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Model EP350  
Electro-Pneumatic Tension Control  
With *DynaGain*

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OPERATOR MANUAL

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## *Dynaweb EP350 Instruction Manual*

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**INSTALLATION:****1. CONTROL:**

The control should be mounted near the brake and dancer. The mounting position is not critical, but the control should not be mounted near sources of high temperature or extreme vibration. The dancer pot and servo leads may be run in the same conduit, but the 115V AC supply leads should be run separately to avoid electrical noise pick-up in the control.

**2. DANCER POT:**

- a) Install the supplied ¼ inch diameter pin on the axis of the dancer pivot.
- b) Mount the pot and align it carefully with the pin.
- c) Couple the pot shaft to the pin with the coupling supplied.

**3. SERVO ASSEMBLY:**

The servo should be mounted as close as possible to the brake. The mounting position is not critical; however, it is recommended that the assembly be mounted vertically with the control cable and connector on top. The air supply line between the servo and brake should be kept as short as possible using 3/8" O.D. tubing.

**START-UP, POWER OFF, NO WEB:****1. SERVO PRESSURE:**

Turn on the supply air and adjust the input pressure to the servo to 80 psi. Input pressures in excess of 80 psi can lead to instability and can also result in excessive tension at the core. This adjustment is made at the small regulator mounted on the servo. Lower pressures can be used, but never less than 60 psi.

**2. DANCER POT ZERO, COARSE ADJUST:**

Remove the wires from terminals #4 & #9 at the control and connect an ohmmeter between the wires that were removed. You should read about 2500  $\Omega$  when the dancer is at mid position. If not, loosen the setscrew on the dancer pot coupling and rotate the dancer pot until the meter reads about 2500  $\Omega$ . Tighten the setscrew and reconnect the wires to terminals #4 & #9. Remove the ohmmeter. This will put the dancer pot close to its null position.

Note: This is a relative setting used to find the approximate center of the dancer pot. Since the pot has no mechanical stops it is free to rotate 360°. However, there are only 340° of electrical travel. This creates an ambiguous zero. This step eliminates the ambiguity.

**START-UP, POWER ON, NO WEB:**

**Turn POWER ON. BE CAREFUL!!! THERE IS 110 VOLTS PRESENT ON THE BOARD.**

**1. DANCER POT ZERO, FINE ADJUST:**

Using a voltmeter, connect the common to terminal #3 and the DC volt lead to terminal #9. Set at the 5V DC range. Voltage should read zero when the dancer is centered. If not, loosen the setscrew on the dancer pot coupling and rotate the dancer pot slightly until zero volts is present at terminal #9. Tighten the setscrew.

The voltage swing on terminal #9 is a function of the dancer swing i.e. for a  $\pm 30^\circ$  dancer swing, you should read approximately  $-2.5$  volts (negative when dancer is in the full storage position). **With no web in the dancer and air pressure applied to the dancer cylinder, the dancer will move to the full storage position.** When the dancer is in the empty position, the meter should read approximately  $+2.5$  volts (positive). The voltage should swing smoothly between  $+2.5$  and  $-2.5$  volts when the dancer is moved to the full  $60^\circ$  range.

Note: The above example is for a  $\pm 30^\circ$  dancer. Dancers designed with any other swing arc will give a voltage swing that is relative to the dancer swing. The ratio is 1 volt for every  $12^\circ$  of dancer swing.

**2. TP4 SET:**

Move the dancer to the full storage position. Connect a DC voltmeter common lead to terminal #3 and the positive lead to test point "TP4". Adjust "TP4 Set" pot for a 1.5 volt indication. If "TP4" is negative when the dancer is in the full storage position, reverse the dancer pot leads at terminals #4 & #5.

**3. DANCER POT ZERO CHECK:**

Swing the dancer from the full to empty storage position. The voltage at "TP4" should swing smoothly from  $+1.5$  volts to  $-1.5$  volts and should read zero when the dancer is at the midpoint of its travel.

**4. TP3:**

The gain of the system is very low and linear over 60% of the dancer travel, but becomes nonlinear very rapidly beyond 60%. The voltage at "TP3" is factory set at  $\pm 8.0$  volts, but usually is not symmetrical due to the shape of the transfer curve. It is normal to have "TP3" read 8.0 volts at full storage and  $-7.5$  volts at empty storage position. The voltage at "TP3" should be somewhere between  $+8.0 \pm 2$  volts and  $-8.2 \pm 1$  volt for most installations.

**START-UP, POWER ON, WEB UP MACHINE:**

1. The goal of this procedure is to get the response rate (adjusted with the “reset” pot) set as fast as possible (CW) and still have stable operation.

2. **STABILITY SET:**

Web up the machine and bring it to a low speed. Set a middle value of tension for the product being run by adjusting the air pressure regulator supplying the dancer. Adjust the “STAB” pot for best (most stable) operation. (Usually between 50% and 70% CW).

3. **RESET ADJUST:**

Stop and start the machine. Note the dancer will tend to bottom out as the machine starts. This is due to the slow response of the integrator. The machine then must be started slowly at first. See troubleshooting section. Note #2 for more information. As the dancer starts to recover from the starting transient, the machine can be accelerated at a higher rate. Turning the “reset” pot in the CW direction causes the integrator to respond more rapidly but too far CW may cause instability at the core. (Usually between 60% and 80% CW). See Note #2 for integrator preset instructions.

4. **CORE ADJUST:**

It will be necessary to check operation with a near empty roll (close to core) since instability can develop at this point in a roll. If instability does develop, increase “Reset” a little and re-adjust “Stab” until the dancer is centered and stable again.

5. **NORMAL POT SETTING:**

- a) The “MAXOUT” pot is ordinarily run at 100%. Decreasing its setting will lower the max brake pressure and may be used to stabilize some difficult installations.
- b) “PROP GAIN” is factory set for 4.25 volts at terminal #11 with +1.5 volts at “TP4” and capacitor C4 jumpered. Decreasing “PROP GAIN” will cause the system to respond slower to stops and starts. Increasing “PROP GAIN” may cause instability.
- c) In most applications, the pots are set as follow:

AGC	= 100% CW
MAX OUT	= 100% CW
STAB	= 60% CW
RESET	= 70% CW
INTGR.PRESET	= 30% CW
TP4 SET	= $\pm 1.5$ volts at TP4
TP3 SET	= Factory set to +8.0 volts with +1.5 volts at TP4
TP2	= Integrator output varies from +.5 to 10 volts
TP1	= AGC amp output varies from $\pm 1.5$ volts with 10 volts at the integrator (TP2) to $\pm .75$ at 0 volts at TP2

**TROUBLESHOOTING:**

Note: Do not mistake normal movement of the dancer for instability. Instability is moderate to wide regular swings of the dancer usually at a frequency not related to the RPM of the unwinding roll. A dancer behaving properly will work up and down a few degrees fairly rapidly and irregularly as it senses tension variation and corrects for them.

**1. Brake will not energize:**

- a) Check for 115 volt AC at terminal #1 & #2
- b) Check the fuse
- c) Check all connections
- d) Measure +15 volts DC between terminal #5 (positive) and terminal #3 (common)
- e) Measure -15 volts DC between terminal #4 (negative) and terminal #3 (common)
- f) Check air pressure to servo valve
- g) Measure +7.5 volts DC between terminals #11 (positive) and #10 (negative) when dancer storage is full, and zero volts DC when storage is empty.

**2. Unable to stabilize:**

- a) Check the brake for smoothness, as it is rotated 360 ° at a fixed low air pressure. Unevenness of the brake will cause torque surges as it rotates and the control may not be able to compensate for them.
- b) Caliper brakes must have less than .001 inch variation in the thickness of the disc.
- c) Check for bent shafts or binding bearings at the unwind.
- d) Check the main machine for speed stability. If it is surging in speed, the dancer may not be able to compensate for it.
- e) The primary failure or problem areas have been faulty brakes, oversize brakes, and excess air pressure to the servo.
- f) See Section II:2 Start-up, **Power Off**, No Web section. Check the transducer with an ohmmeter to make sure that the resistance changes smoothly as the dancer swings through its arc.

**Note 1:**

After the unit is adjusted properly and you are sure that the maximum, air pressure available to the brake is sufficient to tension the largest and widest rolls, lock the adjustment on the small regulator, which supplies the servo valve. Snap the red plastic ring down in to a lock position. The purpose of this is to prevent tempering with the pressure setting, as it influences systems gain. Changing the pressure by itself may cause improper operation.

**Note 2:**

The sluggish response at starting can be improved by turning the "Integrator Preset" pot to 50% and installing a normally open momentary contact from the machine "RUN" pushbutton between terminals #3 and #13 of the EP350 board. Momentary closure of this contact presets the integrator to a low level and allows the brake to de-energize more quickly. The integrator pot may need to be lower or higher than 50 ° depending on your application. See page (7) for connections.

**DANCER DESIGN NOTES:**

1. Dancers should be designed to be as light and friction free as possible. Use aluminum rolls of thin wall construction, small diameter center shaft, light bearings and lightweight aluminum arms. The idea is to keep the inertia as low as possible. Stiffness may be gained by making the pivot shaft of larger dimensions since the pivot shaft contributes relatively little to the system inertia.
2. Dancers should be air loaded because weight loading contributes lots of inertia. Air cylinders should be low friction type, preferable Bellofram or Wabco rolling diaphragm types, or use a conventional cylinder with low friction packing. Design the system so that air loading cylinders are of the smallest practical bore running at a relatively high pressure. Keep pivot-bearing drag to a minimum.
3. Pressure to the dancer air cylinder should be set by a high flow, high relief capacity regulator. One of the best we have found is the Norgren "Microtrol" Model #11-024-030, 5 to 60 psi) with ½" pip ports. Other good models with high relief flow are made by Bellofram and Fairchild. Alternatively, a quick exhaust valve can be used.
4. Ideally, the dancer should be constructed so that it hangs vertically under its pivot shaft. It helps to remove the effects of gravity on the dancer and allow better sensitivity at low tension. The total swing of the dancer from end to end should be about 60 ° ( $\pm 30$  °). The sheet should wrap the dancer 180 ° for best sensitivity of the dancer and best control stability.

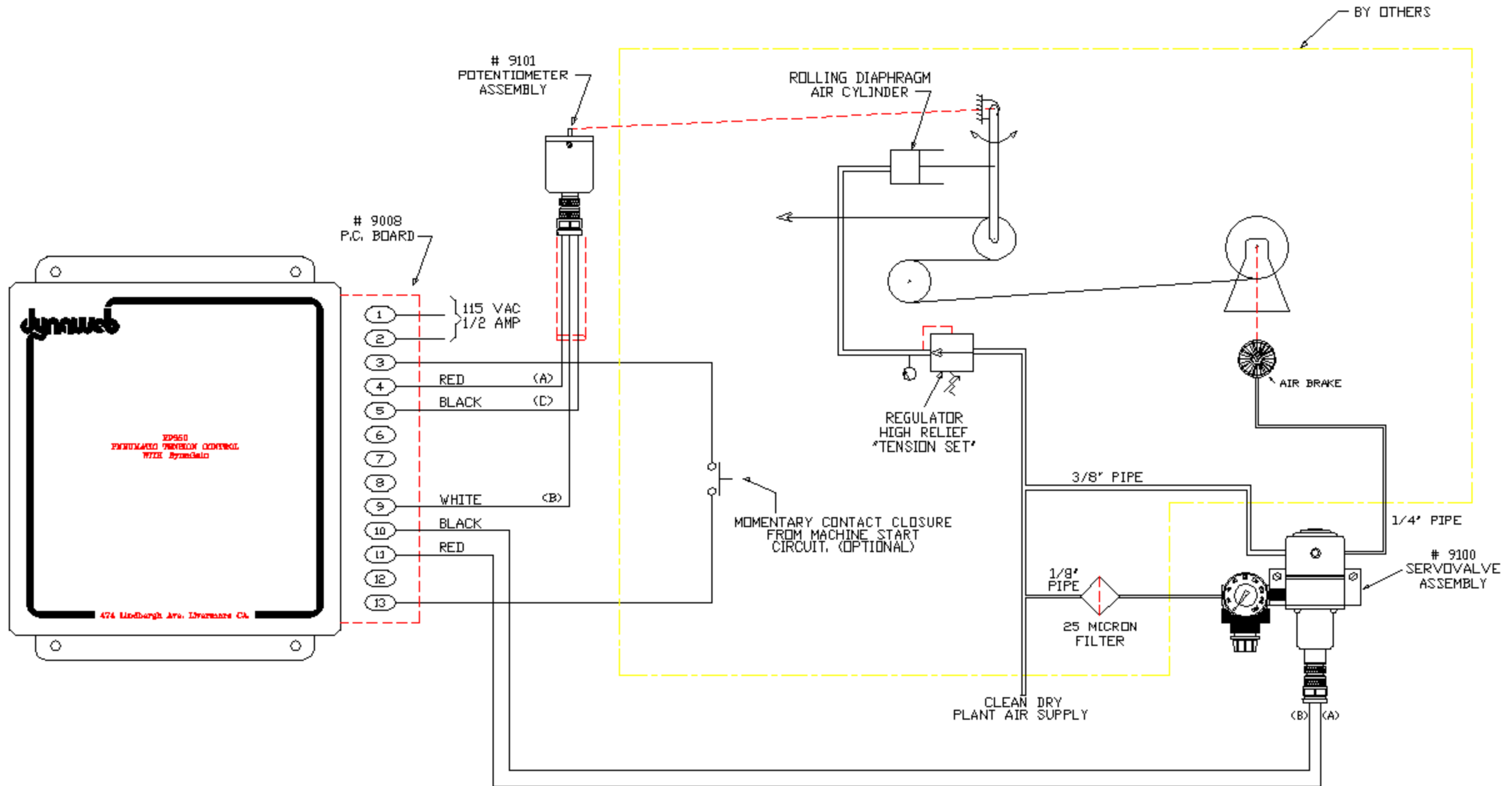
5. The length of the dancer arms should range from about 12" for a line speed of 500 fpm or less up to around 24" – 30" at speeds of about 1500 – 2000 fpm.
6. Make sure that there is no backlash or looseness between the dancer pivot shaft and the Dynaweb transducer. Use of the supplied coupling in a direct drive arrangement will insure zero backlashes. We do not recommend the use of gear drives for the transducer.
7. Provide mechanical stops for the dancer. Do not allow the end of the cylinder stroke to limit the dancer swing since it is possible to seriously damage the air cylinder.
8. Single acting cylinders, such as Bellofram or Wabco, are generally supplied with an internal return spring. This spring must be removed. Any springs which are installed as part of the dancer will make the system difficult or impossible to stabilize.

**PNEUMATIC PIPING:**

1. Air supply to the servo valve should use a minimum piping size of 3/8" OD plastic tubing. Any regulators in the line supplying the servo valve must be capable of a flow rate of at least 50 scfm with 100 psi supply and 20 psi set. The best installation results from supplying the lower part of the servo valve directly from the plant airline through a high flow filter. The lower, second stage does not require regulated air. The upper first stage is supplied with its own regulator. Reference dwg. on Page #7.
2. The airline from the servo valve to the brake should be short as practical and with minimum obstructions. The brake should be sized so that it operates near its upper pressure limits at the full roll. Operation at very low pressures is not desirable.
3. The air supply to the DYNAREB servo valve must be filtered. Servo Valves can be either plugged or blocked open if small particles are allowed into the valve. It is also essential that the filter used have sufficient flow capacity to allow the servo valve to function at full speed. An excellent filter for this purpose is made by Norgren Company. The model number is #F12-400-A2T2. This is a 25-micron self-draining filter.
4. It is important that all of the airlines up to the servo valve be blown free of all small particles before the servo valve is connected to the air system. This will help to remove small particles, which result from piping operations such as pip dope, Teflon tape, rust particles, etc.
5. **WARNING!!!!**

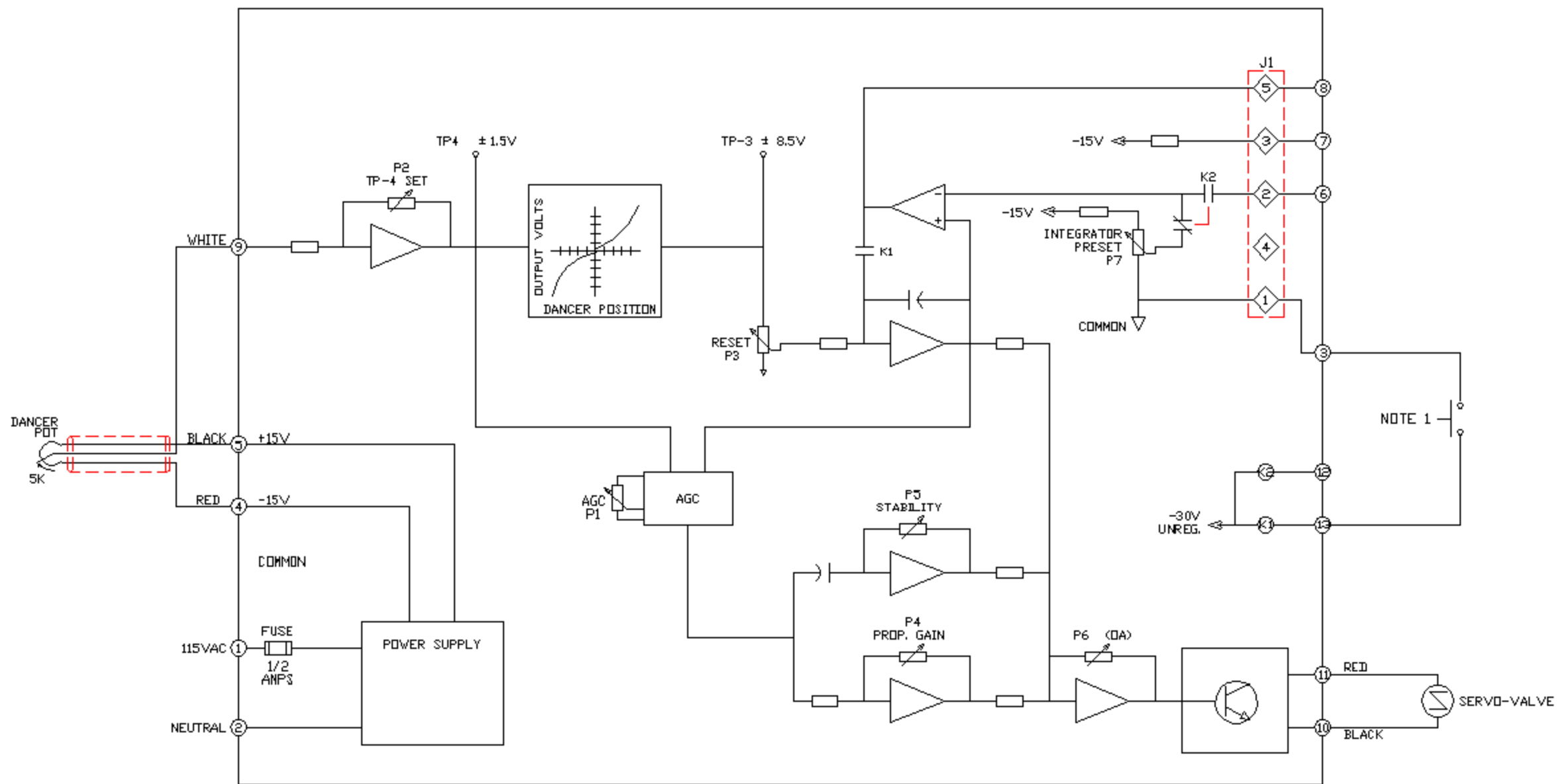
The presence of certain diester oils (synthetic Lubricants) in your airlines may cause deterioration of the elastomers used in the servo valves and early malfunction of the Dynareb control. Any material in the airline must be compatible with Buna-N-Materis. We have seen cases of failure within three weeks under these conditions.

***WARNING!!!!!!******DYNAREB SERVO VALVES ARE NOT FIELD SERVICEABLE******DO NOT ATTEMPT TO DISASSEMBLE!!!!******TO DO SO WILL VOID WARRANTY***



NOTES: 1) (#) INDICATES CUSTOMER CONNECTIONS.

EP350 CUSTOMER CONNECTIONS



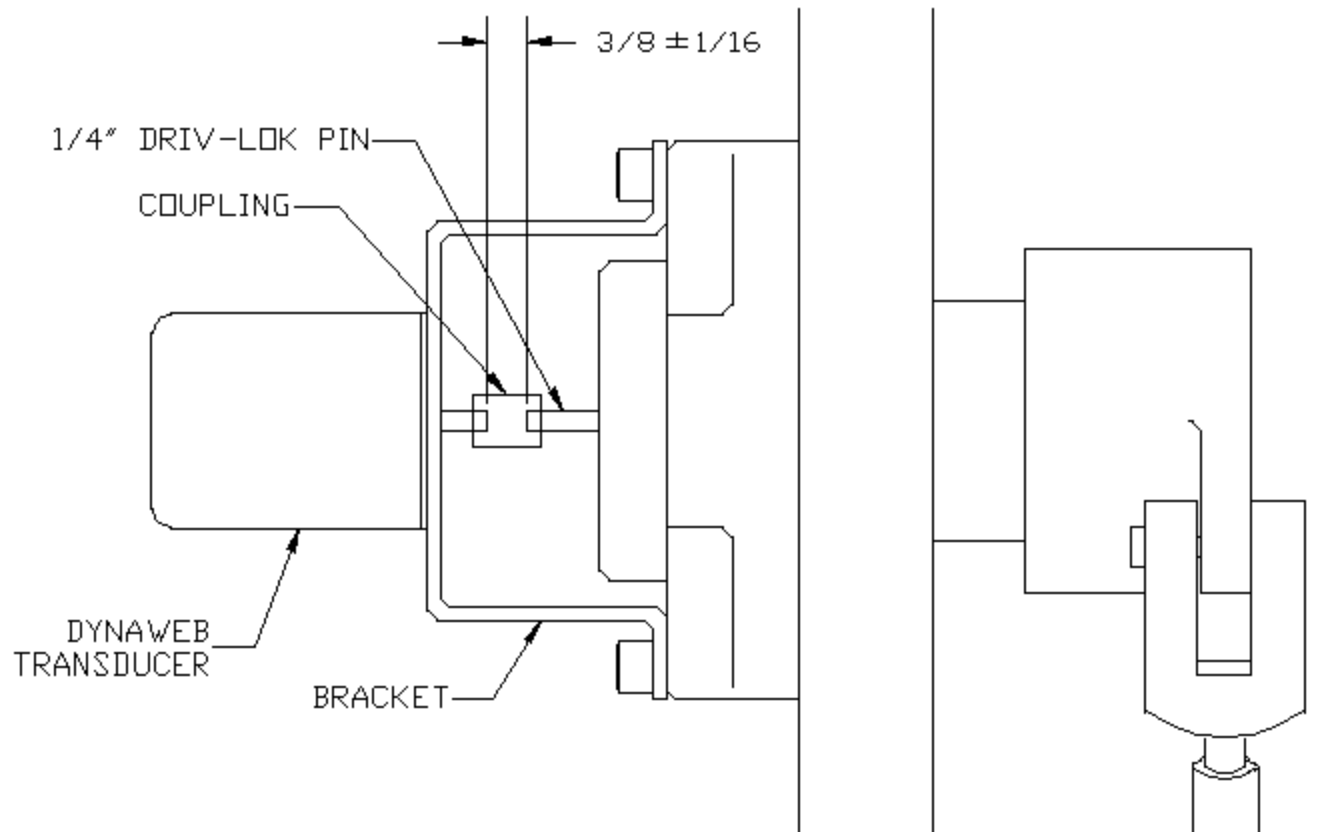
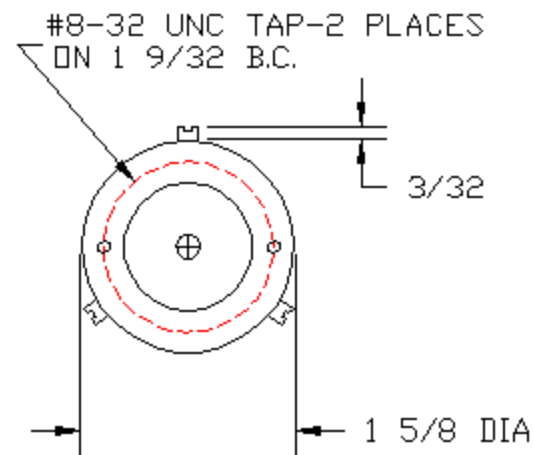
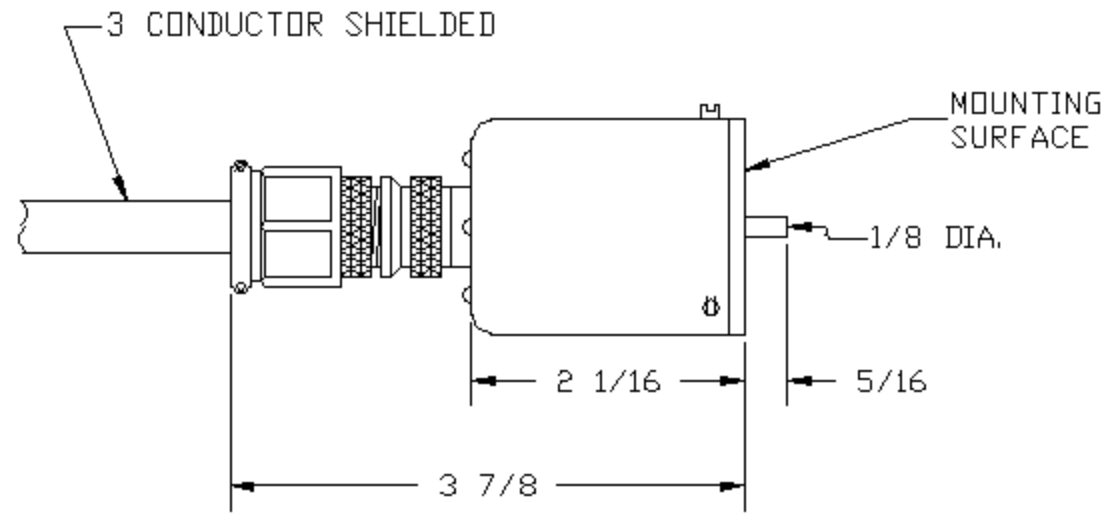
## NOTES:

1. ADD THESE CONTACTS TO MACHINE RUN PUSH BUTTON IF INTEGRATOR PRESET IS REQUIRED FOR SMOOTH DANCER CONTROL DURING START.

EP-350 SYSTEM ONE-LINE DIAGRAM

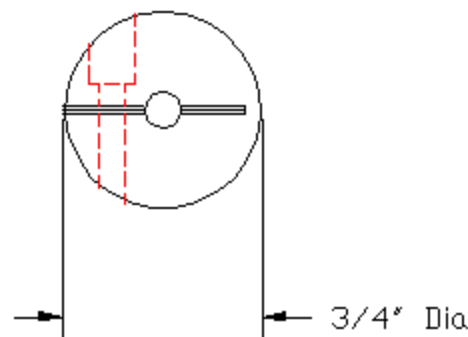
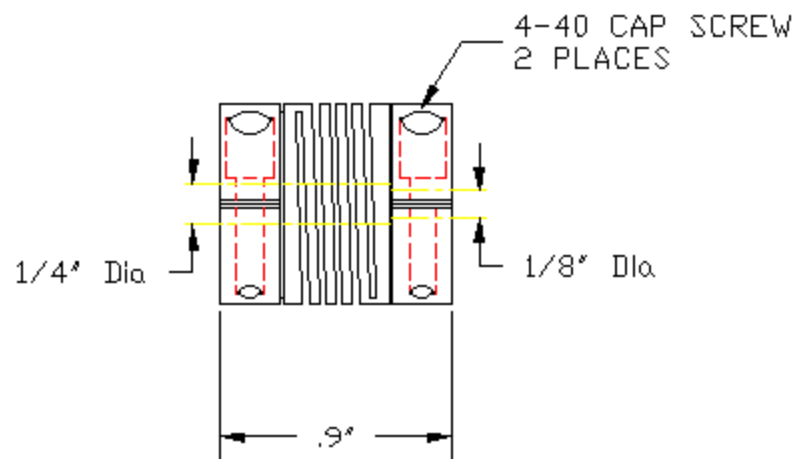
LIVERMORE, CA

# POTENTIOMETER #9101



Make sure that the clearance between the transducer shaft and the Driv-Lok pin is as shown to avoid end thrust on the transducer. The pin may be driven into a 1/4" drilled hole to any depth needed. It does not need to bottom in the hole.

# COUPLING #9301



REV.	DATE	DESCRIPTION
		LIVERMORE, CA
SCALE	NONE	CUSTOMER
DATE	3/8/89	DRAWN BY B.S.W.
SUBJECT		APPROVED BY
PROJECT		SHEET OF
		DRIVER NUMBER
		POT

**Brake Selection Notes:**

A vital part of putting together a successful automatic tension control system is the selection of the proper brake. While many different brands and models of brake can be used successfully, it is also true that the wrong brake can prevent proper operation of the overall tension control system.

There are three primary considerations in the selection of the brake. These are (1) thermal capacity, (2) torque range, and (3) extra torque capacity for an emergency stop. All brake manufacturers include (or have available on request), information on the maximum heat rejection (cooling capacity) for each brake model. Heat rejection for any particular air-cooled model is usually related to the rpm at which the brake is running, while water cooled brakes are not usually rpm sensitive. As a rule, water-cooled brakes will reject much more heat, although modern air-cooled brakes have improved greatly in this respect in recent years. So it is important that calculations be made which take into account rpm, torque, and line speed to determine whether a particular brake will reject the heat that is generated.

The second consideration is the torque range selected. This is very important for proper operation of the overall control system. It is common to find brakes that are too large on older machines that are being refitted with an automatic control. This is because modern substrates are often lighter gauge than those used in years past, and also are often extensible plastics of various sorts. Both of these trends in substrates require lower tension than previously used.

Air brakes are usually rated for operation at pressure up to about 60-75 psi. They also incorporate retraction springs that pull the friction linings clear when the air pressure is removed. A typical retraction spring will require somewhere around 1.5 to 2.5 psi to move the linings into contact. So the brakes are unusable at pressure below the retract pressure. It is usually safe to assume smooth control down to about 2.5 psi for most brakes. This works well with the Dynaweb control servo valve, which is capable of a pressure range from about 1.5 psi up to 75 psi (with an 80 psi air supply). Since the torque requirements are proportional to the roll diameter, the range of torque required will be in the same ratio as the maximum roll diameter divided by the core OD. For example, a 50" diameter roll which runs on a 3.5" core, will need a torque ratio of  $50/3.5 = 14.29$ . This means that if the maximum torque needed at full diameter requires a pressure of, say, 60 psi; the ending pressure will be  $60/14.29$  or 4.2 psi. This is a workable range for both the brake and the Dynaweb. If the brake is oversized so that the starting pressure is instead only 20 psi, the ending pressure will have to be  $20/14.29$  or 1.4 psi. This is down in the range where neither brake nor the servo valve will work well, if at all. This is very likely to cause trouble.

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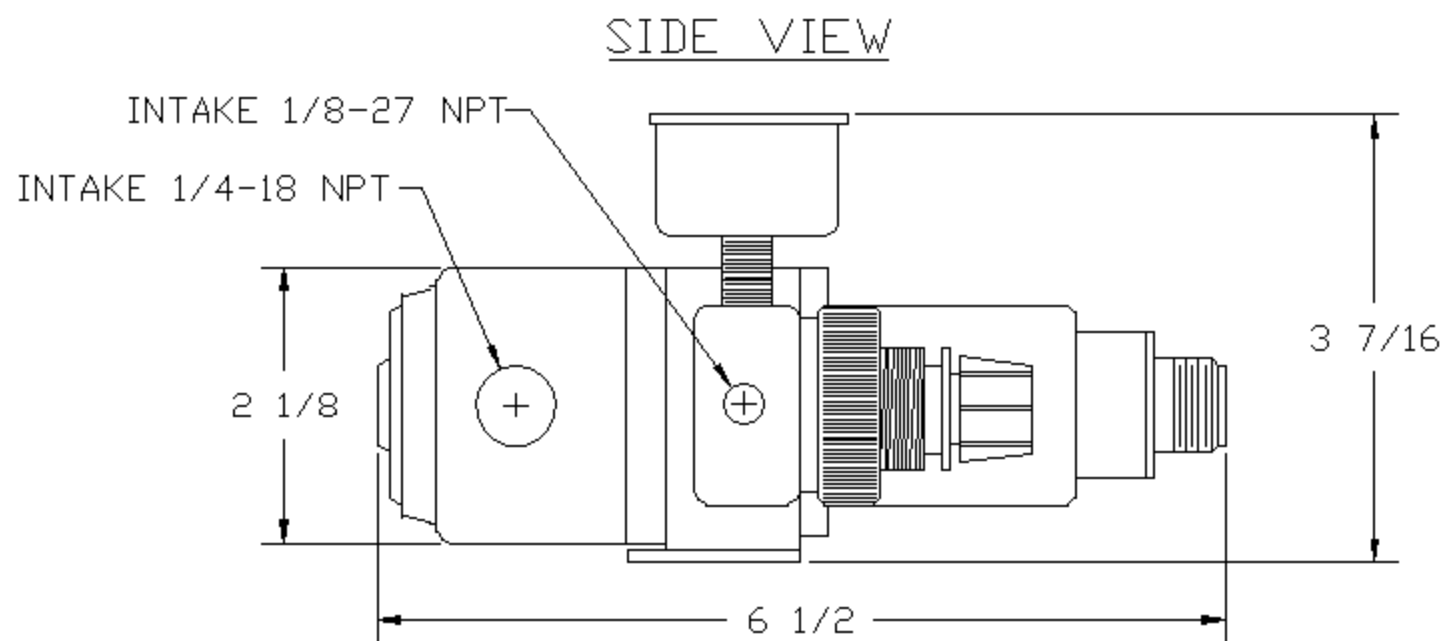
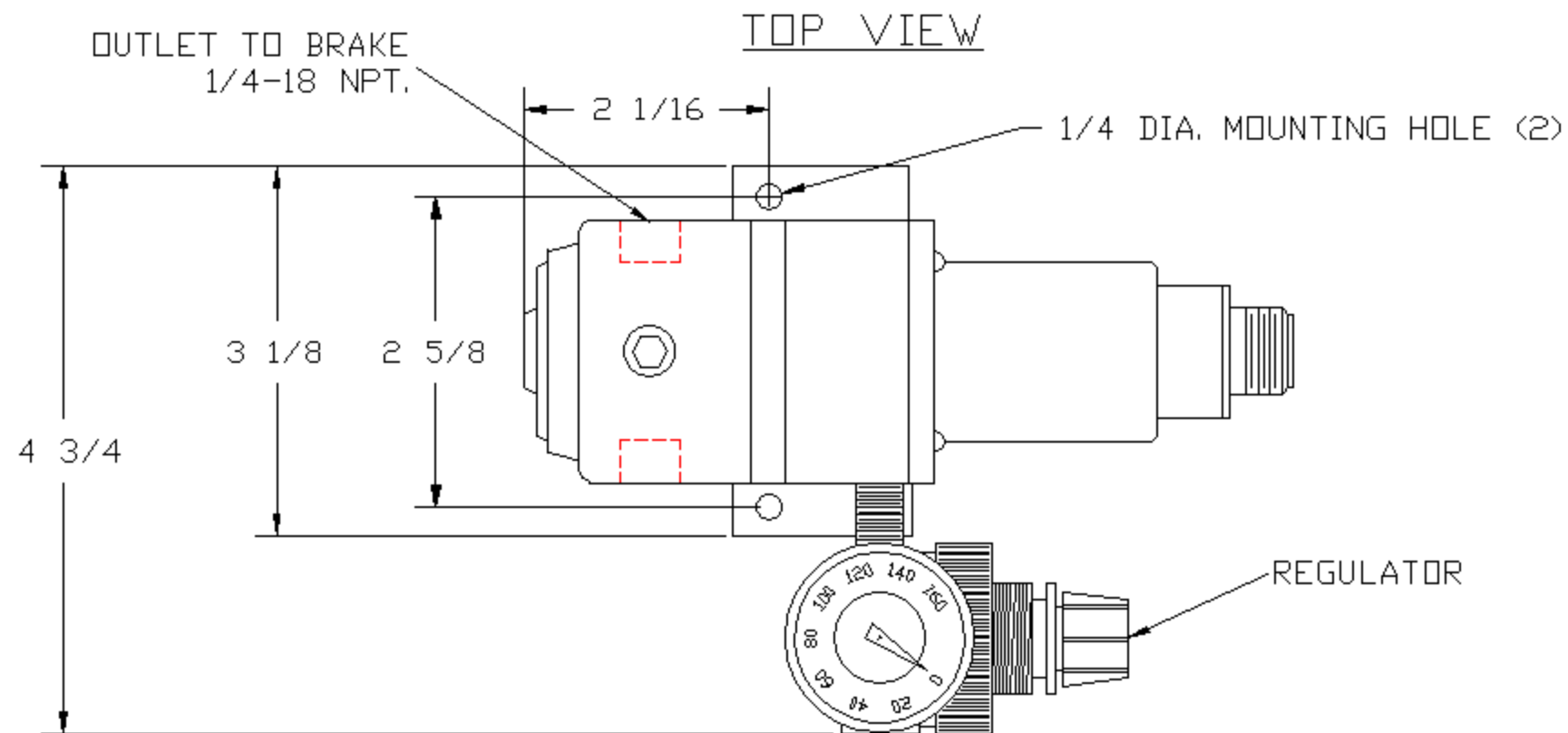
Because of this, it is very important to make sure that the brake is properly sized both for cooling capacity, and for torque range. Size the brake so that the minimum pressure required at core is not less than about 2 psi. In general, everything works better if the pressure range is kept on the high side.

The third consideration is excess torque capacity for emergency stops. During an “E” stop, the Dynaweb will quickly go to maximum pressure (about 75 psi). If a very rapid stop is desired, the excess torque available at 75 psi may not be enough. If this is the case, **don’t** try to run with a larger brake. Instead, make a provision either for extra calipers to be switched into action during “E” stop, or add an extra brake to be used for “E” stop only. In any case, the Dynaweb controller is designed to adjust automatically for the extra brake and maintain control of the web even during the “E” stop. Alternatively, if control of web tension is not needed during “E” stop, it is possible to switch a preset high pressure (not higher than the brake pressure limit) into the brake, while simultaneously switching out the Dynaweb pressure. This may break the web, but will allow rapid stopping of the unwind.

DYNAWEB #9100 SERVO ASSEMBLY

\*\*\* WARNING \*\*\*

DYNAWEB SERVOVALVES ARE NOT FIELD SERVICEABLE  
DO NOT ATTEMPT TO DISASSEMBLE  
TO DO SO WILL VOID WARRANTY.



REV.	DATE	DESCRIPTION
<b>dynaweb</b>		LIVERMORE, CA
SCALE	NONE	CUSTOMER
DATE	3/7/89	DRAWN BY B.S.W.
PROJECT		APPROVED BY
SERVO ASSEMBLY		CHECKED BY
PROJECT		DRAWING NUMBER
		SERVO

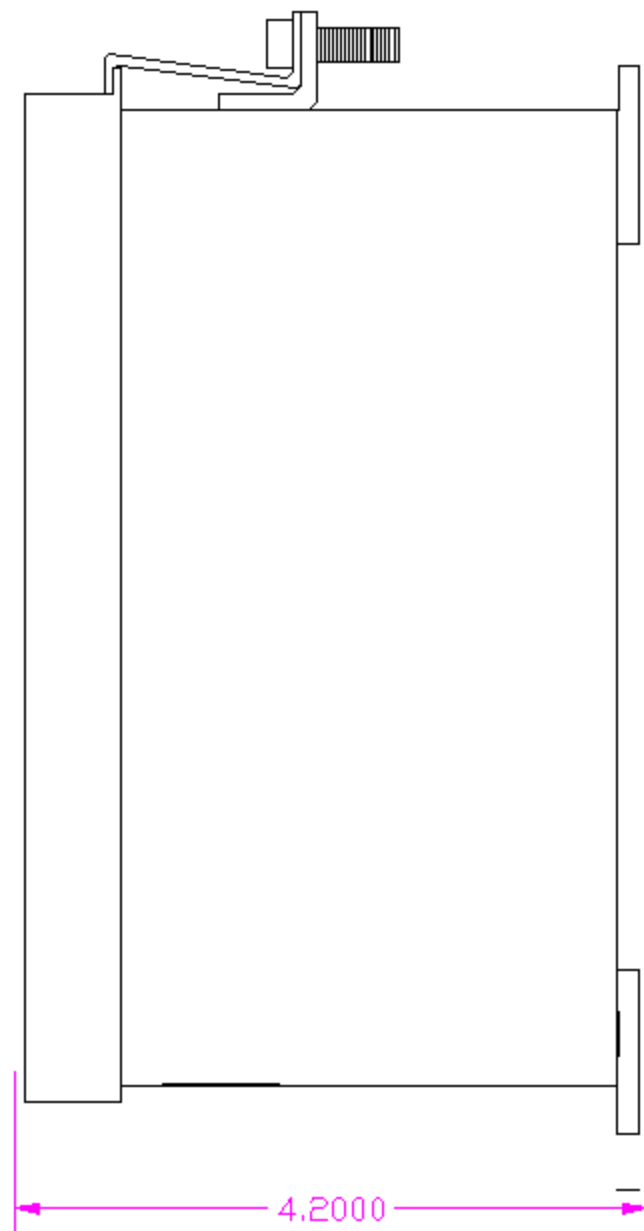
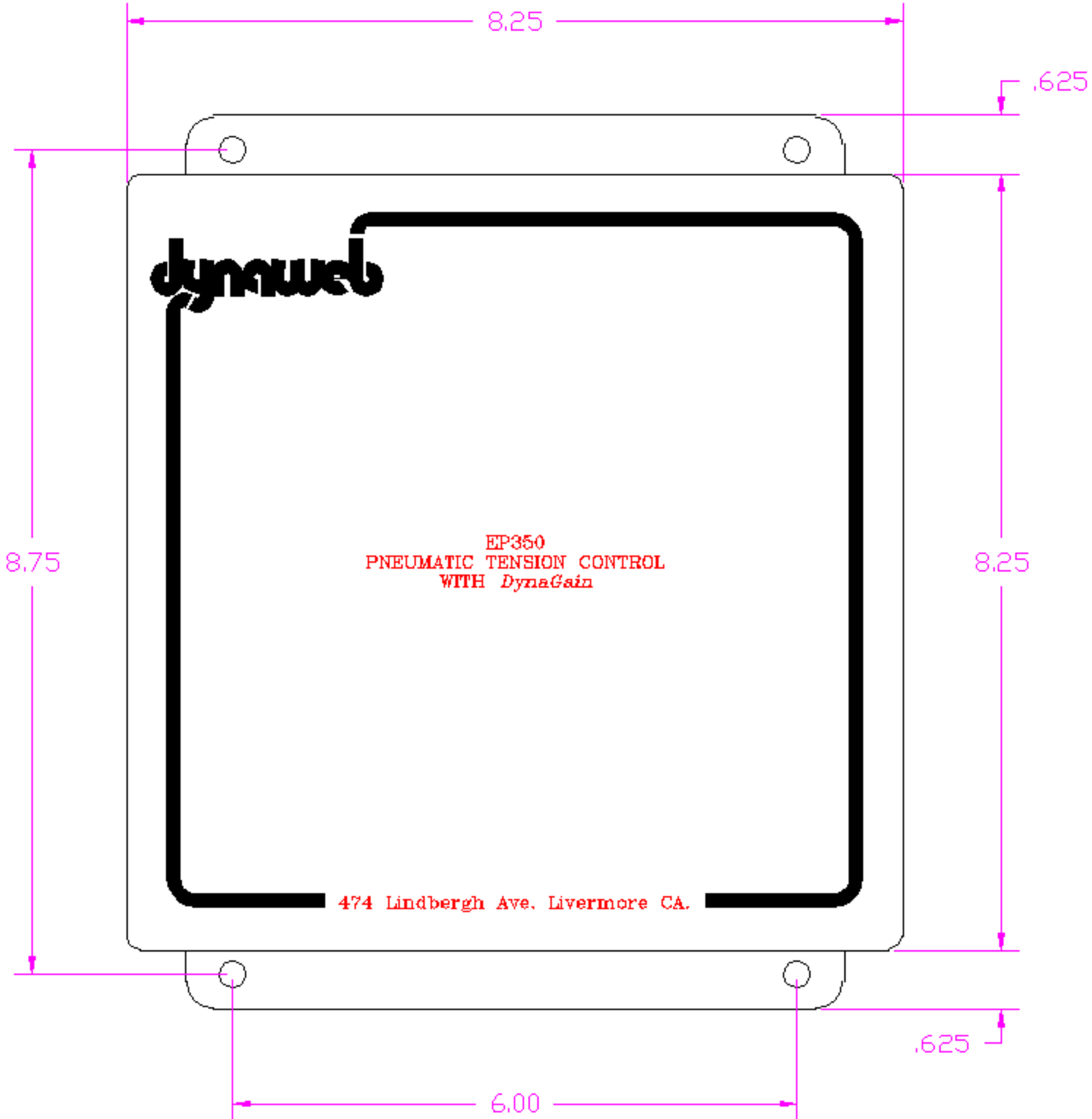
***WARNING!!!!!!***

***DYNAWEB SERVO VALVES ARE NOT FIELD  
SERVICEABLE***

***DO NOT ATTEMPT TO DISASSEMBLE!!!!***

***TO DO SO WILL VOID WARRANTY***

***Please Call Factory for Assistance!!!***



REV.	DATE	DESCRIPTION
<b>dynaweb</b> LIVERMORE, CA		
SCALE	FULL	CUSTOMER
DATE	7/12/89	DRAWN BY B.W.
SUBJECT	EP350 ENCLOSURE LAYOUT	
PROJECT	DRAWING NUMBER EP 350BDX	