

POSITION TRACKING SYSTEMS INC.

POSI-STOP

INSTALLATION AND OPERATING

MANUAL



POSI-STOP

WWW.POSI-STOP.COM

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ABBREVIATIONS AND TRADE NAMES

B3, C2	Size number used by Eaton Co. to indicate the size of the rotor threads and the passage way.
Block	Refers to the travelling block on a drilling rig.
LED	Light Emitting Diode.
NPT	National pipe tapered - refers to thread type.
POSI-STOP	A product of Position Tracking Systems Inc., designed to limit the movement of the travelling block on a drilling rig.
PTS	Position Tracking Systems Inc.
Rotorseal	Eaton Co. trademark name for a rotating union which passes such media as air, or oil.
UNF	Unified national fine - refers to thread type.
UNS	Unified national special - refers to thread type.

SECTION 1 - INSTALLATION

1.1 Introduction

The PTS Block Limit Control System (POSI-STOP) is a solid-state electronic control instrument, which restricts movement of the travelling block on a drilling rig within preset upper and lower limits. Both digital and graphic displays provide the operator with the position of the block in the derrick.

The POSI-STOP is designed for fast and simple installation. For proper operation, ensure that all components are correctly mounted and that all pneumatic and electrical connections are secure.

1.2 Mounting Instructions

The System consists of the following components, which must be mounted in appropriate locations (Figure 1.1):

1. Control / Display Console
2. Signal generator
3. Solenoid operated pneumatic valve

1.2.1 Control / Display Console

The control / display console incorporates two displays that indicate the position of the block to the driller. It also controls the drawworks by activating a solenoid air valve, which applies the brake and disengages the drawworks clutch and throttle when the block travels past either the preset upper or lower limit. A bypass switch enables the driller to override the limit controls and allows the block to move past the upper or lower limits. A Zoom switch is provided that allows the driller to precisely locate block position for accurate control where limited clearance or poor visibility conditions exist.

The control / display console must be mounted in a location where the driller can see the display at a glance while operating the rig. Access to the control / display console is required when the System is programmed or when the driller is required to bypass either the upper or lower limit. Eight (8) mounting holes (1/4") are provided.

CONTROL / DISPLAY CONSOLE

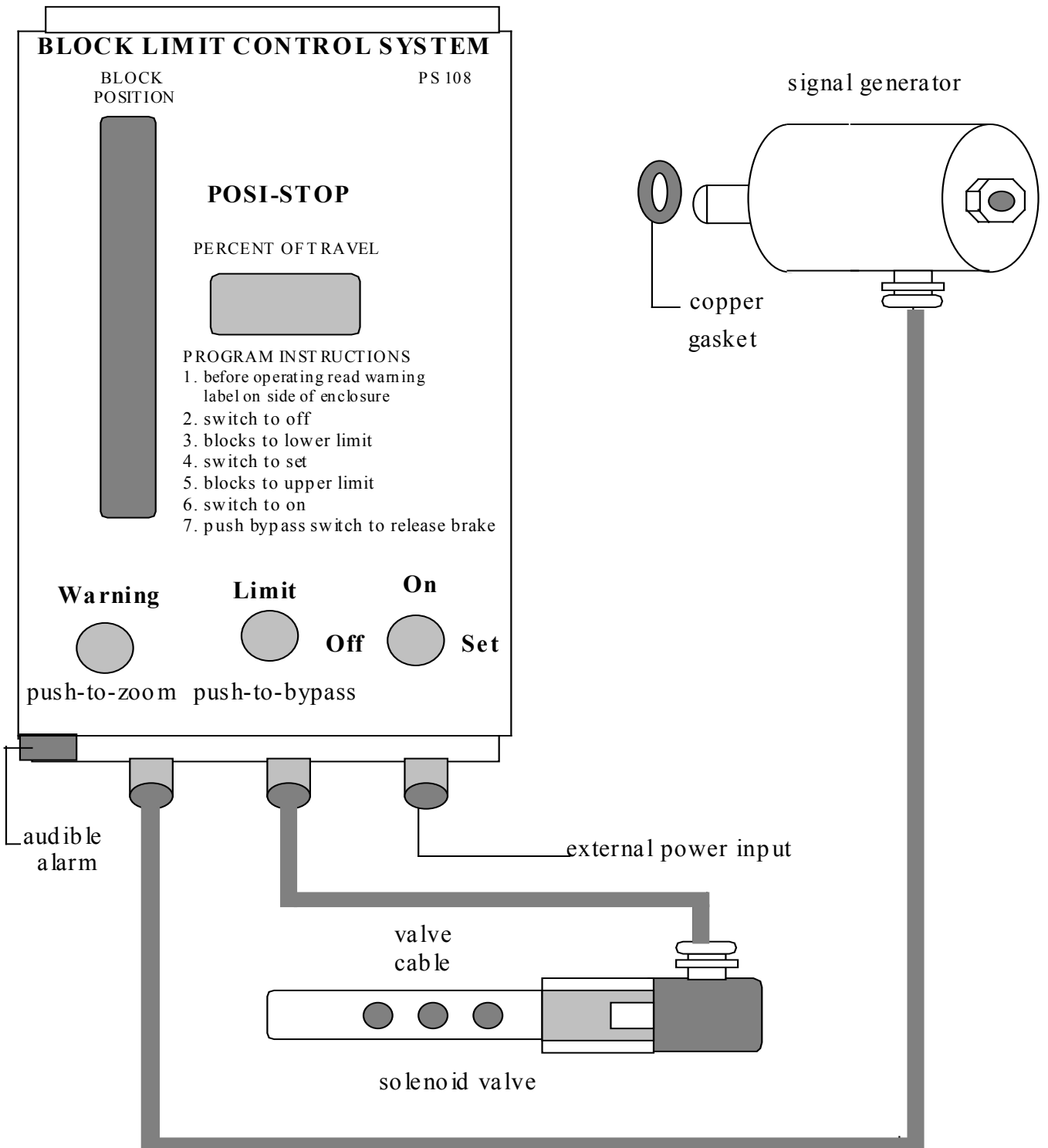


Figure 1.1 POSI-STOP SYSTEM COMPONENTS

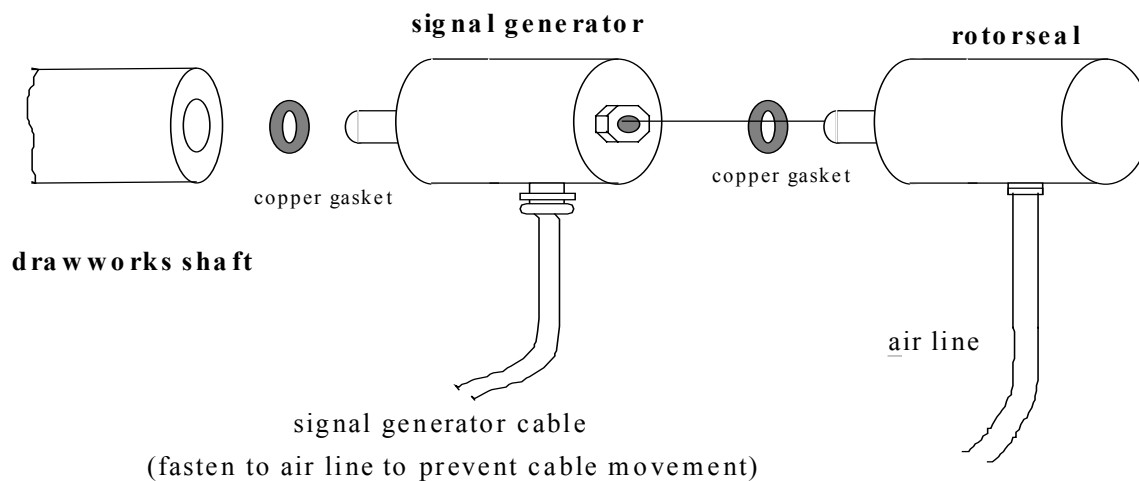


Figure 1.2 SIGNAL GENERATOR MOUNTING

1.2.2 Signal Generator

The signal generator provides an electronic signal in relation to the direction of rotation of the drawworks shaft to allow a microprocessor mounted in the control / display console to determine the position of the block. The signal generator is designed to be mounted between the drawworks shaft and the rotor seal, as illustrated in Figure 1.2 and does not affect the operation of the rotor seal, which provides the air supply for the clutch.

Ensure that the signal generator has the proper mounting threads for the rig. Three sizes are currently available as standard items:

5/8 –18 UNF thread to mate to an Eaton type B2 or B3 rotor seal.

1 - 14 UNS thread to mate to an Eaton type C or C2 rotor seal.

Consult Position Tracking Systems Inc. for custom sizes.

General Mounting Instructions

Remove the air line and remove the rotor seal. Mount the signal generator unit in place of the rotor seal, ensuring that the copper gasket is in place and that the fitting is tightened sufficiently to prevent any air leakage. The rotor seal must be mounted and tightened to the opposite end of the signal generator using a copper gasket. A shield **must** be provided around the rotating union and signal generator assembly to prevent accidental damage. Safely route and secure the signal generator cable, protecting it from damage by moving parts or accidental contact by rig personnel. Secure the cable close to the signal generator to prevent movement of the signal generator from bearing friction.

1.2.3 Solenoid-Operated Pneumatic Valve

The solenoid-operated pneumatic valve must be connected to the pneumatic system to allow actuation of the drawworks brake and disengage the clutches and throttle. The pneumatic circuit is illustrated in Figure 3.1. The air supply should be filtered to 50 micron and also be lubricated otherwise the life of the solenoid-operated valve will be substantially reduced.

Locate a convenient mounting site and attach the solenoid valve using the mounting holes provided in the base of the valve then connect the pneumatic lines.

CAUTION: The solenoid-operated pneumatic valve must be mounted in a **DRY** location (protected from weather and water hose spray), **unless** the valve label indicates a NEMA 4 or IP-65 rating.

1.3 Electrical Wiring

The minimum wire requirements are:

- a) 120 / 240 V AC or 12 VDC supply - 16 AWG, 3 conductor

1.4 System Startup

After the components are mounted and interconnected, the System should be thoroughly tested to ensure that all parts are functioning properly. Complete the installation checklist provided below before turning the control / display console switch from the OFF position.

Installation Checklist

- _____ 1. Control / display console securely mounted.
- _____ 2. Selector switch OFF.
- _____ 3. 120 / 240 Volt AC or 12 VDC power cable is correctly connected.
- _____ 4. Signal generator is tightly connected to the drawworks.
- _____ 5. Signal generator cable is properly connected to the control / display console.
- _____ 6. Solenoid-operated valve securely mounted. **DO NOT CONNECT THE SOLENOID CABLE AT THIS TIME.**
- _____ 7. Pneumatic connections are correct (Figure 3.1).
- _____ 8. All wiring is safely routed and secured.
- _____ 9. The traveling block is located approximately 3 feet above the rig floor.

Turn the POSI-STOP ON and carry out the following test procedure.

1.5 Test Procedure (refer to Figure 1.1 for system components)

- 1. Set the limits. Instructions for setting the limits are shown on the control / display console and are explained in detail in Section 2.
 - Lower limit 3 ft above rig floor (record actual distance above floor and keep track of lower limit within 1 inch).
 - Upper limit approximately 15 ft below crown.
- 2. Move the block past the upper limit. The display, warning and limit lights should be as follows:
 - display - 100% or greater
 - bottom bar illuminated
 - top bar flashing
 - warning light - illuminated
 - limit light - illuminated

3. Press the bypass switch (combined with the limit light) and release. The limit light should start flashing.
4. Move the block past the lower limit. The display, warning and limit lights should be as follows:

Display	-	0% or negative percentage
	-	bottom bar flashing
	-	top bar illuminated
warning light	-	illuminated
limit light	-	illuminated
5. Press the bypass switch and release. The limit light should start flashing.
6. Move the block to the top of the rig reaching maximum speed en route. Position the block within 2 ft of the upper limit. The display should read between 97% and 103%.
7. Lower the block to the lower limit reaching maximum speed en route.
8. Position the block 1 inch below the lower limit. The display should read 0% and the limit light should be illuminated.
9. Press the bypass switch. The limit light should flash. Move the block within limits to prevent activation of the brake while completing the wiring of the solenoid-operated valve.
CAUTION: Stand clear of the brake lever during the remaining test steps because it can move rapidly and with damaging force if the solenoid-operated valve is actuated.
11. Move the block slowly to the lower limit. The brake should engage.
12. Move the block slowly to the upper limit. The brake should engage.

The POSI-STOP is ready for operation.

SECTION 2 - OPERATOR'S INSTRUCTIONS

2.1 Introduction

This section is intended to give the operator an understanding of how to interpret the POSI-STOP displays and properly utilize the System.

2.2 Principle of Operation

A signal generator connected to the drawworks shaft transmits electronic signals relative to block movement to a microprocessor in the control / display console. The block position is displayed in both graphic and digital form. If preset upper or lower block limits have been exceeded, a solenoid-operated pneumatic valve is actuated, the drawworks clutches and throttle are disengaged, the drawworks brake is applied, and a red limit light is illuminated. An amber warning light indicates when the block is within 5% of the upper or lower limit. An audible alarm sounds at the 95% position when the blocks are moving up and sounds more frequently as the blocks approach the upper limit.

A Bypass switch (combined with the limit light) on the control / display console is used to release the drawworks brake after it has been engaged and re-activate the throttle and clutches. The Bypass switch must also be used to allow the engine to operate at increased RPM for the optional speed control function. This switch permits operation of the block outside the preset limits for an unlimited period of time. Once the block is moved inside the limits, the limit control is automatically restored, and the block is again restricted to movement within the limits.

The zoom function is both automatic and selectable. The "Zoom" is automatically selected at the 90% position and changes the final 10% of block travel to 100% to expand the detail and provide more precise indication of block movement. EG: When in zoom the display will read 50% when the blocks are at 95% of the span. The solenoid will actuate at 100% in Zoom. Alternatively, pressing the Zoom switch (combined with the warning light) allows the operator to change to 10 times magnification of the display at any block position point. Pressing the Zoom Switch a second time changes from Zoom to Standard scale.

A selector switch turns the control / display console ON or OFF and is used to SET the upper and lower limits.

Under normal operation, power is supplied by 120 / 240 Volts AC or 12 V DC from the rig. If this power source is disabled, for example during maintenance or service, 12 Volt DC power is supplied to the System from a battery contained within the control / display console. This battery provides emergency backup power and ensures continuous POSI-STOP operation for up to four hours.

The battery Indicator located near the display limit and warning lights indicates when the system is running on battery i.e.: rig power has been interrupted. Battery backup will function for 3-4 hours. Check for loss of rig power when the Power Failure Indicator is illuminated.

2.3 Console Front Panel

2.3.1 Display

Both graphic and digital LED displays continuously provide the operator with the current position of the block. Warning and limit lights also display the system status.

The display functions are explained in detail below:

- a) The BLOCK POSITION GRAPHIC DISPLAY consists of rectangular bar LED units positioned vertically in the display window. This display indicates the current block position relative to the upper and lower limits. Each bar represents 5% of travel. The bottom bar represents the lower limit and is equal to +0%. It is continuously illuminated when the block is above the lower limit but flashes when the block is below the lower limit. The top bar represents the upper limit and is

equal to +100%. It is continuously illuminated when the block is below the upper limit but flashes when the block is above the upper limit. Both the top bar and bottom bar flash when in the SET mode.

- b) The BLOCK POSITION DIGITAL DISPLAY continuously indicates the percent of travel between the upper and lower limits. At the lower limit, the display indicates 0%. At the upper limit it displays +100%. Below the lower limit a negative number is displayed and above the upper limit a number greater than +100% is displayed. Under normal operation, the display will indicate a value between +0% and +100%.
- c) The amber WARNING LIGHT is illuminated at any block position lower than +5% or any block position greater than +95%. It is a visual warning to the operator that the upper or lower limit is being approached. The pushbutton incorporated in the lens also activates the Zoom function.
- d) The red LIMIT LIGHT is illuminated at any block position below the lower limit or at any block position above the upper limit. It is a visual indication that the limits have been exceeded and the solenoid valve has been actuated. The red limit light will flash when the bypass switch incorporated in the lens is pressed to release the brake. This indicates that the block is still outside the limits and the brake has been released. The red limit light will continue to flash until the block re-enters the limits and the limit control is reset.
- e) An audible alarm sounds at the +95% block position. It is an audible warning to the operator and sounds more frequently as the upper limit is approached.

CAUTION: When the red limit light is flashing, NO protection is provided by the System.

2.3.2 Controls

There are three controls on the front panel:

1. A SELECTOR SWITCH used to turn the control / display console ON and OFF, and also used to SET the upper and lower limits.
2. A BYPASS SWITCH used to release the drawworks brake, engage the Clutch and bypass limits when necessary (combined with the limit light lens).
3. A ZOOM SWITCH used to expand 10% of the scale to 100% (combined with the warning light lens).

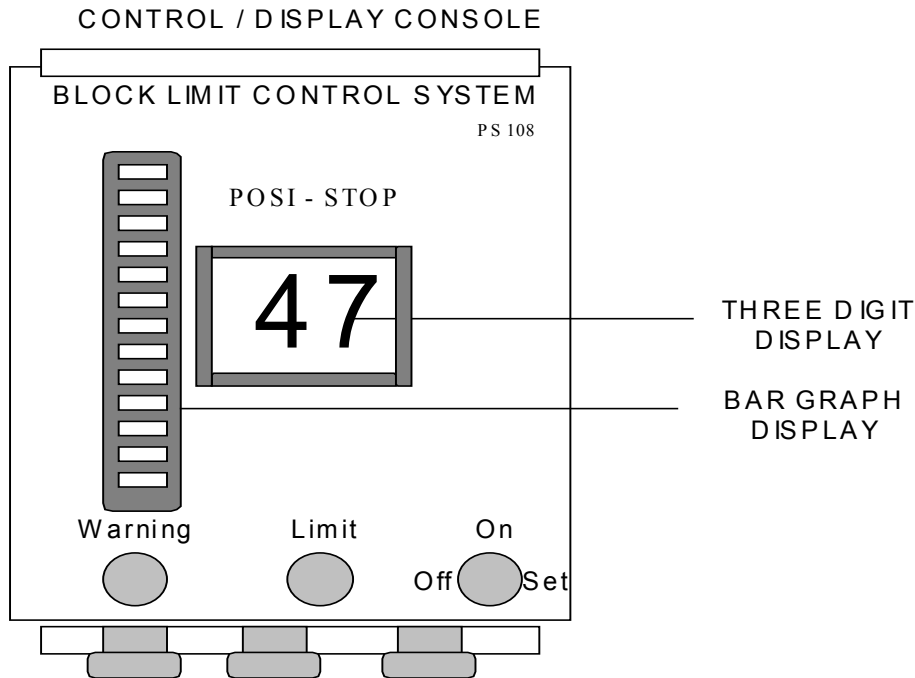


Figure 2.1 FRONT

2.4 Setting the Limits

WARNING: *The limit setting procedure is simple, fast, and accurate and must be performed when:*

- a) The System is initially programmed,
- b) The drawworks cable is slipped or cut, or
- c) Battery backup has been exhausted.

IMPORTANT: TO ENSURE THE SAFETY OF RIG PERSONNEL, THE LIMIT SETTINGS SHOULD BE CHECKED AT THE START OF EACH SHIFT AND RESET IF NECESSARY.

The procedure is summarized on the front panel under PROGRAM INSTRUCTIONS.

PROGRAM INSTRUCTIONS

1. BEFORE OPERATING READ WARNING LABEL ON SIDE OF ENCLOSURE
2. SWITCH TO OFF
3. BLOCKS TO LOWER LIMIT
4. SWITCH TO SET
5. BLOCKS TO UPPER LIMIT
6. SWITCH TO ON
7. PUSH BYPASS SWITCH TO RELEASE BRAKE

UNIT READY

Start the procedure with the block at the lower limit position BEFORE turning power on. The suggested lower limit

position is with the elevators approximately three (3) feet above the rig floor. Turn the selector switch to 'ON' and wait for the display to stabilize. The system presents a diagnostic routine that cycles the display between 25% and 75%. This also prevents the system from activating the solenoid in the event the operator neglects to set the limits and only turns the Posi-Stop to 'ON' mode. This display mode indicates that the limits need to be 'SET'.

Turn the selector switch to 'SET'. At this point, the lower limit position is recorded and the top and bottom horizontal bars and the red limit light flash. Raise the blocks to the upper limit position.

Once the block is at the upper position, turn the switch to 'ON'. The digital display indicates +100% and the top bar of the bar graph display flashes. This completes the procedure for setting the limits.

CAUTION: The drawworks brake is activated when the switch is first turned 'ON' from 'SET' mode to confirm that the solenoid operates at the 100% limit point. The Bypass switch must be pressed to release the solenoid valve and permit movement of the main block.

2.5 Bypass Operation

The Bypass switch permits the operator to move the travelling block past the preset upper or lower limits. When the System is in bypass mode, the solenoid valve signal is disabled and the draw works brake will not be actuated. The operator must use extreme care until the block re-enters the limit region, where the limits are automatically reset.

Bypass mode may be entered by depressing the Bypass switch (combined with the red limit light) as the limits are approached and passed. This is a useful feature when normal operation requires continual bypassing of the lower limit and operation of the brake is not desired.

While in bypass mode, the red limit light flashes and the digital block position display continues to indicate the block position. Depending on which limit is bypassed; the top or bottom bar of the bar graph will flash.

2.6 Zoom Operation

During normal operation, press the Zoom switch incorporated in the lens cap of the warning light once to enter the zoom mode. The display will use the current position as a zero point and the center bar segment will be illuminated. All block movement while in Zoom mode is displayed at ten (10) times normal or approximately one and one-half inch (1 ½") of block travel per percentage change on the digital display. The applicable bar graph segment will blink while in zoom mode during block movement. The Zoom mode is exited under any of the following three conditions:

- 1.) Pressing the Zoom switch while in zoom mode will exit to normal mode.
- 2.) Movement beyond the upper limit will exit the zoom mode.
- 3.) Movement below the lower limit will exit the zoom mode.

Note: The moving bargraph segment will stop blinking when the zoom mode is exited. **When in zoom mode, the upper and lower limits are still controlled by the system.**

SECTION 3 - MAINTENANCE AND SERVICE

3.1 Introduction

The POSI-STOP is designed for extremely low maintenance and will provide years of reliable service. A warranty seal plate restricts tampering with certain parts of the System and will void the warranty if broken.

IMPORTANT: The System must be serviced by a qualified technician. Before opening the front cover of the control / display console for service, turn the selector switch to OFF and disconnect the AC power supply.

3.2 Battery Replacement

A rechargeable, sealed battery is provided with the POSI-STOP Block Limit Control System, to provide emergency backup power supply in the event AC power is disrupted. The battery life is expected to be 3 to 5 years and is dependent on the number of times operated and the degree of discharge during use.

CAUTION: The battery must be replaced in an area designated as non-hazardous. A qualified technician can replace the battery by the following instructions:

Battery Replacement Procedure

1. Obtain replacement battery - Pt # PTS1232
2. Turn key switch OFF and disconnect the AC power supply.
3. Remove two (2) mounting screws from top plate of battery housing.
4. Remove the spade terminal connections on the battery, and then remove battery assembly from the Enclosure.
5. Install the replacement battery in the reverse order, connecting the black wire to the negative terminal and the red wire to the positive terminal.
6. Loctite 242, or equivalent, should be applied on each screw.
7. Close the front cover of the control / display console and tighten the clamps to ensure a watertight seal for the enclosure.

3.3 Fuse Replacement

CAUTION: Turn the selector switch to OFF and disconnect the 120 Volt AC supply before replacing the fuse. There is one (1) fuse, which protects the electronic circuit, mounted on the upper circuit board. The replacement fuse is:

Bussman GMA 1 Amp, 250 Volt rating (5 x 20 mm) size

3.4 Specifications

Draw works Rotation Speed	1,000 rpm max.
Operating Temperature	-40 to +55 °C (-40 to +130 °F)
Power Requirements	100 / 240 volts AC @ 0.5 / 0.25 amps 12 VDC @ 2.0 amps
Battery	
Operating Time	4 hours
Recharge Time	8 hours
Signal generator Assembly (B2 & C2)	
Mounting Thread	5/8-18 or 1-14
Maximum Pressure	175 psi
Dimensions	11.43 x 8.9 dia. cm. (4.5" x 3.50" dia.)
Air Flow Restriction	2% max.
Pneumatic Control Valve	
Power	12 volts DC @ 2.0 amps
Air Supply	12 Bar (175 psi) max.
Air Connection	1/2" NPT fitting
Control / Display Console	8 1/2" x 11" x 5"
Warning Light (AMBER)	12 volts DC, 3 watts
Triggered ON	@ 5% and 95% programmed travel
Audible Alarm	100 dBA / 30cm
Limit Light (RED)	12 volts DC, 3 watts
Triggered ON	@ 0% and 100% programmed travel
Flashes	Bypass, Set Mode
Digital Block Position Display	3 digit, red LED
Resolution	± 1%
Bar Graph Display	20mm x 170 mm (1" x 6"), red LED
Resolution	± 5%
Off/On/Set Switch	Selector switch (or optional key switch)
Bypass Switch	Momentary contact ON - illuminated
Zoom Switch	Momentary contact ON - illuminated
System Shipping Weight	Approx. 41 lbs.

POSI-STOP PNEUMATIC DIAGRAM FIGURE 3.1

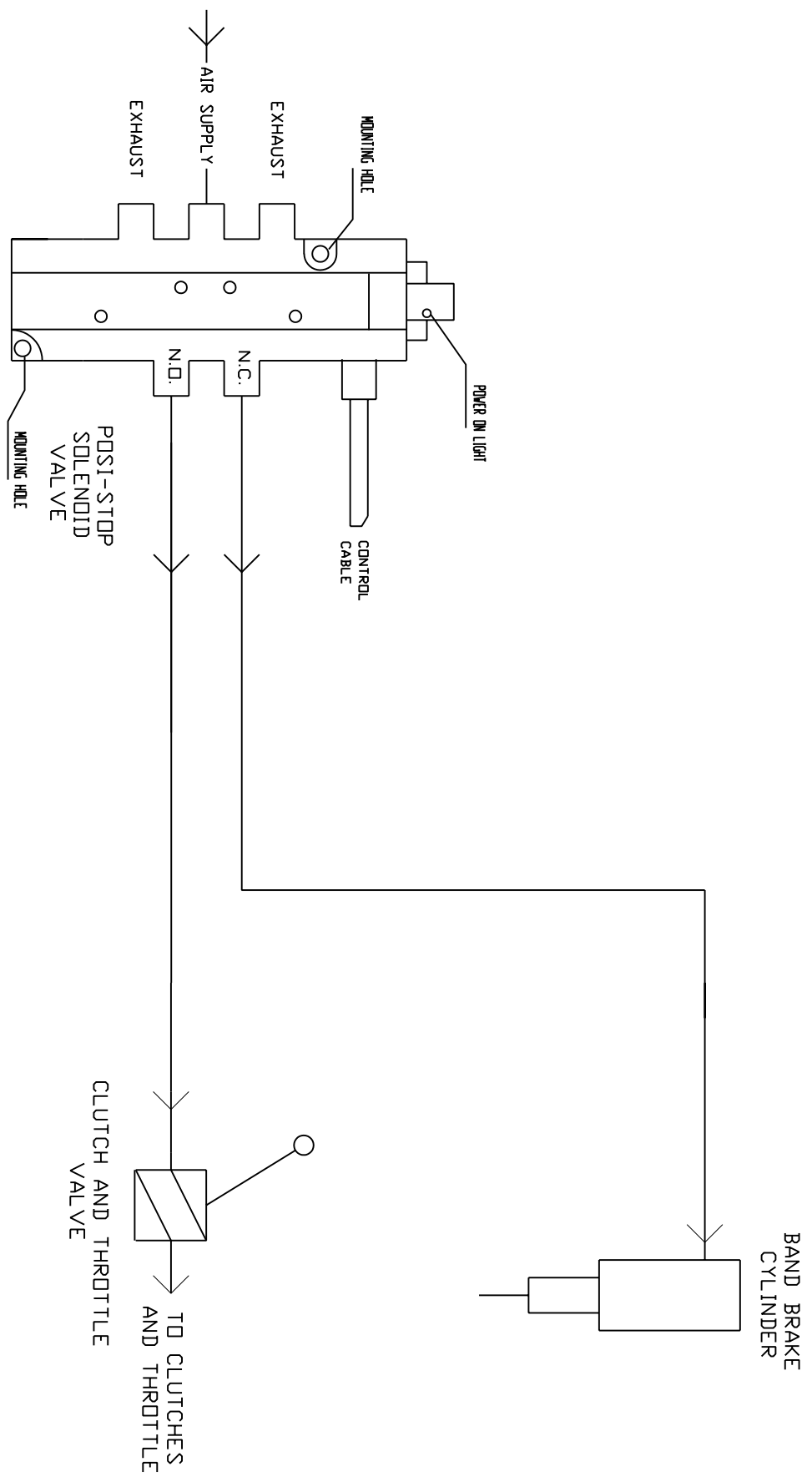


FIGURE 3.2

STANDARD POSI-STOP WIRING DIAGRAM

