ULTRA

Maintenance Terminal Manual (ANVS)

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ACTIVE NOISE & VIBRATION CONTROL SYSTEM (ANVS)

MAINTENANCE TERMINAL USER MANUAL FOR WINDOWS 10 OPERATING SYSTEM

THE TECHNICAL CONTENT OF THIS DOCUMENT IS APPROVED UNDER THE AUTHORITY OF:
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Maintenance Terminal Manual (ANVS)

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Maintenance Terminal Manual (ANVS)

TABLE OF CONTENTS

ULTRA

Maintenance Terminal Manual (ANVS)

TABLE OF CONTENTS

ULTRA.

Maintenance Terminal Manual (ANVS)

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ULTRA

Maintenance Terminal Manual (ANVS)

LIST OF ILLUSTRATIONS

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Maintenance Terminal Manual (ANVS)

LIST OF ILLUSTRATIONS

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Maintenance Terminal Manual (ANVS)

INTRODUCTION

1. **GENERAL:**

This manual provides information for the Maintenance Terminal to be used with Ultra, Precision Control Systems Active Noise and Vibration Control system.

The Manual is divided into the following sections:

- Introduction.
- Maintenance Terminal Description and Operation.
- Maintenance Terminal Requirements, Installation and Registration.
- Connecting and Setting up of the Maintenance Terminal.
- Maintenance Terminal Operation.
- System Calibration.
- System Information.
- Error Messages.

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ABBREVIATIONS AND ACRONYMS

Abbreviations	Definition
AC	Alternating Current
ANCU	Active Noise Control Unit
ANVC	Active Noise and Vibration Control
ANVS MT	Maintenance Terminal
ARINC	Aeronautical Radio, Incorporated
ATVA	Active Tuned Vibration Attenuator
EPX	EPX Series Rectangular Modular Connector
ID	Identity
MCU	Microcontroller Unit
NVM	Non Volatile Memory
PBMS	Propeller Balance Monitoring System
RPM	Revolutions Per Minute
USB	Universal Serial Bus
VGA	Video Graphics Adaptor

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1. DESCRIPTION AND OPERATION:

A. System Description.

(1) The Active Noise & Vibration System (ANVS) reduces the level of the periodic noise and vibration in the passenger cabin caused by the Aircraft Engines and Propellers. This is done by manufacturing another (Secondary) field in the cabin, which is in anti-phase with the primary (Original) field. The primary and secondary fields come together and cancel each other out to produce lower noise levels.

(2) The ANVS consists of the Active Noise Control Unit (ANCU), Sensors and Actuators placed around the Aircraft cabin and Power Amplifiers to operate the actuators.

(a) The Sensors are Microphones, which are attached to the Aircraft trim, ceiling and overhead lockers along with Accelerometers (Dash 8 400) which are mounted on the Aircraft structure.

(b) The Actuators are loud speakers, which are attached to the Aircraft trim and mounted in enclosures, or Active Tuned Vibration Attenuators (ATVA) which are mounted on fuselage frames or other structural components such as bulkheads.

(c) The Power Amplifiers are mounted with or near the Actuators.

(3) The fundamental frequencies of the noise are measured by the ANCU. The measurement inputs are taken from either the Engine Tachometers or wild bus AC alternator signals, which provide frequency data. The ANCU processes this information together with the noise levels measured by the sensors and sends out noise control signals to the Actuators via the Power Amplifiers.

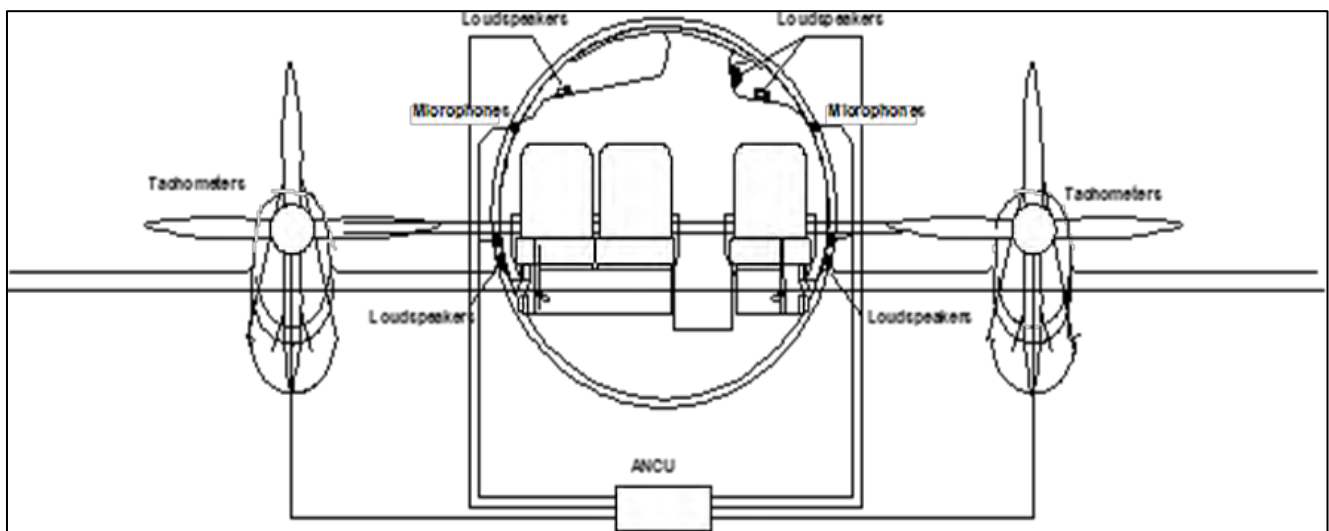(4) **Figure 1-1** shows a typical installation for a Turbo-Prop Aircraft System using Loudspeakers.

Figure 1-1 System Installation

(5)   The ANCU performs a Self-Test whenever power is applied or after it is reset. If all the tests are passed, the ANCU is initialised from configuration data, calibration data and system status data stored in the Non Volatile Memory (NVM).

(6)   Following successful initialisation, the ANCU will start Active Control when at least one frequency input is in the range of control as defined in the configuration data (Normally set as all flight RPM but on some Aircraft, taxi RPM is also in range for ATVA systems).

(7)   During Active Control, the ANCU:

   (a)   Measures the tonal noise from the engines and propellers contained in the signals received from the sensors.

   (b)   Receives cabin pressure input (Systems using ATVA only).

   (c)   Calculate the Actuator outputs necessary to cause noise reduction.

   (d)   Transmits the necessary output signals to the Actuators.

(8)   During Active Control, the ANCU checks the operation of the systems Sensors and Actuators. A signal that cannot be heard is applied to each Actuator and the Actuators outputs are measured at each Sensor. If a faulty Actuator or sensor is found, the applicable channels are not used for the remainder of the flight. The failure is recorded in the NVM. Faulty Actuators or Sensors are restored to operation when the ANCU weight-on-wheels signal is received or the ANCU is re-initialised either by reset or by application of power.

(9)   Any Actuator or Sensor that is found to be faulty for a number of successive flights is permanently failed until maintenance action is taken. The number of successive flights is defined in the configuration data. When the number of permanent failures is more than the degraded limit, the System Status Indicator on the front panel of the ANCU changes from Green to Orange and the degraded output is enabled. The system will operate with slightly degraded performance. No maintenance action is required.

(10)   When the number of failures is more than the failed limit, the ANCU stops Active Control. The System Status Indicator on the front panel of the ANCU will change from Green to Red. The System Fault output is enabled and maintenance is required.

(11)   If the Pause input is set to Pause, the ANCU stops the signals to the Actuators and therefore stops controlling. When the Pause input is set to Control, the ANCU re-starts control by gradually increasing the output to the Actuators.

(12)   If the Pressure input goes outside the range defined in the configuration parameters stored in the ANCU, the ANCU stops active Control. Active Control will restart when the pressure input comes back in to range (Systems using ATVA).

(13)   When the Weight-on-wheels input goes from In-Air to On-Ground the event triggers the increment of the flight count stored in the ANCU and subsequent processing of data affected by the Flight-Count. E.g. The number of successive flights for which an Actuator has failed.

(14) If a fault is detected which cannot be corrected, or a unit fault is detected:

   (a) The System Status indicator on the front panel of the ANCU changes from Green to Red.

   (b) The System Fault output is enabled and maintenance is required.

B. ANCU Description.

(1) The ANCU is an ARNIC 600 4MCU sized unit, hard mounted to the Aircraft on four feet **(Ref Fig 1-2).**

(2) Electrical connections to the ANCU are as follows:

   (a) Up to five EPX connectors, J1 through J4 and J6, mounted on the rear endplate.

   (b) A 9-way D-Type connector, J5, mounted on the front endplate.

   (c) A MIL-DTL-38999 connector, J7, mounted on the front endplate.

(3) The majority of the connectors to the ANCU relate to its Active Noise and Vibration Control function.

   (a) J1, which is the input connector for Aircraft +28V DC power and the frequency reference signals, which define the propeller engine speeds.

   (b) J2 through J4 and J6 connectors for the sensor, ATVA input and output.

   (c) J5 provides the EIA-232 interface to the Maintenance Terminal.

   (d) J7, which is the input connector for the Vibration Transducer, signals.

(4) A Tri-State LED indicator on the front endplate of the ANCU displays the system status.

Figure 1-2 ANCU
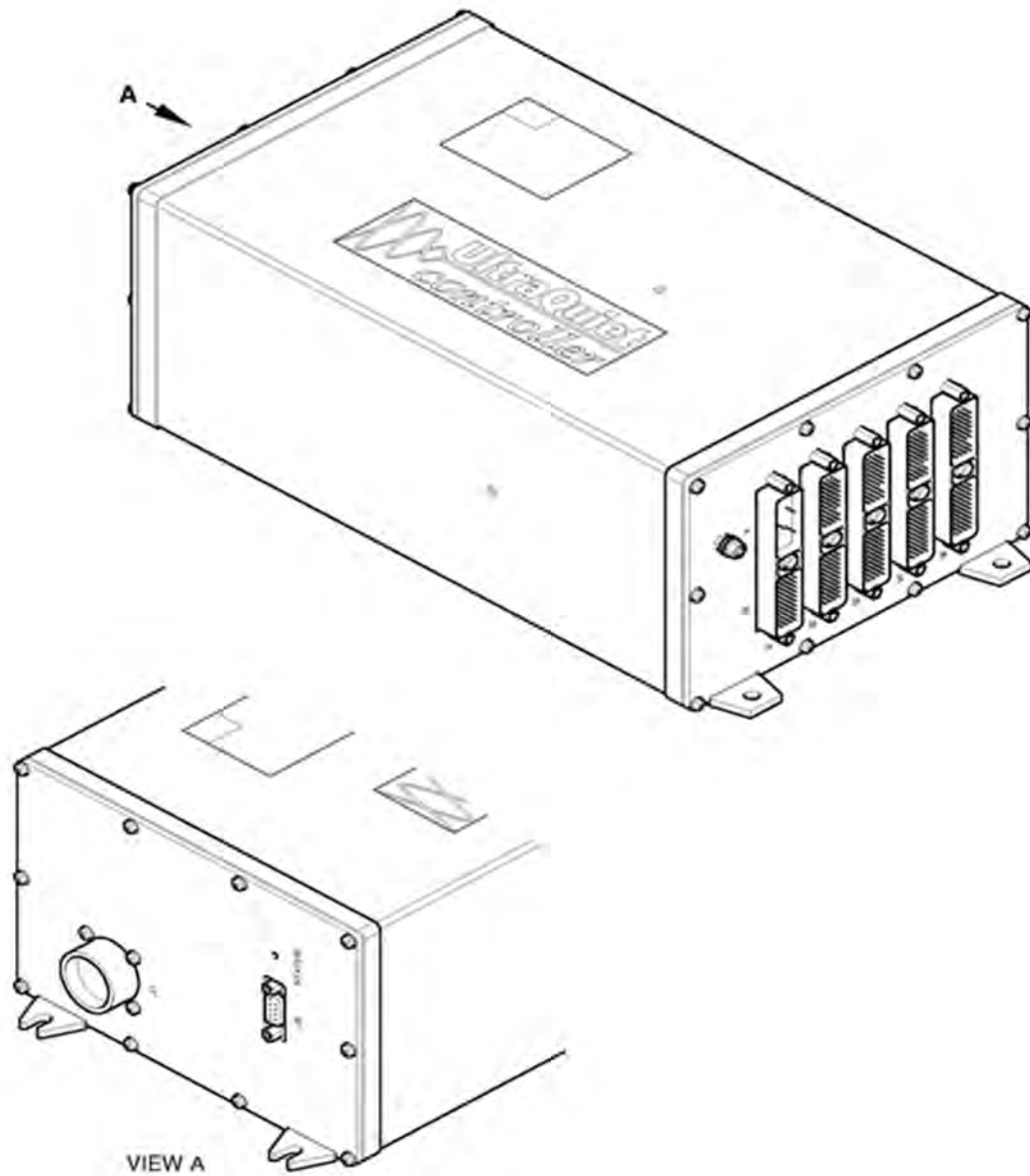
C.   Maintenance Terminal Functions.

The Maintenance Terminal (ANVS MT) contains software to communicate with type 83x range of controllers. It also contains Advanced Maintenance Terminal Software (AMT) to communicate with the 81x and 82x range of controllers.

When the ANVS MT is switched on the software will try to establish if you are connected to 81x, 82x or an 83x type controller**.**
If the MT Detects a Type 81x or 82x controller the message, **(Ref Fig 1-3)** will be shown and the ANVS MT will start the AMT Software.

If you are aware that you are connected to a Type 81x or 82x controller, then you should use the AMT Desktop Icon created at software installation **(Ref Section 2.C)**. Information on the AMT Software is contained in the Maintenance Manual 23-35-40.
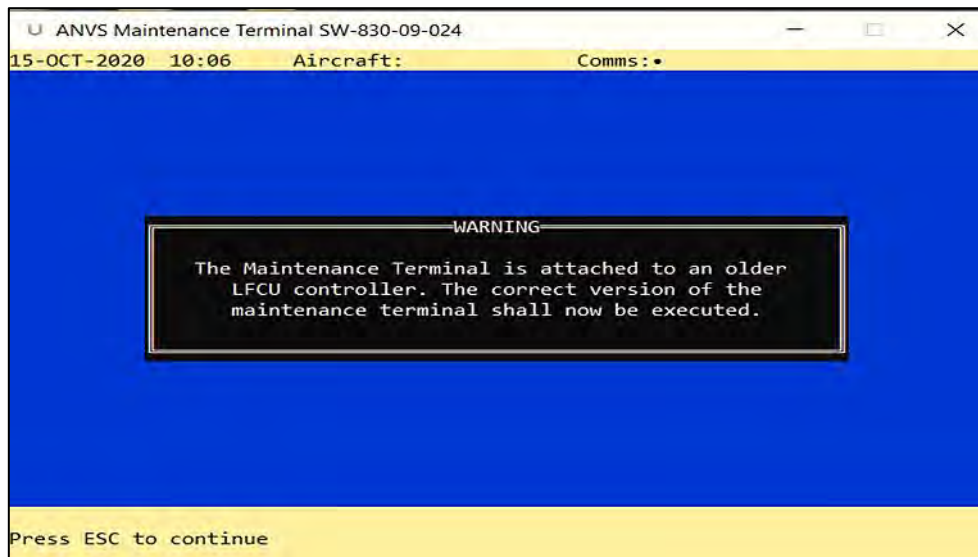
Figure 1-3 Controller Detection

(1)   Functions for 83x controller.

The ANVS MT provides the user with test, diagnostic and troubleshooting functions for the Active Noise and Vibration Control System. Below are the functions provided.

(a)   Set ANCU configuration.

The ANVS MT loads the ANCU with the configuration data file appropriate to the Aircraft installation. This operation is performed automatically. The ANVS MT identifies the installation by the Aircraft wiring loom hardwired inputs to the ANCU, which define the specific installation.

(b)   Display System Status Data.

The ANVS MT reads and displays system failure information stored in the Non Volatile Memory (NVM) in the ANCU.

(c)   Automatic Actuator and Sensor test.

The operation of the Actuators and Sensors installed on the Aircraft are tested.

(d)   Step through Actuator Test.

The Operation of the Actuators installed on the Aircraft can be stepped through manually by the Maintenance personnel.

(e)   Manual Actuator Test.

The operation of individual actuators installed on the Aircraft can be done by the Maintenance personnel.

(f)   Sensor Test.

The ANVS MT gives a display of the input signals to the ANCU from each sensor.

(g)   Calibration.

The ANVS MT initiates the system calibration function. The ANCU calculates and stores the calibration data for the actuator/sensor array installed in the Aircraft. For Active Noise and Control (ANVC) Systems, calibration must be performed at different air pressure and calibration date stored for each pressure setting.

(h)   Read Calibration Data from the ANCU.

The ANVS MT can read the calibration data stored in the ANCU NVM and stores it on the Laptop Hard-drive or a suitable storage device

(i)   Write Calibration Data on to the ANCU.

The ANVS MT writes a data file stored on a the Laptop Hard Drive or a suitable storage device containing specific calibration data into the ANCU.

(j)   Erase Calibration Data on the ANCU.

The ANVS MT erases the calibration data stored in the ANCU NVM.

(k)   ANCU Built-in Self-Test.

The ANCU performs a set of Built-in Self-Tests when the ANCU is powered on the results can be displayed on the ANVS MT Screen. (**Ref Section 6.G for details)**

(l)   System Information.

The ANVS MT provides information on the Aircraft inputs to the ANCU, the software installed and the number of Hours/Flights.

(m)   Restore Factory Defaults.

The ANVS MT will erase all calibration data and configuration data from the ANCU. This selection is Password Protected.

(2)   Screen Formats.

(a)   The ANVS MT uses a standard screen format consisting of a header, data panel and a footer. There are 6 types of data panel.

(b)   Information panels to inform the user on what function is being implemented.

(c)   Data Entry panels that require the user to enter information.

(d)   Menu panels to identify the selections, which the user can make.

(e)   Results panels that display the data received from the System/ANCU at the completion of a test.

(f)   Warning panels that inform the user that the operation requested cannot be reversed and provides the option to cancel the operation.

(g)   Error panels that inform the user that the requested operation could not be performed.

(h)   The Footer provides instructions to the user.

2. **MAINTENANCE TERMINAL REQUIREMENTS, INSTALLATION AND REGISTRATION:**

    A. **General.**

        (1)   This Section details the Requirements and procedures for installing and registering the Maintenance Terminal.

            (a)   Maintenance Terminal Requirements (Ref Para B).

            (b)   Maintenance Terminal Software Installation Procedure (Ref Para C).

            (c)   Registering the Maintenance Terminal Software (Ref Para D).

    B. **Maintenance Terminal Requirements.**

        (1)   Hardware.

            (a)   Processor: 1 Gigahertz (GHz) or faster compatible processor or system on a Chip (SoC).

            (b)   Ram: 2 Gigabyte (GB) for 64-bit.

            (c)   Hard drive 32 Gigabyte (GB) or larger hard disk.

            (d)   Graphics card: Compatible with DirectX 9 or later with WDDM 1.0 driver.

            (e)   Display: 800x 600.

            (f)   Battery power with a minimum battery life of at least 1.5 hours.

            (g)   USB port.

        (2)   Software.

        The Maintenance Terminal software is supplied on USB flash drive as part of the Ground Support Software (GSS) for Active Noise and vibration Control Systems. The Maintenance Terminal software Contains:

            (a)   Version 1 of the Ultra, Precision Control Systems Active Noise and Vibration Control Maintenance Terminal Software. (ANVS MT)

            (b)   Version 1 of the Ultra Precision Control Systems Propeller Balance Monitoring System (PBMS) Software.

            (c)   Maintenance Terminal Software requires a Database of Aircraft Configuration data, which is different for each Aircraft type. These are also supplied within the Ground Support Software. These can be selected during installation.

C. **Maintenance Terminal Software Installation Procedure.**

(1) The Maintenance Terminal programme is installed as part of the Ground Support Software. (**See Relevant Operator Service Bulletin for further information).**

(2) The Maintenance Terminal will be installed as part of the Ground Support Software Installation. It can be installed using the following procedure.

(a) Insert the USB Flash Drive (GSS Part No 8-800-07-047 issue 1) in to a suitable USB port.

Note: You may need to identify the drive letter for your USB port, Typically E: on most PCs.

(b) Follow the steps below for installation

- Select Start from the Windows Task Bar
- Select File Explorer
- Select USB Drive Typically E:
- Select Setup

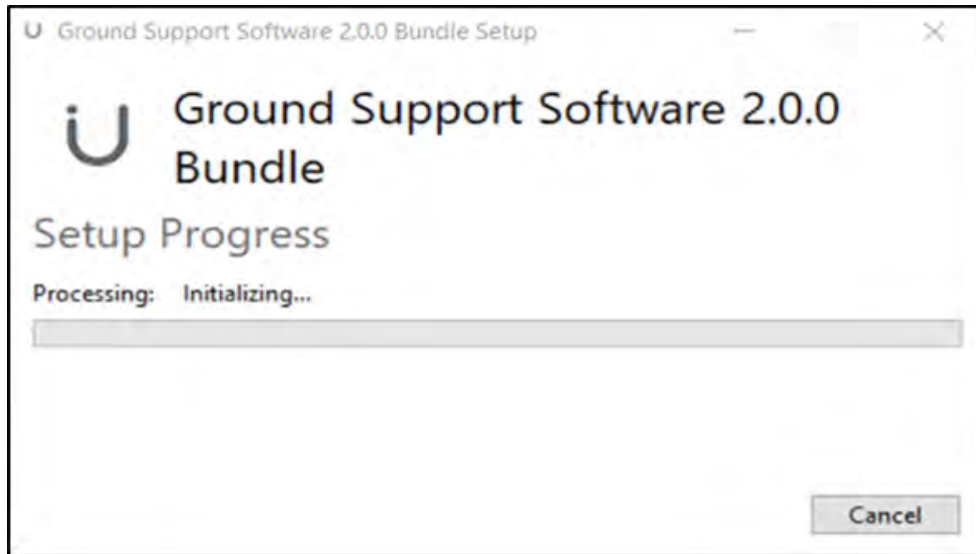(c) Follow the on-screen prompts to the Licence Agreement **(Ref fig 2-1)**
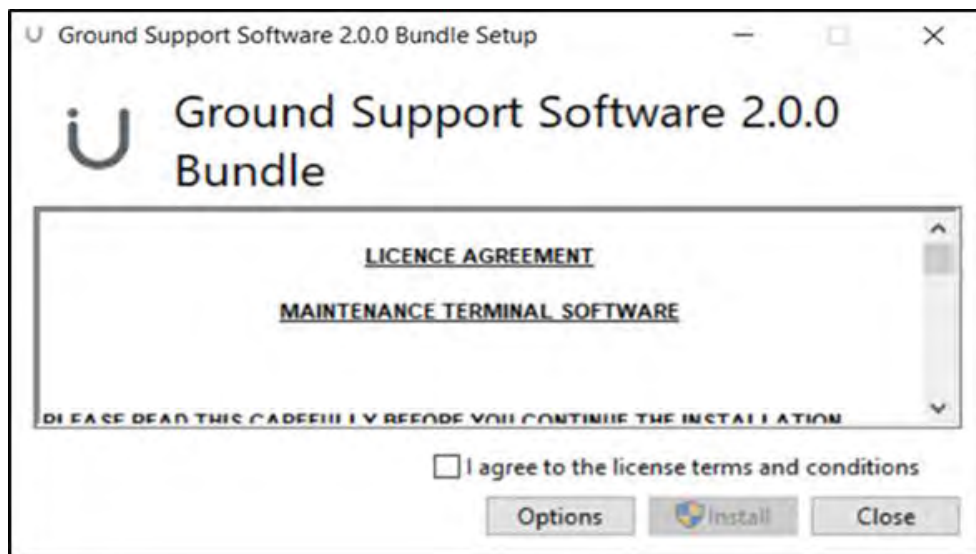
Figure 2-1 Licence Agreement

(d) Read the Licence Agreement (You must agree to the Licence Terms and Conditions by selecting the I agree box before you can continue with the installation). (**Ref Fig 2-1)**

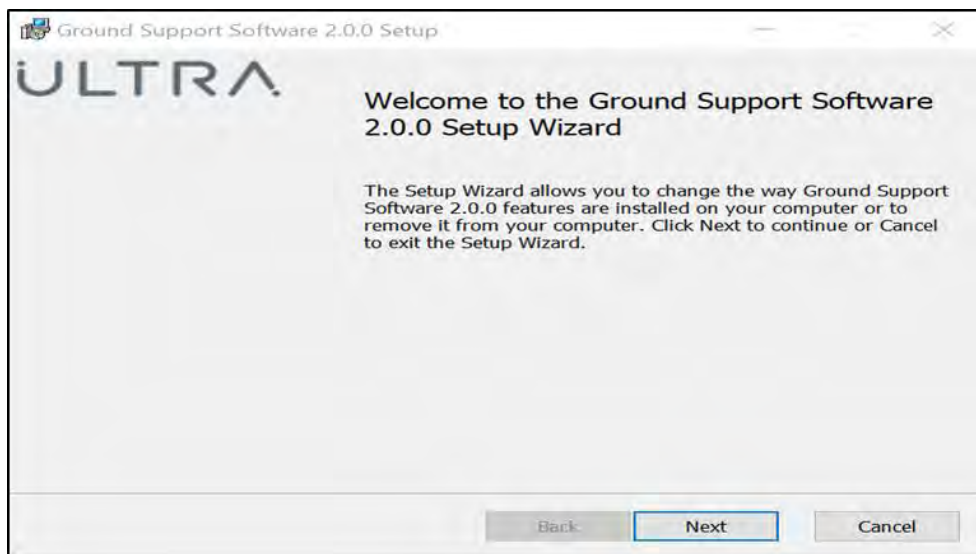(e) The setup progress screen will follow **(Ref Fig 2-2)**

Figure 2-2 Setup Progress

(f)   After the set up progress has finished the Setup wizard will install the Ground Support Software 2.0.0 Press next to continue. **(Ref Fig 2-3)**

Figure 2-3 Setup Wizard

(g)   The End User License Agreement screen will follow and you will need to accept terms in the License Agreement and press next to continue. **(Ref Fig 2-4)**
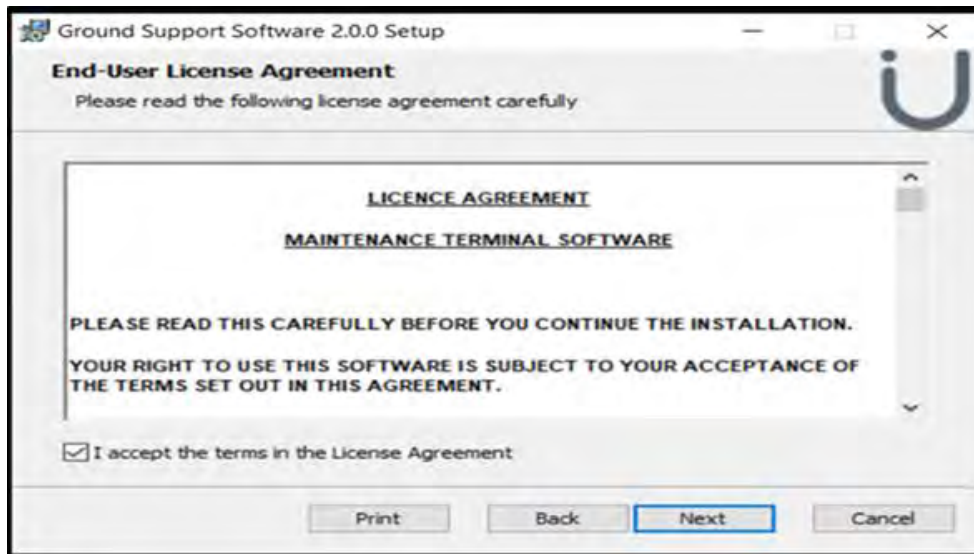
Figure 2-4 End User Licence

(h) The default directory location where the software will be installed is **C:\MT830**

Note: It is Recommended that this default directory be maintained

(i) The **default** settings in the Custom Setup menu are for the De Havilland Dash 8 series and SAAB aircraft all variants. Select the Next button **(Ref Fig 2-5**) and follow the onscreen prompts to begin the installation.

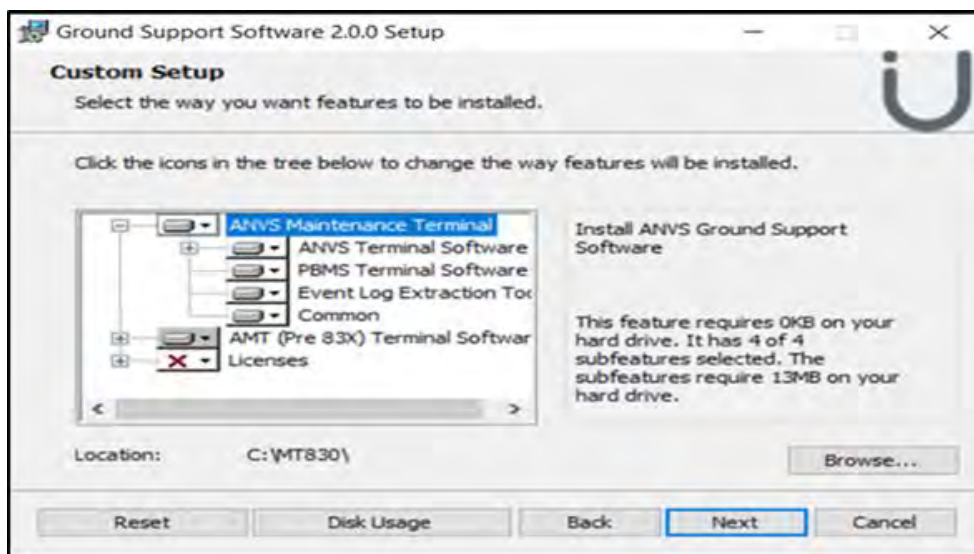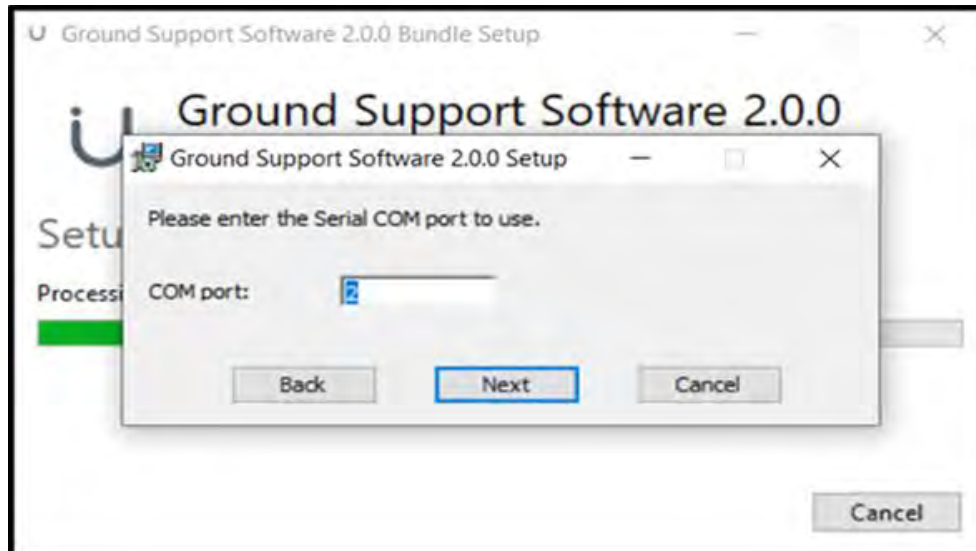**Note: For your relevant operator Type please refer to the Applicable Service Bulletin for Custom Setup information.**
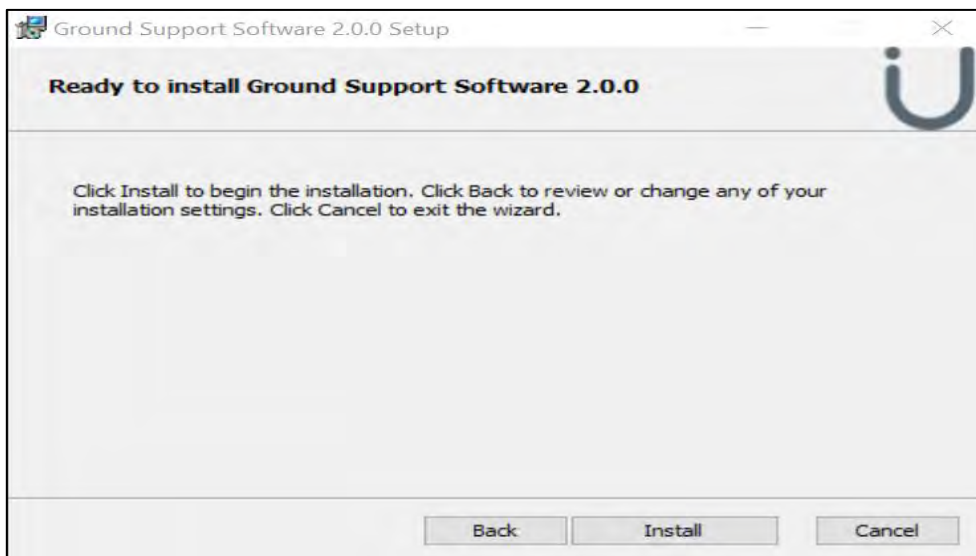

Figure 2-5 Custom Setup

(j)　　The Default COM port allocation for the USB to Serial port adapter is COM port 2 **(Ref Fig 2-6).** Select the next button to continue.

Note: Ref Section 3.B for Serial port Allocation change

Figure 2-6 Com Port

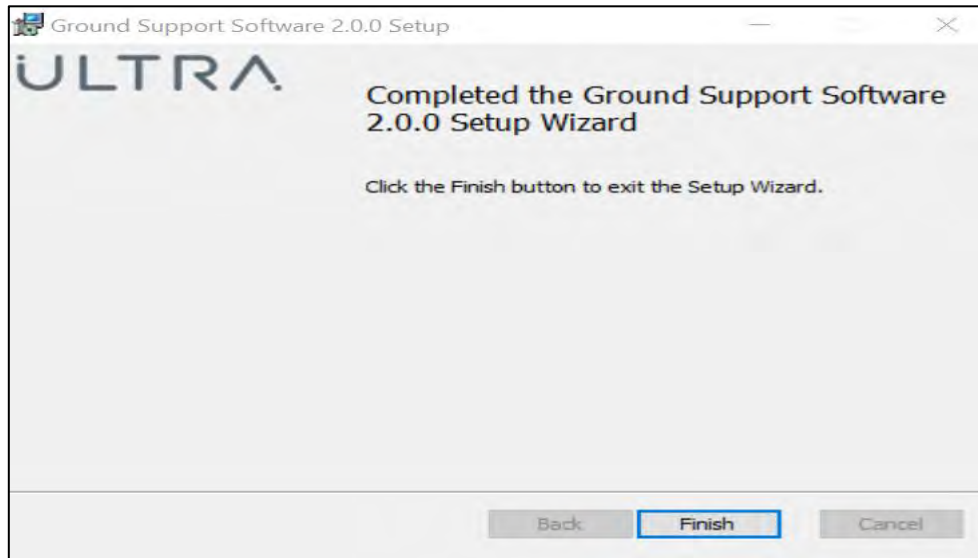(k)　　Select Install on the ready to install screen **(Ref Fig 2-7)**

Figure 2-7 Ready to Install

(l)　　The GSS will now install. Once installed the Finish screen will show, select finish to complete installation. **(Ref Fig 2-8)**
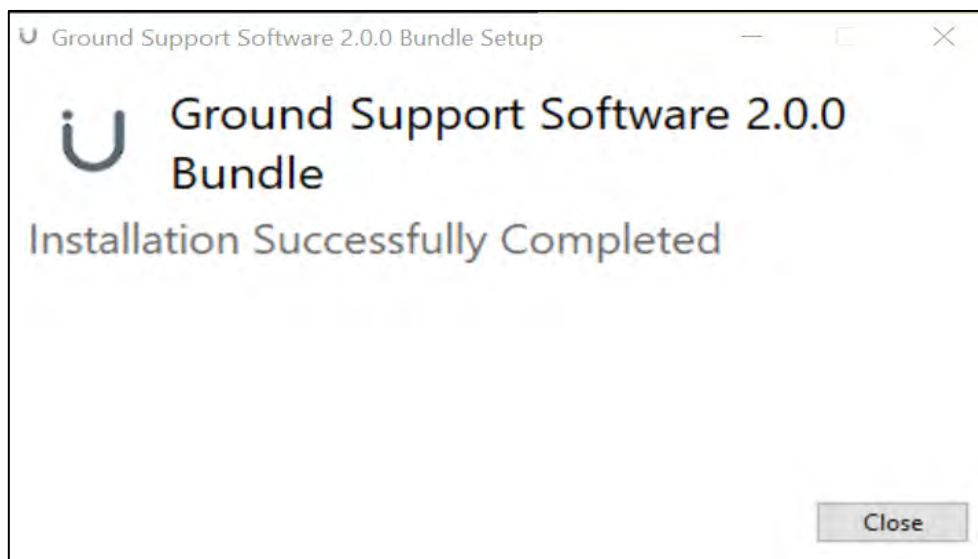
Figure 2-8 Finish

(m)   The Installation is now complete select close on the Installation Successfully
          Completed screen **(Ref Fig 2-9)**
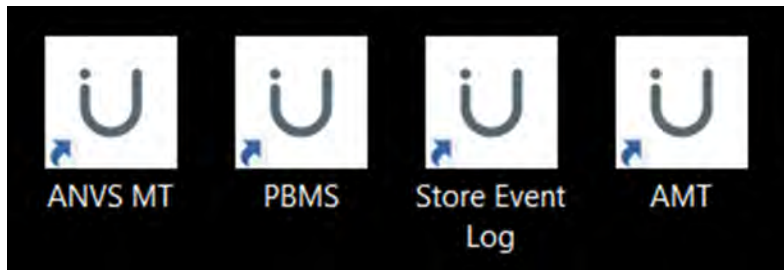

Figure 2-9 Complete

(n)   Four Desktop Icons will be created as part of the installation process these being: **(Ref Fig 2-10)**

- **ANVS MT.**
  ANVS MT is the Active Noise and Vibration Control System Maintenance Terminal Software to be used with 83x type controllers.

- **PBMS.**
  PBMS is the Propeller balance Monitoring System Software to be used with 832 type controllers on aircraft fitted with PBMS.

- **Store Event Log.**
  Store Event log is the Event Log Extraction Tool Which can be used to download an event log from 83x type controllers

- **AMT.**
  AMT is the Advanced Maintenance Terminal Software to be used with a Type 81x or 82x controller. If the ANVS MT is used on a Type 81x or 82x controller, this will be recognised and the AMT will automatically start.

Figure 2-10 Desktop icons

(o)   When installation is complete, disconnect the USB drive safely, remove and store.

D.   Registering the Maintenance Terminal.

(1)   This process is required the first time the Maintenance Terminal is to be used.

Note: You do not have to connect the Maintenance terminal to the ANCU for the registration process.

(2)   Switch on the Windows laptop PC.

(3)   Click on the ANVS MT Icon created on the Windows 10 Desktop.

(4)   After a few seconds the Welcome screen will be shown **(Ref Fig 2-11)** followed by the registration check screen **(Ref Fig 2-12).**

(5)   E-mail Ultra, Precision Control Systems an Authorisation code. You will need to give the information that follows:

(a)   Your name and Company name.

(b)   The Software Licence Number from the USB Key Tag.

(c)   The Registration Number generated by the ANVS MT terminal **(Ref fig 2-12).**

(d)   A contact Telephone number.
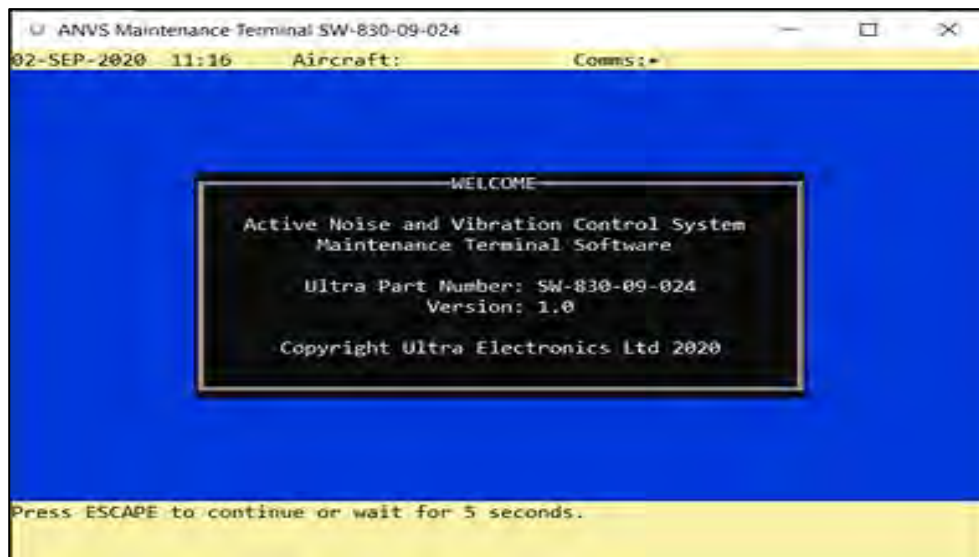

Figure 2-11 Welcome screen

Figure 2-12 Registration

(6)   Once you have an Authorisation code from the registration screen press <Enter>. The Software Registration Screen will be shown **(Ref Fig 2-13).**

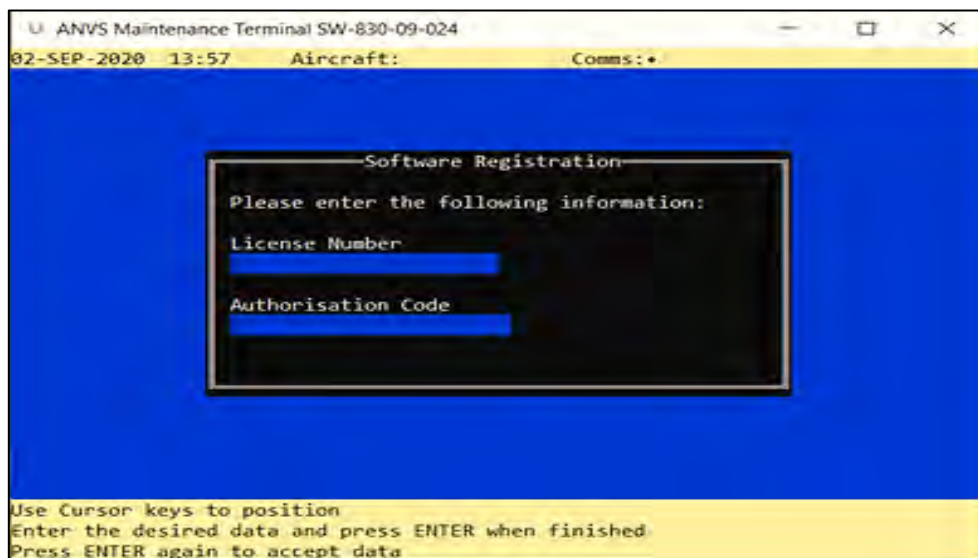**Figure 2-13 Software Registration**

(7)   Enter your Licence Number on to the Software Registration screen.

(8)   Enter the Authorisation Code as supplied by Ultra, Precision Control Systems and press <Enter>. The registration process is complete.

(9)   If the Licence number and the Authorisation Code are entered correctly, the Accepted Screen will show. **(Ref Fig 2-14)**

(10)   The Registration Process is required for the first installation of the Maintenance Terminal and when your Authorisation Code expires.
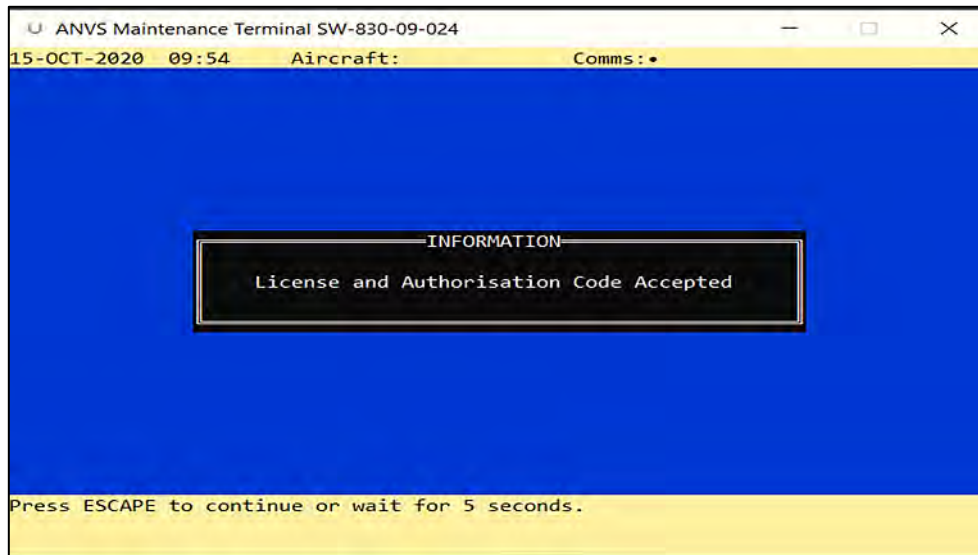

Figure 2-14 Accepted

E.   Manual Licence Expiry.

Ultra Precision Control Systems provides a time limited Authorisation Code so that operators are up to date with any GSS updates. To enable operators to schedule their licence renewals without having to wait for it to expire automatically, a manual licence expiry function has been added. The operator can now manually terminate the licence and request a new authorisation code at their convenience. For example, if maintenance is scheduled for the weekend and the recorded expiry date occurs over this period, the licence can be manually expired at a convenient time prior to the automatic expiry date to prevent any impact on maintenance.

(1) Select the Windows start menu.

(2) Select Windows System from the menu.

(3) Select Control Panel.

(4) Select Programs and features.

(5) Highlight Ground Support Software 2.0.0 and select change **(Ref Fig 2-15)**
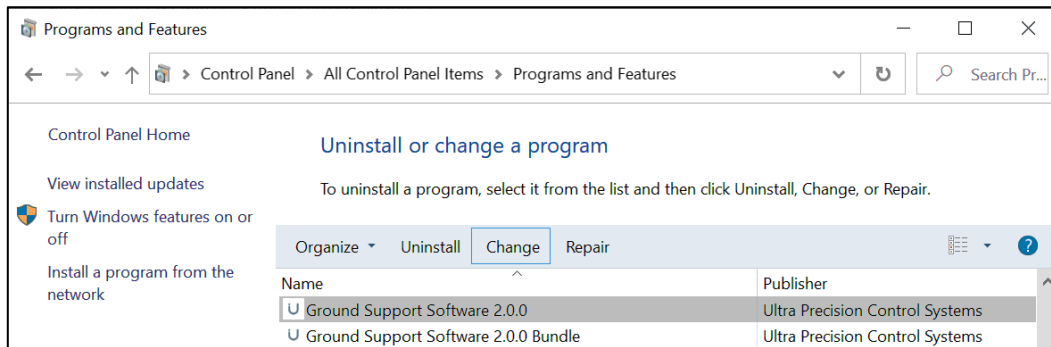
Figure 2-15 GSS 2.0.0

(6) Select next on the Setup Wizard screen **(Ref Fig 2-16)**
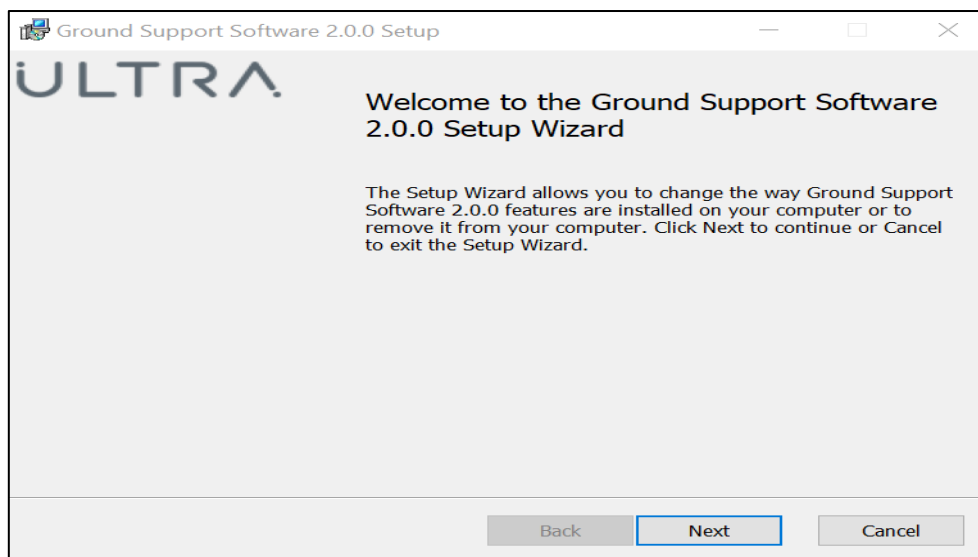
Figure 2-16 Setup wizard

(7) Select change in the Ground Support Software 2.0.0 Setup window **(Ref Fig 2-17)**
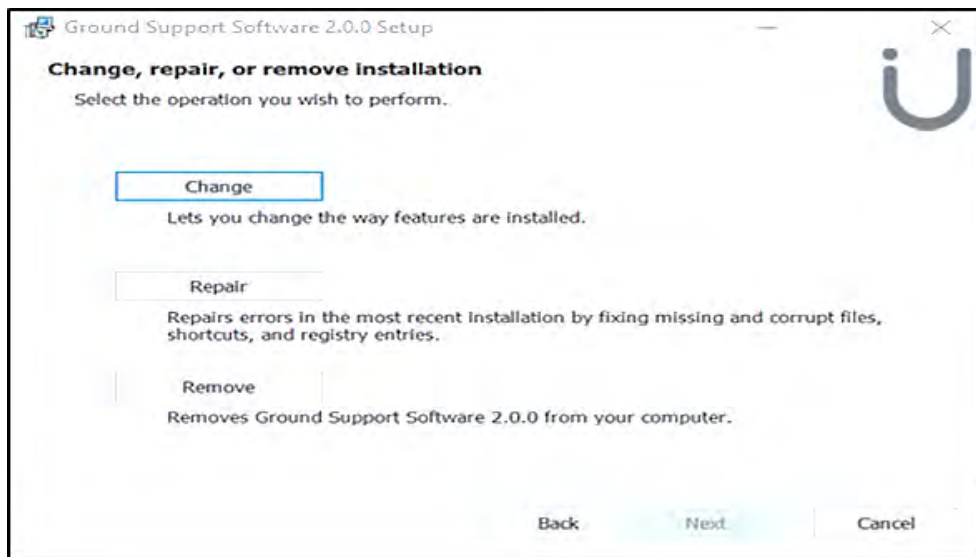
Figure 2-17 Change

(8) Expand the Licences feature **(Ref Fig 2-18)**
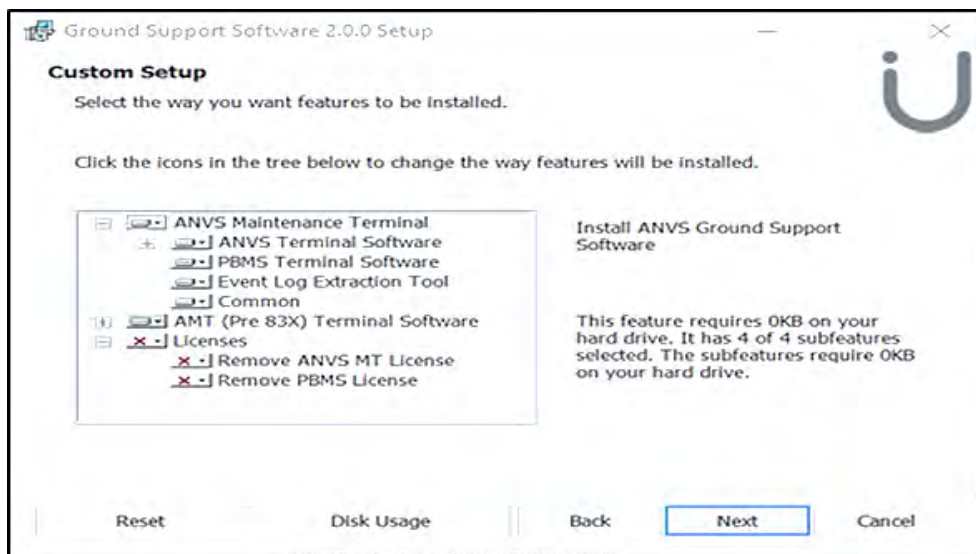
Figure 2-18 Custom Setup

(9) To remove the Licence on the ANVS MT software click on the drop down menu (icon X) next to Remove ANVS MT Licence and select will be installed on Local Hard drive **(Ref Fig 2-19)**
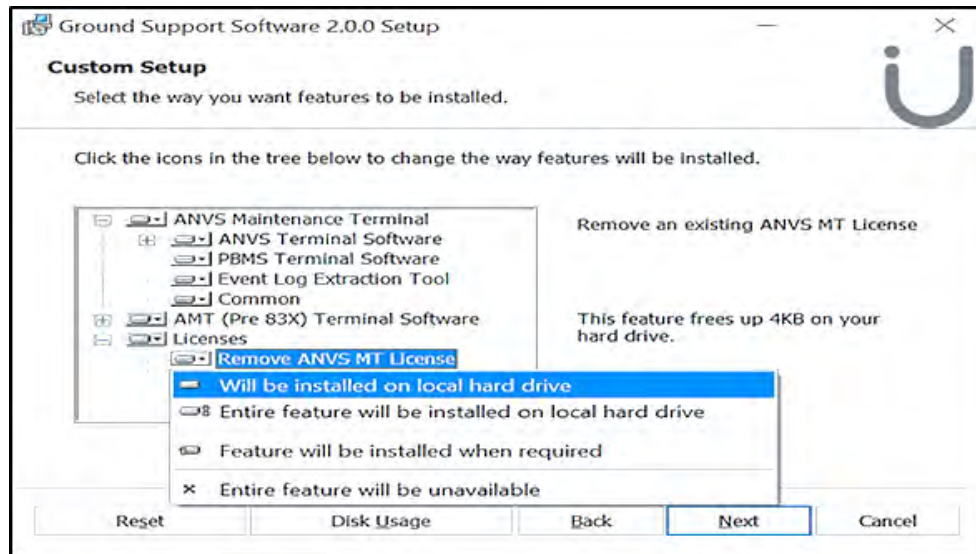
Figure 2-19 Remove Licence

(10) Click on next and follow the on-screen instructions Please restart the laptop for the changes to take effect.

(11) The expired licence/licences will need to be re-authorised. Refer to the Registration instructions in **Section 2.D**

3. CONNECTING AND SETTING UP OF THE MAINTENANCE TERMINAL:

    A. Connecting to J5 Remote Maintenance Connector via Serial Cable.

        (1) The ANVS MT is designed for use via a Serial Port connection. If the Laptop does not have a serial port, a suitable Serial Port Adaptor must be used to connect to the ANCU

    Note: Ultra, Precision Control Systems Recommend the use of the Windows approved Chipi X10 USB Serial Adaptor

        (a) Connect Serial cable (A standard 9 way straight through RS232 serial cable) from the Maintenance Terminal Via the Chipi X 10 USB Serial Adaptor to the J5 Remote Maintenance Connector on the Aircraft.

    B. Serial Com Port Allocation.

        (1) The Default COM port allocation for the USB to Serial port adapter is COM port 2, which is allocated on installation of the GSS. However, this can be changed to use an alternative Port Number. Follow the steps below on how to change the Allocation.

    Note: Com ports 1 and 3 can be used as an alternative to the default allocation.

        (a) Select the Windows Start Menu.

        (b) Select Windows System from the Menu.

        (c) Select Control Panel.

        (d) Select Programs and Features.

        (e) Highlight Ground Support Software 2.0.0 and select change **(Ref Fig 3-1).**
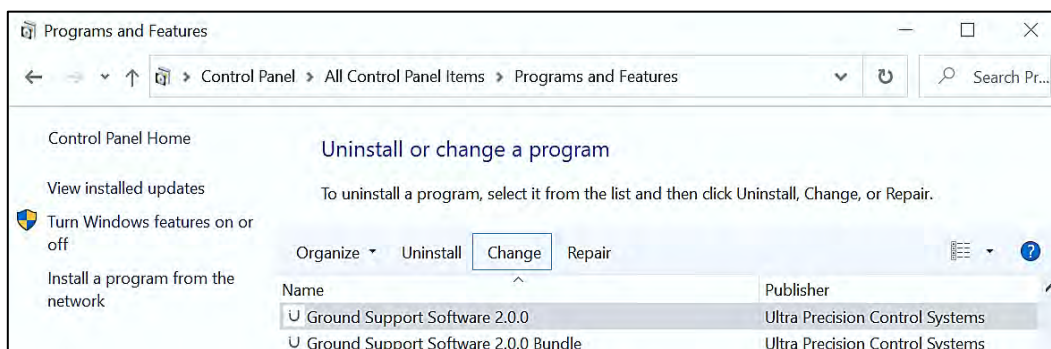
Figure 3-1 GSS Change

        (f) Select next on the Setup Wizard screen **(Ref Fig 3-2)**

Figure 3-2 Setup Wizard

(g)   Select change in the Ground Support Software 2.0.0 Setup window **(Ref Fig 3-3).**
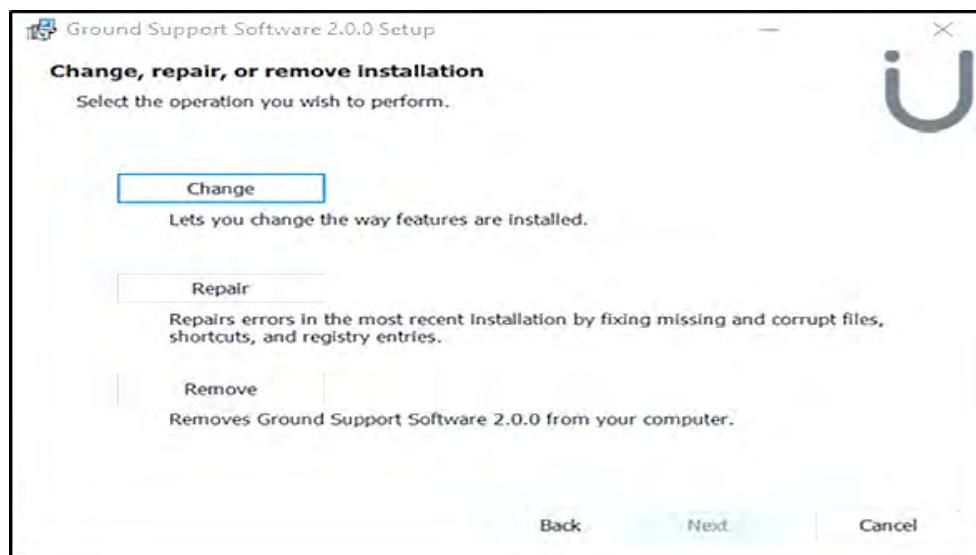
Figure 3-3 Change

(h)   Select next on the Custom Setup Screen **(Ref Fig 3-4).**

23-35-46
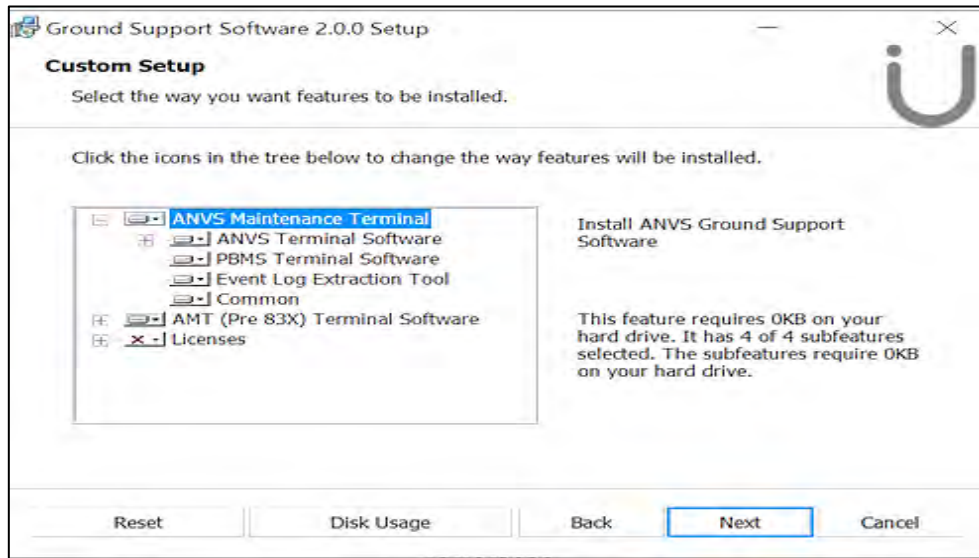
Figure 3-4 Custom Setup

(i)   The Com Port Allocation Screen will be shown. Enter the required port number 1-3 and press next. **(Ref Fig 3-5).**
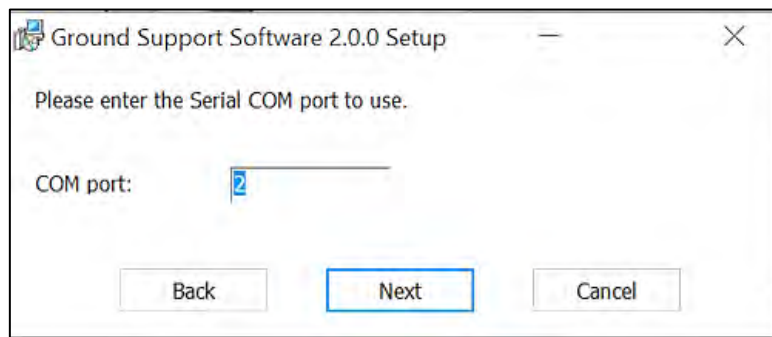
Figure 3-5 Com Port Allocation
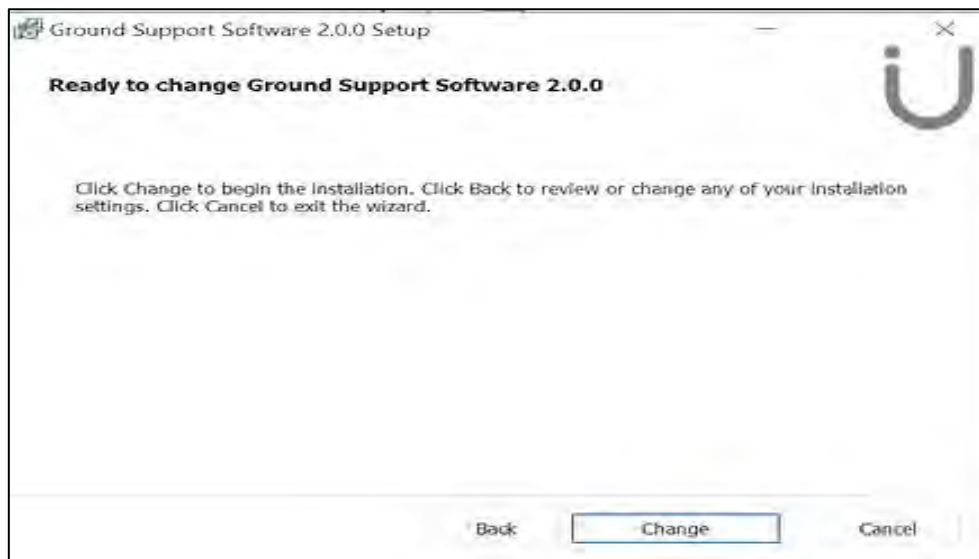
Figure 3-6 Ready to change

(a)   Select Change on the Ready to change Screen **(Ref Fig 3-6).**

(b)   The Changes will update and the completed screen will show. Select Finish to continue.

(c)   You will then need to restart your system for changes to take effect. Select **Yes/ No** depending on your requirements**. (Ref Fig 3-7).**
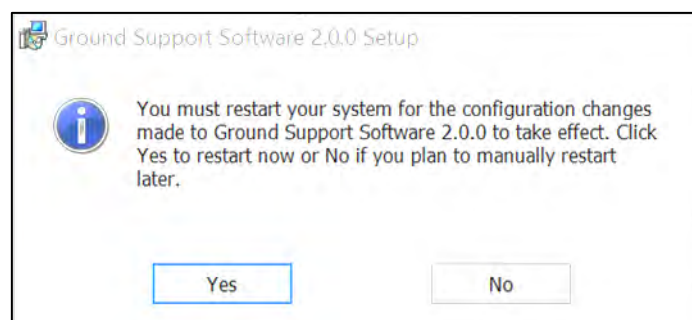
Figure 3-7 Restart

C.   Change The Calibration File Directory.

   (1)   To set the Calibration File Directory Outside of the Default **C:\MT830** to store calibration files proceed as follows.

   (a)   Connect the ANVS MT to the Aircraft Remote Maintenance Port and establish communications with the ANCU **(Ref Section 3.A).**

   (b)   From the Main Menu select Calibration Menu.

   (c)   From the Calibration Menu select Edit Calibration files Directory.

   (d)   The ANVS MT will now show the Edit Calibration Files Directory screen**. (Ref Fig 3-8**) The directory will be set to the default. **The default is C:\MT830**. Created when the program was installed

   (e)   Delete the default if required. Type in the full path name of a directory where you want to store the calibration data. If you wish an alternative directory on the C: Drive but the directory does not exist, then the ANVS MT will create it. The name must be less than 8 characters and must consist of alpha-numeric characters.

   (f)   Press <ESC> twice to return to the Main Menu. Select exit and press <Enter>.
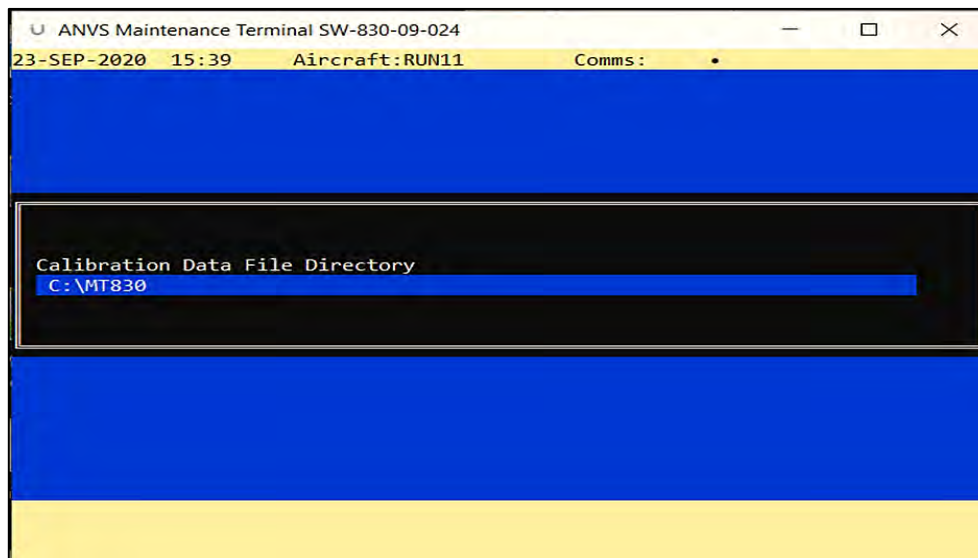
```
U  ANVS Maintenance Terminal SW-830-09-024              —    □    ×
23-SEP-2020  15:39      Aircraft:RUN11          Comms:    •




    Calibration Data File Directory
    C:\MT830



```

Figure 3-8 Calibration Data directory

4.   **MAINTENANCE TERMINAL OPERATION:**

   A.   **General.**

   This Section details the procedures for using the Maintenance Terminal with Type 83X controllers.

   Note: Type 830 ANCU is a controller with Part Number Format 8-830-01-xxx.
   Type 831 ANCU is a controller with Part Number Format 8-831-01-xxx.
   Type 832 ANCU is a controller with Part Number Format 8-832-01-xxx.
   Type 833 ANCU is a controller with Part Number Format 8-833-01-xxx.

   (1)   Start a ANVS MT Session.

   (2)   Display System Status Data.

   (3)   Actuator and Sensor Tests.

   B.   **Start a ANVS MT Session.**

   (1)   This process is to be followed each time the Maintenance Terminal is started.

      (a)   Connect Laptop PC to the J5 Remote Maintenance Connector on the Aircraft **(Ref section 3 para A).**

      (b)   Switch on the Laptop PC.

      (c)   Switch on the NVS on the Flight Attendant Panel.

      (d)   Double click on the ANVS MT Icon created on the Desktop.

      (e)   Wait 30 seconds for the ANCU to initialise.

      (f)   After communications with the ANCU are established, the Aircraft Type screen will be shown on the ANVS MT display **(Ref Fig 4-1).**
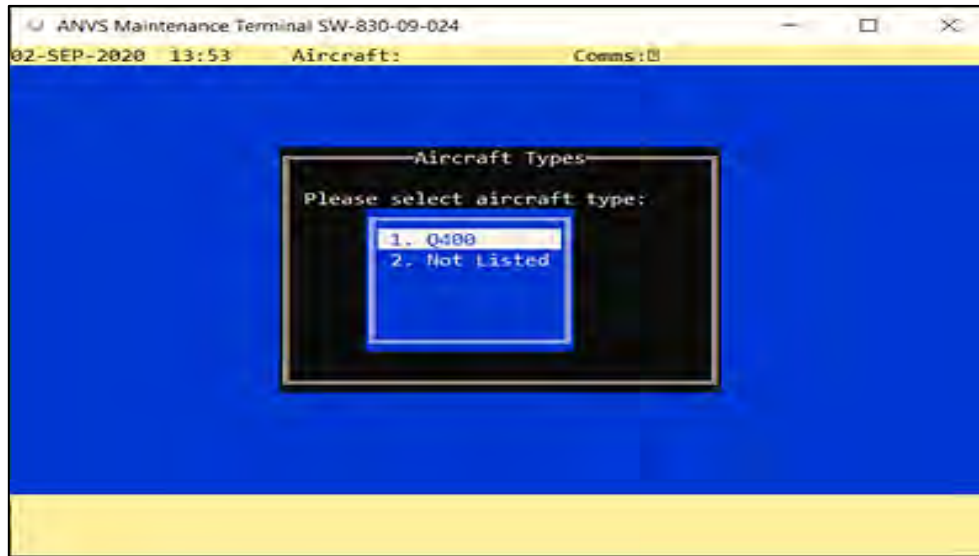
Figure 4-1 Aircraft type

(g)   Select the Aircraft using the cursor keys and press<Enter> The Log File Detail Screen will be shown on the ANVS MT display **(Ref Fig 4-2)**
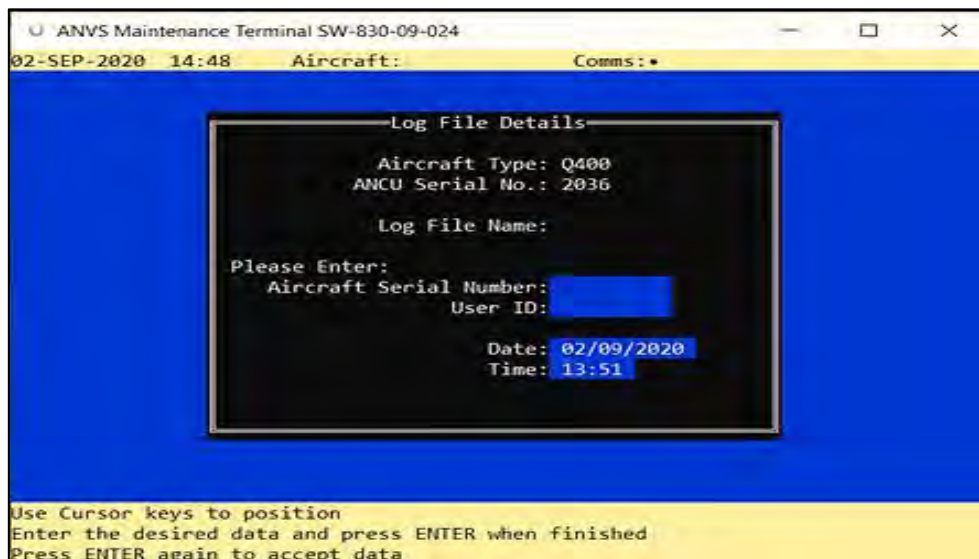
Figure 4-2 Log File Details

(h)   Enter the Aircraft Serial Number and the User ID (Your Initials) and Press <Enter>

(i)   The ANVS MT will show the Log File Name in which the Maintenance session record will be stored Press <Enter> to accept the data.

(j)   The ANVS MT will show the message Checking Configuration on ANCU Please Wait.

(k)   The ANVS MT will read the Configuration Parameters stored in the ANCU and compare them with the data stored in the appropriate file in its database. If the Configuration Parameters are good the Main Menu will be shown on the ANVS MT display **(Ref Fig 4-3)**

(I)   If the Configuration Parameters are not good or not correct for the Aircraft then the ANVS MT will load the appropriate Configuration Parameters in to the ANCU. When complete, the ANVS MT will reset the ANCU. After the ANCU resets the message, "Validating Parameters Please Wait" will be shown and the ANVS MT will read the Configuration Parameters and compare them with the file in its Database to verify that they have been correctly loaded. When the Configuration parameters are validated, the Main Menu will be shown on the ANVS MT display. **(Ref Fig 4-3).**
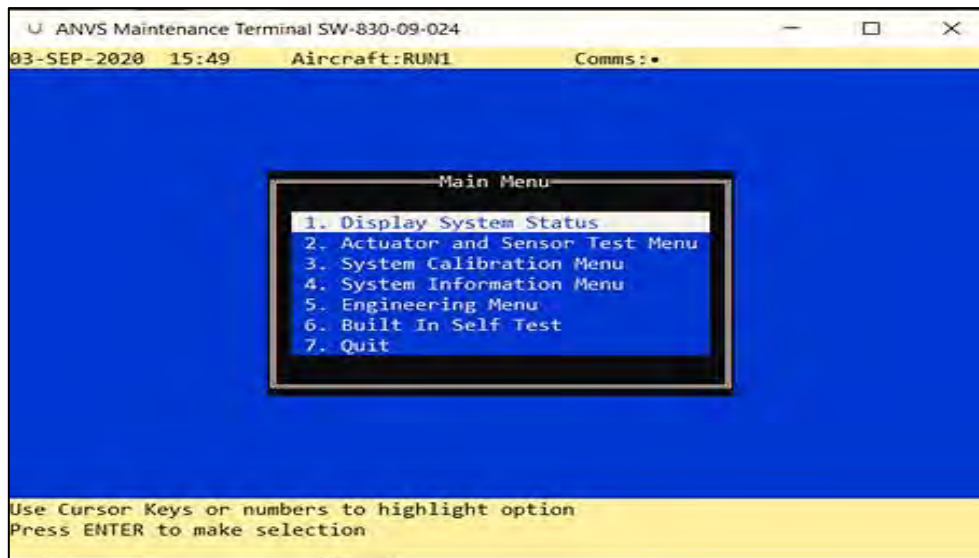

Figure 4-3 Main Menu

C. **Display System Status Data.**

(1) Select Display System Status.

(a) From the Main Menu **(Fig 4-3)** and Press <Enter>. The ANVS MT will show the message "Reading System Status" while the data is read from the ANCU. The System Status Screen will then be shown on the ANVS MT Display **(Ref Fig 4-4)**

(b) Failed Actuator and Sensor Channel numbers are shown.

The Following Letters indicate Actuator and Sensor Status.

- D-- Disabled by the Maintainer.
- F-- Failed by Automatic Actuator and Sensor test.
- C-- Missing from Calibration Data (Loudspeaker System).
- U-- Missing from Unpressurised Calibration Data (ATVA System).
- P-- Missing from Pressurised Calibration Data (ATVA System).

Pressing **F1** will show Display System Status Help **(Figure 4-5**) Showing the Actuator and Sensor Status Key.

Pressing **F10** will show the Error Code Help Screen **(Fig 4-6)** showing the code, Description and a suggested course of action

Note: The suggested course of action must only be used for guidance. Please refer to the Aircraft Maintenance Manual (AMM) for the correct Maintenance Procedures.

Figure 4-4 System Status

Figure 4-5 Display System Status Help
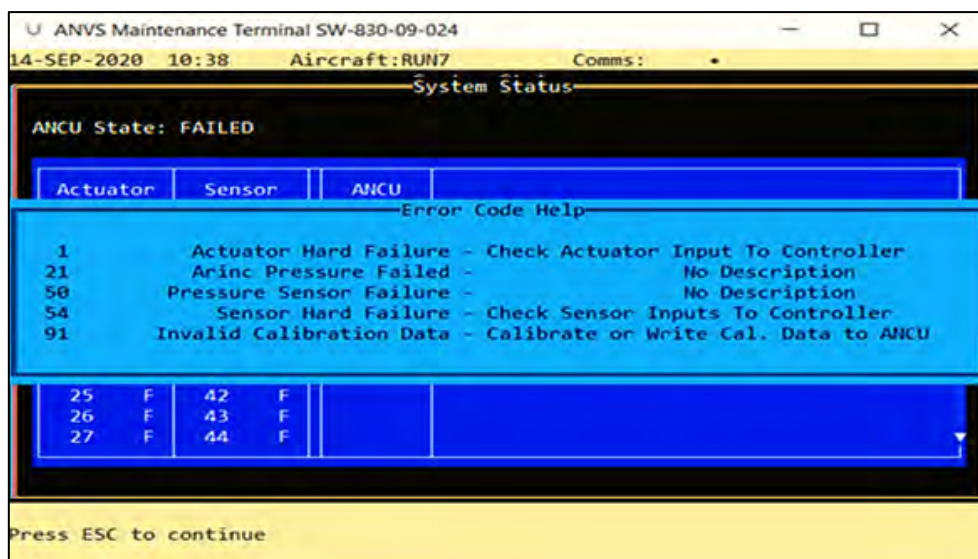
Figure 4-6 F10 Suggested Action

D.   **Actuator and Sensor Tests.**

(1)   **Automatic Actuator Test**

(a)   Select Actuator and Sensor Test Menu from the Main Menu **(Ref Fig 4-3)** and press <Enter>.

(b)   The Automatic Actuator and Sensor Test Menu will be shown on the ANVS MT display **(Ref Fig 4-7).**
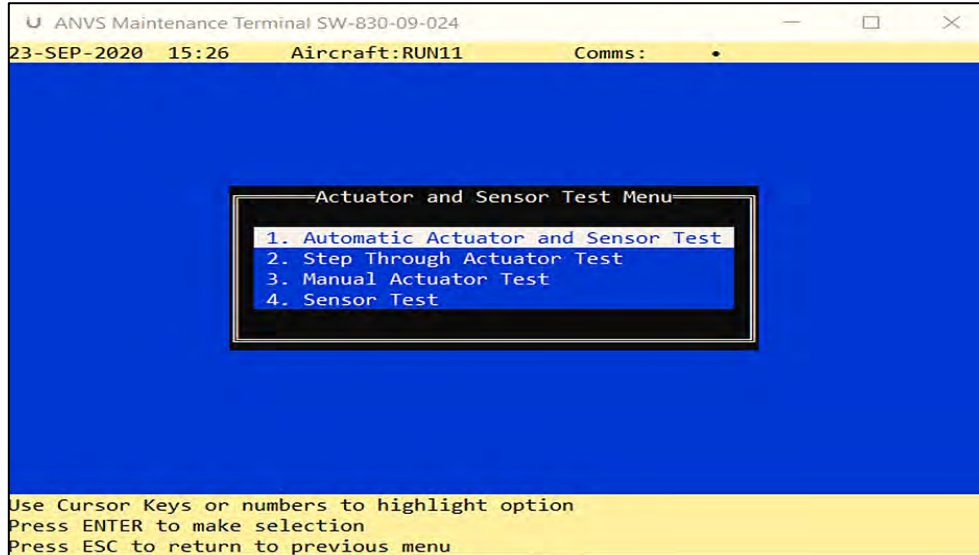
Figure 4-7 Automatic Actuator and Sensor Test

(c)   Select Automatic Actuator and Sensor Test and press <Enter>. The Automatic Actuator and Sensor Test screen will be shown on the ANVS MT display **(Ref Fig 4-8).**
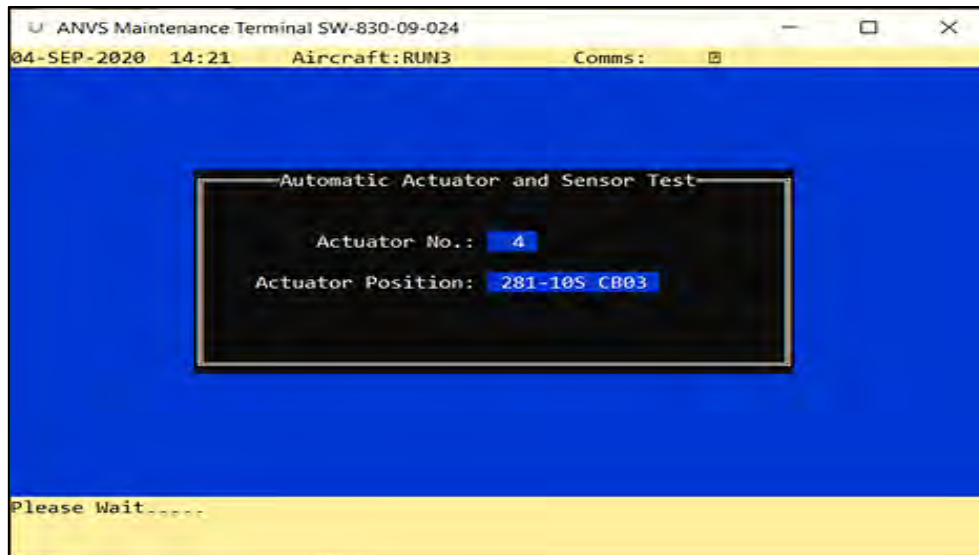
Figure 4-8 Automatic Test

(d)   Each Actuator will be driven in sequence with a single test tone. During the test, all the Sensors will monitor the Actuator output level and distortion.

(e) The number displayed on the ANVS MT screen corresponds to the Actuator number. The Actuator position text shows the physical location of the Actuator in the Aircraft by frame and stringer number. Also shown is the circuit breaker from the power distribution box that supplies 28Vdc to the Actuator/power Amplifier channel.

(f) On completion of the tests, the results will be shown on the ANVS MT display **(Ref Fig 4-9).**

(g) Pressing F1 will show the Display the Actuator and sensor Status Key **(Ref Fig 4-5)**

Figure 4-9 Automatic IO check Results

(h) Press <Enter> or <Esc> to display the distortion Levels Screen **(Ref Fig 4-10).**

Figure 4-10 Distortion Levels

(i) Press <Enter> to return to the Automatic IO check results screen **(Ref Fig 4-9)** or press <ESC> to return to the Actuator and Sensor Test Menu **(Ref Fig 4-7).**

(2) **Step through Actuator Test.**

(a) From the Actuator and Sensor Test Menu **(Ref Fig 4-7)** select Step through Actuator Test and press. <Enter>. The Step through Actuator Test screen will be shown **(Ref Fig 4-11).**
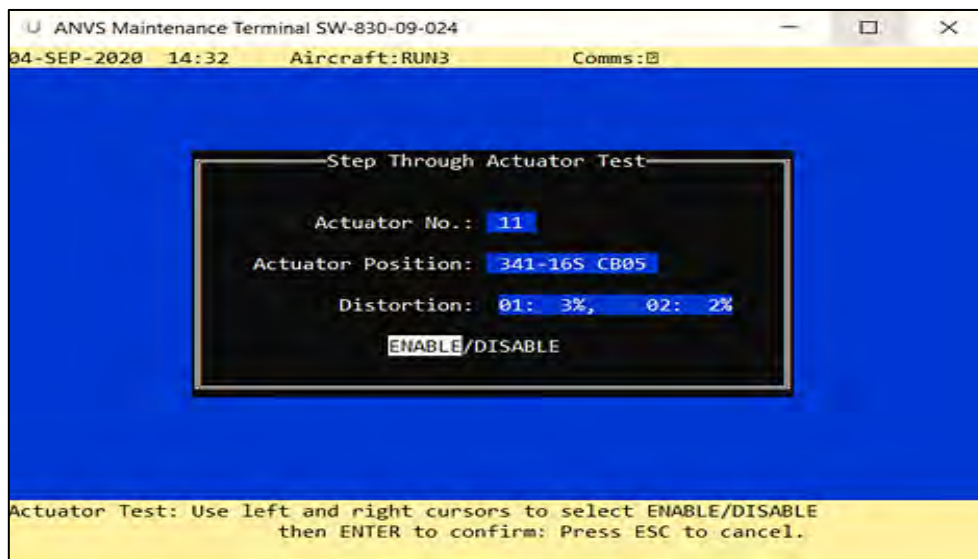
Figure 4-11 Step through Actuator Test

(b) The ANCU will start at channel 1 and drive a single Actuator. The operator decides whether to enable or disable the Actuator by using either the left/right cursor keys on the ANVS MT keyboard. Press <Enter> to confirm the selection or to move to the next Actuator.

(c) The number displayed on the ANVS MT screen corresponds to the Actuator number.

(d) The Actuator position text shows the physical location of the Actuator in the Aircraft by frame and stringer number. Also shown is the circuit breaker from the power distribution box that supplies 28Vdc to the Actuator/Power Amplifier channel. The test can be terminated early by pressing <ESC>.

(e) The distortion is displayed for each Actuator Showing the 1st and 2nd Harmonic and distortion Percentage for the Actuator being tested.

(f) If the selected Actuator is currently disabled then the message that follows is shown on the ANVS MT display.
"Are you sure you wish to produce a tone through this Actuator? YES/NO"

Select YES, if you want to include this Actuator in this test. Select NO, to go to the next Actuator.

(g) If any previously disabled Actuators are enabled, the ANVS MT will perform an Automatic Actuator and Sensor Test unless <ESC> is pressed within 5 seconds. If you do not complete an Automatic Actuator and Sensor Test then any Actuators you have just enabled will be automatically disabled again.

(h) If no previously disabled Actuators have been enabled, or if <ESC> is pressed, the ANVS MT will show any manually disabled Actuators and Sensors on the ANVS MT display **(Ref Fig 4-12).**

Figure 4-12 Manually Disable Actuators and Sensors

(3) **Manual Actuator Test.**

(a) From the Actuator and Sensor Test Menu **(Ref Fig 4-7)** select Manual Actuator Test and press <Enter>.

(b) The ANVS MT will ask you to "Enter Actuator Number" Type in the Number of the Actuator to be tested and press <Enter> The Manual Actuator Test screen will be shown. **(Ref Fig 4-13)**

(c) The number displayed on the ANVS MT screen corresponds to the actuator number.

(d) The Actuator position text shows the physical location of the Actuator in the Aircraft by frame and stringer number. Also shown is the circuit breaker from the power distribution box that supplies 28Vdc to the Actuator/Power amplifier channel. The test can be terminated by pressing <ESC>.

(e) The distortion is displayed for each Actuator Showing the 1st and 2nd Harmonic and distortion Percentage for the Actuator being tested.
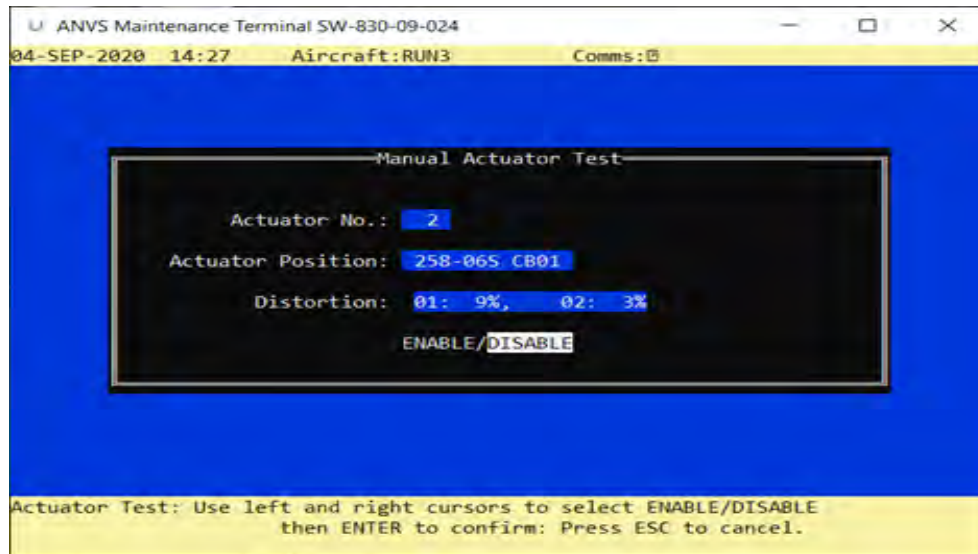
Figure 4-13 Manual Actuator Test

(f)   The ANCU will drive the selected Actuator. The Operator decides whether to enable or disable the Actuator by using the left/right cursor keys on the ANVS MT keyboard. Press <Enter> to confirm selection.

(g)   The ANVS MT will then prompt the operator for the next Actuator. Enter a new Actuator number or press <ESC> to terminate test.

(h)   If the operator enters, an Actuator number that does not exist on the system under test, the ANVS MT will show the message "The Actuator Number entered is not within the valid range". Press <ESC> and re-enter the Actuator Number.

(i)   If the selected Actuator is currently disabled then the Message "Are you sure you wish to produce a tone through this Actuator? YES/NO" is shown. Select YES, if you want to include this Actuator in the test. Select NO, if you want to omit this Actuator from the test.

(j)   If any previously disabled Actuators are enabled, the ANVS MT will perform an Automatic Actuator and Sensor Test unless <ESC> is pressed within 5 seconds. If you do not complete an Automatic Actuator and Sensor Test, then any Actuators you have just enabled will be automatically be disabled again.

(k)   If no previously disabled Actuators have been enabled, or if <ESC> is pressed, the ANVS MT will show any manually disabled Actuators and Sensors on the ANVS MT Display **(Ref Fig 4-12).**

(4) **Sensor Test**

(a) From the Actuator and Sensor Test Menu **(Ref Fig 4-7)** select Sensor Test and press <Enter>.

(b) The ANCU will drive all Actuators that are not disabled or failed with a single tone. The ANVS MT display will show the input signal to the ANCU from each sensor **(Ref Fig 4-14).** The Number shown on the ANVS MT display corresponds to the sensor number. The location shows the physical location of the sensor in the Aircraft.
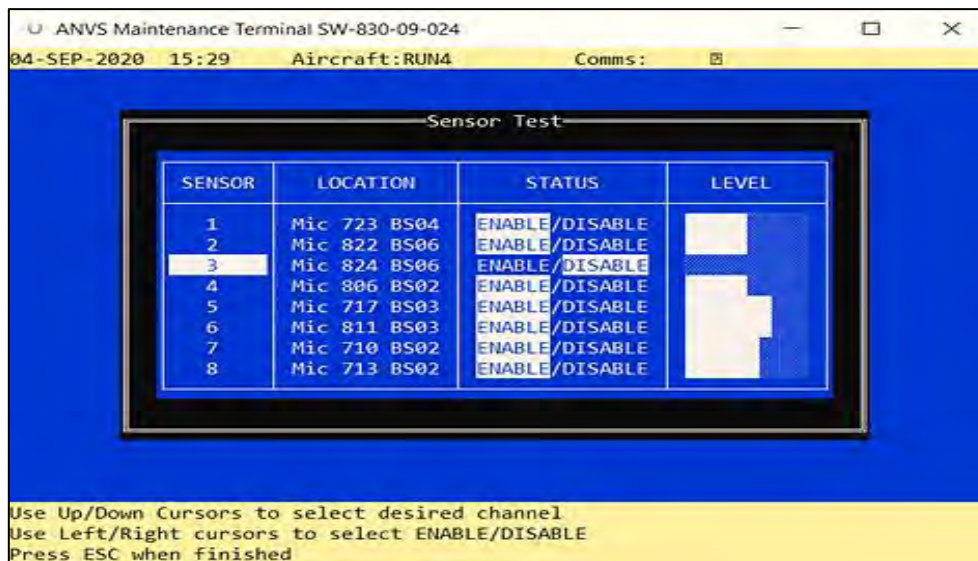
Figure 4-14 Sensor Test

(c) The Operator decides which Sensors to enable or disable by using the left/right cursor keys on the ANVS MT keyboard.

(d) Press <ESC> to end the test.

(e) If any of the previously disabled sensors are enabled, the ANVS MT will perform an Automatic Actuator and Sensor Test unless <ESC> is pressed within 5 seconds. If you do not complete an Automatic Actuator and Sensor Test then any Sensors you have just enabled will be automatically disabled again.

(f) If no previously disabled sensors have been enabled, or if <ESC> is pressed, the ANVS MT will show any manually disabled Actuators and Sensors on the ANVS MT display **(Ref Fig 4-12).**

5.   SYSTEM CALIBRATION:

   A.   ATVA Systems.

      (1)   **System Calibration Menu**.

         (a)   From the Main Menu **(Ref Fig 4-3)** select System Calibration Menu **(Ref Fig 5-1)** and press <Enter>.
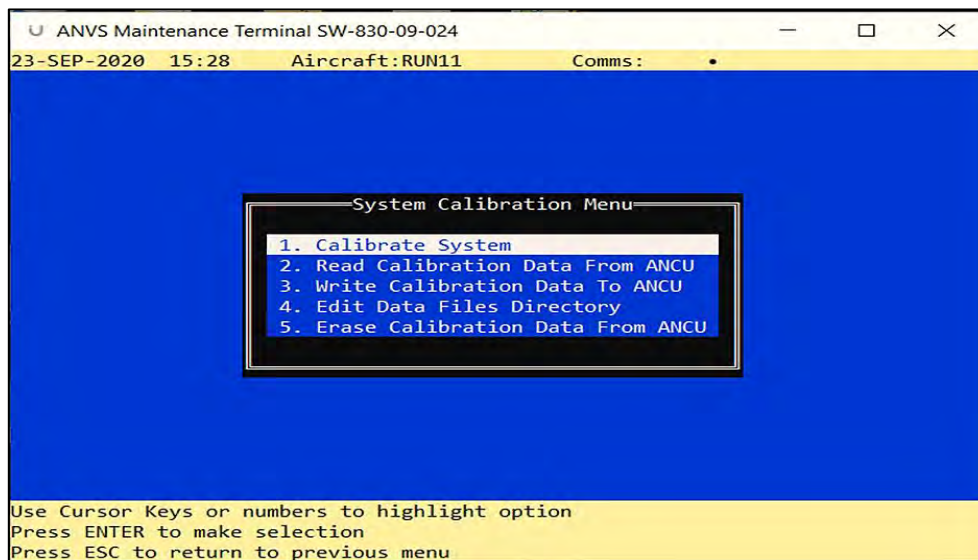
Figure 5-1 System Calibration menu

      (2)   **Calibrating ATVA System.**

         (a)   Select Calibrate System from the System Calibration Menu **(Ref Fig 5-1)** and Press <Enter>.

         (b)   The Information Screen **(Ref Fig 5-2)** will follow on the ANVS MT display. If you have any Disabled or failed Actuator or Sensor Channels **DO NOT BEGIN A CALIBRATION**. Calibration Data will not be gathered for failed or disabled channels. The System will fail when Disabled or Failed channels are repaired and there is no Calibration Data available for those channels.
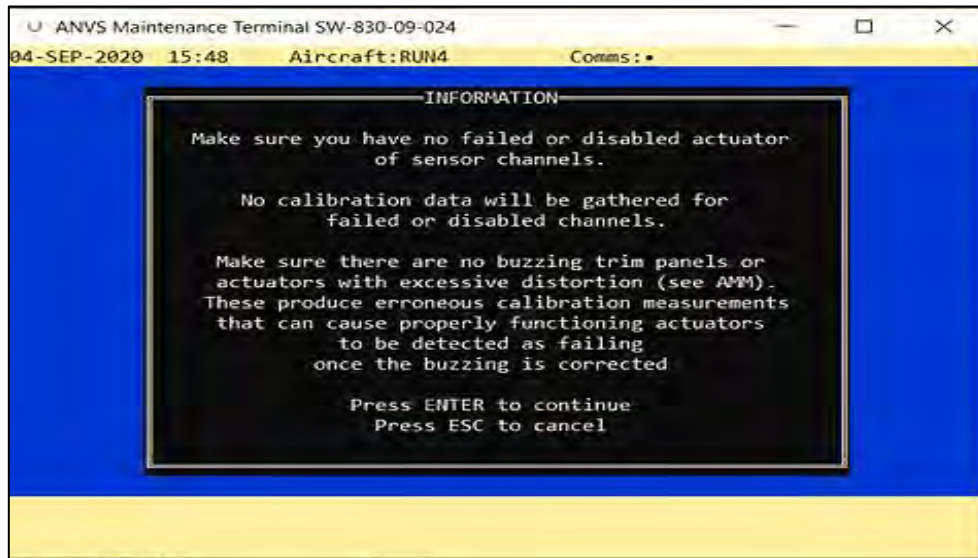
Figure 5-2 Calibration Information

(c)   If any Actuator or Sensor channels are disabled or failed press <ESC>. If all channels are good press <Enter> to continue. The Pressure Band Select screen will be displayed.

(d)   Use the cursor keys to move the pointer to the required pressure band. Press the <Space Bar> to select the required pressure band. Press <Enter> to continue. **(Ref Fig 5-9)**

(e)   The Information screen that follows will be displayed on the ANVS MT display **(Ref Fig 5-3).**

    Note: Pressure is only required for ATVA Systems.
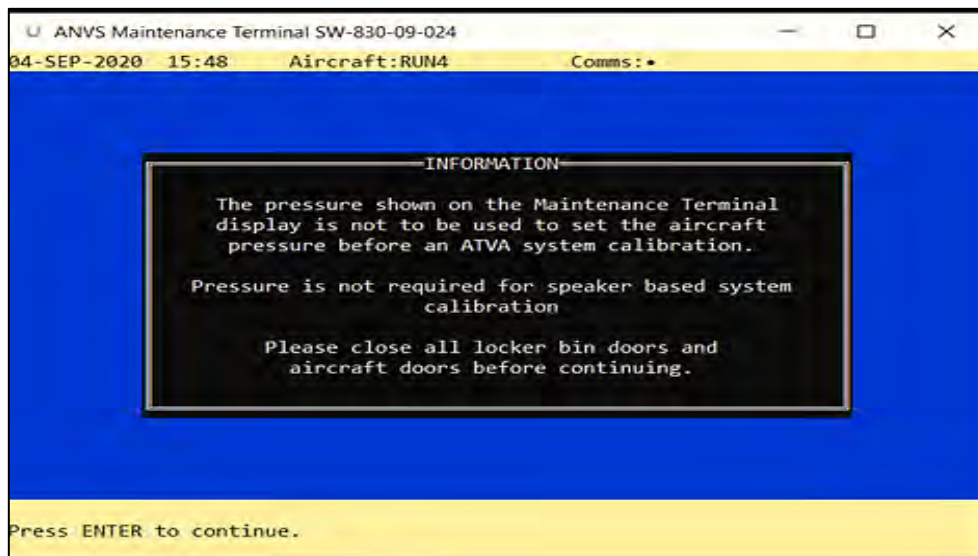
Figure 5-3 Calibration Information 2

(f)   Press <Enter> to Continue.

(g)   The ANCU will automatically drive all Actuators in turn for periods of 2 to 3 seconds. The Performing Calibration screen **(Ref Fig 5-4)** will be shown on the ANVS MT display.
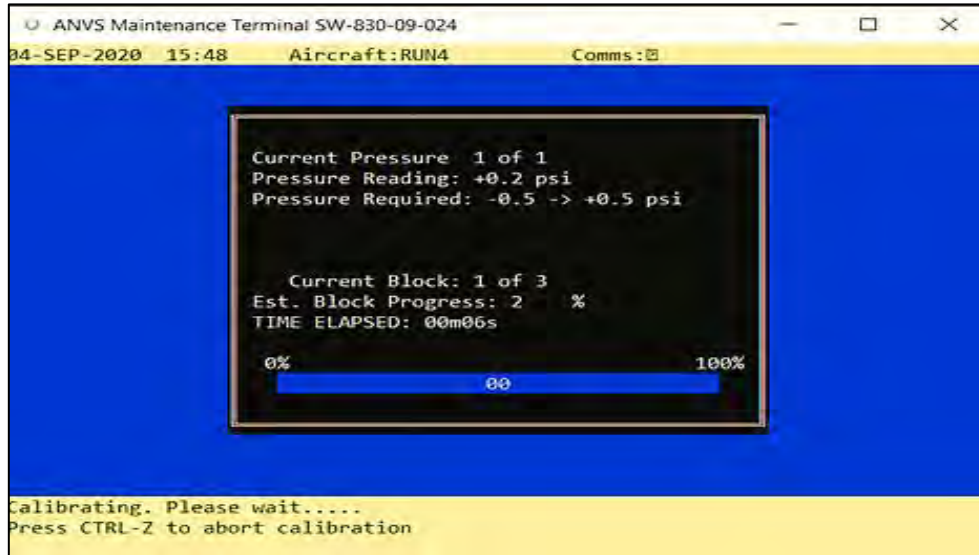
Figure 5-4 Performing Calibration

(h)   The calibration is complete in blocks of frequencies. The ANVS MT display will show the current block in progress and the total amount of blocks required for the calibration. The progress bar at the bottom of the screen shows the percentage completion for the whole calibration.

(i)   After the completion of the Calibration, the ANVS MT display **(Ref Fig 5-5)** will show any Actuators or Sensors that the system had failed during the calibration.
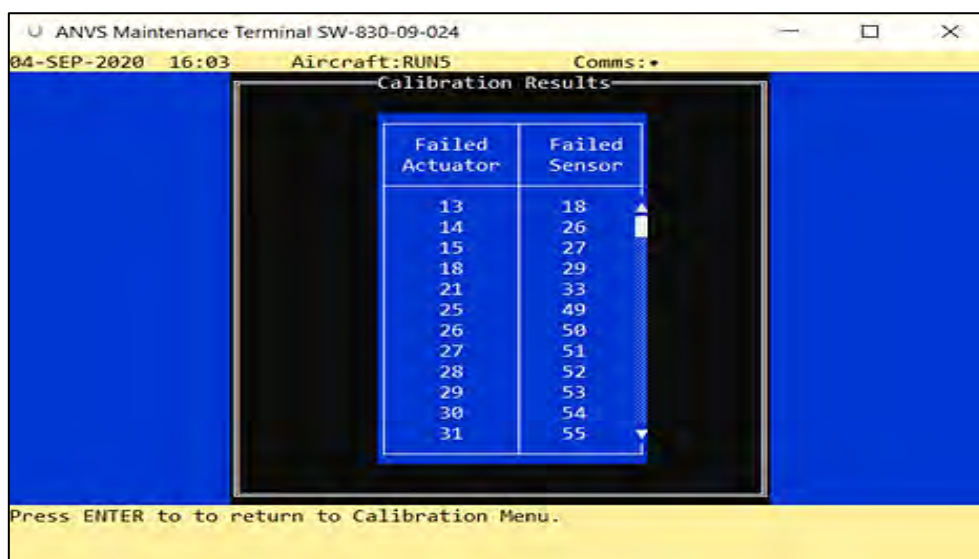
Figure 5-5 Calibration Results

(j)   Failed Actuators and Sensors must be repaired and the calibration repeated.

(k)   Before returning to the Calibration Menu, the controller will be reset.

WARNING: DO NOT SWITCH POWER OFF TO THE ANCU WHILE THE ANCU IS UPDATING ITS CALIBRATION DATA. IF YOU DO, IT WILL CAUSE DAMAGE TO THE ANCU.

(l)   The ANCU will then update its calibration data. In some cases, this may take a few moments to complete, and the ANVS MT will display a message **(Ref Fig 5-6)** indicating that the ANCU is updating it calibration data,
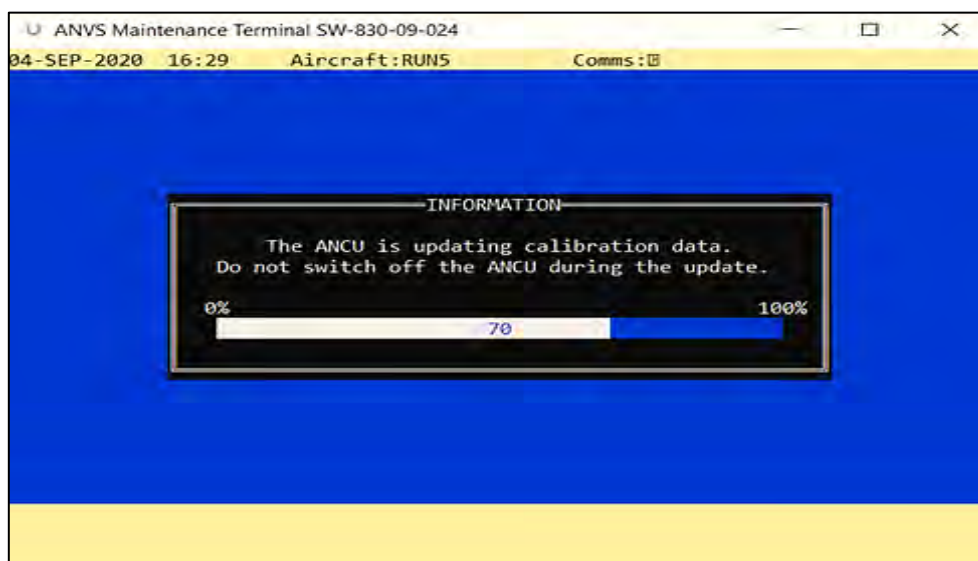
Figure 5-6 ANCU update

Note: Calibration must be done for all pressure bands before the system is used (Pressurised and Unpressurised).

(m)   Press <Enter> to return to the Main Menu.

(3)   **Read Calibration Data from ATVA Systems.**

(a)   From the Main Menu **(Ref Fig 4-3)** select System Calibration Menu **(Ref Fig 5-1)** Press <Enter> then select Read Calibration Data from the ANCU.

(b)   The Pressure Band select screen will be shown. **(Ref Fig 5-7)** Use the Cursor keys to move the pointer to the required pressure band and press <Space Bar> to select required pressure or press <A> to select all pressure bands and press <Enter>.

Figure 5-7 Pressure Band Screen

    (c)   The Message Reading Calibration Data from ANCU will be shown **(Ref Fig 5-8)** on the ANVS MT display.

Figure 5-8 Reading Calibration Data

    (d)   On completion, the message Calibration Data Read Completed will be shown on the ANVS MT display.

    (e)   Press <ESC> or wait 5 seconds to return to the System Calibration Menu.

    (f)   The Calibration files will have the same name as the Aircraft Serial Number you entered during the start of the ANVS MT session **(Ref Section 4.A).** The Calibration files will be stored in a directory as specified in Edit Data Files Directory **(Ref Section 3.B for instructions)** menu selection from the System Calibration Menu.

(4)   Write Calibration Data on to ATVA Systems.

    (a)   From the Main Menu **(Ref Fig 4-3)** select System Calibration Menu **(Ref Fig 5-1)** Press <Enter> then select Write Calibration Data to the ANCU.

    (b)   The Pressure Band select screen will be shown **(Ref Fig 5-9).** Use the Cursor keys to move the pointer to the required pressure band and press <Space Bar> to select required pressure or press <A> to select all pressure bands and press <Enter>.

Figure 5-9 Pressure Band Screen

    (c)   The Message Loading Calibration Data onto ANCU will be shown on the ANVS MT
display. **(Ref Fig 5-10)**

Figure 5-10 Loading Calibration Data

(d)   The ANCU will search for calibration files with the same name as the Aircraft Serial Number you entered during the start of the ANVS MT Session **(Ref Section 4.A).** The ANCU will only search the directory as specified in Edit Data Files directory **(Ref Section 3.B for instructions)** menu selection.

Note: If the calibration files will not load right click each file in turn and select Properties, the READ ONLY attribute should be checked and select APPLY.

WARNING: DO NOT SWITCH POWER OFF TO THE ANCU WHILE THE ANCU IS UPDATING ITS CALIBRATION DATA. IF YOU DO IT WILL CAUSE DAMAGE TO THE ANCU.

(e)   At completion the ANCU will Reboot and update its calibration data. In some cases, this may take a few moments to complete. The ANVS MT will display a message indicating that the controller is updating its calibration.

(f)   On completion, the message Calibration Data Load Complete will be shown on the ANVS MT display.

(g)   Press <ESC> or wait 5 seconds to return to the System Calibration Menu.

B.   Loud Speaker Systems.

(1)   System Calibration Menu.

(a)   From the Main Menu **(Ref Fig 4-3)** select System Calibration Menu **(Ref Fig 5-1)** and press <Enter>.

(2)   Calibrating Loud Speaker Systems.

(a)   Select Calibrate System from the System Calibration Menu **(Ref Fig 5-1)** and Press <Enter>.

(b)   The Information Screen **(Ref Fig 5-2)** will follow on the ANVS MT display. If you have any Disabled or failed Actuator or Sensor Channels DO NOT BEGIN A CALIBRATION. Calibration Data will not be gathered for failed or disabled channels. The System will fail when Disabled or Failed channels are repaired and there is no Calibration Data available for those channels.

(c)   If any Actuator or Sensor channels are disabled or failed press <ESC>. If all channels are good press <Enter> to continue. The Information screen **(Ref Fig 5-3)** will be displayed.

(d)   Press <Enter> to continue.

(e)   The ANCU will automatically drive all Loud Speakers for periods of 2 to 3 seconds. The Performing Calibration screen **(Ref Fig 5-4)** will be shown on the ANVS MT display.

(f)   For Speaker based Systems all pressure information can be ignored.

(g)   The calibration is complete in blocks of frequencies. The ANVS MT display will show the current block in progress and the total amount of blocks required for the calibration. The progress bar at the bottom of the screen shows the percentage completion for the whole calibration.

(h)   After the completion of the Calibration, the ANVS MT display will show (**Ref Fig 5-5)** any Actuators or Sensors that the system had failed during the calibration.

(i)   Failed Actuators and Sensors must be repaired and the calibration repeated.

(j)   Before returning to the Calibration Menu, the controller will be reset.

WARNING: DO NOT SWITCH POWER OFF TO THE ANCU WHILE THE ANCU IS UPDATING ITS CALIBRATION DATA. IF YOU DO, IT WILL CAUSE DAMAGE TO THE ANCU.

(k)   The ANCU will then update its calibration data. In some cases, this may take a few moments to complete, and the ANVS MT will display **(Ref Fig 5-6)** a message indicating that the ANCU is updating it calibration data,

(l)   Press <Enter> to return to the Main Menu.

(3)   **Read Calibration Data from Loudspeaker Systems.**

(a)   From the Main Menu **(Ref Fig 4-3)** select System Calibration Menu **(Ref Fig 5-1)** Press <Enter> then select Read Calibration Data from the ANCU.

(b)   The ANVS MT will display the Message Reading Calibration Data **(Ref Fig 5-8)** from the ANCU.

(c)   On completion, the message Calibration Data Read Completed will be shown on the ANVS MT display.

(d)   Press <ESC> or wait 5 seconds to return to the System Calibration Menu.

(e)   The Calibration files will have the same name as the Aircraft Serial Number you entered during the start of the ANVS MT session **(Ref Section 4.A).** The Calibration files will be stored in a directory as specified in Edit Data Files Directory **(Ref Section 3.B for instructions)** menu selection

(4)   **Write Calibration Data onto Loudspeaker Systems.**

(a)   From the Main Menu **(Ref Fig 4-3)** select System Calibration Menu **(Ref Fig 5-1)** Press <Enter> then select Write Calibration Data to the ANCU.

(b)   The Message Loading Calibration Data from ANCU will be shown on the ANVS MT display. **(Ref Fig 5-10)**

(c)   The ANCU will search for calibration files with the same name as the Aircraft Serial Number you entered during the start of the ANVS MT Session **(Ref Section 4.A).** The ANCU will only search the directory as specified in Edit Data Files directory **(Ref Section 3.B for instructions)** menu selection.

Note: If the calibration files will not load right click each file in turn and select Properties, the READ ONLY attribute should be checked and select APPLY.

**WARNING: DO NOT SWITCH POWER OFF TO THE ANCU WHILE THE ANCU IS UPDATING ITS CALIBRATION DATA. IF YOU DO, IT WILL CAUSE DAMAGE TO THE ANCU.**

    (d)   At completion the ANCU will Reboot and update its calibration data. In some cases, this may take a few moments to complete. The ANVS MT will display a message indicating that the controller is updating its calibration.

    (e)   On completion, the message Calibration Data Load Complete will be shown on the ANVS MT display.

    (f)   Press <ESC> or wait 5 seconds to return to the System Calibration Menu.

C.   Erase Calibration Data

    (1)   Select Erase Calibration Data **(Ref Fig 5-11)** from the ANCU from the System Calibration Menu and Press <Enter>.
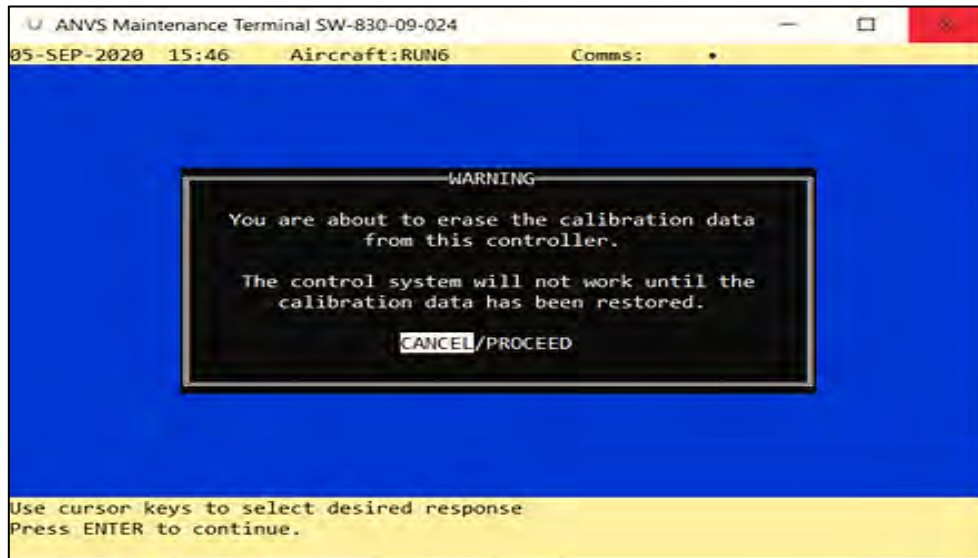
        (a)   The Erase Calibration Data screen will be shown. **(Ref Fig 5-12)**
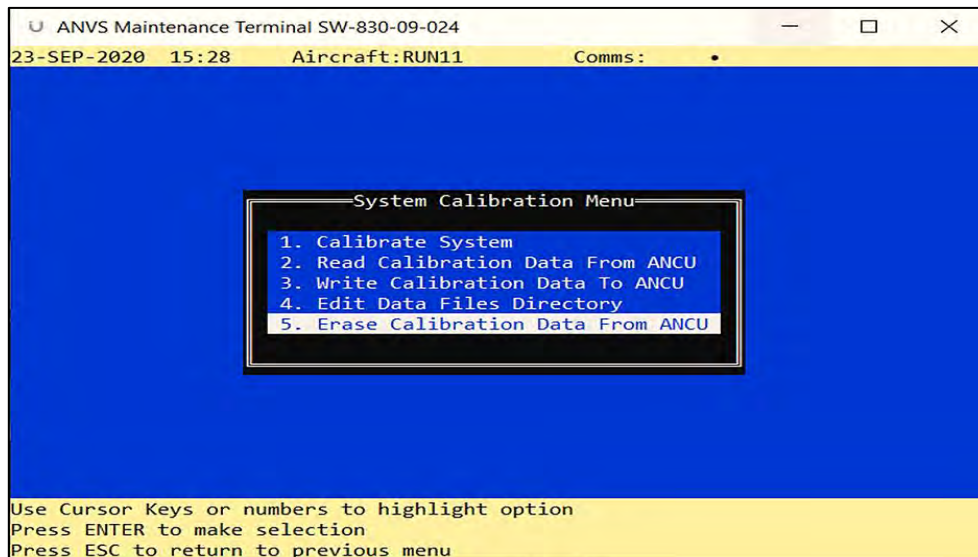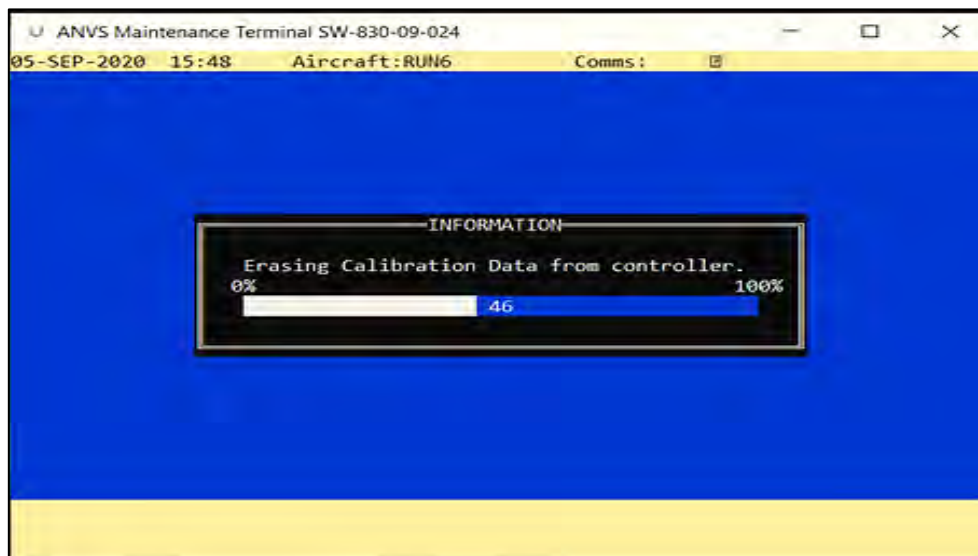

Figure 5-11 Erase Calibration Data

Figure 5-12 Erase Calibration Data proceed

(b)   The ANVS MT will ask if you would like to Cancel or Proceed Use the cursor Keys to select Proceed and /Press <Enter>

(c)   The ANVS MT will show the progress of the Data Erase **(Ref Fig 5-13)**

Figure 5-13 Progress

6. SYSTEM INFORMATION:

    A.   System Information Menu.

        (1)   From the Main Menu **(Ref Fig 4-3)** select System Information Menu and Press <Enter>.

                (a)   The System Information Menu will be shown **(Ref Fig 6-1)**
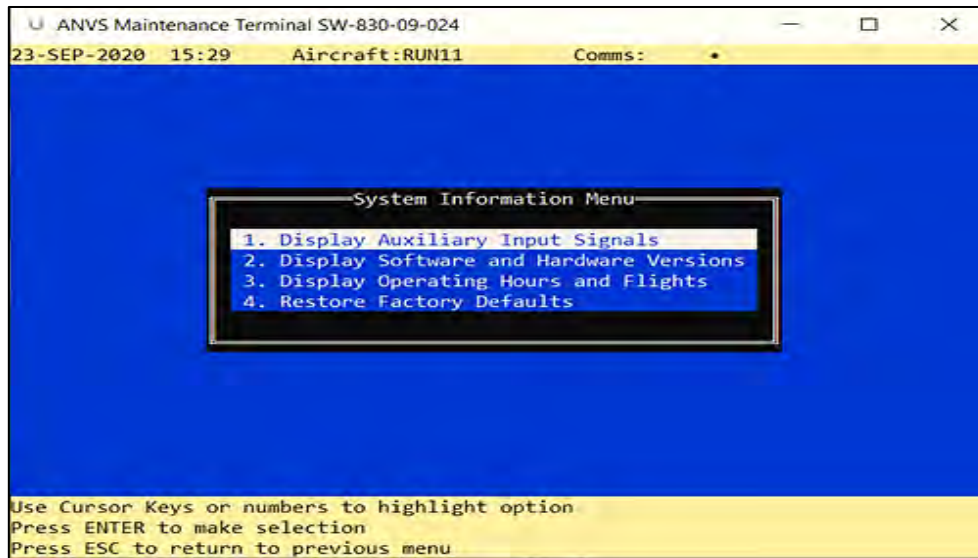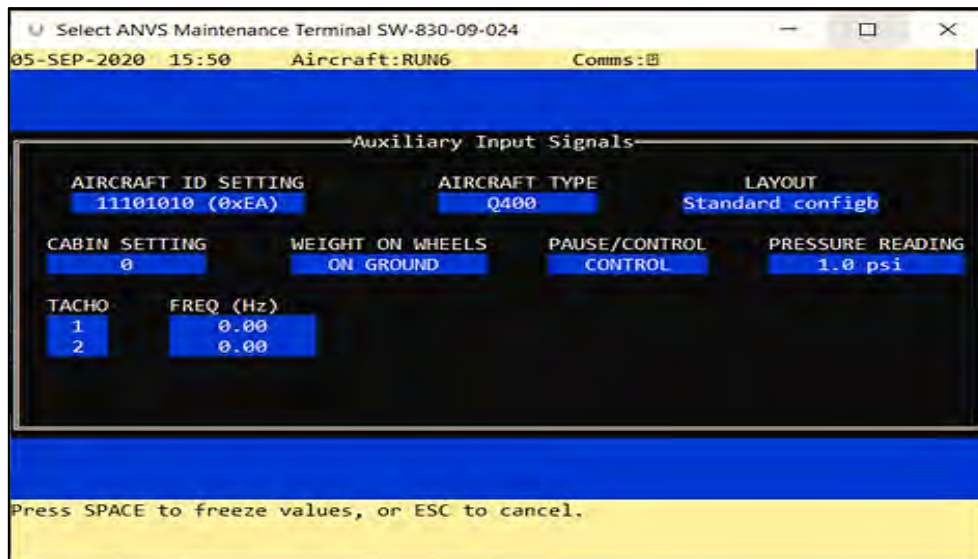

Figure 6-1 System Information Menu

    B.   Display Auxiliary Input Signals.

        (1)   **Select Display Auxiliary Input Signals**

                (a)   From the System Information Menu **(Ref Fig 6-1).** The Auxiliary Input Signal screen will be shown **(Ref Fig 6-2)**

Figure 6-2 Display Auxiliary Input Signals

(b)   The Information Displayed on the screen is as follows

- Aircraft ID Setting   From the Aircraft ID wiring on the Aircraft wiring harness J1 connector.

- Cabin Setting   From the Cabin Switch wiring on the Aircraft wiring harness J1 connector.

- Aircraft Type   As Identified by the Aircraft ID.

- Layout   Taken from Configuration Parameters being used.

- Weight on Wheels   From the Weight on Wheels input from the Aircraft wiring harness connector.

- Pause/Control   From Pause/Control input from the Aircraft wiring harness J1 connector where fitted.

- Pressure Reading   From the Pressure input from the Aircraft wiring harness J1 connector where fitted.

- Tachometer Readings   From the Tachometer signal wiring on the Aircraft wiring harness J1 connector.

(c)   The ANCU tests the auxiliary input signals on the J1 connector as part of the Built in Self-Test. If any of these signals fail the Built in Self-Test, use the System Diagnostics screen to that signal. The Sensors or wiring associated with the failed parameter(s) must be checked. When this has been done confirm the auxiliary input signal and clear the fault.

(d)   Press <ESC> to return to the System Information Menu.

C. **Display Software and Hardware Version Numbers.**

    (1)   **Select Display Software and Hardware Version Numbers**

        (a)   From the System Information Menu **(Ref Fig 6-1)** and Press <Enter>.

        (b)   The Display Software and Hardware Version Number screen **(Ref Fig 6-3)** will display the details of the Software and Hardware installed in the ANCU.

        (c)   Press <Enter> to return to the System Information Menu.

Figure 6-3 Software and Hardware Version Numbers

D. **Display ANCU Operating Hours and Number of Flights.**

    (1)   Select Display ANCU Unit Operating Hours and Number of Flights from the System Information Menu **(Ref Fig 6-1)** and Press <Enter>.

        (a)   The Display Control Unit Operating Hours and Flights screen **(Ref Fig 6-4)** will show details on the System Lifetime and Total Flights.

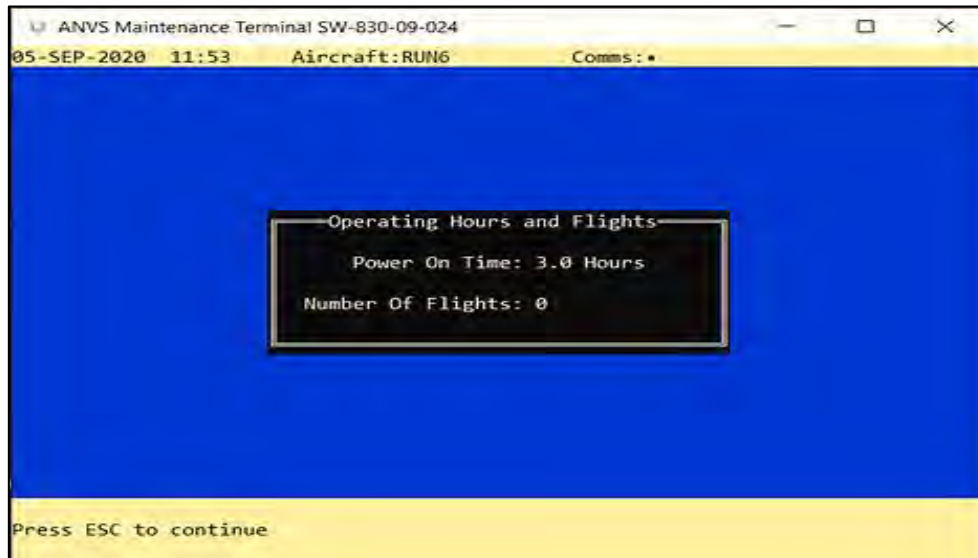   (b)   Press <ESC> to return to the System Information Menu.

Figure 6-4 Operating Hours and Flight

E. **Restore Factory Defaults.**

(1) **Select Restore Factory Defaults**

(a) From the System Information Menu **(Ref Fig 6-1)** and press <Enter>.

(b) The Restore Factory Defaults screen will be shown **(Ref Fig 6-5).**
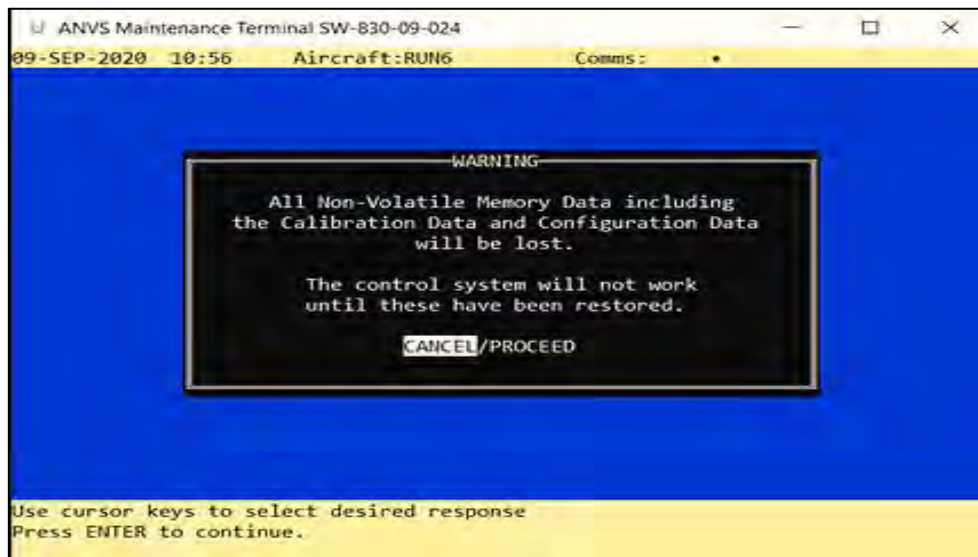

Figure 6-5 Restore Factory Defaults

(c) To Restore Factory Defaults use the Left/Right arrow keys to make the proceed selection and Press <Enter> to confirm selection. The ANVS MT will erase any previously stored Calibration Data and Configuration Parameters from the ANCU. **Note: This Option is Password Protected**.

F.   Engineering Menu.

(1)   The Engineering Menu is for use by Ultra, Precision control Systems Engineers only.

   Note: This Option is Password Protected.

G.   Built In Self-Test.

(1)   **Select BIST**

   (a)   From the Main Menu **(Ref Fig 4-3)** select Built In Self-Test.

   (b)   If the ANCU does not pass the Built In Self-Test the test is stopped at the point the fail occurred.

   (c)   Fail will be shown under the Result column.

   (d)   The results screen is shown after Built In Self-Test has been selected **(Ref Fig 6-6).**

   (e)   The Statement Unchecked in the results column means that this test was not completed before the Built In Self-Test failed.

   (f)   Fail means that the item has failed the Built In Self-Test.

   (g)   If the ANCU passes the Built In Self-Test the Results Screen **(Ref Fig 6-6)** will show all sections in the results column as Pass.

   (h)   Press <ESC> to return to the Main Menu.
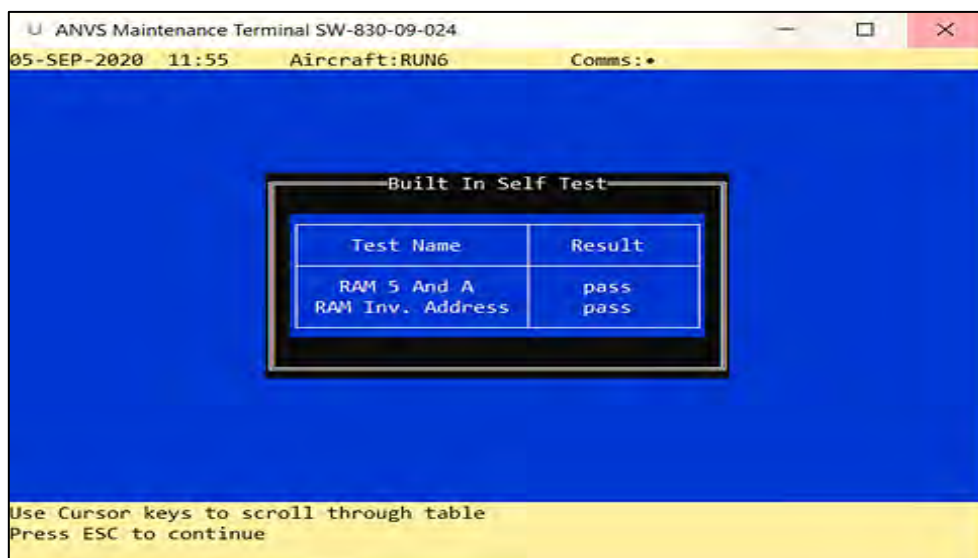
Figure 6-6 Built In Self-Test

H.   **Exit the Maintenance Terminal Session.**

(1)   Exit the ANVS MT

(a)   To exit the ANVS MT select Quit from the main Menu.

(b)   The message Exiting Maintenance Program Log File Name **(Ref Fig 6-7) C:\MT830\XXXX\YYYYYYYY.log** will be shown on the ANVS MT display. The saved log file is a Text file record of the communication between the ANVS MT and the controller during the maintenance session.

(c)   **MT830** is a directory set as the user default directory **(Ref Section 3.B).**

(d)   **XXXX** is a subdirectory created with the same name as the Aircraft Serial number entered **(Ref Section 4.B).** Example below **(Ref Fig 6-7)** shows RUN6 as Aircraft Serial Number

(e)   **YYYYYYYY.log** is the name given to the log file created for the ANVS MT session you have just completed **(Ref Section 4.B).**
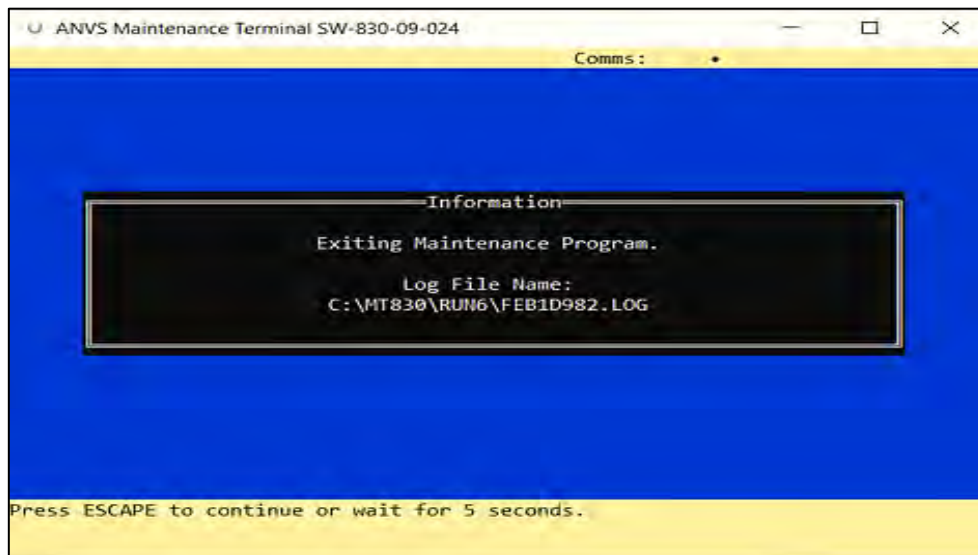

Figure 6-7 Exit The Maintenance terminal

ULTRA

The word "ULTRA" is a logo.

Maintenance Terminal Manual (ANVS)

7. ERROR MESSAGES:

A. The following Error messages may be observed during operation of the ANVS Terminal.

Error Message	Meaning	Recommended Action
Invalid Aircraft Serial Number **(Ref Fig 7-1)**	An Aircraft Serial number of less than 4 digits has been entered	Re-enter the Aircraft Serial number ensuring it is at least 4 digits long
You Must Enter Your Name **(Ref Fig 7-2)**	A Name or Initials has not been entered in the User ID field	Your Name or initials must be Entered into the field in the Log Files Detail Screen (up to 8 characters)
There does not appear to be a controller attached to the ANVS Terminal **(Ref Fig 7-3)**	The ANVS Terminal cannot detect a controller	Select Abort and press <Enter> to return to the Main Menu. Check the connection between the Serial port of the ANVS Terminal and the J5 Connector on the controller before reselecting Aircraft Type
You have indicated that the Aircraft required is not listed **(Ref Fig 7-4)**	The Not listed option as selected from the Aircraft Type screen	Check the Database installation
Some Parameters are missing	The Software has missing parameters	Contact Customer support for assistance **support@ultra-pcs.com**
No Calibration Data files **(Ref Fig 7-5)**	No Valid Calibration Files found in the Specified Directory You have not carried out a Calibration	Check the location of the files in the Directory and retry Carry out a calibration
Serial Port does not exist or USB Serial Adaptor not found **(Ref Fig 7-6)**	The Serial port or USB adaptor has not been found or recognised	Check the USB adaptor or Serial port connection is inserted correctly in to the PBMS Terminal

B. **Error Message Screen Shots**
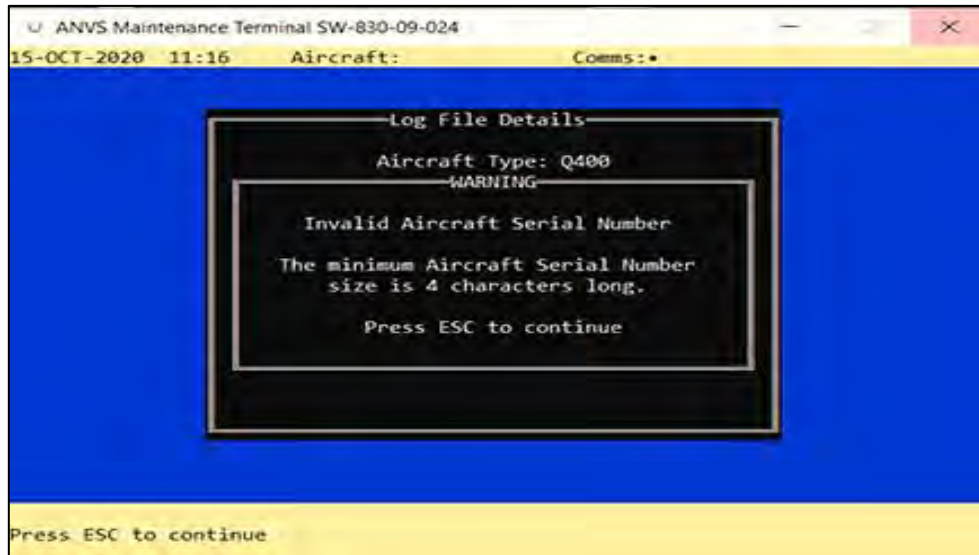
Figure 7-1 A/C Serial Number
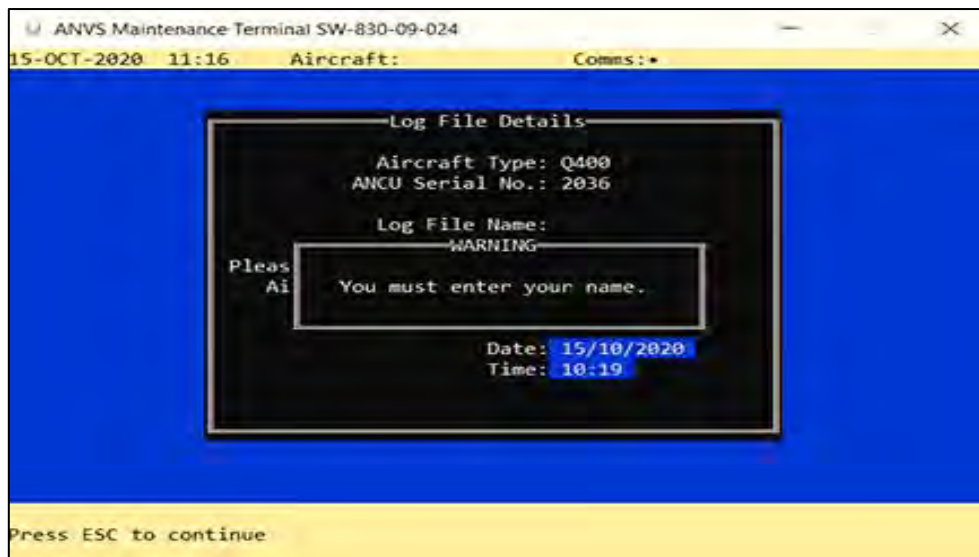
Figure 7-2 Enter Name
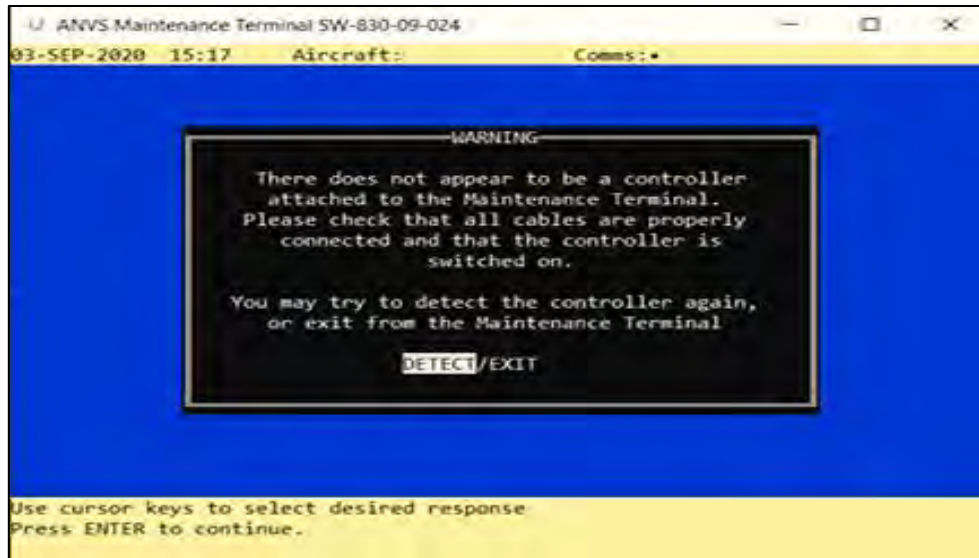
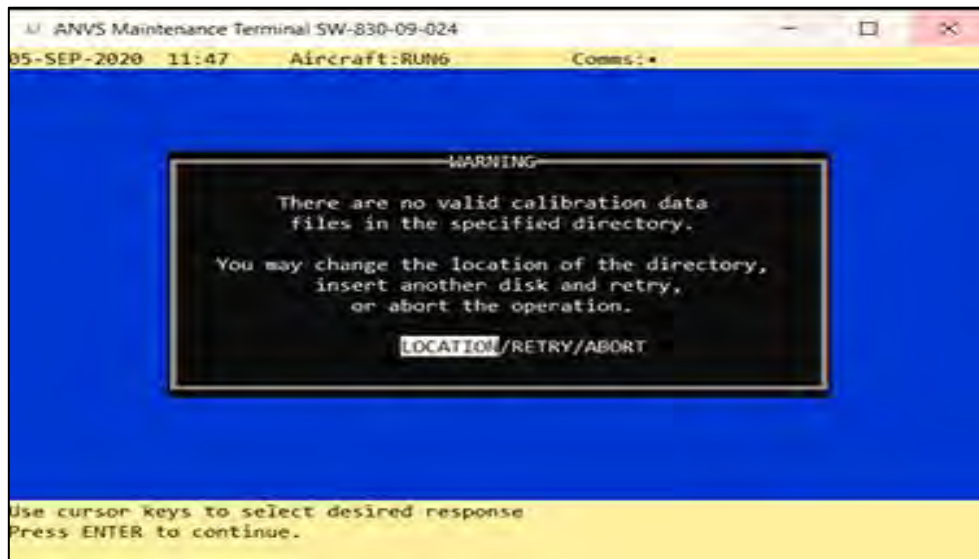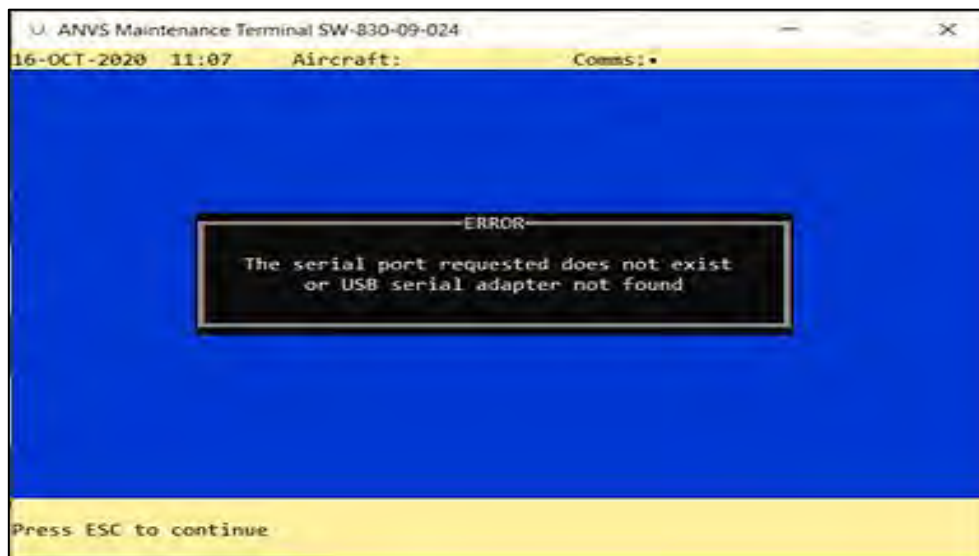**Figure 7-3 No Controller**
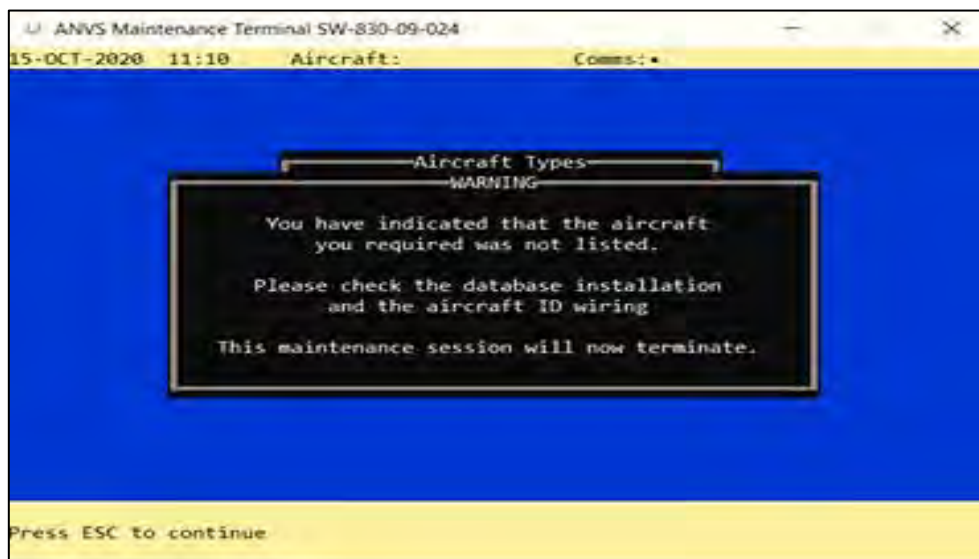
Figure 7-4 Aircraft not listed

Figure 7-5 No Calibration files

Figure 7-6 No Serial Port