

**PRATT & WHITNEY - ENGINE SERVICES
CONFIGURATION AND TEST**

MANUAL PART NO. 3077226 (DPHM PART NO. GN4-T-212-1)

Flight-Data Acquisition Storage and Transmission System (FAST)

**APPLICABLE TO:
All FAST Processor Installations
Issued January 20/2017**

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INTRODUCTION

This FAST Configuration and Test document is used for all FAST processor installations and maintained by P&W Engine Services **D**iagnostics, **P**rognostics and **H**ealth **M**anagement (DPHM).

DPHM Document Number	Document Title	Revision	Revision Date
GN4-T-212-1	FAST Configuration and Test	E	December 20, 2016



Flight Data Acquisition Storage and Transmission System (FAST) Configuration and Test

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		Steve Sackos, Supply Chain & QA Mgr
		signature _____ date _____
		signature _____ date _____

NOTE

This Configure and Test document does not incorporate a list of effective pages. Each page will indicate the latest revision letter to the entire document.

LOG OF REVISIONS

REV.	DATE	ECO #	DESCRIPTION	PAGES REVISED
A	12/13/2010	--	Initial Release	ALL
B	01/31/2011	1060	Revise LED Indication in the Automatic Transmission Test	Cover, I, 11
C	01/27/2012	1113	Revise EMI Testing in Section 6.1 and 6.2	Cover, i, 8, 9
D	06/24/2013	1157	Add Export Control Classification to Cover and Update Document Footer. Add MonitorTM Installation CD-ROM Option. Correct Typographical Errors and Add Additional Notes throughout Document. Add More Details on Removing/Installing SIM Card.	ALL
E	12/20/2016	1282	Update MonitorTM and USB Driver Installation Steps. Add additional details throughout the documentation. Remove Flight Test Column from Table 2	ALL

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1 Introduction

Advancements surrounding fast, intelligent real time in-flight data monitoring, case-based reasoning and next generation trending will drive significant improvements in aircraft availability. Key to maximizing aircraft availability is PWC's vision of an extensive set of real time prognostic and diagnostic tools employed to keep each of our customers flying, while ensuring that the all-important aspects of safety and low cost of operation are also addressed.

1.1 System Description

The FAST is Pratt & Whitney Engine Services fourth generation of monitoring and transmission devices. The FAST provides a wide range of communication interfaces through which aircraft and engine performance data can be collected. The source of this data can be an existing airframe or engine recording system, ARINC-429, or QAR data stream. The data collected will be transmitted to a ground station via cellular protocol when the aircraft is on the ground and the engine(s) are off. The data can also be retrieved through a RS-485 connection to a PC. Both the collection and transmission of data is done in a common, seamless, inseparable platform from both a hardware and software perspective.

1.2 Functional Overview

The FAST will collect the data from the aircraft's data busses and discrete inputs and will store in resident non-volatile memory where data summarizing engine run performance will be maintained, analyzed, and transmitted to the ground station for trend monitoring and maintenance recommendations.

Software configuration files, which customize the operation of the product to the particular aircraft it is installed on, can be loaded to the FAST from a remote server or manually loaded with the ground based software. The ground based software enables direct communication with the FAST to perform maintenance functions, such as loading or retrieving configurations, retrieving data files, and performing system diagnostics via a serial connection.

The FAST will provide the communications system through which aircraft and engine performance data can stream to the Internet without operator intervention. The destination will be the Pratt & Whitney Engine Services ground station. The FAST will be designed to support multiple communication modes to achieve data transfer. These will include hardware, cellular, and wireless LAN.

1.3 Purpose

The purpose of this document is to provide step by step instructions on how to install the Transfer Module program onto a laptop and use the program to configure and test the FAST processor after it has been successfully installed in the aircraft. The Transfer Module program is the ground based software.

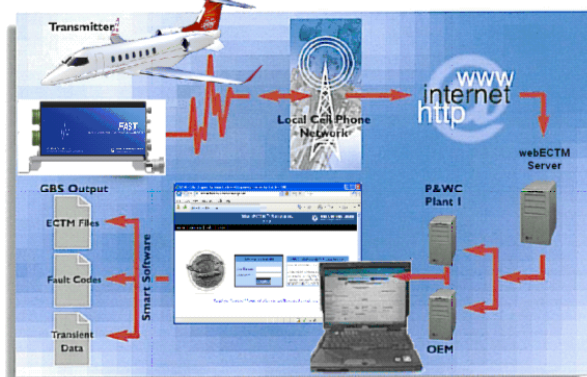


Figure 1: System Architecture

2 Installation of the Monitor Transfer Module (MonitorTM) Program

2.1 Monitor Transfer Module Software Download

NOTE: Prior to installation admin rights on the PC will be required.

- 1) Log onto the My P&WC POWER customer portal at the following address:
<https://customer.pwc.ca>

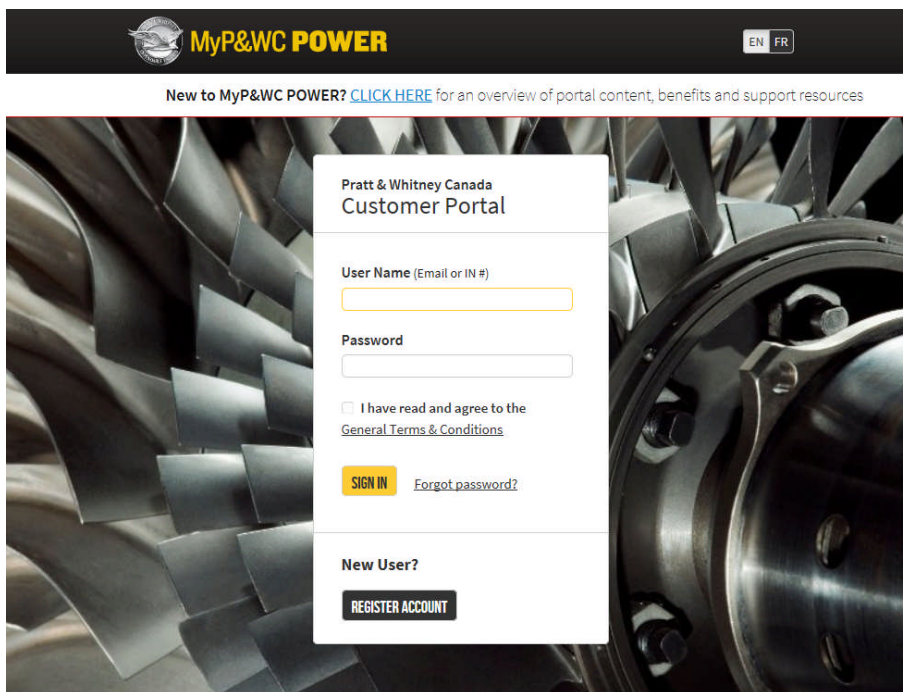


Figure 2: MyP&WC POWER Logon Page

- 2) Navigate and select “Library” as shown in Figure 3.

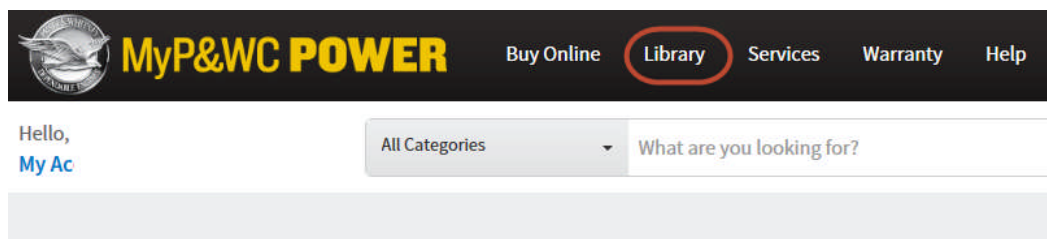


Figure 3: MyP&WC POWER Library

- 3) Select “FAST Interface Software” and click “Download” to save the installation file as shown in Figure 4

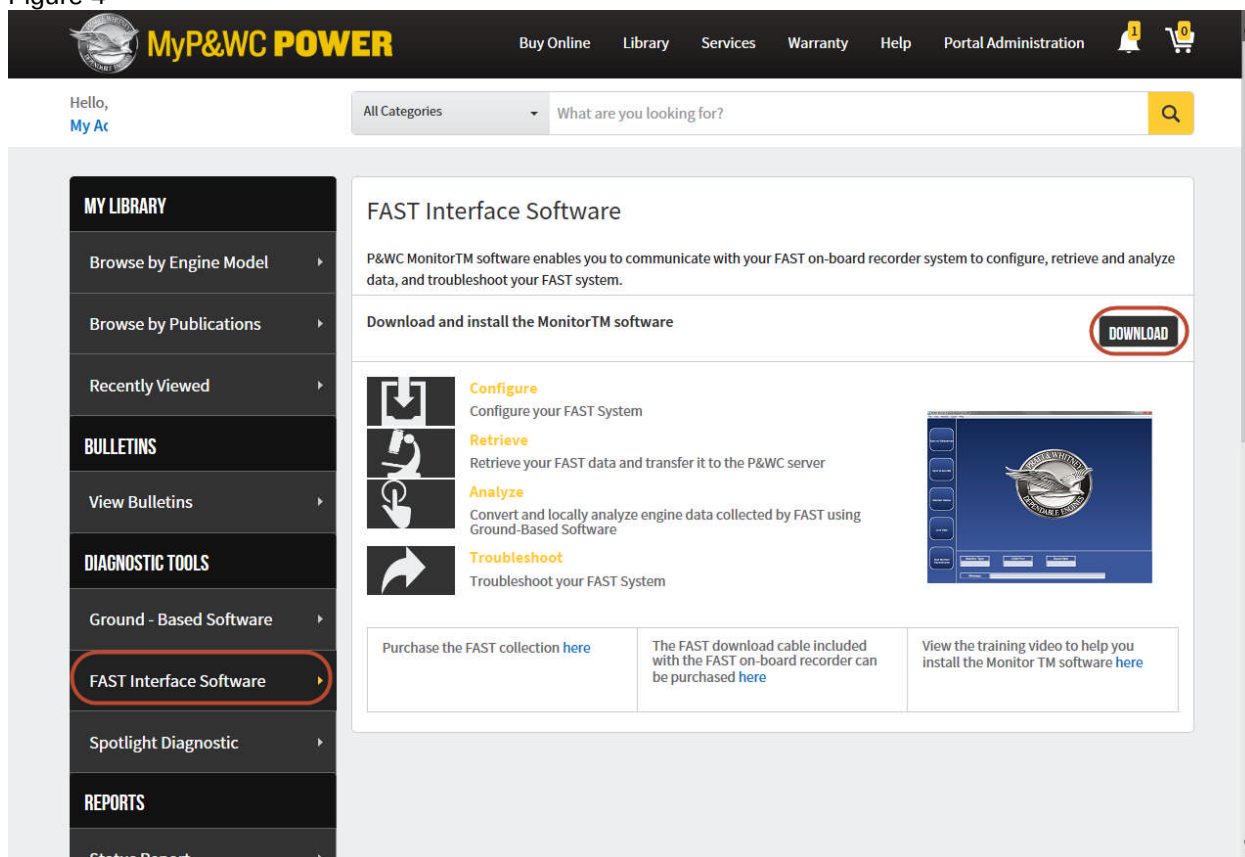


Figure 4: MyP&WC POWER FAST Interface Software

- 4) Follow the Setup instructions.
- 5) The default destination folder is: C:\GBS-PWC
- 6) To launch the program, select the P&WC Monitor TM icon on the desktop, as shown in Figure 5.



Figure 5: P&WC MonitorTM Icon

2.2 FAST USB GSE Cable Driver Installation

NOTE: Driver installation can be done before or after inserting the USB cable into your PC's USB port.

NOTE: Prior to installation admin rights on the PC will be required.

- 1) With MonitorTM installed, open Windows explorer to "Driveletter:\GBS-PWC\bin\Monitor\STARTUP\Driver". Refer to Figure 6.

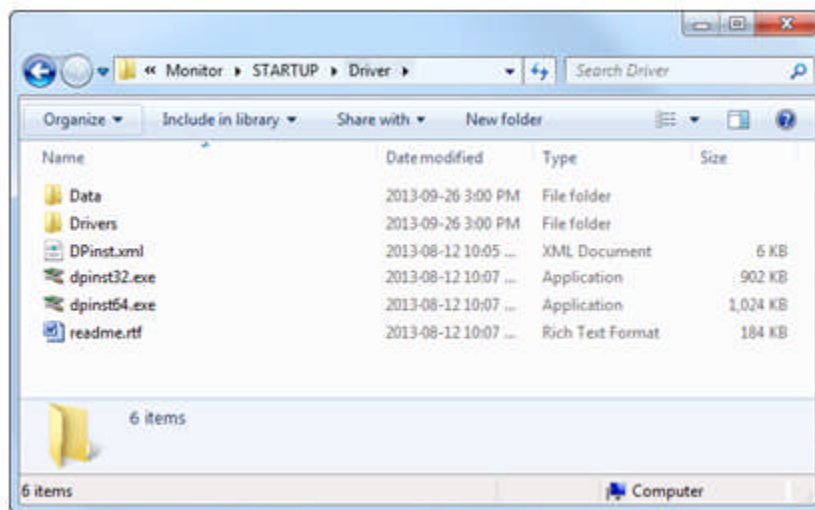


Figure 6: MonitorTM Driver Folder

- 2) Depending on your operating system, double-click dpinst32.exe for 32-bit version of Windows or dpinst64.exe for 64-bit version of Windows. Refer to Figure 6.

NOTE: If you are using 32-bit operating system, dpinst64.exe cannot be opened.

- 3) Follow the onscreen instructions. Select the "Finish" button to complete the driver installation. Refer to Figure 7.



Figure 7: USB Drivers Installed

3 FAST Monitor Configuration

The FAST monitor can be configured using the “synchronize” feature in the Transfer Module program. The steps below will illustrate how to retrieve the configuration file(s) from the Webserver to your laptop and transfer the file(s) from the laptop to the FAST monitor.

NOTE: A Customer Activation Form (CAF) must be completed before a configuration file can be retrieved from the Webserver. Aircraft, engine, and SIM card data are some of the details in the CAF that are required. The CAF can be obtained from the Dealer or authorized representative.

- 1) Connect the laptop to the internet.
- 2) Launch the Transfer Module program by clicking on the Monitor TM Icon, as shown above in Figure 5.
- 3) Click on the “Sync to Webserver” button as shown in Figure 8. This function will do the following:
 - a) Upload any log files to Webserver
 - b) Downloads any configuration files to the laptop
 - c) Downloads any updates to the Transfer Module program



Figure 8: Sync to Webserver

- 4) Enter the FAST serial number as shown in Figure 9.

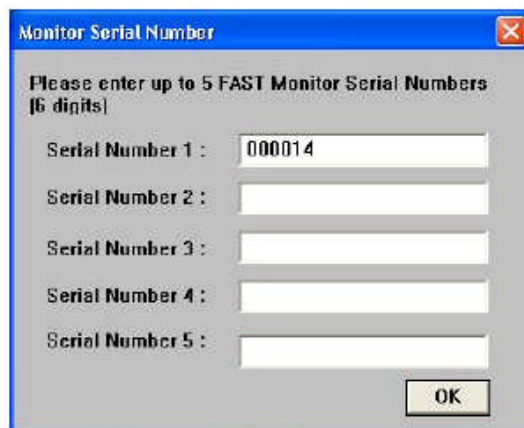


Figure 9: FAST Monitor S/N

- 5) When the Sync to Webserver is complete, connect the Communication Cable between your laptop computer's USB port and the FAST J3 Comm Port.
- 6) Turn aircraft power on.
- 7) Click on the "Sync to Aircraft" button, as shown in Figure 10. This will perform the following functions:
- a) Retrieve any log files from the FAST processor.
 - b) Load any configuration files into the FAST processor

NOTE: The FAST monitor automatically reboots once the configuration file has been successfully loaded and will take approximately 1 minute.

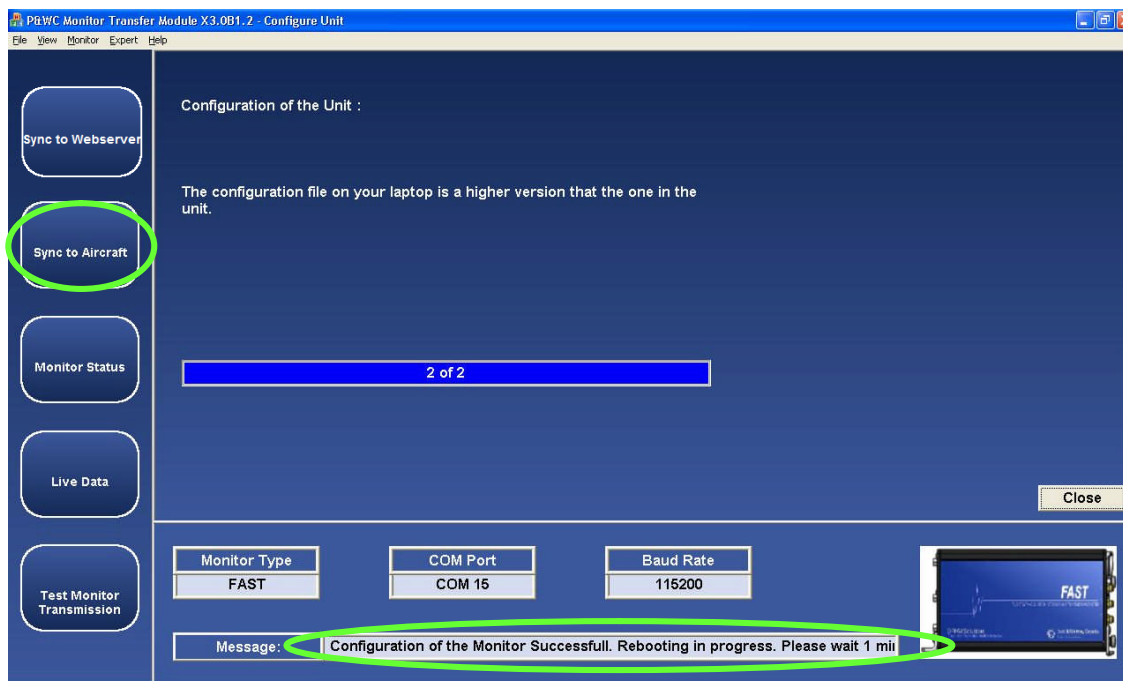
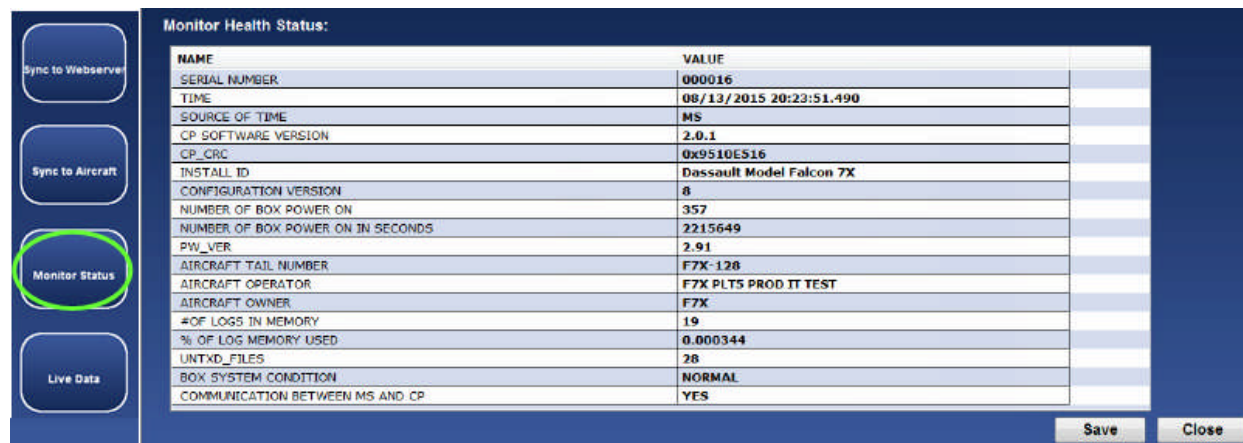


Figure 10: Sync to Aircraft

- 8) Click on the “Monitor Status” button. This will provide you a quick status of the box configuration. Example shown in Figure 11.



NAME	VALUE
SERIAL NUMBER	000016
TIME	08/13/2015 20:23:51.490
SOURCE OF TIME	MS
CP SOFTWARE VERSION	2.0.1
CP_CRC	0x9510E516
INSTALL ID	Dassault Model Falcon 7X
CONFIGURATION VERSION	8
NUMBER OF BOX POWER ON	357
NUMBER OF BOX POWER ON IN SECONDS	2215649
PW_VER	2.91
AIRCRAFT TAIL NUMBER	F7X-128
AIRCRAFT OPERATOR	F7X PLTS PROD IT TEST
AIRCRAFT OWNER	F7X
#OF LOGS IN MEMORY	19
% OF LOG MEMORY USED	0.000344
UNTXD_FILES	28
BOX SYSTEM CONDITION	NORMAL
COMMUNICATION BETWEEN MS AND CP	YES

Figure 11: Monitor Status

- 9) Disconnect the Communication Cable between your laptop computer’s USB port and the FAST J3 Comm Port.
- 10) Turn aircraft power off.

- 1) Connect the Communication Cable between your laptop computer's USB port and the FAST J3 Comm Port.
- 2) Turn aircraft power on.
- 3) Open the Monitor Transfer Module program and click on "Live Data" and select the sensors you would like to view by placing a check mark in the box next to the sensor name. To select all sensors click the top check box next to "NAME". Click "Retrieve Selected" to view the sensor values. Refer to Figure 12 for an example of the Live Data Selection screen. Sensors shown may vary by aircraft configuration.

[illegible]

Figure 12: Live Data Sensor Selection (Sample)

- 4) Confirm that all sensors are valid (Invalid values are displayed in red). An example is shown in Figure 13. Sensors shown may vary by aircraft configuration.

NOTE: Start and Stop recording buttons allow you to record all the live data. The live data will be saved under \Monitor\FAST_GBSDATA\Livedata folder as a GBS std file, which can be later viewed using the GBSLite program.

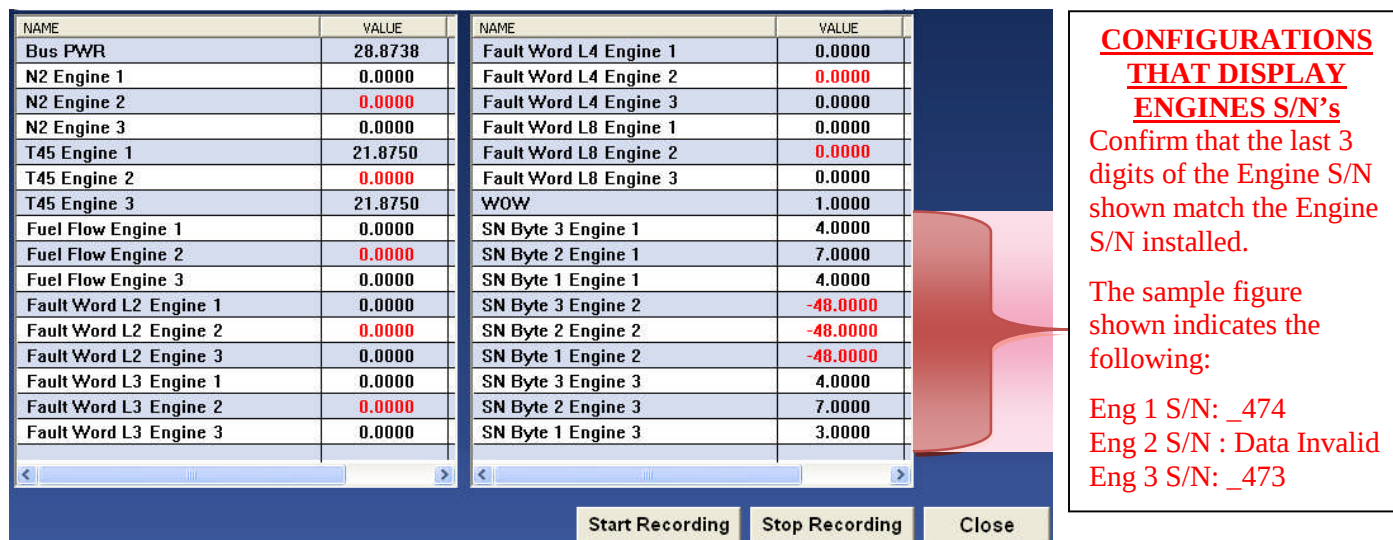


Figure 13: Live Data View (Dassault F7X / F8X shown)

CAUTION

For Aircraft Configurations that display the Engine S/N in Live Data

If the Engine S/N displayed in Live Data does not match the Engine S/N installed the data will not upload to the Webserver account. When this discrepancy is observed the proper engine S/N should be loaded into the Engine and Live Data should be re-verified. If the Engine S/N still does not match contact Pratt & Whitney Engine Services Customer Support.

Phone: 1 (781) 762-8600
Email: dphmsupport@pwc.ca

- 5) Close the Monitor Transfer Module program and disconnect the Communication Cable between your laptop computer's USB port and the FAST J3 Comm Port.
- 6) Turn aircraft power off.

5 FAST Transmission Test – Manual

- 1) Ensure that the SIM Card is installed in the FAST Processor. This can be verified by removing the 2 hex screws (1/16) that secure the SIM Card Door located in the back of the FAST (Near J1 / J2). The SIM card tray can be ejected by pressing the small button at the bottom of the SIM Card Opening. Refer to Figure 14.

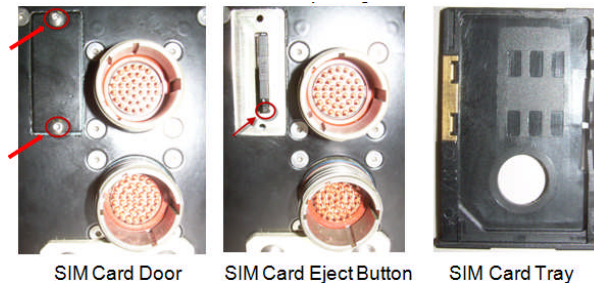


Figure 14: Cellular SIM Card

- 2) Connect the Communication Cable between your laptop computer's USB port and the FAST J3 Comm Port.
- 3) Turn aircraft power ON and wait a minimum of 2 minutes (boot-up time) before advancing to the next step.

NOTE: For Cessna Caravan Operators – Once aircraft power has been ON for a minimum of 2 minutes the aircraft power should be shut OFF before advancing to the next step. The cellular Transmission will only occur when the aircraft Bus Power is switched OFF. The FAST will latch to the "HOT" Battery Bus for a maximum of 10 minutes.

- 4) Open the Monitor Transfer Module program and click on "Test Monitor Transmission" and confirm that all status messages indicate "PASS", as shown in Figure 15.

NOTE: The transmission is completed via a cellular connection and may not transmit in the hangar. A Cellular signal of -95 dB or higher is considered a good signal.

NOTE: Once all status messages indicate "PASS" the transmission is complete. If data logs were stored in the FAST they can now be viewed on Webserver.

Test Monitor Transmission:

NAME	STATUS
SYSTEM CONDITION	PASS
WEIGHT ON WHEELS CONDITION	PASS
ON GROUND TRIGGER	PASS
RECORD DATA TRIGGER	PASS
MICRO SERVER READY	PASS
GSM SIM CARD	PASS
GSM SIGNAL	PASS (~79dB)
VPN CONNECTION	PASS
UPLOAD STATUS	PASS
TEST MONITOR TRANSMISSION STATUS	Pass

Close

Monitor Type: FAST COM Port: COM 5 Baud Rate: 115200

Message: FAST Successfully Connected

Figure 15: Test Monitor Transmission

- 5) Close the Monitor Transfer Module program and disconnect the Communication Cable between your laptop computer's USB port and the FAST J3 Comm Port.
- 6) Turn aircraft power off.

6 Aircraft Testing

While following the requirements of FAR 91.407, it is recommended that the aircraft be inspected for airworthiness prior to testing. If the ground test of the modified aircraft is not successfully completed, the aircraft should be returned to the original aircraft configuration until the tests are completed and acceptable.

After installation of the FAST, it is recommended that ground tests be performed to verify the correct operation of the system in the aircraft. The following sections outline the suggested aircraft and system test procedures.

6.1 Aircraft Ground Test – Engine(s) OFF

- ☐ 010 With external power connected to aircraft, apply external power to the aircraft bus.
- ☐ 020 Power on all avionics.
- ☐ 030 Tune Comm 1 and Comm 2 VHF radios to the frequencies in Table 1 and verify that there is no interference caused by the FAST. This can normally be conducted by checking for auto squelch break on each listed frequency.
- ☐ 040 If interference is suspected at any particular frequency, pull the FAST circuit breaker to see if the interference subsides.
- ☐ 050 If the aircraft is equipped with a GPS navigation receiver, display the satellite status page and cycle power on the FAST.
- ☐ 060 Verify that the GPS signal strength is not affected by the operation of the FAST.
- ☐ 070 Tune the #1 and #2 VHF NAV receivers to receive a valid navigational signal from either a VOR ramp tester or a locally tuned VOR navigation transmitter.
- ☐ 080 Verify that valid course deviation and a retracted NAV flag are displayed on the HSI or the VOR course indicator.
- ☐ 090 Cycle power on the FAST and verify that there is no effect on the displayed NAV data.
- ☐ 100 Survey the aircraft for any other installed equipment (HGS, TCAS, ADF, DME, TAWS, etc.) that may be affected by interference from the FAST. Perform any additional tests as required to determine if the FAST creates objectionable interference. This may be accomplished by pulling the FAST circuit breaker while observing the subject equipment. List the additional equipment tested and any observed effects in the Electromagnetic Compatibility Testing Table (See Table 2).
- ☐ 110 Remove external power from aircraft.

Frequency	Pass/Fail	Frequency	Pass/Fail
118.00 MHZ		127.00 MHZ	
119.00 MHZ		128.00 MHZ	
120.00 MHZ		129.00 MHZ	
121.00 MHZ		130.00 MHZ	
122.00 MHZ		131.00 MHZ	
123.00 MHZ		132.00 MHZ	
124.00 MHZ		133.00 MHZ	
125.00 MHZ		134.00 MHZ	
126.00 MHZ		135.00 MHZ	

Table 1: VHF Frequency Table

6.2 Aircraft Ground Test – Engine(s) ON

- ☐ 010 Turn aircraft power on.
- ☐ 020 Start engine(s).
- ☐ 030 With the engine running and the FAST operational, tune Comm 1 and Comm 2 VHF radios to the frequencies in Table 1 and verify that there is no interference caused by the FAST. This can normally be conducted by checking for auto squelch break on each listed frequency.
- ☐ 040 If interference is suspected at any particular frequency, pull the FAST circuit breaker to see if the interference subsides.
- ☐ 050 If the aircraft is equipped with a GPS navigation receiver, display the satellite status page and cycle power on the FAST.
- ☐ 060 Verify that the GPS signal strength is not affected by the operation of the FAST.
- ☐ 070 Tune the #1 and #2 VHF NAV receivers to receive a valid navigational signal from either a VOR ramp tester or a locally tuned VOR navigation transmitter.
- ☐ 080 Verify that valid course deviation and a retracted NAV flag are displayed on the HSI or the VOR course indicator.
- ☐ 090 Cycle power on the FAST and verify that there is no effect on the displayed NAV data.
- ☐ 100 Survey the aircraft for any other installed equipment (HGS, TCAS, ADF, DME, TAWS, EICAS, etc.) that may be affected by interference from the FAST. Perform any additional tests as required to determine if the FAST creates objectionable interference. This may be accomplished by pulling the FAST circuit breaker while observing the subject equipment. List the additional equipment tested and any observed effects in the Electromagnetic Compatibility Testing Table (See Table 2).
- ☐ 110 Stop Engine(s).
- ☐ 120 Shut aircraft power off.

Equipment	Problem Found Y/N?	Comments Ground Test
HGS		
TCAS		
ADF		
DME		
TAWS		
EICAS		

Table 2: Electromagnetic Compatibility Test Table

7 FAST Data Retrieval and Upload Test

7.1 Automatic Data Retrieval and Upload

- 1) Start engine(s)
- 2) Shut off engine(s)
- 3) Leave aircraft power on for at least 15 minutes (data retrieval and upload time). This can be accomplished by having the APU running (if equipped) or by providing ground power.

NOTE: Cessna Caravan Operators – Step 3 does not apply. The FAST will not retrieve or upload the data until the aircraft power is shut OFF. Once the aircraft power is shut OFF the FAST will latch to the “HOT” battery for 10 minutes and trigger the data retrieval and upload.

- 4) Verify that the status “STS” Green LED illuminates solid on the FAST processor within one minute after engine(s) shutdown. This indicates that the Cell modem RF is ON.
- 5) Verify that the status “STS” Green LED starts blinking (1Hz rate) within 20 minutes on the FAST processor. When blinking, the FAST processor has made a cellular connection and is transmitting data.

NOTE: The duration of step 5 is dependent on cellular signal strength.

- 6) Transmission is complete when the status “STS” Green LED transitions back to solid on the FAST processor.
- 7) Shut aircraft power off.
- 8) Log into the CAMP Engine Health Monitoring (EHM) system.
- 9) Confirm that the data transmitted and posted to your account with the correct engine S/N’s shown.

NOTE: When a Dealer, Manufacturer, or Installer uses their own SIM card for testing purposes ensure that it is removed from the FAST after all tests have successfully completed.

NOTE: When a Dealer, Manufacturer, or Installer uses their own SIM card and is different than the Operator’s SIM card the FAST will require a new configuration file. Refer to Section 3 for configuration instructions.

NOTE: Ensure that the Operator’s SIM card is installed (if available) prior to releasing the aircraft.

NOTE: Ensure that the FAST Transmission Test is completed with the operator’s SIM card if it has the ability to transmit in the geographic location. Refer to Section 5.

7.2 Manual Data Retrieval and Upload

NOTE: *An engine run must have been completed before the log files can be retrieved.*

- 1) Connect the Communication Cable between your laptop computer's USB port and the FAST J3 Comm Port.
- 2) Turn aircraft power ON.
- 3) Open the Monitor Transfer Module program; select "Retrieve Log Files" from the Monitor menu, as shown in Figure 16 then click the "Retrieve Transmitted" files

NOTE: *Check the "Non-Transmitted Data" folder if there are no log files in the "Transmitted Data" folder.*

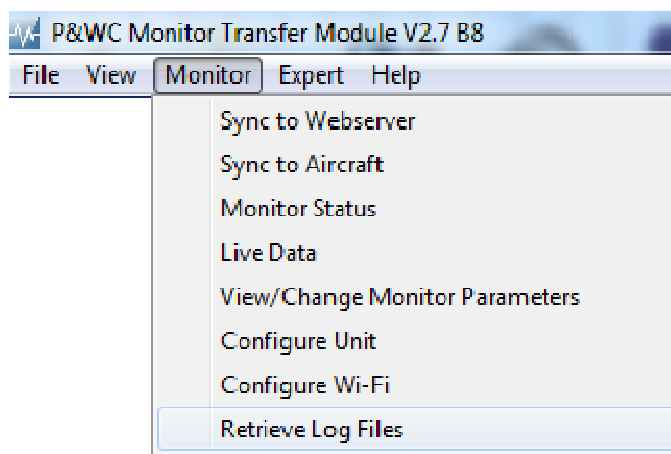


Figure 16: Retrieve Log Files

- 4) When the log files have been successfully downloaded, connect the laptop to the internet.
- 5) Click on the "Sync to Webserver" button, as shown above in Figure 8. The program will perform the following functions:
 - a) Upload any log files to Webserver
 - b) Downloads any configuration files to the laptop
 - c) Downloads any updates to the Transfer Module program
- 6) Confirm that the data transmitted and posted to your CAMP Engine Health Monitoring (EHM) account.