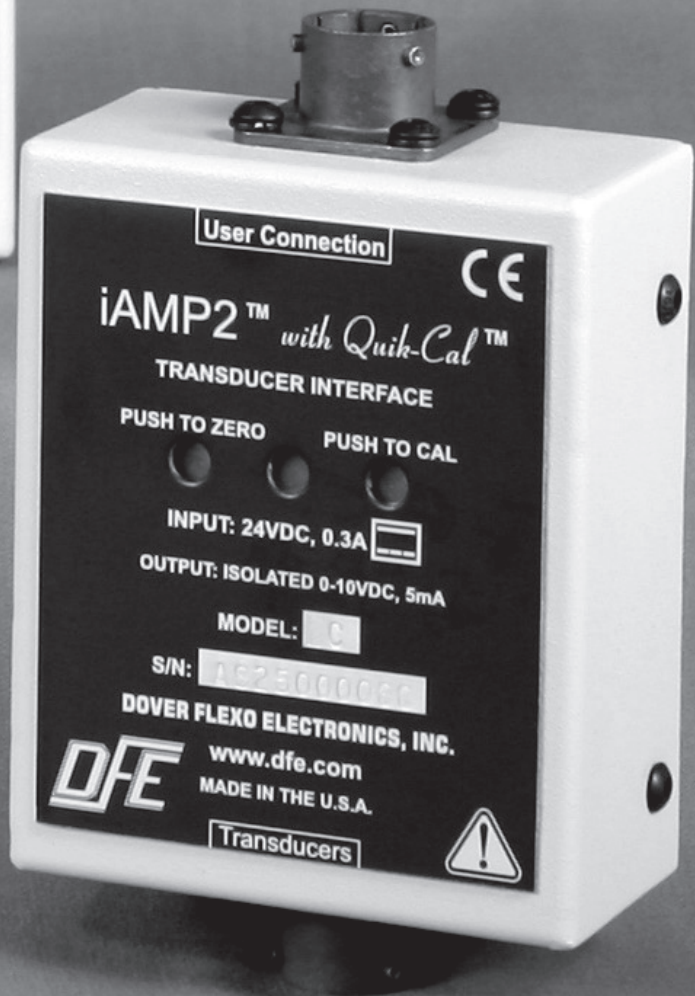


INSTRUCTION MANUAL
Inline Tension Amplifier

iAMP2™

DOC 801-2211



5 YEAR WARRANTY



307 Pickering Road

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

For assistance, please call:

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

CUSTOMER SERVICE - Replacement Parts, Individual Products, Questions about Orders, Manuals. **customerservice@dfe.com**

SALES - Product Information, Systems Application Questions, and placing orders for standard products and special systems. **sales@dfe.com**

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

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

SAFETY



This label indicates: "Read the manual"

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your **iAMP2 Inline Tension Amplifier**. If you have any questions concerning the operation of your Tension Amplifier or the information in this manual, please contact us.

Email: techsupport@dfc.com

Telephone: (603) 332-6150

- **Observe all warning labels.**
- **Never remove warning labels.**

Symbols used in this manual:

⚠ WARNING = This instruction must be followed to avoid a risk of death or serious injury

⚠ Caution = This instruction must be followed to avoid a risk of personal injury

! IMPORTANT = This is additional instruction / information which must be followed to avoid a risk of functionality and/or damage to the equipment

⚠ WARNING: Never operate the Tension Amplifier with damaged cords.

⚠ 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 isolated output is designed to prevent ground loops and noise. It is not intended or approved for safety isolation of hazardous voltages. Do not install unit where isolated circuit and chassis ground are more than 40Vpk differential.

⚠ WARNING: Do not connect standard transducers to iAMP2 units having the Extended Range (XRE) option. The transducers **MAY** be **DAMAGED!**

⚠ WARNING: No user replaceable parts inside. Modifications to product internals invalidates CE approval and warranty of the product. Do not attempt to replace or remove the internal fuse, it is self resetting and not replaceable by user. Attempts to bypass or replace the fuse **MAY CAUSE A FIRE HAZARD.**

! IMPORTANT: The DFE iAMP2 you have purchased has been tested and meets the European Union's Low Voltage Directive and EMC Directive only when installation is done correctly. Secure all wiring to prevent inadvertent removal or strain.

! IMPORTANT: When making your connection to the DFE iAMP2, in order to comply with the EMC directive:

- Use shielded cable or DFE approved shielded cables. See Appendix A on page X for approved cable list.
- Connect the remote end of the User Connections cable shield to earth ground with 360° bonding.

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

The iAMP2 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 the button once, hold for one second, and you are done!

No tension display is needed. 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 and hold 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 and hold for one second, the indicator will produce full output at 150 lbs. tension. Optional 1:4 or 25% CAL ratio is available.

Be sure the transducers are sized properly for the maximum tension you calibrate for.

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.

The iAMP2 is CE marked in all configurations when properly installed.

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1.1 GENERAL DESCRIPTION

The iAMP2™ is designed to provide an isolated 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. The iAMP2 also has a separate output to allow the user to connect an analog meter to indicate operating tension.

The iAMP2 is available in two versions: C and T. The unit connects in-line via cables (C), or with discrete wiring with terminal block connections (T).

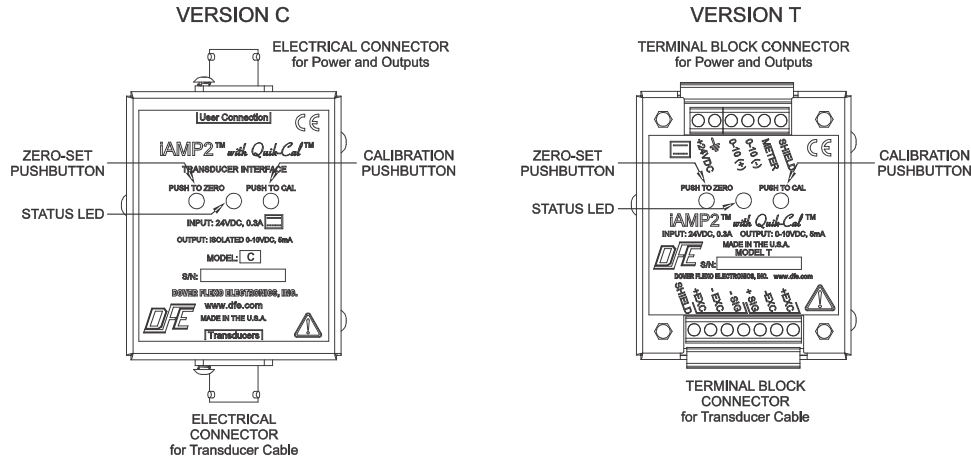


Figure 1 - FRONT VIEWS OF VERSIONS C AND T

1.2 SPECIFICATIONS

Power Input:	Voltage	24 Vdc +/- 10%.
	Current	0.1Adc typical. 0.3Adc internal fusing.
Tension Signal Outputs:		0 to +10Vdc at 5 mA tension output, isolated from input power and transducer circuit. Capable of over-range, -15% to 120% of full scale (-1.5Vdc to 12Vdc), to indicate over-range or error conditions.
		0 to 1mA meter output for optional 50 Ohm tension meter. Isolated from input power and transducer circuit.
Output Response Time		4mSec (<4.12 milliseconds)
Weight:		0.6 lbs (0.27 kg) Versions C and T
Transducer Signal Input:		0.5Vdc at rated load per pair max. (1Vdc for XRE option)
Transducer Excitation:		5Vdc (10Vdc for the XRE option) jumper selectable
Accuracy:		Max error of 1% over temperature range. 0.1% Typical.
Zero (Tare) Range:		Minimum 95% of transducer rating.
Calibration Range:		Minimum 50 : 1.
Ambient Temperature Range:		32°F to 113°F (0°C to 45°C).
Optional tension meter types:		Analog 1mA, 3.5" (DFE P/N: 722-1385), or meter in enclosure (DFE P/N: 723-2682).
Available tension meter scales:		0 to: 1, 5, 10, 25, 50, 100, 150, 250, 500, 1000.

1.3 ENVIRONMENTAL CONDITIONS (Ref. Appendix C for further information)

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

- Indoor use.
- Altitude up to 6500 ft (2000 meters).
- Temperature range: 32° F to 113° F (0° C to 45° C).
- Maximum relative humidity 95% over the temperature range (non-condensing).
- Main supply voltage fluctuations not to exceed +/-10% of the nominal voltage.

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 10Vdc Isolated Tension Output.** Proportional to tension. Used as an input to a controller or instrumentation system. Output is electrically isolated as standard. See Section 3.1 for installation and adjustment.

⚠ WARNING: The isolated output is designed to prevent ground loops and noise. It is not intended or approved for safety isolation of hazardous voltages. Do not install unit where isolated circuit and chassis ground are more than **40Vpk** differential.

- **0-1mA Isolated Tension Output.** A separate output with fixed damping, used for driving an optional 50 Ohm analog tension meter.
- **Easily serviceable.** The unit can easily be removed by either unplugging the mating connectors, or removing the wires from the terminal strip.
- **Small size.** Fits where many other products cannot.
- **Economical.** Provides many important features at a reasonable price.
- **Rugged.** Full metal enclosure provides physical and electro-magnetic protection for amplifier circuits.
- **Output Isolated from Earth Ground.** Isolation is provided between the output circuit and transducer ground, simplifying installations.
- **Status LED.** Green LED indicates presence of power and proper circuit operation. If power is on and no faults are detected, LED will be on continuously. LED will flash once to indicate acceptance of a ZERO or CALIBRATION button push.
- **Short Circuit Protection.** Unit automatically protects transducer excitation and tension output from short circuits or excessive loading. If a short circuit is detected, the unit will safely shut that portion of the circuit off until the fault is cleared. Unit automatically recovers when the fault is removed.
- **Self resetting fuse.** Product protects itself and connected equipment from more serious faults or fire hazard. Unit has integrated fuse that automatically resets from tripped when unit is powered down.
- **Protected against damage from static electricity.**

1.5 OPTIONS

REFER TO SECTION 2.4 FOR INSTALLATION INSTRUCTIONS.

- **25% Calibration Ratio (25CW).** Full output when tension is at 4 times the calibration weight. Factory installed option only.
- **DIN Rail Clip (DRC).** To be used with 35 mm DIN rail.
- **IP65 Enclosure Rating (IP65).** Ingress protection rating of IP65 for enclosure for version C only. Must use cables for wet environment to retain the IP65 capability.
- **Hook and Loop Mounting (HL).** Used in place of Din Rail Clip (DRC) mounting.
- **Extended Range (XRE).** 10 Vdc excitation for Extended Range transducers. Allows measurement of much lower tension than usual. Jumper selectable.

⚠ WARNING: Do not connect standard transducers to units with XRE option. Transducers must also have the XR option.

1.6 ACCESSORIES

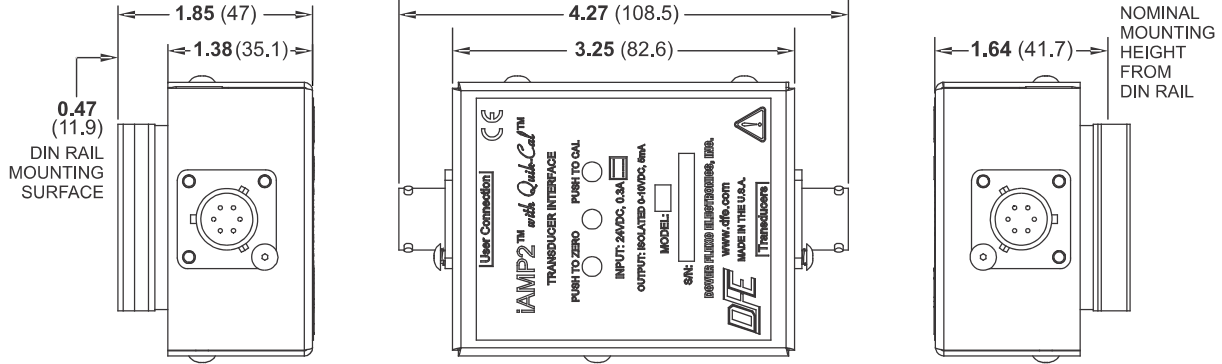
- **Remote Tension Meter.** Analog, 1 mA (DFE P/N: 722-1385) supplied as a single unit. Must be installed by user. This meter is also available in its own enclosure (DFE P/N: 723-2682).
- **Adapter Cable.** Allows use of version C with models C, UPB, F, and RS transducers (with standard 3 pin connectors). DFE PN: 723-0900, 12" long.

SECTION 2

INSTALLATION

2.1 DIMENSIONS inches (mm)

VERSION C (shown with DIN Rail Clip option)



VERSION T

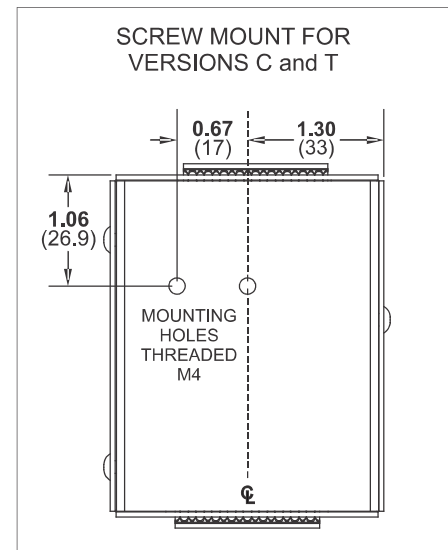
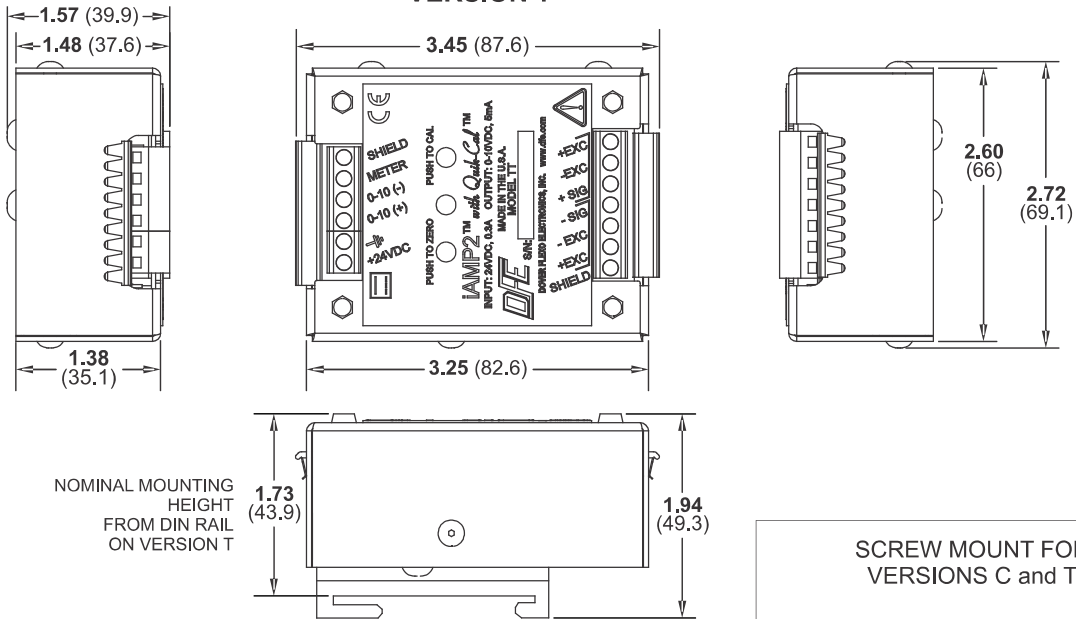


Figure 2 - DIMENSIONS

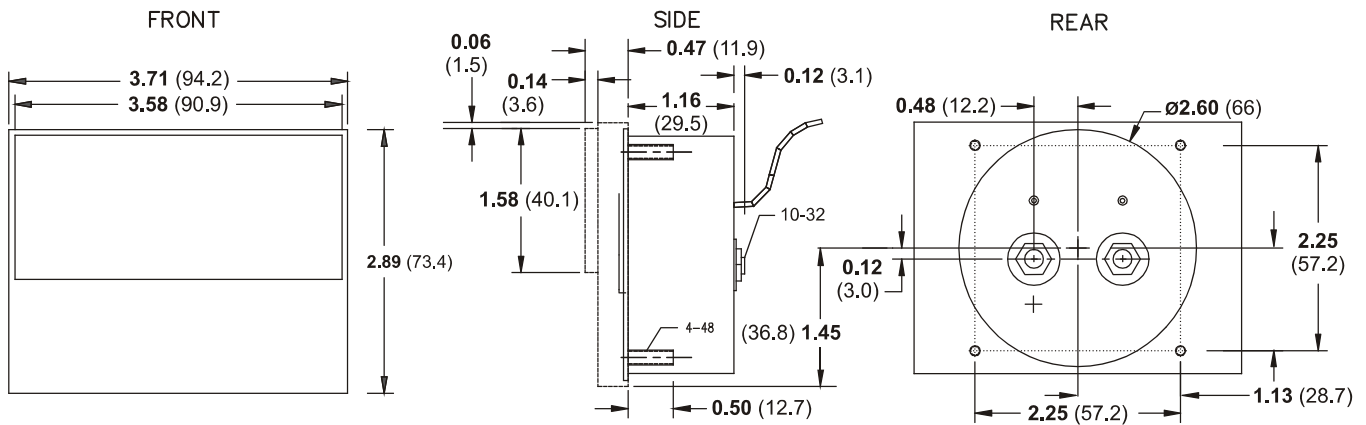


Figure 3 - ACCESSORY TENSION METER DIMENSIONS (DFE P/N 722-1385)

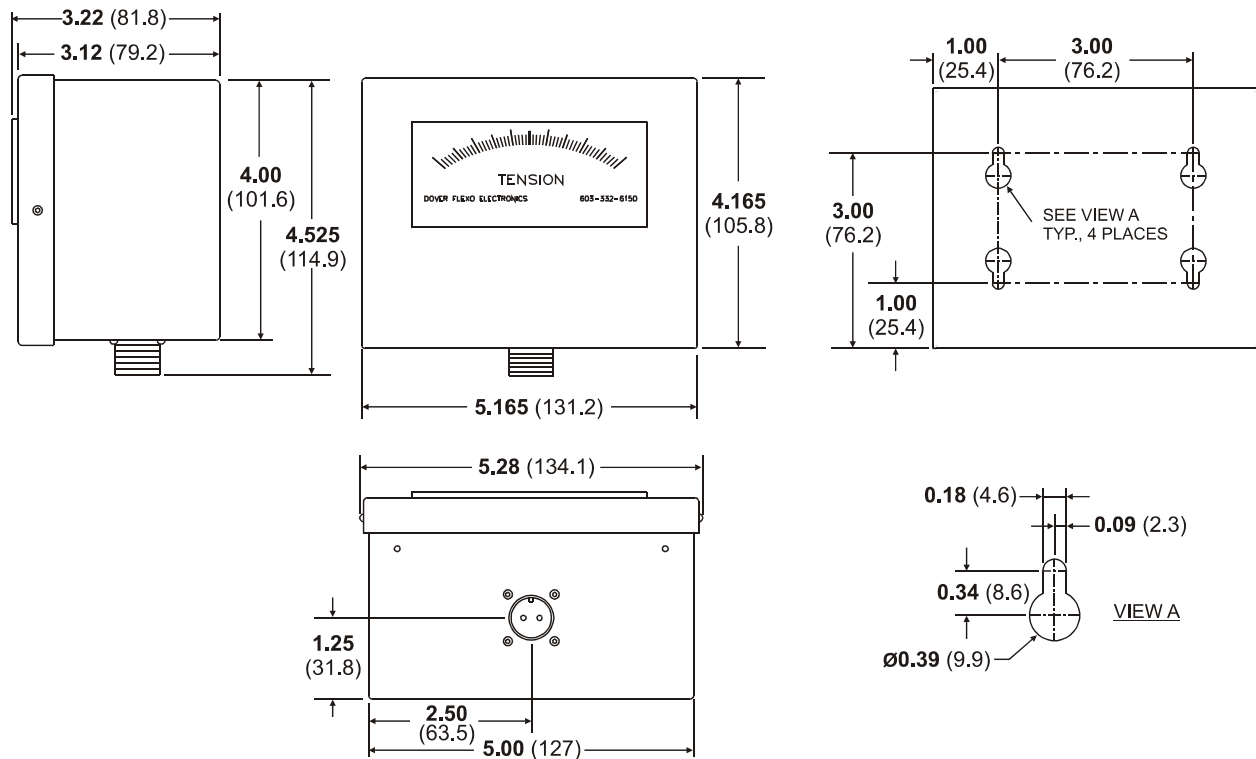


Figure 4 - ACCESSORY TENSION METER ENCLOSURE DIMENSIONS (DFE P/N 723-2682)

2.2 SELECTION OF MOUNTING LOCATION

The unit can be located in a machine cabinet or wire way. It can also be mounted on the machine frame in the tension zone it reads from. Any wall or frame mounted configuration should be secured to a wall or surface that can support in excess of 0.6 lbs. (0.27 kg),

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 isolated output is designed to prevent ground loops and noise. It is not intended or approved for safety isolation of hazardous voltages. Do not install unit where isolated circuit and chassis ground are more than **40Vpk** differential.

2.3 SAFETY AND EMC REQUIREMENTS *continued...*

! IMPORTANT: The DFE iAMP2 you have purchased has been tested and meets the European Union's Low Voltage Directive and EMC Directive only when installation is done correctly.

Secure all wiring to prevent inadvertent removal or strain.

In addition, to meet the EMC Directive, a proper transducer installation, including shielded cables (customer connection and transducer connection) must also be used.

! IMPORTANT: The customer connection cables have shield connections on both ends. Do not cut or leave the shields disconnected. The iAMP2 passes the customer shield connection through its metal enclosure to the transducer cable. This creates a shield that extends from the non-connector shield end (where power and outputs are wired) to the transducer (but not connecting to the transducer, to avoid ground loops).

Cable shielding must be attached to the SHIELD connections on the terminal blocks (T version), or to the conductive body of the circular connectors (C version). If you wish to assemble your own cables, contact DFE for assembly instructions.

2.4 INSTALLATION INSTRUCTIONS

If using an inline cable version C:

1. Attach cables between transducer and iAMP2 module. There is text on the label indicating the transducer connector.

⚠ WARNING: Do NOT connect the iAMP2 having the XRE option (10 Vdc excitation) unless the transducers are LT type transducers or have the extended range (XR) option! The **transducers MAY be DAMAGED!**

- A. For version C to transducer models C, UPB, or RS:

Connect the 6 pin end of the Y adapter cable to the transducer connector on the iAmp2. Find the ends of the transducer cables (3 pin) marked "G" and connect to the Y cable. String your cables to the transducers and connect them.

- B. For version C to all other transducers:

Find the end of the transducer cable marked "G" and connect to the transducer connector on the iAmp2. String your cable to the transducer and connect it.

2. Wire the customer connection cable to customer's meter, and power supply as described below in Section 2.5.
Be sure to wire the customer shield lead to a proper chassis ground.
3. Attach the other end of the customer connection cable to the iAMP2 module.
4. Attach amplifier to frame or wire-way, or use either the DIN Rail Clip option or Hook and Loop option to mount unit.
5. Calibrate the amplifier according to the procedure found in Section 3.

! IMPORTANT: If the iAMP2 unit purchased was ordered with IP65, cables for wet environments must be used to retain its IP65 capability. Refer to the electrical connection drawing, or to the cable list in Appendix A.

If using the terminal strip version T:

1. Wire transducer cable(s) to terminal TB2. The front label indicates transducer end and appropriate pins.

⚠ WARNING: Do NOT connect the iAMP2 having the XRE option (10 Vdc excitation) unless the transducers are LT type transducers or have the extended range (XR) option ! The **transducers MAY be DAMAGED!**

2. Wire the customer connection cable to customer's meter, and power supply as described below in Section 2.5.
Be sure to wire the customer shield lead to a proper chassis ground.
3. Wire the other end of the customer connection cable to the iAMP2 module (terminal TB1). The front label indicates customer connection end and appropriate pins.
4. Attach amplifier to frame or wire-way, or use the optional DIN Clip or Hook and Loop to mount unit.
5. Calibrate the amplifier according to the procedure found in Section 3.

2.5 ELECTRICAL CONNECTIONS

Keep in mind that the indicator is designed to provide 0-10V AND 0-1mA outputs, both isolated from input power.

“C” VERSION

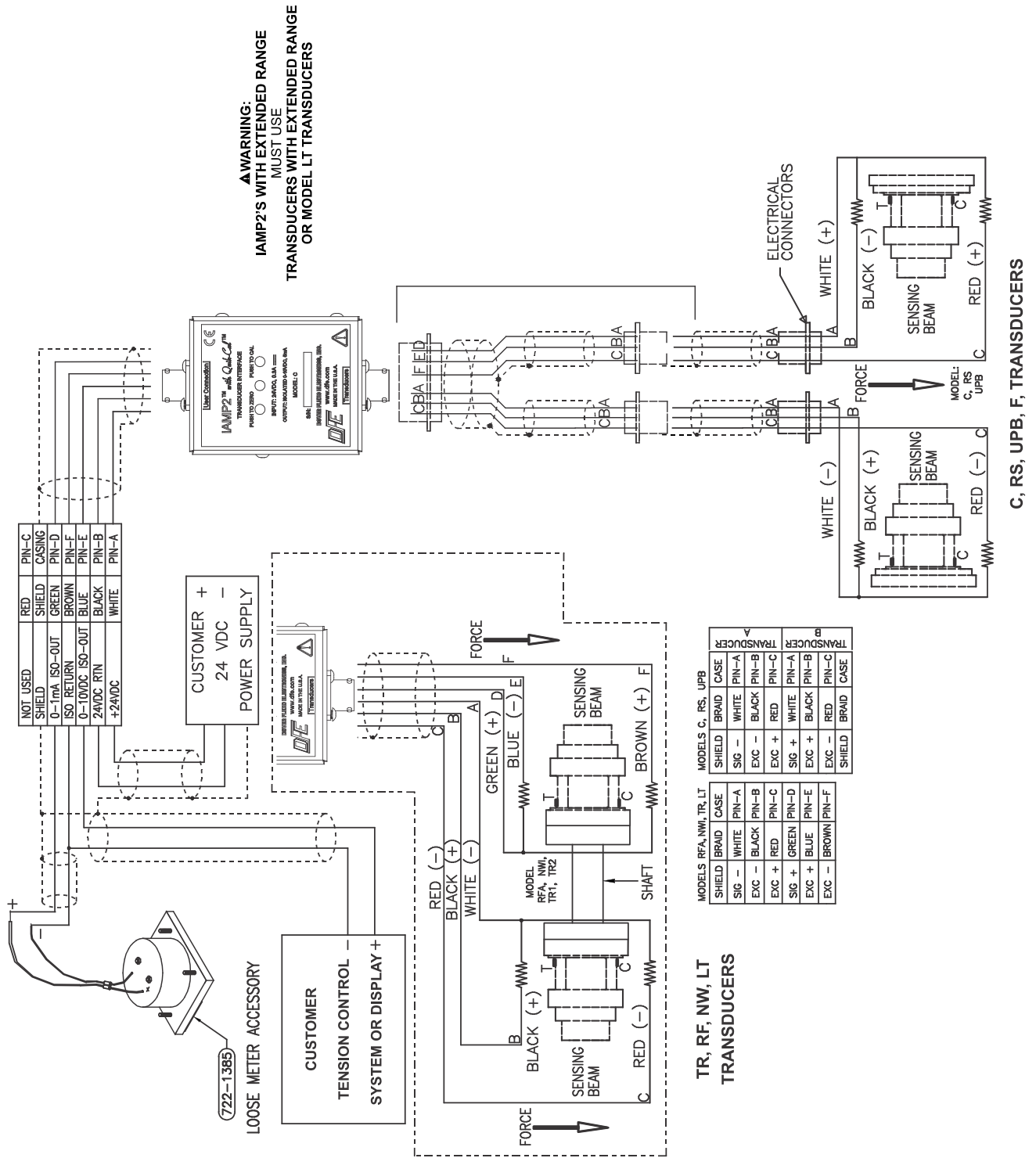


Figure 5 - STANDARD ELECTRICAL CONNECTIONS FOR VERSION C

2.5 ELECTRICAL CONNECTIONS *continued*....

"T" VERSION

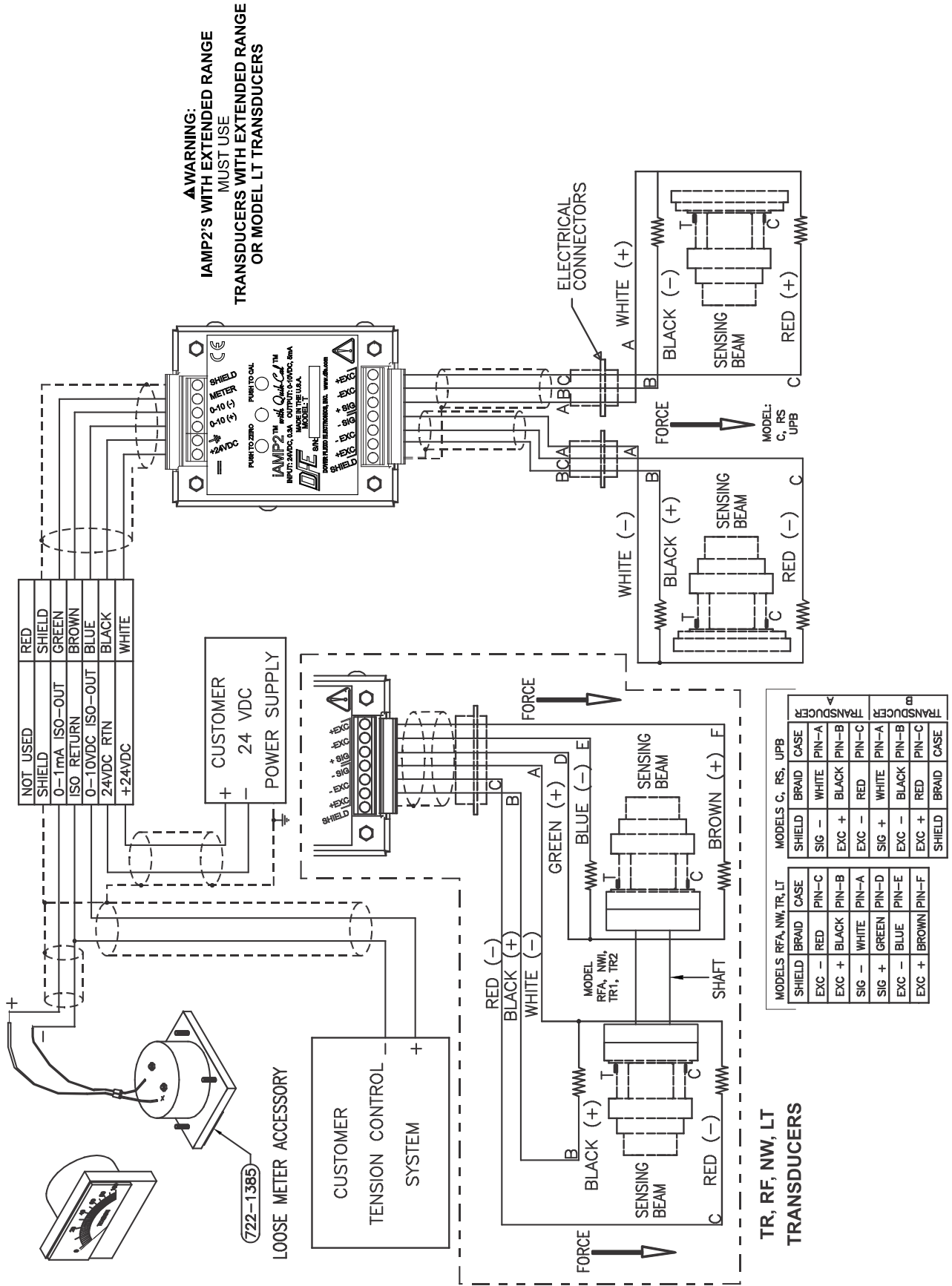


Figure 6 - ELECTRICAL CONNECTIONS FOR VERSION T

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 iAMP2. A 15lb. weight will result in full output at 150 lbs. tension (15 lb. weight will result in full output at 60 lbs. tension with 25CW option). 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 OPTIONAL TENSION METER

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

Turn off power to the iAMP2 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

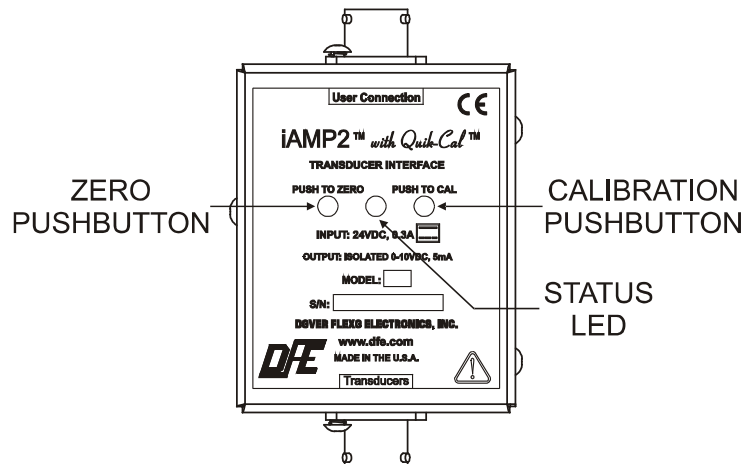


Figure 7 - iAMP2 FRONT SHOWING CAL AND ZERO PUSHBUTTONS

1. **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 automatically adjust and store the tension-zero value 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 (if attached) will read zero.
2. **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 Figure 8.
 1. Attach the weight to the free end of the rope as shown in Figure 8. The weight should not touch anything. Wait for the weight to stop swinging. Ideally, the rope will pass over the center of the transducer roll.

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

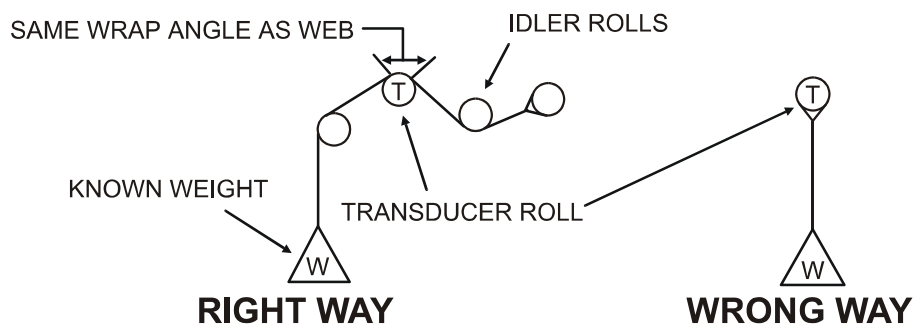


Figure 8 - WEB PATH

2. 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 (located between buttons on product face) once to indicate the calibration has been stored. The output will read 1.0Vdc after pressing calibration button. The meter will read 10% of full scale. If you have the 25CW option, output will read 2.5 Vdc after pressing calibration button. The meter will read 25% of full scale.
3. Remove the weight and observe the output. It should read 0Vdc with nothing touching the tension sensing roller.

The output calibration is now complete.

⚠ Caution: Do NOT press ZERO or CAL pushbuttons while the web is running. The unit will store ZERO or CALIBRATION and the old settings will not be recovered. The only way to recover CALIBRATION is to perform this procedure starting at step 1.

Your iAmp2 amplifier will produce a tension signal 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 no one has changed the calibration. See Section 3 for calibration and setup.

SECTION 5

CARE AND MAINTENANCE

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

Most problems are caused by incorrect installation and misapplication of the equipment. It is very important to be sure these factors are correct.

The green status LED (located between the CAL and ZERO pushbuttons on the product face) indicates the operating status of the unit. It should be steady green within one second of power application. The green status LED should not be flashing during operation except when pressing ZERO or CALIBRATION pushbuttons (LED will flash once indicating acceptance of ZERO or CAL). Continuous flashing is an indication of a problem, contact DFE technical support if this condition is observed.

- If the green status LED is not lit when power is applied, check power connection to unit. Also verify that the transducer excitation or outputs are not shorted.
- If status LED is still not lit after verifying power connection and outputs, disconnect power and let unit sit for at least 30 seconds. This will provide time for the internal self resetting fuse to reset if it has been tripped. Re-apply power and observe the status LED.
- If status LED is still not working, contact DFE technical support for assistance.

⚠ WARNING: No user replaceable parts inside. Modifications to product internals invalidates CE approval and warranty of the product. Do not attempt to replace or remove the internal fuse, it is self resetting and not replaceable by user. Attempts to bypass or replace the fuse **MAY CAUSE A FIRE HAZARD.**

If you have any problems with the functions on your iAMP2, please call Technical Service at 603-332-6150 or Fax 603-332-3758. E-mail: techsupport@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.

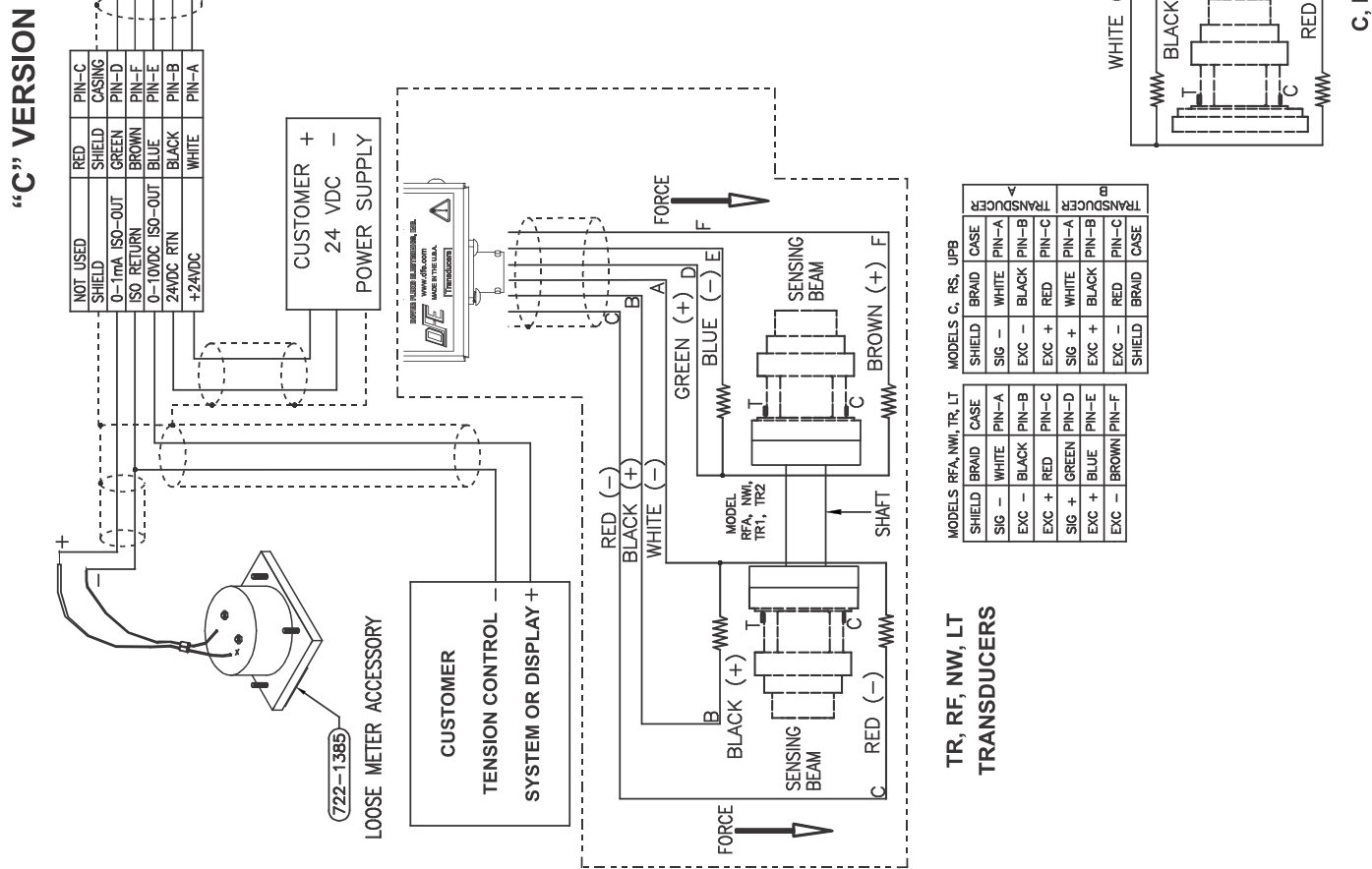
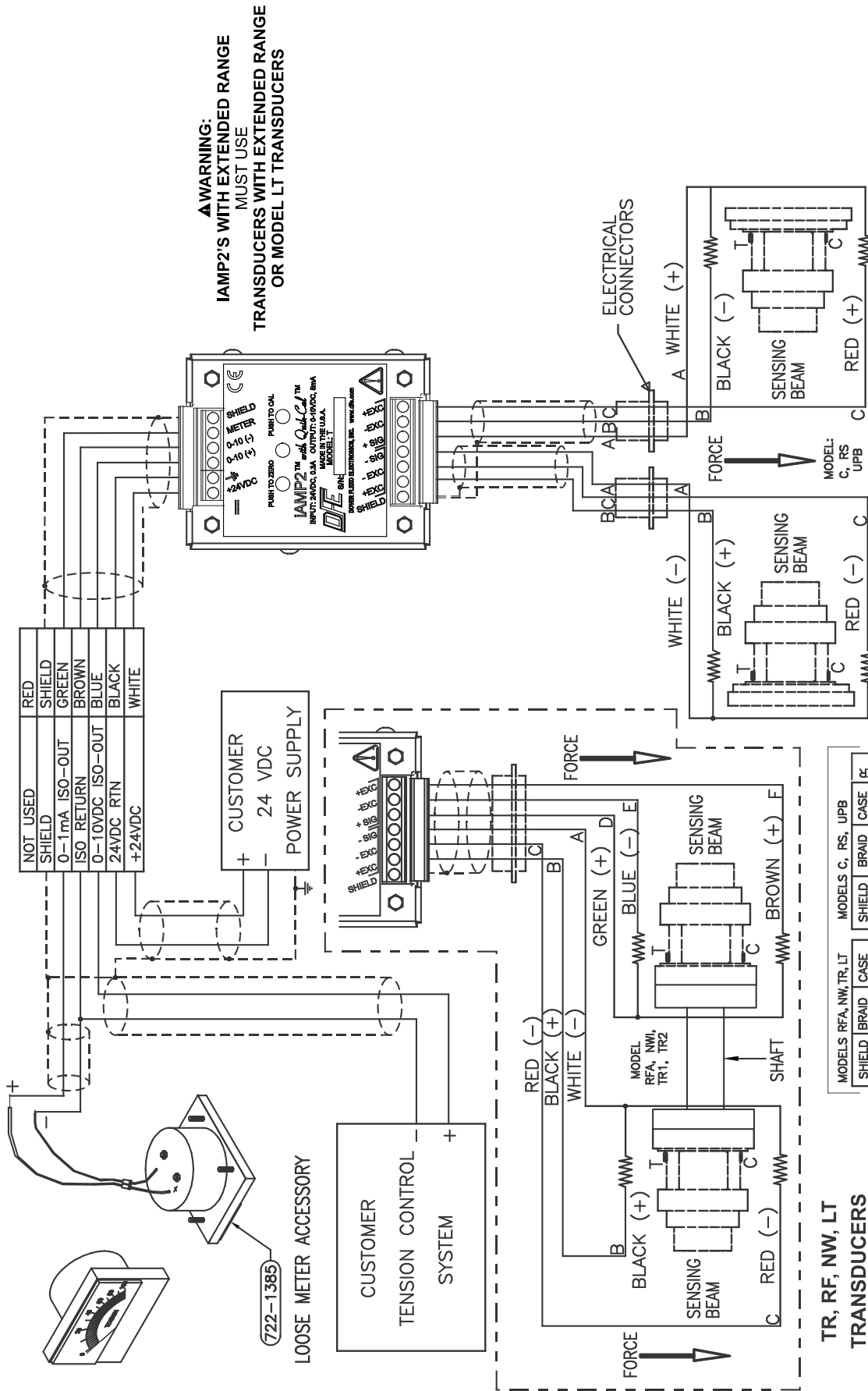


Figure 9 - STANDARD ELECTRICAL CONNECTIONS FOR VERSION C

“T” VERSION



▲ WARNING:
IAMP2'S WITH EXTENDED RANGE
MUST USE
TRANSDUCERS WITH EXTENDED RANGE
OR MODEL LT TRANSDUCERS

NOT USED	RED
SHIELD	SHIELD
0-1mA ISO-OUT	GREEN
ISO RETURN	BROWN
0-10VDC ISO-OUT	BLUE
24VDC RTN	BLACK
+24VDC	WHITE

MODELS RFA, NW, TR, LT				MODELS C, RS, UPB			
SHIELD	BRAD	CASE	TRANS-DUCER	SHIELD	BRAD	CASE	TRANS-DUCER
EXC -	RED	PIN-C	TRANDUCER	SIG -	WHITE	PIN-A	TRANDUCER
EXC +	BLACK	PIN-B	TRANDUCER	EXC +	BLACK	PIN-B	TRANDUCER
SIG -	WHITE	PIN-A	TRANDUCER	EXC -	RED	PIN-C	TRANDUCER
SIG +	GREEN	PIN-D	TRANDUCER	SIG +	WHITE	PIN-A	TRANDUCER
EXC -	BLUE	PIN-E	TRANDUCER	EXC -	BLACK	PIN-B	TRANDUCER
EXC +	BROWN	PIN-F	TRANDUCER	EXC +	RED	PIN-C	TRANDUCER
				SHIELD	BRAD	CASE	TRANDUCER

Figure 10 - ELECTRICAL CONNECTIONS FOR VERSION T

Appendix B: Typical Tensions for Various Materials

TYPICAL TENSIONS FOR WEB MATERIALS

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

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

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

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

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 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. 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 (MRA) must be obtained from the Company's factory before returning any material for which the original Buyer expects credit, exchange, or repairs. Material returned for credit must be unused, received back within 30 days of original ship date and shall be subject to a re-stocking charge of 15%. Special Product Requests (SPRs), product manufactured specially to customer specifications, and non-DFE product purchased on customer behalf 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

Special Product Requests (SPRs), product manufactured specially to customer specifications, and non-DFE product purchased on customer behalf shall not be returnable for any reason. Buyer will be subject to a 15% fee for any standard item on order with the Company which is cancelled by the Buyer. 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.

NOTES

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