



Maintenance Terminal Manual (ANVS)

Ultra Electronics, Precision Control Systems
417 Bridport Road, Greenford, Middlesex, UB6 8UE
United Kingdom
(CAGE: K8081)

Telephone: +44 (0) 20 8813 4444 Fax: +44 (0) 20 8813 4351
Email: support@ultra-controls.com

ACTIVE NOISE & VIBRATION CONTROL SYSTEM (ANVS)

MAINTENANCE TERMINAL USER MANUAL

The technical content of this document is approved under the authority of:
DOA Nr. EASA 21J.092

COPYRIGHT © Ultra Electronics Limited, trading as Ultra Electronics, Precision Control Systems 2006 - 2017.

PROPRIETARY – This document and the information contained herein is the property of Ultra Electronics Limited, trading as Ultra Electronics, Precision Control Systems and must not be disclosed, copied, altered or used without written permission.



Maintenance Terminal Manual (ANVS)

PRODUCT SUPPORT CENTRE

Customer Support Department

Ultra Electronics,

Precision Control Systems (Cambridge)

Vitrum Building, St John's Innovation Park, Cowley Road,
Cambridge, CB4 0DS, United Kingdom.

Tel: +44 (0)208 813 4444

Fax: +44 (0)208 813 4351

Email: support@ultra-controls.com

23-35-45

TITLE PAGE

Page 2

Jan 30/17



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank



Maintenance Terminal Manual (ANVS)

RECORD OF TEMPORARY REVISIONS

Revision No.	Insertion Date	Initial

Revision No.	Insertion Date	Initial

23-35-45



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank

23-35-45

RECORD OF TEMPORARY REVISIONS

Page 2

Jan 30/17



Maintenance Terminal Manual (ANVS)

LIST OF EFFECTIVE PAGES

	Page No.			Page No.	
Title Page	1	Jan 30/17	Maintenance Terminal	3-1	Jan 30/17
	2	Jan 30/17	Operation with Type 830, 831, 832 & 833	3-2	Jan 30/17
Record of Revisions	1	Jan 30/17	ANCUs	3-3	Jan 30/17
	2	Jan 30/17		3-4	Jan 30/17
Record of Temporary Revisions	1	Jan 30/17	3-5	Jan 30/17	
	2	Jan 30/17	3-6	Jan 30/17	
List of Effective Pages	1	Jan 30/17	3-7	Jan 30/17	
	2	Jan 30/17	3-8	Jan 30/17	
Service Bulletin List	1	Jan 30/17	3-9	Jan 30/17	
	2	Jan 30/17	3-10	Jan 30/17	
Table of Contents	1	Jan 30/17	3-11	Jan 30/17	
	2	Jan 30/17	3-12	Jan 30/17	
Introduction	1	Jan 30/17	3-13	Jan 30/17	
	2	Jan 30/17	3-14	Jan 30/17	
Abbreviations & Acronyms	1	Jan 30/17	3-15	Jan 30/17	
	2	Jan 30/17	3-16	Jan 30/17	
Maintenance Terminal Introduction	1-1	Jan 30/17	3-17	Jan 30/17	
	1-2	Jan 30/17	3-18	Jan 30/17	
	1-3	Jan 30/17	3-19	Jan 30/17	
	1-4	Jan 30/17	3-20	Jan 30/17	
	1-5	Jan 30/17	3-21	Jan 30/17	
	1-6	Jan 30/17			
	1-7	Jan 30/17			
	1-8	Jan 30/17			
Maintenance Terminal Functions	2-1	Jan 30/17			
	2-2	Jan 30/17			



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank



Maintenance Terminal Manual (ANVS)

SERVICE BULLETIN LIST

Number	Description	Insertion Date	Initial



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank



Maintenance Terminal Manual (ANVS)

TABLE OF CONTENTS

	Page
Title Page	1
Record of Revisions	1
Record of Temporary Revisions	1
List of Effective Pages	1
Service Bulletin List	1
Table of Contents (this page)	1
Introduction	1
Abbreviations & Acronyms	1
1. MAINTENANCE TERMINAL INTRODUCTION	
A Scope	1-1
B Active Noise Control System – Principles and Operation	1-1
C Maintenance Terminal Requirements	1-3
D Maintenance Terminal Software Installation Procedure	1-4
E Registering the MT	1-4
F Setting Up the MT	1-6
G Set the Calibration File Directory for Type 810, 811 & 823 ANCU's	1-7
2. MAINTENANCE TERMINAL FUNCTIONS	
A Functions	2-1
B Screen Formats	2-3
3. MAINTENANCE TERMINAL OPERATION WITH TYPE 830, 831, 832 & 833 ANCU's	
A General	3-1
B Start a MT Session	3-1
C Display System Status	3-3
D Actuator and Sensor Tests	3-4
E System Calibration – Loudspeaker Systems	3-10
F System Calibration – ATVA Systems	3-13
G System Information	3-17
H Engineering Menu	3-21
I Built In Self Test	3-21
J Exit the Maintenance Terminal Session	3-22

23-35-45

TABLE OF CONTENTS

Page 1

Jan 30/17



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank



Maintenance Terminal Manual (ANVS)

INTRODUCTION

1. General

This manual contains instructions for the Maintenance Terminal to be used with Ultra Electronics Active Noise and Vibration Control Systems.

The manual is divided into the sections given in the ATA 100 Specification and listed in the Table of Contents. The information will let the user:

- Determine the condition of the Active Noise and Vibration Control System.
- Carry out a System Calibration.

23-35-45

INTRODUCTION

Page 1

Jan 30/17



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank

23-35-45

INTRODUCTION

Page 2

Jan 30/17



Maintenance Terminal Manual (ANVS)

ABBREVIATIONS AND ACRONYMS

Abbreviations	Definition
AC	Alternating Current
ATA	Air Transport Association of America
ANCU	Active Noise Control Unit
ANVC	Active Noise and Vibration Control
ATVA	Active Tuned Vibration Attenuator
MT	Maintenance Terminal
RAM	Random Access Memory
RPM	Revolutions Per Minute
VGA	Video Graphics Adaptor

23-35-45

ABBREVIATIONS AND ACRONYMS

Page 1
Jan 30/17



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank

23-35-45

ABBREVIATIONS AND ACRONYMS

Page 2

Jan 30/17



Maintenance Terminal Manual (ANVS)

4. MAINTENANCE TERMINAL INTRODUCTION

A. Scope

- (1) This manual provides information on the Maintenance Terminal (MT) supplied by Ultra Electronics, Precision Control Systems used to test Ultra Active Noise & Vibration Control Systems.

B. Active Noise & Vibration Control system Principles and Operation

- (1) The Active Noise & Vibration Control (ANVC) system reduces the level of the periodic noise and vibration in the passenger cabin caused by the aircraft engines or 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 ANVC system consists of the Active Noise Control Unit (ANCU), Sensors and Actuators placed around the aircraft cabin, and Power Amplifiers to operate the actuators.
 - The Sensors are Microphones, which are attached to the aircraft trim, ceiling and overhead lockers or Accelerometers (Q400), which are mounted on the aircraft structure.
 - The Actuators are Loudspeakers which are attached to the aircraft trim, ceiling and overhead lockers and mounted in enclosures, or Active Tuned Vibration Attenuators (ATVAs) which are mounted on fuselage frames or other structural components such as bulkheads.
 - 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 1.10](#) shows a typical installation for a turbo-prop aircraft system using Loudspeakers.
- (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 non-volatile memory.
- (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).

23-35-45

MAINTENANCE TERMINAL INTRODUCTION

Page 1-1

Jan 30/17

Maintenance Terminal Manual (ANVS)

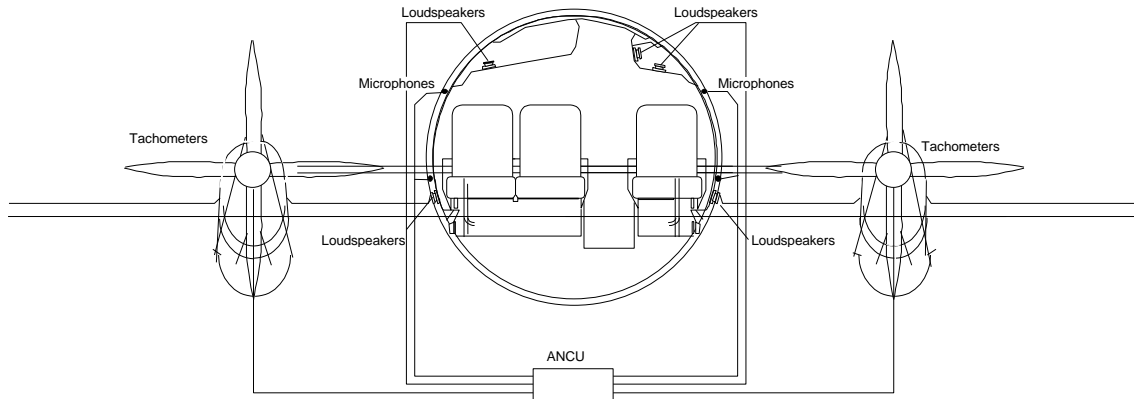


Figure 1.10 - System Schematic

- (7) During Active Control, the ANCU:
 - (a) Measures the tonal noise from the engines or propellers contained in the signals received from the Sensors.
 - (b) From the pressure input, measures the difference between internal and external cabin air pressure (systems using ATVAs only).
 - (c) Calculates 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 system's Sensors and Actuators. A signal that cannot be heard is applied to each Actuator and the Actuator 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 non-volatile memory. 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 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 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 changes from green to red. The SYSTEM FAULT output is enabled and maintenance is required.



Maintenance Terminal Manual (ANVS)

- (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 into range. (This only applies to systems using ATVAs.)
- (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 Controller 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:
 - The System Status indicator on the front panel changes from green to red;
 - The SYSTEM FAULT output is enabled and maintenance is required.

C. Maintenance Terminal Requirements

(1) Hardware

A 386 SX Processor or above.

A PCMCIA drive (optional).

A VGA compatible display.

Windows XP or 7 operating system.

A minimum of 1 Mbyte of RAM.

A hard disk with at least 10 Mbytes of free disk space.

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

CD ROM Drive.

(2) Software

Maintenance Terminal Software CD-ROM Part No. 8-800-07-030 (Windows XP OS) that contains:

- Version 3 of the Ultra Electronics Noise and Vibration Control System Maintenance Terminal (MT830) Software.
- Version 2 of the Ultra Electronics Propeller Balance Monitor System (PBMS) Software.

Maintenance Terminal Software CD-ROM Part No. 8-800-07-040 (Windows 7 OS) that contains:

- Version 4 of the Ultra Electronics Noise and Vibration Control System Maintenance Terminal (MT830) Software.

23-35-45

MAINTENANCE TERMINAL INTRODUCTION

Page 1-3

Jan 30/17

Maintenance Terminal Manual (ANVS)

- Version 3 of the Ultra Electronics Propeller Balance Monitoring System (PBMS) software.
- (3) Maintenance Terminal Database
- The Maintenance Terminal Software requires a database of aircraft configuration data, which is different for each aircraft type. These are also on the Maintenance Terminal Software CD-ROM and the required database is selected during installation.
- D. Maintenance Terminal Software Installation Procedure
- (1) Install the Maintenance Terminal Software using the procedure detailed in the applicable service bulletin for the Maintenance Terminal Software being used.
- E. Registering the MT
- (1) This process is required to be followed the first time after the MT software has been installed onto a laptop computer and when the authorisation code expires.
- NOTE: YOU DO NOT HAVE TO CONNECT THE MT TO THE ANCU FOR THE REGISTRATION PROCESS.**
- (2) Switch the Laptop PC on and start the Maintenance Terminal software as follows:
- (3) Click the newly created icon on the desktop named MT830.
- (4) After a few seconds the 'Welcome Screen' will be displayed (Ref. Figure 1.11) followed by the 'Registration Check Screen' (Ref. Figure 1.12).



Figure 1.11- 'Welcome Screen'



Maintenance Terminal Manual (ANVS)

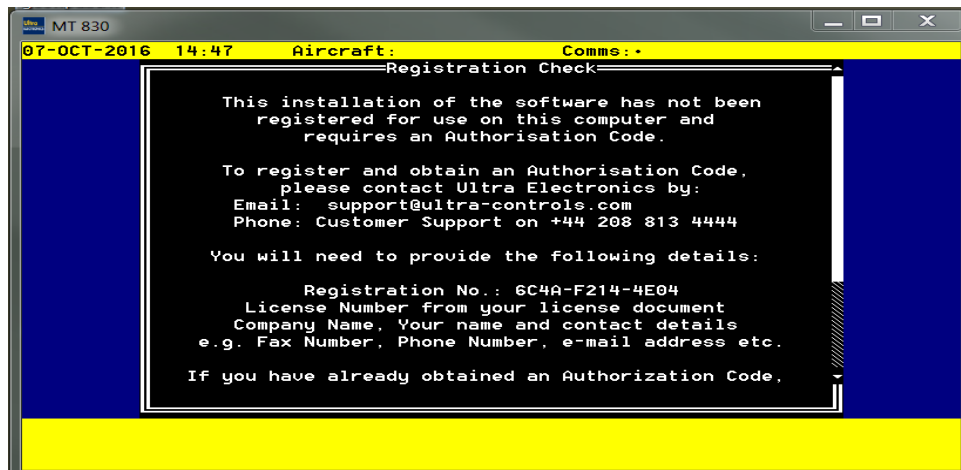


Figure 1.12 – 'Registration Check Screen'

- (5) Call or e-mail Customer Support Ultra Electronics, Precision Control Systems for your Authorisation Code. You will need to give the following information:
 - (a) Your / Company name and contact details.
 - (b) The software licence number from your licence agreement document.
 - (c) The Registration Number generated by the MT (Ref. Figure 1.12).
 - (d) A contact telephone number and email address.
- (6) Once you have an Authorisation code press <ENTER>. The Software Registration Screen will be displayed (Ref. Figure 1.13).



Maintenance Terminal Manual (ANVS)

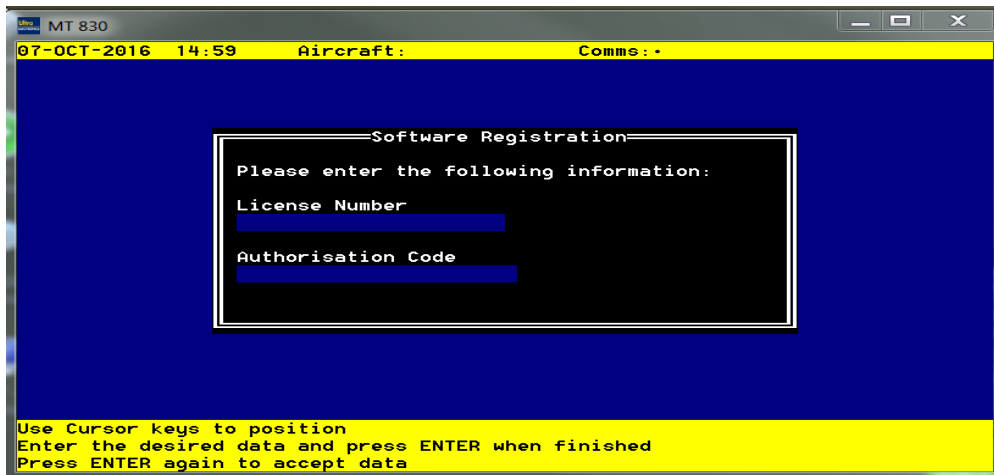


Figure 1.13 - Software Registration Screen

- (7) Enter the licence number which is detailed on the inside of the CD-ROM sleeve.
- (8) Enter the Authorisation Code as supplied by Ultra Electronics, Precision Control Systems and press <ENTER>.

F. Setting Up the MT

- (1) The MT will now show the Default Directories Screen for MT830 Software operation with the Type 830 range of ANCU's (Ref. figure 1.14). Each directory will be set to the default. The default is shown with a single dot. The default directory will be the directory where you have stored the MT program files. This should be C:\MT830.

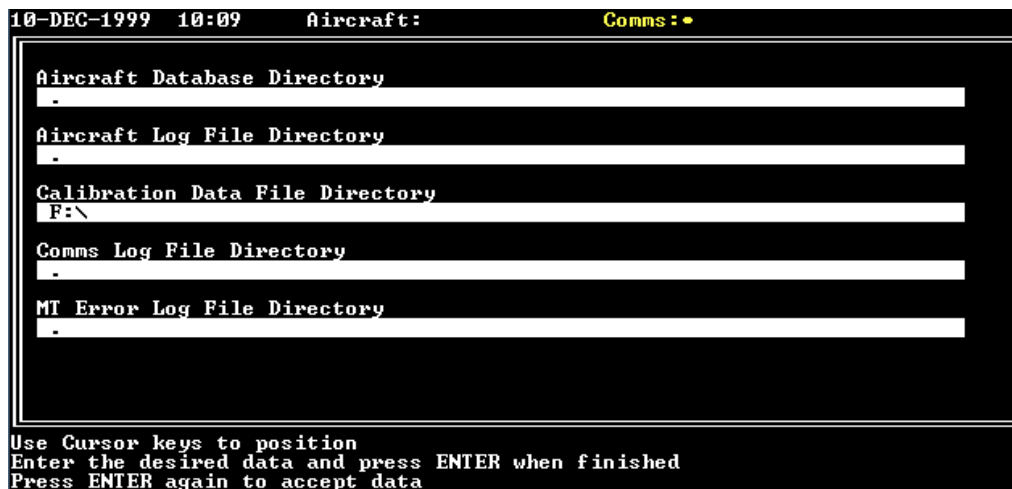


Figure 1.14 - Default Directories Screen

23-35-45

MAINTENANCE TERMINAL INTRODUCTION

Page 1-6

Jan 30/17



Maintenance Terminal Manual (ANVS)

- (2) Use the cursor keys to move to the Calibration Data File Directory and delete the default directory.

NOTE: THE CALIBRATION DATA FILE DIRECTORY FOR THE MT 830 SOFTWARE OPERATION WITH THE TYPE 811 RANGE OF ANCU'S IS DETAILED IN PARA 'G' AND REQUIRES THAT THE MAINTENANCE TERMINAL IS CONNECTED TO THE REMOTE MAINTENANCE PORT ON THE AIRCRAFT.

NOTE: USERS OF LAPTOP PCs AS MAINTENANCE TERMINALS MUST IDENTIFY THE CORRECT DRIVE LETTER FOR THE PCMCIA or USB DRIVE AND SUBSTITUTE "F" IN FIG. 1.14 ABOVE WITH THE CORRECT DRIVE LETTER.

- (3) Press <ENTER> to exit the Default Directories Screen and the MT will now try to establish communications with the ANCU. If you are not connected to an ANCU press <CTRL> and <C> to escape out of the MT software.

23-35-45

MAINTENANCE TERMINAL INTRODUCTION

Page 1-7

Jan 30/17



Maintenance Terminal Manual (ANVS)

- G. Set The Calibration File Directory for type 810, 811 & 823 ANCU's
- (1) To set the Calibration Data File Directory for the Type 810, 811 and 823 ranges of ANCU's, proceed as follows:
 - (a) Connect the MT to the aircraft remote maintenance port and establish communications with the ANCU.
 - (b) From the 'Main Menu', select the 'Calibration Menu'.
 - (c) From the 'Calibration Menu', select 'Edit Calibration Files Directory'.
 - (d) The MT will now show the 'Edit Calibration Files Directory' screen. The directory will be set to the default. The default is shown with a single dot. The default directory will be the directory where you have stored the MT program files. This should be C:\MT830.
 - (e) Delete the default "." and type the required drive letter (eg. F:\) then press <ENTER>.
 - (f) Press <ESC> twice to return to the Main Menu. Select Exit and press <ENTER>.

23-35-45

MAINTENANCE TERMINAL INTRODUCTION

Page 1-8

Jan 30/17



Maintenance Terminal Manual (ANVS)

This Page Intentionally Left Blank

23-35-45

MAINTENANCE TERMINAL INTRODUCTION

Page 1-9

Jan 30/17



Maintenance Terminal Manual (ANVS)

2. MAINTENANCE TERMINAL FUNCTIONS

The Maintenance Terminal MT830 software contains software to communicate with all type 83(X) range of Controllers. MT830 software also contains AMT (Advanced Maintenance Terminal Software) to communicate with the 81(X) and 82(X) range of Controller types.

When the Maintenance Terminal is switched on the MT830 software will try to establish if you are connected to a type 83(X) Controller or one of the other Controller types.

If you are connected to a type 81(X) or 82(X) Controller using software 8-800-07-030 then the MT830 software will automatically start the AMT software. If you are using software 8-800-07-040 you should use the AMT icon. Information on the use of the AMT software is contained in the Maintenance Terminal Manual 23-35-40.

If you are connected to a type 83(X) Controller then continue as follows:

A. Functions

The Maintenance Terminal (MT) provides the user with test, diagnostic and troubleshooting functions for the Active Noise and Vibration Control system. The different functions provided are described in the following paragraphs.

(1) Set ANCU Configuration

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

(2) Display System Status Data

The MT reads and displays system failure information stored in non-volatile memory in the ANCU.

(3) Automatic Actuator and Sensor Test

The operation of the actuators and sensors installed on the aircraft is tested.

(4) Step Through Actuator Test

The operation of the actuators installed on the aircraft can be stepped through manually by the maintenance personnel.

(5) Manual Actuator Test

The operation of individual actuators installed on the aircraft can be done by the maintenance personnel.

(6) Sensor Test

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

23-35-45

MAINTENANCE TERMINAL FUNCTIONS

Page 2-1

Jan 30 2017



Maintenance Terminal Manual (ANVS)

(7) Calibration

The MT initiates the system calibration function. The ANCU calculates and stores the Calibration Data for the actuator/sensor array installed in the aircraft. For ANVC systems calibration must be performed at different air pressures and Calibration Data stored for each pressure setting.

(8) Read Calibration Data from the ANCU

The MT can read the Calibration Data stored in the ANCU's non-volatile memory and store on a diskette, flashcard or the laptop hard drive.

(9) Write Calibration Data onto the ANCU

The MT writes a data file stored on a diskette or flashcard containing aircraft specific Calibration Data into the ANCU.

(10) Erase Calibration Data on the ANCU

The MT erases the Calibration Data stored in the ANCU's non-volatile memory.

(11) ANCU Built-in-Self-Test

The ANCU will perform a set of Built-in-Self-Tests when requested by the MT and the results will be displayed on the MT screen.

(12) System Information

The MT provides information on the aircraft inputs to the ANCU, the software installed in the ANCU and the number of hours/flights.

(13) Restore Factory Defaults

The MT will erase all calibration data and configuration data from the ANCU. This selection is password protected.

B. Screen Formats

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

- (a) Information panels inform the user on what function is being implemented.
- (b) Data Entry panels require the user to enter information.
- (c) Menu panels identify the selections which the user can make at that stage.
- (d) Result panels display the data received from the System/ANCU at the completion of a test.
- (e) Warning panels inform the user that the operation requested cannot be reversed and provides the option to cancel the operation.
- (f) Error panels inform the user that the requested operation could not be performed.

(2) The footer provides instructions to the user

23-35-45

MAINTENANCE TERMINAL FUNCTIONS

Page 2-2

Jan 30 2017



Maintenance Terminal Manual (ANVS)

3. MAINTENANCE TERMINAL OPERATION WITH TYPE 830, 831, 832 & 833 ANCUs

NOTE: A Type 830 ANCU is one in which the part number has the format 8-830-01-xxx
A Type 831 ANCU is one in which the part number has the format 8-831-01-xxx
A Type 832 ANCU is one in which the part number has the format 8-832-01-xxx
A Type 833 ANCU is one in which the part number has the format 8-833-01-xxx

A. General.

This section details the procedures for using the Maintenance Terminal (MT). (Note: the term MT is used to describe the Maintenance Terminal Software operating on a PC.) The procedures that follow are described:

- [Start a MT Session.](#)
- [Display System Status Data.](#)
- [Actuator and Sensor Tests.](#)
- [Calibration.](#)
- [Read Calibration Data.](#)
- [Write Calibration Data.](#)
- [ANCU Tests.](#)
- [Read System Information.](#)

The screens shown in these procedures are examples. The text detail, for each screen may be slightly different from that shown in this manual.

B. Start a MT Session

- (1) This process is required to be followed each time the MT is connected to the ANCU.
- (2) Switch on the MT Terminal (laptop PC).
- (3) Click the MT830 icon on the desktop.
The 'Welcome Screen' will be shown on the MT display.
- (4) After 5 seconds the MT will show the message:
"Initialising communication with ANCU, Please wait."
- (5) After communications with the ANCU are successfully established the 'Aircraft Type' screen will be shown on the MT display (Ref. Figure 3.10).

23-35-45

MAINTENANCE TERMINAL OPERATION

Page 3-1

Jan 30/17

Maintenance Terminal Manual (ANVS)



Figure 3.10 - 'Aircraft Type' screen.

- (6) Select the aircraft type using the cursor keys and press <ENTER>. The 'Log File Details' screen will be shown on the MT display (Ref. Figure 3.11).



Figure 3.11 - 'Log File Details' screen.

- (7) Enter the Aircraft Serial Number and the User ID (your name) and press <ENTER>.
- (8) The MT will show the log file name in which the maintenance session record will be stored. Press <ENTER> to confirm the data.

NOTE: THE MT WILL AUTOMATICALLY READ THE CONTROLLER SERIAL NUMBER FROM THE ANCU AND WILL SHOW THE CURRENT DATE.

- (9) The MT will show the message:
"Checking Configuration on ANCU. Please Wait....".



Maintenance Terminal Manual (ANVS)

- (10) The 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 MT display (Ref. Figure 3.12).
- (11) If the configuration parameters are not good or not correct for the aircraft type then the MT will load the appropriate configuration parameters into the ANCU. When complete, the MT will reset the ANCU. After the ANCU resets the message:

“Validating Parameters. Please Wait....”

will be shown and the MT will read the configuration parameters back 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 MT display (Ref. Figure 3.12).

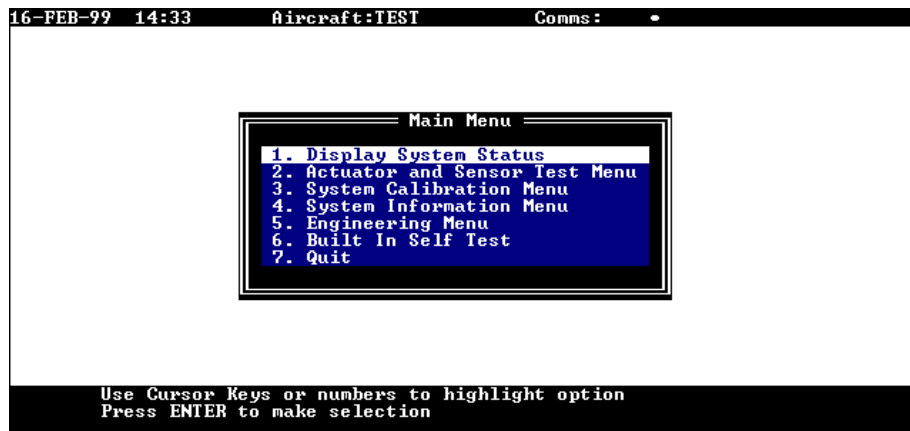


Figure 3.12 - Main Menu Screen.

C. Display System Status Data

- (1) Select 'Display System Status' from the 'Main Menu' and press <ENTER>. The 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 MT display (Ref. Figure 3.13).
- (2) Failed Actuator and Sensor Channel numbers are shown. Disabled actuator or sensor channels are shown with a letter 'D'. Any error codes will also be shown with a description of the fault. Press the F10 key for a suggested course of action.

NOTE: THE SUGGESTED COURSE OF ACTION MUST ONLY BE USED FOR GUIDANCE. REFER TO THE AIRCRAFT MAINTENANCE MANUAL OR COMPONENT MAINTENANCE MANUAL FOR THE CORRECT MAINTENANCE PROCEDURES.

23-35-45

MAINTENANCE TERMINAL OPERATION

Page 3-3

Jan 30/17

Maintenance Terminal Manual (ANVS)

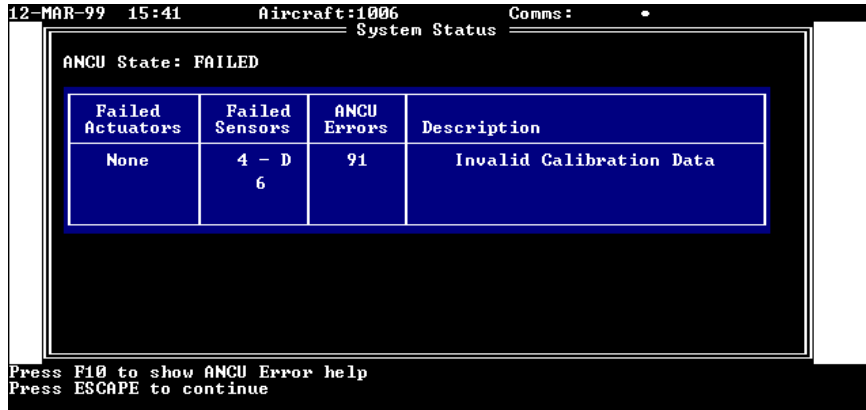


Figure 3.13 – 'System Status' screen.

D. Actuator and Sensor Tests

(1) Actuator and Sensor Test Menu

- (a) Select 'Actuator and Sensor Test Menu' from the 'Main Menu' and press <ENTER>. The 'Actuator and Sensor Test Menu' will be shown on the MT display (Ref. Figure 3.14).

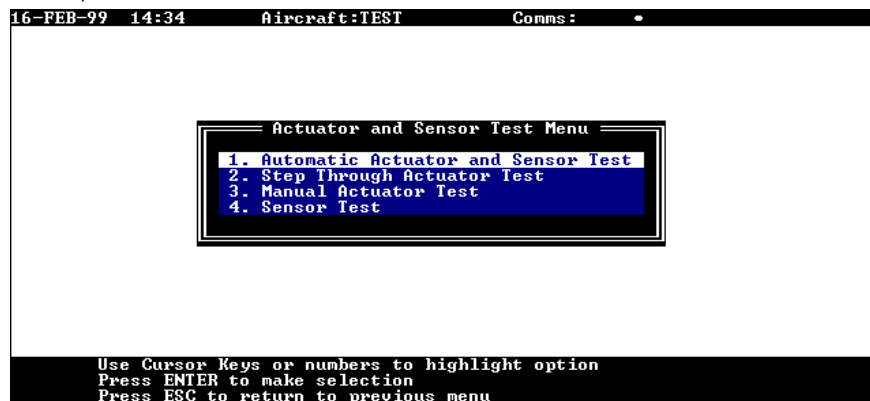


Figure 3.14 – 'Actuator and Sensor Test Menu'.

(2) Automatic Actuator and Sensor Test

- (a) Select 'Automatic Actuator and Sensor Test' and press <ENTER>. The 'Automatic Actuator and Sensor Test' screen will be shown on the MT display (Ref. Figure 3.15).



Maintenance Terminal Manual (ANVS)



Figure 3.15 – ‘Automatic Actuator and Sensor Test’ screen.

- (b) 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.
- (c) The number displayed on the 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.
- (d) On completion of the test the results will be shown on the MT display (Ref. Figure 3.16).

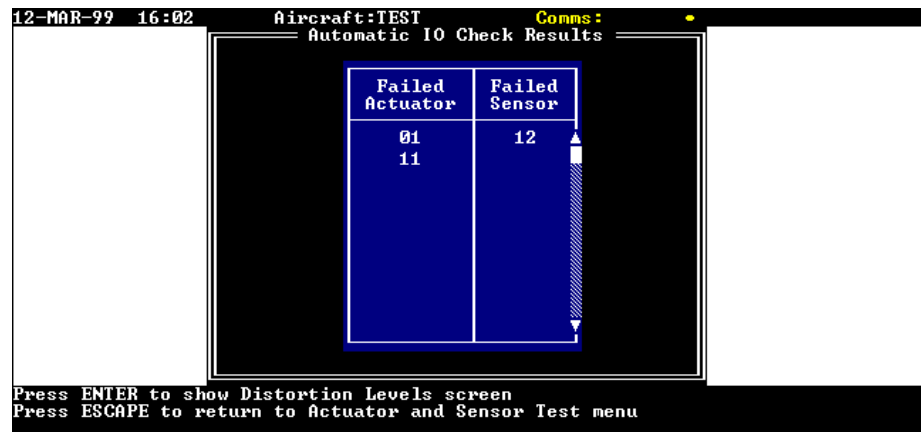


Figure 3.16 – ‘Automatic IO Check Results’ screen.

Maintenance Terminal Manual (ANVS)

- (e) Press <ENTER> to display the 'Distortion Levels' screen (Ref. Figure 3.17).

Actuator	Harmonic	Status	Distortion
01	01	-----	1%
02	02	-----	9%
03	01	-----	1%
04	02	-----	8%
05	01	-----	6%
06	02	-----	1%
07	01	-----	8%
	02	-----	6%
	01	-----	9%
	02	-----	5%
	01	-----	0%
	02	-----	5%

Press ENTER to return to Automatic IO Check results screen
Press ESCAPE to return to Actuator and Sensor Test menu

Figure 3.17 – 'Distortion Levels' screen.

- (f) Press <ENTER> to return to the 'Automatic IO Check Results' screen (Ref. Figure 3.16).
- (g) Press <ESC> to return to the 'Actuator and Sensor Test Menu' (Ref. Figure 3.14).
- (3) Step Through Actuator Test
- (a) From the 'Actuator and Sensor Test Menu' (Ref. Figure 3.14), select 'Step Through Actuator Test' and press <ENTER>. The 'Step Through Actuator Test' screen will be shown on the MT display (Ref. Figure 3.18).

12-MAR-99 16:08 Aircraft:TEST Comms: •

Step Through Actuator Test

Actuator No.: 2

Actuator Position: 258-06S CB01

ENABLE/DISABLE

Actuator Test: Use left and right cursors to select ENABLE/DISABLE then ENTER to confirm: Press ESC to cancel.

Figure 3.18 – 'Step Through Actuator Test' screen.



Maintenance Terminal Manual (ANVS)

- (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 MT keyboard. Press <ENTER> to confirm the selection or to move to the next actuator.
- (c) The number displayed on the 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. The test can be terminated earlier by pressing <ESC>.
- (d) If the selected actuator is currently disabled then the message that follows is shown on the MT display
- (e) "Are you sure you wish to produce a tone through this actuator? YES/NO"
- (f) 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 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 MT will show any manually disabled actuators and sensors on the MT display (Ref. Figure 3.19).

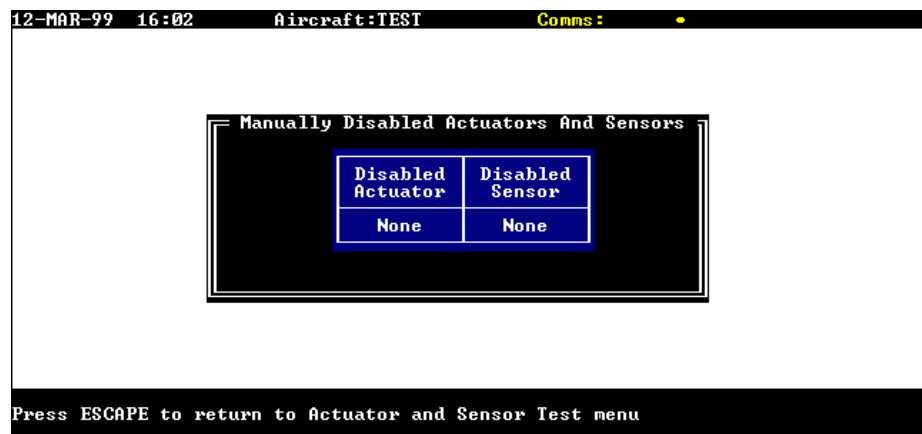


Figure 3.19 – 'Manually Disabled Actuators and Sensors' screen.

Maintenance Terminal Manual (ANVS)

(4) Manual Actuator Test

From the 'Actuator and Sensor Test Menu' (Ref. Figure 3.14), select 'Manual Actuator Test' and press <ENTER>. The 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 on the MT display (Ref. Figure 3.20).



Figure 3.20 – 'Manual Actuator Test' screen.

The ANCU will drive the selected actuator. The operator decides whether to enable or disable the actuator by using either the left/right cursor keys on the MT keyboard. Press <ENTER> to confirm the selection.

The MT will then prompt the operator for the next actuator number. Either enter a new actuator number or press <ESC> to terminate the test.

If the operator enters an actuator number which does not exist on the system under test, the MT will show the message "The actuator number entered is not within the valid range". Press <ESC> and re-enter the actuator number.

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 on the MT display. Select 'YES' if you want to include this actuator in this test. Select 'NO' if you want to omit this actuator and be prompted for another actuator number.

The number displayed on the 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. The test can be terminated by pressing <ESC>.

If any previously disabled actuators are enabled, the 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. If no previously disabled actuators have been enabled, or if <ESC> is pressed, the MT will show any manually disabled actuators and sensors on the MT display (Ref. Figure 3.19).



Maintenance Terminal Manual (ANVS)

(5) Sensor Test

From the 'Actuator and Sensor Test Menu' (Ref. Figure 3.14), select 'Sensor Test' and press <ENTER>. The 'Sensor Test' screen will be shown on the MT display (Ref. Figure 3.21).

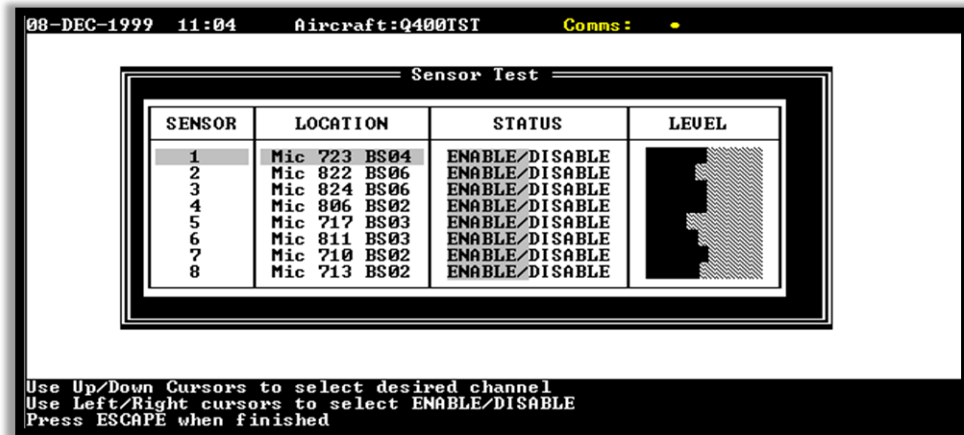


Figure 3.21 – 'Sensor Test' screen.

The ANCU will drive all actuators that are not disabled or failed with a single tone. The MT display will show the input signal to the ANCU from each sensor. The operator decides whether to enable or disable the sensor by using either the left/right cursor keys on the MT keyboard.

The number shown on the MT display corresponds to the sensor number. The sensor location text shows the physical location of the sensor in the aircraft. Press <ESC> to end the test.

If any previously disabled sensors are enabled, the 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 be disabled again.

If no previously disabled sensors have been enabled, or if <ESC> is pressed, the MT will show any manually disabled actuators and sensors on the MT display (Ref. Figure 3.19).



Maintenance Terminal Manual (ANVS)

E. System Calibration, Loudspeaker Systems

(1) System Calibration Menu

Select 'System Calibration Menu' from the 'Main Menu' and press <ENTER>. The 'System Calibration Menu' will be shown on the MT display (Ref. Figure 3.22).

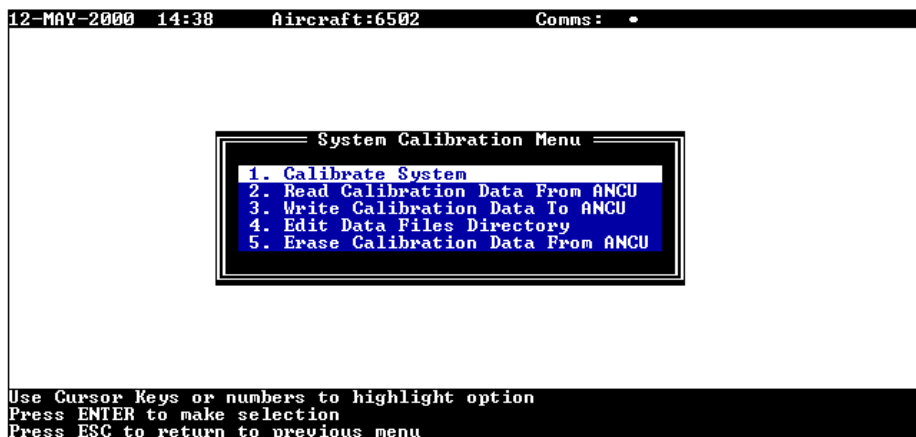


Figure 3.22 – 'System Calibration Menu' screen.

(2) Calibrating Loudspeaker Systems.

Select 'Calibrate System' from the 'System Calibration Menu' and press <ENTER>.

The message that follows will be shown on the MT display (Ref. Figure 3.23):

- (a) Make sure you have no failed or disabled actuator or sensor channels. No calibration data will be gathered for failed or disabled channels.
- (b) The system will fail when disabled or failed channels are repaired and there is no calibration data available for those channels.



Figure 3.23 - Calibration 'Information' screen 1.



Maintenance Terminal Manual (ANVS)

- (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 that follows will be shown on the MT display.(Ref. Figure - 3.24).

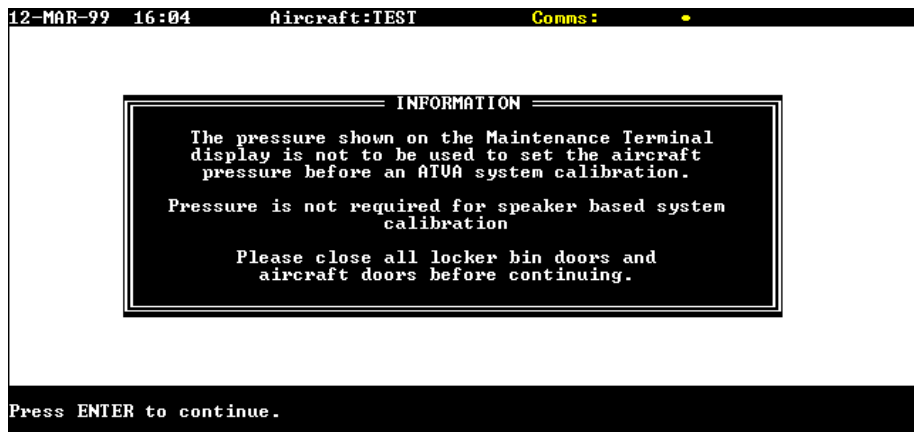


Figure 3.24 - Calibration 'Information' screen 2.

- (d) Press <ENTER> to continue.
- (e) The ANCU will automatically drive all Loudspeakers for periods of 2 to 3 seconds. The 'Performing Calibration' screen will be shown on the MT display (Ref. Figure 3.25).

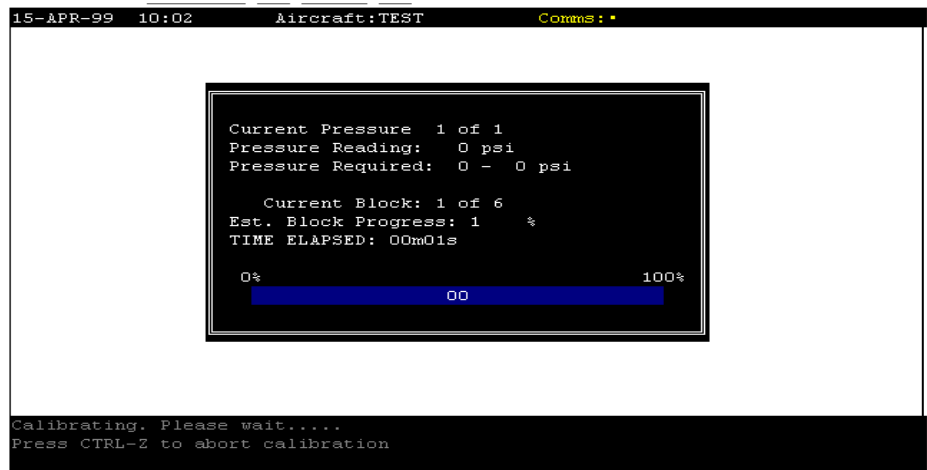


Figure 3.25 – 'Performing Calibration' screen.

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



Maintenance Terminal Manual (ANVS)

- (g) The calibration is completed in blocks of frequencies. The 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) At the completion of the Calibration the MT display will show 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) Press <Enter> to return to the Calibration Menu.
- (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 UPDATEING ITS CALIBRATION DATA. IF YOU DO IT WILL CAUSE DAMAGE TO THE ANCU.

- (l) The controller will then update its calibration data. In some cases this may take a few moments to complete. The MT will display a message indicating that the controller is updating its calibration data. Do not switch power off during this process.
 - (m) Press <Enter> to return to the Main Menu.
- (3) Read Calibration Data from Loudspeaker Systems
- (a) Select 'Read Calibration Data from ANCU' from the 'System Calibration Menu' and press <ENTER>. The message:
“Reading Calibration Data from ANCU.”
will be shown on the MT display.
 - (b) At completion the message:
“Calibration Data Read Complete”
will be shown on the MT display. Press <ESC> or wait 5 seconds to return to the 'System Calibration Menu'.
 - (c) The Calibration files will have the same name as the aircraft serial number you entered during the start of the MT session. The calibration files will be stored in a directory as specified in 'Edit Data Files Directory' menu selection.
- (4) Write Calibration Data onto Loudspeaker Systems
- (a) Select 'Write Calibration Data to ANCU' from the 'System Calibration Menu' and press <ENTER>. The message:
“Loading Calibration Data onto ANCU.”
will be shown on the MT display.

23-35-45

MAINTENANCE TERMINAL OPERATION

Page 3-12

Jan 30/17



Maintenance Terminal Manual (ANVS)

- (b) The ANCU will search for Calibration files with the same name as the aircraft serial number you enter during the start of the MT session. The ANCU will only search the directory as specified in 'Edit Data Files Directory' menu selection.

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.

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

- (d) On completion the message:

“Calibration Data Load Complete”

will be shown on the MT display. Press <ESC> or wait 5 seconds to return to the 'System Calibration Menu'.

- (5) Edit Data Files Directory

- (a) Select 'Edit Data Files Directory' from the 'System Calibration Menu'.
- (b) Type in the full path name of a directory where you want to store the calibration data. If the directory does not exist then the MT will create it. The name must be less than 8 characters and must consist of alpha-numeric characters.
- (c) Press <ENTER> to confirm the directory name or <ESC> to cancel the entry. The MT will return to the 'System Calibration Menu'.

F. System Calibration, ATVA Systems.

- (1) System Calibration Menu

- (a) Select 'System Calibration Menu' from the 'Main Menu' and press <ENTER>. The 'System Calibration Menu' will be shown on the MT display (Ref. Figure 3.26).

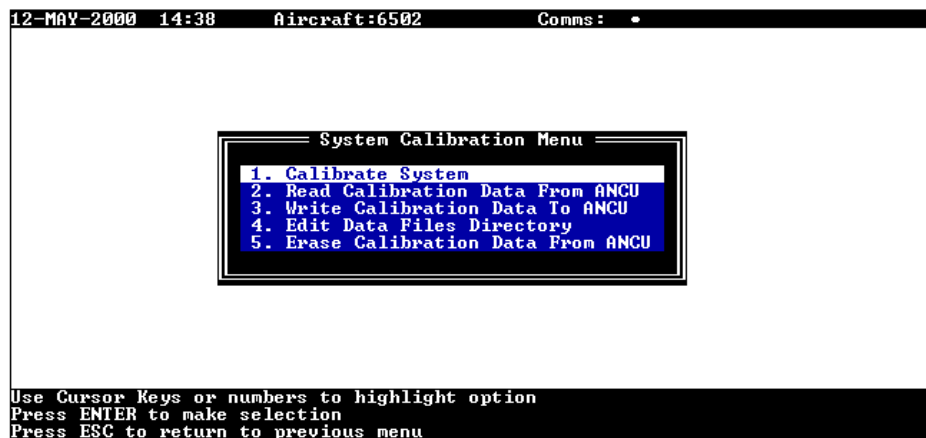


Figure 3.26 – 'System Calibration Menu'

Maintenance Terminal Manual (ANVS)

(2) Calibrating ATVA Systems

- (a) Select 'Calibrate System' from the 'System Calibration Menu' and press <ENTER>.
- (b) The 'Information' screen that follows will be shown on the MT display (Ref. Figure 3.23). 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.

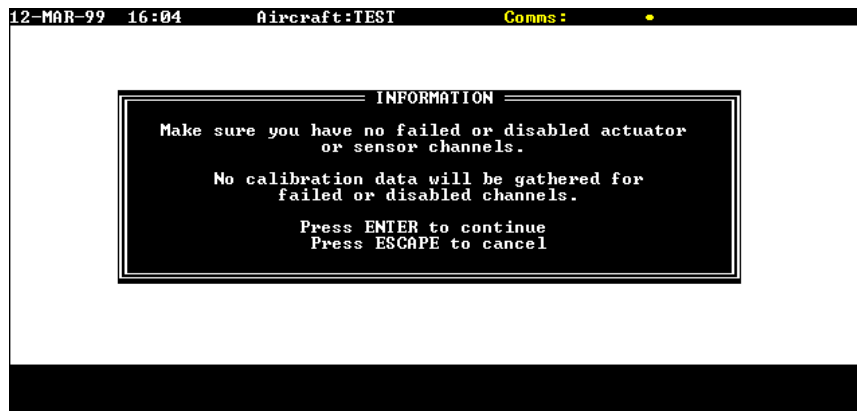


Figure 3.23 - Calibration 'Information' screen 1

- (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.
- (e) The 'Information' screen that follows will be shown on the MT display (Ref. Figure - 3.24).

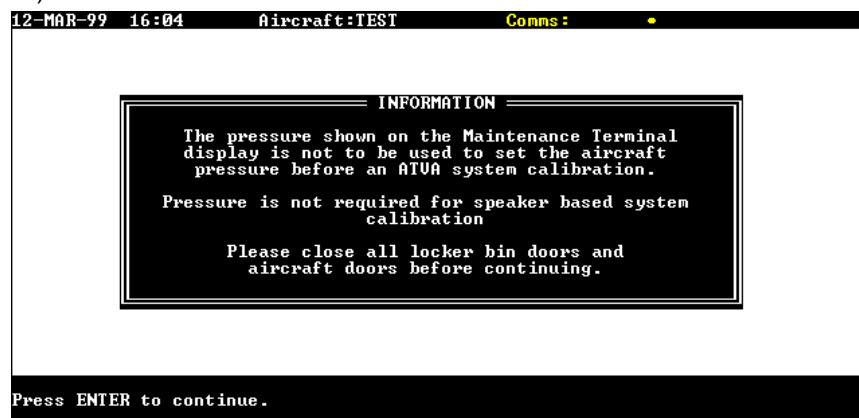


Figure 3.24 - Calibration 'Information' screen 2.



Maintenance Terminal Manual (ANVS)

Press <ENTER> to continue.

- (a) The ANCU will automatically drive all Actuators in turn for periods of 2 to 3 seconds. The 'Performing Calibration' screen will be shown on the MT display (Ref. Figure 3.25).

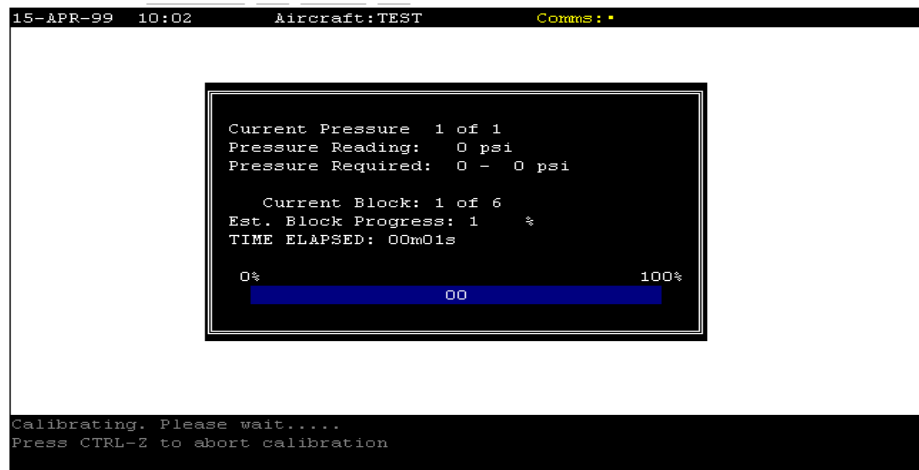


Figure 3.25 – 'Performing Calibration' screen.

- (b) The calibration is completed in blocks of frequencies. The 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.
- (c) At the completion of the Calibration the MT display will show any actuators or sensors that the system had failed during the calibration.
- (d) Failed actuators and sensors must be repaired and the calibration repeated.
- (e) 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.**
- (f) The ANCU will then update its calibration data. In some cases this may take a few moments to complete, and the MT will display a message indicating that the ANCU is updating its calibration data.
- (g) Press <Enter> to return to the 'Main Menu'.

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



Maintenance Terminal Manual (ANVS)

- (3) Read Calibration Data from ATVA Systems
 - (a) Select 'Read Calibration Data from ANCU' from the 'System Calibration Menu' and press <ENTER>. The Pressure Band Select screen will be shown.
 - (b) Use the cursor keys to move the pointer to the required pressure band and press <SPACE> to select required pressure or press <A> to select all pressure bands and then press <ENTER>. The message:
“Reading Calibration Data from ANCU.”
will be shown on the MT display.
 - (c) At completion the message:
“Calibration Data Read Complete”
will be shown on the MT display. Press <ESC> or wait 5 seconds to return to the 'System Calibration Menu'.
 - (d) The Calibration files will have the same name as the aircraft serial number you entered during the start of the MT session. The calibration files will be stored in a directory as specified in 'Edit Data Files Directory' menu selection.
- (4) Write Calibration Data onto ATVA Systems
 - (a) Select 'Write Calibration Data to ANCU' from the 'System Calibration Menu' and press <ENTER>.
 - (b) The Pressure Band Select screen will be shown. Use the cursor keys to move the pointer to the required pressure band and press <SPACE> to select the required pressure or press <A> to select all pressure bands and then press <ENTER>. The message:
“Loading Calibration Data onto ANCU.”
will be shown on the MT display.
 - (c) At completion the ANCU will reboot and update its calibration data. In some cases this may take a few moments to complete, and the MT will display a message indicating that the controller is updating its calibration.
 - (d) The ANCU will search for Calibration files with the same name as the aircraft serial number you enter during the start of the MT session. The ANCU will only search the directory as specified in 'Edit Data Files Directory' menu selection.
 - (e) At completion the message:
“Calibration Data Load Complete”
will be shown on the MT display. Press <ESC> or wait 5 seconds to return to the 'System Calibration Menu'.



Maintenance Terminal Manual (ANVS)

- (5) Edit Data Files Directory
 - (a) Select 'Edit Data Files Directory' from the 'System Calibration Menu'.
 - (b) Type in the full path name of a directory where you want to store the calibration data. If the directory does not exist then the MT will create it. The name must be less than 8 characters and must consist of alpha-numeric characters.
 - (c) Press <ENTER> to confirm the directory name or <ESC> to cancel the entry. The MT will return to the 'System Calibration Menu'.
- (6) Erase Calibration Data
 - (a) Select 'Erase Calibration Data from ANCU' from the 'System Calibration Menu' and press <ENTER>. The 'Erase Calibration Data' screen will be shown on the MT display (Ref. Figure 3.26).
 - (b) If you want to restore the factory default settings then use the left and right arrow keys to make the 'proceed' selection. Press <ENTER> to confirm this selection. The MT will erase any previously stored Calibration Data from the ANCU.

G. System Information

- (1) System Information Menu
 - (a) From the 'Main Menu' select 'System Information Menu' and press <ENTER>. The 'System Information Menu' will be shown on the MT display (Ref. Figure 3.26).

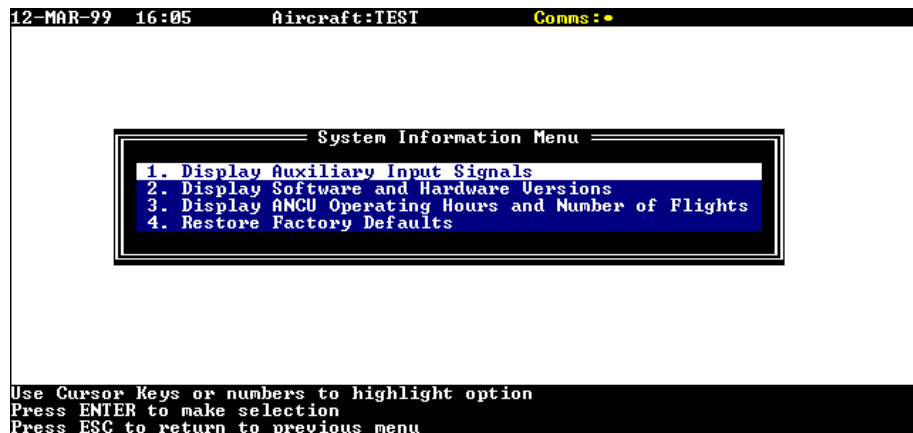


Figure 3.26 – 'System Information Menu' screen.

Maintenance Terminal Manual (ANVS)

- (2) Display Auxiliary Input Signals Screen
 - (a) Select 'Display Auxiliary Input Signals' from the 'System Information Menu' and press <ENTER>. The 'Auxiliary Input Signals' screen will be shown on the MT display (Ref. Figure 3.27).

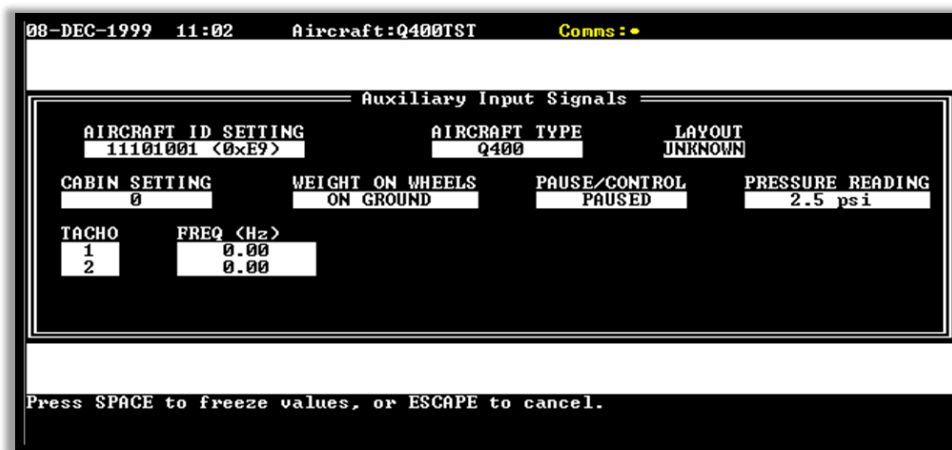


Figure 3.27 - Auxiliary Input Signals Screen



Maintenance Terminal Manual (ANVS)

- (b) The information displayed on the screen is:

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 entered at start-up
Layout	Taken from configuration parameters being used.
Weight on Wheels	From the Weight on Wheels input from the aircraft wiring harness J1 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 aircraft J1 connector as part of its Built in Self Test. If any of these signals fail the built in test, use the 'System Diagnostics' screen to view 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'.

(3) Display Software and Hardware Version Numbers

- (a) Select 'Display Software and Hardware Version Numbers' from the 'System Information Menu' and press <ENTER>. The 'Display Software and Hardware Version Numbers' screen will show details of the software and hardware installed in the ANCU (Ref. Figure 3.28).

Maintenance Terminal Manual (ANVS)

Software and Hardware Version Numbers	
Description	Part Number and Version
MT Software Part Number	SW-830-09-009
MT Software Version	1
ANCU Software	SW-832-80-001-02
ANCU Hardware	8-832-01-001
ANCU Modstrike	00
Database Part Number	SW-021-99-014
Database Version	01

Use Cursor keys to scroll through table
Press ESCAPE to continue

Figure 3.28 - Software and Hardware Version Numbers Screen

- (b) Press <ESC> to return to the 'System Information Menu'.
- (4) Display ANCU Operating Hours and Number of Flights
 - (a) Select 'Display ANCU Unit Operating Hours and number of Flights' from the 'System Information Menu' and press <ENTER>. The Display Control Unit Operating Hours and Flights screen will show information on the System Lifetime and the Total Flights (Ref. Figure 3.29).

Operating Hours and Flights	
Power On Time:	23.3 Hours
Number Of Flights:	1

Press ESCAPE to continue

Figure 3.29 - Operating Hours and Number of Flights Screen

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



Maintenance Terminal Manual (ANVS)

- (5) Restore Factory Defaults
 - (a) Select 'Restore Factory Defaults' from the 'System Information Menu' and press <ENTER>. The 'Restore Factory Defaults' screen will be shown on the MT display (Ref. Figure 3.30).
 - (b) If you want to restore the factory default settings then use the left and right arrow keys to make the 'proceed' selection. Press <ENTER> to confirm this selection. The MT will erase any previously stored Calibration Data and Configuration Parameters from the ANCU, this option is password protected.

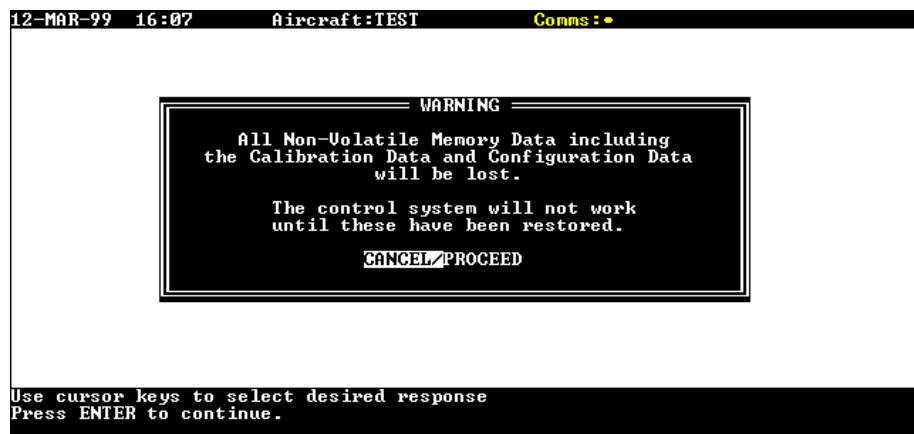


Figure 3.30 - Restore Factory Defaults Screen

H. Engineering Menu

- (1) The Engineering Menu is for use by Ultra Electronics Service Engineers only. This option is password protected.

I. Built In Self Test

- (1) From the 'Main Menu' select 'Built In Self Test'. The message:
“Performing Built In Self Tests”
will be shown on the MT display.
- (2) If the ANCU does not pass the Built In Self Test the test is stopped at the point the fail occurred. The message:
"Built In Self Test Failed"
will be shown on the MT display. Press <ENTER> to show the 'Built In Self Test results' screen on the MT display (Ref. Figure 3.31).
- (3) The statement “unchecked” in the results column means that this test was not completed before the Built In Self Test failed.
- (4) "Fail" means that this item has failed the Built In Self Test.

23-35-45

MAINTENANCE TERMINAL OPERATION

Page 3-21

Jan 30/17



Maintenance Terminal Manual (ANVS)

- (5) If the ANCU passes the Built In Self Test, the 'Built In Self Test Results' screen will be shown on the MT display (Ref. Figure 3.31). All sections of the Built In Self Test should show 'pass'.
- (6) Press <ESC> to return to the 'Main Menu' (Ref. Figure 3.12).



Figure 3.31 – 'Built In Self Test' results screen

J. Exit the Maintenance Terminal Session

- (1) To exit the MT, select 'Quit' from the 'Main Menu'. The message:
'Exiting Maintenance Program. Log File Name C:\MT830\XXXX\YYYYYYYYYY.log'
will be shown on the MT display.
- (2) C:\MT830 is the directory where the MT830 program files are stored.

NOTE: The default directory for storing Log Files can be changed as required. See page 1-7, para. 4. G.

- (3) XXXX is a sub directory created with the same name as the aircraft serial number entered at the 'Log File Details' screen (Ref. Figure 3.11).
- (4) YYYYYYYY.log is the name given to the log file created for the Maintenance Session you have just completed. A Log File is a text file record of the communications between the MT and the ANCU for the maintenance session.