Data Transmission Unit

Installation Manual

DTU-G-010-1

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PREFACE

Disclaimer
Like all instrumentation, the Pratt & Whitney Engine Services, Inc. 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 Unit (DTU) should not be used as a primary means of Aircraft and Engine manufacturers operating limit exceedance. The pilot and/or crew remains the primary means of operation exceedance information. Pratt & Whitney Engine Services, Inc. is not liable for any damages resulting from the use of this product.

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Note: If the DTU Installation Manual is 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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DTU-G-260-1 “Data Transmission Unit (DTU) Instructions for Continued Airworthiness”
1 INTRODUCTION

This document contains the installation instructions for an airframe mounted Data Transmission Unit (DTU) as an element of the P&W Engine Services Data Transport System (DTS). DTS provides two bi-directional data communication portals through which aircraft and engine performance data can be transmitted, primarily via wireless techniques, to a remote data and application-processing server.

1.1 DTS General Description

A simplified block diagram of the DTS, of which the DTU is the primary physical element, is shown in Figure 1 to clarify its interaction with all of its associated elements.

![DTS Simplified Block Diagram](image)

Figure 1: DTS Simplified Block Diagram

The primary purpose of the DTU is to provide a portal between the on-aircraft measurement systems and a remote data and application server. This data communication shall typically occur with no human intervention when wireless communication is available at the aircraft destination point.

1.2 Scope

The purpose of this document is to provide users of this product with P&W Engine Services approved installation instructions. 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.

**NOTE:** To perform an installation, select the appropriate aircraft model addendum, read the system overview, then, complete the preparation section checklist. Find the aircraft wiring diagram and follow the steps described in the mechanical and electrical assembly sections. Check off each instruction as it is completed. When finished, proceed to post-installation, configuration, and testing sections of the manual.
1.3 About This Manual

This document contains general information regarding mechanical and electrical hardware. It also includes a series of addenda with specific installation instructions. For specific aircraft model installation procedures, refer to the appropriate addendum attached.

In all documents, mechanical and electrical sections are made up of instruction lists that take the following form:

1. A heading that lists the applicable aircraft or engine. Headings appear as follows:

   For All Aircraft:

2. Cautions present things to be aware of while performing the installation. Cautions appear as follows:

   **INSTALLATION CAUTION:**

   Excessive torque on the processor-mounting studs can deform the shock mounts. The locking nut should be tightened only to the point of contact with the shock mount.

3. Numbered assembly and wiring instructions, which include boxes for checking off steps as they are performed. Instructions appear as follows:

   **Wiring Instructions:**

   Perform the following steps:

   **Engines**

   1  2

   ```
   010 Trim the cable to length
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4. Notes present things that require specific attention to detail. Notes appear as follows:

   **NOTE:** To perform an installation, select the appropriate aircraft model addendum.
1.4 System Description

A typical Data Transmission Unit (DTU) (Figure 2) is depicted as follows:

![Data Transmission Unit (DTU)](image)

Figure 2: Data Transmission Unit (DTU)

1.5 Unpacking the Equipment

Carefully remove each component from its original package. Place each component on a roll-away cart or suitable workbench in the work area.

1.6 Parts List

Care must be taken when handling all parts and equipment. Before opening packages, perform an inventory check by comparing the receivables to the appropriate bill of materials.

1.7 Weight and Balance

Calculating weight and balance of the Data Transmission Unit (DTU) after installation is the responsibility of the installer. Although the system weight is less than 6 pounds (excluding miscellaneous hardware not supplied with the kit – e.g. clamps, tie wraps, etc), P&W Engine Services suggests that the installer weigh each kit individually and record the weight prior to installation. During the installation, save all items that are not installed on the aircraft, for example: cable that has been trimmed to length and any plastic or paper bags that individual components were packaged in. After the completion of the installation, weigh all materials that were not installed on the aircraft. Subtract this weight from the weight of the kit prior to the installation. This will give you the total system weight that is installed on the aircraft. For LRU weights refer to the addendum specific to your aircraft application.
2 INSTALLATION AND MAINTENANCE PROCEDURES

INSTALLATION CAUTION:

⇒ Use of any procedure (e.g. addendum) that does not apply to your specific application could cause unnecessary damage to the aircraft and/or result in a system or product malfunction.

2.1 Standard Practices-Airframe/Powerplant

Prior to installation, be sure that you have read the appropriate model addendum that applies to your specific installation. Review all manufacturer provided airframe and powerplant documentation in order to understand installation requirements and technical capability of the system.

NOTE: General wiring supplies (solder, crimp splices, heat shrink, tape, grommets, cable ties and cable tie holders, etc) are not included with the installation kit.

Prior to installation, verify and follow each of the following instructions and guidelines:

1. All work to be done in accordance with FAA Advisory Circular 43.13-1B "Acceptable Methods, Techniques, and Practices for Aircraft Inspection and Repair" and with FAA Advisory Circular 43.13-2A "Acceptable Methods, Techniques and Practices - Aircraft Alterations"

2. All work to be done in accordance with applicable aircraft manufacturer’s standard practices. Refer to the manufacture’s maintenance manuals for acceptable methods.

3. Read all instructions completely before beginning any installation. Only qualified mechanics or avionics technicians shall perform the installation.

4. All aircraft systems interfacing with the P&W Engine Services Data Transmission Unit (DTU) must be checked for full functionality before installation begins.

5. All illustrated mounting locations should be used as a general guide for mounting. Locations shown in illustrations may be altered to fit special individual installation requirements as needed, provided accepted structural procedures and practices are followed.

6. Refer to the manufacturer’s manual for approved locations or cautions for clamping hoses and cables, or modifying aircraft structure.

2.1.1 Procedure for Wiring Connections

INSTALLATION CAUTION:

⇒ The DTU cables have shields that connect to the processor chassis ground. When terminating the shielded harness at the airframe connection, these shields must be trimmed back and insulated to prevent possible shorting with the signal wires.

NOTE: Each cable is marked with a shrink on label near the end to indicate its connection. When you shorten the cable behind the label, be sure to re-label it.
2.1.2 Wiring Splices

The use of Raychem™ hermetic style wire splices (Figure 3 and Figure 4) is recommended. When making connections between two shielded cables, the shields should also be maintained using Raychem™ or equivalent shield splices. The entire cable splice should be encased in heat shrink tubing when completed.

A general procedure for wire splices (See Figure 3 and Figure 4) is illustrated as follows:

![Diagram of Wire Splices]

**Figure 3: Single or Dual Wire Splices**

![Diagram of Shielded Connection]

**Figure 4: Shielded connection (Outer Heat-Shrink Tubing Not Shown)**
2.1.3 Maintenance

The P&W Engine Services Data Transmission Unit (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 Data Transmission Unit (DTU) processor must be returned to P&W Engine Services for battery replacement.

The only field-replaceable (non-LRU) component in the P&W Engine Services Data Transmission Unit (DTU) is the incandescent lamps in the Status lamp. This lamp can be purchased at any aircraft supply store or by calling P&W Engine Services. Should you suspect a problem, the unit should be returned to the factory for service with an RMA number obtained from the Help Desk.

Care of the processor under normal operation consists of general cleaning and inspection for bracket and connector security at every major engine or aircraft inspection.
3 INSTALLATION - MECHANICAL

3.1 System Processor

The processor (Figure 5) 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.

![Figure 5: Processor](image)

The system processor is mounted in remote section of the aircraft using a P&W Engine Services supplied mounting bracket (Figure 6). 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.

**NOTE:** For mounting instructions, refer to the appropriate addendum that applies to your specific aircraft.

![Figure 6: Typical Processor Shock Mount Detail](image)
3.2 **Indicating / Control Components**

The system status/fault lamp and communications port must be mounted so that they are accessible. The main circuit breaker and fuse do not need to be accessible, but should be located in an area where maintenance can access them if needed.

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

### 3.2.1 DTU RF Status / Fault Lamp

A status lamp and switch (Figure 7) 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 (flashing) status of the Fault lamp. The push-button switch is also used to initiate actions internal to the DTU processor.

![Figure 7: DTU RF Status/Fault Lamp](image)

### 3.2.2 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.

### 3.2.3 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.

### 3.2.4 Communications (COMM) Port

Used to interface with the processor. Data can be transferred and downloaded through this port (Figure 8).

![Figure 8: Communications Port](image)

**NOTE:** Installation instructions for each of the above components can be found in the addendum specific to your aircraft.
3.3 **Airframe Components**

A description of airframe components as well as their functions is described as follows:

3.3.1 **GSM / GPRS Antenna**

The cellular communications antenna (Figure 9) is mounted inside the aircraft. Specific mounting and installation instructions can be found in the addendum applicable to your aircraft.

*NOTE: The antenna is not certified to be mounted external to the aircraft.*

![Figure 9: GSM / GPRS Antenna](image)

3.3.2 **LAN Antenna**

The LAN antenna (Figure 10) may be affixed to the DTU processor or an existing wire clamp location by using the supplied nylon clamp. Specific mounting and installation instructions can be found in the addendum applicable to your aircraft.

*NOTE: The antenna is not certified to be mounted external to the aircraft.*

![Figure 10: LAN Antenna](image)
4 INSTALLATION - ELECTRICAL

The Data Transmission Unit (DTU) has one external harness and two antenna connections. For specific wiring schematics, refer to the addendum that applies to your specific aircraft installation.

4.1 Electrical Power

The Data Transmission Unit (DTU) requires 2 aircraft power inputs and one ground input.

1. Aircraft bus power is required primarily to supply power to the system. The aircraft master battery switch controls this power source. The connection utilizes a 1 Amp circuit breaker. This connection will also supply power to the DTU fault lamp.

INSTALLATION CAUTION:

⇒ The second power source connection must not be controlled by the aircraft master battery switch and must route directly to the battery.

2. Aircraft battery power is required to supply backup power to the processor during all operating conditions including intentional primary bus power-down. This is required so the DTU can complete a data download in the event main aircraft power is terminated prior to the completion of the transmission. This connection is protected by a supplied 1 Amp fuse.

3. The ground connection can be made to airframe ground close to the aircraft battery power source to minimize any ground loop potential.

NOTE: Power connections are defined in the addendum applicable to your aircraft.

4.2 Fault Lamp and Communications Port

The Data Transmission Unit provides cabling to connect to the communications port and fault lamp.

4.3 Aircraft Subsystem (ACS)

The Data Transmission Unit (DTU) interfaces to the aircraft subsystem (ACS) or Generation III monitor with a serial connection. This connection is typically made at the maintenance port of the aircraft subsystem.

NOTE: ACS connections are defined in the addendum applicable to your aircraft.

4.4 Weight-on-Wheels (WOW) Switch

The weight-on-wheels switch will provide the Data Transmission Unit (DTU) with an on-ground / off-ground indication. This secondary lockout is required to enable the activation of the RF circuitry needed to make a cellular connection. Unless the DTU receives and “On-ground” indication from the weight-on-wheels sensor and it has made connection to the aircraft system to confirm that the engine(s) are not running, the system will not allow activation of the RF circuit. The weight-on-wheels switch provides a secondary/redundant lockout to the engine temp/speed input to determine on ground – engines off.

The connection to the aircraft weight-on-wheels switch is required to provide a ground signal to the DTU when the aircraft is in an “On-ground” condition.

NOTE: Installation instructions the weight-on-wheels sensor can be found in the addendum specific to your aircraft.
5 SYSTEM OPERATION OVERVIEW

5.1 DTU Functional Description

The Data Transmission Unit (DTU) works as follows:

- When the aircraft lands and the engines are shut down, 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.

5.2 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.

![Figure 11: DTU Status Lamp](image-url)
5.2.1 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 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-test. 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.

5.2.2 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, press button to clear
- Transmitting: Flash fast (2 Hz)
- Fault: Solid

<table>
<thead>
<tr>
<th>Failure Type</th>
<th>DTU Fault</th>
<th>RF Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIT</td>
<td>F</td>
<td>Off</td>
<td>Diagnostics error</td>
</tr>
<tr>
<td>ACS Connect</td>
<td>M</td>
<td>Off</td>
<td>Cannot talk to ACS</td>
</tr>
<tr>
<td>Data TX Error</td>
<td>Off</td>
<td>M</td>
<td>Error during up/download</td>
</tr>
<tr>
<td>RF enable</td>
<td>Off</td>
<td>On</td>
<td>RF ok, waiting</td>
</tr>
<tr>
<td>RF TX</td>
<td>Off</td>
<td>T</td>
<td>Sending/receiving data</td>
</tr>
<tr>
<td>Memory size</td>
<td>85% – M</td>
<td>Off</td>
<td>Memory threshold(s) reached</td>
</tr>
<tr>
<td>Data Integrity</td>
<td>C</td>
<td>Off</td>
<td>Talking with ACS, but had a problem</td>
</tr>
</tbody>
</table>

Table 1: DTU Faults
5.2.3 DTU Status

The DTU Status Lamp is used to inform a maintenance person of the DTU status.

The RF Status Lamp is provided to inform a maintenance person of the state of the DTU RF capabilities. The RF Status Lamp is on any time the RF enable is true. The RF Status Lamp is flashing rapidly any time the DTU is transferring data to or from the DTU via RF.
6 SYSTEM CONFIGURATION

The Data Transmission Unit must be configured after installation. The installer, with the help of a computer and software communication tools, performs this configuration. Configuration requires a laptop computer connected to the system with a download cable and running P&W Engine Services Monitor Link Program (MLP).

6.1 Definitions

Configuration File: An MLP data file that contains cellular carrier information, aircraft subsystem (ACS) information for a specific aircraft. This information is transmitted to the processor during configuration.

Configuration Version: A number stored with a particular configuration file. The MLP and TurbineTracker™ both maintain version numbers of the current configuration file in use. These must match each other and correspond with the data collected and stored by the system processor. If the configuration file is changed, the version number is automatically incremented.

MLP (Monitor Link Program): The P&W Engine Services communication program is used to transfer data to and from the processor.

6.2 Processor Configuration

These instructions require that the installer have a laptop computer with the current version of MLP and has created the required installation configuration file. The current version of the MLP and its manual are available from the TurbineTracker™ website.

NOTE: Ensure that you have the correct copy of the Configuration File to be loaded.

- 010 Connect the download cable to the download port of the DTU to be configured. The cable can only be plugged in one way. Connect the other end of the cable to the serial port on a laptop computer with the current version of the MLP.
- 020 Place the download cable “RUN/CONF” switch on the cable in the “CONF” position.
- 030 Establish connection to the processor using MLP. If unable to establish connection, proceed with the MLP Troubleshooting Procedure (See the MLP manual).
- 040 Select “Configure Unit” under the MLU Menu.
- 050 Follow the on-screen prompts and select the appropriate installation configuration file.
- 060 If you are prompted to retrieve the Log File, retrieve the log data by selecting ‘MLU’ under the MLU Menu and then click on ‘Retrieve Unit’s Data Log’.
- 070 Save the log file in the Log directory folder.
- 080 Select “Configure Unit” under the MLU Menu.
- 090 Follow the on-screen prompts and select the appropriate installation configuration file.
7 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 Data Transmission Unit (DTU), 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.

7.1 Aircraft Ground Test

For All Listed Engine Models:

- **010** With the aircraft battery connected and master switch on, verify that the fault lamp illuminates, indicating system boot-up. After approximately 5 seconds, the lamp will extinguish and either:
  - Remain extinguished (NORMAL STATE)
  - Flash (MAINTENANCE OR CAUTION STATE)
  - Illuminate Solid (FAULT STATE)

  If the processor does NOT go into NORMAL STATE, retrieve the log data, and troubleshoot the system.

- **020** Turn battery switch off.

- **030** With external power connected to aircraft, apply external power to the aircraft bus.

- **040** Power on all avionics.

- **050** Tune Comm 1 and Comm 2 VHF radios to the frequencies in Table 2 and verify that there is no interference caused by the DTU. This can normally be conducted by checking for auto squelch break on each listed frequency.

- **060** If interference is suspected at any particular frequency, pull the DTU in-line fuse to see if the interference subsides.

- **070** If the aircraft is equipped with a GPS navigation receiver, display the satellite status page and cycle power on the DTU.

- **080** Verify that the GPS signal strength is not affected by the operation of the DTU.

- **090** 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.

- **100** Verify that valid course deviation and a retracted NAV flag are displayed on the HIS or the VOR course indicator.

- **110** Cycle power on the DTU and verify that there is no effect on the displayed NAV data.

- **120** If the aircraft is equipped with an autopilot, initiate autopilot self test. This may require pulling, and then resetting the autopilot circuit breaker with power applied to the DTU.

- **130** Verify that the autopilot completes a successful self-test.

- **140** Survey the aircraft for any other installed equipment that may be affected by interference from the DTU. Perform any additional tests as required to determine if the DTU creates objectionable interference. This may be accomplished by pulling the DTU in-line fuse while observing the subject equipment. List the additional equipment tested and any observed effects in the Electromagnetic Compatibility Testing Table (See Table 3).
150 Remove external power from aircraft and start engine(s).

```
<table>
<thead>
<tr>
<th>Frequency</th>
<th>Pass/Fail</th>
<th>Frequency</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>118.00 MHZ</td>
<td></td>
<td>127.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>119.00 MHZ</td>
<td></td>
<td>128.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>120.00 MHZ</td>
<td></td>
<td>129.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>121.00 MHZ</td>
<td></td>
<td>130.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>122.00 MHZ</td>
<td></td>
<td>131.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>123.00 MHZ</td>
<td></td>
<td>132.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>124.00 MHZ</td>
<td></td>
<td>133.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>125.00 MHZ</td>
<td></td>
<td>134.00 MHZ</td>
<td></td>
</tr>
<tr>
<td>126.00 MHZ</td>
<td></td>
<td>135.00 MHZ</td>
<td></td>
</tr>
</tbody>
</table>
```

Table 2: VHF Frequency Table

7.1.1 Engine(s) Running:

- **010** Start engine.
- **020** With the engine running and the DTU operational, tune Comm 1 and Comm 2 VHF radios to the frequencies in Table 2 and verify that there is no interference caused by the DTU. This can normally be conducted by checking for auto squelch break on each listed frequency.
- **030** If interference is suspected at any particular frequency, pull the DTU in-line fuse to see if the interference subsides.
- **040** If the aircraft is equipped with a GPS navigation receiver, display the satellite status page and cycle power on the DTU.
- **050** Verify that the GPS signal strength is not affected by the operation of the DTU.
- **060** 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.
- **070** Verify that valid course deviation and a retracted NAV flag are displayed on the HIS or the VOR course indicator.
- **080** Cycle power on the DTU and verify that there is no effect on the displayed NAV data.
- **090** If the aircraft is equipped with an autopilot, initiate autopilot self test. This may require pulling, and then resetting the autopilot circuit breaker with power applied to the DTU.
- **100** Verify that the autopilot completes a successful self-test.
110 Survey the aircraft for any other installed equipment that may be affected by interference from the DTU. Perform any additional tests as required to determine if the DTU creates objectionable interference. This may be accomplished by pulling the DTU in-line fuse while observing the subject equipment. List the additional equipment tested and any observed effects in the Electromagnetic Compatibility Testing Table (See Table 3).

120 Stop Engine(s).
130 Verify RF Lamp illuminates showing RF Status enabled.
140 Manually toggle (activate/deactivate) aircraft “Weight-on-Wheels” switch and verify RF lamp turns off, indicating RF is disabled.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Problem Found Y/N?</th>
<th>Comments Ground Test</th>
<th>Comments Flight Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 3: Electromagnetic Compatibility Test Table
8 SERVICE

8.1 Customer Support

P&W Engine Services provides customer support in accordance with the product warranty detailed within the customer’s sales contract. If you have any questions concerning any P&W Engine Services product, please do not hesitate to contact us. Our Help Desk accepts calls Monday through Friday between 9:00 AM and 5:00 PM EST. Please have your model and serial number ready when you call.

Comments and findings should be forwarded to P&W Engine Services for inclusion in our continued product improvement program.

In the event that the Data Transmission Unit (DTU) must be returned for service, contact the P&W Engine Services Help Desk for a Returned Material Authorization (RMA) number. When you receive the RMA number, include it in the package address and ship it, postage and insurance prepaid, to the address listed below.

When shipping an item for service, please include a complete detailed description of the symptoms you are experiencing. This will greatly assist our technicians in rapidly identifying the problem. After service, the processor will be returned to you or your dealer with the shipping prepaid.

Pratt & Whitney Engine Services, Inc.
Help Desk
249 Vanderbilt Ave.
Norwood, MA 02062
Phone: (781) 762-8600
Fax: (781) 762-2287
E-mail: support@altairavionics.aero
## 9 SPECIFICATIONS

### 9.1 System Specifications

**GENERAL**

Chassis Size (each): 3.7" x 2.7" x 6.0"

Kit Weight: Approximately 6 lbs. – Refer to applicable addendum for actual system weight

**POWER REQUIREMENTS**

Voltage Range: 11 to 32 VDC

Current Draw: < 1.0 A @ 11 VDC

Power Draw:
- 8 Watts operating
- 20 mWatts standby

**ENVIRONMENTAL (ALL TESTS TO RTCA/DO-160D)**

<table>
<thead>
<tr>
<th>Test Performed</th>
<th>RTCA Section</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature &amp; Altitude</td>
<td>Section 4.0</td>
<td>Equipment tested to category D3</td>
</tr>
<tr>
<td>- Low Temperature</td>
<td>Section 4.5.1</td>
<td>- 40 °C Operating, - 55 °C Non-operational</td>
</tr>
<tr>
<td>- High Temperature</td>
<td>Section 4.5.2</td>
<td>85 °C</td>
</tr>
<tr>
<td>Operating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- In-Flight Loss of Cooling</td>
<td>Section 4.5.4</td>
<td>Test not required</td>
</tr>
<tr>
<td>- Altitude Test</td>
<td>Section 4.6.1</td>
<td>-1,000 to 55,000 Ft</td>
</tr>
<tr>
<td>- Decompression Test</td>
<td>Section 4.6.2</td>
<td>Test not required</td>
</tr>
<tr>
<td>- Overpressure Test</td>
<td>Section 4.6.3</td>
<td>Test not required</td>
</tr>
<tr>
<td>Temperature Variation</td>
<td>Section 5.0</td>
<td>Equipment tested to category A, 10 °C/Min</td>
</tr>
<tr>
<td>Humidity</td>
<td>Section 6.0</td>
<td>Equipment tested to category B</td>
</tr>
<tr>
<td>Shock</td>
<td>Section 7.0</td>
<td>Equipment tested to category B</td>
</tr>
<tr>
<td>- Operational</td>
<td>Section 7.2</td>
<td>Equipment tested to category B</td>
</tr>
<tr>
<td>- Crash Safety Test</td>
<td>Section 7.3</td>
<td>Equipment tested to category B</td>
</tr>
<tr>
<td>Vibration</td>
<td>Section 8.0</td>
<td>Robust test performed to category R and U</td>
</tr>
<tr>
<td>Explosion</td>
<td>Section 9.0</td>
<td>Equipment identified as category E</td>
</tr>
<tr>
<td>Waterproofness</td>
<td>Section 10.0</td>
<td>Equipment identified as category R</td>
</tr>
</tbody>
</table>
Fluids Susceptibility  Section 11.0  Equipment identified as category F
Sand and Dust  Section 12.0  Equipment identified as category D
Fungus  Section 13.0  Equipment identified as category F
Salt Spray  Section 14.0  Equipment identified as category S
Magnetic Effect  Section 15.0  Equipment identified as category Z
Power Input  Section 16.0  Equipment tested to category B
Voltage Spikes  Section 17.0  Equipment tested to category B
Audio Freq. Susceptibility  Section 18.0  Equipment tested to category B
Induced Signal Susceptibility  Section 19.0  Equipment tested to category Z
Radio Freq. Susceptibility  Section 20.0  Equipment identified as category V
Radio Freq. Emission  Section 21.0  Equipment tested to category L Lightning Induce
Induced Signal Susceptibility  Section 22.0  Equipment identified as category B3F3
Lightning Direct Effect  Section 23.0  Equipment identified as category X Test done in accordance with HSER23/90 For PT6C-67C
Icing  Section 24.0  Test Not Required
Electrostatic Discharge  Section 25.0  Equipment identified as category A

DATA INTERFACE
Computer Interface:  RS-485 Serial Interface, 57,600 Baud

SYSTEM SOFTWARE
The DTU has been designed and tested to RTCA/DO-178B Level C.

SAMPLE RATE
The DTU samples Engine Temperature and Engine Speed once per second.

DATA STORAGE
Flash Storage Memory:  32 MB
9.2 Interface Requirements for Aircraft Sensors

FAULT LAMP

The DTU may interface with an existing cockpit lamp. The lamp shall have the following characteristics:

Nominal Voltage: +28 VDC
Current: 40 mA +/- 10%
Power Dissipation: 1.24 Watts
Average Rated Life (0°C): 1,500 Hours

DIAGNOSTIC SWITCH

The diagnostic switch is part of the status/fault lamp assembly. The input shall have the following characteristics:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Threshold</td>
<td>0 VDC</td>
<td>Switch Depressed</td>
</tr>
<tr>
<td></td>
<td>&gt; 0 VDC</td>
<td>Switch Disengaged</td>
</tr>
</tbody>
</table>

POWER INPUT +28 VDC

The DTU requires power via two (2) 1 Amp fuses. The input shall be as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>+28 VDC</td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td>20 – 30 VDC</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>11 VDC</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>32 VDC</td>
<td></td>
</tr>
</tbody>
</table>

WEIGHT ON WHEELS SWITCH / HOUR METER

The DTU requires a discrete signal input to detect actuation of the aircraft on-ground. The input shall have the following characteristics:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Threshold</td>
<td>0 VDC</td>
<td>On Ground</td>
</tr>
<tr>
<td></td>
<td>&gt; 0 VDC</td>
<td>Air</td>
</tr>
</tbody>
</table>
Glossary of Terms

ACK – Acknowledge
AC – Alternating current
EGT – Exhaust Gas Temperature
HSP – Hot Start Prevention
ITT – Inlet Turbine Temperature
Log Data - Stored Operational Readings
LRU – Line Replaceable Unit
MEL – Minimum Equipment List
MGT – Measured Gas Temperature
MLP – Monitor Link Program
MLU – Monitor Link Unit
Nf – Free Turbine
Np – Propeller
Nr Speed – Main Rotor Speed
N1 (Ng) Speed – Low Compressor Rotor Speed
N2 Speed – High Compressor Rotor Speed
OAT – Outside Air Temperature
OEI – One Engine Inoperative
Pa – Ambient Pressure
P/N – Part Number
PRV – Pressure Regulating Valve
P/T – Power Turbine
P1 – One Point Slope Calibration
P2 – One Point Offset Calibration
Ta – Ambient Temperature
TOT – Turbine Outlet Temperature
T4.5 – Power Turbine Inlet Temperature
Wf – Fuel Flow (PPH)
ΔP – Differential Pressure
ΔT – Differential Temperature

Ta – Ambient Temperature
TOT – Turbine Outlet Temperature
T4.5 – Power Turbine Inlet Temperature
Wf – Fuel Flow (PPH)
ΔP – Differential Pressure
ΔT – Differential Temperature
ADDENDUM A: Data Transmission Unit Installation Manual for Fairchild Dornier GmbH Model 328-300
ADDENDUM B: Data Transmission Unit Installation Manual for Pratt & Whitney Engine Services, Inc. Part 23 Generation III Monitors
ADDENDUM C: Data Transmission Unit Installation Manual for Bell 206 Series & TH-67 Series
ADDENDUM E: Data Transmission Unit Installation Manual for Sikorsky Model S-76A and S-76C
ADDENDUM F: Data Transmission Unit Installation Manual for Agusta Model A109E
ADDENDUM G: Data Transmission Unit Installation Manual for Agusta Model A119