

**NEW** **TRIPLE LOOP POWERED DISPLAY (& POWERED TOO)**  
**OVER 30 SIGNAL CONDITIONERS**

**MODEL**  
**TLD**

**FEATURES:**

- 0.6" 3 1/2 & 4 1/2 Digits
- Colors: Blue (Top), Red (Middle), Green (Bottom)
- 1/4 DIN Housing
- Signal or Loop Powered
- 3 Isolated Channels (>500VRMS)
- 3 Independent A/D
- HiSpeed Peak/Hold
- Low Burden
- NEMA 4X, EMI/RFI
- Loop or VDC Signal Powered or
- 5-48VDC/100-240VAC Power
- 28-VDC Power for Transmitter
- Nuclear, Mil-Spec, I.S. & Industrial
- Lifetime Warranted

1/4 DIN



**SPECIFICATIONS @ 25°C**

**(Industrial Grade)**

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

- Burden: 5VDC Max. (7V For "S" Version)
- Color Options: Blue, Red and Green
- 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 and Green
- Loop Burden: 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

**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 externally powered) to concurrently display any 3 parameters.

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

(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 90-265VAC. You can even power your 4-20mA transmitters with the optional 28VDC compliance. The **TLD** is available in plastic or metal case (for Mil & Nuclear) conforming 1/4 **DIN** (92 x 92mm) panel cut-out, only 3" Deep. **Intrinsically Safe** (I.S.) versions on request. See Foot Note under Ordering Information.

**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. It is standard.
6. More Questions? Call **OTEK** at 520-748-7900

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



**520-748-7900**

FAX: 520-790-2808  
 E-MAIL: sales@otekcorp.com  
 http://www.otekcorp.com

**OTEK**™ **CORP.**  
 SINCE 1974

4016 E. TENNESSEE ST.  
 TUCSON, AZ. 85714 U.S.A.

MADE  
 IN  
 USA



TLD 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.

**CONNECTIONS:**

**FIG. TLD-00**

TS1 or TS2		
7	2	⊗ N.C.
8	3	⊗ N.C.
9	4	⊗ - LOOP IN
10	5	⊗ + LOOP IN

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

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

**Accuracy:**

± 0.05% of F.S.

**CONNECTIONS:**

**FIG. TLD-01**

TS1 or TS2		
7	2	⊗ +5V I/O
8	3	⊗ INST. GROUND
9	4	⊗ - LOOP IN
10	5	⊗ + LOOP IN

**Option 02: 4-30VDC Signal**

**Powered:** Another OTEK innovation. The voltage signal powers an LDO to protect the TLD 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.

**CONNECTIONS:**

**FIG. TLD-02**

TS1 or TS2		
7	2	⊗ +V SIGNAL
8	3	⊗ -V SIGNAL
9	4	⊗ N.C.
10	5	⊗ NO CONNECT

**Options 04-08: VDC Externally**

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

**Accuracy:**

± 0.05% of F.S.

**CONNECTIONS:**

**FIG. TLD-04**

TS1 or TS2		
2	⊗	+5V I/O
3	⊗	INSTRUMENT
4	⊗	- (LO) SIGNAL
5	⊗	+ (HI) SIGNAL IN

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

**Connections:**

To Be Determined

**Options 10-13: 20µA -**

**200mADC:**

Since the TLD 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.

**CONNECTIONS:**

**FIG. TLD-04**

TS1 or TS2		
2	⊗	+5V I/O
3	⊗	INSTRUMENT
4	⊗	- (LO) SIGNAL
5	⊗	+ (HI) SIGNAL IN

**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.

**CONNECTIONS:**

**FIG. TLD-04**

TS1 or TS2		
2	⊗	+5V I/O
3	⊗	INSTRUMENT
4	⊗	- (LO) SIGNAL
5	⊗	+ (HI) SIGNAL IN

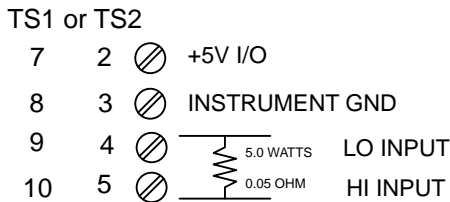
**TLD Continued**

**Option 23: 5 Amps 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 **TLD** but make sure the connections are "Perfect" to electrical codes. The C.T. might have "**Lethal**" High Voltage without a "Shunt" (Open) and the **TLD** will "Smoke". See **O TEK's** New **ACS**, **CTT** & **TAC** models for **C.T.** powered instruments (Pat. # 7,626,378). Accuracy: +/- 0.05% of F. S.

**CONNECTIONS:**

**FIG. TLD-23**



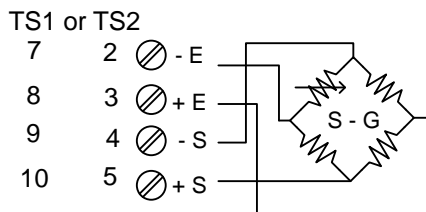
**Option 24: Strain-Gage (<1000 Ohm Type):**

Here we use highly accurate and stable constant current (~1mA) source, and a differential amplifier to convert the 2 or 3mV/V (typical) sensitivity of your "Load-cell". *Specify* your Strain-Gage sensitivity and full scale and the **TLD's** display at Zero and Full Scale Please!

Accuracy: ±0.05% of F.S.

**CONNECTIONS:**

**FIG. TLD-24**



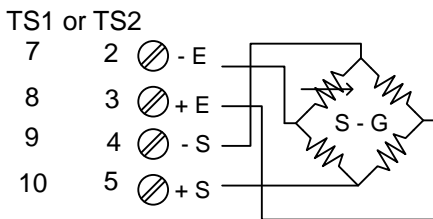
**Option 25: Strain-Gage (≥1K < 4K Ohm):** These are typically "Monolithic" **S-G** that require constant voltage (preferably) excitation. We use 4.096V for high stability and accuracy. *Specify* your S-G impedance and sensitivity and the **TLD's** display at Zero and Full Scale.

Accuracy: ±0.1% of F.S.

Note on S-G: Some S-G offer +/- 1VDC or 4-20mA condition output. Use Option 9 and specify.

**CONNECTIONS:**

**FIG. TLD-24**



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

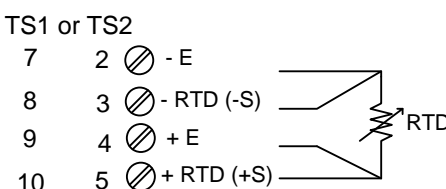
We excite your 2, 3 or 4 wire RTD with 200µA to avoid the "self heating" effect. The range of the **TLD** is the same as your **RTD** typically -200°C to +800°C (-328 + 1562°F). You can place the decimal point at will (typically -200.0 to 800.0 (-328.0 to 1562.0)). The **PT100** has a temperature coefficient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

**CONNECTIONS:**

**FIG. TLD-26**



**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 **O TEK**.

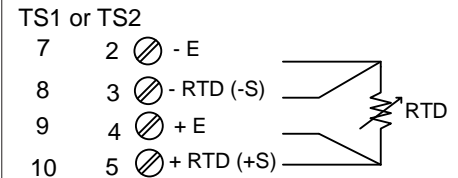
**Accuracy:**

±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.

**CONNECTIONS:**

**FIG. TLD-26**



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

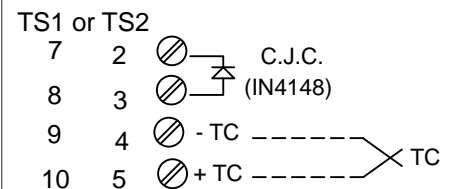
This **TC** has a range of -210 to +760°C (-350 + 1390°F). Its color is white (+) and Red (-), cold junction (CJ) is at the connector. If you short out the **TLD's** + & - TC terminals together, the **TLD** will read the ambient temperature due to its built-in C.J.C.

**Accuracy:**

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

**CONNECTIONS:**

**FIG. TLD-28**

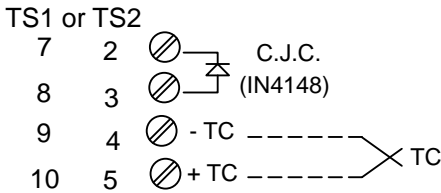


**TLD Continued**

**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)

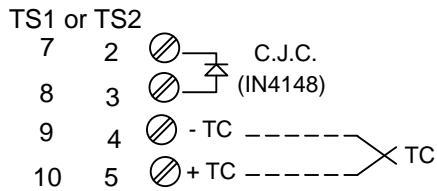
**CONNECTIONS:**  
**FIG. TLD-28**



**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)

**CONNECTIONS:**  
**FIG. TLD-28**



**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 to 440Hz power line frequency measurement. Use Option # "33" or see our **ACS, TAC** Powerless™ Series.

**Accuracy:**  
±0.5% of F.S.

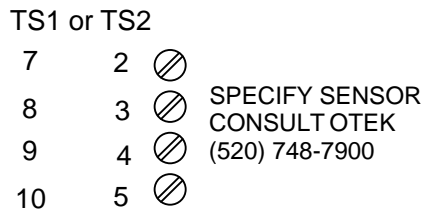
**CONNECTIONS:**  
**FIG. TLD-32**



**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

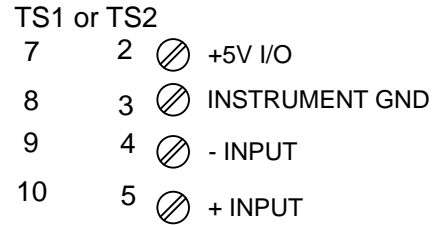
**CONNECTIONS:**  
**FIG. TLD-34**



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

**Accuracy:**  
Same as Probe

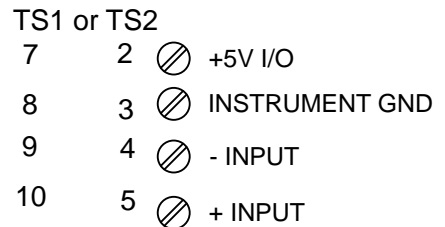
**CONNECTIONS:**  
**FIG. TLD-35**



**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 **TLD** displays it in % (0-100.00%).

**Accuracy:**  
Same as Probe

**CONNECTIONS:**  
**FIG. TLD-35**





## TLD continued

### Option 37: Hi Speed Peak & Hold

**(P&H):** Now you can capture fast transients greater than 50 microseconds (even faster soon) with resolution greater than 0.1% of F.S. and retention of greater than 10 years (Due to OTEK's new and patent-pending **P&H Option**).

**Input:** V or mADC (Specify Range). Contact OTEK for V/mA RMS or Loop Powered).

**Accuracy:** +/- 0.1% of F.S. +/- 1 Digit

**Linearity & Resolution:** +/- of F.S.

**Response time:** >20KHz (<50us)

**Retention:** >10 years (with power on).

### **CONNECTIONS:**

**FIG. TLD-37**

TS1 or TS2



### 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 **TLD** will test all segments and I/O Signals for about 3 seconds on power up.

**Peak & Hold:** The **TLD** has an A/D **Peak & Hold** control at screw terminal connector. Leave terminal floating for normal operation. This P&H is low speed (~3/sec.) for high speed see Option #37.

**Note: Options 40-43 only available with Powerless™ power input (Digit 5, Option 0)**

### Option 40: VAC Signal Powered:

**Warning! No Isolation!** This option uses the AC Voltage Signal to power the **TLD**. Since the **TLD** uses about 30mA @ 5VDC, we use a coupling capacitor AC-DC converter to generate 5VDC and not to "Load" the signal with a transformer. Consequently, your signal source should be capable of producing about 150mW without overloading it, otherwise use Options 14-17 (externally powered). Range: 50-150VAC; Method: RMS Calibrated; Accuracy & Linearity: ±0.5% of F.S. Best and safest when driven by a P.T. (Potential Transformer). **Always turn power off before connecting!**

### Option 41: AAC Signal Powered:

**Warning! No Isolation!** (Pat. Pend.) **OTEK's** Patent Pending technique permits the extraction of power from a regular **C.T.** (Current Transformer) to power the **TLD** without distorting the signal. Since this option is designed to be powered from a C.T., it should not be connected directly to the mains without limiting the current and proper electrical grounding. **Lethal Voltage** might be present at the C.T. secondary (output) if the secondary is open. **Always turn power off before connecting!** Range (at C.T. output): 0.1-5AAC; Overload: 50%/30 seconds; Peak: 100%/1 second; Conversion: True RMS; Accuracy & Linearity: ±0.05% of F.S.; Burden on C.T.: <150mW.

### Option 42: Hertz (Frequency)

**Signal Powered: Warning! No Isolation!** This option uses the same power technique as Option 40 above and the same precautions and warnings apply. Here we use a "Zero Crossing" detector and a F-V converter to give you the **A.C.** line frequency display with 0.1 Hz resolution. Range: VAC: 50-150VAC/Frequency: 30-450Hz; Accuracy & Linearity: ±0.05% of F.S.

### Option 43: Signal Powered AC Watts: Warning! No Isolation!

Here we combine the powerless VAC & AAC options to arrive at real power calculations through our **CPU** and **DAC**. The same warnings and precautions of Options 40 & 41 apply. Range: VAC: 50-150; AAC: 0.1 - 5A; Frequency: 45-65Hz; Accuracy & Linearity: ±0.1% of F.S.; Conversion: True RMS. Contact **OTEK** for other functions. **Note:** For watts, use Fig. 40 & 41. Do **NOT** reverse connectors.

### POWER & SIGNAL INPUTS: (DIGIT 5)

The **TLD** 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). Option 0, 2,4, & 6: All channels are isolated from each other. Option 1: All channels share "-Signal" input and "-Power" input. Options 3 & 5: Share only "-Signal" but are isolated from power input (one common P.S. for all channels).

**TLD Continued**

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

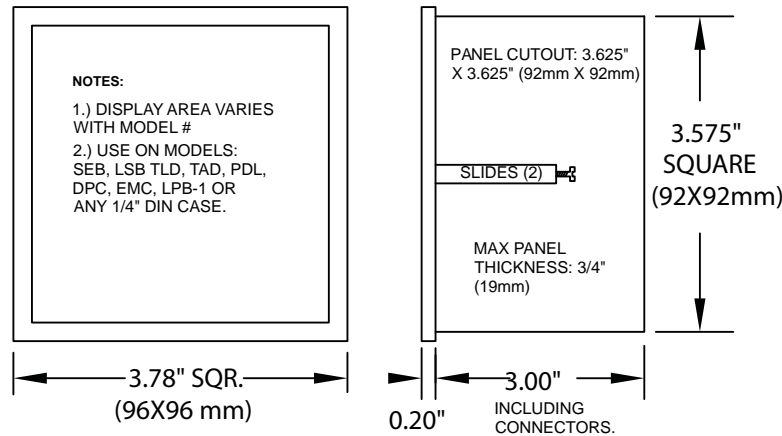
**Case Style:**

**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.

**TLD MECHANICAL INFORMATION**

**STANDARD 1/4" DIN CASE & PANEL CUTOUT**

**FIG. DIN-CSE**

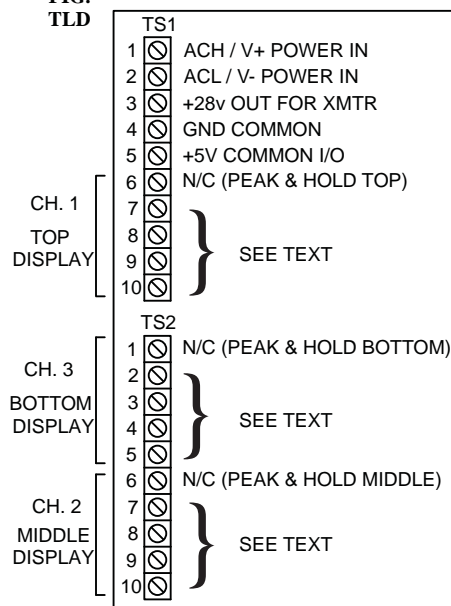


**TLD TYPICAL CONNECTIONS**

**MOD. TLD TYPICAL CONNECTIONS**

(ONLY FOR OPTIONS 02-37)

**FIG. TLD**



- NOTES:** 1.) VERIFY POWER INPUT BEFORE CONNECTING TS1-1&2.  
 2.) +28V OUT FOR OPTIONS 1-3, 6TH DIGIT.  
 3.) +5V I/O FOR OPTIONS 2-6, 5TH DIGIT  
 4.) +/- EXCITATION FOR OPTIONS 24-27, ELSE NO CONNECT.  
 5.) DECIMAL POINT, ZERO & SPAN ON DISPLAY BOARD.  
 6.) Ch. 1, 2 AND 3 HAVE THE SAME I/O. SEE NOTE #2 ON PAGE 7.

# TLD SERIES ORDERING INFORMATION 11-17-14

**NOTE: Please READ BEFORE building part number:**

1. If digit 2 and 3 is option 00, 02, 40, 41, 42 or 43, digit 5 must be option 0 and digit 6 must be option 0.
2. See notes at bottom of page.

## Triple Loop Powered Display 1/4 Din Case

**MODEL  
TLD**

Model: TLD-

<p><b>GRADE (3)</b></p> <p>I.....Industrial</p> <p>M.....Mil-Spec (Contact OTEK)</p> <p>N.....Nuclear (Contact OTEK)</p> <p>S.....Intrinsically Safe (Contact OTEK)</p> <p>9.....Custom (Contact OTEK)</p> <p><b>INPUT SIGNAL (1,4,9)</b></p> <p>00..... 4-20mA Loop Powered</p> <p>01..... 4-20mA External Power</p> <p>02..... 4-30VDC 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 (Contact OTEK)</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 (&lt;1K 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 (50-440Hz Line)</p> <p>34..... % RH (Specify Sensor)</p> <p>35..... pH (0-14.00)</p> <p>36..... ORP (0-2000mV)</p> <p>37..... HiSpeed P &amp; H (0-2VDC)</p> <p>40..... VAC Signal Powered</p> <p>41..... AAC Signal Powered</p> <p>42..... 50-440 AcHz Signal Powered</p> <p>43..... WAC Signal Powered</p>	<p><b>RANGE/CALIBRATION</b></p> <p>0.....Standard</p> <p>9.....Custom (Contact OTEK)</p> <p><b>SCALE PLATE</b></p> <p>0.....Standard</p> <p>9.....Custom (Contact OTEK)</p> <p><b>CASE STYLE (8)</b></p> <p>0.....Plastic</p> <p>1.....Metal</p> <p>2.....Nema 4X Plastic</p> <p>3.....Nema 4X Metal</p> <p>9.....Custom (Contact OTEK)</p> <p><b>POWER FOR TRANSMITTERS (1,7)</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 (Contact OTEK)</p> <p><b>POWER INPUT (1,6)</b></p> <p>0.....Signal/Loop Powered</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 90-265VAC</p> <p>6.....Isol. Signals &amp; Isolated 90-265VAC</p> <p>9.....Custom (Contact OTEK)</p>
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**DISPLAY COLOR & INPUT ASSIGNMENT (5)**

0..... **Blue, Red and Green** (Top: Blue, Middle: Red, Bottom: Green)

9..... Custom (Contact OTEK)

**NOTES (Continued):**

3. Contact OTEK for M, N & S Grades. Otek will build to certain nuclear or MIL-standards but testing and confirmation of compliance, if required, will need to be done by a third party and at customer's expense.
4. All 3 channels **MUST** have the same input option or use Option #09 and specify your Option # vs. channel (ie: Ch.1 (top) Option 01, Ch.2 (Middle) Option 11, Ch.3 (Bottom) Option 26) and desired calibration if not standard (0-F.S. = 0-1,000 counts).
5. Use #9 for custom screen printing, display color locations and input assignment or any other custom requirements.
6. Warning: Options 40-43 are H.V. AC signal powered and are isolated between channels but NOT between the input and within its terminals.
7. Power for transmitter is **NOT** isolated from 5 or 6-14VDC power (Options 1 & 2 on 5th digit) and it 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 **TLD** loop burden is 0.5V @ 20mA when externally powered.
8. Metal case (Option 1) must be ordered for **M** or **N** grades.
9. Mixed or additional inputs (V&A, Temp & 4-20mA, Etc.) are available as customizations. Choose option 09 and specify custom requirements.

**DOWNLOADS:** For manuals, user-software or drivers:  
[www.otekcorp.com](http://www.otekcorp.com)