

**NEW**

## TRIPLE LOOP POWERED DISPLAY FOR LONG DISTANCE VIEWING

**MODEL  
TLP**

### FEATURES:

- (1) 0.8" & (2) 0.6" 3 1/2 Digits
- Colors: Blue (Top), Red (Middle), Amber (Bottom)
- Metal, Plastic, Sanitary or Explosion Proof Case
- Signal or Loop Powered
- 3 Isolated Channels (>500VRMS)
- 3 Independent A/D
- Low Burden (<5V)
- NEMA 4X, EMI/RFI
- Loop or VDC Signal Powered or
- 5-48VDC/100-240VAC Power
- 28-VDC Power for Transmitter
- High Speed Peak & Hold
- Nuclear, Mil-Spec, I.S. & Industrial
- Lifetime Warranted

4" Switchboard



### DESCRIPTION

You talk, **OTEK** listens! We were requested to put 3 **LPE's** in one compact surface mount package with larger digits, like our **HI-Q126**, so we did it! Now you can have 3 independent and isolated displays, driven from their own current loop (or external power) to concurrently display any 3 parameters.

Several options are available on the **TLP**:

(See Ordering Information). You can have it as a:

1. 4-20mA input loop powered. (Powerless™)
2. V/mADC Signal powered. (Powerless™)
3. Externally powered for V, mA DC & True RMS, TC, RTD, S-G, %RH, pH ORP, Hz, etc.

The Grades Are: Nuclear (10CFR50B), Mil-Spec (to your Mil-Std.) or Industrial (to published specs.).

The Power Inputs Are: Loop Powered, 5-48VDC or 100-240VAC. You can even power your 4-20mA transmitters with the optional 28VDC compliance. The **TLP** is available in plastic or metal case (for Mil & Nuclear) conforming to **ANSI 4"** Switchboard standard only 1 1/2" thick with nothing behind the panel that also mounts on existing 1/4 **DIN** (92 x 92mm) panel cut-out, **Sanitary** case for 250 Degree F Steam Cleaning and Explosion Proof for Class I, Div. 1 & 2 are available. **Intrinsically Safe** (I.S.) versions on request. See Foot Note under Ordering Information.

### SPECIFICATIONS @ 25°C

#### (Industrial Grade)

#### Loop Powered Models (Each Channel):

- Burden: 5VDC Max. (7V For "S" Version)
  - Color Options: Red, Blue and Amber
  - Max. Input Current: 36mA, Max. Volts: 30V
  - Min. Input Current: 3.6mA
  - Accuracy & Linearity:  $\pm 0.01\%$  of F.S.  $\pm 1$  Digit
  - Span Adjustment:  $\pm 300$  Counts of F.S. (1000)
  - Zero Adjustment:  $\pm 300$  Counts of Zero (0000)
  - Standard Calibration: 4-20 = 0-1000, Others On Request
- NOTE:** Display brightness is proportional to loop current, brightest @ 20mA, dimmest @ 4mA.

#### Powered Models (Each Channel):

- Color Options: Red, Blue, Green and Amber
- LoopBurden: 0.5V @ 20mA; 25 Ohms
- Current Requirement @ 5V: 35mA for each channel
- Compliance for Xmtrs: 200mA @ 5VDC (1W) per channel
- Power Input: 5VDC, 5-48VDC, 100-240VAC

#### OTHER SPECIFICATIONS

- Isolation Between Channels: >500VRMS
- Display: 0.8" & 0.6" High, 3 1/2 (-1.9.9.9) Color Coded
- Input Type: Differential & Single Ended. 10M For VDC
- Common Mode R.R.: 100dB @ 50/60 Hz
- Conversion Rate: 2.5/Second
- Step Response: 0.8 Sec. (0-90% of F.S)
- Common Mode Voltage:  $\pm 2$ VDC
- Op./Storage Temp: -10 +70/-20 + 70°C
- MTBF: >100,000 Hours
- RH: 5-95% RH Non-Condensing
- Temperature Coefficient: 50PPM/°C
- Plastic Case: 94VO Textured Black
- Metal Case: Aluminum Nickel Plated
- Sanitary Case: To 250°F Steam Cleaning
- Explosion Proof For Class I, Div. 1 & 2 Certified

#### FAQ:

1. Can I change the scale in the field? Yes. Span & Zero are located on the front for each channel.
2. Can I change the display color sequence? Yes. Use #9 and specify when ordering.
3. Can I change the display designation? Yes. Use #9 and specify.
4. Can I change the input signal type in the field? No.
5. Do you have Peak & Hold? Yes, see Model: TLD
6. More Questions? Call **OTEK** at 520-748-7900

**If You Don't See It  
Ask For It!**



**520-748-7900**

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http://www.otekcorp.com

**OTEK**™  
CORP.  
SINCE 1974

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TUCSON, AZ. 85714 U.S.A.

MADE  
IN  
USA



*TLP Continued*

**THE SIGNAL CONDITIONERS:**

**Option 00: 4-20mA Powered:**

First introduced in 1975, the current flows through a Zener and "Shunt" resistor. The Zener clamps the voltage to about 3.5 Volts and the voltage across the Shunt is measured and displayed. If the "burden" (3.5 - 4.5V) is too high for your application, use the externally powered option.

**Accuracy:**

± 0.05% of F.S.

**Option 01: 4-20mA Externally**

**Powered:** It only drops 2V @ 20mA (100 Ohms) but the "**TLP**" needs 5VDC @ 40mA to operate per channel.

**Accuracy:**

± 0.05% of F.S.

**Option 02: 3-30VDC Signal Pow-**

**ered:** Another OTEK innovation. The voltage signal powers an **LDO** to protect the **TLP** and a divider network is used to measure and display the signal. If the relatively low impedance (500 Ohms) and current (3-20mA) required by this Powerless™ technique is unacceptable, use externally powered options (Digit 5).

**Accuracy:**

± 0.1% of F.S.

**Option 03: 20-50VDC**

**Powerless™:** To this we add a Zener in series with the **LDO** (of Option 02) to extend its range. Use External Power Options if your signal cannot drive the **TLP**'s load of about 1K Ohm and 20mA. Options 02-03 are used normally to monitor power supplies. Use Option "09" for 50V + input signals.

**Accuracy:**

± 0.1% of F.S.

**Options 04-08: VDC Externally**

**Powered:** Input impedance is 10 Mega Ohms.

**Accuracy**

± 0.05% of F.S.

**Option 09: Custom:** Use this option to describe any custom input, scale or modification to the TLP and contact us for feasibility and cost.

**Connections:**

To Be Determined

**Options 10-13: 20µA -**

**200mADC:**

Since the **TLP** is 2V full scale the "Shunt" resistors used are 10K, 100 or 10 Ohm. Don't forget that maximum display is 1,999 not 2,000! (19999 on 1/4 DIN Middle display only)

**Accuracy**

± 0.05% of F.S.

**Options 14-22: V & mA RMS:**

Here we use a **True RMS-DC** Converter for accurate (± 0.05%) measurement of sine waves up to 10KHz (± 0.1% for 10-20KHz). Input impedances vs. range are the same as for VDC ranges.

**Accuracy:**

± 0.05% of F.S.

**Option 23: 5Amps AC:**

Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.1 Ohm, 0.1% 3 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the **TLP** but make sure the connections are "Perfect" to electrical codes. The C.T. might have "**Le-thal**" High Voltage without a "Shunt" (Open) and the **TLP** will "Smoke". See OTEK's New **ACS**, **CTT** & **TAC** models for **C.T.** powered instruments (Patent Pend.)

**Accuracy:**

± 0.05% of F.S.

**Option 24: Strain-Gage (350**

**Ohm Type):** Here we use a "tracking" ± excitation of ±2.5VDC and a differential amplifier to convert the 2 or 3mV/V (typical) sensitivity of your "Loadcell". Specify your Strain-Gage sensitivity and full scale and the **TLP**'s display at Zero and Full Scale Please!

**Accuracy:**

± 0.05% of F.S.

**NOTE:** Only center (red) display (channel 2) can be connected for 4 wire Strain-Gage. Use Option "09" for others and specify.

**Option 25: Strain-Gage (≥1K < 5K Ohm):**

These are typically "Monolithic" **S-G** that require constant current (preferably) excitation. We use 100µA and diff. op. amp for high stability and accuracy. **Specify** your S-G impedance and sensitivity and the **TLP**'s display at Zero and Full Scale.

**Accuracy:**

± 0.1% of F.S.

**NOTE:** Only center (red) display (channel 2) can be connected for 4 wire Strain-Gage. Use Option "09" for others and specify.

**Option 26: RTD (PT100):**

We excite your 2, 3 or 4 wire RTD with 200µA to avoid the "self heating" effect. The range of the **TLP** is the same as your **RTD** typically -200°C to +800°C (-328 + 1562°F). You can place the decimal point at will (typically -200.0 to 800.0 (-328.0 to 1562.0)). The **PT100** has a temperature coefficient of 0.00385 Ohms/Ohm/°C. For legacy 0.00392 TC (known as ANSI 392) contact OTEK and use Option "09".

**Accuracy:**

± 0.5°C/F + Sensor's Error

**NOTE:** Only center display (Channel 2) can be connected for 3 or 4 wire RTD. Others only 2 wire.

**TLP Continued**

**Option 27: RTD (PT1000):** Same as PT100 except it is 1000 Ohms at 0°C instead of 100 Ohms @ 0°C. The same technique is used. For copper **RTD** (10 Ohm), contact **OTEK**.

**Accuracy:**

±0.5°C/F + Sensor's Error

**NOTE:** Only center display can be connected for 2, 3 or 4 wire (Channel 2) RTD. Others only 2 wire.

**Option 28: Thermocouple (Type J):**

This **TC** has a range of -210 to +760°C (-350 + 1390°F). Its color is white (+) and Red (-), cold junction (CJ) is inside the **TLP** at the connector base. If you short out the **TLP's** + & - TC terminals together, the **TLP** will read the ambient temperature due to its built-in C.J.C.

**Accuracy:**

±2°F/C + Sensor's Error  
(Per. TC. Tables)

**Option 30: TC (Type K):** This is yellow (+) and red (-) and has a range of -270 + 1370°C (-440 + 2500°F). The same notes as above.

**Accuracy:**

±2°F/C + Sensor's Error  
(Per TC Table)

**Option 31: TC (Type T):** This blue (+) and red (-) **TC** wire has the range of -270 + 400°C (-440 + 750°F). Same notes as above apply.

**Accuracy:**

±2°F/C + Sensor's Error  
(Per TC Table)

**Options 32-33: Frequency Input:**

We use an **F-V** to accept frequencies from 40 - 20KHz and amplitudes from 1-400V peak or dry contact or open collector transistor (O.C.T.) for 50 or 60Hz power line frequency measurement. Use Option # "33" or see our **ACS**, **TAC** Powerless™ Series.

**Accuracy:**

±0.5% of F.S.

**Option 34: %RH:** This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option "09" and contact **OTEK** with your sensor's specifications.

**Accuracy:**

Same as Sensor

**Option 35: pH (Acidity):** We use a FET input (10<sup>15</sup>) amplifier and calibrate the **TLP** for 0-14.00 pH using the Industry's standard ± 413 mV = ± 7pH co-efficient.

**Accuracy:**

Same as Probe

**Option 36: ORP (Oxygen Reduction Potential):** Our FET amplifier (10<sup>9</sup>) accepts the industry standard 2000mV F.S. of the probe and the **TLP** displays it in % (0-100.00%).

**Accuracy:**

Same as Probe

**More:**

New Signal Conditioners will be added as per your requests and popularity, such as Ohms, Conductivity, Shock, Vibration, Position etc. Contact **OTEK**.

**NOTES:**

1. **Self Diagnostics:** The **TLP** will test all segments and I/O Signals for about 3 seconds on power up.

**Note:** Both switchboard and 1/4 DIN models have internal **decimal point** selection (See User's Manual)

**Peak & Hold:** Only the 1/4 DIN (Options 2 & 3) has **Peak & Hold** control at screw terminal connector. Leave terminal floating for normal operation. See User's Manual for operation.

**POWER & SIGNAL INPUTS: (DIGIT 6)**

The **TLP** has 3 isolated A/D & displays. You can connect them all with common ground (- Loop or - Signal Return) or independent from each other (isolated, Option 0). When externally powered, (Options 1 & 2) you can power each display with independent 5 or 6-14VDC power supply (approx. 30mA/Display).

Options 3-7 accept **one** power input isolated from your power supply **but common** to all 3 displays "- Power". The differential "- Signal" still can have up to 2VDCMV between them and the common "-Power", this is to reduce ground loops in your wiring.

Option 8 provides 3 isolated power sources with a common isolated 100-240VAC power input. (Option 7 only provides isolation from the mains.)

**Power for Transmitters:** When ordered (Options 1-3 on 6th digit), non-isolated DC-DC converter ( 5 to 28VDC) is included in the **TLP** (See Note 5). Its ground is common to all 3 channels signal ground. Watch out for external **ground loops!**

**Case Style:**

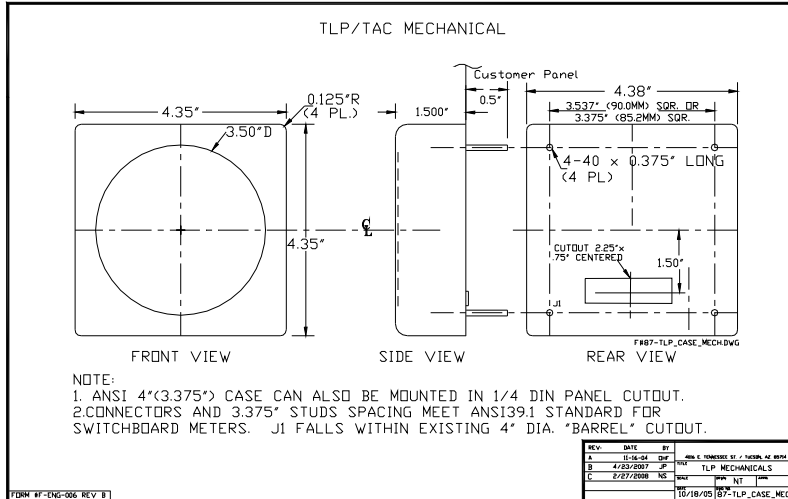
**Switchboard:** Conforms to ANSI 4" standard without barrel. Can also be mounted on existing 1/4 DIN (92 x 92mm) cut-out.

**1/4 DIN:** Conforms to DIN standard.

**Sanitary:** Withstands 250°F steam cleaning.

**Explosion Proof:** Certified for Class I Div 1 & 2.

## TLP MECHANICAL FOR SWITCHBOARD (Options 0, 1, 4 & 5)

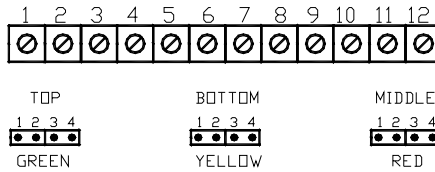
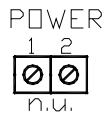


NOTE:  
 1. ANSI 4" (3.375") CASE CAN ALSO BE MOUNTED IN 1/4 DIN PANEL CUTOUT.  
 2. CONNECTORS AND 3.375" STUDS SPACING MEET ANSI39.1 STANDARD FOR SWITCHBOARD METERS. J1 FALLS WITHIN EXISTING 4" DIA. "BARREL" CUTOUT.

**Note:**  
 1. TS1 & TS2 connectors and 3.375" studs spacing meet ANSI 39.1 standard for switch board meters. TS1 & TS2 fall within existing "Barrel" cutout. Connectors accept 16-26 ga. wire.

### TYPICAL CONNECTION (SWITCHBOARD) LOOP POWERED

DECIMAL POINTS	
D.P.	JUMPER
XXXX	NONE
X.XXX	3&4
XX.XX	1&2
XXX.X	1&2 3&4



TERMINAL	CONNECTION
3	+LOOP TOP (GREEN)
4	-LOOP TOP (GREEN)
5	+LOOP MIDDLE (RED)
6	-LOOP MIDDLE (RED)
7	*PEAK MIDDLE (RED)
8	*HOLD MIDDLE (RED)
9	+LOOP BOT (YELLOW)
10	-LOOP BOT (YELLOW)

\*CONNECT 7&8 TO 1 TO ENABLE

# TLP SERIES

## ORDERING INFORMATION 12-2-09

**MODEL  
TLP**

Model: TLP- 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9

<p><b>GRADE (1)</b></p> <p>I ..... Industrial</p> <p>M ..... Mil-Spec</p> <p>N ..... Nuclear (Contact Otek)</p> <p>S ..... Intrinsically Safe</p> <p>9 ..... Custom</p> <p><b>INPUT SIGNAL (2)</b></p> <p>00 ..... 4-20mA Loop Powered</p> <p>01 ..... 4-20mA External Power</p> <p>02 ..... 5-15VDC Signal Powered</p> <p>03 ..... 15-25VDC Signal Powered</p> <p>04 ..... ±200mVDC</p> <p>05 ..... ±2VDC</p> <p>06 ..... ±20VDC</p> <p>07 ..... ±200VDC</p> <p>08 ..... ±50mVDC</p> <p>09 ..... Custom (Specify)</p> <p>10 ..... ± 200µADC</p> <p>11 ..... ±2mADC</p> <p>12 ..... ±20mADC</p> <p>13 ..... ±200mADC</p> <p>14 ..... 200mV RMS</p> <p>15 ..... 2V RMS</p> <p>16 ..... 20V RMS</p> <p>17 ..... 200V RMS</p> <p>18 ..... 50mV RMS</p> <p>20 ..... 2mA RMS</p> <p>21 ..... 20mA RMS</p> <p>22 ..... 200mA RMS</p> <p>23 ..... 5 Amp RMS</p> <p>24 ..... Strain-Gage (350 Ohm)</p> <p>25 ..... Strain-Gage (&gt;1K Ohm)</p> <p>26 ..... RTD (PT100)</p> <p>27 ..... RTD (PT1000)</p> <p>28 ..... TC (Type J)</p> <p>30 ..... TC (Type K)</p> <p>31 ..... TC (Type T)</p> <p>32 ..... Frequency (40-20KHz)</p> <p>33 ..... Frequency (50-60Hz Line)</p> <p>34 ..... % RH (Specify Sensor)</p> <p>35 ..... pH (0-14.00)</p> <p>36 ..... ORP (0-2000mV)</p> <p>37 ..... High Speed P &amp; H (0-2VDC)</p> <p><b>DISPLAY COLOR &amp; INPUT ASSIGNMENT (3)</b></p> <p>0 ..... <b>Blue, Red and Amber</b> (Top: Blue, Middle: Red, Bottom: Amber)</p> <p>9 ..... Custom (Specify- see note #3)</p>	<p><b>RANGE/CALIBRATION</b></p> <p>0 ..... Standard</p> <p>9 ..... Custom</p> <p><b>SCALE PLATE</b></p> <p>0 ..... Standard</p> <p>9 ..... Custom</p> <p><b>CASE STYLE (6)</b></p> <p>0 ..... Switchboard Plastic</p> <p>1 ..... Custom Switchboard Metal</p> <p>4 ..... Sanitary</p> <p>5 ..... Explosion Proof</p> <p>9 ..... Custom (Specify)</p> <p><b>POWER FOR TRANSMITTERS (5)</b></p> <p>0 ..... None</p> <p>1 ..... For 1 Channel</p> <p>2 ..... For 2 Channels</p> <p>3 ..... For 3 Channels</p> <p>9 ..... Custom (Specify)</p> <p><b>POWER INPUT (4)</b></p> <p>0 ..... Triple Isolated Powerless™</p> <p>1 ..... Non - Isolated 5VDC ± 10%</p> <p>2 ..... Isolated 5VDC ± 10%</p> <p>3 ..... - Signal Common, Isolated 10-32VDC</p> <p>4 ..... Isol. Signals &amp; Isol. 10-32VDC 10%</p> <p>5 ..... - Sig. Com. &amp; Isolated 100-240VAC</p> <p>6 ..... Isol. Signals &amp; Isolated 100-240VAC</p> <p>9 ..... Custom (Specify)</p> <p><b>Other Loop Powered Models:</b></p> <p>LBD: Bargraph LCD</p> <p>LPB: Bargraph LED</p> <p>LPE: Digital LED, 4 1/2 Digits</p> <p>LPI: Loop Powered Isolator</p> <p>LPL: Miniature Loop Powered</p> <p>LPM: Digital LCD</p> <p>LPT: Wireless Transmitter</p> <p>LPX: Explosion Proof LCD or LED</p> <p>LSB: Bargraph - Switchboard LCD</p> <p>FPM: Flatpack LED &amp; LCD</p> <p>TLD: Same as TLP, but in 1/4 DIN Case</p> <p>900: Controller</p> <p>See Selection Chart at <a href="http://www.otekcorp.com">www.otekcorp.com</a></p>
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**NOTES:**

1. Contact OTEK for M, N & S Grades. Otek will build to certain MIL-standards but testing and confirmation of compliance, if required, will need to be done by a third party and at customer's expense.
2. Options 00, 02 & 03 **must** use Option 0 (Powerless) on Digit 5. Others must use Options 1-6 or 9 on Digit #5. All 3 channels **MUST** have the same input option (Digits 2 & 3) or use Option #09 and specify your Option # vs. channel (ie: Ch.1 (top) Option 01, CH2 (Middle) Option 11, CH# (Bot.) Option 26) and desired calibration if not standard (0-F.S. = 0-1,000 counts).
3. Use #9 for custom screen printing, display color locations and input assignment or any other custom requirements.
4. Options 1-6 **must** be selected (external power) for input types (2nd digit) 01 & 04-36. Or for Digit 6 Options 1-3. (24VDC power for transmitters) Important note: Options 0, 2, 4 & 6 all signal inputs are isolated from each other and from power input. Options 1, 3 & 5 : "-" Signals are all common (No Isolation between channels).
5. Power for transmitter (Not available as powerless {Option 0, Digit 5}) is common to all 3 "-" loop inputs. Worst case V out (@ 20mA Out): 1 Channel: 25V, 2 Channels: 20V, all 3 channels: 15VDC. Consider your voltage drop and other loads. The **TLP** loop burden is 0.5V @ 20mA when externally powered.
6. Metal case (Option 1) must be ordered for **M** or **N** grades.