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MEX (55) 53 63 23 31 MTY (81) 83 54 10 18
QRO (442) 1 95 72 60 ventas@industrialmagza.com

TCS-200-1 and TCS-200-1H Tension Controls

Service & Installation Instructions

P-2003-2
819-0420

Warner Electric

An Altra Industrial Motion Company

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Contents

Component Parts List

Coupling, MCS-605-1	284-8000-003
Roll Pin (Drive) for Sensor Coupling	679-8001-067
TCS-200-1 Tension Control	6910-448-086
TCS-200-1H Tension Control	6910-448-087
Ultrasonic Sensor 4-40in	7600-448-001

List of Illustrations and Figures

Introduction

The Warner Electric Tension Control system is comprised of a tension brake, control module, and optional external sensor input.

This manual has been designed to cover installation, start-up, adjustment, and maintenance of your tension control system and covers the control system only. Further information on brake sizing and selection can be found in catalogs P-1234 or P-771.

Power Source

The TCS-200-1 series Tension Controls operates from a power source of 115 or 230 VAC, 50/60 Hz input. Primary voltage is determined by the customer's input voltage source. The control is factory set to accept 115 VAC input. Refer to the wiring section for 230 VAC input connections.

Control

The TCS-200-1 series controls are selectable voltage or current controlled power supply designed to power up to a 16 magnet Electro Disc tension brake system, Electromagnetic Particle Brakes, TB series brakes or Advanced Technology tension brakes. This control can be operated manually from the front panel or remotely via an analog voltage input, a current input, a remote pot, or a roll follower. External inputs are also provided for remote brake "off", "run", and "stop" functions, as well as front panel control of these functions.

The analog voltage and current inputs are electrically isolated from the main power circuitry of the control when 15-35 VDC supply is provided to maintain full isolation. If isolation is not needed, an on board 15 VDC supply is jumpered to act as a default.

Sensors

When the TCS-200-1 series controls are operated in a remote torque adjust mode, a 1,000 ohm potentiometer is required. This should be a linear type potentiometer with a rating of .5 watts, 10 percent tolerance, and a .5 percent linearity.

For roll follower input applications, a 1,000 ohm potentiometer with a rating of .5 watts, 10 percent tolerance, and .5 percent linearity is required for best performance.

Brakes

All 24 VDC tension brakes that Warner Electric offers, to a maximum of 4.25 amps, can be used with the TCS-200-1 tension control. For all 24 VDC tension brakes that require greater current capability from the control (not to exceed 5.8 amps), use a TCS-200-1H. The brake converts electrical current supplied by the control into torque, which retards material flow, maintaining the desired web tension.

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Theory of Operation

When in operation, the control is powered by a standard 115/230 VAC line. The control has a transformer that converts that voltage to a level suitable for any 24 VDC brake system. The signal is rectified to DC and pulse width modulated (PWM) to the desired brake current via the TENSION ADJUST knob.

The front panel TENSION ADJUST feeds a small voltage to a comparator, which compares this signal to a triangular wave. This is where the PWM pulse is generated. This pulse is then inverted and used to drive a power circuit. The main brakes and a sense brake are then energized by the power circuit at regular intervals. From the sense brake, a growth and decay signal is converted to a voltage that can be added to the signal by setting a jumper on the inside of the cover. This signal, when selected, is used to maintain constant current to the brake. The signal must not be selected when no sense brake is connected.

The control has several options that allow for external/remote tension adjust in addition to the tension adjust pot on the front of the panel. Two such options are the remote pot or a roll follower. Another is the option for an analog input of voltage or current from a PLC or ultrasonic sensor. A special feature of the analog inputs is that they are optically isolated from the rest of the control circuitry if an external power source is used to power the isolated circuits. The isolation is needed when using a PLC or an external power supply for the ultrasonic sensor. An internal power source is also available and jumpered in as default if isolation is not necessary. The tension adjust pot on the front of the panel becomes a span adjust when any of the external control options are connected.

The control also has the capability to duplicate the front panel selector switch at a remote location. Brake "off" mode overrides the tension adjustment and provides for resetting the short circuit indicator. In the "run" mode, output operation is normal and is controlled by any of the front panel or remote tension adjust features discussed above. The brake "stop" mode provides for full output current to the brake.

The two indicators on the front of the panel are green for "power on" and red to indicate a short circuit. When a short occurs in the brake, the control disables the power circuits to prevent damage. Turn the switch to "off" to reset the short circuit indicator.

Because this is a basic tension control, no anti-residual circuits, zero adjust circuits, or other complex control circuits (found in other Warner Electric tension control systems) are included in the TCS-200-1 series controls.

Technical Specifications
TCS200-1 and TCS200-1H

Input Power

115/230 VAC 50/60 Hz

Output TCS-200-1

Adjustable 0-24 VDC. Maximum of 4.25 amps continuous. Can be used with any 24 VDC tension brake with or without the need for a sense coil.

Output TCS-200-1H

Adjustable 0-24 VDC. Maximum of 5.8 amps continuous. Can be used with any 24 VDC tension brake with or without the need for a sense coil.

Ambient Temperature

-20° to 125° F (-29° to 51° C)

Fuse

2.5 Amp, 250 VAC, Slow-Blow

Protection

Internal short-circuit protection on driver output stage

Sensor Inputs

- Remote Torque Adjust 1,000Ω
- Roll Follower 1,000Ω
- Analog voltage input, 0-10 VDC (Optically isolated when 15-35 VDC supplied from external source)
- Analog current input, 4-20mA (Optically isolated when 15-35 VDC supplied from external source)

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Auxiliary Inputs

- Brake Stop – Applies full voltage to the connected brakes. Active high input
- Brake Run – Voltage to the brake is controlled by any of the sensor inputs and/or the front panel tension adjust. Active high input.
- Brake Off – Removes output current to the brake. Puts the brake at zero current level. Active high input.

Note 1: The remote input signal for these functions requires a minimum contact rating of 20 VDC at .01 amps and a maximum of state leakage current less than 100 micro-amps.

Note 2: The remote switch input overrides the front panel switch.

Front Panel

- Tension Adjust – Provides current adjust to the brake from 0 to 100%. In the remote and analog input mode, provides for maximum output level set to the brake.
- Brake Mode Switch –

  Modes: "stop"-brake full on

  "run" -normal operation

  "off" -brake off

Indicators (Front Panel)

- Green LED indicates AC power has been applied to the control.
- Red LED indicates there is a short on the output. Turn the front panel switch "off" to reset the short circuit.

General

The control chassis must be considered NEMA 1 and should be kept clear of areas where foreign material, dust, grease, or oil might affect control operation.

Potentiometers (supplied by the customer)

- Remote Torque Adjust
  1,000 ohms, 10% tolerance, .5% linearity, .5 watts, linear taper
- Roll Follower – 1,000 ohms, 10% tolerance, .5% linearity, .5 watts, linear taper

❏ 1. **⚠CAUTION** If you are using a PLC or an external power supply with this control, you must enable the isolation of the control.

❏ 2. The TCS-200-1 can not operate a single brake or brakes that require more than 4.25 amps continuous.

❏ 3. The TCS-200-1H can not operate a single brake or brakes that require more than 5.8 amps continuous.

This Installation and Operation Manual has been arranged for the systematic installation and start-up of your tension control system. To achieve the best possible results, we recommend checking off each completed step in the space provided before proceeding to the next step.

Sample

❏ Attach the TCS-200 control chassis to the mounting surface and secure with mounting hardware.

Check box after completing each step.

Control Mounting

❏ 1. Determine a suitable location for the control to be mounted. Consideration should be given to whether the front panel adjustments will require access by the operator.

❏ 2. Using the dimensional data supplied in Figure 1a and Figure 1b, drill four mounting holes using a #16 drill if #8 through-bolts are used. For #8 capscrew mounting, use a #29 drill and tap holes for #8 screws. Templates for hole drilling are found on page 21.

❏ 3. Attach the TCS-200-1 or TCS-200-1H control chassis to the mounting surface and secure with mounting hardware.

Note: The control chassis has been designed to accommodate two half-inch conduits for wiring when the control is mounted to the machine frame.

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❏ 4. Attach conduit or seal tight connectors.

The control is now ready to be wired. Refer to the wiring section of this manual for proper system wiring.

Brake Installation

Refer to the brake manual that is appropriate for the brake selected for its installation procedures.

External Sensor Mounting (Optional)

Options for four types of external sensor inputs are available. These consist of either an external torque adjust, roll follower input that provides a signal directly proportional to the diameter of the roll to be processed, analog voltage, or analog current input. Determine which type of external sensor will be used and proceed to the appropriate section of this manual.

Remote Torque Adjust Potentiometer (Optional)

❏ 1. Select an appropriate mounting location for the external torque-adjust potentiometer.

Note: In determining this mounting location, take into consideration the routing of the wires necessary to connect the control, access for the operator, and space required by the physical size of the potentiometer.

❏ 2. Drill a mounting hole based on the bushing diameter of the potentiometer selected.

❏ 3. Mount and secure the potentiometer.

This completes the mounting for an external remote torque adjust potentiometer. Refer to the wiring section of this manual for proper control wiring.

Roll Follower Adjust Potentiometer (Optional)

❏ 1. Mount the roll follower potentiometer and determine the amount of angular rotation at the potentiometer shaft.

Note: If angular rotation is not adequate, insufficient output from the control is possible. In this case, a timing belt drive between the roll follower pivot-point and the sensor potentiometer may be necessary to obtain adequate angular rotation.

❏ 2. Secure the roll follower potentiometer. This completes the mounting for a roll follower potentiometer. Refer to the wiring section of this manual for proper control wiring.

Analog Input (Optional)

❏ 1. Select an appropriate mounting location for the PLC or ultrasonic sensor.

❏ 2. Mount and secure the PLC or ultrasonic sensor according to the specifications for those products.

This completes the mounting. Refer to the wiring section of this manual for proper control wiring.

System Wiring

System Wiring Precautions

The following wiring precautions will help you properly wire and install a trouble free system.

❏ 1. Use a proper gauge wire for all wiring.

❏ 2. Insure that wires are cut and stripped so that no excess bare wire is exposed.

❏ 3. Segregate AC input power from control switching and external sensor wiring (if used).

❏ 4. Do not run AC power lines with DC power, input sensor wiring, or switching wiring. Noise transients can be easily transferred, causing erratic control operation.

❏ 5. Use shielded cable when possible for connecting the TCS-200-1 to external switches, the sensor potentiometer, PLC's, and ultrasonic sensor.

❏ 6. Under no circumstances should auxiliary accessories be operated from the TCS-200-1 control.

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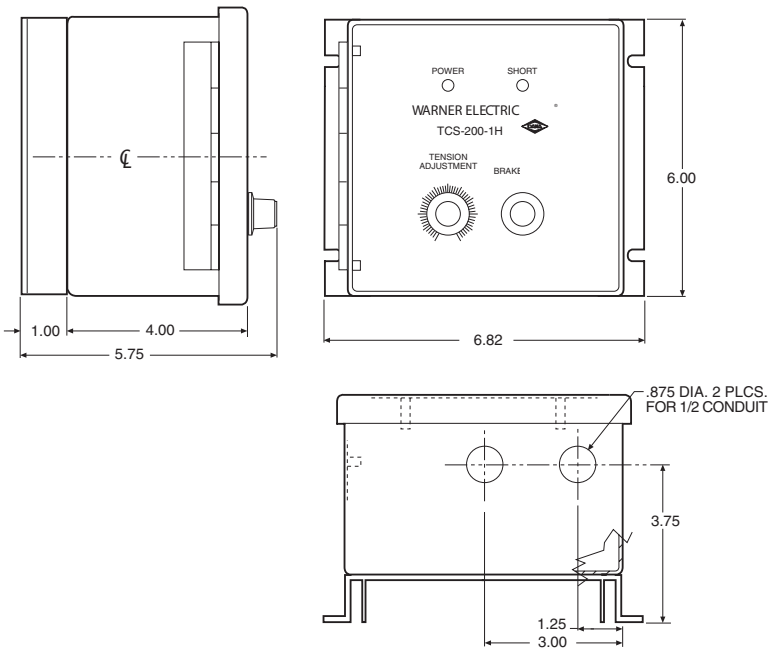
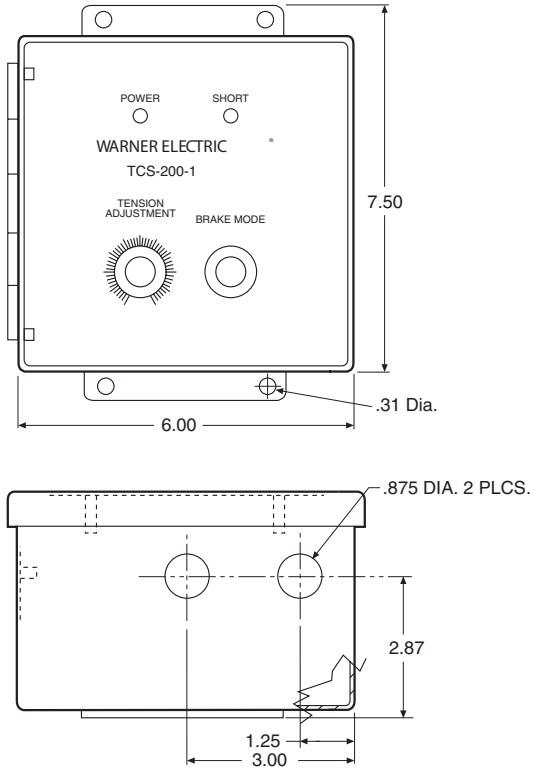


TCS-200-1H with Heat Sink
Figure 1a



CS-200-1
Figure 1b

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❑ 7. **⚠WARNING** Do not attempt to incorporate external switching schemes between two or more brakes and the TCS-200-1 output. This will damage the control and void the warranty.

❑ 8. Do not attempt to wire two or more controls in parallel.

TCS-200-1 Series Controls Wiring

Refer to Figure 2 for actual wiring connections.

❑ 1. Unlatch the front cover of the TCS-200-1.

Power

Determine if 115 VAC or 230 VAC will be used to power the control and proceed to that section of this manual.

⚠CAUTION Insure power is off and disconnects open on the control panel before connecting the AC input. Failure to do so can result in damage to equipment and injury or even death to personnel.

115 VAC

Refer to Figure 2a for 115 VAC power input connections.

❑ 1. Connect the 115 VAC power to terminals 4 & 8 of terminal block TB2 located in the base of the TCS-200-1 enclosure. Secure the terminal screws.

❑ 2. Connect an earth ground wire between terminal 9 of terminal block TB2 and an unpainted metal surface of the control panel to ensure a good ground connection. Secure the terminal screw. Make sure the control panel itself is properly grounded.

230 VAC Input

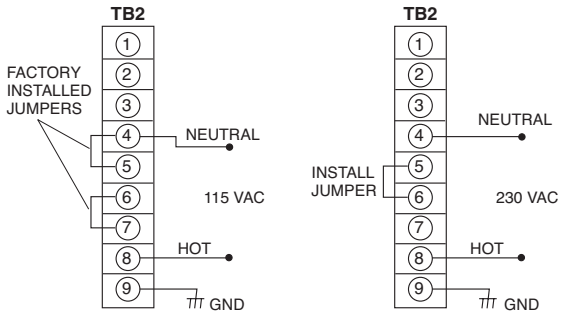
Refer to Figure 2b for 230 VAC power input connection.

❑ 1. Remove the factory installed jumpers from terminals 4 & 5 and 6 & 7 of terminal block TB2 located in the base of the TCS-200-1 enclosure.

❑ 2. Connect one of the jumpers to terminals 5 and 6 of terminal block TB2 and discard the spare jumper.

❑ 3. Connect the 230 VAC power to terminals 4 & 8 of terminal block TB2. Secure the terminal screws.

❑ 4. Connect an earth ground wire between terminal 9 of terminal block TB2 and an unpainted metal surface of the control panel to ensure a good ground connection. Secure the terminal screw. Make sure the panel itself is properly grounded.



a. 115 AC Power Wiring b: 230 VAC Power Wiring

Figure 2

Note: Do not apply power to the system at this point.

Brake

Determine the type of brake to be used with this control and proceed to that section of this manual.

Insure connections are tightly secured. Intermittent **⚠CAUTION** connection will cause the control to shut down and output current to the brake will be removed.

Electro Disc Tension Brake

Refer to Figure 3a for the Electro Disc Tension Brake wiring connections.

❑ 1. Connect the red wire from one brake magnet to terminal 1 of terminal block TB2 of the TCS-200-1. This becomes the sense magnet.

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❏ 2. In a system with more than one magnet, connect the remaining red wires from magnets 2 through 16 to terminal 2 of terminal block TB2 of the TCS-200-1.

❏ 3. Connect all black magnet wires to terminal 3 of terminal block TB2 of the TCS-200-1.

Note: Magnets of the Electro Disc tension brake must be properly connected, otherwise the control system will not function properly.

All Other 2 Wire Tension Brakes

To connect all other 2-wire tension brakes [Warner Electric's Magnetic Particle Brakes, Precision Tork Magnetic Particle Brakes, TB series brakes, or Advanced Technology (AT) tension brakes], refer to Figure 3b for 2-wire tension brakes wiring connections.

❏ 1. Connect one wire from the brake magnet to terminal 2 of terminal block TB2 of the TCS-200-1. Secure the terminal screw.

❏ 2. Connect the second wire from the brake magnet to terminal 3 of terminal block TB2 of the TCS-200-1. Secure the terminal screw.

❏ 3. Locate the five position jumper in the inside cover of the TCS-200-1. Move the 2-position black selector jumper from positions 1 & 2 to 2 & 3. This allows the control to operate without a brake sense magnet.

Remote Torque Adjust Input (Optional)

Refer to Figure 4a for remote torque adjust input connections.

❏ 1. Wire a three conductor shielded cable to the remote sensor potentiometer previously installed.

Note: Using a shielded cable with wire colors red, black, and green is recommended to simplify potentiometer and terminal connections:

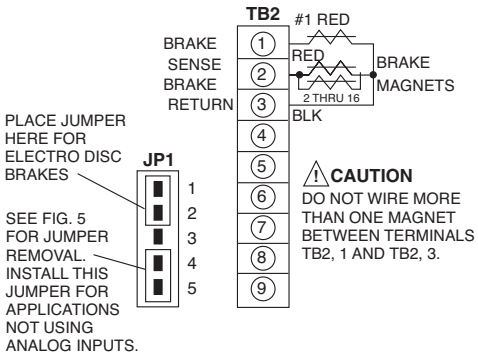
a. Black wire to low resistance end terminal of potentiometer.
b. Red wire to high resistance end terminal of potentiometer.
c. Green wire to wiper terminal of potentiometer.

⚠CAUTION Do not connect the shield lead of the cable at the potentiometer end. Cut the shield lead off at this end.

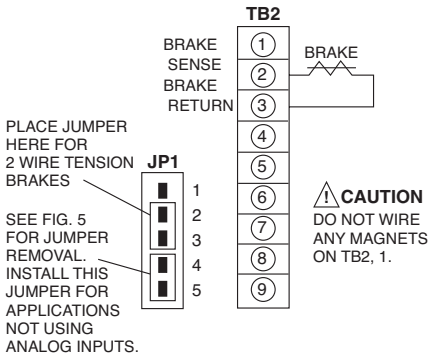
❏ 2. Route the cable from the sensor potentiometer to the control, keeping the cable segregated from high voltage AC power lines and other wiring that may cause noise transients.

❏ 3. Connect the black wire from the low resistance end of the remote potentiometer to terminal 11 of terminal block TB1 in the TCS-200-1. Snug terminal only.

❏ 4. Connect the green wire from the wiper of the remote potentiometer to terminal 9 of terminal block TB1 in the TCS-200-1. Secure the terminal screw.



Electro disc tension braking system
Figure 3a.



All other 2 wire tension brake wiring
Figure 3b.

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❏ 5. Connect the red wire from the high resistance end of the remote potentiometer to terminal 7 of terminal block TB1 of the TCS-200-1. Secure the terminal screw.

❏ 6. Connect the shield lead from the cable to terminal 11 of terminal block TB1 of the TCS-200-1. Secure the terminal screw.

Roll Follower Adjust Input (Optional)

Refer to Figure 4b for roll follower adjust input connections.

❏ 1. Wire a three conductor shielded cable to the roll follower potentiometer previously installed.

Note: Using a shielded cable with wire colors red, black, and green is recommended to simplify potentiometer and terminal connections:

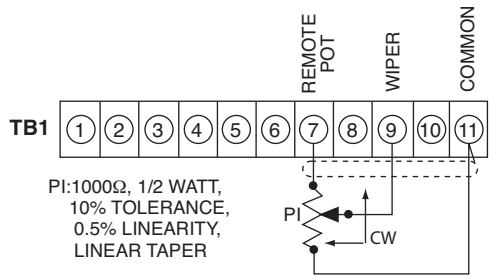
a. Black wire to low resistance end terminal of potentiometer.
b. Red wire to high resistance end terminal of potentiometer.
c. Green wire to wiper terminal of potentiometer.

❏ 2. Route the cable from the sensor potentiometer to the control, keeping the cable segregated from high voltage AC Power lines and other wiring that may cause noise transients.

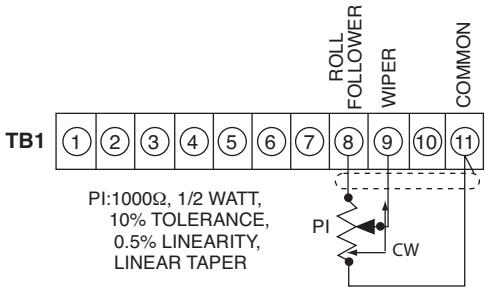
❏ 3. Connect the black wire from the low resistance end of the roll follower potentiometer to terminal 11 of terminal block TB1 of the TCS-200-1. Do not tighten the terminal screw. Snug down only.

❏ 4. Connect the green wire from the wiper of the roll follower potentiometer to terminal 9 of terminal block TB1 of the TCS-200-1. Secure the terminal screw.

❏ 5. Connect the red wire from the high resistance end of the roll follower potentiometer to terminal 8 of terminal block TB1 of the TCS200-1. Secure the terminal screw.



Remote torque adjust input
Figure 4a



Roll follower adjust input
Figure 4b

❏ 6. Connect the shield lead from the cable to terminal 11 of terminal block TB1 on the TCS-200-1. Secure the terminal screw.

Remote Mode Selector Switch (Optional)

Refer to Figure 5a for the remote mode selector switch connections.

❏ 1. Install selector switch at a convenient location.

❏ 2. Wire a three conductor shielded cable to the external mode selector switch.

Note: It is recommended that a shielded cable with wire colors of red, black, and green be used as this will simplify switch and terminal connections.

a. Black wire to common contacts of both switch poles.
b. Red wire to normally open contact for "on" or "stop" pole.
c. Green wire to normally open contact for "off" pole.

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⚠CAUTION Do not connect the shield lead of the cable at the switch contacts. Cut the shield lead off at this end.

❑ 3. Route the remote mode switch cable to the control, keeping the cable segregated from high voltage AC power lines and other control wiring that may cause noise transients.

❑ 4. Connect the black wire from the switch common contacts of the remote mode switch to terminal 10 of terminal block TB1 of the TCS-200-1. Tighten the screw.

❑ 5. Connect the red wire from the normally open contact for the “on” or “stop” position of the remote mode switch to terminal 5 of terminal block TB1 of the TCS-200-1. Tighten the screw.

❑ 6. Connect the green wire from the normally open contact for the “off” position of the remote mode switch to terminal 6 of terminal block TB1 of the TCS-200-1. Tighten the screw.

❑ 7. Connect the shield wire from the cable to terminal 11 of terminal block TB1 of the TCS-200-1. Securely tighten the screw.

The TCS-200 Tension Control has now been wired for operation. Before applying power to the system, double check the wiring and installation for proper connection. After this check has been completed, proceed to the start-up and adjustment section of this manual.

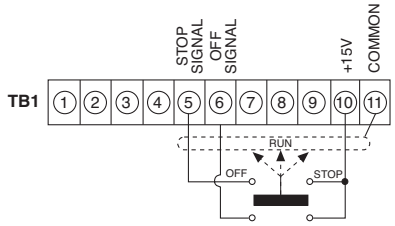
Analog Input (Optional)

Two options for the analog input signal are available. These include 0-10 VDC or 4-20 mA signal. Determine which signal will be supplied and refer to the proper section of this manual below. Also, determine if this input needs to be isolated from the control ground. For example, if a PLC is used, this input must be isolated. Then refer to the Isolation section of this manual.

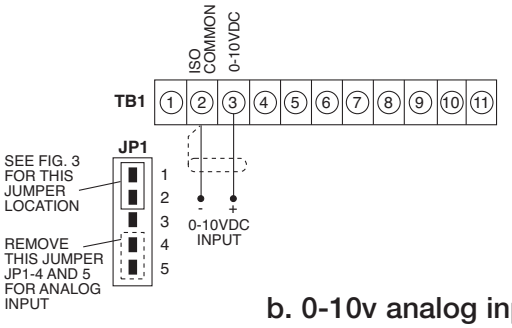
Note: A shielded cable is recommended for the 0-10 VDC or 4-20 mA input to insure a good signal.

0-10 VDC

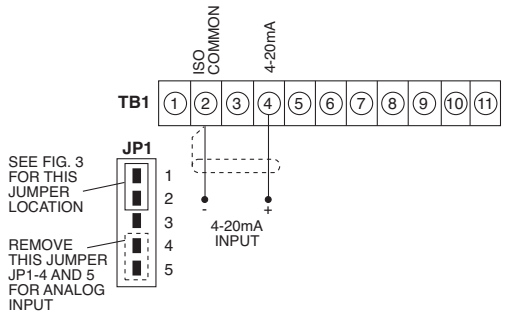
Refer to Figure 5b for the 0-10 VDC analog input connections.



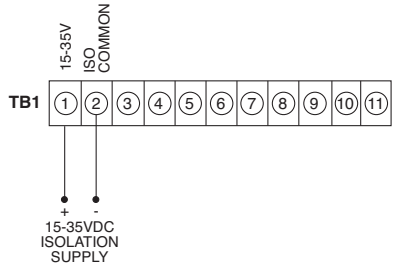
a. Remote mode selector switch



b. 0-10v analog input



c. 4-20mA analog input



d. Isolation power supply

Figure 5

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❏ 1. Connect the positive lead of the 0-10 VDC input to terminal 3 of terminal block TB1. Securely tighten the screw.

❏ 2. Connect the negative lead of the 0-10 VDC input to terminal 2 of terminal block TB1. Snug terminal only.

❏ 3. Connect the shield wire to terminal 2 of terminal block TB1. Securely tighten the screw.

❏ 4. Locate the five-position jumper mounted on the board on the inside cover of the TCS-200-1. Remove the two position black selector from positions 4 & 5 of jumper JP1 and discard.

4-20 mA

Refer to Figure 5c for the 4-20 mA Analog input connections.

❏ 1. Connect the positive lead of the 4-20 mA input to terminal 4 of terminal block TB1. Securely tighten the screw.

❏ 2. Connect the negative lead of the 4-20 mA input to terminal 2 of terminal block TB1. Snug terminal only.

❏ 3. Connect the shield wire to terminal 2 of terminal block TB1. Securely tighten the screw.

❏ 4. Locate the five-position jumper mounted on the board on the inside front cover of the TCS-200-1. Remove the two position black selector from positions 4 & 5 of jumper JP1 and discard.

Isolation Power Supply

Refer to Figure 5d for analog input isolation power supply connections.

Note: To isolate the analog input from the TCS-200-1 control ground, a separate 15-35 VDC voltage supply is needed.

❏ 1. Connect the positive side of the 15-35 VDC external voltage supply to terminal 1 of terminal block TB1. Securely tighten the screw.

❏ 2. Connect the negative side of the 15-35 VDC external voltage supply to terminal 2 of terminal block TB1. Securely tighten the screw.

System Start-Up and Adjustment

Manual Tension Adjust (Front Panel)

❏ 1. Apply power to the control system.

❏ 2. Check that the green LED marked “power” is illuminated.

❏ 3. Using an AC voltmeter, measure the AC input voltage at terminals 4 and 8 of terminal block TB2. This voltage should be 115 or 230 VAC, depending on the voltage chosen.

❏ 4. Remove power from the control system and wait approximately 30 seconds before proceeding to the next step.

Electro Disc Tension Brake

Note: If you are not using electro disc tension brakes, proceed to step 5 under all other 2 wire tension brakes section.

❏ 5. Remove the sense magnet lead from terminal 1 of terminal block TB2 and insert a DC current meter between the lead of the sense magnet and terminal 1 of terminal block TB2. Note: Use a DC current meter that reads 0 to 500 mA with the Positive (+) lead connected to terminal 1 and negative (-) lead connected to the wire.

❏ 6. Reapply power to the control system.

❏ 7. Place the mode selector switch in the brake “off” position. The meter should read zero current and the brake should free wheel.

❏ 8. Place the mode selector switch in the brake “on” or “stop” position. The meter should read 345 to 375 mA and the brake should be locked.

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❏ 9. Place the mode selector switch in the “run” position and set the tension adjust potentiometer to zero (or fully counterclockwise). The meter should read zero current output to the brake.

❏ 10. Slowly rotate the tension adjust potentiometer from fully counterclockwise to fully clockwise, noting that the output current increases from zero to 345-375 mA at maximum output.

❏ 11. This concludes checkout of the control system. Remove power and allow approximately 30 seconds before proceeding to the next step.

❏ 12. Remove the meter and reattach the sense magnet lead to terminal 1 of terminal block TB2 and secure the lead. Proceed to step 13.

All other 2 wire tension brakes

❏ 5. Attach a DC voltmeter to terminals 2 and 3 of terminal block TB2.

Note: A DC voltmeter with the capability of reading 0 to 24 VDC should be used. Positive (+) to terminal 2 and negative (-) to terminal 3.

❏ 6. Reapply power to the control system.

❏ 7. Place mode selector switch in the brake "off" position. The meter should read zero voltage and the brake armature should be free-wheeling.

❏ 8. Place mode selector switch in the brake "stop" position. The meter should read approximately 24 VDC and the brake should be locked up tight.

❏ 9. Place mode selector switch in the brake "run" position and set the tension adjust potentiometer to zero or full counterclockwise position. The meter should read zero output voltage to the brake.

❏ 10. Slowly rotate the tension adjust potentiometer from fully counterclockwise to full clockwise, noting the output voltage increases from zero to approximately 24 VDC at maximum output.

❏ 11. This concludes check-out of the control system. Remove power and allow approximately 30 seconds before proceeding to the next step.

❏ 12. Remove the meter and from terminals 2 and 3 of terminal block TB2 and secure.

❏ 13. Reapply power to the control system.

❏ 14. Adjust the tension potentiometer for the desired brake level required for operation.

Note: If start-up and adjustment procedures do not produce the desired results, consult the troubleshooting section of this manual.

❏ 15. If a remote mode selector switch is used, repeat steps 5 through 13 using the remote mode selector switch.

❏ 16. Close the cover to the control chassis using the cover screw supplied with the control.

Remote Tension Adjust

❏ 1. Apply power to the control system.

❏ 2. Check that the green LED marked “power” is illuminated.

❏ 3. Using an AC voltmeter, measure the voltage at terminals 4 and 8 of terminal block TB2. This should be approximately 115 VAC or 230 VAC, depending on the input voltage chosen.

❏ 4. Remove power from the control system and wait approximately 30 seconds before proceeding to the next step.

Electro Disc Tension Brake

Note: If you are not using electro disc tension brakes, proceed to step 5 under all other 2 wire tension brake section.

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❑ 5. Remove the sense magnet lead from terminal 1 of terminal block TB2 and insert a DC current meter in series with the lead of the sense magnet and terminal 1 of terminal block TB2.

Note: Use a DC current meter that reads 0 to 500 mA with the Positive (+) lead connected to terminal 1 and negative (-) lead connected to the wire.

❑ 6. Reapply power to the control system.

❑ 7. Place the mode selector switch in the brake “off” position. The meter should read zero output current and the brake should free wheel.

❑ 8. Place the mode selector switch in the brake “on” or “stop” position. The meter should read 345 to 375 mA and the brake should be locked.

❑ 9. Place the mode selector switch in the “run” position and set the tension adjust potentiometer to zero (or fully counterclockwise). The meter should read zero current output to the brake.

❑ 10. Slowly rotate the remote tension adjust potentiometer from fully counterclockwise to full clockwise, noting that the output current increases from zero to 345-375 mA at maximum output. Leave this potentiometer at its maximum setting.

❑ 11. Slowly rotate the front panel tension adjust potentiometer from its fully clockwise, or maximum setting, to its fully counterclockwise, or minimum setting. Monitor the meter, observing that the current goes from 345 - 375 mA to zero at the minimum setting.

❑ 12. This concludes the control system checks. Remove power and allow approximately 30 seconds before proceeding to the next step.

❑ 13. Remove the meter and reattach the sense magnet lead to terminal 1 of terminal block TB2 and secure it.

Proceed to step 14 in next section.

All Other Two Wire Tension Brakes

❑ 5. Attach a DC voltmeter to terminals 2 and 3 of terminal block TB2.

Note: Use A DC voltmeter that reads from 0 to 24 VDC. Connect the positive (+) lead to terminal 2 and negative (-) lead to terminal 3.

❑ 6. Reapply power to the control system.

❑ 7. Place the mode selector switch in the brake "off" position. The meter should read zero voltage and the brake should free wheel.

❑ 8. Place the mode selector switch in the brake "stop" position. The meter should read approximately 24 VDC and the brake should be locked.

❑ 9. Place the mode selector switch in the brake "run" position and set the remote tension adjust potentiometer to the zero, or fully counter-clockwise, position. The meter should read zero voltage output to the brake.

❑ 10. Slowly rotate the remote tension adjust potentiometer from fully counterclockwise to full clockwise, noting that the output voltage increases from zero to approximately 24 VDC at its maximum. Leave the potentiometer at its full clockwise, or maximum, position.

❑ 11. Slowly rotate the front panel tension adjust potentiometer from its fully clockwise, or maximum setting, to its fully counterclockwise, or minimum setting. Monitor the meter, observing that the voltage goes from 24 VDC to zero at the minimum setting.

❑ 12. This concludes the control system checks. Remove power and allow approximately 30 seconds before proceeding to the next step.

❑ 13. Remove the meter from terminals 2 and 3 of terminal block TB2 and secure the leads to the terminals.

❑ 14. Reapply power to the control system.

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❏ 15. Adjust the front panel tension adjust potentiometer to the maximum output level required for the application. Now set the remote tension adjust potentiometer between maximum and zero.

Note: If start-up and adjustment procedures do not produce the desired results, consult the troubleshooting section of this manual.

❏ 16. If a remote mode selector switch is used, repeat steps 5 through 13 using the remote mode selector switch.

❏ 17. Close the control front cover and latch it by tightening the screw that is provided.

Roll Follower Tension Adjust

❏ 1. Apply power to the control system.

❏ 2. Check that the green LED marked "power" is illuminated.

❏ 3. Using an AC voltmeter, measure the AC input voltage at terminals 4 and 8 of terminal block TB2. This voltage should be approximately 115 or 230 VAC, depending on the voltage chosen.

❏ 4. Remove power from the control system and wait approximately 30 seconds before proceeding to the next step.

Electro Disc Tension Brake

Note: If you are not using electro disc tension brakes, proceed to step 5 under all other 2 wire tension brake section.

❏ 5. Remove the sense magnet lead from terminal 1 of terminal block TB2 and insert a DC current meter in series with the lead of the sense magnet and terminal 1 of terminal block TB2.

Note: Use a DC current meter that reads 0 to 500 mA with the positive (+) lead connected to terminal 1 and the negative (-) lead connected to the wire.

❏ 6. Reapply power to the control system.

❏ 7. Set the mode selector switch to the brake “off” position. The meter should read zero current and the brake should free wheel.

❏ 8. Place the mode selector switch in the brake “stop" position. The meter should read 345 to 375 mA and the brake should be locked.

❏ 9. Place the mode selector switch in the brake "run" position and set the tension adjust potentiometer to its maximum (fully clockwise) setting.

Note: Refer to Table 1 for various inputs and outputs when using the roll follower system

❏ 10. Connect a second DC voltmeter between terminals 9 and 11 of terminal block TB1.

Note: Use a DC voltmeter capable of measuring zero to 10 volts DC.

❏ 11. With the roll follower potentiometer disconnected from the roll follower arm, position the follower arm to its true zero position, which should be the centerline of the unwind spindle.

❏ 12. Adjust the roll follower potentiometer to a zero voltage reading on the voltmeter which is connected per step 10, page 14.

❏ 13. Connect the roll follower potentiometer to the roll follower arm. After coupling the follower arm to the potentiometer, recheck the voltage between terminals 9 and 11 of terminal block TB1 to insure the voltage is still zero VDC.

❏ 14. Place a full roll of material on the unwind stand.

❏ 15. Set the roll follower arm on the unwind roll.

❏ 16. Check the voltage between terminals 9 and 11 of terminal block TB1 and refer to Table 1. If the voltage reading is less than 0.8 VDC, refer to Table 1 for the nominal output current available.

Note: If maximum starting torque available is less than the actual starting torque required, the amount of angular travel of the roll follower potentiometer must be increased.

If the voltage reading is greater than 1.3 VDC, decrease the front panel tension adjust until a 2.5 VDC reading is obtained.

❏ 17. Set the front panel tension adjust for the desired starting torque required for the application.

❏ 18. Start the machine and draw the web through.

❏ 19. Monitor the voltage at terminals 9 and 11 of terminal block TB1, as well as the brake current on terminal 1 of terminal block TB2. As the roll diameter decreases, the sensor voltage and the brake current will decrease, keeping the tension relatively constant.

❏ 20. After an initial run has been completed, remove power from the system and wait approximately 30 seconds before proceeding to the next step.

❏ 21. Disconnect the meter from the sense magnet lead to terminal block TB2. Tighten the lead screws.

Proceed to step 23 in next section.

All Other Two Wire Tension Brakes

❏ 5. Connect a DC voltmeter between terminals 2 and 3 of terminal block TB2.

Note: Use a DC voltmeter that reads from 0 to 24 VDC. Connect the positive (+) lead to terminal 2 and the negative (-) lead to terminal 3.

❏ 6. Reapply power to the control system.

❏ 7. Place the mode selector switch in the brake "off" position. The meter should read zero voltage and the brake should be free wheel.

❏ 8. Place the mode selector switch in the brake "stop" position. The meter should read approximately 24 VDC and the brake should be locked.

❏ 9. Place the mode selector switch in the brake "run" position and set the tension adjust potentiometer to its maximum (fully clockwise) setting.

Note: Refer to Table 1 for various inputs and outputs when using the roll follower system.

❏ 10. Connect a second DC voltmeter between terminals 9 and 11 of terminal block TB1.

Note: Use a DC voltmeter that measures zero to 10 VDC and connect the positive (+) lead to terminal 9 and the negative (-) lead to terminal 11.

❏ 11. With the roll follower potentiometer disconnected from the roll follower arm, position the follower arm to true zero, which should be the centerline of the unwind spindle.

❏ 12. Adjust the roll follower potentiometer to zero voltage on the voltmeter connected between terminals 9 and 11 of terminal block TB1.

❏ 13. Connect the roll follower potentiometer to the roll follower arm. After coupling the follower arm to the potentiometer, recheck the voltage between terminals 9 and 11 of terminal block TB1 to insure that the voltage is still zero VDC.

❏ 14. Place a full roll of material on the unwind stand.

❏ 15. Set the roll follower arm on the unwind roll.

❏ 16. Check the voltage between terminals 9 and 11 of terminal block TB1 and refer to Table 1. If the voltage reading is less than 0.8 VDC, refer to Table 1 for the nominal output voltage available.

Note: If maximum starting torque available is less than the actual starting torque required, the amount of angular travel of the roll follower potentiometer must be increased. If the voltage reading is greater than 1.3 VDC, decrease the front panel tension adjust until a 1.3 VDC reading is obtained.

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❏ 17. Set the front panel tension adjust for the starting torque required for the application.

❏ 18. Start the machine and draw the web through.

❏ 19. Monitor the voltage at terminals 9 and 11 of terminal block TB1, as well as the brake voltage at terminals 2 and 3 of terminal block TB2. As the roll diameter decreases, the sensor and the brake voltage will decrease, keeping the tension relatively constant.

❏ 20. After an initial run has been completed, remove power from the system and wait approximately 30 seconds before proceeding to the next step.

Note: If start-up and adjustment procedures do not provide the desired results, consult the trouble shooting section of this manual.

❏ 21. Remove the meter from terminals 2 and 3 of terminal block TB2 and tighten the terminal screws.

❏ 22. Disconnect the second voltmeter used from terminals 9 and 11 of terminal block TB1.

❏ 23. Reapply power to the control system.

❏ 24. If the remote mode selector switch is used, repeat steps 5 through 21 using the remote mode selector switch.

Note: If start-up and adjustment procedures do not provide the desire results, consult the trouble-shooting section of this manual.

❏ 25. Close the cover of the TCS-200-1 and latch it by tightening the screw that is provided.

Analog Input

❏ 1. Apply power to the control system.

❏ 2. Check that the green LED marked “power” is illuminated.

❏ 3. Using an AC voltmeter, measure the AC input voltage at terminals 4 and 8 of terminal block TB2. This voltage should be approximately 115 or 230 VAC, depending on the voltage chosen.

❏ 4. Remove power from the control system and wait approximately 30 seconds before proceeding to the next step.

Electro Disc Tension Brake

If you are not using electro disc tension brakes, proceed to step 5 under “All other 2 wire tension brake” section.

❏ 5. Remove the sense magnet lead from terminal 1 of terminal block TB2 and connect a DC current meter that reads from 0 to 500 milliamps between the lead of the sense magnet and terminal 1 of terminal block TB2. Connect the positive (+) lead to terminal 1.

❏ 6. Reapply the power to the control system.

❏ 7. Place the mode selector switch in the brake “off” position. The meter should read zero current and the brake should free wheel.

❏ 8. Place the mode selector switch in the brake “run” position. The meter should read 345 to 375 mA and the brake should be locked.

❏ 9. Place the mode selector switch in the brake "run" position and set the tension adjust potentiometer to its maximum (fully clockwise) setting.

Note: Refer to Table 2 and Table 3 for various inputs and outputs when using the analog input system.

❏ 10. If using a 0-10 VDC input, connect a second DC voltmeter capable of reading from zero to 10 VDC between terminals 3 and 2 of terminal block TB1. Connect the positive (+) lead to terminal 3 and the negative (-) lead to terminal 2.

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If using a 4-20 mA input, remove the wire from terminal 4 of terminal block TB1 and connect a second DC current meter capable of reading zero to 20 mA between this terminal and the positive 4-20 mA signal wire. Connect the positive (+) lead to terminal 4 and the negative (-) lead to the wire.

❏ 11. Adjust the analog input to obtain a zero voltage reading on the voltmeter connected between terminals 3 and 2, or a 4 mA reading on the current meter connected on terminal 4 of terminal block TB1.

❏ 12. Place a full roll of material on the unwind stand.

❏ 13. Set the front panel tension adjust for the starting torque required for the application.

❏ 14. Start the machine and draw the web through.

❏ 15. Monitor the voltage at terminals 3 and 2 or the current at terminal 4 of terminal block TB1, as well as the brake current on terminal 1 of terminal block TB2.

a. If using a sensor: As the roll diameter decreases, the sensor voltage or current will decrease which will cause the brake torque to decrease, keeping the tension proportional to the roll size.

b. If using a PLC: As the roll diameter decreases, the analog signal from the PLC must decrease to keep the tension proportional to the roll size.

❏ 16. After an initial run has been completed, remove power from the system and wait approximately 30 seconds before proceeding to the next step.

❏ 17. Remove the meter from between the sense magnet lead to terminal 1 of terminal block TB2 and tighten the terminal screw.

Proceed to step 19.

All Other Two Wire Tension Brakes

❏ 5. Attach a DC voltmeter capable of reading zero to 24 VDC between terminals 2 and 3 of terminal block TB2. Connect the positive (+) lead to terminal 2 and the negative (-) lead to terminal 3.

❏ 6. Reapply power to the control system.

❏ 7. Place the mode selector switch in the brake “off” position. The meter should read zero voltage and the brake should free wheel.

❏ 8. Place the mode selector switch in the brake “stop” position. The meter should read approximately 24 VDC and the brake should be locked.

❏ 9. Place the mode selector switch in the brake "run" position and set the tension adjust potentiometer to its maximum (fully clockwise) setting.

Note: Refer to Table 2 and Table 3 for various inputs and outputs when using the analog input system.

If using a 4-20 mA input, remove the wire from terminal 4 of terminal block TB1 and connect a second DC current meter capable of reading zero to 20 mA between this terminal and the positive 4-20 mA signal wire. Connect the positive (+) lead to terminal 4 and the negative (-) lead to the wire.

❏ 11. Adjust the analog input to obtain a zero voltage reading on the voltmeter connected between terminals 3 and 2, or a 4 mA reading on the current meter connected on terminal 4 of terminal block TB1.

❏ 12. Place a full roll of material on the unwind stand.

❏ 13. Set the front panel tension adjust for the starting torque required for the application.

❏ 14. Start the machine and draw the web through.

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❏ 15. Monitor the voltage at terminals 3 and 2 or the current at terminal 4 of terminal block TB1, as well as the brake current on terminal 1 of terminal block TB2.

a. If using a sensor: As the roll diameter decreases, the sensor voltage or current will decrease which will cause the brake torque to decrease, keeping the tension proportional to the roll size.

b. If using a PLC: As the roll diameter decreases, the analog signal from the PLC must decrease to keep the tension proportional to the roll size.

❏ 16. After an initial run has been completed, remove power from the system and wait approximately 30 seconds before proceeding to the next step.

❏ 17. Remove the meter from between the sense magnet lead to terminal 1 of terminal block TB2 and tighten the terminal screw.

❏ 18. Disconnect the second voltmeter from terminals 2 and 3 of terminal block TB1.

❏ 19. Reapply power to the control system.

❏ 20. If the remote mode selector switch is used, repeat steps 5 through 17, using the remote mode selector switch.

Note: If start-up and adjustment procedures do not provide the desired results, consult the troubleshooting section of this manual.

❏ 21. Close the cover of the TCS-200-1 and latch by tightening the screw that is provided.

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Voltage Tables

Table 1				
			Brakes 2-Wire Mode	MTB Brakes 3-Wire Mode
Ω Resistance	Degrees	Input Voltage from Roll Follower	Output Voltage	Current Output
0	0	0	0	0
27.8	10	.062V	1.354	20mA
55.6	20	.150V	2.903	40mA
83.4	30	.256V	4.41	60mA
111.11	40	.368V	6.05	84mA
138.9	50	.464V	7.53	103mA
166.7	60	.578V	8.92	125mA
194.4	70	.681V	10.46	145mA
222.2	80	.795V	11.95	167mA
250	90	.888V	13.62	184mA
277.8	100	.998V	14.97	203mA
305.6	110	1.103V	16.47	222mA
333.3	120	1.200V	17.90	240mA
361.11	130	1.324V	19.44	255mA

Table 2		
	Brakes 2-Wire Mode	MTB Brakes 3-Wire Mode
Analog Input Voltage	Voltage On Brake	Current On Brake Sense
0	0	0
1	3.7	50mA
2	6.9	90mA
3	9.9	140mA
4	13.5	180mA
5	16.1	220mA
6	19.3	260mA
7	22.5	290mA
8	25.5	330mA
9	27.2	350mA
10	27.2	350mA

Table 3		
	Brakes 2-Wire Mode	MTB Brakes 3-Wire Mode
Current Input	Voltage On Brake	Current On Brake Sense
4mA	0	0
6mA	4.3	60mA
8mA	7.5	110m
10mA	10.7	160mA
12mA	14.2	200mA
14mA	17.4	240mA
16mA	20.7	280mA
18mA	23.8	320mA
20mA	27.1	350mA

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Troubleshooting

General: The chart below will be helpful when isolating exact problems that may occur in the control system. When the system has been running for some time, the chart will also prove helpful when checking for worn, broken or frayed wires; bent or broken control system parts; blown fuses; loose terminal connections and defective wire connections.

Symptom A: Green LED indicator does not iluminate with power on	
Probable Cause	**Solution**
No power is applied to the control	Check that AC power is on.
Fuse Blown	Check fuse and replace if blown.
Symptom B: Red LED illuminates short circuit	
Shorted magnet coil	Check magnet coil resistance for approximately 66-68 ohms cold for MTB's. Coil resistance for 2-wire brakes, TB's, ATT's and Magnetic Particle units will vary. Check resistance specifications in Tension Catalog P-771 or appropriate service manual.
Brake connections improperly wired	Check wiring and rewire if necessary.
Transient Noise	Check for source of noise and suppress. Segragate wiring. Used shielded cable.

Note: After checking control. Reset control by turning the switch to "off" and then to "run".

Symptom C: Brake is not engaging	
Mode switch in brake "off" position	Set mode selector to "run" position.
Tension set at zero	Increase tension adjust.
Remote mode switch in brake off position	Set remote mode switch to "run" position.
Remote sensors incorrectly wired	Check wiring and rewire if necessary.
No signal on analog inputs	Check wiring and signal from PLC or ultrasonic sensor.
No power to control	Refer to Symptom A.
Symptom D: Brake is not releasing	
Mode switch in brake "on" or "stop" position	Set mode selector switch to "run" position.
Tension adjust set at maximum	Reduce level and see if brake rotates.
Remote mode switch in brake "on" or "stop" position	Set remote mode selector to "run".
Remote sensor incorrectly wired	Check wiring and rewire if necessary.
Mechanical binding	Check brake for free wheeling when control power is off. Correct if mechanical problems still exist.
Symptom E: Brake does not have adequate torque capacity	
Brake is incorrectly sized	Verify brake sizing by repeating the selection procedure in Tension Catalog P-771.
Brake is incorrectly wired	Recheck wiring and magnet connections and rewire if necessary.
Local or remote tension adjust	Recheck set-up procedures for the incorrectly set mode of operation in which the control is used. Readjust if necessary.

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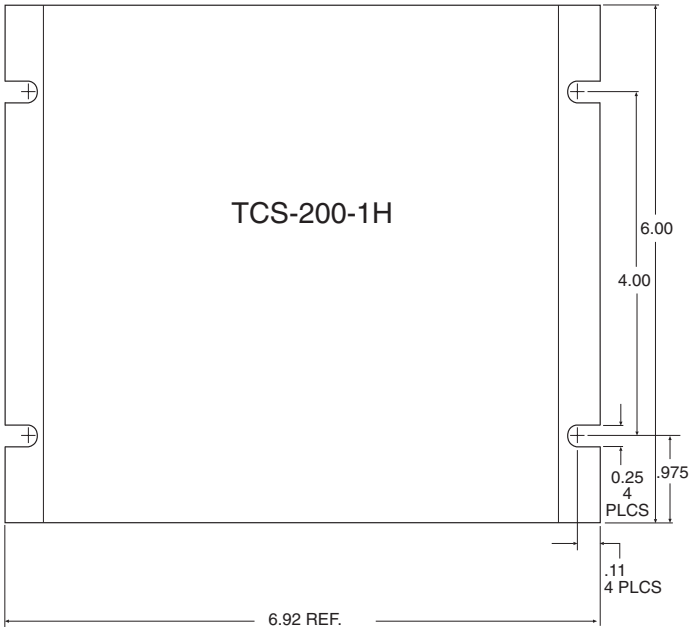
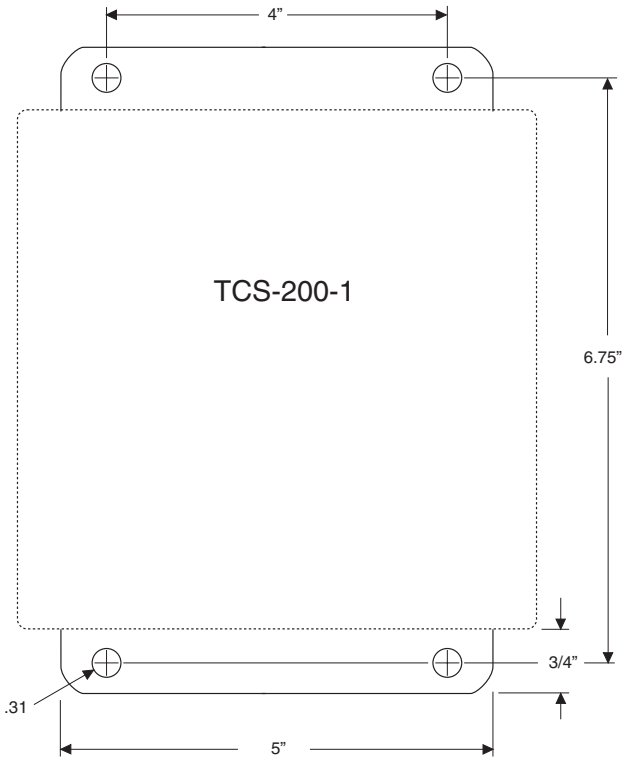
TCS-200-1H with Heat Sink



Template 1

TCS-200-1 Mounting Template



Template 2

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Warranty

Warner Electric LLC warrants that it will repair or replace (whichever it deems advisable) any product manufactured and sold by it which proves to be defective in material or workmanship within a period of one (1) year from the date of original purchase for consumer, commercial or industrial use.

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

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Warner Electric LLC
449 Gardner Street • South Beloit, IL 61080
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www.warnerelectric.com
An Altra Industrial Motion Company

P-2003-2 • 819-0420 10/07

Printed in USA