



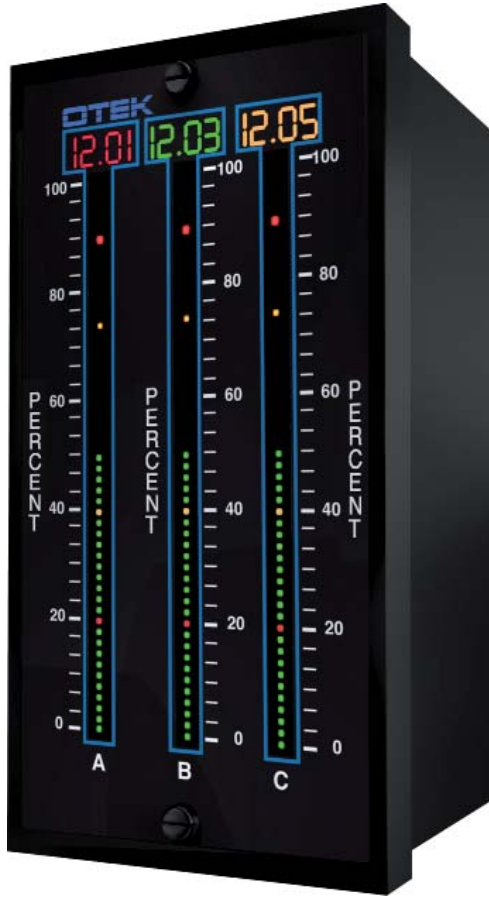
ISOLATED TRIPLE REDUNDANT CONTROLLER
FOR CRITICAL NUCLEAR, MILITARY & INDUSTRIAL USE
WITH uSD (LOGGER), ETHERNET, USB, 485, RTCC & MORE

MODEL TRC

FEATURES:

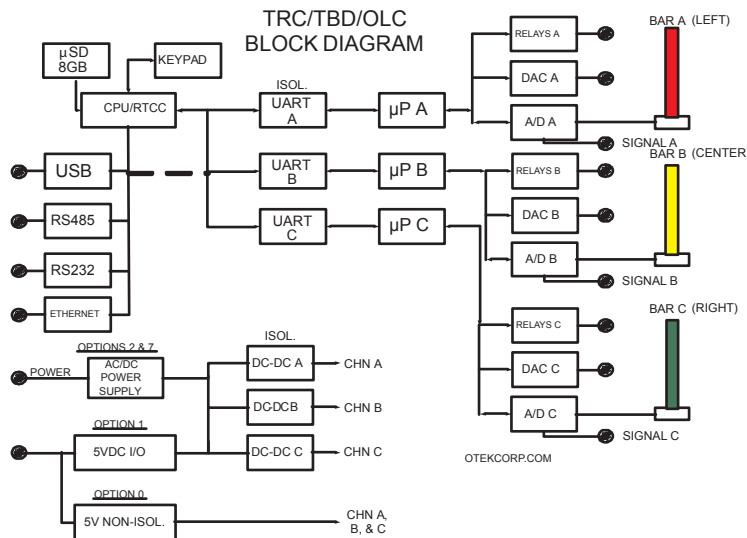
- *3 isolated 14 bit A/D with 51 segment auto tricolor bargraph & 4 colored digits
- *RTCC (Real Time Clock/Calendar)
- *Smart Programmable Alarms
- *Custom Algorithms Welcome
- *Metal case ready for EMI/RFI compliance (Mil-Std 461, EPRI 102323)
- *Shock & Vibration (Mil-Std 617)
- *>30 Input Signal Conditioners
- *5-32 VDC & 90-265 VAC Power
- * uSD For Data Logging to 8 GB
- *USB, 232, 485, ETHERNET I/O
- *High Speed (>20Khz) Peak & Hold
- *Isol. 30VDC Power for XMTR
- *Up/Down or Center Zero Bargraph
- *12 Relays or Transistors
- *3 Isolated 16 bit Analog Out
- *Remote Display For SCADA/DCS
- *Front Panel Keypad (Optional)
- *NEMA 3 (4 on request) Only 3" Deep
- *Math Functions (+, -, X, ÷, √), Polynomial & X-Y Tables
- *Lifetime Warranty.

(Actual size is 3"x 6")



SPECIFICATIONS (@ 25°C)

- NOTE: All 3 channels isolated from each other, power and input (>500V).
- Accuracy & Linearity: $\pm 0.01\%$ of F.S.
 - Bargraph Resolution: 2%
 - Span & Zero: $\pm 30\%$ of F.S.
 - C.M.V.: 2VDC Max.
 - Digits: 0.2", 4 (9.9.9.9)
 - Temperature Coeff.: 50 PPM
 - Op. /Storage: 0-60/-20 + 80°C
 - Power Consumption: 2 Watt @ 5VDC + Options. Max: 15W.
 - Environmental: NEMA 3, 5-95% RH
 - Case: All Metal Machined or 94VO
 - CMTBF:** 100,000+ Hours
 - Relays: 1 Amp 120VAC/30VDC SPDT or O.C.T.: 30V/30mA
 - Analog Out: 16 Bit $\pm 0.01\%$
 - Serial I/O 300-19.2KB (8N1)
 - All ASCII I/O; Address: 8 Characters



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TRC SERIES continued

DESCRIPTION:

What is it? A redundant controller is a common term used in **military, space and nuclear** industries to ensure Fail Safe operation of critical processes where human errors, wiring, sensor or equipment failure is possible, thus preventing loss of product, investment or environment.

How is it done? In large and small applications, 3 expensive and sophisticated computers are used to monitor/control critical parameters. The **TRC** is the first instrument of its kind that offers redundant control at an affordable price in a compact package dedicated to redundant control of one (1) specific parameter.

The **TRC** contains 3 identical isolated channels with their own A/D, DAC, uC, relays, Serial I/O and power supply.

The core of the **TRC** is the algorithm performed by the **CPU** that continuously compares the serial output of each channel to the other 2. Having all 3 channels monitoring the signals from 3 different sensors/transmitters at the process site using their own isolated power source and wiring eliminates **single point failures**.

The **CPU** is configured via keypad (or serial) to set a "window" of acceptance (i.e. 5% band). This means that any channel that falls outside of this window (as compared to the other 2) is disabled by the **CPU** and reported (alarms) to the supervisory personnel or equipment. It's important to note that the **TRC**'s function is to assure redundant control of the process by a democratic (majority) algorithm in addition to accurate data presentation

The majority rules! The **TRC** eliminates 3 out of the 4 most important causes of catastrophes: sensor, wiring and instrumentation. The human error is up to the user.

CPU FAILURE: In the event the CPU was to fail (see block diagram), all 3 channels' controllers would cease to receive COP data from the CPU. After a delay, the **TRC** will: 1) Cease to transmit serial data; 2) Each channel (display, relays, DACS) will continue to operate normally, but independent of each other (lost its commander). 3) All numerical displays will continue to display their data, but their own bargraph will turn ALL orange. 4) Other visual indications on requests (use #9 on digit 8 and contact OTEK).

***RTCC** (Real Time Clock/Calendar A.K.A. Julian Clock): Standard format is MM-DD-YY. Using the 3 displays, it can be configured for YYYY-MM-DD or DD-MM-YYYY and its programmable "Wake-Up" smart alarms can be set to control any included function/hardware such as relays/DACS, store data, dial phone #, etc.

***MATH FUNCTIONS:** +, -, x, ÷, √ Polynomial (9th), RTD, TC & X-Y linearization plus Tare, Offset, Scale, Peak and more are programmable via simple commands. The floating math functions are useful in linearizing RTD, TC, TH & other signals such as odd shape vessels, along with X-Y tables or polynomials. We use them to convert from °F to °C or vice versa, G to L, Y to M, # to Kg, etc. Contact OTEK for your unique application. We love challenges. Use option #9 and tell us about it.

***POWER OUTPUT (30 VDC) FOR 4-20mA XMTR**

This option allows you to power your own external 4-20mA transmitter, eliminating the need of an additional power supply (only 2 wires to connect)

***ANALOG OUTPUT:** Optional isolated 4-20mA with 16 Bit resolution. 3 each.

***RELAYS:** Each channel has 4 relays assigned to it, and just like the analog output modules they are floating (meaning you can reassign to any stream for any purpose). As standard, they are shipped as follows: K1: Hi-Hi Limit; K2: Hi Limit; K3: Lo Limit & K4: Lo-Lo Limit for each channel. Their contacts are protected for over voltage to 300V, but not for over current (surge).

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

***DISPLAY:** The 51 segment automatic tricolor bargraph to give you the trend at a glance. If all bargraphs have the same color, AOK. If not, there is a problem brewing. The bargraph can be programmed for any direction (up or down), any start (bottom, top, middle), colors change as limits are reached or exceeded to give you accuracy of 0.01% (9999) of full scale (scalable to eng. units).

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

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). Also see Option #9.

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).

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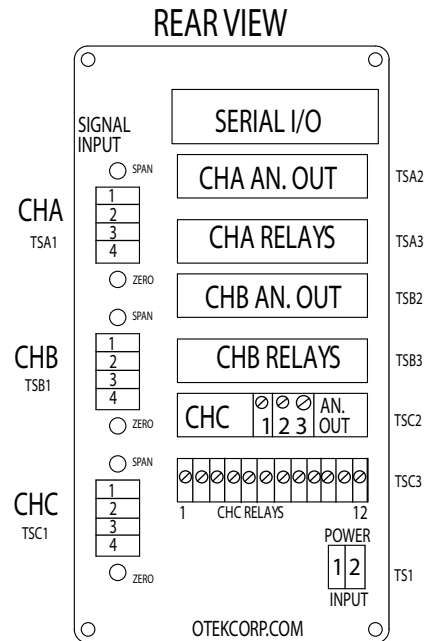
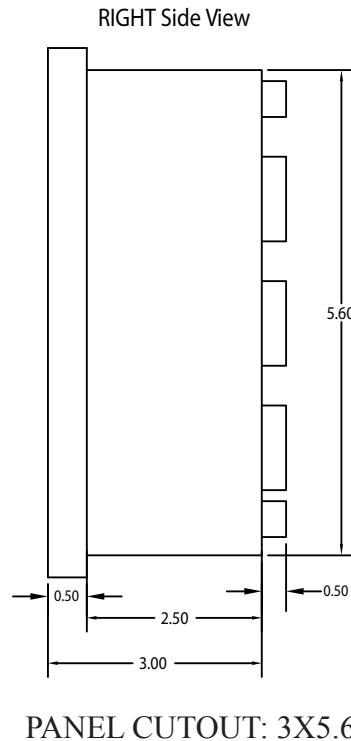
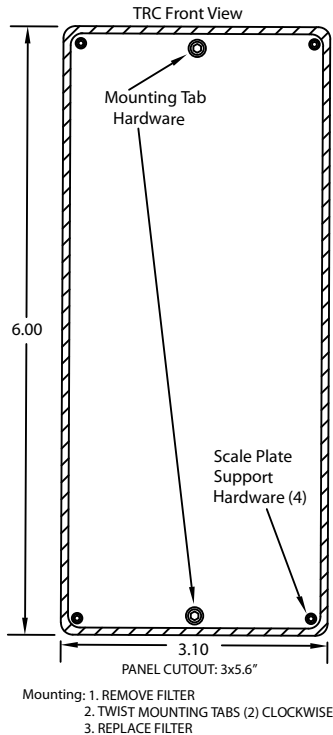
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TRC TYPICAL CONNECTIONS

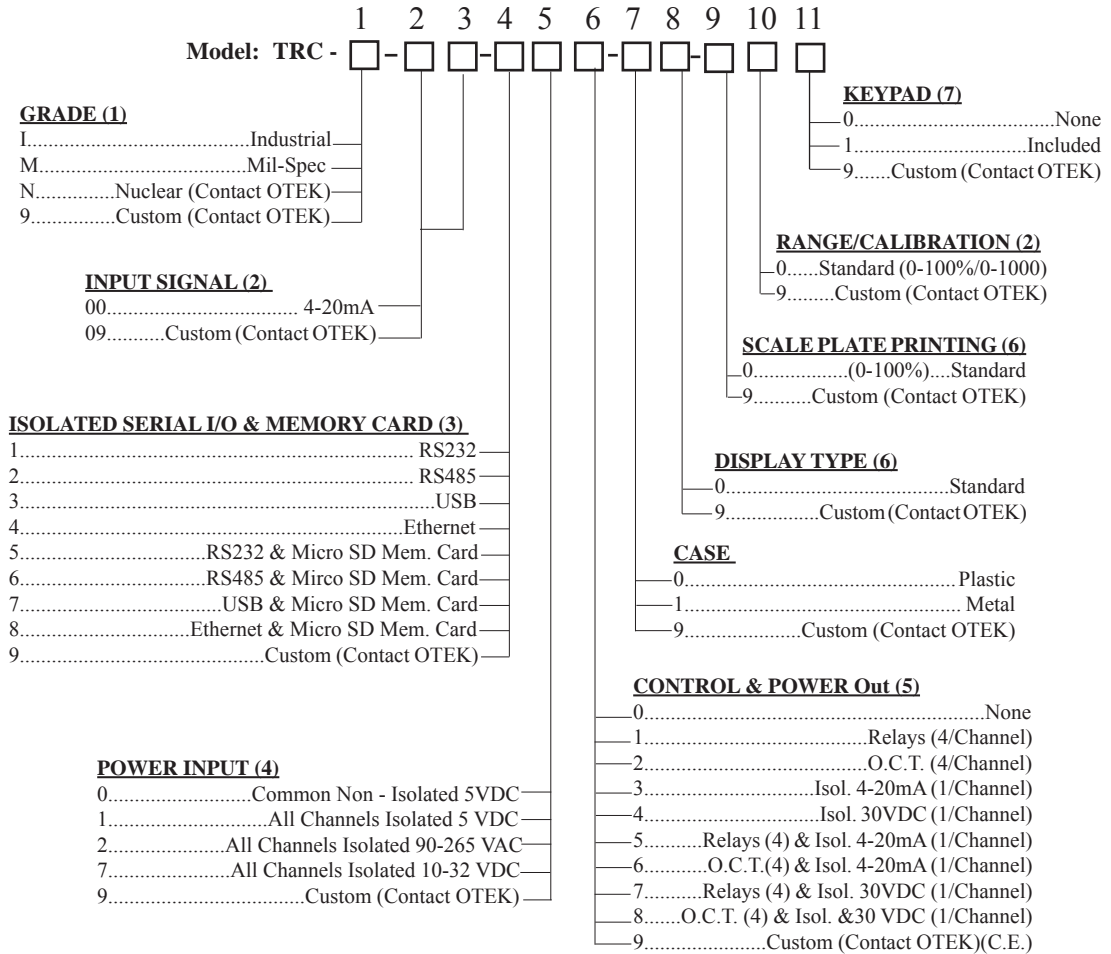
<p>INPUT SIGNALS (CHA=CHB=CHC) TSA1-TSC1 1. +5V I/O 2. GROUND 3. -LOOP/-SIGNAL 4. +LOOP/+SIGNAL</p>	<p>SERIAL I/O RS-232 (DB9) #2: TX; #3: RX, #5: GND. RS-485 (SCREW CONN.) #1: B; #2: A, #3: GND. USB (IND.STD.) #1: VBUS; #2: D+ #3: D-; #4: GND. ETHERNET Standard Termination</p>	<p>RELAYS (CHA=CHB=CHC) 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.</p>	<p>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)</p>
<p>POWER INPUT TS1 1. ACH/V+ 2. ACL/V- Note: Verify power input (digit 6) before connecting.</p>	<p>ANALOG OUTPUT (CHA=CHB=CHC) TSA2-TSC2 1. +LOOP OUT 2. GROUND (RETURN) 3. +30V OUT</p>		

TRC MECHANICAL INFORMATION



PRELIMINARY TRC SERIES

ORDERING INFORMATION 3-22-13



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

NOTES:

- 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.
- All 3 channels get same signal input. For mixed signals, see our model **TBD**. -Channel A is left, B is center & C is right.
- Serial I/O is isolated from all other I/O & power.
- Non-isolated 5 VDC (option 1) eliminates isolation between channels & all I/O except relays & analog out. Max power required: 15 watts.
- As on note 2, digit 6, options 1-8 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).
- 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).
- Keypad can be locked by user via serial port.