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DO NOT USE THIS EQUIPMENT TO PURGE TOXIC OR FLAMMABLE GAS

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DO NOT USE THIS EQUIPMENT UNDER FLAMMABLE, VOLATILE OR TOXIC ENVIRONMENTAL CONDITIONS

INSTALLATION, OPERATIONS, AND MAINTENANCE MANUAL FOR THE GALISO

RECORTEST OPEN (A)

AUTOMATED HYDROSTATIC TEST SYSTEM

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MANUAL NUMBER 21-11-1062 **Revision B Issued 11/02**

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The Galiso Recortest/Open (A) is a computer controlled hydrostatic test system which is designed for rapid, accurate testing of compressed gas cylinders at test pressures up to 10,000 PSI. The Recortest/Open (A) uses an IBM compatible PC and a patented Electronic Expansion Measuring System to automate the cylinder test procedure. After test requirements have been entered in the Recortest/Open (A) control computer, the system will automatically seal test pressure within the cylinder, perform the test at the required specifications, interpret and record the test results and de-pressurize the cylinder at the end of the test. In addition, the control computer may be used as a personal computer to perform data analysis and processing tasks.

The Recortest/Open (A) system controls the entire hydrostatic testing procedure. Each cylinder is tested in accordance with specifications that are entered into the control computer with the keypad. Identical test specifications may be repeated many times when a series of identical cylinders are tested, or specifications may be changed to fit the requirements of each individual cylinder. Test specifications include; Remarks, Cylinder Serial Number, Size, D.O.T. / I.C.C. Rating, Test Pressure, Maximum Allowable Elastic Expansion, Test time, and Visual inspection results.

The Recortest/Open (A) will record specifications and store them along with test results for each cylinder tested. Test results include the test pressure, total expansion, permanent expansion, percent expansion and a disposition code which indicates whether the cylinder has passed or failed. All specifications and results are shown on a high resolution, color display monitor. The RECORTEST Printer prints a complete test report, which includes all test specifications and results. The test report should be filed to provide a permanent record of the test. Results can also be archived to floppy disks.

Depending on the cylinder sizes, a typical Recortest/Open (A) System with one test jacket, filling, draining and drying equipment can process between 10 and 20 cylinders per hour when manned by two operators.

The Recortest/Open (A) system will provide greater accuracy than is possible with conventional cylinder testing equipment. With this system, documented test results are no longer subject to operator interpretation. The Recortest/Open (A) automatically determines if each cylinder meets Department of Transportation specifications, or any other pre determined specification, and will notify the test operator if a cylinder must be re-tested or rejected. The Recortest/Open (A) also monitors the pressurization and expansion circuits for leaks that would invalidate results. Upon detection of leaks the system will notify the operator so that corrective measures may be taken.

The components and equipment required for a complete Recortest/Open (A) installation may be custom configured to meet the specific customer requirements. Recortest/Open (A) systems are also designed to be able to grow with the production requirements of your operation. Options may be added after time of purchase that will allow you to expand the production output of your system. Contact your Galiso representative for additional information regarding cylinder testing and handling equipment and accessories.

1.1 Hydrostatic Test Requirements

In accordance with D.O.T. / I. C. C. regulations, certain cylinders must be periodically re-qualified and certified safe for use. The re-qualification procedure and regulations are discussed in detail in the Code Of Federal Regulation (CFR), Title 49, Section 173.34. Copies of the CFR may be obtained from Galiso, or by writing to the following address:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

The Galiso Recortest/Open (A) Test System will perform water jacket (hydrostatic) testing of compressed gas cylinders. The specifications and procedure for hydrostatic testing are outlined in Compressed Gas Association Pamphlet C-1, “Methods for Hydrostatic Testing of Compressed Gas Cylinders”. Copies of Compressed Gas Association Pamphlets are available by writing to the following address:

Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, Virginia 22202
(703) 979-0900

1.2 Hydrostatic Test Overview

In general, the water jacket method for hydrostatic testing consists of loading a water filled cylinder into a sealed chamber (test jacket), which is also filled with water and is connected to a calibrated glass tube (burette). The Recortest/Open (A) uses a patented Electronic Expansion Measuring System (Expansion Bowl) in place of the burette. The burette or Expansion Bowl is first zeroed, and the cylinder is then pressurized to 5/3 of its D.O.T. or I.C.C. rating, which is stamped on the shoulder of the cylinder. This test pressure is held for thirty seconds (or an operator defined time period).

As internal pressure is applied to “inflate” the cylinder, the cylinder expands and forces water out of the test jacket and up into the Expansion Bowl. After the thirty second test time has elapsed, the Expansion Bowl is then read to determine the **Total Expansion** (in cubic centimeters) of the cylinder under test pressure. The test pressure is released and the cylinder “deflates”. As the cylinder shrinks to it’s approximate original size, water is allowed to drain back into the test jacket from the burette or Expansion Bowl. In most cases, the cylinder will not return to its original size, having been slightly stretched by the pressurization process. This stretching is called **Permanent Expansion**. The difference between the Total Expansion and the Permanent Expansion is called the **Elastic Expansion**.

1.2 Hydrostatic Test Overview, continued

The **Percent Permanent Expansion** of the cylinder is determined as follows:

Percent Permanent Expansion = (Permanent Expansion / Total Expansion) X 100

When the Percent Permanent Expansion exceeds the predetermined limits for the cylinder being tested, the cylinder must be condemned and removed from service. A high percent permanent expansion value is an indication that the cylinder metal has lost it's elasticity, or that there has been excessive thinning of the cylinder wall and that the cylinder is no longer safe for use.

All test data, such as test pressure, cylinder serial number, expansion results, etc. are recorded by the Recortest/Open (A) Control Computer. At the end of a test period, a test report may be printed to provide a hard copy of test specifications and results. All test records must be saved and maintained for the life of the cylinder or until the cylinder is re-tested, in the event that there is any future problem with cylinder.

Cylinders which will receive a plus (+) stamp or a star (*) stamp require additional test specifications and calculations. Plus (+) stamping allows the cylinder to be filled to an additional 10 percent beyond the rating which is stamped on the cylinder shoulder. Star (*) stamping makes the cylinder eligible for an extended ten year retest interval. The procedure and requirements for plus stamping are contained in the Code Of Federal Regulations (CFR), Title 49, Section 173.302(c). Star stamping requirements are discussed in the Code Of Federal Regulations (CFR), Title 49, Section 173.34(e)(16).

1.3 Scope Of Manual

This manual was written for the test operator/technician familiar with cylinder hydrostatic testing fundamentals. The Recortest/Open (A) systems and equipment should only be operated by personnel who have been properly trained in the function and use of the requisite systems and equipment.

This manual discusses the various hardware components of the Recortest/Open (A) Automated Hydrostatic Test System. This manual covers:

- Equipment Specifications
- Operator Safety and Equipment Protection
- Equipment Installation
- Equipment Operations
- Equipment Maintenance

1.4 Quick System Start-Up Procedure (RECORTEST OPEN)

Prior to Testing:

Before the system is turned on, it is important to complete the following:

- Ensure the cylinders to be tested are free from defects and have been properly inspected per CGA C-6.
- Completely fill the cylinders with clean water and allow them to achieve room temperature.
- Master Gauge and Calibrated Cylinder must be on hand each day, to verify calibration of system.
- Read all instructions before attempting to operate the Recortest Open test system. Before turning on computer, ensure air and water are turned **off** or **closed**.

1. Turn power on to computer, monitor, and printer and wait for computer to initialize.
   When monitor displays blue screen, do the following:
   a) Go to <EDIT> in main menu and press <ENTER>.
   b) Go to <HARDWARE> and press <ENTER>. In the hardware screen, press <QUIT> (F10).

Note: This must be done each time the computer is turned on and testing is to be done.

2. Turn on air and water to system. Verify that control air pressure is 90 PSI on small regulator at right on pump manifold. Check oil level in lubricator. Place calibrated cylinder in test jacket and connect hoses to test head, blue hose first. Turn 3-way valve to EXPANSION.
3. Bleed air from expansion lines by filling bowl using BOWL/JACKET FILL valve and disconnecting blue hose to allow water to drain back into jacket. Be sure to not drain bowl water below end of tube in bowl. Be sure 3-way valve is turned to EXPANSION when cylinder is in jacket and hoses are connected.
4. Go to <VERIFY> screen and enter VERIFY for the jacket that the calibrated cylinder will be placed in that day. Ensure the system is stable by holding a ZERO reading before any other checks are done.
5. To verify the bowl reading: With the reading starting at 0.0, place the test weights on the bowl hanger. The reading for the two test weights should be 100 grams +/- .3 grams (99.7-100.3). If the reading is outside of this tolerance, you must recalibrate the load cell using the calibration procedure in the manual.

6. To verify the pressure, connect the master gauge to the test head and attach the test hose to the top fitting on the master gauge. Pressurize the system using the AUTO (F5) key, and enter a pressure that is within the testing range of the cylinders to be tested that day. Verify that the master gauge reads within the 1% required by DOT, and that the expansion is within its 1% value. If the reading is outside the tolerance acceptable by DOT, the pressure will need to be recalibrated. Refer to the manual if pressure calibration is needed.
7. Bleed off pressure using <BLEED> (F6), and verify system returns to 0.0. You may need to pressurize the cylinder once or twice more for the cylinder to zero out.

Note: Calibrated cylinder must show **NO** permanent expansion.

8. Remove master gauge from system and <EXIT> the verify screen. Go to the test cylinder screen and test calibrated cylinder to within 500PSI of the pressure ranges to be tested that day. DOT mandate: The calibrated cylinder is always the first cylinder to be tested in the day, to provide a record of the system accuracy.
9. Once calibrated cylinder has been tested, the operator will proceed to test cylinders that day.

The operator should be familiar with cylinder marking to ensure proper entry into the fields provided in the test menu. Entries will now be made into the test menu for the next cylinder to be tested and jackets enabled or disabled.

Prior to cylinder testing, the 3-way valve needs turned to HOLD, the hoses removed, and the calibration cylinder removed and replaced with the first cylinder of the day to be tested. When that cylinder has been placed in the jacket, fill the jacket, then connect the hoses, and then be sure to turn 3-way valve to EXPANSION before putting pressure on the cylinder. This part of the procedure is very important to do in the correct order. Call Galiso Inc. with any questions. 1-800-854-3789.

CYLINDER TESTING:

1. Allow the system to automatically test each cylinder by entering the information according to the guides in the REC OPEN manual. As each cylinder is finished testing with a PASSED result, they may then be removed from the jacket for draining and drying.
2. When the day's testing is complete, <EXIT> the test cylinder menu and go to <FILES> in the main menu.

To print out the report for the day, go to <REPORT> and press <ENTER>. Continue to press <ENTER> until you see “PRINT THE WHOLE FILE” appear at the top of the screen. Press <ENTER>. The operator may choose to select a range of dates or other information to print from. **Note:** Be sure printed text is clear and legible before deleting any information.

3. Operator may choose to archive the results to a floppy disk. Follow the instructions in the archive section of printing a report in the REC OPEN manual.
4. To shutdown the system, turn off or close the water and then the air to the system.

From <FILES>, go to <QUIT> and press <ENTER>. The computer may now be turned off.

Note: Refer to the manual for any detailed information, or call Galiso Customer Service at 1-800-854-3789 for additional information and assistance.

2.1 RECORTEST/OPEN (A)System Components

The advanced design of the Recortest/Open (A) Test System is the culmination of fifteen years of research and development in the field of computer controlled hydrostatic test systems. Each component of the Recortest/Open (A) Test System has been carefully designed to streamline the cylinder re-qualification process. Collectively, the components of the Recortest/Open (A) Test System work together to provide unparalleled speed, accuracy and simplicity of operation. The primary Recortest/Open (A) test system components are discussed in detail in Sections 2.1 through 2.6. Standard Recortest/Open (A) System specifications are as follows:

Test Pressure Range: 0 to 10,000 psig

Expansion Test Results: 0.1 cc increments

Cylinder Throughput: 10 to 20 cylinders (2640 cu. in. ea.) per hour

Warranty: 1 Year, see warranty terms

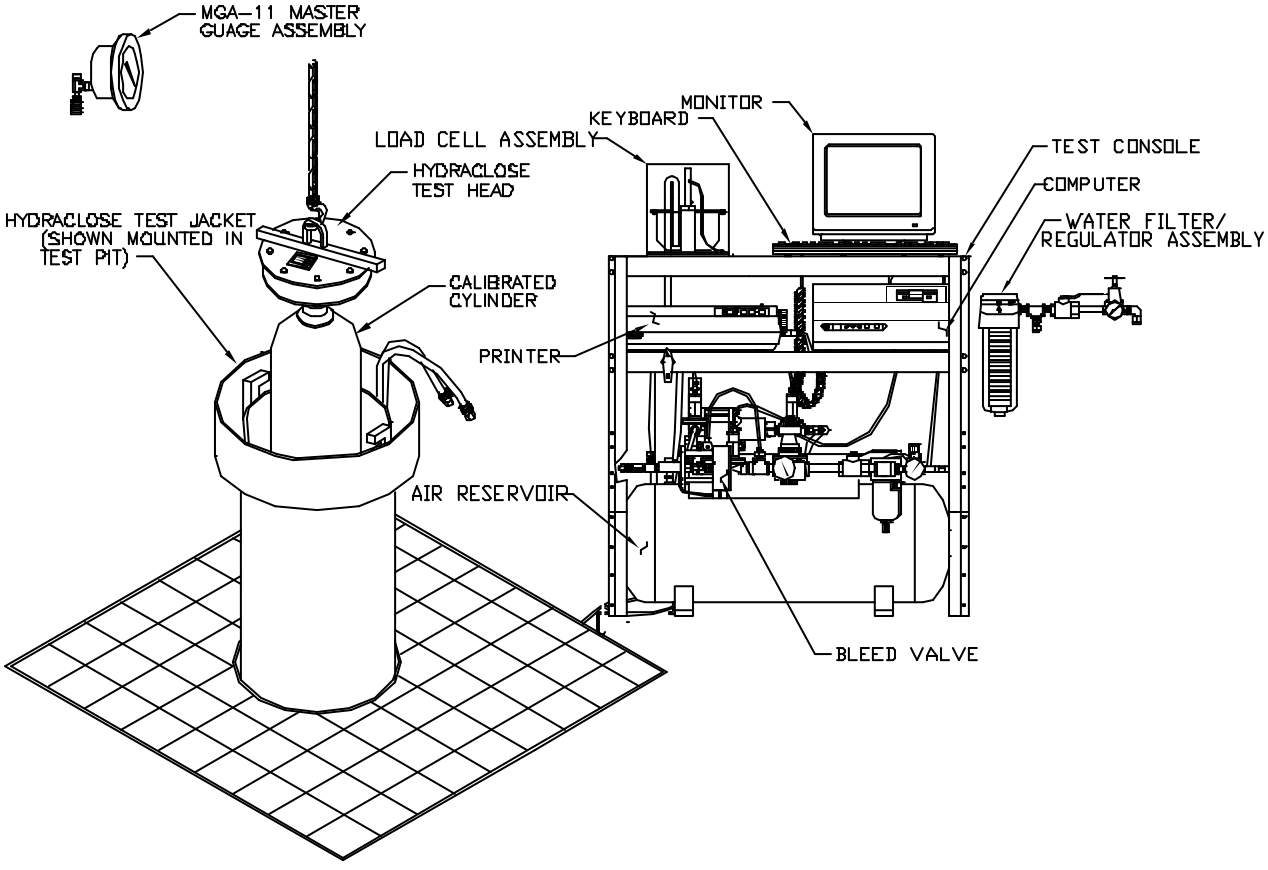


Figure 2 - 1
TYPICAL RECORTEST/OPEN (A) TEST SYSTEM

2.2 RECORTEST/OPEN (A) Control Console:

1. The RECORTEST/OPEN (A) Control Console (figure 2-2) contains a IBM Compatible PC (computer) which controls and monitors the hydrostatic testing process. The Control Console also contains the valves and other components that mechanically control the test process is response to commands from the Control Computer. The patented Expansion Bowl Assembly, which electronically measures cylinder expansion, is also included in the Control Console. The Computer features convenient keypad for entry of test specifications and results a high resolution display monitor that notifies the test operator of test status and results. The Control Console is equipped with a 20 gallon Air Reservoir that supplies filtered air to its components, including the 10,000 PSI water pump. The Control Console also provides a suitable protective enclosure for the printer,

   MAIN COMPONENT SPECIFICATIONS:

Dimensions:	41.12” high x 40.07” long x 26.07” wide
Display Monitor:	SVGA
Printer:	Dot matrix
Electrical Req’d:	5amps @ 110 VAC/3.0 amps @ 220 VAC

2. **PRINTER:** The printer is a high speed, dot matrix printer which types out a report that shows test specifications and results. Care should be taken that the printer is protected form moisture and dirt. The printer is installed inside the Control Console

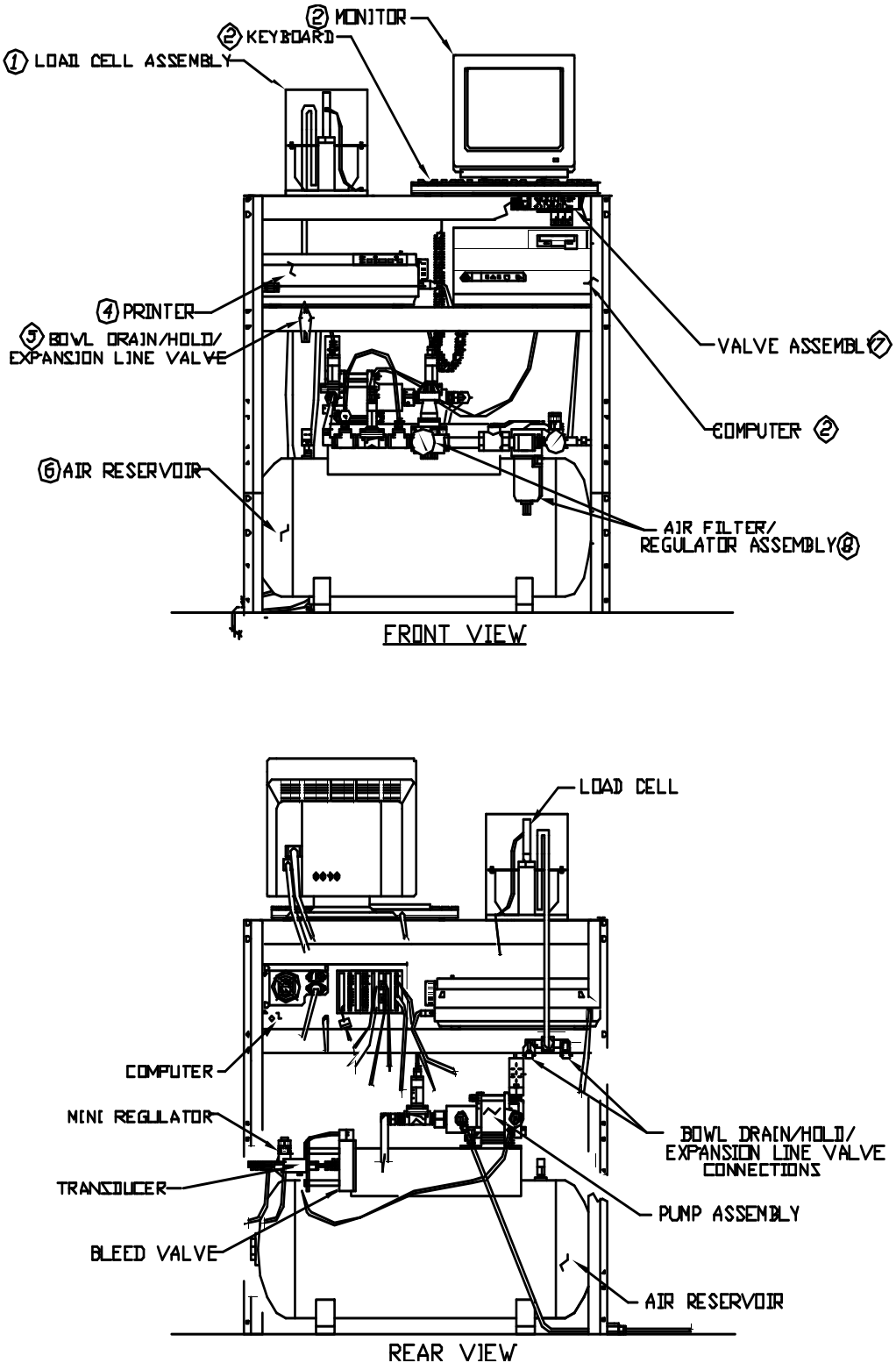


Figure 2 - 2 RECORTEST/OPEN (A) Control Console:

2.3 HYDRACLOSE® Test Heads:

The patented HYDRACLOSE® Test Head (figure 2.4) is a pneumatically controlled test jacket closure and cylinder pressurization device. The HYDRACLOSE Test Head automatically seals itself within the test jacket and also seals the connection between the cylinder and the test head. Note that if a Test Head, Test Spud, Test Adapter, Master Gauge or any other equipment is to be used for oxygen cylinder testing, it must be cleaned per the instructions in CGA pamphlet G-4.1 “Cleaning Equipment for Oxygen Service”.

HYDRACLOSE® Test Heads are available to fit all Galiso HYDRACLOSE® Test Jackets. Spud adapters are available to fit ½”, ¾” and 1” NPT and NGT cylinder neck threads. Custom and specialty cylinder neck thread adapters and spud’s are also available.

SPECIFICATIONS:

Maximum Air Pressure: 100 psig
Maximum Hydraulic Pressure: 11,000 psig

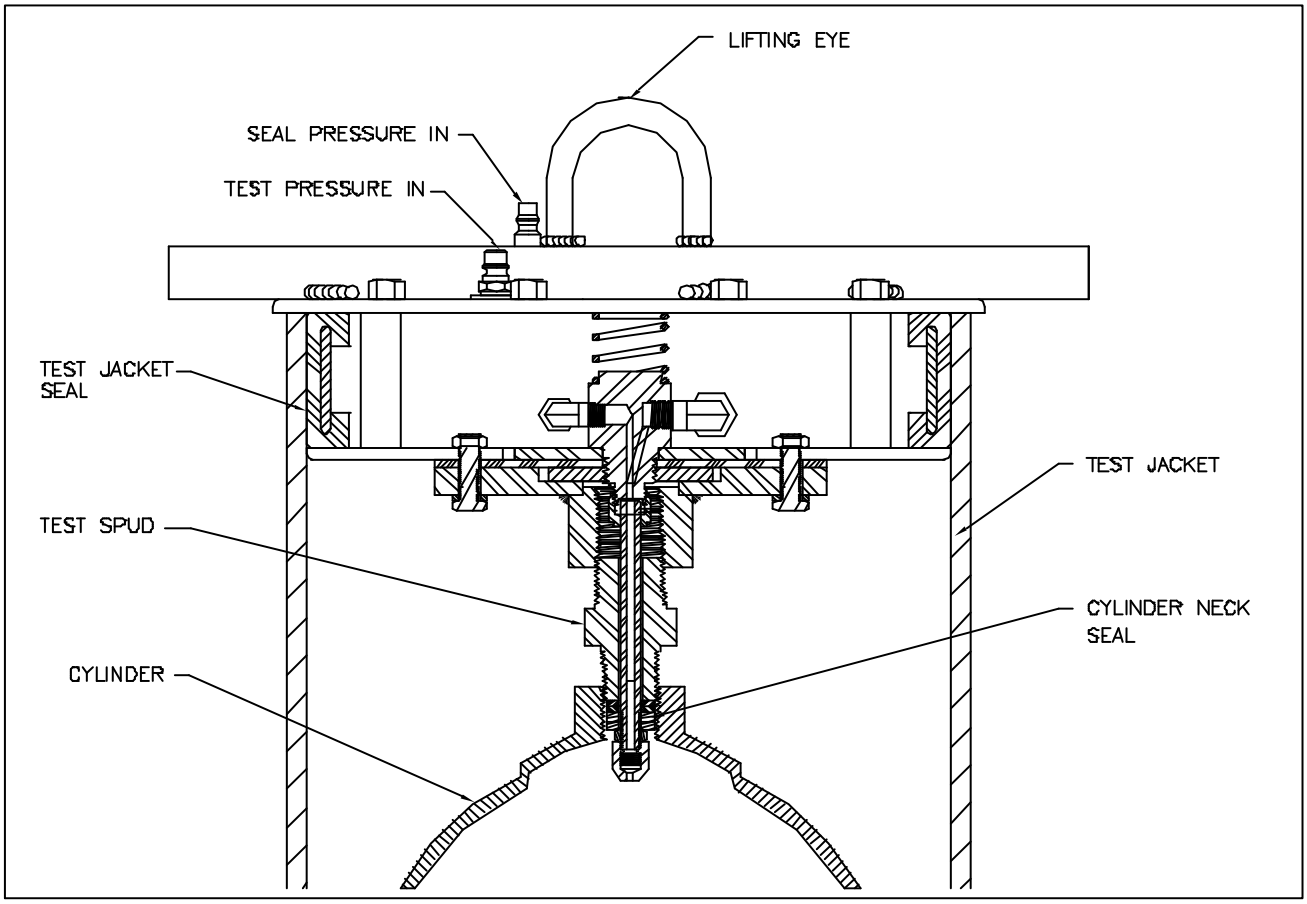


Figure 2-3 HYDRACLOSE® Test Head

2.4 HYDRACLOSE® Test Jacket:

The Test Jacket is used in conjunction with a Test Head to provide volumetric expansion measurement capability during cylinder pressurization. The Test Jacket includes a splash shield, burst disk expansion connections, and drain valve as well as the plumbing components needed for operation of the Hydraclose Test Head. Test Jackets, 24" and larger, have thumb screws incorporated on the Test Head retainer brackets to prevent Test Head "floating", giving inaccurate expansion reading. Tighten thumb screws against head, hand tight after head is in place. After testing , back-off thumb screws to prevent damage to them during subsequent head installation. Standard Test Jacket specifications are provided below (figure 2-5).

2.5 Master Gauge Assembly:

The Master Gauge Assembly (figure 2-6) is used to perform daily pressure reading calibration in accordance with D.O.T. specifications. The Master Gauge Assembly features a mirror dial face and needle pointer for increased accuracy and legibility. The Master Gauge Assembly includes a calibration certificate.

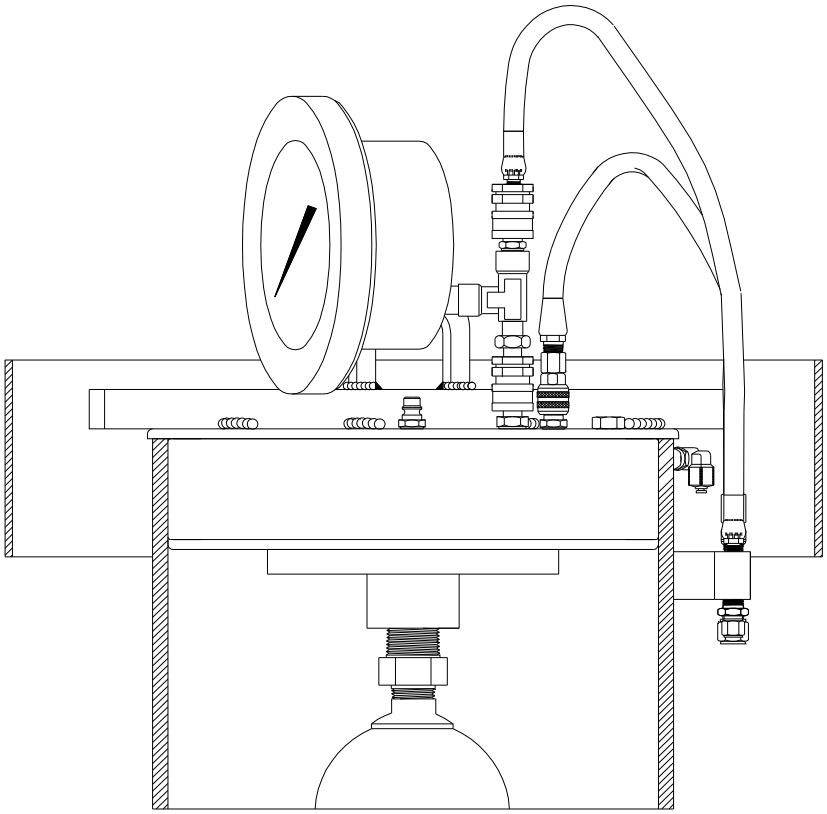


Figure 2-4
Master Gauge Assembly

SPECIFICATIONS:

Accuracy:	0.25 %
Range:	0 to 11,000 psig
Size:	6 inch diameter
Connections:	¼" Female Quick Connect - Test Head ¼" Male Quick Connect - Test Pressure Hose

2.6 Calibrated Cylinder:

The Calibrated Cylinder is a special steel cylinder which is used for daily test system expansion reading calibration. Calibration points are stamped on the cylinder shoulder and a NPT adapter is included to protect the cylinder neck threads. The Calibrated Cylinder includes a calibration certificate which provides an accurate record of the amount of expansion that can be expected at a given test pressure.

3.1 Optional Equipment For RECORTEST/OPEN (A) Systems

The following optional equipment is recommended for use with the RECORTEST/OPEN (A) system for increased testing efficiency and reduction in the number of operators required to meet production requirements

3.2 RCSG Automatic Cylinder Filling Equipment:

The RCSG will quickly fill up to four (4) empty cylinders simultaneously with water, in preparation for testing. The RCSG features an automatic shut off that is activated when the cylinder is full.

CFS-1 and CFS-2 large cylinder fill nozzles providing up to 12.0 gpm (per nozzle) @ 90 psig are also available.

3.3 PCT Series Automatic Cylinder Wash/Dry Equipment:

The PCT is designed to automatically invert cylinder(s), inject hot water and/or detergent solution, dry the cylinder(s) with compressed air and re-invert cylinder(s) all within a timed user programmed cycle. The PCT is available in single, and dual cylinder handling configurations.

3.4 GAH Series Hoists

GAH Hoists feature an air driven 10 ft. standard chain assembly capable of lifting up to 2,000 lbs. GAH models are ideal for high production environments and include a chain basket and trolley assembly.

3.5 OPTI-LITE Fiber Optic Cylinder Inspection Kit

The OPTI-LITE kit features a flexible stainless steel illuminator cable and a 150 watt quartz halogen lamp with brightness control. Since the lamp is housed remotely in the illuminator box, only the stainless steel wrapped fiber optic probe approaches and/or enters the cylinder during DOT required visual inspections. This feature makes the OPTI-LITE ideal for use in potentially flammable environments.

Read all instructions before attempting to install or operate the RECORTEST/OPEN (A) System.

NOTICE:

GALISO, INC. IS NOT RESPONSIBLE FOR DAMAGE OR INJURY CAUSED BY UNSAFE USE, IMPROPER MAINTENANCE OR MIS-APPLICATION OF THIS EQUIPMENT.

Please contact Galiso for guidance if you are in doubt as to the proper safety precautions to be taken when installing or operating this equipment.

4.1 Personnel Safety

4.1.1 Always double check the cylinder pressure rating stamped on the cylinder shoulder to determine the required test pressure.

!WARNING!

DO NOT OVER-PRESSURIZE CYLINDERS.
CYLINDER OVER-PRESSURIZATION CAN CAUSE SEVERE EQUIPMENT DAMAGE AND RESULT IN PERSONNEL INJURY OR DEATH

4.1.2 Galiso, Inc. recommends installation of a safety barrier which isolates the test vessel (cylinder and jacket) from all personnel while testing is in progress. The safety barrier must be capable of protecting personnel in the event of a catastrophic test vessel failure. All personnel must stay clear of the test vessel during testing.

!WARNING!

HYDRACLOSE® Test Jackets are equipped with etched glass burst disks to relieve pressure within the test jacket should the cylinder fail during testing. Should a cylinder fail during testing, personnel injury and/or equipment damage could occur due to shattered burst disc glass.

4.1.3 Do not handle the test pressure hose while the test vessel is pressurized. Injury could occur due to hose leaks.

4.1 Personnel Safety, continued

4.1.4 Do not handle electrical components or exposed connections inside of the Control Computer. The control relays and E/P valves have exposed electrical connections which could cause electrical shock and injury. Verify that all electrical power has been turned off and/or disconnected prior to performing any work activities within the control enclosure.

4.1.5 NEVER operate the RECORTEST/OPEN (A) test system without the lower rear cover plate in place. Both the rear door and the side door of the Control Console should be kept closed while the system is in operation.

4.1.6 Do not attempt to remove the test connection prior to verifying that the test vessel has been completely de-pressurized.

4.1.7 Regularly inspect the pressure connection hose fittings. The hose connection fittings must be repaired or replaced when they become worn or loose fitting.

4.1.8 Always wear eye protection and gloves when using the system.

4.1.9 Keep the work area around the RECORTEST/OPEN (A) System clean, dry and free of debris to reduce the risk of operator injury due to slips or falls.

4.2 Equipment Operation and Test Precautions

4.2.1 DO NOT remove the lower cover plate from the Control Console except to perform repairs or maintenance. The lower rear cover plate seals the enclosure which houses the control computer. This protects the control computer and other electronic components from moisture and dirt and prolongs the life of the components. If it becomes necessary to remove the lower rear cover plate for repairs or maintenance, make certain that your hands are dry and that the floor is also dry.

4.2.2 Before connecting a cylinder for testing, inspect the cylinder neck threads. Cylinders with excessively worn or damaged neck threads must be dispositioned in accordance with CGA Pamphlets C-6, 6.1 or 6.2 as appropriate.

4.2.3 Before connecting a test vessel for testing, check the test pressure hose and fittings to ensure they are in proper working order.

4.2.4 The test spud (see figure 4-1) must engage the cylinder neck threads with at least four threads for the cylinder to be safely tested. If the test connection is not properly attached to the cylinder, it could be blown off during pressurization. If there is any question about the test connection **do not test the cylinder.**

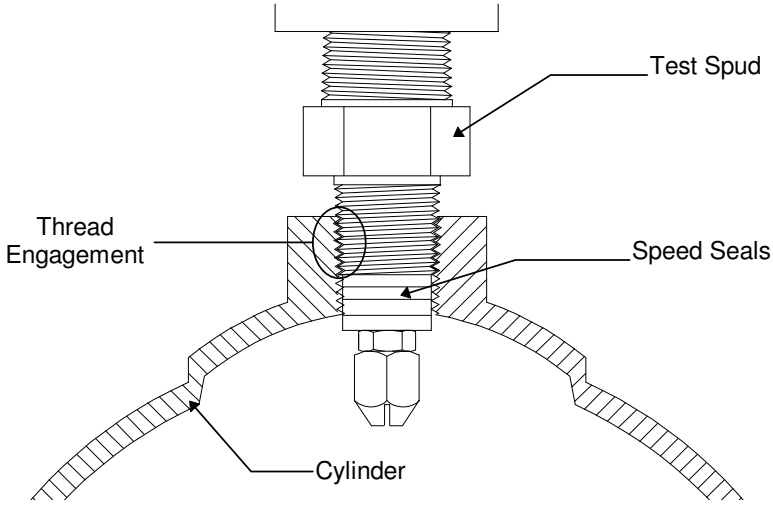


Figure 4 - 1 HYDRACLOSE® Seal

4.2.5 Verify that the test spud used is appropriate for the neck threads of the cylinder that is being tested (see figure 4-2). If an incorrect test spud is screwed on to certain types of cylinders (such as Linde cylinders with oversize neck threads or Airco cylinders with double tapered neck threads), the cylinders will appear firmly attached, but they do not properly engage the threads of the test spud. If you have any questions concerning the appropriate test spud to be used with a particular type of cylinder, contact Galiso.

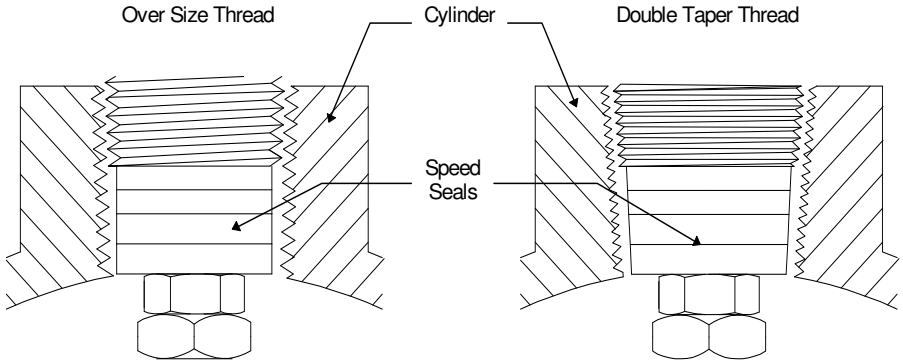


Figure 4 - 2 Cylinder Neck Thread Detail

4.2.6 All Galiso HYDRACLOSE® test jackets include appropriate explosion port(s) and burst disk(s). The purpose of the explosion port and burst disk is to protect the operator and test equipment in the event of catastrophic failure of the cylinder while it is under pressure. The burst disk is designed to shatter in the event of an explosive release of pressure into the test jacket. When the burst disk shatters, excess pressure is released through the explosion port, preventing the test head from being forced out of the test jacket. In the event that you must replace the Test Jacket Burst Disk, make certain that you use a replacement burst disk from Galiso, Inc.

!WARNING!

Do not use Galiso, Inc test equipment with another manufacturers test jackets. Use of other manufacturers test jackets without appropriately designed explosion port(s) and burst disk(s) could result in equipment damage, personnel injury or death.

4.2.7 Before pressurizing a cylinder, adjust the air pressure regulator to the intensifier pump to prevent cylinder over-pressurization. For example, if the cylinder test pressure is 500 psig, adjust the air pressure regulator to stall the pump at approximately 550 to 600 psig. See section 5 for additional information regarding pump output pressure adjustment.

4.2.8 Keep the expansion load cell clean and dry. If water is spilled on the load cell, immediately unplug the unit from the computer and thoroughly dry the unit before plugging the unit back in. After reconnecting the load cell to the computer, the scale must be re-calibrated.

Read all instructions and familiarize yourself with your system installation drawings before attempting to remove contents from crate, installing or operating the RECORTEST/OPEN (A) Test System.

Contact your Galiso representative if you require additional details regarding test pit design, equipment layout and/or utility requirements.

5.1 Site preparation

Select a test location that will maximize the quantity of cylinders to be tested.

Be sure to consider all requirements of the test. Such as removing the valves from the cylinders, filling the cylinders with water, testing the cylinder, draining/drying the cylinders, and replacing the valves into the cylinders.

The Test System must be installed in a location that does not allow direct sunlight to shine on the test jackets or breezes to impinge on the expansion bowl. These external influences could cause expansion reading instability and adversely affect the accuracy of the test results.

Prepare a test pit with an ”I” beam for a hoist. A suggested test pit layout drawing is included with this manual. Plumb a ¾” water and air line to the test pit location.

NOTICE! The air supply must be 120-175 PSI. the water supply must be a minimum of 10 gallons per minute at 60 PSI. Electrical Supply must be

Mount a suitable hoist on the “I” beam. The “I” beam needs to handle all the calculated weights. Contact a civil or structural engineering company for proper fabrication.

Install the I-Beams and Hoist Assemblies. Figure 5-2 also indicates where the hoist trolley beam should be located relative to the test pit and RECORTEST/OPEN (A) equipment.

Once the test pit has been constructed, move the Test System components (while still on crate) to the test pit location.

Starting with the Test Jacket Crate, carefully remove the Calibrated Cylinder, Test Head, and Test Jacket from the crate base.

WARNING!! These items are extremely heavy!! Use the proper equipment to lift these items.
Set the calibrated Cylinder and the (2) lengths of ¼” SST tubing out of the way for now. Make sure that the drain valve on the Jacket is closed.

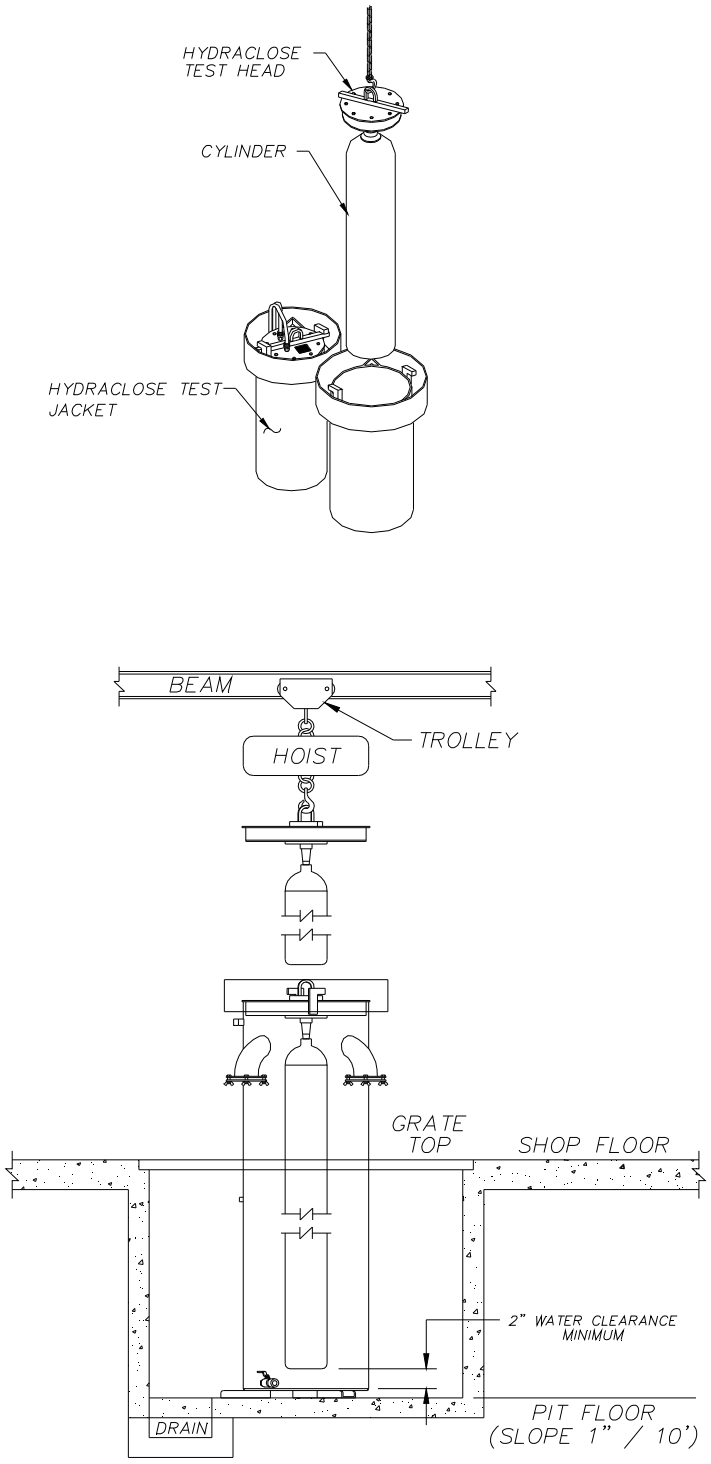


FIGURE 5-1
"I": Beam and Hoist Assembly

Lower the Test Jacket onto the anchor bolts in the test pit. The terminal connections should be facing in the direction of the Control Console. Use shims to level the Jacket, then tighten the nuts onto the anchor bolts.

NOTICE!! Performing the following will assist in centering the jacket to the hoist beam. Insert the Test Head into the jacket and twist it to lock it into place under the Head Retaining Brackets. With the Hoist mounted to the ”I” beam, pick up the Jacket via the Test Head. This will center the Test Head/Jacket to the hoist/”I” beam. Lower the Test Head/Jacket down to the floor of the Test Pit.

Position the grating around the Jacket.

Carefully remove the Control Console and the Air Reservoir from the crate base.

CAUTION!! Do not lift equipment using components that are attached to the Control Console

CAUTION!! These items are delicate instruments and need special care in moving. Move these items into place according to the test pit layout drawing. Use a concrete anchor bolt to bolt these items to the floor. **It is extremely important to prevent movement of the equipment during testing.**

Unpack and remove the Water Filter/regulator assembly. Install this item between the city water inlet connection and the Test Console. Plumb a 3/4" line to the Water Filter inlet port. The Regulator should be factory set to 3 PSI, however, make certain that the setting **is** at 3 PSI.

CAUTION!1 do not turn the water on until this manual instructs you to do so.

Unpack and remove the 1/2" plastic tubing. Plumb a line using the 1/2" plastic tubing from the Water Filter (Tee – “Water to Pump”) to the “Water in From filter” port on the pump.

Plumb a line using 1/2" plastic tubing from the “Bowl/Jacket Fill Regulator” to the “Jacket Fill” port on the jacket (lower port).

Plumb a line using ½” plastic tubing form the Bowl Fill/Expansion” port on the Jacket (upper port) to the Expansion Line Connection” on the Expansion bowl Valve. This line must be a continuous drop from the Control Console to the Test Jacket with no high or low spots.

Plumb a line using ½” plastic tubing form the “Bowl Drain Connection” on the Expansion bowl Valve to the test pit or an adequate drain. This is just a drain line and it needs to be anchored down.

Carefully remove the Jacket Bleed line ("L" shaped ¼" SST tubing) from the crate base. Connect this line (long end) to the "Bleed From Jacket" port on the Bleed Valve. Direct this line towards the back left leg of table.

Remove the H.P. Pump Line ("lazy L" shaped ¼" SST tubing) and connect it (long end) to the "H.P. Water To Test" port on the Pump. Direct this line toward the back left leg of the table.

Locate the ¼" SST Union Tee and connect it to the "Jacket Bleed Line" and the "H.P. Pump Line" near the back left leg of table. The unused port should point toward the test pit.

Plumb a line using 1/4" SST tubing from the Tee (unused port) to the "High Pressure Connection" (elbow) on the Jacket.

Plumb a line using 1/4" SST tubing from the "H.P. Bleed Line" port on the Bleed valve to the test pit or to an adequate drain. This is just a drain line. It needs to have a 90 degree bend in the horizontal direction and a 90 degree bend in the downward direction. This line also needs to be anchored down. This will prevent the line form whipping around during the draining cycle.

Remove the ¼" plastic tubing. Plumb a line from the Mini Regulator (Air filter/Regulator Assembly) to the "Head Seal Connection" on the Jacket.

Unpack and remove the Computer and keyboard. Make sure that the ON/OFF switch is OFF. Position the computer on the lower shelf to the right side. The keyboard will sit in front of the monitor on top of the table. Connect the keyboard to the port labeled "Keyboard Cable Connection" located on the back of the computer.

Remove the monitor and place it on top of the table, to the right rear corner. Make sure that the ON/OFF switch is OFF. Connect the monitor to the port labeled "Monitor Cable Connection" located on the back of the computer

Remove the printer and place it to the left of the computer on the lower shelf. Make sure that the ON/OFF switch is OFF. Connect the "Parallel" end of the cable to the printer and "DB25" end to the port labeled "Printer Cable (DB25) End Connection"

Unpack and carefully remove the load cell from its packaging. Remove the two (2) corks from the load cell on the bowl mounting side.

CAUTION!! This item is very delicate – handle with care

Make sure that cord is facing the front of the control Console and mount it to the load cell mount bracket assembly that is mounted on top of the table. Connect the end of the cable to the "Load Cell Cable Connection" located on the back of the computer. Remove the expansion bowl and attach it to the hanger bolt between the bolt and rubber washer. Remove the expansion cover and cover the load cell assembly.

Locate the transducer that attached to the bleed valve and connect the end of the cable to the ”Transducer Cable Connection” located on the back of the computer.

Locate the Opto Ribbon cable (back of computer) and connect it to the Opto card (attached to underside of table). Connect the WHITE WIRE to the #7 signal terminal.. connect the GREEN WIRE to the #5 signal terminal. Connect the RED WIRE to the #3 signal terminal.

Locate the Opto Power Cable (located on Opto Card) and connect the end of the cable (male plug) to the Opto Power Cable connection, located on the back of the computer.

Locate the Control Valve Stack nearby the Opto Card and check/perform the following:

A. Valve #1 ports, #2 & #4 (not connected).

B. Valve #2, ports #2 & #4 (not connected).

C. Valve #3, port #2 connects to the “Pump slow Valve,” #4 (not connected).

D. Valve #4, port #2 Connects to the “Bleed Valve” (open), port #4 connect to the “Bleed Valve” (closed).

E. Valve #5, port 32 (not connected), port #4 connects to the “Pump Water supply shut Off Valve” and the ”Air To Pump Shut Off Valve.”

F. Connect the ¼” air supply line to the tee that mounts to the mini regulator (air filter/regulator assembly).

Verify that everything has been properly connected. Make sure that the front, back and side splash guards are in place. After doing so, turn on the air supply to the system. Check for leaks and fix and any leaks that may have occurred. Turn on the water supply to the system. Check for leaks and fix any leaks that may have occurred.

CAUTION!! The water supply to the system should be turned off if the air supply to the system is turned off. When the system is not in use the water and air should be turned off.

Regulator Settings:

A. The large regulator should be set to 13PSI.

B. The mini regulator should be set to 90 PSI.

C. The Bowl/Jacket Fill Regulator should be set to 3 PSI.

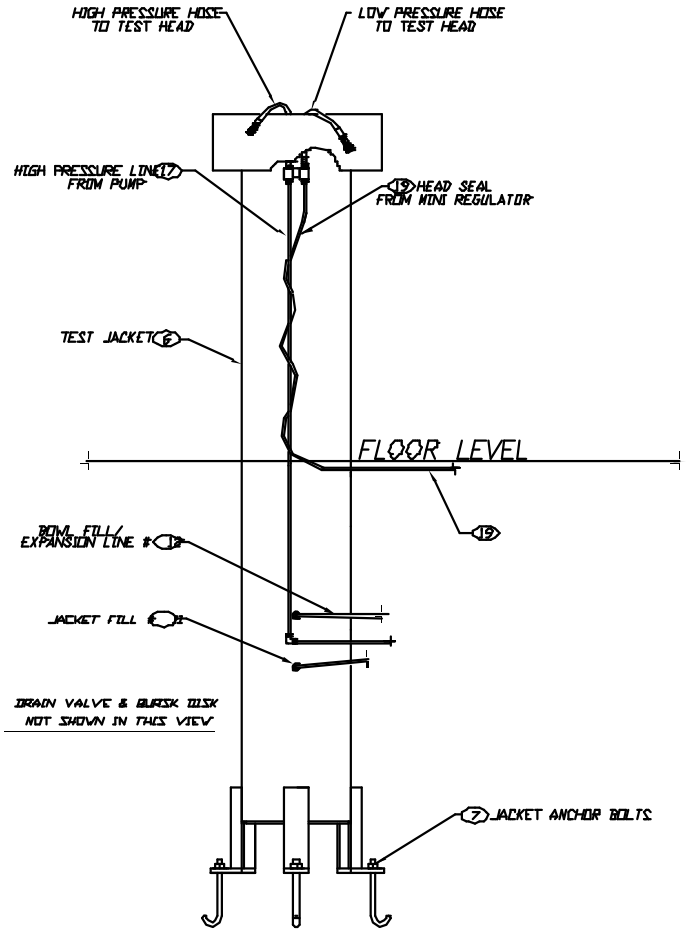
Plug the computer, monitor, and printer into a 3-prong, 4-outlet, 115 VOLT AC Surge Control Unit (customer supplied). Turn on surge Control Unit, then computer, monitor and printer.

Remove the Jacket Splash Cover and put it on the Jacket.

Unpack and remove a stack of paper and place it behind the printer. Refer to the users manual for more information on the setting up of the printer.

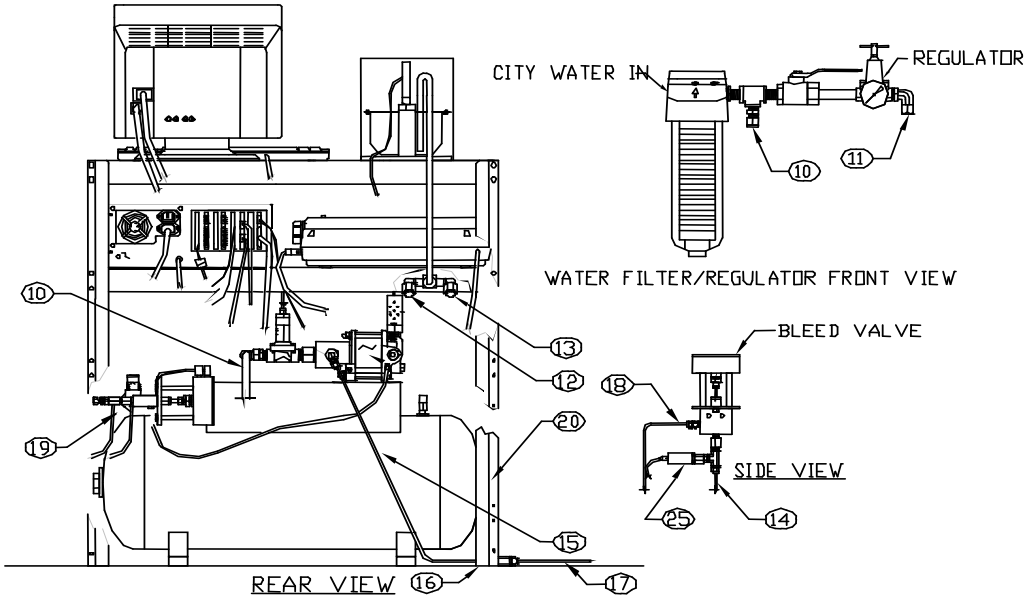
Unpack and remove the Master Gauge Assembly and attach it to the Test Head. Refer to Section 13, VERIFY FUNCTION, in this instruction manual.

Refer to Section Start Up Procedure, in this instruction Manual.



5-2 PLUMBING INSTALLATION, HYDRACLOSE TEST JACKET

5-3 CONTROL CONSOLE PLUMBING INSTALLATION



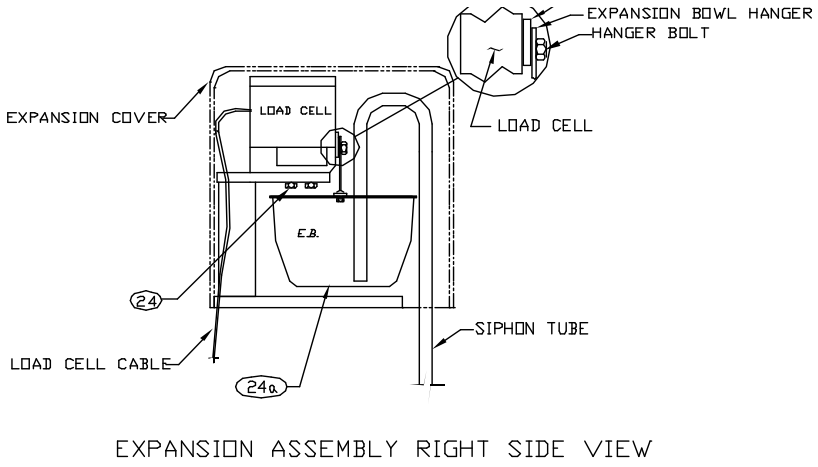


FIGURE 5-4 EXPANSION BOWL INSTALLATION

From time to time it may become necessary to load a new program onto the Recortest/Open Computer. The customer loads this disk into the system and the operational program is automatically updated. This information pertains to loading software if, at any time in the future, you receive an Update Disk.

The update disk contains the program which the Recortest/Open uses in it's standard operational procedure. When an update disk is loaded into the system, the control computer reads the information on the disk and updates the files on the hard disk.

NOTE: the disk loading procedure is not part of the standard operational procedure. The only time that the disk loading procedure is required is when you receive an update disk, or when options are added to the Recortest/Open System.

1. Switch the computer off.

2. Locate the Floppy Disk Drive. The floppy disk drive is on the front panel of the computer.

3. Insert the Update Disk (label facing up and out) into the floppy disk drive slot until the disk clicks into place.

4. Switch the computer back on to reset the system
.
5. Wait for the system to load the program. The display monitor will indicate when the system is ready for the next step.

6. Press the button on the front of the floppy disk drive to release and remove the update disk. Store the disk in a cool, dry environment.

7. Switch the computer off. Switch the computer back on to again, reset the system.

8. From the Edit section of the Main Menu, select Parameters. Review the information described in section 11-7. Perform the Verification and Calibration procedures as described in sections 12, 13, 14, and 15.

9. The new program is now loaded and the system is ready to operate.

The following Start Up Procedure should be performed before attempting to operate the Recortest/Open (A) Test System for the first time after installation or for the first time after water pressure to the unit has remained off for a prolonged period of time. The purpose of the Start Up procedure is to flush trapped air from the Recortest/Open (A) Test System.

6.1 Requirements Before Testing

The following items are listed to ensure that the system is ready for cylinder testing.

A. Verify system installation is complete in accordance with Section 13.0 of this manual and any installation drawings specifically prepared for your system.

B. Take care not to disturb the Load Cell Assembly, located in the left hand corner of the Control Console side enclosure. Excessive force to the Expansion Bowl can seriously damage the Load Cell Assembly.

C. Do not lean on the Control Console or test jackets while a test is in progress. Weight applied against the side of the Control Console can cause the Expansion Bowl to sway and affect the accuracy of expansion readings.

D. The RECORTEST printer must be kept clean and dry in order for the manufacturer's warranty to be valid. In accordance with the manufacturer's warranty, the customer will be responsible for repair of any damage due to neglect or abuse of the printer.

E. The water supply should be turned off if the air supply to the system is turned off. The water supply to the system should also be turned off when the system is not in use.

F. **Always** turn off the air pressure before turning on the power to the control computer. As soon as the main menu appears, turn the air back on.

6.2 TEST JACKET PREPARATION

1. Fill Jacket with clean water using Bowl/Jacket Fill Valve or customer garden hose. If using bowl fill, reset pressure to 3 PSI.
2. Once the Test Jacket is full. Allow it to stand for at least three hours to enable air bubbles to escape.

6.3 EXPANSION BOWL OPERATION

1. Once the Test Jacket is full and ready to use, lower the cylinder, attached to the Test Head, into the Test Jacket. Twist the Test Head to lock it into place under the Head Retaining Bracket.

2. Seal the Test Head by attaching the Head Seal Hose.

3. Reset Bowl/Jacket Fill Regulator to 3psi; Turn the Expansion Bowl Valve to the Expansion Line Port and fill the bowl to the desired level. Slowly open the Bowl/Jacket Fill Valve. Turn OFF the Bowl/Jacket Fill Valve once the bowl is set. To drain, turn the Valve to the BOWL DRAIN and drain the bowl to the desired level, then turn the alve back to EXPANSION

CAUTION!! Failure to set the Bow/Jacket Fill Regulator to 3 PSI could result in the breaking of the Burst Disk.

6.4 CALIBRATED CYLINDER, PREPARATION AND CARE

1. Fill the Calibrated Cylinder with clean, filtered water and allow it to stand for at least three hours before using. The purpose for letting the cylinder stand is to enable trapped air bubbles to escape and to allow the temperature of the water in the cylinder to stabilize. Add water as needed to completely fill the cylinder before using.

2. Water should be left in the Calibrated Cylinder at all times. If the cylinder is emptied, it should be dried immediately to prevent corrosion.

3. The Calibrated Cylinder should be protected from freezing temperatures. The force generated by the freezing water can permanently damage the calibration of the cylinder and possibly rupture the cylinder wall.

4. Keep a copy of the Calibrated Cylinder Report close to the system to be used during calibration of the test pressure reading and expansion reading.

6.5 SYSTEM START UP

Turn on electricity, computer and display monitor. Before performing system checkout and verification check, ensure all air and water valves are closed.

Read all instructions before attempting to operate the RECORTEST/OPEN (A) Test System.

1. Bring up the Main Menu on the Display Monitor. The Main Menu will appear on the Display Monitor when power to the system is first turned on, when the system is reset, or after exiting from another menu.

2. Reset the Date and Time if required. These functions are found in the Edit Menu. The Control Computer uses date and time when it prints a date and time on each cylinder report. Once date and time are set, they will

continue to run until they are reset. Circumstances such as Daylight Savings Time (U.S.) may require the date and time to be reset.

3. Set the System Parameter. To enter the Parameters Function from the Main Menu, use the Arrow Keys to highlight the Edit Menu, then press **Enter**. Using the Arrow Keys, select the Parameters Function and then press **Enter**. Refer to Section 10.0, Display Monitor, Parameters Function, to determine how to set System Parameters.

4. Turn on Air supply to the system. Check Control Air Pressure 80 to 90 PSI. **NOTE:** Check oil level in lubricator.

5. Turn on Water.

   NOTE: Always turn on the air supply before turning on the water supply to the system.

6. Go to the Edit Menu and press **Enter**. Then select Hardware using the Arrow Keys and press **Enter.** Press F10.

7. When the Main Menu appears on the Display Monitor, highlight the Calibrate Menu by using the Arrow Keys and press **Enter**. Then select the Verify Function with the Arrow Keys and press **Enter.**

   A. Normally the verification program is used for checking the calibration of the system. In this case, the verification program will be used to flush trapped air from the system.

8. The Display Monitor will prompt the operator to select which test jacket will be used for the verification program. Type in the number of the test jacket, the system will automatically enable that test jacket for the verification program.

10. Next, the Display Monitor will cue the operator to load the Calibrated Cylinder into the enabled test jacket.

    A. If the Calibrated Cylinder is not yet loaded into the test jacket, attach the test head to the water filled Calibrated Cylinder (See section 2.3 Hydroclose Test Head) and load the cylinder and test head into the test jacket.

    B. Attach the Head Seal Hose and Test Pressure Hose to Hydroclose Test Head

11. When the Calibrated Cylinder has been loaded into the test jacket, press any key to continue with the verification program. The Verification Function will appear on the Display Monitor, as shown in Figure 13-1

6.6 PURGING AIR FROM EXPANSION LINES:

A. Go into Verify for Jacket 1. When using Verify, you MUST have a cylinder loaded into the jacket with the Test Head attached. As an alternative, you can manually activate the air pilot control valve for jacket 1 by pressing the manual override button on the air pilot valve and turning it one quarter turn clockwise.

   NOTE: If there is not a cylinder in the jacket with the Head Seal attached, this will drain the water out of the Expansion Bowl, putting MORE air into the expansion line. To avoid this, first fill the bowl with water using the Expansion Bowl Valve and the Bowl/Jacket Fill Valve (see step B).

B. Slowly open the Bowl/Jacket Fill Valve. Turn the Expansion Bowl Valve to EXPANSION LINE PORT and fill the bowl to the desired level. Turn the Valve back to HOLD to stop the flow. Turn the Valve to DRAIN to drain the bowl. Continue filling and draining the bowl for a period of 15 to 20 seconds.

NOTE! Take care not to overflow the Expansion Bowl, or to drain it completely.

The air driven intensifier pump, which is mounted on top of the Air Reservoir, supplies filtered water at pressures up to 10,000 PSI for use in the hydrostatic test process. In order to enable the RECORTEST/OPEN (A) computer to accurately control pressurization of the cylinder, the pump speed must be correctly adjusted to compensate for the cylinder test pressure and size/volume. As a rule, the pump speed should be readjusted whenever there is a change in the size of cylinders being tested, or the test pressure used. The test pressure (air to pump) regulator should always be properly adjusted.

Adjustment of the pump speed is especially critical when the system is being used to test small cylinders. Due to their small volume, small cylinders will require only a few strokes of the pump in order to achieve test pressure, therefore, the pump speed must be slowed down to prevent over-pressurization of the cylinder.

When testing larger cylinders, adjustment of the pump speed is less critical. The larger volumes require a longer pressurization time, allowing more latitude in control of the pump. For large cylinders the pump speed should be set fast enough to rapidly pressurize the cylinder without overshooting the desired test pressure.

During the normal test cycle, pressurization of the test is divided into two separate modes, the Pump Fast Mode and the Pump Slow Mode. Both the Pump Fast speed and the Pump Slow speed must be adjusted in order for the system to operate properly.

- Pump Fast Mode:

  During the Pump Fast Mode the pump runs fast to provide the bulk of the pressure used in the hydrostatic test. The Pump Fast Mode stops when the pressure in the cylinder is 200 PSI short of the desired test pressure. The Pump
  Fast Speed Control Valve (see Figure 4-5) controls the speed at which the pump runs during the Pump Fast Mode.

- Pump Slow Mode:

  During the Pump Slow Mode the pump runs slowly to allow the system to more accurately control final pressure of the cylinder. The Pump Slow Speed Control Valve (see Figure 4-5) controls the speed at which the pump runs during the Pump Slow Mode.

If the system consistently over pressurizes or under pressurizes the cylinder, or requires an unusually long period of time to pressurize the cylinder, the Pump Speed probably needs to be adjusted.

When the cylinder has been loaded into the test jacket, press any key to continue with the Verify program. The Verify Function Screen will appear on the Display Monitor.

A. From the Main Menu, select the Calibrate Menu by using the Arrow Keys and pressing Enter. Highlight the Verify Function with the Arrow Keys and press Enter. The system will prompt the operator to select which test jacket will be used for the verify program. Type in the number of the test jacket, the system will automatically enable that test jacket for verify program.

B. The system will prompt the operator to load a cylinder into the enabled test jacket. The cylinder to be used for pump speed adjustment should be representative of the type of cylinder that will be tested. For example, if the system is being prepared to test small Medical E cylinders, then a small Medical E cylinder should be used for pump speed adjustment. Likewise, if the system is being prepared to test large cylinders, a large cylinder should be used for pump speed adjustment. It is preferable to use a cylinder which has already been tested.

! CAUTION !

Do Not Exceed 90% of the Test Pressure for the Cylinder being used for Pump Speed Adjustment

If not such cylinders are available, this procedure may be carried out from the Test Cylinders Function as the first test is being performed.

When the Verify function is being used to check system calibration, the Calibrated Cylinder is loaded into the test jacket.

C. Attach the water filled cylinder to the test head and load the cylinder and test head into the enabled test jacket.

D. Attach the Head Seal Hose to the test head, and then the Test Pressure Hose to the test head.

Once the Cylinder has been loaded into the test jacket, press any key to continue with the verify program. The Verify Function Screen will appear on the display monitor.

Locate the Air to Pump Regulator" on the Air Reservoir (see figure 7-1). Adjust the Air to Pump Regulator to allow the pump to achieve the appropriate pressure.

The intensifier pump will supply water at a pressure that is 140 times greater than the regulated input air pressure. For example, if the Air To Pump Regulator is set

at 50 PSI, the pump will be capable of attaining pressures up to approximately 7,000 PSI.

Note that the Air To Pump Regulator should be set to allow the pump to attain a maximum pressure that is slightly higher than the desired test pressure. For example, if a test pressure of 6,000 PSI is desired, the Air To Pump Regulator should be set at approximately 45 PSI. This will allow the pump to achieve a maximum pressure of 6,300 PSI.

This is especially critical when testing small cylinders. As an example, when testing medical E or D size cylinders with a test pressure of 3360, the Air To Pump.

Regulator should be set so that test pressure will not exceed 3,500 PSI. (The Calibrated Cylinder must be used to determine the stall pressure since it will be over the test pressure of the cylinders being tested.)

Setting the Air To Pump Regulator in this fashion will cause the pump to naturally slow down as it approaches test pressure, and pressure spikes will be smoothed out, making it much easier to consistently hit the target pressure.

The Verify function will allow the operator to manually control pressurization of the Calibrated Cylinder. Use the **F1, F2, F3,** and **F6** Function Keys to control pressurization of the Calibrated Cylinder. The pressure and expansion readings will be shown above the Function Key Labels. The effects of the Function Keys that are used during Verify are shown below and on the next page.

F1 STOP PUMP: The **F1** key will stop the pump from further pressurizing the cylinder.

F2 Pump FAST: The **F2** key will cause the pump to enter the Pump Fast Mode.

F3 Pump SLOW: The **F3** key will cause the pump to enter the Pump Slow Mode.

F4 ZERO: The **F4** key will zero the Expansion and Pressure Reading.

F5 AUTO: The **F5** key will allow the operator to enter a specific test pressure for verification purposes. When **F5** is pressed, the display will prompt the operator to enter a verification pressure. Type in the pressure and press **Enter**. The system will automatically pressurize the cylinder to that pressure.

F6 BLEED: The **F6** key will cause the system to release all pressure from the cylinder.

F8 B/PSI: The **F8** key changes units from Bar to PSI.

F9 INCR: The **F9** key allows the operator to set the expansion increments used in the Verify procedure.

F10 ABORT/Exit: The **F10** key will abort the verification program and exit to the Main Menu.

E. Close the Pump Fast Speed Control Valve and the Pump Slow Speed Control Valve.

F. Perform the following steps to adjust the Fast Mode pump speed:

1. Press the F2 key to initiate the Pump Fast command. Since the Pump Fast Speed Control Valve has been closed, the pump will not begin pumping, however, water will be introduced into the cylinder. **Once the operator presses the F2 key the F1 key must be used to stop pressurization.**

2. Slowly open the Pump Fast Speed Control Valve until the pressurization speed is approximately 200-500 psi per second (no more than 200 psi/sec for small cylinders).

3. When the pressure approaches 200 psi below the test pressure, press the F1 Function Key to stop the pump. Take care not to over pressurize the cylinder.

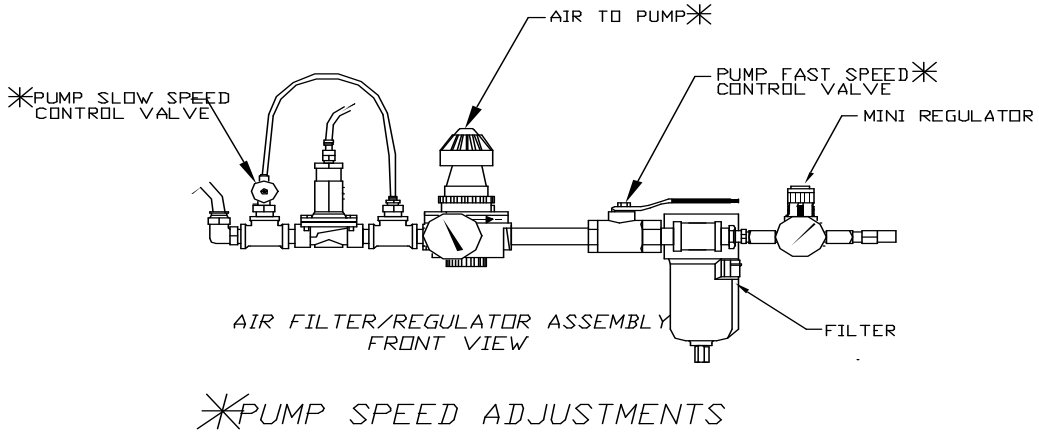


FIGURE 7-1 PUMP SPEED ADJUSTMENT

K. Perform the following steps to adjust the Slow Mode pump speed:

1. Slowly open the Pump Slow Speed Control Valve until the Pump Slow Mode pump speed is approximately 20 psi per second.
2. With the cylinder at a pressure that is approximately 200 psi below the test pressure. Press the F3 key to initiate the Pump Slow command. Since the Pump Slow speed Control Valve has been closed, the pressure should not change.
3. If the pressure approaches the cylinder test pressure, press the F1 key to stop the pump. Take care not to over pressurize the cylinder.
4. When the Pump Slow Mode pump speed has been adjusted to 20 psi per second, press F1 to stop the pump and then press F6 to release pressure from the system.
5. During the Pump Slow Mode, you should see the pressure increase in approximately 10 psi increments, such as 3311, 3322, 3330, 3341, etc. For small cylinders and composite cylinders, you will want to slow the Pump Slow Mode down to the point that you can watch the pressure climb in one or two psi increments.

L. Press the F10 key to exit the Verify routine and return to the Main Menu.

M. Verify that all pressure has been released from the cylinder and then remove the Test Pressure Hose and the Seal Pressure Hose from the test head. Remove the cylinder and test head from the test jacket and remove the test head from the cylinder.

The membrane switch keypad, located on the face of the Recortest/Open (A) Control Console, allows the operator to input commands and test specifications to the control computer. The keypad is used for entering test specifications into the computer, initiating or aborting the test cycle, initiating the command to print a test report, and controlling various test functions. The keypad also controls the position of the cursor on the Display Monitor for the purpose of editing or altering test specifications.

The keypad includes keys for the alphabetical characters **A** to **Z**, the numerals **0** to **9**, ten functions keys, arrow keys, delete, enter, and space keys, and a range of program and arithmetic operator keys.

The functions of the keys are described following Figure 8-1 below.

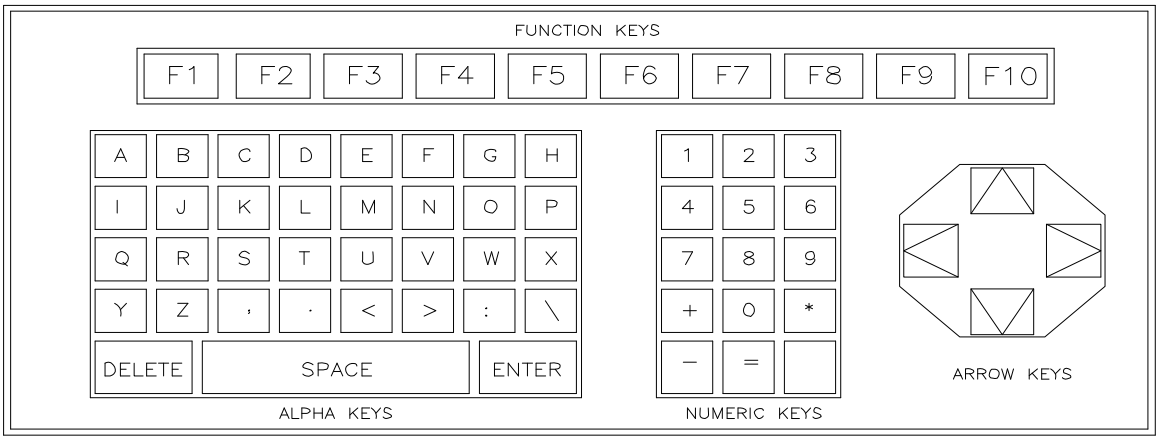


Figure 8-1
Control Console Keypad

1. **ALPHA KEYS:** The Alpha Keys are used to enter literal data (such as Remarks and Cylinder Code) into the computer.

2. **NUMERIC KEYS:** The Numeric Keys are used to enter numeric data (such As Cylinder Serial Number) into the computer

3. **FUNCTION KEYS:** The Function Keys are used to initiate commands which are described at the bottom of the Display Monitor. The commands initiated by the Function Keys will change at various points in the operation cycle. The bottom portion of the Display Monitor will provide a description of the commands that correspond to each key at all times when they are active.

4. **ARROW KEYS:** The Arrow Keys control the position of the cursor on the Display Monitor screen. The cursor is the blinking line that indicates the position of the next character to be typed. The Arrow Keys will move the cursor in the direction indicated by the arrow on the key. The Arrow Keys are useful for correcting and changing test specifications shown on the Display Monitor.

5. **DELETE KEY:** Each time the Delete Key is pressed, the cursor will move left one space and erase the character which occupied that space. The Delete Key is used to correct errors made while entering data.

6. **SPACE BAR:** The Space Bar functions like a space bar on a typewriter. While entering test specifications, the operator may use the Space Bar to enter a space between two characters.

7. **ENTER KEY:** The Enter Key is used to enter test specifications into the Recortest III computer and to scroll past test specifications cues that do not need to be changed.

   A. During the entry of test specifications, the computer will cue the operator to enter a specification. The operator then types the specification into the computer. The computer will then show the specification on the Display Monitor. If the specification shown is correct, press the Enter Key to enter the specification into the computer.

   B. The Enter Key may also be used to scroll past test specification cues which do not need to be changed. It the Enter Key is pressed without typing in a response to the cue, the computer will continue to use the last response that was entered for that cue. For example, if the test operator only needs to change the cylinder serial number at the beginning of the test, he can use the Enter Key to by pass specifications such as cylinder rating that may not need to be changed.

8. **PROGRAM OPERATOR KEYS:** With the exception of the decimal point and comma, the program operator keys are not normally used during hydrostatic testing. Do not use comma, period or colon in any of the remark or specifications fields.

9. **ARITHMETIC OPERATOR KEYS:** The arithmetic operator keys are not normally used during hydrostatic testing, except for entering the Plus (+) and Star (*) specifications.

The Display Monitor is a 15" SVGA monitor which is used to display data, specifications, and other test related messages. It is also used to cue the operator to enter test specifications and display function key definitions.

Operator cues or prompts are of three types, menus, function keys and data entry prompts. Menus typically consist of a list of options available to the operator. To select one, move the cursor to the desired menu and depress **Enter**. Selection of one menu entry will often cause another list of options to be displayed.

Function key prompts are displayed as a row of colored blocks at the bottom of the screen. There are ten blocks, each labeled with a function key name, **F1** through **F10**. Each block may have, in addition to the function key name, another label which briefly describes its function. The part of the screen above the row of function key prompts may be used for displaying information or for a data entry prompt.

Data entry prompts cue the operator to enter information needed for specification or description of the hydrostatic test. Typically, the prompt looks like a form to be filled in by the operator. Each entry has a caption and highlighted field for the information to be entered. Usually, the fields are filled either with default information or with information from a preceding test cycle.

The following must be completed before the operator can run the Hydro machine:

1. Turn on power to computer, monitor and printer; observations – computer will boot up to main menu.
2. From Main menu, use arrow keys to go to edit file. Press Enter
3. Use (down) arrow key to go to hardware screen. Press Enter
4. After operator has entered hardware screen press (F10) Quit Key. This will accept devices installed (i.e. Load Cell Transducer) channels.

This task must be performed each time the computer has been shut off or rebooted.

If the system has only high pressure capability, the operator need only depress the "QUIT" key. Otherwise, if for example, the system has both high and low-pressure hydrotest capabilities, the operator must choose the channels that need to be verified or calibrated. To make this choice he needs to remember the name of the file to be used and then press **F7** to "SWITCH." The "REKOPEN.HWC" file is **ALWAYS** for the standard high-pressure test capabilities. The names of the other files will indicate their function, for example, for the low-pressure test capabilities, the file is named "LOPRESS.HWC."

The next screen appearing on the Display Monitor is the Main Menu. The Main Menu lists commands that may be used to enter other modes of the operational program. The commands that are listed on the Main Menu may only be actuated while the Main Menu appears on the Display Monitor. From the Main Menu, the operator may initiate all other phases of the Recortest/Open (A) Operational Program. Main Menu commands will allow access to the Files Menu, Edit Menu Calibrate Menu, Test Cylinders Menu and Info Menu. The Main Menu is discussed in detail in Control Console Display Monitor, Main Menu, later in this section.

FILES MENU: The Files Menu allows the user to archive (copy) the test results file to a preformatted "DOS" diskettes, and run reports of the test results using the Control Computer. The Files Menu is also used to load cylinder information from an optional handheld PC, download a cylinder table to the optional handheld PC or to quit to "DOS."

EDIT MENU: The Edit Menu is used to set Date and Time, change parameters, run reports of the test results, change the hardware configuration, or look up information on the Cylinder Table Code. There is also a menu entry with the title "Edit Voice File," but it is for experimentation with voice entry of cylinder data and is not operational as of this date.

CALIBRATE MENU: The Calibrate Menu is used during the verification and calibration of the pressure and expansion readings. Verify is discussed in **Section 12. Expansion and Calibration are discussed in Section's 13 and 14.**

TEST CYLINDERS MENU: The Test Cylinder Menu allows the operator to enter the hydrostatic testing mode. Operation of the system in the Test Cylinders mode is discussed in detail in Display Monitor, Test Cylinder Function, later in this section.

INFORMATION MENU: This menu is currently listed on the Main Menu, but is non-functional at this time.

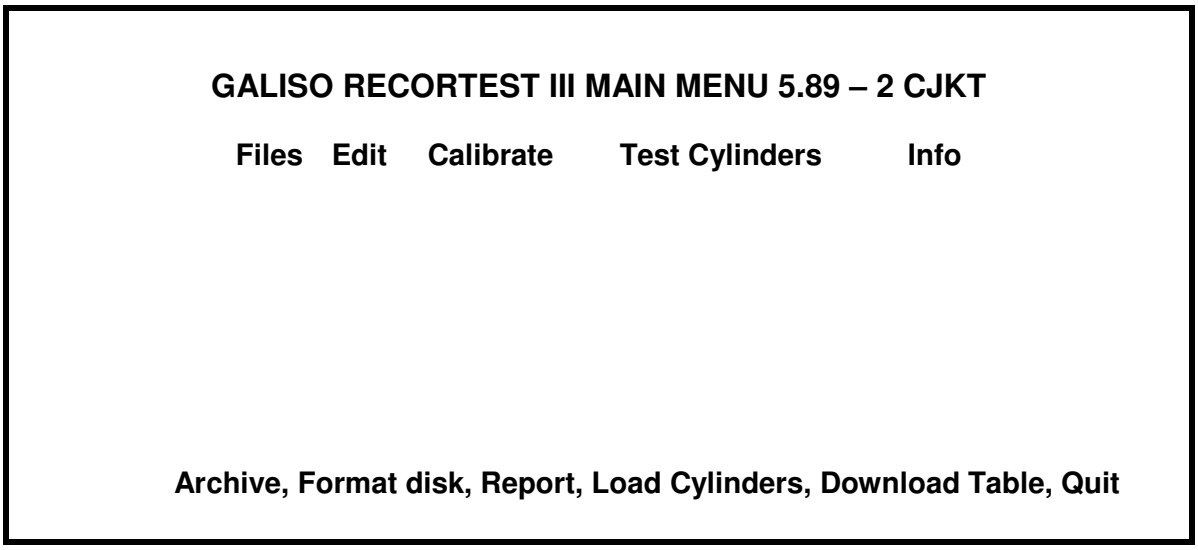
The operation procedure and Keypad commands for the Main Menu are discussed below.

1. The Main Menu will appear on the Display Monitor for the first time after exiting from the hardware configuration screen. It appears again after exiting from any submenu or other operational mode.

2. Following is a description of the keypad commands that may be actuated while The Main Menu (see figure 8-1 below) is on the Display Monitor.

3. To select a submenu, use the arrow keys to highlight the desired option and press **Enter.**

9.1 Main Menu Options



Display Monitor, Main Menu
Figure 9-1

File menu:

The File Menu contains six functions, Archive, Format Disk, Report, Load Cylinders, Download Table and Quit. These functions are selected by using the Arrow Keys to highlight the desired function and pressing **Enter**.

A. **Archive Function**: The Archive function allows the user to archive (copy) the test results file to a preformatted ”DOS” diskette.

B **Format Disk Function**: The Format Disk Function will format diskettes to be used when running Archive Function. The system will prompt “Insert disk to be formatted in drive A” and “Press any key to begin.” Insert an unformatted disk into the slot on the Control Computer and press any key. The formatting process will begin automatically, keeping the operator informed of the progress of the format. When completed, the operator will be notified if the format was successful and asked if another disk is to be formatted. Press **Y** to format another disk and follow the above instructions. Press **N** to return to the Main Menu.

9.1 Main Menu Options, continued

NOTE: Care must be taken to use only new, unformatted disks when formatting. Previously used disks might contain information that will be erased during the formatting process.

C. **Report Function**: Use the Report Function to print a hard copy of all stored test results. The computer will store data and test results until the hard disk is filled or the memory is purged.

D. **Load Cylinders**: This function not used.

E. **Download Table**: This function not used

F. **Quit Function**: By selecting the Quit Function, the system will return to the "DOS" prompt. To reset the Control Computer, switch the unit off, and then switch it back on. The computer will bring up the Main Menu.

9.2 Edit Menu:

The Edit Menu consists of five functions, Date, Time, Parameters, Report, Lookup Table, and Edit Voice File. These functions are selected by using arrow keys to highlight the desired function, then pressing **Enter**.

A. **Date Function**: This function will set the current date. The system will ask for the password. After typing in the password, press **Enter**. Next, the computer will display a message prompt to enter the current date. Type in today's date (MM/DD/YYYY) and press **Enter**. The system will return to the Edit Menu. Once the Date is set, it will continue to run until it is reset.

B. **Time Function**: This function will set the current time. The system will ask for the password. After typing in the password, press **Enter**. Next the computer will prompt you to enter the current time. Enter the current time (24 hour clock [HH/MM/SS]) and press **Enter**. The system will return to the Edit Menu. Once the time is set, it will continue to run until it is reset. Circumstances such as Daylight Savings Time (U.S.) may require the Time to be re-entered.

C. **Parameters Function**: The Parameters Function allows the operator to enter and/or change information to customize the system for a particular need. The Parameters Function will be discussed in detail later, in this section.

D. **Hardware**: Selection of this option allows the operator to change the hardware configuration for verify and calibrate.

9.2 Edit Menu, continued:

E. **Report Function**: Use the Report Function to print a hard copy of all stored test results. The computer will store data and test results until the hard disk is filled or the memory is purged. This function is also available in the File Menu, and serves the same purpose.

F. **Look Up Table Function**: This function is used to edit the standard cylinder codes that are supplied with the current version of the Recortest Open operating software. Refer to Section 20, Cylinder Code Table.

G. **Edit Voice File**: This option is used only for experimentation with voice-entry of cylinder data and is not of any use in normal operation as of this date.

9.3 Calibrate Menu:

The Calibrate Menu has three functions, Verify, Calibrate Expansion, and Calibrate Pressure. Use the Arrow Keys to highlight the desired function, then press **Enter.**

A. **Verify Function**: The Verify Function is used to check the calibration of the system at the beginning of each day. The Verify Function may also be used when adjusting the pump speed. See Section 13.0, for a full description of a Verify Function.

B. **Expansion Calibration**: The Expansion Calibration is used to calibrate the Load Cell. See Section 14.0, for a full description of Expansion Calibration.

C. **Pressure Calibration**: The Pressure Calibration is used to calibrate the Pressure Transducer. See Section 15.0, for a full description of Pressure Calibration.

9.4 Test Cylinders Menu:
The Test Cylinders Menu is used to begin testing cylinders. Use the Arrow Keys to highlight the Test Cylinders Function and press Enter. See Display Monitor, Test Cylinders Function, in Section 11.0, for detailed instructions.

9.5 Information Menu:
The Information Menu has two functions, Information and Visual Documentation. Use the Arrow Keys to select the desired function, then press **Enter.**

A. Information Function: The Information Function contains system Information on the Recortest III Test System.

B. Visual Documentation: This menu is currently listed on the Main Menu, but is non-functional at this time.

The Parameter Function allows the operator to customize the set up of the system. The information in the Parameters function must be checked and updated after update software has been loaded into the system.

1. The Main Menu will appear on the Display Monitor after exiting from the Hardware Configuration Screen, which appears when power to the machine is first turned on or when the machine is reset. The Main menu also appears after exiting from any of the sub menus. To enter the Parameters Function from the Main Menu, use the Arrow Keys to highlight the Edit Menu, then press **Enter**. Using the Arrow Keys, select the Parameters Function and then press **Enter.** The system will prompt for operator password. Parameters Menu as shown in Figure 10.1 below.

PARAMETERS MENU

Enter Registration Number		**????**
Extended inputs ? (Y/N)		**Y**
Stabilize timeout factor		**30**
Stabilize increments in CC		**0.20**
Maximum No-Leak Press Drop?		**5.00**
A/D board type?		**2**
Recopen ?	**(Y/N)**	**Y**
Zero bowl ?	**(Y/N)**	**N**
Save aborts	**(Y/N)?**	**Y**
Company name		**Galiso Inc.**
Address line 1		**22 Ponderosa Ct.**
Address line 2		**Montrose, Coloardo 81401 USA**
Address line 3		*****THIS LINE NOT USED*****
Do you want to enter expanded info?		

Figure 10-1
Parameters Menu

Following is a description of the parameters which may be changed while the Parameters Function is shown on the display monitor.

ENTER REGISTRATION NUMBER: Enter you D.O.T./I.C.C. registration number and press Enter. If Enter is pressed before an entry is made the cursor will move to the next line, retaining the information as displayed.

EXTENDED INPUTS? (Y/N): These inputs are generally used only when re-testing cylinders. The operator may choose whether or not to use the extended format. Press **Y** to choose the extended format. Cues for each additional specification may be found in the Test Cylinders screen. The additional specifications, asked during the test cycle are as follow.

A. **Owner:** The owner of the cylinder.

B. **Owner's Account Number:** The owner's account number.

C. **Cylinder Mfg:** The cylinder manufacturer (up to 8 characters).

D. **Year of Mfg:** and manufacture date (up to 8 characters).

E. **Gas Service:** The type of gas that the cylinder has contained (up to 7 characters).

F. **Enter Plus/Star:** Includes a note in the test report which indicates if the cylinder will be Plus/Star stamped (up to 2 characters).

G. **Operator:** operator initials

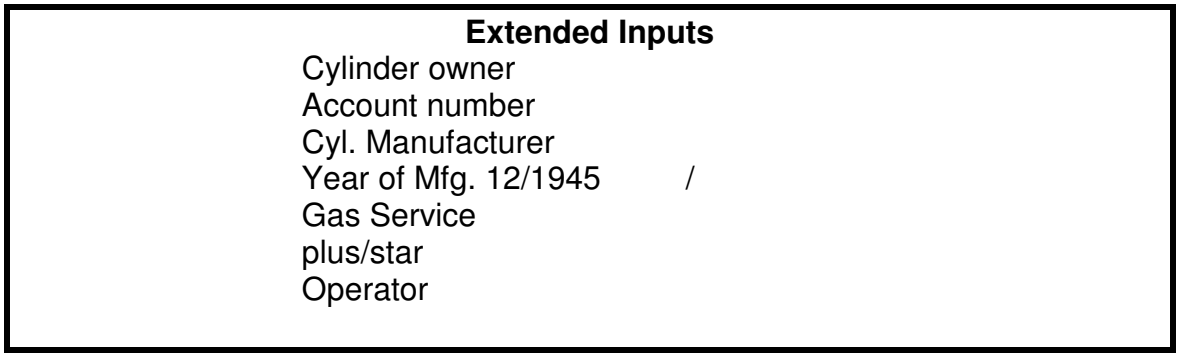


Figure 10-2
Extended Inputs Menu

Press **N** to omit the additional information. Press **Enter**.

STABILIZE TIMOUT FACTOR: The amount of time in seconds that the system will wait before aborting due to an unstable bowl.

STABILIZE FACTOR IN CC: Specifies the degree of sensitivity the system will use to check the stability of the bowl. 0.2 to 0.5 is recommended, with 0.2 being more sensitive and 0.5 less sensitive.

MAX – NO LEAK PRESSURE DROP: Amount of pressure leak allowed in preliminary leak check.

A/D BOARD TYPE?: This allows the operator to enter the type of the A/D card (1 or 2) which is being used in the Recortest/Open (A) computer system. All systems after 1987 will use the Type 2 A/D card.

REKOPEN? (Y/N): If your system is an older system which has been converted to a “Rekopen,” or a “Rekopen, Open Component System,” type **Y** and press **Enter.**

ZERO BOWL? (Y/N): The Recortest/Open (A) systems all have the automatic bowl adjusting capability, and should be configured with a **Y**. After pressing **Y** or **N**, press **Enter**.

ZERO-BOWL LEVEL: The expected response here is a three digit number which represents the level to which the bowl will be filled for its’ starting zero level. This level needs to be enough to ensure that the end of the siphon tube is submerged under water. For standard weigh bowls, 100cc is a good number to use here. The value must be between 50 and 500 cc. Whatever the value used for the zero-bowl level, the bowl will be filled to approximately that level before any expansion measurements are made, and the measurements will be with respect to that level.
SAVE ABORTS: When a test is aborted the test will be on your report. This is required in the U.S.A.

COMPANY NAME: Key in the company name (up to 40 characters). Press **Enter**.

ADDRESS LINES (2): Key in the company address, including phone number on the two lines (up to 40 characters each line), and press **Enter** after each line.

After the last address line has been edited, a cue appears asking the operator if the information is correct. **Y** should be entered if no more changes are needed. Pressing **N** followed by **Enter** will return the cursor to the first parameter line.

When you have responded with a **Y** to the previous cue, another cue appears asking if you want to save the changes to disk. If you press **Y** followed by **Enter**, the changes will be saved on disk and will take effect immediately. Otherwise, they will be abandoned.

Return to Main Menu to begin System Operations Section 5.

The Test Cylinders selection is used to enter the hydrostatic testing mode. In the Test Cylinders mode, the operator is prompted to enter the various test parameters and cylinder identifying information for the cylinder to be tested. If cylinder data from a handheld PC has been previously uploaded press the **F9** key to enter the information for the test. In this case, the uploaded data for the given cylinder is displayed in a window where it can be edited. When the necessary information has been entered for all active jackets, the operator can start the test cycle by pressing the **F2** key. Some general considerations regarding the Test Cylinders mode are listed below.

1. The Main Menu will appear on the display Monitor when power to the machine is first turned on, when the machine is reset, or after the operator has exited from any other menu. To enter the Test Cylinders Menu from the Main Menu, use the Arrow Keys to select the Test Cylinders Menu and press **Enter.**

2. If you wish to exit the Test Cylinders Function and enter the Main Menu, press the **F10** key. You will be asked **"Exit? Y/N."** Type **N** if you wish to continue in the Test Cylinders Function. Type **Y** if you want to exit. The Main Menu will appear on the Display Monitor.

FIGURE 11-1
Display Monitor, Test Cylinders Function

GALISO RECORTEST III Ver. 5.89d.STD

Remarks
Serial Number
Cylinder Code
Cylinder Size
DOT/CTC Rating
Test Pressure
Max. Elastic Exp.
Test Time

Inspection – Disposition
Test Number/ Starting Time
Pressure / Duration
Total Exp. Perm. Exp.
% Perm Exp. / Fail % Perm
Elast. Exp. / REE

11.1 Test Jacket Selection

The Recortest/Open Computer allows the test operator to select which test jacket will be used for the hydrostatic test. The operator may select Test Jacket No. 1, Test Jacket No. 2, or both test jackets if applicable. Jackets selected for testing are labeled “enabled” on the Display Monitor. When the Test Jacket is enabled, the computer will accept test specifications for that jacket.

NOTICE! The Recortest/Open (A) uses only one Test Jacket. **Do not select or enter information for Jacket #2** unless you have the optional two jacket system.

If your system has the optional second Test Jacket, during the standard hydrostatic test procedure, both jackets are normally enabled. The jacket is then loaded with cylinder and specifications for the cylinder is entered. The **F2** Function key is pressed to begin the test in Jacket 1. After the test in Jacket 1 is complete, switch the hoses to Jacket 2. Then press any key to continue.

Following is a brief description of the procedure for enabling the test jacket prior to the hydrostatic test.

1. While the test Cylinders Function appears on the Display Monitor, the Function Key Labels at the bottom of the screen will describe the purpose of each Function Key. **F4** and **F5** are used to enable and disable the test jackets.

2. **F4** controls Jacket No. 1 and **F5** control Jacket No. 2. Both **F4** and **F5** function like a toggle switch. Press the key once to enable the jacket; press the key a second time to disable the jacket.

3. The Jacket Selector Indicator at the top of the jacket specification column will appear in capitol letters, framed by a green box, when the corresponding test jacket is enabled. The Jacket Selector Indicator will appear in lower case letters without the green box when the corresponding test jacket is disabled.

4. Note that at least one test jacket must always be enabled.

11.2 Test Cylinders Function, Specification Cues:

While the Test Cylinders Screen is shown on the Display Monitor, all test specifications and cues will be shown in the box at the top of the screen that is surrounded by a double red line. Note that each line displays specifications for both test jackets when both jackets are enabled. Each specification shown on the Display Monitor is followed by a blue box, which indicates the length of the specification. A dark blue box will appear beside the first specification and all of the other boxes will be light blue. The cursor will appear inside the of the dark blue box. The cursor indicates the position of the next character that will be typed on the Display Monitor.

The meanings of the specification cues and the procedure for responding to the cues are discussed below.

1. **REMARKS:** This cue allows the operator to enter a remark to describe the condition of the cylinder. For example, the “Remarks” cue may be used to enter the results of the visual inspection. The Remark may be up to 14 characters long. Type in a remark, and press **Enter.**
2. **SERIAL NUMBER:** this cue records the serial number of the cylinder. The Serial Number may be up to 12 characters long. Type in the Serial Number and press **Enter**.
3. **CYLINDER CODE:** The cylinder code is used to automatically enter preset specifications for Cylinder Size, D.O.T./I.C.C. Rating, Test Pressure, Maximum Elastic Expansion, and Test Time. See Section 20 of this manual for a complete listing of the standard cylinder codes which are supplied with the Recortest III operating program.

   A. Refer to the chart in Section 20 of this manual to determine the appropriate cylinder code. Type in the cylinder code (up to four characters) and then press **Enter**. The cylinder codes are determined by the software which is loaded into the system. If you require additional cylinder codes, use the Edit/Lookup Table Function found on the Main Menu.

   B. When cylinder code (excluding “M”) is entered, the computer will skip the remaining specification cues and proceed to the visual inspection results.

   C. To override the cylinder code and enter the specifications manually, press the **“M”** key and then **Enter** when the computer cues you to enter the cylinder code. This will allow you to enter specifications for any type of cylinder that is not included in the cylinder code table shown in Section 20.

   D. If a previously stored code is entered, the information on the next four lines automatically appears on the screen.

11.2 Test Cylinders Function, Specification Cues, continued:

12 **CYLINDER SIZE:** This cue records the dimensions of the cylinder. The description of the cylinder size may be up to 14 characters long. Type in the dimensions of the cylinder and press **Enter**.

13 **D.O.T./C.T.C. RATING:** This cue records the Department of Transportation rating. The D.O.T./C.T.C. Rating may be up to eight characters long. Enter the D.O.T./C.T.C. rating of the cylinder and press **Enter**.

14 **TEST PRESSURE:** This cue determines the pressure at which the cylinder will be tested. The Test Pressure may be up to five characters long, the maximum test pressure of the Recortest/Open (A) is 10,500 PSI. Enter the desired Test Pressure and press **Enter**.

15 **MAX. ELASTIC EXP:** This cue determines the maximum allowable elastic expansion for the cylinder being tested. The Maximum Elastic Expansion may be up to four characters long, with a decimal point followed by one character. Enter Maximum Elastic Expansion and press **Enter**.

A. If the cylinder's elastic expansion exceeds this value, the computer will determine that the cylinder is not suitable for the "Plus" or "Star" marking.

16 **TEST TIME:** This cue determines the amount of time that the pressure will be held inside of the cylinder before it is released. The test time may be any value between Zero and 999 seconds. Type in the desired Test Time and press **Enter**.

11.3 Test Cylinders Function, Test Results

All test results will be shown in the box at the bottom of the screen that is surrounded by a double red line. Each line displays results for both test jackets when both jackets are enabled. The individual lines of the test box are described below.

1. **INSPECTION – DISPOSITION:** This line is used to enter the results of the visual inspection of the cylinder and to report the results of the hydrostatic test.

   A. If the cylinder has passed visual inspection, press **Enter**. The letters "PA" will appear next to the cue.

   B. If a cylinder has failed the Visual inspection, type the letters "FV" and press **Enter**. If the letters "FV" are entered on the Inspection line , the computer will record the specifications without running the test press any key to return to the "Remarks" cue. When the test results are printed, the report will show that the cylinder failed visual inspection and was not tested.

11.3 Test Cylinders Function, Test Results, continued

C. If the cylinder fails the hydrostatic test the "PP" code will change to another Disposition Code to indicate the status of the cylinder. Following is a description of the Disposition Codes.

PPP: Pass Visual, Passed % Perm, Passed REE
PAA: Pass Visual, Abort % Perm, Abort REE
FAA: Failed Visual, Abort % Perm, Abort REE
PFA: Pass Visual, Fail % Perm, Abort REE
PPF: Pass Visual, Pass 10% Perm Fail REE

2. **TEST NUMBER / STARTING TIME:** This line displays the Test Number and the time that the test is started. The Test Number is the number of tests that have been performed since entering the Test Cylinders Function. The Test Number is displayed first, followed by the Starting Time.

3. **PRESSURE / DURATION:** This line displays the current pressure of the cylinder being tested and the elapsed test time. The test pressure is shown in PSI and the test time is shown in seconds. Pressure is displayed first, followed by Duration.

4. **TOTAL EXP/ PERM. EXP:** This line displays the Total/ Permanent Expansion of the cylinder in cubic centimeters.

5. **PERM/FAIL % EXP:** This line displays the Percent Permanent/Fail Expansion of the cylinder.

6. **ELAST. EXP/REE:** Allowable Elastic expansion.

10.4 Test Cylinder Function, Test Indicators and Control Labels

The Test Cylinder Function includes several features which communicate messages to the operator concerning the status of the test, the tasks performed by the Function Keys, and other instructions and warnings. The test indicators and Function Key Labels are discussed below and on the following pages.

1. **MESSAGE LINES:** The message lines located in the lower left hand of the screen are used by the computer to communicate instructions and warnings to the test operator.

2. **EXTENDED CYLINDER INFORMATION:** If the Extended format Test Report has been selected in the Parameters Function (see Display Monitor, Parameters Function Section 10-1), the system will prompt the user to enter the additional specifications in the message area at the bottom of the Test Menu. Key in each specification and press **Enter**. The additional specifications will be included when the Test Report is printed.

11.4 Test Cylinder Function, Test Indicators and Control Labels

3. **JACKET INDICATORS:** The Jacket Indicators display the current status of the two test jackets. When a test jacket has been enabled (selected for testing) the indicator at the top of the jacket specification column on the Test Cylinders Menu will appear enclosed in a green box and the letters of the indicator will be in upper case.

   A. **Enabled:** This message indicates that the corresponding test jacket has been enabled to test and must receive test specifications before the test may begin.

   B. **Disabled:** This message indicates that the corresponding test jacket has not been enabled to test.

4. **PRESS START TO BEGIN TEST:** This message will be displayed when all specifications have been entered into the computer and the system is ready to perform the test.

5. **TEST STATUS INDICATOR:** The Test Status Indicator displays messages which inform the test operator of the current status of the test in each jacket.

   A. **Test In Progress:** This message is displayed in blinking white text on a red background while a test is running in the corresponding Test Jacket.

   B. **Test Completed:** This message is displayed in green when the test has been completed and all results have been recorded. The “Test Completed” message indicates that the system is ready to begin the next test.

   C. **Test Aborted:** This message is displayed when the test is aborted before it is finished. The “Test Aborted” message appears when the operator aborts the test or when the system aborts the test due to a leak or other problem. It is displayed in blinking white text on a red background

6. **FUNCTION KEY LABELS:** The Function Key Labels describe the purpose of the Function Keys at various phases of the operation cycle. While the Test Menu is on the Display Monitor, the function Keys will perform the tasks as follows:

F1 ABORT TEST: The **F1** key is used to Abort the test. If **F1** is pressed while a test is in progress, it will cause the system to abort the test and return to the first test specification cue.

F2 START: The **F2** key is used to begin the test. This option will not show until a jacket has been enabled and all information has been loaded.

11.4 Test Cylinder Function, Test Indicators and Control Labels, cont'd

F4 JACKET 1: The **F4** key functions like a toggle switch. Press **F4** once to enable Jacket 1, press **F4** a second time to disable Jacket 1

F5 JACKET 2: The **F5** key functions like a toggle switch press **F5** once to enable Jacket 2, press **F5** a second time to disable Jacket 2

F6 CUTOFF FUNCTION: The **F6** key initiates the Cutoff Function. The Cutoff Function allows the user to stop the pump at any specified point to avoid under or over pressurization of the cylinder. If the system consistently over or under pressurizes each cylinder tested and you properly readjusted the pump speed, you may initiate the Cutoff Function as follows.

1. Enter the test specifications , then press **F6**. A message will appear at the bottom of the Test Cylinders Function which asks for the cutoff point.

2. If the cylinder was overpressurized, the cutoff point should be a negative value. For example, if the test pressure was 3000 PSI and the cylinder was overpressurized to 3050 PSI , enter "-30." The pump will stop at 2970 PSI and the final stroke of the pump should bring the pressure to approximately 3020 PSI. In some cases, a positive value may be entered as the cutoff point. Key in **"-"** or **"+"** and the cutoff value then press **Enter**.

3. The pump will stop at the test pressure, plus or minus the cutoff value that was entered.

F7 STD: This key is non functional at this time

F8 PERMHLD: Pressing **F8** causes a small window with two entries to pop up. The entries are prompts for the relief pressure and the post relief hold time. The former is the pressure at which the cylinder will be assumed to be at zero gauge pressure. The default value is 2 PSI, rather than zero, because occasionally it will take the transducer a moment to flex completely back to its Zero State, even though pressure has completely relieved. The maximum value which can be entered here is 6 PSI.

The post relief hold time is the time delay between when the pressure is effectively relieved and when the permanent expansion is measured. It is sometimes useful to enter a nonzero hold time to allow the cylinder to completely settle before the permanent expansion is measured.

F9 is non functional at this time.

F10 EXIT: Press **F10** key to exit the Test Menu and return to the Main Menu. Operator may elect to archive or print report at this time.

The Archive Function allows the user to archive (copy) the test results file to a preformatted “DOS” diskette. Archive test data can be stored and used later to perform statistical analysis or to maintain a data base history of all cylinders tested. To archive test data proceed as follows.

1. If the Main Menu is not shown on the display Monitor, press **F10** to return to Main Menu.

2. Load the preformatted diskette (see Section 9-3, File Menu, Format Disk Function) into the disk Drive.

3. Select the files Menu by using the Arrow Keys, press **Enter**. Use the Arrow Keys to highlight the Archive Function and press **Enter**. The system will ask for the password. Type in the password and press **Enter**.

4. The Archive File Screen will appear showing the drive, path and filename the systems will use to save the results. The System, will ask “Is this correct (Y/N)?” Type **Y** if you want to save to this file and press **Enter**. Type **N** if you want to use a name other than what is displayed, and press **Enter**. You will be asked for a new file name. Input the file name you have chosen and press **Enter**. The system will ask “Is this correct (Y/N)?” Repeat this step if the name is still not correct.

5. The system will display a message indicating that the archive process is complete and ask whether to save or delete test results that are stored in the system. If a test report containing the archived test results has already been printed, the user may wish to delete the test results stored in the system memory. Press **N** to delete test results, the system will ask “Are you sure? Y/N,” as a precaution to prevent accidental deletions. Press **Y** to save test results, then press **Enter**.

6. The system will exit the Archive Function and the Main menu will appear on the display Monitor. Remove the Archive diskette from the disk Drive and store the archive diskette in cool , dry place.

7. As Archive disks accumulate, they should be stored off the premises, in case of fire.

The purpose of the Verify and Calibration Procedure is to check and, if necessary, adjust the accuracy of the system pressure and expansion readings. The Calibration of the system should be verified at the beginning of each workday.

For the purpose of clarity, the Calibration Procedure is divided into three separate procedures; Pressure and Expansion Reading Verification (Verify Function), Expansion Calibration (Expansion Calibration Function), and Pressure Reading Calibration (Pressure Calibration Function). Pressure and Expansion Reading Verification are discussed in this section, Expansion Calibration is discussed in Section 14 and Pressure Calibration is discussed in Section 15**.**

The verification procedure is performed at the beginning of each day to check the calibration of the system in accordance with D.O.T./I.C.C. regulations. Normally, the verification procedure will show that the system is reading accurately and the calibration of the system will not need to be adjusted. However, if the verification procedure indicates that the pressure and expansion readings shown on the Display Monitor are not accurate, the readings may be adjusted by following the calibration procedures.

13.1 Verify Function

1. Bring up the Main Menu on the Display Monitor. The Main Menu will appear on the Display Monitor when power to the system is first turned on, or after exiting from another menu.

2. When the Main Menu appears on the Display Monitor, use the Arrow Keys to select the Calibrate Menu and press **Enter**. Highlight the Verify Function with the Arrow Keys and press **Enter**.

3. The Display Monitor will prompt the operator to select which test jacket will be used for the verification program. Type in the number of the test jacket, the system will automatically enable those test jackets for the verification program.

4. Next, the Display Monitor will cue the operator to load the Calibrated Cylinder into the enabled test jacket.

   A. If the Calibrated Cylinder is not yet loaded into the test jacket, attach the water filled Calibrated Cylinder to the test head and load the cylinder and test head into the test jacket.

   B. Attach the Master Gauge Assembly to the test head as shown in Figure 2-5.

   C. Attach the Head Seal Hose to the test head. Attach the Test Pressure Hose to the Master Gauge Assembly as shown in Figure 2-5.

   D. Expansion Bowl valve must now be turned to expansion.

13.1 Verify Function, continued

5. When the Calibrated Cylinder has been loaded into the test jacket, press any key to continue with the verification program. The Verify Function Menu will appear on the Display Monitor, as shown in Figure 13-1, below.

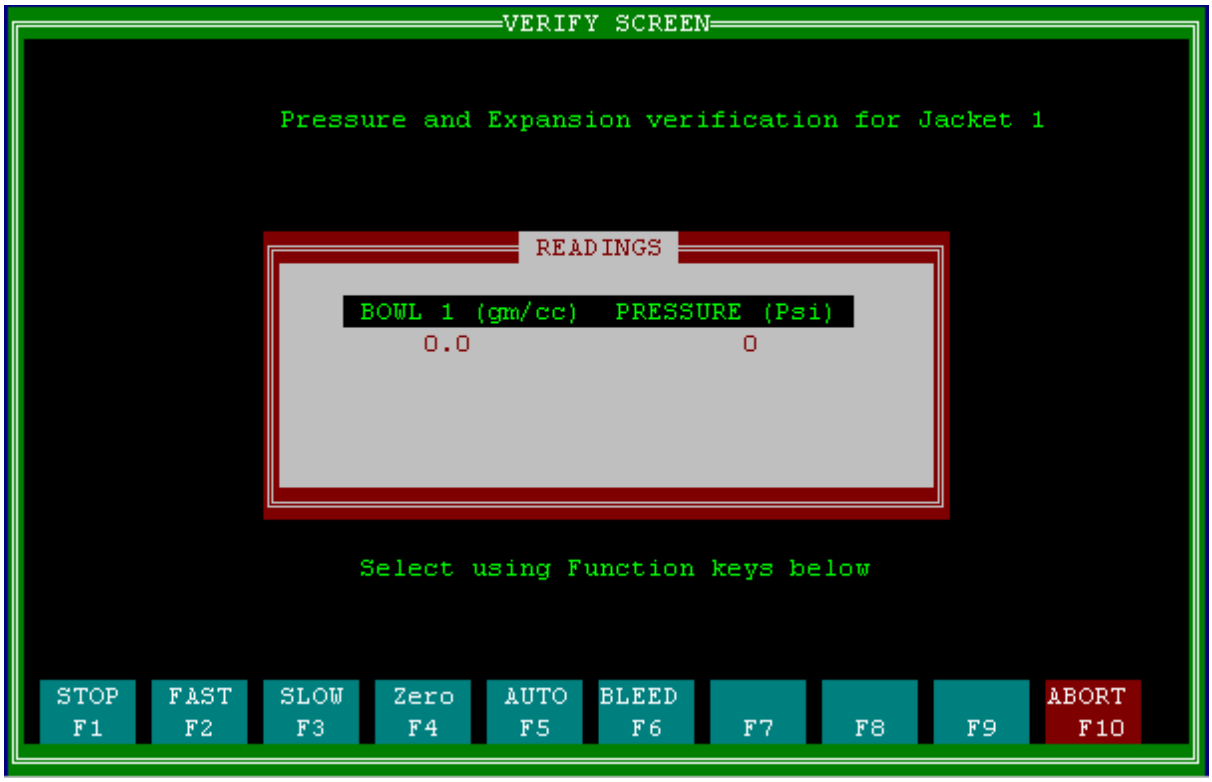


Figure 13-1
Verify Screen

6. The Verify Function Menu will allow the operator to manually control pressurization of the Calibrated Cylinder. The Function Keys control pressurization and initiate additional program commands. The pressure and expansion readings will be shown above the Function Key Labels. The effects of the Function Keys are shown below.

   F1 STOP Pump: The **F1** key will stop the pump from further pressurizing the cylinder.

   F2 Pump FAST: The **F2** key will cause the pump to enter the Pump Fast mode.

   F3 Pump SLOW: The **F3** key will cause the pump to enter the Pump Slow mode.

13.1 Verify Function, continued

F4 Zero: The **F4** key will zero the Expansion and Pressure Readings.

F5 Auto: The **F5** key will allow the operator to enter a specific test pressure for verification purposes. When **F5** is pressed, the display will prompt the operator to enter a verification pressure. Type in the pressure and press **Enter**. The system will automatically pressurize the cylinder to that pressure.

F6 BLEED: The **F6** key will cause the system to release all pressure from the cylinder.

F7 Not used at this time

F8 PSI/BAR: Allows operator to switch between PSI and Bar units as desired.

F9 INCR: The **F9** key allows the operator to set the expansion increments used in the Verify Function.

F10 ABORT: The **F10** key will abort the verification program, and exit to the main menu.

13.2 Expansion Reading Verification:

Proceed as follows to check the display monitor expansion reading.

A. A set of precision laboratory weights, (2) 50 gram weights are required to verify and calibrate the system expansion reading. A Calibration Weight Set may be purchased at most laboratory supply stores or from Galiso (37-11-8015).

B. Press **F4** to Zero the readings. The display Monitor Expansion reading will return to zero.

C. Remove the Load Cell cover on top of the Control Console and locate the Expansion Bowl and the Load Cell Assembly.

D. Carefully place (2) 50 gram weights on the cross piece which supports the Expansion Bowls**.** See Figure 12-2

E. Check the Display Expansion reading. The Display Expansion reading should read the weight total +/- 0.5 gm/cm which reflects the load on the cross piece.

F. If the Display Expansion reading matches the calibration weight within +/- 0.5 gm/cm calibration of the expansion reading is NOT required.

13.2 Expansion Reading Verification, continued:

G. If the Display Expansion reading does not match the calibration weight within +/- 0.5 gm/cm, then the Display expansion reading is in need of calibration. Calibrate the Display expansion reading as described in Section 8.

H. Remove the Calibration Weights from the Expansion Bowls.

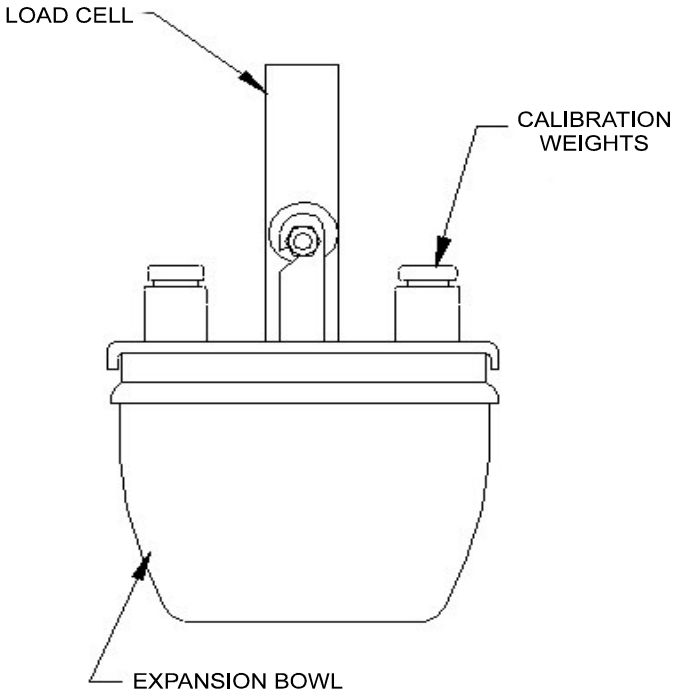


Figure 13-2
Expansion Bowl

13.3 Pressure Reading Verification:

Proceed as follows to check the Display Monitor pressure reading against the Master Gauge pressure reading.

A. Press **F5**. The computer will prompt the operator to enter a pressure. Type in the pressure (in PSI) and press **Enter**. The system will pressurize the Calibrated Cylinder to that pressure. Make certain this pressure does not exceed the Calibrated Cylinder.

B. Check the reading of the Master Gauge, the Master Gauge pressure reading should match the Display Monitor pressure reading within 1 percent of the total pressure reading.

C. If the Master Gauge pressure reading (as corrected by the Gauge Certification Sheet) matches the system pressure reading with 1%, the system pressure reading is accurately calibrated and no adjustment of the system pressure reading is required.

13.3 Pressure Reading Verification, continued:

D. If the Master Gauge pressure reading does not match the system pressure reading within 1%, the system pressure reading is in need of calibration. Calibrate the pressure reading as described in Section 15.0, Pressure Calibration.

E. Press **F6** to release pressure from the Calibrated Cylinder, the Display Monitor pressure reading will return to Zero.

Press **F10** to abort the verification program and exit to the Main Menu.

1. Bring up the Main Menu on the Display Monitor. The Main Menu will appear on the Display Monitor when power to the system is first turned on, or after exiting from another menu.

2. When the Main Menu appears on the Display Monitor, use the Arrow Keys to select the Calibrate Menu and press **Enter**. Highlight the Expansion Calibration and press **Enter** to begin the Expansion Calibration (Load Cell) program. A bowl selection option will now be given. Select which bowl to use, by pressing **1** or **2**. After selecting the bowl to use, the selected bowl will now drain.

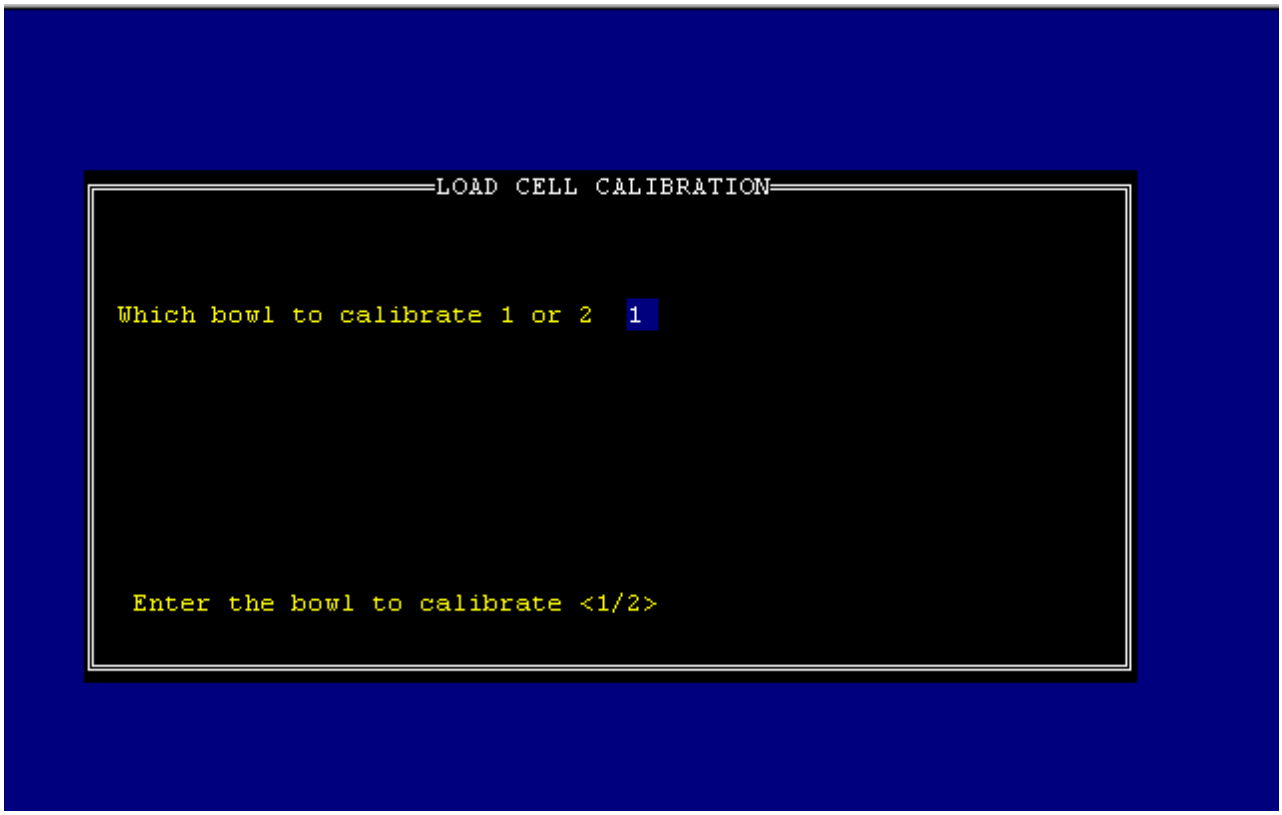


Figure 14-1
Load Cell Calibration

3. The Display Monitor will prompt the operator to place the calibration weights on the Expansion Bowl.

    A. A set of precision laboratory weights (Calibration Weight Set is required to verify and calibrate the Display Monitor expansion reading. The Calibration Weight Set should provide two 50 gram weights.

    B. Remove the Load Cell cover on top of the Control Console and locate the Expansion Bowl and the Load Cell Assembly.

    C. Carefully place two 50 gram test weights on the cross piece which supports the Expansion Bowl as shown in Figure 13-2.

4. The Display Monitor will prompt the operator to enter the calibration weight. Type in the calibration weight and press **Enter**.

5. The Display Monitor will show several diagnostic values and then display a message indicating that the Expansion Calibration program has been completed. Remove test weights

    A. If the Display Monitor shows a message, which indicates that there has been an error in the expansion calibration procedure, repeat Steps 1-4, above.

    B. If the Display Monitor continues to indicate that there has been an error in the expansion calibration procedure, contact Galiso Inc. for further instructions.

6. Press any key to exit from the Expansion Calibration procedure to the Main Menu.

1. Bring up the Main Menu on the Display Monitor. The Main Menu will appear on the Display Monitor when power to the system is first turned on, or after exiting from another menu.
2. When the Main Menu appears on the Display Monitor, use the Arrow Keys to select the Calibrate Menu and press **Enter**. Highlight the Pressure Function and press **Enter** to begin the Pressure Calibration program.
3. The Display Monitor will prompt the operator to select which test jacket will be used for the pressure reading calibration program. Type in the number of the test jacket (1-4), and press **Enter**.
4. Next the Display Monitor will cue the operator to load the Calibrated Cylinder into the selected jacket.
    A. If the Calibrated Cylinder is not yet loaded in the test jacket, attach the water filled Calibrated Cylinder to the test head (see Figure 5-1) and load the cylinder and test head into the test jacket.
    B. Attach the Master Gauge Assembly to the test head as shown in Figure 2-5.
    C. Attach the Head Seal Hose to the Master Gauge Assembly test head. Attach the Test Pressure hose to the as shown in Figure 2-5.
    D. Expansion Bowl Valve must be turned to expansion.
5. When the Calibrated Cylinder has been loaded into the test jacket, press any key to continue with the Pressure Calibration program. The Pressure Calibration Menu will appear on the Display Monitor, as shown in Figure 15-1, below.

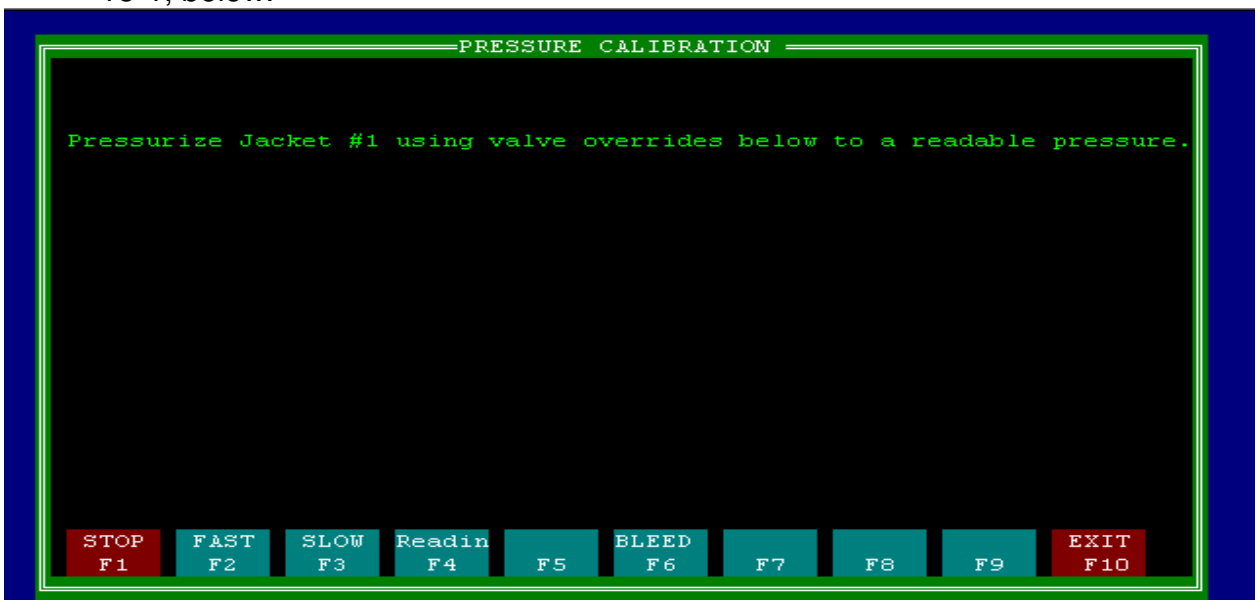


Figure 15-1
Pressure Calibration

6. The Pressure Calibration Menu will allow the operator to manually control pressurization. The Function Keys control pressurization and initiate additional program commands. The effects of the Function Keys are shown below.

   F1 STOP Pump: The **F1** key will stop the pump from further pressurizing the cylinder.

   F2 Pump FAST: The **F2** key will cause the pump to enter the Pump Fast Mode.

   F3 Pump SLOW: The **F3** key will cause the pump to enter the Pump Slow Mode.

   F4 Reading: The **F4** key will prompt the operator to check the Master Gauge pressure reading and enter the pressure reading into the computer. The computer will use the Master Gauge pressure reading to calibrate the Display pressure reading and automatically release press.

   F6 BLEED: The **F6** key will cause the system to release all pressure from the cylinder.

   F10 EXIT: The **F10** key will exit to the Main Menu.

7. Next, the computer will cue the operator to use the Function Keys to pressurize the cylinder to a measurable pressure.

   A. Carefully pressurize the cylinder using the **F2** key for fast pressurization, the **F3** key for slow pressurization, and the **F1** key to stop pressurization.

   B. Pressurize the cylinder until the Master Gauge Assembly indicates a readable pressure (i.e. 5000 psi). Press the **F1** key to stop pressurization.

   C. **Be careful not to exceed the range of your calibrated cylinder.**

8. Press the **F4** Key. The computer will prompt the operator to enter the Master Gauge pressure reading. Type in the Master Gauge pressure reading (as corrected by the Gauge Certification Sheet) and press **Enter**. This Display Monitor will show several diagnostic values and then indicate that the pressure reading has been properly calibrated.

   A. If the Display Monitor shows an error message, repeat the calibration procedure using a different pressure. If the Display Monitor continues to show the error message, contact Galiso Inc. for further instructions.

9. When the pressure calibration procedure is complete, allow the system to release pressure from the cylinder, then press any key to exit the Pressure Calibration program and return to the Main Menu.

1. Cylinders to be tested must be subjected to an internal and external visual inspection in accordance with CGA pamphlet C-6, “Standard for Visual Inspection of Compressed Gas Cylinders.”

   A. The inspector should check the entire exterior surface, including the bottom of the cylinder, for any damage such as dents, arc or torch burns, bulges, serious corrosion or any other damage that could appreciably weaken the cylinder.

   B. Any cylinders that do not pass the inspection should be removed from further service. It is not necessary to test obviously defective cylinders.

2. **CAUTION**: The Hydraclose Test Head must be securely engaged with 3 to 5 threads in the cylinder neck in order to safely seal. All cylinders should be inspected before testing to insure that the neck threads are not excessively worn or damaged. If the cylinder has inadequate neck threads, either the neck threads should be re-tapped or the cylinder should be condemned. There is no need to test an obviously defective cylinder.

3. Prior to hydrostatic testing, each cylinder should be tapped with a 1/2 pound machinist’s hammer. If the cylinder has a dull or dead ring, it should be internally cleaned by tumbling or other suitable means. If the dull or dead ring persists after the cylinder has been internally cleaned, the cylinder must be condemned.

   A. Internal cleaning of the cylinder should be performed prior to hydrostatic testing. Internal cleaning methods such as tumbling with abrasives or shot blasting can slightly weaken the cylinder wall

4. Remove the cylinder valve and tag it with the cylinder serial number so that the valve may be reinstalled in the same cylinder. Cylinder valves generally conform themselves to the particular neck threads of the cylinder in which the valve is first installed and may not seal as well in cylinders with a slightly different neck thread configuration.

5. If the cylinder has contained a flammable gas it must be washed prior to internal visual inspection. Fill the cylinder with water and then dump it out, or purge cylinder with clean, dry air or Nitrogen.

6. Use a Galiso Opti-Lite, Fiber Optic Inspection Light or low voltage bulb (to prevent the possibility of electrical shock) to inspect the interior of the cylinder per CGA pamphlet C-6, “Standards for Visual Inspection of Compressed Gas Cylinders.” Carefully check the interior of the cylinder for excessive corrosion, dirt, scale, or sludge which must be removed prior to hydrostatic testing. If the cylinders to be tested are for oxygen use, Galiso offers a Ultra-Violet inspection light which radiates a brilliant light indicating oil or grease contamination presence.

7. Cylinders that pass visual inspection should be filled with clean, filtered water and allowed to stand for at least three (3) hours, or as long as necessary, to allow the temperature of the water in the cylinder to stabilize at room temperature.

   A. Add water as needed to **completely** fill the cylinder before testing.

   B. The Galiso CFS and RCSG Cylinder Filling Station rapidly fills the cylinder with water and shuts off when the cylinder is full.

   C. The temperature of the water in the cylinder should be within five (5) degrees Fahrenheit of the temperature of the water in the test jacket. A large variation of the two water temperatures will cause inaccurate test results.

8. The exterior of each cylinder should be cleaned of dirt, scale, grease, oil and any other contamination before the cylinder is loaded into the test jacket. The test jacket should be cleaned periodically to remove any accumulation of dirt or debris as needed, or at least once every three (3) months.

1. Bring up the Main Menu on the Display Monitor. The Main Menu will appear on the Display Monitor when power to the system is first turned on, or after exiting from another menu.

2. When the Main Menu appears on the Display Monitor, locate the Test Cylinders Menu by using the Arrow Keys and press **Enter**. Highlight the Test Cylinders Function and press **Enter**.

3. Use the **F4** and **F5** Function Key to enable both test jackets.

   A. When the test jacket is enabled, the Jacket Enable Indicator at the top, enclosed in a green rectangle and the word “Enabled” will appear at the bottom of the specification column

      If the cylinder has failed the test, the Disposition Code that appears on the Inspection – Disposition line will change to a Disposition Code, which indicates the reason that the cylinder failed the test. The meanings of the Disposition Codes are given below.

      PPP: Pass Visual, Passed % Perm, Passed REE
      PAA: Pass Visual, Abort % Perm, Abort REE
      FAA: Failed Visual, Abort % Perm, Abort REE
      PFA: Pass Visual, Fail % Perm, Abort REE
      PPF: Pass Visual, Pass 10% Perm Fail REE

4. The Test Menu will display a series of test specification cues. Refer to section 11-2 for a description of the Test Menu and an explanation of the meaning of each cue.

   A. The cursor will first appear next to the ‘Remarks” cue for the cylinder to be tested in Jacket #1. Type in appropriate remarks (i.e. cylinder owner, etc.) and then press **Enter.**

   B. The cursor will appear beside the “Serial Number” cue. Type in the cylinder serial number of the cylinder to be tested in Jacket #1 and press **Enter.**

C. Next the cursor will appear beside the “Cylinder Code” cue.

i. See section 19 “Cylinder Code Table” for a complete listing of the cylinder codes that are supplied with the standard Recortest III operating software. Type in the appropriate cylinder code and then press **Enter**. When a cylinder code is used, the remaining specification cues will be answered automatically and the cursor will appear in the Test Result box on the Inspection – Disposition line. Proceed to Step 6 below.

ii. If you wish to test a cylinder with specifications that are **NOT** included in the Cylinder Code Table, type in the letter **M** and press **Enter**. The cursor will appear beside the next specification cue. Specifications may then be entered manually as described in Steps 5D through 5H below.

D. Next the cursor will appear beside the “Cylinder Size” cue. Type in the dimensions of the cylinder and then press **Enter**.

E. The cursor will then appear beside the “D.O.T./C.T.C. Rating” cue. Enter the D.O.T./C.T.C. rating of the cylinder and then press **Enter.**

F. The cursor will appear beside the “Test Pressure” cue. Type in the test pressure and then press **Enter**.

G. Next the cursor will appear beside the “Max Elastic Exp” cue. Enter the maximum allowable elastic expansion and then press **Enter**.

H. The cursor will then appear beside the “Test Time” cue. Type in the desired test time and press **Enter**. If the **Enter** is pressed before a test time is entered, the system will set test time at 30 seconds.

6. After all test specifications have been entered, the cursor will appear in the Test Result Box on the Inspection – Disposition line. This line is for recording the results of the Visual Inspection of the cylinder (see Cylinder Preparation, Step 6, section 16.0) and for reporting the results of the hydrostatic test.

A. If the cylinder has passed Visual Inspection, simply press **Enter**., the computer will automatically enter the letters “PA” (Pass) on the Inspection – Disposition line.

B. If the cylinder has failed Visual Inspection, type in the letters “FV” (Fail) and press **Enter**. The system will skip the remainder of the test cycle for that cylinder and include the cylinder in the final test report along with a test result code noting the cylinder has failed the visual examination.

7. If the Extended Inputs option was selected in Parameters Function, the following cue will also need to be answered by the operator:

   A. **Owner:** The owner of the cylinder.

   B. **Owner’s Account Number:** The owner’s account number.

   C. **Cylinder Mfg:** The cylinder manufacturer (up to 8 characters).

   D. **Year of Mfg:** and manufacture date (up to 8 characters).

   E. **Gas Service:** The type of gas that the cylinder has contained (up to 7 characters).

   F. **Enter Plus/Star:** Includes a note in the test report which indicates if the cylinder will be Plus/Star stamped (up to 2 characters).

   G. **Operator:** operator initials

8. If your system has the optional second jacket, after the results of the visual inspection have been entered, the cursor will appear next to the “Remarks” cue in the Jacket 2 specification column. Repeat steps 5 and 6 above to enter all specifications for they cylinder that will be tested in Test Jacket 2.

   A. If you notice an entry mistake after entering specifications for Jacket 1 and/or Jacket 2, press the **F1** / **Abort** key to return to the first specification cue.

9. The first test should be on the user’s calibrated cylinder, in order to have record showing that the system is accurate to 1%.

10. Attach the test heads to the cylinder for which you have entered the information.

    A. Load the cylinder to be tested in Jacket #1, must turn Expansion valve to expansion. Attach the Head Seal Hose and Test Pressure Hose and then press **F2** to begin the test.

B. While the cylinder in Jacket #1 is being tested, load the other cylinder into Jacket # and attach the Head Seal Hose and Test Pressure Hose.

NOTICE! The Recortest/Open (A) uses only one Test Jacket. Jacket #2 is optional.

C. **CAUTION!** When connection a cylinder to the Hydraclose Test Head, make certain that the cylinder neck threads are properly engaged with the test spud. Before testing each cylinder, inspect the cylinder neck threads.

D. The test spud should engage with 3 to 5 neck threads in order for the cylinder to be safely tested. Cylinder with excessively worn neck threads should be re-tapped or condemned.

E. If the cylinder is not properly attached to the Hydraclose Test Heads, the cylinder may be blown off of the test head during pressurization.

F. If you have any doubt concerning the connection between the Test Head and the cylinder, **DO NOT TEST THE CYLINDER.**

11. When the test in Jacket 1 is complete, the Display Monitor will show the "Test Completed" message at the bottom of the Jacket 1 specification column. On Recortest/Open (A) systems, if you have the optional second jacket, you must press a key to continue

The Test Report may be printed daily or whenever conditions demand. All specifications and results that have been entered since the last Test Report was printed are stored on the system hard drive. After the Test Report has been printed, the operator has the options to save all data that was just printed, or erase the file from the hard disk drive to make room for new data.

The printed Test Report is then filed by the operator in accordance with D.O.T. CFR 49 Section 173.34 (e) (5). A sample copy of the Recortest/Open (A) Test Report is shown below

GALISO INC
22 PONDEROSA CT
MONTROSE,COLORADO 81401 USA

HIGH PRESSURE CYLINDER RETEST REPORT
PPP - Pass Visual,passed%Perm,Passed REE FAA - Failed Visual,Abort%Perm,Abort REE PPF - Pass Visual,Pass 10% Perm, Fail REE
PAA - Pass Visual,Abort % Perm, Abort REE PFA - Pass Visual, Fail % Perm, Abort REE

DOT/CTC Registration #???? Test Date: 08/02/2004 Operator Signatures:_____ DATE:_____

I hereby certify that all the following tests were made under my supervision and in accordance with DOT/CTC Regulations.

Test # Operator	Time	Cylinder Serial # Owner	Size	Gas Service	Cylinder MFG. MFG. Date	Rating	Pressure Test Unit	Pressure Actual Unit	Test Time	Expansion Total	Perm	%Perm	Elas Ree Source	Disp	+: *:	Remark
1	14:53	12	400			3AA-3600	6000 PSI	0 PSI	30	0.0	0.0	0.0	0.0 230.0 C5	FAA		GH
2 DM	14:53	12	400		/	3AA-3600	6000 PSI	0 PSI	30	0.0	0.0	0.0	0.0 230.0 C5	FAA		GH

FIGURE 18-1
Recortest/OPEN (A) Test Report

The standard Recortest/Open (A) Test Report contains the following specifications for each cylinder tested.

The Extended Recortest/Open (A) Test Report can be selected from the Parameters Menu and lists the following additional specifications; cylinder manufacturer, date of manufacture, cylinder service, capacity and eligibility for plus stamp. Test results for each cylinder include the total expansion, permanent expansion, percent permanent expansion, elastic expansion and a disposition code which indicates the status at the end of the test. The Test Report also includes the D.O.T./C.T.C. Registration Number of the facility, the date of the test, and the time of the test.

Following is a description of the procedure for printing a Test Report.

1. Bring up the Main Menu on the Display Monitor. The Main Menu will appear on the Display Monitor when power to the system is first turned on, when the system is reset, or after exiting form another menu.

2. Prepare the Printer, line up the perforation between the first two sheets of paper with the top of the guide on the printer carriage head.

3. Select either the Files Menu or the Edit Menu with the Arrow Keys. Press **Enter**. Highlight the Report Function with the Arrow Keys and press **Enter**.

4. The system will ask "What files, including path and drive do you want to search?" Press **Enter** to select the file name showing on the screen. It the operator wants to search a different file or drive (such as the floppy drive), type in the file you want to search and press **Enter**.

5. A list of the current files will appear on the screen. Use the Cursor Control Keys to select the desired file and press **Enter**. High light the desired option, proceed with the commands at that option, then press **Enter**.

   NOTE: Archived files on floppy disks can be accessed by using **A:*.res**.

6. The Primary Menu Screen will appear listing display options for running the report. Up to two options may be selected for a report.

   PRINT THE WHOLE FILE: Will print a report of all information in the file.

   DOT/CTC RATING: Prints a report only on selected cylinder specifications.

   GAS SERVICE: Selects specified service products for the report

   CYLINDER OWNER: Owner of Cylinder

   DISPOSITION: Input a selected Dispositon for a report on tersted cylinder with a specific disposition (i.e. PA, FV).

   REMARK: Input the Remark to search for.

   RANGE OF TEST DATES: Choose the beginning and ending test dates you want included in the report.

   OPERATOR: Retest Operator

CHANGE THE DATA FILE: Returns to the statement "What files, including path and drive do you want to search." Refer to command number 4 on the previous page for instructions.

VIEW RECORDS: Allow the operator to view a record on a specific test. This command will also allow the operator to print a report on a selected tested cylinder

ARCHIVE FILE: Stores files onto hard-drive.

QUIT: Will return you to the Main Menu.

7. After the Test Report has been printed, the Display Monitor will show the message "Do you want to save old results to a unique file name? (Y/N)."

   A. Press **N** to delete the information or **Y** to save the information.

   B. If the information is continually saved and never deleted, the computer memory will eventually become full. If the computer memory becomes full, print a report and then press **Y** in response to the Delete/Save question.

8. When the Test Report is complete, tear off the report at the perforation. File the Test Report and maintain it for the life of the test.

This section describes the general maintenance requirements for the RECORTEST/OPEN (A) System.

19.1 RECORTEST/OPEN (A) Control Console Components:

Keep the Control Console clean and dry and free of dirt and debris. Regularly inspect the plumbing components of the Control Console for leaks. Also inspect the lines which connect the Control Console to the test jackets and pressure supply for leaks.

Regularly inspect the Expansion Bowl Assembly. Remove the Load Cell Cover to gain access to the Expansion Bowl. Use a mirror to inspect the Expansion Bowl, if dirt and residue have accumulated in the Expansion Bowl, carefully remove the Expansion Bowl and clean it. Replace the Expansion Bowl as described in Section 2.5, Expansion Bowl Setup.

Inspect the high pressure bleed valves at the front left corner of the Control Console. The high pressure control valves are hard seat valves and therefore, any foreign material on the valve seat may cause the valve to leak. If there is external dripping coming from the stem, bonnet nut, or weep hole, first tighten the bonnet nut ¼ turn – **DO NOT OVER TIGHTEN**. If the bonnet nut is bottomed out, replace the packing gland. If there is pressure loss passing through the valve, inspect the stem and seat for nay scratches and replace as needed.

19.2 Control Valve Stack

the Control Valve Stack consists of a series of 3 air pilot control valves. The air pilots operate the valves which mechanically control the test in response to commands from the computer.

19.3 RECORTEST Printer :

In order for the manufacturer's warranty to be valid, the Printer must be kept clean and dry. In accordance with the manufacturer's warranty, the customer will be responsible for repair of any damage due to neglect or abuse of the Printer. The Printer must be operated in a clean environment or housed in a protective enclosure (such as the RECORTEST/OPEN (A) Control Console with the rear door closed) to prevent dirt and debris from accumulating inside of the machine.

Refer to the manual supplied with the Printer for complete maintenance details and the manufacturer's warranty.

Replace the ribbon on the Printer when necessary.

19.4 HYDRACLOSE® Test Heads:

Change the "Speed Seals" when they become excessively worn or ragged to avoid leakage and damage to the sealing mechanism.

Regularly Inspect the threads on the bottom of the test spud, if the threads become excessively worn or damaged, replace the test spud.

The Quick Connect Fittings should be inspected for wear periodically and replaced as needed. The hose couplers should fit snugly on the Quick Connect Fittings. The "O"-Ring seal in the Quick Connect Fittings should be changed when wear prevents proper sealing.

The metal surfaces of the HYDRACLOSE® Test Head should be kept clean and free of rust and corrosion. Metal surfaces should be painted with a high quality, cold galvanizing metal primer.

19.5 HYDRACLOSE® Test Jackets :

The inside upper 12 inches of the test jacket should be painted with cold galvanizing metal primer to protect the sealing area.

The Test Jacket should be cleaned periodically to remove any accumulation of dirt or debris as needed or at least once every three months.

Test jacket water that has become stagnant or brackish should be drained from the test jacket and replaced with fresh water.

19.6 Calibrated Cylinder :

The water filled Calibrated Cylinder must be protected from freezing temperatures, the force generated by the freezing water can permanently damage the calibration of the cylinder and possibly rupture the cylinder wall.

19.7 Master Gauge Assembly :

In accordance with D.O.T. Regulations, the Master Gauge Assembly must be re-calibrated at least once per year.

Handle the Master Gauge Assembly very carefully. Sudden shocks and rough handling can damage the calibration of the gauge.

19.8 High Pressure Pump :

Pump speed and pressure must be adjusted for the size/rating of cylinders being tested. Proceed as described in Section 7, Pump Speed Adjustment.

Replace worn pump seals and packing s as needed. Check the Air Lubricator oil level daily to ensure an adequate oil level. Fill as necessary with 10 weight non-detergent oil only.

See CGA pamphlet C-41, “Cleaning Equipment For Oxygen Service” for more information, This pamphlet is available from Galiso, or from the Compressed Gas Association at the address indicated in Section 1.

19.9 Replacement Parts:

The purpose of the following information is to provide the customer with a description of the various replacement assemblies of the Recortest/Open (A) Test Control Console.

Although the multitude of parts comprising the Recortest/Open (A) Test System may seem confusing at first glance, the parts may be more easily understood if grouped together in assemblies. For this reason, and also to simplify field service, the parts of the Recortest/Open (A) Control Console have been divided into easily recognizable assemblies. Each assembly has a part number to simplify ordering replacement parts.

The lower shelf of the Control Console houses most of the electrically operated components of the test system, such as the computer and printer. The splash guards cover the lower shelf of the Control Console to protect the Central Processing Unit and other sensitive electronic components form dirt and moisture. All four splash guards should always remain in place, except when performing repairs or maintenance to the components within.

The following pages describe the locations an appearance of the Control Computer Assemblies.

19.9.1 RECORTEST/OPEN (A) Console Replacement Parts:

Table 19-1
Replacement Parts

ITEM	DESCRIPTION	PART NO.
1	Load Cell Assembly, includes cable with DB-9 connector	01-41-1330
2	Computer Assembly	02-41-0621A
3	Bleed Valve	81-11-0130
4	Printer, Parallel	94-11-0018
5	Valve Assembly, Expansion/Drain	02-41-0220
6	Valve Assembly, Micro-5	02-41-0218
7	Air filter/Regulator Assembly	02-41-0223
8	Transducer Assembly., includes cable with DB-9 connector	01-42-1402
9	Pump Assembly	02-41-0221
10	Water Filter/Regulator Assembly	02-41-0128
11	Burst Disc w/Gasket	01-41-3235
12	Sno Trik Repair Kit	81-41-0263
13	½” Speed Seals	01-32-2531-B
14	¾” Speed Seals	01-32-2534-B
15	1” Speed Seals	01-32-2537-B
16	½” SS Washer	01-32-2532
17	¾” SS Washer	01-32-2535B
18	1” SS Washer	01-32-2538
19	Brass Protector Nut	01-32-2545
20	Jam Nut	62-33-6862

Cylinder Size *	Reference Code	DOT Rating	Test Pressure	Max. Expan.	Test Time	Cut Off	% Exp.
3.25 x 13	B	3AA-2015	3360	07.2	30	10	10
4.25 x 16.75	D	3AA-2015	3360	014.5	30	10	10
4.25 x 25.75	E	3AA-2015	3360	023.1	30	10	10
5.25 x 13.87	A1	3AA-2015	3360	018.2	30	10	10
5.25 x 14.87	A2	3AA-2015	3360	019.8	30	10	10
6.25 x 21	A3	3A-2015	3360	032.7	30	10	10
6.75 x 18.5	A4	3AA-2015	3360	041.3	30	10	10
5.37 x 37	A5	3A-2015	3360	045.0	30	10	10
5.75 x 32	A6	3AA-2015	3360	057.0	30	10	10
7 x 25	A7	3A-2015	3360	047.0	30	10	10
7 x 32.5	A8	3A-2015	3360	063.0	30	10	10
7 X 32.5	A9	3AA-2015	3360	080.0	30	10	10
7.12 x 30	A10	3A-2215	3700	058.0	30	10	10
7.12 x 30	A11	3AA-2215	3700	073.0	30	10	10
7 x 43	A12	3A-2015	3360	088.0	30	10	10
7 x 43 (CR-MO)	A13	3A-2015	3360	110.0	30	10	10
7 x 43	A14	3AA-2015	3360	110.0	30	10	10
7 x 43 (CR-MO)	A15	3A-2265	3775	110.0	30	10	10
7 X 43	A16	3AA-2265	3775	110.0	30	10	10
7.37 X 46.12	A17	3AA-2015	3360	133.0	30	10	10
9 X 51	A18	3A-1800	3000	179.0	30	10	10
9 X 51	A19	3AA-1800	3000	225.0	30	10	10
9 X 51	A20	3A-2000	3333	178.0	30	10	10
9 X 51	A21	3A-2015	3360	178.0	30	10	10
9 X 51 (CR-MO)	A22	3A-2015	3360	216.0	30	10	10
9 X 51	A23	3AA-2015	3360	216.0	30	10	10
9 X 51 (CR-MO)	A24	3A-2260	3775	227.0	30	10	10
9 X 51 (W.D.)	A24W	3A-2260	3775	227.0	30	10	10
9 X 51 (CR-MO)	A25	3A-2265	3775	227.0	30	10	10
9 X 51 (W.D.)	A25W	3A-2265	3775	227.0	30	10	10
9 X 51	A26	3AA-2265	3775	216.0	30	10	10
9 X 51 (CR)	A27	3A-2400	4000	257.0	30	10	10
9 X 51	A28	3A-2400	4000	181.0	30	10	10
9.25 X 55	A29	3AA-2400	4000	251.0	30	10	10
10.6 X 56	A30	3AA-2400	4000	343.0	30	10	10
9.25 X 51	A31	3AA-3500	5833	229.0	30	10	10
9.25 X 51	A32	3AA-3600	6000	230.0	30	10	10
9.37 X 51	A33	3AA-4500	7500	226.0	30	10	10
9.75 X 51	A34	3AA-6000	10,000	226.0	30	10	10
CAL-CYL	X	3AA6000	3,000	200.0	30	10	10

*** Dimensions are in inches**

Table 20-1

PROBLEM	POSSIBLE CAUSE	SOLUTION (WHAT TO DO)
Expansion Increasing	Bowl/Jacket Fill Valve Leaks	Remove line from valve to see if water is leaking through the valve.
	Head Seal Leak	Switch heads (if another is available. If problem ceases, repair faulty head. If another head is not available, using proper Head Retaining Device, leak check head around diaphragm and boot. If any leaks exist, repair head.
	Temperature Problem (problem will eventually stop as temperatures stabilize	Check to see that all temperatures (incoming water, test jackets, filled cylinders, and ambient air temperature) are within 5 degrees of each other.
Expansion Decreasing in ONE Jacket only (negative expansion)	Head Boot not sealing against Jacket	Check inside sealing surface of Test Jacket to ensure that the surface is smooth Check Head Boot for deformations
	Leak in expansion plumbing	Dry off all tubing with an air hose, and check for drops of water
	Opposite jacket expansion valve leaks	Remove ½" plastic tubing from the bottom of the valve, and check to see if water is dripping from the valve.
	Temperature problem (problem will eventually stop as temperatures stabilize	Check to see that all temperatures (incoming water, test jackets, filled cylinders, and ambient air temperature) are within 5 degrees of each other.
Expansion Decreasing in BOTH jackets (negative expansion)	Expansion/Bowl drain valve leaks	Remove ½" plastic tubing from the bottom of the drain valve, and check to see if water is dripping from the valve.
Expansion Unstable	Air trapped in expansion line	Flush expansion lines by filling with water, and removing the head seal to each jacket while it is selected in verify
	Damaged load cell	Remove expansion bowl from bolt on Load Cell, and see if expansion stabilizes without load. If expansion continues to drift, Load Cell may be damaged
	Vibration	Weigh Bowl must be stable. If there is a vibration coming through the floor, or other sources, this must be isolated

PROBLEM	**POSSIBLE CAUSE**	**SOLUTION (WHAT TO DO)**
Expansion does not change from zero, no matter what you do	Improper calibration factor set to zero	Recalibrate expansion following the procedure step by step as detailed in the instructions
	Cable not connected to the computer	Check load cell cable connection to the back of the computer
	Broken load cell	Unplug the load cell cable from the back of the computer. If reading then jumps to an enormous number, this could indicate a broken load cell
Pressure decreasing	Leak in High Pressure Bleed Valve	Remove the ¼" SST Tubing from the bleed valve (the line going out to the pit). If drops begin to form at elbow when the system is pressurized, the valve needs to be rebuilt (stem and/or seat)
	Leak in High pressure tubing	Check all connections from console out to jacket that has the leak
	Test head has high pressure leak	Switch test heads. If problem goes to the other jacket , test head needs rebuilding.
	Pump Outlet check Valve Leaking	Change the check valve
Pressure increasing	Pump is continuing to pump even though computer has tried to turn it off. (see also pressure unstable)	Pump control valve is stuck. Turn the air to the pump off. If this stops the increase, troubleshoot the control circuit from the control valve out to the pump.
Pressure unstable	Damaged pressure transducer	Attach master gauge to the system. Pressurize to a readable pressure and hold. If the pressure is stable on the gauge, but drifts on the transducer, replace the transducer
Pressure does not change from zero, no matter what you do	Improper calibration factor set to zero	Recalibrate pressure, following the procedure step by step as detailed in the instructions
	Cable not connect to computer	Check transducer cable connection to back of the computer
	Broken Transducer	Unplug Transducer cable from the back of the computer. If reading then jumps to an enormous number, this could indicate broken transducer.
Pressure and expansion both readings are out of the ordinary i.e., both are unstable, or stay on zero	Possible damaged A/D card	Recalibrate both pressure and expansion, note the "Calibration Factors" of each, and call Galiso. Replace the A/D Card in computer

PROBLEM	**POSSIBLE CAUSE**	**SOLUTION (WHAT TO DO)**
Computer keyboard locks up	Power fluctuation	Reset the computer. If this problem becomes chronic, an uninterruptable power supply (UPS) may solve it. If not, check your incoming power
Computer new floppy disk will not format	Incompatible floppy disk	Check to see that the floppy disk that your are using is IBM compatible, with the specification: MFD-2HD or MF-2HD
Computer when the computer is tuned on, floppy disk light turns on, and computer seems to boot, but…….. Monitor remains black	Monitor is not getting power: small green power light is on	Monitor may have a blown fuse. Factory repair is necessary. Check the power connection
	Monitor brightness adjustment is turned down	Adjust

PRODUCT WARRANTY

1. **DURATION:** Galiso extends a one-year warranty from date of purchase, to the original purchaser, for all its manufactured products. For all spare parts purchases, Galiso extends the manufacturer's warranty or 90 days, whichever is longer. Soft goods parts, such as speed seals, washers, and O-rings, which are subject to wear in the normal course of operation, are not covered under this warranty. Collar Tooling products are warranted for six months.

2. **COVERAGE:** Galiso manufactured equipment is warranted against defective materials or workmanship. THIS WARRANTY IS VOID IF:

   A) THE EQUIPMENT HAS BEEN DAMAGED BY ACCIDENT OR UNREASONABLE USE, IMPROPER SERVICE/MAINTENANCE, IMPROPER INSTALLATION, ABNORMAL OPERATING CONDITIONS, NEGLECT, REPAIR BY ANY PERSON NOT AUTHORIZED BY GALISO, INC. OR OTHER CAUSES NOT RELATED TO MATERIAL DEFECTS OR WORKMANSHIP.

   B) THE SERIAL NUMBER HAS BEEN ALTERED OR DEFACED.

3. **PERFORMANCE:** Galiso reserves the right to make warranty determination only after inspecting the item at the Galiso manufacturing facility. If the warranty determination indicates that the defective item is covered under warranty, the item will be repaired or replaced with same parts/items or parts/items of equivalent quality, at the option of Galiso. In the event of replacements, the replacement unit will continue under the original equipment warranty or carry a 90-day warranty, whichever is longer. No charge will be made for warranty repairs, and/or replacements. All freight charges are the responsibility of the customer requesting warranty service.

   If the warranty determination indicates that the item is not covered by warranty, a repair/replacement cost estimate will be submitted to the purchaser for approval prior to initiating any repair work.

4. **CLAIMS:** In the case of equipment malfunction, notify Galiso (1-800-854-3789) and provide the Model Name, Model Number, Serial Number and a description of the problem. Return Authorization Number, shipping and/or service information will be provided on receipt of the required information.

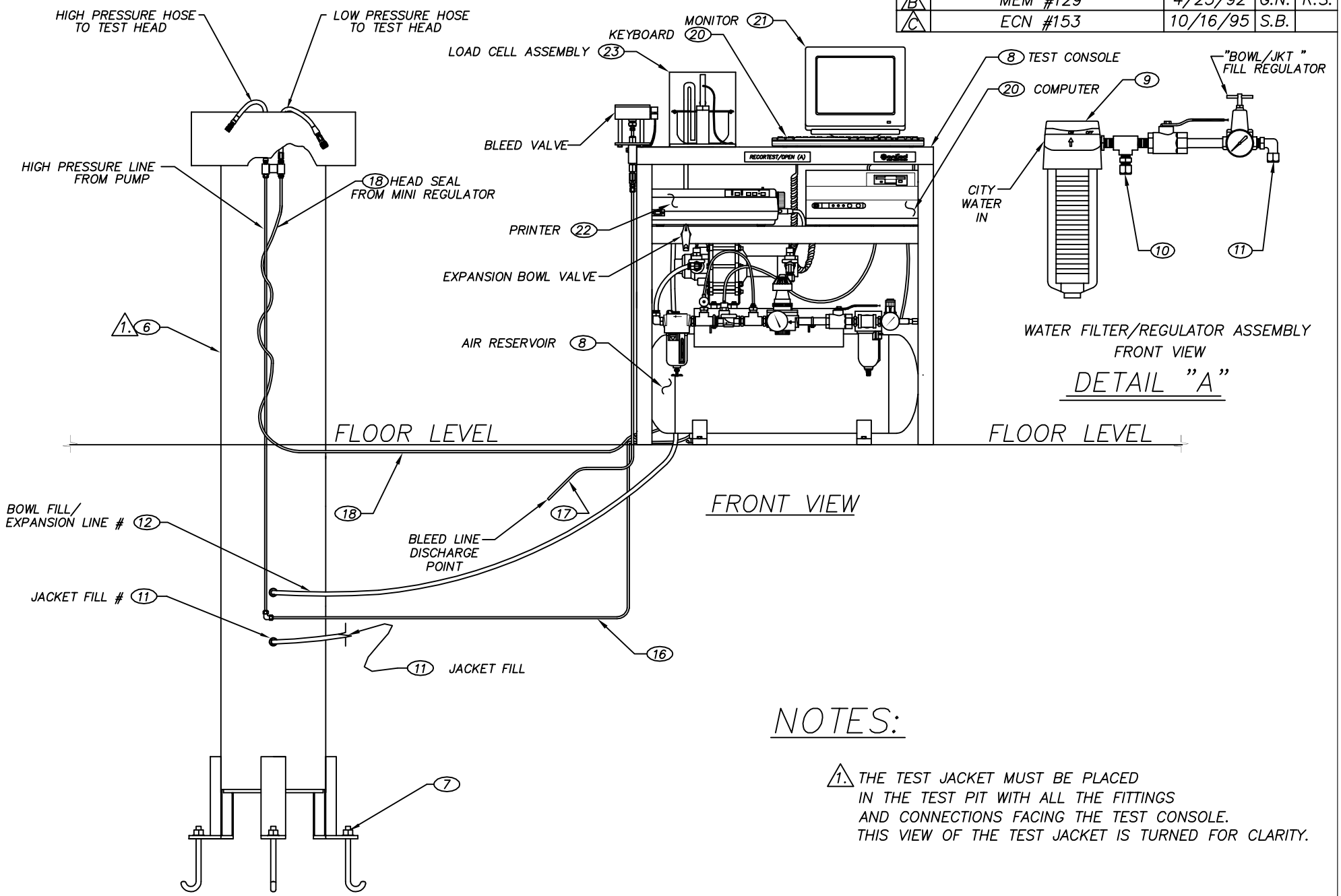
5. **SERVICE EQUIPMENT:** Galiso attempts to make available, whenever possible, a limited amount of service equipment at a minimal use charge, plus freight expense, for those customers wishing to avoid downtime during repair of their equipment. Such items are available on a first come, first served basis and are billable at the specific service charge applying with a one-month minimum.

6. **MODEL CHANGES:** Galiso reserves the right to make changes in materials and specifications, without notice. Galiso may offer, for a stipulated fee, the opportunity to upgrade your equipment to the latest configuration.

7. **DISCLAIMERS:** Galiso provides technical data and assistance to aid customers in the selection and use of our products. There are no implied warranties of merchantability nor suitability for a particular purpose associated with the transmittal of technical data and/or customer assistance.

   Galiso does not assume liability for any consequential, incidental, or special damages. Liability under this warranty is limited to repairing, or replacing Galiso equipment items returned to the factory or an authorized facility.

REV.	DESC.	DATE	BY:	APP.
B	MEM #129	4/23/92	G.N.	R.S.
C	ECN #153	10/16/95	S.B.	



FRONT VIEW

WATER FILTER/REGULATOR ASSEMBLY
FRONT VIEW

DETAIL "A"

NOTES:

1. THE TEST JACKET MUST BE PLACED IN THE TEST PIT WITH ALL THE FITTINGS AND CONNECTIONS FACING THE TEST CONSOLE. THIS VIEW OF THE TEST JACKET IS TURNED FOR CLARITY.

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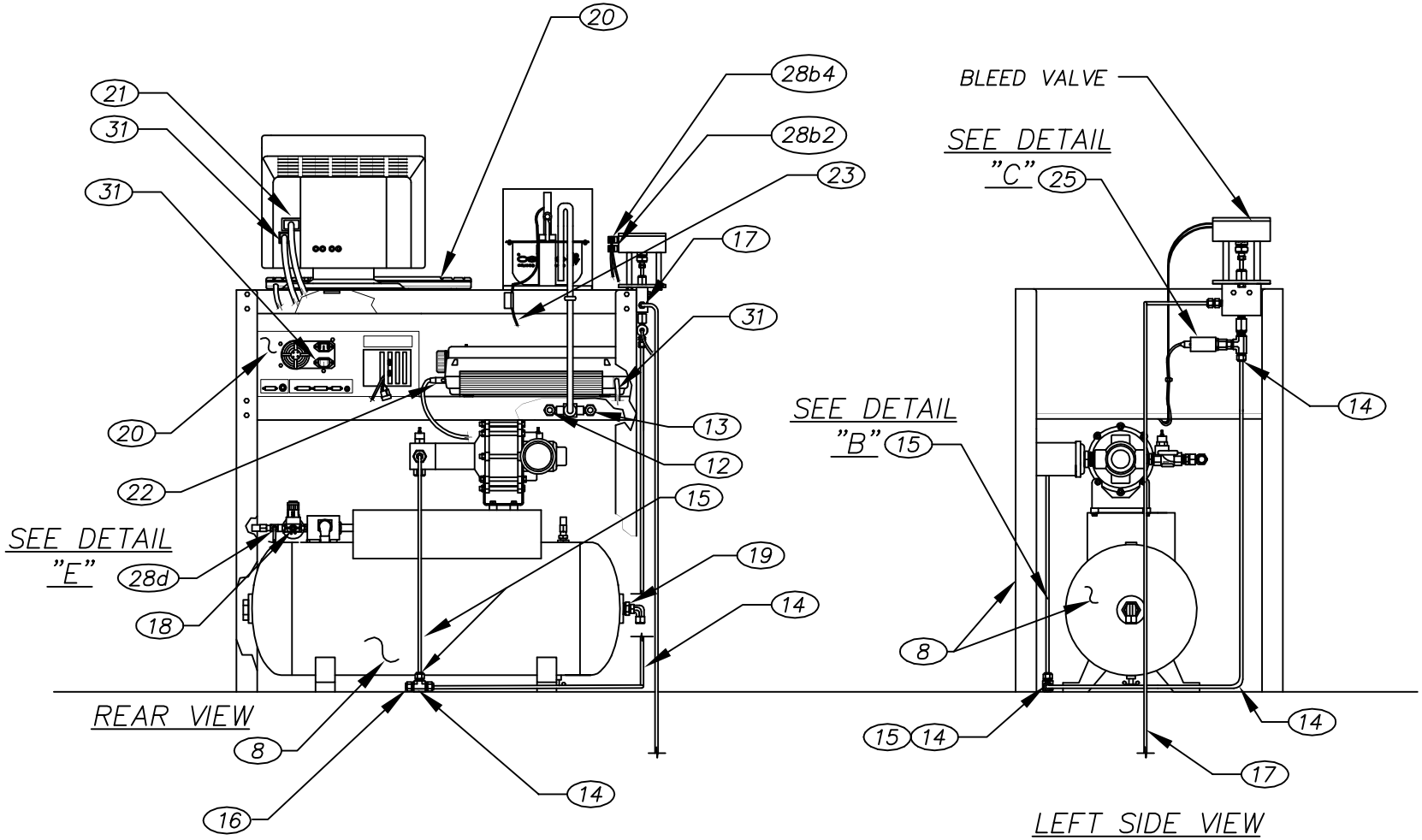
MATERIAL N/A	INSTALLATION/INSTRUCTION/LAYOUT REC/OPEN (A)			DRAWN G.NIELSEN	DATE 2/17/92
				CHECKED TOM REY	DATE 5/14/92
	DRAWING NUMBER 02-71-0172	NEXT ASSEMBLY N/A	SHEET 1 OF 6	REVISION C	ISSUED RICH SMITH / DATE 6/17/92
	UNLESS OTHERWISE SPECIFIED - TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A			E.C.N. #153	SCALE NONE / FILE NAME 02710172

REV.	DESC.	DATE	BY:	APP.
B	MEM #129	4/23/92	G.N.	R.S.
C	ECN #153	10/16/95	S.B.	



SOME ITEMS NOT SHOWN FOR DETAIL

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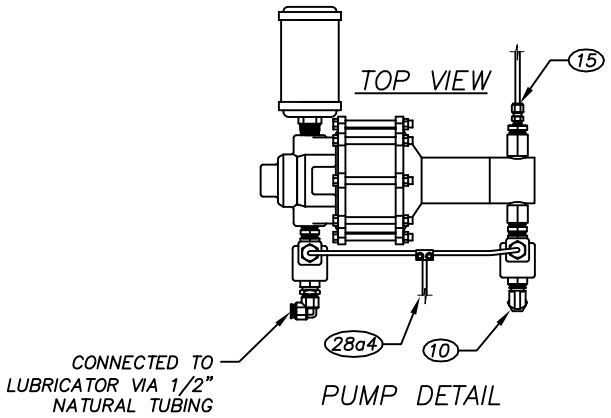
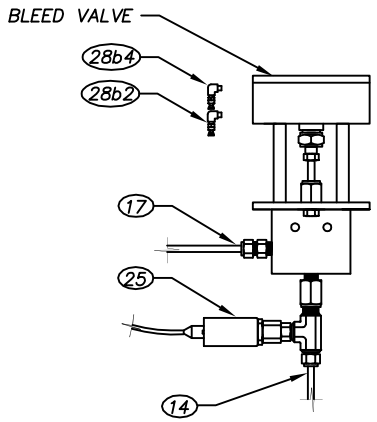
MATERIAL N/A	INSTALLATION/INSTRUCTION/LAYOUT REC/OPEN (A)				DRAWN G.NIELSEN	DATE 2/17/92
					CHECKED TOM REY	DATE 5/14/92
	DRAWING NUMBER 02-71-0172	NEXT ASSEMBLY N/A	SHEET 2 OF 6	REVISION C	ISSUED RICH SMITH	DATE 6/17/92
	UNLESS OTHERWISE SPECIFIED - TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A			E.C.N. #153	SCALE NONE	FILE NAME 02710172

REV.	DESC.	DATE	BY:	APP.
B	MEM #129	4/23/92	G.N.	R.S.
C	ECN #153	10/16/95	S.B.	



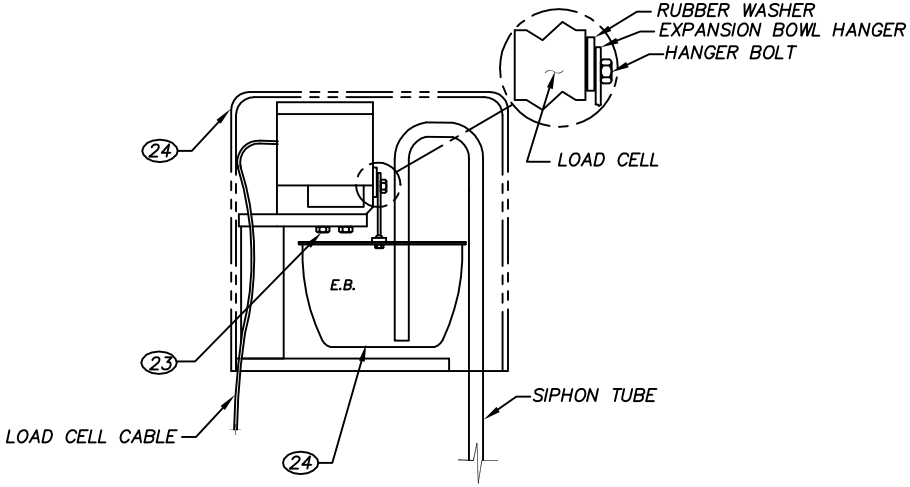
PUMP DETAIL

DETAIL "B"



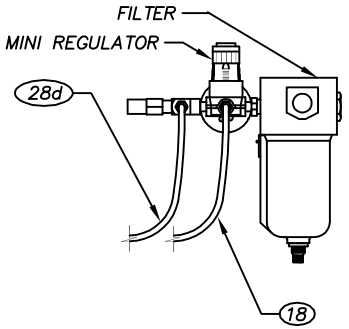
BLEED VALVE LEFT SIDE VIEW

DETAIL "C"



EXPANSION ASSEMBLY RIGHT SIDE VIEW

DETAIL "D"



AIR FILTER/REGULATOR BACK VIEW

DETAIL "E"

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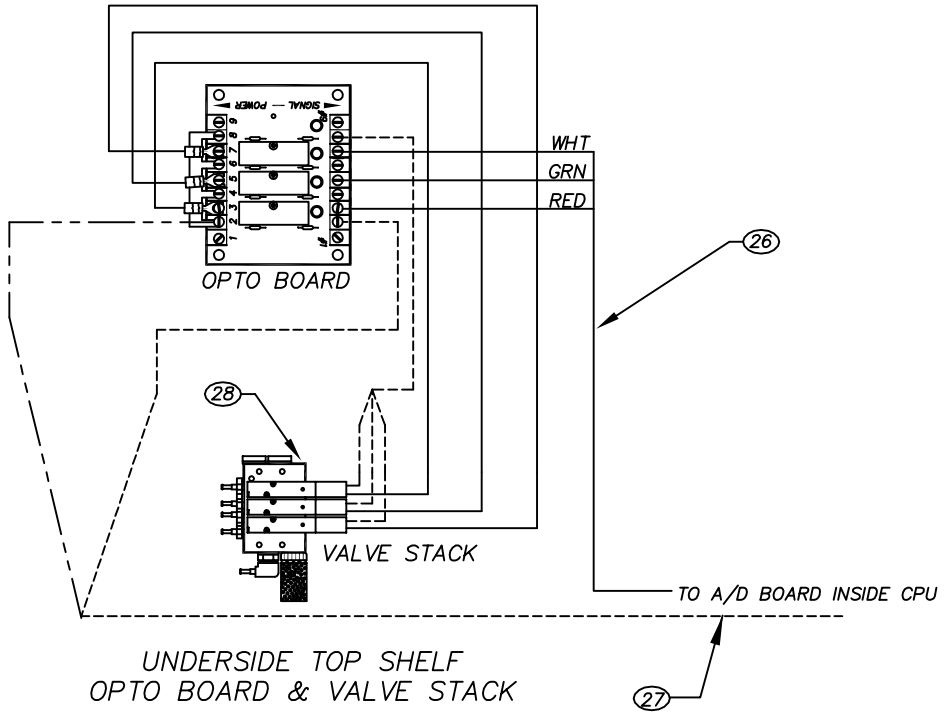
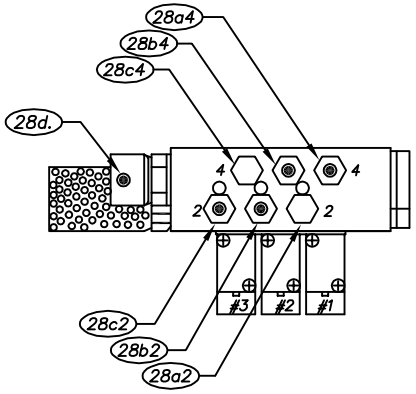
MATERIAL N/A	INSTALLATION/INSTRUCTION/LAYOUT REC/OPEN (A)			DRAWN G.NIELSEN	DATE 2/17/92
				CHECKED TOM REY	DATE 5/14/92
	DRAWING NUMBER 02-71-0172	NEXT ASSEMBLY N/A	SHEET 3 OF 6 / REVISION C	ISSUED RICH SMITH	DATE 6/17/92
	UNLESS OTHERWISE SPECIFIED - TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A		E.C.N. #153	SCALE NONE	FILE NAME 02710172

REV.	DESC.	DATE	BY:	APP.
B	MEM #129	4/23/92	G.N.	R.S.
C	ECN #153	10/16/95	S.B.	



UNDERSIDE TOP SHELF
OPTO BOARD & VALVE STACK

DETAIL "F"



VALVE STACK FRONT VIEW

DETAIL "G"

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MATERIAL: N/A	INSTALLATION/INSTRUCTION/LAYOUT REC/OPEN (A)				DRAWN: G.NIELSEN	DATE: 2/17/92
					CHECKED: TOM REY	DATE: 5/14/92
	DRAWING NUMBER: 02-71-0172	NEXT ASSEMBLY: N/A	SHEET: 4 OF 6	REVISION: C	ISSUED: RICH SMITH	DATE: 6/17/92
	UNLESS OTHERWISE SPECIFIED – TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A			E.C.N.: #153	SCALE: NONE	FILE NAME: 02710172

INSTALLATION INSTRUCTION NOTES:

REV.	DESC.	DATE	BY:	APP.
B	MEM #129	4/23/92	G.N.	R.S.
C	ECN #153	10/16/95	S.B.	

"DO NOT CONNECT MAIN POWER, AIR OR WATER TO ANY COMPONENTS UNTIL SPECIFIED"

REFERENCE SCHEMATICS; AIR/WATER DRAWING #02-91-0200 OR ELECTRICAL DRAWING # 02-95-0200

1. READ ALL INSTRUCTIONS AND FAMILIARIZE YOURSELF WITH THE INSTALLATION INFORMATION, AND DRAWINGS, BEFORE ATTEMPTING TO REMOVE CONTENTS FROM CRATE, INSTALL, OR OPERATE THE RECORTEST/OPEN TEST SYSTEM.

2-5. REFER TO THE INSTALLATION SECTION OF THE INSTRUCTION MANUAL. (SECTION 6-1)

6. CAREFULLY REMOVE THE CALIBRATED CYLINDER, TEST HEAD, AND TEST JACKET FROM CRATE. WARNING: USE PROPER LIFTING EQUIPMENT, THESE ITEMS ARE EXTREMELY HEAVY.

7. CAREFULLY LOWER TEST JACKET INTO THE TEST PIT OVER ANCHOR BOLTS. THE TERMINAL CONNECTIONS ARE TO BE POSITIONED, FACING THE CONTROL CONSOLE. TO LEVEL THE TEST JACKET USE SHIMS ON THE ANCHOR BOLTS. ONCE THE TEST JACKET IS IN PLACE, TIGHTEN ANCHOR NUTS AND POSITION GRATING AROUND THE TEST JACKET.

8. CAREFULLY REMOVE THE AIR RESERVOIR AND CONSOLE FROM THE CRATE. POSITION EACH USING THE RECOMMENDED TEST PIT LAYOUT LOCATION, AND BOLT EACH TO THE FLOOR. CAUTION !! DO NOT LIFT EQUIPMENT USING COMPONENTS THAT ARE ATTACHED TO THE CONTROL CONSOLE. THIS COULD RESULT IN SERIOUS DAMAGE!

9. CAREFULLY REMOVE THE "WATER FILTER/REGULATOR ASSY". AND MOUNT THE WATER FILTER ASSEMBLY, BETWEEN THE CONTROL CONSOLE AND YOUR CITY "WATER IN" CONNECTION. PLUMB A 3/4" LINE TO THE WATER FILTER INLET PORT. THE REGULATOR SHOULD BE FACTORY SET AT 10 PSI, HOWEVER, MAKE CERTAIN THAT THE SETTING IS AT 10 PSI (STATIC).

10. PLUMB A 1/2" PLASTIC LINE FROM "WATER TO PUMP" TO THE "WATER IN FROM FILTER" PORT ON THE PUMP.

11. PLUMB A 1/2" PLASTIC LINE FROM THE "BOWL/JACKET FILL REGULATOR" TO THE "JACKET FILL" PORT ON THE JACKET (LOWER PORT).

B 12. PLUMB A 1/2" PLASTIC LINE FROM THE "BOWL FILL/EXPANSION" PORT ON THE TEST JACKET (UPPER PORT) TO THE "EXPANSION LINE CONNECTION" ON THE EXPANSION BOWL VALVE. THIS LINE MUST HAVE A CONTINUOUS DROP FROM THE CONTROL CONSOLE TO THE TEST JACKET, WITH NO HIGH OR LOW SPOTS.

B 13. PLUMB 1/2" A PLASTIC LINE FROM THE "BOWL DRAIN CONNECTION" ON THE EXPANSION BOWL VALVE TO THE TEST PIT OR AN ADEQUATE DRAIN. THIS DRAIN LINE SHOULD BE ANCHORED DOWN.

B 14. CAREFULLY REMOVE THE HIGH PRESSURE LINE FROM THE CRATE. (NOTE: THIS LINE HAS A TEE AT ONE END.) CONNECT THIS LINE (END WITHOUT TEE) TO THE "HIGH PRESSURE" PORT ON THE BLEED VALVE. THIS LINE IS DIRECTED TOWARDS THE BACK LEFT LEG OF THE CONSOLE AND THEN TURNS TOWARDS THE CENTER OF THE CONSOLE.

15. CONNECT THE HIGH PRESSURE PUMP LINE TO THE "H.P WATER TO TEST" PORT ON THE PUMP AND TO THE TOP PORT OF THE TEE FROM THE JACKET BLEED LINE.

16. PLUMB A 1/4" SST LINE FROM THE UNUSED PORT OF THE TEE TO THE "HIGH PRESSURE CONNECTION" (ELBOW) ON THE JACKET.

17. PLUMB A 1/4" SST LINE FROM THE "H.P. BLEED LINE" PORT ON THE BLEED VALVE, DOWN INTO THE TEST PIT OR, TO AN ADEQUATE DRAIN. THIS DRAIN LINE NEEDS TO HAVE A 90 DEGREE BEND IN THE HORIZONTAL DIRECTION, AND A 45 DEGREE BEND IN THE DOWNWARD DIRECTION, BELOW THE GRATING. NOTE: THIS LINE MUST BE AT AN ANGLE THAT DOES NOT ALLOW THE DISCHARGED WATER TO HIT THE JACKET. ALLOW SUFFICIENT DISTANCE BETWEEN BLEED LINE DISCHARGE POINT AND ANY OBSTACLE. IF THIS IS NOT DONE DAMAGE CAN OCCUR TO PIT OR JACKET. THIS IS A HIGH PRESSURE BLEED LINE, IT MUST BE SECURED.

18. PLUMB A 1/4" PLASTIC LINE FROM THE MINI REGULATOR TO THE "HEAD SEAL CONNECTION" ON THE JACKET.

19. PLUMB A 1/2" PLASTIC LINE FROM YOUR AIR SOURCE TO THE "SHOP AIR IN" PORT ON THE AIR RESERVOIR. (OPTIONAL AIR IN ON EITHER END OF RESERVOIR)

20. CAREFULLY REMOVE THE "COMPUTER" FROM THE BOX AND PLACE IT ON THE RIGHT SIDE OF THE BOTTOM SHELF FACING FRONT. REMOVE THE "KEYBOARD" FROM THE BOX AND PLACE IT ON THE TOP SHELF IN THE RIGHT FRONT CORNER OF THE TOP SHELF AND PLUG IT INTO THE COMPUTER.

GALISO®
GAS LIQUIDS SOLIDS

MATERIAL: N/A	INSTALLATION/INSTRUCTION/LAYOUT REC/OPEN (A)			DRAWN: G.NIELSEN	DATE: 2/17/92
				CHECKED: TOM REY	DATE: 5/14/92
	DRAWING NUMBER: 02-71-0172	NEXT ASSEMBLY: N/A	SHEET: 5 OF 6	REVISION: C	ISSUED: RICH SMITH	DATE: 6/17/92
	UNLESS OTHERWISE SPECIFIED - TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A			E.C.N. #153	SCALE: NONE	FILE NAME: 02710172

REV.	DESC.	DATE	BY:	APP.
B	MEM #129	4/23/92	G.N.	R.S.
C	ECN #153	10/16/95	S.B.	

INSTALLATION INSTRUCTION NOTES CONTINUED:

"DO NOT CONNECT MAIN POWER, AIR OR WATER TO ANY COMPONENTS UNTIL SPECIFIED"

THIS EQUIPMENT IS VERY DELICATE AND SENSITIVE.

21. CAREFULLY REMOVE THE "MONITOR" FROM THE BOX AND PLACE IT ON TOP OF THE TABLE NEAR THE RIGHT REAR CORNER. CONNECT THE MONITOR TO THE PORT LABELED "MONITOR CABLE CONNECTION", AT THE REAR OF THE COMPUTER.

22. CAREFULLY REMOVE THE "PRINTER" FROM THE BOX AND PLACE IT ON THE LOWER SHELF NEXT TO THE COMPUTER. CONNECT THE "PARALLEL" END OF THE CABLE TO THE PRINTER AND THE "DB25" END TO THE PORT LABELED "PRINTER CABLE (DB25) END CONNECTION," LOCATED AT THE BACK OF THE COMPUTER.

23. CAREFULLY REMOVE THE "LOAD CELL" AND INSTALL IT ONTO THE LOAD CELL BRACKET, BOLTING IT ON WITH THE "LOAD CELL CABLE" TOWARDS THE FRONT OF THE CONSOLE. CONNECT THE END OF THE CABLE TO THE "LOAD CELL CABLE CONNECTION," LOCATED ON THE BACK OF THE COMPUTER.

24. CAREFULLY REMOVE THE "EXPANSION BOWL" AND PLACE IT ONTO THE HANGER BOLT BETWEEN THE BOLT AND THE RUBBER WASHER. HAND TIGHTEN THE HANGER BOLT. THE HANGER BOLT SHOULD BE LOOSE ENOUGH TO ALLOW THE EXPANSION BOWL TO JUST FIT OVER THE BOLT. OVER TIGHTENING THE EXPANSION-BOWL BOLT CAN SERIOUSLY DAMAGE THE "LOAD CELL". PLACE THE "EXPANSION COVER" OVER THE "LOAD CELL" ASSY.

25. LOCATE THE "TRANSDUCER" ATTACHED TO THE "BLEED VALVE," AND CONNECT THE "TRANSDUCER CABLE" TO THE BACK OF THE "COMPUTER".

B 26. LOCATE THE "OPTO SIGNAL CABLE" AT THE BACK OF THE COMPUTER AND CONNECT IT TO THE "OPTO BOARD" LOCATED UNDER THE TOP SHELF.
CONNECT WHITE WIRE TO #7 SIGNAL TERMINAL.
CONNECT GREEN WIRE TO #5 SIGNAL TERMINAL.
CONNECT RED WIRE TO #3 SIGNAL TERMINAL.

27. LOCATE THE "OPTO POWER CABLE" UNDER THE TOP SHELF, CONNECTED TO THE "OPTO BOARD". CONNECT IT TO THE BACK OF THE "COMPUTER, LABELED "OPTO POWER CABLE CONN".

28. LOCATE THE "CONTROL VALVE STACK" UNDER THE TOP SHELF OF THE CONSOLE AND CHECK THE FOLLOWING:

a.) VALVE#1
2.) PORT 2 IS NOT CONNECTED
4.) PORT 4 TO TEE CONNECTED TO VALVES AT PUMP.

b.) VALVE#2
2.) PORT 2 TO "BLEED VALVE" OPEN
4.) PORT 4 TO "BLEED VALVE" CLOSED

c.) VALVE#3
2.) PORT 2 TO "PUMP SLOW VALVE"
4.) PORT 4 IS NOT CONNECTED

d.) CONNECT A 1/4" PLASTIC LINE FROM THE SWIVEL CONNECTION ON THE VALVE STACK TO THE AFTER THE MINI REGULATOR ON THE "AIR FILTER/REGULATOR ASSY".

29-30. REFER TO THE INSTALLATION INSTRUCTION SECTION 6-1 IN THE MANUAL FOR THE AIR AND WATER PROCEDURES.

31. PLUG THE MONITOR, COMPUTER AND PRINTER INTO A 115 VOLT AC SURGE CONTROL UNIT (CUSTOMER SUPPLIED). PRIOR TO TURNING ON POWER TO THE SURGE CONTROL UNIT BE CERTAIN THE COMPUTER, PRINTER, AND MONITOR ARE IN THE OFF POSITION. TURN ON THE SURGE CONTROL UNIT FIRST. TURN ON THE MONITOR AND THE PRINTER SECOND. TURN ON POWER TO THE COMPUTER LAST.

32-35. REFER TO THE INSTALLATION INSTRUCTION SECTION IN THE MANUAL.

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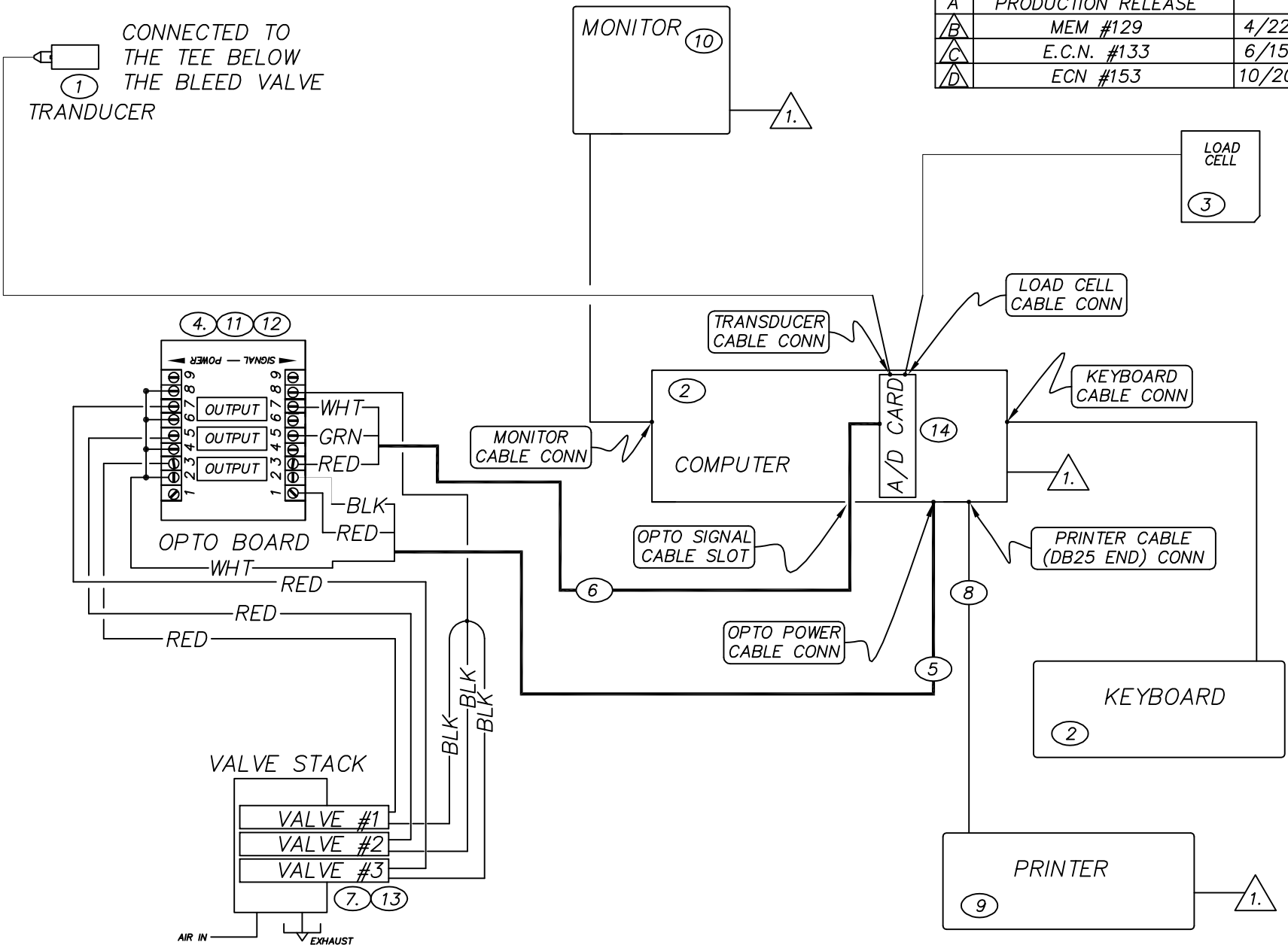
MATERIAL: N/A	INSTALLATION/INSTRUCTION/LAYOUT REC/OPEN (A)			DRAWN: G.NIELSEN	DATE: 2/17/92
				CHECKED: TOM REY	DATE: 5/14/92
	DRAWING NUMBER: 02-71-0172	NEXT ASSEMBLY: N/A	SHEET: 6 OF 6	REVISION: C	ISSUED: RICH SMITH / DATE: 6/17/92
	UNLESS OTHERWISE SPECIFIED - TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A			E.C.N.: #153	SCALE: NONE / FILE NAME: 02710172

DRAWING # 02-95-0200		SHEET : 1 OF 2		
REV.	DESC.	DATE	BY:	APP.
A	PRODUCTION RELEASE			
B	MEM #129	4/22/92	G.N.	R.S.
C	E.C.N. #133	6/15/93	G.N.	C.H.
D	ECN #153	10/20/95	S.B.	



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MATERIAL N/A

ELECTRICAL SCHEMATIC
REC/OPEN (A)

DRAWING NUMBER	NEXT ASSEMBLY	SHEET	REVISION
02-95-0200	N/A	1 OF 2	D

UNLESS OTHERWISE SPECIFIED – TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A

E.C.N. #153

DRAWN	DATE
G.NIELSEN	4/14/92
TEAM LEADER C.HOOVER	DATE 7/15/93
Q.A. W.BACUS	DATE 7/09/93
SCALE NONE	FILE NAME 02950200

DRAWING # 02-95-0200		SHEET : 2 OF 2		
REV.	DESC.	DATE	BY:	APP.
A	PRODUCTION RELEASE			
B	MEM #129	4/22/92	G.N.	R.S.
C	E.C.N. #133	6/15/93	G.N.	C.H.
D	ECN #153	10/20/95	S.B.	

NOTES:

1. PLUG THE COMPUTER, MONITOR & PRINTER INTO A 115 VOLT AC SURGE CONTROL UNIT (CUSTOMER SUPPLIED). TURN ON THE SURGE CONTROL UNIT, THEN MONITOR, PRINTER, AND COMPUTER.

ITEM	QTY.	UNIT	PART NUMBER	DESCRIPTION	MATERIAL
14	1	EA	86-41-9100 B	A/D CARD, 18 BIT	
13	3	EA	81-11-0501	VALVE, SOLENOID ACTD.	
12	3	EA	87-11-5003	RELAY OUTPUT, 5 VOLT DC	
11	1	EA	87-11-5001	BOARD, RELAY, MOUNT, 4 POSITION	
10	1	EA	86-11-6562	MONITOR, 14"	
9	1	EA	94-11-0018	PRINTER, PARALLEL	
8	1	EA	94-11-0017	CABLE, PRINTER, PARALLEL	
7	1	EA	02-41-0233 A	VALVE ASSEMBLY, MICRO-3	
6	1	EA	02-41-0242 A	CABLE ASSEMBLY, OPTO SIGNAL	
5	1	EA	02-41-0243 A	CABLE ASSEMBLY, OPTO POWER	
4	1	EA	02-41-0234 A	BOARD ASSEMBLY, OPTO RELAY-4	
3	1	EA	01-41-1330 A	LOAD CELL/DB9 CONN. ASSY	
2	1	EA	02-41-0215 D	COMPUTER, & KEYBOARD W/POWER CABLES	
1	1	EA	01-42-1402 C	TRANSDUCER ASSEMBLY	

GALISO®
GAS LIQUIDS SOLIDS

MATERIAL: N/A

ELECTRICAL SCHEMATIC
REC/OPEN (A)

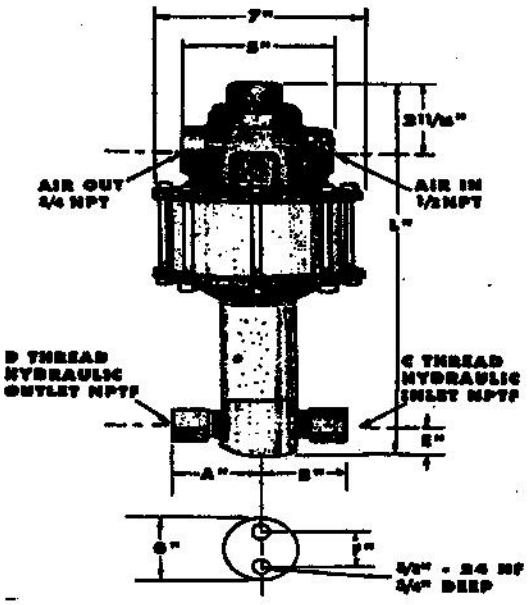
DRAWING NUMBER	NEXT ASSEMBLY	SHEET	REVISION
02-95-0200	N/A	2 OF 2	D

UNLESS OTHERWISE SPECIFIED - TOLERANCES ARE: .X = ± N/A .XX = ± N/A .XXX = ± N/A

DRAWN	DATE
G.NIELSEN	4/14/92
TEAM LEADER	DATE
C.HOOVER	7/15/93
Q.A.	DATE
W.BACUS	7/09/93

E.C.N. #153 | SCALE NONE | FILE NAME 02950200

PARTS LIST FOR AZ-1-58CF



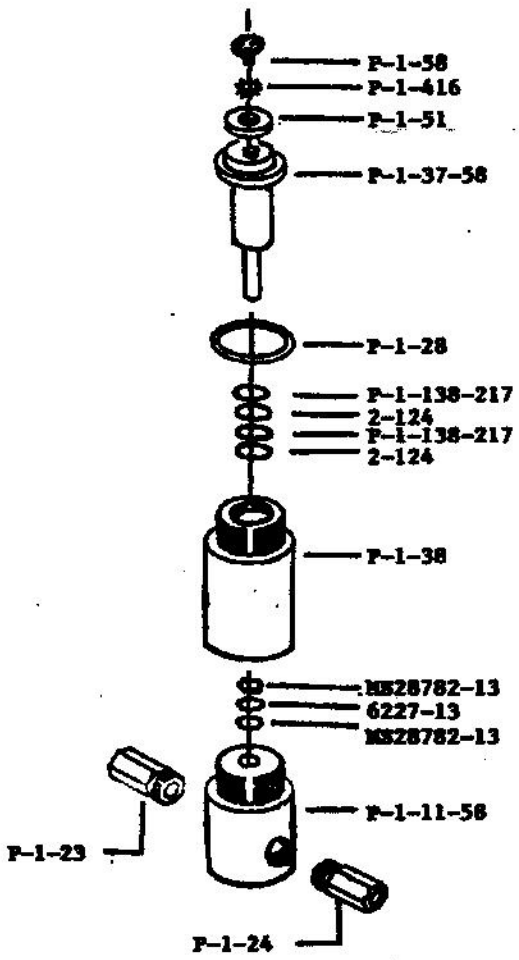
P-1-113
AIR MOTOR ASSEMBLY

P-1-26-10058
HYDRAULIC ASSEMBLY

DIMENSIONS ins mm								
AZ-1 ASSY	L	A	B	C	D	E	F	G
-10 thru -19	16	3	4	1"	1/2"	1	1 3/4	2 1/2
	406	76	102			25	44	64
-28 thru -107	14 9/16	3	3 3/8	1/2"	1/2"	7/8	1 3/4	2 1/2
	370	76	86			22	44	64
-148 thru -428	14 15/16	2 1/2	2 5/16	3/8"	3/8"	7/8	1 3/4	2 1/2
	379	64	59			22	44	64

Pump may be mounted in any position. (Vertical Prefered) if mounted in an inverted position, drill a 1/16" hole in head or install a drain cock to release any fluid that may accumulate.

AIR PRESSURE-PSI	10	20	30	40	50	60	70	80	90	100
HYDRAULIC PRESSURE-PSI	400	1,000	1,700	2,200	2,900	3,400	4,000	4,600	5,200	5,800



HYD. PISTON DIA.(ins.)	0.6875
HYD. PISTON AREA (ins.)	0.3712
VOLUME PER STROKE (cl.)	0.464

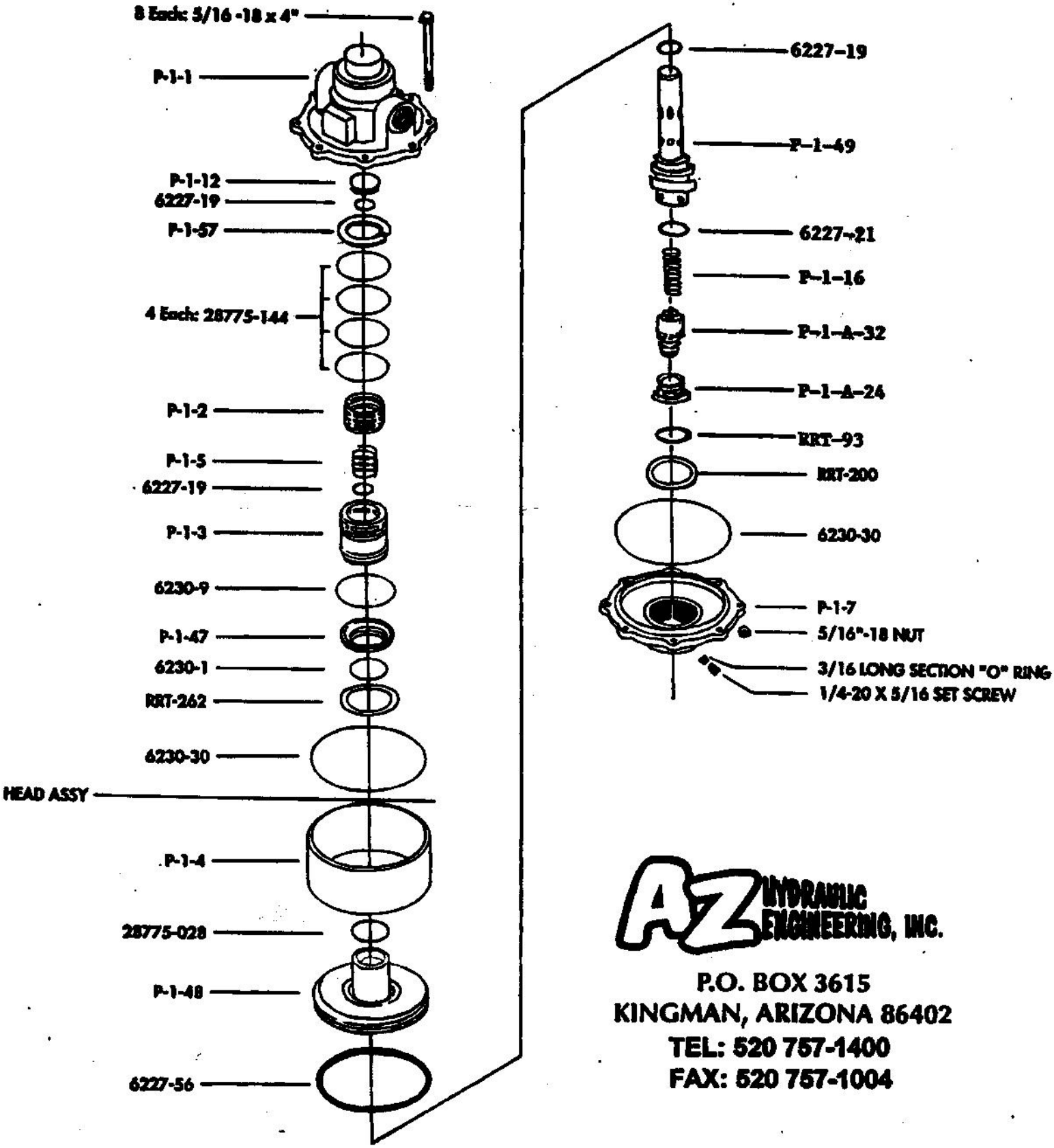
AIR PSI		60	80	100	APPROXIMATE RATE OF DISCHARGE-CIPM
HYDRAULIC PRESSURE-PSI	0	186	200	217	
	250				
	500				
	750				
	1,000	119	137	153	
	1,250				
	1,500				
	1,750				
	2,000	99	117	137	
	2,500				
	3,000	63	96	113	
	3,500	0	84	104	
	4,000		67	95	
	4,500		0	79	
	5,000			62	
	6,000			0	

EXPLODED VIEW OF HYDRAULIC ASSEMBLY

AZ-1 MODEL PUMP / PARTS LIST

EXPLODED VIEW OF AIR MOTOR

P - 1 - 113



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