Optional Remote Display Programmer


LEOPARD FAMILY

TL-H

Leopard Series Temperature Transmitter and Controller

An economically smart temperature transmitter for J, K, R, and T type T/C and RTD inputs.

General Features

- Thermocouple (J, K, R and T types) or RTD (Pt-100. 385 and 392 curves. 3 wire/4wire). Digitally Linearized.
- Optional isolated 16 bit analog output. User or factory scalable to 4 to 20 mA, 0 to 20 mA or 0 to 10 V across any desired digital span from ± one count to the full scale range of – 1999 to 9999 (12000 counts).
- 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).
- Two annunciator LEDs provide front panel alarm status indication for up to two setpoints.
- Two 9Amp Form C relays.

Software Features using Remote Display

- Three-button programming. (UP, DOWN and PROGRAM buttons).
- Two front panel selectable ranges. 0.1ºC or F, 1ºC or F.
- Front panel selectable four-level brightness control of digital display, and setpoint LEDs.
- Two programmable setpoints.
- Relay activation can be selected to occur above (HI) or below (LO) each setpoint.
- Hysteresis setting for all three setpoints. Delay on make and delay on break for SP1 and SP2.

Input Module Compatibility

There are 2 different Plug-in Modular Input Signal Conditioners for this specialized temperature only member of the Leopard Family. IT10 is for J, K, T and R thermocouples. IT11 is for 3 wire/4 wire Pt-100 RTD inputs.

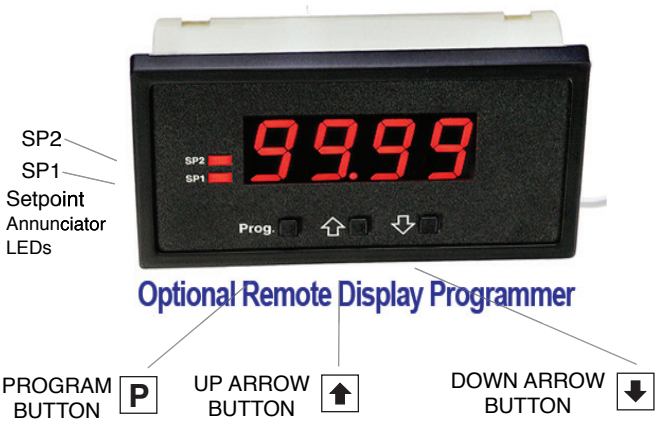

LEOPARD

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
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
OIC (mA out).....4-20 mA @ 0 to 500Ω max loop resistance
OIV (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

Index

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, but not change, the setting of **setpoint 1**.

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 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

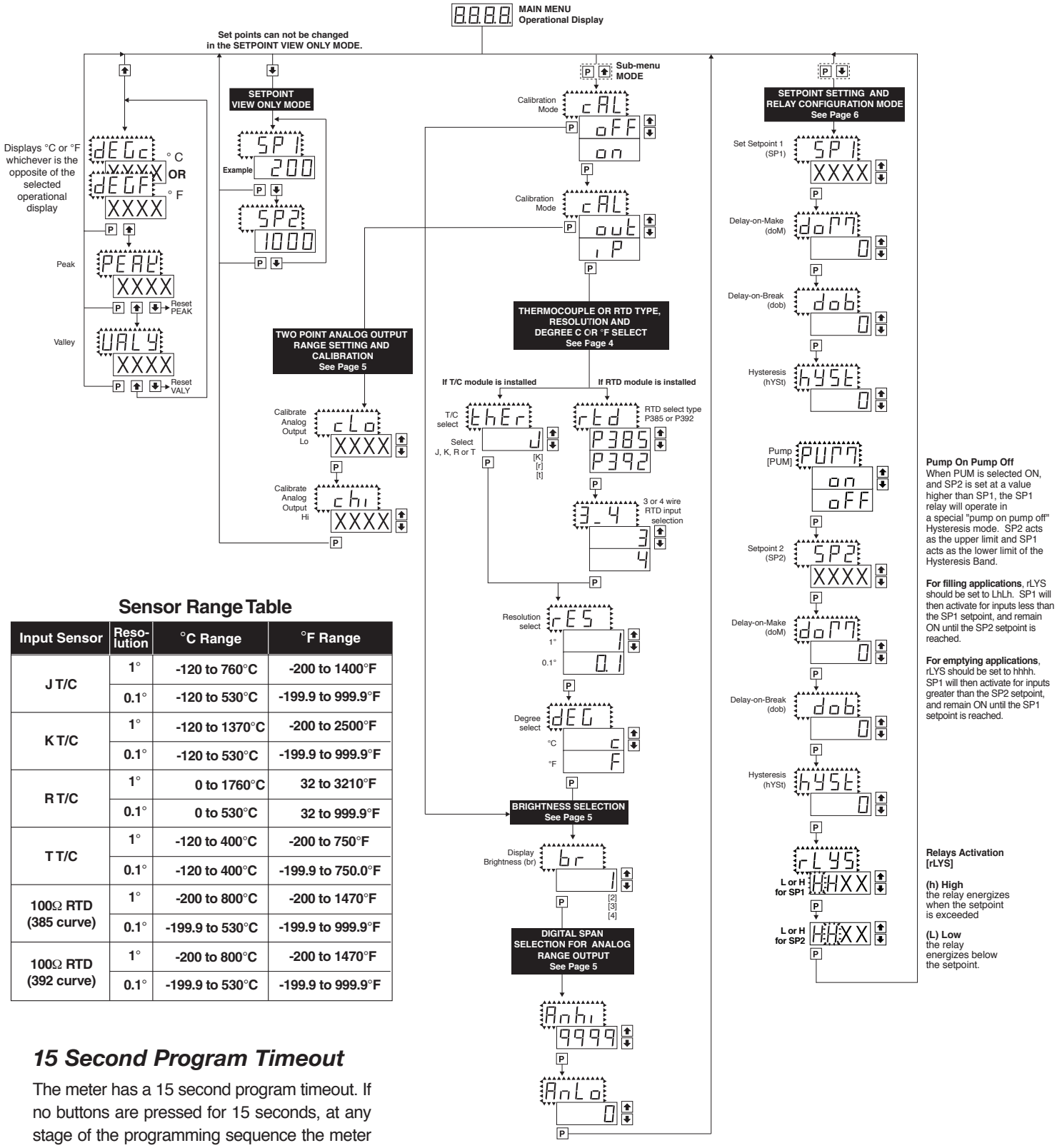
To explain software programming procedures, logic diagrams are used to visually assist in following the programming steps. The fol-lowing symbols are used throughout the logic diagrams to repre-sent the buttons and indicators on the meter:

Symbol	Explanation
8.8.8.8.	This symbol represents the OPERATIONAL DISPLAY.
P	This is the PROGRAM button.
↑	This is the UP button.
↓	This is the DOWN button.
P ↑	When a button is shown, press and release it to go onto the next step in the direction indicated by the arrow. When two or more buttons are shown, each with an arrow, this indicates that there is a number of programming choices.
P ↑	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.
XXXX 0	If the display is shown with XXXX it means the value displayed will be the previously set value. When a number is shown it indicates the initial factory default setting or a specific "example number".
2Ero 0 ↑↓	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 pro-gramming code name of the function or the value displayed on the meter display.
0 ↑↓	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.
oFF ↑ on ↓	When the ↑ and ↓ buttons are shown with two displays, either display can be selected by pressing and releasing the ↑ or ↓ buttons.
hhh- ↑↓ **[LhL-]** **[hLh-]** **[LLL-]**	When there are more than two display selec-tions they are shown in brackets below the first display and are also selectable by press-ing and releasing the ↑ or ↓ buttons.

Software Logic Tree (when Optional Remote Display is used)

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

After the meter 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.

Sensor Range Table

Input Sensor	Reso-lution	°C Range	°F Range
J T/C	1°	-120 to 760°C	-200 to 1400°F
	0.1°	-120 to 530°C	-199.9 to 999.9°F
K T/C	1°	-120 to 1370°C	-200 to 2500°F
	0.1°	-120 to 530°C	-199.9 to 999.9°F
R T/C	1°	0 to 1760°C	32 to 3210°F
	0.1°	0 to 530°C	32 to 999.9°F
T T/C	1°	-120 to 400°C	-200 to 750°F
	0.1°	-120 to 400°C	-199.9 to 750.0°F
100Ω RTD (385 curve)	1°	-200 to 800°C	-200 to 1470°F
	0.1°	-199.9 to 530°C	-199.9 to 999.9°F
100Ω RTD (392 curve)	1°	-200 to 800°C	-200 to 1470°F
	0.1°	-199.9 to 530°C	-199.9 to 999.9°F

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.

Thermocouple or RTD Sensor Type Selection

STEP A Enter the Sensor Type Selection Mode Through the Sub Menu [CAL] [iP]

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]
4) Press the ↑ or ↓ button. Display changes from [out] to [iP].
5) Press the P button and depending on the module installed the dis play will either toggle between [thEr] and the thermocouple selected [J], [K], [R] or [T] or [RTD] and the RTD type selection [P385] or [P392].

STEP B Sensor Type Selection

1) Using the ↑ and ↓ buttons, adjust the display to the desired sensor type.
2) Press the P button. Display toggles between [rES] resolution select and previous [rES] setting.

STEP C Set the Resolution

1) Using the ↑ and ↓ buttons, adjust the display to the desired resolution [rES] value.
2) Press the P button. Display toggles between [dEg] and previous [dEg] selection.

STEP D Selection of Degree C or Degree F

1) Using the ↑ and ↓ buttons, adjust the display to either ˚C or ˚F.
2) Press the P button. The meter exits the sensor type selection mode and go to Brightness setting.

Brightness Selection

STEP E Enter the 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 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

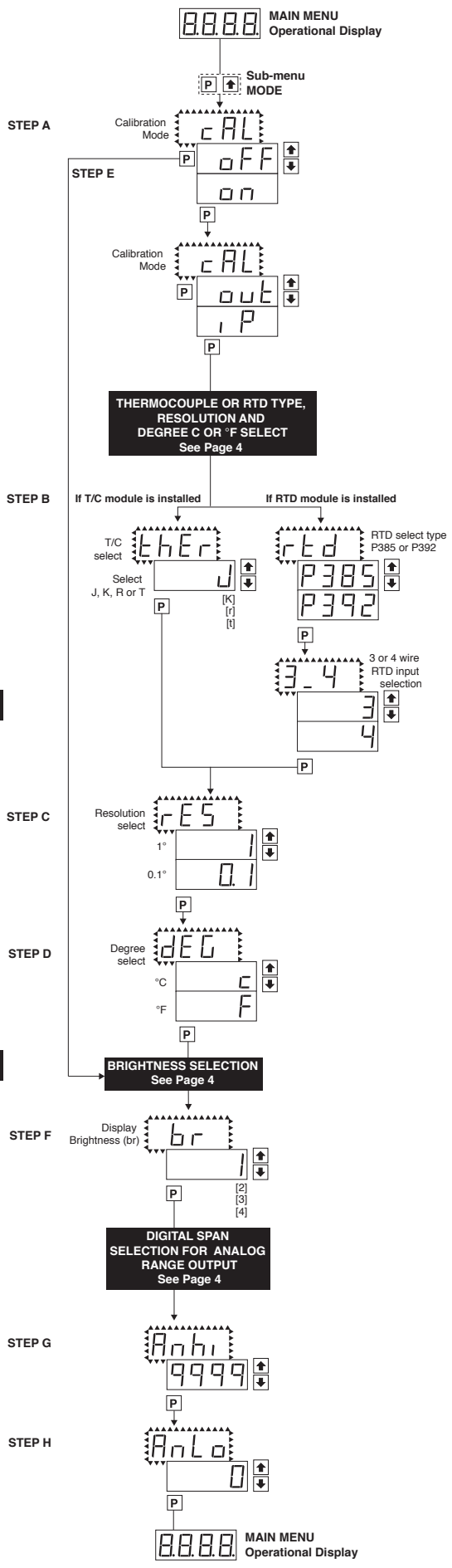
STEP G Setting the Digital Span Point for Analog High Output

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.



IT10 Thermocouple Input Signal Conditioner installed.

1. Unplug the connector plugs from the meter. Remove the case back panel and slide the PCB out of the case.
2. Select the appropriate header jumper position depending on which thermocouple is to be used. Thermocouple types J, K, R and T are supported. This sets up the correct cold junction compensation.
3. Insert the PCB back into the case. Snap the back panel back into the case. Apply power to the meter.
4. Enter the program mode and select the type of thermocouple (J, K, R, T), the resolution (0.1° or 1°) and the display units ·°C or °F). See the Software Logic Tree on Page 3 of the data sheet for details.
5. Connect a thermocouple simulator to the meter inputs. Apply an input corresponding to 0° and adjust the ZERO Potentiometer to make the display read 0.
6. Apply an input corresponding to the maximum reading of the thermocouple and adjust the SPAN Potentiometer to make the display read correctly.
7. The TL-H is now calibrated and ready for use. Calibration will have to be performed again if the thermocouple type is changed.

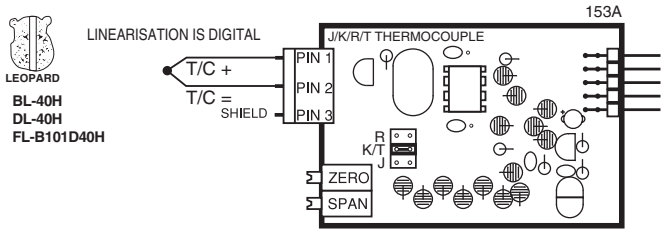
IT11 RTD Input Signal Conditioner installed.

1. Enter the program mode and select the type of RTD (385 or 392 curve and 3-wire/ 4-wire), the resolution (0.1° or 1°) and the display units ·°C or °F). See the Software Logic Tree on Page 3 of the data sheet for details.
2. Connect an RTD simulator to the meter inputs. Apply an input corresponding to 0° and adjust the ZERO Potentiometer to make the display read 0.
3. Introduce a lead resistance of 10Ω in each lead. Adjust the Lead Resistance Compensation potentiometer to make the display again reads 0.
4. The TL-H is now calibrated and ready for use. Calibration will have to be performed again if the RTD type is changed.

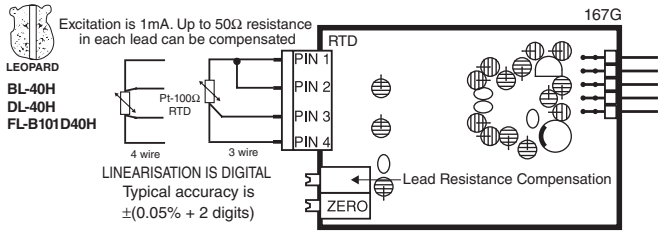
Symbols Indicate Module Compatibility Within Meter Families

TIGER Family	TIGER Family	TIGER Family
LEOPARD Family	LEOPARD Family	LEOPARD Family
LYNX Family	LYNX Family	LYNX Family
ALL MODELS	**SOME MODELS**	**MODEL SPECIFIC**

IT10: Thermocouple, J/**K**/R/T, Selectable C/ **F**, **1** /0.1



IT11: RTD, 100Ω Pt. Select **3**/4-wire,°C/°**F, 1**°/0.1°
IT15: RTD, 1000Ω Pt. Select 3/4-wire, °C/°**F, 1**°/0.1°



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].

STEP B Enter the Analog [out] Output Mode

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

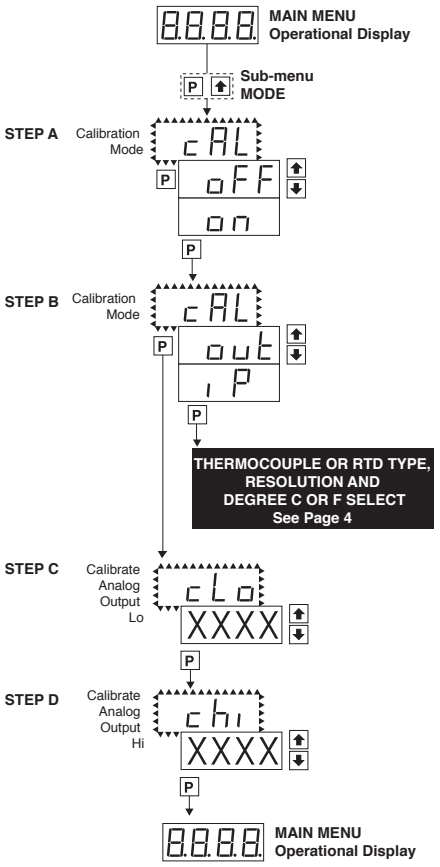
STEP C Set or Calibrate the [cLo] Low Analog Output Range

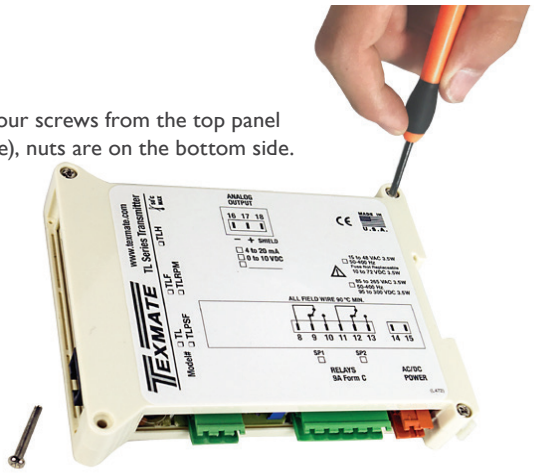
1) Select the voltage or current loop output header position on the output module. (see below picture).
2) Connect a multimeter to pins 8 and 9 on the output module. (See Rear Panel Pinouts on page 8). Using the [▲] and [▼] buttons, adjust the analog output to the desired low value as shown on the multimeter 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

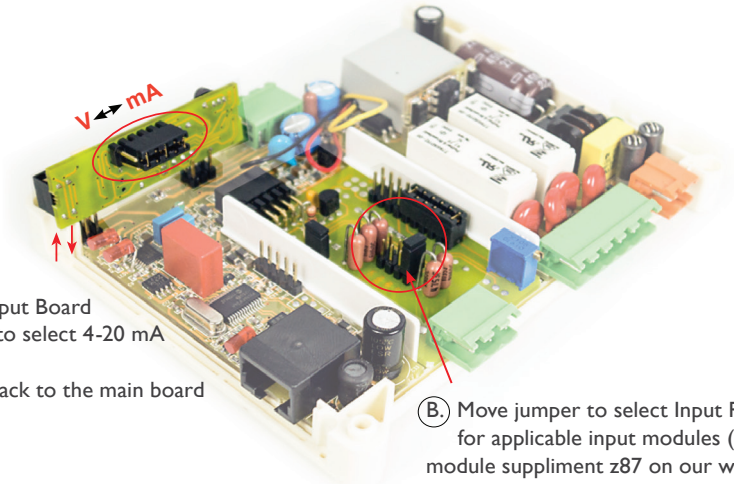
1) Using the [▲] and [▼] buttons, adjust the analog output to the desired high value as shown on the multimeter display. chi may be adjusted to any value from 17 mA to 21 mA (mA output selected) or from 8 V to 10.3 V (volt output selected)
2) Press the [P] button. The display exits the calibration mode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





Ⓐ. 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.)

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 software auto detects missing relays and deletes reference to them from the menu. In some cases setpoints without relays are operational for display only purposes.

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 an 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 Set the Hysteresis Setting for Setpoint 1

1) Using the ↑ and ↓ buttons, adjust the display to the desired hysteresis [hYSt] value.
2) Press the P button. Display toggles between [SP2] and the previous [SP2] setting.
   NOTE: Half of the Hysteresis value selected is applied above and below the setpoint.

NOTE: Steps G, H, I and J have functionally the same procedure as steps B, C, D, and E shown above.

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
STEP I Set the SP2 Delay-on-Break (dob) Delay Time Setting

STEP J Set the Hysteresis Setting for Setpoint 2

1) Using the ↑ and ↓ buttons, adjust the display to the desired 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.

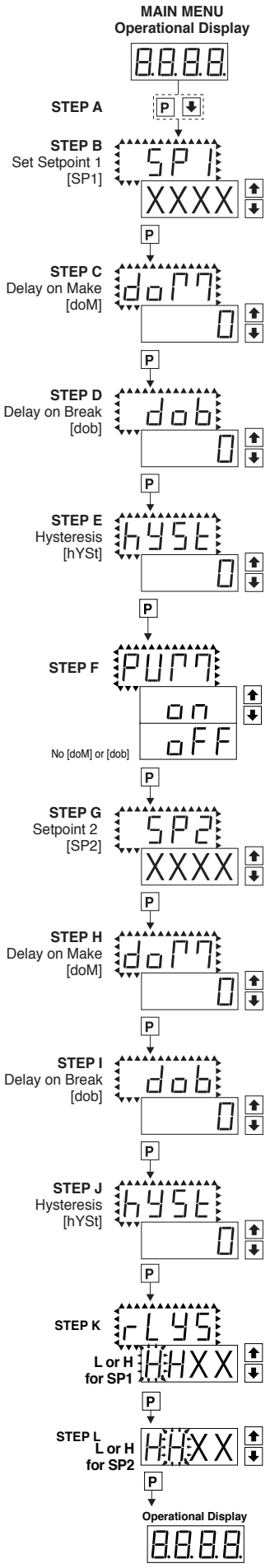
1) Using the ↑ and ↓ buttons, select (L) or (h) for the first digit, which corresponds to SP1.
2) Press the P button. The SP2 Relay Activation digit begins to flash, and its decimal point is lit.

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

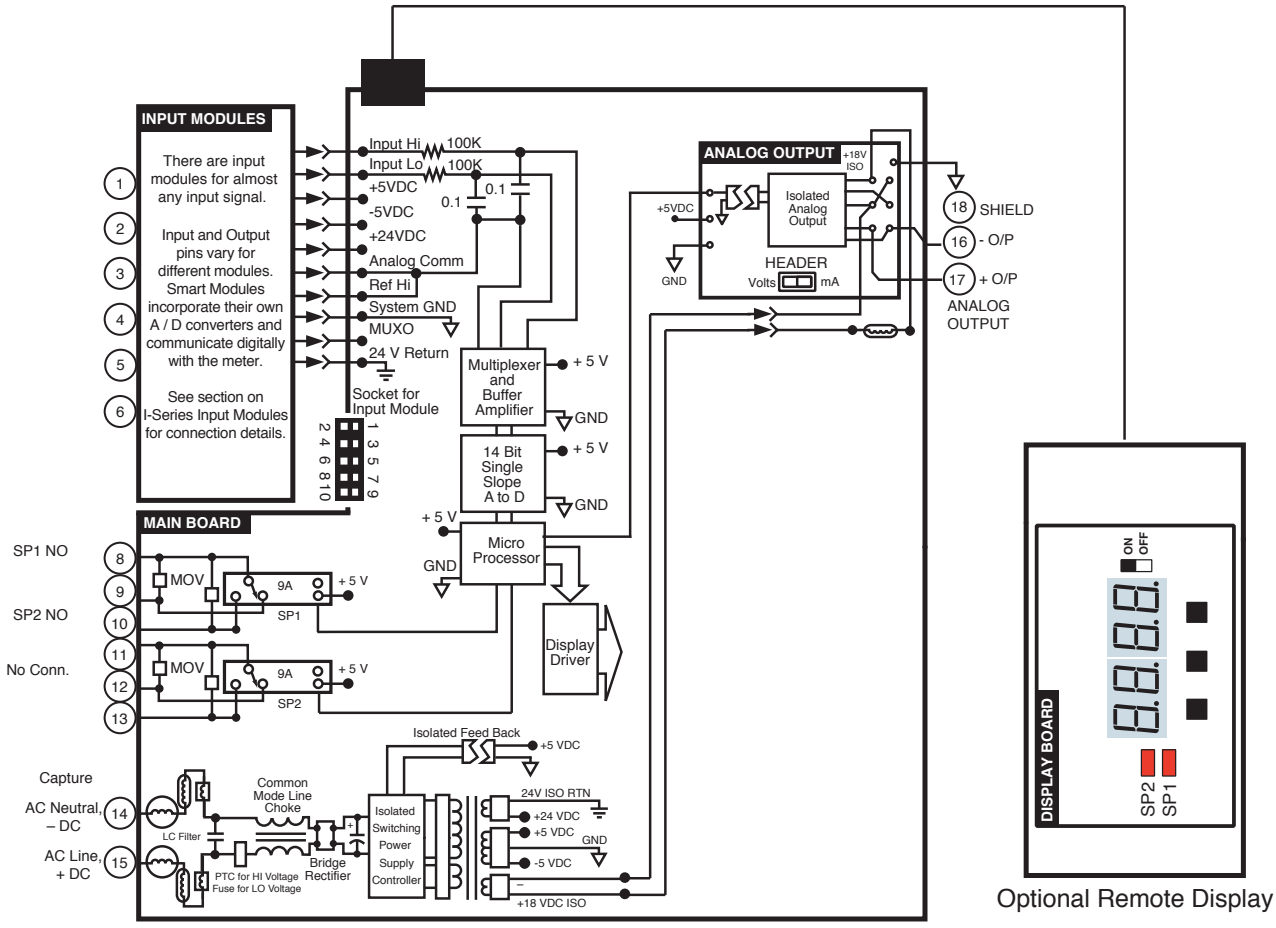
1) Using the ↑ and ↓ buttons, select (L) or (h) for the second digit, which corresponds to SP2.
2) Press the P button.

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

The Setpoint Relay programming mode is now complete.



Functional Diagram



Optional Remote Display

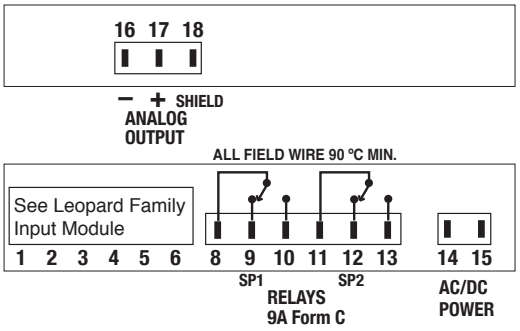
Connector Pinouts

Pinout Diagram

The Top and Bottom View of the trnsmitter diagram shows the transmitter with the relay configuration: Two 9 Amp Form C. An analog output module is also shown as installed.

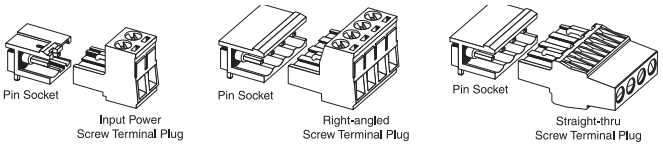
The TL Series Transmitter uses plug-in type screw terminal connectors for all input and output connections. The power supply connections (pins 14 and 15) have a unique plug and socket outline to prevent cross connection. The main board and input signal conditioner use right-angled connectors as standard.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

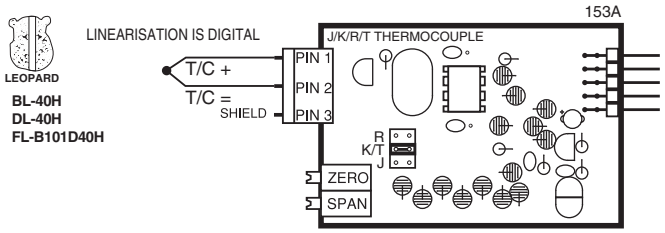
Symbols Indicate Module Compatibility Within Meter Families		
TIGER Family LEOPARD Family LYNX Family	TIGER Family LEOPARD Family LYNX Family	TIGER Family LEOPARD Family LYNX Family
ALL MODELS	**SOME MODELS**	**MODEL SPECIFIC**

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.

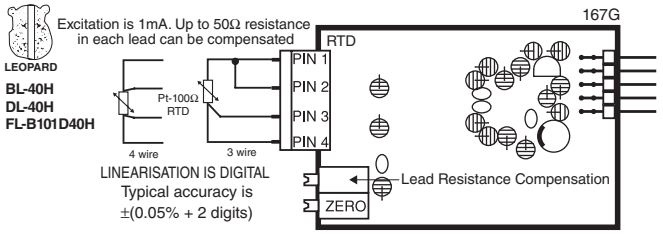
Pre-calibrated **I-Series** input modules, that have span or zero potentiometers, can be interchanged between any **I-Series** compatible meter, without recalibration, because all of the analog scaling and reference circuitry is self-contained within the module.

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).

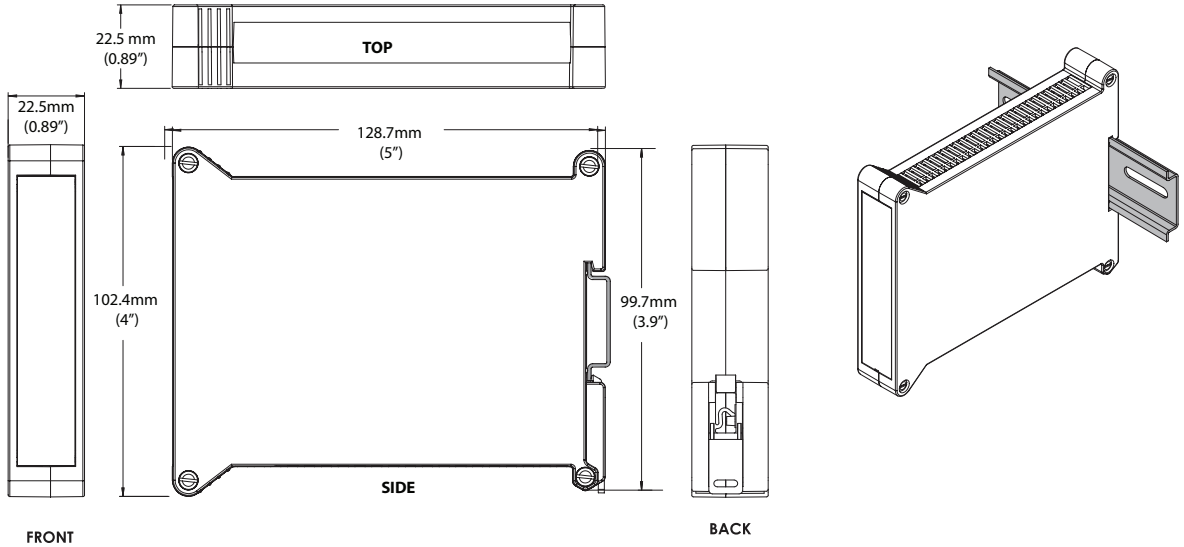
IT10: Thermocouple, J/**K**/R/T, Selectable C/ **F**, **1** /0.1



IT11: RTD, 100Ω Pt. Select **3**/4-wire,°C/°**F, 1**°/0.1°
IT15: RTD, 1000Ω Pt. Select 3/4-wire, °C/°**F, 1**°/0.1°



Case Dimensions



Installation

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).

Ordering Information

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

*** Selection Required**

BASE MODEL NUMBER

TL-H . . . . . Temperature Transmitter and Control . . . . . .

POWER SUPPLY

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

INPUT MODULES

IT10 . .Thermocouple, J/**K**/R/T, Selectable °C/**°F**, **1°**/0.1°. .
IT11 . .RTD,100Ω Pt. Selectable **3**/4-wire,°C/**°F**, **1°**/0.1°, 385/392. .
IT11 . .RTD,1000Ω Pt. Selectable **3**/4-wire,°C/**°F**, **1°**/0.1°, 385/392 .

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 OPETION

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

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