



**INSTRUCTION MANUAL**  
**INLINE TRANSDUCER AMPLIFIER**  
**MODEL: iAMP**  
**DOC 801-1600 R1**

**5 YEAR WARRANTY**



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

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

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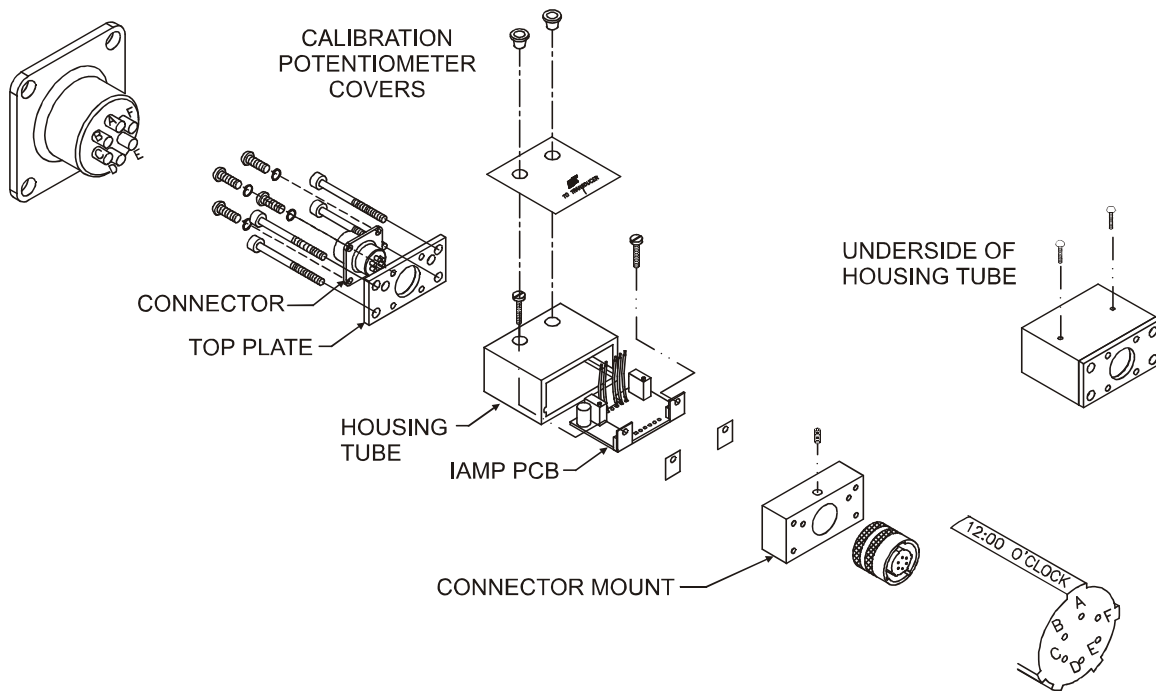
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## 1.1 GENERAL DESCRIPTION

The iAmp 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 has mating connectors on each end for connecting to a transducer and for power input, and output signals. The unit connects in-line via cables, or directly mounts on a transducer via a mating connector. This plug-in feature allows easy field installation and servicing. The iAmp is available with several mounting configurations.

## 1.2 EXPLODED VIEW OF iAMP



**Figure 1 - EXPLODED VIEW OF iAMP (F1S Shown)**

## 1.3 SPECIFICATIONS

Power Input:	Voltage	.....	14-24 Vdc
	Current	.....	100 mA. 250mA with DM option
Tension Signal Outputs		.....	0 to +10Vdc @ 2mA, Isolated, 0 to 1mA Isolated
Weight		.....	0.5 lbs (0.23 kg)
Transducer Signal Input		.....	500 mVdc at rated load per pair
Transducer Excitation		.....	5Vdc
Mating connectors		.....	Bendix MS3116F10-6S (DFE P/N: 106-0050)
Zero (tare) Range		.....	95% of transducer rating
Calibration Range		.....	20 : 1
Ambient temperature range		.....	32°F to 104°F (0°C to 40°C)

## 1.4 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.
- 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 24Vdc, +10% / -40% .
- Pollution Degree 1 or 2 in accordance with IEC 664.

## 1.5 STANDARD FEATURES

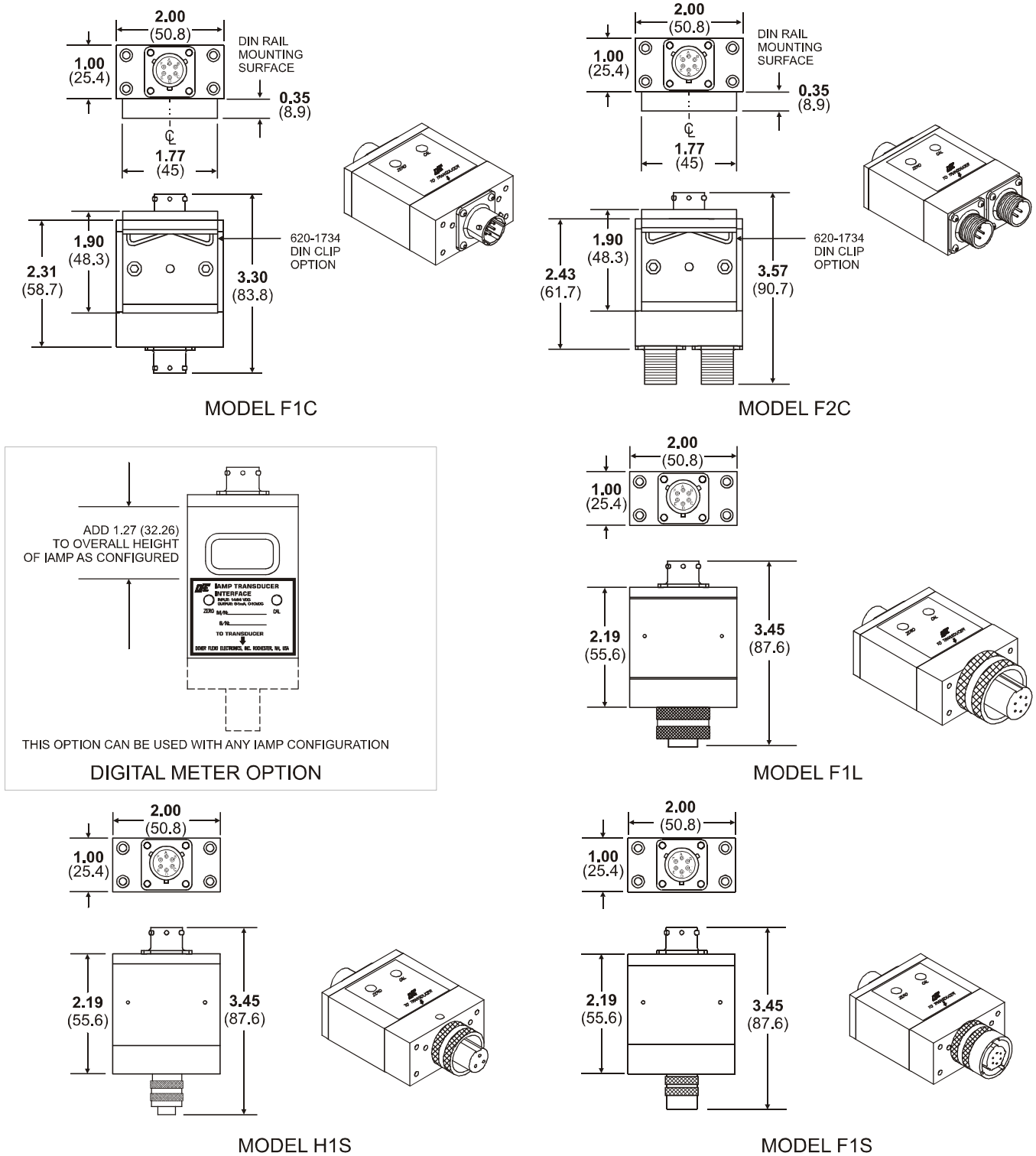
SOME OF THESE FEATURES REQUIRE EXTERNAL WIRING. REFER TO SECTION 2.4 FOR INSTALLATION INSTRUCTIONS AND SECTION 2.5 FOR WIRING.

- **14 to 24 Vdc Power Input**
- **0 to +10 Vdc Output** Adjustable, isolated, and proportional to tension. Used as an input to a controller or instrumentation system.
- **0 to 1 mA Tension Output.** A separate output used for driving an analog tension meter.
- **Easily serviceable.** The unit can easily be removed and replaced to its mating connectors.
- **Small size.** Fits where many other products cannot.
- **Economical.** Provides many important features at a reasonable price.

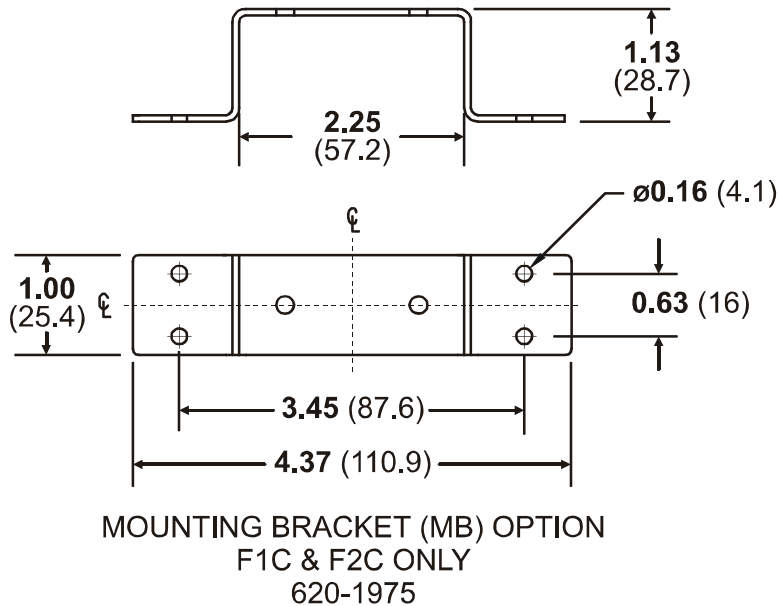
## 1.6 OPTIONS

- **Digital Meter (DM).** Built-in 3 digit red LED display with factory preset decimal point and range.
- **DIN Rail Mounting Clip (DRC).** The Inline cable versions have an optional DIN Clip for convenient mounting inside electrical cabinets.
- **Mounting Bracket (MB).** Angled metal bracket for stable inline mounting of models F1C and F2C only.

## 2.1 DIMENSIONS inches (mm)



**Figure 2 - DIMENSIONS, ALL CONFIGURATIONS**



**Figure 3 - DIMENSIONS - OPTIONAL MOUNTING BRACKET**

## 2.2 SELECTION OF MOUNTING LOCATION

The unit can be located in a machine cabinet or wire way, or mounted directly to the transducer. It can also be mounted on the machine frame in the tension zone it reads from.

## 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!** This unit is not equipped with internal fuses due to space and access requirements. For proper safety, ensure incoming power is fused or has current limiting not greater than 0.25A.

## 2.4 INSTALLATION INSTRUCTIONS

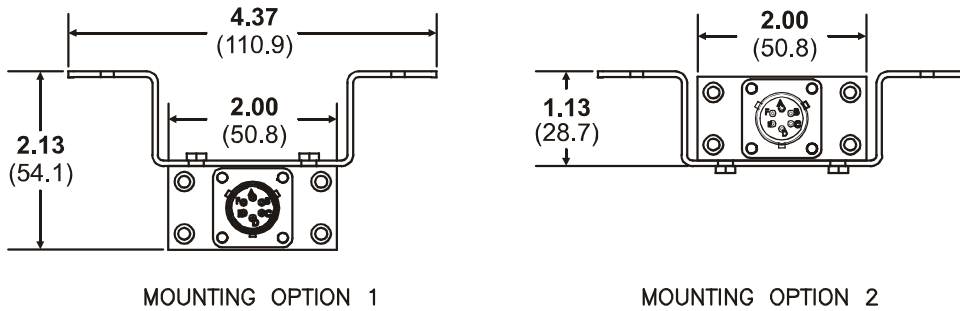
### **If using a transducer mounted style:**

1. Attach the amplifier to the connector on the transducer. There is an arrow on the label pointing towards the transducer connector.
2. Wire the power cable to controller, meter, etc. and power supply as described below in Section 2.5.
3. Attach the other end of the cable to the iAmp module.
4. Calibrate the amplifier according to the procedure found in Section 3.

### **If using an inline cable version:**

1. Attach cable between transducer and iAmp module. There is an arrow on the label pointing towards the transducer connector.
2. Wire the power cable to controller, meter, etc. and power supply as described below in Section 2.5.
3. Attach the other end of the power cable to the iAmp module.
4. Attach amplifier to frame or wire-way, or use the optional DIN Clip or optional Mounting Bracket to securely mount unit. Figure 4 shows two ways to mount your iAmp with the optional bracket.





MOUNTING OPTION 1

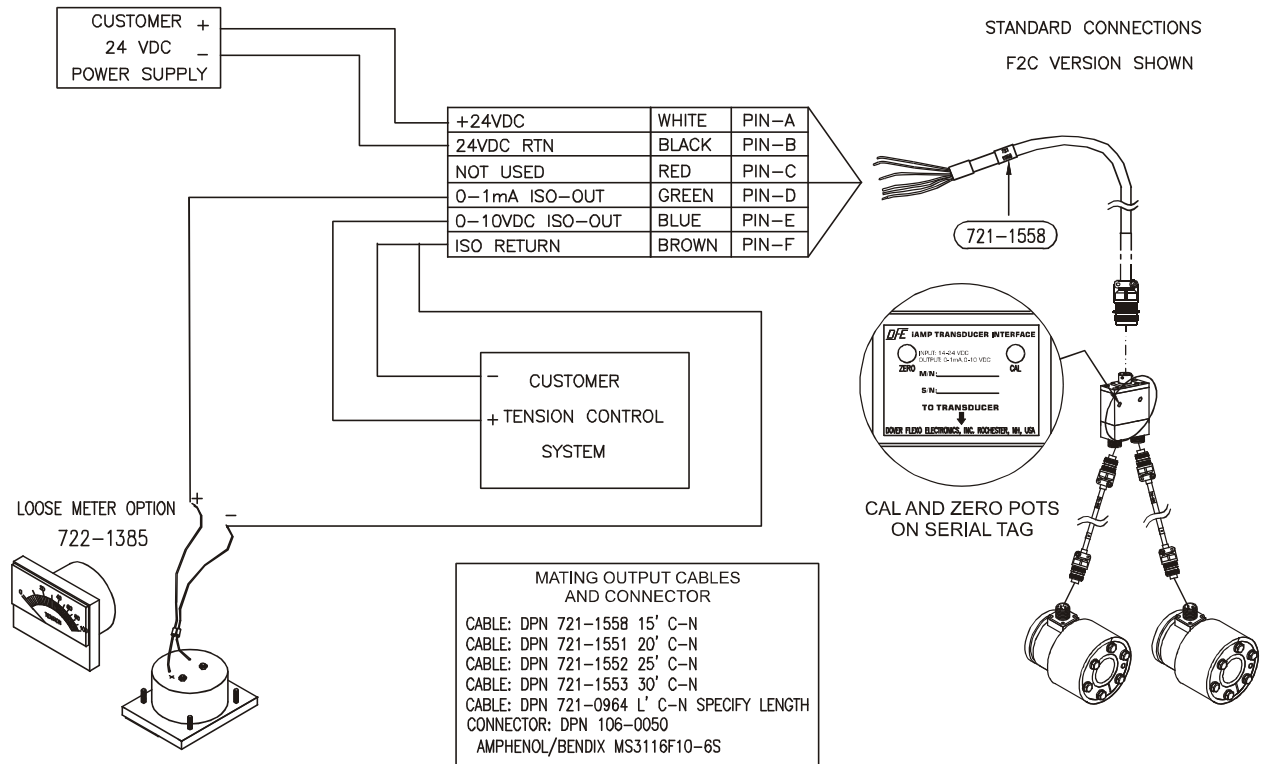
MOUNTING OPTION 2

**Figure 4 - MOUNTING OPTIONS OF BRACKET**

## 2.5 ELECTRICAL CONNECTIONS

Refer to the drawing below for electrical connections. Keep in mind that the indicator is designed to provide a 0-1mA meter output, and a 0-10V output. Make your wiring connections in accordance with the below drawing. Connect cable shields to chassis ground, one end of each cable only.

**NOTE:** To use with a UPBV Transducer with force pulling away from the top plate, special adapter cables are required.



**Figure 5 - ELECTRICAL CONNECTIONS**

## 3.1 PREPARATION

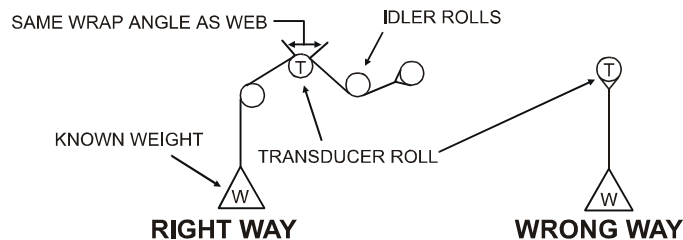
The best way to calibrate your system is to attach the device which will be accepting the output from the indicator. Otherwise attach a voltmeter or milliammeter, as appropriate for the type of output you intend to use.

## 3.2 MECHANICALLY ZERO THE TENSION METER

This step is necessary only if the accessory analog tension meter is to be used. Turn off power to the iAmp 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.

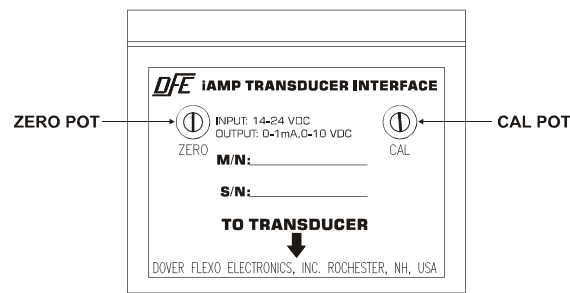
## 3.3 CALIBRATE THE OUTPUT FOR ACCURACY

1. 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.
2. Turn on power to the iAmp. Allow 5 minutes for the system to thermally stabilize.
3. Remove both calibration pot cover caps and set aside. Turn the CAL pot clockwise at least 5 turns (This makes the ZERO pot 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; 0 mA for the meter output).
4. 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 figure below.



**Figure 6 - WEB PATH**

5. Attach the weight to the free end of the rope as shown above. The weight should not touch anything. Adjust the CAL pot as required to set the meter needle at the value of the weight. If measuring voltage (not using a tension meter) adjust the cal pot to achieve a reading of  $10.0 \times$  the percentage of full scale tension that your calibration weight equals. Example: 100 lbs. Max tension, 25 lbs. cal wt.  $10.0 \times 0.25 = 2.5$  V. Adjust to get 2.5 Vdc output.



**Figure 7 - iAMP CAL & ZERO POT LOCATIONS**

6. Remove the weight and observe the tension meter. If your output is not zero volts or 0 mA, adjust the ZERO pot as needed. Repeat steps 5 and 6 as needed. The output calibration procedure is now complete. Replace both calibration pot cover caps.

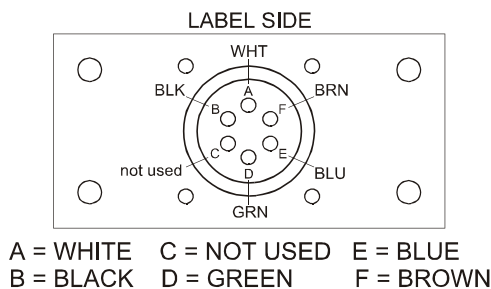
### 3.4 SET-UP AND CONFIGURATION OF THE DISPLAY OPTION

Your display comes pre-set to match the 10Vdc output of your indicator at the scale specified on the order. If for some reason you need to change or adjust the display setting, select one of the procedures listed below. This should be performed after you have calibrated your system.

**NOTE:** If you do not need to change the number of digits go directly to B or C below.

#### A. To Convert from 3 Digits to 2 Digit readout OR from 2 Digit readout to 3 Digits

1. Remove the power from your unit. Disconnect the cable at the top of the unit.  
NOTE: This portion of the procedure is best done on a workbench.
2. Using a 5.5 mm box wrench or socket, remove the 4 acorn nuts from the top (thin block) end of the unit.
3. Lift the top plate off the threaded rods and rotate it up and away from the display window.
4. Make note of the color of wires and the pins they connect to. Unsolder the wires from the inside of the connector.
5. Gently slide the box off the top of the threaded rods.
6. Find JP2 on the lower right side of the display digits.
  - a. To set for a 3 digit display, place jumper on pins 1 and 2 of JP2.
  - b. To set for a 2 digit display, place jumper on pins 2 and 3 of JP2
7. Gently slide the box back over the threaded rods being careful to align the circuit board in the slots in the side walls of the box.
8. Resolder the wires to the pins they came from. Factory default is shown below:



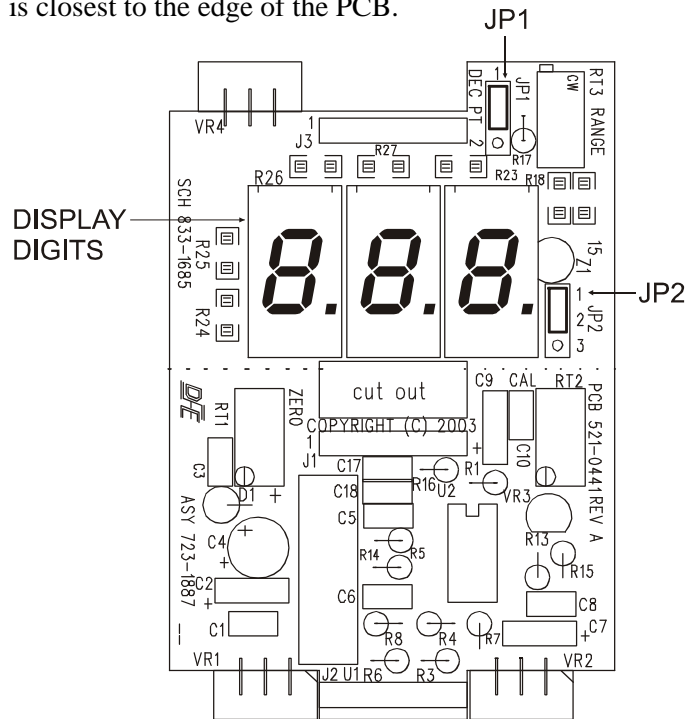
**Figure 8 - CONNECTOR WIRE LOCATIONS**

9. Reconnect your user connection cable to the top of the unit.
10. Proceed with either B or C below.

#### B. To Adjust for a 3 Digits Reading ( for 2 Digit readings skip to C.)

1. IF you opened the unit in A, skip to step 2. Otherwise, use a 5.5 mm box wrench or socket and remove the 4 acorn nuts from the top (thin block) end of the unit.
2. Gently lift the top plate off the threaded rods and rotate it up and away from the display window. Be careful not to break the wires to the connector.
3. Turn the power ON (+24Vdc). Wait 5 minutes before proceeding.  
Note: For any range using a leading 1 (such as 0-10, 0-100, or 0-1000) use the next number down as your range to avoid having a constant leading zero on the readout (i.e.: using 0-99.9, 0-999 for a scale eliminates the lead zero. Setting the 0-10V output to 9.99V will make the setting more accurate.
4. Adjust the Zero pot on the front of the unit to produce a 10Vdc reading on the 0-10Vdc output wires from the unit (pins E and F). This can also be measured at the Blue (+) and Brown (-) wires at the inside of the connector. Be careful not to short the output or you may damage the unit.
5. Adjust the Range trim pot (RT3) in the end of the unit to read the full scale you desire. For a 100 scale, set the 0-10Vdc to 9.99V using the Zero pot and set the display to 999. For ranges less than 100, set the reading to x10 and set the decimal place on in Step 7. (i.e.: for a range of 0 to 50, set the reading to 500).
6. If your display maximum range is between 100 and 1000, you are finished adjusting. Skip to step 8.

- For full scale displays between 10.0 and 99.9, set the jumper JP1 to cover pins 2 and 3. For no decimal place set the jumper sideways on a single pin. This jumper is located beside the RT3 Range pot in the top of the unit. Pin 1 is closest to the edge of the PCB.



**Figure 9 - LED BOARD WITH JUMPER LOCATIONS (Enlarged view)**

- Re-adjust the Zero pot to achieve a zero output on your 0-10V output
- Replace the top plate on the threaded rods. It will be easier to do this with the user connection cable disconnected.
- Reinstall the acorn nuts on the threaded rods and tighten securely. Do not over-tighten.
- Reconnect the user connection cable and power up the unit normally. If the unit was previously calibrated in its current location, the cal is still valid as long as you do not change the Cal pot setting. Note: Calibration will not be valid if you changed your web wrap on the transducer, moved it to a new location, or have not calibrated it since installation.
- If the Calibration is not valid, re-calibrate using the procedure in Section 3.

**C. For Units with a 2 digit Readout (Scales of 0-10 or less)**

- If you opened the unit in A, skip to step 2. Otherwise, use a 5.5 mm box wrench or socket and remove the 4 acorn nuts from the top (thin block) end of the unit. Gently lift the top plate off the threaded rods and rotate it up and away from the display window. Be careful not to break the wires to the connector.
- Adjust the Zero pot on the front of the unit to produce a 10Vdc reading on the 0-10Vdc output wires from the unit (pins E and F). This can also be measured at the Blue (+) and Brown (-) wires at the inside of the connector. Be careful not to short the output or you may damage the unit
- If your reading needs a decimal place, set the jumper JP1 to cover pins 1 and 2. This will allow readings of 0.0 to 9.9. Set 0-10V at 9.9V for 0-10 scale. For **No** decimal place, set the jumper sideways on a single pin. This jumper is located beside the RT3 range pot in the top of the unit. Pin 1 is closest to the edge of the PCB.
- Adjust the range trim pot (RT3) in the end of the unit to read the full scale you desire.
- Re-adjust the Zero pot to achieve a Zero output on your 0-10V output.
- Replace the top plate on the threaded rods. It will be easier to do this with the user connection cable disconnected.

7. Reinstall the acorn nuts on the threaded rods and tighten securely. Do not over-tighten.
8. Reconnect the user connection cable and power up the unit normally. If the unit was previously calibrated in its current location, the cal is still valid as long as you do not change the Cal pot. setting.  
Note: Calibration will not be valid if you changed your web wrap on the transducer, moved it to a new location, or have not calibrated it since installation.
9. If the Calibration is not valid, re-calibrate using the procedure in Section 3.

Your transducer amplifier will amplify the signal from the transducer(s) 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.

It is not necessary to perform any type of maintenance on the amplifier. 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 before making any changes.

If you have any problems with the functions on your iAmp, please call Technical Service at 603-332-6150 or fax 603-332-3758. E-mail: [techsupport@dfc.com](mailto: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.



# Appendix A:

# iAmp Cables and Accessories

To select the cables you will need, find the transducer model of interest, match it to the iAmp type you will be connecting to, and choose the desired cable length. Read across to obtain the correct part number and quantities for ordering.

In all cases an output cable is required, but you may supply your own if desired.

<b>iAMP CABLE AND ACCESSORY LIST</b>				
TRANSDUCER MODEL	iAmp MODEL	ACCESSORY DESCRIPTION	DOVER PART NUMBER	QUANTITY NEEDED
ALL	ALL	Output Cable 15' Lg	721-1558	1
ALL	ALL	Output Cable 20' Lg	721-1551	1
ALL	ALL	Output Cable 25' Lg	721-1552	1
ALL	ALL	Output Cable 30' Lg	721-1553	1
ALL	ALL	Output Cable "L" Lg	721-0964	1
C, UPB, RS	F2C	Input Cable 15' Lg	721-1554	2
C, UPB, RS	F2C	Input Cable 20' Lg	721-1539	2
C, UPB, RS	F2C	Input Cable 25' Lg	721-1540	2
C, UPB, RS	F2C	Input Cable 30' Lg	721-1541	2
C, UPB, RS	F2C	Input Cable "L" Lg	721-0085	2
C, UPB, RS	F2C	DIN Clip mounting option	620-1734	1
RF, VNW, TR1	F1C	Input Cable 15' Lg	721-1839	1
RF, VNW, TR1	F1C	Input Cable 20' Lg	721-1840	1
RF, VNW, TR1	F1C	Input Cable "L" Lg	721-0356	1
NW, TR2	F1C	Input Cable 15' Lg	721-1842	1
NW, TR2	F1C	Input Cable 20' Lg	721-1843	1
NW, TR2	F1C	Input Cable "L" Lg	721-1841	1
RF, TR, NW, VNW	F1C	DIN Clip mounting option	620-1734	1

# 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.

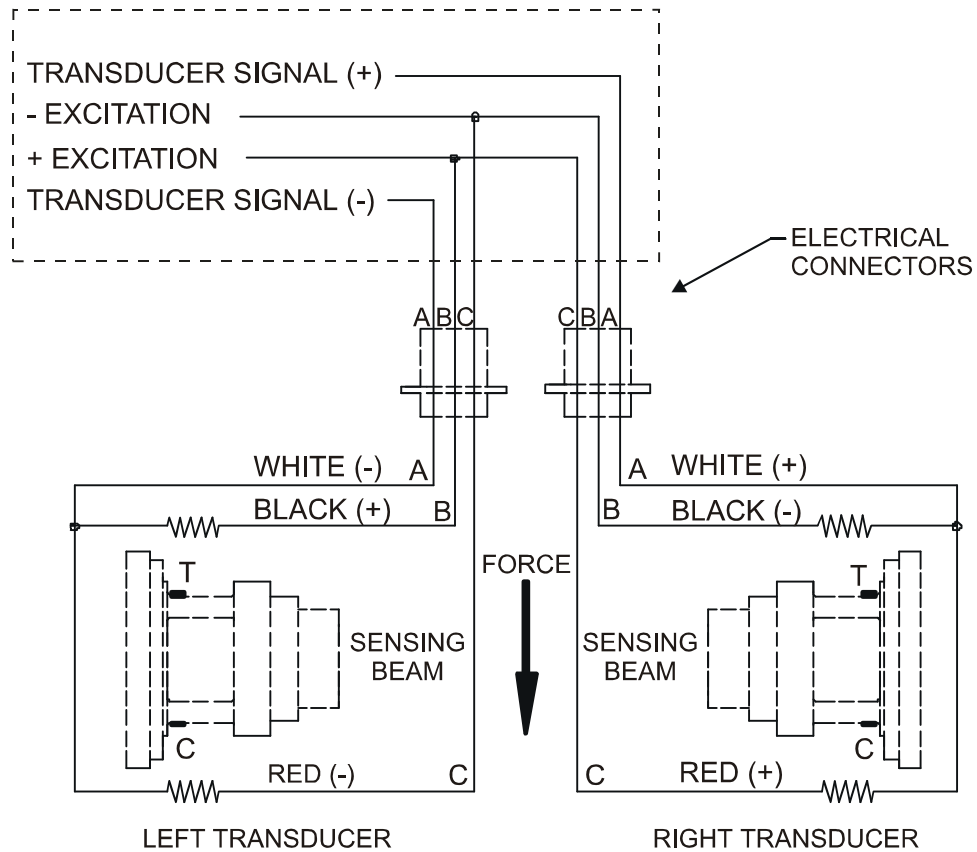
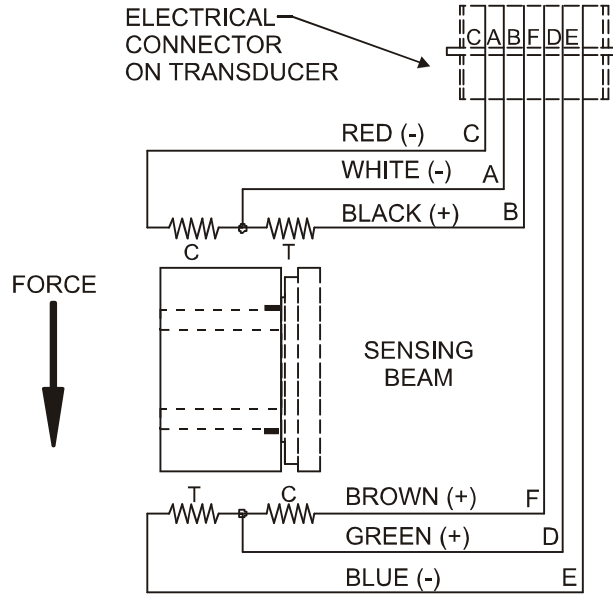


Figure 10 - MODELS C, RS, & UPB TRANSDUCER WIRING

## RIBBON FILAMENT (RFA), AND VERY NARROW WEB (VNW) TRANSDUCERS

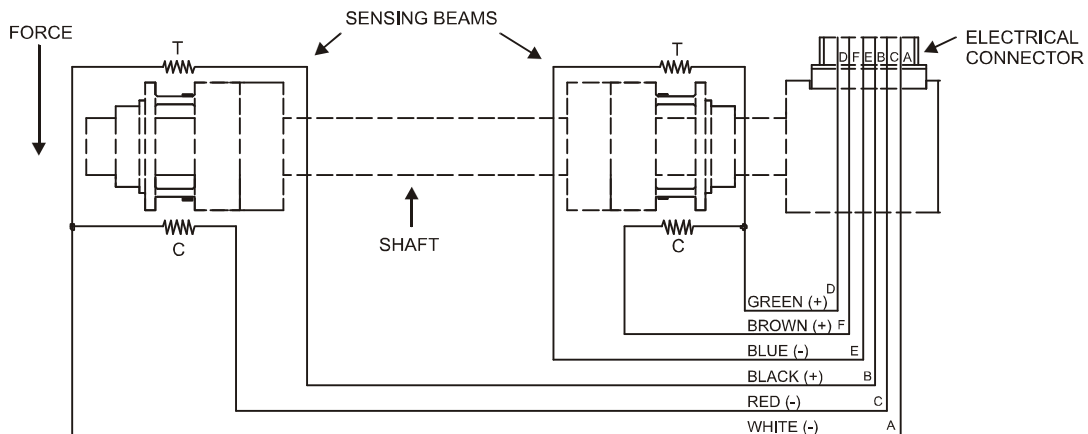
THE TENSION (T) AND COMPRESSION (C) STRAIN GAGES ARE CONNECTED IN A BRIDGE CONFIGURATION. AS THE BEAMS BEND SLIGHTLY UNDER WEB TENSION, THE GAGE RESISTANCES CHANGE PRODUCING AN OUTPUT SIGNAL WHICH IS DIRECTLY PROPORTIONAL TO THE WEB TENSION.



**Figure 11 - RFA AND VNW TRANSDUCER WIRING**

## TENSION ROLL (TR) AND NARROW WEB (NWI) 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 12 - TR & NWI TRANSDUCER WIRING**

# Appendix C: Typical Tensions for Various Materials

## TYPICAL TENSIONS FOR WEB MATERIALS

ACETATE		0.5 lb. per mil per inch of width
---------	--	-----------------------------------

FOIL	Aluminum	0.5 lb. per mil per inch of width
	Copper	0.5 lb. "

CELLOPHANE		0.75 lb. per mil per inch of width
------------	--	------------------------------------

NYLON		0.25 lb. per mil per inch of width
-------	--	------------------------------------

PAPER 15 lb *		0.4 lb. per inch of width
	20 lb	0.5 lb. "
	30 lb	0.75 lb. "
	40 lb	1.25 lb. "
	60 lb	2.0 lb. "
	80 lb	3.0 lb. "
	100 lb	4.0 lb. "

\* based on 3000 sq. ft. ream

PAPERBOARD	8pt	3.0 lb. per inch of width
	12pt	4.0 lb. "
	15pt	4.5 lb. "
	20pt	5.5 lb. "
	25pt	6.5 lb. "
	30pt	8.0 lb. "

POLYETHYLENE		0.12 lb. per mil per inch of width
--------------	--	------------------------------------

POLYESTER (Mylar)		0.75 lb. per mil per inch of width
-------------------	--	------------------------------------

POLYPROPYLENE		0.25 lb. per mil per inch of width
---------------	--	------------------------------------

POLYSTYRENE		1.0 lb. per mil per inch of width
-------------	--	-----------------------------------

RUBBER	GAUGE	AT 25% STRETCH	AT 50% STRETCH
	10 mil	1.75	3.68
	12 mil	1.10	2.03
	16.5 mil	4.09	8.17
	26 mil	2.47	4.97

SARAN		0.15 lb per mil per inch of width
-------	--	-----------------------------------

STEEL	GAUGE - INS	UNWIND-PSI	REWIND-PSI
	0.001 -0.005	1000	4000
	0.006 -0.025	850	3500
	0.026 -0.040	750	3000
	0.041 -0.055	650	2600
	0.058 -0.070	550	2200
	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
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\*\*\* For laminated webs, sum the tension for the individual webs and add 0.1 lb per inch of width.

**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.

# 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 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 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.

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