

INSTRUCTION MANUAL

TI-7 TENSION INDICATOR

DOVER FLEXO ELECTRONICS
93 Pickering Rd.
Rochester, NH 03867
PHONE (603) 332-6150 FAX (603) 332-3758

TABLE OF CONTENTS

<u>SECTION</u>	<u>SUBJECT</u>	<u>PAGE</u>
1	INSTALLATION AND OPERATION	1
2	CALIBRATION	2
3	AUXILIARY OUTPUT	3
4	PREVENTIVE MAINTENANCE AND REPAIR	4
5	OPTIONAL CIRCUITS	5
	TERMS AND CONDITIONS OF SALE	6
	DIAGRAMS	7

INSTALLATION

1. Intrinsic safety can not be guaranteed if associated apparatus (meters, transducers, and cables) are not supplied by DOVER FLEXO ELECTRONICS. The TI-7 tension indicator is intended for use in Class 1 and 2, Division 1 and 2, Group C, D, E, F, and G areas only.
2. Install the tension transducers. Refer to the Transducer Instruction Manual you received 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!

3. Mount the indicator cabinet in a convenient location in safe area only away from heat and vibration. [Operating temperature 32°F to 104°F (0°C to 40°C)].
4. Connect a transducer cable to each transducer. Use the longer cable on the one farthest away from the indicator.
5. Connect the other end of the cable to the Terminal Block provided. (ref. E1708D).
6. Connect 120 Volts, 60 Hz. AC (240 Volts, 50 Hz is optional) to terminals 1 and 2 on TB2. Connect the ground wire to TB2-3.

OPERATION

Operation of the indicator is fully automatic. Apply AC power to energize circuitry.

WARNING

EXTERNAL GROUND BOLT MUST BE CONNECTED TO EARTH GROUND TO ENSURE INTRINSIC SAFETY. SEE DIAGRAM E1708D TO ENSURE PROPER CONNECTIONS ARE MADE.

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. Open the door of the indicator and, using a small screwdriver, turn the Zero 1 pot. until the meter reads zero. The needle moves upscale when the pot. is turned clockwise (CW).

CALIBRATION ADJUSTMENT

4. Thread a length of rope over the *center* of the tension sensing roll following the *exact* same path the web will take. 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.
5. 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.
6. Turn the Cal 1 pot. until the tension meter reads the same as the known weight being applied to the sensing roll.
7. Remove the load from the sensing roll and observe the tension meter. If it does not read zero, repeat Step 3.
8. Apply the load to the sensing roll again and repeat Step 6.
9. Repeat Steps 6, 7, and 8 until the tension meter reads the same as the applied weight *and* returns to zero when the weight is removed.

THIS COMPLETES THE CALIBRATION PROCEDURE

SAFE AREA

1. 100 mV output - Terminals 10(+) and 7(-) on TB2. 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.
2. Voltage Output, adjustable - Terminals 11(+) and 9(-) on TB2. Normal adjustment range is 4 V to 13 V, 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 10 V. Isolated output is standard.

SECTION 4

PREVENTIVE MAINTENANCE AND REPAIR

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.

REPAIR

There are no serviceable parts or components to the TI-7. Repair is to be done by a qualified DOVER FLEXO ELECTRONICS Technician only. Repair by other than a DFE Technician will void warranty and may impair intrinsically safe circuitry, thus creating a potential hazard.

SAFE AREA20 mA Current Output:

Terminals 12(+) and 9(-) on TB2. 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.

Digital Meter:

Connected to the low voltage output, terminals 10(+) and 7(-) 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.

Dual Meter Scale:

The standard meter scale is calibrated with the Zero 1 and Cal 2 pots. If a lower range is required, close the Dual Cal switch (ref. drawing 832-0402). This energizes relay K1, which switches in the Zero 2 and Cal 2 pots. These are used to calibrate the lower meter scale.

HAZARDOUS AREAMeter in Hazardous Area

Use terminals 13(+) and 17(-) on TB1. ***Intrinsic safety can not be guaranteed if meter is not specified and approved by DOVER FLEXO ELECTRONICS.***

SECTION 6

SPECIFICATIONS

T17 Tension Indicator specifications:

Power input:	Voltage: 120 Volts, 60Hz Current: 0.25 Amp
Outputs (proportional to tension):	
Low voltage:	0-100 mVDC @ 10mA
High voltage:	0-10 VDC @ 2mA non-adjustable, 5k Ohm, min. load resistance
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
Zero range:	95% of transducer rating, minimum
Calibration range:	25:1
Temperature range:	32°F to 104°F (0°C to 40°C)
Hazardous areas:	Class I, II, III, Division 1, 2, Groups C, D, E, F, G
Weight:	16 lbs. (7.2 kg)

Available Options:

Remote mounted tension meter in 6 x 8 x 4 inch enclosure	RME
Loose tension meter for remote mounting	RTM
Digital tension meter, 3 1/2 digit, red LED 1/2" high (includes 5 volt power supply)	DM
0-20 mA DC output proportional to tension (470 Ohm maximum load resistance)	020M
4-20 mA DC output proportional to tension (470 Ohm maximum load resistance)	420M
Dual calibration (includes dual meter scale and switch)	DC
Non-standard meter scale (specify)	NMS
220 V 50 Hz, AC power input	220
Negative 10 VDC output	N10

Attached power cord; type SJ, 3 conductor, 5' long	APC
Single transducer operation (except Narrow Web [NW] and Tension Roll [TR] transducers)	ST
0-10 VDC isolated output proportional to tension	I-10
Enclosure for TLS card 6 x 8 x 4"	TLSE
Low and High tension detector with two separate SPDT relay outputs	TLS*

**The TLS circuit operates on the total tension signal. Large enclosure is required.*

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 mis-use. 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 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 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.

DOVER FLEXO ELECTRONICS

Intrinsically Safe
Tension Indicator

MODEL: TI-7
DIAGRAM:
REF:

	PART	DESCRIPTION	QTY		MFR
1		Diagrams			
2	813-0590	Layout, Chassis	1		
3	832-0402	External Wiring	1		*
4	833-0189	Tension Amp Schematic	1		*
5	833-0477	Power Supply Schematic	1		*
6	833-0492	Isolation PCB	1		*
7	833-0591	Interconnect Wiring Diagram	1		
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

4

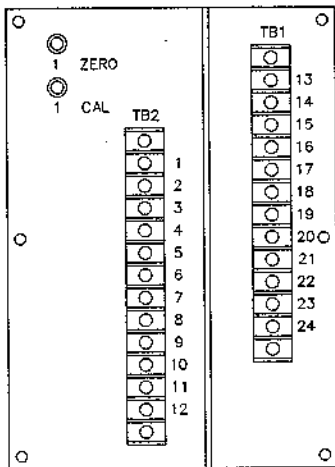
3

2

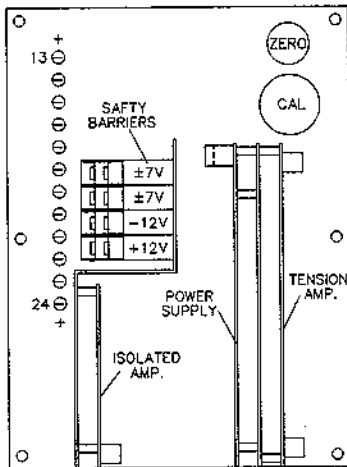
1

COMPANY CONFIDENTIAL

THE SMALLEST NOTICES INCLUDES WHICH DENIES PROPRIETARY INFORMATION WHICH IS THE CONFIDENTIAL PROPERTY OF DOVER FLEXO ELECTRONICS. NONE OF WHICH SHALL BE COPIED, REPRODUCED, DISCLOSED TO OTHERS, PUBLISHED OR USED IN WHOLE OR IN PART, FOR ANY PURPOSES OTHER THAN THAT FOR WHICH IT IS BEING MADE AVAILABLE. EXCEPT THE EXPRESS WRITTEN PERMISSION OF A SALES AUTHORIZED AGENT OF THE COMPANY, THIS DOCUMENT IS THE PROPERTY OF DFE AND IS TO BE RETURNED TO THE COMPANY ON DEMAND.

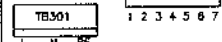


FRONT



REAR

SIGNAL ISOLATION PCB
BRD. NO. 523-0201 REV 0
SCHEMATIC 833-0492
ASSEMBLY 723-1144



POWER SUPPLY
BRD. NO. 843-0186
SCHEMATIC 833-0477
ASSEMBLY 723-0357

TENSION AMPLIFIER
BRD. NO. 843-0191
SCHEMATIC 833-0189
ASSEMBLY 723-0366

REV	DATE	DESCRIPTION	FILE STORAGE NAME	ITEM NO.	QUANTITY	PART NO.	DESCRIPTION
662	4/27/98	THIS ITEM SHALL CONFORM TO WORKMANSHIP SPECIFICATION 821-0338 UNLESS OTHERWISE SPECIFIED SURFACE QUALITY SHALL BE	8130590.DWG	11-7	1	C.S.R. 6/25/98	DOVER FLEXO ELECTRONICS 50 PERIODS RD. WILMINGTON, DEL 19807-0606 USA
		UNLESS OTHERWISE SPECIFIED SURFACE QUALITY SHALL BE				ENG: <i>AL</i> 4/27/98	TITLE: LAYOUT, CHASSIS
		UNLESS OTHERWISE SPECIFIED SURFACE QUALITY SHALL BE					SIZE: C SCALE: N/A SH: 1 OF 1
		UNLESS OTHERWISE SPECIFIED SURFACE QUALITY SHALL BE					DWG NO: 813-0590 REV: A

4

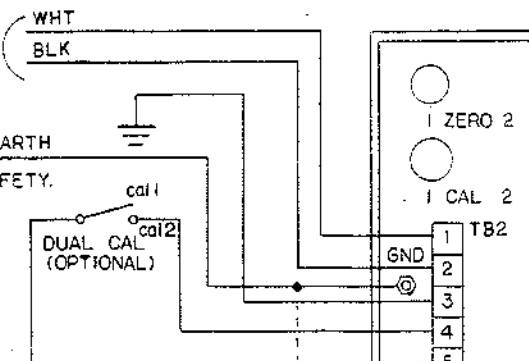
3

2

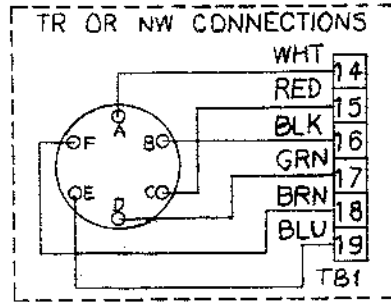
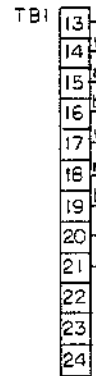
1

A.C. INPUT

✦ GROUND LUG MUST BE EARTH GROUNDED TO ENSURE INTRINSIC SAFETY.



SEE MANUAL FOR SPECIAL PRECAUTIONS



TENSION METER

- (1) COMMON FOR HIGH V-OUTPUT
- 100MV OUTPUT
- (1) HIGH V-OUTPUT
- 20MA OUTPUT OR ±5VDC

SAFE AREA

HAZARD AREA

NOTES:
1) CONNECTION ISOLATED



CLASS I-2-3
DIVISION 1&2
GROUPS C-D
E-F-G

NOTE: FOR OPTIONAL MARTEL DIGITAL METER CONNECT:

- TI-7 METER
- TB2 PIN 8 0
- TB2 PIN 10 IN HI OR MEASURE INPUT
- TB2 PIN 12 +5VDC

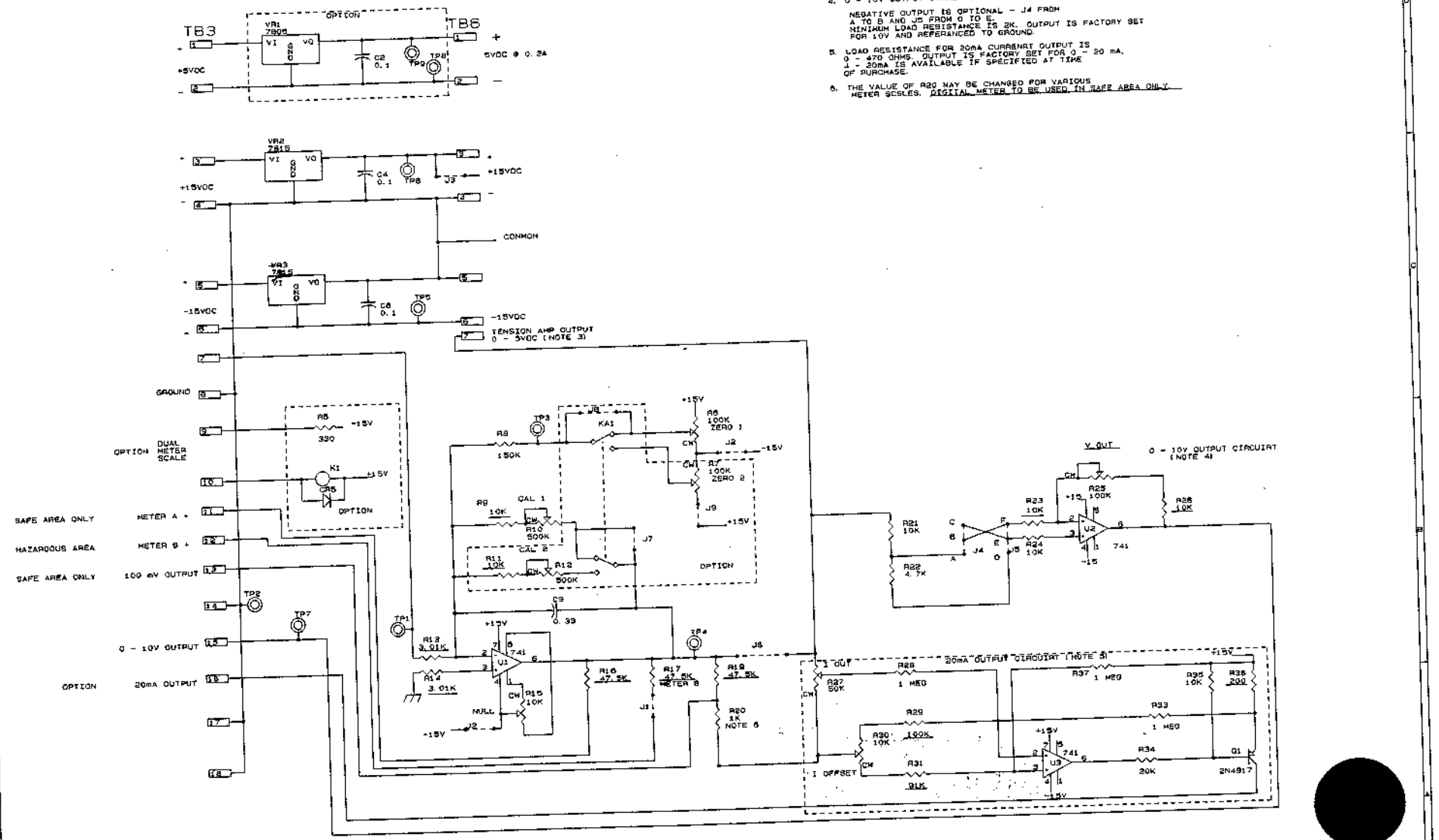
THE VALUE OF R20 MAY CHANGE TO ACCOMMODATE VARIOUS METER SCALES, NOTE ON SOME METER SCALES IT IS NECESSARY TO CONNECT DV IN TO IN LO.

DIGITAL METER TO BE USED IN NON-HAZARDOUS AREAS ONLY

725	RSB	9/23/85	E	MATL.	REF.	PART	DOVER FLEVO ELECTRONICS INC. ROCHESTER, N.H. 03867
662	KM	4-27-85	D	KC 4/27/85	WAS E1164B		
303	LSR	12/21/85	C	MACHINED LIMITS UNLESS OTHERWISE SPECIFIED	DIMENSION UNLESS SPECIFIED	MODEL E17	DR. BY MAC
-	RT	6/25/87	B	.X ± .04	.XX ± .02	USE EXTERNAL WIRING	SCALE
-	MC	11-10-87	A	.XXX ± .005			DRAWING NO. 832-0402
ECO	BY	DATE	REV.				

NOTES:

- UNLESS OTHERWISE NOTED:
 A) ALL CAPACITORS VALUES ARE IN MICROFARADE (UF)
 B) ALL RESISTORS ARE IN OHMS, 1/4 W 5% TOLERANCE
- UNDERLINED RESISTORS ARE 1% TOLERANCE
- MEASURED WHEN TENSION METER READS FULL SCALE
- 0 - 10V OUTPUT STANDARD CONNECTION IS: PU, PA; S10, D, 152; PU, PA; S20, 5955; L6-J4 FROM A TO C AND J5 FROM D TO TC
 NEGATIVE OUTPUT IS OPTIONAL - J4 FROM A TO B AND J5 FROM C TO E.
 MINIMUM LOAD RESISTANCE IS 2K. OUTPUT IS FACTORY SET FOR 10V AND REFERENCED TO GROUND.
- LOAD RESISTANCE FOR 20MA CURRENT OUTPUT IS 0 - 470 OHMS. OUTPUT IS FACTORY SET FOR 0 - 20 MA.
 1 - 20MA IS AVAILABLE IF SPECIFIED AT TIME OF PURCHASE.
- THE VALUE OF R20 MAY BE CHANGED FOR VARIOUS METER SCALES. DIGITAL METER TO BE USED IN SAFE AREA ONLY.

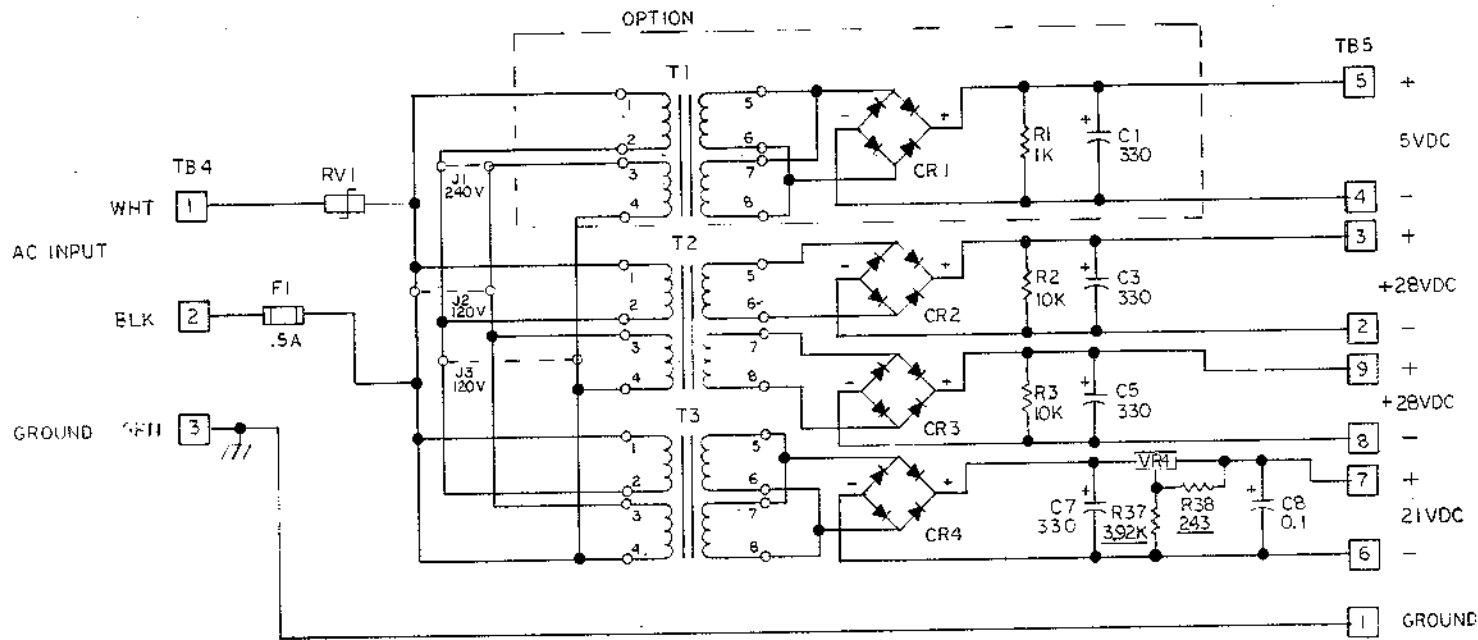


- OPTIONS:
- A. STANDARD
 - B. DUAL CAL
 - C. 20MA OUTPUT
 - D. DIGITAL METER

REFER TO:
 843-0181 FOR BOARD NUMBER
 723-0386 FOR ASSEMBLY DRAWING
 721-0387 FOR S. O. M.

DOVER FLEXO ELECTRONICS	
Title	TI-7 TENSION AMP SCHEMATIC
Size	Document Number
C	833-0189
Date	March 31, 1982 Sheet 1 of 1

274 3/8/85 A
 ECD DATE REV



NOTES:

1. UNLESS OTHERWISE NOTED:
 - A.) ALL CAPACITOR VALUES ARE IN MICROFARADS(μ f)
 - B.) ALL RESISTORS ARE IN OHMS, 1/4 W 5% TOLERANCE
2. UNDERLINED RESISTORS ARE 1% TOLERANCE
3. 120VAC INPUT: INSTALL JUMPERS J2+J3
 RVI USE 6EVI30LA20B.
240VAC INPUT: INSTALL JUMPER J1
 RVI USE 6EV250LA40B

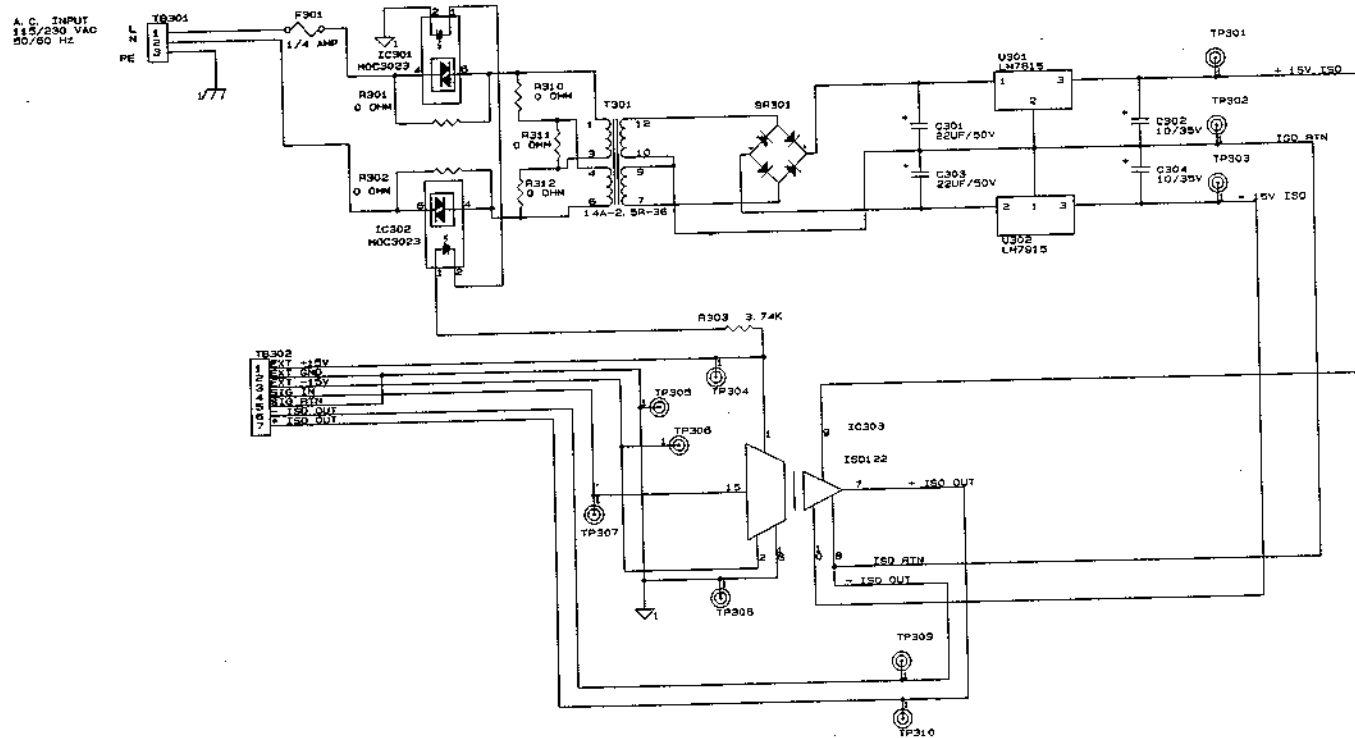
REFER TO:

843-0186 FOR BOARD NUMBER
 723-0357 FOR ASSEMBLY DWG.
 PL1700A FOR PARTS LIST

MATERIALS		REV. WAS	PART SCHEMATIC, POWER SUPPLY		DOVER FLECO ELECTRONICS INC.	
MACHINED DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED		ELECTRICAL		ROCHESTER, N. Y. 02007		
303	APPROVED	MODEL Y17		DR. BY	DATE	SCALE
ECO	BY DATE REV.	.X	1 .04	TR	7-1-68	1X
		.XX	1 .02	DRAWING NO. 843-0186		
		.XXX	1 .005			

NOTES:

1. FOR 115VAC INPUT INSTALL R310 AND R312 ONLY
FOR 230VAC INPUT INSTALL R311 ONLY
2. IC301 AND IC302 MAY BE BY-PASSED
BY INSTALLING R301 AND R302 IF NECESSARY



TB302
 1 -15V
 2 -15V
 3 -15V
 4 ISD ATN
 5 ISD OUT
 6 ISD OUT
 7 ISD OUT

DOVER FLEX ELECTRONICS	
Title	ISOLATION PCB
File Document Number	REV
C	833-0482 *
Date	JULY 17, 1988 Sheet 1 of 1

