Optional Remote Display Programmer

LEOPARD FAMILY

TL-F

Leopard Series Frequency Transmitter and Controller

An economically smart programmable frequency transmitter with isolated 4 to 20 mA retransmission or relay control output capability for measurement and control applications.

General Features

- Frequency input. Easily user scales.
- Optional Isolated 16 bit analog output. User or factory scalable to 4 to 20 mA, 0 to 20 mA or 0 to 10 V.
- Auto-sensing AC/DC power supply. For voltages between **85-265 V AC / 95-300 V DC (PS1)** or 15-48 V AC / 10-72 V DC (PS2).
- 24 V DC excitation is available to power Proximity sensors.
- Remote Diplay Option only.

Software Features

- Three-button programming from the optional remote display (UP, DOWN and PROGRAM buttons).
- Front panel selectable four-level brightness control of digital display, and setpoint LEDs when diplay is used.
- Two programmable setpoints.
- Relay activation can be selected to occur above (HI) or below (LO) each setpoint.
- Hysteresis, Delay on make and delay on break for both setpoints.
- Peak and Valley. View and Reset.(only when diplsya is used)

Input Module Compatibility

☑ There are 2 Plug-in Modular input Signal Conditioners for this specialized frequency only member of the Leopard Transmitter Family: IF05 & IF08.

LEOPARD

Specifications

Input Specs:.....Depends on Input signal conditioner
A/D Converter:.....14 bit single slope
Accuracy:.....±(0.05% of reading + 2 counts)
Temp. Coeff.:.....100 ppm/°C (Typical)
Warm up time:.....2 minutes
Conversion Rate:.....5 conversions per second (Typical)
Remote Display:.....**4 digit 0.56" Red LED Remote display. (Optional)**
Range –1999 to 9999 counts.
Polarity:.....Assumed positive. Displays – negative
Decimal Selection:....Front panel button selectable, X•X•X•X•
Positive Overrange:..Top segments of digital display flash
Negative Overrange: .Bottom segments of digital display flash
Relay Output:.....Two 9 Amp Form C relays.
Analog Output:.....Isolated 16 bit user scalable mA or V
AIC (mA out).....4-20 mA @ 0 to 500Ω max loop resistance
AIV (volts out)..... 0-10 V DC @ 500 Ω or higher resistance
Power Supply:.....AC/DC Auto sensing wide range supply
PS1 (std).....**85-265 VAC 50-400Hz / 95-300 VDC @ 3.5W**
PS2.....15-48 VAC 50-400Hz / 10-72 VDC @ 3.5W
Operating Temp.:.....0 to 50 °C
Storage Temp:.....–20 °C to 70 °C.
Relative Humidity:....95% (non condensing)
Case Dimensions:....DIN Rail Mount
22.5mm x 102.4mm x 128.7mm
(Width x Height x Depth)
Plus 11.8 mm (0.47") for Right-angled connectors.
Weight:.....7.5 oz., 9.0 oz when packed

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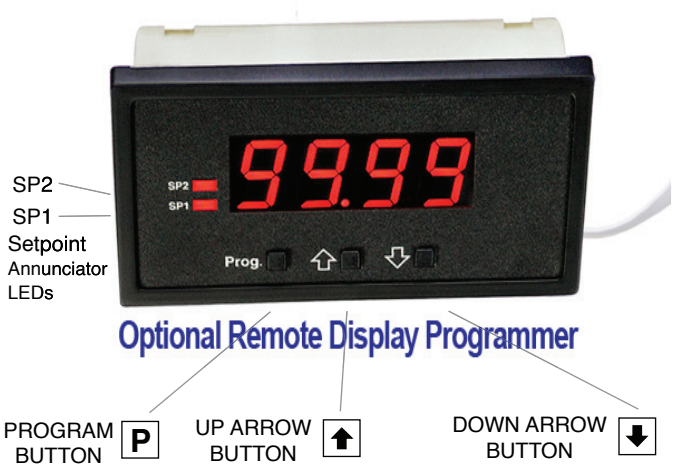
Optional Remote Display for Field Programming and Setup is needed



Front Panel Buttons

Program Button

The P button is used to move from one program step to the next. When pressed at the same time as the ↑ button, it initiates the **calibration mode**. When pressed at the same time as the ↓ button, it initiates the **setpoint setting mode**.

Up Button

When in the operational display, pressing the ↑ button alone, allows you to view and reset the Peak and Valley (Highest and Lowest Readings.)

When in the **calibration mode** or the **setpoint setting mode** the ↑ button is used to increase the value of the displayed parameter.

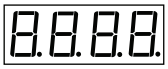
Down Button

When in the operational display, pressing the ↓ button alone, allows you to view, but not change, the setting of setpoint 1&2.

When in the **calibration mode** or the **setpoint setting mode** the ↓ button is used to decrease the value of the displayed parameter.

Glossary of Programming Symbols

To explain software programming procedures, logic diagrams are used to visually assist in following the programming steps. The following symbols are used throughout the logic diagrams to represent the buttons and indicators on the meter:

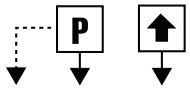


This symbol represents the OPERATIONAL DISPLAY.

This is the PROGRAM button.

This is the UP button.

This is the DOWN button.

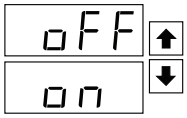


When a button is shown, press and release it to go onto the next step in the direction indicated by the arrow. When an alternative dotted line is shown, this indicates that an alternative logic branch will be followed when a particular option is present.

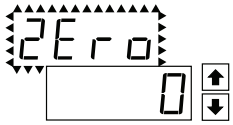
When two buttons are shown side by side and enclosed by a dotted line, they must be pressed at the same time then released to go onto the next programming step.

If an X appears through a digit, it means that any number displayed in that digit is not relevant to the function being explained.

When the ↑ and ↓ buttons are shown together, the display value can be increased by pressing and releasing the ↑ button or decreased by pressing and releasing the ↓ button.



When the ↑ and ↓ buttons are shown with two displays, either display can be selected by pressing and releasing the ↑ or ↓ buttons.



When two displays are shown together with bursts, this indicates that the display is toggling (flashing) between the name of the function and the value.

[Span]
[10000]

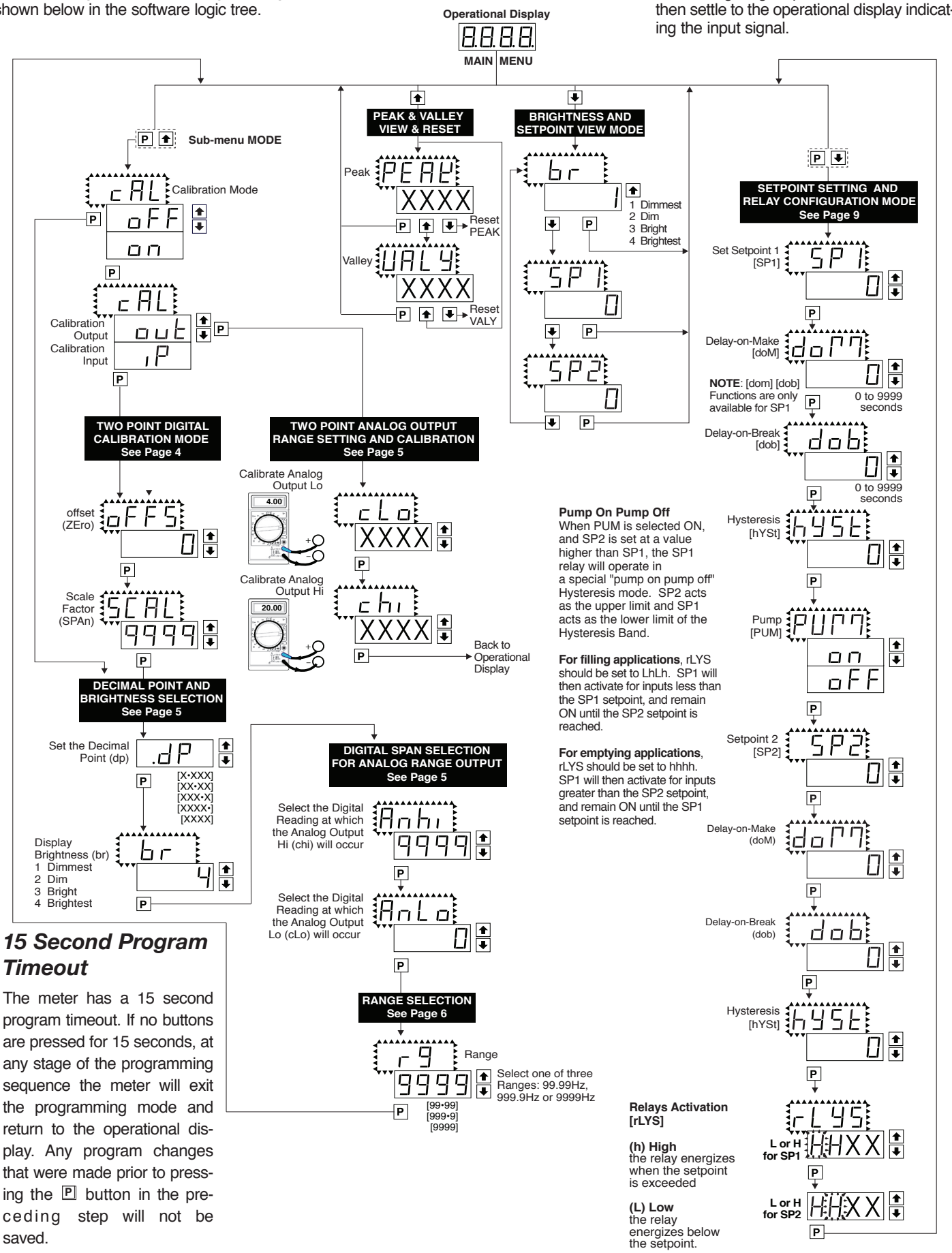
Text or numbers shown between square brackets in a procedure indicate the programming code name of the function or the value displayed on the meter display.

[X•XXX]
[XX•XX]
[XXX•X]
[XXXX•]
[XXXX]

When there are more than two display selections they are shown in brackets below the first display and are also selectable by pressing and releasing the ↑ or ↓ buttons.

The TL is an intelligent transmitter with a hierarchical software structue designed for easy programming and operation, as shown below in the software logic tree.

After the transmitter has been powered up, the four digits light up for three seconds and then settle to the operational display indicating the input signal.



Pump On Pump Off
When PUM is selected ON, and SP2 is set at a value higher than SP1, the SP1 relay will operate in a special "pump on pump off" Hysteresis mode. SP2 acts as the upper limit and SP1 acts as the lower limit of the Hysteresis Band.

For filling applications, rLYS should be set to LhLh. SP1 will then activate for inputs less than the SP1 setpoint, and remain ON until the SP2 setpoint is reached.

For emptying applications, rLYS should be set to hhhh. SP1 will then activate for inputs greater than the SP2 setpoint, and remain ON until the SP1 setpoint is reached.

Relays Activation [rLYS]

(h) High
the relay energizes when the setpoint is exceeded

(L) Low
the relay energizes below the setpoint.

15 Second Program Timeout

The meter has a 15 second program timeout. If no buttons are pressed for 15 seconds, at any stage of the programming sequence the meter will exit the programming mode and return to the operational display. Any program changes that were made prior to pressing the P button in the preceding step will not be saved.

Digital Rescaling

The transmitter may be rescaled without applying an external signal by changing the Offset and Scale factor.

Offset is the reading that the meter will display for a zero input. The Offset may be set to any value from -1999 to +9999. The default value of the Offset is 0.

Scale factor is the gain of the meter. The displayed reading is directly proportional to the Scale factor. The default value of the scale factor is 9999, but it may be set to any value between -1999 and +9999.

For an input of 100Hz a calibrated meter will read 99.99 with the default Scale factor of 9999, 99.9 with a Scale factor of 999 and 99 with a Scale factor of 99.

If a linear scale is represented by mx + b, then the Scale Factor corresponds to the slope 'm' and the Offset corresponds to the intercept 'b'

Digital Rescaling Procedure

STEP A Enter the Calibration Mode

1) Press the P and ↑ buttons at the same time. Display toggles between [CAL] and [oFF].
2) Press the ↑ or ↓ button. Display changes from [oFF] to [on].
3) Press the P button. Display toggles between [CAL] and [out].

STEP B Select Two Point Digital Calibration of Input Signal

1) Press the ↑ or ↓ button to select CAL [iP] for input signal calibration.

STEP C Set the Offset (oFFS)

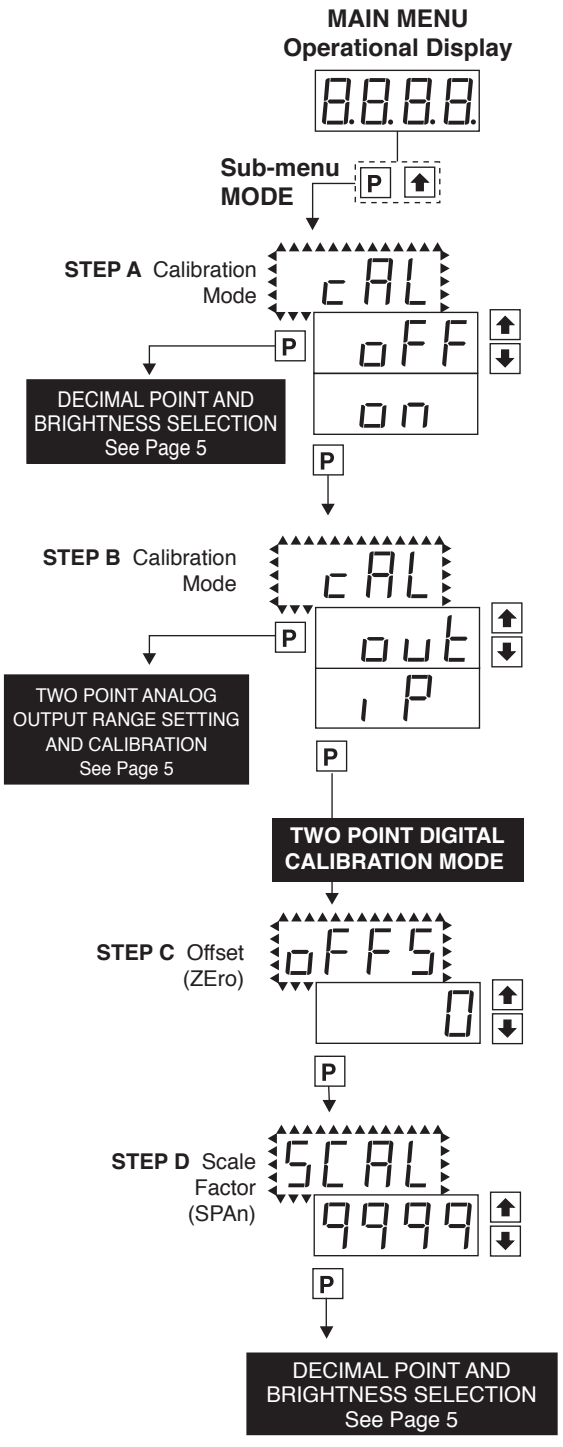
1) Press the P button. Display toggles between [oFFS] and the previous offset setting. For direct frequency measurement, set the offset to 0.
   If a display that is scaled to read in engineering units is required, this offset may be set to any value from -1999 to +9999.
2) Press the P button.

STEP D Set the Scale Factor (SCAL)

1) Display toggles between [SCAL] and the previous scale setting.
2) For direct frequency measurement, set the scale to 9999.
   If a display that is scaled to read in engineering units is required, this scale factor may be set to any value from 0 to 9999.
3) Press the P button.

The Digital Calibration Procedure is now complete.

If the digital calibration was successfully completed, the menu branches to the Decimal Point and Brightness Selection (see page 5), and the display shows [dP] and the previous setting.



Two Point Analog Output Range Setting and Calibration

STEP A Enter the Calibration Mode

1) Press the P and ↑ buttons at the same time. Display toggles between [cAL] and [oFF].
2) Press the ↑ or ↓ button. Display changes from [oFF] to [on].
3) Press the P button. Display toggles between [cAL] and [out] input calibration.

Note: If at this point the display skips directly to toggle between [SPAn] and the previous [SPAn], the software is detecting that the optional analog output hardware is NOT installed.

STEP B Enter the Analog [oUT] Output Mode

1) Press the P button. Display toggles between [cLo] and an internal scale factor.

STEP C Set or Calibrate the [cLo] Low Analog Output Range

1) Select the voltage or current loop output header position on the output module. (See Select Input Range and Analog Output on page 9).
2) Connect a multimeter to pins 16 and 17 on the output module. (See Rear Panel Pinouts on page 7). Using the ↑ and ↓ buttons, adjust the analog output to the desired low value as shown on the multimeter display. cLo may be adjusted to any value from –0.3 mA to 17 mA (mA output selected) or from –0.6 V to 8 V (volt output selected)
3) Press the P button. Display toggles between [chi] and an internal scale factor.

STEP D Set or Calibrate the [chi] High Analog Output Range

1) Using the ↑ and ↓ buttons, adjust the analog output to the desired high value as shown on the multimeter display. chi may be adjusted to any value from 17 mA to 21 mA (mA output selected) or from 8 V to 10.3 V (volt output selected)
2) Press the P button. The display exits the calibration mode and returns to the operational display.

Note: Having established the Low and High range of the analog output, the digital span can now be selected which will set the two digital points between which the analog output will occur. (See Digital Span Selection below).

Decimal Point and Brightness Selection

Enter the Decimal Point and Brightness Mode Through the Sub Menu [CAL] [oFF]

1) Press the P and ↑ buttons at the same time. Display toggles between [cAL] and [oFF].
2) Press the P button. Display shows previous [dp] selection.

STEP E Set the Decimal Point

1) Using the ↑ and ↓, adjust the display to the desired decimal point setting.
2) Press the P button. Display toggles between [Br] and the previous [Br] setting.

STEP F Set the Display Brightness

1) Using the ↑ and ↓ buttons, adjust the display to the desired brightness setting (4 is the brightest setting).
2) Press the P button. Display brightness changes to new setting and display toggles between [Anhi] and the previous [Anhi] setting.

Digital Span Selection for Analog Range Output

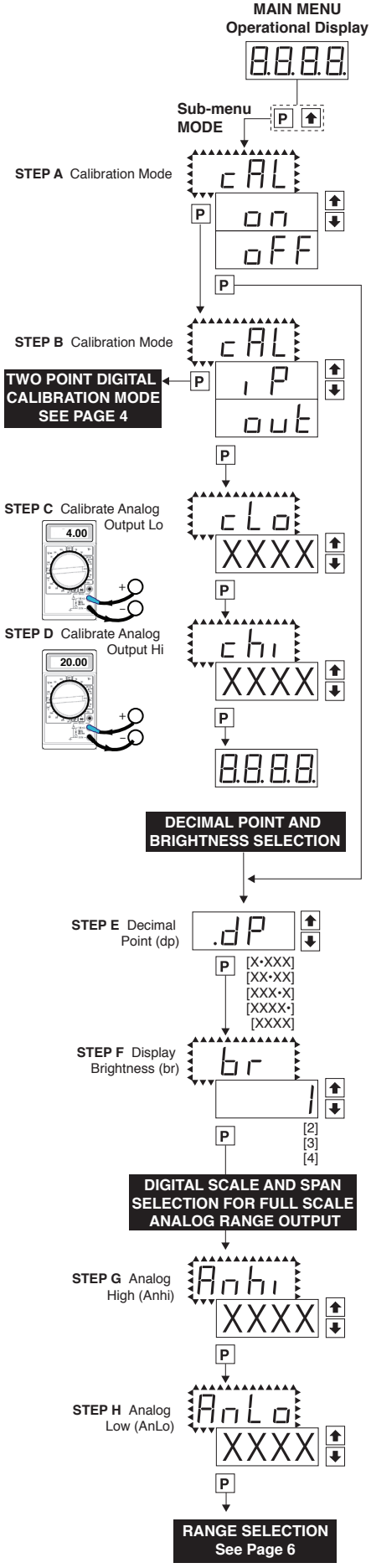
STEP G Setting the Digital Span Point for Analog High Output

1) Using the ↑ and ↓ buttons, adjust the display to the desired digital value which sets the point at which the selected analog high output range will occur.
2) Press the P button. Display toggles between [AnLo] and previous [AnLo] setting.

STEP H Setting the Digital Span Point for Analog Low Output

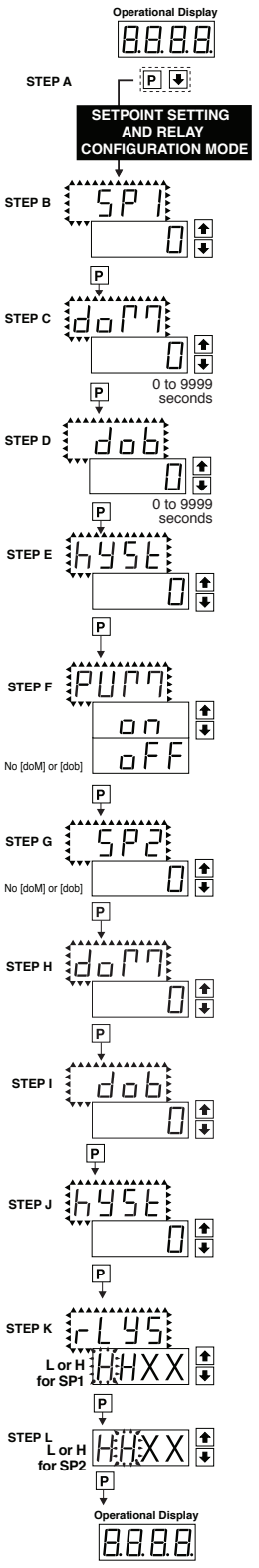
1) Using the ↑ and ↓ buttons, adjust the display to the desired digital value which sets the point at which the selected analog low output range will occur.
2) Press the P button. The display exits the calibration mode and returns to the operational display.

Note: Any two digital scale points from –1999 to 9999 can be selected. The digital scale points for analog high and analog low can be reversed for reversed 20-4 mA output. The span of the digital scale can be as small as two counts however small spans cause the 16 bit D to A to increment in stair case steps.



Setpoint Setting and Relay Configuration Mode

The following programming steps are required to enter the setpoint values and configure the relay functions in a meter with four relays using four setpoints. Generally if less than four relays are installed, the setpoints without relays are operational in software for tri-color control or display only purposes. To remove unwanted setpoint indications, set them to 9999 or -1999 depending on the relay activation mode selected.



STEP A Enter the Setpoint Mode

1) Press the P and ↓ buttons at the same time. Display toggles between [SP1] and the previous SP1 setting.

STEP B Set Setpoint 1 [SP1]

1) Using the ↑ and ↓ buttons, adjust the display to the desired SP1 value.
2) Press the P button. Display toggles between [doM] and the previous [doM] setting.

STEP C Set the SP1 Delay-on-Make [doM] Delay Time Setting

1) Using the ↑ and ↓ buttons, adjust the display to the desired [doM] value (0 to 9999 seconds). The reading must continuously remain in an alarm condition until this delay time has elapsed before the relay will make contact (energize).
2) Press the P button. Display toggles between [dob] and the previous [dob] setting.

STEP D Set the SP1 Delay-on-Break [dob] Delay Time Setting

1) Using the ↑ and ↓ buttons, adjust the display to the desired [dob] value (0 to 9999 seconds). The reading must continuously remain in a non-alarm condition until this delay time has elapsed before the relay will break contact (de-energize).
2) Press the P button. Display toggles between [hYSt] and the previous [hYSt] setting.

STEP E Select the Hysteresis [hYSt]

1) Using the ↑ and ↓ buttons, adjust the display to the desied hysteresis [hYSt] value.
2) Press the P button. Display toggles between PUM and (on) or (oFF).

STEP F Select Pump [PUM] (on) or (oFF)

1) Using the ↑ and ↓ buttons, select the Pump to be ON or OFF. When PUM is selected ON, and SP2 is set at a value higher than SP1, the SP1 relay will operate in a special "pump on pump off" mode. SP2 acts as the upper limit and SP1 acts as the lower limit of the Hysteresis Band on the SP1 relay.

For filling applications:

[rLYS] should be set to [LhXX] (see step M). The SP1 relay and SP1 LED Annunciator will then activate for inputs less than the SP1 setpoint, and remain ON until the SP2 setpoint is reached.

For emptying applications:

[rLYS] should be set to [hhXX] (see step M). The SP1 relay and SP1 LED Annunciator will then activate for inputs greater than the SP2 setpoint, and remain ON until the SP1 setpoint is reached.

2) Press the P button. Display toggles between [SP2] and the previous SP2 setting.

STEP G Set Setpoint 2 (SP2)
STEP H Set the SP2 Delay-on-Make (doM) Delay Time Setting
SETP I Set the SP2 Delay-on-Break (doB) Delay Time Setting

STEP J Select the Hysteresis [hYSt] for Setpoint 2

1) Using the ↑ and ↓ buttons, adjust the display to the desied hysteresis [hYSt] value.
2) Press the P button. Display toggles between [rLYs] and the previous relay setting.

STEP K Set Relay Activation mode [rLYS] for SP1

(h) High the relay energizes when the setpoint is exceeded. (L) Low the relay energizes below the setpoint. The setpoint is indicated from left to right SP1, SP2.

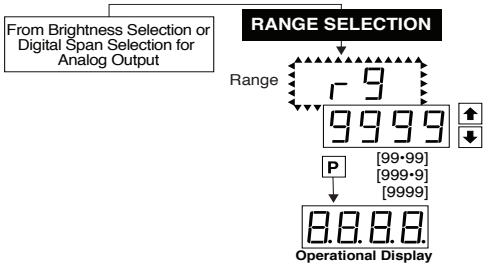
1) Using the ↑ and ↓ buttons, select (L) or (h) for the first digit, which corresponds to SP1.
2) Press the P button. The SP2 Relay Activation digit begins to flash, and its decimal point is lit.

STEP L Set High (h) or Low (L) for SP2

1) Using the ↑ and ↓ buttons, select (L) or (h) for the second digit, which corresponds to SP2.
2) Press the P button.

The transmitter exits the setpoint mode and return to the operational display.

Range Selection Mode

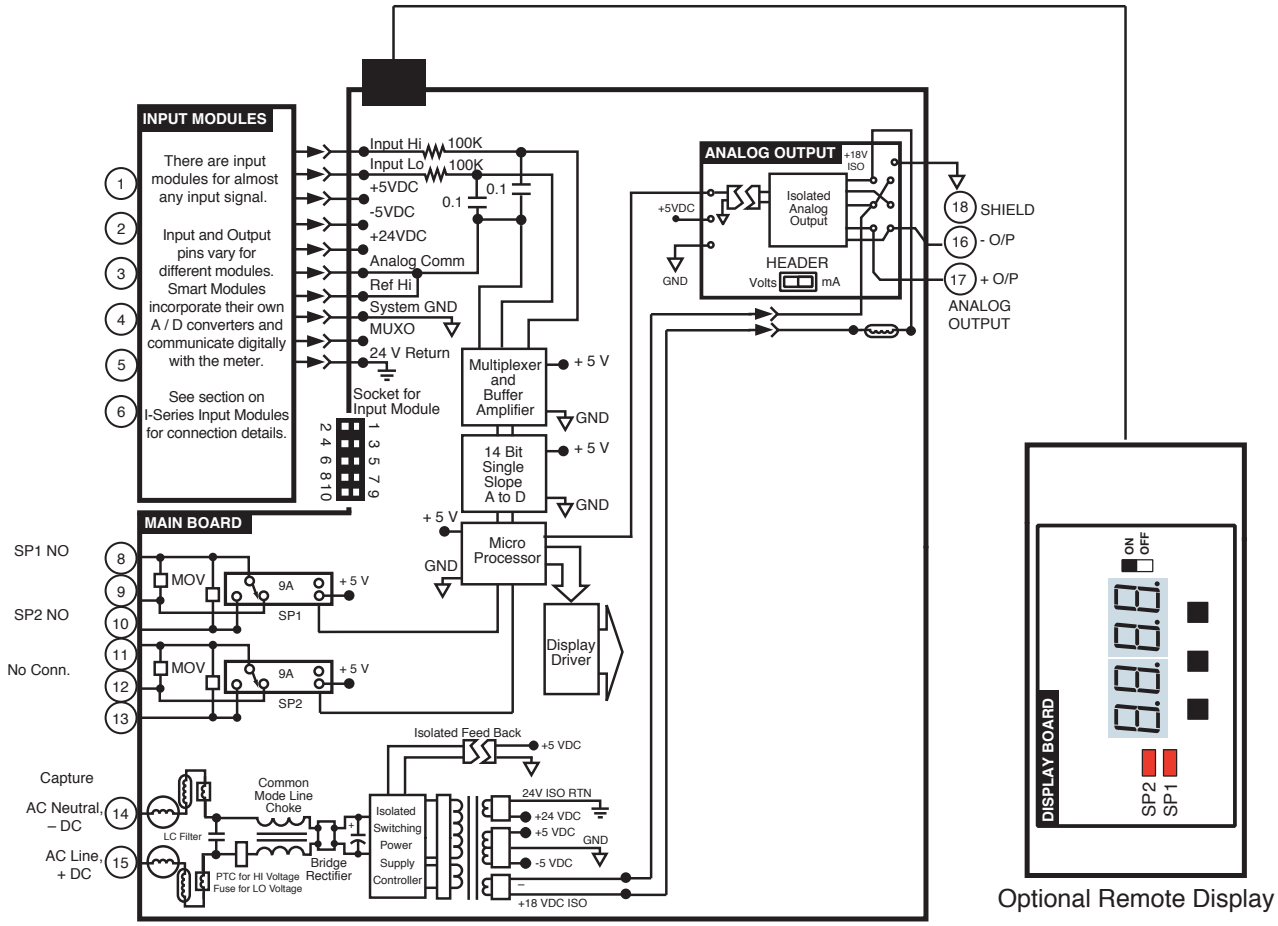


STEP I Select the Range

1) Using the ↑ and ↓ buttons, select the required range. There are three ranges of 99.99Hz, 999.9Hz and 9999Hz
2) Press the P button. The display exits the calibration mode and returns to the operational display.

The Display/Bargraph settings are now complete.

Functional Diagram



Optional Remote Display

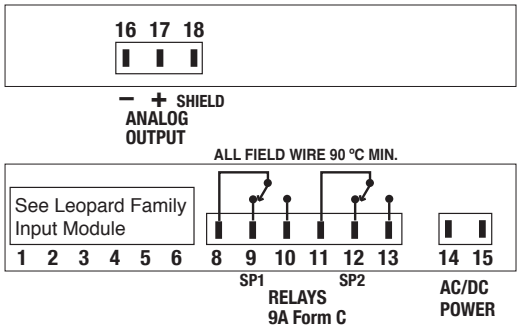
Connector Pinouts

Pinout Diagram

The Rear View of the Meter diagram shows the meter with the relay configuration: dual 10 Amp Form C and dual 5 Amp Form A relays. An analog output module is also shown as installed.

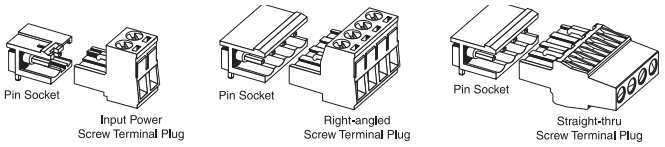
The TL Series Transmitter uses plug-in type screw terminal connectors for all input and output connections. The power supply connections (pins 14 and 15) have a unique plug and socket outline to prevent cross connection. The main board and input signal conditioner use right-angled connectors as standard. The output module uses straight-thru connectors as standard.

WARNING: AC and DC input signals and power supply voltages can be hazardous. Do Not connect live wires to screw terminal plugs, and do not insert, remove or handle screw terminal plugs with live wires connected.



Auto-sensing AC/DC power supply. For voltages between 85-265 V AC / 95-300 V DC (PS1) or 15-48 V AC / 10-72 V DC (PS2).

Standard plug-in screw terminal connectors provided by Texmate:



Input Signal – Pins 1 to 6

Pins 1 to 6 are reserved for the input signal conditioner. See the data sheet for the selected input signal conditioner.

Relay Output Pins- Pins 8 to 13

Pin 8-10 **SP1 Normally Open**
Pin 8-9 **SP1 Normally Close**
Pin 11-13 **SP2 Normally Open**
Pin 11-12 **SP2 Normally Close**

AC/DC Power Input- Pins 14 and 15

Auto-sensing AC/DC power supply. For voltages between 85-265 V AC/95-300 V DC (PS1) or 15-48 V AC/10-72 V DC (PS2).

Pin 14 **AC/DC Neutral.** Neutral power supply line.
Pin 15 **AC/DC line.** Live power supply line.

Analog Output- Pins 16 and 18

Pins 16 and 17 are the analog output pins on the optional output module. Their pin definitions are:

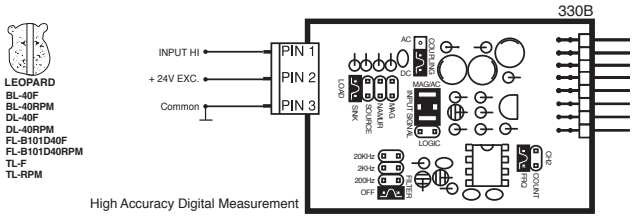
Pin 16 Negative (–) analog output.
Pin 17 Positive (+) analog output.
Pin 18 Shield.

Symbols Indicate Module Compatibility Within Meter Families		
TIGER Family LEOPARD Family LYNX Family	TIGER Family LEOPARD Family LYNX Family	TIGER Family LEOPARD Family LYNX Family
ALL MODELS	**SOME MODELS**	**MODEL SPECIFIC**

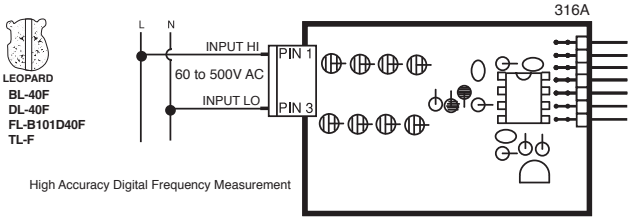
Unless otherwise specified Texmate will ship all modules pre-calibrated with factory preselected ranges and/or scalings as shown in **BOLD** type. Other pre-calibrated standard ranges or custom ranges may be ordered. Factory installed custom scaling and other custom options are also available (see Ordering Information, Special Options on last page).

WARNING: AC and DC input signals and power supply voltages can be hazardous. Do Not insert, remove or handle modules with live wires connected to any terminal plugs.

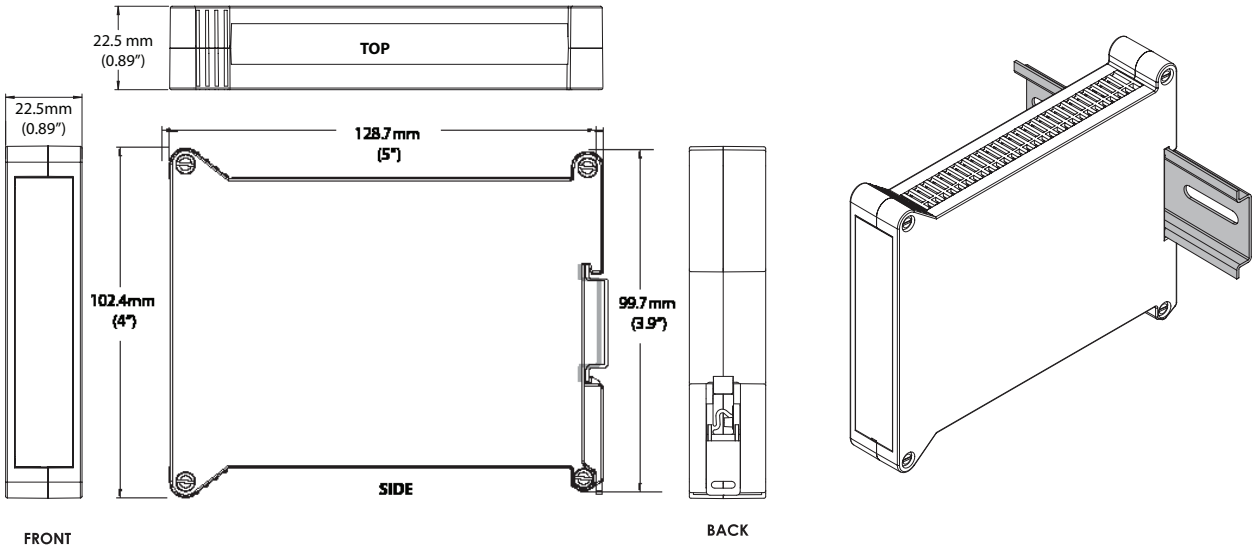
IF05: Universal Frequency / RPM



IF08: Line Frequency



Case Dimensions



Installation Guidelines

1. Install and wire transmitter per local applicable codes/ regulations, the particular application, and good installation practices.

2. Install transmitter in a location that does not exceed the maximum operating temperature and that provides good air circulation.

3. Separate input/output leads from power lines to protect the transmitter from external noise. Input/output leads should be routed as far away as possible from contactors, control relays, transformers and other noisy components. Shielding cables for input/output leads is recommended with shield connection to earth ground near the meter preferred.

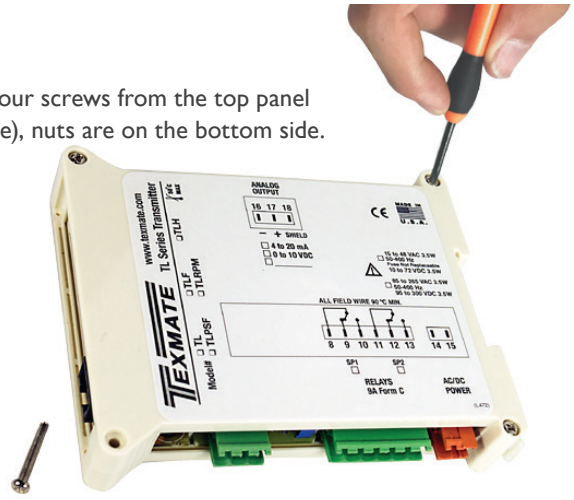
4. A circuit breaker or disconnect switch is required to disconnect power to the meter. The breaker/switch should be in close proximity to the meter and marked as the disconnecting device for the meter or meter circuit. The circuit breaker or wall switch must be rated for the applied voltage (e.g., 120VAC or 240VAC) and current appropriate for the electrical application (e.g., 15A or 20A).

5. See *Connector Pinouts section* for wiring.

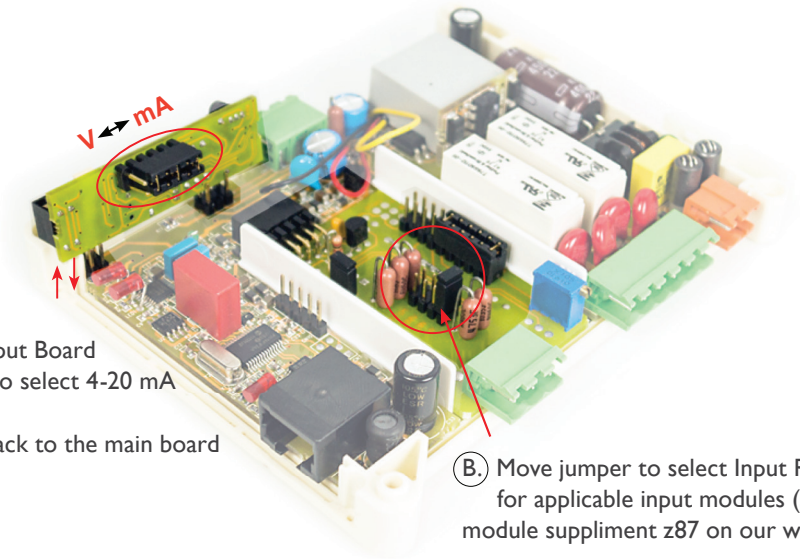
6. Use 28-12 AWG wiring, minimum 90˚C (HH) temperature rating. Strip wire approximately 0.3 in. (7-8 mm).

7. Recommended torque on all terminal plug screws is 4.5 lb-in (0.51 N-m).

Select Input Range and Analog Output



Ⓐ Remove the four screws from the top panel (the label side), nuts are on the bottom side.



Ⓒ 1. Lift up Analog Ouput Board
2. Move the jumper to select 4-20 mA or 0 to 10 V
3. Insert the board back to the main board

Ⓑ Move jumper to select Input Range for applicable input modules (see Input module suppliment z87 on our website.)

Ordering Information

* Selection Required

BASE MODEL #	POWER SUPPLY	INPUT MODULES	ANALOG OUTPUT	RELAY OUTPUT	
					OA____
*	*	*	*		

BASE MODEL NUMBER

TL-F . . . . . Frequency Transmitter and Controller . . . . . .

POWER SUPPLY

PS1 . . . . . 85-265VAC/95-300VDC . . . . . .
PS2 . . . . . 15-48VAC/10-72VDC. . . . . .

INPUT MODULES

Unless otherwise specified Texmate will ship all modules precalibrated with factory preselected ranges and/or scalings as shown in **BOLD** type

IF05. . .Frequency with 2mV/5V with Excitation . . . . . .
IF08. . .Line Frequency. . . . . .

ANALOG OUTPUT

OIC . . Isolated 16 Bit Current Output, 4-20mA . . . . . .
OIV . . Isolated 16 Bit Voltage Output, 0-10VDC. . . . . .

RELAY OUTPUT

R11 . . Single 9A Form C Relay . . . . . .
R12 . . Dual 9A Form C Relays . . . . . .

SPECIAL OPTIONS

SPECIAL OPTIONS

Range Change and Custom Scaling
Customer must specify the input signal range or digital span and the desired display range, or output signal range. Multiple inputs or multiple displays require a separate range change or custom scaling part number and a specified channel for each input or display.

Range Change and calibration to another header selectable standard range
CR-CHANGE . . . Range Change from Standard Range shown in **BOLD** type . .

Output - Custom Scaling within standard ranges of analog output.
COA-3/3.5/4 . . . Custom scaling of analog output . . . . . .

Short Depth 96x48 Remote Display/Programmer
OP-TL/RDISP . . Remote Display/Programmer w/Cable . . . . . .
and Belt Clip Carrying Case

WARRANTY

Texmate warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment. Texmate's obligations under this warranty are limited to replacement or repair, at its option, at its factory, of any of the products which shall, within the applicable period after shipment, be returned to Texmate's facility, transportation charges pre-paid, and which are, after examination, disclosed to the satisfaction of Texmate to be thus defective. The warranty shall not apply to any equipment which shall have been repaired or altered, except by Texmate, or which shall have been subjected to misuse, negligence, or accident. In no case shall Texmate's liability exceed the original purchase price. The aforementioned provisions do not extend the original warranty period of any product which has been either repaired or replaced by Texmate.

USER'S RESPONSIBILITY

We are pleased to offer suggestions on the use of our various products either by way of printed matter or through direct contact with our sales/application engineering staff. However, since we have no control over the use of our products once they are shipped, NO WARRANTY WHETHER OF MERCHANTABILITY, FITNESS FOR PURPOSE, OR OTHERWISE is made beyond the repair, replacement, or refund of purchase price at the sole discretion of Texmate. Users shall determine the suitability of the product for the intended application before using, and the users assume all risk and liability whatsoever in connection therewith, regardless of any of our suggestions or statements as to application or construction. In no event shall Texmate's liability, in law or otherwise, be in excess of the purchase price of the product.

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