A	Lamp, Cluster #4	G.E.	330 (Aviation Blue)
21LP40A	Lamp, Cluster #5	G.E.	330 (Aviation Blue)
21 LS01B	CB, Strobe Light	Mooney	930023-107
21 LS02B	Power Supply Strobe	Symbolic Displays	701295-3A
-----	L. Wing	(Mooney)	(880018-501)
21 LS03B	Strobe Light, L. Wing	Sybmolic Displays	70130A
-----		(Mooney)	(880021-501)
21 LS03D	Cable Assy-Left Wing	Symbolic Displays	702000-3
-----	Strobe	(Mooney)	(880017-501)
21 LS04B	Power Supply Strobe,	Symbolic Displays	701295-3A
-----	R. Wing	(Mooney)	(880018-501)
21 LS04D	Cable Assy-Rt. Wing,	Symbolic Displays	70-2000-3
-----	Strobe	(Mooney)	(880017-501)
21 LS05B	Strobe Light - R. Wing	Symbolic Displays	701303A
-----		(Mooney)	(880021-502)
21 LS06A	Power Supply,Tail Strobe	Mooney	880018-501
21 LS06D	Cable, Tail Lite	Mooney	880017-507
21 LS07A	Strobe, Tail Light	Mooney	880020-501
21 MA01A	Receptacle		AN2552-3A
21 MA02A	Relay	Cole Hersee	24059
21 MA03A	Diode	Sarkes Tarzian	10H3N

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ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 MB01B	Ckt. Bkr. COM-I	Klixon or equivalent	7277-2- ³
21 MB02B	Ckt. Bkr. NAV-I	Klixon or equivalent	7277-2- ³
21 MB03B	Ckt. Bkr. COM-II	Klixon or equivalent	7277-2- ³
21 MB04B	Ckt. Bkr. NAV-II	Klixon or equivalent	7277-2- ³
21 MB05B	Ckt. Bkr. XPN	Klixon or equivalent	7277-2- ³
21 MB06B	Ckt. Bkr. AUC	Klixon or equivalent	7277-2- ³
21 MB07B	Ckt. Bkr. ADF	Klixon or equivalent	7277-2- ³
21 MB08B	Ckt. Bkr. DME	Klixon or equivalent	7277-2- ³
21 MB09C	Speaker	ARA	6707001
21 MB10A	Left Side-MIC-JAC-1	Switchcraft	C-128
-----	/Washers	Switchcraft	S-1028,S-1029
21 MB14A	L. Side-FONE-JAC-1	Switchcraft	C-11
21 MB16B	Ckt. Bkr. - Autopilot	Klixon or equivalent	7277-2- ³
21 MB18A	Ckt. Bkr.-R-NAV	Klixon	7277-2- ³
21 MB19A	Ckt. Bkr. HSI	Klixon	7277-2- ³
21 MB20A	Ckt. Bkr. Encoder	Klixon	7277-2- ³
21 MB21A	Ckt. Bkr. Fuel Flo	Klixon	7277-2- ³
21 MB22A	Ckt. Bkr. Telefone	Klixon	7277-2- ³
21 MB23A	Ckt. Bkr. VME	Klixon	7277-2- ³
21 MB24A	Ckt. Bkr. - FONE	Klixon	7277-2- ³
21 MB25A	Ckt. Bkr. - Inverter	Klixon	7277-2- ³
21 MB26A	Ckt. Bkr. - RMI	Klixon	7277-2- ³
21 MB28B	CB, WX Radar	Mooney	930023-121
21 MB33A	CB, Radio Blower	Klixon	7277-2-1 ³
21 MB34A	Assy, Radio Blower	King	KA20
21 MB35A	CB, Stereo	Klixon	7277-2- ³
21 MB36A	CB, Alt Servo	Klixon	7277-2- ³
21 MB37A	CB, Alt Select	Klixon	7277-2- ³
21 MB38A	CB, Converter	Klixon	7277-2- ³
21 MC01B	Cigar Lighter	Mooney	800336-503
21 ME01A	Electric Clock	Borg Instr.	CA-7212
21 ME01B	Electric Clock (Opt.)	Borg Instr.	CA7616
21 NF01B	CB, Fuel Pump-Lo	Mooney	930023-117
21 NF02B	Fuel Pump	Dukes	1499-00-19
-----		(Mooney)	(610153-501)
21 PA02C	Alternator	Lycoming	LW 15404
21 PA04B	CB, Alt. Output	E.T.A.	41-3-514-LN2-70
21 PA05A	Capacitor	Sangamo	500-1041-01
21 PA06B	Voltage Regulator	Electro Delta	VR-415D/880016-501
		(Mooney)	(Replaces Oeco 20082, VR414 & VR415)
21 PA07B	Plug, Volt. Reg./	AMP	206060-1/
-----	Clamp		206062-1
21 PA08B	Recpt. Volt. Reg./	AMP	206153-1/
-----	Clamp		206062-1
21 PB01A	Battery (Alternate)	Gill	PS6-11
21 PB01B	Battery	Prestolite	R-35
21 PB02A	Relay-Battery	Cutler Hammer	6041-H-231
21 PB03B	CB, Aux. Power	E.T.A.	41-3-514-LN2-50

³ Amperage rating is determined by particular unit installed.

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ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PB04B	Relay, Radio Master	Potter & Bromfield	MB 4413
21 PB05A	Switch-Master	Cutler Hammer	8911K828
21 PB06B	CB, Radio Master	Mooney	930023-113
21 PB07D	Bus Bar-Main Flex #2		4
21 PB07E	Bus Bar-Main Power	Mooney	4
21 PB07F	Bus Bar-Main Power	Mooney	4
21 PB07G	Bus Bar-Main Power	Mooney	4
21 PB09H	Bus Bar-Aux. #1	Mooney	913127-27
21 PB09J	Bus Bar-Aux #2	Mooney	913127-29
21 PB10C	Bus Bar-Main #1	Mooney	913127-19
21 PB11B	Bar-Main #2	Mooney	913127-19
21 PB12B	Bus Bar-Radio #3	Mooney	913127-19
21 PB13B	Bus Bar-Radio #1	Mooney	913127-19
21 PB14B	Bus Bar-Radio #2	Mooney	913127-19
21 PB14C	Bus Bar-Radio #3	Mooney	913127-19
21 PB15A	Diode-Radio Master	Sarkes Tarzian	F-4
21 PB21A	Bus Bar-Radio Flex		4
			(Use 1 Braid only)
21 PB22A	Diode, Master Relay	Sarkes Tarzian	F-4
21 PB23A	Diode, Radio Relay	Sarkes Tarzian	F-4
21 PB24A	Shunt-Radio Relay	Kulka	600RJ-2
21 PB25A	Shunt-Radio Relay	Kulka	600RJ-2
21 PB26A	CB-Bat Power	E.T.A.	41-3-514-LN2-70
21 PB27A	Bus Bar Main Power	Mooney	913127-031
21 PB28A	Diode	Sarkes Tarzian	F-4
21 PG01A	Generator, Standby	Electro Mech	8012
21 PG02A	Fuse Holder/ (Fuse C15A Slo-Blo)	Littel	155020 or 155120
21 PG03A	Plug-Regulator/ Cable Clamp	Littel	MS3106A-18-1S MS3057-10A or B
21 PG04A	Voltage Regulator	Electro Mech	2073-2
21 PG05A	CB-Standby Gen.	Klixon	7277-2-15
21 PG06A	Relay-Bus Switching/ Socket	Leach	JD1B/ 50-1049-8309
21 PG07A	Relay-Control Socket	Magnacraft	W67CSX-2/ 70-303
21 PG08A	Light - On/Lamp	Western Indicator	501-61K-11K-3BP/ WI-7046
21PG09A	Light - O.V./Lamp	Western Indicator	501-61K-11K-3BP/ WI-7046
21 PG10A	Diode-On Light	Sarkes Tarzian	F-4
21 PG11A	Diode - O.V. Light	Sarkes Tarzian	F-4
21 PG12A	Receptacle Cable Clamp	AMP	206153-1/ 206062-1
21 PG13A	Plug/Cable Clamp	AMP	206060-1/ 206062-1

4 Manufacture using "Alpha Wire Co." #2171 tubular braid (or equivalent) and "Amp" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

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ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PG14A	Diode	Sarkes Tarzian	F-4
21 PL02B	Flt. Panel-#1 Plug	Mooney	930021-505
21 PL03B	Electric Gear Plug	Mooney	930021-1
21 PL04B	Left Wing Plug	Mooney	930021-1
21 PL05C	Left Wing Stub Plug	Mooney	930021-1
21 PL08A	Headliner Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL09A	Firewall Plug/ Clamp		MS3106A-22-14S/ MS3057-12B
21 PL14C	Left Side Panel Plug	Mooney	930021-501
21 PL16A	Console Plug	AMP	206037-1
21 PL18A	Cluster Gage/ Cable Clamp - Plug	AMP	206070-1/ 206037-1
21 PL18B	Cluster Gauge Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL22B	Ckt. Bkr. Panel - Aux. Power Plug/Clamp	AMP	206037-2/ 206070-1
21 PL24C	Cabin-Tail Cone Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL25C	Right Wing Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL26B	Right Wing Nav Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL29B	Plug, Empennage/ Clamp (Alt)	AMP	206708-1/ 206966-1
21 PL30A	CB, Pnl.-Opt/ Cable Clamp	AMP	206070-1/ 206037-1
21 PL31A	Radio Pkg. Cable Plug/ Clamp	AMP	206037-1/ 206070-1
21 PL33A	Pwr.-Flt. Panel Plug/ Clamp	AMP	206037-2/ 206070-1
21 PL34B	Light Control Plug/ Clamp	AMP	206708-1/ 206966-1
21 PL35B	Gear Control Plug/ Clamp	AMP	206060-1/ 206062-1
21 PL37A	Plug, Vac. Warn/ Clamp	AMP	206060-1/ 206062-1
21 PL38A	Plug, ELT Switch/ Clamp	AMP	206060-1/ 206062-1
21 PL39A	Plug, Overhead Lite Rear/Clamp	AMP	206060-1/ 206062-1
21 PL41A	Plug, Glareshield/ Clamp	AMP	206060-1/ 206062-1
21 PL42A	Plug, Hour Meter/ Clamp	AMP	206060-1/ 206062-1
21 PL53C	Plug, Main Cable/ Clamp	AMP	206708-1/ 206966-1
21 PL59A	Avionics Dimmer Cable Clamp/Receptacle	AMP	206070-1/ 206037-1
21 PS01B	Ckt. Bkr.-Ignition	Klixon or equivalent	7277-2-10
21 PS03A/B	Solenoid-Starter	Prestolite	SAZ-4201E

MOONEY M20 SERIES SERVICE & MAINTENANCE MANUAL

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1982

FOR SCHEMATIC 800330 E6

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PS04A	Starter	Prestolite	MZ4206
21 RC01B	Ckt. Bkr. Panel Recpt/ Clamp	AMP	206151-1/ 206138-1
21 RC02B	Flight Panel Cable Clamp/Receptacle	Mooney	930021-506
21 RC03B	Electric Gear Recpt.	Mooney	930021-2
21 RC04B	Left Wing Recpt.	Mooney	930021-2
21 RC05C	Left Wing Stub Recpt/ Clamp	Mooney	930021-2
21 RC08A	Headliner Recpt/ Clamp	AMP	206036-3/ 206070-1
21 RC09A	Firewall Rept/ Clamp		MS3100A-22-14P/ MS3057-12B
21 RC11B	Flight Panel #2 Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC14C	Left Side Panel Recpt	Mooney	930021-502
21 RC16A	Console Recpt/ Clamp	AMP	206036-3 206670-1
21 RC18A	Cluster Gauge Cable Clamp/Receptacle	AMP	206070-1/ 206036-1
21 RC22B	Ckt. Bkr. Panel - Aux. Power Recpt/Clamp	AMP	206036-2/ 206070-1
21 RC24C	Cabin - Tail Cone Recpt/Clamp	AMP	206036-3/ 206070-1
21 RC25C	Right Wing Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC26B	Right Wing Stub Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC29B	Tail Receptacle/ Clamp	AMP	206705-2/ 206966-1
21 RC30A	CB, Pnl. Cable Clamp Receptacle	AMP	206070-1/ 206036-1
21 RC31A	Radio Pkg. Cable Recpt/ Clamp	AMP	206036-3/ 206070-1
21 RC33A	Pwr.-Flt. Panel/Recpt/ Clamp	AMP	206207-1/ 206070-1
21 RC34B	Light Control Recpt/ Clamp	AMP	206705-2/ 206966-1
21 RC35B	Gear Control Recpt/ Clamp	AMP	206153-1/ 206062-1
21 RC37A	Recpt., Vac. Warn. Clamp	AMP	206153-1/ 206062-1
21 RC38A	Recpt., ELT Switch/ Clamp	AMP	206153-1/ 206062-1
21 RC39A	Recpt., Overhead Lite (Rear)/Clamp	AMP	206153-1/ 206062-1
21 RC41A	Recpt., Glareshield/ Clamp	AMP	206153-1/ 206062-1
21 RC42A	Recpt., Hour Meter Clamp	AMP	206153-1/ 206062-1

MOONEY M20 SERIES SERVICE & MAINTENANCE MANUAL

ELECTRICAL SYSTEM HARDWARE CHART, M20 SERIES, 1982 FOR SCHEMATIC 800330 E6

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 RC53C	Recpt., Main Cable	AMP	206705-2/
-----	Ground/Clamp		206966-1
21 RC59A	Avionics Dimmer Cable	AMP	206070-1/
-----	Receptacle		206036-316
21 WE01B	Ckt. Bkr.-Gear Warning	Klixon or equivalent	7277-2-2
21 WE03C	Switch-Throttle	Micro	V3L-3 
-----	/Actuator	Micro	JV-5
21 WE04A	Horn-Gear Up Warning	Mallory	SC628P
21 WE05A	Rectifier	Sarkes Tarzian	F-4
21 WE06A	Light-Gear Position/	Sloan	855S-O-U
-----	Bulb (1)	General Electric	327
21 WE10A	Diode-Gear Horn	Sarkes Tarzian	F-4
21 WS01B	Ckt. Bkr. Stall Warning		
-----	Horn	Klixon or equivalent	7277-2-2
21 WS02A	Horn-Pre-Stall Warning	Mallory	SC628
21 WS03A	Switch-Pre-Stall		
-----	Warning	Safe Flight	C46001
21 WT02A	Ckt. Bkr. Annunciator	Klixon or equivalent	7277-2-2
21 WT03G	Annunciator/	Mooney	880025-501
-----	Lamps (8 ea.)	Chicago Minature	CM7-7330
21 WT04A	Plug-Annunciator Panel	Molex	09-50-3121
21 WV01B	Ckt. Bkr.-Vac. Warn.	Klixon or equivalent	7277-2-2
21 WV02A	Switch-Vac. Warn.	Garwin	22-1280-04-1
-----		(Mooney)	(880012-501)
21 WW01A	Switch-Warn.-Ram Air	Micro	V3-1
-----	/Actuator	Micro	JV-5

 Alternate for V3L-3 is V3-1 switch with JV-5 actuator.

MOONEY M20 SERIES ELECTRICAL SYSTEM

ELECTRICAL SYSTEM HARDWARE CHART, M20J S/N 24-1418 thru
for SCHEMATIC 800330 E7

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 CF01B	Circuit Breaker-Flap	Klixon or equivalent	7277-2-5
21 CF04A	Actuator-Flap	Mooney	750105-501
21 CF05A	Switch-Limit, Down	Micro	V3-1
-----	Actuator	Micro	JV-5
21 CF06A	Switch-Limit, Up	Micro	V3-1
-----	Actuator	Micro	JV-5
21 CF09B	Switch-Control, Flap	Cutler-Hammer	8906K3149
21 CT01B	CB, Electric Trim	Mooney	930023-109
21 DA01C	Shunt	Empro or equivalent	MLA-60-100
21 DA02B	Fuse	McGraw-Edison	FM01-5A
-----	Retainer		FHN 42 W
21 DA03B	Fuse	McGraw-Edison	FM01-5A
-----	Retainer		FHN 42 W
21 DA04A	Ammeter	Mooney	640281-509
-----	Bulb	Rochester	0153500003
21 DB01B	CB, Turn Coordinator	Klixon	7277-2-5
21 DB02B	Turn Coordinator	Aerosonic	ANS50ML
21 DB03A	Plug, Turn Coordinator	Standards	MS3106A-10SL-3S
-----	Clamp		MS3057-4A(or 4B)
21 DC01C	Probe-Cyl, Head Temp.	Mooney	880010-503
21 DD01E	Gauge-O.A.T./E.G.T.	Mooney	880001-505
21 DD02C	Plug, O.A.T./E.G.T.	AMP	205838-1
-----	Clamp	AMP	206062-1
21 DD03C	Probe - O.A.T.	Mooney	880004-501
21 DD04A	C.B., O.A.T./E.G.T.	Klixon	7277-2-2
21 DF01A	Transmitter - Left		
	Inboard Fuel	Mooney	610242-1
21 DF02A	Transmitter - Left		
	Outboard Fuel	Mooney	610243-3
21 DF03A	Transmitter - Right		
	Inboard Fuel	Mooney	610242-1
21 DF04A	Transmitter - Right		
	Outboard Fuel	Mooney	610243-1

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ELECTRICAL SYSTEM HARDWARE CHART, M20J S/N 24-1418 thru

(CONT.)

FOR SCHEMATIC 800330 E7

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 DG01B	C.B., Cluster Gauge	Klixon	7277-2-2
21 DG02J	Cluster Gage	Mooney	640281-519
-----	Fuel Quantity, L.H.	Mooney	640281-163
-----	Fuel Quantity, R.H.	Mooney	640281-165
-----	Fuel Press.	Mooney	640281-167
-----	Oil Press	Mooney	640281-171
-----	Oil Temp.	Mooney	640281-133
-----	Cyl. Temp.	Mooney	640281-135
21 DH01B	Probe-Oil Temp.	Mooney	880009-501
-----	Washer		AN900-10 or MS35769-11
21 DJ01B	Transducer-Oil Press.	Mooney	880046-501
21 DJ02B	Plug, Transducer-Oil Press.		MD3106A10SL-3S
-----	Clamp		MS3057-4A
21 DK01D	Transducer-Fuel Press.	Mooney	800045-501
21 DK01E	Transducer, Fuel Flow (Opt.)	Mooney	880030-503
21 DK02D/E	Gauge, Fuel Flow (Opt.)	Mooney	880034-501 ②
21 DK03D/E	Plug, Fuel Flow (Opt.)	Cannon	DE-9S
21 DK04A	C.B., Fuel Flow	Klixon	7277-2-2
21 DK05A	Switch, Memory (Opt.)	Alco	MST215N
21 DK06A	Plug, Transducer, Fuel Flow		MS3106A10SL-3S
-----	Clamp		MS3057-4A
21 DL01E	Tachometer, Elec.	Mooney	880039-507
21 DL02A	Plug, Tachometer	Standard	MS3106A-14S-5S
-----	Clamp		MS3057-6A

ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
1 DM01B	Hour Meter (Opt.)	Mooney	880035-503
1 DP01B	CB, Pitot Heat	Mooney	930023-105
1 DP02B	Heated Pitot	Aero Instl. (AN5812)	PH502-12
1 DP03B	Plug-Heated Pitot		AN3115-1
-----	Socket		AN3116-1
1 DT01A	Probe-E.G.T.	Mooney	880005-501
1 EG01C	Ckt. Bkr.-Gear Control	Klixon	7277-2-5
1 EG02B	Switch-Control-Gear	Cutler-Hammer	8906K2875
1 EG03A	Switch, Limit	Micro	DT-2R-A7
-----	Actuator	Micro	MCD-2711
1 EG04G	Actuator-Gear	Mooney	560254-501
1 EG05E	Relay-Gear Up	Cole-Hersee	24401
1 EG06D	Switch-Safety-Airspeed	Mooney	880013-505
1 EG07A	Switch, Down Limit	Micro	1CH1-6
1 EG08E	Relay-Gear Down	Cole-Hersee	24401
1 EG09B	Ckt. Bkr.-Gear Act.	Klixon	7277-2-15
1 EG10A	Switch-Override	Cutler-Hammer	SB1DDX492-2
-----	Lamp	General Electric	388
1 EG11A	Diode, Up-Relay	Sarkes Tarzian	F-4
1 EG12A	Diode, Down-Relay	Sarkes Tarzian	F-4
1 ELT18	ELT	Dorne & Margolin, Inc.	DM-ELT-8
1 ELT2A	Switch, Remote ELT	Dorne & Margolin, Inc.	DM-U65-1
-----	Switch, Remote, ELT (Alt.)	C & K	7101K
1 JM01B	Switch-Magneto	Bendix Scintilla	10-357210-9
1 JM02B	Magneto-Dual	Bendix Scintilla	D4LN2021
1 LB01B	CB, Rotating Beacon	Mooney	930023-103
1 LB02A	Rotating Beacon	Whelen	WRML-12
-----	Adapter	Whelen	WRM-65
1 LC01A	Fuse-(5A-3AG SLO-BLO)	Littel Fuse	313005
-----	Retainer		155020 or 155120
1 LC03D	Switch, Overhead Cabin		
	Light (F)	Carling	TILC64-1S-WH-FN
1 LC03E	Switch, Overhead Cabin		
	Light (R)	Carling	TILC64-1S-WH-FN
1 LC04B/C	Resistor-Dimming		
	(10 Ohm-5W)	Dale	RH-10-5 OHM
1 LC11A	Lamp (F1-R)	General Electric	1816
-----	Holder	Herman H. Smith	1930
1 LC12A	Lamp (F2-R)	General Electric	1816
-----	Holder	Herman H. Smith	1930
1 LC13A	Lamp (F1-L)	General Electric	1816
-----	Holder	Herman H. Smith	1930
1 LC14A	Lamp (F2-L)	General Electric	1816
-----	Holder	Herman H. Smith	1930
1 LC15A	Lamp (R1-R)	General Electric	1816
-----	Holder	Herman H. Smith	1930
1 LC16A	Lamp (R2-R)	General Electric	1816
-----	Holder	Herman H. Smith	1930
1 LC17A	Lamp (R1-L)	General Electric	1816
-----	Holder	Herman H. Smith	1930



Set for 75 MPH (+5.0) increasing actuation.

$$2.775" \text{ H}_{20} \pm \begin{matrix} .384 \\ .358 \end{matrix}$$

ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 LC18A	Lamp (R2-L)	General Electric	1816
-----	Holder	Herman H. Smith	1930
21 LL01C	CB, Landing Light	Mooney	930023-115
21 LL03A	Light-Landing	General Electric or equivalent	4522
21 LN01B	CB, Position Lights	Mooney	930023-101
21 LP01C	C.B. Instl. Lights	Klixon	7277-2-5
21 LP01D	C.B. Radio Lights	Klixon	7277-2-5
21 LP18E	Light Holder, Glareshield	Sloan	855S-9-I
-----	Lamp (7 ea.)	General Electric	330
21 LP21A	Lamp, Compass Lt.	General Electric or equivalent	330
21 LP22C	Light Holder, Flap & Trim	Dialight	270-1930-0171-702
-----	Lamp	General Electric	370
21 LP30A	Light Holder, Oxygen	Sloan	855S-O-U
-----	Lamp	General Electric	330
21 LP36A	Lamp, Cluster #1	General Electric	330 (Aviation Blue)
21 LP37A	Lamp, Cluster #2	General Electric	330 (Aviation Blue)
21 LP38A	Lamp, Cluster #3	General Electric	330 (Aviation Blue)
21 LP39A	Lamp, Cluster #4	General Electric	330 (Aviation Blue)
21 LP40A	Lamp, Cluster #5	General Electric	330 (Aviation Blu
21 LP41A	Connector, Male	Deans	DEA 90020
21 LP42A	Connector, Female	Deans	DEA 90020
21 LP43A	Fuse (1A)	Littel Fuse	313001
-----	Fuse Holder	Littel Fuse	155020 or 155120
21 LP44A	Connector, Plug	AMP	206060-1
-----	Clamp	AMP	206062-1
21 LP45A	Connector, Receptacle	AMP	206153-1
-----	Clamp	AMP	206062-1
21 LS01B	CB, Strobe Light	Mooney	930023-107
21 LS02B	Pwr. Supply, Strobe, Left Wing	Mooney (Alt.)	880018-501
21 LS02C	Pwr., Supply, Strobe, Left Wing	Mooney	880028-507
21 LS03B	Strobe Light, L. Wing	Mooney (Alt.)	880021-501
21 LS03C	Strobe Light, L. Wing	Mooney	880038-501
21 LS03D	Cable Assy-L. Wing Strobe	Mooney	880017-501
21 LS04B	Pwr., Supply, R. Wing, Strobe	Mooney (Alt.)	880018-501
21 LS04C	Pwr., Supply, R. Wing Strobe	Mooney	880028-507
21 LS04D	Cable Assy-R. Wing Strobe	Mooney	880017-501
21 LS05B	Strobe Light-R. Wing	Mooney (Alt.)	880021-502
21 LS05C	Strobe Light, R. Wing	Mooney	880038-502
21 LS06B	Pwr. Supply, Tail Strobe	Mooney	880028-507
21 LS07B	Strobe, Tail Light	Mooney	880041-501
21 LS08A	Plug, Tail Strobe	AMP	206708-1
21 LS09A	Recpt., Tail; PS-Strobe	AMP	1-480305-0
-----	Pins (3 each)	AMP	61118-1 or 60620-
21 MA01A	Receptacle		AN2552-3A
21 MA02A	Relay	Cole Hersee	24059

ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER	
MA03A	Diode	Sarkes Tarzian	10H3N	
MB01B	Ckt. Bkr. COM-I	Klixon or equivalent	7277-2-	3
MB02B	Ckt. Bkr. NAV-I	Klixon or equivalent	7277-2-	3
MB03B	Ckt. Bkr. COM-II	Klixon or equivalent	7277-2-	3
MB04B	Ckt. Bkr. NAV-II	Klixon or equivalent	7277-2-	3
MB05B	Ckt. Bkr. XPN	Klixon or equivalent	7277-2-	3
MB06B	Ckt. Bkr. AUD	Klixon or equivalent	7277-2-	3
MB07B	Ckt. Bkr. ADF	Klixon or equivalent	7277-2-	3
MB08B	Ckt. Bkr. DME	Klixon or equivalent	7277-2-	3
MB09C	Speaker	ARA	6707001	
MB10A	MIC-JAC, Lt. Side	Switchcraft	C-128	
-----	Washers	Switchcraft	S-1028, S-1029	
MB14A	FONE-JAC, Lt. Side	Switchcraft	C-11	
-----	Washers		S-1029, S-1029	
MB16B	Ckt. Bkr.-Autopilot	Klixon or equivalent	7277-2-	3
MB18A	Ckt. Bkr.-R-NAV	Klixon	7277-2-	3
MB19A	Ckt. Bkr. HSI	Klixon	7277-2-	3
MB20A	Ckt. Bkr. Encoder	Klixon	7277-2-	3
MB21A	Ckt. Bkr. Fuel Mgmt.	Klixon	7277-2-	3
MB22A	Ckt. Bkr. Telefone	Klixon	7277-2-	3
MB23A	Ckt. Bkr. VME	Klixon	7277-2-	3
MB24A	Ckt. Bkr. - FONE	Klixon	7277-2-	3
MB25A	Ckt. Bkr. - Inverter	Klixon	7277-2-	3
MB26A	Ckt. Bkr. - RMI	Klixon	7277-2-	3
MB27B	CB Prop. De-Ice	Mooney	930023-123	
MB28B	CB, WX Radar	Mooney	930023-121	
MB33A	CB, Radio Blower	Klixon	7277-2-1	3
MB34A	Assy, Radio Blower	King	KA20	
MB35A	CB, Stereo	Klixon	7277-2-	3
MB36A	CB, Alt Servo	Klixon	7277-2-	3
MB37A	CB, Alt Select	Klixon	7277-2-	3
MB38A	CB, Converter	Klixon	7277-2-	3
MB39A	CB, Loran	Klixon	7277-2-	3
MB40A	CB, Standby Vacuum	Mooney	930023-127	
MB41A	CB, Stromscope	Klixon	7277-2-	3
MC01B	Cigar Lighter	Mooney	800336-503	
ME01C	Clock, Elect. (Lighted)	Mitchell	98470-1LW	
NF01B	CB, Fuel Pump-Lo	Mooney	930023-111	
NF02B	Fuel Pump, Boost	Weldon	8163A	
NF07A	Connector, Recpt., Pump	AMP	206153-1	
-----	Clamp	AMP	206062-1	
NF08A	Connector, Plug, Pump	AMP	206060-1	
-----	Clamp	AMP	206062-1	
PA02C	Alternator	Lycoming	LW 15404	
PA04B	CB, Alt. Output	E.T.A.	41-3-S14-LN2-70	
PA05A	Capacitor	Sangamo	500-1041-01	
PA06B	Voltage Regulator	Mooney	880016-501	
PA03C	Filter	Mooney	880014-501	
PA07B	Plug, Volt. Reg.	AMP	206060-1	
-----	Clamp		206062-1	
PA08B	Recpt. Volt. Reg.	AMP	206153-1	
-----	Clamp		206062-1	
PB01A	Battery	Gill	G-35	

ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PB01B	Battery (Alt.)	Prestolite	R-35
21 PB02A	Relay-Battery, Master	Cutler Hammer	6041-H-231
21 PB03B	CB, Aux. Power	E.T.A.	41-3-S14-LN2-50
③ Amperage rating is determined by particular unit installed.			
21 PB04B	Relay, Radio Master	Potter & Bromfield	MB 4413
21 PB05A	Switch-Master	Cutler Hammer	8911K828
21 PB06B	CB, Radio Master	Mooney	930023-113
21 PB07J	Bus Bar-Main Power (Flex)	Mooney	
21 PB07K	Bus Bar	Mooney	
21 PB07L	Bus Bar	Mooney	
21 PB09G	Bus Bar-Aux. #2	Mooney	913127-25
21 PB15A	Diode-Radio Master	Sarkes Tarzian	F-4
21 PB21E	Bus Bar	Mooney	
21 PB22A	Diode, Master Relay	Sarkes Tarzian	F-4
21 PB23A	Diode, Radio Relay	Sarkes Tarzian	F-4
21 PB24A	Shunt-Radio Relay	Kulka	600RJ-2
21 PB25A	Shunt-Radio Relay	Kulka	600RJ-2
21 PB26A	CB-Bat Power	E.T.A.	41-3-S14-LN2-70
21 PB29A	Bus Bar-Radio #5	Mooney	913127-1
21 PB30A	Bus Bar-Radio #4	Mooney	913127-1
21 PB31A	Bus Bar-Main Pwr. #4	Mooney	913127-3
21 PB32A	Bus Bar-Radio #3	Mooney	913128-5
21 PB33A	Bus Bar-Radio #2	Mooney	913128-19
21 PB34A	Bus Bar, Main Power #3	Mooney	913127-35
21 PB35A	Bus Bar, Main Power #3	Mooney	913127-35
21 PB36A	Bus Bar-Radio #1	Mooney	913127-35
21 PB37A	Bus Bar-Main #1	Mooney	913127-37
21 PG01A	Generator, Standby	Electro Mech	8012
21 PG02A	Fuse Holder	Littel	155020 or 155120
-----	Fuse 15A Slo-Blo	Littel	313015
21 PG03A	Plug-Regulator	Littel	MS3106A-18-1S
-----	Clamp	Littel	MS3057-10A or 10B
21 PG04A	Voltage Regulator	Electro Mech	2073-2
21 PG05A	CB-Standby Gen.	Klixon	7277-2-15
21 PG06A	Relay-Bus Switching	Leach	JD1B
-----	Socket	Leach	S0-1049-8309
21 PG07A	Relay-Control	Magnacraft	W67CSX-2
-----	Socket	Magnacraft	70-303
21 PG08A	Light - ON	Western Indicator	501-61K-11K-3BP
-----	Lamp	Western Indicator	WI-7046
21 PG09A	Light - O.V.	Western Indicator	501-61K-11K-3RP
-----	Lamp	Western Indicator	WI-7046
21 PG10A	Diode-On Light	Sarkes Tarzian	F-4
21 PG11A	Diode - O.V. Light	Sarkes Tarzian	F-4
21 PG12A	Receptacle	AMP	206153-1
-----	Clamp	AMP	206062-1
21 PG13A	Plug	AMP	206060-1
-----	Clamp	AMP	206062-1

④ Manufacture using "Alpha Wire Co." #2172 or #1233/2 (1 ea) tubular braid (or equivalent) and "AMP" terminals as necessary to connect the bus bars as shown on schematic. Cover braid with PVC-105/A tubing for insulation.

ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

EM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
1 PG14A	Diode	Sarkes Tarzian	F-4
1 PL01B	Plug, CB Panel	AMP	206150-1
-----	Clamp	AMP	206138-1
1 PL02B	Plug, Flt. Panel #1	Mooney	930021-505
1 PL03B	Plug, Electric Gear	Mooney	930021-1
1 PL04B	Plug, Left Wing	Mooney	930021-1
1 PL05C	Plug, Left Wing Stub	Mooney	930021-1
1 PL08A	Plug, Headliner	AMP	206037-1
1 PL09A	Plug, Firewall		MS3106A-22-14S
-----	Clamp		MS3057-12B
1 PL11B	Plug, Flt. Pnl. #2	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL14C	Plug, Left Side Panel	Mooney	930021-501
1 PL16A	Plug, Console	AMP	206037-1
-----	Clamp	AMP	206070-1
1 PL18A	Plug, Cluster Gage	AMP	206037-1
-----	Clamp	AMP	206070-1
1 PL18B	Plug, Cluster Gauge	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL22B	Plug, C.B. Pnl., Aux Bus	AMP	206037-2
-----	Clamp	AMP	206070-1
1 PL24C	Plug, Cabin-Tailcone	AMP	206037-1
-----	Clamp	AMP	206070-1
1 PL25C	Plug, Right Wing	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL26B	Plug, Right Wing Nav.	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL29B	Plug, Empennage	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL30B	Plug, C.B., Pnl.-Opt.	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL33A	Plug, Pwr.-Flt. Panel	AMP	206037-2
-----	Clamp	AMP	206070-1
1 PL34B	Plug, Light Control	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL35B	Plug, Gear Control	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL37A	Plug, Vac. Warn	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL38A	Plug, ELT Switch	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL39A	Plug, Light, O.H. Rear	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL41A	Plug, Glareshield	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL42A	Plug, Hour Meter	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL43A	Plug, Flt. Pnl.	AMP	206708-1
-----	Clamp	AMP	206966-1
1 PL44A	Plug, Gr. Safety Switch	AMP	206060-1
-----	Clamp	AMP	206062-1
1 PL45A	Plug, Firewall #2		MS3106A-22-14S
-----	Clamp		MS3057-12B

ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
21 PL46A	Plug, Avionic Pwr.	Mooney	930021-501
21 PL47A	Plug, Audio Interconnect	AMP	205839-3
-----	Clamp	AMP	206070-1
21 PL48A	Plug, Flt. Pnl. Dim. Grnd.	AMP	206037-1
-----	Clamp	AMP	206070-1
21 PL49A	Plug, C.B. Grnd.	AMP	205838-1
-----	Clamp	AMP	206062-1
21 PL50A	Plug, C.B. Dimmer	AMP	206060-1
-----	Clamp	AMP	206062-1
21 PL53C	Plug, Main Cable Grnd.	AMP	206037-1
-----	Clamp	AMP	206070-1
21 PL59A	Avionics Dimmer	AMP	206037-1
-----	Clamp	AMP	206070-1
21 PS01B	Ckt. Bkr.-Ignition	Klixon or equivalent	7277-2-10
21 PS03A/B	Relay (Alternate)	Cutler-Hammer	6041H105A
21 PS04A	Starter	Prestolite	MZ4206
-----	Starter (Alt.)	Prestolite	MZ4218 or MZ4222
21 PS06A	Fuse	Littel Fuse	313001
-----	Holder	Littel Fuse	155020 or 155120
21 RC01B	Recpt., Ckt. Bkr. Panel	AMP	206151-1
-----	Clamp	AMP	206138-1
21 RC02B	Recpt., Flight Panel	Mooney	930021-506
21 RC03B	Recpt., Electric Gear	Mooney	930021-2
21 RC04B	Recpt., Left Wing	Mooney	930021-2
21 RC05C	Recpt., Left Wing Stub	Mooney	930021-2
21 RC08A	Recpt., Headliner	AMP	206036-3
-----	Clamp	AMP	206070-1
21 RC09A	Recpt., Firewall		MS3100A-22-14P
-----	Clamp		MS3057-12B
21 RC11B	Recpt., Flight Panel #2	AMP	206705-2
-----	Clamp	AMP	206966-1
21 RC14C	Recpt., Left Side Panel	Mooney	930021-502
21 RC16A	Recpt., Console	AMP	206036-3
-----	Clamp	AMP	206070-1
21 RC18A	Recpt., Cluster Gauge	AMP	206036-3
-----	Clamp		206070-1
21 RC22B	Recpt., Ckt., Bkr. Panel	AMP	206036-2
-----	Aux. Pwr.		
-----	Clamp	AMP	206070-1
21 RC24C	Recpt., Cabin-Tailcone	AMP	206036-3
-----	Clamp	AMP	206070-1
21 RC25C	Recpt., Right Wing	AMP	206705-2
-----	Clamp	AMP	206966-1
21 RC26B	Recpt., Right Wing Stub	AMP	206705-2
-----	Clamp	AMP	206966-1
21 RC29B	Recpt., Tail	AMP	206705-2
-----	Clamp	AMP	206966-1
21 RC30B	Recpt., CB, Pnl.	AMP	206705-2
-----	Clamp	AMP	206966-1
21 RC33A	Recpt., Flt. Panel, Pwr.	AMP	206207-1
-----	Clamp	AMP	206966-1

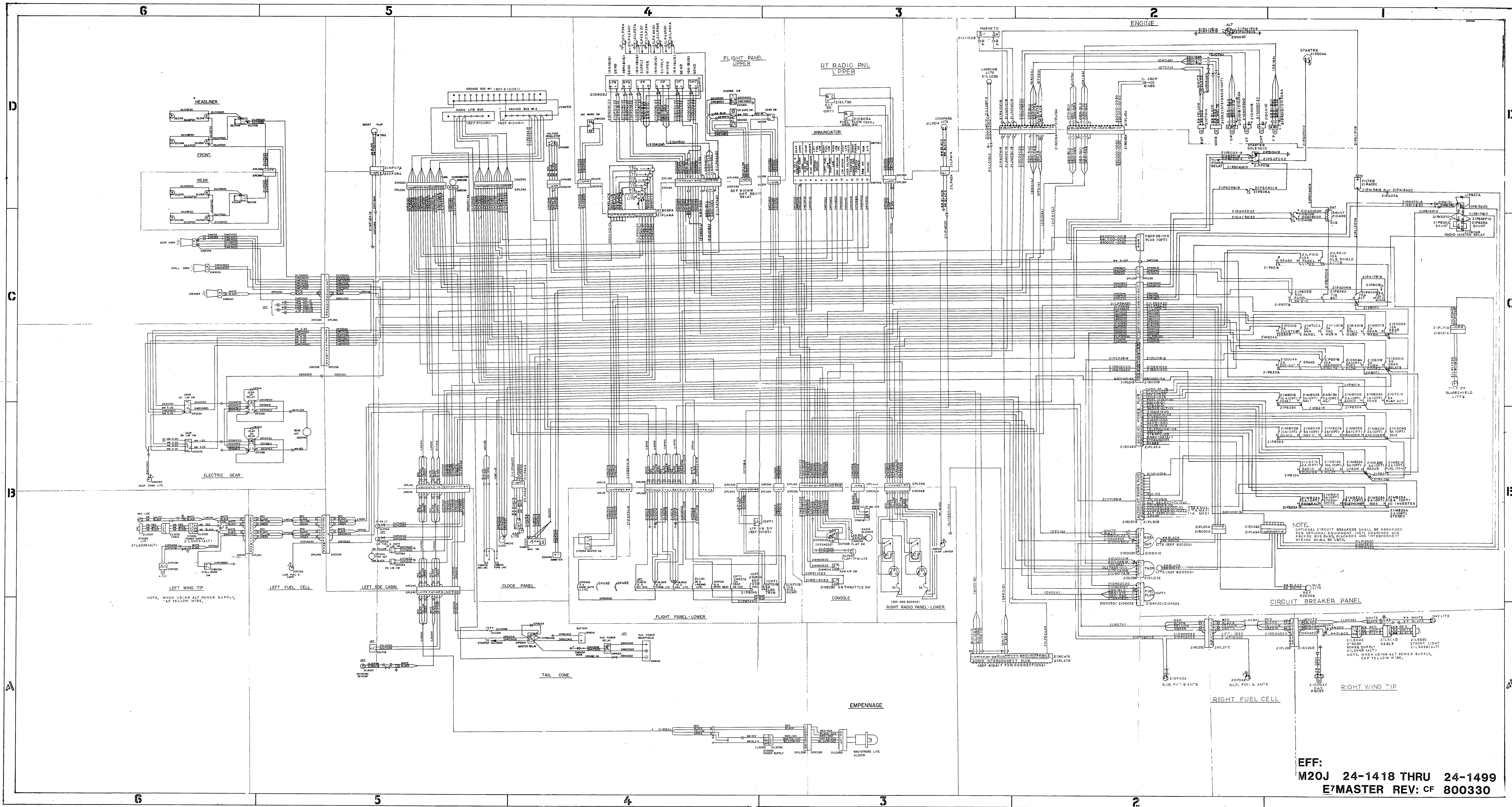
ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru
FOR SCHEMATIC 800330 E7

(CONT.)

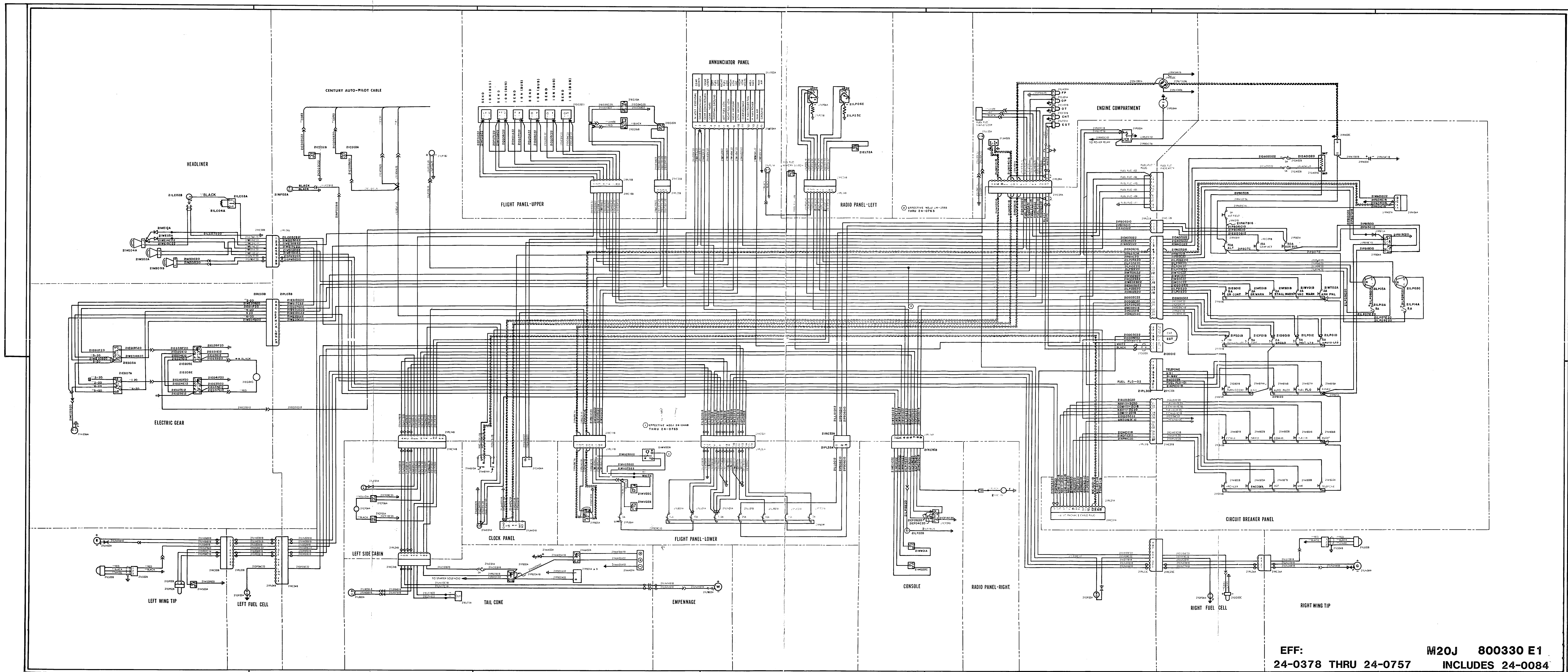
ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
RC34B	Recpt., Light Control	AMP	206705-2
-----	Clamp	AMP	206966-1
RC35B	Recpt., Gear Control	AMP	206153-1
-----	Clamp	AMP	206062-1
RC37A	Recpt., Vac. Warn.	AMP	206153-1
-----	Clamp	AMP	206062-1
RC38A	Recpt., ELT Switch	AMP	206153-1
-----	Clamp	AMP	206062-1
RC39A	Recpt., Overhead Lite (Rear)	AMP	206153-1
-----	Clamp	AMP	206062-1
RC41A	Recpt., Glareshield	AMP	206153-1
-----	Clamp	AMP	206062-1
RC42A	Recpt., Hour Meter	AMP	206153-1
-----	Clamp	AMP	206062-1
RC43A	Recpt., Flt. Pnl.	AMP	206705-2
-----	Clamp	AMP	206966-1
RC44A	Recpt., Gr. Safety Switch	AMP	206153-1
-----	Clamp	AMP	206062-1
RC45A	Recpt., Firewall #2		MS3100A-22-14P
-----	Clamp		MS3057-12B
RC46A	Recpt., Avionics Pwr.	Mooney	930021-502
RC47A	Recpt., Audio Interconnect	AMP	206152-1
-----	Clamp	AMP	206070-1
RC48A	Recpt., Flt. Pnl. Gnd/DM	AMP	206036-1
-----	Clamp	AMP	206070-1
RC49A	Recpt., C.B. Grnd.	AMP	205841-2
-----	Clamp	AMP	206062-1
RC50A	Recpt., C.B. Dimmer	AMP	206153-1
-----	Clamp	AMP	206062-1
RC53C	Recpt., Main Cable Gnd.	AMP	206036-3
-----	Clamp	AMP	206070-1
RC59A	Recpt., Avionics Dimmer	AMP	206036-3
-----	Clamp	AMP	206070-1
WE01B	Ckt. Bkr.-Gear Warning	Klixon	7277-2-2
WE03C	Switch-Throttle	Micro	V3-1
-----	Actuator	Micro	JV-5
WE04A	Horn-Gear Up Warning	Mallory	SC628P
WE05A	Diode, Gr. Unsafe, Warn.	Sarkes Tarzian	F-4
WE06A	Light-Gear Position	Sloan	855S-O-U
-----	Bulb (1)	General Electric	327
WE10A	Diode-Gear Horn	Sarkes Tarzian	F-4
WS01B	C.B. Stall Warning Horn	Klixon	7277-2-2
WS02A	Horn-Pre-Stall Warning	Mallory	SC628
WS03A	Switch-Pre-Stall Warning	Safe Flight	C46001
WT02A	Ckt. Bkr., Annunciator	Klixon	7277-2-2
WT03J	Annunciator	Mooney	880025-511
-----	Lamps (8 ea.)	Chicago Minature	CM7-7330
WT04A	Plug,-Annunciator Panel	Molex	09-50-3151
WV01B	Ckt. Bkr.-Vac. Warn.	Klixon	7277-2-2
WV02A	Switch-Vac. Warn.	Mooney	880012-501
WW01A	Switch-Warn.-Ram Air	Micro	V3-1
-----	Actuator	Micro	JV-5

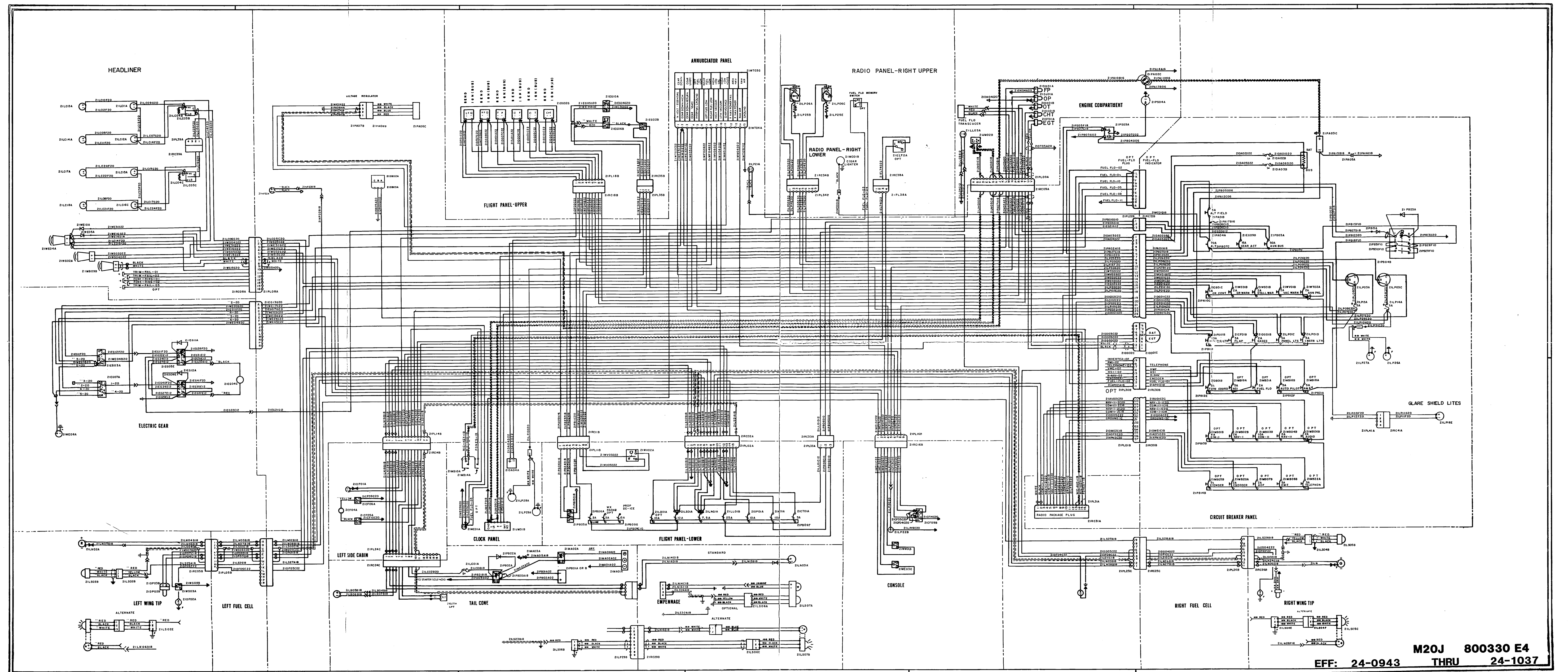
ELECTRICAL SYSTEM HARDWARE CHART, M20J, S/N 24-1418 thru 24- (CONT.)
FOR SCHEMATIC 800330 E7

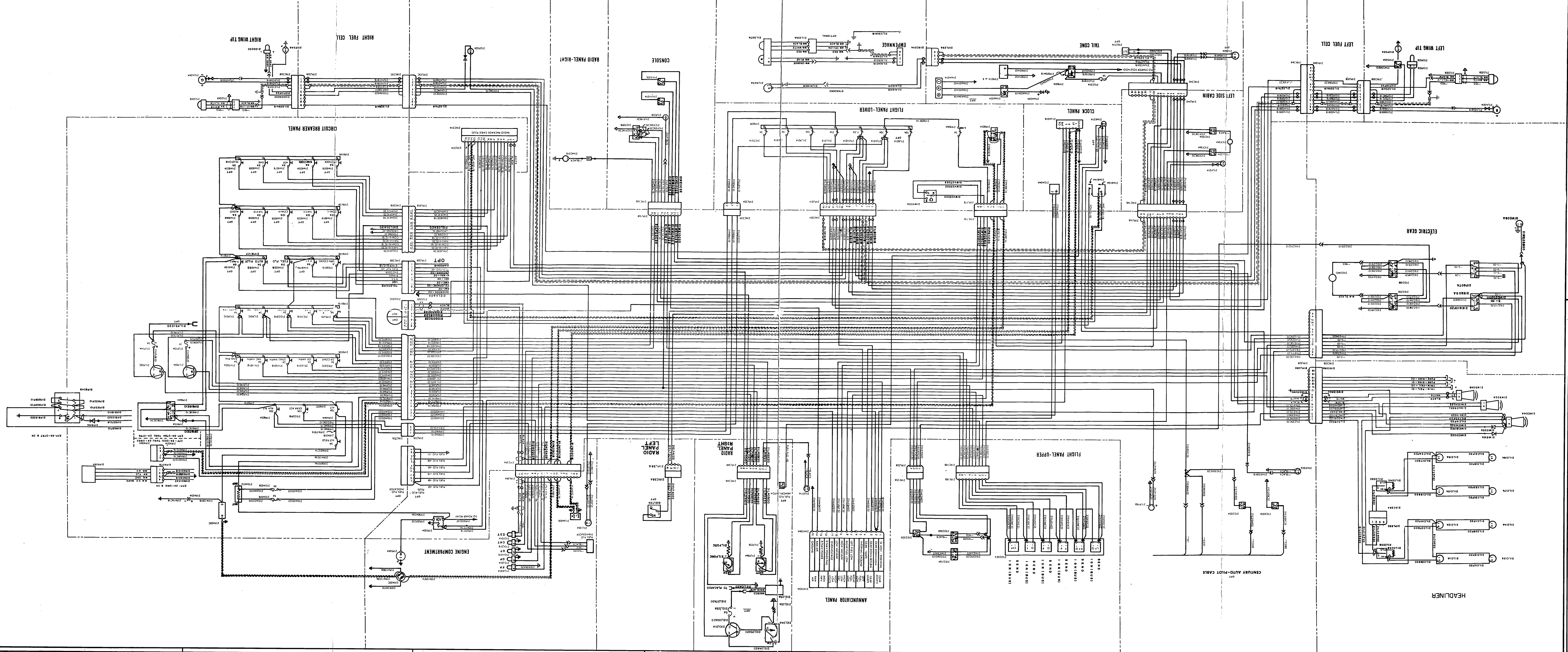
ITEM NO.	DESCRIPTION	MANUFACTURER	PART NUMBER
-----	Light Dimmer Switch Box	Mooney	800344
-----	Rheostat	Allen-Bradley, Milwaukee, WI	JS1N056P02MA
-----	Transistor	RCA	2N3055
-----	Transistor (Alt)	RCA	2N3773
-----	Fuse	Bussman, Div. McGraw- Edison	FM01-5A
-----	Receptacle	AMP	206705-2
①	Alternate Turn Coordinators:	United Instruments Astronautics Talley Corp.	9112-Code N. 9 303990-113MSC 1394T100-3Z
②	Alternate Fuel Flow Gauges:	Gals. Per Hr. Liters/Hr. Imp. Gals/Hr. Liters/Hr. Pounds/Hr.	880034-507 880034-509 880034-511 880034-503 880034-505
③	Alternate Gear Actuator:	Mooney	880037-501

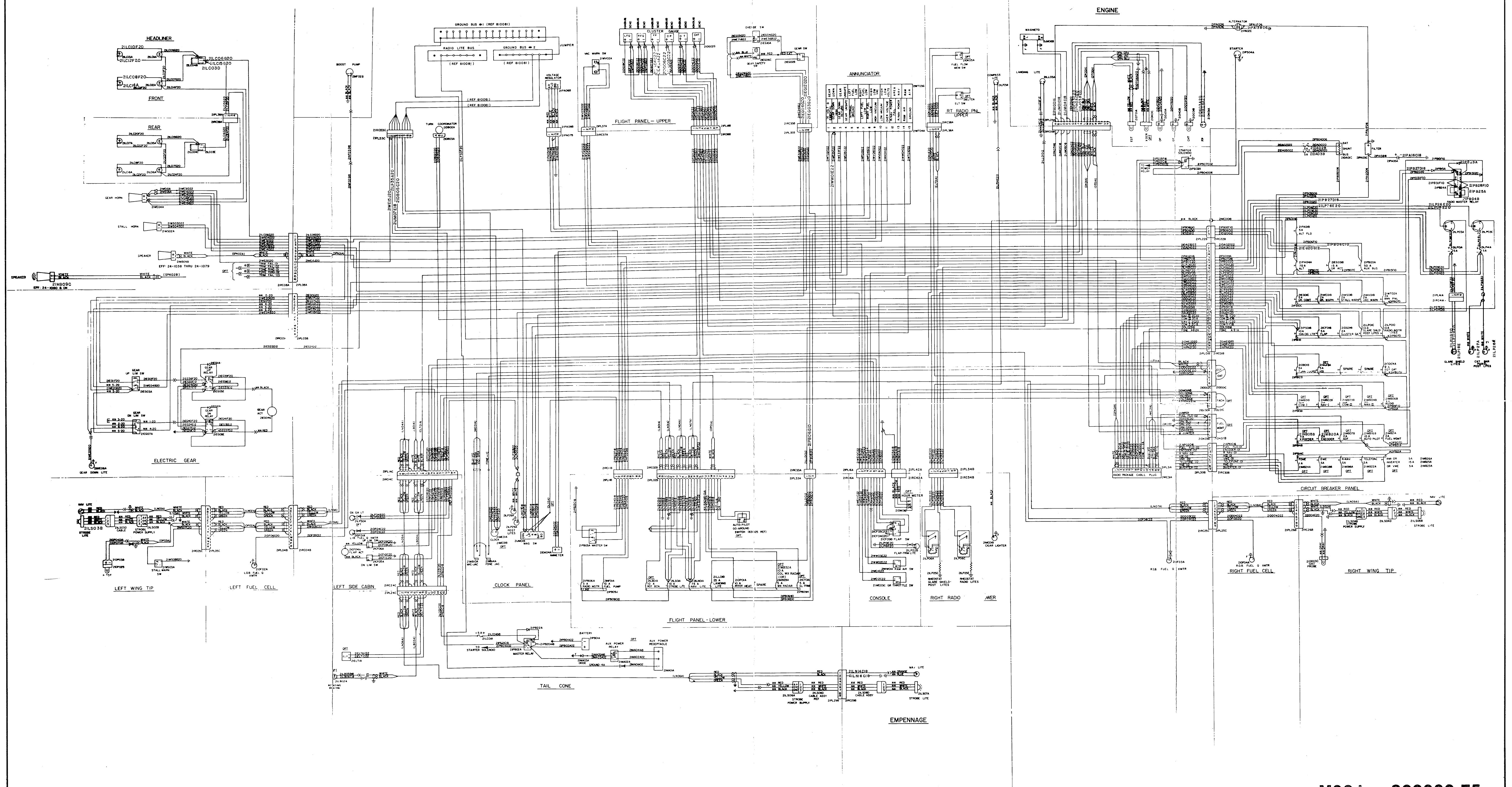


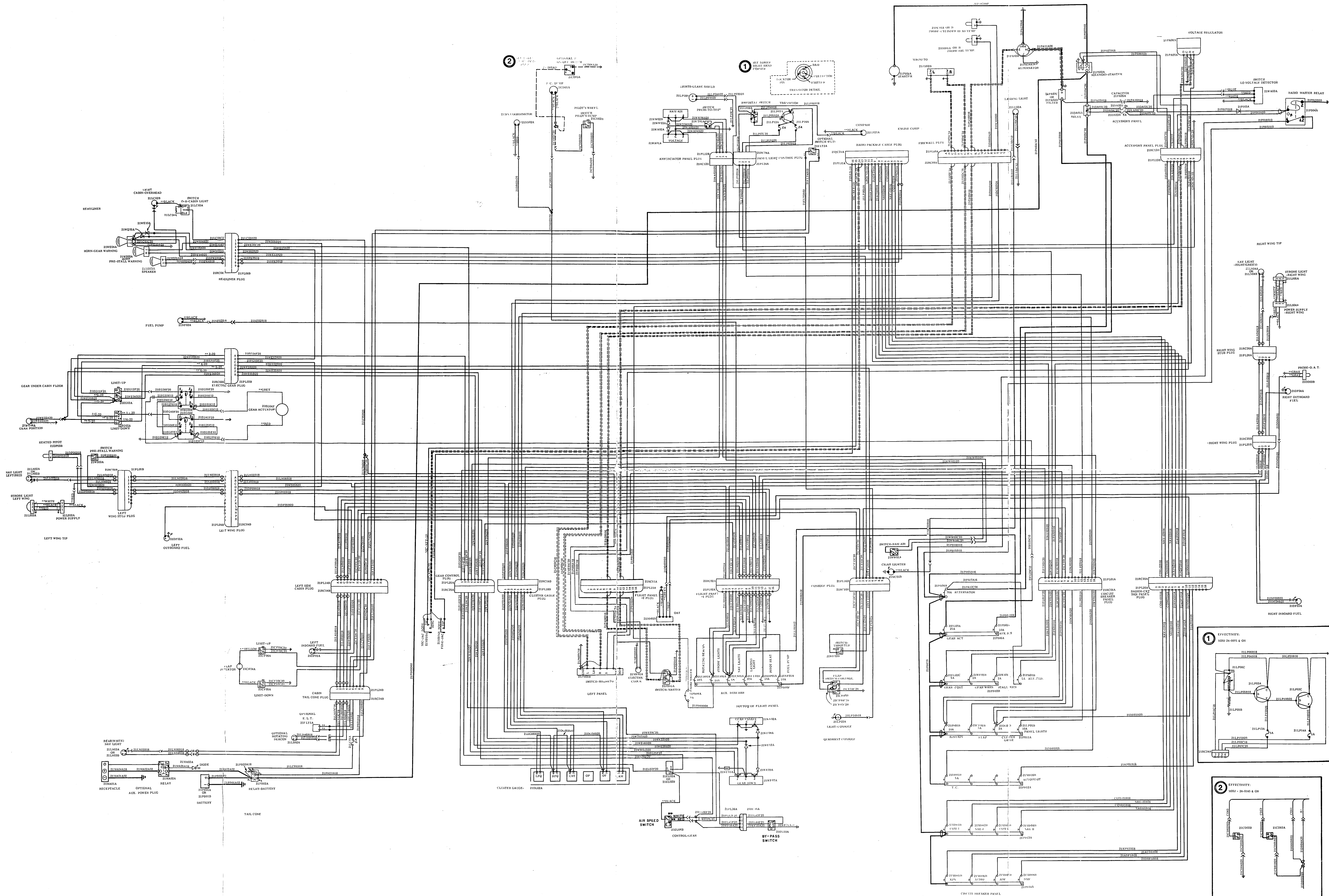
EFF:
M20J 24-1418 THRU 24-1499
E7MASTER REV: CF 800330





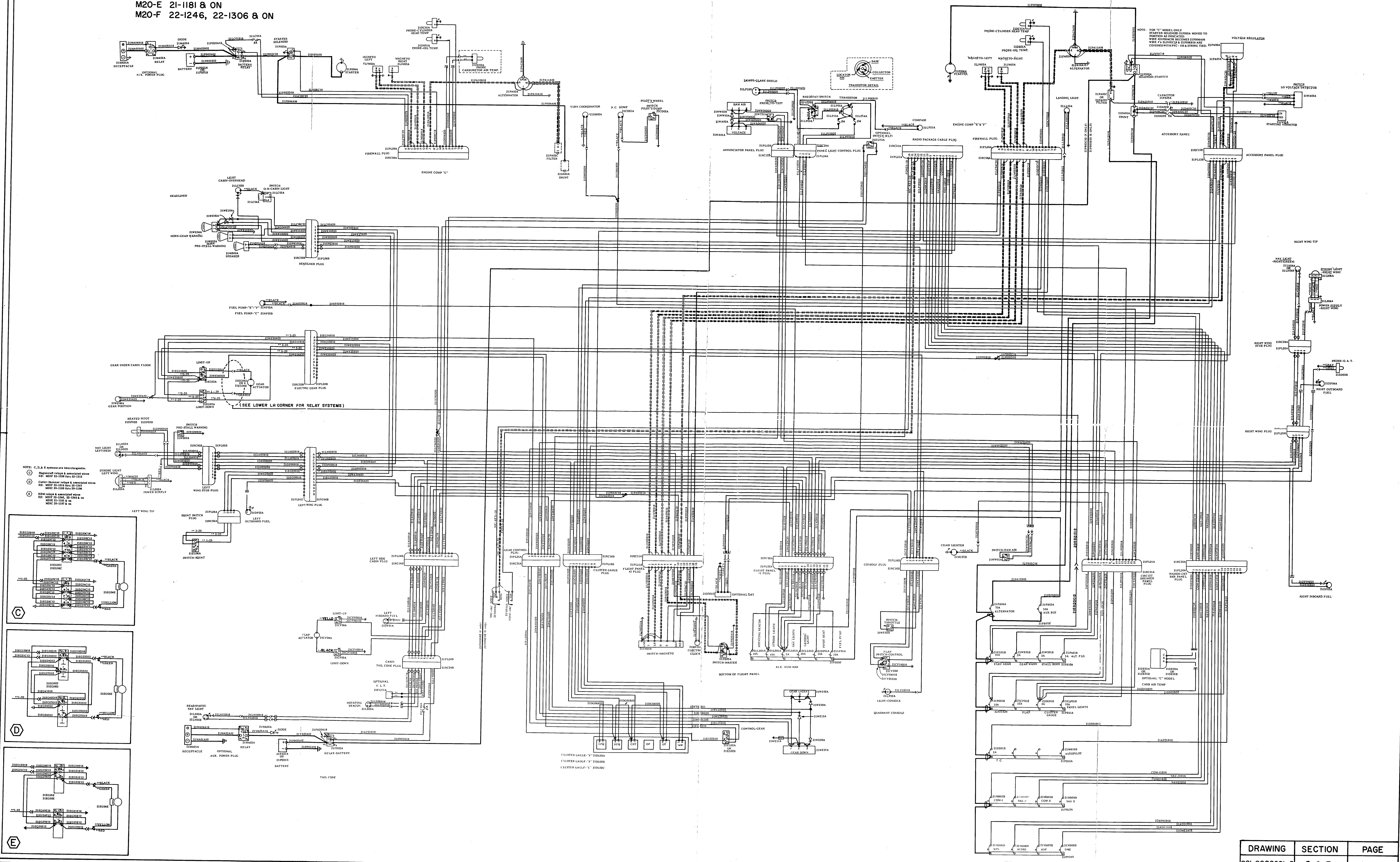






MOONEY M20 SERIES ELECTRICAL SYSTEM

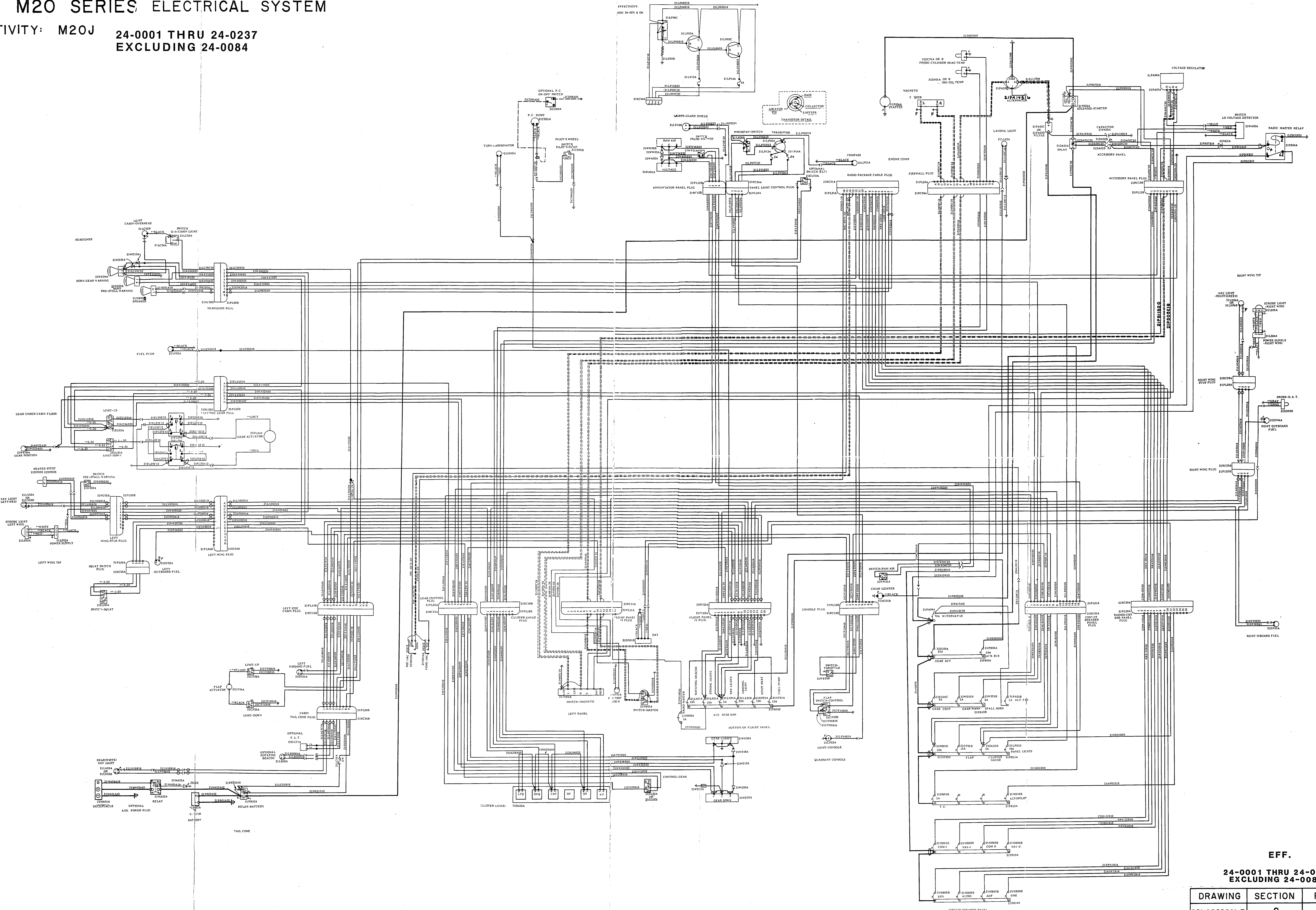
EFFECTIVITY: M20-C 20-1186 & ON
M20-E 21-1181 & ON
M20-F 22-1246, 22-1306 & ON



MOONEY M20 SERIES ELECTRICAL SYSTEM

EFFECTIVITY: M20J

24-0001 THRU 24-0237
EXCLUDING 24-0084



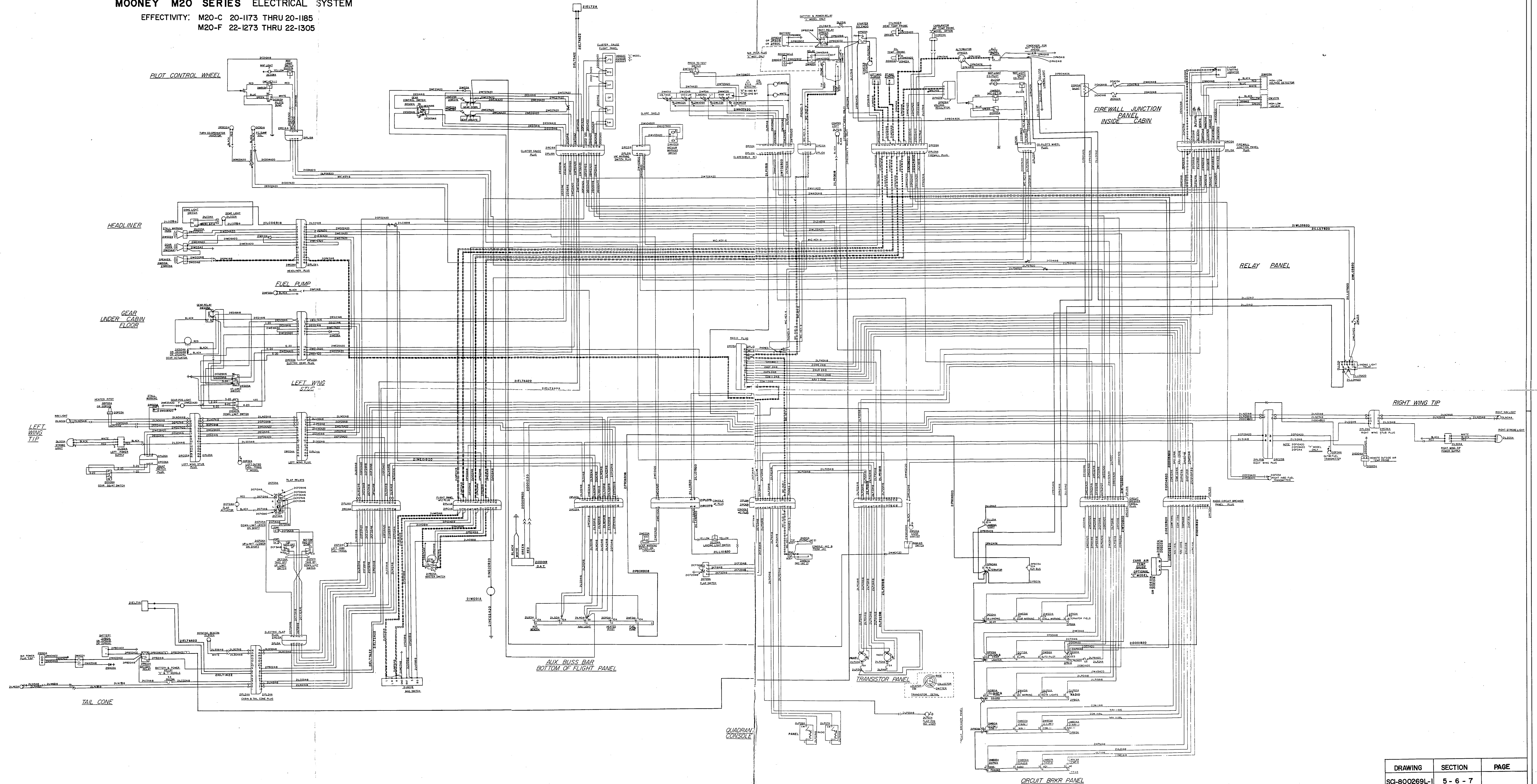
EFF.

24-0001 THRU 24-0237
EXCLUDING 24-0084

DRAWING	SECTION	PAGE
SCI-800269L-3	8	

MOONEY M20 SERIES ELECTRICAL SYSTEM

EFFECTIVITY: M20-C 20-1173 THRU 20-1185
M20-F 22-1273 THRU 22-1305

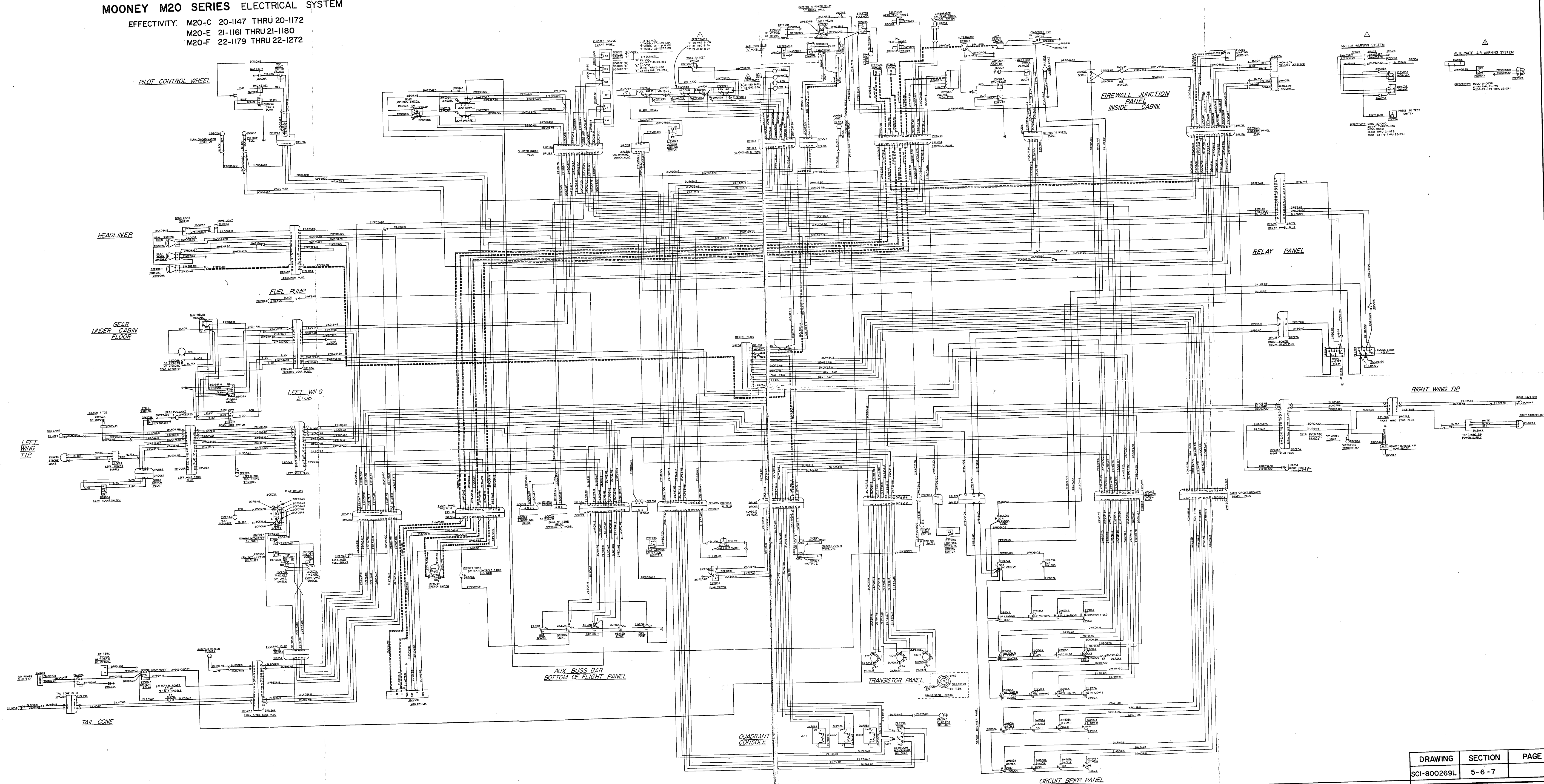


MOONEY M20 SERIES ELECTRICAL SYSTEM

EFFECTIVITY: M20-C 20-1147 THRU 20-1172

M20-E 21-1161 THRU 21-1180

M20-F 22-1179 THRU 22-1272



ENVELOPE A

M20 SERIES ELECTRICAL SCHEMATICS

SCI-800269L EFFECTIVITY: M20-C 20-1147 THRU 20-1172 M20-E 21-1161 THRU 21-1180 M20-F 22-1179 THRU 22-1272	SCI-800269L-1 EFFECTIVITY: M20-C 20-1173 THRU 20-1185 M20-F 22-1273 THRU 22-1305
SCI-800269L-2 EFFECTIVITY: M20-C 20-1186 & ON M20-E 21-1181 & ON M20-F 22-1246, 22-1306 & ON	SCI-800269L-3 EFFECTIVITY: M20-J 24-0001 THRU 24-0237 EXCEPT 24-0084.

SCI-800269L-3A

EFFECTIVITY:
24-0238 THRU 24-0377

REV. F 10/1/82

ENVELOPE B

M20 SERIES ELECTRICAL SCHEMATICS

800330E1 EFFECTIVITY: M20J - 24-0378 THRU 24-0763	800330E2 EFFECTIVITY: M20J - 24-0764 THRU 24-0900
800330E3 EFFECTIVITY: M20J - 24-0901 THRU 24-0942	800330E4 EFFECTIVITY: M20J - 24-0943 THRU 24-1037

800330E5

EFFECTIVITY:
M20J 24-1038 thru 24-1213

ENVELOPE C

M20 SERIES ELECTRICAL SCHEMATICS

800330E6

EFFECTIVITY

M20J 24-1214 thru 24-1417

REV. E 9/1/81

800330E7

SCHEMATIC

E₇

M20J EFFECTIVITY

24-1418 thru 24-1499

RELATED S & M MANUAL PAGES

9-177 thru 9-184

REV. G 10/1/83