

DPS400 PITOT-STATIC TEST SET

P/N 101-01180

MOD P

56-101-01180-C November 5, 2003



USERS ARE KINDLY REQUESTED TO NOTIFY THE MANUFACTURER OF ANY DISCREPANCY, OMISSION ORERROR FOUND IN THIS MANUAL.

INQUIRIES SHOULD INCLUDE SPECIFIC QUESTIONS AND ALWAYS REFERENCE THE PUBLICATION TITLE, NUMBER, CHAPTER, PAGE, FIGURE, PARAGRAPH, AND EFFECTIVE DATE.

PLEASE SEND COMMENTS TO:

TECHNICAL CUSTOMER SUPPORT - GSTE BARFIELD CORPORATION P.O. BOX 025367 MIAMI, FL 33142 USA

TELEPHONE: (305) 871-3900

(800) 321-1039

FAX: (305) 876-1680

E-MAIL ADDRESS: Techsupport.GSTE@barfieldinc.com



ATTENTION

Although every effort has been made to provide the end user of this equipment with the most current and accurate information, it may be necessary to revise this manual in the future. Please be sure to complete and return a *Revision Request Form* to Barfield GSTE Revision Services.

Additionally, Barfield <u>MUST</u> have your name and address on file as a registered user of this equipment to ensure validation of the warranty. Please complete the **OWNER WARRANTY REGISTRATION** card promptly and return it. This card insures validation of the warranty.



REVISION RECORD

REV.	ECO#	REV. DATE	DESCRIPTION OF CHANGE
А	N/A	October 29, 1996	Initial Release
В	260-00462	May 15, 2001	Revised to show software/menu/screen changes as per ECO.
С	260-00643 and 260-00642	November 2, 2003	Revised to newest format and per EC's for latest software modification (MOD P) and new keyboard assembly (Option C)



LIST OF APPROVED REPAIR FACILITIES

TRADE-NAME

BARFIELD PRODUCT SUPPORT DIVISION

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INTRODUCTION

1. PUBLICATION BREAKDOWN

This instruction manual establishes the standards of operation for the Barfield Digital Pitot Static Test Set and has been prepared using ATA Specification 101 as a guide.

Questions related to this manual should be submitted in writing to:

Barfield P.O. Box 025367 Miami, FL 33102-5367 USA

Attn: Technical Customer Support - GSTE

Inquiries should be specific and refer to the publication title, number, chapter, page, figure, paragraph, and effective date.

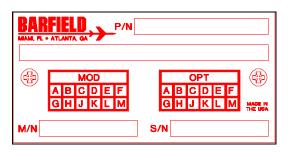
Changes, when approved, will be published as revisions to the basic publication

2. IDENTIFICATION - MODIFICATION STATUS

A. The identification label, (Figure 1), located on the front bulkhead of the Test Set, provides the following information:

Manufacturers' Name Designation of Equipment Equipment Part Number **Equipment Description**

Equipment Modification Equipment Options Equipment Model Number Equipment Serial Number



IDENTIFICATION LABEL Figure 1

B. In addition to the identification label, there are three (3) other record forms packaged with the test set as follows:

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(1) The Owner's Warranty Registration card, (Figure 2), which is to be completed by the owner and returned to the Barfield within ten (10) days of purchase to insure automatic update of printed matter and validation of warranty.

OWNER WARRANTY REGISTRATION

RETURNING THIS CARD COMPLETED ENABLES US TO KEEP YOU AUTOMATICALLY INFORMED OF TECHNICAL UPDATES and VALIDATES YOUR WARRANTY.

NAME	TITLE	
CITY	STATE	
P/N		MODEL #
PURCHASED FROM	DATE	
AIRLINE OTHER	REPAIR STATION	OEM 🗆
	W ON THIS BARRIELD, INC. WARRANTY GARD	IS AND WILL REMAIN
\$73	RICTLY CONFIDENTIAL AND WILL NOT BE SHAI	RED. DW-29 REV / DK-00

OWNER WARRANTY REGISTRATION CARD Figure 2

(2)The Limited Warranty Statement Card, (Figure 3), which lists the manufacturer's obligation to the original purchaser.



LIMITED WARRANTY STATEMENT CARD Figure 3

(3) The Certificate of Calibration

Each new unit and re-certified unit is delivered with a Certificate of Calibration that shows the date of the last calibration and when the next calibration is due. It certifies the accuracy of the unit and lists the part number and serial number to which it applies.

56-101-01180-C **INTRO**



3. RECERTIFICATION

The Test Set P/N 101-01180 has a one-year recertification requirement. Qualified technicians in a shop equipped with the necessary tooling and facilities must perform the maintenance required by this unit.

INTRO



SECTION 1: DESCRIPTION

1. PURPOSE OF MANUAL

This publication contains the description, identification data and operating procedures for the PITOT-STATIC TEST SET, MODEL DPS400.

Manufactured by: Barfield (305) 871-3900

4101 N.W. 29 Street (800) 321-1039 Miami, FL 33142 U.S.A. (FAX) 305-871-5629

The DPS400 Pitot-Static Test Set meets the requirements of DOT Advisory Circular 43-203B and of FAR 91.411 for performing Altimeter and Static System Tests and Inspections.

2. **GENERAL DESCRIPTION**



DPS400 (Mod P) Digital Pitot Static Tester Figure 4

The DPS400 Pitot Static Test Set provides an accurate and convenient method of performing leak testing of aircraft pitot-static systems including air data computers and airspeed, altimeter, mach, vertical speed, engine pressure ratio, and manifold pressure indicators. The DPS400 is a microprocessor based pitot-static tester. It uses transducer technology combined with manually controlled ultra sensitive pneumatic regulators able to control altitude and airspeed very precisely.

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The DPS400 has a menu-driven, electronic control panel that simplifies the operation of the test set. Menu selectable items include: display units, programmable protection limits, and calibration/maintenance support. Protection limits are included in the test set to avoid damage to the aircraft systems or instruments to which it is connected. Limit protection is provided by computer actuated solenoid valves. The valve(s) are actuated to isolate the system under test from excessive vacuum or pressure being applied. The limit protection trip points are user or operator programmed using the display's menu system. These trip points provide protection for altitude, airspeed, rate of climb/decent and mach.

Separate internal pumps are provided to supply vacuum and pressure capable of achieving 55,000 ft and 6000 ft/min on a wide body aircraft. The test set readout and control circuits are powered from 115/230 VAC 50-400 Hz.

3. PHYSICAL DESCRIPTION

A. Carrying Case

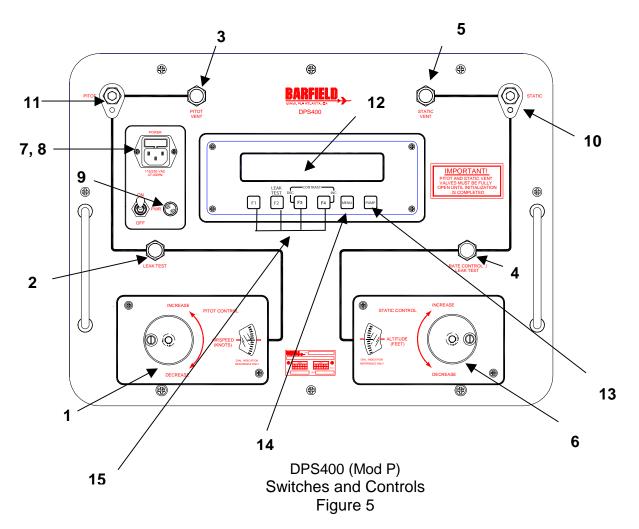
- (1) The carrying case is a fiberglass case comprised of upper and lower sections.
- (2) The lower section supports the panel assembly and external storage pouches (one on each side). The pouches provide storage for the hoses and adapters.
- (3) The upper section has sliding pin hinges for easy removal. The upper section is also fitted with a shelf suitable for storage of this manual and the power cable.

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B. <u>DPS400 Switches and Controls</u>

Note: For DPS400 units incorporating Mod G, Mod D, or for units before Mod D, refer to previous releases of the DPS400 Instruction manual.



(1) PITOT CONTROL Controls pitot system pressure to achieve simulated conditions for airspeeds between 0 Knots to 650 Knots.

(2) PITOT LEAK TEST Isolates the pitot system of the aircraft for leak tests.

(3) PITOT VENT Releases applied pitot system pressure to ambient atmosphere.

(4) STATIC RATE CONTROL/ Isolates the static system of the aircraft for leaks tests, and controls the rate of change of static pressures.



INSTRUCTION MANUAL DPS400

(5)	STATIC V	'ENT	Releases applied static system pressure, allowing tester to return to ambient atmospheric pressure.		
(6)	STATIC C	CONTROL	Controls Static system pressure to simulate the barometric conditions for altitudes between -1000 Feet and 55,000 Feet.		
(7)	POWER	CONNECTOR	Connects external power to the tester. The current Mod P, uses either a standard 115 VAC plug or a cable for operator installation of a plug.		
(8)	FUSE		Protects external power source		
(9)	POWER SWITCH		Applies power to the tester.		
	Note:	The Power switch PITOT VENT valv	h must be turned on only after opening both STATIC and ves.		
(10)	STATIC F	PORT	Connects the aircraft static system to the tester.		
(11)	PITOT PORT		Connects the aircraft pitot system to the tester.		
(12)	PANEL DISPLAY		Shows measured data, programmable limits, and calibration information. Also used to enter programmed limits and set operating mode.		
(13)	s) PUMP key		Allows operator to turn Tester internal pressure/vacuum pumps on and off at anytime externally. (First key press, shows a "Caution" screen and instructs user to verify the Leak Test valves. The second key press turns pumps ON. If doing the Pitot Static Leak Test, PUMP key only functions if 100 knots have been developed.		
(14)	MENU key		When pressed accesses Main Menu functions such as changing limits or displayed units and performing calibrations		
(15)	FUNCTIC	N KEYS	Function keys (F1, F2, F2, F4) provide additional equipment controls such as displaying maximum programmed limits, adjusting display contrast, and activating Test Set Leak Test.		

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C. Hose Assembly and Adapters

- (1) The hose kit is included with each test set and includes the following items:
 - (a) A PITOT hose assembly is a 25 foot clear hose with **"red"** bands near each end and a self sealing quick disconnect for attachment to the test set pitot port. The aircraft hose end has an AN4 type fitting for connecting to a pitot port adapter.
 - (b) A STATIC hose assembly is a 25 foot clear hose with "blue" bands near each end and a self sealing quick disconnect for attachment to the test set static port. The aircraft hose end has an AN4 type fitting for connecting to a static port adapter.
 - (c) PITOT TUBE ADAPTER is a flexible expandable rubber tube used for connecting the pitot hose to an aircraft's pitot port.
- (2) STATIC PORT ADAPTER KIT is a universal adapter designed for connecting the static hose to the aircraft's static port.

Note:

The pitot and 2423F static adapters universally fit many aircraft but in some cases these adapters are not recommended or are inadequate. Barfield distributes high quality custom made pitot and static adapters for use on all general aviation, airline, helicopter and military aircraft. For information and Barfield order numbers, contact GSTE Sales Department.

D. Power Cables

(1) AC Power Cable.

Uses a common 3 prong IEC320-C13 AC power cable.

9' 10" Power Cable with standard 115 VAC Plug (Shipped with new units)

9' 10" Power Cable without a Plug.

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SECTION 2: SPECIFICATIONS AND CAPABILITIES

1. PHYSICAL DATA

A. <u>Height</u>: 11.3 in (28.7 cm)
B. <u>Width</u>: 18.0 in (45.7 cm)
C. <u>Depth</u>: 12.0 in (930.5 cm)
D. <u>Weight</u>: 54 lb (24.5 kg)

2. **SPECIFICATIONS**

A. <u>Altitude</u>: -1,000 to 55,000 ft

B. Airspeed: 20 to 650 knots

C. Rate of climb: 0 to \pm 20,000 ft/min.

D. <u>Mach</u>: 0.1 to 3.5

E. Ps channel: 0.8 inHg -to- 32 in Hg

absolute (static port)

F. Pt channel: 0.8 inHg -to- 77 inHg

G. <u>EPR</u>: 1.00 -to- 3.00

3. ACCURACY

A. <u>Altitude</u>: ± 4 ft at sea level

± 12 ft at 35,000 ft ± 20 ft at 50,000 ft

B. <u>Airspeed</u>: 50 to 200 kts (±1.0 kts)

200 to 650 kts (± 0.5 kts)

C. Rate of Climb: \pm 1% of Reading

D. Mach: ± 0.001 mach above 0.10 mach

E. EPR: ± 1 count of display

F. Stability: 0.01% of Range/Year (Max)



4. OPERATING TEMPERATURE RANGE

0 to 50°C. (32 TO 122°F)

5. **DISPLAY UNITS**

A. Airspeed: knots, km/hrB. Altitude:feet, meters

C. Mach: mach

D. Rate of Climb: feet/min, meters/min

E. EPR: Ratio (Pt/Ps), Pt & Ps: in Hg, mb, psia

6. PRESSURE MEDIA

Pressure and vacuum are generated by two separate internal pumps.

7. TRANSDUCERS

Latest technology transducers with highest accuracy and stability commercially available.

8. <u>INPUT POWER</u>

115/230 VAC 47-400 Hz



SECTION 3: THEORY OF OPERATION

1. PRESSURE/VACUUM REQUIREMENTS

The internal pressure pump is capable of producing a pressure of 20 psi. The vacuum pump can supply 26 inches Hg. in systems with high volumes.

2. REGULATOR/CONTROL VALVE OPERATION

The static system pressure is controlled by an absolute pressure regulator. The pitot system pressure is controlled by a true differential regulator that senses the pressure on the static and pitot ports of the tester. There are also two metering valves that isolate the pitot/static systems for leak checks and are used for rate control.

3. POWER SUPPLY CIRCUITS

The DPS400 can be powered from 115/230 VAC 47-400 Hz.. On MOD G units and later, the power supply detects the incoming voltage 115 or 230 VAC automatically. No switches or jumpers are needed. 28 VDC operations are NOT available on MOD G units or later.

On units before MOD G, the unit can also be powered from 28 VDC. On these units, the power cable connector has internal jumpers, which determine the required operating voltage (115 VAC, 230 VAC or 28 VDC).

4. PROTECTION CIRCUITS

The aircraft systems are protected against excessive rates and pressures by several failsafe solenoid and check valves. Solenoid valve actuation is controlled by programmable limits set by the operator on the control panel.

When the actual airspeed, altitude, or VSI approaches the protection limit programmed by the operator, an asterisk appears next to the affected parameter on the display and warns the operator that a limit is about to be exceeded. If no corrective action is taken and the limit is reached, the solenoid valves actuate and isolate the aircraft systems from the tester. Asterisks change to double asterisks to indicate protection limits have been reached, and the message "Limit(s) Exceeded F1 to Continue" displays. Negative airspeed and negative altitude protection limits are not programmable by the operator and are set to -30 kts and -1,800 ft. When any of these two limits are exceeded, two asterisks immediately appear next to the exceeded parameter and the protection circuits trip. A negative airspeed trip is indicated by an airspeed reading of 0 kts with two asterisks.

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The operation of the solenoid valves can be summarized as follows:

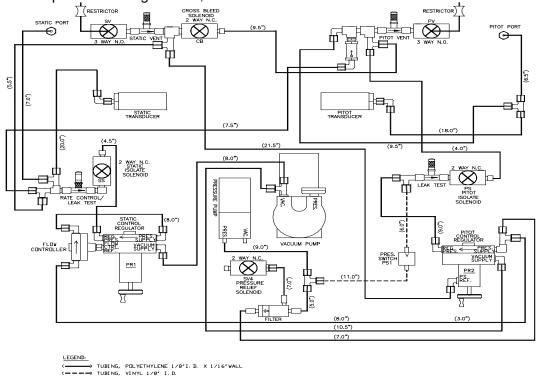
Limit Exceedance	Deviation From Programmed Limit	Solenoid Valves Actuated
Altitude	± 1000 ft, 350 m	SV1A, SV1B
Airspeed	± 50 kts, 100 km/hr	SV1A, SV1B, SV3A
VSI	± 500 ft/min, 150 m/min	SV1A, SV1B, SV2A, SV2B
Mach	± 0.2 mach	SV1A, SV1B, SV3A

Note: It is imperative that the operator monitors the displayed parameters closely to avoid excessive differential pressures between the test set and the aircraft systems once the solenoid isolation valves are actuated. Refer to Operations paragraph D.

PROTECTION CIRCUIT RESET INSTRUCTIONS of this manual for instructions on how to equalize static/pitot system pressures and return them to ambient after the protection circuits have tripped.

5. PNEUMATIC SCHEMATIC DIAGRAM

Figure 6 shows the internal pneumatic connections of the most recent production DPS400 Mod P. For previous configurations, refer to earlier revisions of this instruction manual.



PNEUMATIC DIAGRAM Figure 6

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SECTION 4: OPERATION

1. GENERAL

The user should become familiar with the DPS400 Test Set before attempting any test. The procedures described in this manual are not intended to replace the specifications of the airframe nor the instrument manufacturer. Particular attention should be given to preliminary setup procedures to avoid erroneous test results and the possibility of tripping the protection circuits of the tester. Strict adherence to the procedures for returning the test set and aircraft systems to ambient pressure are advised to safeguard the sensitive instruments in the aircraft from conditions such as negative airspeed and over pressurization.

<u>Caution</u>: Do not use unnecessary force to adjust any test set metering valve. Positive

stop spacers have been installed on all metering valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the

knob on the pressure regulators.

Note: The term "ambient" will occur frequently in these instructions. It refers to the existing

atmospheric pressure in the area where the test is being performed.

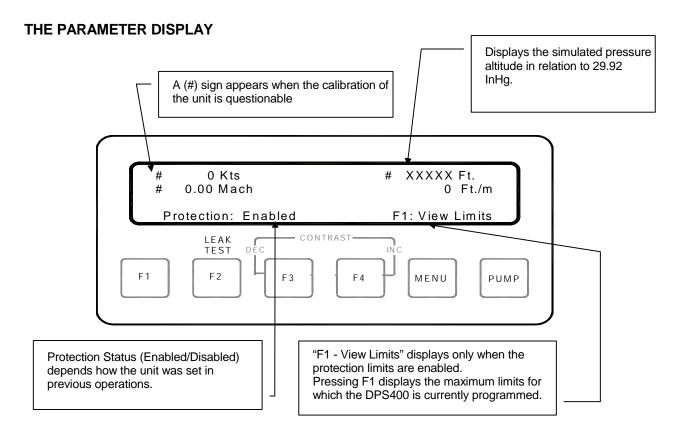
Each test set is completely calibrated and tested before shipment. To ensure the integrity of the tests, the tester should be leak checked before each use.

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2. CONTROL PANEL INSTRUCTIONS

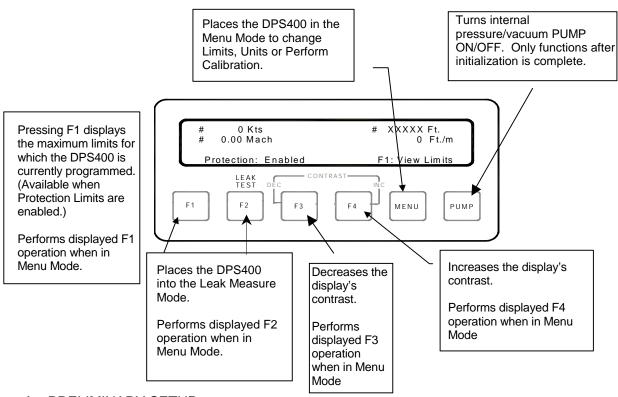
The DPS400 is equipped with an easy-to-use menu system designed to assist the technician during setup and testing. After initialization, the DPS400 shows the parameter display:





FUNCTION KEYS (F1, F2, F3, F4)

The LEAK TEST and MENU keys are functional under normal operation. Test set display CONTRAST may be adjusted using the **F3** (decreasing) and **F4** (increasing) function keys during normal operation. During power-up initialization or while in the MENU mode, the MENU key must be pressed in while pressing **F3** or **F4** at the same time to adjust the contrast. Certain functions (described below pushbuttons **F1** through **F4**) are only available when the DPS400 is in MENU or LEAK TEST modes.



A. PRELIMINARY SETUP

(1) Set tester as follows for initial valve positions for storage and initial power on.

(a)	Leak Test	Closed
(b)	Rate Control/Leak Test	Closed
(c)	Pitot Vent	Open
(d)	Static Vent	Open
(e)	Pitot Control	≈ 100 knots
(f)	Static Control	≈ Field Elevation

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INSTRUCTION MANUAL DPS400

Caution:

Do not use unnecessary force to adjust any test set valve. Positive stop spacers have been installed on all metering valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the knob on the pressure regulators.

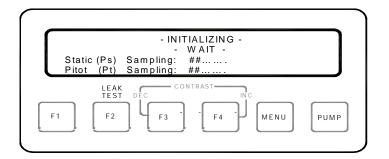
Note:

It is imperative that the PITOT VENT, STATIC VENT valves be fully opened before turning power on to prevent the auto-zero error correcting circuits from malfunctioning. Wait until the initialization is finished before closing these valves.

Note:

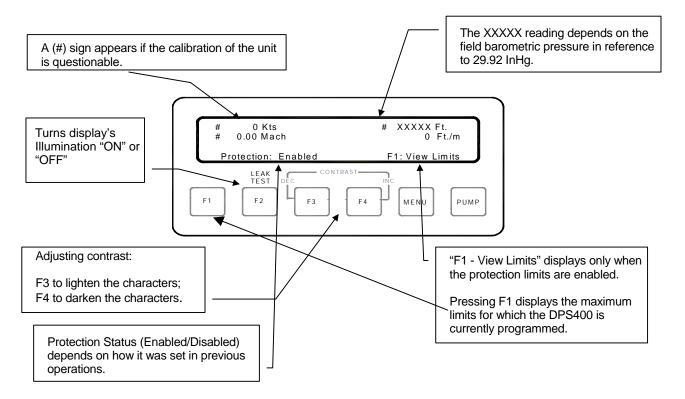
If the unit loses power or is powered off while at elevated altitude or airspeed, <u>DO NOT OPEN</u> the PITOT VENT or STATIC VENT valves before powering ON the test set. The test set can be powered on without venting to ambient in these circumstances. The only detriment being the airspeed accuracy at very low airspeeds (below 50 kts) may suffer.

(2) Set Power switch to ON. The following screen appears:





When initialization finishes, the **PARAMETER DISPLAY** appears:



B. <u>SETTING THE DISPLAYED UNITS</u>

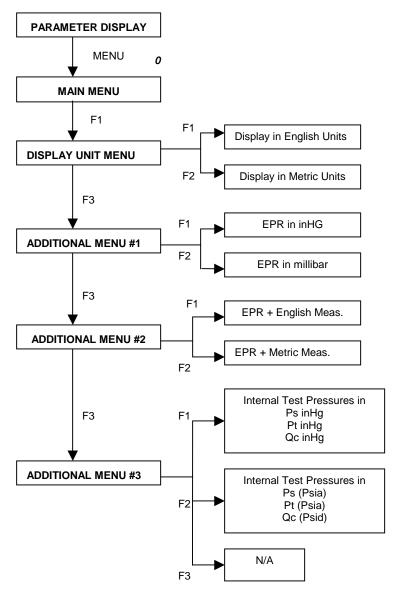
The DPS400 may be configured to display the altitude and airspeed data using either the Metric (M, Km/min), or English (ft, ft/min) system of measurement. Other options include:

- Displaying the Engine Pressure Ratio (EPR) in inches of mercury (inHg), millibars (mb), or pounds per square inch absolute (psia).
- Displaying the EPR with the altitude and airspeed in Metric or English measurements.
- Displaying the internal pressures (Pt, Ps, and Qc) of the tester in psia (pounds).

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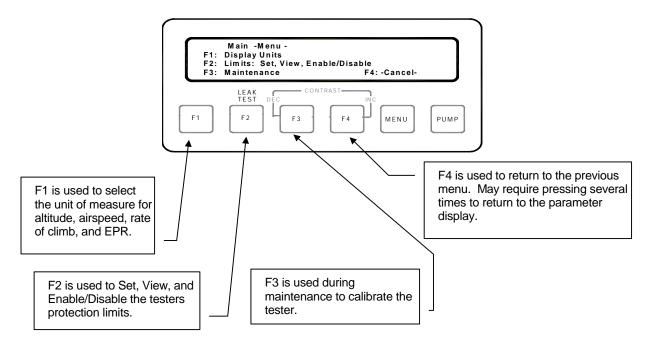
The following flow diagram (Figure 7) shows the path to change the displayed units of measure using the menus:



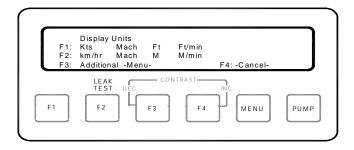
DISPLAY UNITS FLOWCHART Figure 7



(1) Press the MENU button. The Main menu appears:



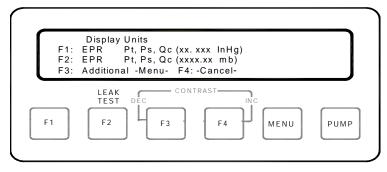
(2) To change the displayed unit of measure, press (**F1**) to select Display Units. The **DISPLAY UNITS** menu appears:



- **F1** sets altitude to feet, airspeed to knots, and rate of climb to feet/min.
- **F2** sets altitude to meters, airspeed to km/hr, and rate of climb to meters/min.
- **F3** is used to scroll to the other pressure units such as inches of mercury, millibar, or psi or setting the units up for EPR tests.
- **F4** is used to return to the previous screen (-Main Menu-).

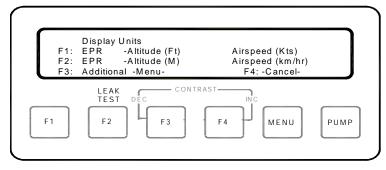


When **F3** is pressed, the second Display Units Menu appears:



- **F1** displays the EPR data in the English system (inHg).
- **F2** displays the EPR data in the Metric system (mb).
- **F3** displays the third Display Units menu to set up unit for EPR data displayed in ft and knots or meter and km/hr or continue to Psia.
- **F4** is used to return to the previous menu (first Display Units). Press 2-times to return to the -Main Menu-.

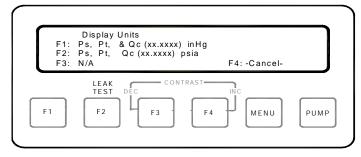
When **F3** is pressed again, the third Display Units Menu appears:



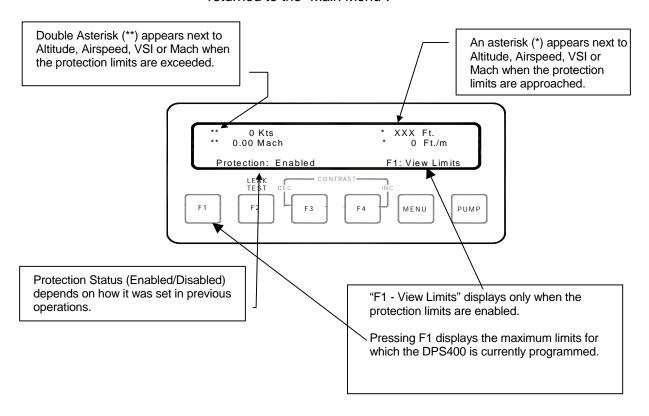
- F1 displays EPR data in feet and knots
- **F2** displays EPR data in meters and km/hr.
- **F3** displays the fourth Display Units menu to set up the unit to display in inHg or Psi (absolute).
- **F4** is used to return to the previous menu (second Display Units). Press three times to return to the -Main Menu-.



Press **F3** again, the fourth Display Units Menu appears:



- F1 Pt, Ps and Qc are displayed in units of inHg
- **F2** Pt and Ps displayed in units of psi (absolute) and Qc in psi (differential).
- **F3** Not Applicable
- **F4** Returns user to previous menu (third Display Units). Press **F4** until returned to the -Main Menu-.



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C. <u>SETTING THE PROTECTION LIMITS</u>

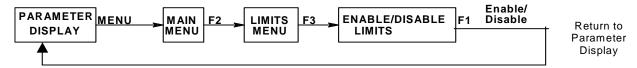
The protection limits feature of the DPS400 enable a technician to safeguard the sensitive pressure sensing devices aboard the aircraft from damage. The protection limits shield the aircraft from times when the technician could generate conditions of over pressurization, excessive vertical speed, negative altitude, or excessive mach speed.

The DPS400 protective limits may also be disabled. The protective limits should always be enabled when the test set is being used for aircraft testing, but can be disabled when leak checking only the tester and hoses.

Note:

While leak checking the tester and hoses, the limits may be disabled because the transducers used in the DPS400 are damage resistant. (The typical conditions that cause damage to an aneroid instrument do not affect the DPS400 components.)

The following flowchart (Figure 8) shows the process through the menus needed to enable/disable the protective limits feature.



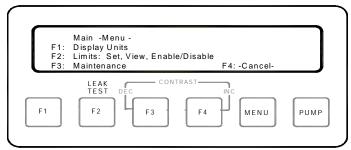
NOTE: F4 Button Returns Display to the Previous

ENABLE/DISABLE FLOWCHART Figure 8

(1) Enable/Disable Protection Limits

The following procedures describe how to enable/disable or set values for the DPS400 protection limits.

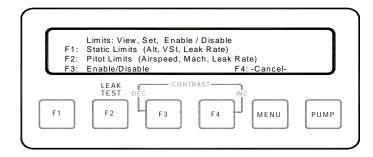
(a) To begin enabling/disabling the limits, press the MENU pushbutton. The Main menu appears:



F2 is used to set the protection limits for all parameters or to enable/disable limit protection.

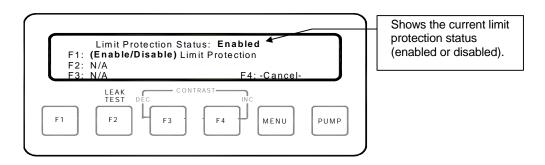


- **F4** is used to return to the previous menu. Press once to return to the previous screen (parameter display).
- (b) Press F2 to set the PITOT and STATIC protection limits or to enable/disable protection limits. The following LIMITS VIEW, SET, ENABLE/DISABLE menu appears:



Note: Protection values are stored in non-volatile memory, and the values displayed are those set in previous operations. It is recommended that the operator <u>always</u> set their desired protection limits and insure the protection limits are enabled <u>before</u> use on an aircraft or pressure sensitive equipment.

(c) Press **F3** To change protection limits status. The **LIMIT ENABLE/DISABLE** menu appears:



(d) Press **F1** to change the status of the current Limit Protection parameters. (Once changed, the display returns to the parameter display.)

Note: Do <u>not</u> press **F1** if you do not wish to change the status. Press **F4** until returned to the parameter display menu without changing status.

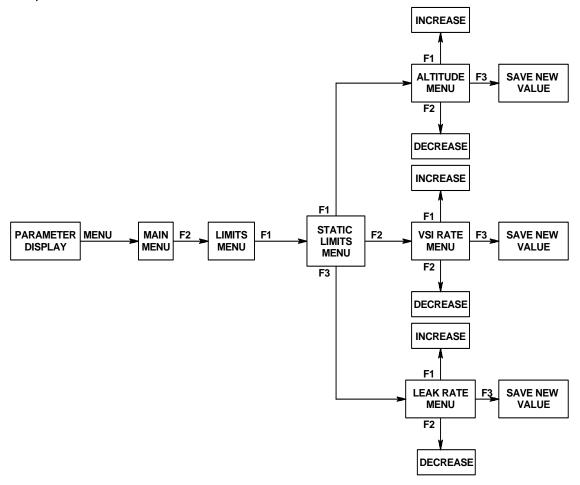
(e) Verify that Protection Status and Display Units are set to the required limits; then perform normal testing.

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(2) Setting Static Port Limits

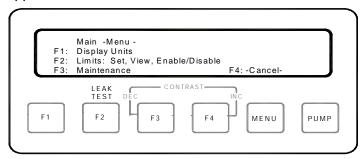
The Static Port limits include limits for Altitude, Vertical Speed (VSI), and Leak Rate. The following flow diagram (Figure 9) shows the process through the menus needed to set the static port limits.



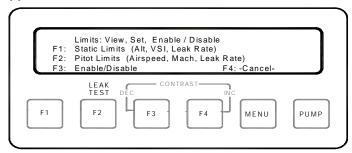
STATIC PORT LIMITS FLOWCHART Figure 9



(a) To set the Static Port limits, press the MENU switch. The Main menu appears:

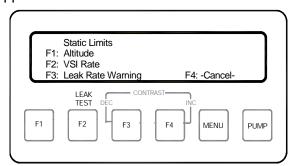


b) Press **F2** to set the pitot or static protection limits. The following Limits menu appears:



Note: Protection values are stored in non-volatile memory, and the values displayed are those set in previous operations. It is recommended that the operator <u>always</u> set the desired protection limits and enable the protection circuits <u>before</u> each use.

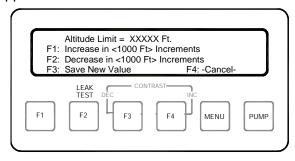
(c) Press **F1** to set static port protection limits. The following Static Limits menu appears:



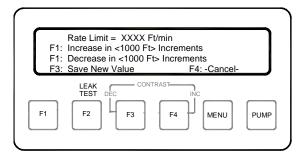
- **F1** sets the altitude protection limits.
- **F2** sets the rate of climb/descent (VSI) limits.
- **F3** sets the Leak Rate limits during Leak Testing.
- **F4** to return to previous menu.



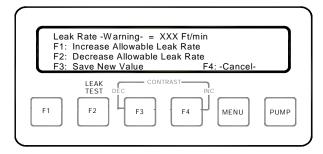
(d) To change the limits, press F1 for Altitude, F2 for Rate protection limits or F3 to set the Leak Rate limits. One of the following Altitude/Rate Limit menus appears:



F1 = Altitude Limit Menu



F2 = Rate Limit Menu



F3 = Leak Rate Limit Menu

Note: XXXXX and XXXX represents the values set by the previous operator.

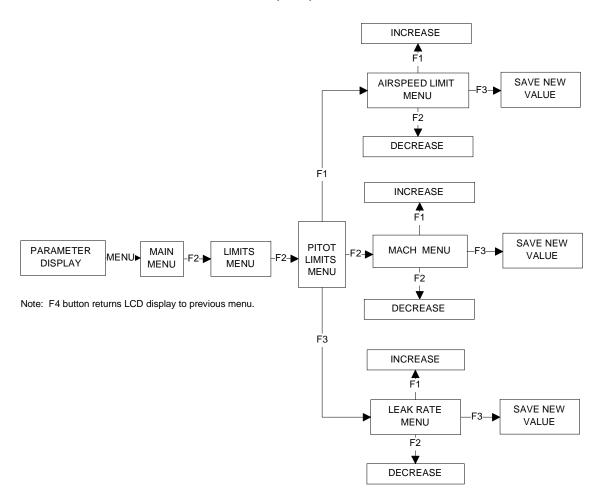
- **F1** increases and **F2** decreases the Altitude or Rate Limits in 1000 Ft increments or Leak Rate Limits by 50 Ft/min. To scroll up/down quickly, press and hold **F1** or **F2** pushbuttons.
- Press F4 to return to the STATIC LIMITS Menu without saving any changes.



- Once the desired Altitude or Rate protection limit is reached (as indicated in the display) press F3 to store the new value. The display automatically returns to the STATIC Limits menu after saving the limit value.
- (e) Press F4 until returned to the parameter display.

(3) Setting Pitot Port Limits

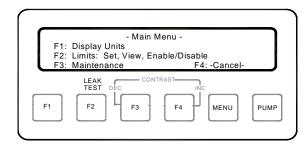
The Pitot Port limits includes a maximum airspeed and a zero minimum airspeed and Mach limits. The following flow chart (Figure 10) shows the process through the menus needed to set the pitot port limits.



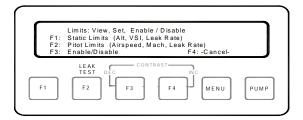
PITOT PORT LIMITS FLOWCHART Figure 10



(a) To begin setting the Pitot Port limits, press the MENU pushbutton. The Main menu appears:

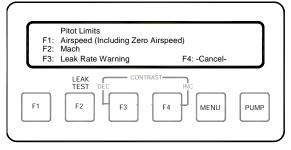


(b) Press **F2** to set the pitot (or static) protection limits. The Limits menu appears:



Note: Protection values are stored in non-volatile memory, and the values displayed are those set in previous operations. It is recommended that the operator <u>always</u> set their desired protection limits and enable the protection circuits before each use.

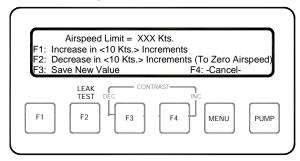
(c) Press **F2** to set the Pitot Port protection limits. The Pitot Limits menu appears:



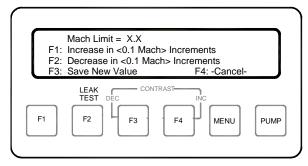
- F1 sets the Airspeed protection limits.
- **F2** sets the Mach protection limits.
- **F3** sets the Leak Rate Warning.
- **F4** is used to return to the previous menu.



(d) To change the limits, press **F1** for airspeed or **F2** for Mach protection limits. One of the following Airspeed/Mach Limit menus appears:



F1 = Airspeed Limit Menu



F2 = Mach Limit Menu

Note: XXX or X.X represents values set by previous operator.

 F1 increases and F2 decreases the Airspeed Limits in 10 kt increments, or the Mach Limit in 0.1 increments. To scroll up/down quickly, keep the F1 or F2 button pressed.

Note: Press **F4** to return to the pitot limits Menu without saving any changes.

 Once the desired Airspeed or Mach protection limit is reached (as indicated in the display) press F3 to store the new value. After saving the limit value, the display automatically returns to Pitot Limits menu.

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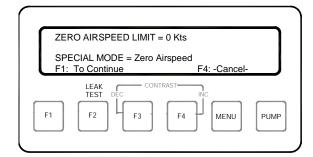


(e) Pitot Limits to Zero Airspeed (To set Airspeed to zero see previous section, Setting Pitot Limits)

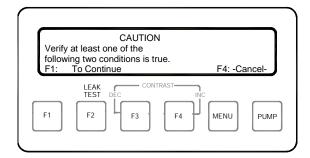
Note: The pneumatic regulators in previous versions of the DPS400 were unable to achieve zero airspeed (0 kts or 0.0 inHg differential pressure) at high altitudes. The user interface/control of the crossbleed solenoid valve was modified to ensure against operator damage to the instrument of aircraft-under-test while zero airspeed is set.

<u>Caution</u>: Set pumps to ON. Maintain pumps ON when setting zero airspeed or while testing with the zero airspeed special mode. (If pumps are turned OFF during zero airspeed testing, use **F4** to cancel out of special zero airspeed mode.)

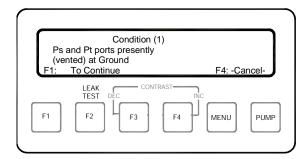
If 0 (zero) airspeed is set, the DPS400 shows the following screens::



• Press **F1** to continue. The following screen appears:



• Press **F1** again. The next screen appears



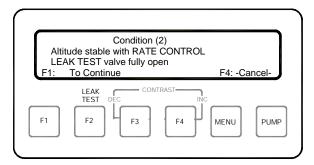
• Press **F1** to continue; (**F4** to cancel and return to the previous screen)

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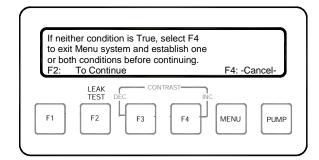
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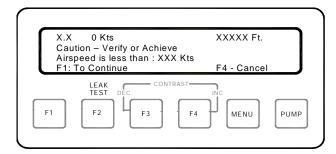
• If **F1** is pressed, the following display appears:



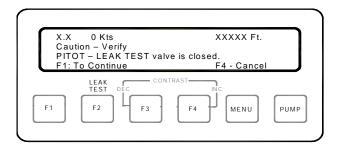
Press F1 one more time and the following screen appears:



- Press **F4** to cancel and return to parameter screen, or
- Press F2; the following screen appears:

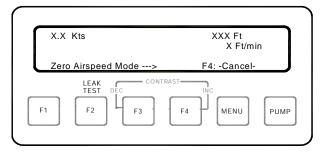


Press F1 to continue (or F4 to return to the previous screen)

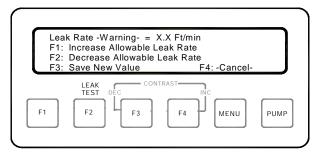




 Press F1 once more to confirm setting zero airspeed. The DPS400 shows the following screen:



- Press **F4** until the display shows the parameter screen.
- f) To change the Leak Rate limits at the Pitot Limits screen, press **F3**. The Leak Rate limits menu appears:



F3 = Leak Rate Limit Menu

Note: X.X represents values set by previous operator.

- **F1** increases and **F2** decreases the Leak Rate Limits by 50 ft/min. To scroll up/down quickly, press and hold in the **F1** or **F2** button.
- Press **F4** to return to the Pitot Limits Menu without saving any changes.
- Once the desired Rate protection limit is reached (as shown on the display) press F3 to store the new value. After saving the limit value, the display automatically returns to Pitot Limits menu.
- Press F4 until returned to the parameter screen.



D. PROTECTION CIRCUIT RESET INSTRUCTIONS

- (1) Altitude Limits Exceedance
 - (a) Close static RATE CONTROL/LEAK TEST and pitot LEAK TEST valves fully.

<u>Caution</u>: Do not use unnecessary force to adjust set valve. Positive stop

spacers have been installed on all needle valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob setscrew and result in valve damage. Use the same caution applies when using the knob on

the pressure regulators.

(b) Open the STATIC VENT valve slowly until the displayed altitude is 2000 feet below the programmed limit, then close STATIC VENT valve. Readjust the static regulator to a value 1000 ft below the programmed altitude limit.

<u>Caution</u>: Do not exceed programmed VSI rates while venting the system or the VSI rate protection circuit will trip.

- (c) Press **F4**. The message "Limit Exceeded F4:-RESET-" replaces the message "Protection Enabled F1: View Limits" and the protection circuit resets.
- (d) If a higher altitude is desired, reprogram the altitude limits and continue with normal testing.
- (e) Readjust the STATIC CONTROL to an altitude within the programmed altitude limit.
- (f) Slowly reopen the static RATE CONTROL/LEAK TEST valve. Do not exceed programmed VSI limits. Continue with normal testing.
- (2) VSI Rate Limit Exceedance
 - (a) Close the static RATE CONTROL/LEAK TEST valve fully.
 - (b) Allow the VSI rate to drop below the programmed limit. Press **F4**. The message "Limit Exceeded, F4:-RESET-" replaces the message "Protection Enabled F1: View Limits" and the protection circuits resets.

Note: The display will show variations of altitude and VSI <u>after</u> the protection circuits have tripped due to pressure transients. This is a result of the instantaneous readings sensed by the transducers (which respond much quicker than analog instruments) and do not affect the aircraft systems to which the tester is connected. Once the protection systems are tripped, the aircraft systems remain fully

isolated until they are reset by the operator.

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- (c) Slowly reopen the static RATE CONTROL/LEAK TEST valve. Do not exceed programmed VSI limits.
- (d) Continue test as required.
- (3) Airspeed/Mach Limit Exceedance
 - (a) Close static RATE CONTROL/LEAK TEST and pitot LEAK TEST valves.
 - (b) Readjust the PITOT CONTROL for a dial reading 50 kts below the programmed limits and then open pitot LEAK TEST valve fully.
 - (c) Allow the Airspeed/Mach to go below the programmed limit. Press **F4**. The message "Limit Exceeded, F4:-RESET-" replaces the message "Protection Enabled F1: View Limits" and the protection circuits reset.
 - (d) If a higher airspeed is necessary, reprogram the Airspeed or Mach limits.
 - (e) Slowly reopen static RATE CONTROL/LEAK TEST valve and perform normal testing.

E. DISPLAYING FIRMWARE VERSION

Upon power up the DPS400 displays the current firmware version. However, it may be necessary to display the current firmware version during the tester's normal operation. To display the DPS400's current firmware version after initializing has been completed, do the following:

- (1) If necessary, press **F4** until returned to the parameter display.
- (2) Press Menu pushbutton.
- (3) Press **F3** (Maintenance).
- (4) Press **F1** (Level-1).
- (5) Press **F3** (Additional menu) three times until the Maintenance (Level 1) screen showing a Display Config / Firmware Version option appears.
- (6) Press **F1** to show firmware version. (The DPS400 shows the Firmware version and its release date.)
- (7) Press **F4** until returned to the parameter display.



The following flowchart (Figure 11) shows the sequence of menus needed to display the firmware version:



NOTE: F4 Button Returns Display to the Previous

FIRMWARE FLOWCHART Figure 11

3. LEAK CHECKING THE TESTER

Each Test Set is completely calibrated and tested before shipment, but to ensure the integrity of the sensitive tests to be made, the pretests of this section should be performed immediately before each use of the DPS400.

A. Preliminary Setup

(1) Initial Valve Position for Test Set Leak Check

(a)	Leak Test	Closed
(b)	Rate Control/Leak Test	Closed
(c)	Pitot Vent	Open
(d)	Static Vent	Open
(e)	Pitot Control	≈ 100 knots
(f)	Static Control	≈ Field Elevation

Note: Do not over tighten the valves. A light pressure is necessary to completely open or close the valves supplied with the DPS400 or other Barfield Pitot-Static testers.

- (2) Insure hoses are connected to the PITOT port and STATIC port of the test set and that the hose connections make a good seal. If the connectors on the aircraft side of the hoses are not quick disconnect or self-sealing, then a tight sealing plug should be used to seal the hose assembly. This is necessary to test the leakage of the hoses as well as the tester. This is the ideal leak test to determine the condition of the tester and hoses together. If a sealing plug is not available, then leak test the DPS400 without the hoses connected.
- (3) If not already connected, connect the power cable, the STATIC (blue band) hose and PITOT (red band) hose to the test set.

Note: The quick connect ports on the test set and mating hoses are *color-coded* and keyed to help prevent accidental crossing of Pitot and Static hoses.



(4) Set the POWER switch to ON. The power indicator illuminates. Wait until initialization completes (indicated when the parameter display appears).

The Protection limits may be disabled during the DPS400 Leak tests to reduce the time necessary to check the condition of the test set and, because the transducers used in the test set are resistant to damage typically affecting Aneroid Instruments. The DPS400 Protection Limits must be enabled anytime the tester is connected to the aircraft. The protection limits ensure that no damage to the aircraft's Pitot-Static systems occurs during testing.

B. Static Leak Checks

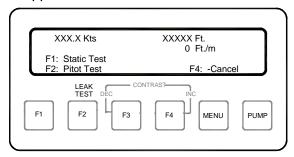
- (1) Close the STATIC and PITOT vents.
- (2) Slowly open the LEAK TEST valve. Verify the airspeed increases to approximately 100 knots. Set the PITOT CONTROL to 100 knots).
- (3) When airspeed reaches approximately 100 knots, open the LEAK TEST valve fully. Allow the differential regulator to maintain the airspeed at its present level.
- (4) Turn the STATIC CONTROL knob to 20,000 feet. Slowly open the RATE CONTROL/LEAK TEST valve until the XXXXX ft. is approximately 20,000 ft. Use the STATIC CONTROL knob to fine tune the altitude close to 20,000 ft. Close the RATE CONTROL/LEAK TEST valve.

Note:

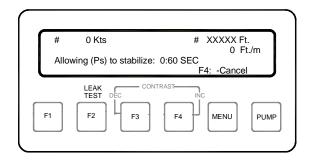
If the Limit Protection feature of the DPS400 is enabled, the technician must maintain a lower VSI Rate then programmed. If the VSI or any other limit is exceeded during the leak test, then the testers Limit Protection feature will trip and stop the flow of pressure between the pump and the output ports. Since the tester is designed with solid-state transducers and not susceptible to the damage that commonly happens to analog instruments, the protection limits may be disabled during the tester leak test.



(5) To begin the Static Leak test, press the Leak Test Button (**F2**). The following Leak Test Mode menu appears:



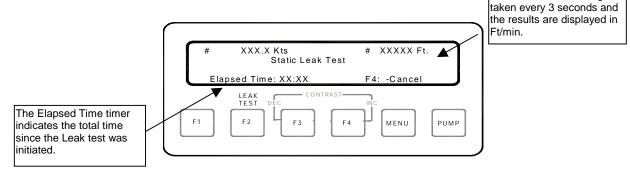
- (6) The XXX Kts and XXXXX Ft. indications are the airspeed and altitude from which the leak test was started.
- (7) Press **F1** for a Static Leak Check. The following display appears:



Note: Do <u>not</u> press **F1** until ready to do the Leak Check. As soon as **F1** is pressed, the screen above appears with a 60-second countdown timer that allows time for stabilization of the static pressure. The actual leak check measurement is started when the timer completes the 60-second stabilization time.

(8) After the 60 seconds stabilization time elapses, the Static Leak Test screen appears to indicate the start of the actual leak test.

The Static Leak reading is





- (9) Allow the test set elapsed time to reach approximately 2.00 min or more. Record the leak rate of the tester and hoses so it may be deducted from the aircraft leak rate. Verify the test set has a leak rate of 50 feet/min or less. If the leak rate is greater than 50 ft/min, remove the hoses from the test set and repeat the Static Leak Test. (Repeating this procedure isolates the Test Set from the hoses.) If the test set passes the procedure, the leak is located in the static hose or connector. To correct the problem, repair or replace the hoses or connectors. A repeated failure of the test set means the leak is within the test set. In this case, it is recommended that the test set be sent to the manufacturer for repair.
- (10) Press **F4** to cancel the leak check at any time during the procedure. Press **F4** to return to the parameter display.
- (11) Return the STATIC CONTROL to approximately field elevation altitude. Do not exceed the programmed limit of the VSI. Slowly open the RATE CONTROL / LEAK TEST (returning the aircraft static system to field elevation). Close the RATE CONTROL/LEAK TEST valve. Slowly open the STATIC VENT valve to return the static system to ambient pressure.
- (12) Close the LEAK TEST valve. Slowly open the PITOT VENT to bleed the pressure from the system.
- (13) Before turning power off, configure the Tester as follows:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control \approx 100 knotsStatic Control \approx Field Elevation

C. Pitot Leak Checks

(1) <u>Close</u> the PITOT VENT valve but leave the STATIC VENT valve <u>open</u> to ambient pressure.

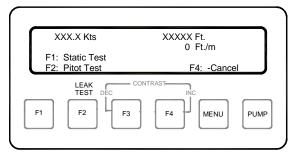
Caution:

Do not use unnecessary force to adjust any test set valve. Positive stop spacers have been installed on all needle valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the knob on the pressure regulators.

(2) Turn the PITOT CONTROL knob to 300 knots. Slowly open the LEAK TEST valve until the XXX Kts displays (approximately 300 kts). Use the PITOT CONTROL knob to fine-tune the airspeed to about 300 kts. <u>Close the LEAK TEST valve</u>.

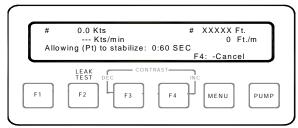


(3) To begin the Pitot Leak test at the parameter screen, press the Leak Test Button (**F2**). The following Leak Test Mode menu appears:



Note: The XXX Kts and XXXXX Ft. indications are the airspeed and altitude from which the leaks test was started.

(4) Press **F2** for a Pitot Leak Check. The following menu appears and the message: "**Minumum Airspeed of 100 Knots Required**" flashes:

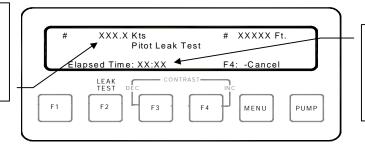


Note:

Do <u>not</u> press **F2** until ready to do the Leak Check. As soon as **F2** is pressed, the screen above appears with a 15 second countdown timer and allows time for stabilization of the pitot pressure. The actual leak check measurement starts when the timer completes the 15-second stabilization time.

(6) After the 15 seconds stabilization time elapses, the Pitot Leak Test screen appears indicating the start of the actual leak test.

A Pitot Leak reading is taken every 3 seconds. The results are displayed in kts/min.



timer indicates the total time since the Leak test was initiated.

The elapsed



- (7) Allow the test set elapsed time to reach approximately 1.00 min or more. Record the leak rate of the tester and hoses. Verify the test set must have a leak rate of 2 kts/min or less. If the leak rate is greater than 2 kts/min, remove the hoses from the test set and repeat the Pitot Leak Test. Repeating this procedure isolates the Test Set from the hoses. If the test set passes the test, the leak is located in the Pitot hose or connector. To correct the problem, repair or replace the hoses or connectors. A repeated failure of the test set shows that the leak is contained within the test set. In this case, it is recommended that the test set be sent to the manufacturer for repair.
- (8) Press **F4** to cancel the leak check at any time during the procedure. Press the **F4** button to return to the parameter display screen.
- (9) When testing is complete, set the PITOT CONTROL for airspeed of 100 knots.
- (10) Record the tester/hose leak rate so it may be deducted from the aircraft leak rate.
- (11) Slowly open the LEAK TEST valve. Verify the airspeed increases or decreases to approximately 100 knots. Close the LEAK TEST valve.
- (12) Slowly open the PITOT VENT until the airspeed reaches 0 knots.
- (13) Configure the Tester as follows before removing power:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control \approx 100 knotsStatic Control \approx Field Elevation

(14) If the DPS400 leak testing is complete, turn off power.

D. Applying Leak Correction

If the leak rate does not exceed 2 knots/min or 50 ft/min, record the leak rate of the test set and hoses so the values can be subtracted from the leak test of aircraft. The calculated value removes the leaks caused by the tester and hoses and isolates the leak rate of the aircraft systems.



4. AIRCRAFT TESTING

A. Preliminary Setup

(1) Verify the power switch is OFF,

(2) Set initial valve positions for the test set as follows:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control \approx 100 knotsStatic Control \approx Field Elevation

Note: Do not over tighten the valves. A light pressure is necessary to completely

open or close the valves supplied with the DPS400 or other Barfield Pitot-

Static testers.

(3) Connect the Power cable, the STATIC (blue band) hose and PITOT (red band) hose to the test set if not already connected.

<u>Note</u>: The quick connect ports on the test set and mating hoses are color coded and keyed to help prevent accidental crossing of Pitot and Static hoses.

- (4) Insure the Tester Leak Checks have been completed before connecting the tester to the aircraft systems.
- (5) Connect the PITOT PORT hose (Red Band) to the aircraft pitot system per the aircraft maintenance manual. Using the Barfield 2423F Static Port adapter or another manufacturer's custom aircraft static adapter, connect the STATIC PORT hose (Blue Band) to the aircraft static system per the aircraft maintenance manual.

Note: Some aircraft have more than one static port associated with a given static system. Make sure that other ports in the system being tested are sealed before going on.

- (6) Set the aircraft altimeter barometer to 29.92 in Hg.
- (7) Set the POWER switch to ON. (The power indicator illuminates.) Wait for the initialization to complete (indicated when the parameter display appears).
- (8) Program and enable the Altitude, Airspeed/Mach, and VSI limits on the test set.

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B. PITOT SYSTEM TEST

(1) Leak Test

<u>Caution</u>: Before pressurizing the aircraft Pitot and/or Static systems insure

Limit Protection is ENABLED and the Airspeed & Mach limits are set to the appropriate values. Make sure that the aircraft instrument limits

are not exceeded.

(a) Close the PITOT VENT valve and leave the STATIC VENT open to ambient pressure. Set the PITOT CONTROL to the required leak test airspeed

(typically 300 kts).

<u>Caution</u>: Do not use unnecessary force to adjust any test set valve. Positive

stop spacers have been installed on all metering valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the knob on the pressure regulators.

<u>Caution</u>: Should any later step fail, close the pitot LEAK TEST valve fully, then

slowly open the PITOT VENT valve to return system to ambient before

disconnecting test set.

(b) Observe the aircraft and test set airspeed indications while slowly opening the pitot LEAK TEST valve to the desired airspeed test point (typically 300 kts). Open the pitot LEAK TEST valve fully and readjust the PITOT CONTROL as needed to set the desired airspeed.

(c) Close the pitot LEAK TEST valve fully. Perform instructions listed in the Pitot Leak check.

(2) Airspeed Checks

<u>Caution</u>: Before pressurizing the aircraft Pitot and/or Static systems insure

Limit Protection is ENABLED and the Airspeed & Mach limits are set to the appropriate values. Make sure that the aircraft instrument limits

are not exceeded.

(a) Verify that the Tester Pitot Leak and the Aircraft Pitot System Leak checks) have been completed. Set the front panel controls as follows.

STATIC VENT valve Open
PITOT VENT valve Closed
PITOT LEAK TEST valve Closed
STATIC RATE CONTROL/LEAK TEST Closed

STATIC CONTROL Field elevation altitude

PITOT CONTROL 100 kts.



- (b) Set the PITOT CONTROL to the desired airspeed test point, then slowly open pitot LEAK TEST valve until the desired airspeed shows on the tester. Leave the pitot LEAK TEST valve fully open and adjust the PITOT CONTROL as required to set the desired airspeed.
- (c) Repeat the previous step (step (b) above) for all altitudes required. Always close the pitot LEAK TEST valve first; then adjust the PITOT CONTROL to the next airspeed. Reopen the pitot LEAK TEST valve slowly.

Note: If the protection circuits trip, reduce the airspeed below the programmed limit and reset the protection circuits (**F4**).

- (d) After finishing testing, close the LEAK TEST valve and set the PITOT CONTROL for airspeed of 100 knots.
- (e) Slowly open the LEAK TEST valve. Verify the airspeed increases or decreases to approximately 100 knots. Close the LEAK TEST valve.
- (f) Slowly open the PITOT VENT until the airspeed reaches 0 knots.
- (g) Configure the Tester as follows before turning power off:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control \approx 100 knotsStatic Control \approx Field Elevation

(h) Continue to the Static System Test, or if testing is complete, disconnect the Pitot and Static ports from the aircraft.

C. STATIC SYSTEM TEST

(1) Leak Test

Caution: Should any subsequent step fail, open the LEAK TEST valve and close

the static RATE CONTROL/LEAK TEST valve fully counterclockwise. Do not exceed the VSI rate. Slowly open the STATIC VENT valve to return the static system to ambient pressure. Close the LEAK TEST valve and slowly open the PITOT VENT until the airspeed reads 0 knots.

(a) Set the Tester in the following positions:

Leak Test Closed
Rate Control/Leak Test Closed
Pitot Vent Open

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Static Vent Open
Pitot Control \approx 100 knots
Static Control \approx Field Elevation

<u>Caution</u>: Before pressurizing the aircraft Pitot and/or Static systems

insure Limit Protection is ENABLED and the Airspeed & Mach limits are set to the appropriate values. Make sure that the

aircraft instrument limits are not exceeded.

(b) Close the STATIC and PITOT vents.

<u>Caution</u>: Do not use unnecessary force to adjust any test set valve.

Positive stop spacers have been installed on all needle valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the knob

on the pressure regulators.

(c) Slowly open the LEAK TEST valve. Verify the airspeed increases to approximately 100 knots. (Set PITOT CONTROL at 100 knots).

(d) When near the 100 knots airspeed, open the LEAK TEST valve fully to allow the differential regulator to maintain the airspeed at its present level.

Note: Disregard the test set airspeed indications during these tests.

Note: The Pitot LEAK TEST valve is opened to control the test set

pressures and protect the airspeed indicator from negative airspeed

conditions.

- (e) Turn the STATIC CONTROL knob to the required altitude (typically 20,000 feet).
- (f) Taking care not to exceed the programmed limit of VSI and altitude, slowly open the static RATE CONTROL/LEAK TEST valve until close to the desired altitude, then open the static RATE CONTROL/LEAK TEST valve fully and adjust STATIC CONTROL as required to trim to the desired altitude (typically 20,000 Ft).
- (g) Close the static RATE CONTROL/LEAK TEST valve fully.
- (h) Do the Static Leak Test following the instructions for the Tester Static Leak test.



(2) Altitude Checks

(a) Verify that Tester Static Leak and the Aircraft Static System Leak check have been completed. Set the front panel controls as follows:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control $\approx 100 \text{ knots}$ Static Control $\approx \text{Field Elevation}$

<u>Caution</u>: Before pressurizing the aircraft Pitot and/or Static systems

insure Limit Protection is ENABLED and the Airspeed & Mach limits are set to the appropriate values. Make sure that the

aircraft instrument limits are never exceeded.

(b) Close the STATIC and PITOT vents.

<u>Caution</u>: Do not use unnecessary force to adjust any test set valve.

Positive stop spacers have been installed on all needle valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the

vernier knobs on the pressure regulator.

- (c) Slowly open the LEAK TEST valve. Verify the airspeed increases to approximately 100 knots. (Set PITOT CONTROL to 100 knots).
- (d) When close to the 100 knot airspeed, open the LEAK TEST valve fully to allow the differential regulator to maintain the airspeed at its present level.

Note: Disregard the test set airspeed indications during these tests.

Note: The Pitot LEAK TEST valve is opened to equalize the test set pressures and to protect the airspeed indicator from negative

airspeed conditions.

(e) Set the STATIC CONTROL to the desired altitude. Do not exceed the altitude or VSI programmed limits. Slowly open static RATE CONTROL/LEAK TEST valve until desired altitude shows on the tester. Open the static RATE CONTROL/LEAK TEST valve fully and adjust STATIC CONTROL as needed to set the desired altitude.



(f) Repeat step (e) above for all altitudes required. Always close the static RATE CONTROL/LEAK TEST valve first, and then adjust the STATIC CONTROL to the next test altitude. Reopen the static RATE CONTROL/LEAK TEST valve slowly.

Note: If the altitude protection circuits trip, reduce altitude below the

programmed limit and reset protection circuits. If the VSI protection trips, wait until the test set VSI indicator reads zero, reset protection

circuits, and continue testing.

- (g) Set the STATIC CONTROL to approximately field elevation altitude.
- (h) Observe and maintain the VSI below programmed limits. Slowly open the RATE CONTROL/LEAK TEST to return the aircraft static system to field elevation.
- (i) Close the RATE CONTROL/LEAK TEST valve and slowly open the Static VENT valve to return the static system to ambient pressure.
- (j) Close the LEAK TEST valve and slowly open the PITOT VENT until the airspeed reaches 0 knots.
- (k) Configure the Tester as follows before turning power off:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control \approx 100 knotsStatic Control \approx Field Elevation

(I) Continue on to the Combined Pitot/Static Test or if testing is complete, disconnect the Pitot and Static ports from the aircraft.

D. COMBINED PITOT / STATIC TEST

(1) Combined Altitude/Airspeed Tests

Note: Always start tests at the lowest altitude and airspeed required. To prevent tripping the protection circuits, do not exceed the programmed rate limits while changing altitudes or airspeeds.

- (a) Verify that Tester Leak tests and the Aircraft System Leak have been completed.
- (b) Insure the aircraft altimeter is set to 29.92 inHg.



(c) Set the Tester controls in the following positions:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control \approx 100 knotsStatic Control \approx Field Elevation

<u>Caution</u>: Before pressurizing the aircraft Pitot and/or Static systems insure

Limit Protection is ENABLED and the Airspeed & Mach limits are set to the appropriate values. Make sure that the aircraft instrument limits

are not exceeded.

(d) Close the STATIC and PITOT vents.

<u>Caution</u>: Do not use unnecessary force to adjust any test set valve.

Positive stop spacers have been installed on all needle valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the

vernier knobs on the pressure regulator.

(e) Slowly open the LEAK TEST valve. Verify the airspeed increases to approximately 100 knots. (Set PITOT CONTROL to 100 knots).

(f) When approximately 100 knot airspeed, open the LEAK TEST valve fully to allow the differential regulator to maintain the airspeed at its present level.

Note: The Pitot LEAK TEST valve is opened during altitude changes to

control the test set pressures and protect the airspeed indicator from

negative airspeed conditions.

(g) Set the STATIC CONTROL to the desired altitude. Do not exceed the altitude or VSI programmed limits. Slowly open the static RATE CONTROL/LEAK TEST valve until the desired altitude shows on the tester. Open the static RATE CONTROL/LEAK TEST valve fully and adjust STATIC CONTROL as needed to set the desired altitude.

- (h) Close the static RATE CONTROL/LEAK TEST and pitot LEAK TEST valve fully.
- (i) Set the PITOT CONTROL to the desired airspeed test point. Slowly open pitot LEAK TEST valve until the tester approaches the desired airspeed, then open the pitot LEAK TEST valve fully and adjust PITOT CONTROL as required to set the desired airspeed.



- (j) Repeat the previous steps (g) through (i) for all the airspeed and altitude test points required. Always maintain the pitot LEAK TEST valve open while adjusting the altitude and adjusting the airspeed.
- (k) When testing is complete, set the PITOT CONTROL for airspeed of 100 knots.
- (I) Slowly open the LEAK TEST valve until it is fully open. Verify the airspeed increases or decreases to approximately 100 knots.
- (m) Close the RATE CONTROL/LEAK TEST valve and set the STATIC CONTROL approximately to field elevation altitude.
- (n) Observe and maintain the VSI below the programmed limits. Slowly open the RATE CONTROL/LEAK TEST to return the aircraft static system to field elevation.
- (o) Close the RATE CONTROL/LEAK TEST valve and slowly open the Static VENT valve to return the static system to ambient pressure.
- (p) Close the LEAK TEST valve and slowly open the PITOT VENT until the airspeed reaches 0 knots.
- (q) Configure the Tester as follows before turning power off:

Leak TestClosedRate Control/Leak TestClosedPitot VentOpenStatic VentOpenPitot Control $\approx 100 \text{ knots}$ Static Control $\approx \text{Field Elevation}$

(r) Turn off power and disconnect the STATIC and PITOT hoses from the STATIC and PITOT ports of the tester and aircraft.

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E. MACHMETER TESTS

Use the procedures outlined in the Combined Pitot / Static Test to set and change the airspeed and altitude. Select an Altitude from the first column of Table 1. Select one of the eight Airspeeds directly across from the selected Altitude. Cross-reference the selected Airspeed and Altitude to find the required Mach. Select a new airspeed and altitude and repeat the test as required.

AIRSPEED (IN KNOTS) (FROM NTIS #62-71396)								
ALTITUDE (IN FEET)	.50	.60	.70	.75	.80	.82	.85	.90
10k	277	334	391	420	449			
15k	247	298	350	376	403	414	429	
20k	228	275	324	348	373	383	398	424
25k	205	248	292	315	338	347	361	384
29k	188	228	269	289	311	319	332	354
33k	172	207	246	265	285	292	304	324
37k	157	190	224	242	260	267	278	297
41k	142	173	204	220	237	243	253	277
45k		157	186	201	216	222	231	246
49k		143	169	183	196	202	210	225
51k			161	174	187	193	201	214

Mach Meter Test **Table 1**

When testing is complete, refer to Standard Test Set Shutdown Procedures to return the Tester and aircraft to ambient.



F. ENGINE PRESSURE RATIO (EPR) TEST

Note: This test is limited by the Tester airspeed range.

- (1) Preliminary
 - (a) Connect PITOT PORT (Red) to the PT7 (Hi) port of E.P.R. transmitter to be tested.
 - (b) Connect STATIC PORT (Blue) to the PT2 (Lo) port of E.P.R. transmitter to be tested.
- (2) Test
 - (a) The EPR function of the DPS400 allows the display the EPR Ratio PT7/PT2 and pressures of PT2 and PT7 individually. The units of measurement available for the PT2 and PT7 pressure display are; inHg; mb; or altitude (ft or M) and airspeed (kts or km/hour). To set up the EPR display to desired units of measurement, refer to Setting the Display Units.

Note: If the EPR data is displayed in altitude (ft) and airspeed (kts),
Table 2 can be referenced as a guide to establish the desired EPR
Ratio.

(b) Make sure the static (Altitude or PT2) and pitot (Airspeed or PT7) pressure combination achieves the desired EPR ratio.

ENGINE PRESSURE RATIO	AIRSPEED (KNOTS) Pt7 (Hi) PORT	ALTITUDE (FEET) Pt2 (Lo) PORT
3.4	650	25,870
3.4	546	35,000
3.0	650	21,650
3.0	504	35,000
2.5	650	14,690
2.5	534	25,870
2.5	444	35,000
2.0	650	4,210
2.0	500	20,000

EPR Test
Table 2



ENGINE PRESSURE RATIO	AIRSPEED (KNOTS) Pt7 (Hi) PORT	ALTITUDE (FEET) Pt2 (Lo) PORT
2.0	369	35,000
1.5	478	5,000
1.5	365	20,000
1.5	265	35,000

EPR TEST **Table 2** (continued)

(c) When testing is complete, refer to Standard Test Set Shutdown Procedures to return the Tester and aircraft to ambient pressures.

G. MANIFOLD PRESSURE GAUGE TEST

- (1) Preliminary
 - (a) Connect STATIC PORT (Blue) to the manifold gauge to be tested.
 - (b) The Protection limits may be disabled during the Manifold Pressure Gauge tests.
- (2) Test
 - (a) The DPS400 can be changed to display the static pressure in inHg units. Refer to Setting the Display Units.
 - (b) Close the STATIC VENT and adjust the STATIC CONTROL to the required altitude (ft.) for the Manifold Pressure test point.

Note: Use

MANIFOLD PRESSURE TEST

Table 3 as a guide to set the STATIC CONTROL. (

MANIFOLD PRESSURE TEST

Table 3 shows the relation between Altitude and the corresponding pressure in inHg.)



(c) Slowly open the RATE CONTROL/LEAK TEST valve to set the static pressure.

MANIFOLD PRESSURE (INCHES OF MERCURY)	ALTITUDE (FEET)
31	-985
30	-75
29	+860
28	1825
27	2815
26	3835
25	4890
20	10,730
15	17,905
10	27,375

MANIFOLD PRESSURE TEST Table 3

(d) When testing is complete, refer to Standard Test Set Shutdown Procedures to return the test set to ambient pressures.



5. SHUTDOWN PROCEDURES

A. Standard Shutdown Procedure

<u>Caution</u>: Do not use unnecessary force to adjust any test set valve. Positive stop

spacers have been installed on all needle valves to permit firm closing of the valves without damage. However, excessive force can overcome the knob set screw resulting in valve damage. The same caution applies when using the

vernier knobs on the pressure regulator.

(1) When testing is complete, set the PITOT CONTROL for airspeed of 100 knots.

- (2) Slowly open the LEAK TEST valve until it is fully open. Verify the airspeed increases or decreases to approximately 100 knots.
- (3) Close the RATE CONTROL/LEAK TEST valve and set the STATIC CONTROL to approximately field elevation altitude.
- (4) Observe the maximum VSI. Open the RATE CONTROL/LEAK TEST to return the aircraft static system to field elevation.

Note: If the protection circuits trip, lower the altitude, VSI or airspeed below the programmed limits and reset the protection circuits (F4).

- (5) Close the RATE CONTROL/LEAK TEST valve and slowly open the Static VENT valve to return the static system to ambient pressure.
- (6) Close the LEAK TEST valve and slowly open the PITOT VENT until the airspeed reaches 0 knots.
- (7) Configure the Tester as follows before turning power off.

(8) Turn off power and disconnect the STATIC and PITOT hoses from the STATIC and PITOT ports of the tester and aircraft.

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SECTION 5: SHIPPING

1. RECEIVING

No special unpacking procedures are necessary. It is recommended that the factory shipping container and packing materials be retained should it become necessary, for any reason, to reship the Test Set.

It is also recommended that the Test Set be Leak Checked upon receipt and its carrying case be carefully inspected for damage. If the test set has an excessive leak or is damaged, immediately notify the carrier and the manufacturer.

2. SHIPPING

Use standard delicate electronic equipment packaging procedures when packing the Test Set for reshipment.



SECTION 6: STORAGE

1. PROCEDURE

- A. Place a four ounce bag of desiccant inside the container.
- B. Close and latch the cover.
- C. Store in a cool dry place.

Should the Test Set become exposed to moisture or very high humidity, dry as soon as possible. Temporarily the tester store in a dehumidified area.