NEW! PRELIMINARY

# *AUTOMATIC TRI-COLOR ISOLATED TRIPLE BAR-DIGITAL CONTROLLER WITH USB/232/485/ETHERNET I/O & MICRO CARD FOR NUCLEAR, MIL-STD & INDUSTRIAL USE*

**MODEL TBD**

## FEATURES:

*3 Ea. isolated 14 bit A/D with 51 segment auto tricolor bargraph & 4 digits
*Metal case for EMI/RFI compliance (Mil-Std 461) Shock (901C)
*Shock & Vibration (Mil-Std 167) Ready
*>30 Input Signals & >5 Power Inputs
* SDHC For Data Logging up to 8 GB
*USB, 232, 485, ETHERNET I/O
*High Speed (>20Khz) Peak & Hold (Opt'l)
*Isol. 28VDC Power for XMTR (Opt'l)
*Up/Down or Center Zero Bargraph
*12 Relays or Open Coll. Transistors (4 per Channel)
*Isolated Analog Out (4-20mA/0-5 VDC)
*Remote Display For SCADA/DCS
*Front Panel or Serial Zero & Span
*NEMA 3 Case Only 3" Deep
*Math Function, Polynomial & X-Y Tables
*Lifetime Warranty

**(Actual size is 3"x 6")**

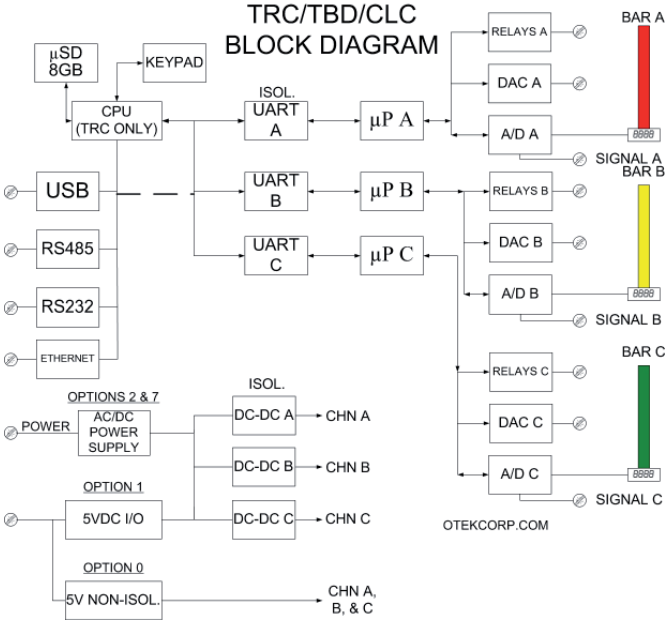

## SPECIFICATIONS (@ 25$^0$C)

NOTE: All 3 channels isolated from each other and power input.
(See options description)
•Accuracy & Linearity: ±0.05% of F.S.
•Sampling Rate: 3/Second
•Bargraph Resolution: 2%
•Span & Zero Range: ± 3000 Counts
•C.M.V. - Signal to - Power: 2VDC Max.
•Digits: 0.2", 4 (9.9.9.9) Floating D.P.
•Temperature Coefficient: 50 PPM
•Op. /Storage Temp: 0-60/-20 + 80$^0$C
•Power Consumption: 2 Watts @ 5VDC + Options
•Environmental: NEMA 3 , 5-95% RH •Case: All Metal Machined or 94VO
•**CMTBF:** 100,000+ Hours
•Relays: 1 Amp 120VAC/30VDC (4) SPDT or O.C.T.: 30V/30mA
•Analog Out: 16 Bit ± 0.01%
•Serial I/O 300-19.2KB (8N1 Setting)
•All ASCII I/O; Address: $10^{34}$ (>$10^{34}$)

## DESCRIPTION:

A nuclear customer liked our model "EBD" and gave us the challenge to put 3 isolated channels in one case, make it to military standards 461,901,810 & 167 (Epri TR-102323R3), Class 1E, and keep the case< 4 inches deep! Now you can benefit from their need, OTEK's ingenuity and over 35 years experience in high quality instrumentation and its unique lifetime warranty.

**LIFETIME WARRANTED!**




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

**Think of the possibilities!**

*Triple Redundant Controller
*Any 3 input process: V/A/Hz/W; C°/#/G; pH/C°/rH; etc.

***POWER OUTPUT (28 VDC) FOR 4-20mA XMTR**


**Tel: 520-748-7900 Fax: 520-790-2808**
**Toll Free: 877-BAR-OTEK (227-6835)**
**E-Mail:sales@otekcorp.com**
**Web:www.otekcorp.com**

OTEK™ CORP.
*Since 1974*

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


**MADE IN U.S.A.**

## TBD SERIES

Some features include:

***ANALOG INPUTS:** >30 Signal conditioners. (See ordering information on P.6)

***MATH FUNCTIONS:** Polynomial (9th), RTD, TC & X-Y linearization plus Tare, Offset, Scale, Peak, Hold and more are programmable via simple command.

***CONTROL OUTPUTS:** 4 each relays or 4 open collector transistors for High, High-High, Low and Low-Low Control of each channel.

***ANALOG OUTPUT:** Optional isolated 4-20mA, 0-20mA or 0-5VDC with 16 Bit resolution.

***SERIAL I/O:** RS232, RS485, USB or Ethernet.

***ISOLATED POWER INPUT:** Standard is 3 isolated 5VDC or common isolated 10-32VDC, 100-240VAC or USB powered.

***DISPLAY:** The 51 segment automatic tricolor bargraph can be programmed for any direction (up or down), any start (bottom, top, middle), colors change as limits are reached or exceeded.

***DATA LOGGING:** Removable SDHC memory card up to 8 gigabytes.

We use our series "SC" signal conditioners (~1"x 1") so we can mix and match any offered combination, but only 3 maximum per instrument. (See note 1 in ordering information).

**Typical Connections**:

Applies to all 3 channels unless otherwise ordered (Option #09).

## THE SIGNAL CONDITIONERS: (2nd & 3rd Digits)

**Option 01: 4-20mA Input:**
A 50 Ohm 1% resistor is used as a shunt. Don't connect/disconnect the signal without limiting the current (max 50mA<1 second). Accuracy: +/- 0.05% of full scale.

CONNECTIONS:
**FIG. TBD-00**

(CH.1-CH. 3)

1 N.C.
2 N.C.
3 - LOOP IN
4 + LOOP IN

**(2nd & 3rd Digits): Options 04-08:**

Input impedance is 1 Mega Ohms on all VDC ranges.
**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-04**

(CH.1-CH. 3)

1 +5V I/O
2 INSTRUMENT
3 - (LO) SIGNAL IN
4 + (HI) SIGNAL IN

**(2nd & 3rd Digits): Option 09: Custom:** Use this option to describe any custom input, scale or modification to the **TBD** and contact us for feasibility and cost.
**Accuracy:** To Be Determined

**(2nd & 3rd Digits): Options 10-13: 200μA - 200mADC:**
Since the **TBD** is 200mV full scale (2,000 Counts) the "Shunt" resistors used are 1K, 100, 10 or 1 Ohm.

**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-04**

(CH.1-CH. 3)

1 +5V I/O
2 INSTRUMENT
3 - (LO) SIGNAL IN
4 + (HI) SIGNAL IN

**(2nd & 3rd Digits):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) and SCR fired to ± 2%. Input impedances vs. range are the same as for VDC & mADC ranges. **Warning: No Isolation!**
**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-04**

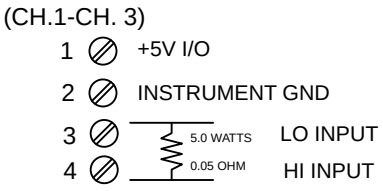
(CH.1-CH. 3)

1 +5V I/O
2 INSTRUMENT
3 - (LO) SIGNAL IN
4 + (HI) SIGNAL IN

## TBD SERIES

**(2nd & 3rd Digits): Option 23: 5Amps AC:**
Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.04 Ohm, 0.1% 5 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the **TBD** but make sure the connections are "Perfect" to electrical codes. The C.T. might have **"Lethal" High Voltage** without a "Shunt" (Open) and the **TBD** will "Smoke". See OTEK's New **ACS** & **CTT** models for **C.T.** powered instruments (Patent #7,626,378).
**Warning: No Isolation!**
**Accuracy:** ±0.05% of F.S.

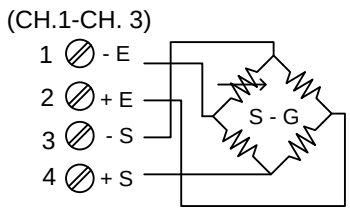
CONNECTIONS:
**FIG. TBD-23**




**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 **TBD's** display at Zero and Full Scale Please!

**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-24**

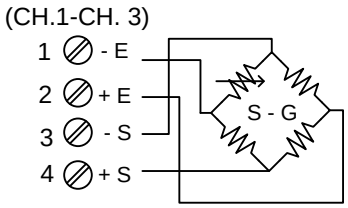



**Option 25: Strain-Gage (≥1K < 4K Ohm):** These are typically "Monolithic" **S-G** that require constant voltage (preferably) excitation. We use 4.096V for high stability and accuracy. **Specify** your S-G impedance and sensitivity and the **TBD's** display at Zero and Full Scale.

**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.

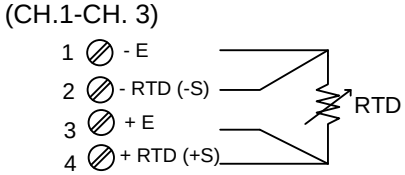
CONNECTIONS:
**FIG. TBD-24**




**(2nd & 3rd Digits): 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 **TBD** is the same as your **RTD** typically -200$^0$C to +800$^0$C (-328 + 1562$^0$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/$^0$C. (For legacy 0.00392 TC {known as ANSI 392} or 10 Ohm copper, contact **OTEK** and use Option "09".)
**Accuracy:** ±0.5% of F.S. plus sensor's error.
Note: For 2 wire, jump - S to -E and +S to +E. For 3 wire only jump -S to -E.

Note: You can change °C to °F via serial port.

CONNECTIONS:
**FIG. TBD-26**

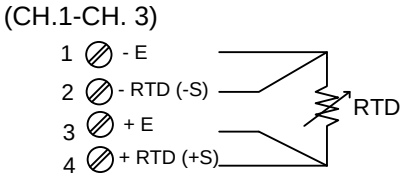



**(2nd & 3rd Digits): Option 27: RTD (PT1000):** Same as PT100 except it is 1000 Ohms at 0$^0$C instead of 100 Ohms @ 0$^0$C. The same technique is used for copper **RTD** (10 Ohm), contact **OTEK**. Same connection as Option 26 apply.

Note: You can change °C to °F via serial port.

**Accuracy:** ±0.05% of F/C plus sensor's error.
Note: For long distances (>100') use a 4-20mA transmitter such as our 900 or LPX series.

CONNECTIONS:
**FIG. TBD-26**

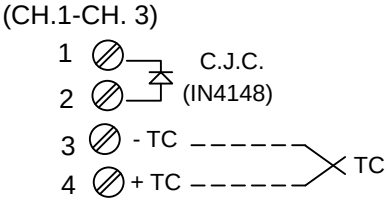



**(2nd & 3rd Digits): Option 28: Thermocouple (Type J):** This **TC** has a range of -210 to + 760$^0$C (-350 + 1390$^0$F). Its color is white (+) and Red (-), cold junction (CJ) is inside the **TBD** at the connector base. Make sure the connections from the **TBD** and your **TC** are as close to the **TBD's** terminals as possible to avoid errors. If you short out the **TBD's** +**TC** & -**TC** together, the **TBD** will read the ambient temperature due to its built-in C.J.C.

Note: You can change °C to °F or TC type via serial port.

**Accuracy:** ± 2$^0$ F/C of signal input.

CONNECTIONS:
**FIG. TBD-28**

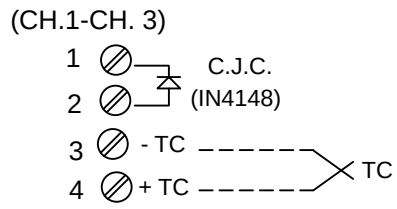


## TBD SERIES

**(2nd & 3rd Digits): Option 30:**
**TC (Type K):** This is yellow (+) and red (-) and has a range of -270 + 1370$^0$C (-440 + 2500$^0$F). The same notes as Option 28.
**Accuracy:** ± 2$^0$ F/C of signal input

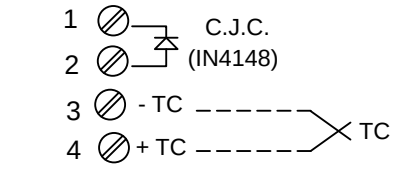
Note: You can change °C to °F or TC type via serial port.

CONNECTIONS:
**FIG. TBD-28**



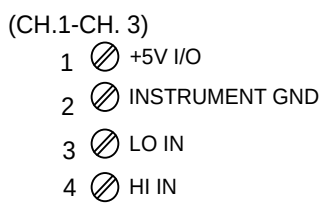

**(2nd & 3rd Digits): Option 31:**
**TC (Type T):** This blue (+) and red (-) **TC** wire has the range of -270$^0$ + 400$^0$C (-440 + 750$^0$F). Same notes as Option 28.
**Accuracy:** ± 2$^0$ F/C of signal input.

CONNECTIONS:
**FIG. TBD-28**




**(2nd & 3rd Digits): 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 440 Hz power line frequency measurement. Use Option #"33" or see our **ACS** Powerless™ Series.
**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-32**

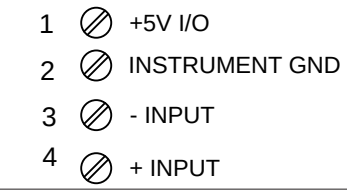



**(2nd & 3rd Digits): Option 34: %RH:** This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option "09" and contact **OTEK** to specify your sensor's specifications.
**Accuracy:** ± 2% RH of signal input.

CONNECTIONS:
**FIG. TBD-34**

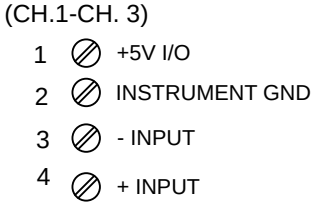

**(2nd & 3rd Digits): Option 35: pH (Acidity):** We use a FET input ($10^{15}$) amplifier and calibrate the **TBD** for 0-14.00 pH using the Industry's standard ± 413 mV = ± 7pH coefficient.
Note: Not temperature compensated.
**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-35**



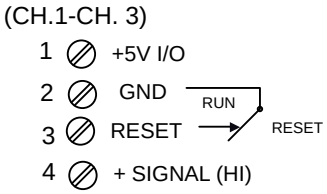

**(2nd & 3rd Digits) Option 36: ORP (Oxygen Reduction Potential):** Our FET amplifier ($10^9$) accepts the industry standard 2000mV F.S. of the probe and the **TBD** displays it in % (0-100.00%).
**Accuracy:** ±0.05% of F.S.

CONNECTIONS:
**FIG. TBD-35**




**(2nd & 3rd Digits): Option 37: Hi Speed Peak & Hold (P&H ):**
Now you can capture fast transients greater than 50 microseconds (even faster soon) with accuracy and 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**).

CONNECTIONS:
**FIG. TBD-37**




**Serial I/O: (4th Digit)**

**Note: All set for 9600 Baud (Programmed)**

Option "0": No Serial I/O: Only options 0, 5 or 6 on digit 6 are available when option "0" is selected.

**Option 1:** RS2323: 1200-19.2kb, all ASCII (8N1) open protocol "DB9" connector

**Option 2:** RS485: 1200-19.2kb, all ASCII (8N1) open protocol screw terminal connector.

**Option 3**: USB: 1200-19.2kb, all ASCII (8N1) open protocol "USB Type B." Driver included at ***www.otekcorp.com***
Any terminal program (Hyperterminal, Procomm, Kermit) will work with OTEK's serial com. ports.

**Option 4 (Ethernet):** Fully compliant 10 baseT, RJ45 connector.

**Option 5 (Micro SD Memory Card):** Automatic log of all data as configured via the serial port. The TBD can store up to 8 gigabytes of data. The µSD is pluggable on the rear.

**TBD SERIES**

**POWER INPUT:( 5th Digit):**

Option "0": Non-Isolated 5 VDC (2W/channel); all I/O of all 3 channels (except relay contacts and analog out) are non-isolated.

Option "1": 5VDC input (2W/Channel); all I/O are 100% isolated from each channel and each other.

Option "2": 90-265VAC (same option as 1, but single VAC power supply)

Option "7": 10-32VDC: Same as option 2 but single VDC power supply

Option "9": Specify your own (i.e. independent and isolated 10-32VDC (or VAC) power input). Contact Otek (might have to delete some outputs).

**Control & Power Out (6th Digit):**

**Option 1: Relays (4):** Standard outputs are SPDT of all 4 relays(for Hi, Hi Hi, Lo & LoLo). Contacts are rated at 1 amp at 120 VAC/30 VDC resistive load. Also applies to option 5 & 7 (Relays). Power required by each relay is 200 mW (40mA@5VDC) x 4=800 mW. (Contact OTEK for 10 A contacts).

**(6th Digit): Option 2: Open Collector Transistors (O.C.T):**

Four O.C.T are included and all are common emitter (sinking) to digital ground (terminal TS1-2). The 5VDC internal power is available at terminal TS1-1. Maximum current allowed per O.C.T. (From the internal 5 VDC) is 20mA/O.C.T. if external VCC is used, the maximum VCE is 30 VDC and 100 mA per O.C.T. Switching time is under 500mS.

**(6th Digit): Option 3: Isolated 4-20 mA:** (Must include serial I/O options 1-3 Digit 4)

This option is offset & scaled via the serial port (digit 4) and can be configured for 4-20, 0-20 or 0-24 mA or 0-5 VDC via internal jumpers (standard is 4-20 mA).

This option requires under 200 mA@5VDC internal power due to step up from 5-30 VDC compliance. Accuracy & linearity is +/-.1% of setting and can drive up to 1K ohms load.

**(6th Digit): Option 4: Isolated 30 VDC**

You can use it to excite your transmitter at up to 25mA. It consumes under one (1) watt at full load.

**(6th Digit): Option 3, 5-8:** Combinations of Options 1-4. Don't forget to add all power requirements of each option desired.

**( 7th Digit): Option 0: Plastic 94 VO Black (Not for Mil-Spec. or Nuclear)**

**Option 1:** Aluminum machined, nickel plated ready for Mil-Std. 461 (EPRI TR-102323R3)

**Mounting Instructions:**

1. Remove filter.
2. Slide TBD in panel and twist lock the tabs until secured.
3. Replace filter.

# TBD TYPICAL CONNECTIONS

**INPUT SIGNALS**
See data sheet text for information.

**POWER INPUT**
TS1
1. ACH/V+
2. ACL/V-
Note: Verify power input (digit 6) before connecting.

**SERIAL I/O**
RS-232 (DB9)
#2: TX; #3: RX, #5: GND.

**RS-485 (SCREW CONN.)**
#1: B; #2: A, #3: GND.

**USB (IND.STD.)**
#1: VBUS; #2: D+
#3: D-; 4: GND.

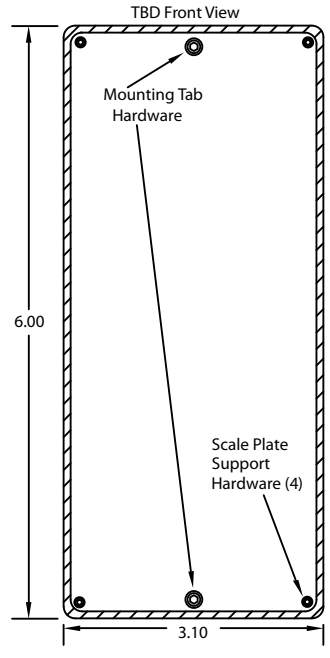
**ETHERNET**
Standard Termination

**ANALOG OUTPUT**
(CHA=CHB=CHC)
TSA2-TSC2
1. +LOOP OUT
2. GROUND (RETURN)
3. +30V OUT

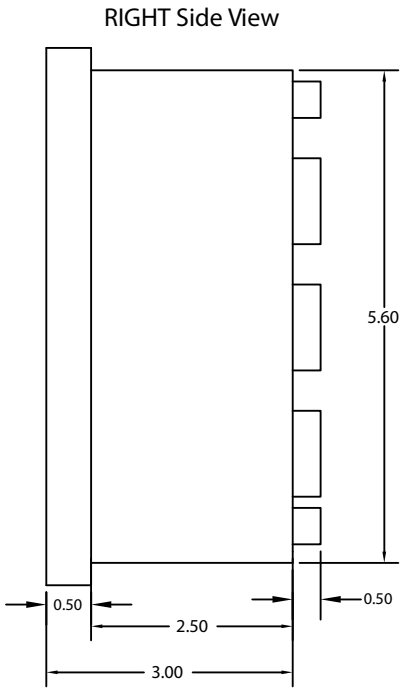
**RELAYS**
(CHA=CHB=CHC)
TSA3-TSC3
1. N.O.
2. COMMON K1
3. N.C.
4. N.O.
5. COMMON K2
6. N.C.
7. N.O.
8. COMMON K3
9. N.C.
10. N.O.
11. COMMON K4
12. N.C.

**OPEN COLLECTOR TRANSISTORS**
(CHA=CHB=CHC)
TSA3-TSC3
1. COLLECTOR #1
2. COLLECTOR #2
3. COLLECTOR #3
4. COLLECTOR #4
5. COLLECTOR #5
6. COLLECTOR #6
7. COLLECTOR #7
8. COLLECTOR #8
9. N.C.
10. EMITTER (GROUND)
11. N.C.
12. +5V OUT (<50mA)

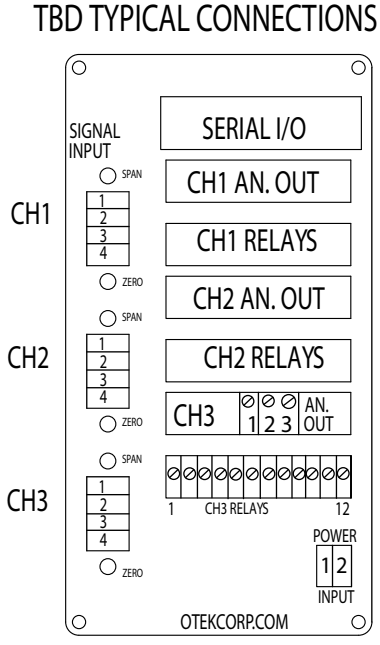
# TBD MECHANICAL INFORMATION




Mounting: 1. REMOVE FILTER
2. TWIST MOUNTING TABS (2) CLOCKWISE
3. REPLACE FILTER




PANEL CUTOUT: 3X5.6”



# TBD SERIES ORDERING INFORMATION 3-26-13

**Model: TBD -** 1 2 3 - 4 5 6 - 7 8 - 9 10

**GRADE (8)**
- I.....Industrial
- M.....Mil-Spec (Contact OTEK)
- N.....Nuclear (Contact OTEK)
- 9.....Custom (Contact OTEK)

**INPUT SIGNAL (1,2)**
- 01.....4-20mA
- 04.....±200mVDC
- 05.....±2VDC
- 06.....±20VDC
- 07.....±200VDC
- 08.....±50mVDC
- 09.....Custom (Contact OTEK)
- 10.....± 200µADC
- 11.....±2mADC
- 12.....±20mADC
- 13.....±200mADC
- 14.....200mV RMS
- 15.....2V RMS
- 16.....20V RMS
- 17.....200V RMS
- 18.....50mV RMS
- 20.....2mA RMS
- 21.....20mA RMS
- 22.....200mA RMS
- 23.....5 Amp RMS
- 24.....Strain-Gage (<1K Ohm)
- 25.....Strain-Gage (>1K Ohm)
- 26.....RTD (PT100)
- 27.....RTD (PT1000)
- 28.....TC (Type J)
- 30.....TC (Type K)
- 31.....TC (Type T)
- 32.....Frequency (40-20KHz)
- 33.....Frequency (50-440 Hz Line)
- 34.....% RH (Specify Sensor)
- 35.....pH (0-14.00)
- 36.....ORP (0-2000mV)
- 37...Hi Speed Peak & Hold (2 VDC)

**ISOLATED SERIAL I/O & MEMORY CARD (3,7)**
- 1.....RS232
- 2.....RS485
- 3.....USB
- 4.....Ethernet
- 5.....RS232 & Micro SD Mem. Card
- 6.....RS485 & Mirco SD Mem. Card
- 7.....USB & Micro SD Mem. Card
- 8.....Ethernet & Micro SD Mem. Card
- 9.....Custom (Contact OTEK)

**POWER INPUT (4)**
- 0.....Common Non-Isolated 5VDC
- 1.....All Channels Isolated 5 VDC
- 2.....All Channels Isolated 90-265 VAC
- 7.....All Channels Isolated 10-32 VDC
- 9.....Custom (Contact OTEK)

**CONTROL & POWER OUT (5)**
- 0.....None
- 1.....Relays (4/Channel)
- 2.....O.C.T. (4/Channel)
- 3.....Isol. 4-20mA (1/Channel)
- 4.....Isol. 30VDC (1/Channel)
- 5.....Relays (4) & Isol. 4-20mA (1/Channel)
- 6.....O.C.T.(4) & Isol. 4-20mA (1/Channel)
- 7.....Relays (4) & Isol. 30VDC (1/Channel)
- 8.....O.C.T. (4) & Isol. &30 VDC (1/Channel)
- 9.....Custom (Contact OTEK)

**CASE (8)**
- 0.....Industrial Plastic
- 1.....Industrial Metal

**DISPLAY TYPE (6)**
- 0..... Standard
- 9.....Custom (Contact OTEK)

**SCALE PLATE PRINTING**
- 0.....(0-100%)....Standard
- 9.....Custom (Contact OTEK)

**RANGE/CALIBRATION**
- 0.....Standard (0-100%/0-100.0)
- 9.....Custom (Contact OTEK)

***DOWNLOADS*: For manuals, user-software or drivers:**
***www.otekcorp.com***

**NOTES:**

1. Mixed or additional inputs (V&A, Temp & 4-20mA, etc.) are available as customizations. Choose option "09" and specify input option # vs. channel #. Channel 1 is left, #2 is center & #3 is right. Option 23 (5Arms) includes 3 each 0.05 Ohm 1%5W shunt resistor.
2. See "EBD" or HI-Q119 series for single channel & dual channel.
3. Serial I/O is isolated from signal. Must have serial I/O to implement processor's functions (if required).
4. Non-isolated 5 VDC (Option 1) eliminates isolation between channels & all I/O except relays & analog out. Max power Required.: 5 watts.
5. Digit 6, Options 1-6 get same outputs for each channel (i.e. 3 each 4-20mA out). For mixed outputs (i.e. Ch. 1, Relays, Ch.2, O.C.T. & Ch.3, 4-20mA) use Option 9 and specify (subject to acceptance by OTEK).
6. Standard display is 3 bars & 3 sets of digits. For other configurations or custom colors, use option 9 and specify (subject to acceptance by OTEK).
7. Ethernet connector extends 1/2" beyond back cover
8. 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.