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# T.M.ELECTRONICS, INC.

MDT-500 LEAK/FLOW TESTER
OPERATOR'S MANUAL

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# MDT-500-V2 User's manual addendum.

The MDT-500-V2 is a Flow and Leak tester that has all the features from the standard MDT-500-V1 and adds a chamber based test for leak testing sealed devices. The features of the version two are:

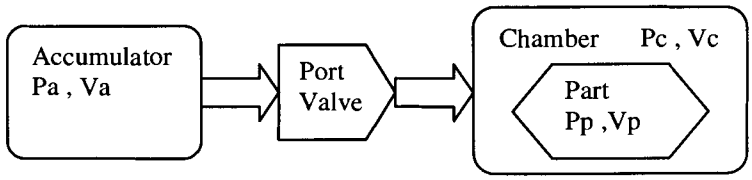
- Chamber leak-testing mode.
- Maximum-pressure-drop setting.
- Chamber-overpressure setting.

This addendum describes only the non-standard features of the unit, for all other subjects please refer to standard MDT-500 manual.

**Chamber Leak testing mode**.

The chamber leak testing mode provides the leak testing of sealed parts by placing them in a chamber then pressurizing the chamber to the test pressure and measuring the pressure decay inside the chamber to indirectly measure the leakage into the test part. The chamber-leak-test mode is turned ON by entering a value into the Maximum-pressure-drop parameter and it is switched OFF by setting it to zero. The system has the following components:

1. Test chamber (Volume Vc when empty).
2. Accumulator (Volume Va)
3. Part under test (Volume Vp)
4. Port valve.




Before the test starts the accumulator is pressurized to a pressure higher than the actual test pressure. The port valve is closed to separate the accumulator from the test chamber, and the chamber and part are both at atmospheric pressure.

The test begins with a CHARGE cycle during which the port valve opens to connect the accumulator to the test chamber. The initial test pressure "Pa" drops to a lower pressure by a factor that is controlled by the ratio of the volumes "Va", "Vc" and "Vp". Thus the final test pressure (Pfinal) is given by the formula:

$$P_{final} = Pa\left(\frac{Va}{Va + Vc - Vp}\right)$$

**Chamber-Overpressure setting**

The final pressure (Pfinal) is lower than the initial accumulator pressure because the same volume of air (Va) is allowed to expand into a larger volume (Va+Vc-Vp). This is why an overpressure is required for the chamber test. The correct overpressure is the one when applied to the test chamber results in the desired test pressure. When the test part is airtight the chamber volume (Vc) will be reduced by the volume occupied by the part (Vp) resulting in a higher final pressure. On the other hand if the part leaks the volume of the chamber will not be reduced as much resulting in a lower final pressure. It is the difference in final pressures that is used to determine gross leakers in the MDT-500 Chamber test. By setting **a maximum-pressure-drop** limit the instrument can discriminate between leakers and airtight parts.

**Maximum-Pressure-Drop Setting**

Different chamber sizes, tubing and part volumes result in different pressure drops. To account for this variation the MDT-500 has a setting for the maximum amount that the overpressure is allowed to drop when applied to a sealed chamber containing an airtight part. This is called the maximum-pressure-drop and it is entered as a percentage of the initial pressure (overpressure). If a part when tested causes the pressure to drop below this level the instrument will display "GROSS LEAK". For example if a chamber-part system requires an overpressure of 15 psig to drop to a test pressure of 10 psig, the pressure drop is 5 psi, which is 33.3% of the overpressure of 15 psig. The maximum pressure drop should be set slightly higher than 33.3% to allow minor volume differences in the parts to be tested.

The maximum-pressure-drop is also used to select between the Standard and the Chamber leak test modes. Thus when the Maximum-pressure-drop is set to 0.0% the MDT-500 switches to the Standard leak test and when set to a value other than zero it switches the unit to its Chamber leak test mode.

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MDT-500 Chamber test setup example.

Initial settings.

1. From the main screen press the top function key (F1 pointing to PRS).
2. Turn the regulator knob until the overpressure is displayed on the top line of the display, and then press F1 to enter it as the specified pressure. This sets the overpressure. Use the required test pressure as the initial guess for the overpressure.
3. Press the second function key (F2 pointing to "PRSR.TOL" and "MAX.P.DROP").
4. At the "TEST PRESSURE ± TOL %" screen press "↵" to enter the MAX.P.DROP screen.
5. At the "CHAMBER.MAX.DROP" screen use the up arrow to enter 30.0%, This turns ON the chamber-leak-test mode with an allowed drop of 30%, or use the down arrow to set 0.0% to turn the chamber leak test OFF. Press start to return to the main screen when done setting this parameter.
6. Use the Bleed cycle (refer to pg. 58 in the MDT-500 manual) or open the chamber to relieve any residual pressure between tests.

From the READY screen press the second function key (F2 pointing to SET). Select CHARGE TIMER and enter a charge time of 10 sec. (Or any time long enough to read the pressure during charge). Press start when done to return to the main screen.

Finding the overpressure.

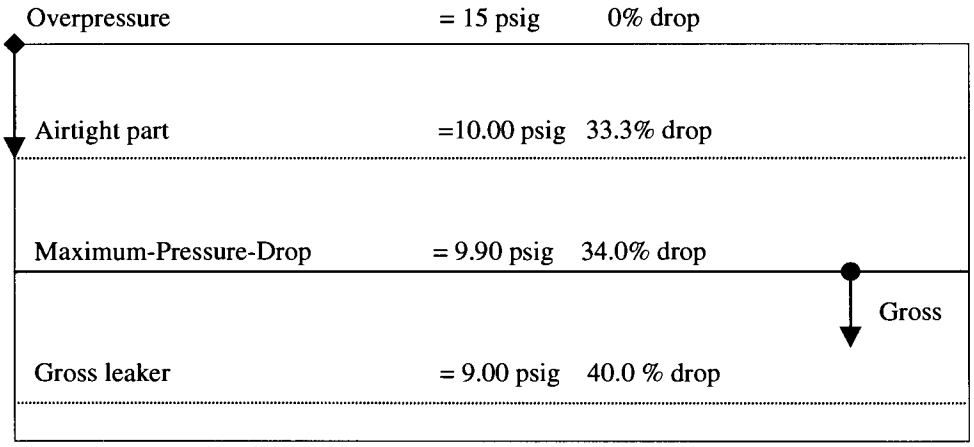
Place an airtight part (or a filled part) in the test chamber, and then start a test by pressing the start button. Observe the pressure reading during the charge cycle (disregard PASS/FAIL/GROSS results during setup).

- If the pressure was **less** than the required test pressure, **increase** the overpressure (step 1)
- If the pressure was **more** than the required test pressure, **decrease** the overpressure (step 1)
- If the pressure was **equal** to the required test pressure, then the correct overpressure has been found.

Determining Maximum-Pressure-Drop.

The allowed pressure drop must be set high enough to account for the normal drop that occurs when the chamber holding an airtight part is pressurized, and low enough to detect a gross leaker part.

For example, a chamber-part system requires an overpressure of 15 psig to drop to a test pressure of 10.0 psig; the pressure drop is 5 psi, which is 33.3% of the overpressure of 15 psig. A gross leaker drops to 9.0 psig, which is a 40% drop. Therefore the Maximum pressure drop must be set somewhere between 33.3% and 40.0% to discriminate a gross leaker. If the Maximum pressure drop is set too close to the normal drop, good parts with slightly smaller volume might be rejected because they create larger drop even if they are non-leakers. In this example system the limit is set to 34% to allow for small variations in the volume of the parts.




All other leak test parameters are set as in a standard leak test that is described in the MDT-500 manual under "Chapter 2: Leak test mode" (page 13).

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## INTRODUCTION TO THE MDT-500

The MDT-500 was designed to test devices that pass liquid or gas at a required flow rate through an intended path. Examples of such devices include filters, tubing, valves and catheters. These types of devices generally require a two part test. The device is first flow tested to verify that flow through the device is acceptable. Then a leak test is performed to verify that there are no leakage outside of the intended flow path.

The MDT-500 performs both tests in a single cycle automatically. The tests can be done in either order: flow followed by leak or leak followed by flow. Flow tests require the flow path to be open at one end. Leak tests require a closed path. The MDT-500 is designed with a clamping device driver which can activate an external fixture that seals the open end(s) of the device. Once the clamping is achieved, the leak test can be done.

For applications where occlusions or flow restrictions are the primary concern and leaks are rare, the MDT-500 can set-up to perform only flow tests. If leakage is the main concern and flow is of no consequence, the MDT-500 can be set for leak testing.

At the completion of any test cycle, the MDT-500 indicates whether the device met the preset test limits. The green "PASS" light indicates that the device met the leak and/or flow specifications. The red "FAIL" light indicates that the device did not meet the test specifications for the indicated test



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## FEATURES OF THE MDT-500

The MDT-500 Flow/Leak Tester contains several features and functions that the user should become familiar with. These features and functions are summarized below.

The pressure transducer provides state-of -art sensitivity and temperature stability. Integrated with the system electronics the MDT-500 achieves resolution down to 0.02 In $H_2O$ (0.0007 PSIG).

The flow transducer is highly responsive to flow changes with a response time generally within 60 milliseconds. The MDT-500 is equipped with a flow transducer which a sensitivity of 1 cc/min. For greater sensitivity optional transducer models are available.

Self diagnostics are part of the MDT-500 start up program. This feature assures the operator that the instrument meets its own specifications when powered up.

The 3"x 4" LCD display consists of white figures on a blue background. The display size and contrast features provide a wide angle view in a work station environment. The alphanumeric and graphic features of the display provide ease in viewing menu options as well as visual display of Pressure vs. Time or Flow Rate vs. Time graphs, process control charts or process statistics.

The operating menu is similar in format to that of an Automated Teller Machine (ATM). This ATM style programming controls enable the user to move from one menu option to another. Each menu screen provides push button access to successive steps in set-up procedures and selection of test parameters.

Up to ten programs are available for individual test procedures. This feature allows for fast changeover of test procedures.

The Key Lockout function assures operation security. Once the key lock is activated neither test functions or data can be altered.

The push of one button activates the test cycle once the test parameters have been programmed. Data from each test is stored automatically and a bright indicator light tell the operator if the tested part is a "PASS" or "FAIL".

The MDT-500 is capable of logging and retaining 500 test results in its Data Log Memory. This allows for documentation of



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test results by work station or shift as well as trend analysis of the process.

The MDT-500 statistical capabilities provide the user with immediate information on process performance. Process control statistics are calculated. Process histograms, X Bar and Range charts are available for graphic LCD display. This allows for statistical analysis for process validation or in-process purposes.

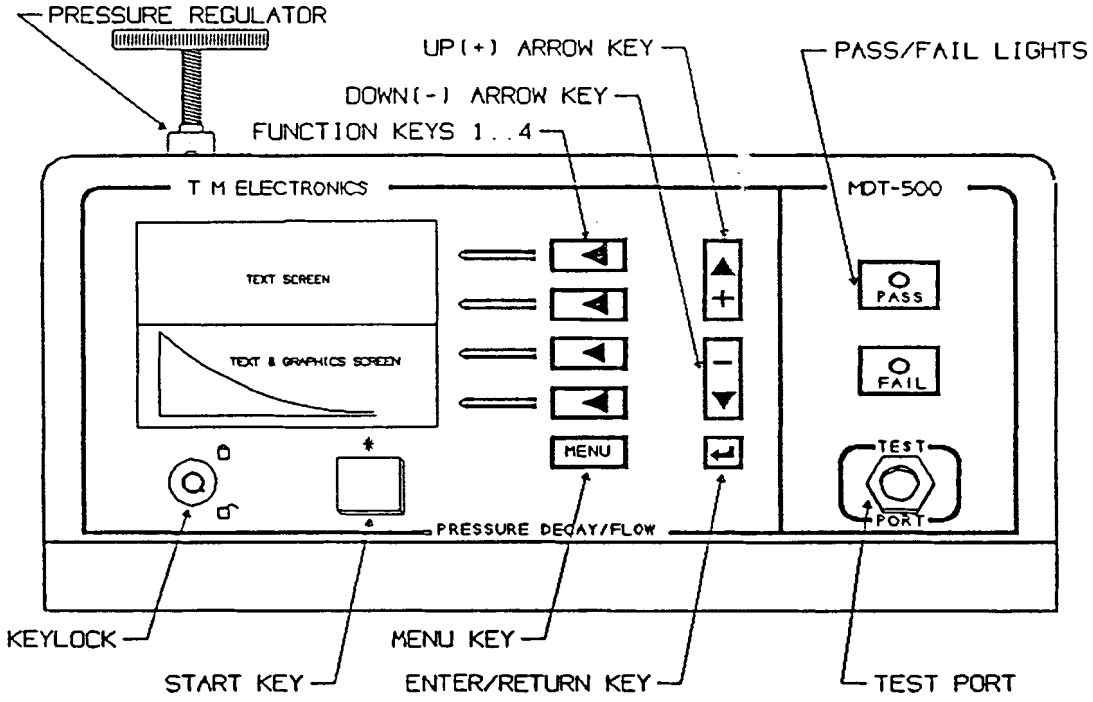
The MDT-500 has multiple modes of output. Visual display of test results is available on the LCD display. Printer capability is available through the instrument printer port connection to an Epson compatible printer. The RS232C communication port allows for computer connection and data transmission.

The Bleed Valve is a Safety feature of the MDT-500. This internal valve allows for air bleeding of a pressurized part prior to detaching the part from the test port. This safety feature prevents short bursts of air from escaping as parts are removed from the test port.

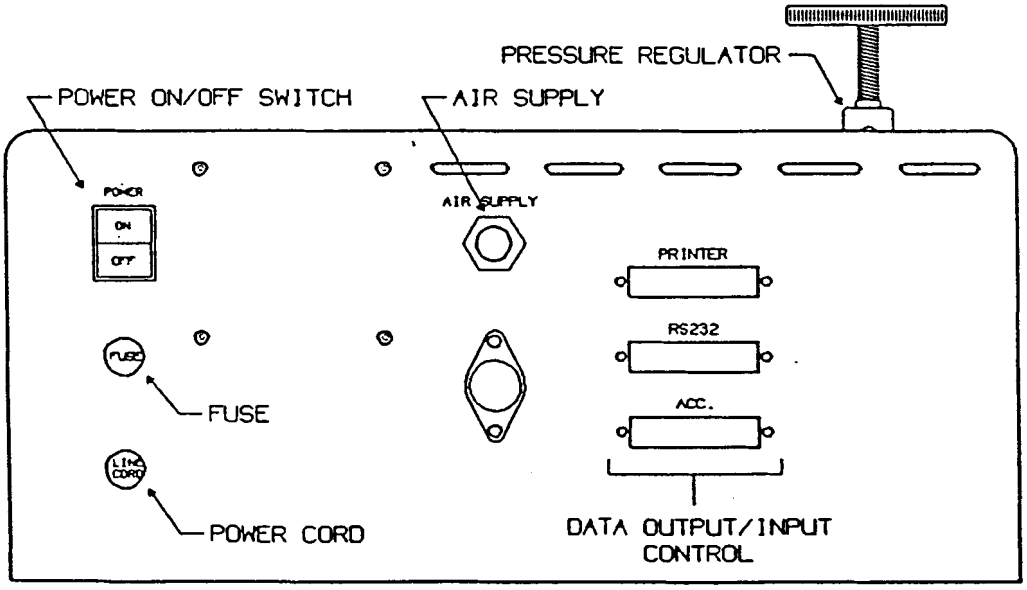


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## FRONT PANEL




## REAR PANEL






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## MDT-500 INSTRUMENT CONNECTIONS

**Refer to "INSTRUMENT CONNECTION LOCATIONS" for location of the connections mentioned below.**

| | |
|---|---|
| AIR SUPPLY CONNECTION: (Pneumatic) | Compressed air inlet to the instrument. Connection Type: Instrument air supply fitting is a Female Bulkhead fitting which will accept any male a 1/8" NPT fitting or a standard 1/8" NPT male to 1/4" tube fitting. |

**NOTE:** The air used for the MDT-500 must be clean, dry, instrument quality and at a recommended pressure between 90 and 150 PSIG. A minimum of 60 PSIG must be supplied for proper operation. For models with a maximum test pressure higher than 50 PSIG, the inlet pressure must exceed the maximum test pressure by at least 10 PSIG.

| | |
|---|---|
| TEST PORT CONNECTION: (Pneumatic) | Test air outlet. To be connected to Test Part. Connection Type: Instrument port fitting is a Female Bulkhead 1/8" NPT which will accept either a male or a female 1/8" NPT luer fitting or a male or female 1/8 "Quick Disconnect fitting. |
| PRINTER CONNECTION: (Electrical) | Printer output connection. Interface: Centronics Connection Type: DB-25 Female |
| RS232 CONNECTION: (Electrical) | Serial port input/output connection. Interface: RS232-C Connection Type: DB-25 Male |
| ACC. CONNECTION: (Electrical) | Accessory Control connection Connection Type: DB-25 Female |
| Power Cord: | 100-125 VAC / Grounded plug |
| Fuse: | 1.25 Amps @ 250 Volts Type: 5x20 mm. |



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## MDT-500 INSTRUMENT CONTROLS

**Refer to "INSTRUMENT CONTROL LOCATIONS" for location of the instrument controls mentioned below.**

| | |
|---|---|
| POWER SWITCH: | Turns instrument On and Off. |
| PRESSURE REGULATOR: | Controls the pressure used in the test. Turning the knob clockwise increases the pressure . Turning the knob counterclockwise decreases the pressure. |
| START/ABORT BUTTON (*): | Starts the test sequence or stops any test or procedure currently in progress. |
| KEYLOCK: | Locks the key pad to prevent parameter changes. The OPEN Lock symbol indicates the key is in the unlocked position. The CLOSED Lock symbol indicates the key is in the locked position. When the key is in the locked position, the CLOSED Lock symbol on the display also indicates the keypad is "LOCKED". |
| ACCEPT LIGHT: | Indicates when the result of a particular test is a "PASS" or "ACCEPT". |
| REJECT LIGHT: | Indicates when the result of a particular test is a "FAIL" or "REJECT". |



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KEYPAD:

| | |
|---|---|
| MENU KEY: | Takes display to main menu |
| **ENTER/RETURN(↵) KEY:** | Returns display back to previous screen. |
| UP(+) ARROW KEY: | Increases the variable values. Also provides momentary look at preset test parameters. |
| DOWN(-) ARROW KEY: | Decreases the variable values. Also provides momentary look at preset test parameters. |
| FUNCTION KEYS 1 - 4 | Address main menu selections. |
| FUNCTION KEY #1 | Allows operator to return directly to set regulator display |
| FUNCTION KEY #2 | Allows operator to return directly to the Leak Test Parameter Display |
| FUNCTION KEY #3: | Allows operator to scroll **FORWARD** through each operational display screen for a test program. Screens include:<br>#1 Numeric result display<br>#2 Part counters screen<br>#3 Test curve Plot<br>#4 Datalog<br>#5 Test Statistics<br>#6 Test Histogram<br>#7 X-Bar Chart<br>#8 R (Range) Chart |
| FUNCTION KEY #4: | Allows operator to scroll **BACKWARD** through each operation display screen for a test program. See Function Key #3 Above. |



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## MDT-500 INSTALLATION INSTRUCTIONS, POWER UP & AUTOMATIC DIAGNOSTICS TEST

**UNPACKING:** After taking the system out of its carton, make sure that the following parts are present:

MDT-500 Instrument
Operator's Manual
Air hoses
Keys

Contact the factory for missing or damaged parts.

INSTRUMENT ENVIRONMENT: The MDT-500 should be installed in an environment with moderate temperature, humidity and static electricity. Keep away from strong electromagnetic interference or machinery that generates large line voltage spikes.

CONNECTIONS: Connect the power cord of the instrument to a three pronged, properly grounded, 120 Volt AC outlet.

Connect the air hose from the "AIR SUPPLY" port to a compressed air outlet. The air must be free of moisture, oil and dust and at a pressure between 60 and 150 PSIG.

POWER UP: Turn on the MDT-500 by using the power switch in the back of the instrument.

The instrument starts with the automatic self-diagnostic test.



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POWER UP:
(continued)

After turning power on the instrument will displays the following screen:

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MDT-500-V1
LEAK /FLOW TESTER
xxx.x Psig / y.y InH2O

INITZ. SENSORS: nnnnn

This identifies the type of instrument:
MDT-500-V1 is the Instrument Model.
-XXX.X Maximum Operating Pressure (Psig)
- Y.Y Resolution (Inches of H2O).
- NNNN Initialization timer.

The MDT-500 will also display its internal time and date.

INITZ . SENSORS: is displayed and the instrument counts backwards from 1000 down to 0.

At this point the instrument has completed all the internal self-diagnostics and is ready to start testing.



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## LEAK TESTING IN THE MDT-500

Leak test methods range from looking for a bubble (bubble testing) to testing for a few molecules of a tracer gas (mass spectrometer testing). The bubble test seems efficient at first but its faults of high per unit cost due to handling, contamination, and operator "judgment" calls soon become apparent. Mass Spectrometry, on the other hand, carries a very high price tag as well as a high per unit cost, and it is more useful in testing for permeability rather than actual leaks.

Pressure decay testers allow sensitive testing with simplified test methods. A pressure decay tester is much less costly than a Mass Spectrometer and has a lower per unit cost when compared to both of the above methods. Pressure decay testers are designed to test leaks and results are presented in a manner that eliminates operator judgment calls.

As the term pressure decay implies, the test is looking for a minute decay in the pressure of the tested part that results from leakage. The MDT-500's air handling system pressurizes the test volume and monitors pressure for a decay in the test pressure.

Since the MDT-500 pressurizes a gas, it must deal with the physical effect of gas pressurization. When a gas is pressurized its temperature increases. This is know as "Adiabatic Heating". As this heat dissipates, the pressure decreases. Additionally, if the item being tested is flexible, the walls will expand during and immediately after the pressurization. This will also cause a pressure decrease. The MDT-500 uses a "Settle" (equilibration) period to accommodate the cooling and expansion of the part. After the settle period is completed the test cycle begins and the instrument then monitors pressure changes due to leakage from the tested part.

The following information needs to be established for the item to be tested.

Product Description: How will the item be used? Will it contain air or a liquid? To what pressures will the item be subjected and for what time period? What is the elasticity of the product? What are the heat absorption properties of the item (material, temperature, volume)? The way these questions are answered will influence the design of the test procedure.

Production Requirements: What test time will fit into the product's manufacturing process? What is the desired sampling frequency?

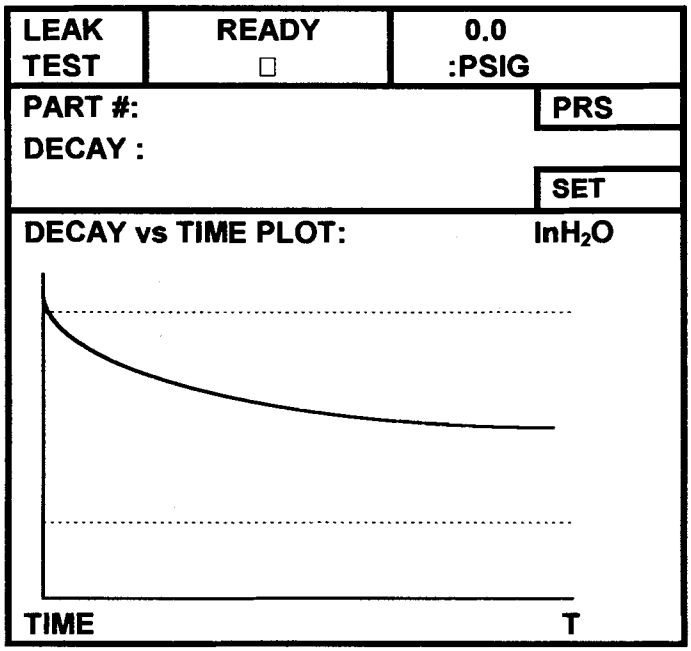
Define the Leak Test Parameters: In determining the test parameters consider the system's internal volume, the test temperature, the time for test, and the density of the air vs. liquid. Also define the minimum leak rate to be detected.

Establish Test Specifications: Determine the test time and test pressure that will enable the detection of leaks and that correlate with the results of the previous leak test methods.



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## TYPICAL DECAY CURVE




ZERO DECAY LEVEL

SETTABLE DECAY LIMIT



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## MDT-500 LEAK TEST SETTINGS

This portion of the manual describes how to set the MDT-500 for leak testing a part. The settings to be described are:

Charge Timer
Settle Timer
Test Timer
Test Pressure
Test Pressure Tolerance ( ± % of Test Pressure)
Decay Limit.
Gross Leak

### CHARGE TIMER

This timer controls the amount of time that the MDT-500 will use to pressurize the device to be tested. When setting this timer allow sufficient time for the pressure inside the part to reach the required test pressure. Use short charge times for small parts/volumes and longer times for larger parts/volumes.

### SETTLE TIMER

This timer controls the amount of time that the MDT-500 will allow the part to stabilize after pressurization. When setting this timer set sufficient time for the pressurized part to stabilize (equilibrate) to account for Adiabatic Cooling and elastic expansion.

Metallic devices, devices with large surface areas or devices that are colder than normal tend to absorb large amounts of heat from the pressurizing gas. Loss of heat will show up as a pressure decay during test.

Soft, flexible or otherwise compliant devices will expand when pressurized. This increases the volume of the part. This volume increase will also show up as a pressure decay during test. **Some devices are so flexible that restraining by means of a fixture may be necessary to stop the expansion**.

The settle time should be set long enough to allow the part to reach 90% to 100% of its equilibrium state. The equilibrium state is reached when the part no longer expands and the temperature of the device is the same as that of the test gas. There is no universal settle time which can be used since the time required to reach equilibrium depends on the volume of the part, its material of construction, its thickness, the test pressure and test temperature. Settle time is only determined through actual test results.



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TEST TIMER

The test timer controls the amount of time that the MDT-500 will check the decay of the device being tested. Set a short test times for large leaks and a long test time for small leaks. To increase reliability, the test timer should be set for the time required to see a minimum difference of 3 to 4 decay steps* between good and bad parts, 5 or more steps is desirable.

TEST PRESSURE

This is the pressure which is to be used during testing. It is also known as the Standard Pressure. This pressure is set by manually turning the regulator knob on the top of the instrument until the desired pressure is displayed on the Regulator screen and entered by pushing F1.

TEST PRESSURE TOLERANCE ( ± % OF TEST PRESSURE)

The selected test pressure tolerance is the amount that the regulator can vary and not stop a test. If the pressure of the regulator varies outside of the tolerance range, the instrument will not allow the test to begin.

DECAY LIMIT

The decay limit is the pressure decay threshold used to determine a REJECT or FAILURE. Typically, the decay limit is set 3 to 4 decay steps above the maximum decay of an acceptable part. For example, if the maximum decay of an acceptable part is 1.0 $InH_2O$ at a resolution of 0.2 $InH_2O$, the decay limit must be set at least at 1.6 or 1.8 In $H_2O$ in order to allow a clear distinction between an acceptable and rejectable part.

NOTE: Settings of below 3 decay steps are not recommended unless the leaks are large.

GROSS LEAK

This setting is used to detect parts with large leaks during the **CHARGE** and **SETTLE** periods. The MDT-500 compares the pressure inside the part to the preset standard test pressure. If the pressure drops by an amount equivalent to the Minus tolerance on the pressure of the part then the part will be rejected

Small or rigid parts can work with a smaller ± % tolerance of standard test pressure setting. Large or flexible parts will need a larger ± % tolerance of the standard test pressure to allow for variations from part to part and pressure drops due to normal expansion of the part.

* Decay Steps: The smallest amount of pressure decay that the instrument can detect, i.e.; resolution.



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## MDT-500 LEAK TEST CYCLE

The MDT-500 Leak Test consists of three periods: CHARGE, SETTLE and TEST. The leak test begins when the START button is pressed. The part is pressurized to the specified pressure. This part of the cycle is called the CHARGE portion of the cycle or pressurization period.

If at the end of the CHARGE the pressure inside the part is less than the % tolerance setting, the device being tested is considered a REJECT and the result is a Gross leak failure and the cycle stops. If the pressure inside the part is within the selected pressure tolerance range the instrument will move to the SETTLE portion of the cycle.

The SETTLE part of the cycle allows the part to expand and cool before it goes into the TEST portion of the cycle. If the pressure detected is below the standard pressure tolerance during the SETTLE time the part is rejected as a GROSS leaker. The standard pressure range (i.e.: ± % Tolerance) should be set high enough so that good parts are not rejected due to their normal expansion and cooling. A gross leaker decays far more than a good part, therefore, it can be detected before the actual TEST portion of the cycle begins. If the pressure is within the set tolerance range during the SETTLE time the MDT-500 will initiate the TEST portion of the cycle.

During the TEST portion of the cycle the pressure decay of the part is monitored and compared to the preset Decay Limit. If the decay exceeds the preset limit then the device is REJECTED and the result is displayed on the screen as "LEAK - FAIL". If the decay is less than the decay limit the part is ACCEPTED and the display reads "LEAK - PASS".

NORMAL MDT-500 TEST CYCLE

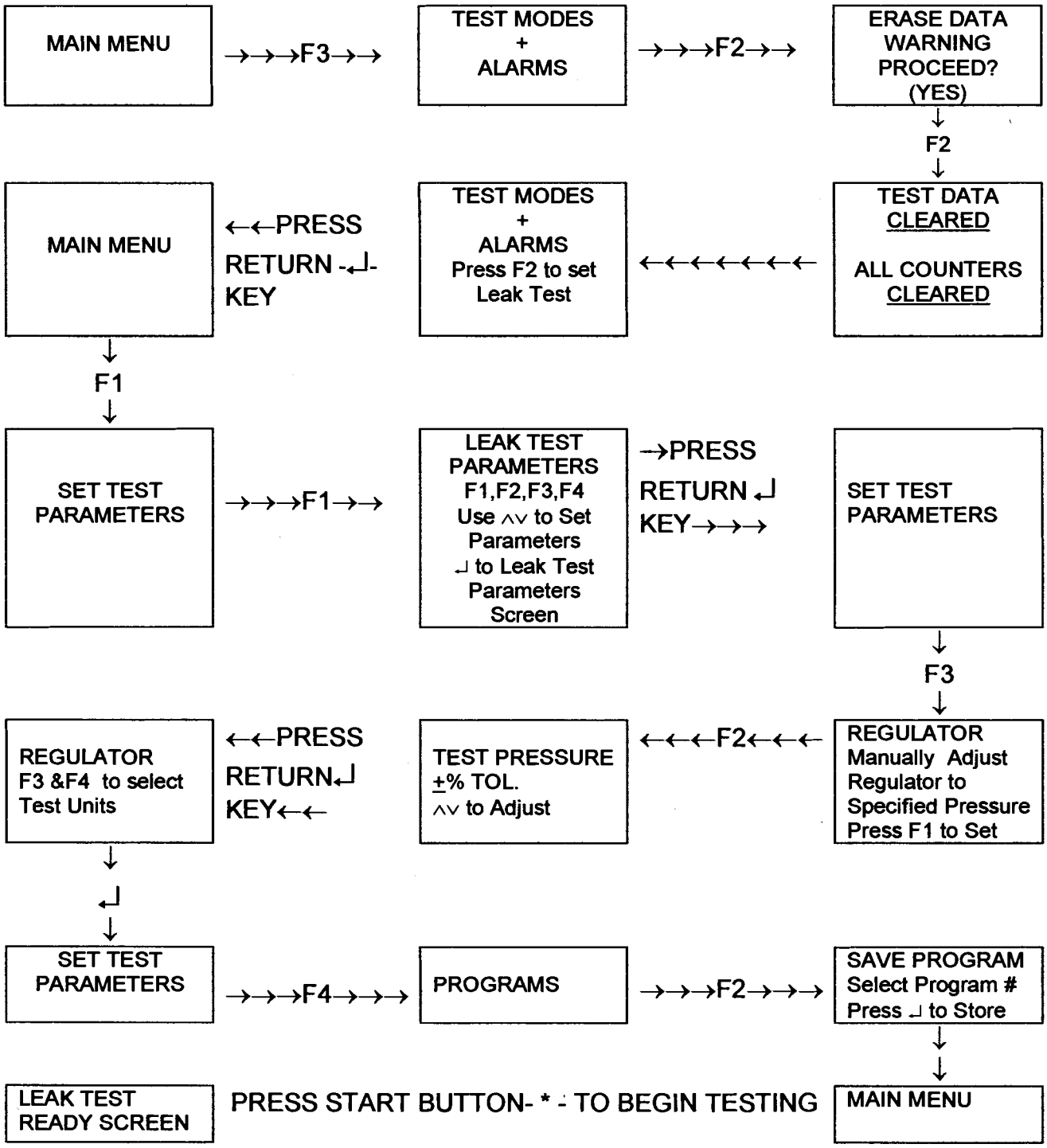





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## LEAK TEST SET-UP PROCEDURE PROCESS CHART

The process chart indicates the process of set up for Leak Testing in the MDT-500. See detailed explanation of Screens that follows.






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## SCREENS - LEAK TEST MODE

| MAIN MENU | *EXIT |
|---|---|
| SETTINGS & PROGRAMS | |
| PRINT, DATALG, STATS | |
| TEST MODE, ALARM, CAL | |
| DATA ERASE MENU | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Settings & Programs | Selection will move to **Set Test Parameters** Screen | Select leak or flow test parameters, OR move to screen to select test pressure units, OR Save and Recall programs that are stored or to be stored. |
| Print, Datalg, Stats | Selection will move to **Test Data** Screen | Select Printer Reports to send data to a local printer ( selections are available in this menu), OR Select View Datalog (selection are available to view, print or clear the datalog memory and to set an alarm to warn of datalog overwrite), OR Set Statistics (selections are available to set calculations for statistical operations. |
| Test Mode, Alarm, Cal. | Selection will move to **Test Modes + Alarms** Screen | Select Test Modes of Leak, Flow or Combo tests, OR Set audible failure alarm, OR set Clamp or Bleed time cycles, OR enter Calibration Mode screen. |
| Data Erase Menu | Selection will move to **Clear Data** Screen | Selections in this menu allow deletions of test data, OR resetting of the part counter. |



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**SCREENS**

| TEST MODES + ALARMS | *EXIT |
|---|---|
| **FAIL ALARM: OFF**<br><br>**TEST MODE: LEAK TEST**<br><br>**CLAMP: OFF BLEED: OFF**<br><br>**CALIBRATION MODE** | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Fail (Failure) Alarm | No Screen Change | Allows selection of Setting of Failure Alarm in On or Off Mode |
| Test Mode | No Screen Change if DataLog contains No Data;<br>Selection will move to **Erase Data Warning** Screen if DataLog contains Data(see **Data Erase** Screen for further explanation). | Allows selection of "Leak Test" Mode;<br>"Flow Test" Mode;<br>"Leak + Flow" Mode;<br>or "Flow + Leak" Mode |
| Clamp Timer/ Bleed Timer | Selection will move to **Set Clamp Timer** Screen followed by **Set Bleed Timer** Screen. | Allows selection of Clamping time and Bleed Time. |
| Calibration Mode | Selection will move to **Calibrate** Screen | Allows selection of Test Pressure. Reading, Pressure Decay<br>Reading, Flow Rate Reading<br>Screens for calibration and Time,<br>Date and Contrast Adjustment<br>Screen |



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## SCREENS

| ERASE DATA WARNING | *EXIT |
|---|---|
| THE DATALOG, COUNTERS AND TEST RESULTS ARE GOING TO BE ERASED.<br><br>PROCEED?-> (YES)<br>CANCEL? -> (NO) | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Proceed? | Selection of "Yes" | Proceeds with clearing of all Test Data and Clearing of All Counters. **Test Data Cleared** and **All Counters Cleared** displayed on Screens. |
| Proceed ? | Selection of "No" | Proceeds to **Test Data Not Erased** Screen |

| TEST DATA CLEARED |
|---|

| ALL COUNTERS CLEARED |
|---|

| TEST MODES + ALARMS | *EXIT |
|---|---|
| FAIL ALARM: OFF<br><br>TEST MODE: LEAK TEST<br><br>CLAMP: OFF BLEED: OFF<br><br>CALIBRATION MODE | |

| MAIN MENU | *EXIT |
|---|---|
| SETTINGS & PROGRAMS<br>PRINT, DATALG, STATS<br>TEST MODE, ALARM, CAL<br>DATA ERASE MENU | |



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## SCREENS

| SET TEST PARAMS | *EXIT |
|---|---|
| LEAK TEST SETTINGS<br><br>FLOW TEST - OFF - | |
| TEST PRSR + UNITS<br><br>SAVE/RECALL PROGRAM | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Leak Test Settings | Selection will move to Leak Test Parameters screen | Set Charge, Settle, and Test time lengths in this screen. Set Decay pressure limit here also. |
| Flow Test | Selection will move to Flow Parameters screen | Set the expected Standard flow rate in sccm. Set the allowable maximum flow tolerance variation from standard flow rate and minimum flow tolerance before alarm. Set flow test time. |
| Test Prsr + Units | Selection will move to Regulator screen | Select Spec. Presr to confirm the air regulator value shown at the top of the screen. (This is your test pressure). Select Presr. Tol. to set the upper/lower allowable variation of test pressure. Select Test Presr Units to set PSIG or In $H_2O$. Select Prs. Decay Units to set PSIG or In $H_2O$. |
| Save / Recall Prog | Selection will move to Programs screen | Select Recall Program to choose a previously stored program ( #1- #10). Save Prog to recall a program of current test parameters, OR View/ Print Programs to print currently stored programs. |



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| LEAK TEST PARAMS | *EXIT |
|---|---|
| CHARGE TMR: 00.0 SEC. | |
| SETTLE TMR: 00.0 SEC | |
| TEST TMR: 00.0 SEC | |
| DECAY LIMIT: 00.000 PSIG | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Charge Timer | Selection will allow use of **Up** or **Down** Arrows | Set the time in seconds that allows complete pressurization of the test part by pushing the Up or Down arrows on the control panel. |
| Settle Timer | Selection will allow the use of **Up** or **Down** Arrows | Set the time in seconds that allows adequate time for cooling or stretching of the test part so it comes to equilibrium by pushing the Up or Down arrows on the control panel. |
| Test Timer | Selection will allow the use of **Up** or **Down** Arrows | Set the time in seconds that meets the required test time set by validated test method by pushing the Up or Down arrows on the control panel. |
| Decay Limit (pressure) | Selection will allow the use of **Up** or **Down** Arrows | Set the Decay limit of pressure that meets the required test time set by the validated test method by pushing the Up or Down arrows on the control panel. |



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**LEAK CHARGE TIMER**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

< SEC >

**00.0**

**LEAK SETTLE TIMER**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

< SEC >

**0.0**

**LEAK TEST TIMER**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

< SEC >

**0.0**

**PRESSURE DECAY LIMIT**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

< PSIG >

**00.0**



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## SCREENS

| SET TEST PARAMS | *EXIT |
|---|---|
| LEAK TEST SETTINGS<br><br>FLOW TEST - OFF - | |
| TEST PRSR + UNITS<br><br>SAVE/RECALL PROGRAM | |

| ☐ REGUL: XX.X PSIG | *EXIT |
|---|---|
| SPEC. PRESSR: XX.X PSIG<br><br>PRESR. TOL: 0.0 ± % | |
| TEST PRSR UNITS: PSIG<br><br>PRS. DECAY UNITS: PSIG | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Spec. Pressr. | Indicates pressure setting for manual adjustment of regulator | Sets testing pressure for flow and pressure decay tests. The GROSS LEAK for the Charge is 95% of the Specified Pressure or the Set Pressure. |
| Pressure Tolerance | Selection will move to **Test Pressure ± % Tol** Screen | Selects ± Tolerances of the set test pressure. Push UP and DOWN Arrows to increase or decrease the tolerance. NOTE: THIS IS GROSS LEAK SETTING FOR SETTLE. |
| Test Prsr.Units | Screen does not change. | Allows selection of test pressure units (Psig or In.$H_2O$) |
| Pressure Decay Units | Screen does not change. | Allows selection of pressure decay units ( PSIG or In $H_2O$.) |



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| TEST PRSR. ± TOL (%) |
| --- |
| USE ∧ ∨ TO CHANGE or<br><br>USE ↵ * TO EXIT<br><br>< % ><br><br>**0.0** |

| ☐ REGUL: PSIG | *EXIT |
| --- | --- |
| SPEC. PRESSR: 00 PSIG<br><br>PRESR. TOL: 0.0 ± % | |
| TEST PRSR UNITS: PSIG<br><br>PRS. DECAY UNITS: PSIG | |

| SET TEST PARAMS | *EXIT |
| --- | --- |
| LEAK TEST SETTINGS<br><br>FLOW TEST - OFF - | |
| TEST PRSR + UNITS<br><br>SAVE/RECALL PROGRAM | |



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| PROGRAMS | *EXIT |
|---|---|
| RECALL PROGRAM | |
| STORE PROGRAM | |
| VIEW/PRINT PROGRAMS | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Recall Program | Selection will move to **Recall** Program Screen | Allows Recall of Program # |
| Store Program | Selection will move to **Save Program** Screen | Allows Selection of Program # and Storage of Program |
| View/Print Programs | Selection will move to **View/Print** Screen | Allows On-Screen View of Test Program Parameters and Print-out of that information. |



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## SCREENS

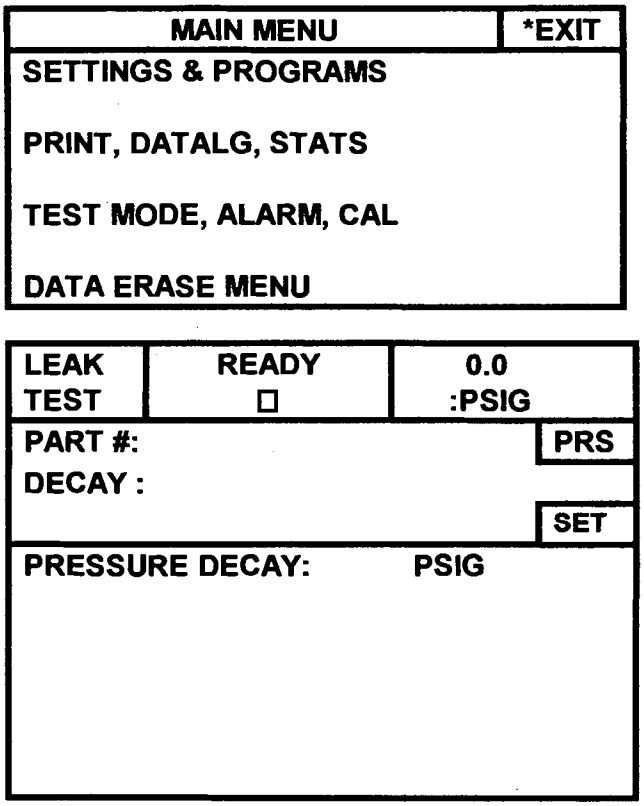
| RECALL PROGRAM | *EXIT |
|---|---|
| USE ∧ ∨ TO PICK PROGRAM #<br>THEN USE ↵ TO RECALL<br>OR USE * TO EXIT<br><br>**1.** | |

| SAVE PROGRAM | *EXIT |
|---|---|
| USE ∧ ∨ TO PICK PROGRAM #<br>THEN USE ↵ TO STORE<br>OR USE * TO EXIT<br><br>**1.** | |

| VIEW: ∧ ∨ PRINT: ↵ | *EXIT |
|---|---|
| **PROGRAM # _ LEAK TEST**<br><br>**CHARGE TMR: 00.0 Sec**<br>**SETTLE TMR: 0.0 Sec**<br>**TEST TMR : 0.0 Sec**<br>**DECAY LIMIT: 0.000 PSIG**<br><br>**SPEC. PRESR: 00. PSIG**<br>**PRESR. TOL.: 0.0 ± %** | |



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## RUNNING A LEAK TEST

To simplify the description of Leak settings, set the MDT-500 in the LEAK Mode by following the Process Chart. While in the LEAK TEST Parameters Screen set the following values as the screens are displayed:

| | |
|---|---|
| CHARGE TIME: | 2.0 Seconds |
| SETTLE TIME: | 3.0 Seconds |
| TEST TIME : | 4.0 Seconds |
| DECAY LIMIT: | 0.6 $InH_2O$. |

Once the above parameters have been set return to the SET TEST PARAMETERS Screen and press the F3 key to move to the REGULATOR Screen. Vary the regulator to the desired standard test pressure and press F1 to enter the pressure into the program. Set the pressure to:

| | |
|---|---|
| PRESSURE : | 10.0 PSIG |

After setting the TEST PRESSURE and while still in the REGULATOR Screen press the F2 key. This will move the display to the TEST PRESSURE $\pm$ TOL.(%) Screen. Press the UP or DOWN arrows to set the TEST PRESSURE to that indicated below:

| | |
|---|---|
| TEST PRESSURE $\pm$ TOL : | 10.0 %. |

This is the Gross Leak setting for the CHARGE AND SETTLE. TEST TIME also no test can begin if the pressure of the regulator has varied outside of this tolerance.

In the REGULATOR Screen the Test Pressure Units and Pressure Decay units can be set by using the F3 and F4 keys, respectively.

To Save Leak Test Parameter Program prior to testing press the Return key to return to the SET TEST PARAMETERS Screen (see Process Chart).

After selecting the test pressure and pressure decay units and to begin testing, with or without saving the program, press the "START-*-"button to move the display back to the LEAK TEST READY Screen and the first part can be tested.



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| LEAK TEST | READY ☐ | 10.0 :PSIG |
|---|---|---|
| PART #: | | PRS |
| DECAY : | | SET |
| PRESSURE DECAY: | PSIG | |

Connect the part to be tested to the test port. Press the "START -* -" button and the following screen will be displayed:

| LEAK TEST | CHARGE ☐ | 10.0 :PSIG |
|---|---|---|
| PART #: | | PRS |
| DECAY : | | SET |
| PRESSURE DECAY: | PSIG | |
| *>>>>>>>>>T | | |

The test will progress through the CHARGE, SETTLE and TEST phases as displayed above with the appropriate test phase being displayed in place of the word "READY".

When the leak test is done the "READY" screen will appear with the part number and test results displayed on the screen.

READING THE TEST RESULT

GROSS LEAK CHARGE

Simulate this by leaving the test port open and pressing "START". The Part # and GROSS will be displayed along with the blinking red fail light. The Pressure decay reading will be displayed. Gross leak during the "CHARGE" period means a part failure. The pressure inside the part at the end of the charge time was less than the lower tolerance limit of the preset standard test pressure. In the example, if the pressure doesn't get above 9.0 PSIG by the end of the charge then the part will be rejected or failed as a GROSS LEAK. This result occurs when the CHARGE time is too short or the part has a large leak. In either event the test is stopped and labeled as "GROSS".



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GROSS LEAK SETTLE

To simulate this type of failure put a shut-off device (any device which can be used to stop air flow i.e.: a closed stopcock) on the test port and press the "START-*-" button. Allow the Charge time to finish and as soon as the instrument enters the SETTLE period, remove the device from the test port. Settle time is indicated by "SETTLE" on the display in place of "READY". The test result that will be obtained will indicate that the part was a reject with a Gross Leak during the Settle mode.

As an example: If the standard test pressure is 10 PSI and the Selected Pressure Tolerance is 10% then the pressure inside of the part must not drop by more than 1 PSI (10% of 10 PSI) during the SETTLE Period, otherwise, it will be considered a gross leak during settle.

NOTE: If a known ACCEPTABLE part does not come to stabilization during the SETTLE period due to insufficient settle time a Gross Leak test result will be obtained. In this situation, SETTLE TIME should be increased.

DECAY LIMIT FAILURE

The DECAY LIMIT failure is simulated by putting a shut-off on the test port and pressing the "START-*-" Button. Allow the CHARGE and SETTLE times to finish and as soon as the instrument enters the LEAK TESTING mode remove the shut-off from the test port. LEAK TESTING is indicated in place of READY on the Screen.

The MDT-500 will detect the pressure loss and display the failure on the READY screen if the pressure decay in the part exceeded the allowable preset DECAY LIMIT. The MDT-500 makes this decision as soon as the limit is exceeded.

DECAY LIMIT PASS

Place the shut-off device on the test port and leave it there for the duration of the test cycle. Press the "START-*-" button and let the CHARGE, SETTLE and TEST cycles finish. The "PASS" message appears after the part number on the READY Screen. The actual DECAY LIMIT is also displayed along with the lighted green "PASS" light. The pressure decay in the specified TEST TIME was less than the preset DECAY LIMIT. This decision was made when the test time was over.

MANUAL TEST ABORT

A test can be stopped by pressing the "START/ABORT -*-" BUTTON for at least one second. No result is given and the counters are not incremented. The READY screen is displayed.



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## CLEARING THE RESULTS

The result messages described above will remain on the display. It is not necessary to clear the previous result in order to start a new test Pressing the "START-*-" button will clear the previous result and will automatically start a new test cycle. Use of the DATA ERASE MENU will allow deletion of the test, clearing of test data and clearing of all counters.



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**CHAPTER 3 FLOW TEST MODE** **PAGE**


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## FLOW TESTING IN THE MDT-500

In manufacturing and quality control, one of the most important parameters to be measured is flow. The air flow through a part can indicate whether the part is within the acceptable dimensional, seal or density tolerances.

For example, a smaller than normal flow rate in a particular section of tubing might indicate a reduction in the Internal Diameter (I.D.) of the tubing. An unusually high flow rate in a filter element might indicate lower fiber density or membrane perforation. In the extreme case, a very low or zero flow rate would indicate a partial or total occlusion of the part which might be the result of manufacturing flaws or poor bonding - welding, assembly operations, etc..

The MDT-500 uses a mass flow meter that is the state of the art in flow measurement technology to perform its flow tests. This allows accurate measurement of the flow through a part regardless of pressure or temperature.

The flow test, as performed by the MDT-500 allows the setting of the **Standard** flow rate and the **Upper** and **Lower tolerances.**

**Standard** flow rate refers to the average flow rate for a given part. The **Upper tolerance** is the maximum acceptable flow rate ( as a percent) **ABOVE** the **Standard** flow rate. The **Lower tolerance** is the minimum acceptable flow rate ( as a percent) **BELOW** the **Standard** flow rate. A part with a flow rate at the upper tolerance level or the lower tolerance level will be considered acceptable. A part with a flow rate outside the tolerance range would be rejected.

For example: If a part has a flow rate of 1000 cc/min. with a tolerance of $\pm$ 250 cc/min, then a flow rate between 750 cc/min and 1250 cc/min is acceptable.

The settings for a flow test on this part would be the following:

Standard Flow: 1000 sccm*
Flow + Tol: + 25%
Flow - Tol: - 25%.

Parts with flow rates BETWEEN 750 and 1250 will PASS the Flow test.
Parts with flow rates OUTSIDE 750 and 1250 will FAIL the Flow test.



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## MDT-500 FLOW TEST SETTINGS

This portion of the manual describes how to set the MDT-500 for flow testing a part. The setting to be described are:

Standard Flow Rate,
Flow + Tolerance,
Flow - Tolerance,
and
Flow Timer.

Prior to setting up test parameters for flow testing select the TEST MODE+ALARM screen by pushing F3 when in the Main Menu Screen. Verify that the TEST MODE indicated on the screen indicates FLOW TEST. If LEAK, LEAK + FLOW or FLOW + LEAK TEST are indicated the pressing of F2 will move the screen to ERASE DATA WARNING screen. While in this screen, pressing of F2 when the answer to PROCEED? is (YES) moves the screen to TEST DATA CLEARED and ALL COUNTERS CLEARED screens and back to the TEST MODES + ALARMS screen automatically. This clears all data contained in the datalog i.e.: deletes all records of previous of tests.

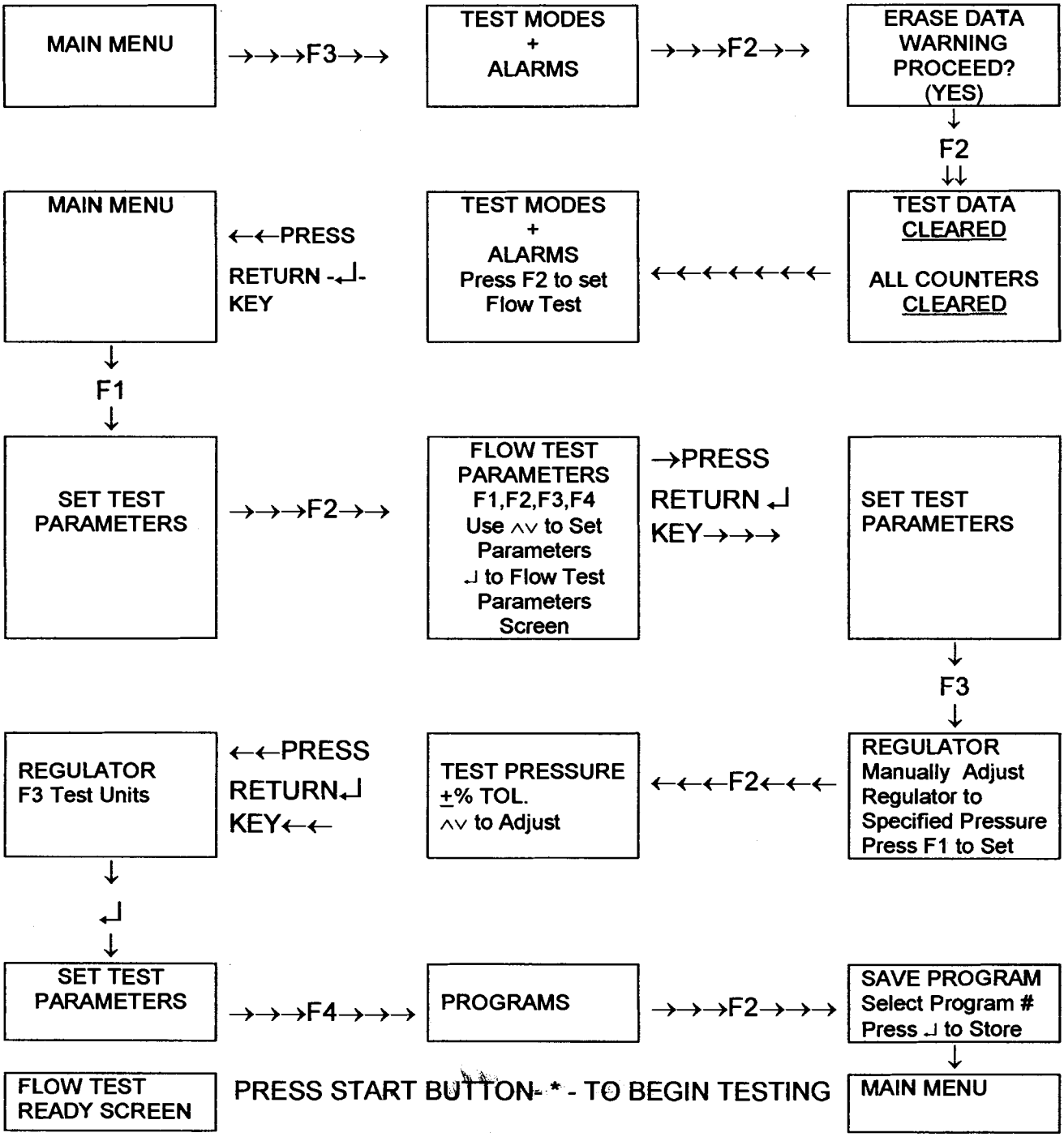
Press the RETURN key to return to the MAIN MENU Screen. Select the Main Menu Address -SETTINGS & PROGRAMS- by pushing F1. This will move the screen to the SET TEST PARAMETERS Screen. Use F2 to move to the FLOW TEST SETTINGS Screen. In this screen use F1 through F4 and the directions on the STANDARD, MAX., AND MIN FLOW RATE AND FLOW TEST TIMER Screens to set the test parameters. The Standard flow rate per minute is usually set equal to the average flow rate of a batch of acceptable samples. When the test parameters have been entered into the instrument, press the "START -*-" button and the LEAK FLOW screen will be ready for the first test.



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**FLOW TEST SET-UP PROCEDURE PROCESS CHART**

This process chart indicates the process of set up for Flow Testing in the MDT-500. See detailed explanation of Screens that follows.






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## SCREENS - FLOW TEST MODE

| MAIN MENU | *EXIT |
|---|---|
| SETTINGS & PROGRAMS | |
| PRINT, DATALG, STATS | |
| TEST MODE, ALARM, CAL | |
| DATA ERASE MENU | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Settings & Programs | Selection will move to **Set Test Parameters** Screen | Select leak or flow test parameters, OR move to screen to select test pressure units, OR Save and Recall programs that are stored or to be stored. |
| Print, Datalg, Stats | Selection will move to **Test Data** Screen | Select Printer Reports to send data to a local printer ( selections are available in this menu), OR Select View Datalog (selection are available to view, print or clear the datalog memory and to set an alarm to warn of datalog overwrite), OR Set Statistics (selections are available to set calculations for statistical operations. |
| Test Mode, Alarm, Cal. | Selection will move to **Test Modes + Alarms** Screen | Select Test Modes of Leak, Flow or Dual tests, OR Set audible failure alarm, OR set Clamp or Bleed time cycles, OR enter Calibration Mode screen. |
| Data Erase Menu | Selection will move to **Clear Data** Screen | Selections in this menu allow deletions of test data, OR resetting of the part counter. |



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## SCREENS

| TEST MODES + ALARMS | *EXIT |
|---|---|
| **FAIL ALARM: OFF**<br><br>**TEST MODE: FLOW TEST**<br><br>**CLAMP: OFF BLEED: OFF**<br><br>**CALIBRATION MODE** | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Fail (Failure) Alarm | No Screen Change | Allows selection of Setting of Failure Alarm in On or Off Mode |
| Test Mode | No Screen Change if DataLog contains No Data;<br>Selection will move to **Erase Data Warning** Screen if DataLog contains Data(see **Data Erase** Screen for further explanation). | Allows selection of "Leak Test" Mode;<br>"Flow Test" Mode;<br>"Leak + Flow" Mode;<br>or "Flow + Leak" Mode |
| Clamp Timer/ Bleed Timer | Selection will move to **Set Clamp Timer** Screen followed by **Set Bleed Timer** Screen. | Allows selection of Clamping time and Bleed Time. |
| Calibration Mode | Selection will move to **Calibrate** Screen | Allows selection of Test Pressure. Reading, Pressure Decay<br>Reading, Flow Rate Reading<br>Screens for calibration and Time,<br>Date and Contrast Adjustment<br>Screen |



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| ERASE DATA WARNING | *EXIT |
|---|---|
| THE DATALOG, COUNTERS AND TEST RESULTS ARE GOING TO BE ERASED.<br><br>PROCEED?-> (YES)<br>CANCEL?-> (NO) | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Proceed? | Selection of "Yes" | Proceeds with clearing of all Test Data and Clearing of All Counters **Test Data Cleared** and **All Counters Cleared** displayed on Screens. |
| Proceed ? | Selection of "No" | Proceeds to **Test Data Not Erased** Screen |

| TEST DATA CLEARED |
|---|

| ALL COUNTERS CLEARED |
|---|

| TEST MODES + ALARMS | *EXIT |
|---|---|
| FAIL ALARM: OFF<br><br>TEST MODE: FLOW TEST<br><br>CLAMP: OFF BLEED: OFF<br><br>CALIBRATION MODE | |

| MAIN MENU | *EXIT |
|---|---|
| SETTINGS & PROGRAMS<br>PRINT, DATALG, STATS<br>TEST MODE, ALARM, CAL<br>DATA ERASE MENU | |



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## SCREENS

| SET TEST PARAMS | *EXIT |
|---|---|
| LEAK TEST - OFF - | |
| FLOW TEST SETTINGS | |
| TEST PRSR + UNITS | |
| SAVE/RECALL PROGRAM | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Leak Test Settings | Selection will move to **Leak Test Parameters** screen | Set Charge, Settle, and Test time lengths in this screen. Set Decay pressure limit here also. |
| Flow Test | Selection will move to **Flow Parameters** screen | Set the expected Standard flow rate in sccm. Set the allowable maximum flow tolerance variation from standard flow rate and minimum flow tolerance before alarm. Set flow test time. |
| Test Prsr + Units | Selection will move to **Regulator** screen | Select Spec. Presr to confirm the air regulator value shown at the top of the screen. (This is your test pressure). Select Presr. Tol. to set the upper/lower allowable variation of test pressure. The test will abort if the limits are exceeded. Select Test Presr Units to set PSIG or In $H_2O$. Select Prs. Decay Units to set PSIG or In $H_2O$. |
| Save / Recall Prog | Selection will move to **Programs** screen | Select Recall Program to choose a previously stored program ( #1- #10). Save Prog to recall a program of current test parameters, OR View/ Print Programs to print currently stored programs. |



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| FLOW TEST PARAMS. | *EXIT |
|---|---|
| STAND. FLOW: 0000 cc/m | |
| FLOW + TOL: 00.0 % | |
| FLOW - TOL: 00.0 % | |
| FLOW TIMER: 0.0 Sec | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Stand. Flow | Selection will move to **Standard Flow Rate** Screen | Select flow rate per minute. Push Up or Down arrows to select flow rate. |
| Flow + Tolerance % | Selection will move to **Max. Flow Rate (+Tol)** Screen | Select + Tolerance of the Flow Rate. Push up or Down Arrows to select the upper % Tolerance limit. |
| Flow - Tolerance % | Selection will move to **Min. Flow Rate (- Tol)** Screen | Select - Tolerance of the Flow Rate. Push up or Down Arrows to select the lower % Tolerance limit. |
| Flow Timer | Selection will move to **Flow Test Timer** Screen | Select Flow Test Time in seconds. Push up or Down Arrows to Select Seconds. |



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**STANDARD FLOW RATE**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

**< CC/M >**

**0000**

**MAX. FLOW RATE (+ TOL)**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

**< % >**

**00.0**

**MIN. FLOW RATE (- TOL)**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

**< % >**

**00.0**

**FLOW TEST TIMER**

USE ∧ ∨ TO CHANGE or
USE ↵ * TO EXIT

**< SEC >**

**0.0**



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## SCREENS

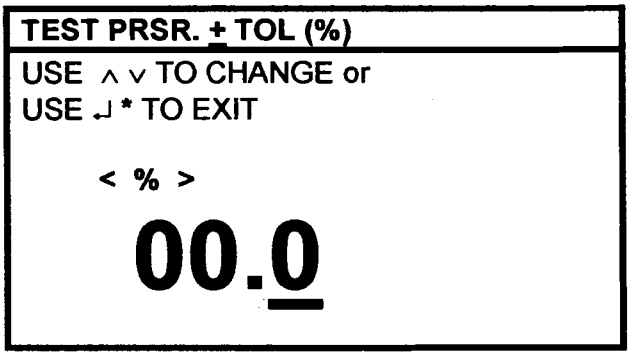
| SET TEST PARAMS | *EXIT |
|---|---|
| LEAK TEST - OFF - | |
| FLOW TEST SETTINGS | |
| TEST PRSR + UNITS | |
| SAVE/RECALL PROGRAM | |

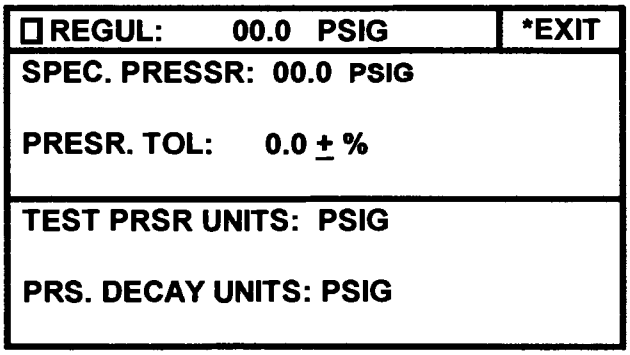
| □ REGUL: 00.0 PSIG | *EXIT |
|---|---|
| SPEC. PRESSR: 00.0 PSIG | |
| PRESR. TOL: 0.0 ± % | |
| TEST PRSR UNITS: PSIG | |
| PRS. DECAY UNITS: PSIG | |

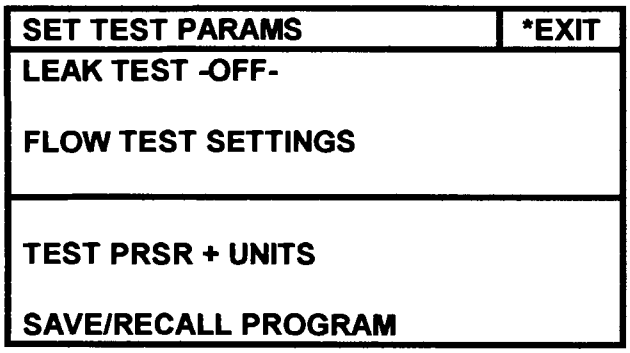
| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Spec. Pressr. | Indicates pressure setting for manual adjustment of regulator | Sets testing pressure for flow and pressure decay tests. The GROSS LEAK for the Charge is 95% of the Specified Pressure or the Set Pressure. |
| Pressure Tolerance | Selection will move to **Test Pressure ± % Tol** Screen | Selects ± Tolerances of the set test pressure. Push UP and DOWN Arrows to increase or decrease the tolerance. NOTE: THIS IS GROSS LEAK SETTING FOR SETTLE. |
| Test Prsr.Units | Screen does not change. | Allows selection of units of test - PSIG or In.$H_2O$. |
| Pressure Decay Units | Screen does not change. | Allows selection of units of test - PSIG or In $H_2O$. |



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| PROGRAMS | *EXIT |
|---|---|
| RECALL PROGRAM | |
| STORE PROGRAM | |
| VIEW/PRINT PROGRAMS | |

| Menu Address | Select Address Result | Resulting Action |
|---|---|---|
| Recall Program | Selection will move to **Recall** Program Screen | Allows Recall of Program # |
| Store Program | Selection will move to **Save Program** Screen | Allows Selection of Program # and Storage of Program |
| View/Print Programs | Selection will move to **View/Print** Screen | Allows On-Screen View of Test Program Parameters and Print-out of that information. |



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## SCREENS

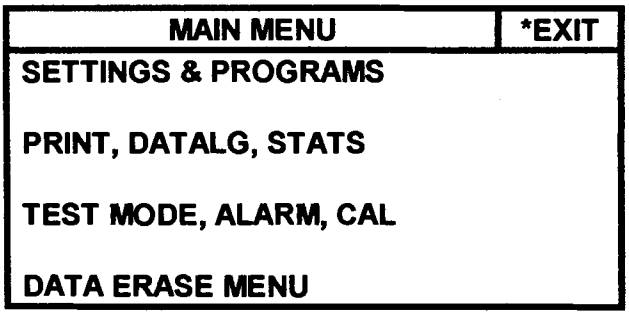
| RECALL PROGRAM | *EXIT |
|---|---|
| USE ∧ ∨ TO PICK PROGRAM #<br>THEN USE ↵ TO RECALL<br>OR USE * TO EXIT<br><br>**1.** | |

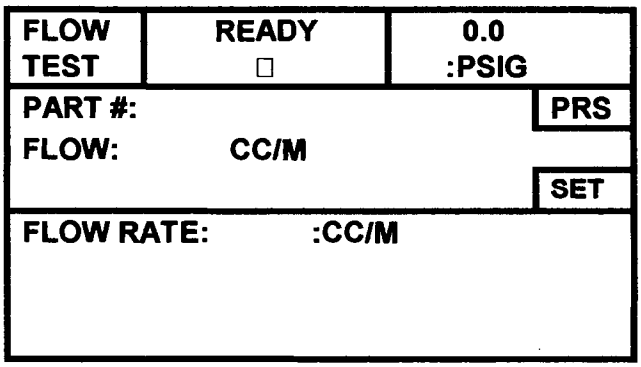
| SAVE PROGRAM | *EXIT |
|---|---|
| USE ∧ ∨ TO PICK PROGRAM #<br>THEN USE ↵ TO STORE<br>OR USE * TO EXIT<br><br>**1.** | |

| VIEW: ∧ ∨ PRINT: ↵ | *EXIT |
|---|---|
| **PROGRAM # _ LEAK TEST**<br><br>**CHARGE TMR: 00.0 Sec**<br>**SETTLE TMR: 0.0 Sec**<br>**TEST TMR : 0.0 Sec**<br>**DECAY LIMIT: 0.000 PSIG**<br><br>**SPEC. PRESR: 00. PSIG**<br>**PRESR. TOL.: 0.0 ± %** | |



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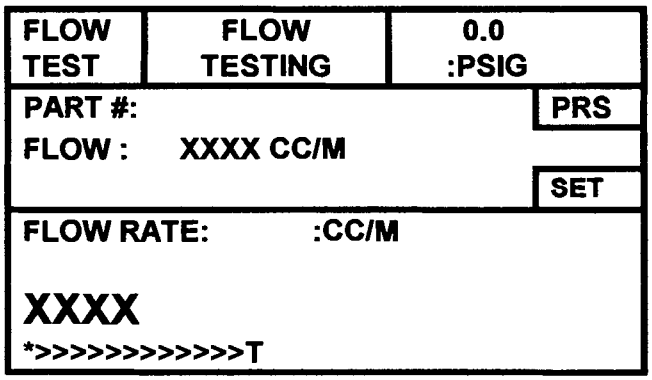

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## RUNNING A FLOW TEST

To simplify the description of FLOW settings the MDT-500 should be set in the Flow Test Mode. Follow the instructions in the "Flow Test Set-Up Procedure Process Chart" and "Screen & Screen Definitions" Sections. Set the following parameters if they are not already entered

Standard Flow Rate = 1000 CC/m
Max. Flow Rate = 10%
Min. Flow Rate = 10%
Flow Test Timer = 1.0 sec.

Connect a test part to the test port of the MDT-500. Press the "START" button. The screen that follows indicates that the instrument is measuring the flow rate through the part being tested.




When the test is done the instrument will either pass or fail the flow test depending on the result. If the part is a "PASS" the READY Screen will indicate the part # and PASS and display the actual Measured flow rate. The Green Pass light will be lit. This means that the MDT-500 measured a flow rate that was within the allowable range. The allowable range is the

Upper Limit = Standard + Upper Tolerance
Lower Limit = Standard - Lower Tolerance.

The part is a "PASS" if:

Lower Limit < Flow Rate < Upper Limit

If the MDT-500 measured a flow rate that was outside the allowable range the READY Screen displays "FAIL" instead of "PASS" and the red FAIL light is lit. The part is a "FAIL" if:

Lower Limit > Flow Rate OR Flow Rate > Upper Limit.



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**CHAPTER 4: TWO PART TESTS** **PAGE**


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Using the Bleed Cycle 58




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## SETTING THE TEST MODES IN THE MDT-500

The MDT-500 can be set to perform any of the following tests:

Leak test only
Flow test only
Flow test + Leak test
Leak test + Flow test.

To set the type of test that the MDT-500 will be performing follow the instructions on the Process chart for the desired test. When the Main Menu Screen is displayed press the F3 key to move to the TEST MODE, ALARMS, CAL SCREEN. Press the F2 key and the display will move to the ERASE DATA WARNING SCREEN where the statement "THE DATALOG, COUNTERS AND TEST RESULTS ARE GOING TO BE ERASED - PROCEED? (YES)" will appear. By pressing the F2 key the "ALL DATA CLEARED" and "ALL COUNTERS CLEARED" screens will be displayed and the instrument will return to the TEST MODES + ALARMS screen. Press the F2 screen to select the desired Test Mode. Press the Return Key ↵ to move the display back to the Main Menu screen where pressing the F1 key SETTINGS AND PROGRAMS moves the screen to the SET TEST PARAMETER screen and allows the operator to enter the desired test parameters as directed by the displays. The desired test mode will be displayed as follows:

**LEAK TEST MODE**

| TEST MODES + ALARMS | *EXIT |
|---|---|
| FAIL ALARM: OFF<br><br>TEST MODE: LEAK TEST<br><br>CLAMP: OFF BLEED: OFF<br><br>CALIBRATION MODE | |

**FLOW TEST MODE**

| TEST MODES + ALARMS | *EXIT |
|---|---|
| FAIL ALARM: OFF<br><br>TEST MODE: FLOW TEST<br><br>CLAMP: OFF BLEED: OFF<br><br>CALIBRATION MODE | |



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**FLOW + LEAK MODE**

| TEST MODES + ALARMS | *EXIT |
|---|---|
| FAIL ALARM: OFF<br><br>TEST MODE: FLOW + LEAK<br><br>CLAMP: OFF BLEED: OFF<br><br>CALIBRATION MODE | |

**LEAK + FLOW MODE**

| TEST MODES + ALARMS | *EXIT |
|---|---|
| FAIL ALARM: OFF<br><br>TEST MODE: LEAK + FLOW<br><br>CLAMP: OFF BLEED: OFF<br><br>CALIBRATION MODE | |

If the answer to the question PROCEED? (N0) is selected ( press the ∧ or ∨ key to obtain the desired answer) then the data is not cleared and the instrument remains in the current test mode.



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## TWO PART TEST MODES IN THE MDT-500

TWO PART TESTS ( FLOW + LEAK; LEAK + FLOW)

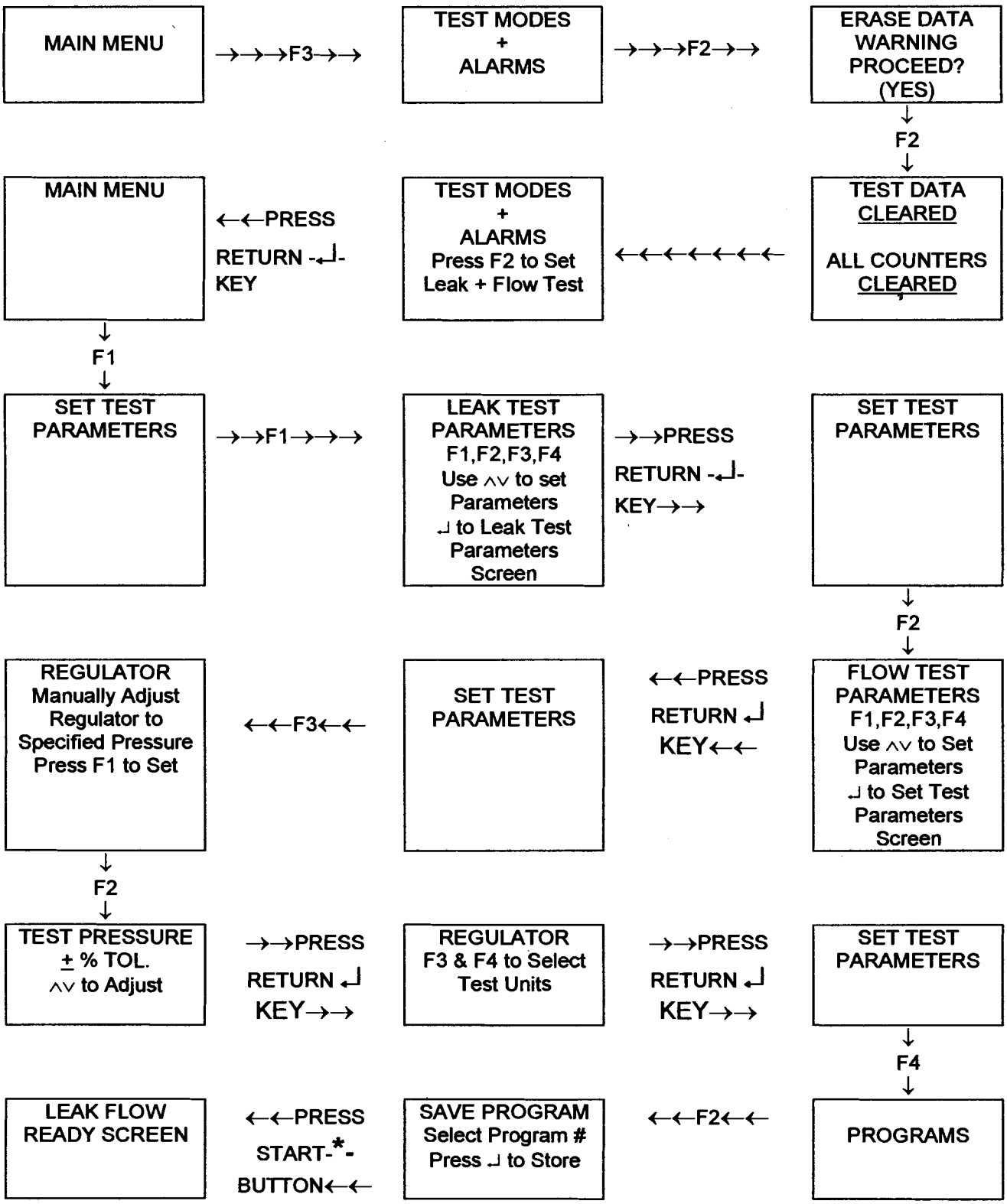
There is no functional difference between leak testing first and flow testing after or vice versa. The two test modes have been provided to accommodate special test fixtures that in some cases require a particular test sequence. For example: clamping devices must operate in the Flow + Leak Mode because after the leak test the part has been deformed and a flow test is not appropriate at this time. When a two part test is performed, The instrument will proceed through the first and second tests and display both results on the screen at the end.

The settings for these tests have been described in detail in Chapters 2 and 3. For a review, please refer to those chapters and the Test Set-Up Procedure Process Charts that follow.



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## LEAK + FLOW TEST SET-UP PROCEDURE PROCESS CHART






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