



INSTRUCTION MANUAL

**MODEL T15
TENSION INDICATOR**

DFE DOVER FLEXO ELECTRONICS, INC.
217 Pickering Road

Rochester, NH 03867-4630 U.S.A.

For assistance, please call:

TECHNICAL SERVICE - Installations, Start-Up, Troubleshooting, Repairs, Field Service, Returns. **techsupport@dfc.com**

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Telephone: (603) 332-6150 Fax: (603) 332-3758

E-mail: info@dfc.com Internet: www.dfc.com

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1.1 GENERAL DESCRIPTION

The TI-5 Tension Indicator is used anywhere the tension in a web should be accurately known. Tension is sensed by a pair of Dover tension transducers mounted on an idler roll. The web traveling over the roll produces an electrical output signal which is directly proportional to web tension. Each transducer signal is amplified separately by the indicator circuitry thus allowing the left, the right, or the total tension to be displayed on the tension meter. This tension is calibrated to read actual web tension, in pounds.

Once web tension is known, the operator can make machine adjustments to produce the correct tension level or pattern. The result is improved productivity and quality, and less waste. Auxiliary tension signal outputs are included for interfacing with recorders or drive systems for control of tension. High and low tension detectors and a web break detector are available to provide alarms or control, or to shut the machine down if tension is incorrect.

1.2 SPECIFICATIONS

Power input:	120 Volts, 60Hz @ 1/4 AMP
	Current: 0.25 Amp
Outputs: Low voltage:	0-100 mVDC @ 10mA
High voltage:	Adjustable 0-3.5 V to 0-13 VDC @ 2 mA proportional to total Tension
Transducer power supply:	5 VDC , regulated (10 VDC for Extended Range option)
Auxiliary power supply:	5 VDC @ 200 mA, regulated
Transducer signal input:	nominal 500 mVDC at rated load of transducers
Meter:	6" analog taut band, 2%, 100 µa DC with 1k Ohm coil and solvent proof front
Zero range:	95% of transducer rating, minimum
Calibration range:	25:1
Temperature range:	32°F to 104°F (0°C to 40°C)
Transducer cable mating connector:	Amphenol MS3106A-10SL-3S
Weight:	10 lbs. (4.5 kg)

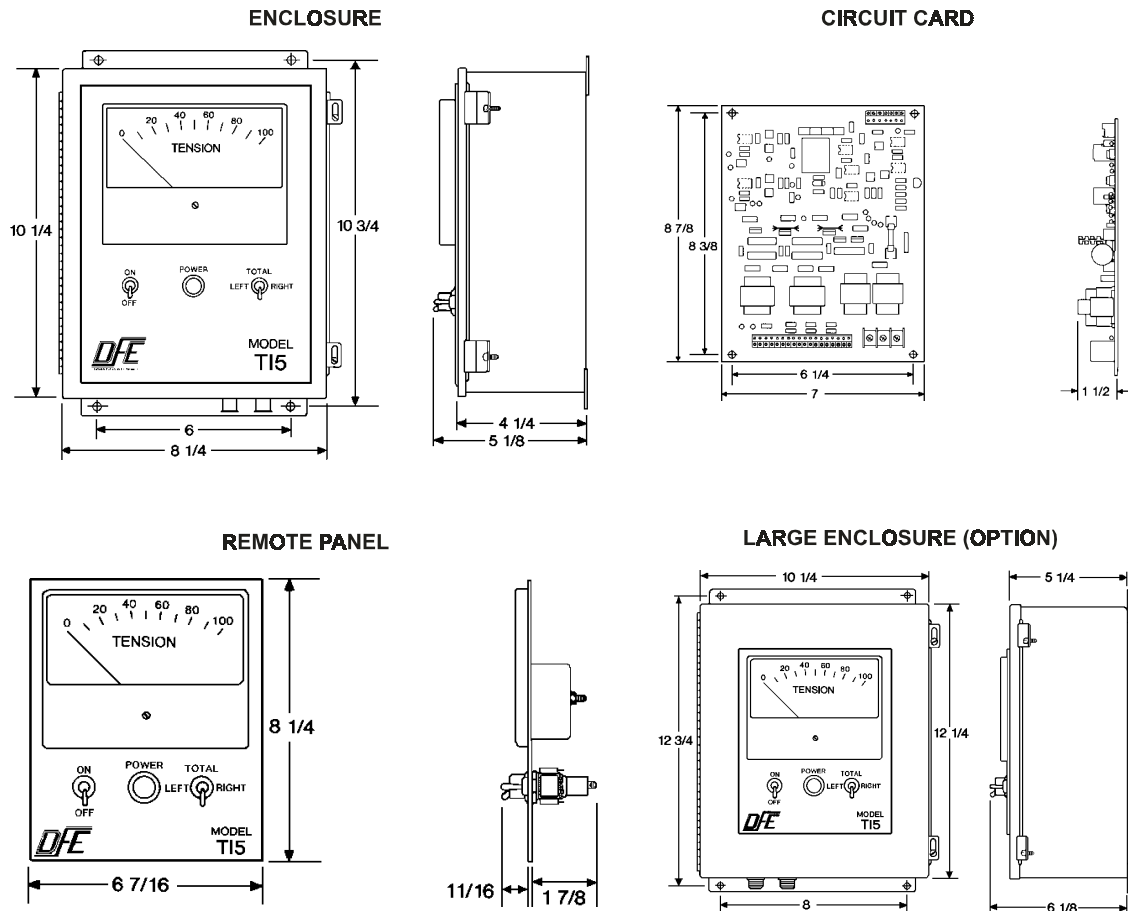
1.3 STANDARD FEATURES

- 115 Vac 60 Hz power input.
- NEMA 12, 13 wall mounted steel enclosure with all operator devices on cover.
- Red indicating light for AC power.
- 6" analog tension meter with any standard scale
- 0-100mVdc output proportional to total tension
- Adjustable 0-3.5 to 0-13Vdc output proportional to total tension.
- Single circuit card with unpluggable terminal strip for all electrical connections except AC power.
- Three position selector switch to allow alternate display of left side, right side, and total tension.

1.4 OPTIONS

- **230V (230)** 50Hz AC power input.
- **20mA DC & 4-20mA DC (020, 420)** Outputs for both standard and non-standard ranges. 470 Ohm maximum load resistance . Proportional to tension.
- **5 Volt (5V)** power supply.
- **Attached Power Cord (APC)** A heavy duty 3 conductor power cord wired to the device by DFE.
- **Auxiliary Tension Meter (ATM)**. An additional meter to the standard one in the unit. Also available in its own enclosure (ATME).
- **Circuit Card Configuration (CC)**. No enclosure or operator devices for custom mounting.
- **Dual Calibration (DC)**. Includes dual meter scale (Hi/Lo) and switch.
- **Digital Meter (DM)**. Digital tension meter in place of analog meter.
- **Isolated 10Volt (I10)**. A 0 to 10 Volt output not connected to circuit common or to earth ground.
- **Large Enclosure (LE)**. A larger enclosure than standard. Must be used with I10 and TLS options.
- **Negative 10Volt (N10)**. Output goes from 0 to -10V instead of from 0 to +10V.
- **Non-Standard Meter Scale (NMS)**. Custom scale other than standard scales listed.
- **Remote Meter in Enclosure (RME)**. The std. meter in an enclosure for remote installation.
- **Remote Operator Panel (ROP)**. Operator devices installed in a separate panel for remote installation attached to indicator with 6' standard cable.
- **Tension Limit Switch (TLS)**. Operates a relay when tension reaches an adjustable set point. Used for web break detection. TLS card can also be installed in its own enclosure (TLSE).
- **Extended Range (XRE)**. For extra sensitivity at low tension. Transducers must also have XR option.

2.1 DIMENSIONS



2.2 INSTALLATION AND OPERATION

INSTALLATION

1. Install the tension transducers. Refer to the Instruction manual that was included with your transducers. When the Extended Range option is used, ensure that the transducers are also Extended Range transducers.

NOTE: Using +10V excitation for other than Extended Range transducers, will damage your transducers!

2. Mount the TI-5 in a convenient location away from heat and vibration.
3. Connect a transducer cable to each transducer. Use the longer cable on the farthest away from the indicator.
4. Connect the other end of the cables to the receptacles on the bottom of the indicator cabinet.
5. Connect 120 VAC 50/60 Hz into the indicator cabinet. Refer to the external wiring diagram for proper termination.

OPERATION

Operation of the indicator is fully automatic. Flip the toggle switch (on the front of the cabinet) up to the "ON" position to apply power. The red pilot light will glow as long as power is on. If the switch is on, but the light does not glow, check the 117 Volt source and the 1/2 amp fuse on the indicator panel.

3.1 TARE (ZERO) ADJUSTMENT

1. Turn the power "off" to the indicator. Observe the tension meter. If the needle is not on zero, adjust the screw on the meter face until the needle rests on zero.
2. Turn on power and allow the indicator to warm up for five minutes.
3. Switch the L-R-T switch to Left (L). Open the door of the indicator and, using a small screwdriver, turn the "Left Zero" pot. until the meter reads zero. The needle moves upscale when the pot. is turned clockwise (CW).
4. Switch the L-R-T switch to Right (R). Using a small screwdriver turn the "Right Zero" pot. until the meter reads zero. The needle moves upscale when the pot. is turned clockwise (CW).

3.2 CALIBRATION ADJUSTMENT

5. Keeping the switch in the (R) position, thread a length of rope over the *center* of the tension sensing roll following the *exact* same path the web will take.

NOTE: Each transducer is calibrated separately and it is important for proper calibration that the rope is centered on the sensing roll.

Do NOT pass the rope over dead-bars, driven rolls, braces, or any other non-free wheeling member. The sliding friction introduced by these members will cause inaccurate calibration. Fasten one end of the rope securely.

6. Attach a weight of known value to the other end of the rope. Its weight should be about half the maximum scale reading of the tension meter. A spring scale can also be used to apply the required force.
7. Adjust the "Right Cal" pot. until the tension meter reads exactly half of the known weight being applied to the sensing roll.
8. Remove the load from the sensing roll and observe the tension meter. If it does not read zero, repeat Step 4.
9. With the weight removed, switch the L-R-T switch to the (L) position. Adjust the "Left Cal" pot. until the tension meter reads exactly half of the known weight being applied to the sensing roll.
10. Remove the load from the sensing roll and observe the tension meter. If it does not read zero, repeat Step 3.
11. Continue to repeat Steps 7, 8, 9, and 10 until the tension meter reads half the applied weight AND returns to zero when the weight is removed.
12. Switch the L-R-T switch to the Total (T) position. The tension meter should read the same value as the known weight being applied over the sensing roll.

THIS COMPLETES THE CALIBRATION PROCEDURE

4.1 100 MV OUTPUT

Terminals 3(+) and 1(-) on TB3. This output is usually fed to a tension recorder for permanent record of tension patterns and levels. Output is 100 mV when tension meter reads full scale and V-OUT is adjusted for 10V, and varies directly with total tension. Minimum input resistance of recorder should be 10,000 Ohms.

4.2 VOLTAGE OUTPUT, ADJUSTABLE

Terminals 6(+) and 1(-) on TB3. Normal adjustment range is 4V to 13V, measured when tension meter reads full scale. This output varies directly with total tension, and can be used for display or control purposes. Minimum load resistance should be 10,000 Ohms. The standard output is positive-going. A negative-going output is optional. The output is factory set for 10V. Adjust the V-OUT pot. to vary the voltage.

SECTION 5

PREVENTIVE MAINTENANCE

Preventive maintenance for electronic equipment consists of keeping it clean. Layers of dust cause overheating of electronic components. If the dust is conductive, it can cause short circuits and produce all kinds of strange behavior.

Check the equipment at least once a month. It does not take long and could prevent costly down-time.

**DO NOT USE COMPRESSED AIR FOR CLEANING
DAMAGE COULD RESULT**

Use a dry, soft brush to remove dust. If a solvent is necessary, use Denatured Alcohol.

6.1 20 MA CURRENT OUTPUT:

Terminals 7(+) and 1(-) on TB3. This output is 20 mA when the tension meter reads full scale, and varies directly with the tension. It is factory set for 0 to 20 mA. A 4 to 20 mA output is available if specified at the time of purchase. The load resistance must be between 0 and 470 Ohms. If necessary, adjust the I-OUT pot. to vary the current.

6.2 DIGITAL METER:

Connected to the low voltage output, terminals 1(+) and 2(-) on TB2. The optional 5 V, 0.2 Amp DC power supply is required to power the meter. The value of R20 may be changed to accommodate various meter scales.

6.3 DUAL METER SCALE:

The standard meter scale is calibrated with the Zero 1 and Cal 2 pots. If a lower range is required, close S2 (ref. drawing E1073D). This energizes relay K1, which switches in the Zero 2 and Cal 2 pots. These are used to calibrate the lower meter scale.

6.4 AUXILIARY TENSION METER / AUXILIARY TENSION METER IN ENCLOSURE (ATM / ATME)

Connect the two meter leads (or the two cable leads if you have an enclosure version) to TB3 - 3(+) and TB3 - 2(-). The auxiliary meter will only display the total tension. R59 should not be installed in the circuit card.

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 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, 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 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 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

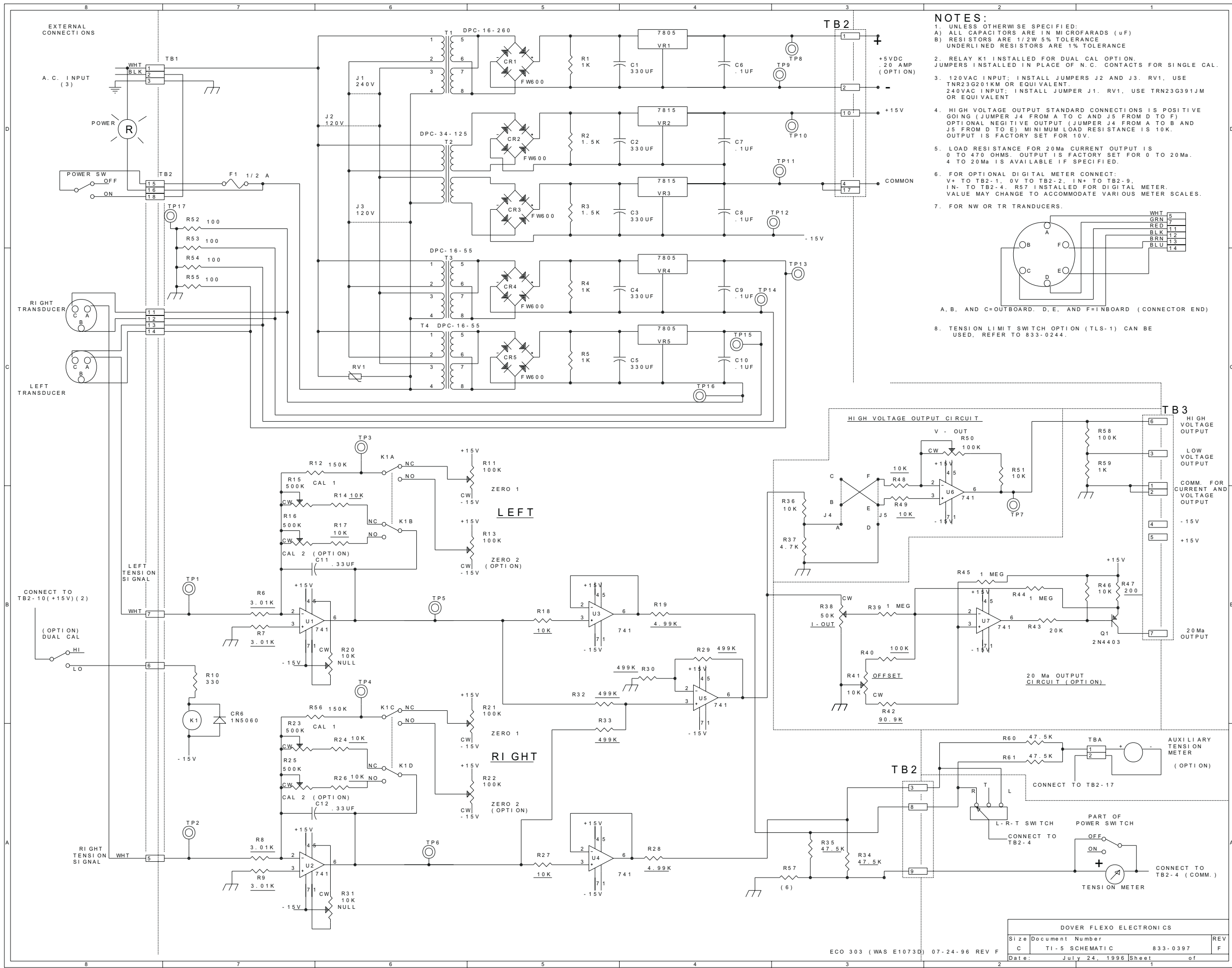
Products sold are to remain the property of the Company until full payment of the purchase price is made.

DOVER FLEXO ELECTRONICS

Left-Right-Total
Tension Indicator

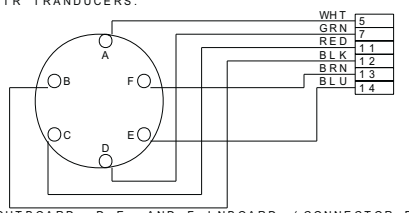
MODEL: TI-5-LRT
DIAGRAM:
REF:

	DES	PART	DESCRIPTION	QTY		MFR
1			Diagrams			
2		833-0397	TI5 Schematic	1		
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NOTES:

1. UNLESS OTHERWISE SPECIFIED:
- A) ALL CAPACITORS ARE IN MICROFARADS (uF)
- B) RESISTORS ARE 1/2W 5% TOLERANCE
UNDERLINED RESISTORS ARE 1% TOLERANCE
2. RELAY K1 INSTALLED FOR DUAL CAL OPTION.
JUMPERS INSTALLED IN PLACE OF N.C. CONTACTS FOR SINGLE CAL.
3. 120VAC INPUT; INSTALL JUMPERS J2 AND J3. RV1, USE
TRN23G201KM OR EQUIVALENT.
4. HIGH VOLTAGE OUTPUT STANDARD CONNECTIONS IS POSITIVE
GOING (JUMPER J4 FROM A TO C AND J5 FROM D TO F)
OPTIONAL NEGATIVE OUTPUT (JUMPER J4 FROM A TO B AND
J5 FROM D TO E) MINIMUM LOAD RESISTANCE IS 10K.
OUTPUT IS FACTORY SET FOR 10V.
5. LOAD RESISTANCE FOR 20Ma CURRENT OUTPUT IS
0 TO 470 OHMS. OUTPUT IS FACTORY SET FOR 0 TO 20Ma.
4 TO 20Ma IS AVAILABLE IF SPECIFIED.
6. FOR OPTIONAL DIGITAL METER CONNECT:
V+ TO TB2-1, 0V TO TB2-2, IN+ TO TB2-9,
IN- TO TB2-4. R57 INSTALLED FOR DIGITAL METER.
VALUE MAY CHANGE TO ACCOMMODATE VARIOUS METER
SCALES.
7. FOR NW OR TR TRANSDUCERS.



A, B, AND C=OUTBOARD. D, E, AND F=INBOARD (CONNECTOR END)

8. TENSION LIMIT SWITCH OPTION (TLS-1) CAN BE USED, REFER TO 833-0244.

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Date:	July 24, 1996	Sheet of



217 PICKERING ROAD
ROCHESTER, NEW HAMPSHIRE 03867-4630 U.S.A
TEL: 603-332-6150
FAX: 603-332-3758
E-mail: info@dfec.com Internet: www.dfec.com

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