PART I - DESCRIPTION

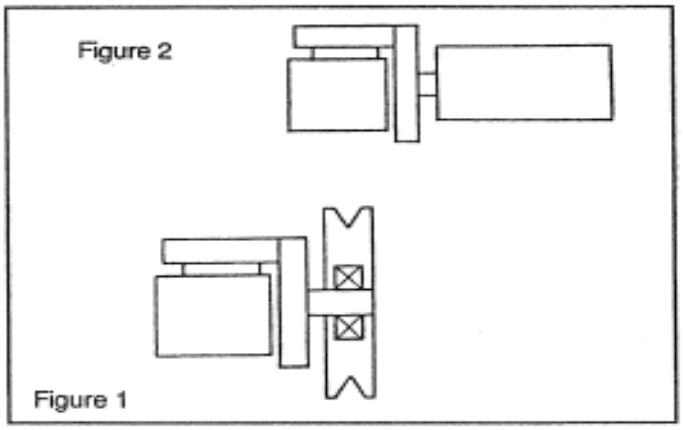
I-A GENERAL INFORMATION

Comptrol Model 30 Type “A” & “D” Tensioncells are force transducers, specially designed to measure and control tension on single strands wire, cable or filaments, on continuous process lines. They convert the mechanical force of strand tension into an electrical signal, which is directly proportional to the strand tension.

Type “A” Tensioncells are installed as single units with a pulley or sheave. (See Figure 1)

Type “D” Tensioncells are available for cantilevered applications up to 18" length. These are type “A” Tensioncells where the body has been ground to provide an absolute perpendicular position for the cantilevered shaft.

Tensioncells can be provided to accept shaft sizes from 1/8 inch to 1/2 inch, and threaded rods with English or metric threads. See Table I-B and II-B, Page 8 & 9)



I-B THE MECHANICAL SYSTEM

The mechanical system consists of a Patented "C-Flexure Pivot Assembly" which incorporates a mounting Base Block, frictionless elastic pivot (or hinge), and Load Plate. (See Figure 3) When a mechanical force is applied to the Load Plate, the pivot permits its deflection toward or away from the Base Block.

For our discussion here, deflection of the Load Plate toward the Base Block is defined as the "Compression Mode", while the opposite is defined as the "Tension Mode". Tensioncells are designed to operate equally well in either mode.

The Base Block contains an integral Mechanical Stop to limit the amount of deflection in either direction, and a Viscous Damper to allow control of the Tensioncell response to rapid changes in apparent tension loads. (See Figure 3)

I-C THE ELECTRICAL SYSTEM

The electrical system consists of a Linear Variable Differential Transformer (LVDT) which converts the mechanical deflection of the Load Plate as useful electrical output signal. (See Figure 4) The movable core of the LVDT is mechanically coupled to the Load Plate by means of the Core Adjust Assembly. (See Figure 4) This adjustment is factory set and is not accessible.

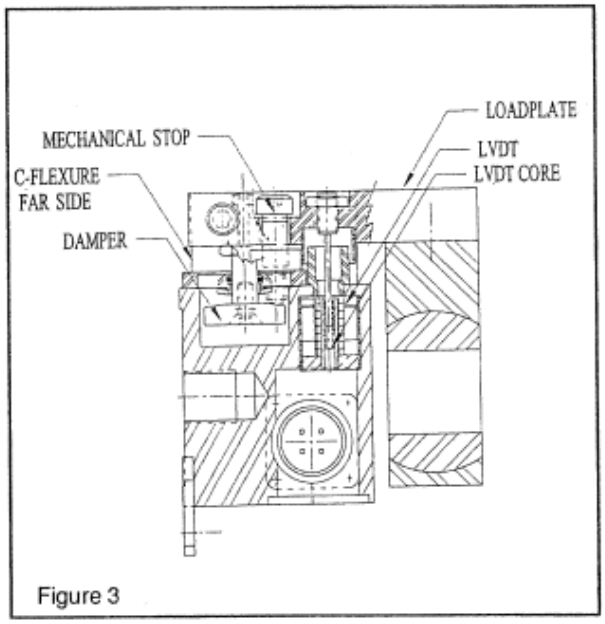


Table of Contents

I-D TYPE "K" DC LVDT

As illustrated in Figure 4, a DC LVDT consists of the following components:

- An oscillator network, which converts the DC input voltage into a high frequency alternating current for exciting the primary Coil (P_1).
- A Primary Coil (P_1).
- A movable, permeable metallic core.
- Two Secondary Coils (S_1 and S_2).
- A demodulator and summing network to rectify and integrate the currents from the Secondary coils.

With Comptrol LVDTs, the input and output circuits are electrically isolated from each other and from the mechanical structure of the Tensioncells. Thus, they may be used in "floating ground" or "ground return" systems. This eliminates the need for extra circuit boards which are required for most strain gage loadcells.

Tensioncells are factory adjusted to provide an offset voltage with no load applied (no deflection). Using an input of 24 volts DC, the LVDT is set to provide an output of 3.5 volts into a resistive load of not less than 100,000 ohms. The voltage resulting from the maximum rated deflection then adds to or subtracts from the 3.5 volt offset. This results in an output voltage of 3.5 to 6.5 volts in the Compression Mode and 3.5 to 0.5 volts in the Tension Mode. (See Figure 5)

While acceptable performance may be obtained over an input voltage range of 6.0 to 30.0 volts DC, the output voltage will vary in direct proportion to the input voltage. Because of this, the use of a "well regulated" constant voltage power supply is essential for accurate and repeatable tension measurement.

In standard applications, where two Tensioncells are used, the inputs may be connected in parallel, allowing the Tensioncells to be excited from the same power supply. The LVDT outputs are then summed to obtain a signal representing the strip tension and tare loads distributed across the roll.

Comptrol Tensioncell Indicators supply 24-volt DC and integrate the output signals in a summing amplifier. This permits incorporation of additional circuitry for offset and tare adjustment, as well as adjustments for balance and gain.

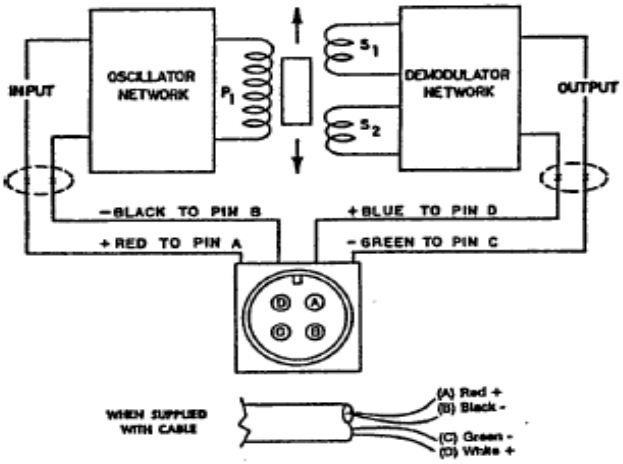


Figure 4

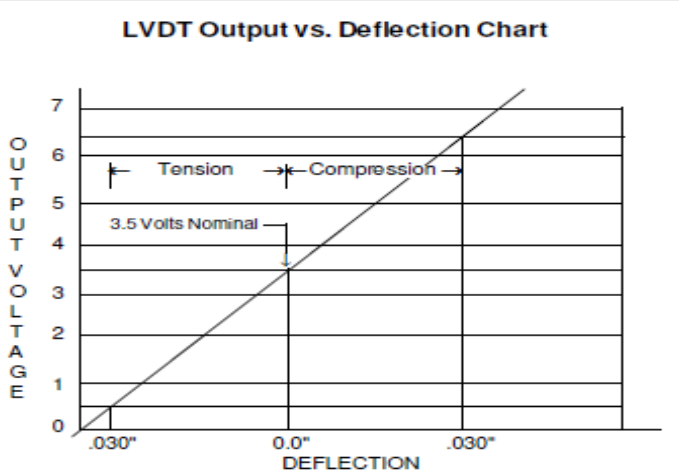


Figure 5

I-E DESCRIPTION OF OPERATION

The total resultant load per cell (JT) is calculated by resolving web force vectors acting upon the Tensioncells, with respect to the Loading Line (OX). (JT) is the resultant of both TENSION and TARE loads, PER CELL! (See Figure 6)

The intrinsic design of Comptrol Tensioncells allows the location of the Resultant Load of Strip Tension (H) on any angle with respect to the Load Line (OX). Note, however, that the Total Force vector (JT) must always be calculated on the line (OX).

Any force vector falling on the line (OR) (through the pivot point of the C-Flexure) will produce no deflection, and thus no electrical output.

Rotating the Tensioncell on its mounting bolt changes the force vectors on the cell. This feature makes it possible to minimize the tare component and maximize the load signal output.

The resultant tare is minimized by mounting the Tensioncell so that (N) is 149° (See Figure 7A and 7B) or so that (N) is 329° (See Figure 8A and 8B)

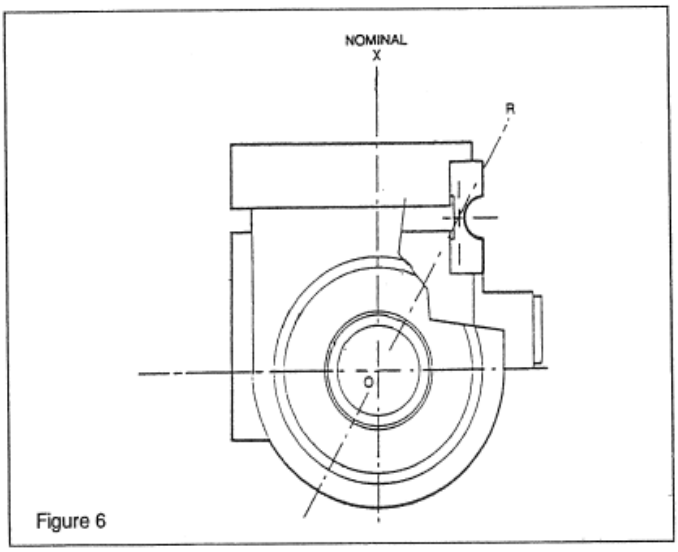


Figure 6

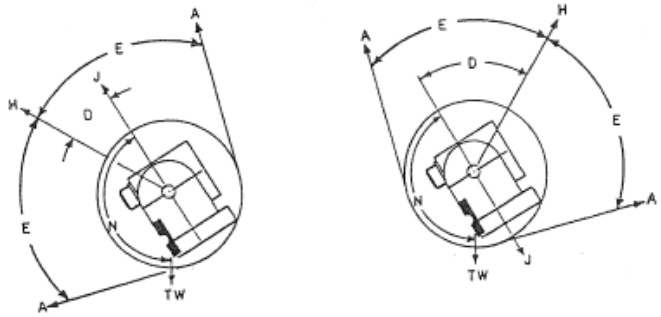


Figure 7A

Figure 7B

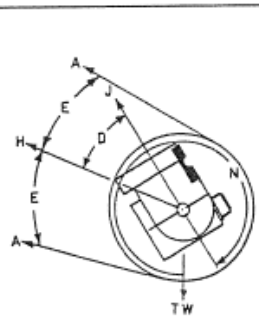


Figure 8A

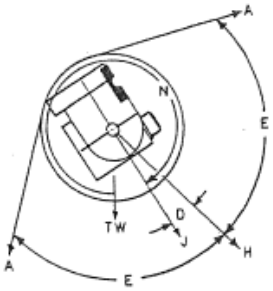


Figure 8B

PART II - INSTALLATION AND OPERATION

II-A INSPECTION UPON DELIVERY

Comptrol Tensioncells are carefully packaged in sturdy reinforced cartons or wooden boxes and are securely blocked or bolted in place.

1. Upon receipt, examine the exterior of the container for obvious damage or tampering.

2. Check the contents against the packing list.

3. Promptly report any damage or shortage to both the carrier and Comptrol.

II-B HANDLING

Tensioncells can be handled manually.

II-C LONG TERM STORAGE

While Comptrol loadcells are plated, exposure to weather, dirt, or moisture should be avoided when they are stored.

II-D MECHANICAL INSTALLATION

NOTE: Refer to the Dimension Drawing Pages 8 and 9 of this manual for detailed identification of all parts.

Tensioncells are designated as “W1” and “W2”, one being the mirror image of the other. (See Figure 9)

Comptrol Wall Mounted Tensioncells are mounted to the machine frame by a 5/8-11 UNC bolt which is in line with the centerline of the measuring roll shaft. This allows the Tensioncell to be rotated around the centers of the measuring roll and mounting bolt to achieve the proper mounting angle. (Description of Operation on Page 3)

The locating tab prevents the Tensioncell from rotating and secures it in a permanent location. It also provides a means of repeating rotatory position when the Tensioncell needs replacement.

Note: Remove the 1/4" locking screw and the 5/8" mounting bolt. This permits the roll assembly with Tensioncells to be lifted out of the machine.

To Install Tensioncells:

1. Make sure a 5/8" diameter hole is drilled through the machine frame in line with the centerline of the measuring roll shaft for the 5/8-11 UNC mounting bolt.
2. Fasten the Tensioncell to the machine frame with the mounting bolt.
3. Rotate the Tensioncell to the proper mounting angle and tighten the mounting bolt. (Refer to N on the calibration sheet for the proper mounting angle.
4. Drill a #6 (.204) hole concentric with the 1/4" hole in the locating tab.
5. Remove the Tensioncell and tap the hole for a 1/4-20 thread.
6. Repeat steps 1 through 5 for the Tensioncell to be mounted at the other end of the measuring roll.
7. Assemble the Tensioncells onto the ends of the measuring roll shaft. ·
8. Position the roll with the Tensioncells on the machine and fasten with the mounting bolts.
9. Rotate the Tensioncells to the proper mounting angle and tighten the mounting bolts.
10. Lock the locating pad for each Tensioncell against the machine frame using the 1/4-20 x 1/2 socket head cap screw.
11. Tighten the shaft in the mounting block on the “W1” unit. (The shaft end at “W2” is left free to allow it to move as the shaft expands with temperature changes).

II-E MECHANICAL ALIGNMENT

Align the sectional measuring roll to avoid any mechanical binding or friction. The measuring roll must be level and perpendicular to the path of the strip material for accurate measurement.

The Mechanical Stops are fixed for the required travel of the Load Table.

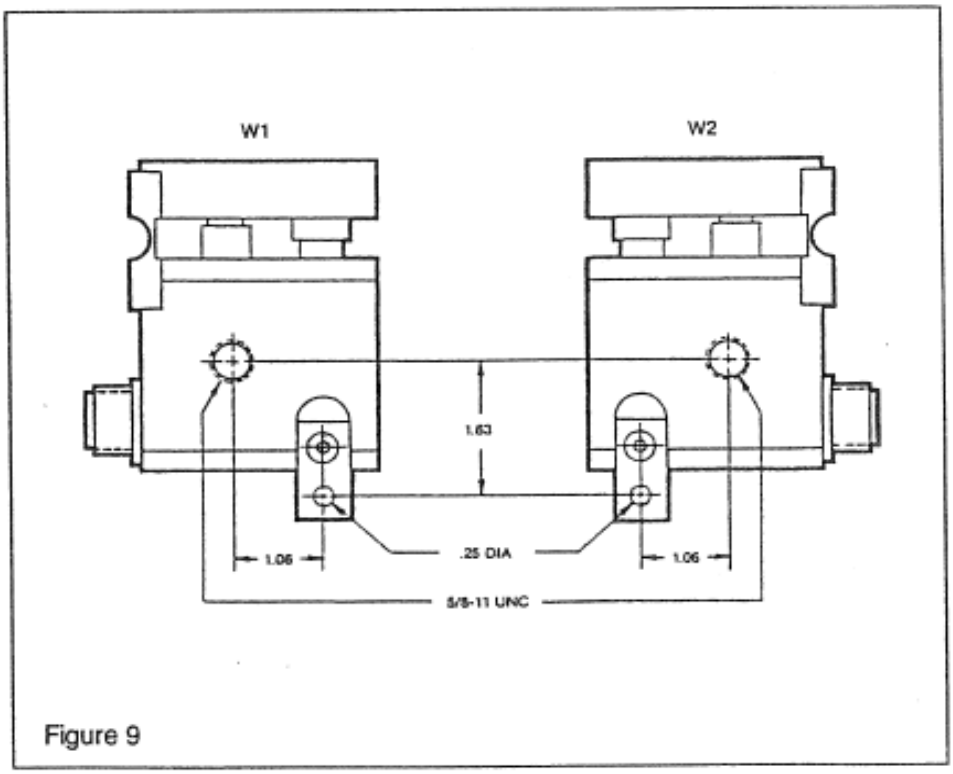


Figure 9

II-F ELECTRICAL INSTALLATION

(Read the entire electrical wiring procedure before proceeding.)

1. Turn off all electrical power to the loadcell.

2. Use twisted four conductor signal cable, Belden 9402 or equivalent, in grounded steel conduit from the LVDTs to the control panel.

3. Observing correct polarity, connect the positive (+) input lead to Pin A and the negative (-) input lead to Pin B. (See Figure 10)

4. Connect the positive (+) output lead to Pin D and the negative (-) output lead to Pin C. (See Figure 10)

II-G ELECTRICAL ZERO ADJUSTMENT

(Read the complete Electrical Zero Adjustment procedure before proceeding with the adjustment.)

1. Disengage strip from the measuring roll so that no tension force is applied to the loadcell.

2. Connect a voltmeter to Pins C and D (See Figure 10)

3. Apply 24-volt DC electrical power to the loadcell observing the correct polarity. [Plus (+) to Pin A and minus (-) to Pin B]. Do not exceed the maximum rated input voltage.

NOTE: Allow 20 minutes for the loadcell to warmup before taking first readings to insure accurate readings.

4. Measure the output voltage of the LVDT between the Green and Blue leads for each Tensioncell with a voltmeter with a sensitivity of at least 100,000 ohms per volt. The output voltage should be between 0.5 and 6.5 volts.

TYPE 'K' 24 VOLT DC LVDT SPECIFICATIONS

Input	6-30volts DC
Output	0.5 - 6.5 volts DC (nominal, open circuit)
Output impedance	2.5K ohms
Current Consumption	40mA
Recommended Load	100K ohms or greater
Maximum Temperature:	250°F

Note: Comptrol loadcells are calibrated for 24-volt DC input voltage to provide a 0.5 to 6.5 volts DC output signal. Output voltage will vary proportionally to input voltage.

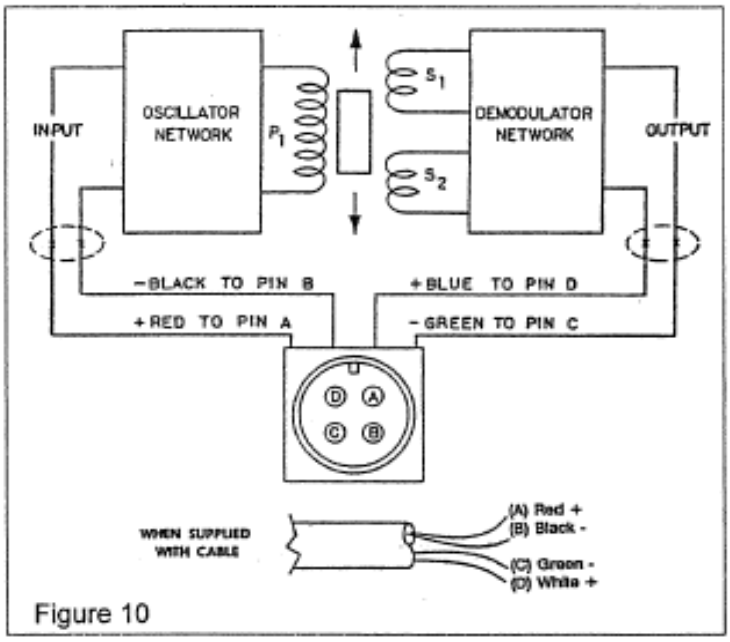


Figure 10

5. Since Comptrol Tensioncells cannot be mechanically zeroed, refer to the Control Manual for zeroing out the tare weight voltage.

II-H FULL LOAD ADJUSTMENT

After the loadcell has been zeroed, a pull test can be made to check the output voltage of the loadcell at full load. (See calibration sheet for voltage output.)

1. Run a non-stretchable rope over the center of the tension roll simulating the web path. (NOTE: the rolls should be free to turn.)

2. With one end of the rope secured, hang a known weight, equally over the roll so that the total tension is equal to the maximum strip tension specified on the calibration sheet, at the other end. (See Figure 11)

3. With a voltmeter connected to Pins C and D of the connector, an output voltage will be observed.

Comptrol loadcells instrumentation provides the required signal conditioning and a reliable high level output signal for use as feedback control of a tension drive system. The feedback signal is directly proportional to the strip tension applied. If a Comptrol control is used, refer to the control manual for further calibration.

Although the electrical output of Comptrol Tensioncells are sufficient to drive most electrical indicators, substantial signal conditioning is normally required for effective tension instrumentation system control. Refer to the documentation available from the instrumentation supplier for more information.

PART III - TROUBLE SHOOTING

When properly installed in accordance with the original design specifications, Comptrol Tensioncells should require little or no regular maintenance or service.

Certain conditions, however, can impair their inherently accurate and reliable performance. Therefore, if trouble should arise, the following conditions should be checked:

1. Has the tension measuring system been changed?
   a. An increase or decrease in strip tension. (Refer to A on the calibration sheet for specified strip tension)

   b. An increase or decrease in the wrap angle. (Refer to B on the calibration sheet for the specified wrap angle.)

If the above parameters have been changed enough to prevent the unit from operating within the limits of the fixed Mechanical Stop, replacement of the Flexure will be required.

For this modification, the Tensioncell should be returned to the factory with complete specifications.

2. Is the loadcell mounted securely?

3. Is tension measuring roll in proper alignment and does it tum freely?

4. Are bearings and seals free of all binding and stickiness? Are they worn?

III-B ELECTRICAL

1. Are LVDTs receiving correct input voltage?

Check line voltage, fuses or circuit breakers, and power switches. Check power supply output and voltage to LVDTs.

2. Are all connections secure?

Check for continuity. Retighten all connections. Recheck operation.

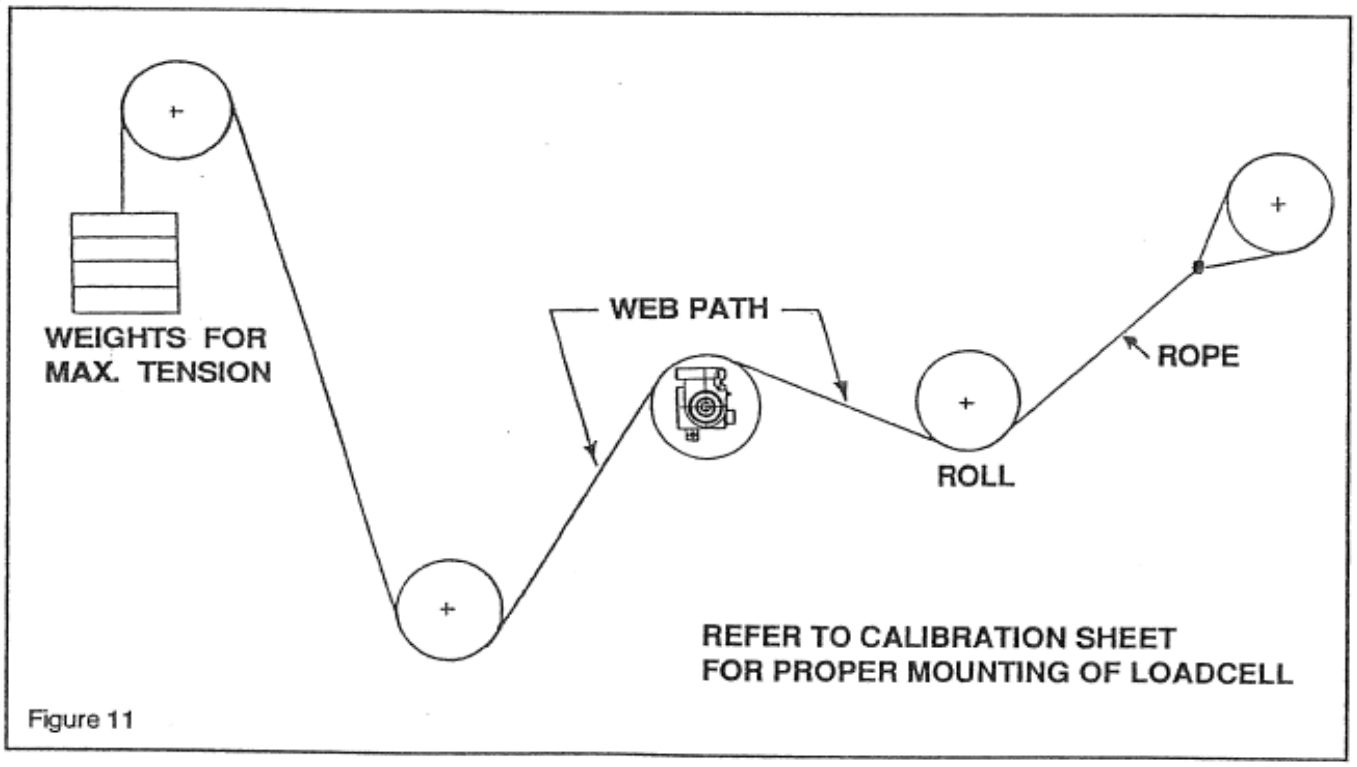


Figure 11

3. Are LVDTs open or shorted.
To check, turn off power and disconnect the input and output leads. Check coil continuity and resistance. (Refer to Figure 12)

a. Pin A to Pin B (Primary Coil) should be in excess of 2 megohms.

b. Pin A or Pin B to LVDT shell should be in excess of 5 megohms.

c. Pin C to Pin D (Secondary Coil) should be approximately 20,000 ohms.

d. Pin C or Pin D to LVDT shell should be in excess of 5 megohms.

If LVDT circuits are open or shorted, replace LVDT. Contact Comptrol with Tensioncell model number and serial number.

PART IV - RECALIBRATION PROCEDURES

All Comptrol Tensioncells are factory calibrated before shipment as specified in the purchase order. However, if any of the following parameters vary from the original design specifications, recalibration will become necessary.

1. Strip Tension (Refer to A on the calibration sheet for the specified strip tension)

2. Wrap Angle (Refer to B on the calibration sheet for the specified wrap angle)

3. Inclination of the Passline (Refer to C on the calibration sheet for the specified Passline.)

4. Mounting Angle (Refer to N on calibration sheet for the specified mounting angle)

IV-A RECALIBRATION AFTER INSTALLATION

Wall Mounted Tensioncells can be relocated around the center of the measuring roll. The theory of this operation is explained in the Description of Operation on Page 3. If this procedure cannot accomplish the necessary changes because the tension requirements are extremely different than the original application, t will be necessary to return the Tensioncells to the factory for new flexures and a new nominal rating.

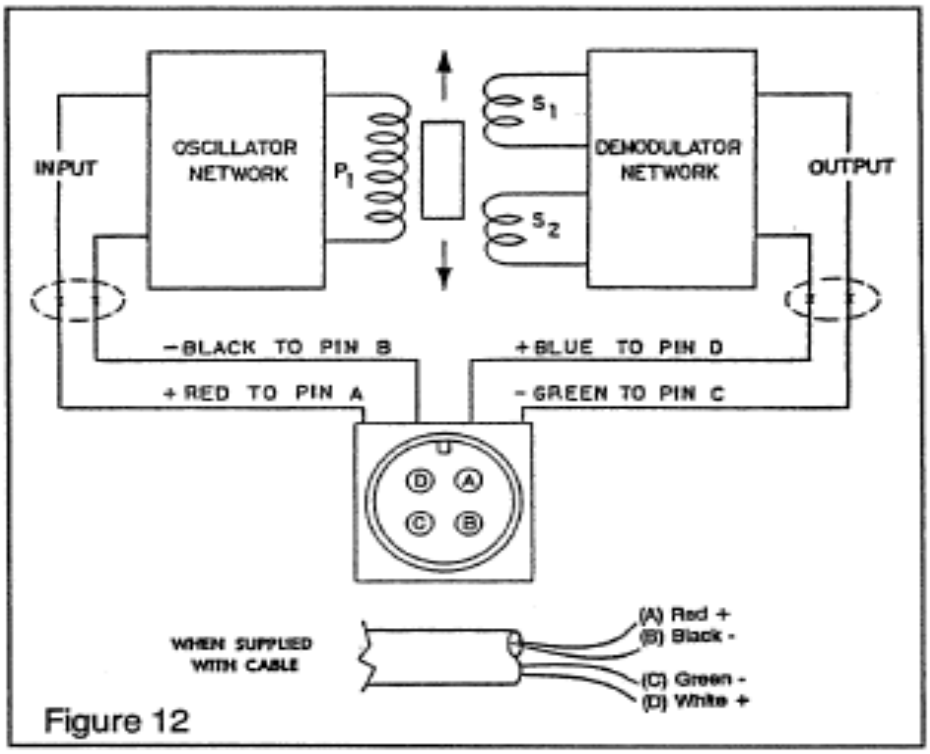


Figure 12

MODEL NUMBER NOMENCLATURE EXAMPLE

ELECTRICAL CONNECTON	SERIES NUMBER (2 DIGITS)		K - DC LVDT WITH MAXIMUM 3 VDC OUTPUT CHANGE INCLUDING TARE DISPLACEMENT
B - MS Connector F - 12' Cable	30 WALL MOUNT 36 HIGH BASE MOUNT 37 LOW BASE MOUNT		

F C 3 0 S 1 6 K

TYPE	CAPACITY Range	SHAFT DIAMETER
A - Pulley or Sheave B - Non-Rotating Shaft C - Rotating Shaft D - Cantilever Roll	See Table I-A for Type A See Table II-A for Type D	See Table I-B for Type A See Table II-B for TypeD

Example shown:
FC30S16K
12 Foot Cable
Rotating Shaft
Series 30, Wall Mount
0-30 lbs. Capacity
1" Diameter Shaft
K Type DC LVDT

SERIES 30, TYPE A SPECIFICATIONS - PULLEY OR SHEAVE MOUNTING

TABLE I-A SERIES 30, TYPE A - NOMINAL CAPACITY RANGES

CODE	L*	M*	N	P	S	T	U	W	X	Y	Z
POUNDS	0-4	0-8	0-13	0-20	0-30	0-50	0-90	CONSULT FACTORY			

* Tensioncells in this range supplied for shaft sizes up to maximum 3/4" diameter unless approved by factory.
** Comptrol wall mounted tensioncells are located by a 5/8-11 bolt at the roll centerline and locating tab which maintains rotational position of the tensioncell. (See Page 4.)

W1 UNIT SHOWN HERE
W2 UNIT IS AVAILABLE

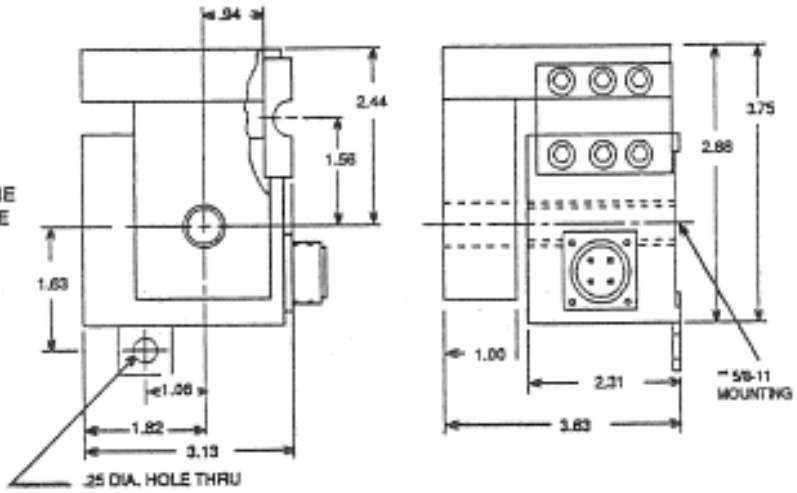


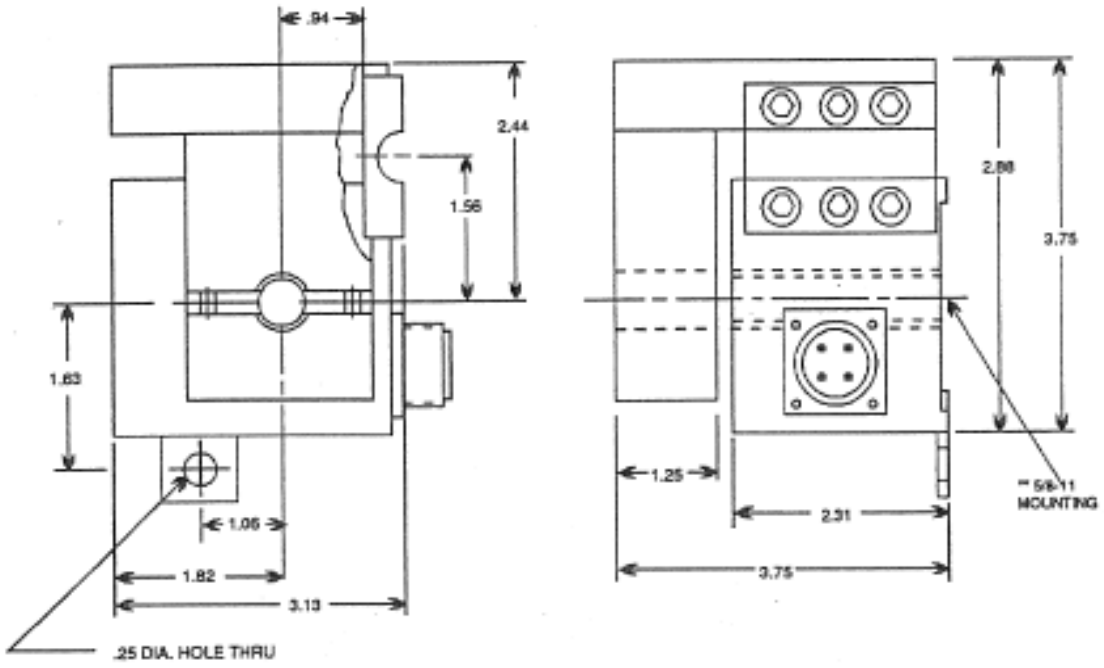
TABLE I-B SHAFT SPECIFICATIONS

INCHES	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1.0	1-1/8	1-1/4	1-3/8	1-1/2				
CODE	02	04	06	08	10	12	14	16	18	20	22	24				
TAP SIZE	8-32	10-32	1/4-20	1/4-24	5/16-18	5/16-24	3/8-16	3/8-24	7/16-14	7/16-20	1/2-13	1/2-20	5/8-11	5/8-18	3/4-10	3/4-16
CODE	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
METRIC TAP	M3x1.5	M4x.7	M5x.8	M6x1.0	M8x1.2	M10x1.5	M12x1.7	M14x2	M16x2	M18x2.5	M20x2.5					
CODE	70	72	74	76	78	80	82	84	86	88	90					

SERIES 30, TYPE D SPECIFICATIONS -CANTILEVER MOUNTING

TABLE II-A	SERIES 30, TYPE D - NOMINAL CAPACITY RANGES										
CODE	L*	M*	N	P	S	T	U	W	X	Y	Z
POUNDS	0-4	0-8	0-13	0-20	0-30	0-50	0-90	CONSULT FACTORY			

* Tensioncells in this range supplied for shaft sizes up to maximum 3/4" diameter unless approved by factory.
** Comptrol wall mounted tensioncells are located by a 5/8-11 bolt at the roll centerline and locating tab which maintains rotational position of the tensioncell. (See Page 4.)



W_1 UNIT SHOWN HERE
W_2 UNIT IS AVAILABLE

TABLE II-B	SHAFT SPECIFICATIONS								
INCHES	1/2	5/8	3/4	7/8	1.0	1-1/8	1-1/4	1-3/8	1-1/2
CODE	08	10	12	14	16	18	20	22	24

HOW TO ORDER TENSIONCELLS AND CONTROLS

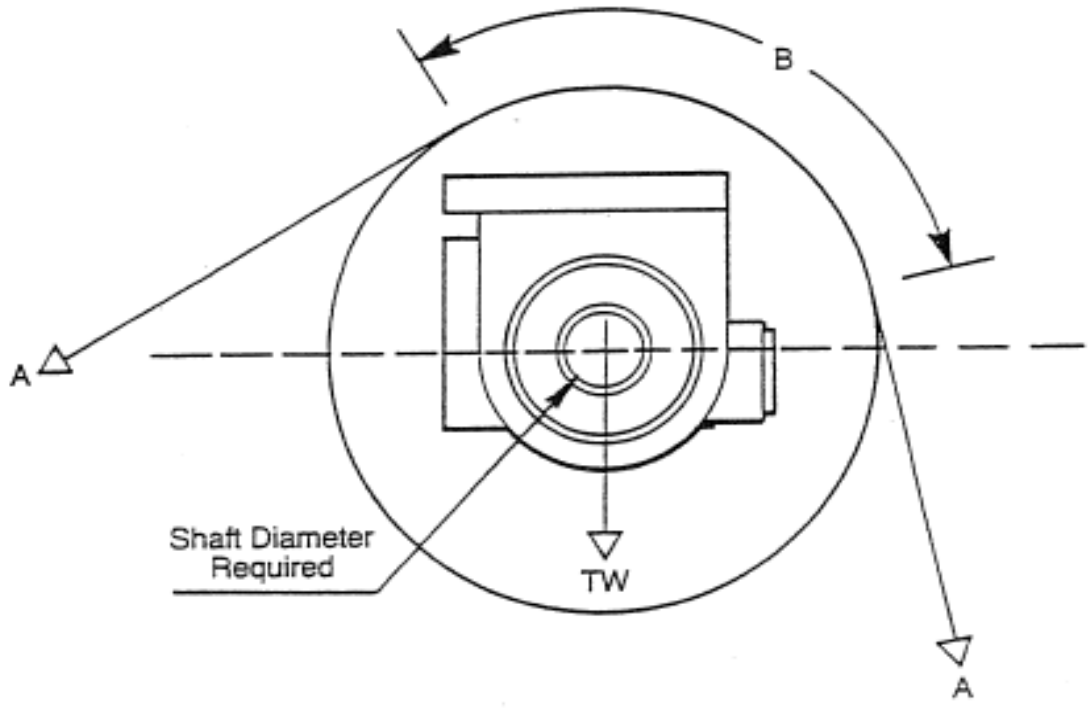
Our Application Engineering Department will make all calculations and offer installation suggestions as part of our formal quotation. To help us provide these services, we request that you furnish us with complete information about your requirements. If possible include a drawing or sketch of your application, noting the preferred position of the electrical conduit box. The information listed below is the MINIMUM we require: (Refer to illustration below.)

- Maximum Strip, Web, or Strand Tension (A)
- Total Wrap Angle (B)
- Inclination of the Passline with respect to horizontal (C)
- Total Weight of the roll and bearings (or sheave and bearing) (TW)
- Shaft Diameter
- Rotating or Non-Rotating Shaft
- Measuring Roll Diameter (in inches)
- Maximum Machine Speed (FPM)

Include the Model Number of the Loadcell Control Required.

When placing your order, please include instructions as to how the equipment and/or shipping containers are to be marked. Loadcells are assembled from stock parts for fast delivery.

When ordering spare, or replacement parts, please reference the Model and Serial Number of the original equipment. Comptrol maintains complete files and documentation on all loadcell equipment.



APPLICATION REVIEW

Company _____

Address _____

City _____ State_____ Zip _____

Name _____

Phone _____ Email _____

APPLICATION DATA

Wrap No._____ C = _____ deg. C' = _____ deg.

Strip Tension: Max _____ lbs. Min. _____ lbs.

Line Speed: Max _____ fpm Min _____ fpm Roll Diameter _____ in.

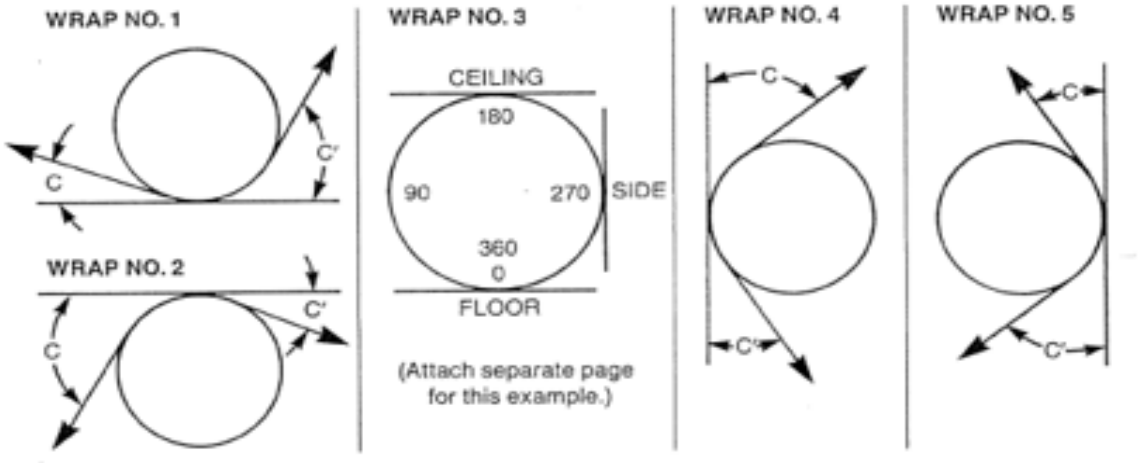
Mounting: ◯ Side ◯ Under Pillow Block Bearing (specify manufacturer & model)

Bearing Mfr. _____ Model No. _____

Roll and bearing weight: _____ lbs. Shaft diameter: _____ in.

Controller: ◯ Analog ◯ Digital Installation: ◯ New ◯ Existing

COMPTROL STRIP TENSION TRANSDUCER DATA



Special Considerations (Environment, temperature, etc.): _____

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Note that protective covers or guarding may not be shown in some illustrations to provide a clearer view of specific components or assemblies. All protective covers and guarding must be installed before operating the unit.

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