

L1095 Rev. O 09/99

#### 1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is not covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

#### SAFETY FIRST

#### 2.0 SAFETY ISSUES



Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.



**WARNING:** Wear proper personal protective gear when operating hydraulic equipment.



**WARNING: Stay clear of loads supported by hydraulics.** A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.



**WARNING: USE ONLY RIGID PIECES TO HOLD LOADS.** Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.



**DANGER:** To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.



**WARNING:** Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes



equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 700 bar [10,000 psi]. Do not connect a jack or cylinder to a pump with a higher pressure rating.



**Never** set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.



**WARNING:** The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.



**CAUTION:** Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.



**Do not** drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.



**IMPORTANT:** Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.



**CAUTION: Keep hydraulic equipment away from flames and heat.** Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65 °C [150 °F] or higher. Protect hoses and cylinders from weld spatter.



**DANGER: Do not handle pressurized hoses.** Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.



**WARNING:** Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.



**WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD.** Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.



**Avoid** situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.



Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.



**IMPORTANT:** Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.



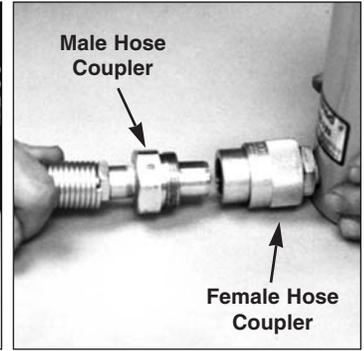
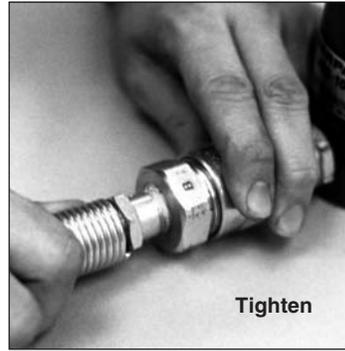
**WARNING:** Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.



**CAUTION:** Avoid excessive force when tightening the adapter to the transducer. Excessive tightening will affect gauge readings. Use 30 ft. lb. torque.



**WARNING:** Transducers are rated for an operating pressure of 10,000 psi. with a proof pressure if 15,000 psi. Operation above 15,000 may damage the transducer and void the warranty.



**Check all coupler and hose connections for damage or leaks due to loose fittings. A loose coupler or hose connection will restrict fluid flow, resulting in loss of efficiency and correct gauge readings.**

### 3.0 COMMON GAUGE FEATURES

Pressure Range	0 - 10,000 psi
Accuracy	± 0.5% Full Scale (at room temperature)
Low Frequency Filter	2 Hz
Din Case	Panel or Table Mounted
Operating Temperature Range	30°F / -1.1°C to 130°F / 54.4°C
Power Source	115V / 230V AC Power Supply
Accessories	Mounting Bracket (not for DGL-1) Screwdriver (adjustments) Rubber Mounting Feet Transducer (serialized) and checked to ensure calibration

### 4.0 DESCRIPTION

#### 4.1 Basic Pressure Gauge, Model DGB

Used to monitor and display system hydraulic pressure. The display readings range from 0 to 10,000 psi in increments of 10 psi. The gauge can be mounted on a bracket or in a system panel.

A 2Hz filter is built into the gauge to ensure stable readings by damping pressure pulsations which are less than .5 seconds in duration.

The basic gauge has one external adjustment for setting the display. A external "zero set" screw (**A**) is located in the face plate (Figure 1) and is adjusted with the screwdriver supplied.

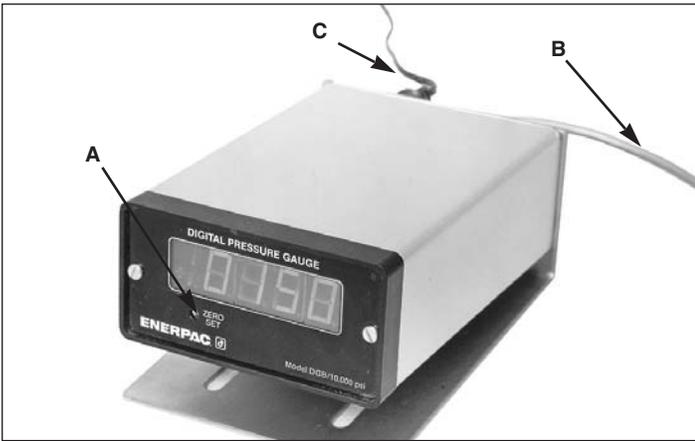
A 0 to 10,000 psi transducer with a 15-foot (4,5m) cord (**B**) and a 115V or 230V A.C. power transformer (**C**) are supplied with each gauge. As an option, 30 feet (9m) of transducer cord can be used without affecting gauge performance. Transducer cords longer than 30 feet (9m) require gauge re-calibration. For information regarding cord length and calibration, contact an Enerpac Technical Service Center.

### Shunt Cal. Reference Reading

Factory Set for Matching Gauge and Transducer

Gauge Serial No. \_\_\_\_\_

Transducer Serial No. \_\_\_\_\_



**Figure 1, Basic Pressure Gauge, Model DGB**

A serial number is marked on each gauge. The transducer packed with the gauge is also serialized. A tag on the transducer cord is stamped with the last two digits of the gauge serial number. Gauges and transducers must be used as a matched set to maintain  $\pm .5\%$  accuracy.

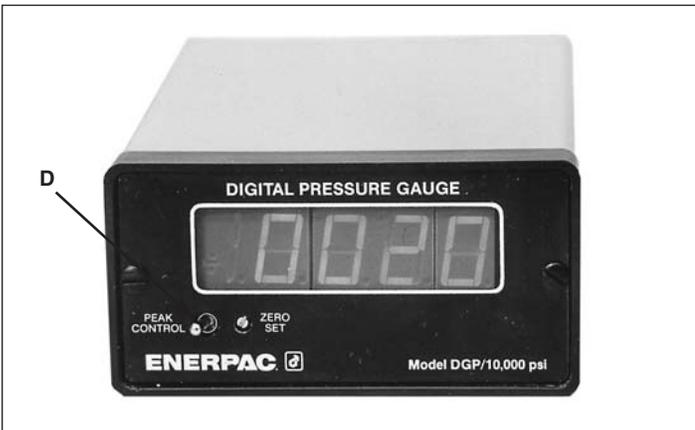
**NOTE:** A plastic bag (packed with gauges) contains the transducer adapter and o-ring seal. Install the o-ring on the smaller ( $7/16-20$  UNF) threaded side of the adapter. Install the adapter in the transducer, use 30 ft. lbs. of torque. The larger adapter threads are  $1/4-18$  N.P.T.F.

#### 4.2 Peak Indicating Gauge, Model DGP

Peak indicating gauges are used to either track system pressure or indicate peak system pressure. A two-position toggle switch (D) on the gauge face plate, selects which function the gauge performs.



**CAUTION:** Resetting peak (or switching to Peak Mode from Basic) when at any pressure other than zero psi will result in an inaccurate peak pressure reading until the gauge display value is exceeded.



**Figure 2, Peak Indicating Gauge**

A 2Hz filter is built into the gauge to ensure stable readings by damping pressure pulsations which are less than .5 seconds in duration.

The display reading can be zeroed for the pressure tracking function. An external "zero set" screw is located in the face plate and is adjusted with the screwdriver supplied.

A mounting bracket is provided or the gauge can be mounted in a panel. See 5.0 Mounting Gauges.

Each gauge is serialized and each transducer is marked with the last two digits of the same serial number. Use the gauge and transducer as a matched set. If the transducer is damaged or changed for any reason, the gauge will require calibration. Contact an Enerpac Technical Service Center.

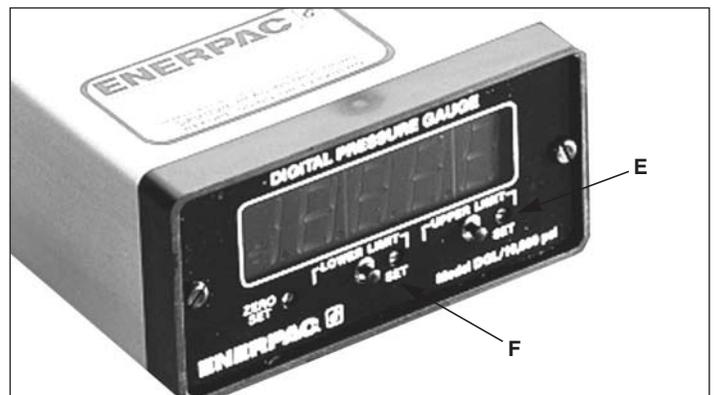
#### 4.3 Dual Limit Control Gauge, Model DGL

Dual limit gauges display basic pressure and can display pre-set upper (E) and lower (F) pressure limits.

A terminal block on the rear panel can be used for wiring external control devices to aid in maintaining and monitoring system pressure.



**CAUTION:** The gauge is not a pressure regulating device, but is strictly a monitoring unit capable of activating electronic circuits in other components.



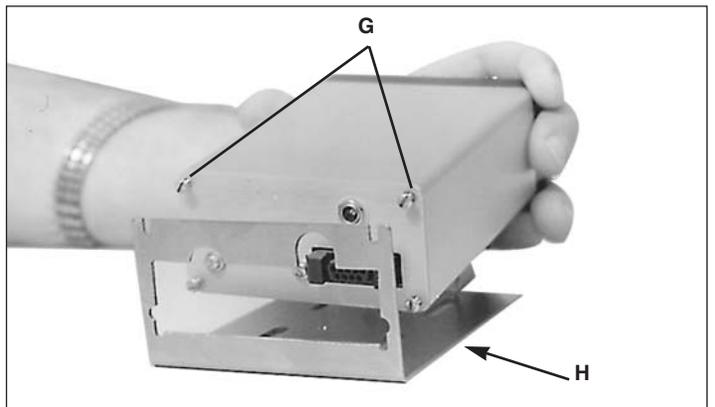
**Figure 3, Dual Limit Gauge**

The terminal block can be wired to control starting and stopping a pump, shifting a valve, sound alarms or activate a light when pressure deviates from pre-set limits. Current switching capacity is 1.5 amp at 120V AC or 240V AC.

### 5.0 MOUNTING GAUGES

#### 5.1 Bracket Mounting: Basic DGB and Peak DGP Models Only

1. Remove four rear panel mounting screws (G).
2. Position the bracket over the rear panel (H) and reinstall the screws.



**Figure 4, Bracket Mounting**

## 5.2 Panel Mounting – All Models

1. Remove two circuit board mounting screws (I) from the rear panel. Remove four rear panel mounting screws (J). Pull the circuit board out of the gauge.

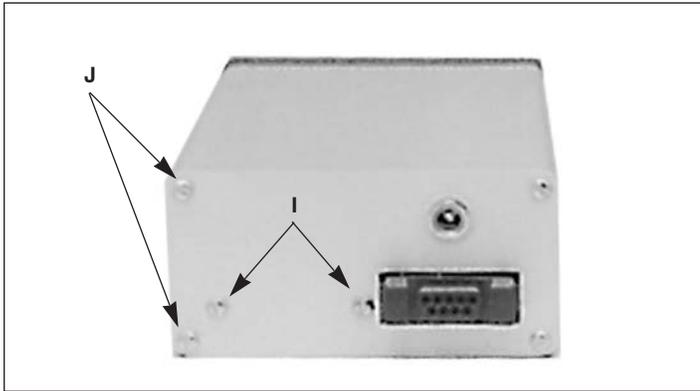


Figure 5, Rear Panel Removal

2. Insert the two circuit board mounting screws in the rear panel (K). Place a 1/8" washer (supplied in plastic bag) on each screw. With the screws in the rear panel, align the screws with the circuit board mounting pads (L). Tighten the screws.

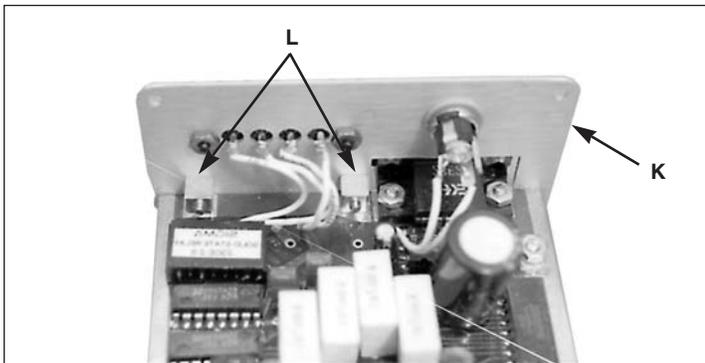


Figure 6, Circuit Board Mounting Pads

 **CAUTION:** To Avoid damaging the circuit board, the rear panel must remain off until the front bezel is removed.

3. Remove the face plate (M) (2 screws) and the front bezel (N) (4 screws).
4. Install the rear panel and circuit board using the four self-tapping screws.



Figure 7, Face Plate and Bezel Removed

5. System panel cutout dimensions are shown in Figure 8.

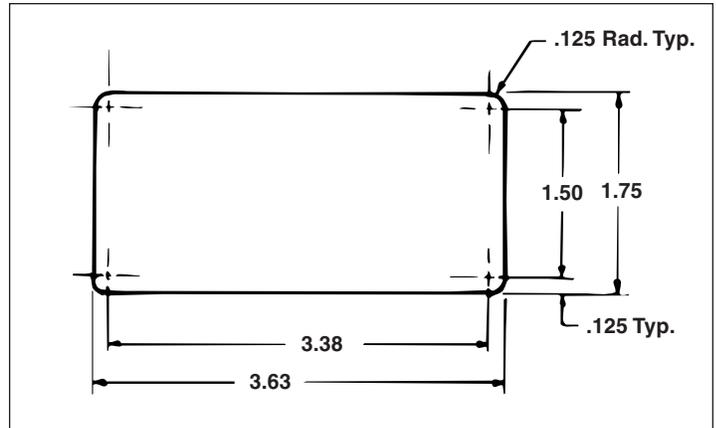


Figure 8, Panel Cutout Dimensions

6. Position the gauge (O) behind the panel (P). Install the gauge bezel (Q) in front of the panel, secure with four screws. Refer to Figure 9. Maximum panel thickness is 1/8 inch. Attach the face plate (R) (2 screws).

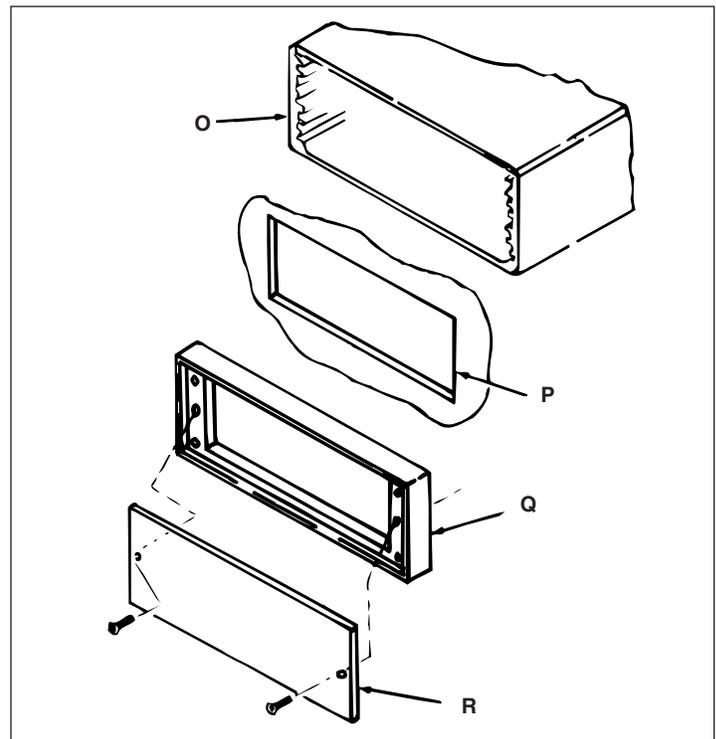


Figure 9, Mounting Gauge in a Panel

7. Attach the transducer to gauge rear panel. Attach the transducer to the equipment using 1 1/2 lap of Teflon tape on the threads. Do not over-tighten. Excessive tightening will damage the fitting.
8. Attach the power supply to the gauge and plug into a 115V/230V AC outlet, depending on transformer being used.

 **CAUTION:** Do not disconnect the transducer when power is being supplied to gauge. This could cause serious electrical damage to the internal components of the gauge.

## 6.0 ADJUSTMENTS

**NOTE:** Varying air temperatures will affect gauge readings. For consistent accuracy, gauge adjustments should be made at the same temperatures in which the gauge will be operating in.

### 6.1 Zero Set

All gauges should be "zeroed" prior to use. A "zero set" adjustment screw is located in the face plate of each gauge (Figure 10). The zero adjustment is to set the display to all zeros at the beginning of each application, with no pressure on the system. Zero adjustment does not calibrate the gauge but does ensure accurate pressure readings by removing non-pressure related inputs which may affect display readings.



Figure 10, Zero Set Adjustment

To adjust zero set, attach the power supply and attach the transducer to the gauge and hydraulic fitting. (On peak limit gauges, move toggle switch to left.) Allow 15 minute gauge warm-up and ensure system pressure is at zero. Turn the screw until the display reads all zeros.

**NOTE:** Due to climactic variations and minor electrical inputs, an absolute zero may not be obtainable.  $\pm 10$  psi is tolerable for most applications.

### 6.2 Two Position Switch — Peak Limit Gauges Only (DGP)

The toggle switch (S) elects the gauge operating mode for either straight pressure tracking (switch left) or peak pressure indicating (switch right). In the peak mode, the gauge will display the highest system pressure and hold it for approximately 10-15 minutes, then decay at 10 psi per 15 minutes.

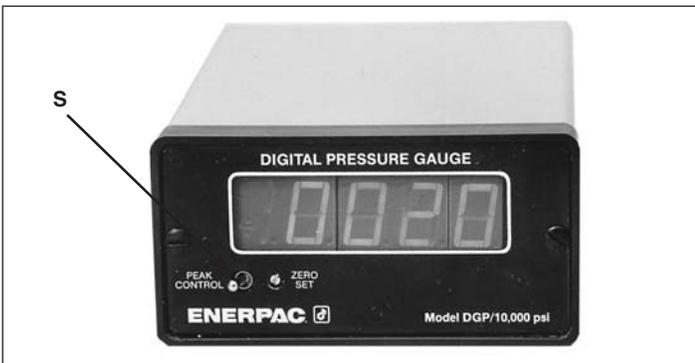


Figure 11, Peak Indicating Gauge

To cancel the peak pressure reading and reset for another display, move the toggle switch left then back to right.

### 6.3 Upper and Lower Limits — Dual Limit Gauges Only (DGL)

Prior to limit adjustments, connect the power supply and the transducer. Allow 15 minutes for gauge warm-up.

Pre-set an upper and/or lower limit (T) by holding the appropriate pushbutton and turning the corresponding set screw (U) until the desired psi limit is displayed. A red light will come on when the output limit contact is closed. The limit contacts reset at 80 psi below the pre-set limit.



Figure 12, Dual Limit Gauge

Two solid state, zero crossing triac outputs are programmable to simulate normally open or normally closed limit contacts. Two jumper plugs (V) are movable for selecting the open or closed condition.

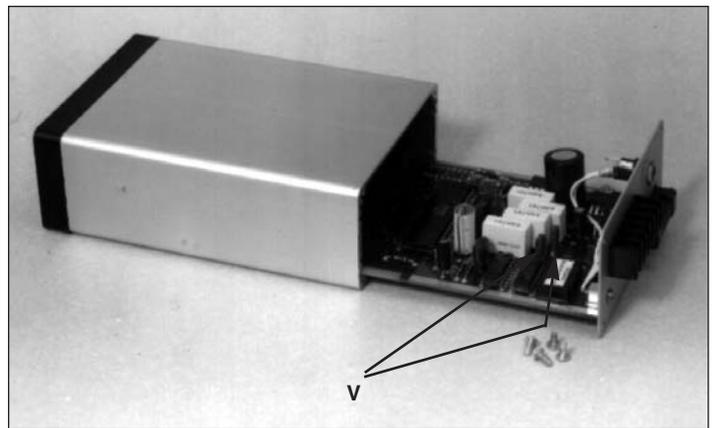


Figure 13, Jumper Plugs

The jumper plug location determines when the red indicator light comes on to interact with the pre-set limits.

Jumper plugs are changed by removing the gauge rear panel and sliding the circuit board out of the case.

Lift the plug off the pins and move one pin over (Figure 14). The center pin is always used. Moving the plug changes the limit contact to normally closed and changes the limit indicator light to stay on until pressure limit is reached, then goes off (Figure 15).

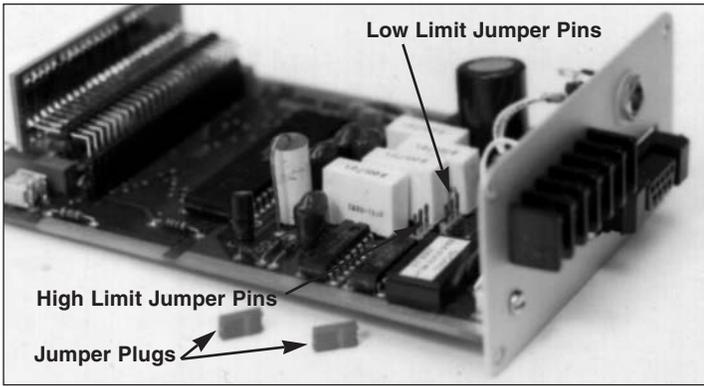


Figure 14, Jumper Plug Pins

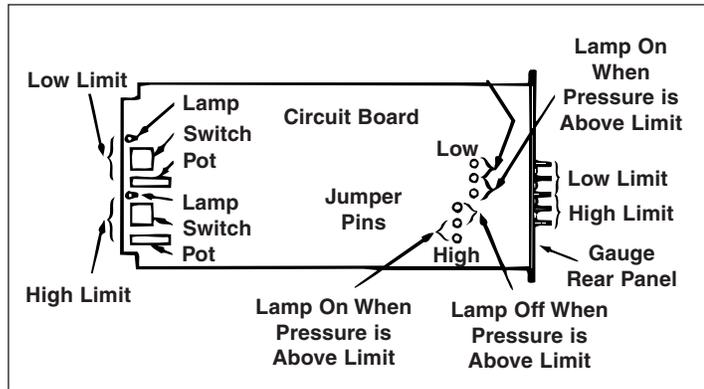


Figure 15, Switch Positions

### 6.3 Rear Terminal Block Wiring (Dual Limit Gauges Only)

Terminals on the rear panel are used to wire a solenoid, a valve or other external circuits which function with the high and low limits switches in the gauge.

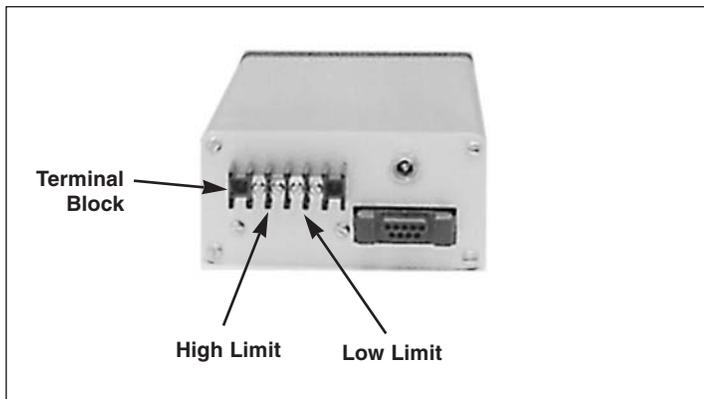


Figure 16, Terminal Block

The upper and lower limit switches aid in maintaining system pressure within the pre-set range by controlling the starting and stopping of a pump or shifting a valve.

Samples of control circuits which can be wired to the gauge are shown in Figure 17. An external AC power source is required.



**CAUTION:** Terminal Block must be enclosed if it is wired to a control circuit. Consult local wiring codes for proper enclosure requirements.

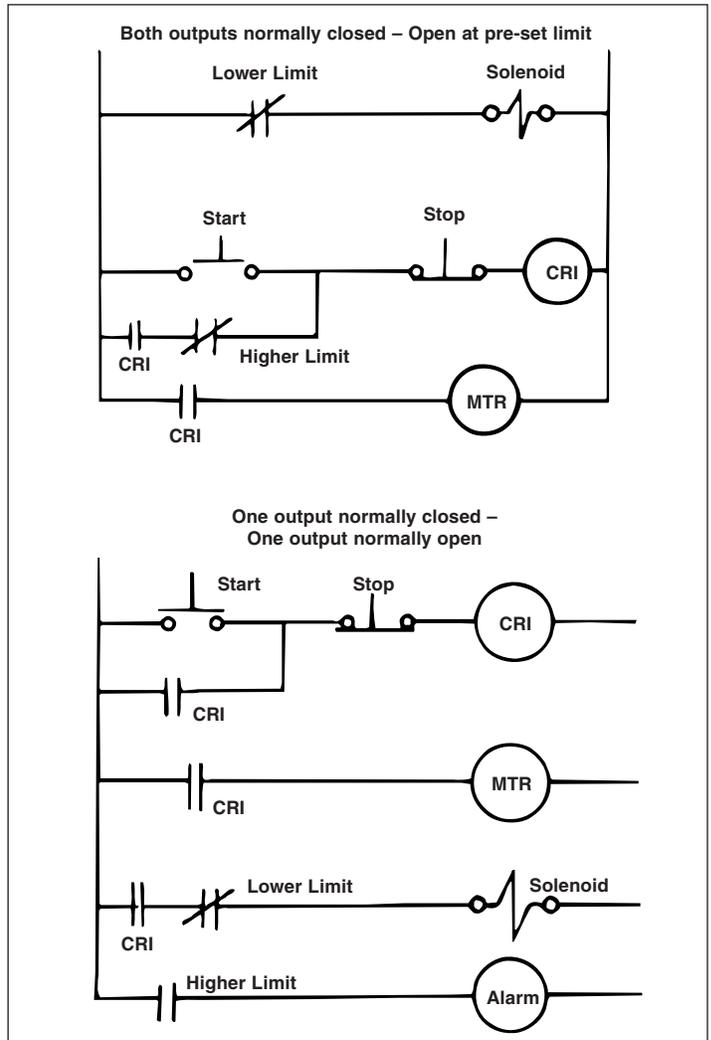


Figure 17, Gauge Circuit Samples

## 7.0 CALIBRATION

### 7.1 Span Adjustment

- Span adjustment is factory set at  $\pm .5\%$  accuracy for the gauge and transducer with matching serial numbers. The shunt cal. switch (Figure 18) can be used as a spot check for calibration settings.
- Allow 15 minutes for gauge warm-up. With zero pressure to the transducer, perform the zero set adjustment (see page 5).
- Remove the face plate. Press the shunt cal. switch ( **V** Figure 18) and compare the display value with the reference value shown on inside front cover of this instruction sheet. If the display value varies by more than the  $\pm .05\%$  from the reference value, the gauge must be re-calibrated.

- If the gauge and transducer are a matched set (check gauge serial number and transducer cord) the gauge can be re-calibrated. Press the shunt cal. switch (V) and turn the span adjustment screw (W) until display value matches the reference value.

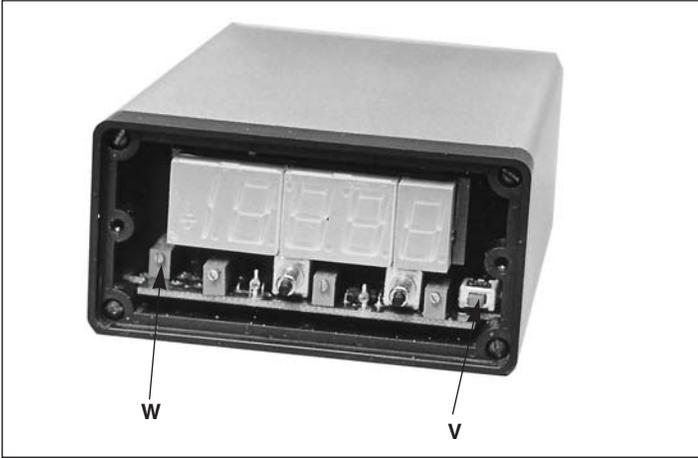


Figure 18, Shunt Cal. Switch

- Gauges and transducers which are not a matched set, must be re-calibrated using the dead weight tester method described in 7.2 Calibrating Gauge Using Dead Weight Tester.

### 7.2 Calibrating Gauge Using Dead Weight Tester

- Calibration is checked at the factory but anytime accuracy is questionable or as a routine maintenance measure, the dead weight test should be performed. Also anytime a new transducer is used with an existing gauge or a new gauge is used with an existing transducer, the dead weight test must be performed to establish calibration.
- Connect the power supply. Attach the transducer to the gauge and the dead weight tester. Transducer to fitting uses teflon tape.
- Remove the gauge front face plate. Check and adjust zero set (see page 5).

**NOTE:** Do not use excessive force when tightening the hydraulic fitting to the transducer adaptor.

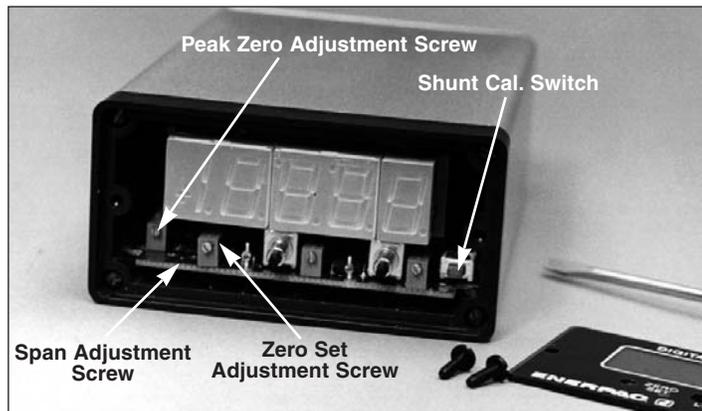


Figure 19

- Apply a load (10,000 psi) to the tester. Check the gauge reading, it should match the load value. If not, adjust the span adjusting screw until the display is correct (Figure 19).
- As a result of the dead weight test, the gauge electronics has established a new transducer input value. To determine the new value reduce load to zero psi and press Shunt Cal. switch. The numbers displayed are the new values and represent a calibration reference used to check the gauge electronics and transducer output whenever necessary. Record the new numbers on the inside front page of this instruction sheet. Cross out the original set of numbers.
- All future calibration checks (checked by pressing shunt cal.) should result in the recorded numbers. If not, the gauge must be re-calibrated using the calibration procedures on page 5.

### 7.3 Peak Zero Adjustment (Peak Limit Gauges Model DGP — Only)

- The peak limit gauges should display all zeros when the peak control switch is moved from left to right position and no pressure applied. If the display shows anything else adjust the peak zero adjustment screw (Figure 19).
- Remove the face plate. Connect the power supply and the transducer. With no pressure on the system, adjust the speak zero adjusting screw (furthest adjusting screw on left side, Figure 19) until gauge reads all zeros with toggle switch in right position.

### 8.0 SERVICE INFORMATION

The only services performed by the user are the adjustments and calibrations described in this instruction sheet. For all other repairs the gauge along with the power supply and transducer should be returned to an authorized Enerpac Technical Service Center.

All gauges and transducers are serialized and must be used as matched sets. For completely calibrated and dedicated gauges, contact an Enerpac Technical Service Center.

All gauges and accessory items are warranted for one year from the purchase date. Contact Enerpac for more details.

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