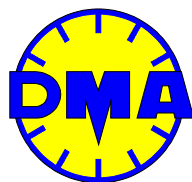


# **MPS43B AIR DATA TEST SET**

## **OPERATING MANUAL**



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## SECTION 1 PRELIMINARY

This manual contains the operating procedures for the MPS43B air data test set and is suitable for both workshop and flight-line servicing.

### 1.1 SAFETY

The MPS43B is designed to be safe when operated in the manner described in this manual, it should be used only in the described way and for no other purposes. The manual contains Safety Instructions that must be followed, the instructions are either warnings or cautions given to protect the Operator and the equipment from damage.

Use trained technicians and good engineering practices for all the procedures in this manual.

### 1.2 WARNING

Potentially explosive atmospheres may occur during aircraft refuelling. This equipment is **not** certified for use within potentially explosive atmospheres. An appropriate risk assessment should be performed when this equipment is to be used on aircraft with particular attention being given to the dangers arising from re-fuelling operations. Within the EU, organisations operating equipment where potentially explosive atmospheres may occur are required to conform to the ATEX 137 Worker Protection Directive, EU 99/92/EC. Contact DMA for details of the ATEX certification standards applicable to the MPS range of products.

### 1.3 PRESSURE

Never apply pressure greater than the maximum safe working pressure to the equipment.

### 1.4 TOXIC MATERIALS

There are no known toxic materials used in the manufacture or build standard of this MPS43B. An internal rechargeable totally sealed battery is housed within the instrument.

### 1.5 MAINTENANCE AND REPAIR

The MPS43B is to be maintained and repaired using the approved procedures and be carried out only by DMA authorized agencies or the manufacturer.

### 1.6 INFORMATION AND ADVICE

Contact the manufacturer, subsidiary or agent for further detailed technical advice.

### 1.7 NOTE

### 1.8 IMPORTANT NOTES

This Manual is applicable starting from SW Version 3.06.

- The manual vent valves on the front panel must be closed before the start of testing.
- Connect the ADTS to the static and pitot ports only after the start up procedure is completed.

- For optimum operation and highest precision, the MPS43B should be operated with the front panel face up.
- When transporting the MPS43B in an unpressurized aircraft, utilize the case VENT /SEAL valve (if present) to prevent damage by equalizing the internal – external pressure.
- It is recommended to mount the MPS43B at a height of 1 meter above floor level where fuel vapor could be present, for example during re-fueling operations.
- The total volume of the pneumatic circuit of the MPS43B is small. When no pneumatic load is connected to the ADTS, thermal effects could result in apparent leaks. The final inspection and calibration procedures indicate rate values and stabilization times that must be followed in order to compensate for thermal effects.

## 1.9 GETTING STARTED

Prior to using the MPS43B the following points should be considered.

### 1.9.1 INTERNAL BATTERY

The internal battery can be removed from the bottom side of the unit. It is not strictly required for operating the MPS43B. However it also serves as an emergency back up system, to safely return the instrument and aircraft system to ground conditions in the event of an external power failure during testing.

### 1.9.2 BATTERY CHARGING

The internal Battery has an operational life of 1 hour when fully charged. On receipt of the MPS43B the internal battery will require charging. Due to internal monitoring circuits, the battery will slowly discharge when not in use. The battery is recharged whenever the MPS43B is connected to an AC power supply.

The time needed to fully recharge the battery when connected to the AC supply is 1.5 to 2 hours.

The battery should never over-discharge. When the MPS43B is not being used for long periods of time, it is suggested to recharge the battery at least once every 2 months.

The MPS43B can be powered from an external DC supply. The DMA-Aero part EPU6E will provide suitable power and give a DC operating life for the MPS43B of 6 hours.

### 1.9.3 INTERNAL LEAK TEST

When carrying out a preliminary Leak Test of the MPS43B, in order to establish the correct operation, it is very important to follow the altitude and airspeed rates that are indicated in the MPS43B Calibration and Adjustment manual. Higher rate values could cause thermal effects that would be detected as leaks. If it is not possible to control the indicated rates, then the stabilization times must be longer, for example 30 minutes.

### 1.9.4 DMA ADAPTOR KIT USE

Certain DMA pitot static adapter kits require an external vacuum source, to keep the static adapters fixed to the aircraft fuselage by means of vacuum cups. The MPS43B provides a vacuum port on the front panel.

### 1.9.5 STATIC & PITOT PORTS SEALS

Do not use any tools to tight the MPS43B pneumatics ports. Only finger tight fastening is required due to the O ring seal incorporated into the AN fitting. For the replacement of the

seals after a long period of use, use O-Ring series 2015, 2018 and 2031.

### 1.9.6 AUTOMATIC STABILIZATION MODE

When the MPS43B is close to the target values of altitude and airspeed, it will automatically switch to “Stabilization mode”. In stabilization mode, the control system is deactivated after a timeout, to save battery and pump life. The control system is immediately re-activated if the values change outside the defined tolerances.

For information about setting the timeout and the tolerance values, please refer to the Calibration and Adjustment manual.

### 1.9.7 VACUUM AND OVERPRESSURE GENERATION

The MPS43B generates vacuum and pressure for controlling the Static and Pitot lines. Vacuum is generated inside an internal reservoir. The pumps only run when needed, in order to save power and ensure a longer operational life.

### 1.9.8 28V DC SUPPLY

The MPS43B can be powered from a 28V DC power supply.

**Use only cables marked “CBL110929GPA” for powering the MPS43B from a 28V DC supply! Other cables could damage the instrument.**

### 1.9.9 FIELD ALTITUDE

The pressure control system of the MPS43B needs to know the altitude at which the unit is operated.

**If the field altitude (“QFE” parameter) is not set correctly, the MPS43B may not be able to control altitude values below the ambient pressure.**

To set the correct field elevation value, follow the instructions given in the Calibration and Adjustments Manual.

## SECTION 2 GENERAL INFORMATION

The DMA MPS43B is a compact, lightweight, automatically controlled low cost Air Data Test solution for troubleshooting and certification of aircraft pitot-static systems with RVSM accuracy requirements. It provides facilities for the simulation of altitude and airspeed. All rate values are also controlled.

The MPS43B instrument is simple and fast to use. The operator interface is easy to understand by both experts and first time users. All testing and troubleshooting with the MPS43B is carried out via the touch-screen and an intuitively arranged color-coded keyboard on the front panel (FIG 3).

The values of pressure, altitude, airspeed and associated rates are shown on the color graphical LCD display. Commanded and measured test values are simultaneously displayed at all times.

The MPS43B is also compatible with the DMA MPSRC remote control (FIG 4), that provides the same operating interface.

The MPS43B is designed to reject any commanded values which exceed pre-programmed limits. Limiting values are password protected.

Test profiles can be programmed and automatically executed by the MPS43B.

The Unit Under Test (UUT) is safely isolated in the event of any power loss.

The MPS43B incorporates two internal pump units for pressure and vacuum supplies. The pumps only run when required, to save power and ensure a longer operating life.



**FIG 1 MPS43B – EASE OF TRANSPORTATION**

### 2.1 MAIN PARTS

The MPS43B main parts are:

- Power supply.
- Static and Pitot lines pneumatic components.
- Electronic circuits including a microprocessor based system necessary to measure and control pressures
- Internal battery.
- High Performance Piezoresistive Pressure sensors.
- Compressor – vacuum membrane type pump units.



- Keyboard and Color Touch-Screen Display.

The front panel (FIG 2) provides operating controls and displays, pressure fittings and connectors for external control.

The equipment is packaged within a lightweight HDPE (high density polyethylene) case.

## 2.2 MAIN TECHNICAL SPECIFICATION

### 2.2.1 FUNCTION

- Generation of pressure and vacuum sources using the internal pumps.
- Generation of static (absolute) pressure or altitude
- Generation of total (absolute) pressure or dynamic (differential) pressure or airspeed.
- Simultaneous generation of altitude and airspeed.
- Generation of altitude rate (climb or dive ) (feet/min)
- Generation of airspeed rate (increasing or decreasing ) (knots/min)
- Generation of static (Ps) pressure rate (climb or dive) (hPa/min)
- Generation of dynamic (Qc) pressure rate (increasing or decreasing) (hPa/min)
- Generation of Mach number
- Generation of Engine Pressure Ratio (E.P.R.) as Pt / Ps ratio.
- Leakage test.
- Automatic Vent to ambient pressure.
- Maximum LIMIT set values: the ADTS allows the simple setting of maximum values (limits) to which the unit can operate. It is supplied at the time of delivery with the following default values set by the manufacturer:
  - Max altitude: 50,000 feet.
  - Min. altitude: -2,000 feet.
  - Max. airspeed: 450 knots.
  - Max vertical speed: 6,000 feet/min.
  - Set airspeed rate: 300 kt/min.
  - Max. Mach number: 1.
- Low battery mode, allowing only pressure measurement and return to ambient pressure.
- Automatic safety protection avoids negative Qc values (Ps < Pt) in airspeed and Qc control modes.

### 2.2.2 RANGE, ACCURACY

#### Altitude

- Range: from -2,000 to 55,000 feet.
- Resolution: 1 foot
- Accuracy:
 

± 3 feet	@ sea level;
± 7 feet	@ 30,000 feet;
± 18 feet	@ 50,000 feet.

**Vertical speed:**

- Range: from 0 to 6,000 feet/min.  
The maximum value depends on the volume of the pneumatic load.
- Resolution: 5 feet/min below 1,500 feet/min.
- Accuracy:  $\pm 1\%$  of reading.

**Airspeed:**

- Range: from 0 to 550 knots.
- Resolution:
  - standard:       1 knot       below 50 knots;  
                  0.1 knots     above 50 knots;
  - Ultra-Low Speed:   1 knot       below 20 knots;  
                          0.1 knots     above 20 knots.
- Accuracy:    $\pm 0.8$  knots   @ 50 knots;  
                  $\pm 0.1$  knots   above 500 knots.

**Airspeed rate:**

- Range: from 0 to 500 knots/min.  
The maximum value depends on the volume of the pneumatic load.
- Resolution: 10 knots/min.
- Accuracy:  $\pm 10$  knots/min  $\pm 1\%$  of reading.

**Mach number:**

- Range: from 0 to 1.5 (limited by airspeed range).
- Resolution: 0.001.
- Accuracy: better than  $\pm 0.002$  @ sea level.

**2.2.3 POWER**

90 to 240 VAC and 50 to 400 Hz.

28V DC with cable "CBL110929GPA".

Internal backup battery. Battery life: approx. 60 minutes.

Maximum current output from the Encoding Altimeter connector (option B7):

- 24V line (pins 1, 2): 300 mA;
- 5V line (pin 5): 500 mA.

**2.2.4 PRESSURE MEDIA**

Air

**2.2.5 MEASURE UNITS**

The operator can change the default units as required. In addition, if so required, DMA can deliver the ADTS with different default units.

- Default Units are: feet, knots, hPa.
- The following additional aeronautical and pressure units are available by pressing the appropriate key:

- for Altitude: meter and hectometer,
- for Pressure: inHg, mmHg, Pa, kPa, inH<sub>2</sub>O, p.s.i., bar,
- for Airspeed: mph and km/h.

### 2.2.6 PHYSICAL SPECIFICATIONS

- The MPS43B is lightweight and dimensionally small enabling it to be carried easily for use in the aircraft cockpit.
- Weight: 10 lbs, (4,5 kg)
- Dimensions: L 11.80", x W 9.80", x H 4.70" (30.0 cm x 24.9 cm x 11.90 cm.)

### 2.2.7 ENVIRONMENT LIMITS

- The ADTS can safely be operated in an ambient temperature ranging from -5°C up to 50°C.
- CE compliant

### 2.2.8 CALIBRATION

The MPS43B can be calibrated in-house, if desired: calibration is performed by software adjustment only, and the parameters are password protected for security. No mechanical adjustments are required to calibrate the MPS43B.

Using a transfer calibration standard (for example the DMA's own PAMB11H), the MPS43B can be calibrated in typically less than 40 minutes. Please refer to the MPS43B Calibration and Adjustment Manual for more information.

### 2.2.9 START-UP TIME

The MPS43B goes through an automatic self-test at each power-on.

The equipment is ready for operation about 60 seconds after power-on.

### 2.2.10 CONTROL CAPABILITY WITH INTERNAL PUMPS

The control capability is optimized to allow allow up to 6,000 feet/min at 50,000 feet with the following loads:

- Static line: 125 cu. in. (2 liters).
- Pitot line: 80 cu. in. (1.3 liters).

### 2.2.11 PROTECTION

The MPS43B comes equipped with built-in protection to safeguard the test set itself and the instruments under test, ensuring there will be no more damaged instruments or air data test set as so often occurred on older equipment.

The hardware is intrinsically safe:

- control valves are normally closed when not powered;
- manual vent valves never allow  $P_t < P_s$ ;

The software also incorporates the following safety functions:

- user-defined limits for all controlled values and rates;
- protection against  $P_t < P_s$ ;
- protection against excessive leaks in MEASURE mode.

In case of AC power loss, the MPS43B automatically switches to battery operation.

If the battery is flat or not available, the static and pitot lines remain sealed.

When power is restored, the MPS43B senses the current pressure values and begins controlling again.

In case of emergency, the manual venting valves enable the Operator to safely bring all lines back to ambient pressure.

### 2.2.12 EXTERNAL SUPPLY PORTS

The MPS43B vacuum source is connected to a pneumatic port on the front panel. The port supports the use of DMA adaptor kits with suction cups.

### 2.2.13 ADDITIONAL CONNECTIONS

The MPS43B comes equipped with an RS232 port, that enables communication with an external PC for remote control. Refer to SECTION 12 for more information. The MPSRC also connects to the RS232 port.

An optional Encoding Altimeter connector enables the MPS43B to receive gray code input.

An optional Bluetooth interface allows wireless remote control.



**FIG 2 MPS43B FRONT PANEL**

- |                                 |  |
|---------------------------------|--|
| 1 Electrical ground connector   | 8 Keyboard                               |
| 2 External power socket         | 9 Display                                |
| 3 Main switch                   | 10 Pitot line output                     |
| 4 Fuse                          | 11 Static line output                    |
| 5 Pitot line manual vent valve  | 12 Vacuum port                           |
| 6 Cross-bleed manual vent valve | 13 Encoding altimeter connector (option) |
| 7 Bluetooth antenna (option)    | 14 Remote control connector              |

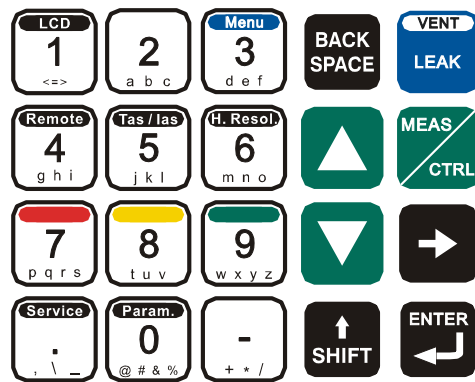


FIG 3 KEYBOARD LAYOUT



FIG 4 MPSRC REMOTE CONTROL

## SECTION 3 CONTROL KEYS AND TOUCH SCREEN

Control and data entry of the MPS43B is via the touch screen and the 20-element keypad on the front panel (FIG 3).

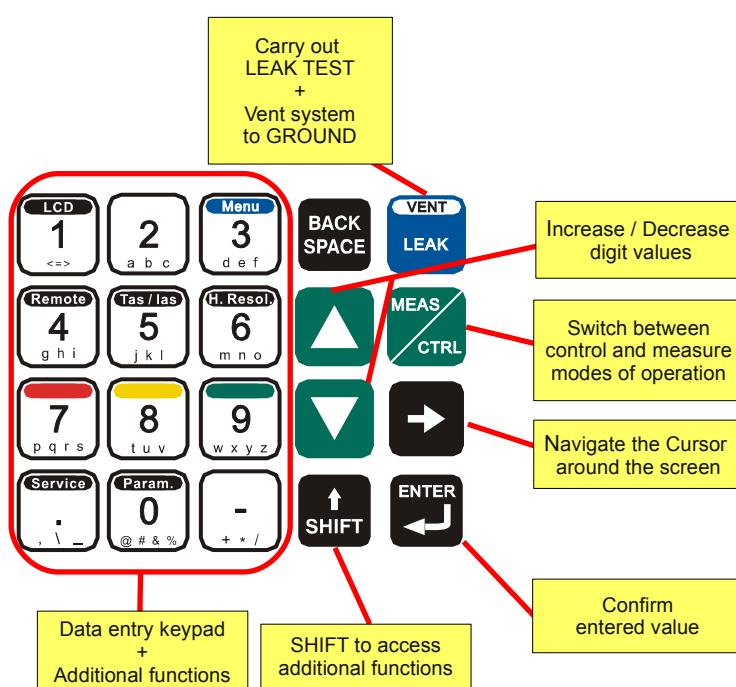
The color graphical LCD display features a dot matrix of 320x240 pixels.

The MPSRC remote control (FIG 4) provides a wider keyboard layout (24 keys), and a color graphical LCD touch-screen display, also featuring a dot matrix of 320x240 pixels.

Four rows of keys provide access to all of the MPS43B's control and operational functions.

Keys are color coded for ease of use. A telephone format 0 to 9 keypad is included for entry of target values.

All functions can be accessed using the keypad. The touch screen only provides faster access to some functions, depending on the current display mode.



### FIG 5 KEYBOARD EXPLANATION

#### Rightmost – operation keys:

**SHIFT:** has the same function as a shift key on a computer keyboard. It is used together with other keys to command alternative key functions (e.g. **SHIFT** followed by **3** to activate the “Main Menu”).

A summary of **SHIFT** key operations is shown in SECTION 13. Please note that the **SHIFT** key must be pressed **before** other keys, and not at the same time. A small arrow appears in the lower-left corner of the display while the **SHIFT** key is active.

As a special function, if the **SHIFT** key is pressed for at least two seconds, it toggles the display of the battery level.

**BACKSPACE:** is used to delete the last entered digit for correcting mistakes.

**MEAS / CTRL:** the “**MEASUREMENT / CONTROL**” key is used to switch between the “Measure” and “Control” mode of operation. In Measure mode, the pressure control system is turned off, leaving only the pressure measuring system active. This function is used to

achieve extra accuracy for measuring pressures statically to avoid any controller induced effects.

**LEAK**: is used to automatically perform a leak test using the built in timer/stopwatch function of the MPS43B. The **MEAS / CTRL** key is used to restore the test set to the Measure mode of operation, after the **LEAK** key function is completed.

**VENT** (activated by pressing **SHIFT** then **LEAK** in sequence) is used to vent the pressure in the static and pitot lines to ambient pressure. This function allows for the safe disconnection of test lines from the aircraft / UUT at the end of testing. The **MEAS / CTRL** key is used to restore the MPS43B to the Control mode, after the vent function has been activated.

The UP ( DOWN ) triangle keys **▲** (or **▼**) are used:

- to increase (decrease) the different parameters (ALTITUDE, AIRSPEED, RATE OF CHANGE, PRESSURES) by a selected value;
- to navigate inside the menus;
- in the Display Screen, to adjust the display brightness (refer to paragraph 10.2).

**NOTE** **MEAS / CTRL** is the most frequently used key in the general operation of the MPS43B

The **→** key is used to navigate around the display in the Status and Leak screens, and inside the menus. This key is used to move the selection to the desired input zone for entry of a specific value using the numerical keypad.

The **ENTER** key is used to input desired data the MPS43B. The operation is the same as an “Enter” key on a computer keyboard.

### Numerical keypad

This keypad is a standard telephone layout ten-number keypad. The numerical keys (0–9) are used to enter any desired value of the various controlled parameters. After keying in number value, the **ENTER** key is always required to enter, confirm, the completed value into the system.

**NOTE** For some optional operations, number keys may be used in combination with the **SHIFT** key, to access additional functions.

The decimal point key (.) is used to input decimal points when required (e.g. airspeed).

The minus key (–) is used to set negative altitudes (e.g. when static pressure is higher than the ambient).

### Entering text using the numerical keypad

The numerical keypad is also used to enter text data. Each key can be used to enter the letters and symbols that are printed on the key itself. Press the key repeatedly to cycle through all its symbols.

An empty space can be entered by pressing once the key '1'.

## SECTION 4 CONTROLLED UNITS, OPERATIONAL MODES, MENUS AND SCREENS

The MPS43B has multiple operational modes, menus and screens.

- Modes are defined by the operating characteristics that are relevant during operation in the specific mode.
- Screens refer to data that is shown on the LCD display. Some screens may be read only, not allowing parameters to be entered or changed.
- Menus are screens that contain a list of parameters and allow their values to change.

### 4.1 CONTROLLING AERONAUTICAL OR PRESSURE UNITS

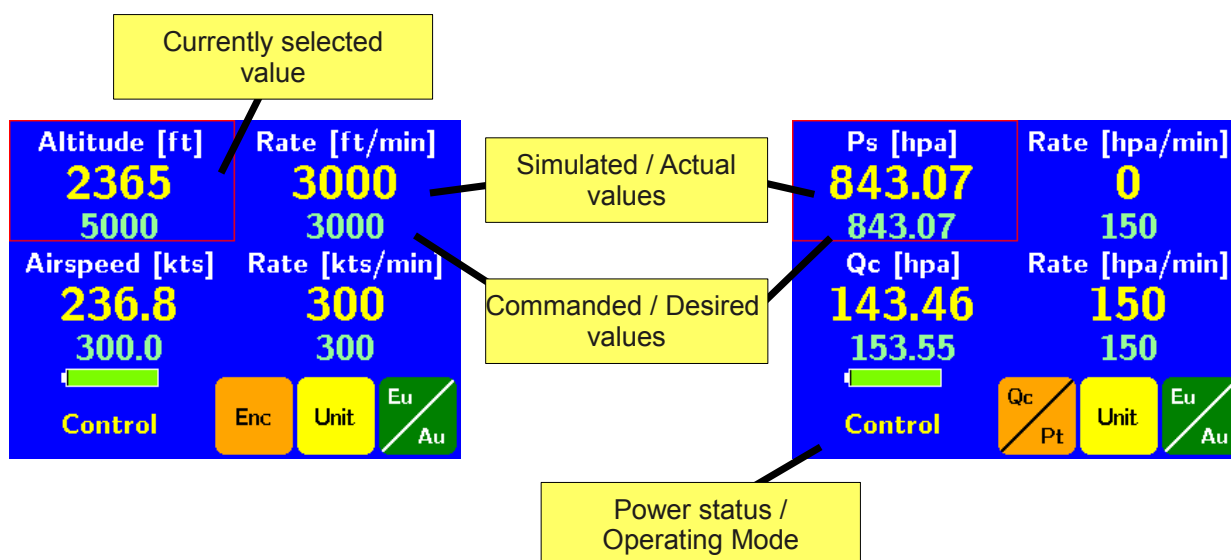
The MPS43B can display and control either **Aeronautical Units (Au)** (altitude and airspeed) or **Engineering Units (Eu)** pressures (static and dynamic).

For rate control:

- When controlling aeronautical units, the altitude and airspeed rates are controlled.
- When controlling pressures, the Ps rate and Qc rate are controlled.

The display settings are independent from the control mode. For instance, it is possible to display static pressure while controlling altitude rate.

The controlled and displayed units can be changed by pressing the **Eu/Au** button on the status screen (FIG 6).



**FIG 6 THE STATUS SCREEN (AERONAUTICAL AND PRESSURE UNITS)**

- To change the **display** mode, select the altitude/Ps or airspeed/Pt/Qc values in the left part of the screen;
- to change the **control** mode, select the altitude/Ps or airspeed/Pt/Qc **rate** values in the right part of the screen;

then touch the **Eu/Au** button.

**NOTE** some automatic procedures (like returning to ambient pressure or valve mapping) are only available in either pressure or aeronautical units. The Operator will need to switch the MPS43B to the correct units before starting such procedures.



When the ADTS is displaying or controlling Qc or Pt, the orange button **Qc/Pt** allows to switch the display between differential Qc and absolute Pt values.

## 4.2 OPERATIONAL MODES

### 4.2.1 CONTROL MODE

This is the primary mode for control of the MPS43B. Air data parameter entry and all the operational/control functions are all performed in this mode. The main display used in this mode is the status screen (FIG 6).

While the MPS43B is in the CONTROL mode, the internal pumps may run continuously, until the target value is reached. The MPS43B then switches automatically to stabilization mode (see below).

Entry to the CONTROL mode is by pressing the **MEAS / CTRL** key.

Return to CONTROL mode at any time from any other mode of operation is by pressing the **MEAS / CTRL** key.

**NOTE** *when the battery level is low, the MPS43B will automatically switch from CONTROL to MEASUREMENT mode. It will not be possible to switch back to CONTROL mode until the MPS43B is connected to AC power. Refer to paragraph 4.2.6 for more details.*

### 4.2.2 AUTOMATIC STABILIZATION MODE

The stabilization mode is automatically activated from the CONTROL mode, when the simulated values are close to the target within determined tolerance values.

In stabilization mode, the control system is automatically shut down for saving battery and pump life, and re-activated whenever an additional stabilization is needed.

While in stabilization mode, the lower-left corner of the Status Screen (FIG 6) alternatively shows the tolerance values for altitude and airspeed.

All parameters of the stabilization mode can be tuned; please refer to the Calibration and Adjustment manual for more information.

### 4.2.3 MEASUREMENT MODE

The MEASUREMENT MODE is used to place the system into the mode where only the pressure measuring system is active and the control system is turned off. The unit under test (UUT) is now completely isolated from the pressure generator and precise measurements can be obtained when the line pressures in the UUT under test are stabilized. Whenever a precision measurement is required, in particular when large volumes are involved, the MEAS function should be used: all control functions are disabled and only sensor measurement functions are active. The MEASUREMENT mode can be accessed from all menus.

Entry to the MEASUREMENT MODE is by pressing the **MEAS / CTRL** key.

Return to the CONTROL MODE is by pressing the **MEAS / CTRL** key again. Other modes can be selected by pressing the corresponding mode entry key.

**CAUTION** When the MPS43B is in MEASURE or LEAK mode of operation, the MPS43B may automatically switch to CONTROL mode if a problem is detected; for example, a high altitude leak or a negative Qc pressure. It is possible to permanently store the values that trigger such operation; if desired, consult the MPS43B Calibration and Adjustment Manual.

## Different measure modes

The MPS43B supports mixed MEASUREMENT and CONTROL modes for particular leak testing procedures.

By pressing the **SHIFT** and **MEAS / CTRL** keys in sequence, it is possible to change the state of the control system between the “STATIC MEASUREMENT” and “DYNAMIC MEASUREMENT” modes.

- In STATIC MEASUREMENT mode, the altitude/Ps channel stays in MEASUREMENT mode, while the airspeed/Qc channel remains under control.
- In DYNAMIC MEASUREMENT mode, the airspeed/Qc channel stays in MEASUREMENT mode, while the altitude/Ps channel remains under control.

The current mode is always indicated in the lower-left corner of the Status Screen (FIG 6).

The **MEAS / CTRL** key returns the MPS43B into the “standard” MEASUREMENT mode.

**NOTE** while in the mixed MEASUREMENT/CONTROL modes, the MPS43B will automatically switch to CONTROL mode if any problems are detected.

### 4.2.4 VENT AND “AMBIENT PRESSURE REACHED” MODES

The Vent mode is used to vent the pitot and static ports of the MPS43B to the ambient pressure condition. The “Ambient Reached” mode is the operation mode that follows a successful venting procedure.

For more information about the venting procedure, refer to paragraph 7.3.

To return to the CONTROL mode press the **MEAS / CTRL** key at any time.

**NOTE** The “Ambient Pressure Reached” mode is similar to the MEASURE mode (paragraph 4.2.3) with one difference: the Ps and Pt ports are internally connected, forcing a zero Qc value. The MPS43B may repeat the venting procedure automatically, if the simulated pressures move away from the ambient pressure, due to thermal effects.

### 4.2.5 LEAK MODE

The LEAK mode initiates the automatic leak test and the internal timer/stopwatch measurement feature of the MPS43B.

While in the LEAK mode, the display shows the Leak Screen (FIG 8).

Entry to the LEAK mode is by pressing the **LEAK** key. If pressed again, the **LEAK** key restarts the leak measurement.

Return to MEASURE mode is by pressing the **MEAS / CTRL** key.

### 4.2.6 MODE LIMITATIONS DUE TO LOW BATTERY LEVEL

When the battery level is low, the MPS43B disables the CONTROL mode. The only allowed modes are MEASURE (paragraph 4.2.3) and VENT (paragraph 4.2.4).

When the MPS43B is connected to AC power, the CONTROL mode will be accessible once again.

## 4.3 SCREENS

### 4.3.1 STATUS SCREEN

The Status Screen (FIG 6) is the most used screen during the ADTS operation. It is displayed when the MPS43B is turned on. Simulated (actual) values are displayed above

the commanded (target) values, each with its measure unit.

The screen displays four physical quantities:

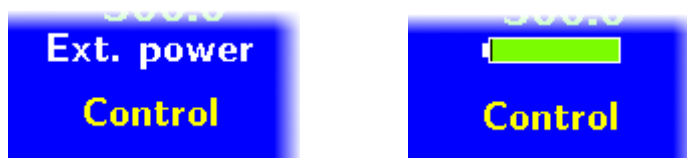
- altitude, airspeed and the corresponding rates, when the ADTS is controlling aeronautical units;
- static pressure, dynamic/total pressure, the static pressure rate and the dynamic pressure rate, when the ADTS is controlling pressures.

Each quantity can be selected by pressing on the touch screen, or using the **→** key.

A red frame indicates the currently selected quantity.

The lower part of the screen displays:

- the current AC/battery status (FIG 7). If the MPS43B is being powered by its internal battery, a small diagram displays the battery charge level. Otherwise, the display shows “Ext. power”.
- the current operational mode of the ADTS (refer to chapter 4.2). Touching this area of the screen is equivalent to pressing the **MEAS / CTRL** key.
- three colored buttons. Their function can vary with respect to the current operational mode. The buttons can be activated either by touching them or pressing the **SHIFT** and one among the '7', '8' and '9' keys.



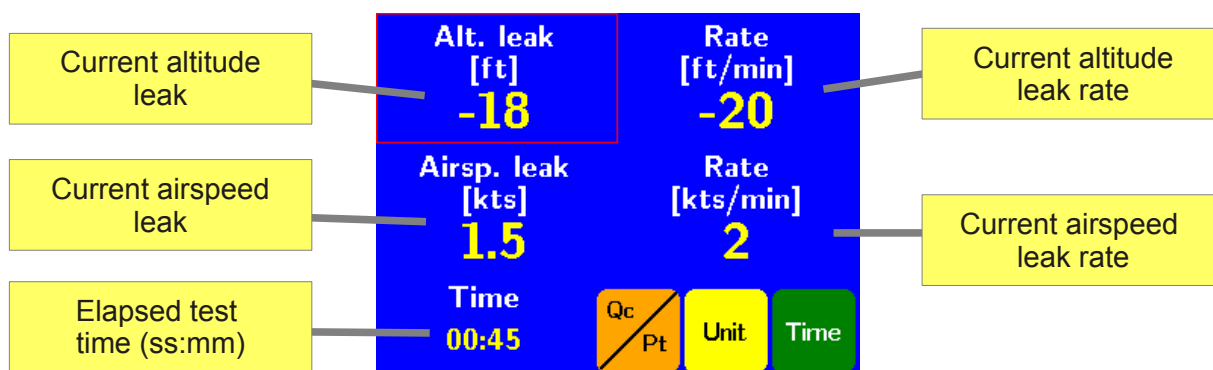
**FIG 7 POWER STATUS INDICATION (EXTERNAL POWER OR BATTERY)**

**4.3.2 LEAK SCREEN**

The Leak Screen is shown when the MPS43B is in LEAK mode. It displays:

- the measured leaks (in the left part of the screen);
- the currently measured rates (in the right part of the screen);
- the elapsed or remaining time in seconds.

The leak values are calculated by subtracting the current values from the values at the beginning of the leak test. Therefore, a decreasing quantity will have a negative sign.



**FIG 8 LEAK SCREEN IN AERONAUTICAL UNITS**

**NOTE** The leak values for airspeed and Qc are calculated by comparing the current airspeed/Qc value to the value at the beginning of the test.

The displayed rates are the currently measured rate values.

## 4.4 MENUS

The MPS43B can display two kind of menus:

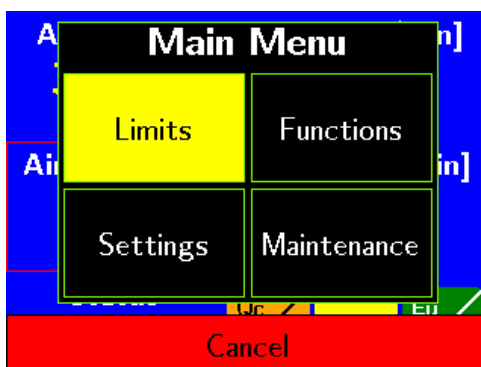
- choice menus, composed of buttons;
- value menus, displaying a set of values that may also be changed.

All MPS43B functions can be accessed from the Main Menu and its sub-menus<sup>1</sup>.

Most MPS43B settings can be accessed through the Settings Menu.

### 4.4.1 CHOICE MENU

An example of choice menu is the Main Menu (FIG 9), which is opened by pressing sequentially the keys **SHIFT** + 3.



**FIG 9 THE MAIN MENU**

The Operator can choose one of the displayed options by touching it, or by using the **→** and **ENTER** keys.

To exit the menu, the Operator can touch the red button at the bottom of the screen, or by pressing the keys **SHIFT** + 7.

### 4.4.2 VALUE MENU

An example of value menu is the Limits Menu (FIG 10) that can be accessed from the Main Menu.



**FIG 10 LIMITS MENU**

The central part of the screen shows at most three values. The bar on the left indicates at

<sup>1</sup> a “sub-menu” is a menu which is accessed from another menu.

which part of the menu is being shown.

The Operator can move through the menu by pressing the ▲ and ▼ keys on the keyboard or by touching the corresponding buttons on the screen.

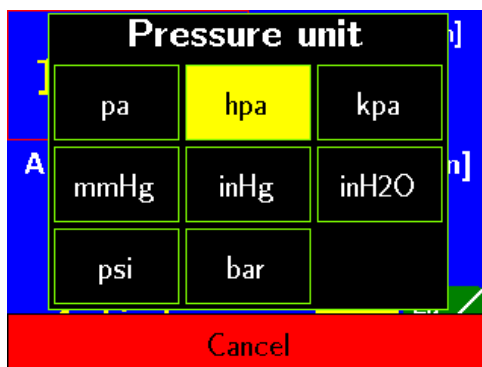
The selected item can be changed by just entering the new value using the keypad. The value will be committed either by pressing the **ENTER** key, or by selecting another item.

The square buttons in the lower part of the screen may change among different menus. The “Back” button always exits the menu.

## 4.5 SELECTING MEASURE UNITS

The MPS43B can display both simulated and commanded values in several measure units.

The measure units can be changed from any screen featuring the yellow **Unit** button (e.g. the Status Screen and the Leak Screen). When the **Unit** button is pressed, a choice menu will appear, displaying all the measure units for the selected quantity. Refer to FIG 11 for an example.



**FIG 11 SELECTION OF THE PRESSURE UNIT**

MPS43B supports the following measure units:

**Pressure:** pa (pascal), hpa (hectopascal), kpa (kilopascal), mmHg (millimeters Hg), inHg (inches Hg), inH2O (inches water), psi (pounds per square inch), bar.

**Altitude:** ft (feet), mt (meters), hm (hectometers).

**Airspeed:** kts (knots), km/h (kilometers per hour), mph (miles per hour)

The rate units always correspond to the measure unit of the “base” quantity: if the altitude unit is feet, then the altitude rate unit will be feet/minute; if the pressure unit is hectopascal, then the pressure rate unit will be hectopascal/minute, and so on.

To permanently store new measure units as default in the MPS43B non-volatile memory, use the same procedures for permanent storage of new limits, as described in paragraph 8.2.

### 4.5.1 HIGH RESOLUTION

Values are displayed with a certain number of decimal digits, depending on the current measure unit. The number of digits is chosen in order to maximize values readability. For this reason, not all measure units allow to exploit the full resolution of the transducers.

For example: when pascal are selected, the resolution is 0.2 pa or 0.5 pa depending on the transducer; when hectopascal are selected, the resolution is 0.01 hPa, i.e. 1 pa.

The resolution of certain measure units can be increased, to fully exploit the capability of the transducers. The Operator shall press the **SHIFT** + 6 keys to display the High

Resolution Menu, and then select “High res.”

**NOTE** *This setting only affects the display of certain measure units in the Status Screen. It does not have any influence on pressure control, or on the remote control protocol.*

## SECTION 5 START UP PROCEDURE

- Place the MPS43B with the panel face up.
- Check that the VENT/SEAL valve on the case, if present, is in the “VENT” position.
- Connect the power cord to the military style connector on the front panel.
- **NOTE** when using 28V DC power supply, use cable “CBL110929GPA” **only**.
- Leave static and pitot lines disconnected. Static and pitot lines should be connected only after start-up is completed and the test set is at ambient pressure.
- Turn the power toggle switch to “ON”.
- The MPS43B display will first show a DMA logo; followed by the serial number of the unit and last calibration date.

When the start-up and self-check is completed, there are two possible scenarios:

1. If the altitude measured in the static line is less than 8,000 ft above QFE, then the MPS43B will automatically vent the pitot and static lines to ambient. The pitot and static ports will be automatically zeroed. When the venting process is completed, the display will read: "AMBIENT PRESSURE REACHED". After this reading is displayed, press the **MEAS / CTRL** key to initiate use in MEASUREMENT mode.
2. If the altitude measured in the static line is greater than QFE + 8,000 ft, the following conditions will be automatically imposed:
  - the Commanded Altitude will be adjusted to the value measured in the static line,
  - the Commanded Airspeed will be adjusted to the value measured in the pitot line,
  - the Commanded Altitude Rate will be set at a fixed value (normal default 3000 ft/min).

The operator is then able to change the commanded values into suitable test points for the UUT and select **MEAS / CTRL** to set the ADTS to CONTROL mode, or to return to ambient conditions.

To vent the MPS43B and zero the airspeed/Qc line, press the **VENT** key.

Again wait until "AMBIENT PRESSURE REACHED" is displayed, press the **MEAS / CTRL** key to go into the MEASUREMENT mode.

**NOTE** For maximum accuracy of AIRSPEED measurements at low airspeed, refer to chapters 7.4.2 and 7.4.3.

## SECTION 6 ENTERING AIR DATA TEST PARAMETERS

Air Data Parameters (Altitude, Airspeed and the corresponding Rates) can be commanded (entered) in two modes:

- 1) by operating the MPS43B in the CONTROL mode. When the CONTROL mode is active the MPS43B starts to change the pressures as soon as a new air data value is entered.
- 2) by operating the MPS43B in MEASURE mode. If it is desired that the MPS43B starts to change pressures only after **all** the new air data parameters have been entered, it is necessary to activate MEASURE mode, then enter **all** the new target values and then return to CONTROL mode by pressing the **MEAS / CTRL** key, now all the new values will be activated together.

New target values can also be entered by using the triangle keys ▲ (to increase) or ▼ (to decrease).

**NOTE** *If a value of Altitude or Airspeed or Rate greater than the actual limits (the values programmed in the Limits Screen) is selected, the value will be not accepted and instead the actual limit value will automatically be entered. As an example, if an airspeed value of 999 knots is entered while the limit value is set at 400 knots, then when the **ENTER** key is pressed, the commanded value into the equipment will be 400 knots.*

### 6.1 ENTERING SPECIFIC COMMANDED VALUES

The MPS43B is operated by entering Commanded values for Altitude, Airspeed, Altitude Rate and Airspeed Rate (or static pressure, dynamic pressure and corresponding rates) from the Status Screen (FIG 6). To enter a Commanded value, the corresponding area of the screen must be selected. The values can be selected by touching them, or with the right arrow key →.

The selected commanded values can be changed in two ways:

- entering the new value using the numerical keypad, and pressing either **ENTER** or the → key when finished, to confirm the value. Press the **BACKSPACE** key to delete the last digit. To cancel the editing, just delete all digits and confirm. While the value is being edited, a cursor mark is shown. Once the value is confirmed, the cursor mark disappears.
- using the triangle keys ▲ and ▼ to increment or decrement the value. The value is automatically confirmed.

The MPS43B will not accept values outside of the programmed limits (refer to SECTION 8).

### 6.2 MACH NUMBER AND AIRSPEED/QC LIMITS

The Mach number is calculated from the current altitude/Ps and airspeed/Qc values. The MPS43B considers at any time both the airspeed and the Mach number limiting values.

- If an **airspeed** command exceeds the **airspeed** limit, it is **rejected**.
- If a **Mach** command exceeds the **airspeed or Mach** limits, it is **rejected**.
- If an **airspeed** command exceeds the **Mach** limit only, it is **accepted**.

When the **current** Ps and Pt values result in a Mach number outside the limits, the Mach number limit is enforced. The lower-left corner of the Status Screen (FIG 6) will flash with a black background to signal that the airspeed/Qc is being limited due to the Mach number.



### 6.3 ACOUSTIC ALARM FUNCTION

When the Simulated (Actual) values are almost at the Commanded (Desired) values (around 10 feet and 1 knot) an acoustic alarm will start sounding (beep-beep) to warn the operator that the MPS43B is approaching the target values.

The acoustic alarm function can be enabled or disabled from the Settings Menu.

## SECTION 7 ADVANCED OPERATIONS

### 7.1 SPECIFIC PITOT PRESSURE VALUE COMMAND

When the MPS43B is controlling pressures (see chapter 4.1), the Status Screen (FIG 6) can show either the dynamic (Qc) pressure or the total pressure. The display can be changed by touching the orange button **Qc/Pt** or by pressing **SHIFT** + 7.

**NOTE** the MPS43B can only control the Qc rate, not the Pt rate.

### 7.2 LEAK TEST

The MPS43B can perform a leak test of the static and pitot lines using a built-in timing function. Leak rates for pitot and static lines are calculated every second and are automatically shown in the selected units in the Leak Screen.

The MPS43B can perform three kinds of leak tests:

1. "Free-running", without time limit.
2. Timed.
3. Fully automatic, at pre-programmed altitude/Ps and airspeed/Qc/Pt values.

All kinds of leak tests are enabled by pressing the **LEAK** key. The Leak Screen (paragraph 4.3.2) will appear.

**NOTE** the leak test can be performed either in aeronautical or pressure units. FIG 8 is an example of the Leak Screen in aeronautical units.

**NOTE** the pneumatic circuit inside the MPS43B consists of a very small volume. For this reason, any leak test conducted on the MPS43B **without** any pneumatic load and at high rate values may give unexpected results, due to the fast change of the temperature inside the pneumatic circuitry. In order to conduct a leak test of the MPS43B alone, please refer to the Final Inspection and Calibration Certificate for the rate values and stabilization time required.

#### 7.2.1 FREE-RUNNING LEAK TEST

When the **LEAK** key is pressed, the MPS43B starts a free-running leak test: it begins counting the seconds and displaying the leak rates for the pitot and static circuits.

For the best measurement results, wait until the values in the Leak Screen are stabilized after pressing the **LEAK** key. Typically this will happen after one minute. When the stabilization has occurred, press the **LEAK** key once again to reset the clock for a fresh start of a leak test.

#### 7.2.2 TIMED LEAK TEST

A timed leak test can be prepared by touching either the time indication in the lower-left part of the display, or the **Time** button. After setting the leak test time, the Leak Screen will be shown again, but the time will count backwards. At the end of the test, the Leak Test Results Screen (FIG 12) will be displayed.

To end a leak test, press the **MEAS / CTRL** key.

#### 7.2.3 FULLY AUTOMATIC LEAK TEST

A fully automatic leak test consists of the following steps:

1. reach pre-programmed altitude and airspeed values (or Ps and Pt/Qc values);

2. wait some time for stabilization;
3. run a timed leak test;
4. display the results (see FIG 12), comparing the measured leak values with the pre-programmed tolerances.

The fully automatic leak test is programmed as the first step of a test profile. Please refer to SECTION 11 for information about profiles, and to the Calibration and Adjustment Manual for setting the parameters of the test.

If a fully automatic leak test is available, the Leak Screen (paragraph 4.3.2) will also show a yellow button **Auto**. Tap on that button to start the test.

Leak Test Results			
	Set	Meas.	Max
Alt.	39999	-23	
Airsp.	400.0	0.0	

Time: 60 sec

Me/Ra

Close

**FIG 12 LEAK TEST RESULTS SCREEN**

**NOTE** the green button **Me/Ra** switches between display of the measured losses and of the measured leak rates. For example, a measured leak of 50 feet in 120 seconds would be displayed as 50 feet or 25 feet/min.

### 7.3 AUTOMATIC RETURN TO AMBIENT PRESSURE

MPS43B can automatically vent the pitot and static ports to the ambient pressure condition. The venting procedure operates as follows: when the **VENT** key is pressed the MPS43B will automatically set the airspeed to zero, and to an altitude equal to ambient pressure, then initiate a descent (or ascent) with a rate of 3,000 ft/min and 300 knots/min. When the ambient pressure is reached, the message: "Ambient pressure reached" will be displayed, and the MPS43B will switch to "Ambient pressure reached" mode.

**NOTE** the **VENT/SEAL** valve on the case, if present, must be in the "VENT" position.

To interrupt the venting procedure, or after the procedure has been completed, the Operator can press the **MEAS / CTRL** key to return to CONTROL mode.

For more information about the Vent and the "Ambient Pressure Reached" modes, refer to chapter 4.2.4.

### 7.4 PRECISION MEASUREMENTS

Maximum measurement accuracy is obtained by following some simple rules, that are described in the following paragraphs.

The Operator can also enable High Resolution mode, to increase the number of decimal digits, depending on the current measure unit. Refer to paragraph 4.5.1.

#### 7.4.1 OPERATION ON LARGE OR VERY SMALL VOLUMES

A precision measurement can only be obtained when the test lines pressures are stabilized.

Even though the stability of the controlled values in the CONTROL mode are very good, this MEASUREMENT mode should be used whenever a very precise measurement is required.

The MEASUREMENT mode function should always be used if large test volumes are being measured, such as with an older aircraft.

On the other hand, if the volumes are very small, the pressure changes could generate thermal effects that may lead to long settling times.

The suggested procedure to follow in these cases is the following:

1. set the commanded values and wait for the MPS43B to reach them;
2. remain in CONTROL mode for some minutes, to allow the MPS43B to “actively” stabilize thermal effects and other transients;
3. enter MEASUREMENT mode by pressing the **MEAS / CTRL** key;
4. remain in MEASUREMENT mode for some minutes, to allow further stabilization;
5. measure the values;
6. return to CONTROL mode, by pressing the **MEAS / CTRL** key.

#### 7.4.2 DYNAMIC PRESSURE ZERO ADJUSTING

For the most accurate low Airspeed measurements, it is recommended that the MPS43B dynamic pressure should be zeroed at the start of each new test sequence, where a precision airspeed measurement is required. Zeroing ensures the best accuracy of the Airspeed circuit.

The Altitude channel of the MPS43B is not affected.

Zeroing is accomplished by setting the pressure differential between the pitot and static line to zero at the ambient pressure.

The fully automatic procedure will be activated only at the following conditions:

- When the equipment is in the CONTROL mode of operation.
- When the Airspeed command Value is zero.
- When Static Pressure inside the static line is very close to the ambient pressure.
- When the pressure inside the Pitot Line is almost the same as that in the Static Line.
- When the Altitude Rate is close to 0 feet/min (or the Ps rate is close to 0 hPa/min).

Once the equipment is in these conditions, the **auto-zero** is automatically activated; wait until the differential pressure is almost equal to zero before commanding new Airspeed values.

**NOTE** *the auto-zero may be disabled from the Settings Menu. Refer to the MPS43B Calibration and Adjustment Manual for more information.*

MPS43B supports an additional enhancement to the airspeed resolution, that is described in the following paragraph.

#### 7.4.3 ULTRA-LOW SPEED FUNCTION

When all the conditions for the dynamic pressure zero adjustment are satisfied, the Operator may also enable the “Ultra-low speed function” to enhance the resolution at very low airspeed values.

The function can be enabled by entering the Main Menu (**SHIFT** + 3) and selecting “Functions” and then “ULS”.

As long as the ultra-low speed function is active, the speed resolution is increased as described in the following table, and the Status Screen displays “ULS” in the lower-left corner.

	<i>Normal</i>	<i>Ultra low speed</i>
Minimum measured speed with 1 knot resolution	10 knots	2 knots
Minimum measured speed with 0.1 knots resolution	20 knots	50 knots

As soon as the altitude significantly changes, or any other of the above conditions are no longer satisfied, the MPS43B will automatically leave the ultra-low speed function.

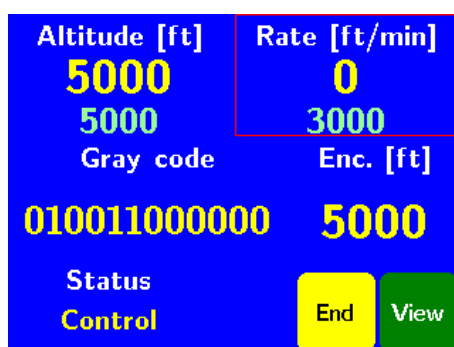
## 7.5 ENCODING ALTIMETER (OPTION)

An optional front panel connector is used to connect the Encoding Altimeter or Encoding Device, to test the altitude reporting Gray code. Any unit can be tested, if a proper cable is prepared.

**NOTE** the last page of this manual contains the wiring diagram for the adapter cable to connect the UUT to the MPS43B.

When an Encoding Altimeter/Encoding Device is to be tested, connect it to the MPS43B, before the ADTS is powered on.

To start a test of the encoding altimeter, press the orange button **Enc** on the Status Screen. The MPS43B will switch to the Encoding Altimeter Test Screen (FIG 13).



**FIG 13 THE ENCODING ALTIMETER TEST SCREEN**

The “Gray code” label shows the 24 signals coming from the encoding device. The “Enc.” label shows the decoded value.

The ADTS will also signal the change of the reading from the encoding device:

- an acoustic sound will warn the Operator at every altitude transition point;
- the gray code and the decoded altitude will flash in green if the new value is correct, or in red if the new value is incorrect. All errors are recorded.

The green button **View** shows the results of the current test in the Encoding Altimeter Results Screen (FIG 14). The yellow button **End** shows the results and ends the test, returning the MPS43B to the Status Screen.

**NOTE** Depending on the hardware version of the MPS43B, the Encoding Altimeter Test Screen may also display the orange button **Tst/Pw**. Such button switches between the standard display (FIG 13) and an alternate display, in which the yellow and green button control the power supply to the encoder and vibrator of the connected altimeter.

The screenshot shows a screen titled "Enc. Alt. Errors" with a table of error data. Below the table, it displays "Problems: 11", a yellow "Back" button, and a green button with a white downward-pointing triangle.

N.	Altitude	Error
1	1098	Invalid
2	90	Direction
3	80	Direction

**FIG 14 THE ENCODING ALTIMETER RESULTS SCREEN**

The Encoding Altimeter Test records the following kinds of errors:

- Invalid gray code: when the gray code does not correspond to any altitude value, and cannot be decoded. This error is marked as "Invalid".
- Direction error: when the encoded altitude increases while the simulated altitude is decreasing, or vice-versa. This error is marked as "Direction".
- Skip error: when the encoding altimeter skips one or more values (for instance, switching from 1,000 to 1,200 feet). This error is marked as "Skip".

## SECTION 8 CHANGING PRESET LIMITS

### 8.1 GENERAL

The MPS43B allows the pre-programmed maximum parameter values for all functions to be changed. Limiting values can be changed from the Limits Menu (FIG 10).

The Limits Menu is accessible from the Main Menu, that can be opened by pressing the keys **SHIFT** + 3.

**NOTE** *The Limits Menu only displays the limits of the currently controlled units (aeronautical or pressures).*

**CAUTION** Limits are pre-set at the factory to handle most standard test conditions and to protect most aircraft instrumentation. The operator should exercise extreme caution in setting limits outside normal default values.

**NOTE** *Damage to the aircraft or to unit under test could occur, if caution is not observed.*

Limit values can be changed either permanently or for the duration of one power-on cycle. The operator should consider carefully which requirement best suites the needs of all follow-on test set users.

Changes to the values inside the Limits Menu are immediately active. All future operations will automatically utilize the new limits until power is turned off, or the limits are changed again. When the MPS43B is next powered up, the original default limit values will be the active ones.

The procedure can then be repeated after power is restored. If a unique limit value has been entered for a particular test, remember to reset the limits to factory or maintenance shop default values after testing. If the values are required only for one test, it is recommended that the revised value be not saved, it will then be automatically erased at the next power down.

To permanently store new limiting values in non-volatile memory, use the following procedure.

### 8.2 PERMANENT MEMORISATION OF NEW LIMITS

**CAUTION** This procedure overwrites the previously saved limits.

From the Limits Menu, touch the yellow square button **Save** or press the keys **SHIFT** + 8. Then press **ENTER** or touch the **Yes** button to confirm.

**NOTE** *this operation will also save the default measure units.*

## SECTION 9 SAFETY MANUAL OPERATION

### 9.1 MANUAL VENT

The Vent operation can also be executed manually in the event of power loss.

The two needle valves (FIG 2 items 5 and 6), located on the front panel, are used for the manual venting.

Turn counter- clockwise to open the two needle valves.

The needle valves must be rotated together, very slowly, to avoid excessive rate values. Too fast rotation of Pitot Vent needle valve can change too quickly the pitot pressure and too fast a rotation of Cross Bleed needle valve can increase the Altitude Rate to excessive values.

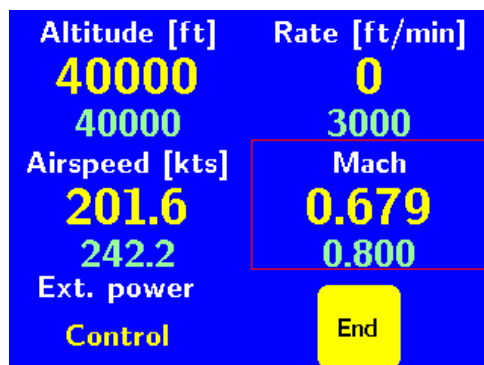
**CAUTION** When the manual venting is completed, the two needle valves must be turned fully clockwise to be closed, to restore the seal on pneumatic circuit.  
**Do not over-tighten.**



## SECTION 10 SPECIAL FUNCTIONS

### 10.1 MACH NUMBER

Mach Number can be entered as a control parameter in place of an Airspeed value. To enter a Mach Number, enter the Main Menu (**SHIFT** + 3), then select “Functions” and “Mach”. The Status Screen will change as in FIG 15.



**FIG 15 STATUS SCREEN SHOWING MACH NUMBER**

The operation is the same as the “normal” Status Screen. The MPS43B can be switched back to Airspeed rate visualization by touching the **End** yellow button.

**NOTE:** the Mach Number is limited by the lowest value between the Airspeed limit and the Mach limit itself.

### 10.2 SETTING DISPLAY BRIGHTNESS

To set the brightness of the display, press **SHIFT** + 1. Adjust the value with the **▲** and **▼** keys or the keypad. Press **ENTER** to save, or any other key to cancel.

### 10.3 BATTERY LEVEL

To show the battery level, press and hold the **SHIFT** key for two seconds while in the Status Screen.

To hide the battery level, press and hold the **SHIFT** key again.

**NOTE:** while the MPS43B is connected to the AC power, the battery level will always be shown as 100%. To obtain an accurate reading, keep the power cable disconnected for one minute, with the ADTS in MEASURE mode. The current battery level may also change while the pumps are running.

### 10.4 ACOUSTIC ALARM FUNCTION

When the SIM (ACTUAL) values almost reach the CMD (TARGET) values (around 10 feet and 1 knot) an acoustic alarm will start (beep-beep) to warn the operator that the MPS43B is approaching the target values.

The acoustic signal is toggled on or off by pressing the keys **SHIFT** + 2.

### 10.5 CENTER LINE CORRECTION

If there is an altitude difference between the ADTS and the UUT, the Centerline Correction function, can be used to correct the error due to such a difference.

The Centerline Correction value can be set by entering the Main Menu (**SHIFT** + 3) and selecting “Functions” and “Alt. Offset”.

If the altitude of the UUT is higher than the ADTS, the correction value must be a positive number and vice versa.

Two asterisk “\*” near the commanded Altitude value show the Operator that the corrected altitude is currently displayed.

To deactivate the Centerline Correction function, just set the offset to 0.

### 10.6 VALVES FINE TUNING (MAP)

The control valves condition, over a period of time, can be the reason for a malfunction or poor performance of the control stability/precision. Whenever the equipment does not stabilize properly at the target values it is recommended the valve tuning procedure is performed, (this is a fully automatic procedure) to restore the equipment to the correct working condition.

The Procedure for carrying out this valve fine tuning is described in the MPS43B Calibration and Adjustment Manual. This procedure, is restricted to SERVICE and must be accomplished ONLY by skilled operators.

### 10.7 FINE TUNING FUNCTION

The "Fine Tuning" function is only provided for skilled operators, to fine tune the MPS43B by the adjustment of the defined stored internal parameters; it is therefore restricted to SERVICE operators, see the MPS43B Calibration and Adjustments Manual. This function is not described in this manual.

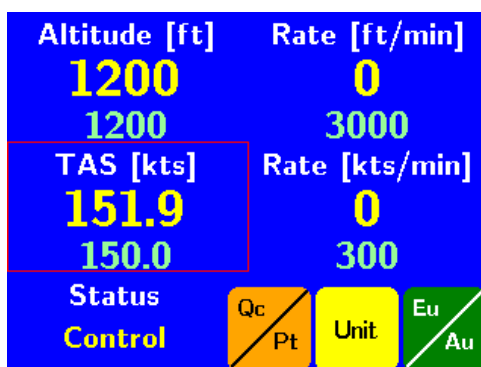
#### 10.7.1 SAVING VARIABLE PARAMETERS

The fine-tuning parameters can be saved in the MPS43B non-volatile memory. The procedure is described in the MPS43B Calibration and Adjustment Manual.

### 10.8 TRUE AIRSPEED

The MPS43B can show both the default I.A.S. (Indicated Air Speed) and T.A.S. (True Air Speed). The Operator can input the temperature for the true airspeed calculation by either pressing **SHIFT** + 5 or entering the Main Menu (**SHIFT** + 3) and selecting “Functions” and then “Tas / Ias”.

When the True Airspeed is shown, the Status Screen displays “TAS” instead of “Airspeed” above the airspeed values (FIG 16).



**FIG 16 STATUS SCREEN SHOWING TRUE AIRSPEED**

To restore the equipment to the IAS read out, touch the green square button **Disable** in the Tas / Ias menu.

## 10.9 E.P.R. (ENGINE PRESSURE RATIO)

For gas turbine engine testing, the Engine Pressure Ratio (i.e., Pt/Ps) function is carried out starting from a desired static pressure value (inlet pressure) in inHg and with the Altitude / Ps Rate set to any value other than zero.

Connect the system to be tested following the aircraft maintenance manual procedures. Open the Main Menu (**SHIFT** + 3) and select "Functions" and "EPR". The EPR Menu will show, allowing the operator to enter the desired values of the Static Pressure (inlet) and the aim EPR value. When the yellow square button **Go** is pressed, The Status Screen will show the EPR instead of the airspeed / Qc rate (FIG 17). The EPR and altitude / Ps can be changed at any time.

To close the EPR visualization, press the square yellow button **End**.

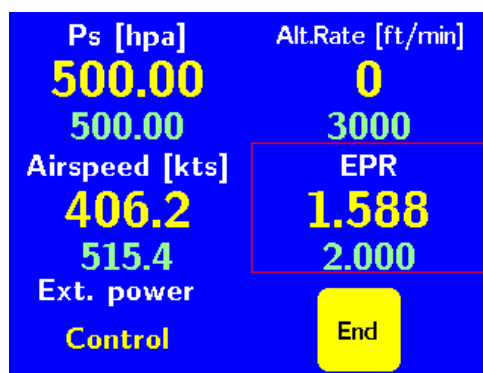


FIG 17 STATUS SCREEN SHOWING EPR

## SECTION 11 TEST PROFILES

### 11.1 INTRODUCTION

If a particular test profile (a set of control points, each one identified by Altitude, Airspeed, Altitude Rate and Airspeed Rate, or Ps, Qc, Ps Rate and Qc Rate) must be performed frequently (for example, when required by a particular UUT test specification), the equipment can be easily programmed to memorize such a profile. Then, when it is required again, it can be selected to carry out the test automatically.

During the automatic test execution, the equipment will go through all the programmed test points. When the MPS43B has reached and stabilized each step, if the stabilization time is not zero, it prompts the Operator for the readings of the UUTs.

The function can be enabled by entering the Main Menu (**SHIFT** + 3) and selecting “Functions” and then “Profiles”.

The MPS43B can display and memorize the results of a test profile.

#### 11.1.1 PROFILES AND PROFILE RESULTS

A test profile contains a sequence of test points, that the MPS43B follows when the profile is run. Each test point contains the following data:

- altitude/Ps;
- altitude/Ps rate;
- upper and lower tolerance for the UUT readings of altitude/Ps;
- airspeed/Qc;
- airspeed/Qc rate;
- upper and lower tolerance for the UUT readings of airspeed/Qc;
- stabilization time;
- optional information about a leak test:
  - leak test units (aeronautical or pressure units)
  - additional stabilization time;
  - leak measurement time;
  - maximum leak allowed for the altitude/Ps;
  - maximum leak allowed for the airspeed/Pt.

The tolerance values are used to check if the UUT readings are acceptable or not.

The summary of the results of all set-points is called “profile result”. The MPS43B supports up to 3 UUTs. That is: 3 altitude/Ps, 3 airspeed/Qc and 3 Mach number readings for each profile step.

#### 11.1.2 MEMORY ORGANIZATION

The non-volatile memory of the MPS43B contains 30 locations for storing the profiles. Every time a profile is saved into one memory location, it overwrites the previously saved profile in the same location.

The same thing applies to the profile results. The MPS43B contains 300 profile results.

## 11.2 ENTERING TEST PROFILES

A test profile can be changed or created by touching the “Edit” button on the Profiles Menu.

The MPS43B will show the Profile Selection Menu for selecting the memory location. If the Operator selects an empty memory location, a new profile will be created.

After pressing the **Select** button, the display will show the Profile Editing Menu (FIG 18). This menu allows the Operator to set the number of steps, the units (aeronautical or pressures) and the name of the profile.

Profile 1	
Name	Default~
Units	Aeronautical
Steps	26

Buttons: Back, Steps, Save, [Down Arrow]

**FIG 18 THE PROFILE EDITING MENU**

The single steps can be modified by touching the **Steps** button. The Profile Step Editing Menu (FIG 19) will appear.

Profile steps	
Current step	1
Altitude	-1500
Alt. upp. tol.	+5

Buttons: Back, Copy, [Down Arrow]

**FIG 19 THE PROFILE STEP EDITING MENU**

The first line of the Profile Step Editing Menu selects the step that is currently shown. The rest of the menu allows the Operator to change all the parameters of the selected step.

The **Copy** button copies all the values from the previous step to the currently displayed one.

When finished editing the profile, press the orange **Back** button and save the profile.

**NOTE** *unsaved changes are immediately lost.*

## 11.3 RUNNING TEST PROFILES

A test profile can be started by touching the “Run” button on the Profiles Menu. The display will show the Profile Selection Menu for selecting the profile to run.

While a test profile is running, the MPS43B will show a slightly modified Status Screen (FIG 20); the lower-right part of the display summarizes the current state of the profile.

1. the commanded values of the set-points are set and stabilized;

2. if the stabilization time is not zero, the display shows the Profile Step Results Menu, allowing the Operator to enter the UUT readings. The first line of the menu selects the UUT. The Menu is closed with the **Ok** or **Skip** buttons;
3. a leak test is run if required. The Leak Results Screen is displayed afterwards, for 60 seconds. The operator may dismiss the results' display before the timeout is expired.
4. the results of the step are stored into the active profile results. The MPS43B switches to the next profile step.

After the last profile step is executed, the MPS43B switches back to the Status Screen.

Altitude [ft]	Rate [ft/min]
-679	-2990
-1500	3000
Airspeed [kts]	Rate [kts/min]
0	0
0	300
Status	Step
Control	Reaching 1/26

**FIG 20 STATUS SCREEN WHILE RUNNING A TEST PROFILE**

While the profile is running, touching any part of the display and pressing any key will show the Profile Running Menu. That menu allows the Operator to:

- skip the current step;
- stop the profile;
- show intermediate results.

## 11.4 PROFILE RESULTS

As explained in chapter 11.1.1, the MPS43B can record the results of test profiles.

When a profile is completed, the results can be saved into the non-volatile memory of the ADTS. Saved results can be reviewed on the MPS43B display, or downloaded to a PC.

The MPS43B prompts the Operator to save the results as soon as the test profile is completed.

**NOTE** *unsaved results are immediately lost.*

Saved profile results are shown by selecting “Results” from the Profiles Menu, and selecting the results to show. The Profile Results Screen (FIG 21) will appear. The **▲** and **▼** keys cycle through the steps. If the displayed step included a leak test, its results can be seen by touching the **Leak** button. The button **Spd / Ma** selects between airspeed and Mach values. The results of skipped profile steps are left blank.

Profile Results				
Step 1/26				
	Set	UUT1	UUT2	UUT3
Alt.	-1500	-1501	-1499	-1499
Airsp.	50.0	50.1	49.8	49.8

Back Leak Spd/Ma ▼

**FIG 21 THE PROFILE RESULTS SCREEN**

### 11.5 EXAMPLE

This chapter explains how to create an example test profile, with the following data:

Step no.	Altitude [ft]	Alt. rate [ft/min]	Airspeed [kts]	Airsp. rate [kts/min]
1	-1,000 ± 50	3,000	150 ± 5	300
2	0 ± 50	3,000	150 ± 5	300
3	500 ± 50	3,000	150 ± 5	300
4	1,000 ± 50	3,000	150 ± 5	300
5	1,500 ± 50	3,000	150 ± 5	300

Stabilization time for each step: 90 sec.

1. From the Status Screen, check that the measure units are feet and knots;
2. Enter the Main Menu (**SHIFT** + 3) and select Functions → Profiles → Edit.
3. Select an empty slot and press the yellow button **Select**.
4. Enter the following values (remember to press **ENTER** after each entry):
  - a) profile name (for example "test");
  - b) units: aeronautical;
  - c) steps: 5.
5. Press the yellow button **Steps**.
6. Enter the data for step 1:
  - a) current step: 1;
  - b) Altitude: -1,000;
  - c) Alt. upp. tol: 50;
  - d) Alt. low. tol: -10;
  - e) Alt. rate: 3,000;
  - f) Airspeed: 150;
  - g) Airsp. upp.tol: 5;
  - h) Airsp. low.tol: -5;

- i) Airsp. rate: 300;
  - j) Stab. time: 90;
  - k) Leak test: Off
7. Return to the top of the menu and change the value of “Current step” to 2, then press **ENTER**.
  8. Press the yellow button **Copy** and confirm. The values from step 1 will be copied into step 2.
  9. Change the only values that differ between the two steps:
    - a) Altitude: 0
    - b) Airspeed: 150
  10. Return to the top of the menu.
  11. Change the value of “Current step” to 3 and press **ENTER**. Copy the value from the previous step and edit them. Repeat for steps 4 and 5.
  12. After entering all the data, press the orange button **Back** twice.
  13. Confirm saving the profile.



## SECTION 12 REMOTE CONTROL

The MPS43B ADTS allows remote control by means of a Personal Computer, laptop or other portable devices.

The ADWIN software is the official remote control software from D.Marchiori. It is available for Windows and Unix platforms.

The MPS43B Remote Protocol Manual describes the communication protocol, and allows software developers to integrate communication with the ADTS inside custom-made software.

For information about the protocol, the available software, or for assistance during the development, contact your sales representative.

Remote control of the MPS43B is enabled in REMOTE mode, and is activated by pressing the **SHIFT** + **4** keys, and selecting the control port (RS232 and Bluetooth if available). While in REMOTE mode, any key or touching the display allow to leave the mode and return to front-panel operation.

### 12.1 WIRED CONNECTIONS

The MPS43B is fitted with a RS232 port. DMA provide a RS232 cable, and also a USB-RS232 cable, for systems that do not feature a RS232 port. The DMA USB-RS232 cables are identified by the operating system as a USB/RS232 converters.

### 12.2 WIRELESS CONNECTIONS

The MPS43B can be controlled by means of a “Serial Port Profile” (SPP) Bluetooth connection.

1. Pressing the **SHIFT** + **4** keys and select “Bluetooth” mode.
2. On the PC, search for Bluetooth device. The MPS43B will be detected as “MPS43B S/N xxxx”, where “xxxx” is the serial number of the unit.
3. Enter the PIN code “xxxx0000” to pair the devices. The PIN code is the serial number of the unit, followed by four zeroes.
4. After Bluetooth pairing, the operating system will display two serial (COM) ports; use the first one to connect to the MPS43B.

## SECTION 13 SPECIAL FUNCTIONS KEYS SUMMARY

Remember; press SHIFT followed by...

<b>SHIFT LEAK</b>	Vent to ambient pressure
<b>SHIFT 1</b>	Display Brightness Setting
<b>SHIFT 2</b>	Audible Beep/beep ON/OFF Setting
<b>SHIFT 3</b>	Enter the Main Menu
<b>SHIFT 4</b>	Enter the Remote Mode
<b>SHIFT 5</b>	Shorthand for the Tas / las menu
<b>SHIFT 6</b>	Enter the High Resolution Menu
<b>SHIFT 7</b>	Same as touching the <b>orange</b> square button, if displayed
<b>SHIFT 8</b>	Same as touching the <b>yellow</b> square button, if displayed
<b>SHIFT 9</b>	Same as touching the <b>green</b> square button, if displayed
<b>SHIFT 0</b>	Shorthand for the Settings Menu
<b>SHIFT DOT</b>	Only for Company Service
Press and hold <b>SHIFT</b>	Show or hide the battery level

## SECTION 14 CALIBRATION

### 14.1 GENERAL

It is recommended that the MPS43B be calibrated at least once per year, preferably by an ISO17025 accredited laboratory with a Best Measurement Uncertainty no greater than  $\pm 0.01\%$  of reading over the entire MPS43B sensor ranges.

Full details for carrying out the calibration of the MPS43B are to be found in the MPS43B Calibration and Adjustments Manual.

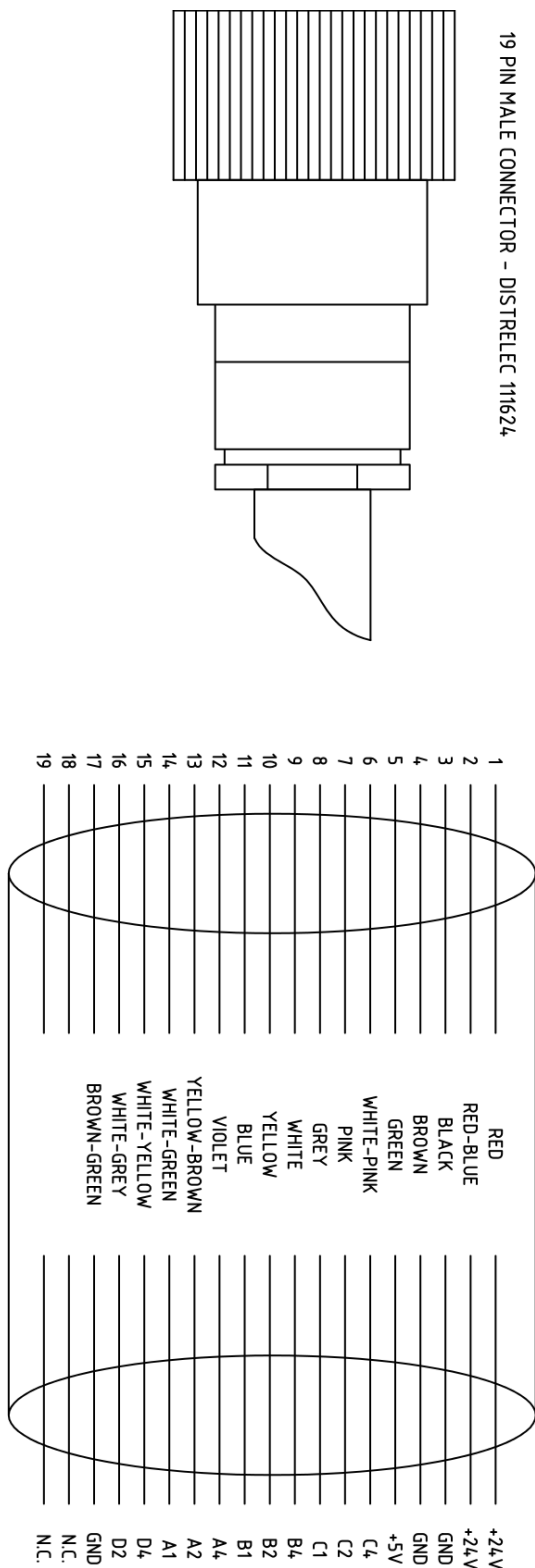
### 14.2 CALIBRATION SERVICE

In Italy, D. Marchiori s.r.l. maintain Accredia accredited calibration laboratory LAT No. 106, guaranteeing low Uncertainties from the National Physical Laboratory for the Air Data pressure range.

D. Marchiori s.r.l. specialise in the service and calibration of Air Data Test Sets and other aerospace and meteorological instrumentation and will be happy to support your test equipment.

### SECTION 15 ENCODING ALTIMETER CONNECTOR DETAIL

The following diagram enumerates the pin connections for the Encoding Altimeter interface plug / socket located on the front panel of the MPS43B (option B7).



**FIG 22 WIRE DIAGRAM OF THE ENCODING ALTIMETER CONNECTOR**

## SECTION 16 MAINTENANCE, RETURN AND DISPOSAL INFORMATION

The MPS43B contains complex electrical and electronic parts. It must be disposed of properly.

**Please do not dispose of this equipment in landfill, with household or municipal waste.**

Due to the fact that all products are for specifically professional use, D.Marchiori s.r.l. offers, to customers in the European Union, a maintenance service, that ensures take-back return for damaged, malfunctioning and presumably unrecoverable instruments.

Customers can contact D.Marchiori s.r.l. whenever they believe that any of such conditions applies, and arrange the shipment of the equipment to Italy.

D.Marchiori s.r.l. will inspect and verify the equipment, and then will contact the customer, in order to arrange repair, substitution or purchase as used product. Only if the equipment cannot be repaired, D.Marchiori s.r.l. will inform the customer, and then dispose of the product, according to current regulations on waste disposal and recycling, at its own expense.

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