DOVER FLEXO ELECTRONICS, INC.
ISO 9001 CERTIFIED

INSTRUCTION MANUAL

FIREGUARD 2™

INTRINSICALLY SAFE TENSION INDICATOR

5 YEAR WARRANTY

DOVER FLEXO ELECTRONICS, INC.

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IMPORTANT!

READ BELOW

• • • SAFETY NOTICE • • •

Important! Refer to Control Drawings on pages 15 & 16. 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.

⚠ = Electrical Hazard. Note warnings listed after symbol.

⚠ **WARNING:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

NEW!

QUIK-CAL™ PUSHBUTTON ZERO-SET AND CALIBRATION-SET

The new FireGuard 2™ tension indicator/transducer interface is built with a new labor-saving technology called Quik-Cal ! **It does not have potentiometers for zero and calibration settings**. Instead, it has pushbuttons. Push each button once, for one second, and you are done!

Tension calibration is built in. No screwdriver is needed. No second-person is needed.

ZERO SET

The weight of the transducer roll produces an output that is not caused by web tension. This is not desirable because it is not a tension measurement. To set the output of the indicator to zero when there is no tension, just press the ZERO button for one second.

CAL SET

The weight you select for calibration determines the full-scale tension signal output. The indicator automatically multiplies the weight by the built-in calibration ratio to calculate full output.

The calibration ratio is the ratio of the calibration weight to the tension at full output.

The standard calibration ratio is 1:10, or 10%. So if you hang a 15 lb. weight and push the CAL button, the indicator will produce full output at 150 lbs. tension.

STABILITY is another benefit of this technology. The zero and calibration settings are stored digitally, so there is no drift over time and temperature variations as there can be with potentiometers.

Read Section 3.3 for details.

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SECTION 1 PRODUCT DESCRIPTION

1.1 GENERAL DESCRIPTION

The DFE FireGuard 2™ 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 2™ 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 24VDC operation with a +5Vdc output voltage for excitation of transducers. It can also be set up for +10Vdc excitation voltage by changing the setting of a Jumper within the unit.

1.2 FRONT VIEW OF FIREGUARD™

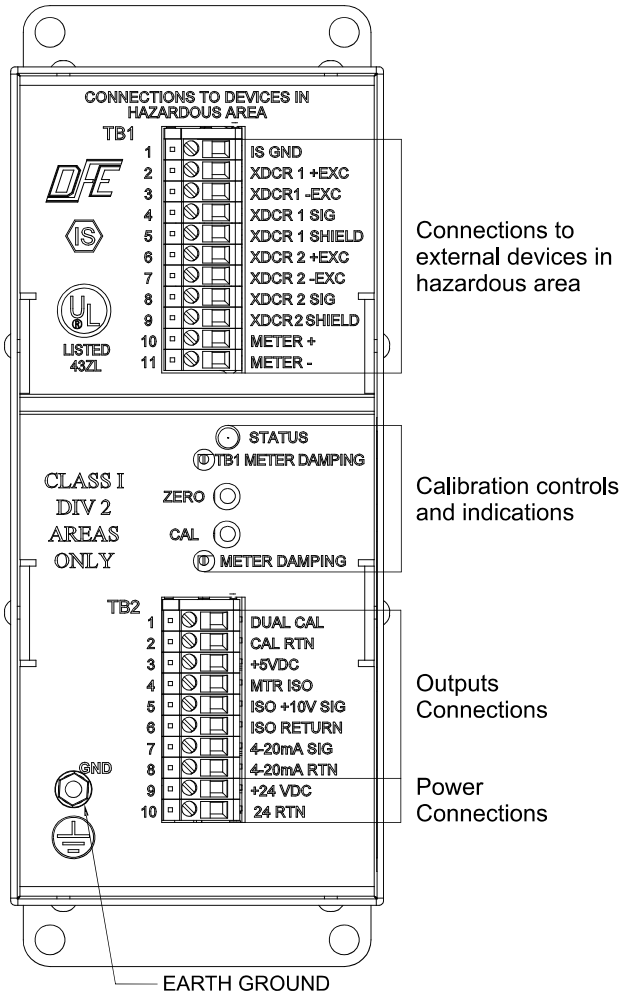


Figure 1 **- Front View of FireGuard 2™ with cover removed**

1.3 SPECIFICATIONS

Power input	. . . . .	24VDC @ 500mA
Tension signal outputs	. . . . .	0 to +10V isolated (up to 2mA load), not damped
	. . . . .	4 to 20mA isolated, not damped
	. . . . .	0 to 1mA damped, energy-limited output for external tension meter located in hazardous area
	. . . . .	0 to 1mA damped, output for external tension meter located in safe area
Transducer signal input	. . . . .	30 to 500 mVdc at rated load (30mV to 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	. . . . .	50:1
Weight	. . . . .	6.0 lb (2.7 kg)
Ambient temperature range	. . . . .	32F to 104F (0C to 40C). Maximum relative humidity of 95% non-condensing.
Temperature Codes:	. . . . .	Fireguard = 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.

- **Quik-Cal™** push-button zero and calibration eliminates pot adjustments to make calibrating simple and fast.
- **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. DO NOT connect the Optional Digital Meter here.
- **0-1mA tension output**. A separate output used for driving an optional analog tension meter located in a safe area. For Analog or Digital Meter.
- **TB1 Meter Damping**. Minimizes variation of the optional Hazard area analog tension meter needle.
- **Meter Damping**. Minimizes variation of the optional safe area tension meter reading.
- **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 in the safe area).
- **+5Vdc/+10Vdc excitation.** Jumper selectable, allows the use of XR or LT type transducers. This output is energy-limited.
- **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 (XRE).** 10 Vdc excitation for extended range transducers. Allows measurement of a much lower tension than usual. Transducers must have the XR option. (LT transducers are always XR)
- **25CW.** A 25% calibration weight for when standard 10% calibration weight is too low a value for the application.

1.6 ACCESSORIES

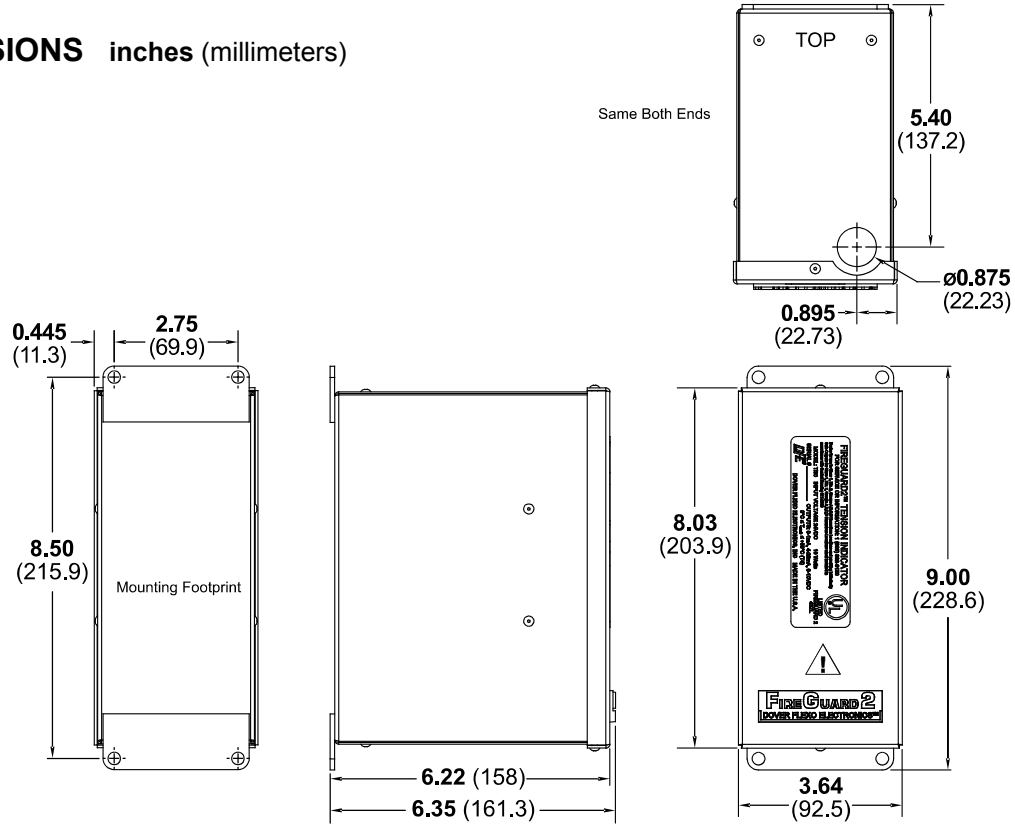
THESE OPTIONAL FEATURES REQUIRE CONFIGURATION OR EXTERNAL WIRING. REFER TO SECTION 2.4 FOR INSTALLATION INSTRUCTIONS AND SECTION 2.6 FOR WIRING.

- **Remote Analog Tension Meter in Enclosure**. 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.
- **Digital Meter in Enclosure.** 4-Digit, 0-1mA meter in enclosure for **SAFE area use ONLY**.

SECTION 2

INSTALLATION

2.1 DIMENSIONS **inches** (millimeters)



DIMENSIONS OF OPTIONAL REMOTE TENSION METER **inches** (millimeters)

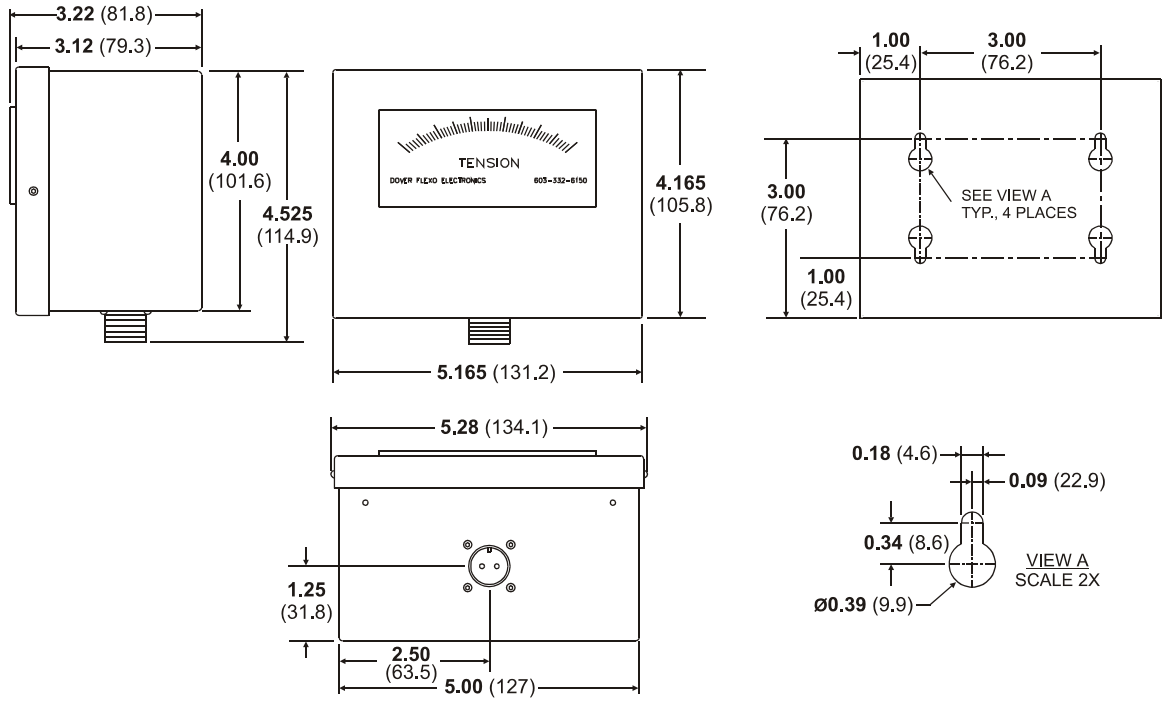


Figure 2 **- DIMENSIONS FOR FireGuard 2 AND METER ENCLOSURE**

2.2 SAFETY NOTICE

Important! Refer to Control Drawings on pages 15 & 16. 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 24VDC 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 2 to the customer's machinery or structure is accomplished using the flanges on the top and bottom edges of the enclosure. The FireGuard 2 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 LOCATION.

If you intend to use optional tension meters, select an appropriate location for each. It may be mounted in either a Class I Division 1 or 2 area if connected to Terminal Block TB1, or in a nonhazardous area if connected to TB2. You may connect both meters at once, they are independently driven. A DIGITAL METER MUST BE IN A NONHAZARDOUS AREA.

2.4 INSTALLATION INSTRUCTIONS

⚠ **WARNING:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

1. Turn off all AC power in the cabinet in which you will be working. Verify that the 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. Verify your power source is +24Vdc. Connecting AC voltage WILL damage the unit. Power source must be a UL listed product.
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 the fuse may be replaced).
3. Securely attach your unit to its mounting surface using appropriate screws and/or nuts.
4. Remove the unit's cover using the two mounting screws shown in Fig. 4. Your unit has been set up per your order. If the unit is set for XRE operation, it will have a sticker on the transducer connection TB1.

   NOTE: If the unit is set correctly for your application, skip down to Section 2.5.
5. Remove the six mounting screws holding the interior panel assembly to the enclosure also shown in Fig. 4. Then remove the interior panel assembly.

2.4 INSTALLATION INSTRUCTIONS *continued...*

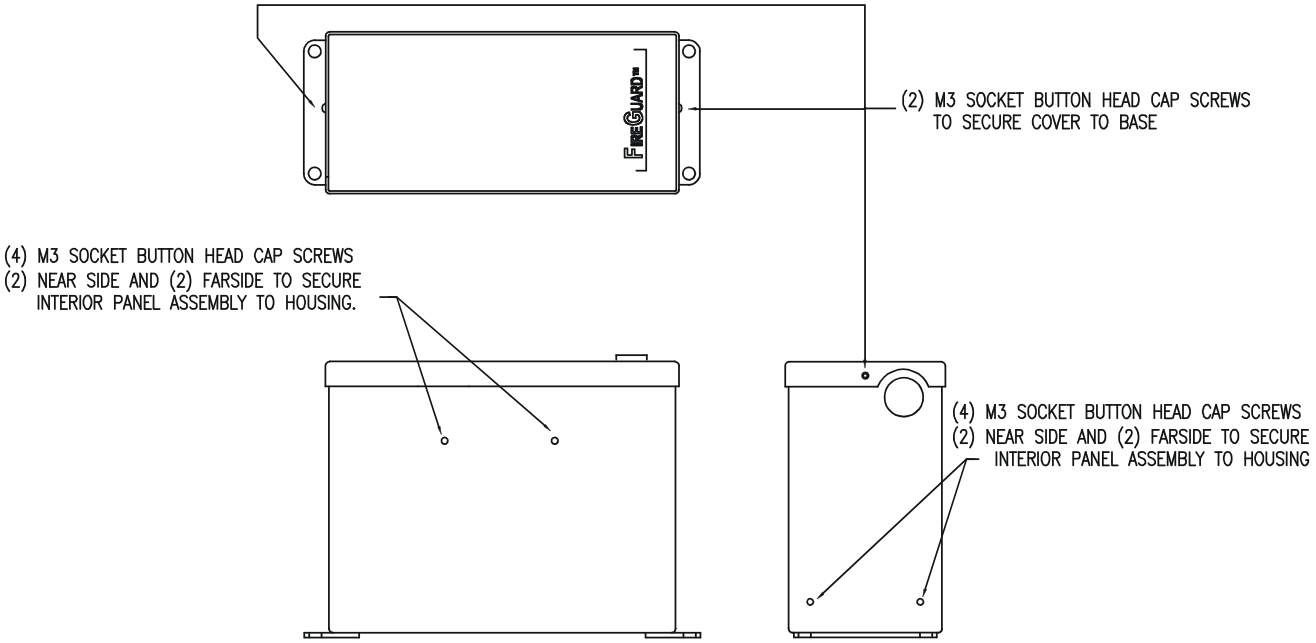


Figure 3 **- COVER AND SCREW LOCATIONS**

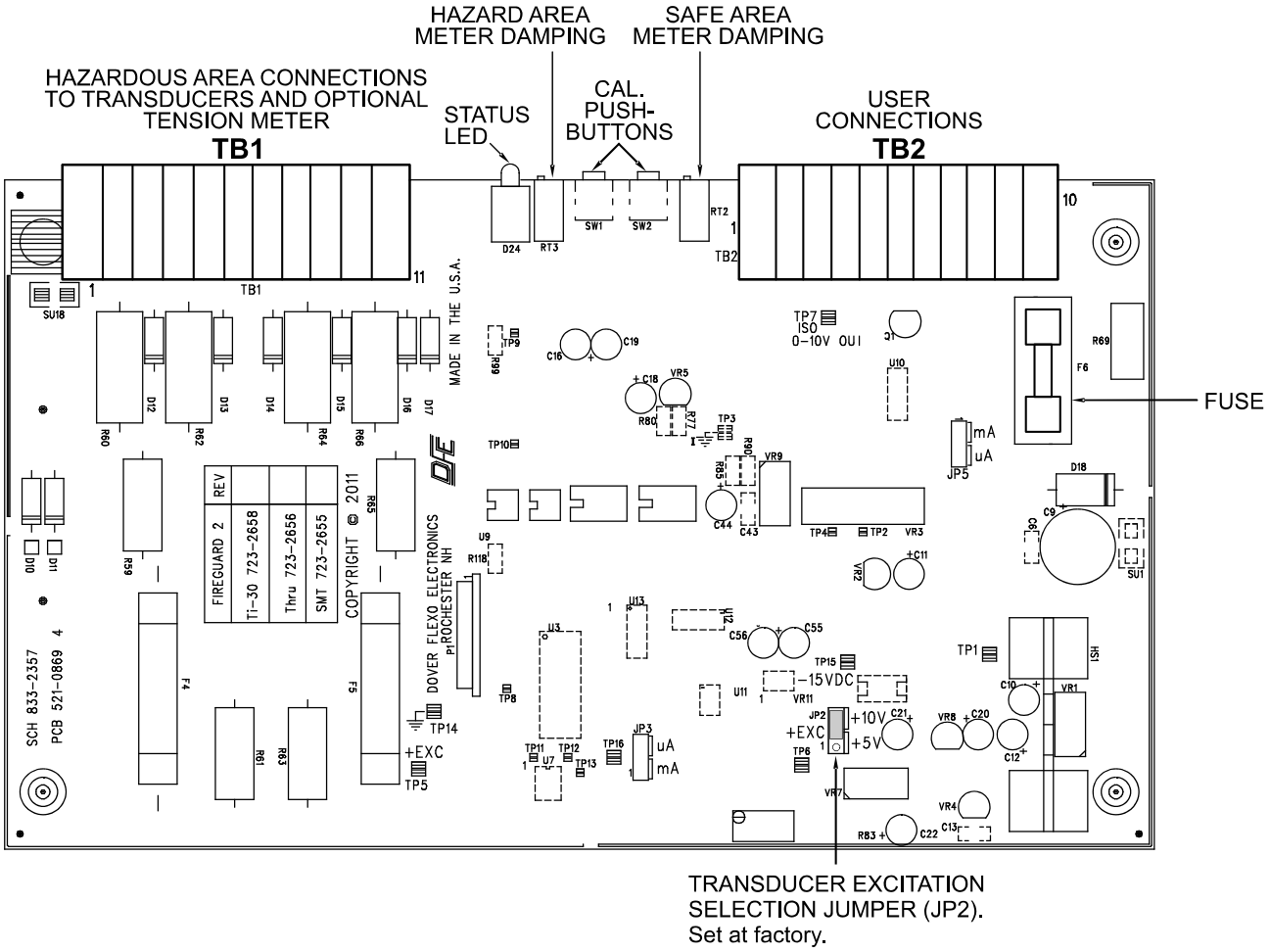


Figure 4 **- FireGuard 2™ CIRCUIT BOARD**

2.4 INSTALLATION INSTRUCTIONS *continued...*

6. Excitation is set at the factory. Units with XRE option will have a sticker on the transducer connector. To verify measure from TB1 pin 2 to TB1 pin 3, 5VDC is standard, 10VDC is XRE. 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 JP2 is in the 10V position. INCORRECT SETTINGS MAY RESULT IN PERSONAL INJURY OR DAMAGE TO THE UNIT OR TRANSDUCERS. INCORRECT SETTING MAY CAUSE LOSS OF INTRINSIC PROTECTION IN THE HAZARDOUS AREA.
7. Reinsert the interior panel assembly into the enclosure and secure it using the eight mounting screws. Ensure you start all the screws prior to tightening them, binding can otherwise occur.
8. 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.
9. 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.
10. If you intend to use the optional analog tension meter, refer to Fig. 2 for mounting dimensions of the meter enclosure. The dimensions are the same for both analog and digital meters.

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

⚠ **WARNING:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing

1. Make your 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 15-16 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.

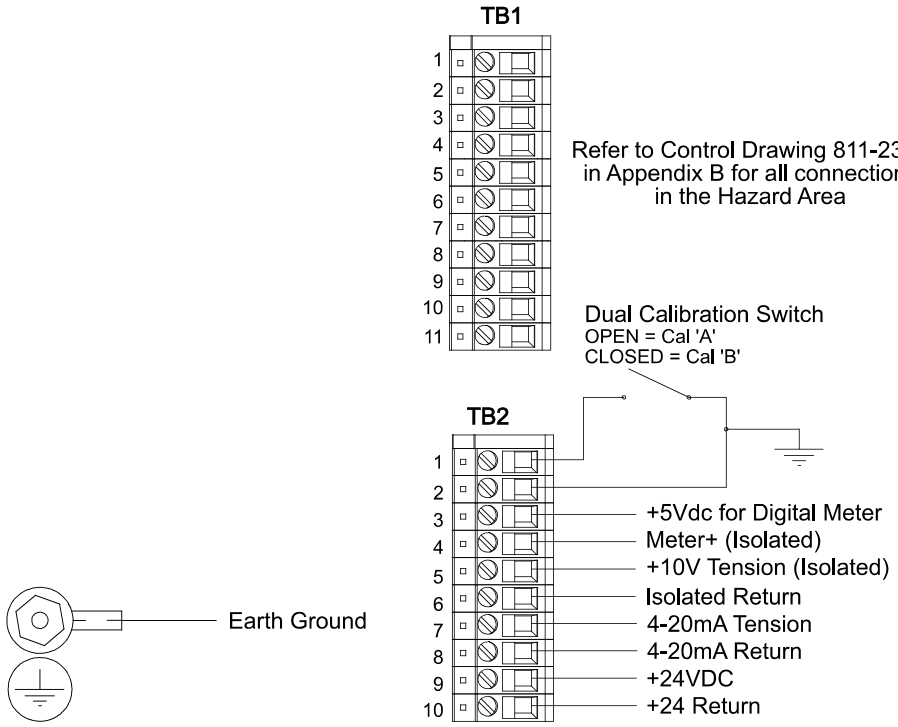


***Figure 5* - ELECTRICAL CONNECTIONS FOR HAZARDOUS & SAFE AREAS**

2.5 ELECTRICAL CONNECTIONS OF STANDARD FEATURES *continued ...*

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

⚠ **WARNING:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

If you intend to use the optional Analog or Digital Tension Indicating Meters, 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(s) 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, DFE tension meter and enclosure (Part #723-1420) must be used if a meter is located in the Hazardous Area.

Use a DFE Analog or Digital Meter in Enclosure for a tension display in the safe area. (Digital Part #723-2660)

SECTION 3

CALIBRATION and SETUP

3.1 PREPARATION

1. Select an appropriate calibration weight. Remember that the weight determines the value of web tension that will produce full output of the FireGuard 2™ . Full Scale output is produced at ten times (10X) the weight you use to calibrate. A 15 lb. weight will result in full output at 150 lbs. tension. A 10 lb. weight will result in full output at 100 lbs. tension. A spring scale can also be used, but absolute accuracy may be reduced.
2. Get a length of rope, wire, or cable of appropriate length. It must NOT be extensible (stretchy). This will cause inaccurate calibration.

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 2™ 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.

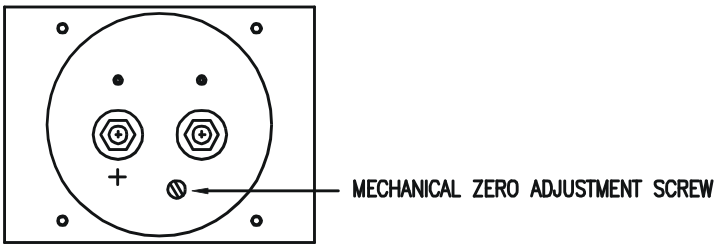


Figure 6 **- METER ZERO ADJUSTMENT**

3.3 CALIBRATE THE OUTPUT FOR ACCURACY

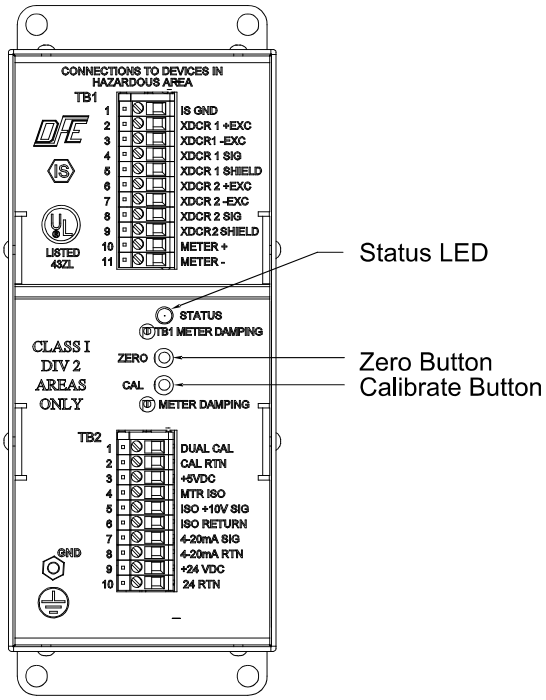


Figure 7 **- CALIBRATION BUTTONS ON FRONT OF UNIT**

3.3 CALIBRATE THE OUTPUT FOR ACCURACY *continued.....*

1. If the Dual Calibration feature is to be used set the CAL A / CAL B switch to the CAL A position.
2. **ZERO:** Ensure nothing is hanging on or pressing on the transducer roll (including the calibration rope). Press the ZERO pushbutton on the unit front panel for at least 1 second. The unit will store the tension zero one second after the button is pressed. The unit will flash the green status LED (located between buttons on product face) once to indicate the zero has been stored. Release the button. The output will read 0Vdc. The tension meter will read zero.

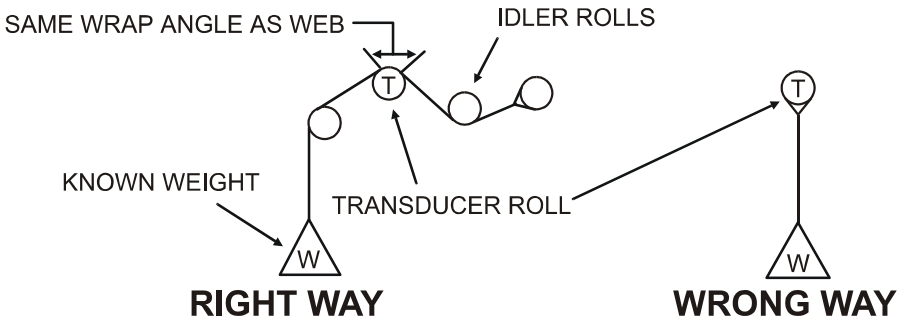


***Figure 8* - WEB PATH FOR CALIBRATION**

3. **CALIBRATION**: Fasten one end of the rope in the machine and thread the other end around the transducer roll in exactly the same path the web will take. Be sure the rope does not pass around any driven rolls, drag bars, or anything else that can affect tension. Ideally the rope should hit an idler roll immediately before and after the tension sensing roll. It does not have to pass over any other rollers once these three are strung.

   Refer to the Figure above.
4. Press the CAL pushbutton on the unit front panel for at least 1 second. The unit will store the calibration information one second after the button is pressed. The unit will flash the green LED ONCE (located above the buttons on product face) to indicate the calibration has been stored. The output will read 1.0Vdc after pressing calibration. The meter will read 10% of full scale.
5. Remove the weight and observe the output. It should read 0Vdc with nothing touching the tension sensing roller.
6. Re-zero can be performed at any time. Simply ensure nothing is touching the tension roller, and press ZERO until the green LED flashes, then release. The zero setting is updated, and the CALIBRATION is maintained.

   !CAUTION: Do NOT press the ZERO or CAL pushbuttons while the web is running. The unit will store ZERO or CALIBRATION and the old settings can <u>not</u> be recovered. The only way to recover CALIBRATION is to perform this procedure starting at step 1.
7. If the Dual Calibration feature is to be used, set the CAL A / CAL B switch to the Cal B position, and repeat steps 2 through 6 using the ZERO and CAL buttons as before.
8. If the optional analog meter is used, adjust the TB1 METER DAMPING pot OR METER DAMPING Pot while the machine is running to minimize meter needle movement if needed.

   The output calibration procedure is now complete.

   Reattach the cover to the unit using the two screws removed in Section 2.4.
9. If adjustment of the Optional Digital Meter scale is needed, refer to the manual shipped with the Digital Meter.

SECTION 4

CARE AND MAINTENANCE

Your FireGuard 2 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 three 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 5 - Troubleshooting, for causes and possible remedies.

If you are not using the Optional Tension meter, you can check the voltage on TB2 Pin 5 to Pin 6 to verify it reads 0 Volts. If this is not the case, refer to Section 5 - Troubleshooting, for causes and possible remedies.

It is not necessary to perform any type of maintenance on the FireGuard 2 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.

SECTION 5

TROUBLESHOOTING GUIDE

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 under 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 2™ 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 weight exceeds the remaining range of the transducer after the zeroing of the transducer is done reducing out the roll weight.

   This may also happen if the change in the signal from the transducers is too small to accurately determine the difference. This is often caused by overloaded Transducers or broken wires in the cables.

   Jitter/Oscillation during Calibration:

   This can also happen if there is significant variation in the signals from the transducers while the FireGuard 2™ 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. Verify the Machine is not Vibrating.

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.

   This can also happen if the signal is unstable due to vibration or if the weight is swinging.

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 Power connections to the terminals on the Power Input Pins of the FireGuard™.

   ⚠ **WARNING:** *To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing*.

   If Power exists at the Pins but no Output is produced AND the status LED is out, check the fuse inside the unit (See Fig. 4 page 6). If the fuse is good but the Status LED is out contact DFE for repair of the unit. No other user repairable items exist in the unit.

Call DFE Technical Support for assistance if your problem persists.

SECTION 6

REPLACEMENT PARTS LIST

7.1 REPLACEMENT PARTS

⚠ **WARNING:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Important!. When replacing fuse, use only the fuse 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.

Part Description	Part Number
Tension meter, analog (option), includes enclosure	723-1420 (specify scale)
Tension Meter, Digital (option), includes enclosure	723-2660 (specify scale)
Analog Meter connection cable	721-0967 (15', contact DFE for other length)
Digital Meter connection cable	721-1558 (15', contact DFE for other length)
Fuse F6 (1)	
24Vdc 250 mA/250V	108 - 0038
Fuse cover	108 - 0105
Instruction Manual	801 - 2420

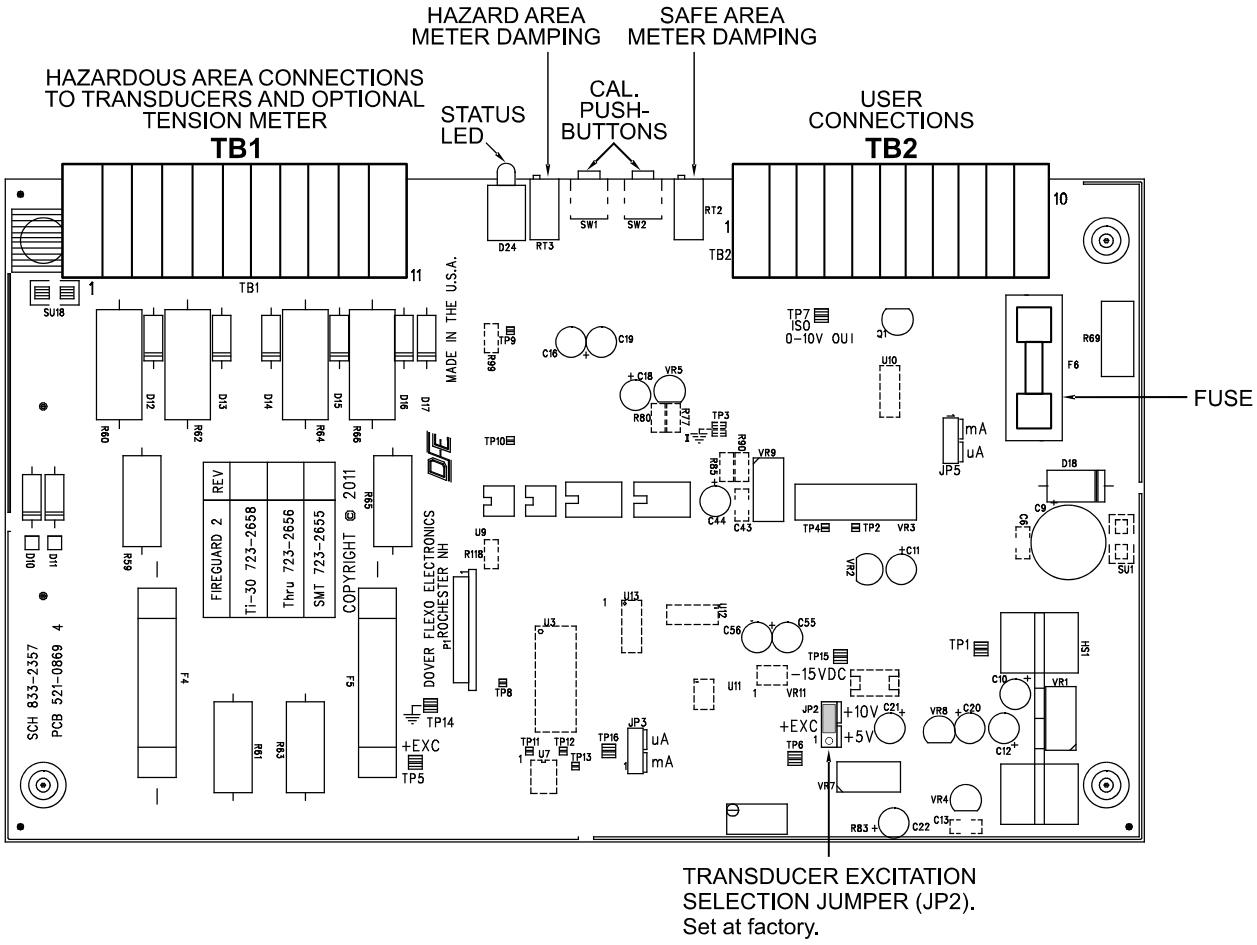


Figure 9 **- FireGuard 2 CIRCUIT BOARD**

Appendix B: Electrical Connection Control Drawings

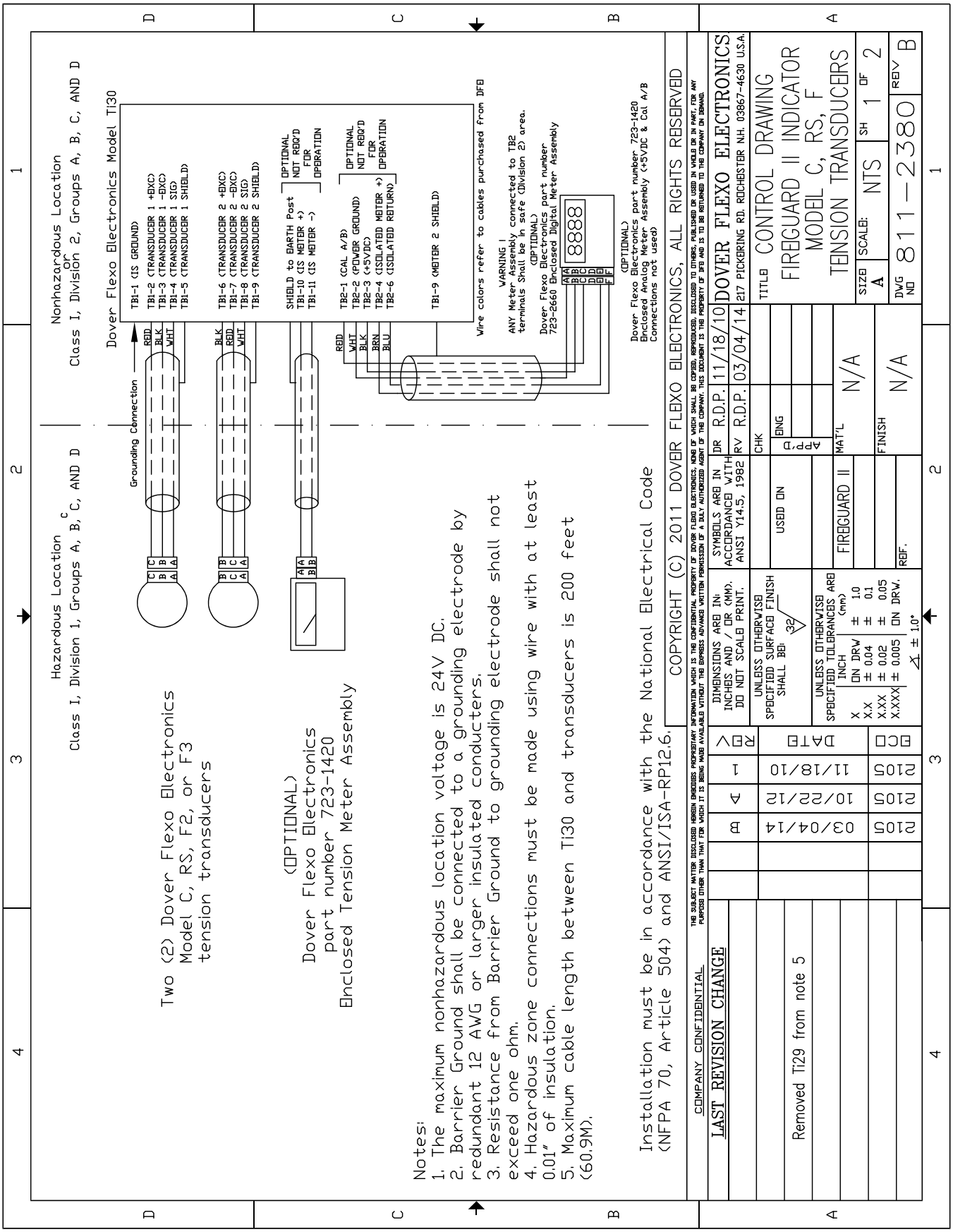


Figure 10 **- CONTROL DRAWING #1 (MODEL C, UPB)**

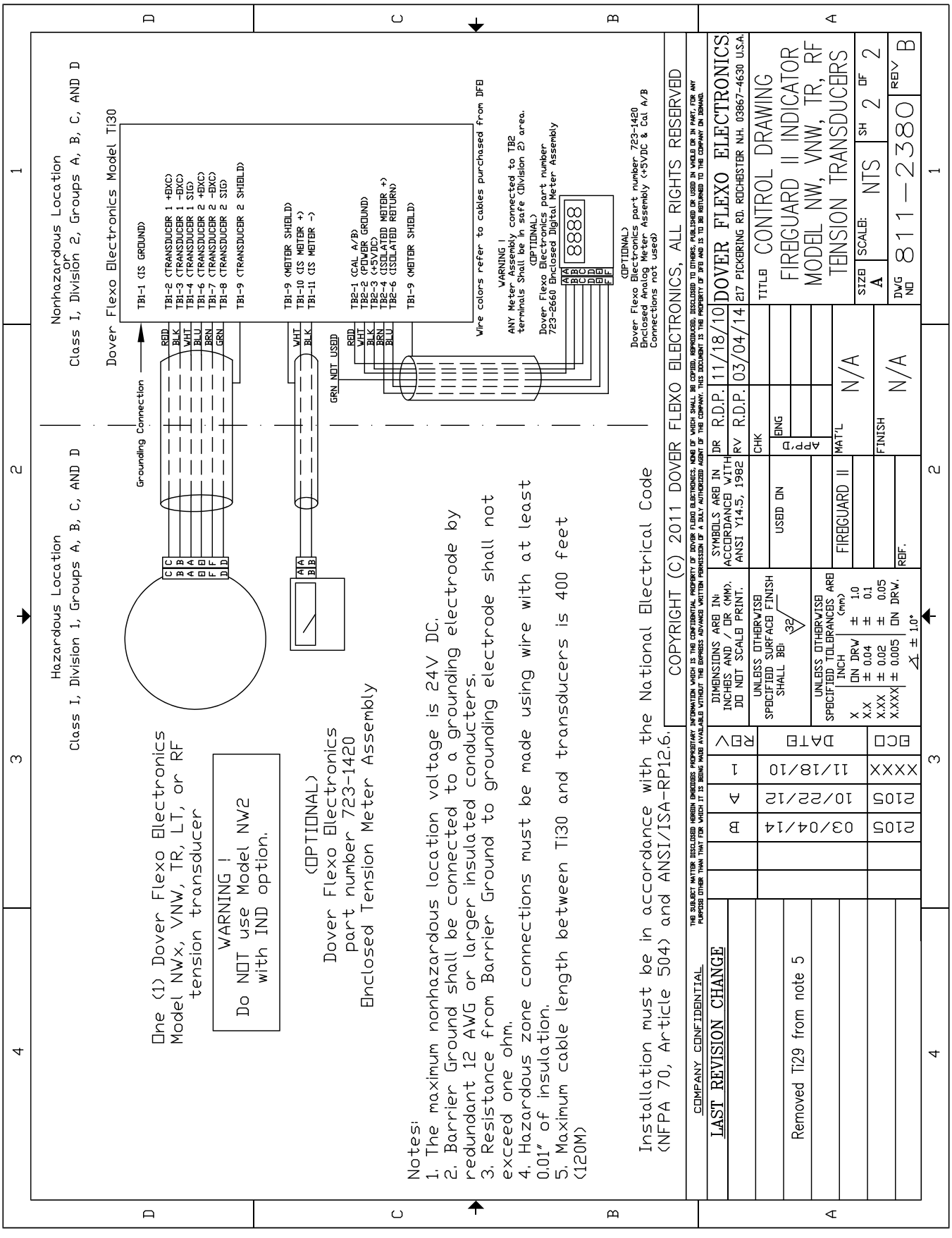


Figure 11 **- CONTROL DRAWING #2 (NW, TR, RF, LT)**

Appendix C: 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	GAUGE	AT 25% STRETCH	AT 50% STRETCH
	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	GAUGE - INS	UNWIND-PSI	REWIND-PSI
	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
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

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, to the original Buyer, its' products to be free of defects in material and workmanship for five years from date of original shipment. Repairs on products are warranted for 90 days from date of shipment. 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 warranteed. 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. The warranty is void if the serial number tag is missing or not readable.

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 payment 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 original 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 EXW 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. Claims of items missing from a shipment must be received, in writing, within 30 days of original shipment

10. CANCELLATION, CHANGES, RESCHEDULING

Buyer shall reimburse Company for costs incurred for any item on order with the Company which is cancelled 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 cancelled 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 will apply to any letter of credit. There will also 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.

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