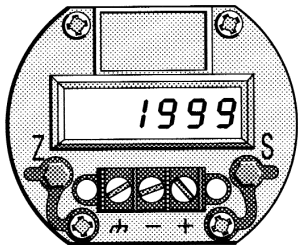


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TX83 and TX84

Two-Wire Current Loop Powered Indicators



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TX83 AND TX84 TWO-WIRE CURRENT
LOOP INDICATORS

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® TX-83 and TX-84 are weather resistant digital indicators which accept 1-5 mA, 4-20 mA, or 10-50 mA process input signals. The digital display (± 1999 active counts) can present the process variable in either percentage or directly in engineering units. The indicators are powered directly from the current loop with a volt drop of less than 2.5 volts, and a power consumption of 2.5 mW at 1 mA.

The TX-83 and TX-84 are watertight to 5 PSIG, and have an ambient temperature specification of from -40 to +85°C making them ideal for locations exposed to “wash-downs” or to the weather. Applications include the measurement of temperature, pressure, flow, PH, or for that matter, the measurement of any process variable for which a current loop transmitter is available.

For indoor applications OMEGA offers 1/8 DIN size panel-mount Process Loop Indicators, including the TX-82A. TX82A Indicators, and others, are described in the "L" and "M" Section of the OMEGA Temperature Measurement Handbook.

The TX-83 and TX-84 feature in-field programmability. Coarse input ranges (1-5, 4-20, or 10-mA) are selected by internal shunts. Three decimal points and a dummy right-hand zero may also be selected with pin-forest shunts. Zero and span are fine-tuned with precision 25-turn potentiometers. Positive slope response can be changed to negative slope response (eg., +6000 to -18000) by simply changing two other internal shunts.

The TX-83 and TX-84 are electrically isolated from the case, and are immune to most sources of electrical noise encountered in process-control environments. In the event of input overrange currents, the TX-83 and TX-84 can tolerate 250 mA in the forward direction and 1000 mA reverse.

Low mass and multi-point circuit board support give excellent vibration and shock resistance. Sturdy, die-cast construction, polyurethane paint, and full fluorosilicone gasketing ensure a virtually waterproof case. Circuit boards are conformally coated for added humidity protection.

The TX-83 can be mounted in a control room on either American or European relay tracks with snaptrack adapters, mounted directly on a wall with a bulkhead adapter, or mounted in an explosion-proof enclosure for wiring compatibility with other equipment in hazardous environments. The TX-84 may be connected directly to a conduit with a "T" junction box. The TX-83 has barrier strip terminals and the TX-84 has a ½" NPT conduit fitting with 12" lead Wires.

1.2 FEATURES

- 3½ Digit Display with Dummy Zero
- Powered Entirely by Signal Loop
- 1 to 5, 4 to 20, or 10 to 50 mA Ranges
- Scalable Zero and Offset for Engineering Units
- High Vibration and Shock Resistant with Cases of Die-Cast Metal that are Waterproof to 35 kPa (5 psi)

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at:

1-800-622-2378 or 203-359-1660.

We can also be reached at:

www.omega.com

email: info@omega.com

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

2.2 MOUNTING

The TX-83 and TX-84 are packaged in a small, rugged, die-cast, zinc-alloy case designed to fit 3" I.D. or larger housings, and requiring less than 2" of height. (Refer to Figure 2-1.)

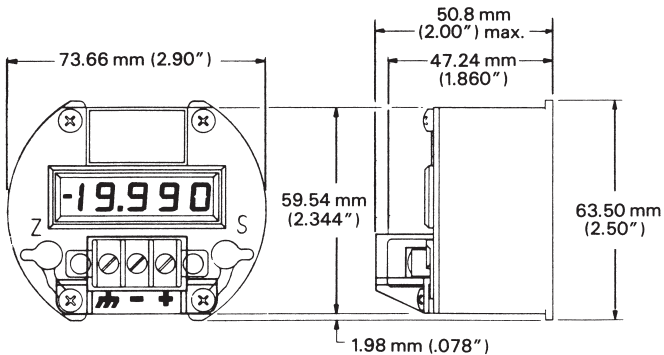


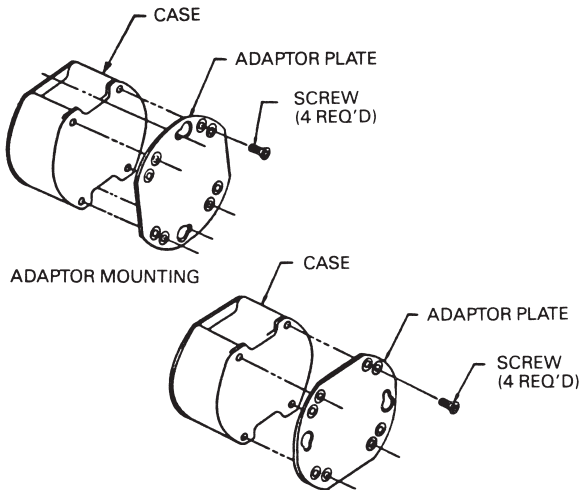
Figure 2-1. Outline Dimensions

The TX-83 provides for surface, track, or explosion-proof housing mounting, and is connected with a three-terminal, #6 screw barrier strip. Tapped holes on the back of the TX-83 case provide for custom mounting to a flat surface; integral flanges on the back of the case provide for standard 8TK2 relay track mounting. For flat surface mounting, use #6 hardware. For 8TK2 relay track mounting, simply push onto track.

The TX-83 also comes standard with an additional adapter plate for surface mount with two #8 front-entry screws through keyhole slots, or for push-mount into TR2/2TK relay track.

The TX84 is equipped with a ½" NPT conduit fitting. The fitting has two, 0.3 meter long, #18 stranded insulated wires passing through a neoprene moisture plug, for hook-up to junction boxes with standard wire nuts. The TX84-2 is the same as the TX84 with a ½" male EMT conduit fitting.

Refer to Figures 2-3a and 2-3b for basic mounting configurations.



RELAY TRACK MOUNTING (FOR TR2/2TK TRACK R.D.I.)

1. POSITION PLATE FOR DESIRED APPLICATION.
2. USE #6 HARDWARE TO MOUNT PLATE TO BACK OF TX-83 CASE AS SHOWN ABOVE.

Figure 2-2. Surface and TR2/2TK Relay Track Mounting, Model TX-83

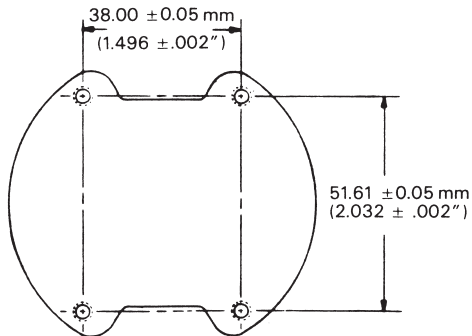


Figure 2-3a. Rear View: Standard Integral Mounting Plate (TX-83)

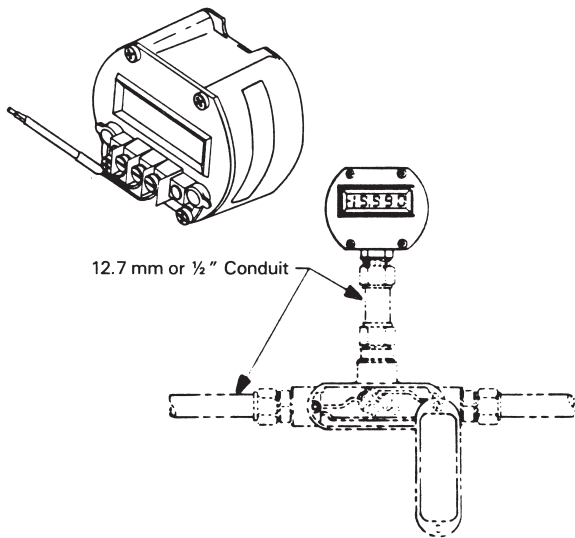


Figure 2-3b. Basic Mounting Configurations

2.3 SIGNAL INPUT CONNECTIONS

WARNING

Input currents in excess of protective limits can damage your TX-83/84 Current Loop Indicator.

2.3.1 TX-83

Figure 2-4 below shows a typical TX-83 installation and wiring when used with a two wire transmitter and power supply. Power supply requirements are covered in Section 2-4.

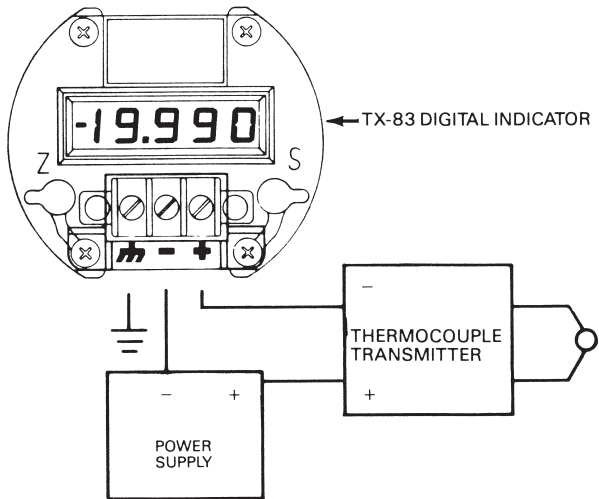


Figure 2-4. TX-83 and Two-Wire Transmitter Wire

2.3.2 TXB4

The TX84 comes equipped with a male ½" NPT conduit fitting. The conduit fitting is plugged with a rubber stopper. Two 0.3 meter (12") long, 18 gage stranded Insulated wires are passed through the stopper. The black wire is the positive (+) signal input and the white wire is the negative (-) signal input. The unit can be hooked up using standard wire nuts. The TX84-2 is the same as the TX84 with a ½" male EMT conduit fitting.

2.4 POWER SUPPLY REQUIREMENTS

Please refer to Figure 2-4. Current loop powered transmitters and indicators normally operate well with both regulated and unregulated power supplies. The TX83 and TX84 will work well with both.

The power supply required to power a current loop circuit is principally dictated by the power demand of the transmitter rather than the indicator. For our example, the typical OMEGA thermocouple transmitter voltage supply specification may read "12-60 Vdc", with an implied 20 plus mA current draw per transmitter. To determine total power supply voltage needs, add to the 12 Vdc voltage (for the transmitter) the maximum voltage drop across the Digital indicator, in this case, 2.5 volts for the TX-83 or TX-84. This would give a power demand of 14.5 volts and 20 milliamps. (if you were working with a 50 milliamp loop, the 20 milliamps would become 50 milliamps).

For the case cited, a safe selection would be an 18 (plus) volt power supply capable of delivering 20 or more milliamps for each transmitter to be powered. The economical OMEGA PSU-24, 24 volt 100 mA unregulated power supply would be an excellent selection for powering up to 4 of the above.

SECTION 3 CONFIGURATION PROCEDURES

3.1 GENERAL

The TX-83 and TX-84 are shipped from the factory with the standard configuration of 4 to 20 mA (displays 00.0 to 100.0). A custom configuration for other values of span and zero and/or changes in in the span slope, decimal point location, or dummy right-hand zero, may be made in the field by relocating internal shunt blocks, and adjusting the zero and span potentiometers (refer to paragraph 3.5). The following Field Set-Up Procedures (paragraphs 3.3 and 3.4) can be used to determine the necessary configuration.

3.2 GLOSSARY

The following terms appear throughout the Configuration Procedures:

TERM	DESCRIPTION
DP1	Decimal Point 1.999
DP2	Decimal Point 19.99
DP3	Decimal Point 199.9
DRHZ	Dummy Right-Hand Zero
G	Gain Expressed in Counts per mA
I1	Lowest Input Current in mA
I2	Highest Input Current in mA
N1	Reading in Displayed Counts at Input Current I1
N2	Reading In Displayed Counts at Input Current I2
FIN	Required Flange Number for Zero Range Selection
RSS	Reverse Span Slope
ZR1	Zero Range (- 2510 to -1420)
ZR2	Zero Range (-1580 to -420)
ZR3	Zero Range (-470 to + 850)
ZR4	Zero Range (+ 760 to +2000)

3.3

FIELD SET-UP CALCULATION PROCEDURE

1. Base all calculations on one of three ranges:
1 to 5 mA, 4 to 20 mA, or 10 to 50 mA.
2. Determine the lowest input current, I_1 , specified by user.
 $I_1 = \underline{\hspace{2cm}}$ mA
3. Determine the highest input current, I_2 , specified by user.
 $I_2 = \underline{\hspace{2cm}}$ mA
4. Determine the reading, N_1 , at input current I_1 , specified by user.
 $N_1 = \underline{\hspace{2cm}}$ counts
5. Determine the reading, N_2 , at input current I_2 , specified by user.
 $N_2 = \underline{\hspace{2cm}}$ counts
6. Calculate the gain (G_1):
$$G = \frac{(N_2 - N_1)}{(I_2 - I_1)} = \underline{\hspace{2cm}}$$
 counts per mA
7. Calculate the required range number:
 $RN = N_1 - (I_1 \times G)$

NOTE

If G is greater than 500, it is out of the operating range for a standard unit.

8. Select the zero range (ZR) that includes the required range number (RN) from the following ranges:

ZR1 = -2610 to -1420

ZR2 = -1580 to -420

ZR3 = -470 to +850

ZR4 = +760 to +2000

9. Proceed to paragraph 3.5 Field Set-Up Procedure Implementation.

3.4 **ALTERNATE FIELD SET-UP CALCULATION PROCEDURE**

1. (Line 1) Low Signal Input (mA) = _____.
2. (Line 2) High Signal Input (mA) = _____.
3. (Line 3) Low Signal Input Reading (Counts) = _____.

4. (Line 4) High Signal Input Reading (Counts) = _____.
5. (Line 5) Line 2 - Line 1 = _____.
6. (Line 6) Line 4 - Line 3 = _____.
7. (Line 7) Line 6 divided by Line 5 = _____.
8. (Line 8) Line 7 x Line 1 = _____.
9. (Line 9) Line 3 - Line 8 = _____.
10. Select a zero range from one of the following, where the number on Line 9 falls between the high and low numbers of that ZR range:
ZR1 = -2510 to -1420
ZR2 = -1580 to -420
ZR3 = -470 to +850
ZR4 = +760 to +2000
11. Proceed to 3.5 Field Set-Up Procedure Implementation.

3.5 HELD SET-UP PROCEDURE IMPLEMENTATION

The TX-83 and TX-84 factory calibrated configuration displays 00.0 to 100.0 for an input of 4 to 20 mA. Internal shunt blocks are factory-installed in positions J, G, a, and L. A custom configuration for other values of span and zero and/or changes in the span slope, decimal point location, or dummy right-hand zero is accomplished by relocating internal shunt blocks as shown in Table 3-1 Configuration Chart. After the internal shunt blocks are changed, the Span and Zero potentiometers must be readjusted as described in paragraph 3.6.2 Calibration Procedure.

Six shunt blocks are provided with the TX-83 and TX-84 to accommodate in-field configuration changes. Unused or spare shunt blocks should be inserted in a vertical position on unused upper pins closest to the display board.

To access the shunt blocks, remove the four Phillips-head screws from the top of the TX-83 and TX-84 case, and lift the main unit from the case.

Refer to Figures 3-1a and 3-1b for shunt block location and designations.

**TABLE 3-1
CONFIGURATION CHART**

CONFIGURATION	SHUNT BLOCK LOCATIONS REQUIRING SHUNT BLOCKS
1 to 5 mA	None
4 to 20 mA	J
10 to 50 mA	A
Normal Span Slope	G and a
Reverse Span Slope (RSS)	F and Z
Zero Range	
-2510 to -1420 (ZR1)	I
Zero Range	
-1580 to -420 (ZR2)	T

TABLE 3-1 (Cont'd)

Zero Range -470 to +850 (ZR3)	None
----------------------------------	------

CONFIGURATION	SHUNT BLOCK LOCATIONS REQUIRING SHUNT BLOCKS
----------------------	---

Zero Range + 760 to +2000 (ZR4)	c
Dummy Right-Hand Zero (DRHZ)	D
Decimal Point 1.999 (DP1)	W
Decimal Point 19.99 (DP2)	L
Decimal Point 199.9 (DP3)	V

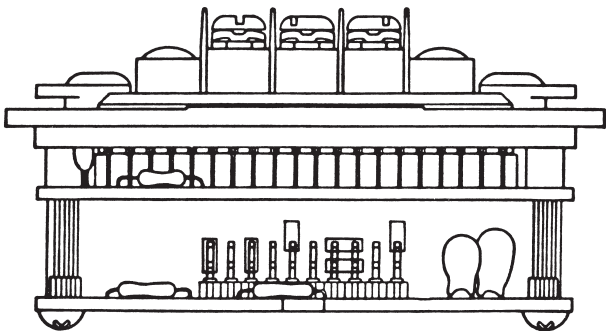


Figure 3-1a. Side View of TX-83/84 with Shunt Blocks Installed for Standard Configuration (4 mA = 00.0 and 20 mA = 100.0). For Other Application-Specific Configurations, Installed Shunt Blocks can have Other Locations

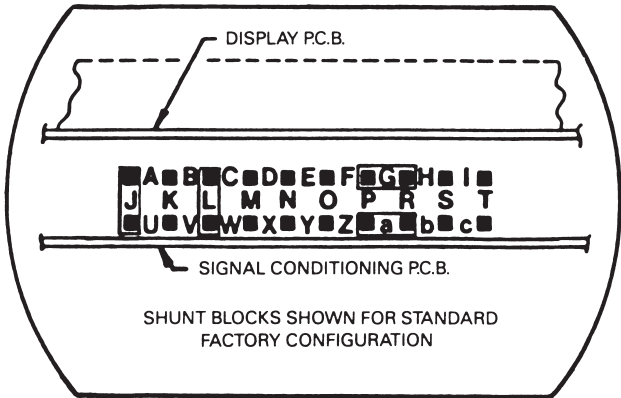


Figure 3-1b. Shunt Block Diagram

To proceed with the Field Set-Up Procedure Implementation:

1. If the current range chosen in either paragraph 3.3 step 1, or paragraph 3.4 step 1 equals either 4 to 20 mA or 10 to 50 mA, install a shunt block as shown in Table 3-1. Pin forest designations are illustrated in Figure 3-1b.
2. If N1 (paragraph 3.3 step 4 or paragraph 3.4 step 3) is more positive than N2 (paragraph 3.3 step 5 or paragraph 3.4 step 4), reverse the span slope (RSS) by installing two shunt blocks as shown in Table 3-1.
3. Select the zero range required (ZR1, ZR2, ZR3, ZR4), and install a shunt block as shown in Table 3-1.
4. If a dummy right-hand zero (DRHZ) is required, install a shunt block as shown in Table 3-1.
5. If a decimal point is required (DP1, DP2, DP3), install a shunt block as shown in Table 3-1.

3.6 CALIBRATION

3.61 Equipment Required

Precision mA power source or, 10 V power supply, 4½ digit DMM with mA range and 10 kilohm rheostat.

3.6.2 Calibration Procedure

1. Remove the four Phillips-head screws from the top of the TX-83/84 case and lift main unit from case
2. Select the desired shunt block configuration and install the push-on shunt blocks in locations indicated in Table 3-1. (Refer to paragraph 3.5.)

NOTE

Store unused shunt blocks in a vertical position, on unused upper pins closest to the Display Board.

3. Pull off two sealing plugs that cover the Span (S) and Zero (Z) potentiometer screw heads on the front of the TX-83/84.
4. Set up the TX-83/84 as shown in Figure 3-2.
5. Calibrate the unit as follows:
 - A. Alternately apply input currents I1 and I2, and adjust Span pot (S) until span reading equals $N2 - N1$ counts.
 - B. Apply input current I1, and adjust the Zero pot (Z) until a reading equal to N1 is displayed.
6. Remove the TX-83/84 from the calibration set-up.
7. Replace the two sealing plugs over the Span and Zero potentiometer screw heads.
8. Apply new labels onto the bottom end side of the TX-83/84, stating the new values of I1, I2, N1, and N2.
9. Re-install the TX-83/84 main unit into its case.

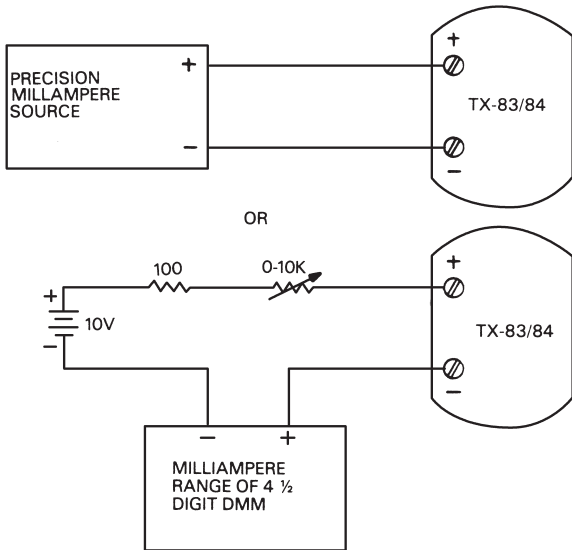


Figure 3-2. Calibration Set-Up

SECTION 4 SPECIFICATIONS

INPUT

CURRENT:	1-5 mA, 4-20 mA. or 10-50 mA, field selectable by internal shunt
VOLTAGE DROP:	2.5 V max forward; up to 50 MA
PROTECTION:	250 mA forward; 10DO mA reverse at 2.5 V
INPUT RESISTANCE:	50 ohms, 1-5 mA range; 12.5 ohms, 4-20 mA range; 5 ohms, 10-50 mA range

ZERO RANGE:	-2510 to +2000 counts; field-selectable by internal shunts in four overlapping coarse ranges, with a 25-turn potentiometer for continuous adjustment within the following selected ranges: -2510 to -1420; -1580 to -420; -470 to +850; and +760 to +2000
SPAN RANGE:	0 to 2000 counts, continuously adjustable with 25-turn potentiometer
NORMAL MODE REJECTION:	46 dB min. a 50/60 Hz
COMMON MODE REJECTION:	120 dB typical, DC to 60 Hz
COMMON MODE VOLTAGE:	700 V peak from DC to 60 Hz (meter to case)

RFI SUSCEPTIBILITY: Less than $\pm 0.5\%$ of span at a distance of one meter from a 2-watt, hand-held transceiver (approximately equivalent to 10 V/m field strength) at frequencies of 27 MHz or 440 MHz

NOTE

Proper lead dress and shielding required.

ACCURACY AT 25°C: Max error: $\pm 0.1\%$ of span ± 1 count; Zero Tempco: ± 0.1 count/ $^{\circ}\text{C}$ typ., ± 0.2 count/ $^{\circ}\text{C}$ max.; Span Tempco: $\pm 0.005\%$ of span/ $^{\circ}\text{C}$ typ., $\pm 0.015\%$ if span/ $^{\circ}\text{C}$ max.

DISPLAY TYPE: 7 segment LCD, 8.9 mm (0.35") high; jumper selectable decimal point

OVERRANGE: Three least-significant active digits blank

ANALOG-TO-DIGITAL CONVERSION

TECHNIQUE: Dual-slope, average-value with autozero, correction

POLARITY: Determined automatically at the end of signal integration period

SIGNAL 100 ms typ.

INTEGRATION PERIOD:

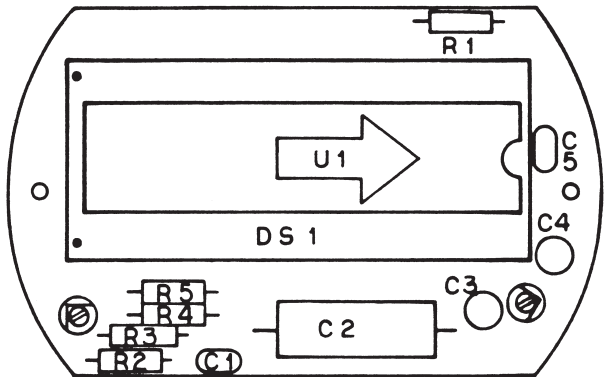
READING RATE: 2.5/sec

ENVIRONMENTAL

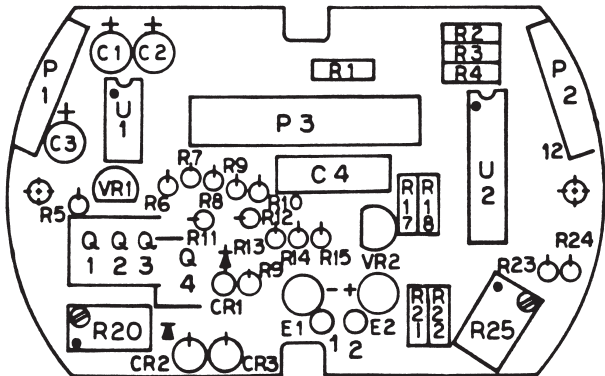
TEMPERATURE: -40 to +85°C

HUMIDITY: To 95% at 40°C

VIBRATION:	1.52 mm (.06") double amplitude, 10-W Hz cycled
SHOCK:	55 g, half-sine, 9-13 msec duration
WATER RESISTANCE:	Watertight to a proof pressure of 35 kPa (5 psi)
MECHANICAL	
WEIGHT:	400 g (14 oz)
DIAMETER:	74 mm (2.9")
HEIGHT (INCL. BARRIER):	48 mm (1.9")
ELECTRICAL CONNECTIONS:	TX-83: three-position terminal barrier strip with #6 screw wire clamps TX-84: ½" NPT male conduit fitting with two 0.3 meter long (12") #18 stranded wires

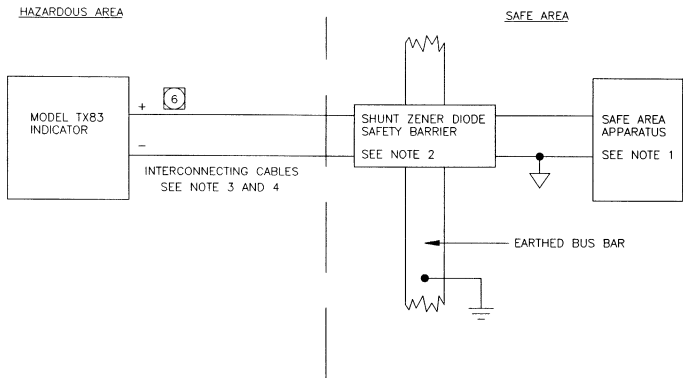


Upper P. C. Board Component Layout



Lower P. C. Board Component Layout

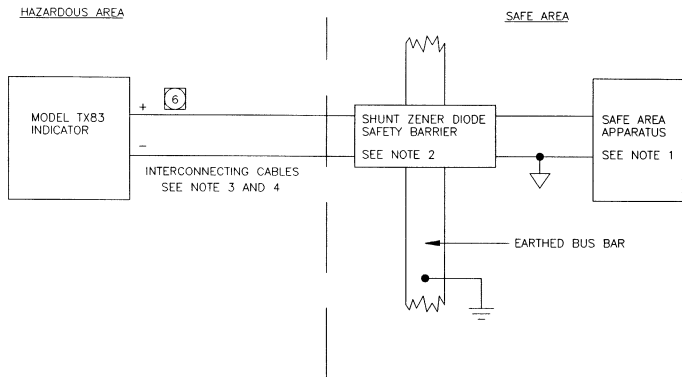
Block diagrams are on the following pages for TX83 and TX 84 with FM and CSA Approvals for use in hazardous area with the appropriate approved intrinsic safety barrier.



Block Diagram of TX83 - FM Approval

NOTES

1. APPARATUS WHICH IS UNSPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250V RMS OR 250VDC.
2. THE FOLLOWING OUTPUT PARAMETERS APPLY;
 $V_{max}=12.5V$, $I_{max}=250mA$, $C_i=8.6\mu F$, $L_i=0mH$
3. THE INTERCONNECTING CABLE MAY BE A TWIN PAIR, OR A PAIR CONTAINED IN A TYPE A OR TYPE B MULTICORE CABLE (AS DEFINED IN EN50 039 CLAUSE 5.3) PROVIDED THAT THE PEAK VOLTAGE OF ANY CIRCUIT CONTAINED WITHIN THE MULTICORE DOES NOT EXCEED 60 VOLTS.
4. THE CAPACITANCE OR INDUCTANCE OR INDUCTANCE TO RESISTANCE (4R) RATIO OF THE INTERCONNECTING CABLE MUST NOT EXCEED THE VALUES SPECIFIED FOR THE BARRIER IN USE.
5. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING WITHOUT BREAKDOWN AN AC TEST VOLTAGE OF 500V RMS TO EARTH OR FRAME FOR ONE MINUTE.



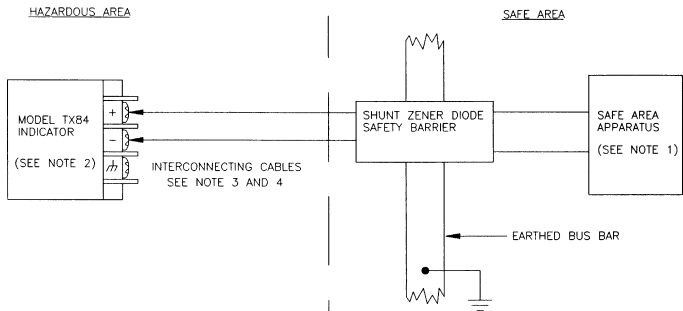
Block Diagram of TX83 - CSA Approval

NOTES

1. APPARATUS WHICH IS UNSPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250V RMS OR 250VDC.
2. ANY SHUNT ZENER DIODE SAFETY BARRIER CERTIFIED BY CSA RATED 28V AT 300 Ω .
3. THE INTERCONNECTING CABLE MAY BE A TWIN PAIR, OR A PAIR CONTAINED IN TYPE A OR TYPE B MULTICORE CABLE (AS DEFINED IN EN50 039 CLAUSE 5.3) PROVIDED THAT THE PEAK VOLTAGE OF ANY CIRCUIT CONTAINED WITHIN THE MULTICORE DOES NOT EXCEED 60 VOLTS.
4. THE CAPACITANCE OR INDUCTANCE TO RESISTANCE (4R) RATIO OF THE INTERCONNECTING CABLE MUST NOT EXCEED THE VALUES SPECIFIED FOR THE BARRIER IN USE.
5. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING WITHOUT BREAKDOWN AN AC TEST VOLTAGE OF 500V RMS TO EARTH OR FRAME FOR ONE MINUTE.



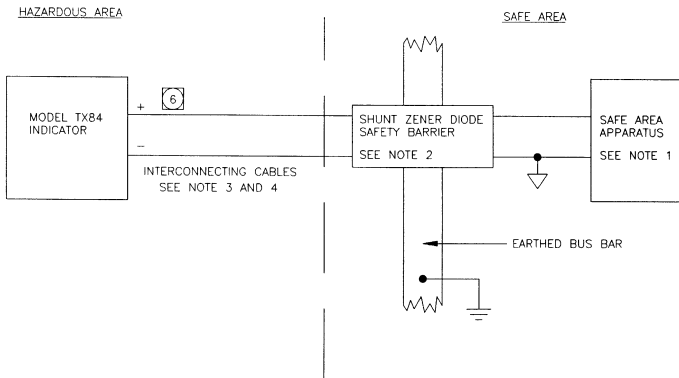
REVERSING CONNECTIONS WILL NOT DAMAGE UNIT.



Block Diagram of TX84 - FM Approval

NOTES

1. APPARATUS WHICH IS UNSPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250V RMS OR 250VDC.
2. THE FOLLOWING OUTPUT PARAMETERS APPLY; $V_{max}=12.5V$, $I_{max}=250mA$, $C_i=8.6\mu F$, $L_i=0mH$
3. THE INTERCONNECTING CABLE MAY BE A TWIN PAIR, OR A PAIR CONTAINED IN A TYPE A OR TYPE B MULTICORE CABLE (AS DEFINED IN EN50 039 CLAUSE 5.3) PROVIDED THAT THE PEAK VOLTAGE OF ANY CIRCUIT CONTAINED WITHIN THE MULTICORE DOES NOT EXCEED 60 VOLTS.
4. THE CAPACITANCE OR INDUCTANCE TO RESISTANCE (4R) RATIO OF THE INTERCONNECTING CABLE MUST NOT EXCEED THE VALUES SPECIFIED FOR THE BARRIER IN USE.
5. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING WITHOUT BREAKDOWN AN AC TEST VOLTAGE OF 500V RMS TO EARTH OR FRAME FOR ONE MINUTE.



Block Diagram of TX84 - CSA Approval

NOTES

1. APPARATUS WHICH IS UNSPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250V RMS OR 250VDC.
2. ANY SHUNT ZENER DIODE SAFETY BARRIER CERTIFIED BY CSA RATED 28V AT 300Ω.
3. THE INTERCONNECTING CABLE MAY BE A TWIN PAIR, OR A PAIR CONTAINED IN A TYPE A OR TYPE B MULTICORE CABLE (AS DEFINED IN EN50 039 CLAUSE 5.3) PROVIDED THAT THE PEAK VOLTAGE OF ANY CIRCUIT CONTAINED WITHIN THE MULTICORE DOES NOT EXCEED 60 VOLTS.
4. THE CAPACITANCE OR INDUCTANCE TO RESISTANCE (4R) RATIO OF THE INTERCONNECTING CABLE MUST NOT EXCEED THE VALUES SPECIFIED FOR THE BARRIER IN USE.
5. THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING WITHOUT BREAKDOWN AN AC TEST VOLTAGE OF 500V RMS TO EARTH OR FRAME FOR ONE MINUTE.



REVERSING CONNECTIONS WILL NOT DAMAGE UNIT

NOTES:

NOTES:

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal **two (2) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence. The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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