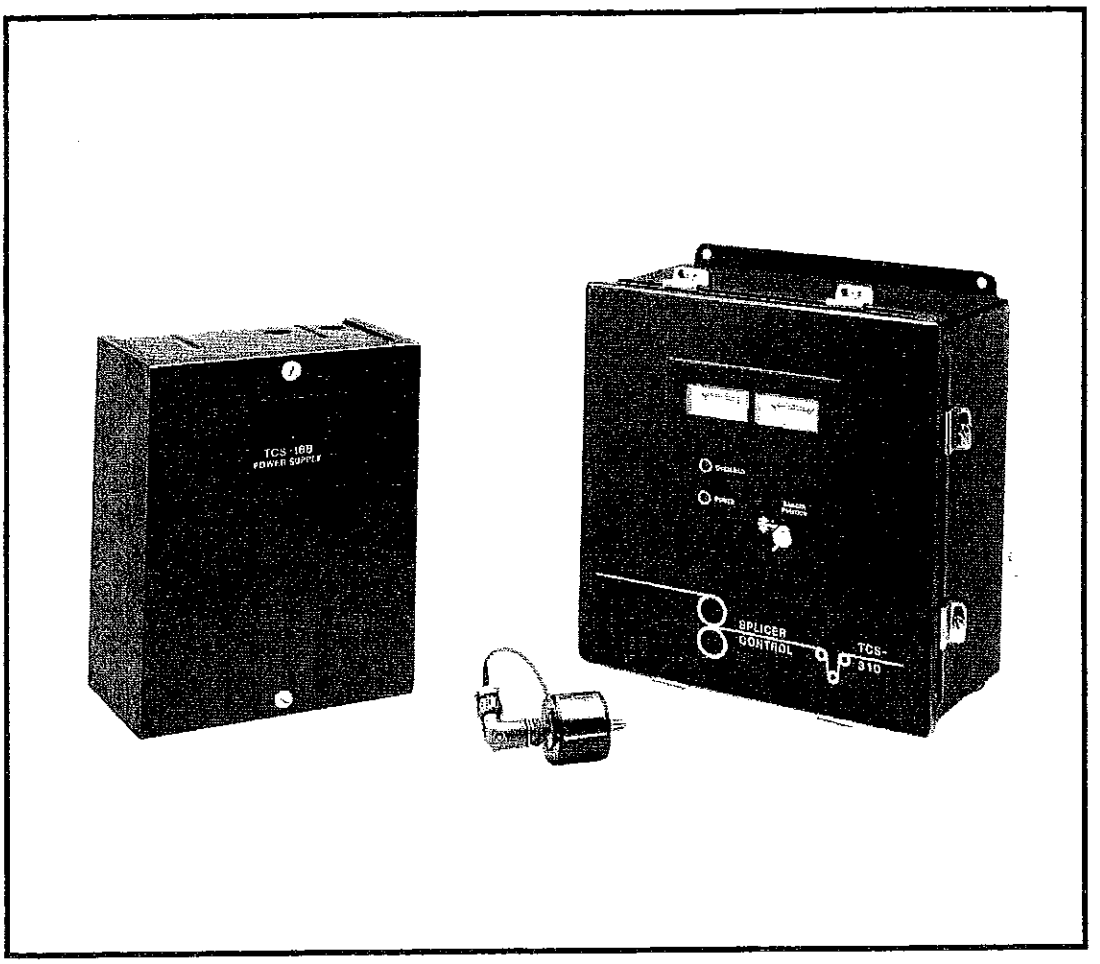
WARNER

INSTALLATION & OPERATION MANUAL

TCS-168 / TCS-310
Dual Brake Dancer Control



Warner Electric

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This warranty extends only to the original purchaser and is not transferable or assignable without Warner Electric, Inc.'s prior consent.

Warranty service can be obtained in the U.S.A. by returning any defective product, transportation charges prepaid, to the appropriate Warner Electric, Inc. factory. Additional warranty information may be obtained by writing the Customer Satisfaction Department, Warner Electric, Inc., 449 Gardner Street, South Beloit, Illinois 61080, or by calling 815-389-3771.

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This warranty covers normal use and does not cover damage or defect which results from alteration, accident, neglect, or improper installation, operation, or maintenance.

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Warner Electric, Inc.'s obligation under this warranty is limited to the repair or replacement of the defective product and in no event shall Warner Electric, Inc. be liable for consequential, indirect, or incidental damages of any kind incurred by reason of the manufacture, sale or use of any defective product. Warner Electric, Inc. neither assumes nor authorizes any other person to give any other warranty or to assume any other obligation or liability on its behalf.

WITH RESPECT TO CONSUMER USE OF THE PRODUCT, ANY IMPLIED WARRANTIES WHICH THE CONSUMER MAY HAVE ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL CONSUMER PURCHASE. WITH RESPECT TO COMMERCIAL AND INDUSTRIAL USES OF THE PRODUCT, THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS.

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INTRODUCTION

Warner Electric's Tension Control systems are comprised of:

- Electro Disc Tension Brake
- Power Supply
- Splicer Control
- Input Sensor

This manual has been designed to cover installation, start-up, adjustment and maintenance of the control portion of your tension control system. Further information on brake sizing and selection can be found in catalog P-771.

Power Supply

The TCS-168 power supply operates from either 120 VAC or 240 VAC to supply operating current for the TCS-310 and the Electro Disc Tension Brake.

Controls

The TCS-310 Dancer Splicer Control is a solid-state electronic control that can operate as a splicer control with one brake controlling and one brake in a holding mode or with dual output for simultaneous operation of dual tension brakes. The TCS-310 includes the necessary control circuits to provide closed loop control from a dancer input and provides the proper output currents to the brakes. All necessary circuits are provided in the control logic for switching between brakes. Meters on the control's front panel show the current being applied to both the running and holding brakes. Because of the control's constant current output, brake torque is not substantially affected by changes in brake temperature. Consequently, brake torque is repeatable for a given input level.

Sensors

Two different sensors are available for use with the TCS-310 control:

- MCS-605-1 single turn pivot point sensor for use with conventional dancers with up to 60° swing.
- TCS-605-5 five turn sensor for use with festoon dancer with pivot point rotation of 300° or more.

Brakes

Electro Disc Tension Brakes convert electrical current supplied by the control into torque, which retards the roll of material from which the web is being drawn to maintain the desired web tension.

Theory of Operation

TCS-168 Power Supply

Input AC power to the TCS-168 power supply flows to the transformer through a switch, which selects either 120 or 240 VAC current. Dual transformers produce the operating currents required for the control and brake. This low voltage AC is rectified and filtered to provide 9 VDC and 48 VDC for operation of the controls and brakes, respectively. Internal fusing and over-voltage protection circuits are included in the TCS-168 to prevent damage from incorrect voltage inputs.

TCS-310 Control

The TCS-310 control has four boards:

1. Main dual output/driver board
2. Splice logic board
3. Input logic board
4. Meter board

The signal from the pivot point sensor provides position, velocity and directional information to the P-I-D control logic board, which translates, conditions and amplifies the signal for proper use by the other control circuits. Gain and dancer position adjustment potentiometers are located on the P-I-D board. The dancer position adjustment sets the dancer so it will maintain a steady running position. The gain adjustment sets the responsiveness of the system. The lower the gain setting, the less responsive the system is; the higher the gain setting the more responsive it becomes. This can also be thought of as the sensitivity adjustment.

The P-I-D board also has the individual gain adjustments for the proportional, integration, and differentiation stages. These allow fine tuning of control logic to the particular dynamics of the machine. The differentiation circuit also provides switch selectable ranges to match the transient response of the control to achieve best dancer stability. Ranges provide for low, medium, and high gain response. An automatic anti-drift reset is also provided to reset the integrator automatically, based on dancer position at machine startup. The reset is adjustable over the full range of dancer movement from +5° to +30°.

The P-I-D board signals are sent to the splice logic board after contitioning. The splice logic board has circuitry to switch between the two brakes based on input signals. Normally, one brake is running while the other brake holds. A mode selector switch on the logic board operates both outputs under dancer control, a particularly desirable feature when dual brakes are required.

Input switching between brakes is by either level or pulse signal. Additional inputs are provided for brake release and full brake on functions. The control system can be configured for operation on either zero-speed splicer or pasters.

Adjustment potentiometers on the splice logic board set the various functions to the holding brake. These include delay time before initiate, ramp time, minimum switch over level, and maximum holding level. With these adjustments, the system can be tailored to almost any application.

The main output/driver board has circuits to convert the controlling signals from the P-I-D board and the splice logic board to current output levels for controlling the brakes.

The main output/driver board includes all the circuits necessary for the operation of the brakes. An overload reduction circuit reduces current output automatically whenever it exceeds 270 milliamps per magnet for 15 to 30 seconds. Current is reduced to 270 mA per magnet when this circuit activates and an indicator LED marked "overload' illuminates on the face of the control. An anti-residual circuit for each output adjusts the reverse current through the brakes in the off-state. This current is adjustable via potentiometers for each channel to eliminate static residual magnetism in the brakes. LED's on the circuit indicate brake outputs and relative brake current for each channel in addition to overload status. These LED's provide valuable information when the control faceplate is not used or when the control is mounted behind a panel.

The main output/driver board also contains the protection circuits necessary to prevent damage to the control should miswiring or shorts exist. These protection schemes include reverse voltage protection on both the 9 volt and 48 volt inputs, fusing on input power, anti-residual outputs, and short-circuit shutdown protection on the main output drive transistors.

The faceplate has two meters, an indicator LED for status and a potentiometer for adjusting Dancer Position. The meters display percentage of output current to the brake. Ranges are color-coded on the meters; yellow indicates anti-residual or reverse current level, green indicates normal operating currents (0 to 270 ma/ magnet) in the range of 0 to 100%, and red indicates over current range (270-500 ma/magnet) or 100% to 150% output range.

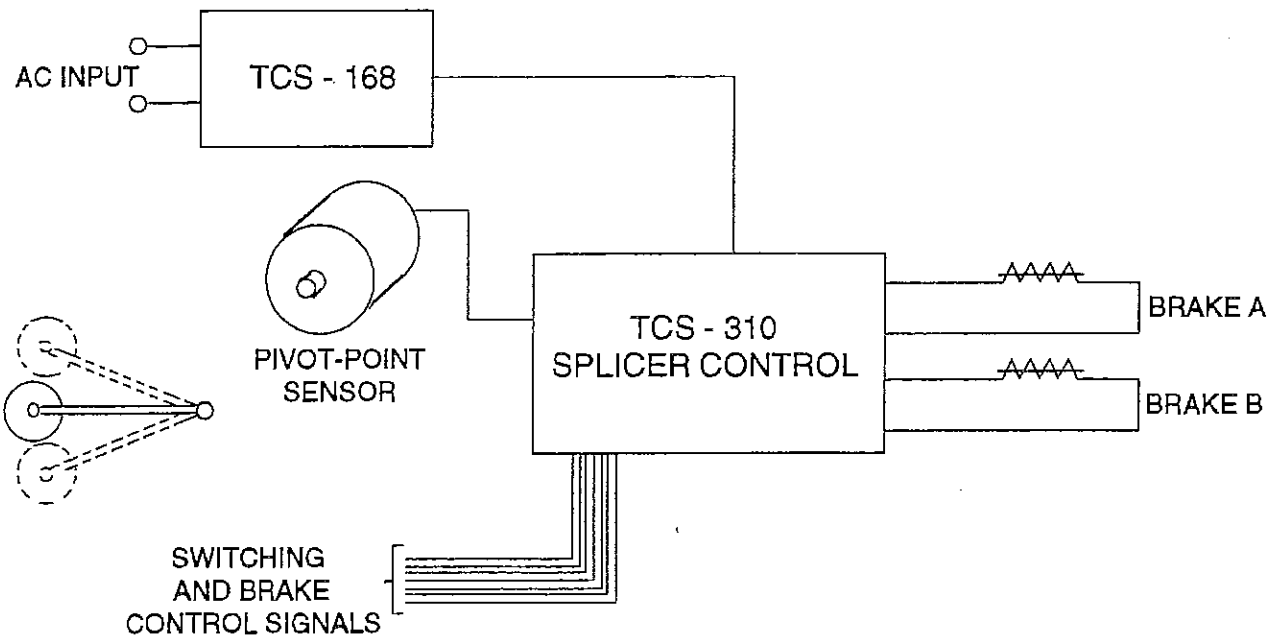


Figure 1 System Block Diagram

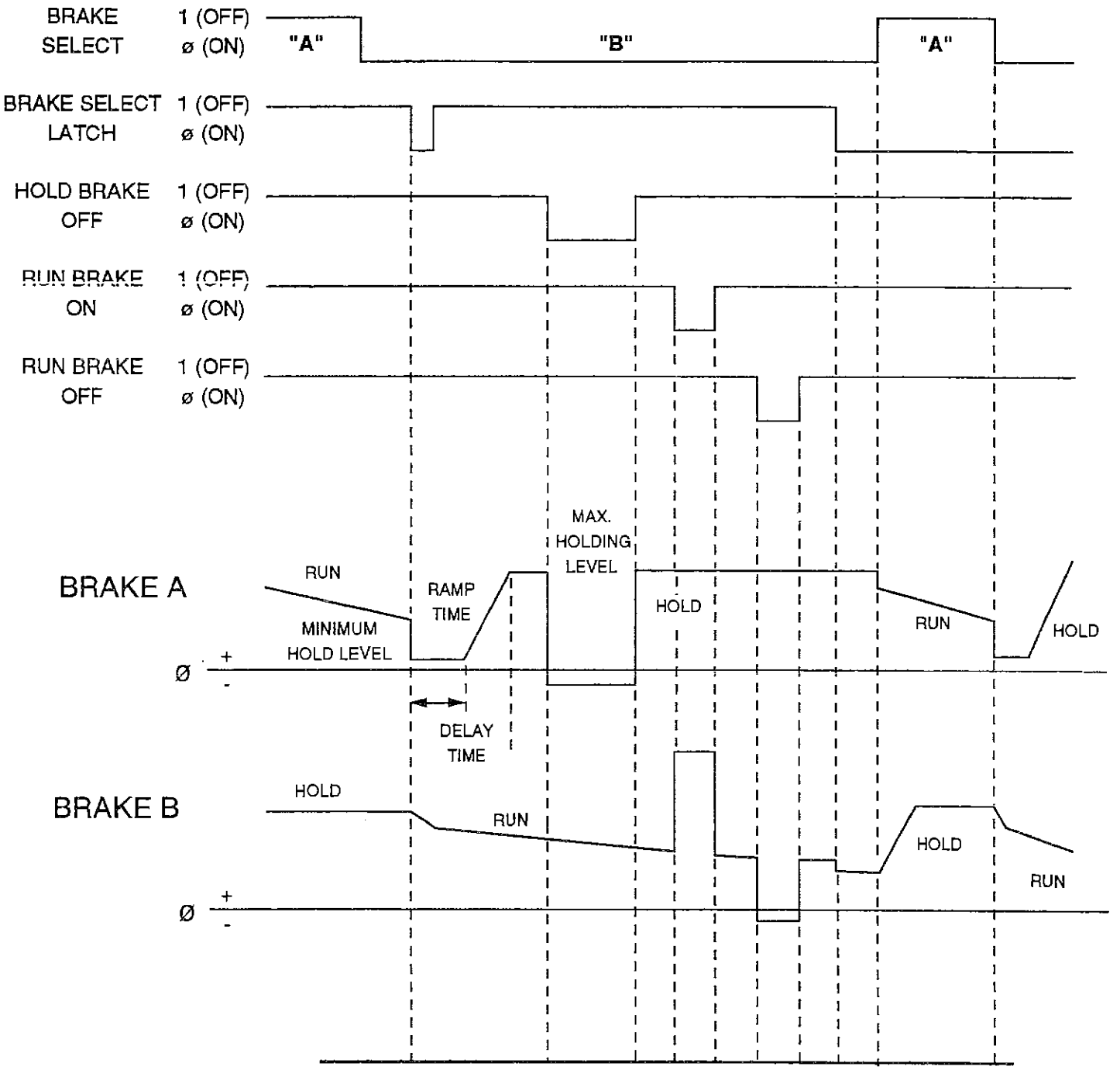


Figure 2 Functional Logic Diagram

TECHNICAL SPECIFICATIONS

TCS-168 Power Supply

Part Number: 6910-448-032

Input Power: 120VAC or 240VAC ±10%, 50/60 Hz, 1 Phase switch selectable on board

Output: Unregulated 9VDC @ 2.0 Amps
Unregulated 48VDC @ 3.2 Amps continuous, 6 Amps intermittent, 1.6% duty cycle, 30 second on-time.

Ambient Temperature: -20°F to +115°F (-29°C to +46°C)

Fusing:

		Dual
F1	2A	2A
F2	8A	15A
F3	7A/120VAC	15A/120VAC
	5A/240VAC	10A/240VAC

All fuses are 312AG, FA, 250V types.

Protection: Overvoltage protected on 9 volt output.

General: The control must be considered NEMA 1 when used with optional enclosure and should be kept clear of all areas where foreign material, dust, grease, or oil might affect power supply operation.

The control chassis should be electrically grounded.

TCS-310 Dancer Splicer Control

Part Number: 6910-448-042

Input Power: 8-12VDC at 3 amps
48VDC at 3.2 amps continuous, 6 amps intermittent, 1.6% duty cycle, 30 second on-time (from TCS-168)

Brake Output: Pulse width modulated, 0 to 270 ma per magnet continuous, 270 to 500 ma per magnet intermittent, 1.6% duty cycle, 30 second on-time. Up to 12 Electro-Disc magnets per brake channel, 2 brakes per control system.

Ambient Temperature: -20°F to +115°F (-29°C to +46°C)

Fusing: F1 - 3 amp, fast-acting, 250V, type 3AG
F2 - 10 amp, fast-acting, 250V, type 3AG
F3 - 1.5 amp, fast-acting, 250V, type 3AG
F4 - 1.5 amp, fast-acting, 250V, type 3AG

Protection: Internal short-circuit protection on each output driver stage. Reverse voltage protection on DC input power connections.

Overload Cutback: Reduces maximum output current to 270 ma per magnet after 15 to 30 seconds in the 270-500 ma per magnet range. Reset by brake release input or reduced demand below 270 ma per magnet for 15-30 seconds.

Sensor Input: MCS-605-1 Pivot-Point Sensor (1 turn)
TCS-605-5 Pivot-Point Sensor (5 turn)

External Inputs: Running Brake Off – Removes current to the running brake and applies anti-residual current, activates anti-drift and resets overload detector. Active low.

Running Brake On – Applies full output of 500 ma per magnet to the running brake. Overrides all other control functions except Brake Off. Active low.

Holding Brake Off – Removes current to the holding brake and applies anti-residual current. Active low.

Anti-Drift – Provides integrator reset function. Active low.

*Brake Select – Selects which brake will be in the running mode and which will be in the holding mode.

"1" (High) A - Running, B - Holding
"0" (Low) A - Holding, B - Running

*Brake Select Latch – Operates in conjunction with brake select input to carry out brake select command. Active low with minimum execute time of 50 msec.

*Brake Select and Brake Select Latch Inputs allow for set-up of control as either level input or pulse input operation for transferring between brakes "A" and "B."

Adjustments:

Front Panel: Dancer Position – Provides reference for setting dancer operating position.

Internal:

P-I-D Logic Board:

Dancer Position – Works in conjunction with front panel dancer position adjustment for setting dancer operating position.

Gain – Controls overall system response based on change of dancer input signal.

Automatic Anti-Drift Reset – VR3. Sets dancer position where integrator reset occurs.

Proportional Gain – via VR4

Integration Gain – via VR6

Differentiator Gain – via VR5

Differentiator Response – via SW1

Note: P-I-D gains, differentiator response, and automatic anti-drift reset adjustments are covered in greater detail in the System Start-Up and Adjustment section starting on page 18.

Splice Logic Board:

Normal/Slave, SW1. Establishes operation of one brake in running mode and one brake in holding mode, or both brakes in the running mode.

Ramp Up Delay, R21 - Adjusts delay time between switching from one brake to the other before ramp timer starts timing.

Ramp Time Adjust, R22 - Sets time for ramp to maximum holding level.

Holding Level Adjust, R23 - Sets final steady-state holding level on holding brake. Adjustable between 0 and approximately 200 ma per magnet.

Minimum Holding Level, R24 - Sets initial minimum holding level during switch over from one brake to the other.

Main Output Board:

Frequency, R57 - Adjusts pulse width modulation frequency to the brake to reduce unwanted hum. Adjustment range is 125 to 360 Hz.

Anti-Residual, Channel A, R106 - Adjusts reverse current in the brake magnets in the brake-off mode to reduce static residual magnetism.

Anti-Residual, Channel B, R128 - Adjusts reverse current in the brake magnets in the brake-off mode to reduce static residual magnetism.

General: The control chassis must be considered NEMA 4 and should be kept clear of all areas where foreign material, dust, grease or oil might affect the operation of the control.

The control chassis should be electrically grounded.

Neither sensor nor brake wires are at ground potential and should be considered "floating" unless both sides of the AC input to the TCS-168 are disconnected.

Sensors

MCS-605-1 Single Turn Pivot-Point Sensor

Part Number: 7330-448-002

Control Element: Precision potentiometer, 1000 ohms, 2 watts, ±5% tolerance

Cable: 15 foot, shielded, with connector

General: The tension sensor should be kept free from foreign materials, dust, grease and oil.

TCS-605-5 5-Turn Pivot Point Sensor

Part Number: 7330-448-003

Control Element: Precision potentiometer, 1000 ohms, 2 watts, ±5% tolerance

Cable: 15 foot, shielded, with connector

General: The tension sensor should be kept free from foreign materials, dust, grease and oil.

Tension Brakes

Data and technical specifications for the Electro-Disc Tension Brakes can be found in Warner Electric's Tension Control Systems Catalog, form no. P-771.

For brake installation, see service manual, form no. P-259 and P-259-1.

INSTALLATION

WARNING: To avoid possible injury (or even death), make certain all power is off before attempting to install or service system components or any electrical equipment.

This installation and operating manual has been arranged for the systematic installation and start-up of your tension control system. To facilitate orderly installation, please check off each completed step in the space provided before proceeding to the next step.

Sample
☒ Check box after completion of each step.

☐ 1. Remove power supply chassis from plywood shipping base by removing the three (3) screws securing the chassis to the plywood.

TCS-168 Power Supply Installation

The TCS-168 can be mounted as an open frame or enclosed unit. For open frame mounting, the power supply must be affixed in your panel or control enclosure. When used with the optional enclosure, the enclosure becomes the base plate for the power supply chassis, and only the enclosure is mounted to the machine frame.

A. Open Frame Mounting

☐ 1. Select an appropriate mounting location in the panel with sufficient space for wiring access.

☐ 2. Using the dimensions shown in Figure 3, page 11, drill three mounting holes using a 13/64" drill to provide clearance for No. 10 bolts.

NOTE: The TCS-168 is shipped bolted to a plywood base which must be removed before mounting.

☐ 3. Securely mount the TCS-168 to its panel using No. 10 bolts.

The power supply is now ready to be wired. Refer to the wiring section of this manual starting on page 14.

B. Optional Enclosure Mounting

☐ 1. Select an appropriate mounting location for the TCS-168 enclosure.

☐ 2. Drill four mounting holes per dimensions shown in figure 4, page 11, using a 13/64" drill to provide clearance for No. 10 bolts.

☐ 3. Securely mount the enclosure in the selected location using No. 10 bolts.

NOTE: The TCS-168 is shipped bolted to a plywood base which must be removed prior to mounting in the enclosure.

☐ 4. Mount the TCS-168 power supply assembly to the enclosure using the mounting studs provided in the enclosure housing. Fasten the TCS-168 securely with the nuts provided on the mounting studs.

This completes the mounting of the TCS-168 power supply and enclosure base. The power supply is now ready to be wired. Refer to the wiring section starting on page 14 for complete instructions.

TCS-310 Control Installation

The TCS-310 can be mounted using the furnished enclosure or mounted open frame in your own panel or enclosure. In either case, please follow these instructions carefully to insure proper mounting.

A. Open Frame Mounting

When the TCS-310 is mounted open frame, the meter panel must be mounted remotely. Follow the instruction below carefully to insure proper installation and connection between the control board and meter board.

1. Meter and Front Panel Assembly

☐ a. Using figure 5, page 11 for dimensions, make a cut-out in the panel where the meter and front panel assembly are to be mounted and drill the four mounting holes using a 5/32" drill.

☐ b. Mount the meter and panel assembly in the cutout using 6-32 flat-head screws and 6-32 nuts with either star washers or lock washers.

☐ c. Apply the label to the panel assembly after the meter and front panel assembly has been securely fastened.

NOTE: The meter board assembly and main board assembly are connected with a fixed length of wire which uses snap terminal connectors. If longer wiring is required, refer to the wiring section for detailed instructions.

2. Control Assembly

☐ a. Pick a suitable location for mounting the control chassis. Allow sufficient space to accommodate wiring.

☐ b. Drill four mounting holes per dimensions shown in figure 6, page 12, using a 13/64" drill to provide clearance for No. 10 bolts.

❑ c. Mount the control chassis using four No. 10 bolts. Make sure the control is securely fastened.

This completes the open chassis mounting of the control and meter assembly. The control system is now ready for wiring. Refer to the wiring section starting on page 14 for complete wiring instructions.

B. Enclosure Mounting

When the TCS-310 is mounted within the enclosure, the meter panel assembly is an integral part of the control system.

❑ 1. Pick a suitable location to mount the control enclosure. Allow sufficient room for the enclosure door to be opened.

❑ 2. Drill four mounting holes per dimensions shown in figure 7, page 12, using a 1/4" drill if through bolts will be used, or a #7 drill if holes are to be tapped for 1/4" capscrews.

❑ 3. Mount the control with 1/4 x 20 bolts and nuts if through holes were drilled. In either case, use lock washers or star washers.

❑ 4. Secure the mounting bolts (capscrews) to insure that the control is solid on the mounting frame.

This completes the mounting of the control. Proceed to the wiring section starting on page 14 for complete wiring instructions.

Pivot-Point Sensor Installation

Refer to Figure 8, page 13, for dimensional information. The pivot-point sensor installation described in this section refers to the dancer systems only. The MCS-605-1 single turn pivot-point sensor is mounted and coupled to the pivoting end of the dancer. The TCS-605-5 five turn sensor, which is used primarily for festoon dancers, is mounted and coupled at one of the rotating shafts where rotation is approximately 300 degrees.

Mounting for the different sensors is identical with the exception of mounting location. Follow the instructions carefully to insure correct mounting and installation.

❑ 1. Using a #2 drill, drill a 1/2" deep hole in the center of the dancer arm pivot point shaft if the MCS-605-1 is used, or in the center of the shaft of the rotating member if the TCS-605-5 is being used.

❑ 2. Drive the supplied pin into the hole in the drilled shaft until half its length remains exposed.

❑ 3. Assemble the two brackets supplied using the two 10-32 screws and nuts.

❑ 4. Mount the sensor and housing to the brackets using the three 8-32 screws supplied.

❑ 5. Position the sensor and bracket so that the sensor shaft and pin are aligned and separated by approximately 5/16".

❑ 6. While holding the sensor and bracket in this position, mark the centers of the bracket holes on the machine frame.

❑ 7. Drill and tap the three holes marked above to accept 8-32 screws.

❑ 8. Connect the shaft to the pin with the supplied universal coupling.

❑ a. If the MCS-605-1 is used, align the index mark on the potentiometer shaft to the index mark on the housing. Position the dancer arm at its midpoint position.

❑ b. If the TCS-605-5 is used, rotate the potentiometer shaft fully counterclockwise. Now rotate the shaft exactly 2 and 1/2 turns clockwise. This will be the approximate midpoint of the sensor. Position the dancer at its midpoint position.

❑ 9. Mount the sensor and bracket to the machine using the three 8-32 screws.

The sensor is now ready to be wired to the control. Refer to the wiring section starting on page 14 of this manual for detailed wiring information.

Tension Brake Installation

Refer to the tension brake installation manual P-259 or P-259-1, for detailed installation and set-up information for Electro Disc Tension Brakes.

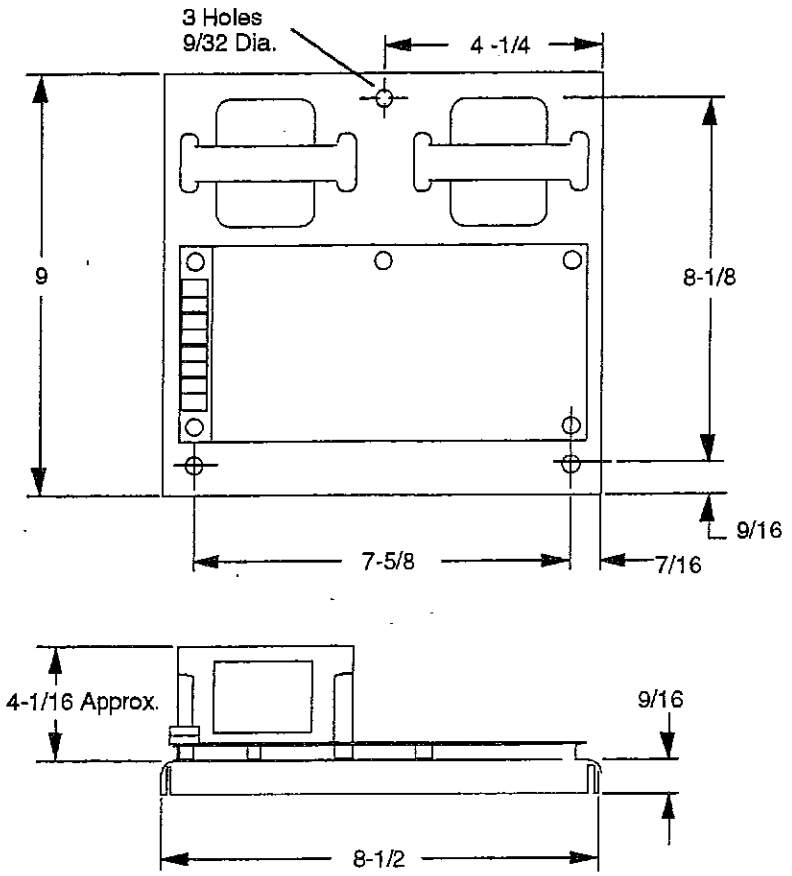


Figure 3 TCS-168 Open Frame Mounting Dimensions

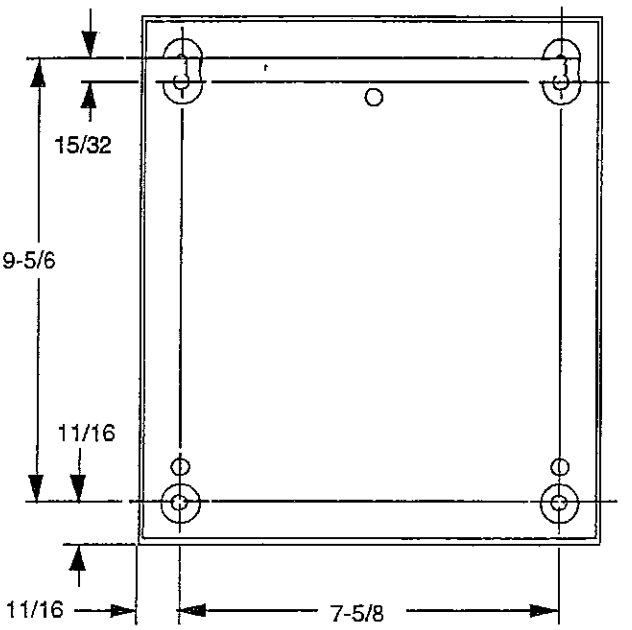
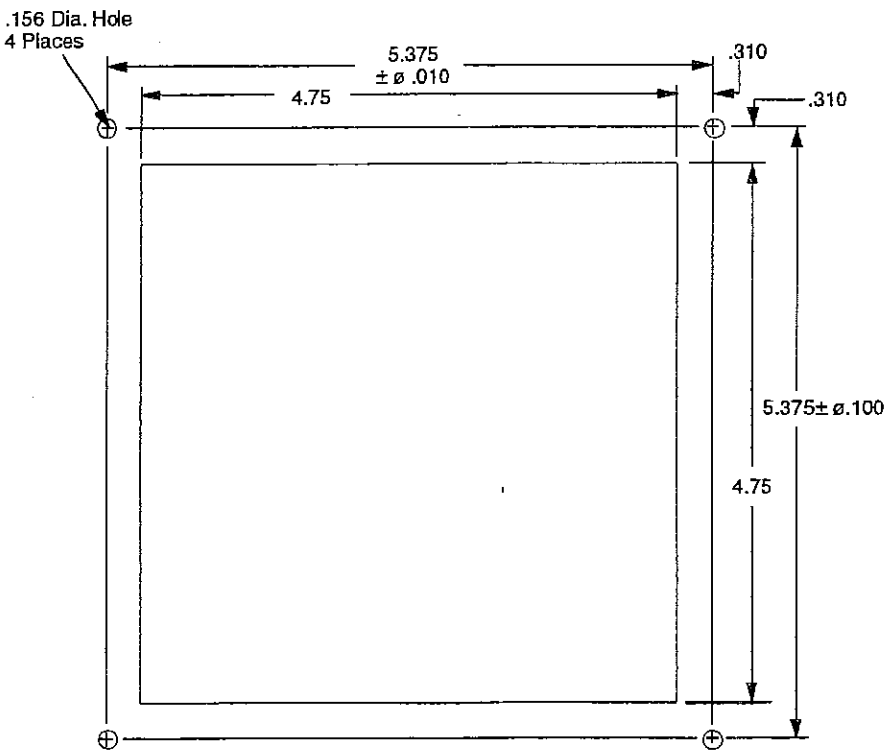


Figure 4 TCS-168 Enclosure Mounting Dimensions



HOLE CUT OUT DIMENSIONS

Figure 5 TCS-310 Meter Assembly Outline and Dimensions

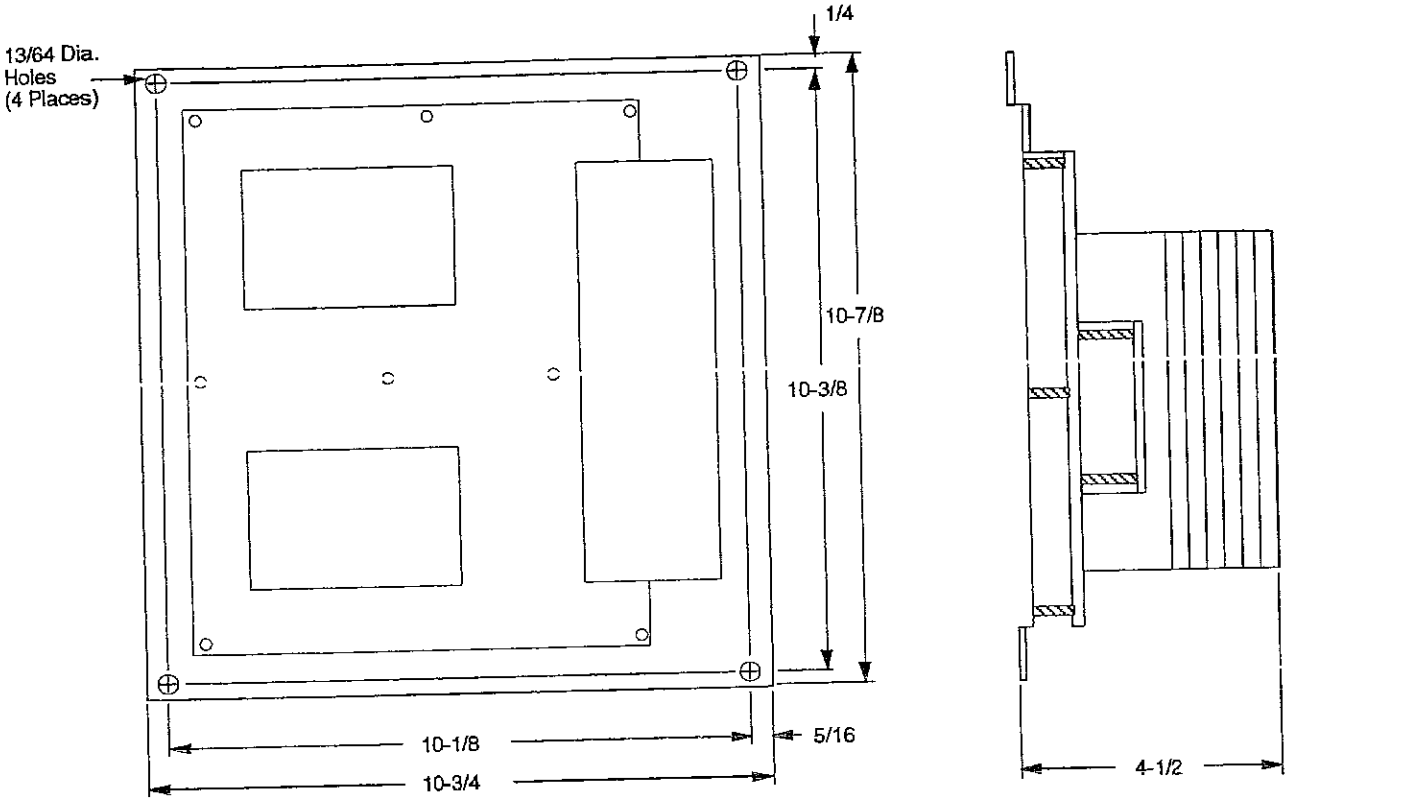


Figure 6 TCS-310 Open Chassis Dimensions

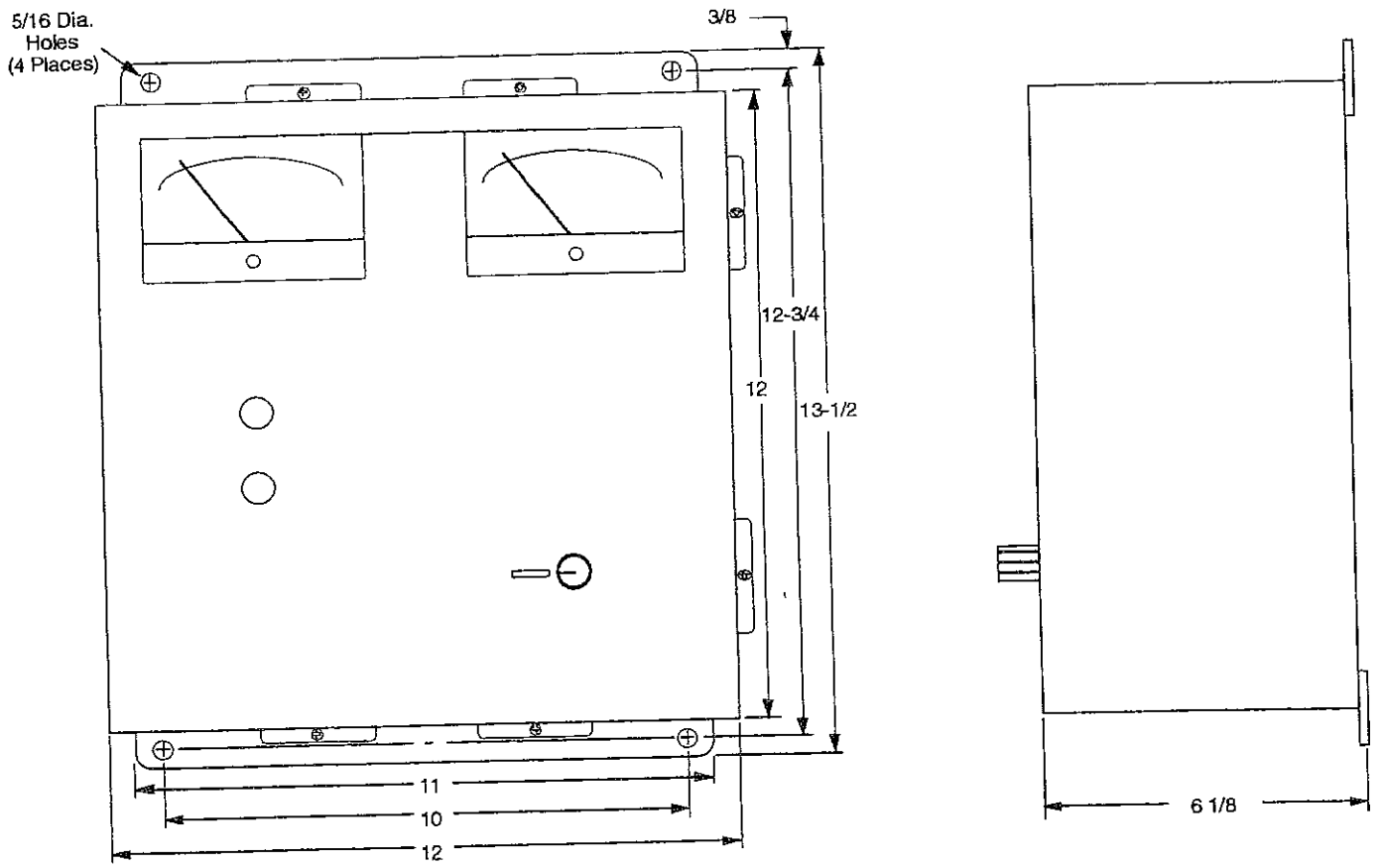


Figure 7 TCS-310 Enclosed Control Dimensions

SYSTEM WIRING PRECAUTIONS

WARNING: To prevent injury (or even death), make certain all power is off before attempting to install system components or any electrical equipment.

These wiring precautions are a guide for proper installation and wiring of a trouble free system. Good wiring practices should be followed as dictated by local electrical codes.

1. Use proper gauge wire for DC input and brake output lines, based on current loads.

2. If practical, segregate wiring for DC power, brake output lines, input signal lines and switches.

3. Do not run AC and DC power lines, brake lines, signal lines, or switching lines in common, as noise transients can easily be transferred, causing erratic control operation.

4. Use shielded cables when possible to connect external sensors and switches to the controls.

5. Under no circumstances should auxiliary accessories be operated from either the TCS-168 or TCS-310 controls.

6. Do not attempt to add external switching schemes to switch between magnets on the outputs (other than the Static Switch Accessory - part number 6910-101-007) as doing so may damage the control or power supply and void the warranty.

SYSTEM WIRING

TCS-168 Power Supply Wiring

Refer to figure 9, page 16 for wiring diagrams.

- ❑ 1. Wire AC neutral line to terminal 5 and tighten.
- ❑ 2. Wire AC hot line to terminal 6 and tighten.
- ❑ 3. Wire AC ground (green) to terminal 7 and tighten.

NOTE: Wires for terminals 1, 2, 3 and 4 below should either be color coded or marked with identification tags.

- ❑ 4. Secure a length of wire long enough to connect between the power supply and the main control to terminal 1 and tighten.
- ❑ 5. Secure a length of wire long enough to connect between the power supply and the main control to terminal 2 and tighten.
- ❑ 6. Secure a length of wire long enough to connect between the power supply and the main control to terminal 3 and tighten.
- ❑ 7. Secure a length of wire long enough to connect between the power supply and the main control to terminal 4 and tighten.
- ❑ 8. Set the 120/240VAC selector switch in the TCS-168 for the proper AC voltage.

CAUTION: DO NOT APPLY POWER at this time.

TCS-310 Control Wiring

Refer to figure 9, page 17 for wiring diagrams.

A. Main Control Wiring

The main control is wired through terminal strip J1 and connector strip J2.

- ❑ 1. Connect the wiring from the current sense magnet (puck 1) of the "A" brake to terminals 6 and 7 of terminal strip J1. Tighten terminal 6 of J1 only.
- ❑ 2. Connect the wiring from the remaining "A" brake magnets (pucks 2 through 12, if used) between terminals 5 and 7 of terminal strip J1. Tighten terminals 5 and 7.
- ❑ 3. Connect the wiring from the current sense magnet (puck 1) of the "B" brake to terminals 9 and 10 of terminal strip J1. Tighten terminal 9 of J1 only.
- ❑ 4. Connect the wiring from the remaining "B" brake magnets (pucks 2 through 12, if used) between terminals 8 and 10 of terminal strip J1. Tighten terminals 8 and 10.
- ❑ 5. Connect the +9V lead from the TCS-168 power supply terminal 1 to terminal 1 of J1 on the TCS-310. Tighten the terminals.
- ❑ 6. Connect the -48V lead from the TCS-168 power supply terminal 4 to terminal 4 of J1 on the TCS-310. Tighten the terminals.
- ❑ 7. Connect the 9V ground lead of the TCS-168 power supply terminal 2 to terminal 2 of J1 on the TCS-310. Tighten the terminals.
- ❑ 8. Connect the 48V ground lead of the TCS-168 power supply terminal 3 to terminal 3 of J1 on the TCS-310. Tighten the terminals.

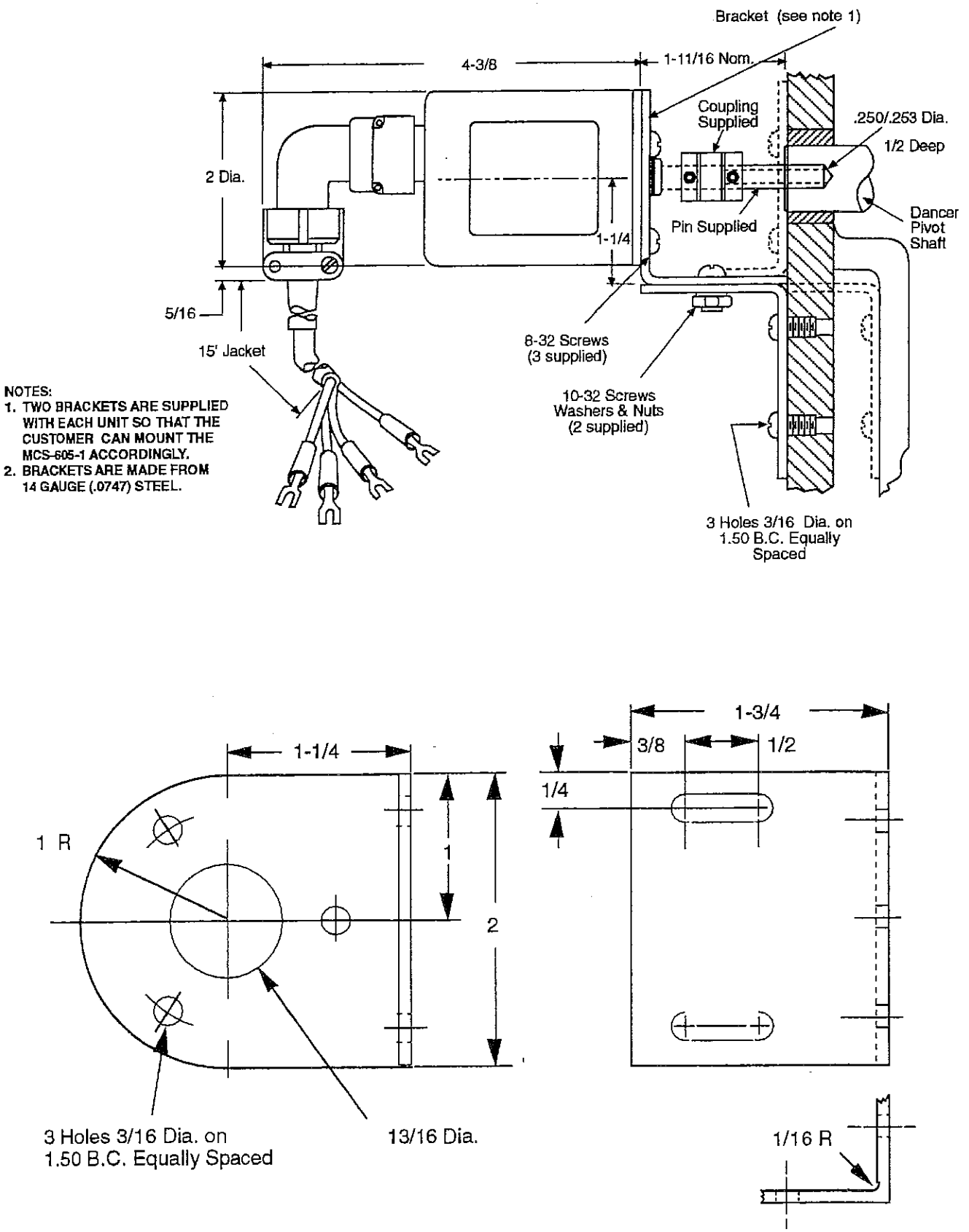


Figure 8 MCS-605-1/TCS-605-5 Mounting Details

NOTE: Even though the 48V and 9V grounds are internally connected in both the TCS-168 and TCS-310, **do not** jumper the terminals and run a single ground wire between the TCS-168 and TCS-310. Individual power grounds are used to eliminate noise problems associated with the switching outputs.

❑ 9. Sensor Connections

❑ a. Determine the direction of the dancer arm or pick-off point rotation (CW or CCW) as the web length is shortened when viewed from the electrical connector end of the sensor.

If rotation is CW, proceed to step b below. If rotation is counterclockwise, proceed to step c below.

CW b. For clockwise (CW) rotation, connect the sensor as follows:

❑ 1. Black lead to terminal 10 of J2 and tighten.

❑ 2. Green lead to terminal 11 of J2 and tighten.

❑ 3. Red lead to terminal 12 of J2; **do not tighten.**

❑ 4. Shield lead to terminal 12 of J2 and tighten.

❑ 5. Proceed to step 10.

CCW c. For counterclockwise (CCW) rotation, connect the sensor as follows:

❑ 1. Red lead to terminal 10 of J2 and tighten.

❑ 2 Green lead to terminal 11 of J2 and tighten.

❑ 3. Black lead to terminal 12 of J2, **do not tighten.**

❑ 4. Shield lead to terminal 12 of J2 and tighten.

❑ 10. External Switch Connections (optional)

❑ a. Anti-Drift or Integrator Reset (S6)

NOTE: This is an optional input. The TCS-310 control already has an internal automatic anti-drift reset function.

Connect switch or relay contacts between terminals 13 and 8 of J2. Tighten terminal 13 only.

NOTE: The anti-drift switch may be a limit switch that senses dancer arm position or a delay-off relay with contact opening after machine start. If a momentary contact closure is used, the minimum closure time should be 50 milliseconds.

CAUTION: The anti-drift switch contacts must be open when running to prevent unpredictable results.

❑ b. Run Brake-On Switch (S1)
Connect switch contacts between terminals 2 and 4 of J2. Tighten terminal 2 only.

❑ c. Run Brake-Off Switch (S2)
Connect switch contacts between terminals 3 and 4 of J2. Tighten terminal 3 only.

NOTE: If only a single run brake-off function is desired, this may be a SPST maintained contact switch. If both functions are to be used, a three position selector switch as shown in figure 9, page 17, is recommended.

CAUTION: Both Brake-On and Brake-Off inputs for the running brake must be open for control from the pivot-point sensor.

❑ d. Hold Brake-Off Switch (S3)
Connect the switch contacts between terminals 5 and 4 of J2. Tighten both terminals 4 and 5.

NOTE: Hold brake-off switch can be either a lever or toggle type single-pole, single-throw switch.

CAUTION: The hold brake-off switch must be open for hold brake adjustment of ramp time and level on the splice logic board during brake transfer from either "A" to "B" or vice versa.

❑ 11. Splice (Transfer) Input Switching

❑ a. Determine which method of transfer switching will be used. Two wire switching uses a single maintained input switch to transfer between brakes. Three wire switching uses two switches – one maintained and one momentary – to transfer between brakes.

If two wire switching will be used, proceed to step b below. If 3 wire switching will be used, proceed to step c below.

2-wire b. For two-wire switching, connect the inputs as follows:

❑ 1. Connect a jumper wire between terminals 7 and 8 of J2. Tighten terminal 7 only.

❑ 2. Connect the switch contacts of the device used between terminals 6 and 8 of J2. Tighten both terminals 6 and 8.

NOTE: With switch contacts open between terminals 6 and 8, brake "A" is the running brake and brake "B" is the holding brake. When contacts are closed and maintained between terminals 6 and 8, brake "B" is the running brake and brake "A" is the holding brake.

❑ Proceed to Step 12.

3-wire c. For 3-wire switching, connect the inputs as follows:

❑ 1. Brake select contacts from switching device between terminals 6 and 8 of J2. Tighten terminal 6 only.

❑ 2. Brake select latch contacts from switching device between terminals 7 and 8 of J2. Tighten both terminals 7 and 8.

NOTE: When the control is operated in the three-wire mode, the brake select switch is an SPST maintained type. When open, brake "A" runs. When closed, brake "B" runs. Transfer does not occur until the brake select latch is activated (or closed) for at least 50 milliseconds.

❑ 12. Remote Panel Board Wiring

Refer to figure 10, page 18, for terminal strip J3 designations if longer wiring runs are required when the unit is mounted open frame.

❑ a. Disconnect the J3 terminal strip from the meter board assembly.

❑ b. Cut the wire ties holding the existing wiring harness together.

CAUTION: DO NOT disconnect all the wires from the connectors at one time.

CAUTION: Wire length from the meter panel to the control should not exceed 4 feet.

❑ c. Starting at terminal 1 of J3, loosen and remove the existing wire at both terminal connectors.

❑ d. Install new wire and tighten terminal screws securely.

❑ e. Repeat steps c. and d. above for wires on terminals 2 through 14.

❑ f. Double check all connections and wiring.

❑ g. Use wire ties to hold the wires together at three or four points along the wire length.

❑ h. Insert the terminal strip on the meter board and snap it into place. Refer to figure 10, page 17, for proper orientation.

❑ i. Route the wires from the meter board to the main control board.

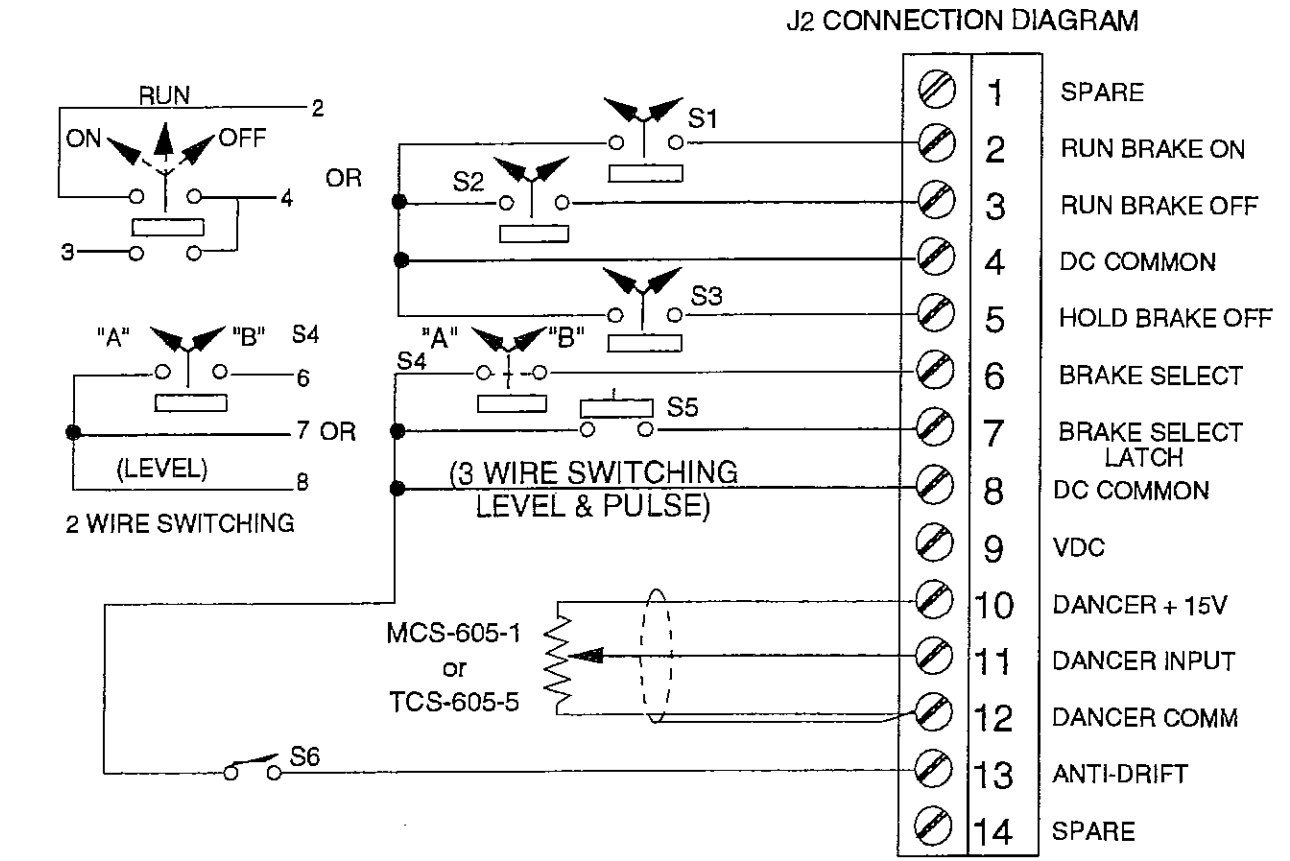
NOTE: Route wiring so that it is not in proximity of other AC or DC wiring in the panel.

❑ j. Insert the J3 terminal strip into the TCS-310 main board and snap it securely into place. Note that the terminal strip will snap into place only one way.

❑ 13. The wiring of the TCS-168/TCS-310 control system is now complete. Double check that all wiring connections are in accordance with figure 9, page 16.

CAUTION: Do not apply power to the system at this time.

Proceed to the System Start-Up and Adjustment section on page 18.



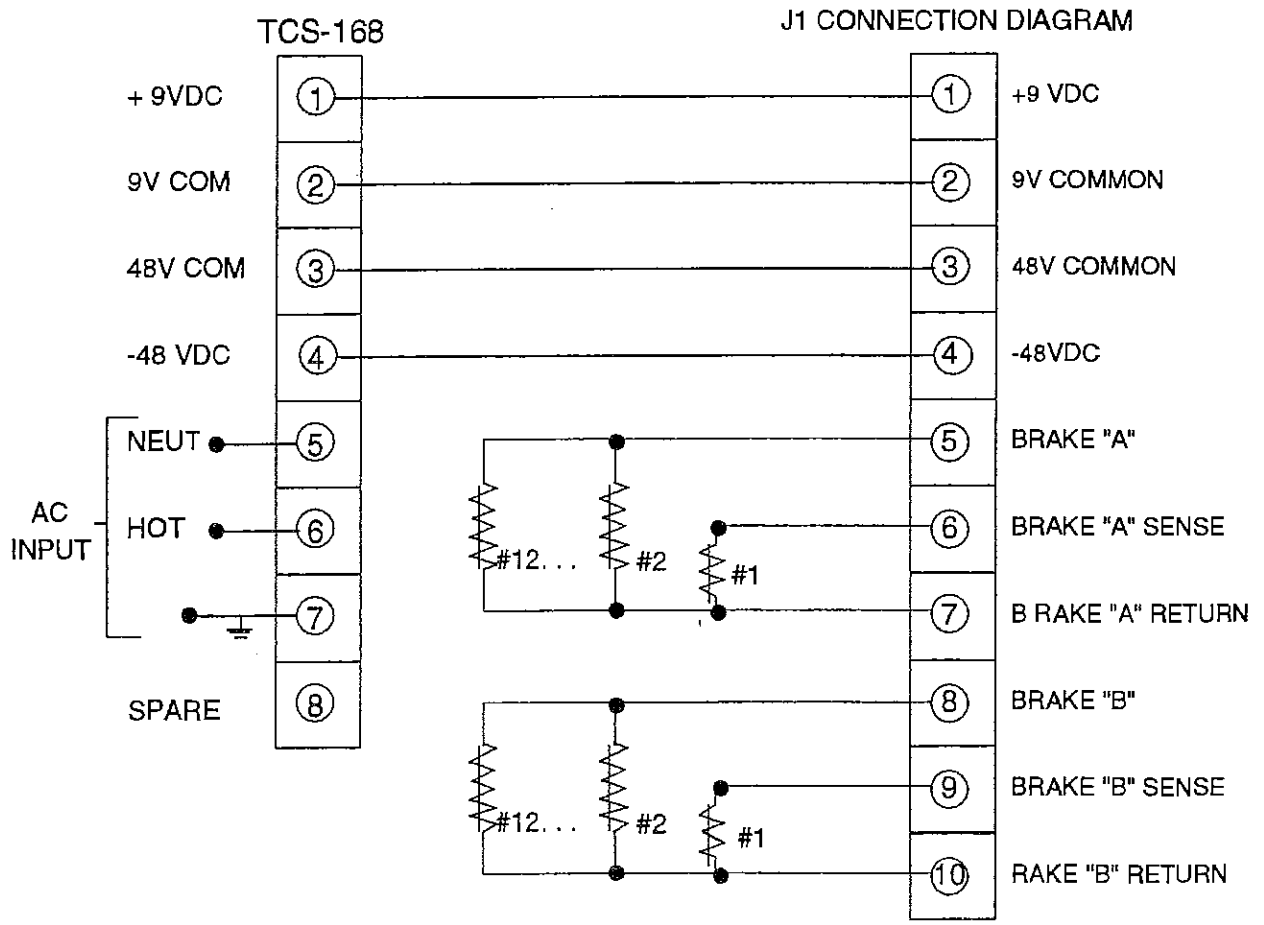


Figure 9 TCS-168/TCS-310 Wiring Connections

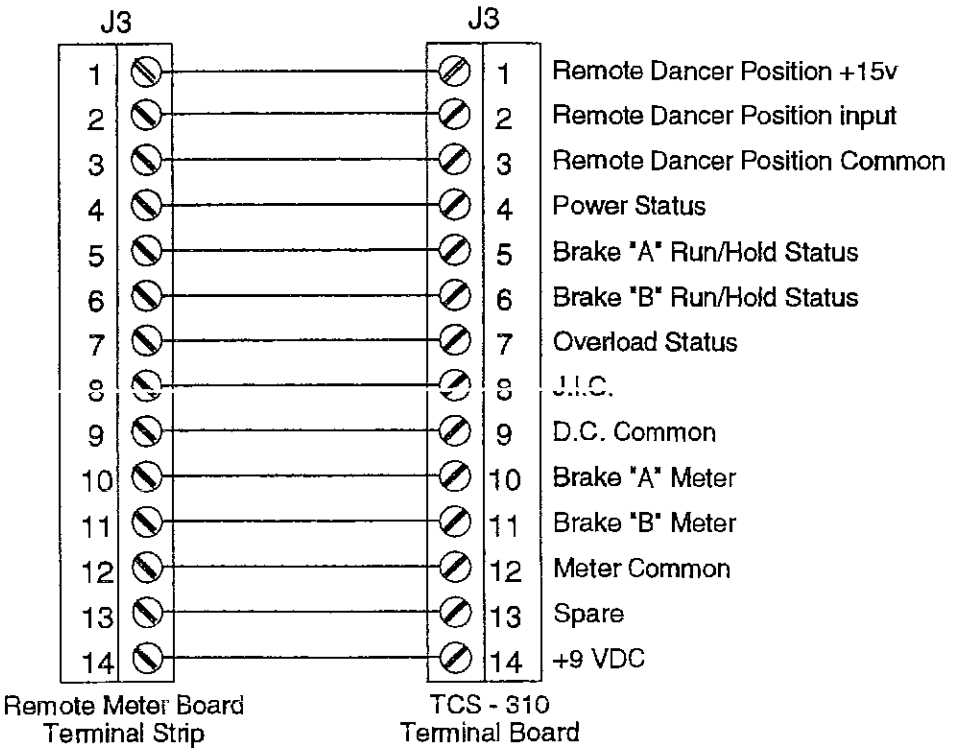


Figure 10 TCS-310/Remote Meter Board Wiring

SYSTEM START-UP AND ADJUSTMENTS

TCS-168/TCS-310 Dancer System

Most TCS-310 adjustments are set once and require no further attention. The exceptions are the "Dancer Position" and possibly the "Gain" controls. Following the adjustment procedures below should result in a stable operation over a wide range of conditions.

Refer to figures 11 and 12, pages 25 and 26, for the exact location of the adjustment potentiometers.

❑ A. Static Adjustments

❑ 1. Main Control Board

NOTE: Only the "A" and "B" channel anti-residual and the frequency adjustments are user set on this board.

❑ a. Channel "A" Anti-Residual Adjustment, R106

Rotate the trim pot adjustment slot fully counter clockwise (CCW). Now rotate it clockwise (CW) approximately 1/4 turn, placing the slot at about the 10 o'clock position.

❑ b. Channel "B" Anti-Residual Adjustment, R128

Rotate the trim pot adjustment slot fully CCW. Now rotate CW approximately 1/4 turn, placing the slot at about the 10 o'clock position.

❑ c. Frequency Adjustment, R57

Rotate the trim pot adjustment screw fully CW.

CAUTION: None of the remaining trim pots should be changed from their factory settings. Doing so may cause problems or damage the control and void the warranty.

❑ 2. P-I-D Logic Board

Normally, the proportional gain, VR4; differentiator gain, VR5; and integrator gain, VR6 are factory set, so they require no adjustment unless system stability can not be achieved from the main gain potentiometer. These adjustments are covered in detail under the dynamic adjustment procedure section.

❑ a. Set the dancer position pot, VR1, at midpoint or "3" on the dial.

❑ b. Set the main gain potentiometer, VR2, at mid-point or "3" on the dial.

❑ c. Set the automatic anti-drift reset pot, VR3, at mid-point by rotating it fully CCW, then rotating it CW halfway back. The potentiometer screwdriver slot should then be vertical.

❑ d. Differentiator gain selector switches, SW1 - adjusts responsiveness of the differentiator gain stage.

❑ 1. For standard dancers with a 60° arc from full up to full down, set switch 1 of SW1 "on" and switches 2 and 3 "off."

❑ 2. For festoon dancer systems using the TCS-605-5 sensor, set switch 3 of SW1 to "on" and switches 1 and 2 to "off."

❑ 3. Splice Logic Board

❑ a. Normal/Slave Switch, SW1

❑ 1. Determine mode of operation:
- Normal: one brake running, one brake holding
- Slave: Both brakes running (when more than 12 magnets are required).

Normal - Move switch lever to the right.

Slave - Move switch lever to the left.

❑ b. If output is in the slave mode, proceed to Step 5, Meter Adjust. Otherwise, go to step c below.

❑ c. Ramp Up Delay Adjust, R21– sets amount of delay time between switch over and when holding brake starts ramping up to holding level.

❑ 1. Turn potentiometer fully CCW, then turn CW to 50% setting. This will correspond to the screwdriver slot being straight up and down.

❑ d. Ramp Time Adjust, R22 – adjusts ramp time from start of ramp to final holding level.

❑ 1. Turn potentiometer fully CCW and then turn CW 1/2 turn to the 50% position with the screwdriver slot vertical.

❑ e. Holding Level Adjust, R23 – sets the maximum steady state holding current level to the holding brake.

❑ 1. Turn potentiometer fully CCW and then turn CW approximately half way until the screwdriver slot is vertical.

❑ f. Minimum Holding Level Adjust, R24 -, sets the minimum current initially applied to the holding brake during switch over from one brake to the other.

❑ 1. Turn potentiometer fully CCW and then CW approximately 25% until the screwdriver slot is at the 10 o'clock position.

NOTE: These are static set up adjustments and are for a reference basis only. During operation, dynamic adjustments may be made to achieve stable system operation.

❑ 4. Meter Adjustment, Zero Setting

Refer to figure 13, page 26 for location of adjustments and layouts.

❑ a. If meter panel was remote mounted, apply the label to the panel assembly.

❑ b. Check "A" brake meter for 0% level. The needle should be on the line between the green and yellow ranges. If adjustment is necessary, set the meter adjust screw on the front of the meter to zero indication.

❑ c. Adjust the "B" brake meter zero just as the "A" adjustment was made above.

❑ d. Set the dancer position adjustment potentiometer on the meter panel to mid-point, which coincides with the line on the knob lining up with the horizontal line on the label.

This completes the control system's preliminary static adjustments. Before proceeding, double check to insure that static adjustments comply with the foregoing.

❑ B. Dynamic (Running) Adjustments

❑ 1. Verify that 120/240 volt selector switch in TCS-168 is set for proper input voltage.

❑ 2. Apply power to the control system.

❑ a. Verify that the two LED indicators on the TCS-168 printed circuit board illuminate.

❑ b. Verify that the LED marked "Power" on the meter panel illuminates to the same intensity as the "Power" LED on the main control board.

❑ c. Depending on which brake is selected, one of the LED's in the brake meter is to be illuminated.

CAUTION: If LED's are not illuminated, turn off power immediately and proceed to the troubleshooting section of this manual to determine the cause and a solution before proceeding.

❑ 3. Pivot-Point Sensor Alignment Check

❑ a. Using a digital voltmeter, connect the positive probe to terminal 11 of J2 and the negative probe to terminal 12 of J2. Set the range for either 15 or 20 VDC.

❑ b. Move the dancer to the exact mid-point of its operating range and read the voltage, which should be 7.5 VDC ±0.1 volt.

❑ c. If the voltage is not within the limits specified above, follow the procedure below.

❑ 1. Loosen the pivot point sensor shaft coupling.

❑ 2. Rotate the sensor shaft CW or CCW until the 7.5VDC reading ±0.1VDC is obtained.

CAUTION: The MCS-605-1 single turn pivot-point sensor is a continuous rotation potentiometer. If the wiper is located between the end-points, a 7.5VDC reading may result from the input divider network on the control logic board. Make sure the reading is taken from the active portion of the pot winding.

❑ 3. After securing the proper voltage reading, tighten the coupling set screws. Check after tightening to make sure the reading has not changed. Repeat the process if necessary.

❑ d. Move the dancer to the shortest web loop position and read the voltage, which should be 6.1 to 6.2VDC ±0.1VDC.

❑ e. Move the dancer to the longest web loop position and read the voltage, which should be 8.8 to 8.9VDC ±0.1VDC.

NOTE: If the voltage readings from steps 3. d. and 3. e. above are reversed, the wires connected to terminals 10 and 12 of J2 need to be reversed.

❑ 4. Meter Calibration - Remote Mounted

❑ a. If the meter is mounted in the control housing, proceed to Step 5, "Anti-Residual Adjustment." For remote mounted meters, proceed to "b." below.

❑ b. Select brake "A" as the running brake.

❑ c. Turn on brake "A" by switch (if used) or jumper terminals 2 and 4 of connector J2.

❑ d. After 15 to 30 seconds the "overload" LED should illuminate.

❑ e. Adjust brake "A" to full torque by turning potentiometer, R7 (located on the back of the meter board) until a 100% reading is noted on the brake "A" meter. The needle is on the line between the red and green ranges on the meter faceplate at 100%

❑ f. This completes the adjustment of the brake "A" meter.

❑ g. Select brake "B" as the running brake.

❑ h. Turn on brake "B" by switch (if used) or jumper terminals 2 and 4 of connector J2.

❑ i. After 15 to 30 seconds the "overload" LED should illuminate.

❑ j. Adjust brake "B" to full torque by turning potentiometer R9 located on the back of the meter board) until a 100% reading is noted on the brake "B" meter. The needle is on the line between the red and green ranges on meter faceplate at 100%.

❑ k. This completes the adjustment of the brake "B" meter.

NOTE: No further adjustments should be required unless the meter panel has been removed and/or replaced.

❑ 5. Anti-Residual Adjustment

Two methods may be used to adjust the anti-residual circuits. Method 1 is by feeling for drag. Method 2 uses a current meter to obtain a precise setting.

❑ a. Method 1

❑ 1. Select Brake "A" as run brake.

❑ 2. Release the run brake by:

❑ (a). Activating run brake off switch if used, or

❑ (b). Moving the dancer to its shortest web loop, or

❑ (c). Jumpering terminals 3 and 4 of Connector J2.

❑ 3. Determine which brake is the running brake and check that its brake magnets are released so the armature will rotate freely.

❑ 4. Reapply the running brake by:
- ❑ (a). Releasing the brake off switch (if used) and turning the brake on switch (if used) on, or
- ❑ (b). Moving the dancer to its longest web loop, or
- ❑ (c). Removing the jumper from terminals 3 and 4 and jumpering terminals 2 and 4 of J2.

❑ 5. Repeat steps 5.a.2. through 5.a.3. above, verifying the brake releases.

❑ 6. If the brake releases, make no further adjustments. Proceed to Step 9.

❑ 7. If the brake fails to release, adjust the anti-residual potentiometer R106 for brake "A" CW or CCW until the magnets release.

❑ 8. Repeat steps 5.a.1. through 5.a.3. and 5.a.6. until optimum release is obtained.

NOTE: CCW adjustment decreases the anti-residual output; CW adjustment increases output. If the anti-residual is adjusted too far CW, brake engagement may occur.

❑ 9. Select brake "B" as the running brake.

❑ 10. Repeat steps 5.a.2. through 5.a.6. above.

❑ 11. If the brake fails to release, adjust the appropriate anti-residual potentiometer, R128 for brake "B," CCW or CW until the magnets release.

❑ 12. Repeat steps 5.a.2 through 5.a.3 and 5.a.16 until optimum release is achieved.

NOTE: CCW adjustment decreases the anti-residual output while CW adjustment increases output. If the anti-residual is adjusted too far CW, brake engagement may occur.

❑ b. Method 2 (optional)

❑ 1. Turn off power to the TCS-168/TCS-310 system and wait approximately 30 seconds for power to bleed off.

❑ 2. Set two digital volt ohmmeters to measure 0.5 to 1.0 amps DC current.

❑ 3. Insert one meter in series with the brake "A" sense magnet with the positive lead fastened to terminal 6 of J1 and the negative lead to the magnet wire.

❑ 4. Insert the second meter in series with the brake "B" sense magnet with the positive lead fastened to terminal 9 of J1 and the negative lead to the magnet wire.

❑ 5. Reapply power to the TCS-168/310 system.

❑ 6. Select brake "A" as the running brake. Turn off the running brake by:
- ❑ (a). Turning the run brake switch (if used) to "on," or
- ❑ (b). Moving the dancer to the shortest web loop, or
- ❑ (c). Jumpering terminals 3 and 4 of J2.

❑ 7. Measure the anti-residual current to the brake magnets on brake "A". Typical current should be -10 to -12 ma.

❑ 8. Adjust the anti-residual potentiometer, R106 for brake "A" to -10 to -12 ma.

❑ 9. Check to insure that the magnets release and the armature rotates freely.

❑ 10. Return the running brake to its operating position by:
- ❑ (a). Returning the switch (if used) to its normal running position, or
- ❑ (b). Removing the jumper from terminal 3 and 4 of J2.

❑ 11. Select brake "B" as the running brake.
- ❑ (a). Turning the run brake switch, if used, to "on," or
- ❑ (b). Moving the dancer to its shortest web loop, or
- ❑ (c). Jumpering terminals 3 and 4 of J2.

❑ 12. Measure the anti-residual current to the brake magnets on brake "B", which should be -10 to -12 ma.

❑ 13. Adjust the anti-residual potentiometer R128 for brake "B" to obtain the proper current.

❑ 14. Check to insure that the magnet release and the armature rotate freely.

❑ 15. Return the brakes to their normal run modes by:
- ❑ (a). Returning the running brake "off" switch (if used) to its run position, or
- ❑ (b). Removing the jumper from terminals 3 and 4 (if used).

❑ 16. Turn off power to the TCS-168/310 system and wait for 1 minute for power to bleed off.

❑ 17. Disconnect meters from the sensing magnet circuits and reconnect wires to their proper terminals and tighten terminal screws.

❑ 18. Reapply power to the TCS-168/310 system.

❑ 6. Running Adjustment (Running Brake)

❑ a. Verify that power is still applied to the TCS-168/310.

❑ b. Start the machine and draw material.

❑ c. After the dancer has stabilized, adjust the dancer position potentiometer (internal or front panel) for the desired dancer running position.

❑ d. If the system operation is stable, increase the "gain" potentiometer clockwise (CW) until hunting or oscillation occurs. Then reduce the "gain" by turning CCW until the system stabilizes and note the knob reading.

❑ e. Reduce the "gain" by turning the knob CCW one-half to one number setting below the value obtained in step 5.d. above.

NOTE: This is only a preliminary gain setting. Final gain adjustment will be made in the steps below as the roll approaches core diameter.

❑ f. Allow the system to run until the unwind roll is within 2 to 4 inches from the core diameter.

❑ g. If the system is still stable, adjust the "gain" potentiometer CW until instability or oscillation occurs. Reduce the "gain" by turning the knob CCW until stability is once more achieved, noting the reading on the potentiometer knob. Turn the "gain" knob CCW one-half to one number below this point.

NOTE: This is the optimum gain setting for system stability and no further adjustments should be required. This will be the setting for either brake.

❑ 7. P-I-D Adjustments

CAUTION: These adjustments should be made only if all attempts to achieve system stability with the main "gain" have failed.

NOTE: When making the P-I-D adjustments, the system must be operating with the machine drawing its web.

❑ a. Using the TCS-900 diagnostics:

❑ 1. Follow the instructions provided with the TCS-900 for proper adjustment procedures.

❑ b. Visual adjustment method. Follow the sequence below to properly adjust the P-I-D circuits.

❑ 1. "P" – proportional gain adjustment, VR4

❑ (a). Short terminal 13 of J2 to DC common terminal 12 of J2 to disable the integrator stage. The dancer will normally move from its running position when the anti-drift is shorted.

❑ (b). Rapidly change the dancer position by suddenly changing air pressure to the dancer cylinder if pneumatically loaded or by depressing the web or dancer arm.

❑ (c). The dancer arm should stabilize in one or two cycles of oscillation. If it does not, reduce the proportional gain, VR4, by turning it CCW in 5 to 10 degree increments.

❑ (d). Repeat steps 7.b.1.b. and 7.b.1.c. above as necessary until a one to two cycle response is obtained.

❑ (e). If system stability is not achieved with proportional gain adjustment, set the potentiometer 100% CW and proceed to step 2 below. If stability is achieved, proceed to the Integrator gain adjustment, Step 3, page 23.

❑ 2. "D" - differentiator gain adjustment, VR5

❑ (a). Insure that the anti-drift input is still grounded to disable the integrator.

❑ (b). Inject a transient into the web as described in 1.b. above and observe the dancer arm response.

❑ (c). If dancer stability is achieved in one to two cycles of operation - DO NOT MAKE ANY ADJUSTMENTS.

❑ (d). If the dancer requires several cycles to stabilize or does not stabilize, the differentiator gain may be set too low. Increase the setting of the "D" gain potentiometer, VR5, CW, observing the dancer arm.

❑ [1]. If the dancer arm does not stabilize with maximum CW setting, reduce the setting by turning VR5 fully CCW.

❑ [2]. Open differentiator switch 1 of SW1 and close switch 2 of SW1.

❑ [3]. Adjust the differentiator gain, VR5, CW, noting its effect on the dancer arm.

❑ [4]. If the dancer arm still does not stabilize, repeat steps d.1. above, and close switch 3 of SW1.

❑ [5]. Repeat step d.3. above to achieve stability.

❑ (e). If stability is improved through the differetiator gain adjust, go back to step 1 and repeat the proportional gain adjustments above.

NOTE: Proportional and differential gain adjustments interact, so adjusting one gain circuit may or may not cause the other to require adjustment, depending on machine dynamics.

❑ (f). If the differentiator gain is set too high, the dancer will be too responsive and the brake will engage and disengage rapidly with small dancer movements. To compensate for this condition, reduce the differentiator gain, VR5, by turning it CCW and/or reduce the SW1 switch setting one or more numbers.

❑ (g). Repeat step 2.b. above to insure the system's transient response has not been compromised by reducing the "D" gain.

NOTE: To insure optimum transient response, the system should be checked at or near full roll diameter.

❑ (h). Remove the short or jumper between the anti-drift input and DC common.

❑ 3. "I" - Integrator gain adjustment, VR6.

CAUTION: The "I" gain adjustment controls the amount of arc through which the dancer must move to compensate for diameter change in the unwind roll. This adjustment should be changed only if the integrator is causing unstable system operation.

❑ (a). With the system running and the dancer stabilized, observe the arc of dancer movement.

❑ (b). If the dancer arc is less than 5° and movement through the arc is smooth, DO NOT ADJUST THE INTEGRATOR GAIN.

❑ (c). If the dancer arc is greater than 10 degrees and movement is smooth, rotate the "I" gain, VR6, CW until the arc is 5° or less and dancer movement is smooth.

❑ (d). If the dancer arc is within a 5° - 10° range but the movement is fast and choppy, adjust the "I" gain, VR6, CCW until the arc is 5° or less and dancer movement is smooth.

CAUTION: Make "I" gain adjustments slowly, observing the effects on dancer arm response, to obtain optimum performance.

NOTE: After completing P-I-D adjustments, the main gain setting should be rechecked per instructions 6.d. through 6.g.

❑ 8. Automatic Anti-Drive Reset Function, VR3.

❑ a. Stop the machine, but leave the TCS-168/310 power on.

❑ b. Connect a DC voltmeter. Positive to terminal 13 and negative to terminal 12 of connector J2. Set the meter to measure 15 to 20 volts DC.

❑ c. Bring the dancer arm to its operation mid-point.

❑ d. While monitoring the VOM, move the dancer slowly toward its shortest web loop position. Note dancer position where the meter reading drops to zero. This is the integrator reset point.

❑ e. If the integrator reset point is too close to the dancer's maximum limit of travel, adjust VR3.

❑ f. Repeat steps c. and d. above until a comfortable reset position is obtained.

CAUTION: Setting the reset point too close to the dancer midpoint may cause instability as the circuit will reset constantly if oscillation occurs.

This completes the adjustments on the P-I-D logic board assembly.

NOTE: If any difficulties encountered cannot be resolved through this start up procedure, contact your local Warner Electric Market Representative.

❑ 9. Splice Logic Board Adjustments

❑ a. Insure TCS-168/TCS-310 system power is on.

❑ b. Place a full roll on the holding brake spindle. Adjust the holding level potentiometer, R23, so the roll doesn't turn.

❑ c. The potentiometer settings which follow depend on machine type.

❑ 1. Ramp delay adjust, R21

❑ (a). For zero speed splicers, set for minimum time or full CCW.

❑ (b). For flying pasters, set the time necessary to provide transition between the rolls before the expiring roll starts to be braked.

❑ 2. Ramp time adjust, R22

❑ Adjust for smooth braking action in stopping the expiring roll.

❑ 3. Minimum holding level adjust, R24

❑ Adjust for the minimum braking required at point of brake transfer.

NOTE: Splice logic board adjustments may require several transitions between rolls before optimum settings are obtained. Depending on the machine, near final settings can be obtained by cycling between brakes in the static mode and making the adjustments.

This completes the start-up and adjustments procedure for the TCS-168/TCS-310 Dancer Splicer Control System.

If any difficulties encountered during adjustment cannot be resolved through the adjustment procedure, contact your local Warner Electric Representative or the factory for further assistance.

❑ If the enclosure is used with the TCS-310, close cover and secure with the six (6) hold down clamps by rotating and slipping latch over the lip of the cover and tightening the retaining screws.

General Notes on TCS-310 Operation

1. The "overload" LED will illuminate whenever the output is operated in the current range of 270 ma to 500 ma/magnet for more than 30 seconds.

2. The "overload" LED can be reset by activating the running brake off input or by reducing the output demand below 270 ma/magnet for approximately 30 seconds.

3. During the machine stop cycle, the "overload" LED may illuminate if the dancer drops below its midpoint, causing the integrator to ramp to maximum output for more than 30 seconds.

4. The output short circuit protection provided for each channel will shut down the system when there is a short in the brake magnets or when extremely high transients for feed back through the brake lines to the control. There is no visual indicator for these short circuit shutdowns. Rather, the "power" and "over load" LEDs will be illuminated, but the meters will read zero output. To reset the short circuit protection, system power should be shut down completely and then turned on again after a short period.

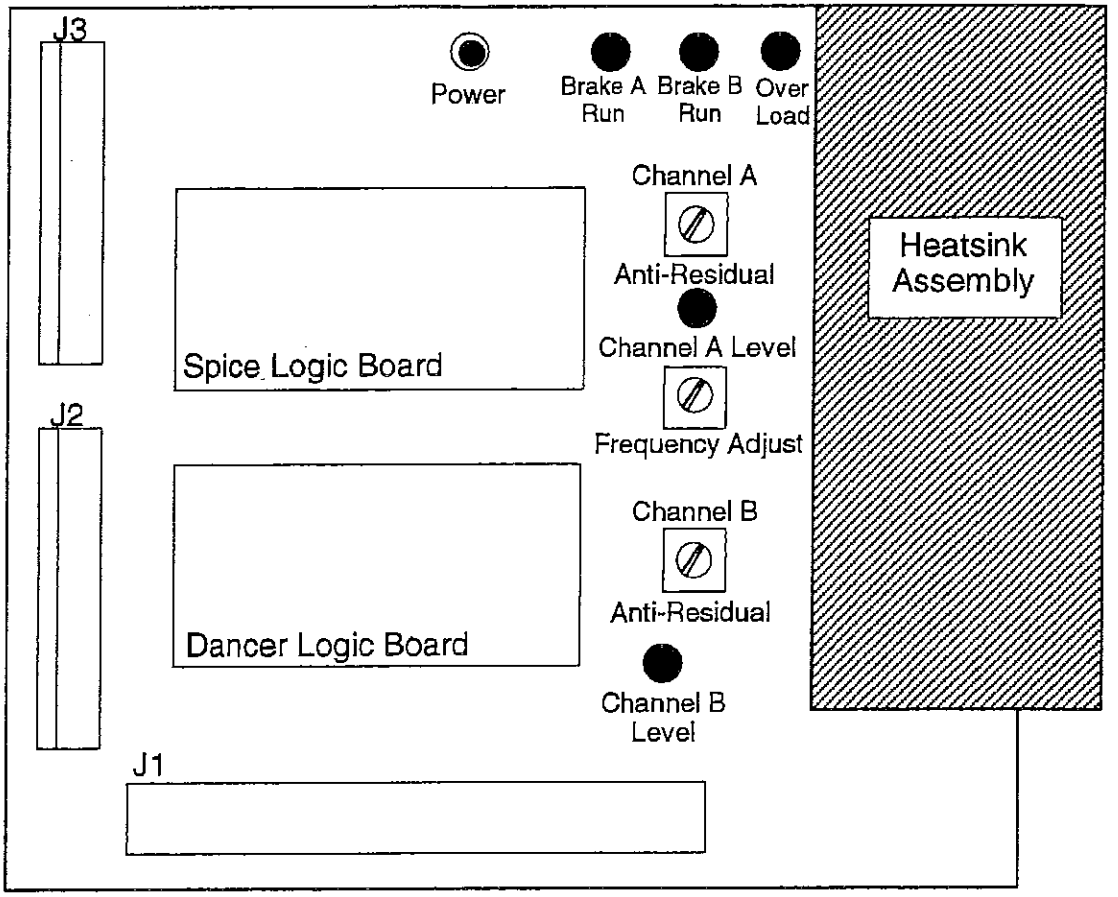
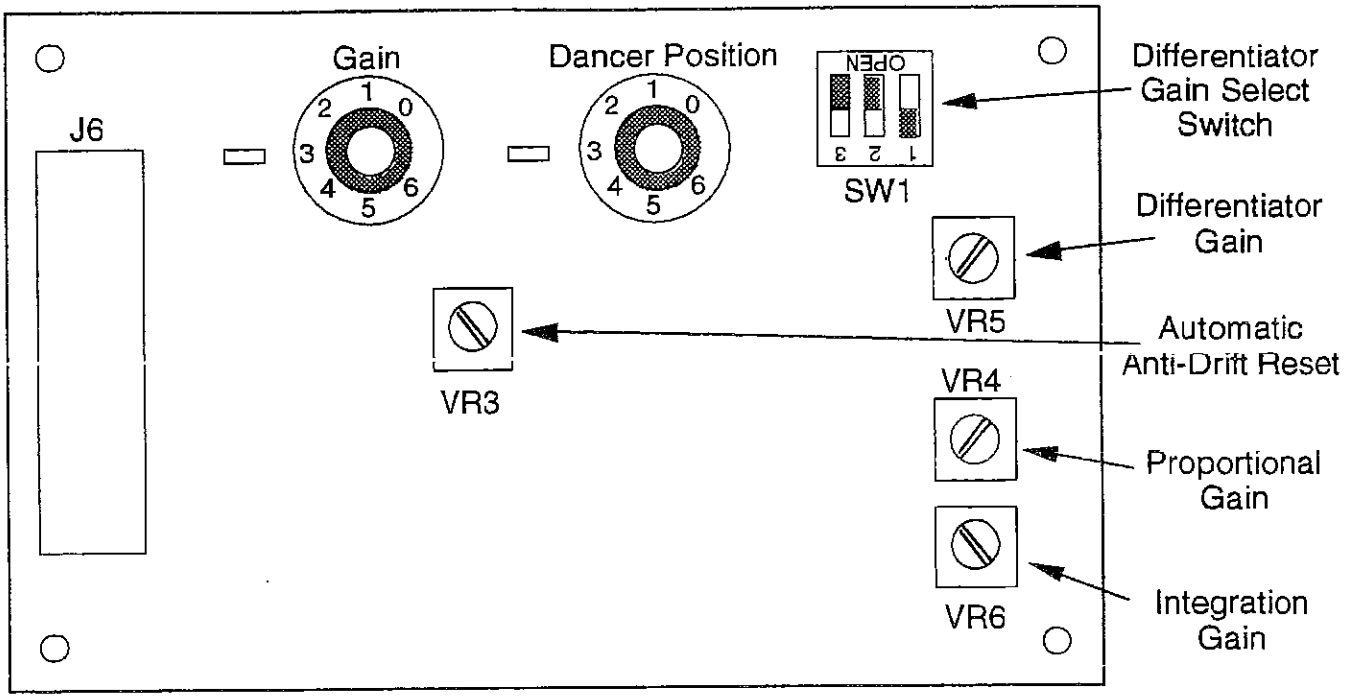
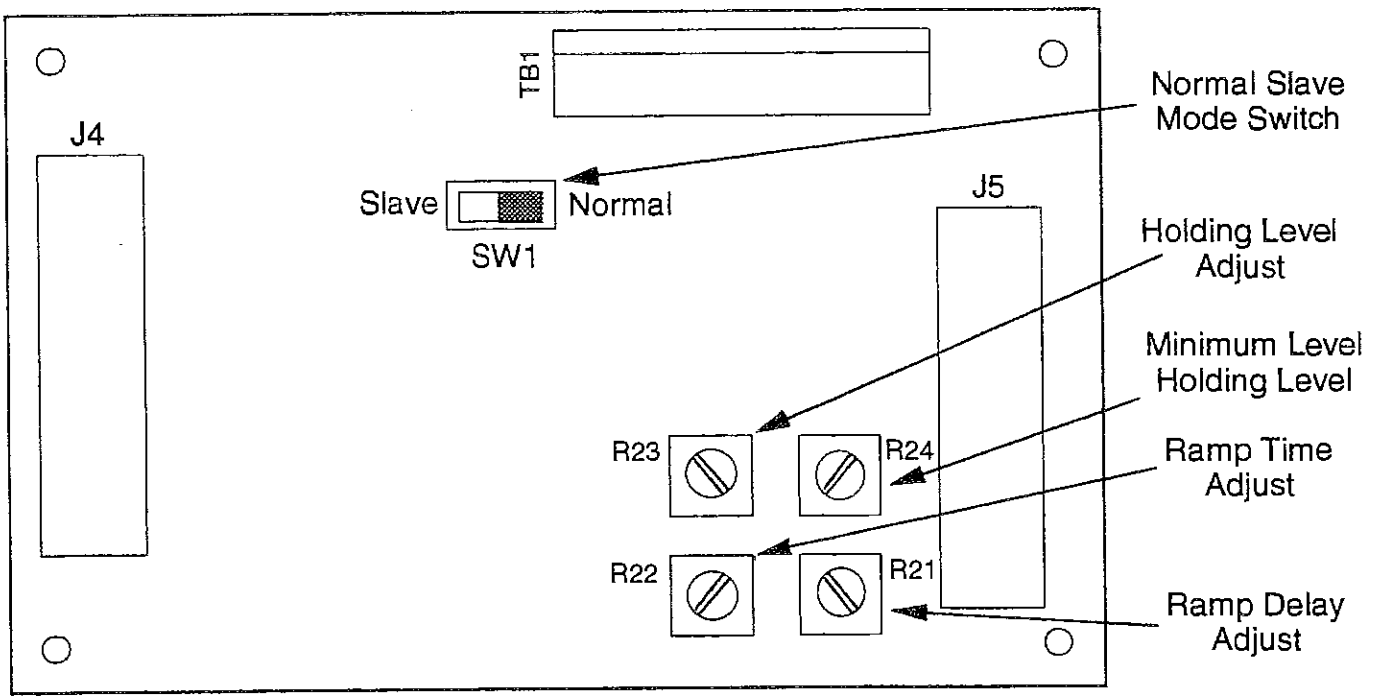


Figure 11 TCS-310 Main Board Layout & Adjustments

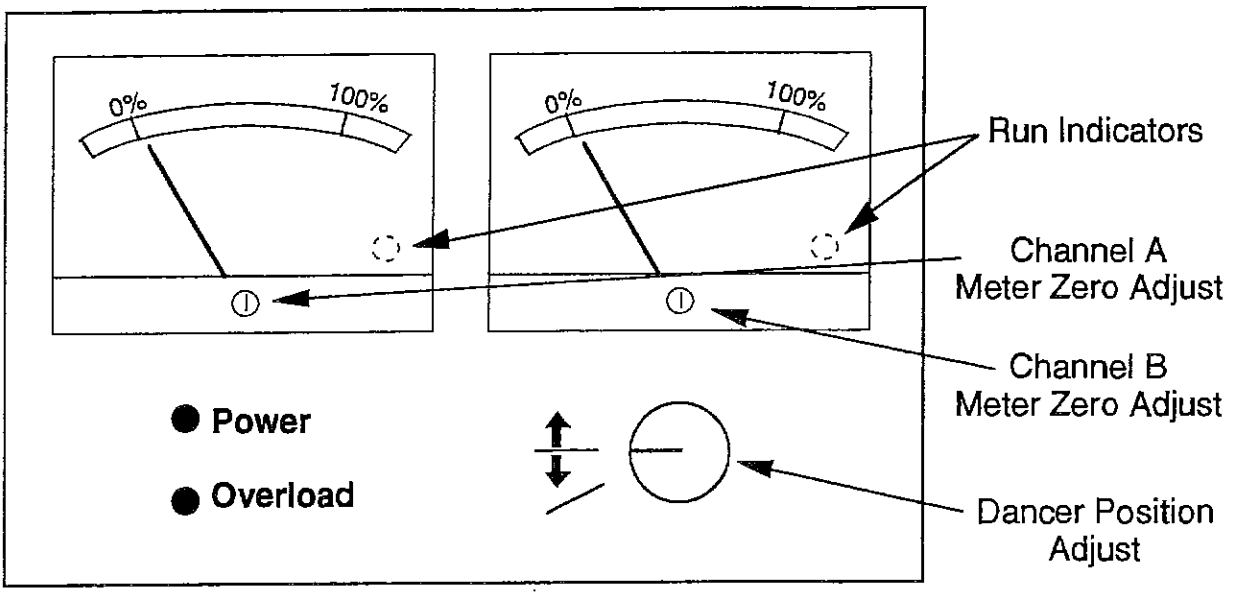


DANCER LOGIC BOARD

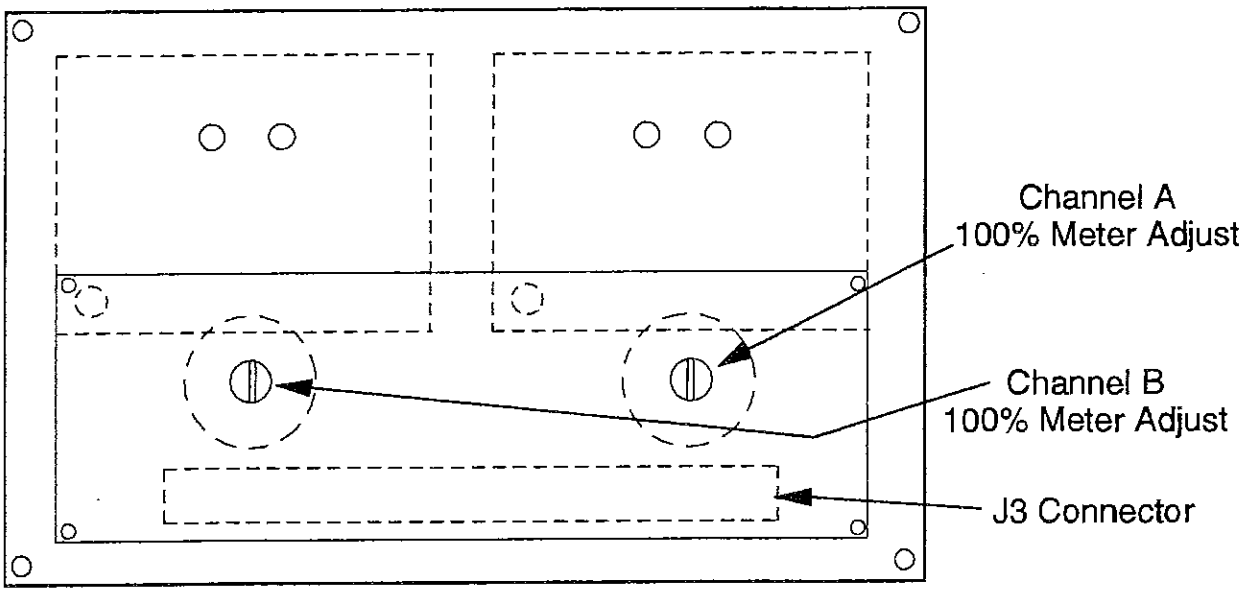


SPLICE LOGIC BOARD

Figure 12 P-I-D & Splice Logic Boards Layout & Adjustments



FRONT VIEW



REAR VIEW

Figure 13 Meter Board Layout & Adjustments

TROUBLESHOOTING

Dancer Splicer Control System
TCS-168/TCS-310/MCS-605-1 or TCS-60505

General: The chart below will help you isolate problems which may occur in startup and operation of the system. When the system has been running for some time, the charts will also be helpful to check for worn, broken, or frayed wires; bent or broken control system parts; blown fuses; loose terminal connections and wire connections; loose or broken sensor couplings; worn or loose mechanical parts for the tension stand (bearings, couplings, etc.); and dust or dirt accumulation inside the control which has caused components to overheat.

Symptom A: No output on either channel

Probable Cause	Suggested Solution
No DC power to control (TCS-310)	- Check for power supply's LED illumination - Check for proper AC input power to TCS-168, if used - Check TCS-168 fuses - Check for proper DC wiring to TCS-310 power inputs - Check for TCS-310 control "power" LED illumination - Check TCS-310 fuses - Check that AC power is applied to TCS-168
Output short circuit protection activated	- Check wiring to brake magnets for proper connections - Check for "power" & "overload" LED illuminations - Go through "power down" reset cycle - Both running brake off and holding brake off inputs activated - check switch positions, if used.

Symptom B: No output on running brake channel

Probable Cause	Suggested Solution
No output when brake switch	- Check running brake off input switch if used - return to run position - Check dancer input-signal from dancer pot. Should be 6.1-6.2 VDC minimum to 8.8-8.9 VDC maximum with centered position of 7.5 VDC. - Check dancer position adjust settings - both internal/external

Symptom C: No output on holding brake channel

Probable Cause	Suggested Solution
No output to holding brake when switched	- Check holding brake off input switch if used - return to run position - Check holding level adjust, R23, on splice logic board

Symptom D: Output trips randomly - shutting brake off

Probable Cause	Suggested Solution
Shorted magnet coils	- Check resistance of individual magnet coils for 66-68 Ω - Check wiring hook-ups per installation section
Loose or intermittent wiring	- Check wiring for continuity - Check terminals and wire junctions for tightness
Transient noise	- Check routing of wiring between control and brake magnets - Rewire if necessary using different routing path - Use shielded wire to reduce noise pick-up

Symptom E: Cannot switch running mode from one brake to the other

Probable Cause	Suggested Solution
Normall-slave switch improperly set	- Check position of normal-slave switch on splice logic board and reset as necessary.
Brake select and brake select latch inputs not properly wired.	- Check wiring of brake select and brake select latch inputs per the installation and wiring diagram - rewire if necessary
Brake select and brake select latch inputs not being switched from external switching source	- Check external switching source for proper operation and sequence.

Symptom F: Meters do not indicate current or indication appears way out

Probable Cause	Suggested Solution
Brake incorrectly wired	- Check magnet wiring to control for proper connection and rewire if necessary
If meter was remote mounted	- Check wiring and connections on J3 connectors for proper wiring and insertion - rewire if necessary - Check that screw terminals on J3 wiring harness connectors are tight
Meter does not give proper indication - calibration not set properly	- Recalibrate meter per calibration sections in this manual - Replace meter board assembly if problems exist

Symptom G: Dancer will not raise from longest web loop position

Probable Cause	Suggested Solution
Brake torque capacity inadequate	- Check for "overload" LED illumination during running - Verify brake was correctly sized by repeating brake selection procedure in catalog P-771
Incorrect dancer position setting	- Adjust until dancer arm moves to correct running position - Incorrect sensor alignment, check sensor voltages and readjust per installation instructions.
Dancer is not free to move because of obstruction	- Remove any obstruction, release any holding devices or safety locks - Check dancer loading - (pneumatic cylinder) for bent rod or misaligned couplings or rod ends
No DC power to control	- Check for AC input to TCS-168 power supply - Check for proper DC outputs from TCS-168 power supply - Check fuses - Check for proper DC wiring to TCS-310 inputs
Brake is not engaging	- Check magnet wiring for proper connections to TCS-310 - Check short circuit activation under symptom A above - Check for proper sensor alignment & connections - Check running brake off switch (if used) for activation - reset to normal run mode - Check for brake voltage across magnets, replace control if necessary.

Symptom H: Dancer assumes shortest web loop position during initial system start-up

Probable Cause	Suggested Solution
Incorrect dancer position setting	- Adjust dancer position setting until dancer moves to normal running position
Roll shaft not free to rotate	- Check for binding in brake - Check for bearing seizure
Incorrect sensor wiring	- Check sensor wiring and voltages - rewire and/or align as necessary
Full output to brake	- Check for running brake on switch (if used) activation - set to run position if required

Symptom I: Dancer moves to shortest web loop and remains there after operating in normal running position

Probable Cause	Suggested Solution
Pivot-point sensor coupling is loose and slipping	- If dancer position adjustment lowers the dancer near its normal running position, realign sensor and recheck voltages
Faulty PC board/control	- Check that brake voltage decreases and goes negative when dancer is moved to shortest web loop - If voltage does not decrease, replace control
Tension too low to overcome system friction and drag	- Check for excess drag or friction in the unwind system when brake is off - Check for anti-residual current in brake. Reduce or eliminate excess friction or drag after cause determined - Increase tension level

Symptom J: Dancer moves erratically - appears to hunt or oscillate

Probable Cause	Suggested Solution
Incorrect gain setting	- Adjust gain CCW until dancer stops hunting
Nonuniform system friction	- If hunting coincides with each resolution of the web parent roll, check for faulty bearing or mismounted brake
Improperly installed sensor	- Check sensor alignment and voltages through full range of the dancer. Also check for lag between the movement of the dancer and the pivot-point sensor shaft
Loose or faulty wiring	- Check all wiring for proper connections and secure by fastening to connector strips - Check any wiring junctions for secure connections - Check for corrosion at connection points and clean as required
Improperly adjusted P-I-D circuits	- Reset P-I-D circuits per the calibration and set-up adjustments - Obtain TCS-900 to make dynamic adjustments - Check differentiator gain selector switch SW1 for proper set up

REPLACEMENT PARTS LISTING

TCS-168 Power Supply 6910-448-032
Enclosure, TCS-168 6910-448-034
Fuse, 10A, 250V, Fast-Acting, F1 (120VAC) 458-8001-031
Fuse, 5A, 250V, Fast-Acting, F1 (240VAC) 458-8001-004
Fuse, 5A, 250V, Fast-Acting, F2 458-8001-004

TCS-310 Dancer Splicer Control Complete 6910-448-042
Main Control Board, Driver, TCS-310 6910-101-030
Dancer Logic Control Board, TCS-310 6910-101-056
Splicer Logic Control Board, TCS-310 6910-101-058
Meter Panel Assembly, TCS-310 6910-101-062
TCS-310 Dancer Splicer Control, Less Housing .. 6910-448-040
Fuse, 3A, 250V, Fast-Acting, F1 458-8001-006
Fuse, 10A, 250V, Fast-Acting, F2 458-8001-031
Fuse, 1.5A, 250V, Fast-Acting, F3, F4 458-8001-020

MCS-605-1 Single Turn Pivot-Point Sensor 7330-448-002
TCS-605-5 5 Turn Pivot-Point Sensor 7330-448-003

LISTING OF FIGURES & ILLUSTRATIONS