Data Transmission Unit
Instructions for Continued Airworthiness
DTU-G-260-1

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PREFACE

Disclaimer
Like all instrumentation, the Pratt & Whitney Engine Services, Inc. Data Transmission Unit (DTU) requires knowledgeable interpretation by the pilot. Any recommendations and operating procedures contained in this manual shall not supersede the Aircraft or Engine manufacturer recommendations, operating procedures, or limits. The Pratt & Whitney Engine Services, Inc. Data Transmission System should not be used as a primary guide monitoring the Aircraft and Engine manufacturers operating limits. Pratt & Whitney Engine Services, Inc. is not liable for any damages resulting from the use of this product.

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**Note:** Revisions to this document shall be coordinated through the Boston Aircraft Certification Office, the Aircraft Evaluation Group, and the STC holder. If the DTU Instructions for Continued Airworthiness are revised, all operators will be provided with a copy of the applicable revision. If you have a subscription with TurbineTracker™, you will be informed via email of new revisions to this manual. In addition to this, P&W Engine Services maintains the latest versions of all manuals in the Support Section of TurbineTracker™.

If you are not a subscriber to TurbineTracker™, you may call P&W Engine Services Customer Support at 781-762-8600 for the latest revision.
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1 INTRODUCTION

1.1 Scope
The purpose of this document is to provide users of this product with the P&W Engine Services approved instructions for continued airworthiness. Any deviation from the procedures described within this document could result in a failure of the product to perform properly and could possibly result in damage to other systems of the aircraft.

1.2 Applicability
This document applies to aircraft that have P&W Engine Services Generation III monitors installed and are altered by the installation of an P&W Engine Services’ Data Transmission Unit, DTU-K-089-2.

1.3 Definitions and Abbreviations
DTU – Data Transmission Unit
GSM – Global System for Mobile Communications
ICA – Instructions for Continued Airworthiness
LAN – Local Area Network
MLP – Monitor Link Program
RF – Radio Frequency
STC – Supplemental Type Certificate

1.4 Precautions
This section not applicable

1.5 Units of Measure
This section not applicable

1.6 Referenced Publications
DTU-G-260-1 Generic Instructions for Continued Airworthiness for Part 23 and Part 25 Aircraft
DTU-G-260-1/A Addendum A, ICA for Fairchild Dornier GmbH Model 328-300
DTU-G-260-1/B Addendum B, ICA for Part 23 P&W Engine Services Generation III Monitors

1.7 Distribution
These Instructions for Continued Airworthiness are to be furnished with new production Data Transmission Units equipped with P&W Engine Services Generation III monitors and is to become part of the permanent aircraft record upon installation.
2 DESCRIPTION

2.1 Data Transmission Unit (DTU) General Description

The DTU will provide the communications system through which aircraft and engine performance data can stream to the Internet without operator intervention. The source of this data will be a pre-existing aircraft or engine monitoring system. The destination will be the P&W Engine Services TurbineTracker™ Server. In this, the primary mode of operation, the DTU passively receives and relays the aircraft data.

The DTU will support multiple communication modes to achieve data transfer. These will include hardwire, Cellular and Wireless LAN. The capabilities of the certified system are illustrated in Figure 1.

![Figure 1: Capabilities of Data Transmission System](image)

The capabilities of the DTU are detailed below in Table 1.

<table>
<thead>
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<tr>
<td>Bi-directional serial interface with P&amp;W Engine Services engine monitors and OEM engine monitors.</td>
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<tr>
<td>Multi-mode GSM Cellular and 802.11 Wireless LAN RF communications for data retrieval and system configuration download.</td>
</tr>
<tr>
<td>Bi-directional serial interface for hardwire data retrieval and system configuration download.</td>
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<tr>
<td>Individual discrete digital outputs for system diagnosis and for control of P&amp;W Engine Services engine monitor.</td>
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<tr>
<td>Hardware and software for power control for the RF sections of the DTU.</td>
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<tr>
<td>Software for Internet protocol addressing and packet data transmission.</td>
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<tr>
<td>Built-in test of interface and communication functions.</td>
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Table 1: Summary of DTU Capabilities
2.2 System Processor

The processor (Figure 2) facilitates wireless connectivity between aircraft mounted subsystems (ACS) and external systems. This connectivity is bi-directional and allows configuration data to be sent to the ACS, data to be retrieved from the ACS, and the ability to interrogate the status of the ACS in near real time.

The processor does not require access during flight.

The processor measures 3.7” high by 6.0” long by 2.7” deep and weighs 1.8 lbs. An aluminum bracket with Lord Aerospace shock mounts is used to mount the processor to the aircraft.

![Processor Image](image)

**Figure 2: Processor**

The system processor is mounted in remote section of the aircraft using the P&W Engine Services supplied mounting bracket (Figure 3). Although the processor will not require access during normal operation, care should be taken to install the processor in an area that complies with the environmental requirements of the system.

![Mounting Bracket Diagram](image)

**Figure 3: Typical Processor Shock Mount Detail**


2.3 *Indicating / Control Components*

Following are the descriptions and functions of the control components and indicators.

- **DTU RF Status / Fault Lamp** – A status lamp and switch (Figure 4) that consists of a .75” x 1.25” rectangle push-to-test combination switch and lamp. Fault indications are displayed to the operator through the on/off, or flashing, status of the lamp. The push-button switch is also used to initiate actions internal to the DTU processor.

![Figure 4: DTU RF Status/Fault Lamp](image)

- **Circuit Breaker (+28 VDC)** – Automatically interrupts the electrical circuit under abnormal conditions. This connection is made to aircraft primary bus power that should be active whenever the aircraft battery switch is activated.

- **Fuse (+28 VDC)** – Automatically interrupts the electrical circuit when the electrical current exceeds the specified amperage. This connection is made directly to the aircraft battery and must have power at all times.

- **Communications (COMM) Port** – Used to interface with the processor. Data can be transferred and downloaded through this port (Figure 5).

![Figure 5: Communications Port](image)
2.4 **Airframe Components**

A description of airframe components as well as their functions is described in the following:

2.5 **GSM / GPRS Antenna**

The cellular communications antenna (Figure 6) and the LAN antenna (Figure 7) are internally mounted items. Where possible, they should be located behind an interior panel or within an area encompassed by fiberglass such as the nose cone of the aircraft. Specific mounting and installation instructions can be found in the addendum applicable to your aircraft.

![GSM / GPRS Antenna](image1)

*Figure 6: GSM / GPRS Antenna*

![LAN Antenna](image2)

*Figure 7: LAN Antenna*
3 CONTROL AND OPERATION

3.1 DTU Functional Description

The Data Transmission Unit (DTU) works as follows:

- When the aircraft lands the DTU will collect data from the aircraft system.
- The DTU will establish a cellular connection. The DTU will utilize an existing GSM/GPRS cellular network for data transmission.
- All information downloaded from the aircraft system will be transmitted to the Internet based data collection management service, TurbineTracker™.
- P&W Engine Services’ TurbineTracker™ website has integrated Pratt & Whitney Canada’s WebECTM® program, so trend data uploaded is automatically processed and made available for WebECTM® analysis.
- The transmission of data can occur after every flight.

3.2 System Initialization and Lamp State Description

The Data Transmission Unit (DTU) incorporates a “push-to-test” dual lamp indicator to provide the operator with information about the system.

DTU status processing involves the display of the DTU status to a user. Two lamps and a button are employed to present and control the DTU status:

- DTU Status Lamp: displays overall system status
- RF Status Lamp: displays the current state of the Micro Server (MS) power
- DTU Button: accepts user control of the DTU Status Lamp and DTU Maintenance mode.

3.3 Initialization

When power is first applied the Data Transmission Unit initializes, the fault lamp will indicate the various stages of the process. The initialization sequence will proceed as follows:

When the processor’s power is first applied, the fault lamp will illuminate both the DTU Status and RF Status lamps for 3 to 5 seconds while the system performs a series of self-tests. The following self-tests are performed during initialization:

- Micro Controller Test
- Lamp Test (momentary flicker)
- Temporary Memory Test
- Data Log Memory Test
- Program Integrity Test

At the completion of the DTU processor initialization, the DTU Status lamp and RF Status lamp will indicate system status as described below.
3.4 System Mode

The lamps incorporated into the Data Transmission Unit provide information by flashing at various rates or being displayed on solid as follows:

- Normal: Off
- Caution: Flash slow (1 Hz)
- Maintenance: Flash slow, hold button for 5 seconds to clear
- Transmitting: Flash fast (2 Hz)
- Fault: Solid

4 SERVICING INFORMATION

This section is not applicable

5 MAINTENANCE INSTRUCTIONS

The P&W Engine Services DTU has been designed with the latest solid-state technology. The only component that has a limited life span is the internal battery. This battery, under normal operating conditions, is expected to last 10 years. If the battery is discharged, the processor must be returned to P&W Engine Services for battery replacement.

5.1 Recommended Periodic Scheduled Servicing Tasks

None required

5.2 Recommended Periodic Scheduled Preventive Maintenance Tests/Checks

None Required

5.3 Recommended Periodic Scheduled Inspections

Specific recommended periodic scheduled inspections can be found in the addendum applicable to your aircraft.

5.4 Recommended Periodic Structural Inspections

Specific recommended periodic scheduled inspections can be found in the addendum applicable to your aircraft.
6 SYSTEM TROUBLESHOOTING

When the system does not function properly (or as you expect it to operate), the first thing that you must do is identify and isolate the problem. When you have accomplished this, you can effectively begin to resolve the problem.

The first step in troubleshooting is to isolate each system component and ensure that each component functions properly when it is run independently. Using the Monitor Link Program (MLP), you can interrogate the system to determine which function or component may have failed. Occasionally you may have to replace existing components to correct the problem. Determine if the problem is in the aircraft, DTU processor, wiring, the antenna or configuration of the processor.

Ask the question, can you repeat or recreate the problem? Random events may appear to be related, but they are not necessarily contributing factors to your problem. You may be experiencing more than one problem. You must isolate and solve one problem at a time. Log (document) all testing and problem isolation procedures. You may need to review this document later. This will also prevent you from duplicating your testing efforts.

Once you have isolated a problem, take the necessary steps to resolve it. Refer to the problem solutions contained in this document. If you cannot solve your system problems using this troubleshooting guide, or if the problem persists, refer to Section 4 herein and contact P&W Engine Services Help Desk.

Before contacting the Help Desk, have someone from your organization with a technical understanding of the Data Transmission Unit (DTU) and its application provide answers to the following questions:

- Engine Type?
- Airframe Type?
- Processor Type?
- Airframe Tail Number?
- Processor Serial Number?
- Is there a problem history?
- Visual or computer indications?
- Has the processor worked previously?
- What activity was being performed when the failure occurred?

The DTU will monitor and record system failures in a log that can be downloaded and reviewed. Status of the system can be obtained through the status/fault lamp.

Detailed troubleshooting for the system processor as well as for the various input channels can be found in the topic-specific sections that follow.
6.1 System Processor

The first point of troubleshooting the DTU is to be able to power up and communicate to the system processor. During the initial power up phase, the system processor will perform self-test and display lamp indications on the cockpit fault lamp (Figure 8). If the system powers up and will communicate with the Monitor Link Program (MLP), the download log will define any system faults. These faults can be investigated by following the troubleshooting methods in this section.

![System Processor Start-Up Test Flow Diagram](image)

Figure 8: System Processor Start-Up Test Flow Diagram
6.1.1 Processor Test
This section defines the basic test to determine if the processor is powered and functioning properly. Follow the processor test flow diagram (Figure 9) to determine failure.

Figure 9: System Processor Test Flow Diagram
6.2 Indicating Components

6.2.1 Status / Fault Lamp Display Test
This section defines the basic test to determine if the cockpit fault lamp display is functioning. Follow the fault lamp test flow diagram (Figure 10) and connection diagram to determine failure.

With processor powered measure voltage at fault lamp connector pins: 1 and 2

24V measured?

No → Check wiring. If OK then replace processor

Yes → Power cycle processor and measure voltage at fault lamp connector pins: 4 and 2

24V during power?

No → Check wiring. If OK then replace processor

Yes → Normal operation. Replace Fault Lamp Bulb.

Figure 10: Cockpit Fault Lamp Test Flow Diagram
6.2.2 Download Port Test

This section defines the basic test to determine if the communications port is functioning. Follow the download port test flow diagram (Figure 11) and connection diagram to determine failure.

**NOTE: Pin (1) one is identified by a dimple.**

With processor powered measure voltage at download port connector pins: 1 and 2

1.5V measured?

Yes

Normal Operation. Check Communications Cable and Computer

No

Disconnect ConXall connector and measure 1.5V at pins 1 and 2.

1.5V measured?

Yes

Check Wiring. If OK replace processor.

No

Replace Lemo Port Assembly.

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Figure 11: Download Port Test Flow Diagram

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Figure 12: Download Port Socket – Front View
7 REMOVAL AND REPLACEMENT INFORMATION
Specific Removal and replacement instructions can be found in the addendum applicable to your aircraft

8 SPECIAL INSPECTION REQUIREMENTS
None required

9 APPLICATION OF PROTECTIVE TREATMENTS
This section is not applicable

10 DATA
Specific instructions for structural fasteners and parts used in the installation of the DTU can be found in the addendum applicable to your aircraft

11 LIST OF SPECIAL TOOLS
A list of special tools can be found in the addendum applicable to your aircraft

12 FOR COMMUTER CATEGORY AIRCRAFT
For Commuter Category Aircraft, electrical load data applicable for each system and aircraft weight and balance must be identified. The Data Transmission Unit has a current draw of 300 milliamps at 28V DC intermittently (during RF transmission), and 150 milliamps at 28V DC continuously. The DTU kit weighs 5.3 lbs.

Note: The DTU is connected directly to the aircraft battery. If the aircraft battery switch is turned off while the DTU is transmitting data, the DTU will remain latched to the battery for up to one hour to complete the data transmission. During this time, the current draw will be 300 milliamps. A typical data packet will take approximately 15 minutes to transmit. In all circumstances, immediately after the completion of the data transmission, the DTU will shut itself off.

13 RECOMMENDED OVERHAUL PERIODS
This section is not applicable

14 AIRWORTHINESS LIMITATIONS
The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

15 DIAGRAMS
Specific diagrams can be found in the addendum applicable to your aircraft.
ADDENDUM A: Data Transmission Unit Instructions for Continued Airworthiness for Fairchild Dornier GmbH Model 328-300
ADDENDUM B: Data Transmission Unit Instructions for Continued Airworthiness for Part 23 Pratt & Whitney Engine Services, Inc. Generation III Monitors