

# **MECHANICAL INDICATING IMPULSE-TYPE CONTROL**

The LFE18 is a time proportioning type indicating controller designed to provide straight-line temperature control of electric heaters and similar applications. It derives its simplicity and efficiency from the Piston-Pak filled system sensing element.



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## **SPECIFICATIONS INSTALLATION OPERATION**

# LFE18

### **Partlow**

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**QUALITY INSTRUMENTATION DESIGNED & MANUFACTURED IN THE USA**

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Please disregard all phone numbers and addresses in this manual. The phone numbers and address on this page are the correct phone number and addresses to use for sales, repair, and application support.

## LFE18 PRODUCT SPECIFICATIONS

Dimensions	8 5/8" W X 8" H X 4 9/32" D
Surface Mounting	Brackets included
Flush Mount Cutout	7" W X 7 3/4" H
Switch Type	Partlow No. 18A, single pole double throw stiff leaf. Only the normally closed and common terminals are used for control circuit
Cam Motor	2 rpm (for other speeds, consult factory)
Modulating Range	8 % standard
Electrical Hookup	Terminal block accessible through top cover hatch
Conduit Openings	1/2 NPS holes on each side of case. Drill guide hole spotted in rear of the case showing optional rear opening location.
Electrical Rating	50 VA inductive, 500 VA non-inductive; AC
Rated Accuracy	+/- 1 % of element range
Agency Approvals	UL and CSA
Approx. Net Weight*	7 lbs.
Approx. Shipping Weight*	10 lbs.

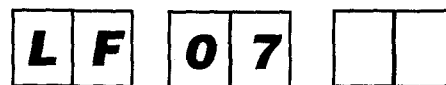
\* Weight may vary depending on element length.

### Note:

**It is strongly recommended that Partlow equipped applications incorporate a high or low limit protective device which will shut down the equipment at a preset temperature condition in order to preclude possible damage to property or product.**

**This document should accompany the instrument to its final installation in order to provide operational and service assistance to the end user.**

## LFE18 ORDER MATRIX



**LFE18\***  
(Requires L type element plunger)

### ACCESSORIES

- 0 None
- 1 201 Weather Resistant (needs inverted dial)

\* Specify Dial Scale required

### PISTON-PAK THERMAL SENSING ELEMENT

A Piston-Pak Thermal Sensing Element must be specified for each LFE18. Use Partlow Form Number 3028 "Mechanical Instrumentation Products Cross Reference and Pricing Guide" to configure the matrix number for the sensing element.

# INSTALLATION AND WIRING

## LOCATION

The element head assembly is subject to ambient temperature limitations of -30°F to 125°F (-35°C to 52°C) for low temperature head assemblies, and 32°F to 150°F (0°C to 66°C) for high temperature head assemblies. These temperature limitations must be considered when determining the instrument location. It should be located in an area as free from vibration as possible.

## MOUNTING

The instrument(s) are shipped to be surface mounted. Figure 1 illustrates hole placement for surface mount conditions. Note: Holes in brackets supplied are 9/32 clearance holes for 1/4" bolts. The three holes called out in the drawing may be any size that will accommodate the fastening required (ie: 9/32 for 1/4" thru-bolt with nut fastener) or #7 drill for 1/4" x NC tapped hole fastening or #3 drill for 1/4" x 28 NF tapped hole fastener.

The instrument may also be flush mounted. This is accomplished by removing the three surface mounting angle brackets from the instrument. Figure 1A illustrates panel cut out dimensions. Cut the panel opening to 7" wide by 7 3/4" high. Drill 9/32 clearance holes in four locations if 1/4" thru-bolt with nut installation is desired. Should a tapped hole be more preferred, drill a #7 hole in four locations for a 1/4" x 20 NC or a #3 drill hole in four locations for a 1/4" x 28 NF. Note: All configurations require a flat head screw for proper cover installation. With the instrument in the upright position, insert it and the element into the panel opening and tilt it into place. Depending upon your panel size, it may be easier to make electrical connections before finally securing the instrument into the panel.

## WIRING

The rear conduit hole is to be used for flush mounting. A drill guide hole is spotted in back of the case to accommodate field drilling. Make the necessary electrical connections using short sections of flexible cable or conduit according to applicable electrical code, ordinances and regulations regarding the use of conduit, etc. Withdraw screws H (Figure 2, page 4) and remove the top cover hatch, exposing connection terminal block. The terminal block is labeled H, C and N (see Figure 3, page 4). H represents normally open, C common and N neutral. Make your necessary electrical connections using Figure 3 (page 4) as a guide.

## INSTALLING THE THERMAL SENSING ELEMENT

Locate the thermal sensing bulb in the most agitated part of the medium to be measured and completely immerse it. (When U and Y type bulbs are used, note separation coupling between bulb and capillary). Do not bend capillary to less than 1/2 inch radius and never bend it too close to the element as this will affect instrument accuracy. U and Y type bulbs may be bent, but never to less than a two inch radius. Anchor the excess capillary securely to prevent vibration damage. These bulbs may be elevated up to 40 feet above the instrument without affecting calibration.

## STUFFING BOX INSTALLATION (IF APPLICABLE)

Overtightening of 21-T-105 stuffing boxes can damage the thermal element by restricting the capillary bore. To prevent damage, the stuffing box gland nut should be turned 1/2 to 3/4 of a revolution from a finger-tight position. This is equivalent to a torque of 130 to 180 inch-pounds for stainless steel.

Figure 1 - Surface Mount Dimensions

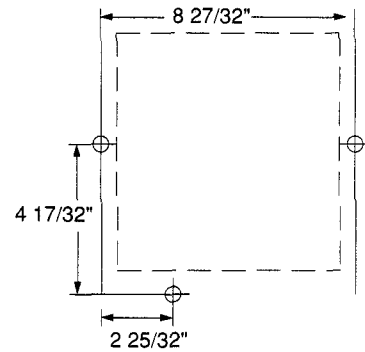
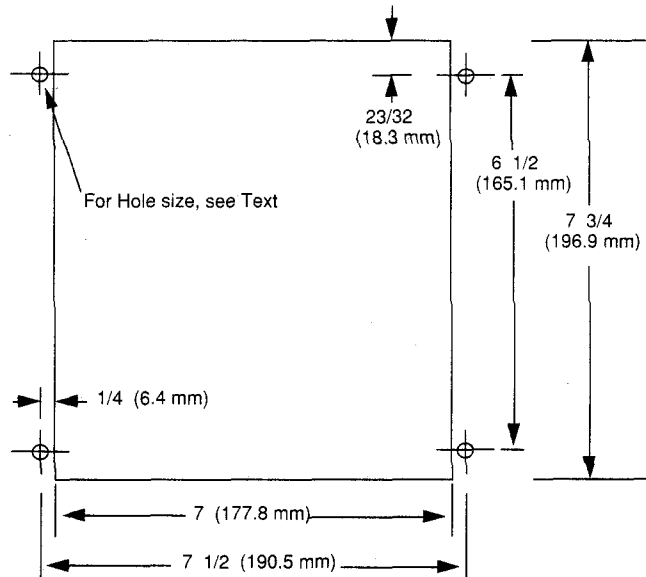


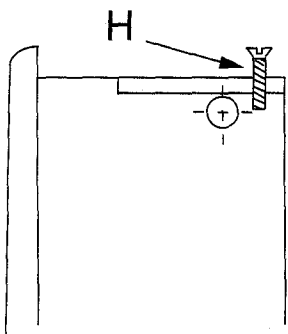
Figure 1A - Panel Cutout Illustration (in inches)



## INSTRUMENT OPERATION

Prior to putting the instrument into service, check it against an accurate test thermometer. As with any precision instrument, minor adjustments may be necessary after shipment and installation. If you are unfamiliar with how to perform this check refer to the CHECKING TEMPERATURE and RE-ZEROING section of this document.

Figure 2 - Screw H



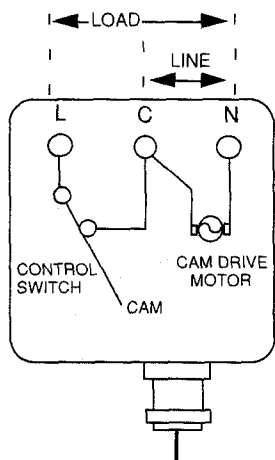
Control temperature is set by turning the knob on the front cover. The knob moves the red set pointer along the scale to the desired setting. The indicating pointer moves up or downscale in response to the expansion or contraction of mercury in the thermal sensing element. A stiff leaf snap acting switch, mounted on the indicating pointer assembly, is actuated by a constantly turning eccentrically shaped cam mounted on the setting arm assembly.

The switch leaf makes initial contact with the rotating cam at the start of the modulating range. As the temperature rises through the modulating range (8% of scale) and approaches set point, switch contacts are made (heat on) for shorter and shorter time periods. When the indicating pointer comes into alignment with the set pointer, switch contacts are made approximately 50% of the time. If the indicating pointer passes the set pointer, the percentage of on time decreases still further as the end of the modulating range is reached, at which time heat is on 0%.

The control always seeks to achieve an equilibrium condition whereby switch on-off takes place in just the right proportion so as to allow the heat input to balance the heat losses from the application.

It should be noted, however, that equilibrium condition seldom takes place at the 50% switch ratio mentioned above. Usually, depending on the application, the indicating pointer settles out either slightly higher or lower than the set temperature. When this occurs, the indicated temperature may be corrected by positioning the set pointer or by adjusting the manual reset screw, see the MANUAL RESET section of this document.

Figure 3 - Wiring



## MAINTAINING YOUR LFE18

### CHECKING TEMPERATURE

When checking and verifying temperature be sure to use a test thermometer of known accuracy. Position the test thermometer sensing bulb or probe adjacent to the thermal sensing bulb from the LFE18. Turn the knob and position the set pointer to the desired process temperature. Wait for the temperature to stabilize, then compare the test thermometer reading with that of the LFE18. If the two readings do not agree, the LFE18 should be re-zeroed.

### RE-ZEROING YOUR LFE18

Be sure that the process temperature is stable. Remove the setting knob on the instrument cover. Loosen set screw S (Figure 4, page 5) and using the wrench provided with the LFE18 turn shaft J until the black indicating pointer reading agrees with the test thermometer reading. Tighten set screw S. Check the adjustment by allowing the temperature to stabilize and compare the readings. Repeat these steps if necessary.

### SWITCH REPLACEMENT

Turn the power to the LFE18 off. Remove the setting knob and cover and remove the two switch holding screws (Figure 5, page 5). Take out the switch to be replaced and remove the wires. Replace the wires on the new switch, making sure the wires are replaced on the same terminals as removed, and re-assemble the mechanism. Replace the front cover and knob. Then turn the power on.

Note: After the switch replacement, it may be necessary to make a slight adjustment to the Manual Reset screw T, see MANUAL RESET section.

**MANUAL RESET**

Inherent with any modulating type control, equilibrium condition is reached at a different percentage of heat available with each application. Hence, the black indicating pointer may settle out either slightly higher or lower than the set pointer and must be compensated in order to achieve the control temperature required. Adjustments to manual reset screw T (Figure 5, below) will bring the indicated temperature into line with the set temperature.

If the indicating pointer settles out above the set pointer, using the wrench provided, slightly back-out screw T (counterclockwise). This will re-position the cam and allow the indicating pointer to move into alignment with the set pointer. When the indicating pointer settles out below the set pointer, turn screw T inward slightly (clockwise). After each screw T adjustment allow adequate time for indicating pointer to settle out. Repeat this procedure until properly aligned; several fine screw T adjustments may be necessary.

**BRAKE TIGHTENING**

Periodically the setting shaft brake may require tightening. If the brake is too loose, the overtravel movement of the black indicating pointer will tend to drag the set pointer upscale from its set position. To tighten brake, turn the adjustment screw U clockwise (Figure 6, below). Do not over-tighten.

Figure 4 - Re-Zeroing

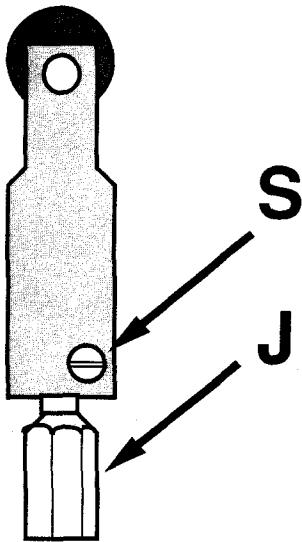


Figure 5 - Switch & T Screws

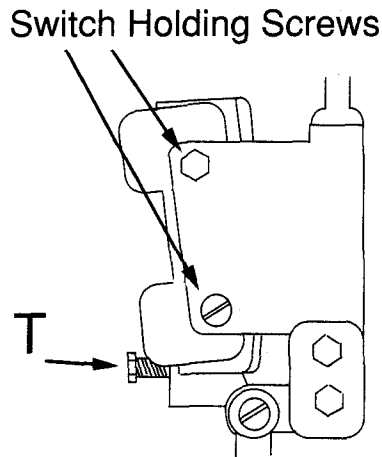
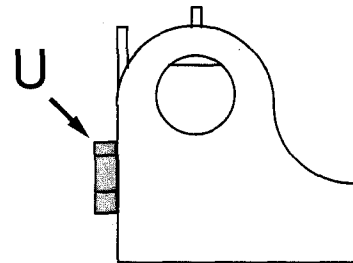


Figure 6 - Brake Tightening



**PISTON-PAK THERMAL SENSING ELEMENT IDENTIFICATION**

An element designation number is stamped on the bottom of the element head. This is a coded description of the element specifications and should be used whenever a replacement element is ordered. The number appearing on the side of the element head (Figure 7, below) is the element age code, which may be required in establishing warranty.

**ORDERING/SPECIFYING THE PISTON-PAK SENSING ELEMENT**

The sensing element is ordered separately from the LFE18 and requires its own matrix number. To determine the correct sensing element configuration for your instrument(s) and application see Partlow Form 3028 "Mechanical Instrumentation Products Cross Reference and Pricing Guide."

**ELEMENT REPLACEMENT**

To change a thermal sensing element, start by removing screws D (Figure 8, below) and withdrawing the element from the instrument body. Then remove the element bulb from the medium. Install the new element bulb into the medium being measured. Note: After the element has been replaced, check the temperature setting as re-zeroing may be necessary. If so, see the CHECKING TEMPERATURE section.

**Caution: The mechanism inside the instrument and particularly the inside of the thermal element housing, should never be oiled. However, if the instrument interior is subject to corrosion or gunking conditions, the linkage should be sprayed periodically with corrosion inhibiting CRC3-36. Use only CRC3-36 as other lubricants may cause buildup and internal parts to stick. CRC3-36 may be purchased at most any hardware store, automotive supplier or from Partlow by specifying part number 63600401 (16oz. can).**

Figure 7 - Element ID

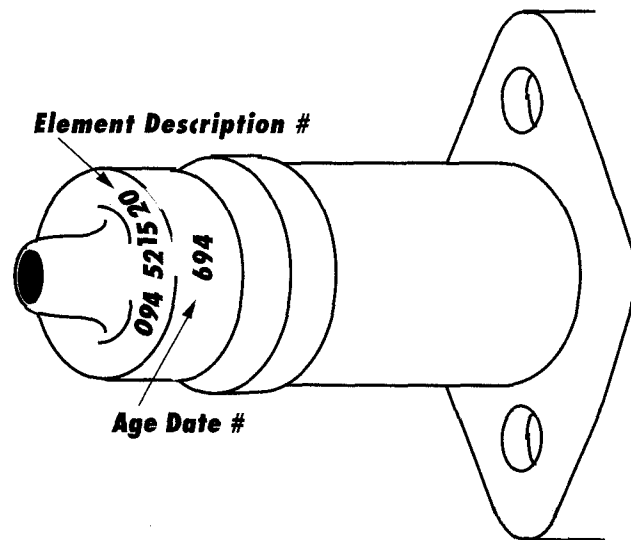
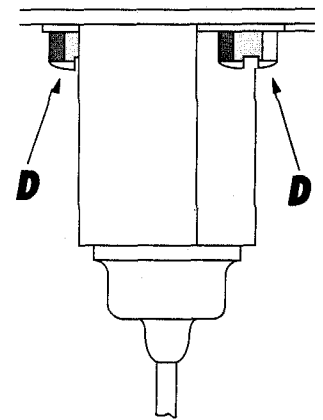


Figure 8 - Replacing Element



# DIMENSIONAL DRAWING

Figure 9 - Dimensional Drawing

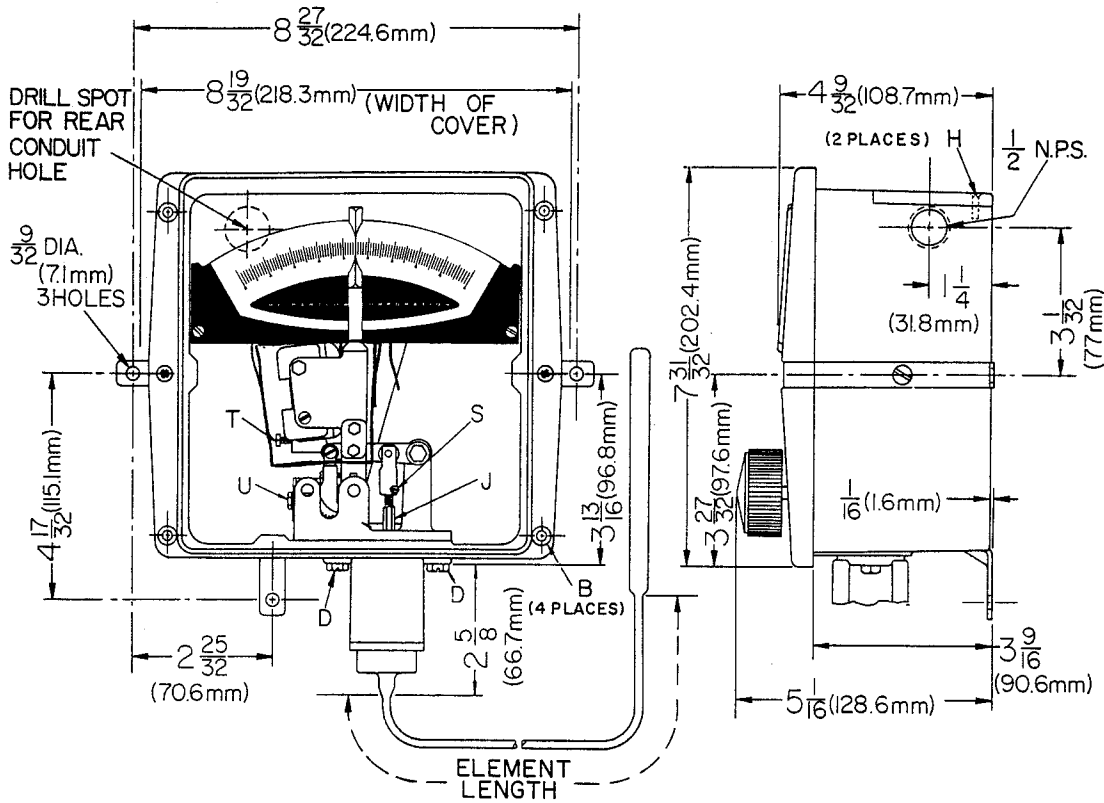


Figure 10 - Mechanism Drawing

