



**INSTRUCTION MANUAL
TRUE TENSION INDICATOR
Models TI17 and TI17A**

5 YEAR WARRANTY



DOVER FLEXO ELECTRONICS, INC.

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For assistance, please call:

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TABLE OF CONTENTS

SECTION ONE	DESCRIPTION	PAGE
1.1	General Description	1
1.2	Versions	1
1.3	Exploded View of TI-17	1
1.4	Specifications	2
1.5	Environmental Conditions	2
1.6	Standard Features	2
	0 to ± 10 Volt Tension Output	2
	4-20mA Tension Output	2
	Meter Damping	2
	Power Voltage Selection	2
	0 to 1mA Output	2
	Isolation from Earth Ground	2
1.7	Options	3
	Extended Range	3
1.8	Accessories	3
	Mating Circuit Card Connector	3
	Remote Tension Meter	3
	Non-Standard Meter Scale	3
SECTION TWO	INSTALLATION	
2.1	Dimensions	4
2.2	Selection of Mounting Location	6
2.3	Safety & EMC Requirements	6
2.4	Installation Instructions	7
2.5	Electrical Connections	7
SECTION THREE	CALIBRATION AND SETUP	
3.1	Preparation	8
3.2	Mechanically Zero the Tension Meter	8
3.3	Calibrate the Output for Accuracy	8
SECTION FOUR	OPERATOR INSTRUCTIONS	9
SECTION FIVE	CARE AND MAINTENANCE	10
SECTION SIX	TROUBLESHOOTING GUIDE	11
SECTION SEVEN	REPLACEMENT PARTS	12
APPENDICES		
APPENDIX A	TI-17 Board Diagram	13
B	Transducer Electrical Connections	14
C	Typical Tensions	18
D	Environmental Terms	19
E	Descriptions of Replacement Parts	20
	TERMS AND CONDITIONS OF SALE	21
	INDEX	23

LIST OF ILLUSTRATIONS

FIGURE	DESCRIPTION	PAGE
1	Exploded View of TI-17	1
2	Horizontal Mounting Dimensions	4
3	Vertical Mounting Dimensions	5
4	Optional Meter Dimensions	6
5	Electrical Connections	7
6	Web Path	8
7	Replacement Part Numbers	12
8	TI-17 Board Diagram	13
9	Models C, RS, & UPB Transducer Wiring	14
10	RF Transducer Wiring	15
11	TR & NW Transducer Wiring	16
12	LT Transducer Wiring	17

PART NUMBER DERIVATION

410 - 1 0 1 0 0 - 0000 - xx

↓	↓	↓	↓	↓	↓
<u>Model</u>	<u>Input</u>	<u>Output</u>	<u>Mounting</u>		<u>Options</u>
<u>Version</u>	<u>Voltage</u>	<u>Voltage</u>	<u>Style</u>		

0 = TI-17
2 = TI-17A

1 = 115 V
2 = 230V

0 = 10V
1 = 4-20mA
2 = 10V Isolated*
3 = 4-20mA Isolated*

1 = Horizontal w/Connector
2 = Horizontal - card only
3 = Vertical w/bracket
4 = Vertical w/bracket and Legend Plate
5 = Vertical w/bracket, Legend Plate, and Housing (CE)†
6 = Vertical w/din mount
7 = Vertical w/din mount and Legend Plate
8 = Vertical w/din mount, Legend Plate and Housing (CE)†
9 = Vertical - Card only

X = NO OPTIONS
A = Extended Range
Z = Special (SPR)

NOTES:

* TI-17A only.

† A CE marked product, this version of the TI-17 satisfies European Low Voltage Directives and certification standards for electro-magnetic compatibility (EMC). **Model TI-17A does not meet this requirement at present.**

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1.1 GENERAL DESCRIPTION

The TI-17 Tension Indicator is designed to provide an interface between any type of DFE tension transducer, and a variable speed drive system, computer, tension recorder, or other devices for tension control and display purposes. It also has a separate output to allow the user to connect an analog meter to indicate operating tension. The circuit card plugs into a single terminal block, to which all external connections are made. This plug-in feature allows easy field installation and servicing.

1.2 VERSIONS

Model TI-17 is available with three mounting configurations and a choice of 0-10VDC or 4-20mA non-isolated output. This model is also CE marked when in its full enclosure configuration.

Model TI-17A is an extended version of the same interface with the added features of dual calibration and the choice of isolated 0-10VDC or 4-20mA outputs.

1.3 EXPLODED VIEW OF TI-17

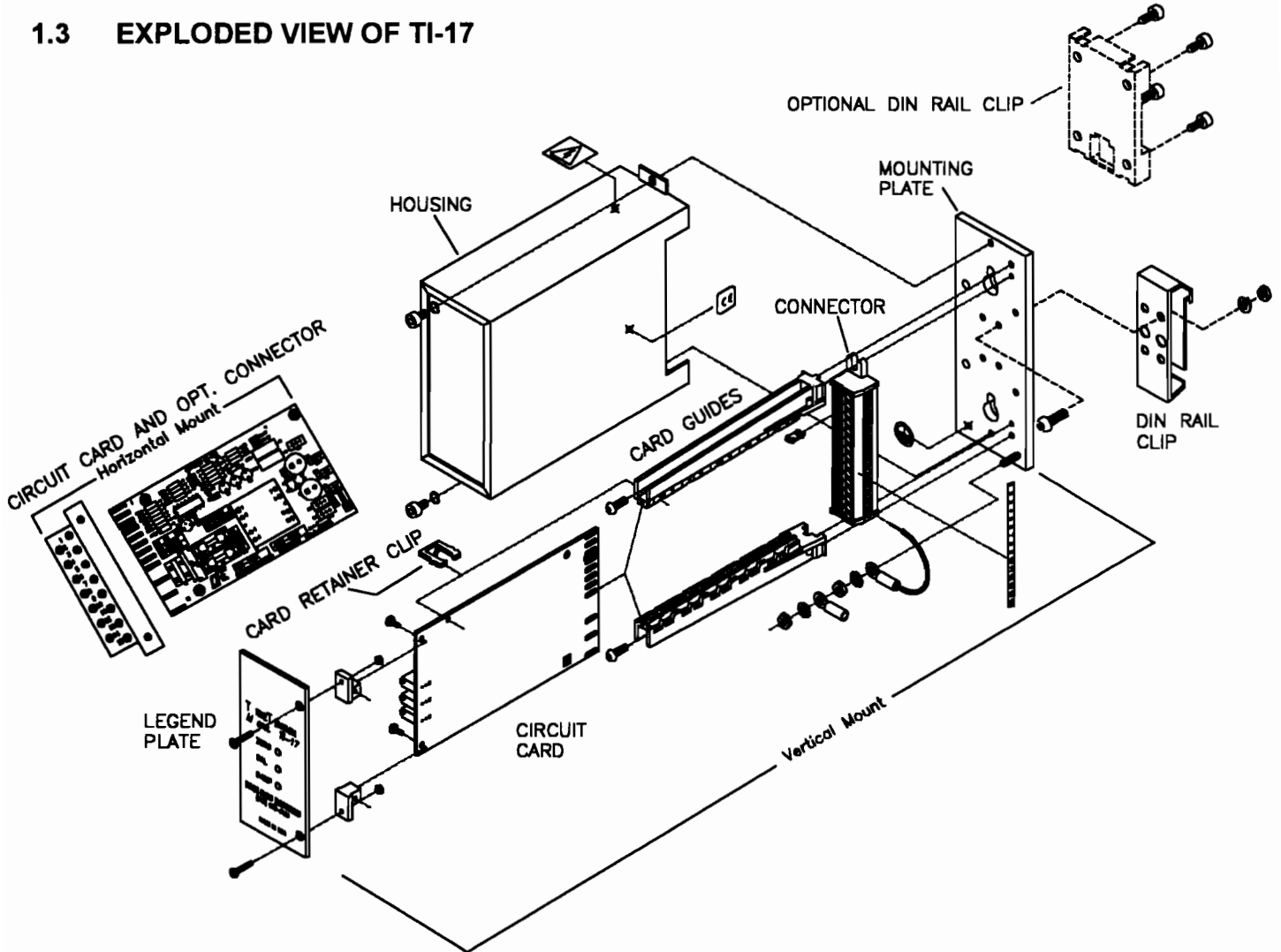


Figure 1 - EXPLODED VIEW OF TI-17

1.4 SPECIFICATIONS

Power Input: Voltage	.....	115/230V 50/60Hz (jumper selectable)
Current	.....	TI-17 = 0.080/0.040A TI-17A = 0.125/0.063A
Tension Signal Outputs	.....	0 to +10V DC @ 2mA OR 4 to 20mA (Both available isolated in TI-17A)
	.....	0 to 1mA damped output for external tension meter
Weight	.....	0.5 lbs (0.23 kg) to 2.0 lbs (0.91 kg), depending on version
Transducer Signal Input	.....	500 mV DC at rated load per pair (1.00 V DC for XR option)
Transducer excitation	.....	5V DC (10V for the XR option)
Mating circuit card connector	.....	PCD#ELD15110 (DFE P/N: 106-0155) for horizontal mounting. (Connector is included for vertical mounting)
Zero (tare) range	.....	95% of transducer rating
Calibration range	.....	16 : 1
Ambient temperature range	.....	32°F to 104°F (0°C to 40°C)
Optional tension meter type	.....	Analog 1mA, 48 ohm (typ) (DFE P/N: 722-1385)
Standard tension meter scales	.....	0 to: 1, 5, 10, 25, 50, 100, 150, 250, 500, 1000

1.5 ENVIRONMENTAL CONDITIONS (Ref. Appendix D for further information)

This section applies to equipment designed to be safe at least under the following conditions:

- Indoor use
- Altitude up to and above 2000 meters
- Temperature 41°F to 104°F (5°C to 40°C)
- Maximum relative humidity 80% for temperatures up to 88°F (31° C) decreasing linearly to 50% relative humidity at 104°F (40°C).
- Main supply voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage; other supply voltage fluctuations as stated by the manufacturer
- Transient Overvoltages according to Overvoltage Categories I, II, and III. For main supply the minimum and normal category is II
- Pollution Degree 1 or 2 in accordance with IEC 664

1.6 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.

- **0 to +10V Tension Output.** Proportional to tension. Used as an input to a controller or instrumentation system. Also available as isolated in TI-17A.
- **4 to 20mA Tension Output.** Proportional to tension. Used as an input to a controller or instrumentation system. Also available as isolated in TI-17A.
- **0-1mA tension output.** A separate output used for driving an optional analog tension meter.
- **Meter Damping.** Minimizes variation of the optional analog tension meter needle.
- **Power Voltage Selection.** The TI-17 Interface / Indicator is designed to operate at either 115V (standard) or 230V using jumper selection.
- **Easily serviceable.** The circuit card can easily be removed and reinstalled into its mating connector (optional with horizontal mounting version).
- **Small size.** Fits where many other products cannot.
- **Flexible Options.** Options and features can be tailored for each application.
- **Economical.** Provides many important features at a reasonable price.
- **Isolated from Earth Ground.** A transformer provides isolation from earth ground, simplifying installations.
- **Dual Calibration.** Allows two calibration settings. (TI-17A only)

1.7 OPTIONS (The option code is shown in parentheses)

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

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

WARNING: Using standard transducers with XR excitation will damage the transducers!

1.8 ACCESSORIES

- **Mating Circuit Card Connector.** Allows easy connection of external wiring (Horizontal mounting style only; connector is included for vertical mounting).
- **Remote Tension meter.** Analog, 1 mA, 48 ohm movement. Must be installed by user.
- **Nonstandard meter scale.** Any other meter scale than standard ones offered by DFE. See Specifications for standard scales.

SECTION 2

INSTALLATION

2.1 DIMENSIONS inches [millimeters]

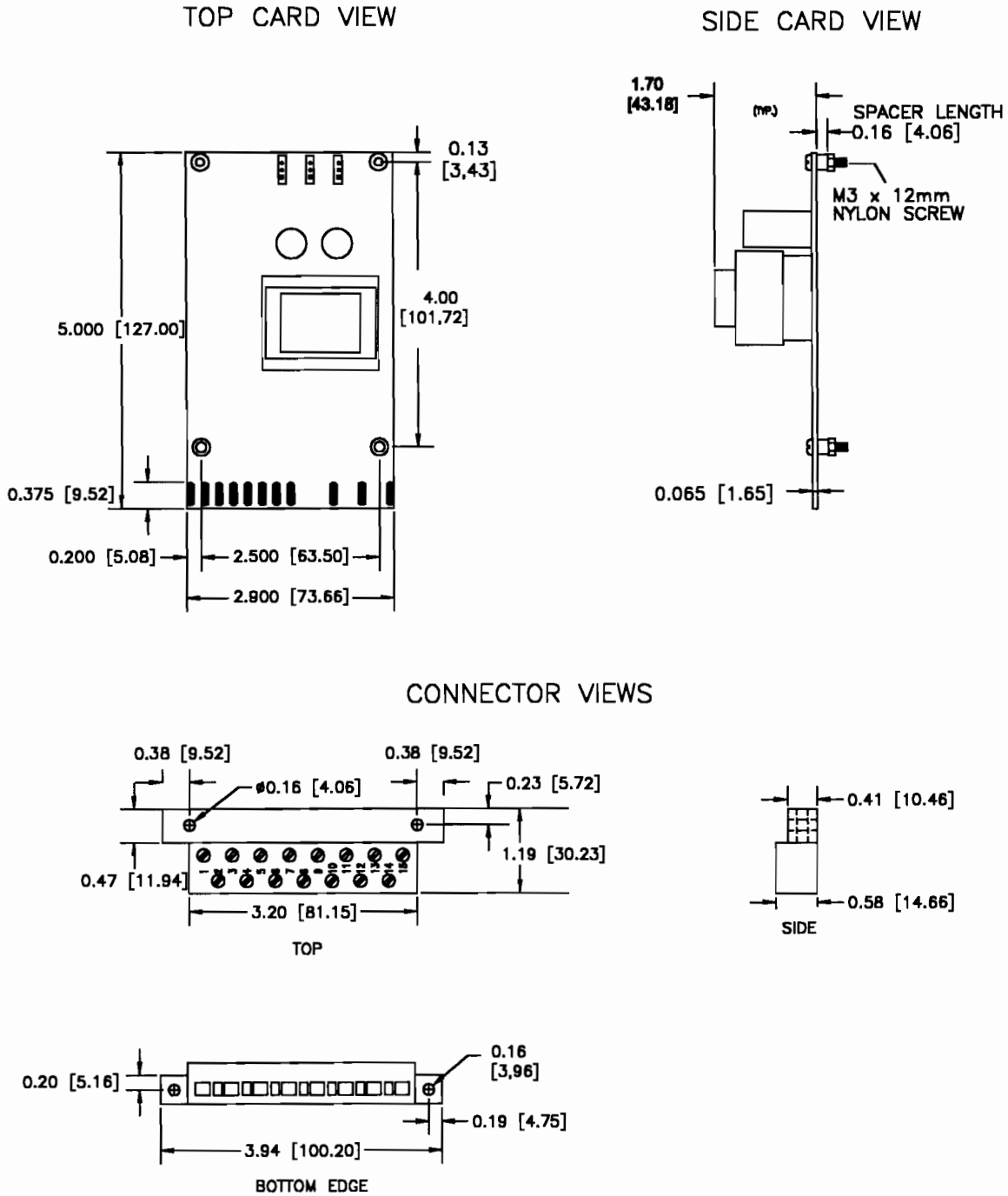


Figure 2 - HORIZONTAL MOUNTING DIMENSIONS

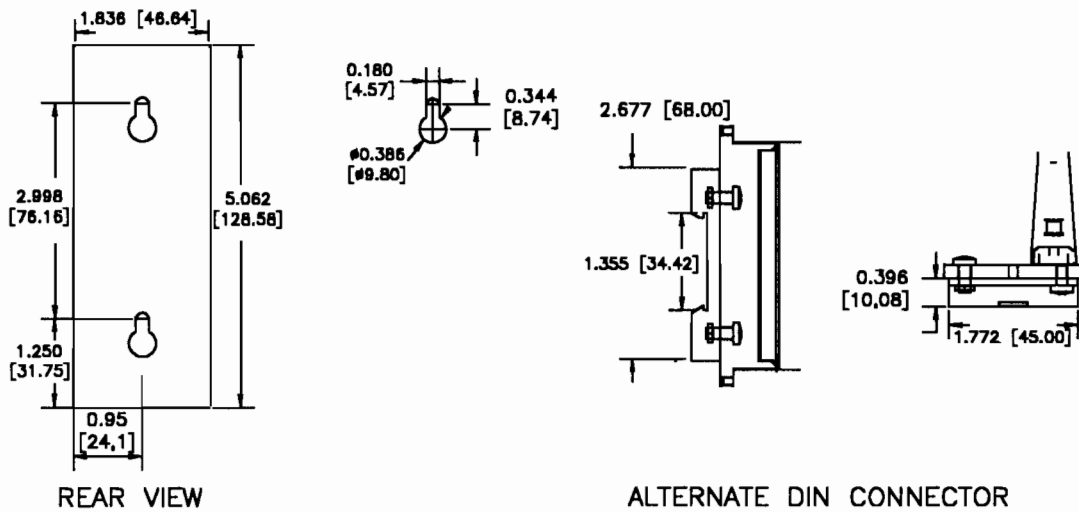
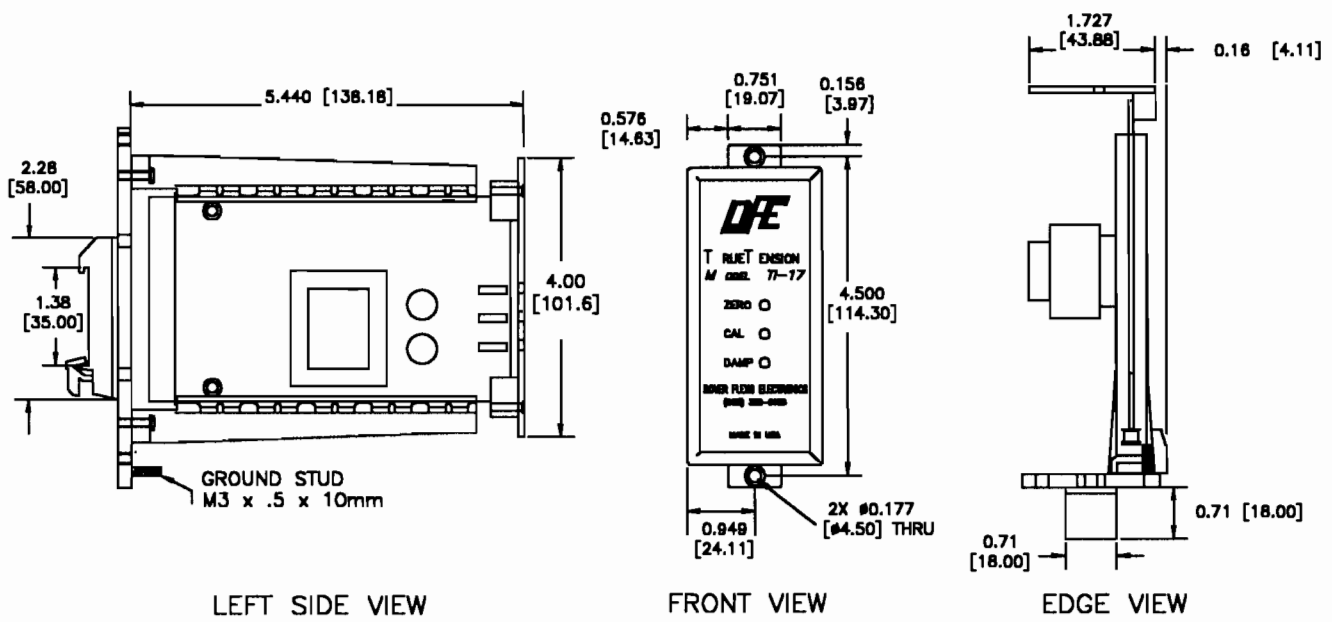


Figure 3 - VERTICAL MOUNTING DIMENSIONS

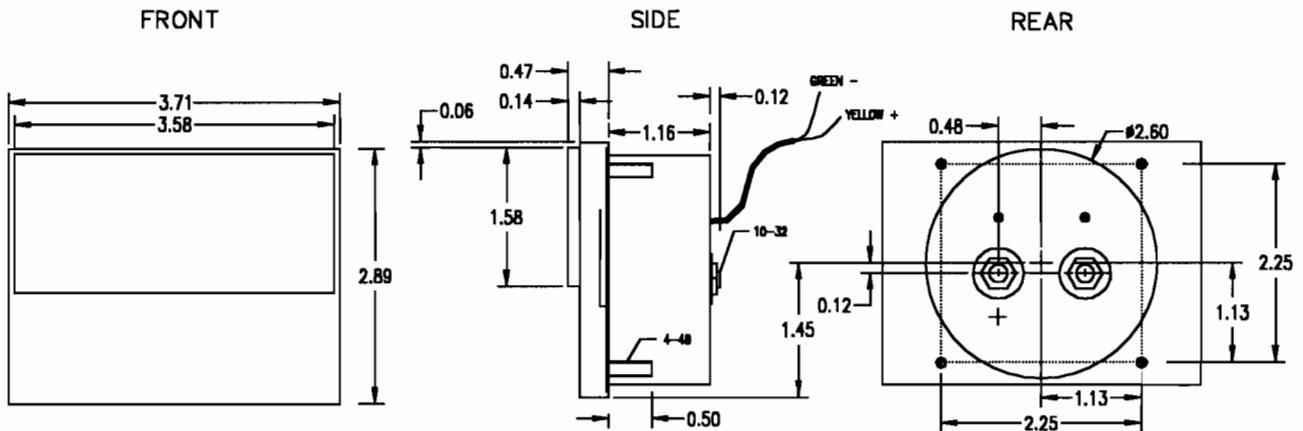


Figure 4 - OPTIONAL METER DIMENSIONS

2.2 SELECTION OF MOUNTING LOCATION

The TI-17 must be located in a machine cabinet, away from dusty or wet environments. If a dusty environment is anticipated and no cabinet is available, the mounting style with housing should be used.

2.3 SAFETY AND EMC REQUIREMENTS

Warning! If this equipment is not connected or operated in the manner specified, the operating safety of this unit or of connected equipment cannot be guaranteed.

Warning! The DFE Model TI-17 you have purchased has been tested and meets the European Union's Low Voltage Directive and EMC Directive only when the available enclosure has been used and when installation is done correctly. For safety reasons, it is necessary to use appropriate wiring for your line voltage connections and for safety grounding. Make your ground connection between a reliable earth ground and the safety ground of your indicator using a wire with a gauge of at least 16 AWG (or a cross-sectional area of at least 1mm²). Make your line voltage connection to P1 positions 11 and 13 using wire with a gauge of at least 16 AWG (or a cross-sectional area of at least 1mm²) for each conductor. Attach this wiring to the panel to prevent inadvertent removal.

An external switch or circuit breaker is required for power disconnection, and it is recommended that this switch or circuit breaker be near the equipment.

In addition, to meet the EMC Directive, a proper transducer installation, including shielded cables must also be used. The following is a list of cables available from DFE which meet this requirement:

721-0084	CN 3-conductor cable for type C, RS, and UPB transducers
721-0964	CN 6-conductor cable for type RF, LT, and TR1 transducers
721-0984	CN 6-conductor cable for NW and TR2 and TR3 transducers

Cable shielding must be attached to chassis ground. If you wish to assemble your own cables, contact DFE for assembly instructions.

2.4 INSTALLATION INSTRUCTIONS

Drill your mounting holes for the mounting style you will be using. Be sure to allow ample clearance beside or in front of the unit for tool access and for wiring.

If you are using the vertical mounting style, remove the indicator circuit card from the connector/cardguide assembly. Then mount the connector/cardguide assembly to your panel. If you are using the horizontal mounting style, mount the indicator circuit card to your panel. If an optional analog meter is used, drill mounting holes per dimensions in Figure 4.

2.5 ELECTRICAL CONNECTIONS

Verify that your unit is set up for the correct line voltage. See Appendix A (page 12) for location of jumpers for making this selection. Also verify that the correct value fuses are installed based upon your line voltage selection:

	115V Operation	230V Operation
TI-17:	T80mA, 250V	T40mA, 250V
TI-17A:	T125mA, 250V	T63mA, 250V

Refer to the drawing below for electrical connections. Keep in mind that the indicator is designed to provide a 0-1mA damped meter output, and either a 0-10V OR a 4-20mA output. If more than one output is used simultaneously, the outputs may not agree and the unit may not be CE compliant.

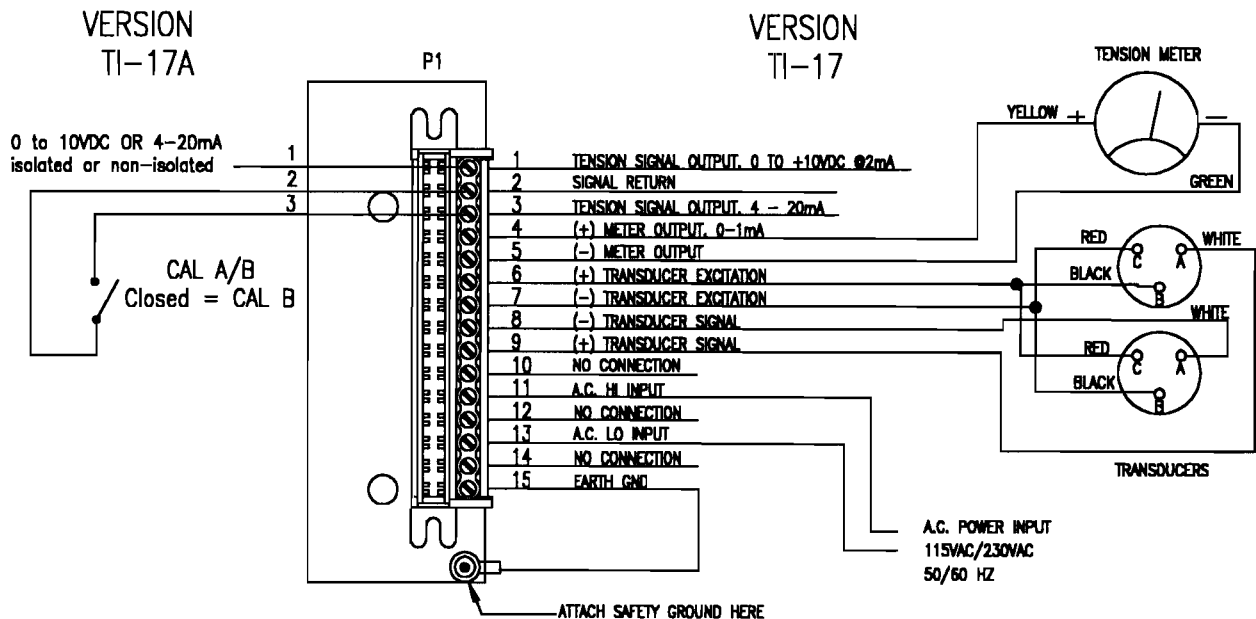


Figure 5 - ELECTRICAL CONNECTIONS

Make your wiring connections in accordance with the above drawing.

1. The insulation rating of all line voltage wiring must be at least 300V
2. Keep line voltage wiring physically separated from signal wiring at the terminal block and at any other point in the installation. If this is not possible, the insulation rating of your signal wiring must also be at least 300V.
3. Connect cable shields to chassis ground.

If you are using the vertical mounting style, you may now reinsert the indicator circuit card into the connector/cardguide assembly. Snap in the yellow card retainer clip located in one of the card guides to lock the card in place. Reference Figure 1 on page 1 for proper location of this clip.

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.

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 TI-17 and observe whether the tension meter needle rests at 0. If not, turn the adjustment screw on the rear of the meter as required to set the meter needle at 0 on the scale.

3.3 CALIBRATE THE OUTPUT FOR ACCURACY

- Find an object of known weight at least as heavy as 25% of the tension meters full scale output, 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 (3 meters) long.
- Turn on power to the TI-17.
- Turn the CAL pot (Cal A or Cal B on TI-17A as appropriate) clockwise at least 5 turns (this makes the ZERO pot (Zero A or Zero B on TI-17A) setting more accurate). Then turn the ZERO pot 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 mA for the meter output).
- 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. below.

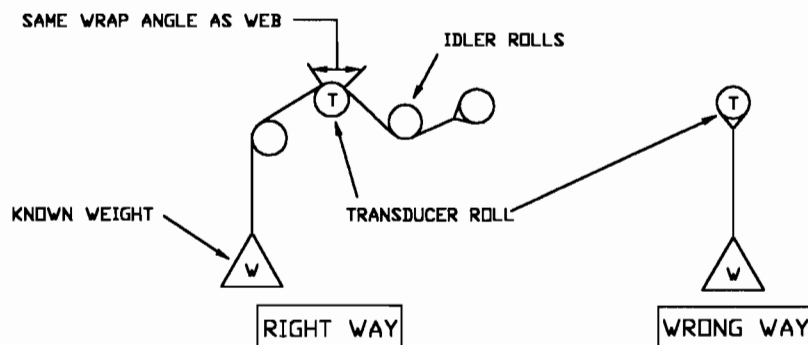


Figure 6 - WEB PATH

- Attach the weight to the free end of the rope as shown above. Adjust the CAL pot (Cal A or Cal B on TI-17A as appropriate) as required to set the meter needle at the value of the weight.
- Remove the weight and observe the tension meter. If the needle is not on zero, adjust the ZERO pot (A/B on TI-17A) as needed. Repeat step e.
- Repeat steps e and f if needed.
- If the optional analog meter is used, adjust the DAMP pot while the machine is running to minimize meter needle movement.
- On TI-17A only: Repeat steps c through g with Cal A/B line grounded (P1, position 3). The output calibration procedure is now complete.

Your tension interface / indicator will indicate tension in your system without any further operator intervention. 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 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 enclosure.

	<u>115V Operation</u>	<u>230V Operation</u>
TI-17:	T80mA, 250V	T40mA, 250V
TI-17A:	T125mA, 250V	T63mA, 250V

Warning! Equipment must be disconnected from the HAZARDOUS LIVE voltage before changing the fuses.

Most problems are caused by incorrect installation and misapplication of the equipment. It is very important to be sure these factors are correct before making any changes to potentiometer and switch settings.

If you have any problems with the tension control functions on your TI-17 Tension Controller, please call Technical Service at 603-332-6150 or fax 603-332-3758. E-mail: info@dfc.com.

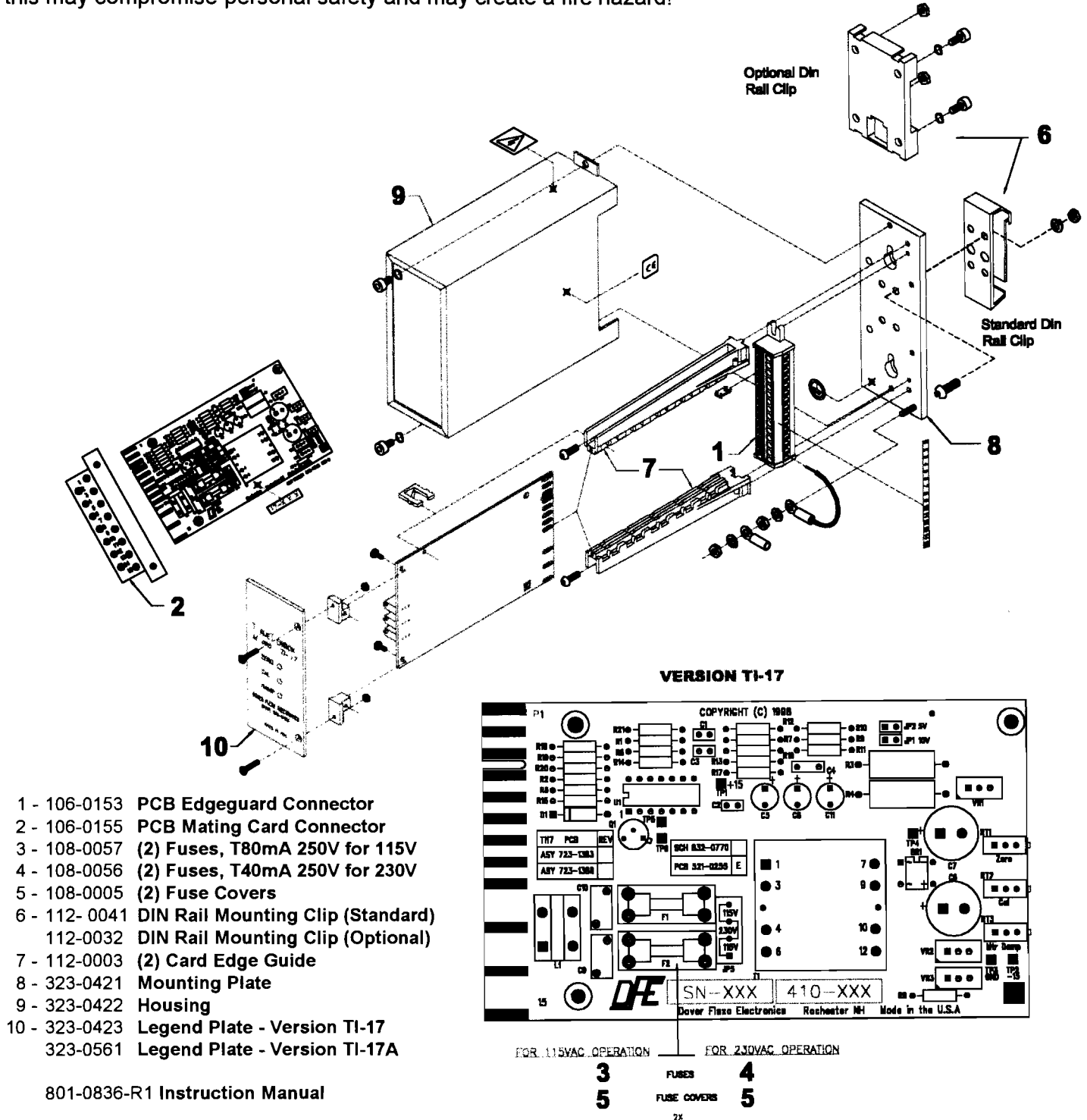
DFE's experienced technicians are responsible to ensure that you are satisfied with your DFE equipment. They will be pleased to assist you.

SECTION 7

REPLACEMENT PARTS

See diagram below for separate components. For complete item descriptions, see Appendix E on page 20.

Warning! When replacing fuses, use only fuses with ratings as shown below, or a lower rating. Failure to do this may compromise personal safety and may create a fire hazard!



- 1 - 106-0153 PCB Edgeguard Connector
- 2 - 106-0155 PCB Mating Card Connector
- 3 - 108-0057 (2) Fuses, T80mA 250V for 115V
- 4 - 108-0056 (2) Fuses, T40mA 250V for 230V
- 5 - 108-0005 (2) Fuse Covers
- 6 - 112-0041 DIN Rail Mounting Clip (Standard)
- 112-0032 DIN Rail Mounting Clip (Optional)
- 7 - 112-0003 (2) Card Edge Guide
- 8 - 323-0421 Mounting Plate
- 9 - 323-0422 Housing
- 10 - 323-0423 Legend Plate - Version TI-17
- 323-0561 Legend Plate - Version TI-17A

801-0836-R1 Instruction Manual

Figure 7 - REPLACEMENT PART NUMBERS

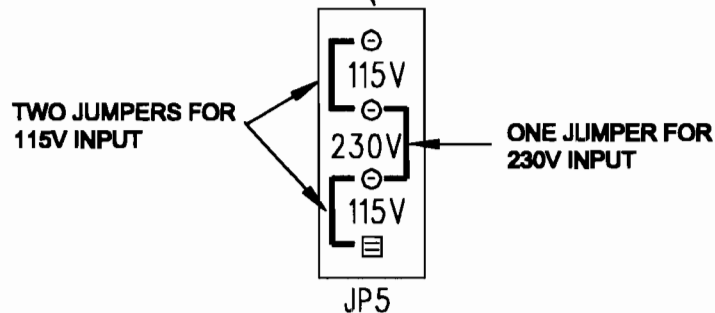
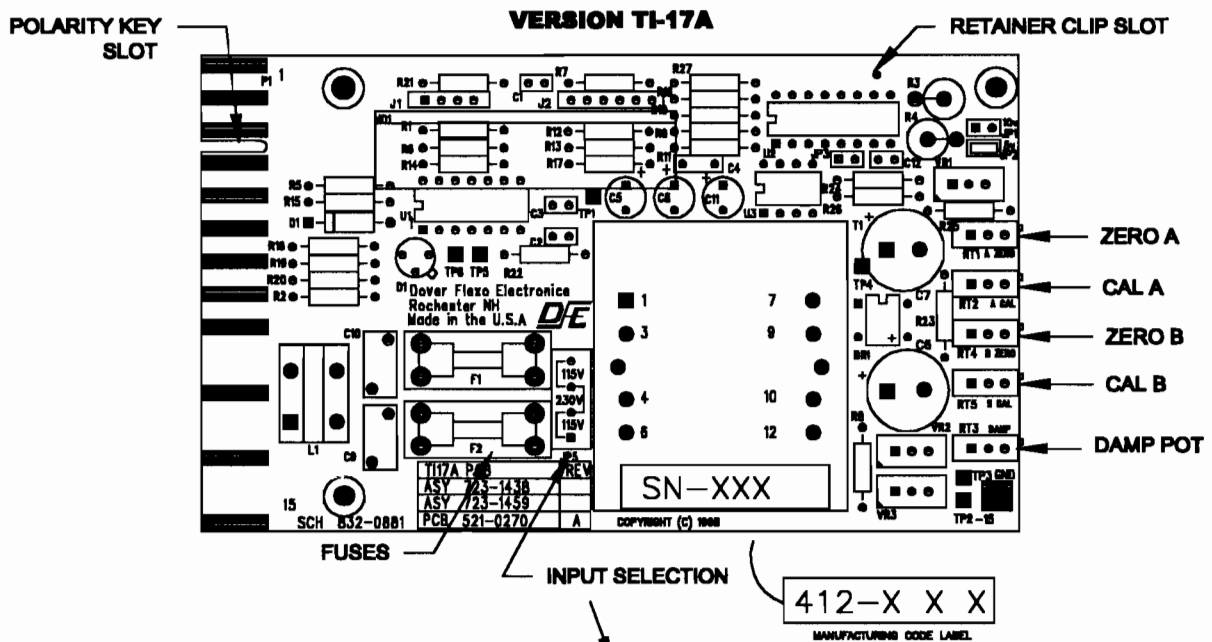
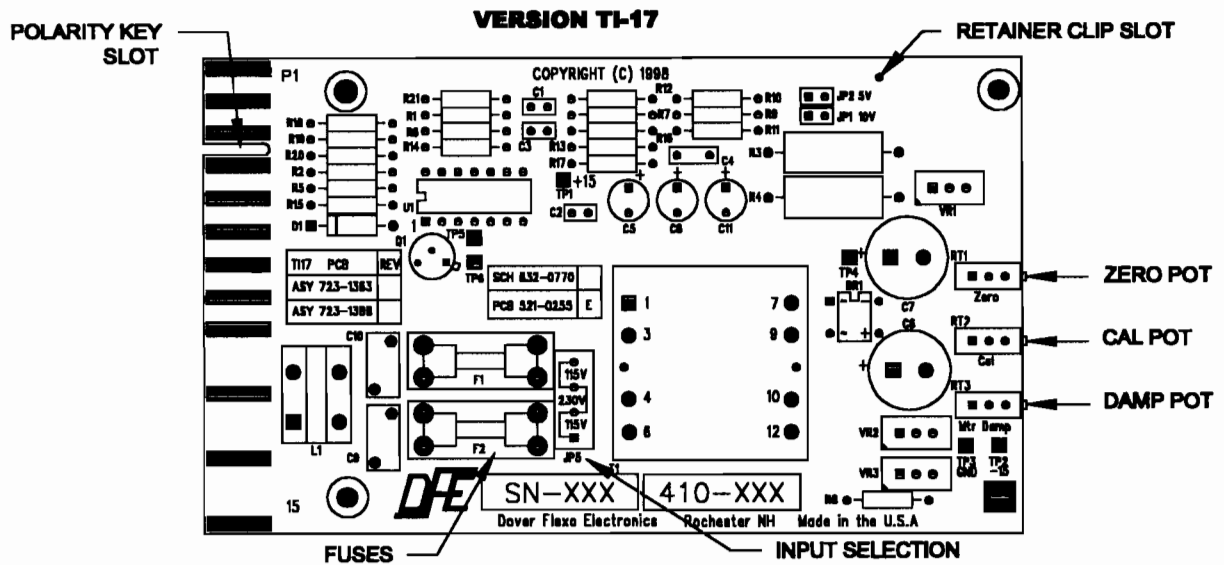


Figure 8 - TI-17 BOARD DIAGRAMS

Appendix B: 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.

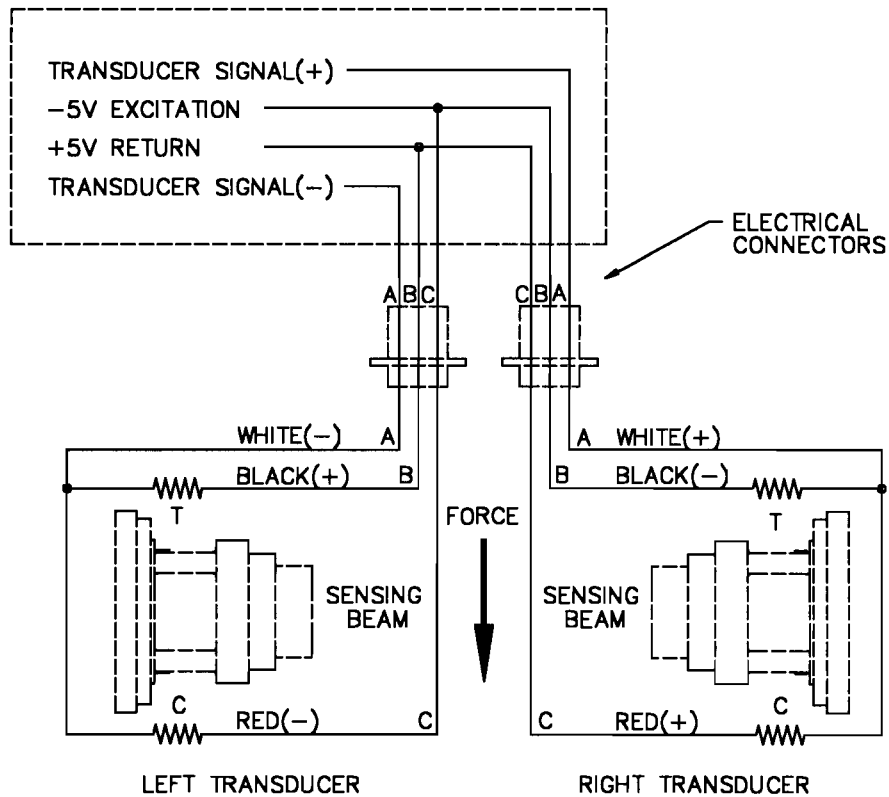


Figure 9 - MODELS C, RS, & UPB TRANSDUCER WIRING

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.

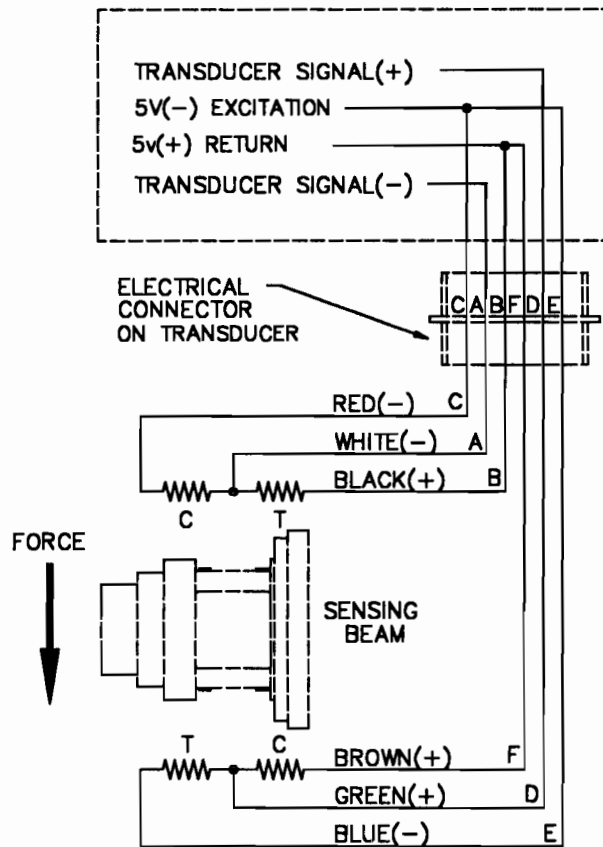


Figure 10 - RF TRANSDUCER WIRING

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

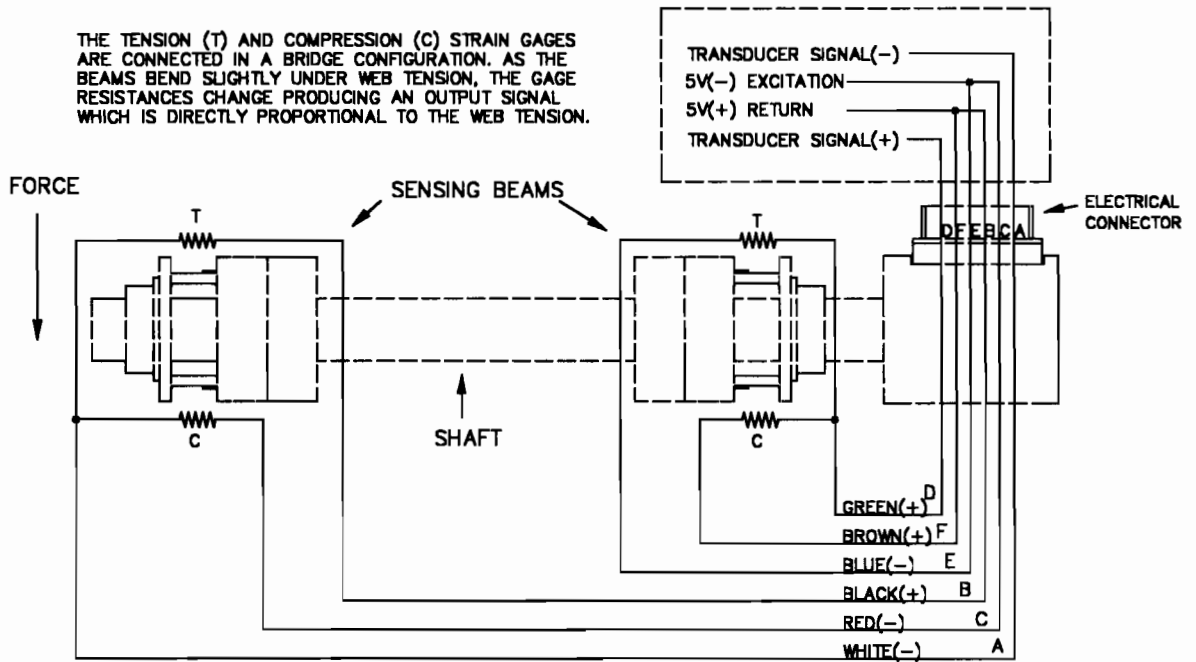


Figure 11 - TR & NW TRANSDUCER WIRING

LOW TENSION (LT) TRANSDUCERS

INDICATOR CONNECTIONS

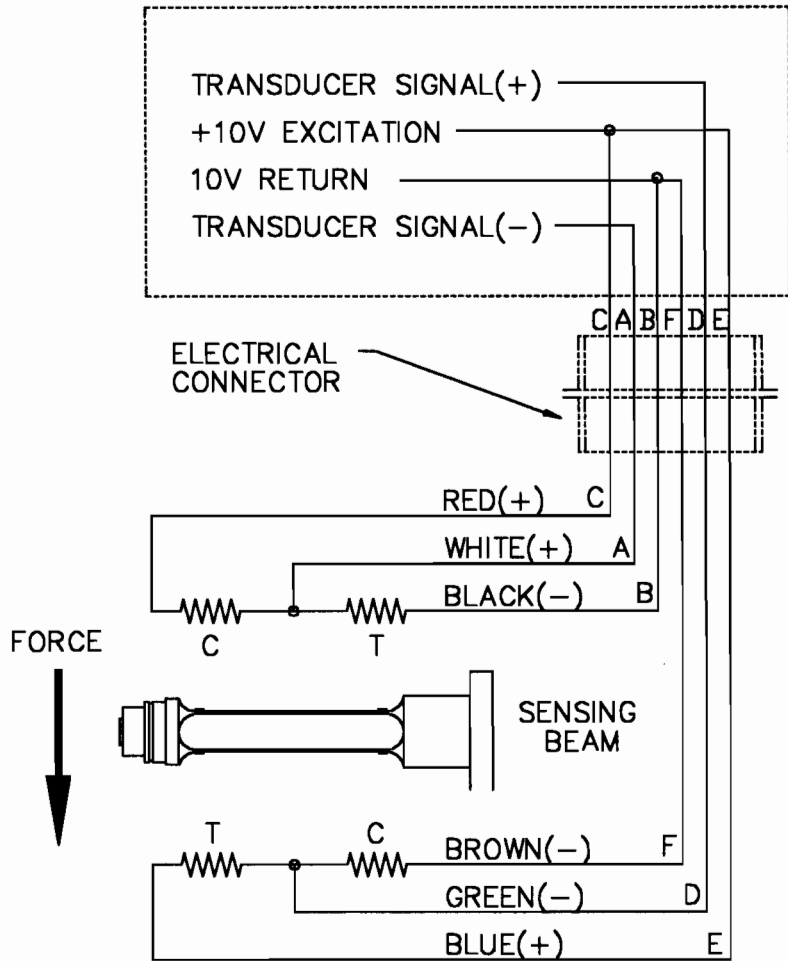


Figure 12 - LT TRANSDUCER WIRING

Appendix C: Typical Tensions for Various Materials

TYPICAL TENSIONS FOR WEB MATERIALS

ACETATE	.5 lb. per mil per inch of width		
FOIL	Aluminum	.5 lb. per mil per inch of width	
	Copper	.5 lb.	"
CELLOPHANE	.75 lb. per mil per inch of width		
NYLON	.25 lb. per mil per inch of width		
PAPER	15 lb *	.4 lb. per inch of width	
	20 lb	.5 lb.	"
	30 lb	.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	.12 lb. per mil per inch of width		
POLYESTER (Mylar)	.75 lb. per mil per inch of width		
POLYPROPYLENE	.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	.15 lb per mil per inch of width		
STEEL	<u>GAUGE - INS</u>	<u>UNWIND-PSI</u>	<u>REWIND-PSI</u>
	.001 -.005	1000	4000
	.006 -.025	850	3500
	.026 -.040	750	3000
	.041 -.055	650	2600
	.058 -.070	550	2200
	.071 -.090	450	1800
	.091 -.120	450	1400
	.121 -.140	400	1200
	.141 -.165	400	1000
	.166 -.200	400	900
	.201 -.275	400	800
	.276 -.380	300	700
VINYL	.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.

OVERVOLTAGE CATEGORY: Classification of parts of installation systems or circuits with standardized limits for transient overvoltages, dependent on the normal line voltage to earth . (Ref. IEC 664)

POLLUTION: Any addition of foreign matter, solid, liquid or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity.

POLLUTION DEGREE: For the purpose of evaluating clearances the following two degrees of POLLUTION in the micro-environment are recognized for use in accordance with IEC 664.

POLLUTION DEGREE 1: No POLLUTION or only dry non-conductive POLLUTION occurs. The POLLUTION has no influence.

POLLUTION DEGREE 2: Normally only non-conductive POLLUTION occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

Appendix E: Descriptions of Replacement Parts

These descriptions correspond to numbers pictured in Figure 7 on page 12.

- 1 - 106-0153 **PCB Edgeguard Connector:** 22 to 14 AWG, 5/10 A, 300 V, 15 position. Allows electrical connection to card in vertical mounting configuration.
- 2 - 106-0155 **PCB Mating Card Connector:** 0.200" spacing, 300V, 10 amp. Optional connector for electrical connection to card in horizontal mounting configuration.
- 3 - 108-0057 **(2) Fuses:** T80mA 250V, for 115V operation
- 4 - 108-0056 **(2) Fuses:** T40mA 250V, for 230V operation
- 5 - 108-0005 **(2) Fuse Cover:** 600V, 105°, blue flex PVC. Insulate and protect fuses.
- 6 - 112-0041 **DIN Rail Mounting Clip:** Type MOFU for 35mm rail. Optional DIN Rail Clip: 112-0032 Type EM-MP, 45N, 45mm x 68mm. Both allow vertical mounting to DIN rail.
- 7 - 112-0033 **(2) Card Edge Guide:** 4.724" high. Holds card for vertical mounting.
- 8 - 323-0421 **Mounting Plate:** Sheet metal, black finish. For vertical mounting with DIN rail, housing, or both.
- 9 - 323-0422 **Housing:** Sheet metal, black finish. Used as unit enclosure.
- 10 - 323-0423 **Legend Plate:** Aluminum with TI-17 artwork. Shows front of unit with meter adjustments.
- 323-0561 **Legend Plate:** Aluminum with TI-17A artwork. Shows front of unit with meter adjustments

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.

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 one year from date of original 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 misuse. 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. 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 Buyer expects credit, exchange, 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 letter of credit approved by an officer of the Company. An additional charge of 2% will apply to any letter of credit. There will be an extra charge for packaging and documentation.

NOTES:

INDEX

0-1 mA	2	Operating Instructions	9
0-10 Volt Tension Output	2	Options	3
230 Volt Power	2	Output,	
4-20mA	2	0-1 mA	2
		4-20mA	2
		0 to +10V	2
AC Power Connections	7	Power Voltage Selection	2,13
Accessories	3	Replacement Parts	12
		numbers and descriptions	20
Cables	6	Safety Requirements	6
Calibration,		Set-up	8
range	2	Specifications	2
tension meter	8	Standard Features	2
Care and Maintenance	10		
Circuit Card	12, 13	Tension Meter	2,8
connector, Optional	2, 3, 20	remote location	3
		standard scales	2
Descriptions	1	Temperature Range	2
Dimensions	4-6	Terms & Conditions	21
Disassembly	1	Transducer,	
		cables	6
Electrical Connections,		connections	14-17
standard	7	excitation	2
transducer	14-17	input	2
Environmental Conditions	2	Troubleshooting	11
terms	19	Typical Tensions	18
Excitation	2		
Exploded View	1	Versions	1
Extended Range	3	Weight	2
Fuses	7, 10, 12, 20	Zero	8
		range	2
Input	2		
Installation	7		
Isolation from Earth Ground	2		
Meter,			
analog	2		
calibration	8		
damping	2, 8		
dimensions	6		
mechanical Zero	8		
meter scales	2		
non-standard meter scales	3		
remote tension meter	3		
Mounting Location	6		



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