



**INSTRUCTION
MANUAL
FIREGUARD™ INTRINSICALLY SAFE
TENSION INDICATOR**



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For assistance, please call:

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IMPORTANT!

READ BELOW

• • • SAFETY NOTICE • • •

Important! Refer to Control Drawings on pages 16 & 17. If this equipment is not installed in accordance with Article 504 of the National Electric Code, and connected in accordance with these Control Drawings, the operating and intrinsic safety of this unit or of connected equipment cannot be guaranteed.

TABLE OF CONTENTS

SECTION ONE	PRODUCT DESCRIPTION	PAGE
1.1	General Description	1
1.2	Front View	1
1.3	Specifications	2
1.4	Standard Features	2
	115Vac/230Vac Power Input	2
	0 to +10 Volt Tension Output	2
	4-20mA Tension Output	2
	0 to 1mA Output	2
	Meter Damping	2
	Dual Calibration	2
	+5Vdc/+10Vdc Excitation	2
	UL Listed	2
1.5	Options	2
1.6	Accessories	3
	Remote Tension Meter	3
	Nonstandard Meter Scale	3
SECTION TWO	INSTALLATION	
2.1	Dimensions	4
2.2	Safety Notice	5
2.3	Selection of Mounting Location	5
2.4	Installation Instructions	5
2.5	Electrical Connections of Std. Features	7
2.6	Electrical Connections of Options	8
SECTION THREE	CALIBRATION AND SETUP	
3.1	Preparation	9
3.2	Mechanically Zero the Meter	9
3.3	Calibrate the Output for Accuracy	9
SECTION FOUR	OPERATOR ADJUSTMENTS	11
SECTION FIVE	CARE AND MAINTENANCE	12
SECTION SIX	TROUBLESHOOTING	13
SECTION SEVEN	REPLACEMENT PARTS	14

APPENDICES

A	PC Board	15
B	Electrical Connection Control Drawings	16
C	Transducer Electrical Connections	18
D	Typical Tensions	22
	TERMS AND CONDITIONS OF SALE	23
	INDEX	25

LIST OF ILLUSTRATIONS

FIGURE	DESCRIPTION	PAGE
1	Front View of FireGuard	1
2	Dimensions	4
3	Cover and Screw Locations	6
4	Power Board	6
5	Electrical Connections for Hazardous and Safe Areas	7
6	Meter Zero Adjustments	9
7	Adjustments of Pots on Front of Unit	9
8	Web Path	10
9	Power Board	15
10	Control Drawing #1 (Model C & UPB)	16
11	Control Drawing #2 (NW,TR,RF, & LT)	17
12	Models C, RS, UPB Transducer Wiring	18
13	RF Transducer Wiring	19
14	TR and NW Transducer Wiring	20
15	LT Transducer Wiring	21

1.1 GENERAL DESCRIPTION

The DFE FireGuard™ Intrinsically Safe tension indicator is designed to provide an electrical interface between approved DFE tension transducers (and optionally, an approved DFE tension indicating meter) located in Class I, Division 1, Groups A, B, C, and D or Class I, Division 2 Hazardous areas (as defined in Article 500 of the National Electrical Code), and other DFE tension control equipment, variable speed drive systems, computers, or other devices located in "safe" areas. Article 500 defines certain manufacturing environments as "Hazardous" because of the presence of combustible or explosive materials either during normal operating conditions, or because of the potential for their presence due to a fault condition.

The FireGuard™ provides a "safety barrier" between circuitry located in the "safe area" and the DFE transducers (and the optional meter) located in the hazardous area using a technique known as Intrinsic Safety. This technique effectively limits the energy which can be delivered to the devices located in the hazardous areas such that the risk of ignition is greatly reduced.

The indicator is set up for 115Vac operation with a +5Vdc output voltage for excitation of transducers. It can also be set up for 230Vac input voltage and/or +10Vdc excitation voltage by changing the settings of either of two switches within the unit.

1.2 FRONT VIEW OF FIREGUARD™

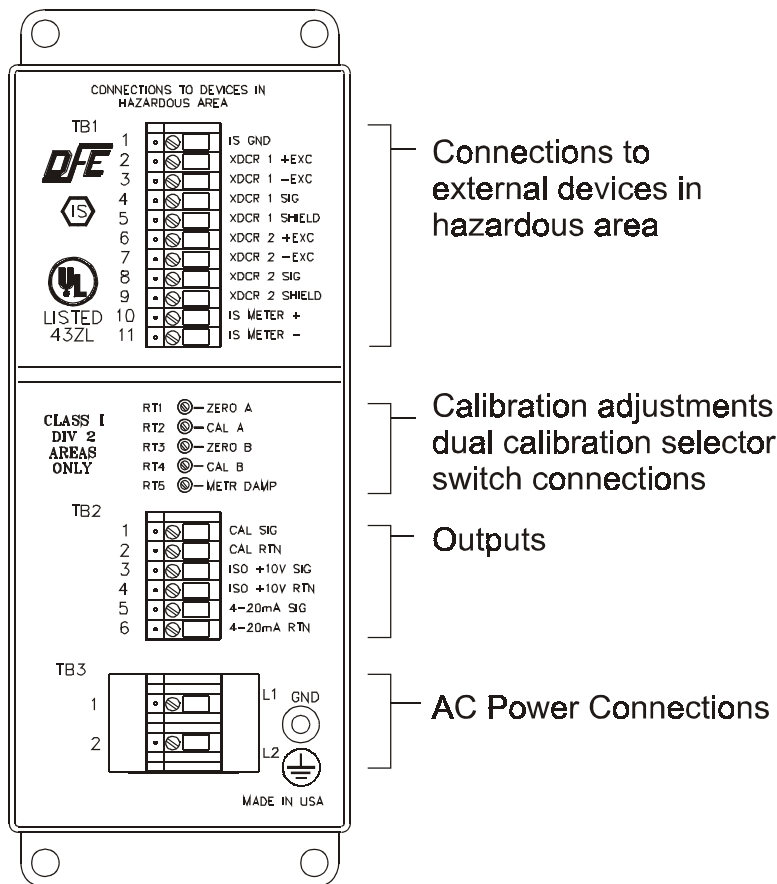


Figure 1 - Front View of Fireguard™ with cover removed

1.3 SPECIFICATIONS

Power input	.....	115Vac @ 125mA
	.....	230Vac @ 63mA
Tension signal outputs	.....	0 to +10V isolated (up to 2mA load), not damped
	.....	4 to 20mA non-isolated, not damped
	.....	0 to 1mA damped, energy-limited output for external tension meter located in hazardous area
Transducer signal input	.....	30-500 mVdc at rated load
	.....	(30mV-1.00V for XR and LT options)
Transducer excitation	.....	5Vdc Energy-limited.
	.....	(10V for the XR and LT options).
Zero (tare) range	.....	up to 95% of transducer rating
Calibration range	.....	16:1 (30:1 using the XR option)
Weight	.....	6.0 lb (2.7 kg)
Ambient temperature range	.....	32F to 104F (0C to 40C)
Temperature Codes: TI-13	.....	T4A
Transducers (all)	.....	T3C
Meter Enclosure	.....	T3C

1.4 STANDARD FEATURES

SOME OF THESE FEATURES REQUIRE CONFIGURATION OR EXTERNAL WIRING. REFER TO SECTION 2.4 FOR INSTALLATION INSTRUCTIONS AND SECTION 2.5 FOR WIRING.

- **115Vac/230Vac power input.** A switch within the unit allows the user to select the appropriate line voltage for operation.
- **0 to +10V isolated tension output.** Proportional to tension. Used as an input to a control or instrumentation system. Isolation simplifies connection.
- **4 to 20mA undamped tension output.** Proportional to tension. Used as an input to a control or instrumentation system.
- **0-1mA tension output.** A separate output used for driving an optional analog tension meter located in a hazardous area. This output is energy-limited.
- **Meter Damping.** Minimizes variation of the optional analog tension meter needle.
- **Dual Calibration.** Allows the indicator to be calibrated for two different tension ranges, if two different roll wrap schemes are used. Also can be used to alternate calibration between two sets of transducers for those applications requiring an extremely broad measuring range (transducers must be switched externally).
- **+5Vdc/+10Vdc excitation.** Switch selectable, allows the use of XR or LT type transducers. This output is energy-limited.
- **UL Listed .** UL has tested and approved the use of this device for certain hazardous locations.
- **Small size.** Fits where many other products cannot.
- **Economical.** Less expensive than other products designed for these applications. System cost is considerably less than a design using commercial barrier devices.

1.5 OPTIONS

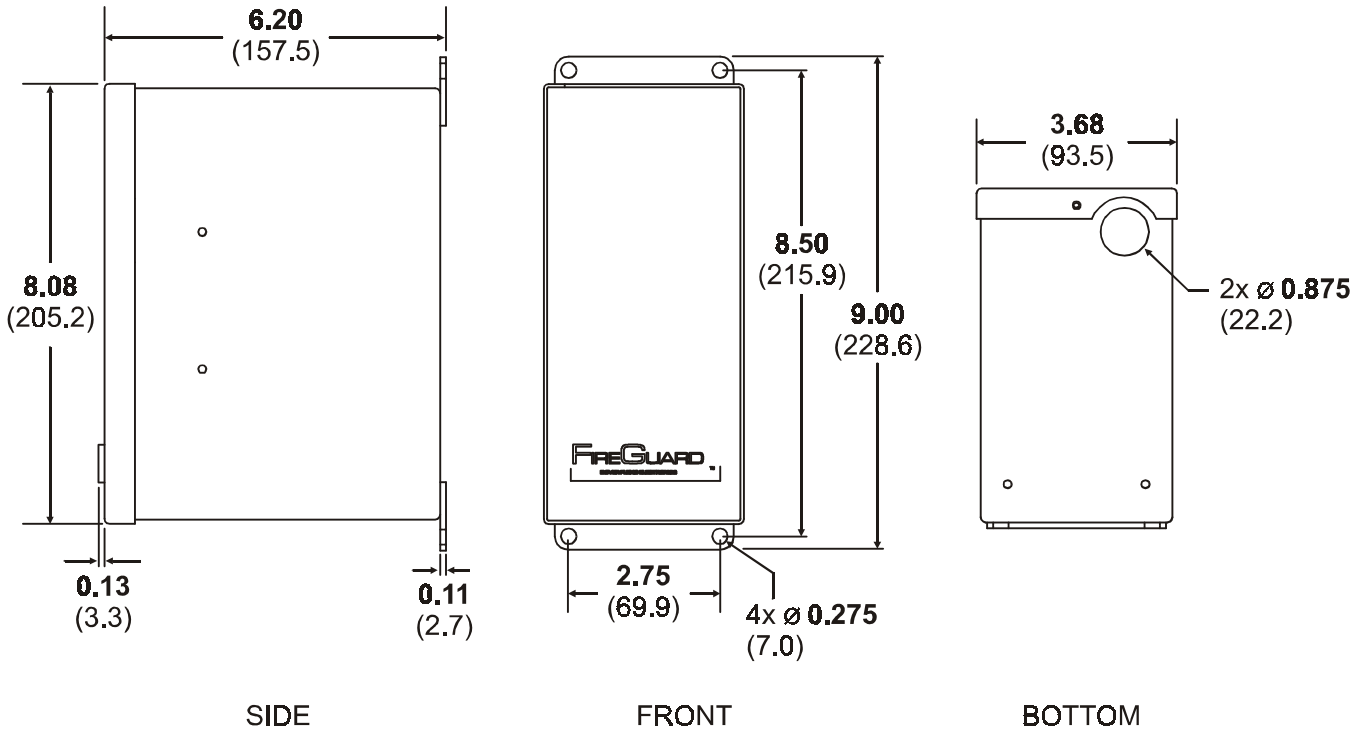
- **Extended Range.** 10 Vdc excitation for extended range transducers. Allows measurement of a much lower tension than usual. Transducers must have the XR option.

1.6 ACCESSORIES

SOME OF THESE OPTIONAL FEATURES REQUIRE CONFIGURATION OR EXTERNAL WIRING. REFER TO SECTION 2.4 FOR INSTALLATION INSTRUCTIONS AND SECTION 2.6 FOR WIRING.

- Analog Tension Meter. UL-approved, 3.5", 2% 1 mA movement, in a 4 x 5 x 3 steel enclosure. Only this meter may be used in the hazardous area to meet UL requirements. (DFE P/N: 723-1420) Standard tension meter scales are 0 to: 1, 5, 10, 25, 50, 100, 150, 250, 500, 1000.
- Nonstandard meter scale. Any meter scale other than the standard scales listed above.

2.1 DIMENSIONS inches (millimeters)



DIMENSIONS OF OPTIONAL REMOTE TENSION METER inches (millimeters)

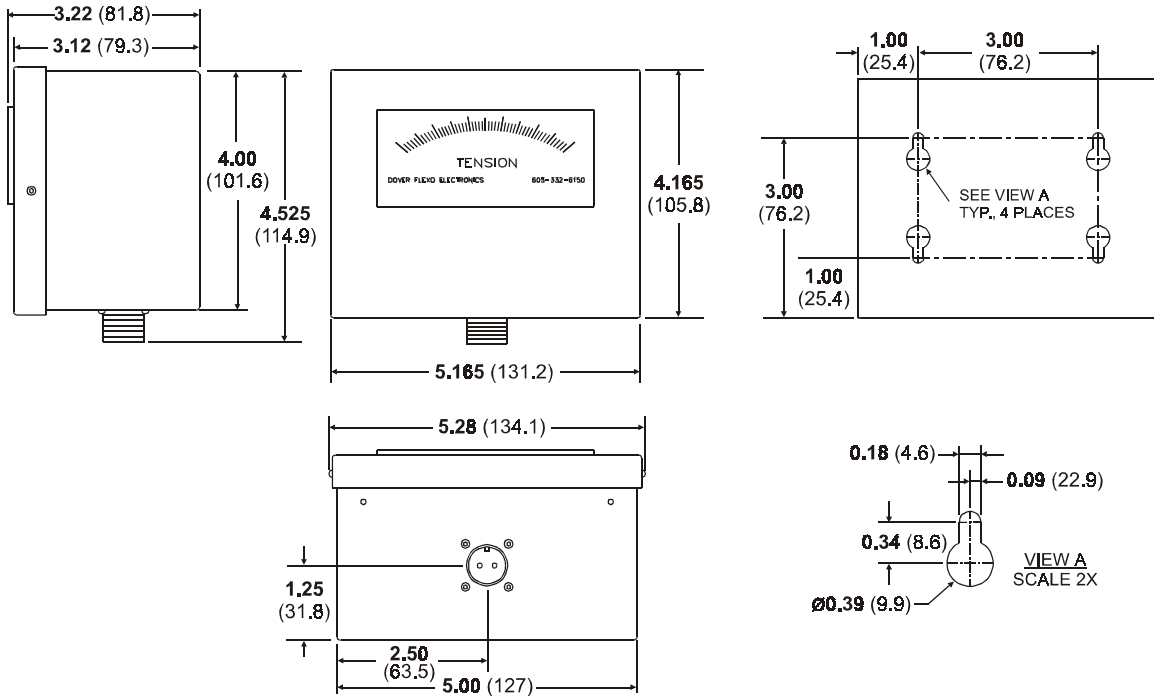


Figure 2 - DIMENSIONS

2.2 SAFETY NOTICE

Important! Refer to Control Drawings on pages 16 & 17. If this equipment is not installed in accordance with Article 504 of the National Electric Code, and connected in accordance with these Control Drawings, the operating and intrinsic safety of this unit or of connected equipment cannot be guaranteed.

Verify that the AC power source to which you will be connecting the unit is not live, by measuring across it with a voltmeter capable of reading in excess of 300Vac.

2.3 SELECTION OF MOUNTING LOCATION

Mounting of the FireGuard™ to the customer's machinery or structure is accomplished using the flanges on the top and bottom edges of the enclosure. The FireGuard™ must be installed in a machine cabinet or on a wall, as far as possible from dusty or wet agents. The ambient temperature of this environment must be in accordance with the specifications shown in section 1.3. Also the mounting environment must be either an area classified as Class I, Division 2 or nonhazardous.

Your transducers must also be mounted in an area appropriate for the application. The transducer(s) may be mounted in either a Class I Division 1 or 2 area, or in a nonhazardous area. Refer to the installation manual for the type of transducers which you intend to use for information on determining an appropriate mounting location on the machinery. Cable length should not exceed 50 feet for optimal functioning. Contact DFE if longer runs are needed.

If you intend to use the Dual Calibration feature, select a location for your CAL A/CAL B selection switch (user-supplied). This switch can be an SPST switch designed to switch 2mA @15Vdc. (When the switch is "open", CAL A will be selected; when it is "closed", CAL B will be selected). The environment in which the CAL A/CAL B selection switch is located must be a nonhazardous area. **THE SWITCH MUST NOT BE MOUNTED IN A CLASS I DIVISION 1 OR 2 LOCATION.**

If you intend to use the optional tension meter, select an appropriate location for it. It may be mounted in either a Class I Division 1 or 2 area, or in a nonhazardous area.

2.4 INSTALLATION INSTRUCTIONS

1. Turn off all AC power in the cabinet in which you will be working. Verify that the AC power source to which you will be connecting the unit is not live, by measuring across it with a voltmeter capable of reading in excess of 300Vac.
2. Drill your mounting holes for the top and bottom flanges shown in section 2.1. Be sure to allow clearance above and below the unit for wire entry and exit and access to the unit's cover mounting screws; and to either side of the unit to allow removal of screws which hold the interior panel to the enclosure (so that fuses may be replaced).
3. Securely attach your unit to its mounting surface using appropriate screws and/or nuts.
4. Your unit has been set up per your order. If the unit is for 230Vac, it will have a sticker near the power connection. If the unit is set for XR operation, it will have a sticker on the transducer connection TB1. If the unit is set correctly for your application, skip down to Section 2.5.
5. Remove the unit's cover using the two mounting screws shown in Fig.4. Then remove the six mounting screws holding the interior panel assembly to the enclosure also shown in Fig. 4. Then remove the interior panel assembly.

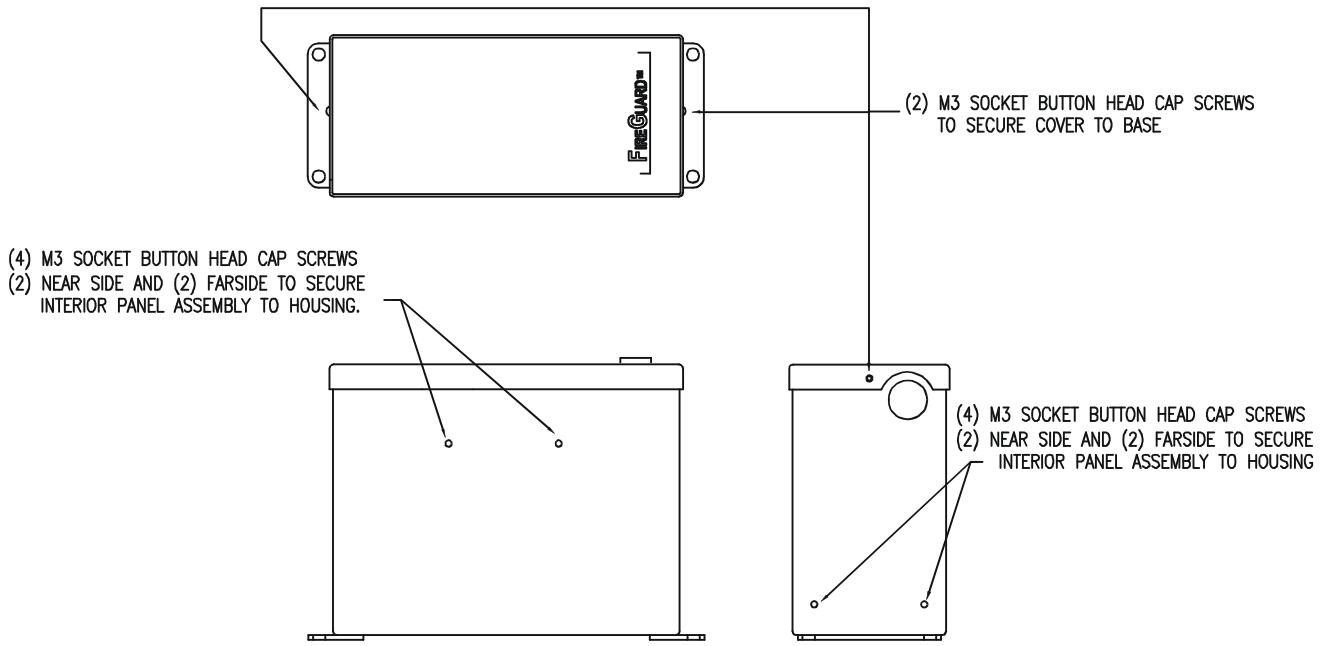


Figure 3 - COVER AND SCREW LOCATIONS

6. Verify that your unit is set up for the correct line voltage. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DAMAGE TO THE UNIT. See Fig. 4 for location of the switch to select between 115Vac and 230Vac operation. Also verify that the correct value fuses are installed based upon your line voltage selection:

For 115V: Use two 125mA, 250V fuses

For 230V: Use two 63mA, 250V fuses

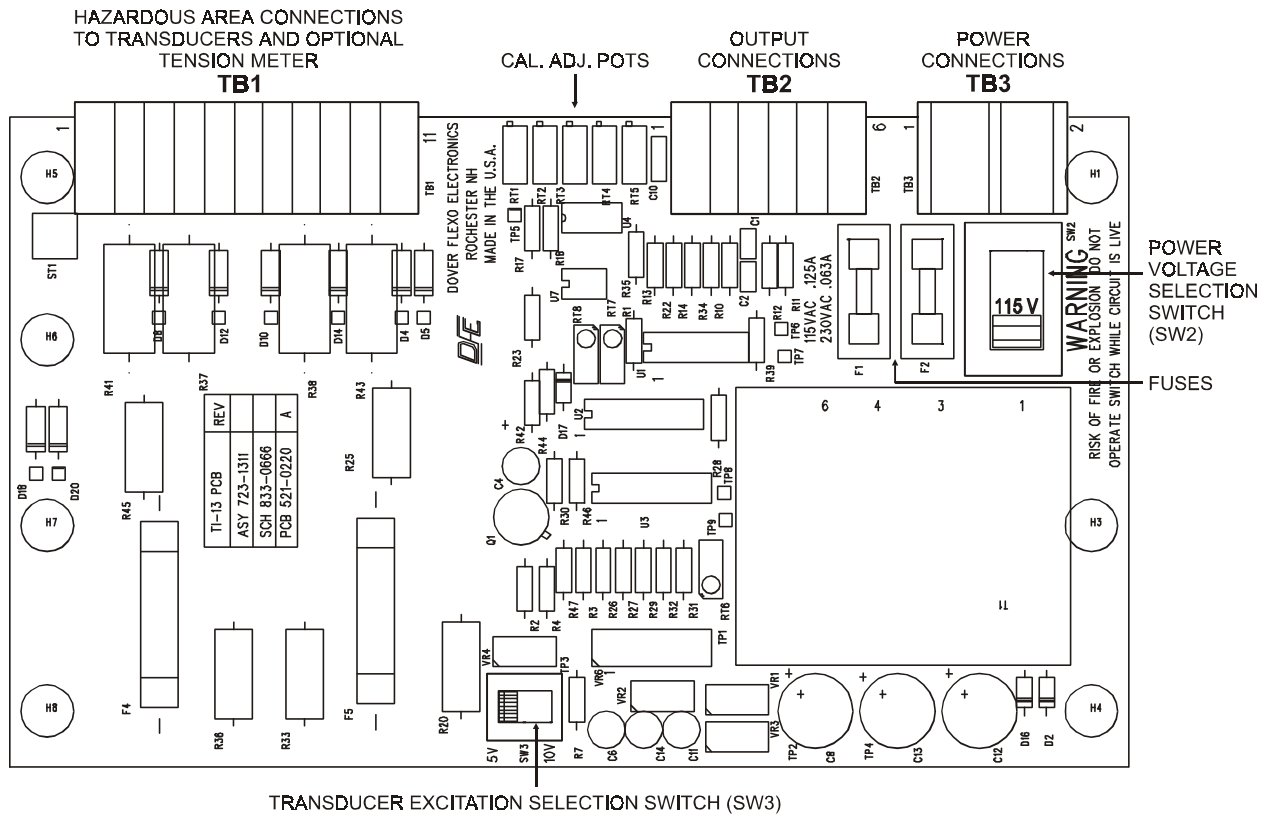


Figure 4 - FireGuard™ POWER BOARD

7. Verify that the transducer excitation voltage selection switch (see Fig. 4) is set up for the type of transducers you intend to use. Switch to 5V for all DFE transducers except Low Tension Transducer, and 10V for those having the Extended Range option. For LT Transducers, make sure R47 is installed and SW3 is in the 10V position. **INCORRECT SETTINGS MAY RESULT IN PERSONAL INJURY OR DAMAGE TO THE UNIT OR TRANSDUCERS.**
8. Reinsert the interior panel assembly into the enclosure and secure it using the eight mounting screws.
9. Install your transducers. Refer to the installation manual for the type of transducers which you intend to use for information on how to do this.
10. If you intend to use the Dual Calibration feature, mount your CAL A/CAL B selection switch (user-supplied) in an appropriate location in a nonhazardous area.
11. If you intend to use the optional analog tension meter, refer to Fig. 2 for mounting dimensions of the meter enclosure.

2.5 ELECTRICAL CONNECTIONS OF STANDARD FEATURES (Reference Fig. 5)

1. Make your AC connections to the unit in accordance with the figure below.
2. Make your connections between the indicator and your other tension control equipment, variable speed drive systems, computers, or other devices located in "safe" areas in accordance with Fig. 5.
3. If you intend to use the Dual Calibration feature, make your connections between the CAL A/CAL B selection switch and the indicator in accordance with Fig. 5
4. Refer to the Control Drawings located in Appendix B on pages 16-17 for electrical connections to devices located in the hazardous area. Make these connections **ONLY** in accordance with this drawing.
5. It is recommended that you refer to Article 504 of the National Electrical Code for further information.

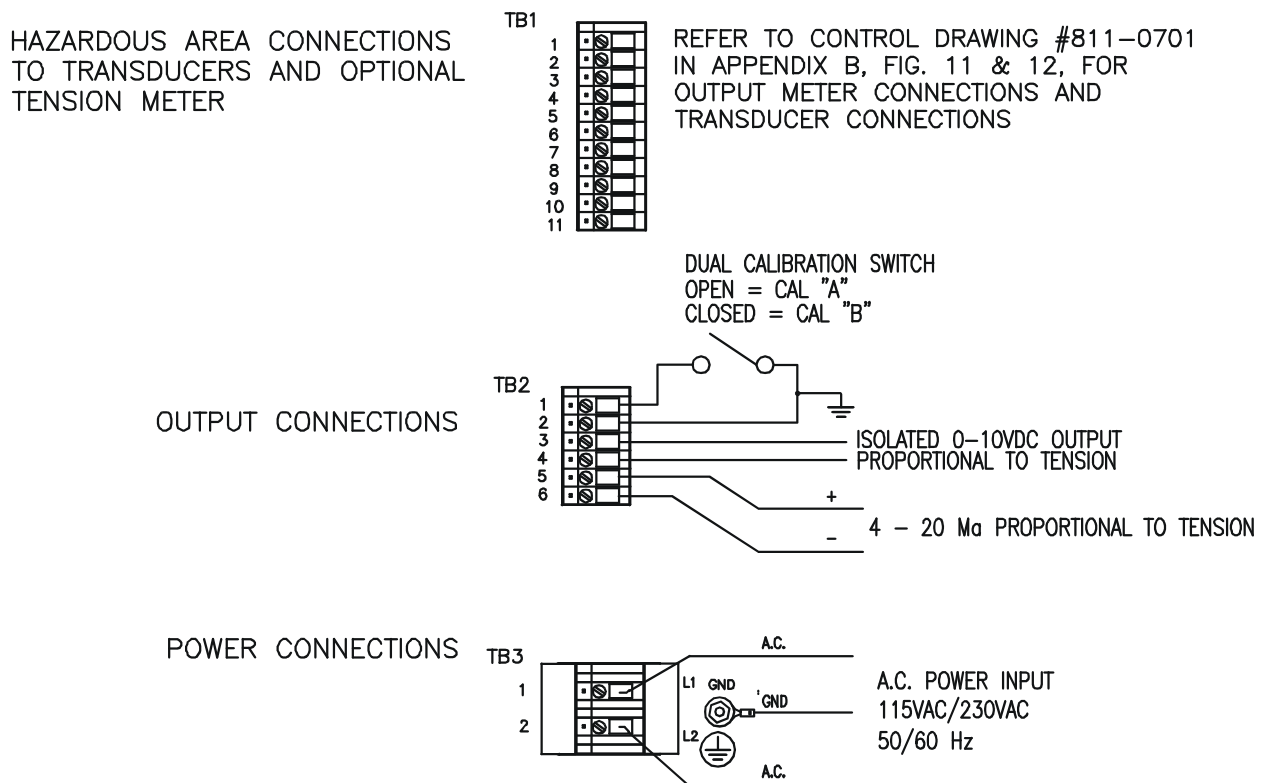


Figure 5 - ELECTRICAL CONNECTIONS FOR HAZARDOUS & SAFE AREAS

6. Use good wiring practices to secure all wiring so that there is no possibility for any associated wiring to chafe on edges of the unit or elsewhere.

2.6 ELECTRICAL CONNECTIONS OF OPTIONAL FEATURES

If you intend to use the optional Analog Tension Indicating Meter, again refer to the Control Drawings located in Appendix B on pages 16-17. Make your electrical connections **ONLY** in accordance with this drawing.

Securely mount the tension meter enclosure using appropriate hardware.

Use good wiring practices to secure all wiring so that there is no possibility for any associated wiring to chafe on edges of the unit or elsewhere.

To ensure system's intrinsic safety and UL approval, DFE tension meter and enclosure (Part #723-1420) must be used if a meter is located in the Hazardous Area.

3.1 PREPARATION

The best way to calibrate your system is to attach the device which will be accepting the output from the indicator. Otherwise attach a voltmeter or milliammeter, as appropriate for the type of output you intend to use, to terminal block TB2.

3.2 MECHANICALLY ZERO THE TENSION METER

(This step is necessary only if the optional analog tension meter is to be used).

Turn off power to the FireGuard™ and observe whether the tension meter needle rests at 0. If not, open the meter enclosure by removing the two cover mounting screws. Then turn the adjustment screw on the rear of the meter as required to set the meter needle at 0 on the scale. Secure the cover on the enclosure.

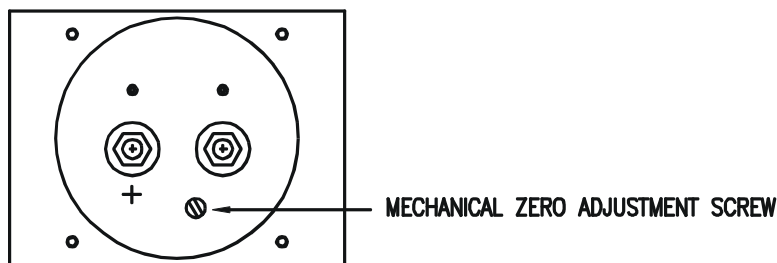


Figure 6 - METER ZERO ADJUSTMENT

3.3 CALIBRATE THE OUTPUT FOR ACCURACY

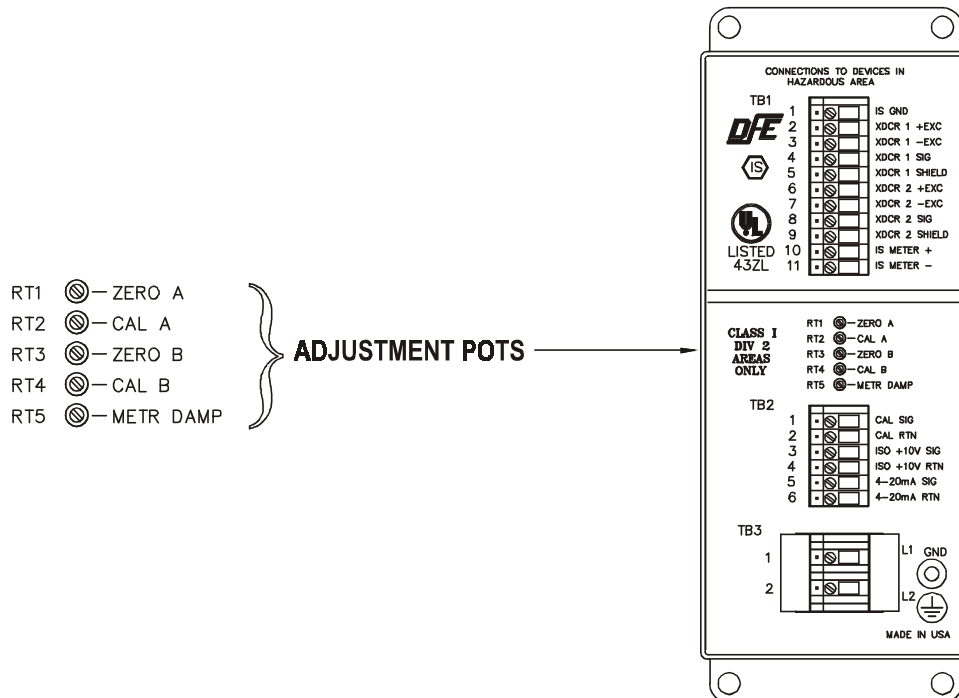


Figure 7 - ADJUSTMENT POTS ON FRONT OF UNIT

1. If the Dual Calibration feature is to be used set the CAL A/CAL B switch to the CAL A position.
2. Find an object of known weight at least as heavy as 25% of the measurement at full scale of the tension meter, and preferably as close to 100% as you can find. A spring scale can also be used. Get a length of rope, wire or cable about 15 feet (3M) long.
3. Turn on power to the FireGuard™. Remove any web from the tension roll and one idler on each side of the tension roll.
4. Turn the CAL A pot (RT2) clockwise at least 5 turns (this makes the ZERO A pot setting more accurate). Then turn the ZERO A pot (RT1) as required to make the output equal to its zero point (0V for the 0 to 10V output; 4 mA for the 4-20mA output; 0% of full scale for the meter output).
5. Fasten one end of the rope in the machine and thread the other end around the transducer roll in exactly the same path as the web will take. Be sure it does not pass around any driven rolls, drag bars, or anything else that can affect tension. Refer to Fig. 8 below.

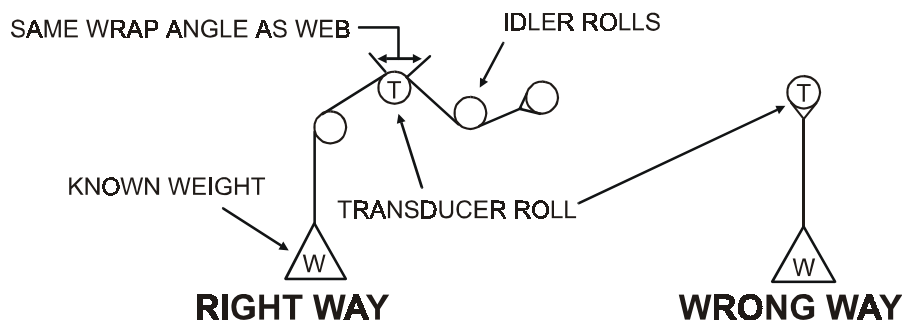


Figure 8 - WEB PATH

6. Attach the weight to the free end of the rope as shown above. Adjust the CAL A pot as required to set the output to the correct percentage of full-scale, based upon the desired full scale reading. If optional tension meter is used, set the meter needle at the value of the weight.
7. Remove the weight and observe the tension meter. If the output or needle is not on zero, adjust the ZERO pot as needed. Repeat step 6 if zero was not correct.
8. Repeat steps 6 and 7 if needed.
9. If the Dual Calibration feature is to be used, set the CAL A/CAL B switch to the Cal B position, and repeat steps 4 through 8 using the ZERO B (RT3) and CAL B (RT4) pots.
10. If the optional analog meter is used, adjust the METR DAMP pot (RT5) while the machine is running to minimize meter needle movement.

The output calibration procedure is now complete.

Reattach the cover to the unit using the two screws removed in Section 2.4.

Your FireGuard™ interface/indicator will indicate tension in your system without any further operator intervention. If you are using the optional analog tension meter, it is a good idea to make a check at roughly one month intervals to verify that the output returns to zero when no web is touching the transducer. If this is not the case, refer to Section 6 - Troubleshooting, for causes and possible remedies.

SECTION 5

CARE AND MAINTENANCE

It is not necessary to perform any type of maintenance on the FireGuard™ indicator. However you may find it worthwhile to observe whether there is a buildup of dust, debris, or moisture on or near the unit after a period of time. If so, you may consider putting the unit in a more appropriate location.

1. *Unable to zero*

This may happen If, during zeroing, the output from the transducers is greater than or equal to 95% of the full range of the indicator. (After zeroing, this would only allow the indicator to use 5% of the range.) Before zeroing, be sure the web and any other weights have been removed from the sensor roll.

This can also happen if there is significant variation in the signals from the transducers while the FireGuard™ indicator is trying to zero. This could be caused by some sort of weight or preload on the transducer roll, or by a problem with the transducers or connecting cables. If necessary, check for a hardware problem by substituting the transducers and cables. This symptom could also be caused by a faulty power supply for the transducer excitation voltage or mis-wiring of the transducer connections.

2. *Unable to calibrate*

This may happen if the setting for the calibration point is not logical (below the zero point). Check the force direction of the transducers per the manual. Attach the weight as shown in Fig. 8.

This may also happen if the weight exceeds the remaining range of the transducer after the zeroing of the transducer after zeroing out the roll weight.

Jitter/Oscillation during Calibration:

This can also happen if there is significant variation in the signals from the transducers while the FireGuard™ is trying to calibrate. This could be caused by a problem with the transducers or connecting cables. Also ensure the weight is not swinging like a pendulum.

3. *Unable to rezero*

This may happen if, during re-zeroing, the output from the transducers is greater than or equal to 95% of the full range of the indicator. (After re-zeroing, this would only allow the indicator to use 5% of the range.) Before re-zeroing, be sure the web and any other weights have been removed from the sensor roll. Also check the transducer installation for the proper amount of free-play in the roll.

4. *Analog output not working correctly*

If you have chosen the 0-10V voltage output, and the voltage is not present, check for a short-circuit or very low impedance in the circuit to the remote indicator.

If you have chosen the 4-20mA current-loop output, and the remote indicator does not go through the full range, check for a very low impedance in the circuit to the remote indicator.

5. *If there is no movement on the meter*

Check the wiring to the meter. Check for output on the 0-10V output, if no voltage exists then check the AC connections to the terminals on the Power PCB of the FireGuard™. Check the fuses inside the unit (See Fig. 4 page 6). There may also be a problem with the 5V power supply inside the unit.

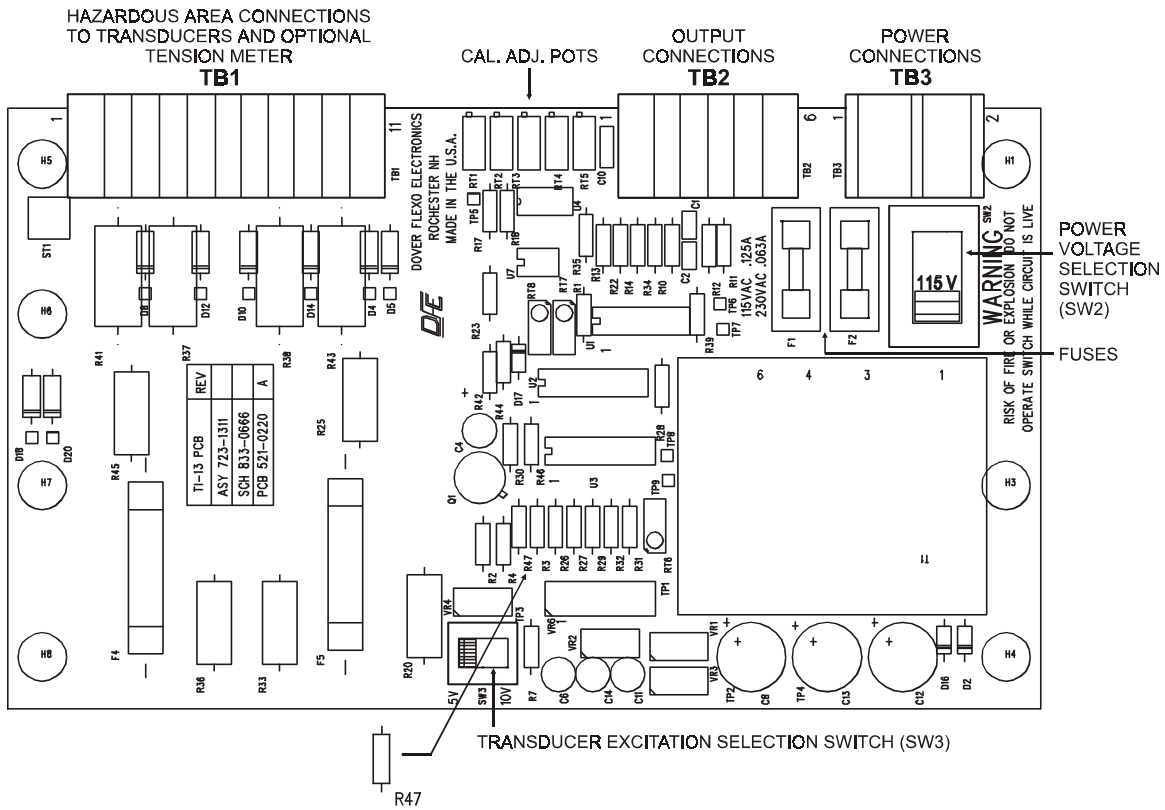
Call DFE Technical Support for assistance if your problem persists.

7.1 REPLACEMENT PARTS

Important! When replacing fuses, use only the fuses as shown below. Failure to do this may compromise personal safety and may create a fire hazard!

Note: Only the following components are user-replaceable. If replacing these components does not result in proper operation, the unit must be returned to Dover Flexo Electronics for repair.

<u>Part Description</u>	<u>Part Number</u>
Tension meter, analog (option), includes enclosure	723-1420 (specify scale)
Meter connection cable	721-0967
Fuses (2)	
For 115V: 125 mA/250V	108 - 0045
For 230V: 63 mA/250V	108 - 0054
Fuse cover	108-0005
Instruction Manual	801-0785 R1



<u>R47 VALUE</u>	<u>DESIRED EXCITATION</u>	<u>SW3 SETTING</u>
N/A	+5V (STD)	+5V
N/A	+10V	+10 (XR) EXTENDED RANGE
8060F	+10V	+10 (LT) LOW TENSION TRANSDUCER

Figure 9 - FireGuard™ POWER BOARD

Appendix B: Electrical Connection Control Drawings

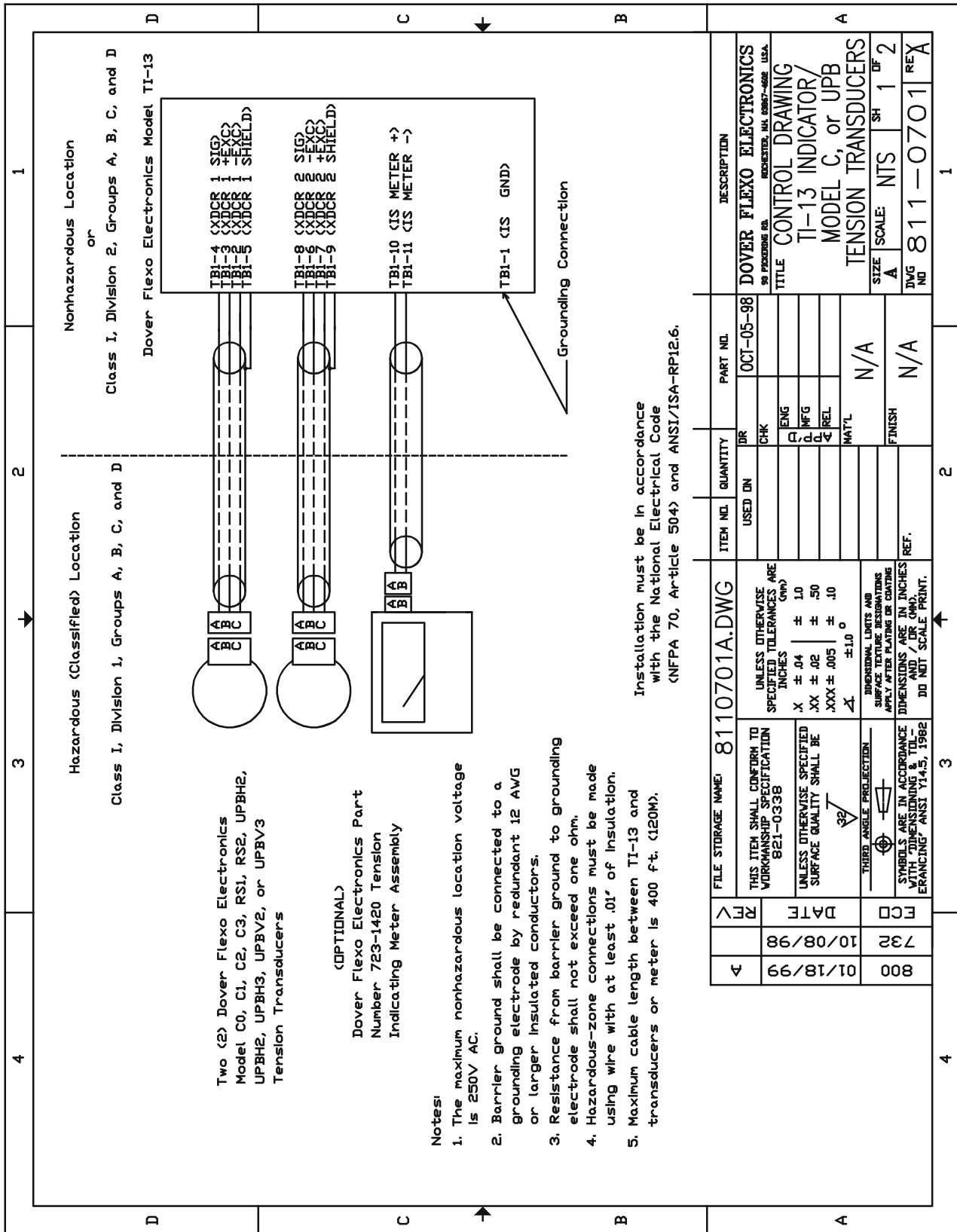
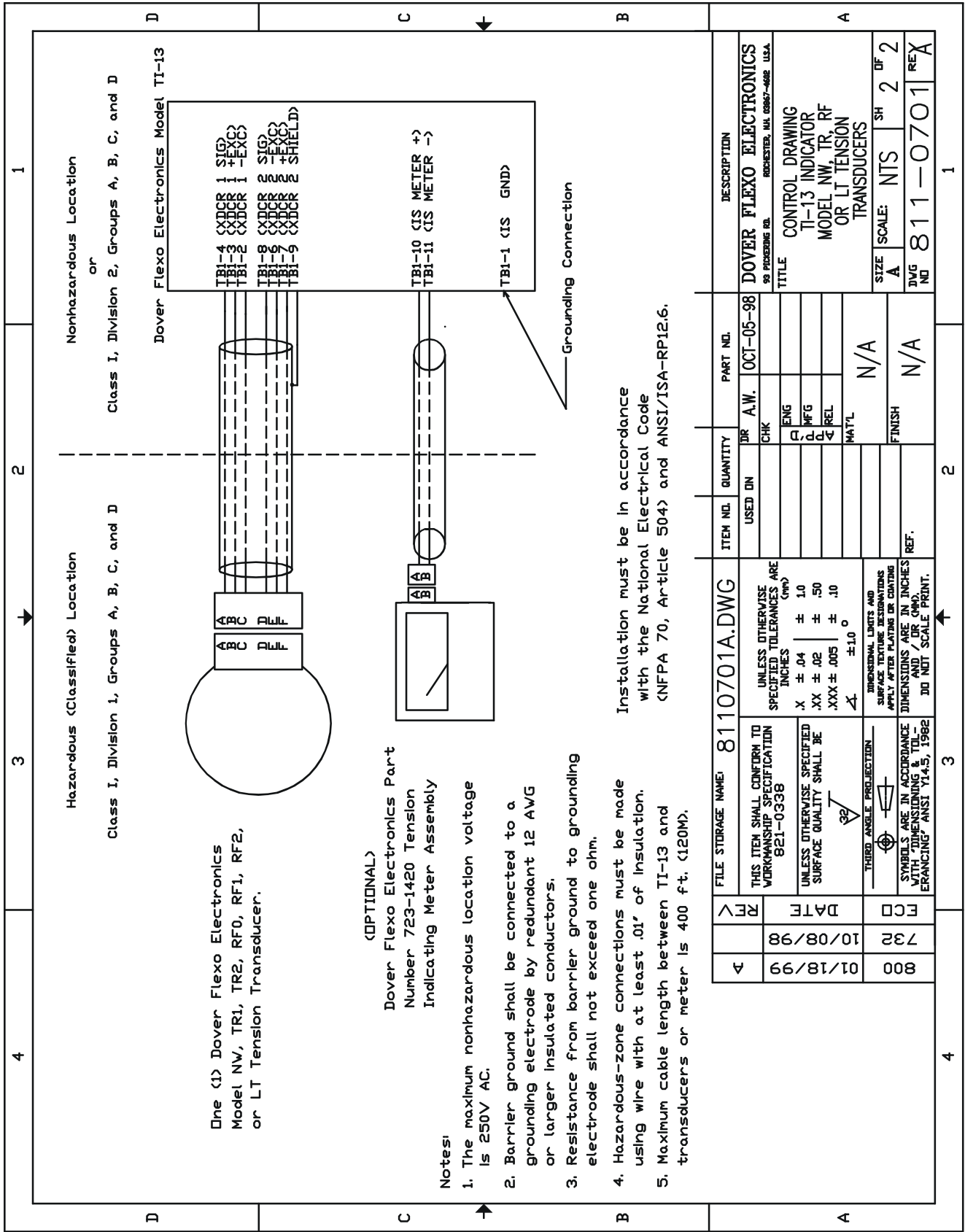


Figure 10 - CONTROL DRAWING #1 (MODEL C, UPB)



One (1) Dover Flexo Electronics Model NW, TR1, TR2, RF0, RF1, RF2, or LT Tension Transducer.

<OPTIONAL>

Dover Flexo Electronics Part Number 723-1420 Tension Indicating Meter Assembly

Notes:

1. The maximum non-hazardous location voltage is 250V AC.
2. Barrier ground shall be connected to a grounding electrode by redundant 12 AWG or larger insulated conductors.
3. Resistance from barrier ground to grounding electrode shall not exceed one ohm.
4. Hazardous-zone connections must be made using wire with at least .01' of insulation.
5. Maximum cable length between TI-13 and transducers or meter is 400 ft. (120M).

Installation must be in accordance with the National Electrical Code (NFPA 70, Article 504) and ANSI/ISA-RP12.6.

ITEM NO.	QUANTITY	PART NO.	DESCRIPTION
800	1	OCT-05-98	DOVER FLEXO ELECTRONICS 99 PICKING RD. ROCHESTER, N.Y. 14607-4602 U.S.A.
732	1		CONTROL DRAWING TI-13 INDICATOR MODEL NW, TR, RF OR LT TENSION TRANSDUCERS
10/08/98			SIZE: NTS SH 2 OF 2
01/18/99			DWG NO 811-0701 REA

Figure 11 - CONTROL DRAWING #2 (NW, TR, RF, LT)

Appendix C: Transducer Electrical Connections

MODELS C, RS AND UPB TRANSDUCERS

THE TENSION (T) AND COMPRESSION (C) STRAIN GAGES ARE CONNECTED IN A BRIDGE CONFIGURATION. AS THE BEAMS BEND SLIGHTLY UNDER WEB TENSION, THE GAGE RESISTANCES CHANGE PRODUCING AN OUTPUT SIGNAL WHICH IS DIRECTLY PROPORTIONAL TO THE WEB TENSION.

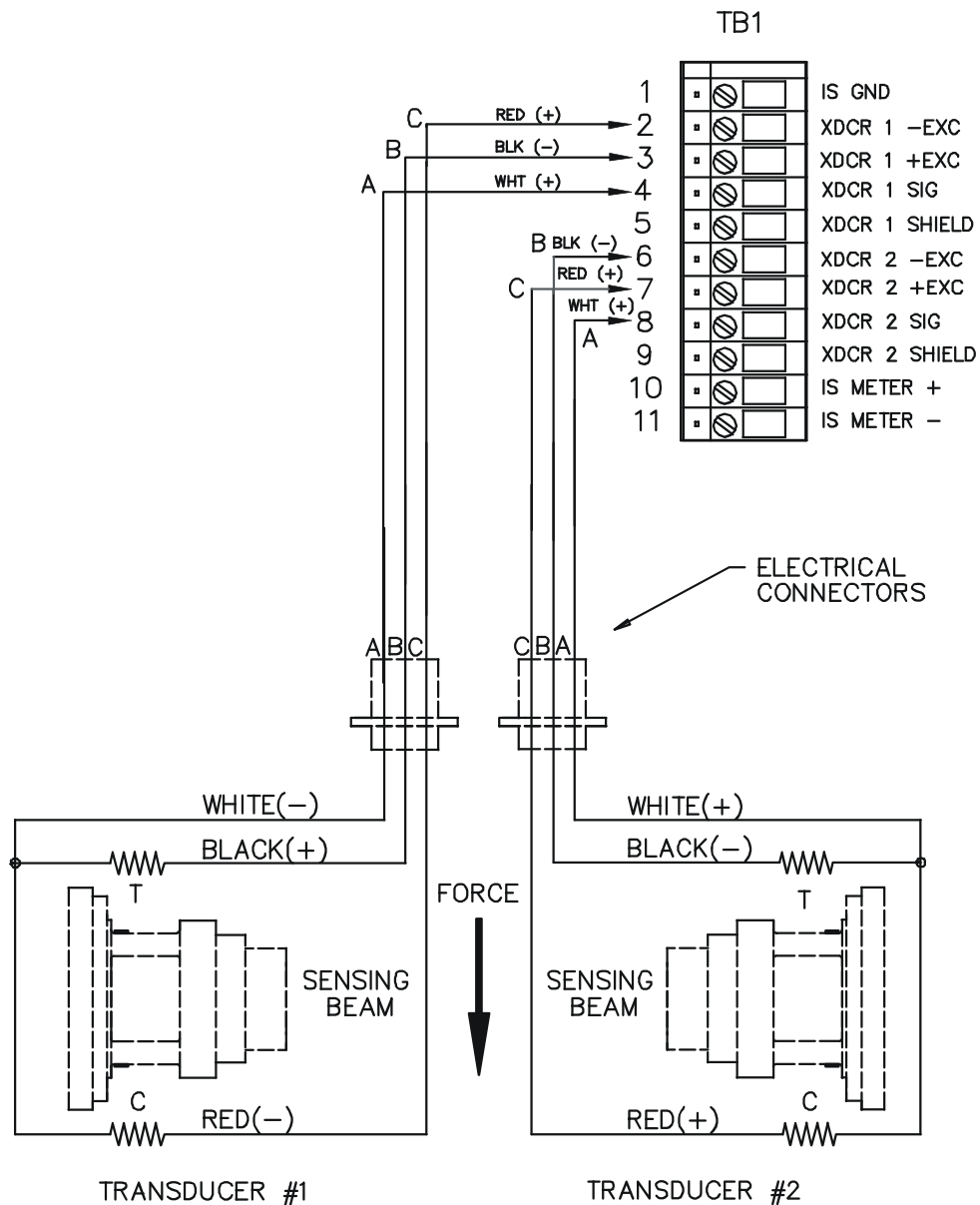


Figure 12 - MODELS C, RS, & UPB TRANSDUCER WIRING

RIBBON FILAMENT (RF) TRANSDUCERS

THE TENSION (T) AND COMPRESSION (C) STRAIN GAGES ARE CONNECTED IN A BRIDGE CONFIGURATION. AS THE BEAMS BEND SLIGHTLY UNDER WEB TENSION, THE GAGE RESISTANCES CHANGE PRODUCING AN OUTPUT SIGNAL WHICH IS DIRECTLY PROPORTIONAL TO THE WEB TENSION.

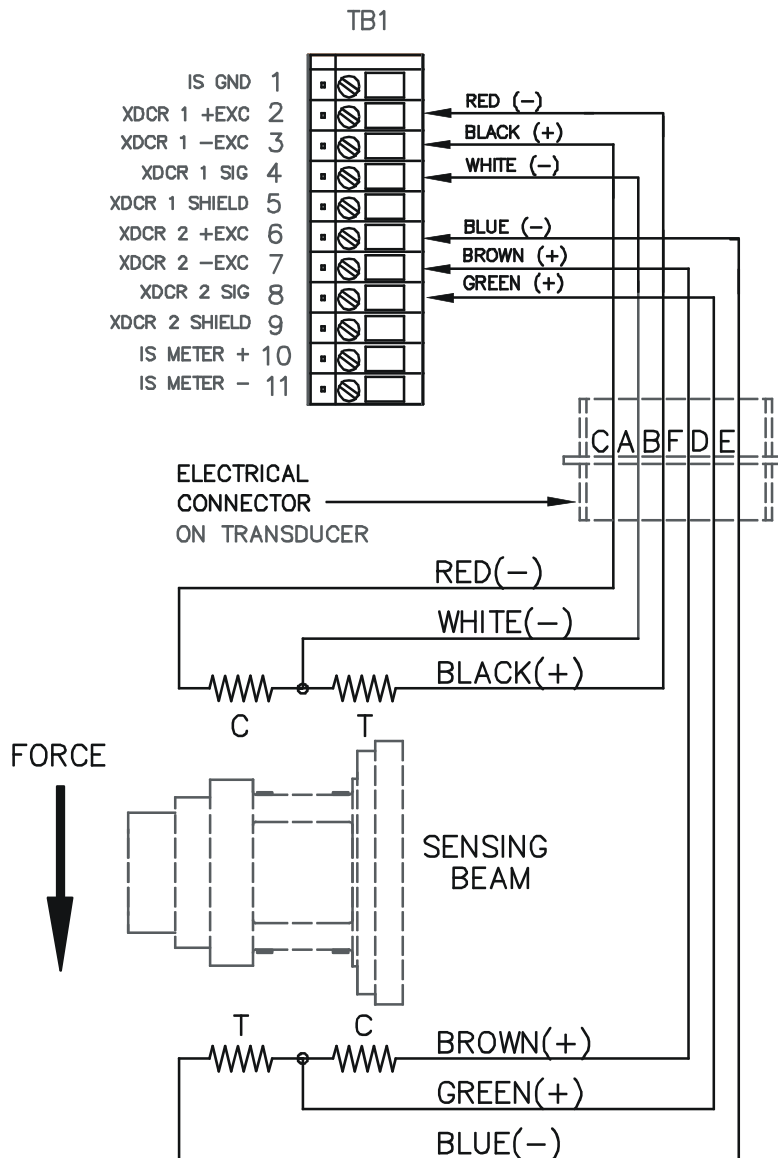


Figure 13 - RF TRANSDUCER WIRING

TENSION ROLL (TR) AND NARROW WEB (NW) TRANSDUCERS

THE TENSION (T) AND COMPRESSION (C) STRAIN GAGES ARE CONNECTED IN A BRIDGE CONFIGURATION. AS THE BEAMS BEND SLIGHTLY UNDER WEB TENSION, THE GAGE RESISTANCES CHANGE PRODUCING AN OUTPUT SIGNAL WHICH IS DIRECTLY PROPORTIONAL TO THE WEB TENSION.

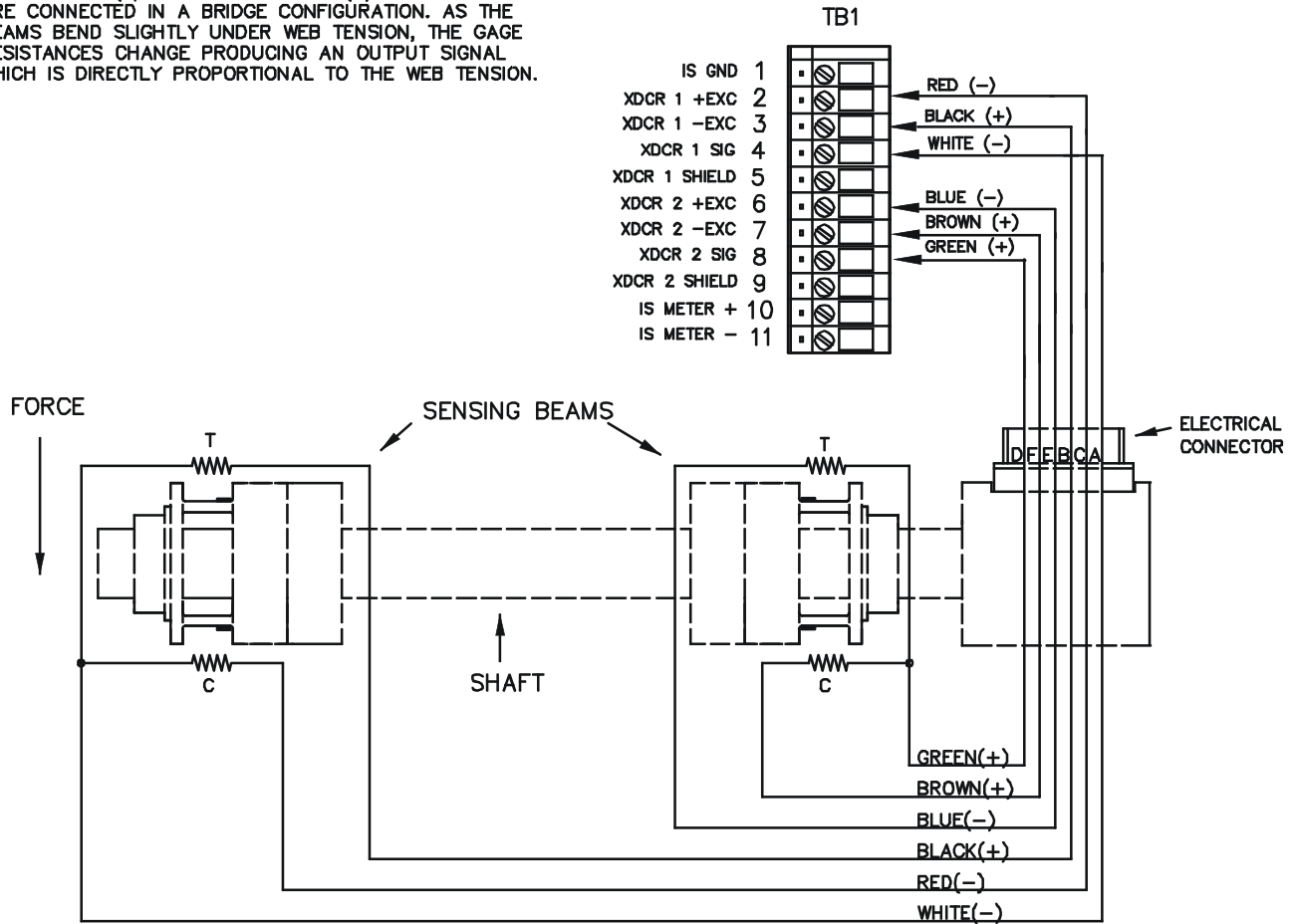


Figure 14 - TR & NW TRANSDUCER WIRING

LOW TENSION (LT) TRANSDUCERS

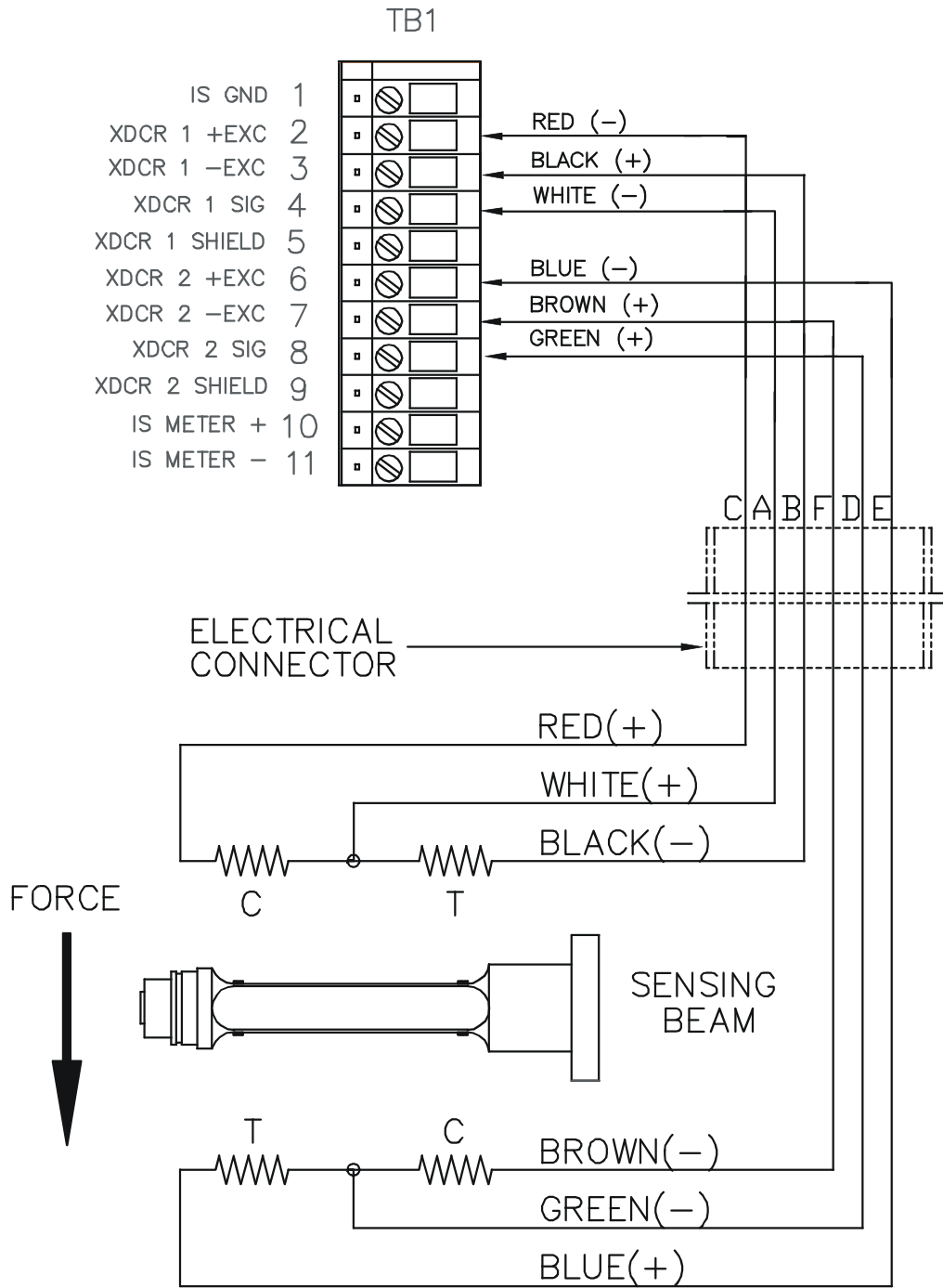


Figure 15 - LT TRANSDUCER WIRING

Appendix D: Typical Tensions for Various Materials

TYPICAL TENSIONS FOR WEB MATERIALS

ACETATE		0.5 lb. per mil per inch of width	
FOIL	Aluminum	0.5 lb. per mil per inch of width	
	Copper	0.5 lb. "	
CELLOPHANE		0.75 lb. per mil per inch of width	
NYLON		0.25 lb. per mil per inch of width	
PAPER	15 lb *	0.4 lb. per inch of width	
	20 lb	0.5 lb. "	
	30 lb	0.75 lb. "	
	40 lb	1.25 lb. "	
	60 lb	2.0 lb. "	
	80 lb	3.0 lb. "	
	100 lb	4.0 lb. "	
* based on 3000 sq. ft. ream			
PAPERBOARD	8pt	3.0 lb. per inch of width	
	12pt	4.0 lb. "	
	15pt	4.5 lb. "	
	20pt	5.5 lb. "	
	25pt	6.5 lb. "	
	30pt	8.0 lb. "	
POLYETHYLENE		0.12 lb. per mil per inch of width	
POLYESTER (Mylar)		0.75 lb. per mil per inch of width	
POLYPROPYLENE		0.25 lb. per mil per inch of width	
POLYSTYRENE		1.0 lb. per mil per inch of width	
RUBBER	<u>GAUGE</u>	<u>AT 25% STRETCH</u>	<u>AT 50% STRETCH</u>
	10 mil	1.75	3.68
	12 mil	1.10	2.03
	16.5 mil	4.09	8.17
	26 mil	2.47	4.97
SARAN		0.15 lb per mil per inch of width	
STEEL	<u>GAUGE - INS</u>	<u>UNWIND-PSI</u>	<u>REWIND-PSI</u>
	0.001 - 0.005	1000	4000
	0.006 - 0.025	850	3500
	0.026 - 0.040	750	3000
	0.041 - 0.055	650	2600
	0.058 - 0.070	550	2200
	0.071 - 0.090	450	1800
	0.091 - 0.120	450	1400
	0.121 - 0.140	400	1200
	0.141 - 0.165	400	1000
	0.166 - 0.200	400	900
	0.201 - 0.275	400	800
	0.276 - 0.380	300	700
VINYL		0.05 lb. per mil per inch of width	

*** For laminated webs, sum the tension for the individual webs and add 0.1 lb per inch of width.

TERMS AND CONDITIONS OF SALE AND SHIPMENT

1. THE COMPANY

5/1/00

Dover Flexo Electronics, Inc. is hereinafter referred to as the Company.

2. CONFLICTING OR MODIFYING TERMS

No modification of, additions to or conflicting provisions to these terms and conditions of sale and shipment, whether oral or written, incorporated into Buyer's order or other communications are binding upon the Company unless specifically agreed to by the Company in writing and signed by an officer of the Company. Failure of the Company to object to such additions, conflicts or modifications shall not be construed as a waiver of these terms and conditions nor an acceptance of any such provisions.

3. GOVERNING LAW

This contract shall be governed by and construed according to the laws of the state of New Hampshire, U.S.A. The parties agree that any and all legal proceedings pursuant to this contract shall take place under the jurisdiction of the courts of the State of New Hampshire in the judicial district of Strafford County.

4. PENALTY CLAUSES

Penalty clauses of any kind contained in orders, agreements or any other type of communication are not binding on the Company unless agreed to by an officer of the Company in writing.

5. WARRANTY

Dover Flexo Electronics, Inc. warrants its products to be free of defects in material and workmanship for five years from date of original shipment. Warranty is valid on products purchased on or after April 2, 1999. During the warranty period the Company will repair or replace defective products free of charge if such products are returned with all shipping charges prepaid and if, upon examination, the product is shown to be defective. This warranty shall not apply to products damaged by abuse, neglect, accident, modification, alteration or mis-use. Normal wear is not warranted. All repairs and replacements under the provisions of this warranty shall be made at Dover Flexo Electronics or at an authorized repair facility. The Company shall not be liable for expenses incurred to repair or replace defective products at any other location or by unauthorized persons or agents. This warranty contains all of the obligations and warranties of the Company. There are no other warranties, either expressed or implied. No warranty is given regarding merchantability or suitability for any particular purpose. The Company shall not be liable in either equity or law for consequential damages, losses or expenses incurred by use of or inability to use its products or for claims arising from same. No warranty is given for products of other manufacturers even though the Company may provide these products with its own or by themselves. The provisions of this warranty can not be changed in any way by any agent or employee of the Company. Notice of defects must be received within the warranty period or the warranty is void.

6. PAYMENTS

Standard terms of credit are net 30 days from date of shipment, providing satisfactory credit is established with the Company. Amounts past due are subject to a service charge of 1.5% per month or portion thereof or 18% per annum. The Company reserves the right to submit any unpaid late invoices to a third party for collection and Buyer shall pay all reasonable costs of such collection in addition to the invoice amount. All quoted prices and payments shall be in U.S. Dollars.

If the Company judges that the financial condition or payment practices of the Buyer does not justify shipment under the standard terms or the terms originally specified, the Company may require full or partial payment in advance or upon delivery. The Company reserves the right to make collection on any terms approved in writing by the Company's Finance Department. Each shipment shall be considered a separate and independent transaction and pay-

ment therefore shall be made accordingly. If the work covered by the purchase order is delayed by the Buyer, upon demand by Company payments shall be made on the purchase price based upon percentage of completion.

7. TAXES

Any tax, duty, custom, fee or any other charge of any nature whatsoever imposed by any governmental authority on or measured by any transaction between the Company and the Buyer shall be paid by the Buyer in addition to the prices quoted or invoiced.

8. RETURNS

Written authorization must be obtained from the Company's factory before returning any material for which the Buyer expects credit, exchange, or repairs under the Warranty. Returned material (except exchanges or repairs under the Warranty) shall be subject to a minimum re-stocking charge of 15%. Non-standard material or other material provided specially to the Buyer's specification shall not be returnable for any reason. All material returned, for whatever reason, shall be sent with all freight charges prepaid by the Buyer.

9. SHIPPING METHOD AND CHARGES

All prices quoted are F.O.B. the Company's factory. The Company shall select the freight carrier, method and routing. Shipping charges are prepaid and added to the invoice of Buyers with approved credit, however the Company reserves the right to ship freight-collect if it prefers. Shipping charges will include a charge for packaging. Company will pay standard ground freight charges for items being returned to Buyer which are repaired or replaced under the Warranty.

10. CANCELLATION, CHANGES, RESCHEDULING

Buyer shall reimburse Company for costs incurred for any item on order with the Company which is canceled by the Buyer. Costs shall be determined by common and accepted accounting practices.

A one-time hold on any item ordered from the Company shall be allowed for a maximum of 30 days. After 30 days, or upon notice of a second hold, Company shall have the right to cancel the order and issue the appropriate cancellation charges which shall be paid by Buyer. Items held for the Buyer shall be at the risk and expense of the Buyer unless otherwise agreed upon in writing. Company reserves the right to dispose of canceled material as it sees fit without any obligation to Buyer.

If Buyer makes, or causes to make, any change to an order the Company reserves the right to change the price accordingly.

11. PRICES

Prices published in price lists, catalogs or elsewhere are subject to change without notice and without obligation. Written quoted prices are valid for thirty days only.

12. EXPORT SHIPMENTS

Payment for shipments to countries other than the U.S.A. and Canada or to authorized distributors shall be secured by cash in advance or an irrevocable credit instrument approved by an officer of the Company. An additional charge of 10% will apply to any letter of credit. There will be an extra charge for packaging and documentation.

13. CONDITION OF EQUIPMENT

Buyer shall keep products in good repair and shall be responsible for same until the full purchase price has been paid.

14. OWNERSHIP

Products sold are to remain the property of the Company until full payment of the purchase price is made.

NOTES

INDEX

0-1 mA	2	Replacement Parts	14
0-10 Volt Tension Output	2	Safety Notice	5
230 Volt Power	2	Set-up	9
4-20mA	2	Specifications	2
AC Power Connections	7	Standard Features	2
Accessories	2, 3	Switch Setting, Power	6, 15
Calibration,		Temperature,	
range	2	codes	2
tension Meter	9	range	2
Care and Maintenance	12	Tension Meter	2, 9, 16
Circuit Cards	6, 15	remote location	3
Control Drawings	16-17	standard scales	2
		non-standard scales	3
Description	1	Terms & Conditions	23
Dimensions	4	Transducer,	
Disassembly	5	connections	18-21
Dual Calibration	2, 7	excitation	2
		input	2
Electrical Connections,		temperature codes	2
optional	8, 16-17	Troubleshooting	13
standard	7, 16-17	Typical Tensions	22
transducer	18-21		
Excitation	2	Weight	2
Extended Range	2		
		Zero	
Front Panel	1	range	2
Fuses, replacement	14	tension meter	9
Input	2		
Installation	5		
Meter,			
analog	3		
calibration	9		
dimensions	4		
mechanical zero	9		
standard meter scales	3		
temperature code	2		
Mounting Location	5		
Operating Adjustments	11		
Options	2		
Output,			
0-1 mA	2		
4-20mA	2		
0 to +10V	2		
Power Board	6, 15		
Power Voltage Selection	2, 6		



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