

NEW

**AUTO TRICOLOR CONTROLLER FOR MIL-SPEC,
NUCLEAR AND INDUSTRIAL APPLICATIONS
> 20 INPUT SIGNAL CONDITIONERS**

**MODEL
EBD**

WOW, LESS THAN 2.5" DEPTH!!! GREAT FOR MINIMAL REAR PANEL

FEATURES:

- Powered or Powerless™
- 51 Automatic Tricolor Bars
- 4 Digits (9.9.9.9 or -1.9.9.9)
- Up/Down or Center Zero
- RS232/485/USB Serial I/O
- Industry's Std. 1.77 X 5.7" Cutout
- Use As Indicator/Controller/
Remote Display
- Optional 4 each O.C.T. or SPDT
Relays
- Optional Analog Out (4-20,
0-5VDC)
- 5, 10-32VDC or 100-240VAC
Power
- **NEMA 3** Front Panel, 2.5" Deep



**SPECIFICATIONS @ 25°C 5VDC Power
(Industrial Grade)**

- Accuracy & Linearity: $\pm 0.01\%$ of F.S. ± 1 Digit
- Bargraph Resolution: 2% (51 Segments)
- Span & Zero Range: ± 3000 Counts
- C.M.V. - Signal to - Power: 2VDC Max.
- Digits: 0.4", 4 (9.9.9.9) Floating Decimal Point
- Temperature Coefficient: 50 PPM
- Operating/Storage Temp: 0-60/-20 + 80°C
- Power Consumption: 5 Watts @ 5VDC + Options
- Environmental: NEMA 4X , 5-95% RH N.C.
- Case: All Metal Machined or 94VO Plastic
- **CMTBF:** 100,000+ Hours
- Relays: 1 Amp 120VAC/30VDC (4) SPDT or
O.C.T.: 30V/30mA
- Analog Out: 16 Bit $\pm 0.01\%$ (0-1, 4-20mA & 1-5V)
- Serial I/O 300-19.2KB (8N1 Setting)
- All ASCII I/O Address: 255
- Ethernet 10 Base T Compatible

DESCRIPTION

The New **EBD** was designed to complement **OTEK's** newest line of **LCD & LED** bargraphs where the highest reliability, latest technology and full programmability are required.

Use the **EBD** as stand alone or part of a **DCS, SCADA**, or **PLC** system via its Serial and/or Analog Output. Only order what you need!

GRADES: 4 grades are available: **Hi-Rel** Industrial (see specs.), **Mil-Spec** to specific standards, **Nuclear** to 10CFR50-B and to your requirements. Contact **OTEK** for availability.

SIGNAL CONDITIONERS: 20+ signal conditioners are available (more soon). See ordering information and description sections.

ZERO AND SPAN: Either manual or via serial port.

ANALOG INPUTS: Industry's standard 4-20mA, mA and VDC are included. Custom signal conditioners for pH, TC, RTD, RMS, S-G and more are available on request.

MATH FUNCTIONS: RTD, TC & X-Y linearization plus Tare, Offset, Scale, Peak and more are programmable via simple commands.

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

ANALOG OUTPUT: Optional isolated 4-20mA, 0-1mA, 0-20mA or 0-5VDC with 16 Bit resolution.

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

SERIAL I/O Standard is RS232 with optional RS485 or **USB**. You can even power the **EBD** via the **USB** port (2W Max.).

POWER INPUT: Standard is 5VDC with optional isolated 10-32VDC, 100-240VAC or USB powered.

POWER OUTPUT FOR 4-20mA

TRANSMITTER: Non-Isolated (Options A-E) or isolated (Options 4, 7 or 8)

PROGRAMMING: OTEK will configure the EBD at no charge prior to shipment or you can reconfigure it via the serial port using simple commands (See User's Manual at www.otekcorp.com).

Warranty: Lifetime Ltd.

**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 

EBD Series continued

HOW IT WORKS:

Current Loop Powered: We use a Zener to clamp the voltage to 5V max. and monitor the Loop's current (we invented it in 1974). (Digit 2, Option 0).

VDC Signal Powered: We monitor the voltage with high impedance and clamp it to a safe level to power the **EBD**. (Digit 2, Option 2).

AC Signal Powered: For VAC & Hz we use a capacitor limiting rectifier to power the **EBD** and monitor the VAC with an RMS-DC converter. For Hz we use an F-V for accurate conversion. For A.A.C. we invented (Pat. #7,626,378) a C-V converter to extract the current from your C.T. for power and monitor the signal with RMS-DC. (Digit 2, Options Q-T).

Externally Powered: Non-Isolated 5VDC or isolated 5-32VDC or 90-265VAC 50/60Hz is optional (Digit 3, Options 1-8). Max Power: 150mW plus options.

Display (Digit 4): 51 auto-tricolor (RGY) bargraph for trend/Alarm and 4 digits for accurate readings to .01%.

Serial I/O: When ordered, (Digit 5), the **CPU** controls the Baud Rate (300-9600 Baud), the relays, analog output, math functions, linearization polynomial (9th) & X-Y tables.

Control & Power Out (Digit 6): You can order 4-20mA as standard, or 0-5V, 0-20mA, or you can order the isolated 30VDC (Options 4, 7, & 8) or Non-Isolated 28VDC out for your transmitter (Option E).

Relays/O.C.T. (Only for powered models): Either four (4) relays (SPDT) rated contacts at 10A@120 VAC resistive with ~10mS response; with built-in varistors or 8 open collector transistors rated at 30VDC/20mADC common emitter, with <1uS response._

THE SIGNAL CONDITIONERS: (2nd Digit)

Option 0: 4-20mA Loop 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 version.

Accuracy: $\pm 0.05\%$ of F.S.

Option 1: 4-30VDC

Signal Powered:

Another OTEK innovation. The voltage signal powers an **LDO** to protect the **EBD** and a divider network is used to measure and display the signal. If the input resistance of this Option is too low (~ 500 Ohms), use powered models. Power Input must be Option 4 (Powerless).

Accuracy: $\pm 0.1\%$ of F.S.

Option 2: 4-20mA Externally Powered:

It only drops 0.1V @ 20mA (5 Ohms) but the "**EBD**" needs 5VDC @ 30mA to operate. Power Input must be Options 0-3.

Accuracy: $\pm 0.05\%$ of F.S.

Options 3-6: VDC & mADC Externally Powered:

Input impedance is 1 Mega Ohms on all VDC ranges; 100 Ohm on 2mA and 1 Ohm on 200 mADC ranges.

Accuracy: $\pm 0.05\%$ of F.S.

Options 7, 8 & A:

V & mA RMs: Here we use a **True RMS-DC** Converter for accurate ($\pm 0.05\%$) measurement of sine waves up to 10KHz ($\pm 0.1\%$ for 10-20KHz) and SCR;s fired to $\pm 1\%$. Input impedances vs. range are the same as for VDC & mADC ranges.

Warning: No Isolation!

Accuracy: $\pm 0.05\%$ of F.S.

Option 9: Custom: Use this option to describe any custom input, scale or modification to the **EBD** and contact us for feasibility and cost.

Option B: 5Amps AC:

Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.05 Ohm, 0.1% 5 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the **EBD** but make sure the connections are "Perfect" to electrical codes.

Warning: No Isolation!

Accuracy: $\pm 0.05\%$ of F.S.

EBD Series continued

Option B: 5Amps AC (Continued)

The C.T. might have "**Lethal**" **High Voltage** without a "Shunt" (Open) and the **EBD** will "Smoke". See OTEK's New **ACS & CTT** models for **C.T.** powered instruments (Pat. # 7,626,378) or use option "R."

Option C: Strain-Gage (<1000

Ohm Type): Here we use high accuracy and stability 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 **EBD's** display at Zero and Full Scale Please!

Accuracy: $\pm 0.05\%$ of F.S.

Option D: Strain-Gage ($\geq 1K < 4K$

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 **EBD's** display at Zero and Full Scale.

Accuracy: $\pm 0.1\%$ of F.S.

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

Option E: RTD (PT100): We excite your 2, 3 or 4 wire RTD with 200 μ A to avoid the "self heating" effect. The range of the **EBD** is the same as your **RTD** typically -200 $^{\circ}$ C to +800 $^{\circ}$ C (-328 + 1562 $^{\circ}$ 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/ $^{\circ}$ C. (For legacy 0.00392 TC (known as ANSI 392) contact **OTEK** and use Option 9.)

Accuracy: $\pm 0.5\%$ of F/C plus sensor's error.

Note: For 2 wire, jump - S to -E and +S to +E. For 3 wire only jump -S to -E.

Option F: RTD (PT1000): Same as PT100 except it is 1000 Ohms at 0 $^{\circ}$ C instead of 100 Ohms @ 0 $^{\circ}$ C. The same technique is used. For copper **RTD** (10 Ohm), contact **OTEK**. Same connection as Option E apply.

Accuracy: $\pm 0.05\%$ of F/C plus sensor's error.

Note: For long distances use a 4-20mA transmitter such as our **900** or **LPT** series.

Option G: Thermocouple (Type

J) This **TC** has a range of -210 to +760 $^{\circ}$ C (-350 + 1390 $^{\circ}$ F). Its color is white (+) and Red (-), cold junction (CJ) is inside the **EBD** at the connector base. Make sure the connections from the **EBD** and your **TC** are as close to the **EBD's** entrance as possible to avoid errors.

Option G: Thermocouple (Type J) {Continued): If you short out the **EBD's** +**TC** & -**TC** together, the **EBD** will read the ambient temperature due to its built-in C.J.C. (Cold Junction Compensation).

Accuracy: $\pm 2^{\circ}$ F/C of signal input.

Option H: TC (Type K): This is yellow (+) and red (-) and has a range of -270 + 1370 $^{\circ}$ C (-440 + 2500 $^{\circ}$ F). The same notes as Option G.

Accuracy: $\pm 2^{\circ}$ F/C of signal input

For Other TC use #9 and Specify.

Options J&K: 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 #K or S.

Accuracy: $\pm 0.05\%$ of F.S.

Option L: %RH: This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option 9 and contact **OTEK** to specify your sensor's specifications.

Accuracy: $\pm 2\%$ RH of signal input.

EBD SERIES continued

Option M: pH (Acidity): We use a FET input (10^{15}) amplifier and calibrate the **EBD** for 0-14.00 pH using the Industry's standard $\pm 413 \text{ mV} = \pm 7\text{pH}$ coefficient.

Note: Not temperature compensated.

Accuracy: $\pm 0.05\%$ of F.S.

Standard display is 0-100% and 0-10,000 counts or use digit 9, option 9 and specify.

Option N: ORP (Oxygen Reduction Potential): Our FET amplifier (10^9) accepts the industry standard 2000mV F.S. of the probe and the **EBD** displays it in % (0-100.00%).

Accuracy: $\pm 0.05\%$ of F.S.

Option P: Hi Speed Peak & Hold (P&H): Now you can capture fast transients greater than 5 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: 2VDC/mADC F.S. (Specify Range). Contact OTEK for V/mA RMS or Loop Powered.

Accuracy: $\pm 0.1\%$ of F.S. ± 1 Digit. **Linearity & Resolution:** $\pm 0.1\%$ of F.S. **Response time:** $>200\text{KHz}$ ($<5\mu\text{s}$) **Retention:** >10 years (with power on)

Note: Options Q-T only available with Powerless™ Signal power input (Option 4, Digit 3). (Pat. # 4,908,569)

Option Q: VAC Signal Powered: **Warning! No Isolation!** This option uses the AC Voltage Signal to power the **EBD**. Since the **EBD** 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 7 or 8 (externally powered). Range: 50-150VAC; Method: RMS Calibrated; Accuracy & Linearity: $\pm 0.5\%$ of F.S. Best and safest when driven by a P.T. (Potential Transformer). **Always turn power off before connecting!**

Option R: AAC Signal Powered: **Warning! No Isolation!** (Pat. # 7,626,378)

OTEK's Patented technique permits the extraction of power from a regular **C.T.** (Current Transformer) to power the **EBD** 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: $\pm 0.05\%$ of F.S.; Burden on C.T.: $<150\text{mW}$.

Option S: Hertz (Frequency) Signal Powered: **Warning! No Isolation!** This option uses the same power technique as Option Q 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: 30-100Hz; Accuracy & Linearity: $\pm 0.05\%$ of F.S. For 400 Hz line, use #9 and specify range.

EBD SERIES continued

Option T: 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 Q & R apply. Range: VAC: 50-150; AAC: 0.1 - 5A; Frequency: 40-450Hz; Accuracy & Linearity: $\pm 0.1\%$ of F.S.; Conversion: True RMS. Contact **OTEK** for other functions.

Power/Input (Digit 3):

Option 0: Non-Isolated 5 VDC Power:

All listed I/O options (except Powerless™) are available. Power requirements vary with options included. The **EBD** with No Control or Power Out (Digit 6, Option 0) requires under 150 mW (30 mA@5VDC) for LED and under 100 mW with LCD display.

Options 1, 2: Isolated Power

These options offer minimum isolation of 500 VAC or DC and their efficiency is about 80%. Again, add all the options. Selected power x1.2 to arrive at total power required. All input ranges are +/-5%.

Option 4: Powerless™: The **EBD** is powered from the signal that it measures. ONLY available for options 0, 2, and Q through T of input signal (Digit 2).

WARNING: Any other I/Os are **NOT** isolated from signal. Options Q-T (Digits 2 & 3) could have lethal potentials!

Display (Digit 4)

Standard configuration is 0-F.S.=0-100% and 0-1,000 counts. Colors are per note #3 on ordering information.

Serial I/O (5th Digit): WARNING: No Isolation From Signal.

Option "0": Parasitic RS232E: Only option 0 on digit 6 is available when option "0" is selected.

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

Option 2: RS485: 1200-19.2kb, all ASCII (8N1) open protocol screw "conn."

Option 3: USB: 1200-19.2kb, all ASCII (8N1) open protocol "USB Type B."

Option 4: Ethernet: Fully compliant 10 baseT and RJ45 connector. Free driver.

Any terminal program (Hyperterminal, Procomm, Kermit) will work with OTEK's serial com. ports. For USB download out

Control & Power Out (Digit 6):

Option 1: Relays (4): Standard outputs 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).

Option 2: Open Collector Transistors (O.C.T):

Four O.C.T are included and all are common emitter (sinking) to digital ground. The 5 VDC internal power is available. 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 30 mA per O.C.T. Switching time is under one (1) uSecond.

EBD SERIES continued

Option 3: Isolated 4-20 mA (Retransmission): (Must include serial I/O options 0-4 Digit 5)

This option is offset & scaled via the serial port (digit 5) 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. Accuracy & linearity is +/- .1% of setting and can drive up to 1K ohms load. Also see Option B.

Option 4: Isolated 30 VDC Output

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

Option 5-8: Combinations of Option 1-4.

Don't forget to add all power requirements of each option desired. Worst case: 2 watts.

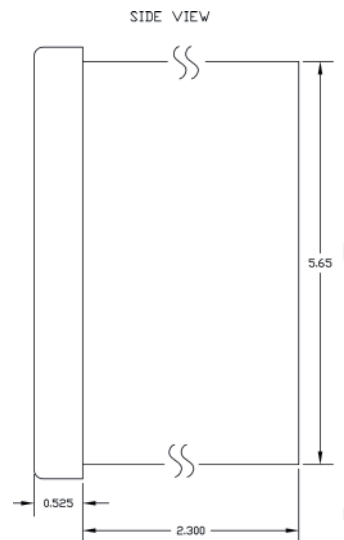
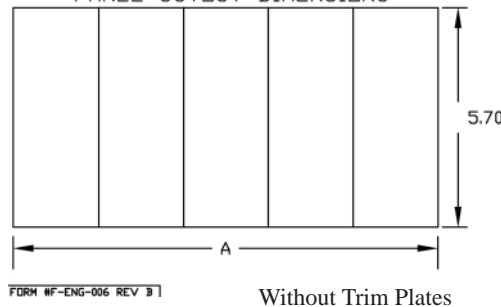
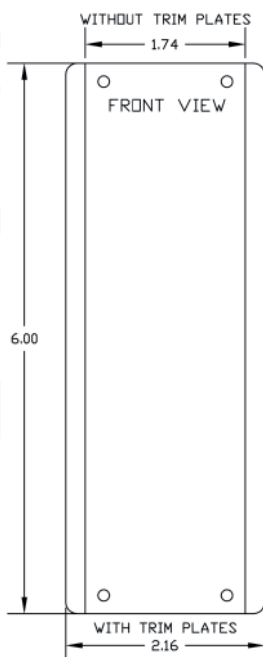
Option E: Non-Isolated 28 VDC & 4-20 mA Out.

This option converts the EBD to a low-cost transmitting DPM. The output is referenced to the EBD's Signal input after it has been conditioned by the signal conditioner (such as strain-gage, Hz, PH, etc.), and it has its own zero and span potentiometers for your customized range. Standard connections are for sourcing with burden under 700 ohms @ 20 mA. In addition, this option gives you 28 VDC non-isolated to power your transmitter. For external compliance and sinking, select option #9 and specify "external compliance" (you supply the VDC power for the 4-20mA transmitter). Minimum voltage is 10 VDC plus your load. Max is 30 VDC plus your load. Accuracy and linearity is +/- 0.05% of full scale. Power requirement is 800mW@5VDC internal compliance or 50mW with external (yours) compliance.

Range/Calibration (9th Digit): 0-100% and 0-1,000 counts, or use #9 and specify (configurable)

MECHANICAL INFORMATION

PANEL CUTOUT DIMENSIONS



DIMENSION	+0.03	+0.76
# UNITS	INCHES	MM
1	1.77	44.96
2	3.52	89.41
3	5.26	133.60
4	6.99	177.55
5	8.73	221.74

REV: A	DATE: 1/10/2005	QTEK
<small>QTEK IS A REGISTERED TRADEMARK OF QTEK CORPORATION, 10000 WILSON AVENUE, SUITE 100, WESTMINSTER, CO 80540</small>		
TITLE: HI-0119 MECHANICAL		
DATE: 01/10/05	BY: JLF	CHK: JLF
FILE: LBD/90-LBD0.DWG		

Plastic Trim Plates P/N 50-LBD-2
Metal Trim Plates P/N 50-119-2

EBD SERIES

ORDERING INFORMATION 5-10-10

	1	2	3	4	5	6	7	8	9
Model: EBD -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GRADE (1)									
I.....Industrial									
M.....Mil-Spec									
N.....Nuclear (Contact Otek)									
9.....Custom (Specify)									
F.S. INPUT SIGNAL/Z in (2, 7)									
0..... 4-20mA Loop Powered									
1.....4-30VDC Signal Powered									
2..... 4-20mA External Powered									
3.....200mVDC/1M Ohms									
4.....500 VDC/1M Ohms									
5..... 2mADC/100 Ohms									
6..... 200mADC/1 Ohms									
7.....200mVRMS/1M Ohms									
8.....500VRMS/1M Ohms									
9..... Custom (Specify)									
A..... 2mARMS/100 Ohms									
B......5ARMS/0.05 Ohms									
C.....Strain Gage<1000 Ohms									
D.....Strain Gage>1000 Ohms									
E..... RTD PT100 (100 Ohms)									
F..... RTD PT1000 (1K Ohms)									
G..... TC Type J									
H..... TC Type K									
J.....Frequency 40-20 KHz									
K.....Frequency 50-60HZ Line									
L.....%RH (Specify Sensor)									
M.....pH (0-14.00)									
N..... ORP (0-2000 mV)									
P..... High Speed Peak & Hold, 2 V									
Q..... VAC Signal Powered (P.T.)									
R.....AAC Signal Powered (5A C.T.)									
S.....40-70 Hertz Signal Powered (P.T.)									
T..... Watts AC Signal Powered (P.T. & C.T.)									
POWER INPUT									
0..... Non-Isolated 5VDC									
1..... Isolated 10-32VDC									
2..... Isolated 100-240VAC									
3.....Non-Isolated USB									
4.....Signal Powered (Powerless™)									
9..... Custom (Specify)									
RANGE/CALIBRATION									
0.....STANDARD									
9.....CUSTOM									
SCALE PLATE									
0.....STANDARD (0-100%)									
9.....CUSTOM									
HOUSING									
0.....Plastic Without Trim Plates									
1.....Plastic With Trim Plates									
2..... Metal Without Trim Plates									
3..... Metal With Trim Plates									
CONTROL OUTPUTS & POWER OUTPUT (5,6)									
0.....None									
1..... Relays (4)									
2.....Open Collector Xtrs. (4)									
3.....Retransmission (4-20mA)									
4..... Isol. 30VDC For Transmitter									
5.....Relays & 4-20mA Out									
6..... O.C.T. & 4-20mA									
7..... Relays & Isol. 30VDC Out									
8..... O.C.T. & Isol. 30VDC Out									
9..... Custom									
E.....Non-Isol. 28VDC & 4-20mA Out									
SERIAL I/O (4)									
0.....Parasitic RS232E									
1.....RS232									
2.....RS485									
3.....USB									
4..... Ethernet									
9..... Custom (Specify)									
DISPLAY CONFIGURATION (3)									
0.....Standard									
9..... Custom									

NOTES:

1. Contact **OTEK** for M & N grades and supply your specifications. 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. See description. Use #9 and specify for ranges not listed.
3. Standard configuration is: 0-100% and 0-1,000 counts for F.S. range. Colors are 0-50% = green, 50-75% = orange, 75-100% = red. Field configurable. Specify yours at time of ordering.
4. Isolated serial RS232 or 485 on request. Use option 9.
5. Maximum power consumption (all options): 10 Watts
6. Power for Transmitter: Non-Isolated: Options A, B, D or E. Isolated: (Options 4, 7 or 8) can Not Have Retransmission (4-20mA Out) and power for transmitter simultaneously. 4-20mA out is standard. Others on request.
7. Specify sensor manufacturer and type for pH and % RH.