DLR3110

Rack-mountable Pneumatic
Pressure Calibration Console

Technical Manual

- **Operation**
- **Calibration**
- **Maintenance**
- **Service**

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Contents

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About This Manual

This manual is intended for use by service technicians responsible for installing and servicing the DLR3110 Digital Pressure Calibrator.

The DLR3110 series rack-mount combines the DLR Digital Pressure Calibrator with the Orion vernier for calibration of a wide variety of pressure sensing and measuring devices.

The DLR3110 utilizes a repeatable sensor coupled to microprocessor-based electronic circuitry and a selectable units conversion display system to provide digital representation of measured pressure. The unit has one test port. Dependent on model, a front panel mounted gauge tells the operator system pressure and includes a pressure regulator so the operator can not over-pressure a unit under test. Test hose is supplied standard for the customer. Front panel buttons provide selection of the desired functions, including zeroing (GAGE models only).

Warning *Before attempting to use either style pressure calibrator, the following instructions must be read and understood by personnel using the equipment. This is a high-pressure system. Only personnel formally trained in the use of pneumatic pressure equipment should be permitted to operate it. Potentially dangerous conditions can be produced through negligent handling or operation of the console due to the high pressure used within the unit.*

These units are strictly for use with pneumatic pressures. Erroneous readings and potential damage could result from the introduction of hydraulic fluids into the internal tubing lines.

Authorized distributors and their employees can view or download this manual from the Condec distributor site at www.4condec.com.

1.0 Introduction

Using microprocessor technology, the rack-mountable DLR3110 instrument offers a combination of features, performance, versatility and reliability not previously available in a single, rack-mount pressure calibration instrument. Some of the features of the DLR3110 are listed below:

- Streamlined, multi-function keyboard.
- Selectable configurations, automatic set-up mode and multiple conversion units.
- Based on model, accuracy equal to or better than ±0.05%, ±0.1% or ±0.25% of indicated value from 20% of full scale.
- Alpha-numeric display prompting provides the operator with functional status information during both operation and calibration.
- A manually adjustable regulator (when applicable) allows the maximum system input pressure to be adjusted to any desired value higher (typically 20 – 50%) than the full scale range of the device being tested. This regulator helps protect the unit under test from being inadvertently over-pressurized.
- No manual alignment or potentiometer adjustments are required for system calibration. (50,000 displayed graduations; ten-point linearity compensation; automatic gain adjustment).
- Calibration integrity: Tamper-proof design. Once calibrated, numerous safeguards guarantee the integrity of pressure readings obtained.
- Operation: All controls, indicators and test port are accessible from the front panel. A version with test port on rear of unit is available by special order. See Section 3.0 on page 8 for instructions on system operation.
- For safe, clean operation, all pressure components are made of brass, copper, aluminum, or stainless steel and proof-tested to at least 150% of maximum operating pressure. In addition, the system contains a high-pressure burst disk and relief valves to protect both the operator and system components from harm in the event of inadvertent over-pressurization.

The heart of this calibration system is a stable and repeatable pressure transducer. These sensors produce an electrical output signal that is linearly proportional to the applied pressure.

By combining these sensors with microprocessor-based circuitry, an even higher degree of operational accuracy and precision has been accomplished. For example, computer-generated correction curves for both the non-linearity and the hysteresis of the sensors improve these characteristics by an order of magnitude or more.

Two micro-metering valves and vernier are provided to control the external nitrogen source while the digital display indicates the magnitude of the applied test pressure. Also, a push-button switch provides the “zeroing” of the pressure display (on GAGE models). Over-pressure protection, based on model, is provided via a fully adjustable pressure regulator which is manually set for each new device being tested.

Figure 1-1 provides an overview of the DLR3110’s function.

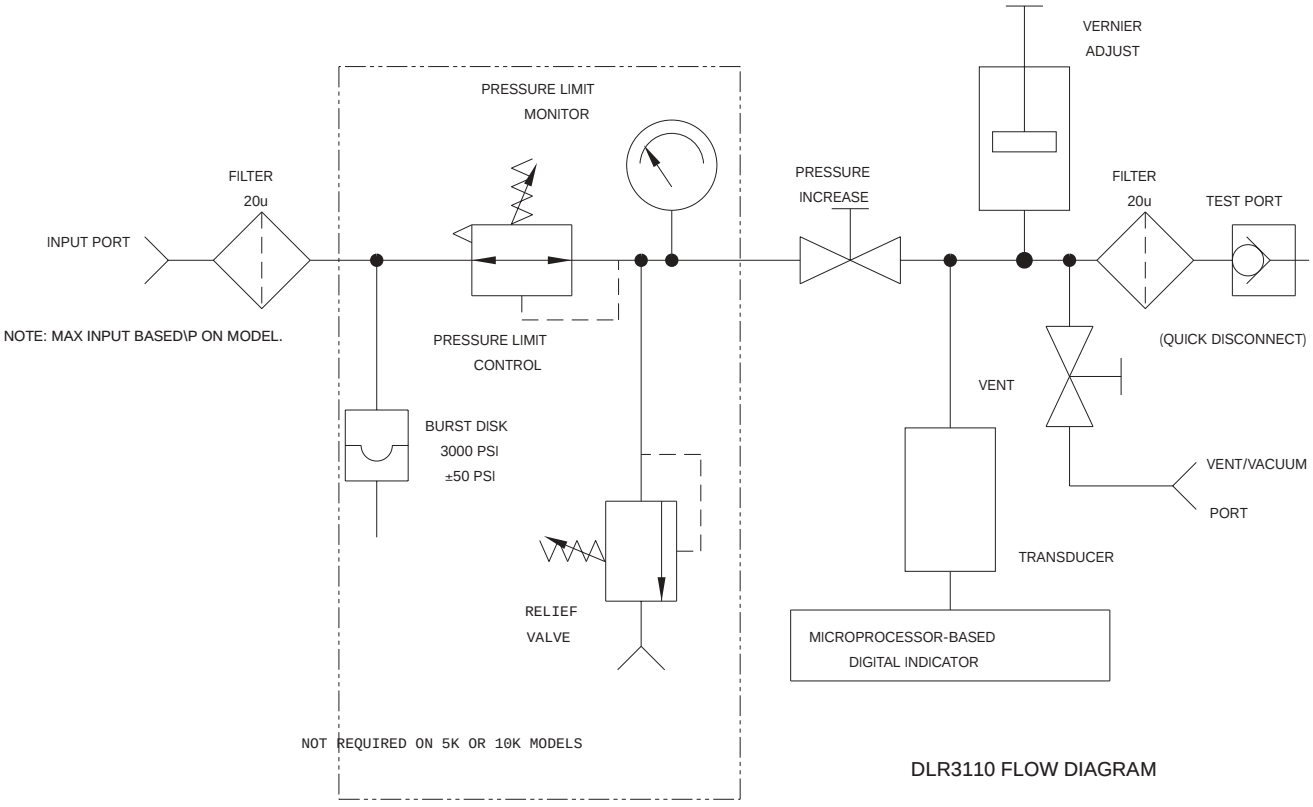


Figure 1-1. DLR3110 Flow Diagram

2.0 Installation and Wiring

2.1 Unpacking and Inspection

Carefully remove the instrument from its shipping container. A visual inspection of the instrument's external surfaces should be performed immediately after unpacking. If obvious damage occurred during transit, notify the shipping agency and distributor as soon as possible to receive instructions on how to proceed after an assessment of the damage is completed.

If the instrument shows no signs of damage, check to be sure all the required equipment and accessories were included. Keep original shipping carton for repacking in case repair is necessary.

2.2 Repacking

If the DLR3110 must be returned for repair, recalibration, or modification, be sure that it is properly cushioned and packed and that a description of the work to be performed is included. The original shipping carton should be kept for this purpose.

2.3 Rear Panel Configuration

The rear panel of the rack mount DLR3110 Series, contains the following items:

- AC power cord (1) and input receptacle.
- 7/16-20, 37°-4 AN male fittings, vent/vacuum port (2) and input pressure port (3).
  NOTE: The maximum input pressure, supplied by user, is noted below input pressure port.
- The unit's identification plate (4) and J6, 25 pin D connector, (5) for serial I/O communication interface.
- Optional if required items: Connector J5, 37 pin D connector, (6) for the Parallel BCD output. Connector J2 (7) for the Freeze mode cable. Test port (8) in place of front mounted.

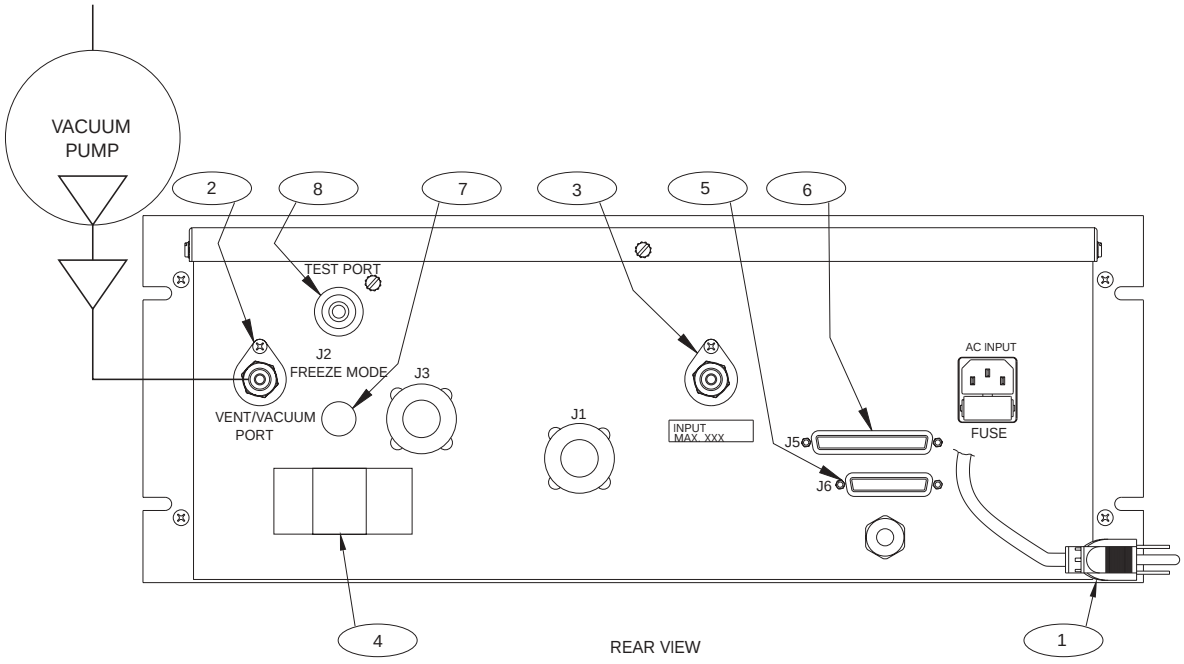


Figure 2-1. DLR3110 Rear View

2.4 Hardware Configuration and Wiring

The CPU board in the DLR series has been designed for easy access to wiring and configuration of all available inputs and outputs. In addition to easy access, the wire and configuration mapping provide clear labeling of all input and output signals and the associated configurations of their device drivers.

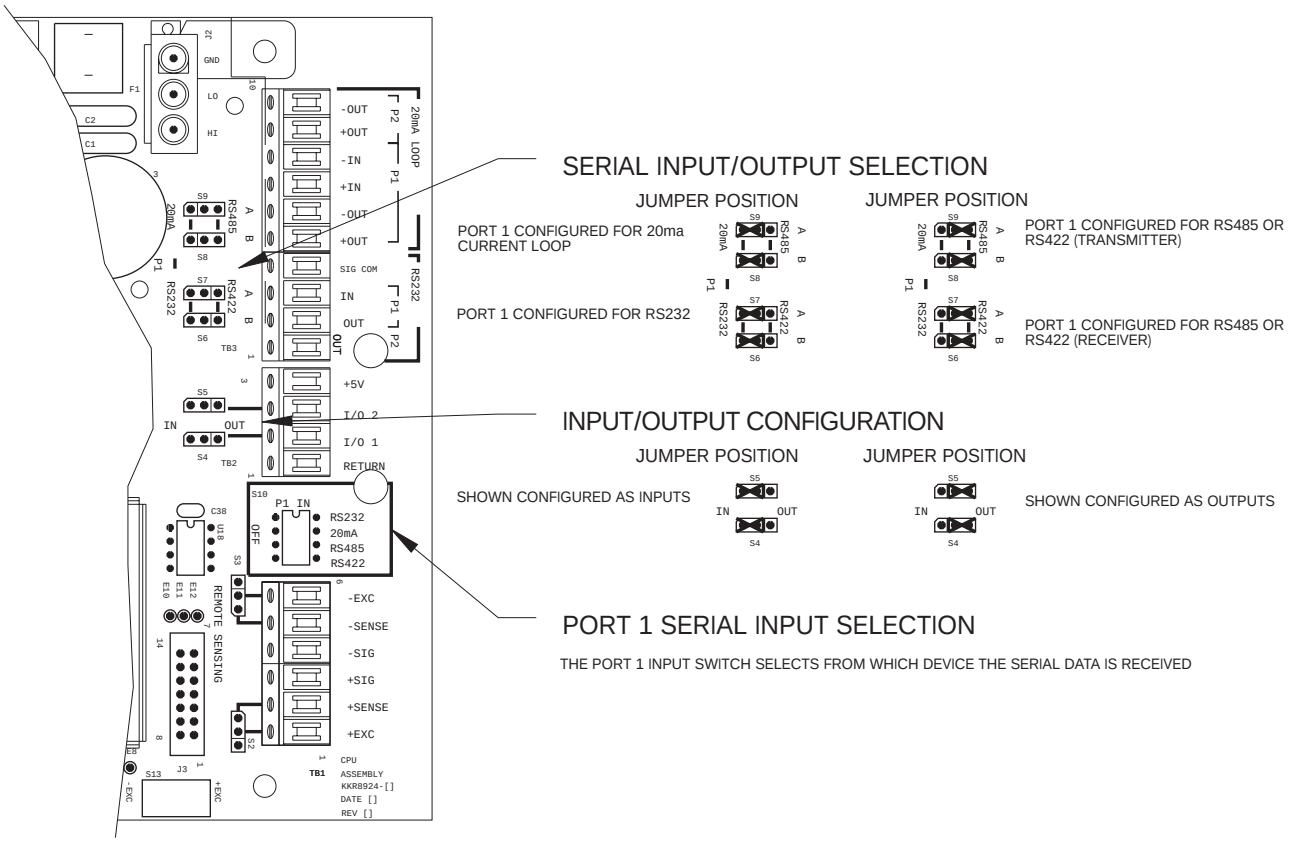


Figure 2-2. CPU Configuration

NOTE: Unit is shipped previously set up and configured. For information on changing hardware configuration see Section 5.11 on page 21.

2.5 Display/Keyboard Functions

See Figure 2-3 on page 5 for information on display and keyboard functions.

- Six-digit LED display of the measured pressure (1).
- Three annuciators: Two of the LEDs are used for indicating whether the unit is operating as a GAGE pressure unit or as an absolute (ABS) pressure unit. The LED marked *P* indicates that the unit is in the delta P display mode (2).
- Eight character LED display for indicating the conversion units that the pressure data is currently being displayed in. This display also scrolls prompting messages if corrective action is required or a problem occurred in performing an operation (3).

  For example, if attempting to perform a push to ZERO while the pressure data is in motion, the display shows *Unit is in MOTION*.
- In GAGE units, the ZERO function key (4) allows the indicator to be zeroed if it is within the limits defined by the ZERO configuration.
- DISPLAY key (5). In the normal operating mode this key is used to select and view all active displays that were enabled in the Configuration mode (i.e., Pressure data, MIN/MAX data, Freeze mode data, and delta P display mode data).

- TARE function key (6). The AUTO TARE (Auto.tr) feature is enabled in the Configuration mode under the ZERO SET selection. When AUTO TARE is enabled, pressing the TARE key automatically tares out the value of the current pressure display reading and shifts the display to the P (delta P) mode. The resultant ZERO reference reading is useful in cases where it is desirable to subtract the atmospheric pressure from an absolute reading to obtain a quick gauge reference.

  NOTE: This pseudo-gage reading is only valid for the current atmospheric pressure that was tared out. Any subsequent changes in atmospheric pressure result in an error.

- PRINT key (7) issues a demand serial printout of the display data from the indicator.
- UP (8) and DOWN (9) arrow keys step through and display the data in the conversion units that were selected in the Configuration mode.

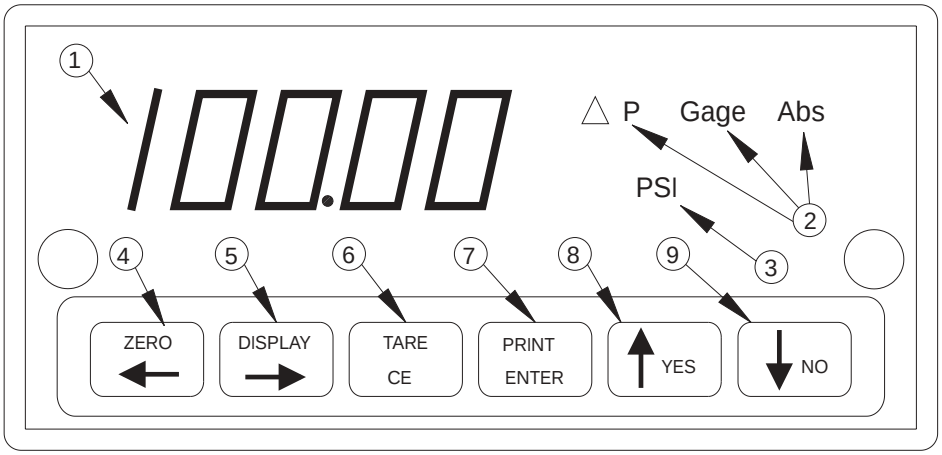


Figure 2-3. Display/Keyboard Functions

2.6 Freeze Mode

Freeze mode, used for testing pressure switches, is an edge triggered input signal that freezes the last display update for the number of seconds (1 – 10 seconds) selected in the Configuration mode. The Freeze mode is enabled in the CONFIG ? menu under freeze time selections (Refer to Section 5.11 on page 21 for enabling the Freeze mode).

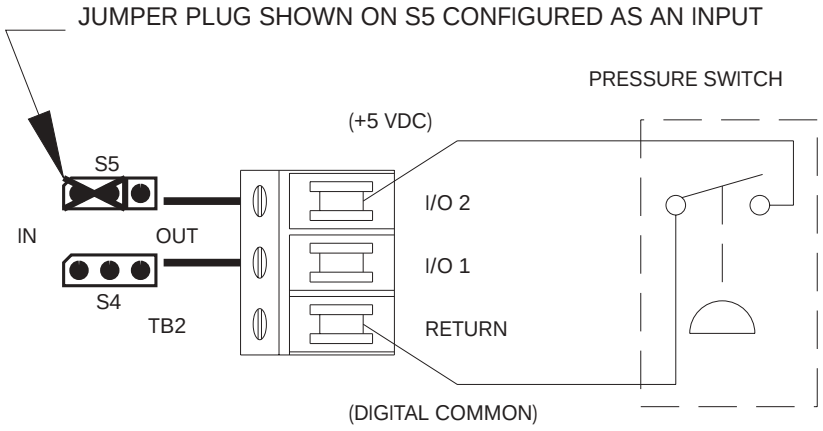


Figure 2-4. Freeze Mode CPU Connections

Either opening or closing of a switch contact between an active input (I/O 1 or I/O 2) and RETURN “freezes” the display (for the pre-selected amount of time in seconds) as shown above. However, while the display is in the freeze condition, it does not respond to another contact transition.

2.6.1 Freeze Mode Specifications

The following bullet points outline general specifications for the DLR3110's Freeze mode.

- The freeze input "freezes" the display for approximately five seconds on the rise and fall time of the input (edge not level triggered) and can not be re-triggered.
- Input pulse > 100 ms required to guarantee detection.
- Freeze mode "freezes" the 6 digit numeric and LED bar displays in whatever mode it is in (for example, Normal, Net, Min and Max mode).
- Alphanumeric display prompts *FREEZE*.
- During the "freeze" the front panel keys are inactive.
- Inputs are a +5 VDC logic level. Sinking current approximately 0.5 mA.

2.7 Min and Max Mode

The Min and Max mode is designed to capture and store the highest and the lowest pressure readings. These values may be recalled at anytime in the normal operating mode by repeatedly pressing the DISPLAY key until the desired value is displayed. When either the minimum or maximum value is selected, the alphanumeric display flashes between the mode (Min and Max) and its units.

NOTE: The Min and Max mode pressure data is automatically converted to any of the active conversion units by stepping through the conversion units using the UP or DOWN arrow keys.

Both the Min and Max mode are independent of each other and are enabled (turned ON) in the Configuration mode (see Section 5.11 on page 21).

2.7.1 Resetting Min and Max Values

To reset the stored minimum or maximum value:

1. Select the Min or Max display to be reset using the DISPLAY key.
2. Press the CE key. One of the following messages appears on the alphanumeric display: *RESET MAX? YES OR NO; RESET MIN? YES OR NO.*
3. At the display prompt shown above, press the YES key to reset the value or press the NO key to abort resetting the value.

NOTE: Min and Max data work with the standard pressure, not delta pressure data.

2.8 Remote Display Mode

The following describes the setup for connecting the optional six-digit remote display (PN 74683). The display duplicates the DLR3110 six-digit front panel display for all ranges and units selected (see Figure 2-5 on page 7).

NOTE: Remote display does not show current unit or mode designation.

See Table 5-10 on page 24 for setting the following parameters:

Parameter	Configuration
Port 1	SIMPLEX
Baud	9600
Parity	EVEN
Port 1	Modify
delay 1	AUTO
t –d 1	OFF
data 1	COMPRESS
EOL 1	CR
SOt 1	NONE
EOt 1	NONE

Table 2-1. DLR3110 Parameters

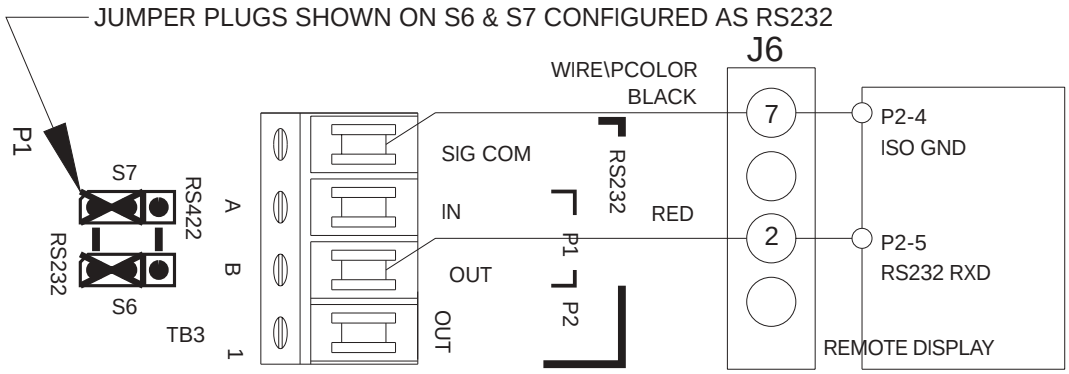


Figure 2-5. DLR3110 CPU to Remote Display PN 74683 Wiring

3.0 Operation

The following sections provide instructions on various operation procedures for the DLR3110.

3.1 Initial Setup Procedure

To prepare for actual calibration usage, see Figure 3-1 on page 9 and proceed as follows:

1. Check that the INPUT valve (1) is closed (rotate clockwise until it stops) and that the VENT valve (2) is open (two turns counter-clockwise from its stop).
2. Plug in the power cord (see Section 2.3 on page 3) and power up the unit by pressing the power switch (3). Allow at least 10 minutes warm-up time.
3. If applicable, use the PRESSURE LIMIT CONTROL REGULATOR (4) to adjust the maximum system input pressure, as read by the PRESSURE LIMIT MONITOR (5), to any desired value higher (typically 20–50% higher) than the full-scale range of the Device-Under-Test (DUT). This procedure fully protects the DUT from being accidentally over-pressurized.
4. Connect the male end of the test hose to the TEST PORT (6) fitting.

   NOTE: DLR3110 may be ordered with Test port on rear of unit. See Section 2.3 on page 3.
5. Connect the swivel fitting end (7/16-20) of the test (output) hose to the DUT using adapters if required. Tighten all connections properly.

3.2 Pressure Measurement Sequence (Gage)

Use the following steps to measure pressure with the GAGE model DLR3110:

1. With reference to Figure 3-1 on page 9, check that the indicator on the right end of the display indicates *Gage* (8). If not, see Section 5.11 on page 21.
2. Press and release the ZERO switch (7). DLR3110's LEDs momentarily display the word *Zero* and then the display returns to a *0* reading. The instrument may be zeroed at anytime, as long as the VENT valve (2) is open, by momentarily depressing the ZERO switch (7) for less than 5 seconds.
3. To apply pressure, close the VENT valve (2) approximately two turns clockwise until it stops, then open the INPUT valve (1) approximately 1/2 turn counter-clockwise until the numerical display begins to move. The pressure may change rapidly until reaching approximately 90% of the desired final value.
4. Use either the INPUT (1) or VENT valve (2) to obtain a specific pressure reading. Both provide precise control. As the pressure approaches the desired value, the valve being used for control should be rotated slowly clockwise to its closed position. With a little experience, pressure values very close to the desired final value can be quickly achieved.
5. To obtain exact pressure readings, slowly rotate the VERNIER control knob (10) in the direction required (clockwise to increase pressure) as indicated by the electronic numerical display.

3.3 Pressure Measurement Sequence (Absolute)

Use the following steps to measure pressure with the ABSOLUTE model DLR3110:

1. With reference to Figure 3-1 on page 9, check that the indicator on the right end of the display indicates *Abs* (9). If not, see Section 5.11 on page 21.
2. If only pressure measurements greater than barometric are required, continue to step 2.1. If pressure measurements above and below atmospheric pressure are required go to step 3.
   a) To apply pressure, close the VENT valve (2) by turning clockwise approximately two times until it stops and open the INPUT valve (1) by turning counter-clockwise approximately 1/2 turn until the numerical display begins to move. In general, the pressure may be changed rapidly until reaching approximately 90% of the desired final value.
   b) Use either the INPUT (1) or VENT valve (2) to obtain a specific pressure reading. Both provide precise control. As the pressure approaches the desired value, the valve being used for control should be rotated slowly clockwise to its closed position. With a little experience, pressure values very close to the desired final value may be quickly achieved.
   c) To obtain exact pressure readings, slowly rotate the VERNIER control knob (10) in the direction required (clockwise to increase pressure) as indicated by the electronic numerical display.

3. If pressure measurements above and below atmospheric pressure are required, connect a VACUUM PUMP to the VACUUM/VENT port (2) as shown in Figure 2-1 on page 3.
4. Open the VENT valve (2), close the INPUT valve (1) and apply power to the vacuum pump and allow it to evacuate the system for several minutes or until the digital display reading reaches equilibrium near 0 PSIA.
5. With the vacuum pump still running, close the VENT valve (2) and check for system leaks. If there are none, continue to step 5.1.
   a) To apply pressure, close the VENT valve (2) by turning clockwise approximately two turns to its stop and open the INPUT valve (1) by turning counter-clockwise approximately 1/2 turn until the numerical display begins to move. In general, the pressure may be changed rapidly until reaching approximately 90% of it desired final value.
   b) Use either the INPUT (1) or VENT valve (2) to obtain a specific pressure reading. Both provide precise control. As the pressure approaches the desired value, the valve being used for control should be rotated slowly clockwise to its closed position. With a little experience, pressure values very close to the desired final value may be quickly achieved.
   c) To obtain exact pressure readings, slowly rotate the VERNIER control (10) knob in the direction required (clockwise to increase pressure) as indicated by the electronic numerical display.

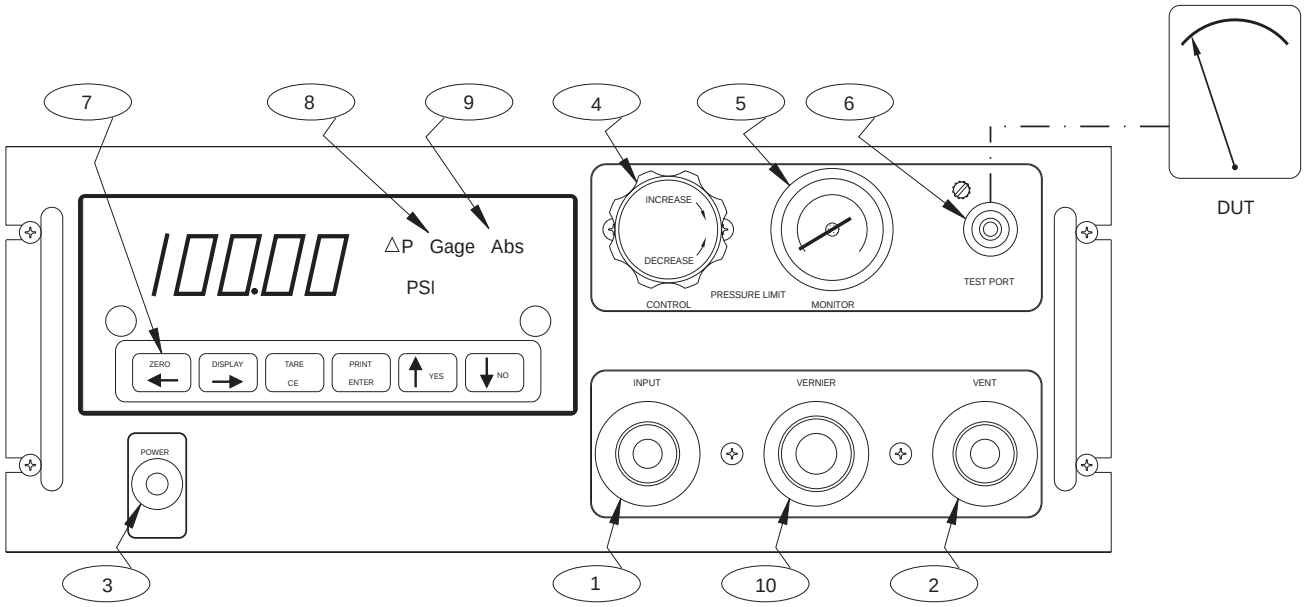


Figure 3-1. Pressure Measurement Sequence

4.0 Re-Calibration Only

NOTE: This section is for the technician that is familiar with the front keyboard menus and is doing nothing more than a re-calibration. The re-calibration must be done in the same base units as originally calibrated. For a more in-depth configuration and calibration explanation, see Section 5.0 on page 12.

The step-by-step calibration sequence provided on the following pages permits a qualified technician to calibrate an entire DLR3110 instrument in approximately 45 minutes.

The instrument has been designed and programmed to provide the operator with various prompting symbols and legends during each phase of the calibration sequence. Also, to prevent unauthorized tampering or calibrations, numerous features have been incorporated to minimize this potential danger.

However, it must be emphasized that when performing these tests, the computer within the DLR3110 is actually being re-programmed and as such, it is imperative that the pressure standard being used is in satisfactory operating condition and that the technician fully understands its operating characteristics and methods of usage. In addition, the DLR3110 itself must be warmed up for approximately 30 minutes and electrically stabilized prior to performing a calibration cycle.

4.1 Pneumatic Calibration Set-Up

Figure 4-1 on page 11 defines a typical calibration set-up using a floating piston type dead weight tester. However, any type of precision standard is acceptable as long as its basic accuracy is twice that of the DLR3110's or better.

To permit proper calibration at least an on/off and a vent valve must be provided (connected as shown in Figure 4-1 on page 11).

4.2 Instrument Calibration Set-Up

Check that the INPUT valve (1) is closed (rotate clockwise until it stops) and that the VENT valve (2) is open (two turns counter-clockwise from its stop).

The DLR3110 is placed into its Calibrate mode by closing rocker switch S1 position 2. In the Calibrate mode, the DLR3110's LED and alpha-numeric display is used to provide operator prompting symbols as well as displaying the various data formats employed.

4.3 Re-Calibration Procedure (Zero, Linearity and Hysteresis)

Use the following steps for the re-calibration procedure of the DLR3110.

1. The alpha-numeric display reads *FILTER X*, where "X" represents a numerical variable.
2. Press the DOWN arrow key on the display panel. The alpha-numeric display reads *CAPACITY*.
3. Press the DOWN arrow key on the display panel. The display reads *XXXX x .x*.
4. Press the DOWN arrow key on the display panel. The LED display reads *base*.
5. Press the DOWN arrow key on the display panel. The alpha-numeric display reads *GAGE* for GAGE models and *ABS* for ABSOLUTE models. For GAGE models continue to step 6. For ABSOLUTE models go to step 7.
6. Press the DOWN arrow key on the display panel. The alpha-numeric display reads *ZERO CAL*. Verify the INPUT valve is closed (rotate clockwise until it stops) and that the VENT valve is open (two turns counter-clockwise from its stop).

   Press the ENTER key on the display panel. The LED display reads *0.00* (number of zeros arbitrary). Close the VENT valve (rotate clockwise until it stops). Go to step 7.
7. The alpha-numeric display reads *SPAN 1 CAL TARGET=XXX*, where "X" represents a numerical variable. Set the input pressure from the test standard to the target value on the display. Wait for system to stabilize and press the ENTER key on the display panel.
8. The alpha-numeric display reads *SPAN 2 CAL TARGET=XXX*, where "X" represents a numerical variable. Set the input pressure from the test standard to the target value on the display. Wait for system to stabilize and press the ENTER key on the display panel. Repeat this step for the next eight predetermined SPAN target values.

9. The alpha-numeric display reads *HYST. CAL TARGET=XXX* (X represents the preset target value on display). Set the input pressure from the test standard to the target value on the display. Wait for system to stabilize and press the ENTER key on the display panel.

   NOTE: For ABS models, use a vacuum pump to reach the applicable SPAN or HYST target values that are below local barometric pressure.

10. The alpha-numeric display reads *FILTER 5*. Save the calibration data by opening rocker switch S1 position 2. DLR3110 returns to normal mode.
11. Vent system and remove test standard.

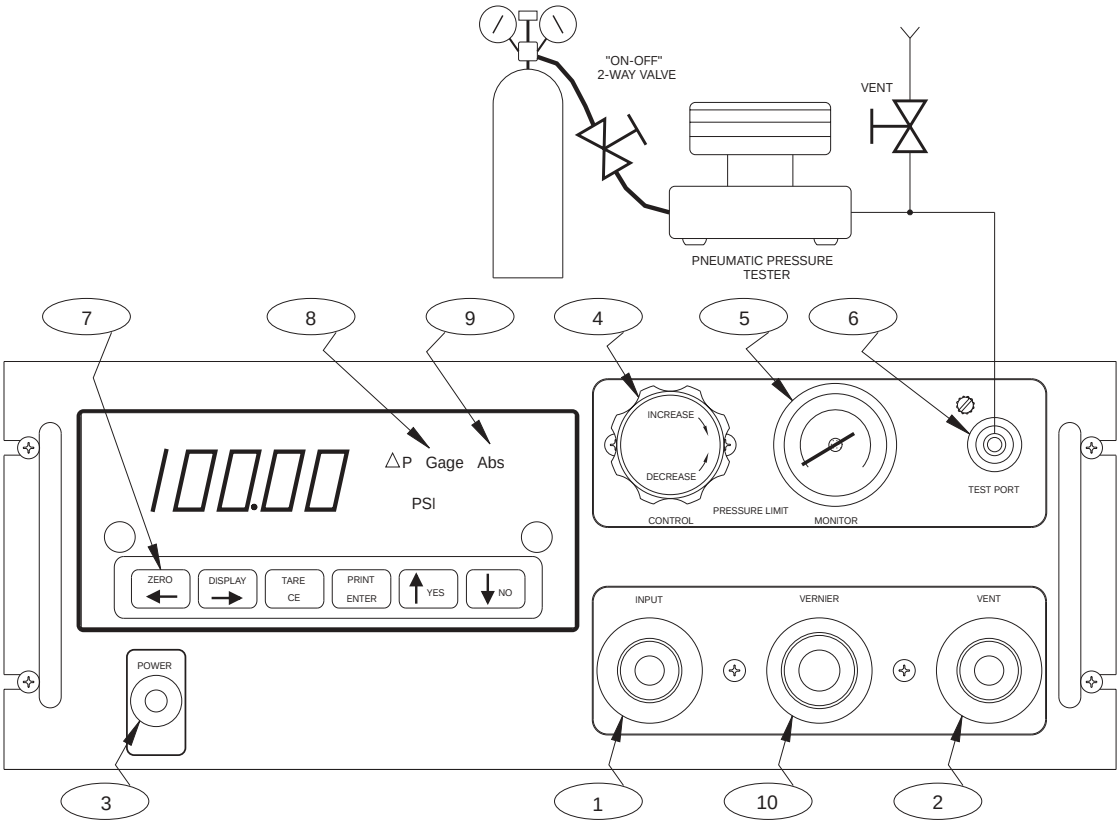


Figure 4-1. Instrument Calibration Set-Up

NOTE: AC input and input port are on back side rack-mountable calibrator.

5.0 Configuration and Calibration

The following sections cover configuration and calibration of the DLR3110. For information on calibrating the unit without configuration changes, see Section 4.0 on page 10.

During the following procedures, the computer within the DLR3110 is actually being re-programmed. The pressure standard being used during calibration should be in satisfactory condition and fully understood by the service technician. In addition, the DLR3110 must be warmed up for approximately 30 minutes and electrically stabilized prior to performing a calibration cycle.

5.1 Pneumatic Calibration Set-Up

Figure 5-1 defines a typical calibration set-up using a floating piston type dead weight tester. Any precision standard is acceptable to use providing its basic accuracy is at least twice that of the DLR3110's.

5.2 Instrument Calibration Set-Up

Check that the INPUT valve (1) is closed (rotate clockwise until it stops) and that the VENT valve (2) is open (two turns counter-clockwise from its stop).

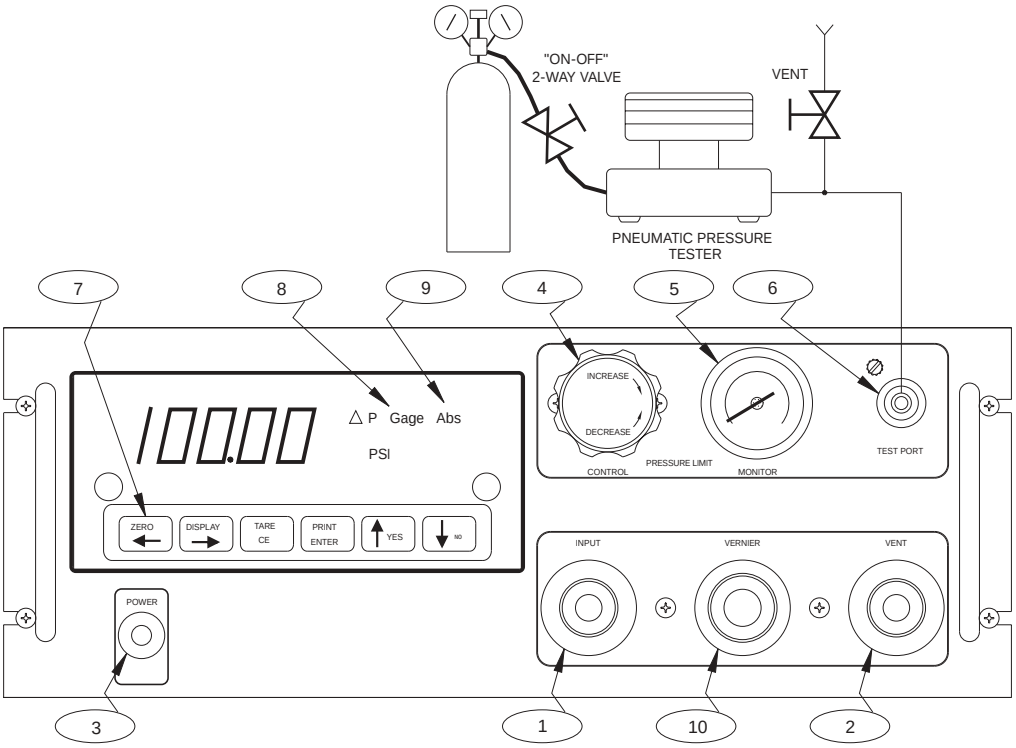


Figure 5-1. Instrument Calibration Set-up

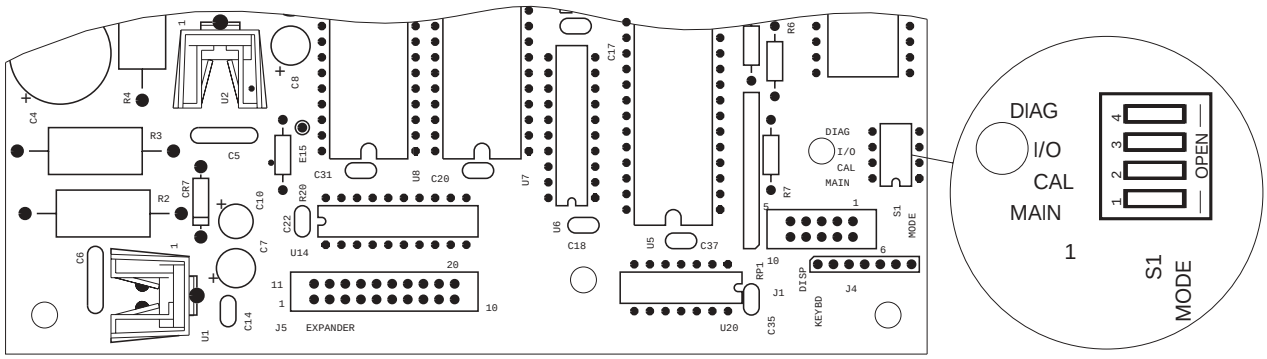
NOTE: AC input and input port are on the back side of rack-mountable calibrator.

5.3 Mode Selection Switch (S1)

- **Main set-up mode** - Allows access to the Configuration and Calibration modes.
- **Calibration mode** - Accesses the Calibration mode directly.
- **I/O mode** - Allows direct access to the set up of the Serial I/O ports (ports 1 and 2), BCD, Analog output, discrete inputs/outputs.
- **Diagnostic mode** - Accesses a diagnostic mode for troubleshooting and evaluation (factory access only).

Mode	Switch Position			
	1	2	3	4
Normal	Closed	Open	Open	Open
Main set-up	Open	Closed	Open	Open
Calibration	Open	Open	Closed	Open
Diagnostic	Open	Open	Open	Closed

Table 5-1. Mode Selection Switch Modes



FRONT OF DLR3110

Figure 5-2. Rocker Switch S1 Location

5.4 Main Set-Up Mode Menu Selections

Enter the main setup mode by closing switch 1 of S1 located on the main board (see Section 5.3 on page 12). All other switch positions on S1 must be open. To save the changes and leave MAIN set-up, open switch 1 of S1. Press YES key to accept selections, NO key to reject.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET	AUTO ?	YES key	See Section 5.5 on page 14
		NO key	Continue to CONFIG?
SET-UP	CONFIG ?	YES key	See Section 5.11 on page 21
		NO key	Continue to CAL?
----	CAL ?	YES key	See Section 5.6.1 on page 17
		NO key	Continue to I/O?
SET-UP	I/O ?	YES key	See Table 5-10 on page 24
		NO key	Continue to CONV?
SET-UP	CONV. ?	YES key	See Section 5.12 on page 22
		NO key	Return to AUTO?

Table 5-2. Main Set-Up Mode Selection Parameters

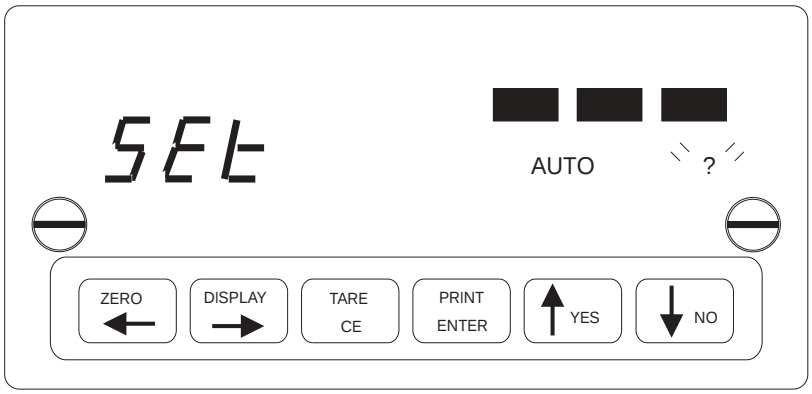


Figure 5-3. Auto Set-Up Mode

5.5 Auto Set-Up Configuration Mode Selection

The auto set-up automatically sets the following conditions in the DLR3110:

- *SET-UP - CONFIG* configuration parameters
- *SET-UP - CONV* conversion parameters
- *SET-UP - I/O* configuration of inputs/outputs
- ---- *CAL* sets capacity, count by, abs/gage, and cal units; resets all calibration values; sets all cal target values for span and hysteresis.

5.5.1 Auto Set-Up Menu (General)

LED Display	Alpha-Numeric Display	Key Pressed*	Remarks
SET	AUTO ?	YES key	See Section 5.4 on page 13
----	GAGE ?	YES key	See Section 5.5.2 on page 15
		NO key	Continue to ---/ABS?
----	ABS ?	YES key	See Section 5.5.3 on page 16
		NO key	Continue to ---/SPECIAL?
----	SPECIAL. ?	NO key	Allocated for future use, continue to ----/CUSTOM ?
----	CUSTOM ?	NO key	Allocated for future use, continue to ----/EXIT ?
----	EXIT ?	YES key	Return to main set-up mode selections (see Section 5.4 on page 13).
		NO key	Returns to ----/GAGE ?

Table 5-3. Auto Set-Up Mode Selection Parameters

** Press YES key to accept selection; NO key to reject.*

Upon completion and accepting an AUTO set-up configuration, the program automatically advances the indicator to the calibration mode (see Section 5.6.1 on page 17).

5.5.2 Auto Set-Up Menu (Gage)

See Section 9.0 on page 63 for a complete listing of the default settings for all gage and absolute selections under the AUTO set-up mode.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET	AUTO ?	YES key	See Section 5.5 on page 14
----	GAGE ?	YES key	See Section 5.5 on page 14
SET-UP	3 PSIG ?	NO key	Continue to press NO key until the alpha-numeric display shows the DLR3110's full scale range.
		YES key	Press YES key when the alpha-numeric display shows the DLR3110's full scale range.
SET-UP	ACCEPT ? YES or NO.	NO key	Continue to press NO key until the alpha-numeric display shows the DLR3110's full scale range. See note below.
		YES key	Accept data
XXXX	CAPACITY	YES key	"XXX" shown on LED display represents the full scale range and is based on previous selection.
—	EXIT ?	YES key	Return to SET-UP/ I/O?. (see Section 5.4 on page 13).
		NO key	Returns to XXX/CAPACITY

Table 5-4. Auto Set-Up Mode (Gage) Parameters Selections

NOTE: If you continue to press NO key past highest full scale range, DLR3110 will go to exit menu. Hit YES key at exit menu (see Table 5-3 on page 14).

5.5.3 Auto Set-Up Menu (Absolute)

See Section 9.0 on page 63 for a complete listing of the default settings for all gage and absolute selections under the AUTO set-up mode.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET	AUTO ?	YES key	See Section 5.5 on page 14
----	GAGE ?	NO key	See Section 5.5 on page 14
—	ABS ?	YES key	See Section 5.5 on page 14
SET-UP	15 PSIA	NO key	Continue to press NO key until the alpha-numberic display shows the DLR3110's full scale range.
		YES key	Press YES key when the alpha-numeric display shows the DLR3110's full scale range.
SET-UP	ACCEPT ? YES or NO	NO key	Continue to press NO key until the alpha-numberic display shows the DLR3110's full scale range. See note below.
—	—	YES key	Accept data
XXXX	CAPACITY	YES key	"XXX" shown on LED display represents the full scale range and is based on previous selection.
—	EXIT ?	YES key	Return to SET-UP/ I/O?. (see Section 5.4 on page 13).
		NO key	Return to XXX/CAPACITY

Table 5-5. Auto Set-Up Mode (Absolute) Parameters Selections

NOTE: If you continue to press NO key past highest full scale range, DLR3110 will go to exit menu. Hit YES key at exit menu (see Table 5-3 on page 14).

5.6 Calibration Set-Up Configuration Mode Selection

Use one of the following methods for configuring the calibration set-up mode:

Method 1

CAL (SELECT). See Section 5.4 on page 13 for information on selecting main mode settings.

Method 2

CAL (DIRECT). Closing only rocker switch position 2 on switch S1 places the DLR3110 directly into CALIBRATION mode. See Section 5.3 on page 12.

NOTE: If the AUTO SET-UP selection is accepted and completed, the indicator automatically advances to the calibration mode (see Section 5.5 on page 14).

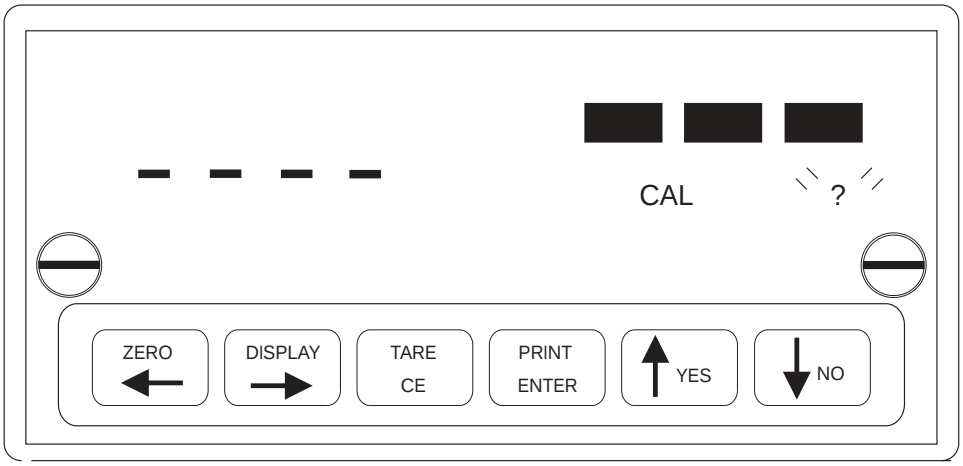


Figure 5-4. Calibration Mode

5.6.1 Calibration Mode Menu

Press LEFT or RIGHT arrow keys to change values. The various menus may be exited or data selection aborted at any time by pressing the CE key. If the CE key is pressed, the prompt *Exit ? YES or NO* scrolls continuously until either the YES or NO key is pressed.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
**XXX	CAPACITY	DOWN arrow	To change the capacity value, see Section 5.7 on page 19.
**XXX	X .5		To change the resolution value, press LEFT or RIGHT arrow key.
BASE	PSI		Press LEFT or RIGHT arrow key to select the base unit used to calibrate indicator. If for any reason this selection is changed, the indicator must be calibrated to the new base unit selection.
----	GAGE ? or ABS ?		Press LEFT or RIGHT arrow key to select choice.
*XX	ZERO CAL	See step 1 below	Does not exist on ABS type units. Disregard steps 1 and 2 below on ABS units.
*XX	SPAN 1 TARGET VALUE=XX	See step 3 below	To change the target value, see Section 5.7 on page 19.

Table 5-6. Calibration Mode Parameter Selections

**XX represents existing data.*
***XXX represents the present capacity of the DLR3110.*

Use the following steps to set calibration data in the DLR3110 using the Calibration mode menu.

1. Verify that the INPUT valve (1) is closed (rotate clockwise until it stops) and that the VENT valve (2) is open (two turns counter-clockwise from its stop). See Figure 5-1 on page 12.
2. Press the ENTER key on the display panel keypad. The LED display reads *0.00*. Close the VENT valve (rotate clockwise until it stops).

   NOTE: If ZERO is not accepted, display shows either SIGNAL INPUT UNDER MINIMUM ZERO RANGE or INPUT ABOVE CAL INPUT RANGE (NO CAL messages).
3. Set the input pressure from the test standard to the target value on the display. Wait for system to stabilize and press the ENTER key on the display panel.

   NOTE: For pneumatic setup, see Section 5.1 on page 12. For absolute models, use a vacuum pump to reach the applicable SPAN target values that are below local barometric pressure.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
CAL	SPAN OK	N/A	Span has been accepted. Proceed to step 4 below. Span may be accepted, but based on span value, alpha-numeric display may return with scrolling message “FULL SCALE WILL NOT BE OBTAINED”.
NO CAL	SPAN CAL	N/A	Span has not been accepted. Repeat step 3 above. If span is not accepted, display returns with one of the following scrolling NO CAL messages: “SIGNAL INPUT UNDER THE MINIMUM ZERO RANGE” or “INPUT ABOVE CAL INPUT RANGE”.

Table 5-7. Calibration Mode Span Messages

4. The alpha-numeric display reads *SPAN 2 CAL TARGET=X* (X represents the existing target value on display). Change target value if required. Set the input pressure from the test standard to the target value on the display. Wait for system to stabilize and press the ENTER key on the display panel. See Table 5-7 as required.
5. The alpha-numeric display reads *SPAN 3 CAL TARGET=X* (X represents the existing target value on display). Change target value if required. Set the input pressure from the test standard to the target value on the alpha-numeric display. Wait for system to stabilize and press the ENTER key on the display panel. Repeat this step for SPAN target values 4 – 10.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
*XX	HYST.CAL TARGET=XXX	See step 6 below	To change the target value, see Section 5.7 on page 19.
*XX	FILTR 5	DOWN arrow	To change target value 1 to 10 by 1, 10 to 20 by 2, 20 to 50 by 5, press UP/DOWN arrow keys.
----	EXIT ?	YES key	Return to main menu display SET-UP/IO ?. See Section 5.4 on page 13.
		NO key	Return to XXX/CAPACITY. See Section 5.6.1 on page 17.

Table 5-8. Calibration Mode Hysteresis and Filter Target Parameters

6. The alpha-numeric display reads *HYST.CAL TARGET=XXX* (X represents the preset target value on display. See Table 5-8.). Set the input pressure from the test standard to the target value on the alpha-numeric display. Wait for system to stabilize and press the ENTER key on the display panel.

   NOTE: For absolute models, use a vacuum pump to reach the applicable hysteresis target value if below local barometric pressure.
7. Save the calibration data by opening rocker switch S1 position 2. The DLR3110 returns to normal mode (see Section 5.3 on page 12).
8. Vent system and remove test standard and/or vacuum pump.

5.7 Modifying Data

Data values previously set are easily altered by pressing either of the horizontal arrow keys to enter the modification mode. Upon entering the mode, the least significant digit *(LSD)* begins to flash. A flashing digit indicates the current position in the data that can be changed. Press the LEFT or RIGHT arrow key to select a desired position indicated by the flashing digit, then use the UP or DOWN arrow key to increment or decrement the value of the selected digit. Once the new data value has been set, press the ENTER key to accept or the CE to abort. If an abort is issued, the data reverts back to its former value. The display prompts with *ENTER* or *ABORT* accordingly.

5.8 Span Calibration Points

There are a total of 10 calibration points (SPAN 1 - 10 CAL TARGET) which are sequentially entered. It is not required that all calibration points be entered. If calibration is performed with less than 10 points, the curve is extrapolated to full capacity based upon the slope correction between the last two entered SPAN CAL points. In the example below, if only four span calibration points were entered (SPAN 1 to SPAN 4), the slope correction from SPAN 4 to full capacity would be defined by the computed slope between SPAN 3 and SPAN 4.

NOTE: If fewer than 10 SPAN CAL points are desired during calibration, simply step past the remaining calibration points using the DOWN arrow key, until the HYSTERESIS calibration point is reached.

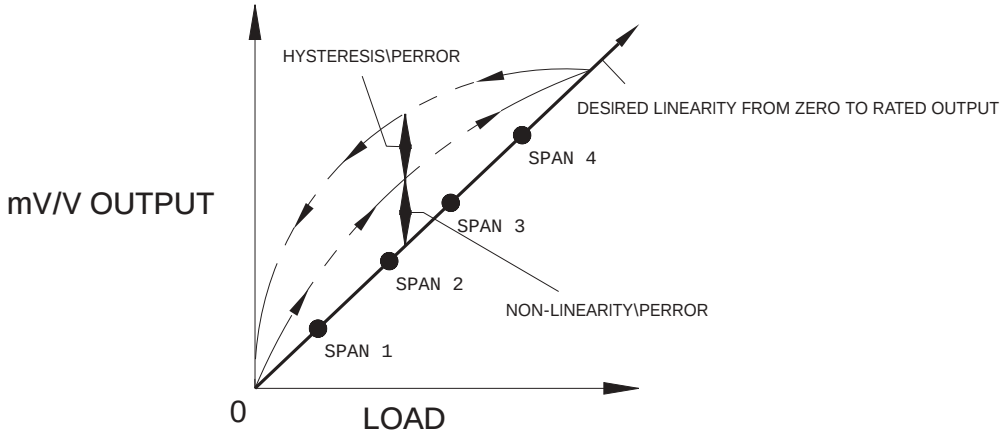


Figure 5-5. Span Calibration Points

5.9 Resetting Span Calibration Points

To reset the span calibration points, use the DOWN arrow key to step to the desired SPAN CAL point and then press the CE key. The correction factor of the selected SPAN CAL point and all others beyond will be reset to unity (see Section 5.6 on page 16).

NOTE: X's shown on LED display and alpha-numeric display columns represent existing data.

After a reset has been performed, entry of new SPAN CAL points proceeds as described in Section 5.6.1 on page 17, starting with step 3.

NOTE: If all 10 SPAN CAL points are not used in the calibration, the last span calibration point to appear (SPAN x CAL TARGET=xx.xx) is not an entered correction point. It only indicates the next span calibration that can be entered.

5.10 Overwriting Span Calibration Points and Hysteresis

Any SPAN CAL point can be overwritten with a new value provided that it remains within the range bounded by the span calibration points above and below the span point to be overwritten. Figure 5-6 on page 20 shows SPAN 2 CAL point being redefined within the boundaries set by SPAN 1 and SPAN 3. HYSTERESIS can also be overwritten as long as the new entry is below 80% of the full capacity value. For information on how to reach SPAN CAL point and HYSTERESIS, see Section 5.6 on page 16.

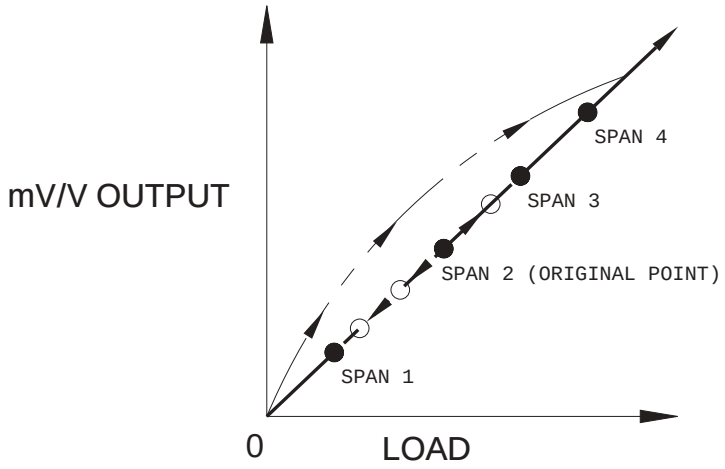


Figure 5-6. Overwriting Span Calibration Points

To overwrite a span calibration point or hysteresis, step to the desired point using the DOWN arrow key and then modify and enter the new value as described in Section 5.6.1 on page 17.

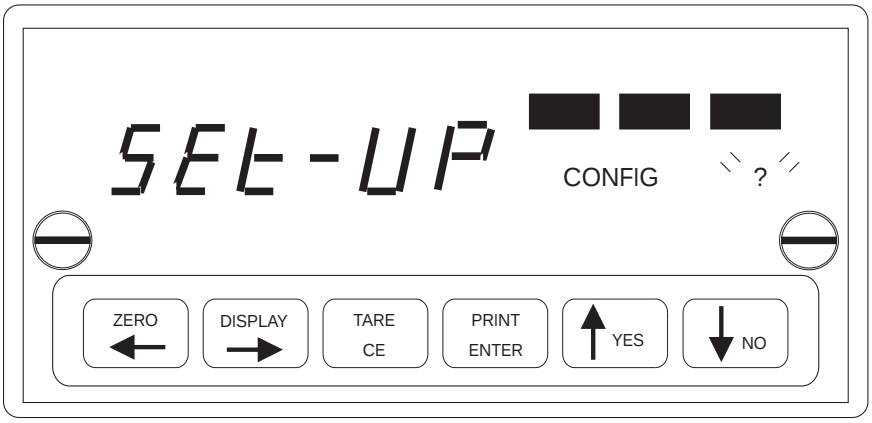


Figure 5-7. Configuration Set-Up Mode

5.11 Configuration Set-Up Mode Selection

To access Configuration mode, see Section 5.4 on page 13. Press UP and DOWN arrow keys to step through and select parameters. Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. The Configuration mode may be exited at anytime by pressing the CE key. If the CE key is pressed the prompt *Exit? YES or NO* scrolls continuously until the YES or NO key is pressed. See Figure 5-7 on page 20 for an example of the DLR3110's display.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET-UP	CONFIG ?	YES key	Will enter CONFIG menu
XXX*	FILTER 5	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. 1 to 10 by 1; 10 to 20 by 2; 20 to 50 by 5.
AUTO	DISP/SEC	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. AUTO, 2, 3 or 5
OFF	ZERO %		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF, 0.5, 1, 2, 5 or 100
Full	ZERO +/- %		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. Full, 0.05, 0.1, 0.2, 0.5, 1 or 1.5
OFF	AZM +/-		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF, 0.5, 1, 3, 5 or 10
OFF	MOTION		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF, 1, 3, 5, 10, 20 or 50
OFF	ZERO SET		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF, Auto.tr or OFFSET
OFF	MIN		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF or ON
OFF	MAX		Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF or ON
OFF	FREEZE		**Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. 1 sec to 10 sec by 1
SET-UP	EXIT ?	YES key	Return to MAIN menu SET-UP/CONFIG. See Section 5.4 on page 13.
		NO key	Return to XXX/FILTER 5 ?

Table 5-9. Configuration Mode Parameters

** Represent existing data.*
*** Requires activation by an input. See Section 5.13 on page 23.*

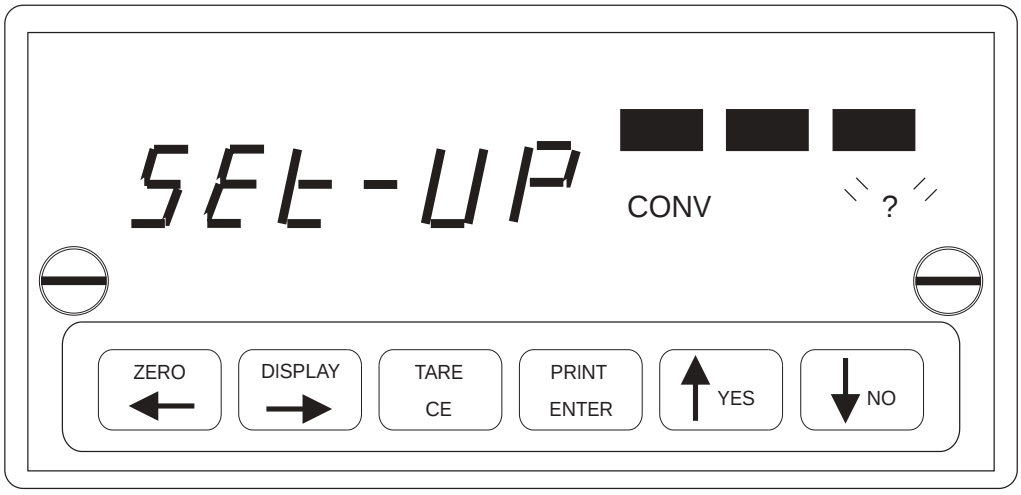


Figure 5-8. Conversion Set-Up Mode

5.12 Conversion Set-Up Mode Selection

To access Conversion mode see Section 5.4 on page 13. Press UP or DOWN arrow keys to step through conversion selections. Press LEFT or RIGHT arrow keys to change the current state of the selected conversion. The Conversion mode may be exited at anytime by pressing the CE key. If the CE key is pressed, the prompt *Exit? YES or NO* scrolls continuously until the YES or NO key is pressed.

The following is a list of the available conversions as they appear on the alpha-numeric display:

- PSI
- KPa
- mmHG 0˚C
- BAR
- inHg0˚C
- mBAR
- cmH_2O
- kg/cm^2
- inH_2O68F
- $inH_2O4˚C$
- $ftseaH_2O$
- TORR
- $metrsH_2O$
- PASCAL
- $mmH_2O4˚C$

The following is a list of the inoperative conversions (allocated for future use) as they appear on the alpha-numeric display:

- CONV.SP1
- CONV.SP2
- CONV.SP1
- CONV.SP2

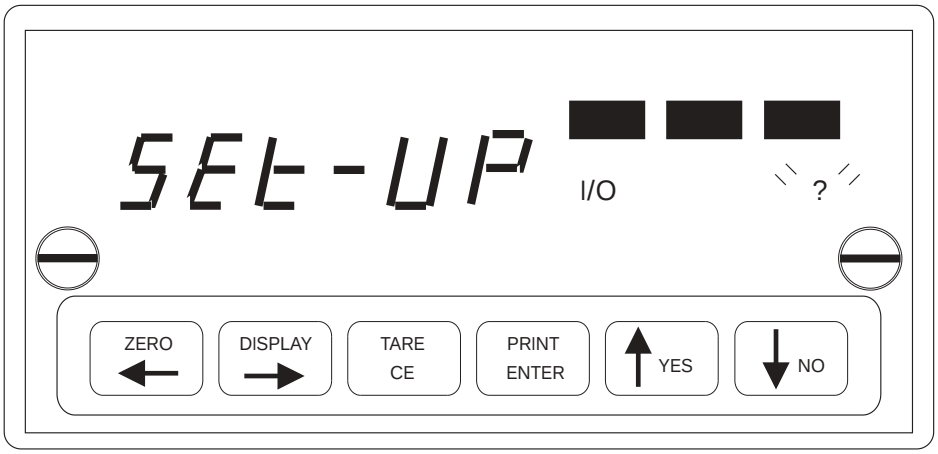


Figure 5-9. Set-Up Mode Selection

5.13 I/O Set-Up Mode Selection

Method 1

I/O (SELECT) - See Section 5.4 on page 13.

Method 2

I/O (DIRECT) - Closing only rocker switch position 3 on switch S1 only places the indicator directly into the I/O mode. See Section 5.3 on page 12.

The I/O SET-UP mode accesses the configuration of available inputs and outputs in the DLR. There are five main groups of configurable inputs and outputs that are defined as follows:

- Serial I/O - configures ports 1 and 2 for baud rate, parity, continuous or demand, etc.
- Time and date - sets the onboard clock for time and date (allows time and date to be transmitted in the serial output).
- Parallel output - configures DLR3110 for BCD output. This is an option requiring the installation of the parallel output option board.
- Analog output - configures DLR3110 for analog output (4-20 mA or 0-10 VDC). This is an option requiring the installation of the analog output option board.
- Discrete input and outputs - configures two discretes to function as either control output(s) or remote command input(s).

Press UP or DOWN arrow keys to step through selections. Press LEFT or RIGHT arrow keys to change the current state of the selection. The modes may be exited at any time by pressing the CE key. If the CE key is pressed, the prompt *Exit? YES or NO* scrolls continuously until the YES or NO key is pressed.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET-UP	I/O	YES key	Enters I/O menu
		NO key	Continue to PORT 1 ?
SET-UP	PORT 1 ?	YES key	See Section 5.13.1
		NO key	Continue to PORT 2 ?
SET-UP	PORT 2 ?	YES key	See Section 5.13.6 on page 29
		NO key	Continue to TIME&D ?
SET-UP	TIME&D ?	YES key	See Table 5-18 on page 29
		NO key	Continue to PARAL ?
SET-UP	PARAL ?	YES key	Requires the installation of the parallel output option board
		NO key	Continue to ANALOG ?
SET-UP	ANALOG ?	YES key	Requires the installation of the analog output option board
		NO key	Continue to INPUT ?
SET-UP	INPUT ?	YES key	See Section 5.13.8 on page 30
		NO key	Continue to TRIP PT ?
SET-UP	TRIP PT?	YES key	Press LEFT or RIGHT arrow keys to change the current configuration of the selected parameter. OFF or ON
		NO key	Continue to EXIT
----	EXIT ?	YES key	Return to Section 5.4 on page 13
		NO key	Return to PORT 1 ?

Table 5-10. I/O Set-Up Mode Parameters

5.13.1 Port 1 Set-Up Menu

Table 5-11 outlines the parameters of the Port 1 Set-up menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET-UP	PORT 1 ?	YES key	Enters Port 1 Set-up
PORT 1	OFF	Press YES key to to accept, NO key to exit	Press LEFT or RIGHT arrow keys to change the current state of the selection. OFF, PRINTER, DUPLEX, SIMPLEX
PORT 1	PRINTER		See Table 5-12 on page 25
PORT 1	DUPLEX		See Table 5-14 on page 26
PORT 1	SIMPLEX		See Table 5-17 on page 28
----	EXIT ?	YES key	Return to Table 5-10 on page 24
		NO key	Return to PORT 1?

Table 5-11. Port 1 Set-Up Menu

5.13.2 Port 1 Printer Menu

Table 5-12 outlines the parameters of the Port 1 Printer menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	PRINTER	DOWN arrow	Enters Printer set-up
SET P1	AUTO PR?	YES key	Enters AUTO PR? menu. Use DOWN arrow key to scroll PRINT 1 – PRINT 8
		NO key	Continue to BAUD/9600
BAUD	9600	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. 1200, 2400, 4800, 9600 or 19200
PARITY	EVEN		Press LEFT or RIGHT arrow keys to change the current state of the selection. EVEN, ODD, MARK or NONE
PORT 1	STANDARD		Press LEFT or RIGHT arrow keys to change the current state of the selection. STANDARD, MODIFY or CUSTOM
PORT 1	MODIFY		See Table 5-13 on page 25
PORT 1	CUSTOM		Allocated for future use
PORT 1	EXIT ?	YES key	Return to menu SET-UP/PORT 1 ?. See Table 5-11.
		NO key	Return to PORT 1/PRINTER

Table 5-12. Port 1 Printer Menu

Port 1 Printer Modify Menu

Table 5-13 outlines the parameters of the Port 1 Printer Modify menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	MODIFY	DOWN arrow	Enters Modify menu
DELAY 1	AUTO	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. 1/SEC, 2/SEC, 3/SEC, 4/SEC, 5/SEC or AUTO
T-D1	OFF		Press LEFT or RIGHT arrow keys to change the current state of the selection. ON, ABOVE, BELOW or OFF
DATA 1	DISPLAY		Press LEFT or RIGHT arrow keys to change the current state of the selection. DISPLAY or G/T/N (port 1 only). DISPLAY, G/T/N or COMPRESS (port 2 only).
EOL 1	CR/LF		Press LEFT or RIGHT arrow keys to change the current state of the selection. CR/LF or CR
SOT 1	STX		Press LEFT or RIGHT arrow keys to change the current state of the selection. NONE, SOH or STX
EOT 1	NONE		Press LEFT or RIGHT arrow keys to change the current state of the selection. EOT, ETX, FF, LF or NONE
PORT 1	EXIT ?	YES key	Return to menu SETUP/PORT 1 ?. See Table 5-10 on page 24.
		NO key	Return to menu PORT 1/PRINTER. See Table 5-12 on page 25.

Table 5-13. Port One Printer Modify Menu

5.13.3 Port 1 Duplex Menu

Table 5-14 outlines the parameters of the Port 1 Duplex menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	DUPLEX	DOWN arrow	Enters Duplex menu
SET P1	AUTO DU?	YES key	Enters AUTO DU? menu. Press LEFT or RIGHT arrow keys to change the current state of the selection. DUPLEX 1?, DUPLEX 2?, DUPLEX 3? or DUPLEX 4?
		NO key	Continue to BAUD/9600
BAUD	9600	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. 1200, 2400, 4800, 9600 or 19200
PARITY	EVEN		Press LEFT or RIGHT arrow keys to change the current state of the selection. EVEN, ODD or MARK
PORT 1	STANDARD		Press LEFT or RIGHT arrow keys to change the current state of the selection. STANDARD, MODIFY, RS-485 or CUSTOM
PORT 1	MODIFY		See Table 5-15 on page 27
PORT 1	RS-485		See Table 5-16 on page 28
PORT 1	CUSTOM		Allocated for future use
PORT 1	EXIT ?	YES key	Return to menu SET-UP/PORT 1 ?. See Table 5-11 on page 24.
		NO key	Return to PORT 1/DUPLEX

Table 5-14. Port 1 Duplex Menu

Port 1 Duplex Modify Menu

Table 5-15 outlines the parameters of the Port 1 Duplex Modify menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	MODIFY	DOWN arrow	Enters Modify menu
PORT 1	PTR OFF	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. PTR OFF or PTR ON
PORT 1	CONT OFF		Press LEFT or RIGHT arrow keys to change the current state of the selection. CONT OFF or CONT ON
DELAY 1	AUTO (if either PTR or CONT is ON)		Press LEFT or RIGHT arrow keys to change the current state of the selection. 1/SEC, 2/SEC, 3/SEC, 4/SEC, 5/SEC or AUTO
T-D1	OFF (if either PTR or CONT is ON)		Press LEFT or RIGHT arrow keys to change the current state of the selection. ON LINE, ABOVE, BELOW or OFF
DATA 1	DISPLAY (if either PTR or CONT is ON)		Press LEFT or RIGHT arrow keys to change the current state of the selection. DISPLAY or G/T/N
EOL 1	CR/LF (if either PTR or CONT is ON)		Press LEFT or RIGHT arrow keys to change the current state of the selection. CR/LF or CR
SOT 1	STX (if either PTR or CONT is ON)		Press LEFT or RIGHT arrow keys to change the current state of the selection. NONE, SOH or STX
EOT 1	NONE (if either PTR or CONT is ON)		Press LEFT or RIGHT arrow keys to change the current state of the selection. EOT, ETX, FF, LF or NONE
CHECK	NONE		Press LEFT or RIGHT arrow keys to change the current state of the selection. NONE, XOR or CHECKSUM
RESP	ACK/NAK		Press LEFT or RIGHT arrow keys to change the current state of the selection. ECHO, ACK/NAK or NONE
PORT 1	EXIT ?	YES key	Return to menu SET-UP/PORT 1 ?. See Table 5-10 on page 24.
		NO key	Return to menu PORT 1/DUPLEX. See Table 5-14 on page 26.

Table 5-15. Port 1 Duplex Modify Parameters

5.13.4 Port 1 RS485 Menu

Table 5-16 outlines the parameters of the Port 1 RS485 menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	RS485	DOWN arrow	Enters RS485 menu
ADDR	1	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. See Section 5.7 on page 19
CHECK	NONE		Press LEFT or RIGHT arrow keys to change the current state of the selection. NONE, XOR or CHECKSUM
RESP	ACK/NAK		Press LEFT or RIGHT arrow keys to change the current state of the selection. ECHO, ACK/NAK or NONE
PORT 1	EXIT ?	YES key	Return to menu SET-UP/PORT 1 ?. See Table 5-10 on page 24.
		NO key	Return to menu PORT 1/DUPLEX. See Table 5-14 on page 26.

Table 5-16. Port 1 RS485 Menu

5.13.5 Port 1 Simplex Menu

Table 5-17 outlines the parameters of the Port 1 Simplex menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	SIMPLEX	DOWN arrow	Enters Simplex menu
SET P1	AUTO SI?	YES key	Press LEFT or RIGHT arrow keys to change the current state of the selection. SIMPLX 1?, SMPLX 2?, SMPLX 3? or SMPLX 4?
		NO key	Continue to BAUD/9600
BAUD	9600	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. 1200, 2400, 4800, 9600 or 19200
PARITY	EVEN		Press LEFT or RIGHT arrow keys to change the current state of the selection. EVEN, ODD, MARK or NONE
PORT 1	STANDARD		Press LEFT or RIGHT arrow keys to change the current state of the selection. STANDARD, MODIFY or CUSTOM
PORT 1	MODIFY		See Table 5-16 on page 28
PORT 1	CUSTOM		Allocated for future use
PORT 1	EXIT ?	YES key	Return to menu SET-UP/PORT 1 ?. See Table 5-10 on page 24.
		NO key	Return to PORT 1/SIMPLEX

Table 5-17. Port 1 Simplex Parameters

Port One Simplex Modify Menu

Table 5-18 outlines the parameters of the Port 1 Simplex Modify menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
PORT 1	MODIFY	DOWN arrow	Enters Modify menu
DELAY 1	AUTO	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. 1/SEC, 2/SEC, 3/SEC, 4/SEC, 5/SEC or AUTO
T-D1	OFF		Press LEFT or RIGHT arrow keys to change the current state of the selection. ON ONE, ABOVE, BELOW or OFF
DATA 1	DISPLAY		Press LEFT or RIGHT arrow keys to change the current state of the selection. DISPLAY, G/T/N or COMPRESS
EOL 1	CR/LF		Press LEFT or RIGHT arrow keys to change the current state of the selection. CR/LF or CR
SOT 1	STX		Press LEFT or RIGHT arrow keys to change the current state of the selection. NONE, SOH, or STX
EOT 1	NONE		Press LEFT or RIGHT arrow keys to change the current state of the selection. EOT, ETX, FF, LF, or NONE
PORT 1	EXIT ?	YES key	Return to menu SET-UP/PORT 1 ?. See Table 5-10 on page 24.
		NO key	Return to menu PORT 1/SIMPLEX. See Table 5-17 on page 28.

Table 5-18. Port 1 Simplex Modify Parameters

5.13.6 Port 2 Set-Up

Port 2 has the same set-up as Port 1 for the PRINTER or SIMPLEX modes. Port 2 does not have a DUPLEX mode. All references to Port 1 are replaced with Port 2 for its PRINTER or SIMPLEX modes.

5.13.7 Time and Date Set-Up Menu

Table 5-19 outlines the Time and Date Set-Up menu parameters of the DLR3110.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET-UP	TIME&D ?	YES key	Enters Time and Date menu
T	STANDARD	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. STANDARD or DLS (Day Light Savings)
T	12 HOUR		Press LEFT or RIGHT arrow keys to change the current state of the selection. 12 HOUR or 24 HOUR
T	6:29 PM		See Section 5.7 on page 19.
DATE	MM/DD/YY		Press LEFT or RIGHT arrow keys to change the current state of the selection. MM/DD/YY or DD/MM/YY
DATE	10/04/00		See Section 5.7 on page 19.
DATE	NUMBER		NUMBER or LETTER (print-out format of date)
PORT 1	EXIT ?	YES key	Return to menu SET-UP/TIME&D ? See Table 5-10 on page 24.
		NO key	Return to T/STANDARD.

Table 5-19. Time and Date Set-Up Menu

NOTE: Setting the time is performed in the 24 hour clock mode for both 12 and 24 HOUR selections.

5.13.8 Input Set-Up

Table 5-20 outlines the parameters of the Input Set-up menu.

LED Display	Alpha-Numeric Display	Key Pressed	Remarks
SET-UP	INPUT	YES key	—
INPUT.1	OFF	UP or DOWN arrow	Press LEFT or RIGHT arrow keys to change the current state of the selection. FREEZE, ZERO, TARE, PRINT or OFF
INPUT.2	OFF		Press LEFT or RIGHT arrow keys to change the current state of the selection. FREEZE, ZERO, TARE, PRINT or OFF
----	EXIT ?	YES key	Return to menu SET-UP/INPUT ?. See Table 5-10 on page 24.
		NO key	Return to SET-UP/INPUT.1

Table 5-20. Input Set-Up Parameters

5.13.9 Print and Zero Wiring Configration Example

Table 5-21 illustrates a typical wiring configuration to operate the PRINT and ZERO commands remotely.

LED Display	Alpha-Numeric Display	Remarks
INPUT.1	ZERO	INPUT 1 assigned as a ZERO input
INPUT.2	PRINT	INPUT 2 assigned as a PRINT input

Table 5-21. Wiring Configuration Example

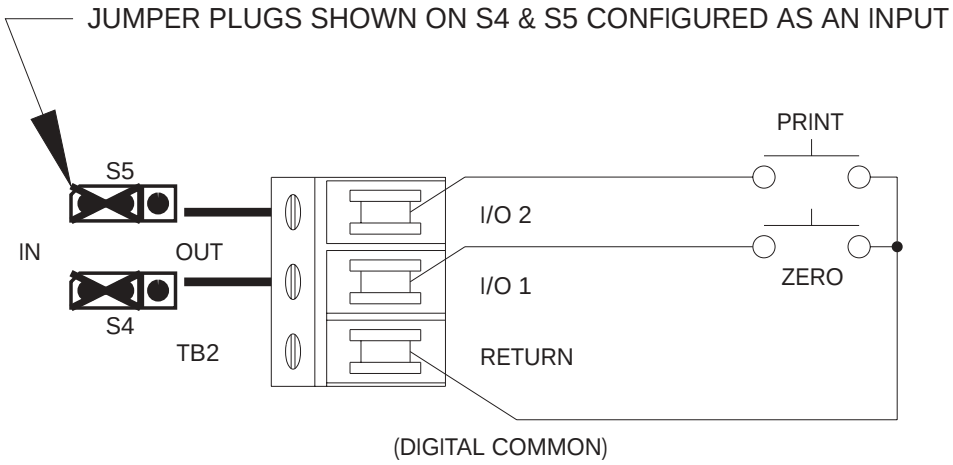


Figure 5-10. Remote Print and Zero Wiring Example

6.0 Serial Input/Output

The DLR3110 offers easy access and configuration of two serial communication ports. Both communication ports are ASCII-compatible and thus the serial data output formats are compatible with most printers, scoreboards, or other remote serial devices. Port One may be configured for bi-directional full duplex or half duplex (duplex = two way communication) mode of operation while Port Two is restricted to a simplex output mode only (simplex = one way communication). The two communication ports support both RS232 and 20 mA current loop (passive or active). In addition, Port One also supports RS485, or RS422 communication.

The transmission of serial output data strings can be initiated in one of three ways: on demand output, continuous output, or by serially soliciting the indicator in a duplex (bi-directional) mode of communication. See Section 5.13 on page 23 for configuring.

Port 1 (set up selections)

- **OFF** - Turns Port One off
- **PRINTER** - On demand printout of the data when the PRINT key is pressed or the remote print input is issued. The printer mode is a simplex output mode.
- **DUPLEX** - Bi-directional communication in which serial data can be both received and transmitted between the indicator and a remote device such as a computer.
- **SIMPLEX** - Continuous serial transmission

Port 2 (set up selections) - No DUPLEX communication

- **OFF** - Turns Port Two off
- **PRINTER** - On demand printout of the data when the PRINT key is pressed or the remote print input is issued. The printer mode is a simplex output mode.
- **SIMPLEX** - Continuous serial transmission

6.1 ASCII - Data Formats

Each serial character sent out in the serial data string is in ASCII - compatible format. The data format selection is based on parity selection in the I/O set-up mode (Refer to Section 5.13 on page 23 for configuration of Serial Ports). The data format for each ASCII character is of the general form described below.

One ASCII character consists of:

(1) Start Bit,

(7) or (8) Data Bits (data bits are the bits that actually encode for the ASCII character)

(1) or No Parity Bit

(1) Stop Bit

Bit	Parity Selection	Odd	Even	Mark	None
Start Bit	ASCII Data Formats	1	1	1	1
Data Bit		7	7	7	8
Parity Bit		1	1	(No Parity)	(No Parity)
Stop Bit		1	1	2	1

Table 6-1. Various Data Formats Available Through Parity Selection

6.2 Printer (Port One or Port Two)

The selection of the PRINTER format is an on-demand serial data transmission that is initiated each time the front panel PRINT key is pressed or when a remote print input is issued. This mode of serial data output is used when interfacing to printers.

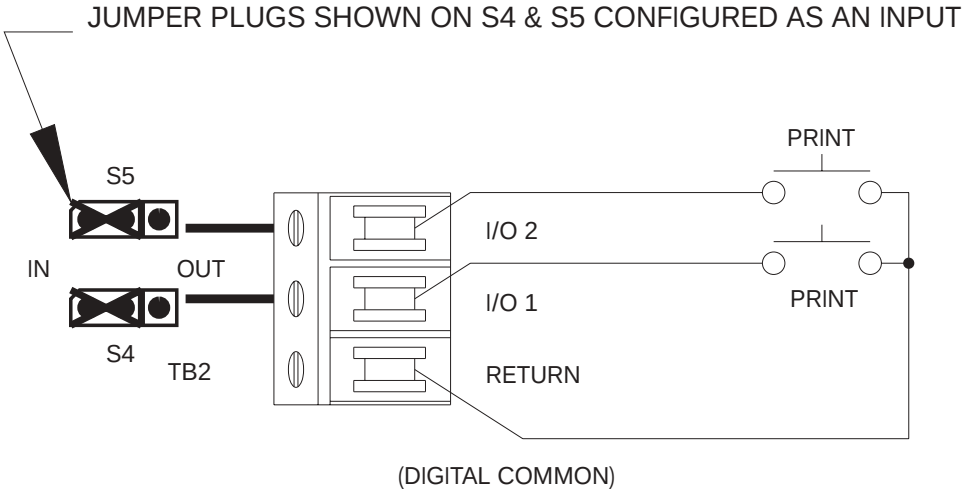


Figure 6-1. Printer Port One and/or Port Two Wiring

The data output format of the serial transmission is of the general form shown below:

<Pol><Data><space><Units><space><Mode><space><space><CR><LF>

Where:

<,> = Brackets are not sent in the transmission of the output data string.

Pol = Single character field that defines polarity of data. Positive data would be space character (20H) and negative data will have a "-" character (2DH).

Data = Seven (7) digit numeric data field that includes decimal point and/or fixed dummy zero when applicable. Leading zeroes are suppressed and an ASCII space character (20H) is transmitted to hold the position of each leading zero.

space = Space character (20H)

Units = A character field that defines the current units of the display data (examples: PSI, cmH2O, Kpa, mBAR, BAR, PASCAL).

Mode = An alpha character field that describes the current mode the indicator is in. GAGE/ ABSOLUTE/Delta P

CR = Carriage return

LF = Line feed

6.3 Duplex (Port One Only)

The selection of the DUPLEX format is only available on Port One. This selection sets up port 1 for bidirectional communication in RS485, RS232, or 20mA. Because of the extensive list of command instructions that can be issued to the indicator from a host computer, the scope of this section is limited to defining those commands that are most often utilized. A more extensive document detailing the full operational parameters for serial duplex protocol is available upon request from CONDEC. Ask for Duplex Serial Protocol Manual, PN 74845.

- The duplex protocol includes the following basic functions:
  - d) Setup entry and recall
  - e) Current weight/pressure data recall
  - f) Calibration and correction recall and entry
  - g) All front panel key functions
  - h) Temperature calibration and correction recall and entry

- The protocol between the “standard” full duplex and the RS485 only differ by the addition of the origin and destination address characters.
- All functions performed via the front panel keys can also be performed via the serial full duplex communications.

6.3.1 Full Duplex Protocol

Communications from the host computer to the DLR:

<*><DD><OO><cmd><{><data entry><}><CHECK><CR>

NOTE: Destination and origin characters (<DD> and <OO>) are only sent in RS485 format

Response from the DLR:

<:><OO><DD><cmd r><{><data resp><}><CHECK><CR>

Where:

"<",">"	=	Brackets are not sent
*	=	Message from master (host computer [2AH])
:	=	Response from DLR3110 (3AH)
DD	=	DLR unit address (two digit) if in RS485
OO	=	Master address (fixed at 00) if in RS485
		If RS485 mode is not selected the "DD" and "OO" are not transmitted.
cmd	=	Three character command to DLR3110
cmd r	=	Three character command echoed from DLR3110
{	=	Start of data character (7BH)
}	=	End of data character (7DH)
		'{' and '}' only sent if data entry or recall.
data entry	=	Data entered into DLR if entry command
data resp	=	Data response from DLR if in response
CHECK	=	Optional two character check if selected
CR	=	Message terminator (0DH)
		A "LF" character following the "CR" is ignored. All characters following the "CR" and preceding the "" is ignored.*

6.3.2 Command Code <cmd> Description

The <cmd> consists of three (3) characters “ppt” where:

pp = the command parameter (see chart I)

t = the command type

The three (3) command types (t) are as follows:

Direct cmd code = < D > character (44H). “D” commands have no data associated with them

Examples:

- General commands (Zero, Tare, etc.)
- Display Mode commands (Gross, Peak, etc.)
- Weight calibration (Zero Cal, etc.)

Data request code = < R > character (3FH). “R” commands are requests for data from the host to the DLR

Examples:

- Weight/pressure data
- Status
- Setup data
- Calibration data

Data entry code = < E > character (45H). Commands with data sent from the host to be entered into the DLR.

Examples:

- Setup data
- Calibration data

6.3.3 Basic RS485 Commands

Unit address 01 is used in Table 6-2 for illustration.

NOTE: A more extensive document detailing the full RS485 command codes is available upon request from CONDEC. Ask for Duplex Serial Protocol Manual, PN 74845.

Polling Command	Function
<*><01><00><PDR><cr>	Request for the display data
<*><01><00><PGR><cr>	Request for the pressure data (irregardless of the current display data
<*><01><00><PPR><cr>	Request for the max data
<*><01><00><PMR><cr>	Request for the min data
<*><01><00><ZED><cr>	Issues a ZERO command to the pressure indicator

Table 6-2. Basic RS485 Commands

6.4 Continuous Simplex Output (Compressed Format)

The pressure value that is compressed consists of the polarity and pressure value including the <dp>. The data in the compress mode is based on the six-digit display plus a <dp> when required. To enable see Section 5.13.1 on page 24.

The data output format of the serial transmission is of the general form shown below:

<-/D06><D05><D04><D03><D02><D01><lb1><lb2><lb3><lb4>

Where:

<-/D06> = The minus character if present and the most significant digit if positive.

<D05>--<D01> = The pressure digits.

<lb1>--<lb4> = Rest of data not effected (for example: units, mode).

The floating <dp> is added to the string when required. Therefore, the string is one character longer when a <dp> is added.

Examples:

100.0--<sp> <sp> <1> <0> <0> <dp> <0> ---

123456-- <1> <2> <3> <4> <5> <6> ---

- 345.6 -- <-> <sp> <3> <4> <5> <dp> <6> ---

6.5 Serial Output Wiring and Hardware Configuration

This section details the wiring configuration for serial transmission to a remote device such as a printer. All direct wiring on terminal block (TB3) and hardware settings are well marked and can be located at the rear portion of the CPU board assembly.

The DLR3110 comes equipped with a 25 pin “D” female serial I/O connector (J6) mounted at the rear of the enclosure which provides access to Port One - RS232 or RS485 hook up.

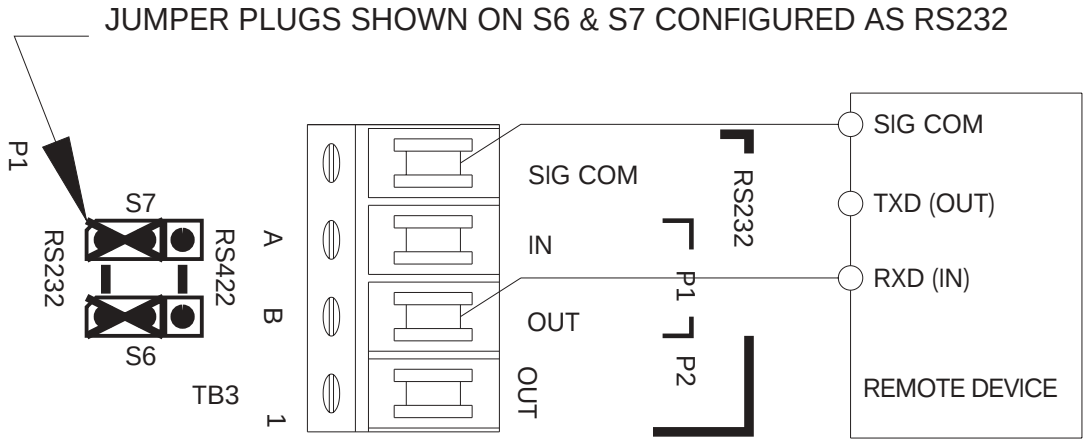


Figure 6-2. Port One RS232 (Simplex) - Direct CPU Terminal Block (TB3) Wiring

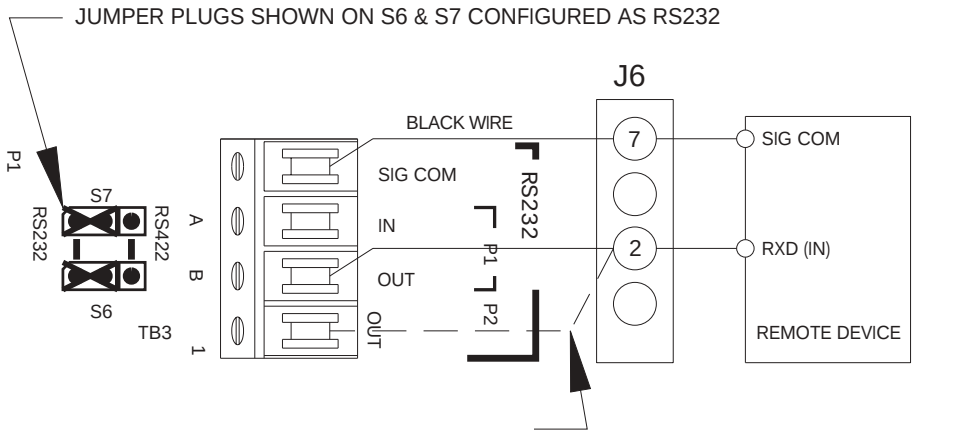


Figure 6-3. Port One RS232 (Simplex) - J6 (25 Pin “D”) Wiring

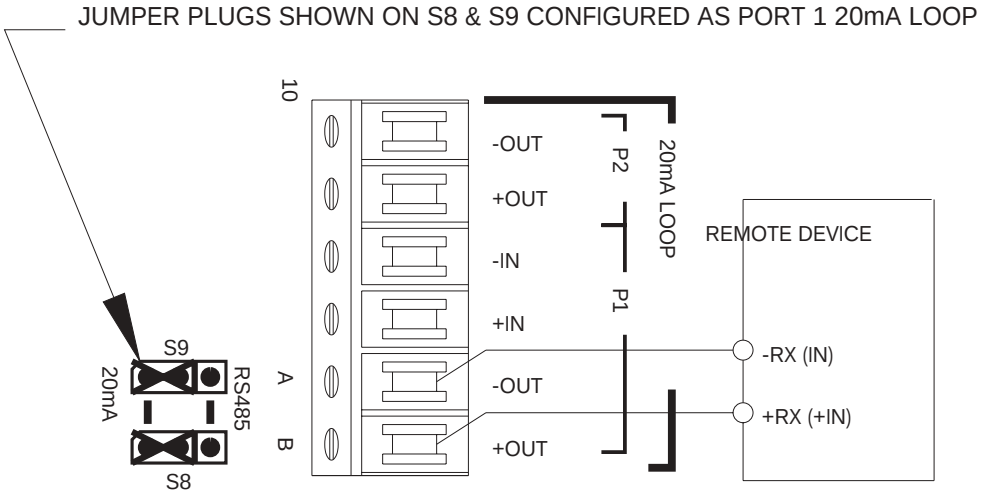


Figure 6-4. Port One RS232 Active 20mA Loop (Simplex) - Direct CPU Terminal Block (TB3) Wiring

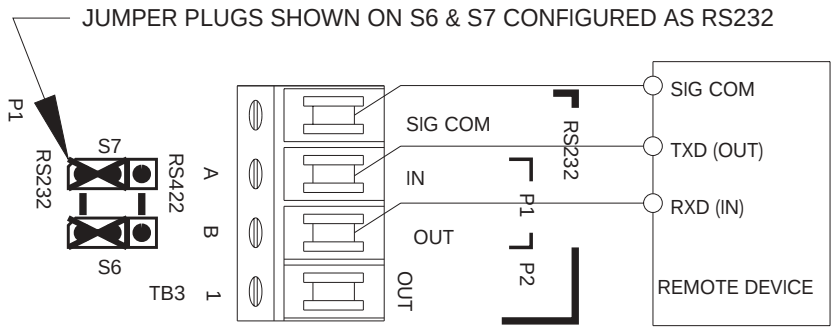


Figure 6-5. Port One RS232 (Full Duplex) - Direct CPU Terminal Block (TB3) Wiring

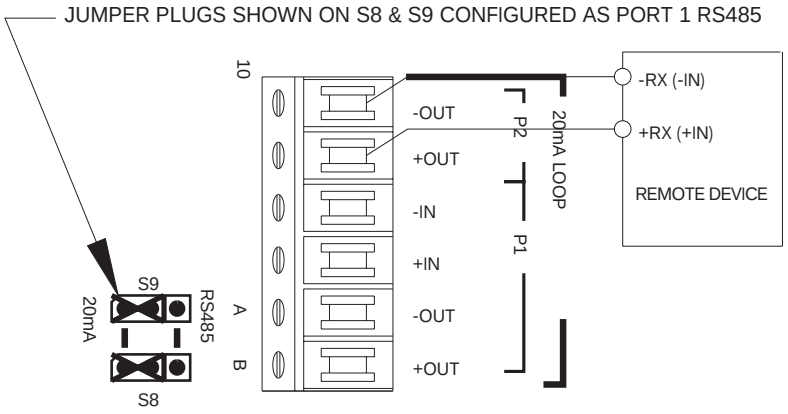


Figure 6-6. Port One RS232 (Full Duplex) - J6 (25 Pin "D") Wiring

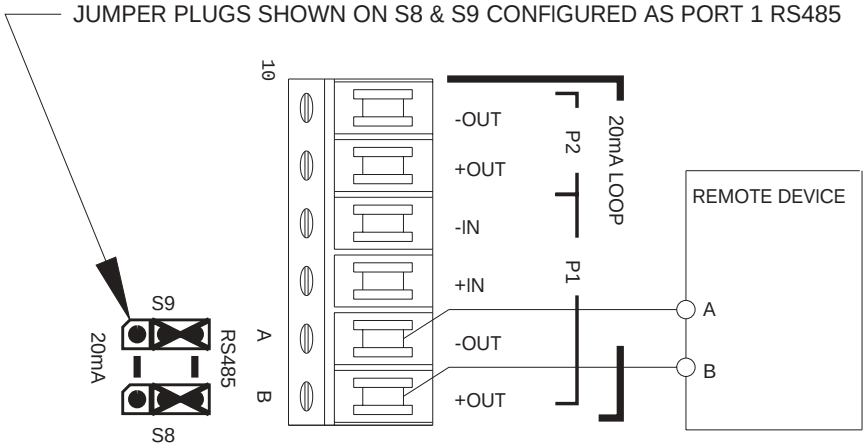


Figure 6-7. Port One RS485 Two Wire (Half Duplex) - Direct CPU Terminal Block (TB3) Wiring

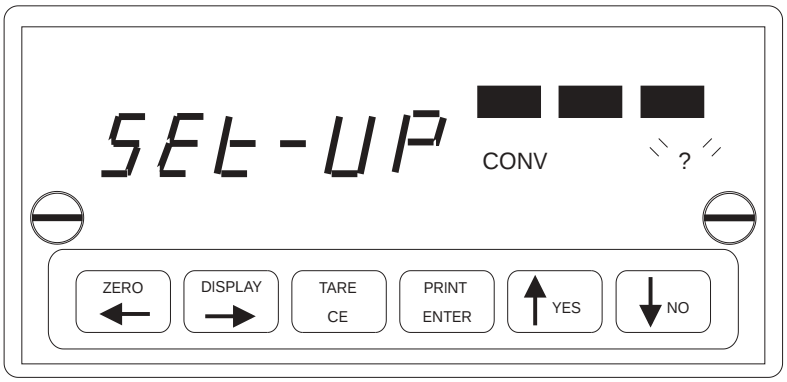


Figure 6-8. Port Two RS232 (Simplex) - Direct CPU Terminal Block (TB3) Wiring

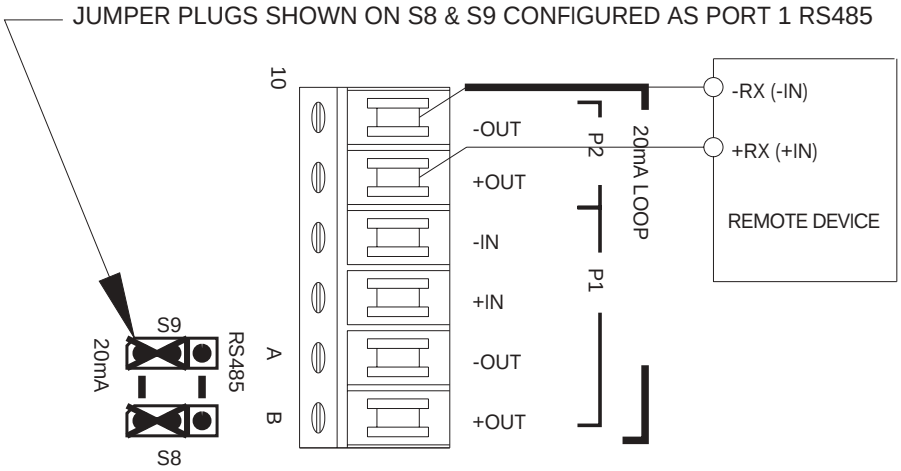


Figure 6-9. Port Two RS232 Active 20mA Current Loop (Simplex) - Direct CPU Terminal Block (TB3) Wiring

7.0 Maintenance and Service

The following sections cover troubleshooting, maintenance and service procedures for the DLR3110.

7.1 Troubleshooting

Symptom	Problem	Remedy
No lit display	Unit does not energize	Check fuse, check power source, check power switch
Display slowly decreases over time	Leak in system	Check all compression and pipe fittings with SNOOP®*, bottle of liquid leak gas detector (PN 64781)
Display does not respond when Vernier knob is turned	No Vernier control	Readjust isolation valves on Orion; replace O-ring on Vernier piston
Display increases or decreases when INPUT (Pressure) or VENT valves are closed	No Pressure or Vent control	Replace valve seats or o-rings in valves; check valve needles
Unit will not stay in CAL, display shows "-0L- -OVER-", or display reads a high value @ zero PSIG	Transducer over-pressurized	Replace transducer
Display does not zero	Display does not zero	Perform a ZERO/SPAN calibration
Display shifts, is not steady	Transducer drifts or possible over pressure	Replace transducer

Table 7-1. DLR3110 Troubleshooting

*SNOOP® is a registered trademark of Swagelok.

7.2 Maintenance and Service Procedures

This section outlines the mechanical and basic electrical repair procedures for the rack-mount pneumatic pressure calibrator, model DLR3110. The repair procedures cover the major components and sub-assemblies that are critical to the proper functioning of the calibrators and that need periodic maintenance over the life of the unit. Only those persons who are formally trained as skilled technicians should attempt to repair these units. All relevant safety precautions should be observed due to the presence of electrical components and high-pressure components.

NOTE: Based on model, the following may give information on components that are not part of your DLR3110.

7.2.1 Panel/Chassis Removal and Installation

Removal

Tools required: Phillips screwdriver

1. Vent system and remove input pressure source. Disconnect power cord, hoses, connectors, etc. from rear of DLR3110. Remove from rack, if applicable, by grasping the handles located on the front of the unit and gently set the rack-mount assembly on a bench top. It can be rested on the panel bottom and chassis edge.
2. Loosen and remove the three screws (PN 14839) from rear and sides that secure the cover to the chassis.

Installation

Tools required: Phillips screwdriver

1. Align mounting holes of cover with chassis and install three screws (PN 14839) from rear and sides that secure the cover to the chassis.
2. Lift the panel and chassis by grasping the handles located on the front of the unit and re-install in rack, if applicable. Connect input pressure source, power cord, hoses, connectors, to rear of DLR3110.

7.2.2 ORION-2C (PN 55283) or ORION-3A (PN 55287) Manifold Removal

Tools required:
Phillips screwdriver
11/32" wrench or nutdriver
.061" hex wrench
adjusting screwdriver (small flat blade)
11/32" open end wrench (thin)
7/16" open end wrench

1. Vent any remaining gas from the system to atmosphere.
2. Remove cover from chassis as described in Section 7.2.1 on page 39.
3. Remove the test port to Orion tubing section using a 7/16" wrench.
4. If the transducer is wired via a connector, remove the connector by turning counter-clockwise. If the transducer is hard-wired, loosen and remove the four transducer wires (red, white, green, black) from the terminal block, TB1, on the CPU board, using the small flat-blade screwdriver.
5. Break the wire ties, if applicable, that hold the transducer wires so that the wires are free.
6. Using the 11/32" thin wrench, loosen and carefully remove the transducer from the Orion-2C manifold.
7. Remove the tubing sections from the vent and pressure inlet fittings on the Orion-2C, using a 7/16" wrench.
8. Remove the panel knobs from the Coarse (pressure), Vernier and Vent valves using the .061" hex wrench.
9. Loosen and remove the two panel screws (PN 60837) from the panel front that secure the manifold to the panel.
10. Remove the manifold from the front panel.

7.2.3 ORION Manifold - Valve Seat Removal

ORION- 2C: Refer to Section 7.3 on page 53 and Figure 7-1 on page 55.

ORION- 3A: Refer to Section 7.4 on page 57 and Figure 7-2 on page 59.

Tools required:
A/R solvent (denatured alcohol)
socket wrench
3/4" socket
female socket (65581)
needle housing socket (65580)
isolation valve needle housing socket (PN 59793)
hex wrench (.050")
hex wrench (.061")
torque wrench
needle-nose pliers
tube fluorinated Krytox grease (PN 55593)
electric hand drill
No. 43 drill bit
No. 4-40 tap
tap handle
small hammer

1. Secure the manifold by its center portion, in a bench vise, with the valve knobs pointing upward.
2. Using the .061" hex wrench, loosen and remove the knob inserts (4) from the pressure and vent valve stems.
3. Using the .050" hex wrench, loosen and remove the set screw (34) and lock nut (2).
4. Loosen the 3/4" locknuts (1) on the pressure and vent valve threaded needle housings (10).
5. Using the needle housing socket (65580) and torque wrench, loosen and remove the needle/housing assembly (10, 1).
6. To disassemble the isolation valve, first remove the valve needle (18) by turning the gear clockwise.
7. Loosen and remove the valve housings (19) using the isolation valve housing removal socket (59793) female socket (65581) and torque wrench.
8. Remove the valve stem seats (8) and valve needle seats (9) using the needle-nose pliers.
9. Remove the inner and outer O-rings (28, 27) and back-up rings (31, 30) from the valve stem seats and wash all parts in solvent (denatured alcohol).

10. To remove valve seats (7) from either the coarse (pressure), vent or isolation valves, try blowing compressed air through the inlet and outlet fittings. Otherwise, the center holes have to be drilled and a tap used to extract the seat (Steps 11-14).
11. Using the electric hand drill with the No. 43 bit, carefully drill out the seat hole, ensuring that the drill does not touch the hole in the manifold housing directly beneath the seat.
12. Blow out any chips from the seat area using compressed air.
13. While holding the 4-40 tap steady and perpendicular to the seat, slowly turn until the tap starts to engage the seat.
14. When the tap has engaged into the seat, use a small hammer and gently knock upward against the tap handle to extract the seat.
15. After the seat has been removed, blow any remaining chips from the seat area.

7.2.4 ORION Manifold - Vernier Control Disassembly

ORION- 2C: Refer to Section 7.3 on page 53 and Figure 7-1 on page 55.

ORION- 3A: Refer to Section 7.4 on page 57 and Figure 7-2 on page 59.

Tools required: A/R solvent (denatured alcohol)
1-1/4" open end wrench
screwdriver (flat-blade)
socket wrench
isolation valve needle housing socket (PN 68508)
isolation valve needle housing socket (PN 68509)

1. With the manifold housing mounted in a vise, turn the vernier shaft (14) clockwise until the piston is bottomed.
2. Loosen and remove the end cap (13) using a 1-1/4" wrench. At certain points during removal the end cap will appear to lock up. If this occurs, rotate the shaft clockwise until the end cap is free to turn.
3. Remove the O-ring (29) from the end cap.

   ORION-3A: Also remove the backup washer (38) from the end cap.
4. Remove the self-sealing screw (36) that acts as the piston key.
5. Extract the piston (15) by partially screwing in the threaded end of the shaft and pulling.
6. Remove the O-ring (32) from the piston groove.
7. To disassemble the end cap/shaft assembly, mount the end cap in the vise.
8. Loosen and remove the locknut (20) using the isolation valve housing socket (PN 59793), female socket (65581), and socket wrench.
9. ORION-2C: Loosen and remove the end bushing (12) using the same socket. Remove the shaft (14). Remove the Mylar®[1] bearing washers (41 or 42) from both sides of the shaft flange. ORION-3A: Loosen and remove the end bushing (12) using the isolation valve housing socket (PN 68508) and socket wrench. Remove the shaft (14). Remove the ball bearings (41) from both sides of the shaft flange.
10. Use a small pick or screwdriver to remove the O-ring (27) from the inner groove of the end cap (13).

    ORION-3A: Also remove backup retainer (39) from inner groove of the end cap (13).
11. Wash all parts in solvent and blow dry with compressed air.

1. Mylar® is a registered trademark of EI DuPont.

7.2.5 ORION Manifold - Vernier Control Reassembly

ORION- 2C: Refer to Section 7.3 on page 53 and Figure 7-1 on page 55.

ORION- 3A: Refer to Section 7.4 on page 57 and Figure 7-2 on page 59.

Tools required:
- tube fluorinated Krytox grease (PN 55593)
- 1-1/4" wrench
- screwdriver (flat-blade)
- socket wrench
- isolation valve needle housing socket (PN 68508)
- isolation valve needle housing socket (PN 68509)
- torque wrench

1. Coat all O-rings with fluorinated Krytox grease before installing. Make sure that the O-rings and backup rings/washers are installed in the proper order.
2. Install the small O-ring (27) into the end cap inner groove.

   ORION-3A: Also install backup retainer (39) in inner groove of the end cap (13).
3. ORION-2C: Add Mylar washers (41) or (42) to each side of shaft (14). Apply a small amount of fluorinated Krytox grease to the shaft threads and install the shaft (14) into the end cap.

   NOTE: Part number and quantity will vary. Washers are used to adjust vertical play in shaft (14). Try one item (41) on each side to start.

   Install the end bushing (12) and tighten until snug using the isolation valve needle housing socket (PN 68509) and socket wrench.
4. Feel vertical motion of shaft (14). If motion exists add thicker washer (41) at step 3, otherwise continue to step 5.
5. Install the locknut (20) into end cap (13) and using the isolation valve needle housing socket (PN 68509) and torque wrench. Torque to approximately 325 in-lbs. (may not get to torque on all sub-assemblies).
6. Install the O-ring (32) in the piston groove and install the piston (15) into the vernier cavity. Ensure that the piston keyway is facing the hole into which the self-sealing screw (36) is assembled.
7. Install the self-sealing screw (36) and tighten until snug.
8. Install the O-ring (29) on the end cap/shaft assembly, install into manifold and tighten until snug.

   ORION-3A: Also install backup washer (38) on the end cap/shaft assembly.

7.2.6 ORION-2C Manifold - Valve Seat Installation

ORION- 2C: Refer to Section 7.3 on page 53 and Figure 7-1 on page 55.

ORION- 3A: Refer to Section 7.4 on page 57 and Figure 7-2 on page 59.

Tools required:
- needle-nose pliers
- tube fluorinated Krytox grease (PN 55593)
- No. 43 drill
- A/R solvent (denatured alcohol)
- hex wrench (.061")
- torque wrench
- socket wrench
- 3/4" socket
- needle housing socket (PN 65580)
- isolation valve needle housing socket (PN 68509)

1. Install a new seat (7) by placing it into the seat well with the needle-nose pliers. Ensure that the seat is centered within the cavity and gently tap it with a blunt end of a drill bit to install.
2. Install the valve needle seat (9) with the smaller diameter end facing outward.
3. Install new O-rings (28, 27) inside and outside of the valve stem seat. Coat all O-rings and back-up rings (30, 31) with fluorinated Krytox grease before installation. Make sure that the rings are installed in the proper order.
4. Install the valve stem seat (8) by grasping the small diameter end with the needle-nose pliers and positioning in the valve cavity, then gently pushing with the blunt end of a drill bit.
5. For input (pressure) and vent valves (two outer valves), disassemble the valve needle (11) from its housing (10) and check for any burrs or dirt on the threads which might interfere with smooth operation.

6. Clean both the needle (11) and housing (10) in solvent, dry the parts and apply a small amount of fluorinated Krytox grease to the needle threads before reassembly.
7. Assemble the Valve Needle (11) into the Valve Needle Housing (10) and turn it until it stops.
8. Reinstall the needle/housing assembly into the valve cavity until finger tight.
9. Mount the manifold body (16) in a vise. For the Coarse (pressure) and Vent valves only, torque the needle/housing assembly to 325 in-lb. using the needle housing socket (PN 65580) and torque wrench.
10. Install the housing lock nuts (1) onto the housing (10) and tighten until snug with the 3/4" socket.
11. Using the .050" hex wrench, install and tighten the lock nut (2) and set screw (34).
12. Install the Knob Insert (4) over the Valve Needle (11) shaft, align the Set Screws (23) with the indents and tighten with the .061" hex wrench.
13. For the isolation valves (two inner valves), install the Needle Housing (19) and tighten until snug using the Isolation Valve Housing Installation Socket (PN 59793), Female Socket (PN 65581) and torque wrench.

    NOTE: There is no specified torque, so use care when tightening so as not to break the socket nibs.
14. Install the Gear (6) over the Isolation Valve Needle (18) shaft, align the Set Screws (23) with the indents and tighten with the .061" hex wrench.
15. Apply a small amount of fluorinated Krytox grease to the threads of the isolation valve needles (18) and install into the valve by turning counter-clockwise. Rotate the gear until the needle just stops at the seat.

7.2.7 ORION Manifold - Panel Installation

Tools required: 7/16" open end wrench
Phillips screwdriver
hex wrench (.061")
SNOOP, liquid leak gas detector (PN 64781)
11/32" open end wrench (thin)

1. If not already done, remove the panel knobs from the Input (pressure), Vernier and Vent valves using the .061" hex wrench.
2. Install the manifold with the transducer port side facing the panel bottom. Install the two mounting screws (PN 60837) from the panel front and tighten until snug.
3. Install the Vernier Knob (17) onto the Vernier Valve Shaft (14). Align the set screws (25) with the indentations on the Vernier Valve Shaft and tighten until snug using the .061" hex wrench.
4. To install and adjust the Input (pressure) and Vent Valve Knobs, follow the procedure in Section 7.2.8.
5. Install the transducer into the manifold port, tighten with the 11/32" thin wrench and reconnect its wire connector.

   NOTE: If transducer is hard-wired, connect the 4 wires to the terminal block, TB1, on the CPU board per the following:

Transducer Wires	Terminal Block Wires
+ Excitation	TB1-1 Green wire
- Excitation	TB1-6 Black wire
+ Signal	TB1-3 White wire
- Signal	TB1-4 Red wire

Table 7-2. Transducer Wiring Specification

6. Install all tubing sections that attach to the ORION Manifold.
7. Install cover as described in Section 7.2.1 on page 39.

7.2.8 ORION-2C Manifold - Valve Adjustment Procedure

For DLR3110 models 2500 PSI and below.

ORION- 2C: Refer to Section 7.3 on page 53 and Figure 7-1 on page 55.

Tools required: hex wrench (.050")
hex wrench (.061")
SNOOP, leak gas detector (PN 64781)

*NOTE: * Denotes reference to Figure 3-1 on page 9.*

1. If not already done, remove the ORION Input and Vent Valve Knobs (3) using the .061" hex wrench.
2. Energize the unit and let warm up. To adjust Input Valve, go to step 4.
3. Using a .050" hex wrench, loosen the Set Screw (34) on the Locknut (2) and turn the Locknut clockwise to its stop.
4. Check to see that the Knob Insert (4) is securely fastened to the Valve Shaft (11). If it is loose, re-tighten the Set Screws (23) with the .061" hex wrench.
5. Close the Input Valve by turning the Knob Insert (4) clockwise. until you feel the valve needle seat on the O-ring (valve is now in closed position).
6. Rotate gears on both Isolation valves, counter-clockwise until they stop, then rotate clockwise 1/2 turn (opening isolation valves).
7. Use the Pressure Limit Control (*4), to increase the supply pressure to between 80% and 100% of full scale.
8. GAGE Model: Open the Vent Valve (*2) to atmosphere (rotate counter-clockwise), zero the indicator, by momentarily pressing ZERO switch (*3), then close the Vent Valve (*2).

   ABSOLUTE Model: Open the Vent Valve (*2) to atmosphere (rotate counter-clockwise), to release line pressure, then close the Vent Valve (*2).
9. Slowly open the Input Valve by turning the Knob Insert (4) counter-clockwise until you notice the displayed pressure increase. Then turn the Knob Insert slightly clockwise until the pressure stops rising.
10. Mark a radial line at the 12 o'clock position on the Knob Insert.
11. Turn the Knob Insert (4) clockwise to move the mark to the 6 o'clock position.
12. Turn the Locknut (2) counter-clockwise until it contacts the bottom of the stop washer. Tighten the Set Screw (34) on the Locknut with the .050" hex wrench.
13. Install the Input Valve Knob (3) on the Knob Insert (4) and engage its Gear (5) with the smaller Isolation Valve Gear (6). Turn the knob clockwise until the Isolation Valve is slightly snug.

⚠ Caution *Do not use excessive torque when tightening isolation valve. Doing so can damage the seat.*

14. Remove the Input Valve Knob. Align the Set Screws (25) with the indentations on the Knob Insert. Install the Knob on the Knob Insert while engaging the Knob Gear (5) with the Isolation Valve Gear (6).
15. Tighten the Set Screws (25) with the .061" hex wrench. The Input Valve is now adjusted.
16. To adjust the Vent Valve, follow steps 3 and 4.
17. Close the Input Valve by turning the Input knob (*1) clockwise.
18. Close the Vent Valve Knob Insert (4) clockwise until slightly snug.
19. With the supply pressure at 100% of full scale, open the Input Valve until the indicated pressure stabilizes and then close the Input Valve.
20. Slowly turn the Vent Valve Knob Insert (4) counter-clockwise until the display starts to decrease, then turn the Knob Insert (4) slightly clockwise until the indicated pressure stops decreasing.
21. Follow steps 10 through 15 replacing the term "Input Valve" with "Vent Valve". The Vent Valve is now adjusted.

7.2.9 ORION-3A Manifold - Valve Adjustment Procedure

For DLR3110 5000 PSI and above models.

ORION- 3A: Refer to Section 7.4 on page 57 and Figure 7-2 on page 59.

Tools required: hex wrench (.050")
hex wrench (.061")
SNOOP, leak gas detector (PN 64781)

*NOTES: 1. * denotes reference to Figure 3-1 on page 9.*

2. Customer must supply, as a minimum, input supply pressure with a supply gauge and pressure regulator.

1. Turn the supply pressure regulator off and vent manifold.
2. If not already done, remove the ORION Input and vent valve (outer) knobs (3) using the .061" hex wrench.
3. Energize the unit and let warm up. To adjust Input Valve, go to step 4.
4. Check to see that each Knob Insert (4) is securely fastened to the ORION input and vent valve shaft (11). If it is loose, re-tighten the set screws (23) with the .061" hex wrench.
5. Using a .050" hex wrench, loosen the set screw (34) on each ORION input and vent valve locknut (2) and turn each locknut clockwise to its stop.
6. Close the Input Valve by turning the Knob Insert (4) clockwise. until you feel the valve needle seat on the O-ring (valve is now in closed position).
7. Rotate gears on both Isolation valves, counter-clockwise until they stop, then rotate clockwise 1/2 turn (opening isolation valves).
8. Turn the supply pressure regulator to increase the supply pressure to between 80% and 100% of full scale.
9. Gage model: Open the Vent Valve (*2) to atmosphere (rotate counter-clockwise), zero the indicator, by momentarily pressing ZERO switch (*3), then close the Vent Valve (*2).

   Absolute model: Open the Vent Valve (*2) to atmosphere (rotate counter-clockwise), to release line pressure, then close the Vent Valve (*2).
10. Slowly open the Input Valve by turning the Knob Insert (4) counter-clockwise until you notice the displayed pressure increase. Then turn the Knob Insert slightly clockwise until the pressure stops rising.
11. Mark a radial line at the 12 o'clock position on the Knob Insert.
12. Turn the Knob Insert (4) clockwise to move the mark to the 6 o'clock position.
13. Turn the Locknut (2) counter-clockwise until it contacts the bottom of the stop washer. Tighten the Set Screw (34) on the Locknut with the .050" hex wrench.
14. Install the Input Valve Knob (3) on the Knob Insert (4) and engage its Gear (5) with the smaller Isolation Valve Gear (6). Turn the knob clockwise until the Isolation Valve is slightly snug.

⚠Caution *Do not use excessive torque when tightening isolation valve. Doing so can damage the seat.*

15. Remove the input valve knob. Align the Set Screws (25) with the indentations on the Knob Insert. Install the knob on the Knob Insert while engaging the Knob Gear (5) with the Isolation Valve Gear (6).
16. Tighten the Set Screws (25) with the .061" hex wrench. The input valve is now adjusted.
17. Close the input valve by turning the Input Knob (*1) clockwise.
18. Close the Vent Valve Knob Insert (4) clockwise until slightly snug.
19. With the supply pressure at 100% of full scale, open the Input Valve until the indicated pressure stabilizes and then close the Input Valve.
20. Slowly turn the Vent Valve Knob Insert (4) counter-clockwise until the display starts to decrease, then turn the Knob Insert (4) slightly clockwise until the indicated pressure stops decreasing.
21. Follow steps 11 through 15 replacing the term "Input Valve" with "Vent Valve". The Vent Valve is now adjusted.

7.2.10 Pressure Limit Control (Standard Pneumatic), Regulator Removal

Tools required:
Phillips screwdriver
7/16" open end wrench
9/16" open end wrench
A/R 1/4" wide Teflon®[1] tape, (PN 60575)
A/R 1/2" wide Teflon tape, (PN 60911)
1/2" socket
socket wrench
1/4" hex wrench

NOTE: See Figure 7-3 on page 61.

1. Remove cover from its chassis as described in Section 7.2.1 on page 39, and carefully place on a bench.
2. Remove regulator knob cap.
3. Remove two screws that secure the round plate.
4. Loosen and remove the locknut using a 1/2" socket while holding the knob. Remove the knob by turning counter-clockwise
5. Remove all tubing sections that connect to the regulator inlet and outlet fittings.
6. Loosen the mounting collar in the panel rear using a 1/4" hex wrench.
7. Remove the regulator by sliding out from the panel rear.
8. Mount the regulator in a bench vise by the flats in the base.
9. Note the orientation of the inlet and outlet fittings in the regulator. Remove the fittings and any remnants of Teflon tape from the pipe threads.

7.2.11 Pressure Limit Control (Standard Pneumatic), Regulator Installation

Tools required:
Phillips screwdriver
7/16" open end wrench
9/16 " open end wrench
A/R 1/4" wide Teflon tape, (PN 60575)
A/R 1/2" wide Teflon tape, (PN 60911)
SNOOP, liquid leak gas detector (PN 64781)
1/2" socket
socket wrench

NOTE: See Figure 7-3 on page 61. Call CONDEC for replacement part numbers.

1. Wrap two layers of Teflon tape on the pipe threads of each fitting and install into the inlet and outlet of the regulator and ensure that each is oriented properly. Use a bench vise when doing this.

   Insert the new regulator into the panel through hole. Pass the adjusting end through the mounting ring. Do not tighten cap screw until adjusting knob is installed.
2. Install the tubing sections to the inlet and outlet fittings.
3. Install the adjusting knob on the threaded shaft by turning clockwise. Turn adjusting knob on threaded shaft until bottomed and install locking nut and tighten. Turn knob until it bottoms. Position the regulator so that the bottom of the knob is 1/2" from the panel surface, then tighten the cap screw on the mounting collar.
4. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
5. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

1. Teflon® is a registered trademark of EI DuPont.

7.2.12 Pressure Limit Control (Tescom), Regulator Removal

Tools required: Phillips screwdriver
7/16" open end wrench
9/16" open end wrench
A/R 1/4" wide Teflon tape, (PN 60575)
A/R 1/2" wide Teflon tape, (PN 60911)
1/2" socket
socket wrench
1/4" hex wrench
flat blade screwdriver (small)
channel locks

NOTE: See Figure 7-3 on page 61.

1. Remove cover from its chassis as described in Section 7.2.1 on page 39, and carefully place on a bench.
2. Remove regulator knob cap by prying off with small screwdriver.
3. Loosen and remove the locknut using a 1/2" socket while holding the knob. Remove the knob by turning counter-clockwise.
4. Remove all tubing sections that connect to the regulator inlet and outlet fittings.
5. Loosen and remove the panel mounting nut using channel locks.
6. Remove the regulator by sliding out from the panel rear.
7. Mount the regulator in a bench vise by the flats in the base.
8. Note the orientation of the inlet and outlet fittings in the regulator. Remove the fittings and any remnants of Teflon tape from the pipe threads.

7.2.13 Pressure Limit Control (Tescom), Regulator Installation

Tools required: Phillips screwdriver
7/16" open end wrench
9/16" open end wrench
1/2" socket
socket wrench
A/R 1/4" wide Teflon tape, (PN 60575)
A/R 1/2" wide Teflon tape, (PN 60911)
SNOOP, liquid leak gas detector (PN 64781)

NOTE: See Figure 7-3 on page 61. Call CONDEC for replacement Part Numbers.

1. Wrap two layers of Teflon tape on the pipe threads of each fitting and install into the inlet and outlet of the regulator and ensure that each is oriented properly. Use a bench vise when doing this.
2. Insert the new regulator into the panel through hole. Thread the large mounting nut onto the body from the panel front.
3. Install the tubing sections to the inlet and outlet fittings.
4. Install the regulator knob on the threaded shaft by turning clockwise, until it sits just low enough to allow locknut to be placed on threaded shaft. Hold knob in position and install the locknut.
5. Close Pressure Limit Monitor, by turning regulator knob counter-clockwise.
6. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
7. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.
8. Energize the unit and let warm up.
9. Close the Input Valve by turning the Input knob clockwise.
10. Turn the regulator knob clockwise until reaching between 5% – 10% of full scale, but not enough to disturb pressure relief valve.

    NOTE: If pressure cannot be attained loosen locknut on shaft, rotate knob a few turns counter-clockwise, retighten locknut. If you hear the pressure relief valve then rotate regulator knob counter-clockwise until relief valve shuts off.

11. Remove locknut from threaded shaft, and rotate knob counter-clockwise until bottoming out on large locknut. After touching large locknut rotate knob clockwise 1/8 turn. Hold knob in position, install and tighten the locknut with 40 – 50 in-lbs. of torque using a 1/2" socket.

12. Open Pressure Limit Monitor completely, by turning regulator knob clockwise. If you reach between 100-105% of full scale and pressure relief valve was not disturbed regulator has been adjusted properly.
13. Replace regulator knob cap.

7.2.14 Panel Gauge Removal

Tools required: Phillips screwdriver
7/16" wrench
9/16 " wrench

NOTE: Call CONDEC for replacement Part Numbers.

1. Remove cover from its chassis as described in Section 7.2.1 on page 39, and carefully place on a bench.
2. Disconnect the tubing section that connects to the gauge fitting.
3. Loosen the two thumb-nuts that hold the gauge mounting U-clamp.
4. While gripping the square portion of the gauge port with the 9/16" wrench, remove the Female Tube Connector (PN 59721) from the gauge.
5. Remove the two thumb-nuts, the mounting U-clamp, and the gauge.

7.2.15 Panel Gauge Installation

Tools required: Phillips screwdriver
7/16" wrench
9/16" wrench
A/R 1/4" wide Teflon tape (PN 60575)
SNOOP, liquid leak gas detector (PN 64781)

NOTE: Call CONDEC for replacement part numbers.

1. Before installing a new gauge, wrap two layers of new Teflon tape on the port.
2. Install gauge into panel, secure with U-clamp and tighten the two thumb screws.
3. While gripping the square portion of the gauge port with the 9/16" wrench, tighten the Female Tube Connector on to the gauge.
4. Attach the tubing section that connects to the gauge fitting.
5. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
6. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.2.16 Test Port Quick-Connect Fitting (PN 59762) Removal and Installation - 3 and 100 Full Scale PSI

If there is leakage out of the port, replace the test port fitting.

Tools required: Phillips screwdriver
5/8" two open end wrenches
9/16" open end wrench
SNOOP, liquid leak gas detector (PN 64781)

1. Remove cover from its chassis as described in Section 7.2.1 on page 39, and carefully set on a bench top.
2. Loosen and remove the tubing end nut from the test port fitting.
3. Grasp the hex nut at the panel face with a 5/8" wrench and using a second wrench, turn the nut on inside of panel counter-clockwise.
4. Install the new quick-connect fitting (PN 59762) by reversing steps.
5. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
6. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.2.17 Test Port Filter (PN 54188) Removal and Installation - 250 and 2500 Full Scale PSI

The port filter is a sintered element filter which is easily removed for inspection and cleaning.

Tools required:
Phillips screwdriver
7/16" open end wrench
9/16" open end wrench
A/R solvent (denatured alcohol)
SNOOP, of liquid leak gas detector (PN 64781)

Removal

1. Remove cover from chassis as described in Section 7.2.1 on page 39, and carefully set on a bench.
2. Loosen and remove the tubing end nut from the reducing union (PN 59764).
3. Loosen and remove the reducing union (PN 59764) from the fractional tube fitting (PN 59780).

   NOTE: Use PN 54946 for fractional tube fitting field replacement.
4. Clean the filter (PN 54188) in solvent (denatured alcohol) and blow-dry with compressed air.

Installation

1. To reinstall, reverse the order of steps 2 and 3 of Section 7.2.17 above.
2. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
3. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.2.18 Test Port Quick-Connect Fitting (PN 59004) and Filter (PN 54188) Removal and Installation - 5000 and 10000 Full Scale PSI

Every two months, a coating of fluorinated Krytox grease should be applied to the inner seal of the test port fitting. The pressure cap (PN 58216) should be plugged in whenever the unit is not in use.

NOTE: For simplest method, apply fluorinated Krytox grease to the outside surface between sealing lip and end of mating pressure cap. Do not put grease on flat end of tip, as this may allow grease to enter system. Vent unit line pressure to atmosphere. Plug pressure cap into test port. Rotate pressure cap clockwise and counter-clockwise to transfer fluorinated Krytox grease to O-ring seal.

If there is leakage out of the port when the pressure cap is in place, replace the port fitting.

Tools required:
Phillips screwdriver
11/16" open end wrench
adjustable wrench
9/16" open end wrench
A/R solvent (denatured alcohol)
A/R 1/4" wide Teflon tape (PN 60575)
A/R 1/2" wide Teflon tape (PN 60911)
tube fluorinated grease (PN 55593)
SNOOP, liquid leak gas detector (PN 64781)

1. Remove cover from chassis as described in Section 7.2.1 on page 39, and carefully set on a bench top.
2. Loosen and remove the tubing end nut from the reducing tube fitting (PN 59830).

   NOTE: Use PN 54047 for reducing tube fitting field replacement.
3. Loosen and remove the reducing tube fitting and filter (PN 54188) from the test port quick-connect fitting.
4. Clean the filter (PN 54188) in solvent (denatured alcohol) and blow-dry with compressed air.
5. Grasp the test port quick-connect fitting on the flats from the rear of panel with a 11/16" wrench and using an adjustable wrench, turn the locknut counter-clockwise. Remove locknut.
6. Remove old and install new test port quick-connect fitting (PN 59004) through front of panel.
7. Thread and tighten locknut by grasping the test port quick-connect fitting on the flats from the rear of panel with a 11/16" wrench and using an adjustable wrench, turn the locknut clockwise.
8. Slide filter (PN 59764) into reducing tube fitting and install into the test port quick-connect fitting.
9. Replace and tighten the tubing end nut on the reducing tube fitting.

10. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
11. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.2.19 Test Port (Output) Hose Quick-Connect Fitting and Filter Removal and Installation (PN 56991)- 5000 and 10000 Full Scale PSI

Tools required:
5/8" open end wrench
3/4" open end wrench
13/16" open end wrench
A/R solvent (denatured alcohol)
tube fluorinated grease (PN 55593)

Removal

1. Loosen and unthread quick-connect fitting assembly (PN 55542) from test port hose using 3/4" and 5/8" wrenches.

   NOTE: Use PN 55280 as replacement for hose and quick-connect fitting. Use PN 59889 as replacement for hose only.

1. Remove cheat seal pad (PN 54854) from “AN” thread side of adapter fitting (PN 60803).
2. Place quick-connect fitting assembly in a vise using filter fitting (PN 59588) as clamping area.
3. Loosen and unthread quick-connect fitting (PN 59034) using 13/16” wrench.
4. Remove filter fitting (PN 59588) from vise.
5. While holding filter fitting (PN 59588) vertically, remove filter (PN 56991) and then O-ring (PN 55608) from filter fitting.
6. Inspect and clean parts in solvent (denatured alcohol) and blow-dry with compressed air. Replace worn or damaged parts with new ones.

Installation

1. Grease inside cavity on bottom flat, (none allowed in hole), of quick-connect fitting (PN 59034).
2. Grease O-ring seat groove area in filter fitting (PN 59588).
3. Grease both sides of O-ring (PN 55608). While holding filter fitting (PN 59588) vertically, place O-ring (PN 55608) and then filter (PN 56991) into filter fitting (PN 59588).
4. Thread quick-connect fitting (PN 59034) onto filter fitting (PN 59588).
5. Place filter fitting (PN 59588) in a vise and tighten quick-connect fitting (PN 59034) using 13/16" wrench.
6. Remove from vise.
7. Place a cheat seal pad, cheat seal pad (PN 54854) on “AN” part of assembly and thread into test port (output) hose. Tighten assembly using 5/8" and 3/4" wrenches.

7.2.20 Input Port Filter (PN 54188) Removal and Installation - 2500 Full Scale PSI

The port filter is a sintered element filter which is easily removed for inspection and cleaning.

Tools required:
Phillips screwdriver
7/16" open end wrench
9/16" open end wrench
A/R solvent (denatured alcohol)
SNOOP, of liquid leak gas detector (PN 64781)

Input Port Filter Removal

1. Remove cover from chassis as described in Section 7.2.1 on page 39, and carefully set on a bench top.
2. Loosen and remove the tubing end nut from the union (PN 59886).
3. Remove the filter from the port connector fitting (PN 59763).
4. Loosen and remove the tubing end nut from the input port bulkhead AN fitting (PN 59707) to remove the the port connector fitting if required.

   NOTE: Use PN 56223 for port connector fitting field replacement.

5. Clean the filter (PN 54188) in solvent (denatured alcohol) and blow-dry with compressed air.

Input Port Filter Installation

1. To reinstall, reverse the order of steps 2, 3 and 4 of the “Input Port Filter Removal” procedure above.
2. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
3. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.2.21 AC Fuse (PN 58076) - Removal and Installation

NOTE: See Figure 2-1 on page 3.

1. Disconnect the power cord from the power source and line filter. Remove the fuse holder at AC input.
2. Inspect fuse, if blown replace with π Amp 250 Volt, 20mm X 5mm diameter (PN 58076).
3. Replace the fuse holder at AC input.

7.2.22 Input Port Filter (PN 54188) Removal and Installation - 5000 and 10000 Full Scale PSI

The port filter is a sintered element filter that is easily removed for inspection and cleaning.

Tools required:
Phillips screwdriver
7/16" open end wrench
9/16" open end wrench
A/R solvent (denatured alcohol)
SNOOP, of liquid leak gas detector (PN 64781)

Removal

1. Remove cover from chassis as described in Section 7.2.1 on page 39, and carefully set on a bench top.
2. Loosen and remove the tubing end nut from the reducing tube fitting (PN 59830).
3. Loosen and remove the tubing end nut from the input port bulkhead AN fitting (PN 59707).
4. Remove the reducing tube fitting (PN 59830) and filter from the bulkhead AN fitting (PN 59707).
   NOTE: Use PN 54047 for reducing tube fitting field replacement.
5. Clean the filter (PN 54188) in solvent (denatured alcohol) and blow-dry with compressed air.

Installation

1. To reinstall, reverse the order of steps 2, 3 and 4 of the “Input Port Filter Removal” procedure above.
2. Using a pressure source set input pressure to approximately 100% of full scale rating of DLR3110 and check all fittings for leaks.
3. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.2.23 AC Fuse (PN 58076) - Removal and Installation

NOTE: See Figure 2-1 on page 3.

1. Disconnect the power cord from the power source and line filter. Remove the fuse holder at AC input.
2. Inspect fuse. If blown, replace with π Amp 250 Volt, 20mm x 5mm diameter (PN 58076).
3. Replace the fuse holder at AC input.

7.2.24 AC Power/EMI Line Filter (PN 58870) - Removal and Installation

Tools required:
Phillips screwdriver
1/4" open end wrench or nutdriver
A/R soldering iron
A/R shrink sleeving (PN 60735)
A/R heat gun

NOTE: See Figure 2-1 on page 3.

1. Disconnect the power cord from the power source and line filter. Remove cover from chassis as described in Section 7.2.1 on page 39, and carefully set on a bench top.
2. Remove the three cable connectors from the line filter terminals.

NOTE: Some units may not have connectors and will have to have wire leads unsoldered.

3. Loosen and remove the line filter retaining nuts on the rear of panel.

   NOTE: Some units may have screws on the front panel.

4. Remove the AC line filter through the panel front.
5. To install a new line filter, reverse the order of steps 1 through 4.

Connect (or solder) wires to the new line filter as follows:

- Green/Yellow wire to terminal (E) Ground
- Blue wire to terminal (N) Neutral
- Brown wire to terminal (P) Line

7.2.25 Power Switch (PN 58878) - Removal and Installation

Tools required: Phillips screwdriver
1 1/16" open end wrench
A/R soldering iron
A/R shrink sleeving (PN 64567)
A/R heat gun

NOTE: CPU Assembly and option boards may need to be removed to gain access.

Removal:

1. Disconnect the power cord from the power source and line filter. Remove cover from chassis as described in Section 7.2.1 on page 39, and carefully set on a bench top.
2. Loosen the switch mounting nut and lock washer from the rear of panel.
3. Loosen and remove the trim ring from the panel front.
4. Remove switch, lock washer and nut from rear of panel as one item.
5. Unsolder and remove the wires from the switch terminals.

Installation:

1. Slide shrink sleeving over wires, connect and solder the wires onto their respective switch terminals:

Terminal	Color
Normally open	Black
(C) common	Black

2. Pull shrink sleeving over switch and connections. Apply heat. Install the new switch, lock washer and nut through the panel rear as one item. Hand tighten the trim ring from front of panel.
3. Tighten the switch mounting nut and lock washer from the rear of panel.

⚠ Caution *Do not over tighten if using wrench. Doing so could result in damage to the switch.*

4. Install panel/chassis assembly in its enclosure as described in Section 7.2.1 on page 39.

7.3 ORION-2C Valve Assembly Parts List

Ref Number	PN	Description	Quantity
1	57482	Nut,Valve Needle Housing 9/16-18, Width Across Flats=.75,Thickness=.12	2
2	54401	Locknut	2
3	58079	Knob	2
4	57889	Insert knob	2
5	57256	Spur 40-tooth gear	2
6	59233	Spur 18-tooth gear	2
7	55896	Valve seat	4
8	59387	Stem valve seat	4
9	59045	Needle seat valve	4
10	54540	Valve needle housing	2
11	59551	Valve needle	2
12	57906	End bushing	1
13	59378	End cap	1
14	59495	Shaft	1
15	59241	Piston	1
16	55714	Dual valve body	1
17	57580	Knob	1
18	55533	Valve needle	2
19	55159	Valve needle housing	2
20	56784	Locknut,9/16-18UNF-3A, SST	1
21	59845	Expansion plug (1562 +.0000/-.0012 hole diameter)	14
23	59383	6-32NCx1/8 SST setscrew	4
24	58342	Cap hex socket head screw, #2-56UNC-3A Purchase per MIL Spec 16995-2	6
25	59322	6-32NCx1/4 SST setscrew	6
26	59326	2-56NCx1/8, alloy steel setscrew	4
27	55554	O-ring,AS568A Dash No 010, Buna N (Nitrile) 70 Durometer Color Black	5
28	55536	O-ring,AS568A Dash No 002, Buna N (Nitrile) 70 Durometer Color Black	4
29	55573	O-ring,AS568A Dash No 117, Buna N (Nitrile) 70 Durometer Color Black	1
30	60633	Retainer, Packing Backup , Single Turn Tetrafluoroethylene	4
31	55570	Washer, Backing .04 Thick, Tetrafluoroethylene Resin	4
32	55577	O-ring,AS568A Dash No 111, Buna N (Nitrile) 70 Durometer Color Black	1
33	59245	Washer,#8 Screw Size .187, ID x .440 OD x .040 Thick Nylon	2
34	60202	Hex setscrew	2
35	60837	MACH pan head screw (#10- 32NFx1/2 Phillips Head 300 Series SST)	2
36	58976	Self sealing screw (8-32 x 5/8 Modified to Print)	1
38	53308	Label Roll,1.25x1.25, Polytrans 3000 Void 3" Core 8" OD	1
41	59878	.005 thick Mylar spacer	2
42	59880	.007 thick Mylar spacer	2

Table 7-3. ORION 2-C Valve Assembly Parts List

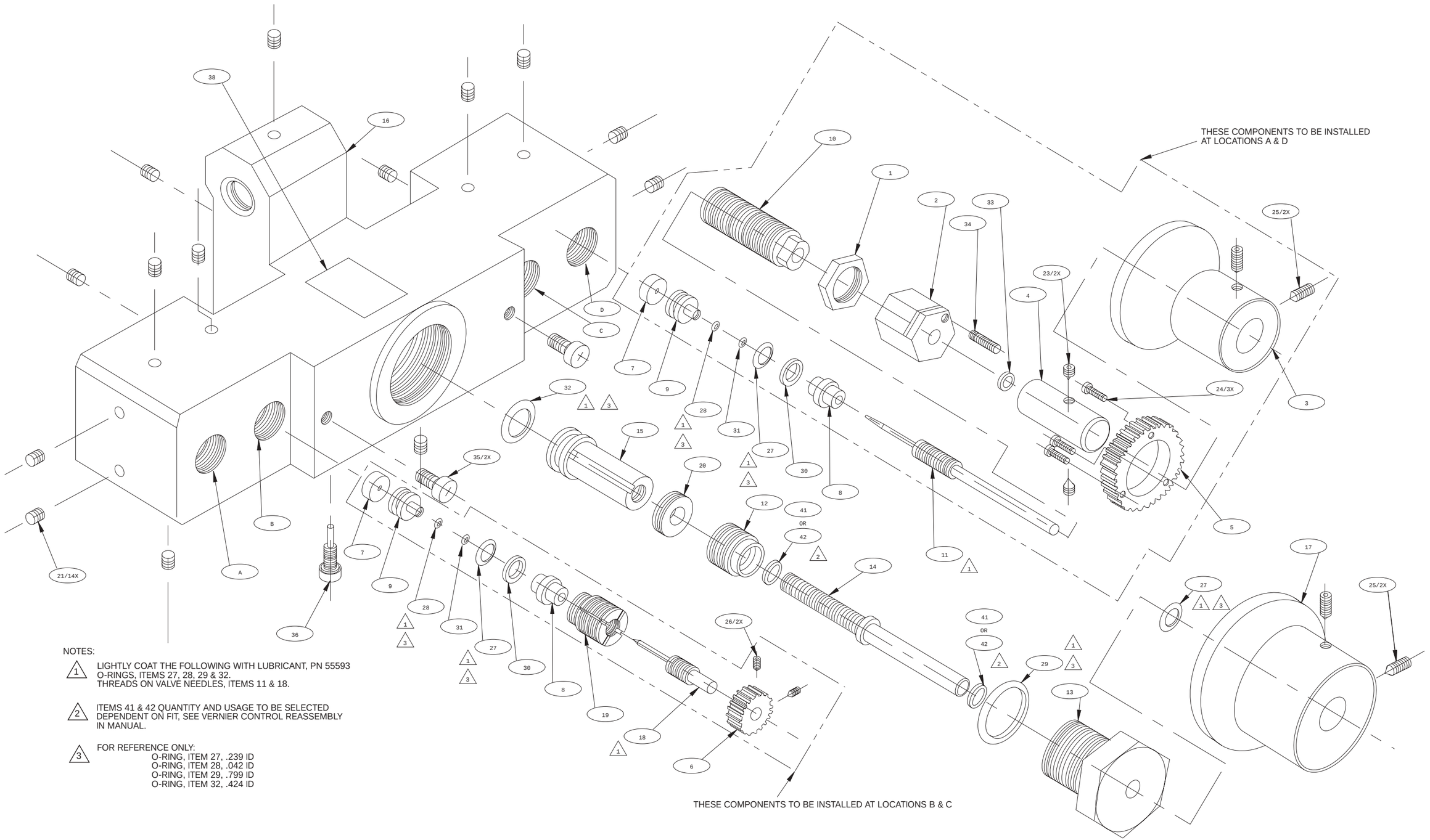


Figure 7-1. ORION-2C Exploded View

7.4 ORION-3A Valve Assembly Parts List

Ref Number	PN	Description	Quantity
1	57482	Valve needle housing nut	2
2	54401	Locknut	2
3	58079	Knob	2
4	57889	Insert knob	2
5	57256	Spur 40 tooth gear	2
6	59233	Spur 18-tooth gear	2
7	55896	Valve seat	4
8	59387	Stem valve seat	4
9	59045	Needle seat valve	4
10	54540	Valve needle housing	2
11	59551	Valve needle	2
12	57600	End bushing	1
13	58554	End cap	1
14	58699	Shaft	1
15	58597	Piston	1
16	59309	Dual valve body	1
17	57580	Knob	1
18	55533	Valve needle	2
19	55159	Valve needle housing	2
20	56784	Locknut,9/16-18UNF-3A, SST	1
21	58464	Setscrew,12-24NCx1/4 SST	14
22	58308	Tungsten carbide ball	14
23	59383	Setscrew,6-32NCx1/8 SST	4
24	58342	Screw,Cap Hex Socket Head, #2-56UNC-3A	6
25	59322	Setscrew,6-32NCx1/4 SST	6
26	59326	Setscrew,2-56NCx1/8, alloy steel	4
27	55569	O-ring, Fluorocarbon (Viton) color black w/white dot	5
28	55552	O-ring, Fluorocarbon (Viton) color black w/white dot	4
29	58090	O-ring, Fluorocarbon (Viton) color black w/white dot	1
30	60633	Packing backup retainer	4
31	55570	Backing washer	4
32	58045	O-ring, Fluorocarbon (Viton) color black w/white dot	1
33	59245	Nylon washer	2
34	60202	Hex setscrew	2
35	60837	Screw, MACH #10- 32NF SST	2
36	54905	Self sealing screw	1
38	57027	Backup washer	1
39	54448	Packing backup retainer	1
40	55615	O-ring, Fluorocarbon (Viton) color black w/white dot	1
41	58314	Ball, chrome, steel	32
42	59731	Male connector, 1/8 tube x 1/8 NPT, stainless steel	3

Table 7-4. ORION 3-A Valve Assembly Parts List

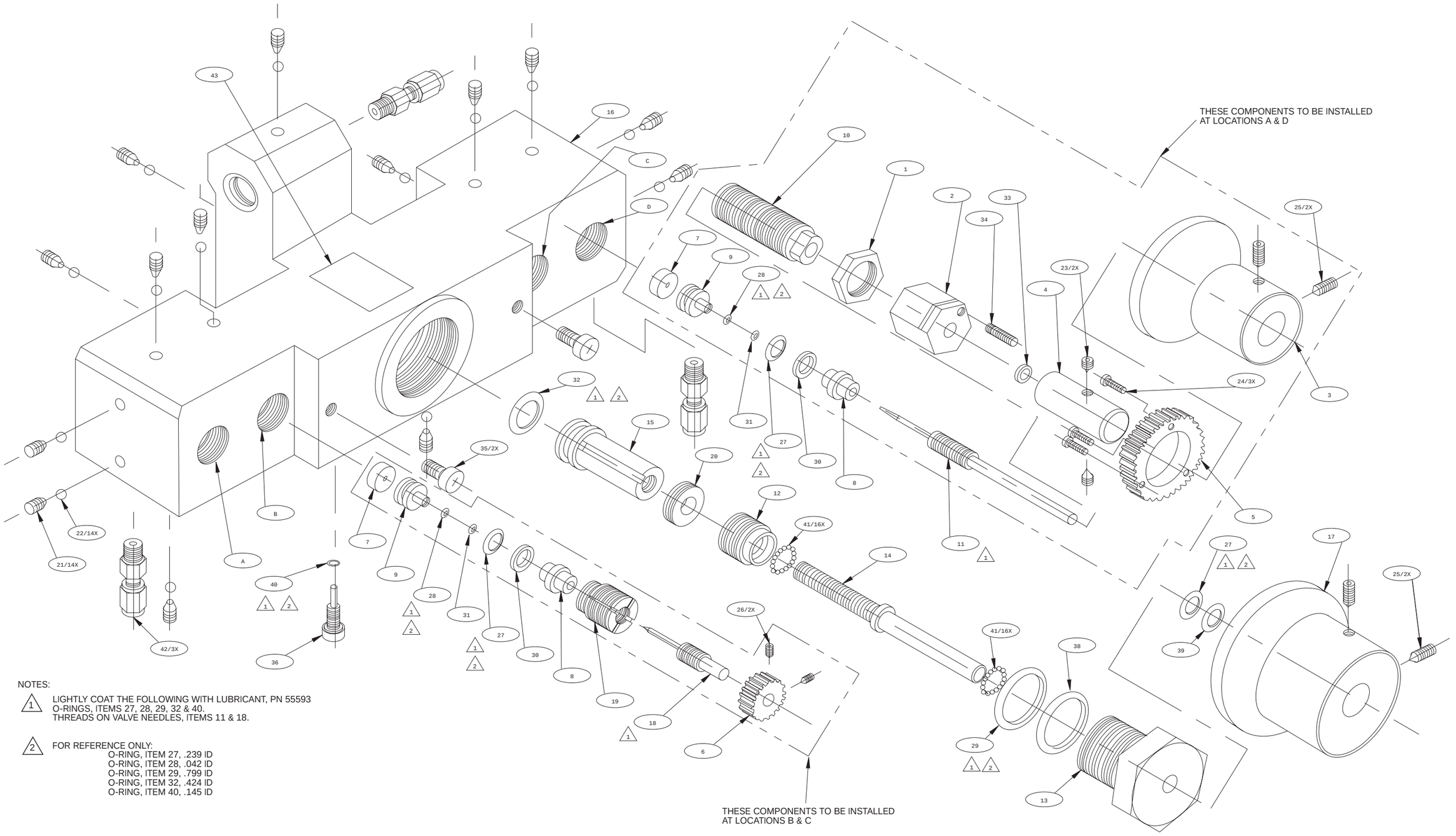


Figure 7-2. ORION-3A Exploded View

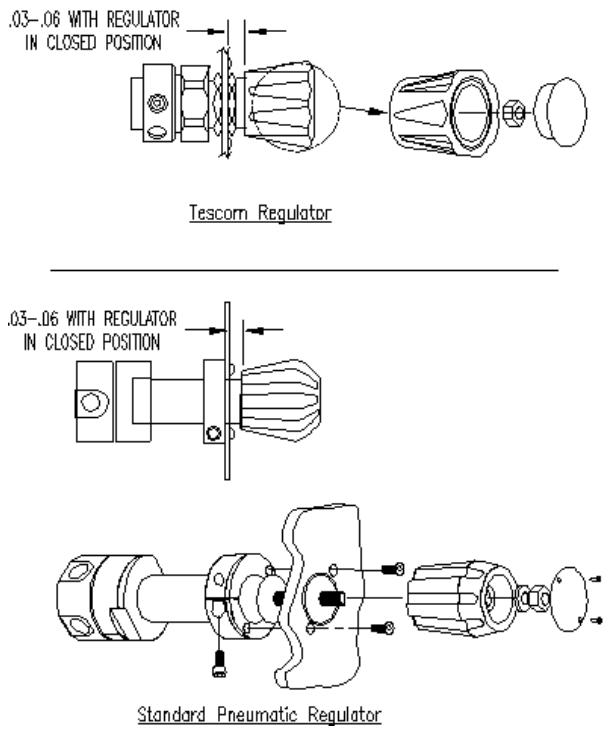


Figure 7-3. Tescom and Standard Pneumatic Regulator Mounting

8.0 Model Numbering System

DLR3110 - ____ ____ ____ ____ ____

MOUNTING

A - 19 in. Rack Mount

POWER REQUIREMENTS

A - 120 VAC Operation
D - 220 VAC Operation

PRESSURE RANGE

A - 0-3 PSIG	**K - 0-2500 PSIG**	**N - 0-15 PSIA**
B - 0-10 PSIG	**L - 0-5000 PSIG**	**P - 0-25 PSIA**
C - 0-15 PSIG	**M - 0-10000 PSIG**	**R - 0-50 PSIA**
D - 0-25 PSIG		**S - 0-100 PSIA**
E - 0-50 PSIG		**T - 0-250 PSIA**
F - 0-100 PSIG		**V - 0-500 PSIA**
G - 0-250 PSIG		**W - 0-1000 PSIA**
H - 0-500 PSIG		**Y - 0-2500 PSIA**
J - 0-1000 PSIG		**Z - 0-10000 PSIA**

ACCURACY

A - 0.05% Indicated value from 20% of full scale
B - 0.1% Indicated value from 20% of full scale
C - 0.25% Indicated value from 20% of full scale

OPTIONS

A – Standard unit which includes, multiple conversion units, min/max, freeze mode, RS232, RS422 and RS485
B – Standard unit plus two Relays and Setpoints option
C - Standard unit plus selectable scalable analog output 0-5VDC, 1-6VDC, 0-10VDC, 0-20mA, and 4-20mA
D - Standard unit plus parallel BCD output

NOTE: DLR3110 is available with test port on back of chassis.

9.0 Auto Selection Default Tables

Auto Selection (Gage) Default Table

Parameter	3 PSIG	10 PSIG	15 PSIG	25 PSIG	50 PSIG	100 PSIG	250 PSIG	500 PSIG
CAPACITY	3	10	15	25	50	100	250	500
CT-BY	0.0005	0.001	0.002	0.002	0.005	0.01	0.02	0.05
UNITS (Cal)	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
TYPE	GAGE	GAGE	GAGE	GAGE	GAGE	GAGE	GAGE	GAGE
CAL SPAN 1	0.3	1	1.5	2.5	5	10	25	50
CAL SPAN 2	0.6	2	3.0	5.0	10	20	50	100
CAL SPAN 3	0.9	3	4.5	7.5	15	30	75	150
CAL SPAN 4	1.2	4	6.0	10.0	20	40	100	200
CAL SPAN 5	1.5	5	7.5	12.5	25	50	125	250
CAL SPAN 6	1.8	6	9.0	15.0	30	60	150	300
CAL SPAN 7	2.1	7	10.5	17.5	35	70	175	350
CAL SPAN 8	2.4	8	12	20.5	40	80	200	400
CAL SPAN 9	2.7	9	13.5	22.5	45	90	225	450
CAL SPAN 10	3.0	10	15	25.0	50	100	250	500
HYSTERESIS	1.5	5	7.5	12.5	25	50	125	250
FILTR	5	5	5	5	5	5	5	5
DSP/SEC	3	3	3	3	3	3	3	3
ZERO %	2	2	2	2	2	2	2	2
ZERO+/-%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
AZM +/-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
MOTION	1	1	1	1	1	1	1	1
MIN PRES	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
MAX PRES	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
PSI	ON	ON	ON	ON	ON	ON	ON	ON
KPa	ON	ON	ON	ON	ON	ON	ON	ON
mmHg0•C	ON	ON	ON	ON	ON	ON	ON	ON
BAR	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
inHg0•C	ON	ON	ON	ON	ON	ON	ON	ON
mBAR	ON	ON	ON	ON	ON	ON	ON	ON
cmH_20	ON	ON	ON	ON	ON	ON	ON	ON
kg/cm^2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
inH_2060•F	ON	ON	ON	ON	ON	ON	ON	ON
inH_204•C	ON	ON	ON	ON	ON	ON	ON	ON
$ftseaH_20$	ON	ON	ON	ON	ON	ON	ON	ON
TORR	ON	ON	ON	ON	ON	ON	ON	ON
$metrsH_20$	ON	ON	ON	ON	ON	ON	ON	ON
PASCAL	ON	ON	ON	ON	ON	OFF	OFF	OFF
mmH_204^oC	ON	ON	ON	ON	ON	ON	ON	ON

Table 9-1. Auto Selection (Gage) Default Table (3 PSIG – 500 PSIG)

PARAMETER	1000 PSIG	2500 PSIG	5000 PSIG	10000 PSIG
CAPACITY	1000	2500	5000	10000
CT-BY	0.1	0.2	0.5	1
UNITS (CAL)	PSI	PSI	PSI	PSI
TYPE	GAGE	GAGE	GAGE	GAGE
CAL SPAN 1	100	250	500	1000
CAL SPAN 2	200	500	1000	2000
CAL SPAN 3	300	750	1500	3000
CAL SPAN 4	400	1000	2000	4000
CAL SPAN 5	500	1250	2500	5000
CAL SPAN 6	600	1500	3000	6000
CAL SPAN 7	700	1750	3500	7000
CAL SPAN 8	800	2000	4000	8000
CAL SPAN 9	900	2250	4500	9000
CAL SPAN 10	1000	5000	5000	10000
HYSTERESIS	500	1250	2500	5000
FILTR	5	5	5	5
DSP/SEC	3	3	3	3
ZERO %	2	2	2	2
ZERO+/-%	1.0	1.0	1.0	1.0
AZM +/-	0.5	0.5	0.5	0.5
MOTION	1	1	1	1
MIN PRES	OFF	OFF	OFF	OFF
MAX PRES	OFF	OFF	OFF	OFF
PSI	ON	ON	ON	ON
KPa	ON	ON	ON	ON
mmHg0•C	ON	ON	ON	ON
BAR	OFF	OFF	OFF	OFF
inHg0•C	ON	ON	ON	ON
mBAR	ON	ON	ON	ON
cmH_20	ON	ON	ON	ON
kg/cm^2	ON	ON	ON	ON
inH_2060•F	ON	ON	ON	ON
inH_204•C	ON	ON	ON	ON
$ftseaH_20$	ON	ON	ON	ON
TORR	ON	ON	ON	ON
$metrsH_20$	ON	ON	ON	ON
PASCAL	OFF	OFF	OFF	OFF
mmH_204•C	OFF	OFF	OFF	OFF

Table 9-2. Auto Selection (Gage) Default Table (1000 PSIG – 10000 PSIG)

Auto Selection (Absolute) Default Table

PARAMETER	15 PSIA	25 PSIA	50 PSIA	100 PSIA	250 PSIA	500 PSIA	1000 PSIA	2500 PSIA	10000 PSIA
CAPACITY	15	25	50	100	250	500	1000	2500	10000
CT-BY	0.002	0.002	0.005	0.01	0.02	0..05	0.1	0.2	1
UNITS (CAL)	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
TYPE	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS
CAL SPAN 1 REF	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1
CAL SPAN 2	1.5	2.5	5	10	25	50	100	250	1000
CAL SPAN 3	3.0	5.0	10	20	50	100	200	500	2000
CAL SPAN 4	4.5	7.5	15	30	75	150	300	750	3000
CAL SPAN 5	6.0	10.0	20	40	100	200	400	1000	4000
CAL SPAN 6	7.5	12.5	25	50	125	250	500	1250	5000
CAL SPAN 7	9.0	15.0	30	60	150	300	600	1500	6000
CAL SPAN 8	10.5	17.5	35	70	175	350	700	1750	7000
CAL SPAN 9	12.0	20	40	80	200	400	800	2000	8000
CAL SPAN 10	15.0	25	50	100	250	500	1000	2500	10000
HYSTERESIS	7.5	12.5	25	50	125	250	500	1250	5000
FILTR	5	5	5	5	5	5	5	5	5
DSP/SEC	3	3	3	3	3	3	3	3	3
ZERO %	2	2	2	2	2	2	2	2	2
ZERO+/-%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
AZM +/-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
MOTION	1	1	1	1	1	1	1	1	1
MIN PRES	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
MAX PRES	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
PSI	ON	ON	ON	ON	ON	ON	ON	ON	ON
KPa	ON	ON	ON	ON	ON	ON	ON	ON	ON
mmHg0•C	ON	ON	ON	ON	ON	ON	ON	ON	ON
BAR	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
inHg0•C	ON	ON	ON	ON	ON	ON	ON	ON	ON
mBAR	ON	ON	ON	ON	ON	ON	ON	ON	ON
cmH_20	ON	ON	ON	ON	ON	ON	ON	ON	ON
kg/cm^2	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
$inH_2060•F$	ON	ON	ON	ON	ON	ON	ON	ON	ON
$inH_204•C$	ON	ON	ON	ON	ON	ON	ON	ON	ON
$ftseaH_20$	ON	ON	ON	ON	ON	ON	ON	ON	ON
TORR	ON	ON	ON	ON	ON	ON	ON	ON	ON
$metrsH_20$	ON	ON	ON	ON	ON	ON	ON	ON	ON
PASCAL	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
$mmH_204•C$	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF

Table 9-3. Auto Selection (Absolute) Default Table

10.0 Conversion Factors

Conversion	Conversion Factor (PSI x)	Conversion Factor (PSI x)
PSI	1	1.000000e+00
Kpa	6.894757	6.894757e+00
mmHg 0˚C	51.7149	5.171490e+01
BAR	0.06894757	6.894757e-02
inHg 0˚C	2.0360	2.036000e+00
mBAR	68.94757	6.894757e+01
cmH_20	70.308	7.030800e+01
Kg/cm^2	0.070308	7.030800e-02
inH_2O 60˚F	27.71	2.771000e+01
inH_2O 68˚F	27.729	2.772900e+01
inH_2O 4˚C	27.68	2.768000e+01
$ftsea H_2O$	2.252	2.252000e+00
TORR	51.7149	5.171490e+01
$metrs H_2O$	0.7030696	7.030696e-01
PACAL	6894.757	6.894757e+03
mmH_2O 4˚C	703.07	7.030700e+02

Table 10-1. Conversion Factors

11.0 Options, Replacement Kits

There are numerous replacement part numbers mentioned throughout manual that may be ordered.

ORION-2C and ORION-3A O-Ring Replacement Kit (data sheet # 65308)

- Fluorocarbon “Viton” (standard for ORION-3A).....PN 55277
- Nitrile Buna-N (standard for ORION-2C).....PN 58499
- Ethylene-Propylene.....PN 58506
- Silicone .....PN 58509
- Neoprene.....PN 58515

  NOTE: A small coating of fluorinated Krytox grease, (PN 55593), should be applied to both sides of O-ring prior to installation.

- Pressure Trap

  100 PSI full scale ranges and below (data sheet # 58621) .....PN 58487

  250, 500, 1000 or 2500 PSI full scale range (data sheet # 58609) .....PN 58483

  5000 or 10000 PSI full scale range (data sheet # 58596) .....PN 58478

- Test Port (output) quick-disconnect male hose fitting

  100 PSI full scale ranges and below .....PN 60195

  250, 500, 1000 or 2500 PSI full scale range.....PN 55394

  5000 or 10000 PSI full scale range.....PN 55542

Test Port (output) hose, with quick-disconnect male fitting:

- 100 PSI full scale ranges and below 5’ long..... .....PN 60195, 55251 (1 each)
- 250, 500, 1000 or 2500 PSI full scale range 5' long .....PN 55279
- 250, 500, 1000 or 2500 PSI full scale range 10' long.....PN 55300
- 250, 500, 1000 or 2500 PSI full scale range 15' long.....PN 55304
- 250, 500, 1000 or 2500 PSI full scale range 20' long.....PN 55310
- 5000 or 10000 PSI full scale range 5' long .....PN 55280

  NOTE: Model may be ordered with Test Port mounted on rear of unit for additional charge.

12.0 Specifications

Pressure Specifications:

Pressure range:	See Section 8.0 on page 62 for available ranges
Available pressure calibrations:	Gage only or Absolute only
Overall accuracy:	0.05% of reading, or 0.1% of reading, or 0.25% of reading all from 20% of full scale and above. Includes all effects of linearity, hysteresis, repeatability and ambient temperature. Accuracy statement includes all effects of linearity, hysteresis, repeatability and ambient temperature
Operating Temperature:	+40° to +140°F (+4.4° to +6 0.0° C)
Storage Temperature:	0° to +185° F (–17.8° to +85°C)
Pressure Media:	Any clean dry gas compatible with 17-4PH stainless steel

***Pressure Limit Gage:**

Size:	2-in. diameter
Range:	Based on model
Test Pressure:	1.5 times range

Pressure Media Filter:

Rating:	20 microns, Test Port, Input Port
Type:	Field replaceable

Orion Control Valve:

Type:	Micro-metering with replaceable soft seat
Material:	Orion-2C: Aluminum body Orion-3A: Stainless Steel body Clear anodized Aluminum knobs, black anodized All other parts 300 series stainless steel

***Over-pressure Rupture Disk:**

Rating:	3000 PSIG, nominal
Type:	Stainless steel outer case

*Relief Valve:

Type:	Adjustable, atmospheric bleed
Setting:	Adjustable to 10% above highest calibrated pressure
Material:	300 series stainless steel

Vent and Input Port:

Style:	1/4" 37° AN male
Pressure Rating:	Based on model
Material:	Brass or Stainless Steel

Pressure Hoses:

Quantity Supplied:	One output

***Pressure Limit Control Regulator:**

Type:	Single stage, self-venting, non-bleed
Pressure Rating:	3000 PSIG max. inlet

Internal Pressure Sensor:

Type:	Bonded, metal foil strain gage, sputtered thin-film or equivalent.
Sensitivity:	30 mVfs
Construction:	Completely weld-sealed stainless steel outer body and pressure cavity

Physical Specifications:

Weight:	19 lbs. including all hoses and cables
Color:	Dark tan
Case Dim's:	19" wide x 9" deep x 7" high

(Case dimensions excluding front handles)

*Not required on 5000 or 10000 PSI models.

DLR3110 Warranty and Return Policy

If possible, please save original packing material, which is specifically designed for the unit. Should it be necessary to ship the unit back to the factory, a suitable shipping container must be used along with sufficient packing material. Do not put a shipping label on the unit as a "suitable shipping container." Some units have been severely damaged this way. This is a delicate, precision instrument. Any damage incurred because of poor packaging procedures will ultimately result in added service charges and longer turn-around times.

Warning *Vent all pressure lines before shipping.*

When factory service is required, send only the unit in for repair. Retain fittings, manuals, etc. at your facility. However, if there is a problem with a particular part, send in that part with the unit.

If a unit is found to be defective, it may be returned to our repair facility at the following address:

CONDEC
3 SIMM LANE
DOOR D, UNIT 2A
NEWTOWN, CT 06470

ATTN: PRESSURE PRODUCTS/REPAIR LAB

Each unit's I.D. plate is stamped with a date code (week/year) prior to shipment. Our warranty is twelve (12) months from that date code and includes repair and/or replacement of the unit at our, Newtown facilities at no charge. Units subjected to abuse or damaged by external influences, are not covered under warranty.

If the unit is found to be out of warranty, an evaluation charge of not less than fifty (U.S.) dollars ($50.00) will be charged. Please note on any attached paperwork if a repair estimate is required or if there are any other specific instructions.

Please be explicit as to the nature of the problem and/or its symptoms. Your documentation will save needless time and expense. Also, please include a return shipping address (with a street address) and a contact name with fax and telephone numbers. Contact numbers are necessary to provide a job estimate and in case further questions arise at the factory.

DLR3110 Return Material Authorization Form

The repair lab is also equipped to do calibrations on our calibrators and pressure standards. Calibrations include a certification and are traceable to NIST.

COMPANY NAME: STREET: CITY, STATE, ZIP: TELEPHONE: FAX: CONTACT PERSON:
MODEL NUMBER:_____ SERIAL NUMBER: _____
PROBLEM WITH UNIT (PLEASE BE SPECIFIC):
IS THIS A WARRANTY REPAIR? ( ) YES ( ) NO
SHIP TO Address: COMPANY NAME: STREET: CITY, STATE, ZIP: ATTN:

CONDEC • 3 SIMM LANE • DOOR D, UNIT 2A • NEWTOWN, CT 06470
ATTN: PRESSURE PRODUCTS/REPAIR LAB
TEL: 888-295-8475 • FAX: 203-364-1556 or 715-234-6967
WEB SITE: www.4condec.com