SHORT-STOP

Electronic Motor Brake
Type D

Instructions and Setup Manual

AMBITECH

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Section 1: Introduction

1.1 Product Overview

The SHORT-STOP Type D electronic motor brake permits rapid stopping of AC motors by DC injection, which creates a stationary magnetic field within the motor. Braking action is smooth, adjustable, and frictionless, and begins automatically when the motor is turned off.

The torque applied during braking is adjustable. When used with three-phase motors, you do not need to set the braking time because the Auto-Timeout feature senses when the motor stops rotating and then turns off the brake. This minimizes heat rise in the motor windings to the smallest amount possible. See Section 6.1 on page 29 for further information on how the SHORT-STOP brake works.

LEDs on the unit show when it is operating and when braking force is being applied. It also does not require mechanical connections and utilizes internal fuses. See Section 5 on page 25 for information on adjusting the SHORT-STOP brake.

Note that the SHORT-STOP brake does not affect normal machine performance, operation, or motor life.

1.2 Typical Applications

The SHORT-STOP Type D electronic motor brake works with all three-phase and single-phase AC induction motors; it will not work with DC or "universal" types of motors. It is designed for jogging applications. Each SHORT-STOP model covers all motor sizes up to its rating for horsepower and amps.

Standard units are completely satisfactory for most applications, particularly for wood- and metalworking machines such as saws, lathes, grinders, sanders, and so forth.

Another important application is to replace a worn-out mechanical brake with a SHORT-STOP electronic brake, which minimizes maintenance and provides for adjustable stopping rates. Note that retrofitting older machines is easy since a mechanical connection is not required.

Also note that for any application requiring frequent or severe braking (more than two stops per minute), a larger SHORT-STOP model may be required. In addition, applications involving exceptionally high inertia (such as flywheels and extractors) may also require a larger model, or

extended braking time or higher torque. Consult with The Parker Group, Inc. for further assistance with these types of applications.

1.3 Scope of This Manual

This manual contains specifications, receiving and installation instructions, configuration, description of operation, and trouble-shooting procedures for the SHORT-STOP Type D electronic motor brake.

1.4 Publication History

Date	Nature of Change
July 1998	First edition of Form 1261.

Section 2: Technical Characteristics

2.1 Type D Available Models

Several models of the SHORT-STOP Type D electronic brake are currently available. The models are broadly classified as follows:

- Those utilizing normal braking time, which allows the motor to stop in about twice the amount of time it takes to start the motor. (The maximum brake application time is 15 seconds.)
- Those utilizing shortened braking time (high-torque models), which allows the motor to stop in about the same amount of time as it takes to start the motor. (The maximum brake application time is 15 seconds.)
- Those utilizing extended braking time, which are intended for use with high-inertia loads where longer braking cycles are required. (These models are supplied with a 45-second braking time, although other braking times are available — consult with The Parker Group, Inc. for further information.)

The following paragraphs show the model numbers that are available within each of these classes. Note that the model numbers shown are "standard," that is, without any options. If options are included, the code number(s) for the options are appended to the right side of the model number. For further information on deciphering the information contained in the model number, see Section 2.2 on page 7.

2.1.1 Models with Normal Braking Time

The table on the following page shows the currently available models that utilize normal braking time. Normal braking time allows the motor to stop in about twice the amount of time it takes to start the motor, with the maximum brake application time being 15 seconds.

Section 2: Technical Characteristics

Voltage[1]	Phase	Motor Horsepower	Model Number[2]	Enclosure Size[3]
115 VAC	1 Phase	1	SS1D1	A
		2	SS1D2	B
230 VAC	1 Phase	2	SS2D2	A
		4	SS2D4	B
	3 Phase	5	SS2D5	A
		10	SS2D10	B
		20	SS2D20	C
		30	SS2D30	D
		60	SS2D60	E
460 VAC	3 Phase	5	SS4D5	A
		10	SS4D10	A
		15	SS4D15	B
		30	SS4D30	C
		60	SS4D60	D
		75	SS4D75	E
		100	SS4D100	E
		150	SS4D150	F
		200	SS4D200	G
		250	SS4D250	H
		300	SS4D300	H
575 VAC	3 Phase	5	SS5D5	A
		10	SS5D10	A
		20	SS5D20	B
		40	SS5D40	C
		75	SS5D75	D
		125	SS5D125	E
		175	SS5D175	F
		225	SS5D225	G
		275	SS5D275	H
		350	SS5D350	H

1. For applications requiring 208 VAC, append E8 to the model number.
2. When a model is used with a PLC, the PLC output must be of a relay type.
3. Use the letter shown with the dimensional information provide in Section 2.4 on page 8 to determine the size and weight of the model.

2.1.2 Models with Shortened Braking Time

The following table shows the currently available models that utilize shortened braking time (high-torque models). Shortened braking time allows the motor to stop in about the same amount of amount of time as it takes to start the motor, with the maximum brake application time being 15 seconds.

Voltage[1]	Phase	Motor Horsepower	Model Number[2]	Enclosure Size[3]
115 VAC	1 Phase	1	SS1D1S	B
230 VAC	3 Phase	2	SS2D2S	A
		5	SS2D5S	B
		10	SS2D10S	C
		20	SS2D20S	D
		30	SS2D30S	E
460 VAC	3 Phase	2	SS4D2S	A
		5	SS4D5S	A
		8	SS4D8S	B
		15	SS4D15S	C
		30	SS4D30S	D
		40	SS4D40S	E
		50	SS4D50S	E
		75	SS4D75S	F
		100	SS4D100S	G
		125	SS4D125S	H
		150	SS4D150S	H
575 VAC	3 Phase	3	SS5D3S	A
		5	SS5D5S	A
		10	SS5D10S	B
		20	SS5D20S	C
		40	SS5D40S	D
		60	SS5D60S	E
		90	SS5D90S	F
		115	SS5D115S	G
		140	SS5D140S	H
		175	SS5D175S	H

1. For applications requiring 208 VAC, append E8 to the model number.
2. When a model is used with a PLC, the PLC output must be of a relay type.
3. Use the letter shown with the dimensional information provide in Section 2.4 on page 8 to determine the size and weight of the model.

2.1.3 Models with Extended Braking Time

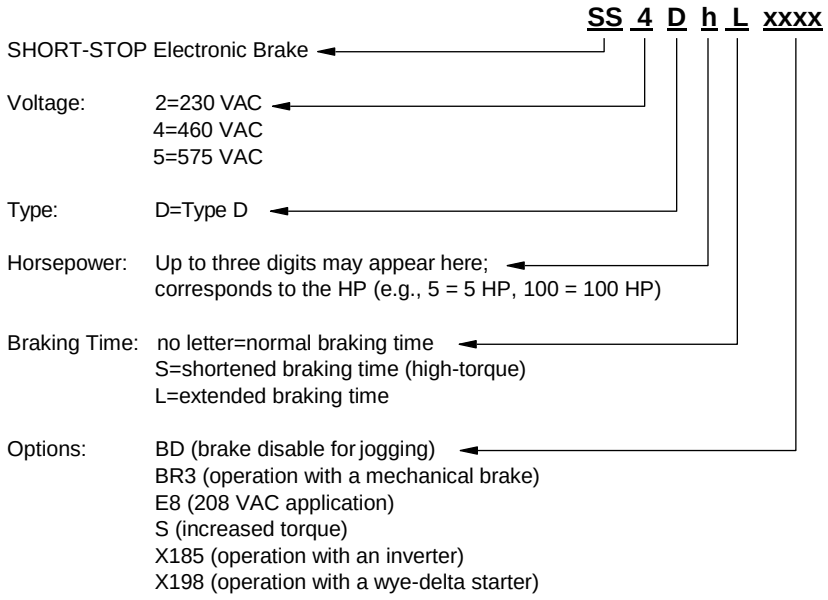
The following table shows the currently available models that utilize extended braking time. These models are intended for use with high-inertia loads where longer braking cycles are needed. A 45-second braking time is standard, although other durations are available – consult The Parker Group, Inc. for further information.

Voltage[1]	Phase	Motor Horsepower	Model Number[2]	Enclosure Size[3]
115 VAC	1 Phase	1	SS1D1L	B
230 VAC	3 Phase	4	SS2D4L	A
		8	SS2D8L	B
		15	SS2D15L	C
		20	SS2D20L	D
		45	SS2D45L	E
460 VAC	3 Phase	4	SS4D4L	A
		8	SS4D8L	A
		12	SS4D12L	B
		25	SS4D25L	C
		50	SS4D50L	D
		60	SS4D60L	E
		75	SS4D75L	E
		125	SS4D125L	F
		150	SS4D150L	G
		200	SS4D200L	H
		250	SS4D250L	H
575 VAC	3 Phase	4	SS5D4L	A
		8	SS5D8L	A
		15	SS5D15L	B
		30	SS5D30L	C
		60	SS5D60L	D
		90	SS5D90L	E
		130	SS5D130L	F
		160	SS5D160L	G
		200	SS5D200L	H
		250	SS5D250L	H

1. For applications requiring 208 VAC, append E8 to the model number.
2. When a model is used with a PLC, the PLC output must be of a relay type.
3. Use the letter shown with the dimensional information provide in Section 2.4 on page 8 to determine the size and weight of the model.

2.2 Interpreting Model Numbers

The model number of the SHORT-STOP brake appears on the shipping carton label and on the technical data label affixed to the unit. The information provided by the model number is shown below:



2.3 General Specifications

Ambient Temperature	32 °F to 110 °F (0 °C to 43 °C)
Heat Sink Maximum Temperature	158 °F (70 °C)
Voltage Tolerance	±10%
Frequency Tolerance	±3%
Installation Location	Indoor
Enclosure	NEMA 1 or NEMA 12 depending on the size of the unit; see the Dimensions table on the next page for further information.

2.4 Dimensions

The following table provides the dimensional information and weight for each of the enclosures used for the models. To determine which enclosure is used for a model, see the appropriate table in Section 2.1 starting on page 3.

Enclosure Size	Style	Enclosure Size: heighth, width, depth inch (mm)	Plate Size: heighth, width inch (mm)	Weight lbs (kg)
A	NEMA-1	10 x 10 x 4.5 (254 x 254 x 115)	9 x 8.25 (229 x 210)	20 (9.1)
B	JIC/NEMA-12	12 x 10 x 5 (305 x 254 x 127)	11 x 9 (280 x 229)	20 (9.1)
C	JIC/NEMA-12	20 x 20 x 7 (508 x 508 x 178)	17 x 17 (432 x 432)	70 (31.8)
D	JIC/NEMA-12	24 x 20 x 7 (610 x 508 x 178)	21 x 17 (534 x 432)	70 (31.8)
E	JIC/NEMA-12	24 x 24 x 7 (610 x 610 x 178)	21 x 21 (534 x 534)	100 (45.5)
F	JIC/NEMA-12	30 x 24 x 7 (762 x 610 x 178)	27 x 21 (686 x 534)	200 (90.9)
G	JIC/NEMA-12	30 x 24 x 13 (762 x 610 x 331)	27 x 21 (686 x 534)	200 (90.9)
H	JIC/NEMA-12	36 x 30 x13 (915 x 762 x 331)	33 x 27 (839 x 686)	300 (136.4)

Section 3: Receiving and Installation

3.1 Preliminary Inspection

Before storing or installing the SHORT-STOP Type D electronic motor brake, thoroughly inspect it for possible shipping damage. Upon receipt, perform the following tasks:

1. Remove the SHORT-STOP model from its package and inspect the exterior for shipping damage. If damage is apparent, notify the shipping agent and your sales representative.
2. Read the data label affixed to the SHORT-STOP model and ensure that the horsepower and input voltage are correct for the application.
3. If you will store the SHORT-STOP model after receipt, place it in its original packaging and store it in a clean, dry place free from direct sunlight or corrosive fumes, and where the ambient temperature ranges between O and 43 °C (32 to 11O °F).

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Do not operate or install the SHORT-STOP brake if it appears damaged.

Failure to observe this instruction can result in injury or equipment damage.

⚠ ATTENTION

RISQUE DE DOMMAGES MATÉRIELS

Ne faites pas fonctionner et n'installez pas tout onduleur qui semble être endommagé.

Si cette directive n'est pas respectée, cela peut entraîner des blessures corporelles ou des dommages matériels.

3.2 Installation and Usage Precautions

Improper installation of the SHORT-STOP Type D electronic brake will greatly reduce its life. Be sure to observe the precautions shown on the following page when selecting a mounting location. ***Failure to observe these precautions may void the warranty!***

1. Ensure that the tool or blade attached to the machine braked by the SHORT-STOP brake is attached securely. Saws and grinders are often fastened with left-hand-threaded nuts, which tend to loosen when the machine is stopped too quickly. Use double nuts, or other positive locking methods, to prevent such loosening. Test for safe operation during braking and check locking often.
2. The SHORT-STOP brake uses AC line power to achieve its braking action. Thus, if the power fails or is disconnected (or if a fuse opens), the motor will coast to a stop without braking. Failure of the internal fuses may also disable the contactor interlock, which will prevent the motor from starting.
3. The SHORT-STOP brake cannot be used as a positive brake against overhauling loads after the motor stops. In such applications, a positive lock, a pin, or a separate mechanical brake must be used to provide for holding at rest. See page 21 for information on **Option BR3**, which allows the use of a mechanical "fail-safe" brake as a holding brake.
4. Power factor capacitors must not be used across the Load controlled by the SHORT-STOP brake. Move any such capacitors to the Line side of the starting contactor (per NEC procedures).
5. If the torque control is set very high, the heat generated during braking can be considered equivalent to adding another start cycle. Therefore, high-cycle operations may require an external fan for cooling the motor. It is the user's responsibility to ensure that the motor is protected from excessive heat rise, whether from extremes of running, starting, or braking.
6. Do not tamper with the wiring or components of the SHORT-STOP brake. Once the brake is installed and adjusted, the box cover of the SHORT-STOP brake should be closed securely.
7. Do not install the SHORT-STOP brake in a place subjected to high temperature, high humidity, or excessive vibration. Avoid exposure to airborne metallic particles.
8. Mount the SHORT-STOP brake vertically away from heat-radiating elements or direct sunlight.

Section 4: Connections

⚠ DANGER

HAZARDOUS VOLTAGE

Disconnect all power before servicing the electrical system.

Failure to observe this instruction will result in death or serious injury.

⚠ DANGER

TENSION DANGEREUSE

Coupez toute source d'alimentation avant d'entretenir le système électrique.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

4.1 Wiring Considerations

4.1.1 General Wiring Practices

All wiring must conform with all national and local electrical codes. Refer to the motor nameplate affixed to the SHORT-STOP electronic motor brake for electrical data.

In particular, when making power and control connections, follow these precautions:

- Good wiring practice requires separation of control circuit wiring from all power wiring. Do not run control wires in the same conduit or raceway with power wiring.
- Cross conduits at right angles whenever power and control wiring cross.

4.1.2 Power Wiring

"Power wiring" refers to the connections made to Terminals 1, 2, 5, and 6 on the SHORT-STOP Type D brake.

Select power wiring as follows:

- Use only UL recognized wire.
- Wire voltage rating must be a minimum of 3OO V for 23O VAC systems, and 6OO V for 46O VAC systems.
- Grounding must be in accordance with NEC and CEC.
- Wire must be shielded and of copper construction.

- All wiring to the SHORT-STOP brake is to the terminals provided. In general, the wires connected to Terminals 1, 2, 5, and 6 must be able to carry the full motor running current. However, for those models supplied with **Option S** (see page 23), the wires to Terminals 1, 2, 5, and 6 must be able to carry up to **twice** the motor running current during braking and should be sized accordingly.

4.1.3 Control Wiring

"Control wiring" refers to the wires connected to Terminals 3, 4, 7, S, and W (and any additional terminals provided for optional features). Select control wiring as follows:

- Shielded wire is recommended to prevent electrical noise interference from causing improper operation or nuisance tripping.
- Use only UL recognized wire.
- Wire voltage rating must be a minimum of 3OO V for 23O VAC systems, and 6OO V for 46O VAC systems (Class 1 wire).
- Since wires connected to Terminals 3, 4, 7, S, and W (and to any terminals provided for optional features) will carry control current only, these may be of the same gauge as the control wires for the motor starting contactor.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

- Control wiring voltage must be between 100 VAC and 240 VAC (the interlock is a solid-state switch that cannot be checked with an ohmmeter).
- Never connect Terminals 3 and 4 of the SHORT-STOP brake across (in parallel with) the motor starter contactor coil or across the power line.
- Do not manually operate the motor starter contactor when the SHORT- STOP brake is connected.

Failure to follow these instructions can result in injury or equipment damage.

⚠ ATTENTION

RISQUE DE DOMMAGES MATÉRIELS

- La tension du câblage de commande doit être entre 100 VCA et 240 VCA (le dispositif d'interverrouillage est un interrupteur transistorisé qui ne peut pas être vérifié avec un ohmmètre).
- Ne jemais relier les bornes 3 et 4 du frein SHORT-STOP â travers (en parallèle avec) la bobine du contacteur du démarreur du moteur ou â travers le secteur.
- Ne pas actionner manuellement le contacteur du démarreur du moteur lorsque le frein SHORT-STOP est branché.

Si cette directive n'est pas respectée, cela peut entraîner des blessures corporelles ou des dommages matériels.

4.2 Control Wiring

You must utilize the contactor interlock feature of the SHORT-STOP brake or the unit will not operate. The interlock should be connected and tested before connecting power wiring. Failure to correctly connect the contactor interlock feature will void the warranty because (if the feature is not connected correctly) both the starter contactor and SHORT-STOP brake may be energized at the same time, which will damage the SHORT-STOP brake.

4.2.1 Connecting the Contactor Interlock Feature

During normal running operation, the contactor interlock is closed and conduction takes place between Terminals 3 and 4. During braking, the interlock circuit opens, which locks out the motor starter contactor.

To correctly connect the contactor interlock feature, Terminals 3 and 4 of the SHORT-STOP brake must be connected **in series** with the motor starter contactor coil(s). This may be accomplished by placing Terminals 3 and 4 in series with the motor overload protection contacts or in series with the control system STOP button. Figures 1 through 3 on the following pages show typical applications with a correctly connected interlock feature. Also see Figure 9 on page 22.

Section 5: Adjusting the SHORT-STOP Brake

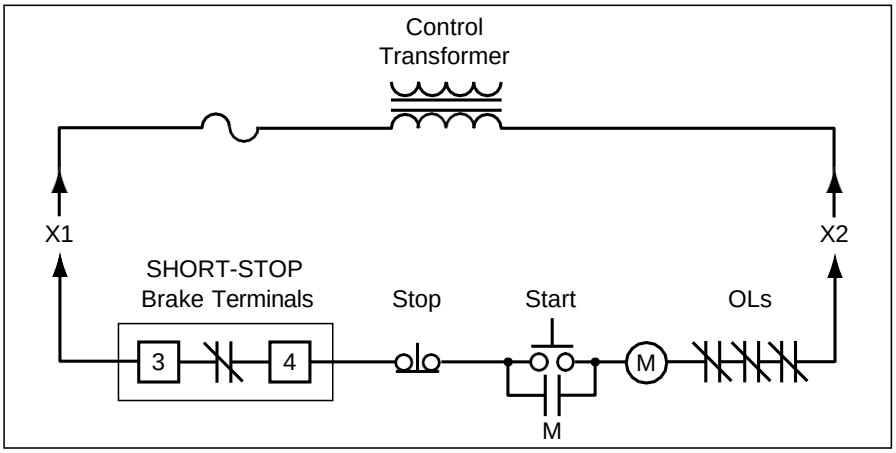


Figure 1: Contactor Interlock – Single Direction with a Control Transformer

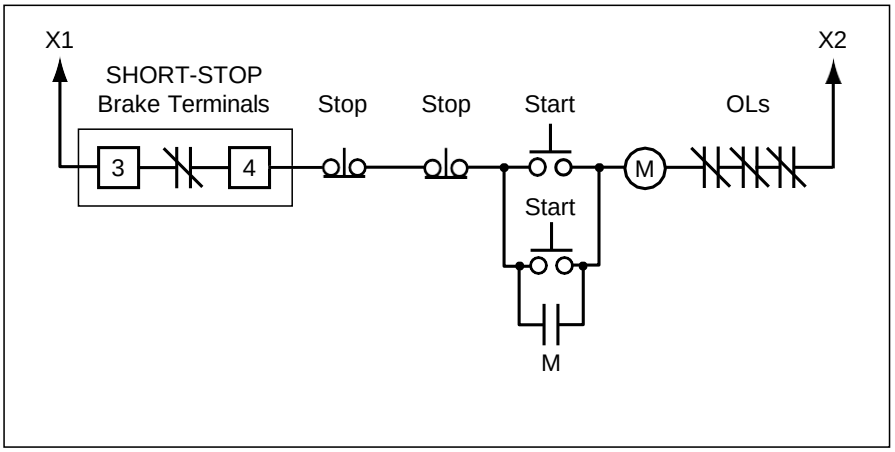


Figure 2: Contactor Interlock – Multiple Station Control

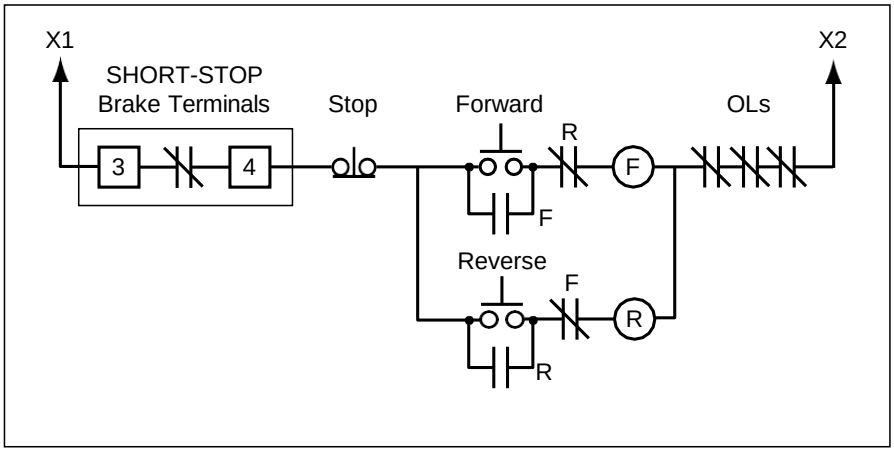


Figure 3: Contactor Interlock – Forward/Reverse System

4.2.2 Testing the Contactor Interlock Feature

After making the connection to Terminals 3 and 4 of the SHORT-STOP brake (as described on page 13), perform the following test to ensure that the wiring is indeed correct:

1. Ensure that the main power is off.
2. Ensure that Terminals 1, 2, 5, 6, and 7 are not connected.
3. Turn main power on.
4. Attempt to start the motor by every means possible. No matter which START switch is employed, or from where a start signal is generated, **the motor must not start**.

   If the motor **does** start, the interlock feature **is not correctly connected**. To remedy this condition, turn the main power off. Then review the information in Section 4.2.1 on page 13 on connecting the interlock feature and correct the wiring fault. After attempting to correct the wiring, **perform this test again** to ensure that the interlock feature performs correctly.

   If the motor **does not** start, **the test is successful**. Turn the main power off, and then proceed with the remaining control and power wiring required.

4.2.3 Terminals S and W

The SHORT-STOP Type D brake includes two additional terminals for control wiring, Terminals S and W. These should be connected to a dry, normally-open (N.O.) auxiliary contact on **all** starter contactors.

4.3 Power Wiring for Three-Phase Motors

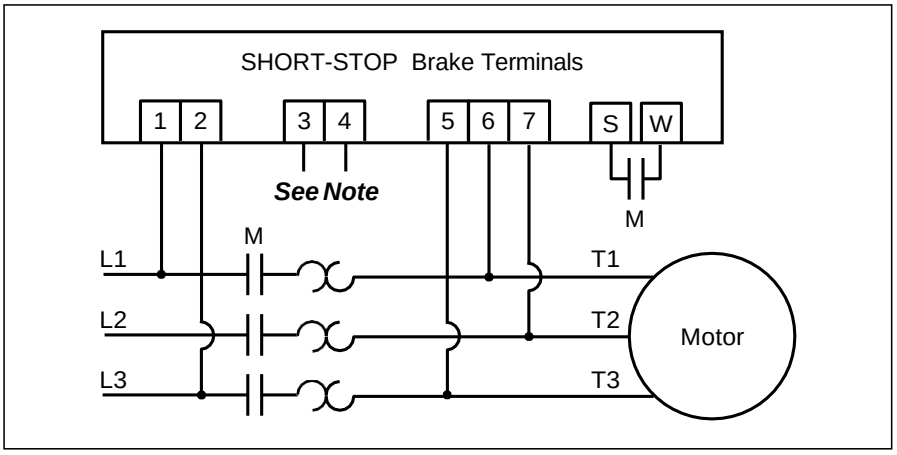
Before connecting power wiring, you should first connect and test the contactor interlock feature of the SHORT-STOP brake. This feature prevents both the motor starter contactor coil(s) and the SHORT-STOP brake from being energized at the same time. See Section 4.2 on page 13 for further information on connecting and testing this feature.

4.3.1 Single Direction, Single Speed Application

Figure 4 shows the power wiring connections when the application calls for a single direction at a single speed.

4.3.2 Application Requiring Forward and Reverse

In an application requiring forward and reverse directions, the wiring is largely the same as that for a single direction, single speed application. Braking will occur when stopping from either direction.



NOTE

Terminals 3 and 4 are for the contactor interlock feature. These must be connected for the unit to work. See Section 4.2 on page 13 for connection information.

Figure 4: Power Connections in a One-Direction, One-Speed Application

See Figure 5 for the power connections for this type of application. Be sure to check that the contactor interlock feature operates correctly when the motor is turning in the reverse direction as well as when it is turning in the forward direction.

4.3.3 Application with a Drum-Switch Controller

The SHORT-STOP Type D brake cannot be used with a motor controlled by a drum switch. Consult The Parker Group, Inc. for further information.

4.3.4 Multiple Speed Application

The power connections for this type of application are shown in Figure 6 on page 18. Note that the high-speed winding must be used for braking.

4.3.5 Application with Wound-Rotor Motors

The SHORT-STOP brake may be used with wound-rotor (slip-ring) motors since they are induction motors. The minimum or lowest rotor resistance should be used for braking. A magnetic starter must also be

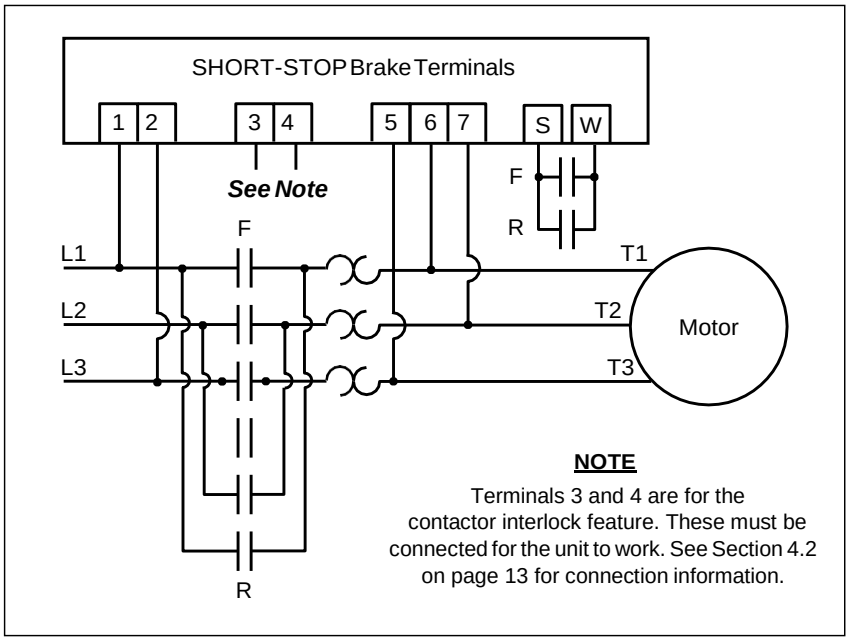


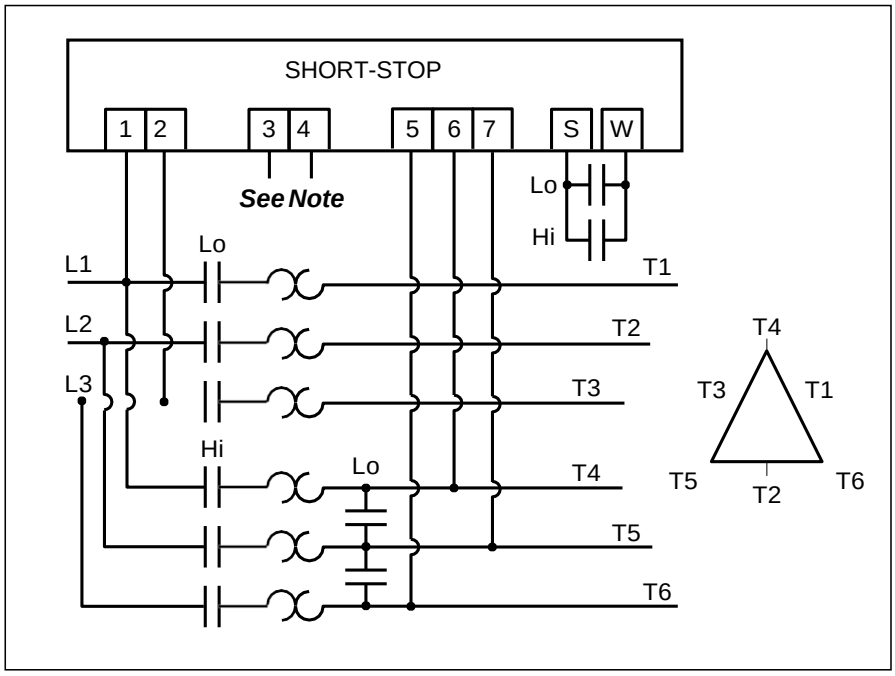
Figure 5: Power Connections in a Forward/Reverse Application

employed so the contactor interlock feature of the SHORT-STOP brake may be correctly utilized.

4.3.6 Application with an Electronic Drive

When the SHORT-STOP Type D brake is used with electronic drives (such as motor accelerators, solid-state starters, and inverters), an isolating contactor must be installed between the motor and the electronic drive. Figure 7 on page 19 shows the power connections, including the required isolating contactor, for this type of application.

*NOTE: **Option X185** should be utilized for pulse width modulated inverters; see page 23 for information on this option.*



NOTE

Terminals 3 and 4 are for the contactor interlock feature. These must be connected for the unit to work. See Section 4.2 on page 13 for connection information.

Figure 6: Power Connections in a Multiple-Speed Application

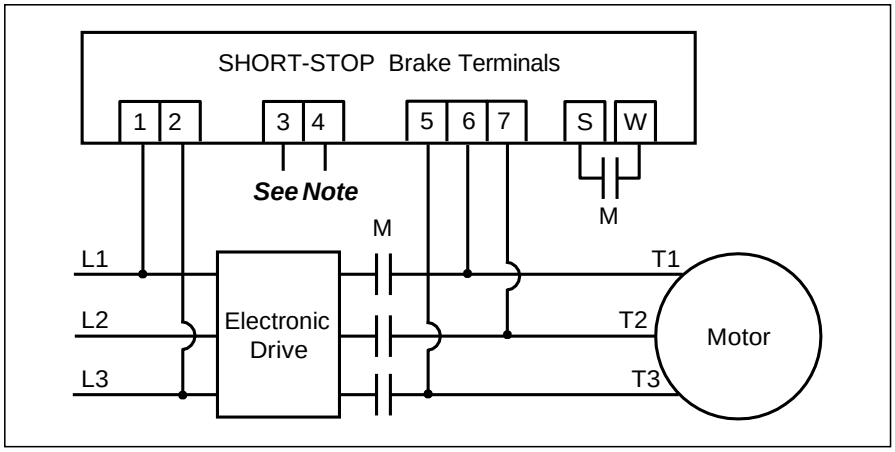
4.3.7 Application with a Wye-Delta Starter

As shown in Figure 8 on page 2O, both ends of each motor winding in the wye-delta starter are utilized for connections (six leads in all).

The wye-delta type of starter operates as follows:

- In the wye configuration, one end of each winding is connected to the power line, with the remaining leads shorted together by means of an S contactor.
- In the delta configuration, each winding is connected across a pair of power line phases.
- In the Off mode, all windings are disconnected.

For the SHORT-STOP brake to be used with a wye-delta starter, **Option X198** is required (see page 23 for information on this option).



NOTE

Terminals 3 and 4 are for the contactor interlock feature. These must be connected for the unit to work. See Section 4.2 on page 13 for connection information.

Figure 7: Power Connections in an Application with an Electronic Drive

Section 5: Adjusting the SHORT-STOP Brake

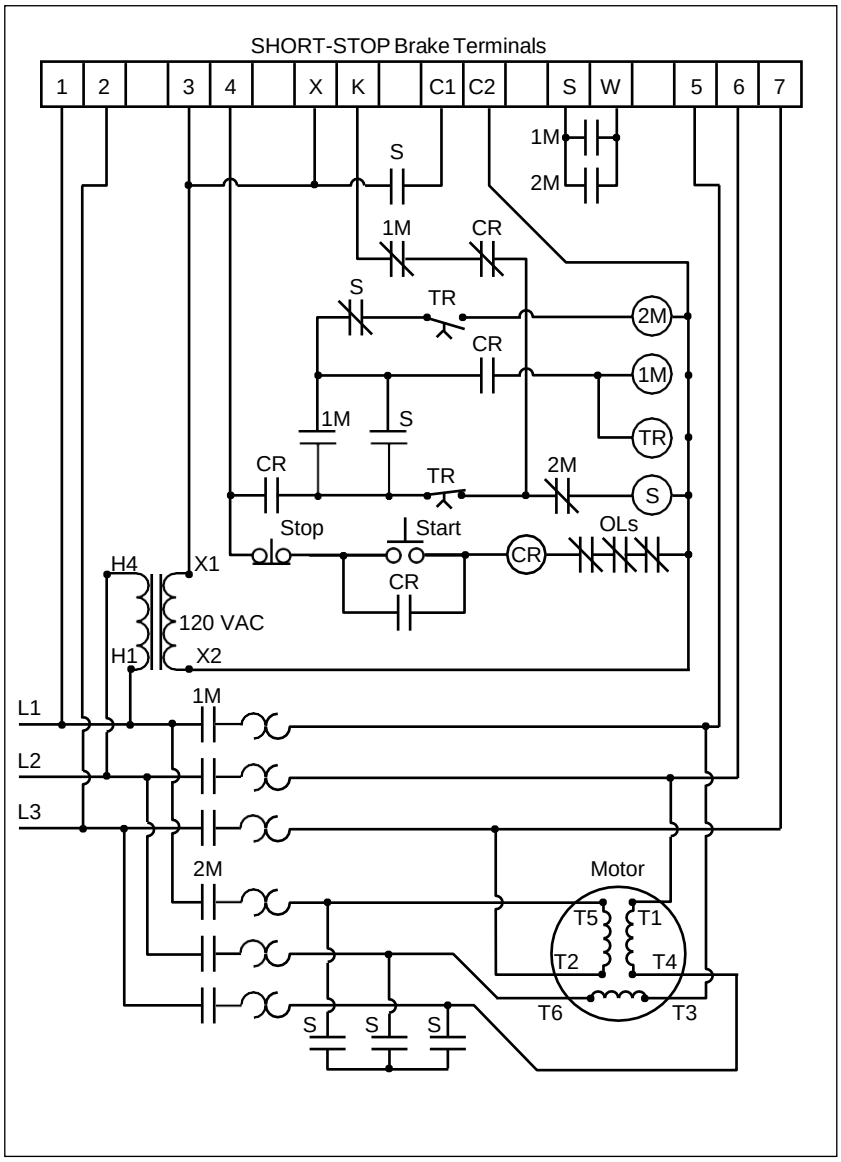


Figure 8: Power Connections in an Application with a Wye-Delta Starter

4.4 Power Wiring for Single-Phase Motors

Power wiring for single-phase motors is the same as that for three-phase motors except that the Auto-Timeout feature will not operate. Power input is connected to Terminals 1 and 2, and the motor load is connected to Terminals 5 and 6. Terminal 7 is left unconnected. See Section 4.3 starting on page 16 for typical power connections.

Amagnetic starter must be used so the contactor interlock feature of the SHORT-STOP brake may be utilized (see Section 4.2 on page 13 for information on this feature).

4.5 Wiring for Optional Features

The SHORT-STOP electronic motor brake may be equipped with various options to better suit certain applications. The available options are listed on page 7, and are described on the following pages.

4.5.1 Option BD

Option BD permits the SHORT-STOP brake to be disabled for certain purposes, such as during jogging or setup. Note that when this option is used for safety, a key switch is recommended so that only authorized personnel may disable the SHORT-STOP brake.

For this option, two terminals (B and D) are added. The operation of these two additional terminals is such that when an **external** contact connected across Terminals B and D is closed, the SHORT-STOP brake will not exert braking force (in effect, the brake is overridden).

However, if a brake cycle is active, closing the contact across Terminals B and D will not terminate the active brake cycle. (In other words, you cannot prematurely terminate a braking cycle once it is initiated.) Figure 9 on page 22 shows how to connect this option for a jogging application.

4.5.2 Option BR3

Option BR3 adds two terminals (B and R) to the SHORT-STOP brake. The normally-open contact associated with these terminals is used to release a customer-supplied spring-actuated brake. This allows the use of a "fail-safe" mechanical brake as a holding brake that is applied after the SHORT-STOP braking cycle is finished and hence prevents overhauling loads.

Figure 1O shows how terminals B and R should be connected.

Section 5: Adjusting the SHORT-STOP Brake

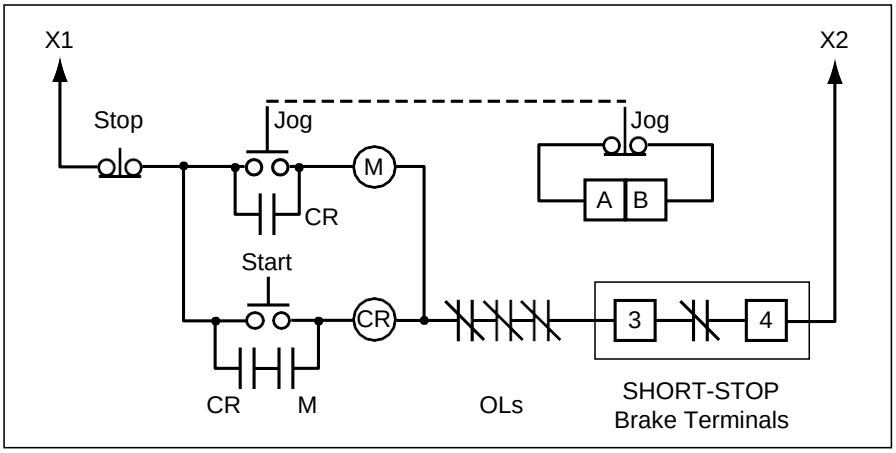
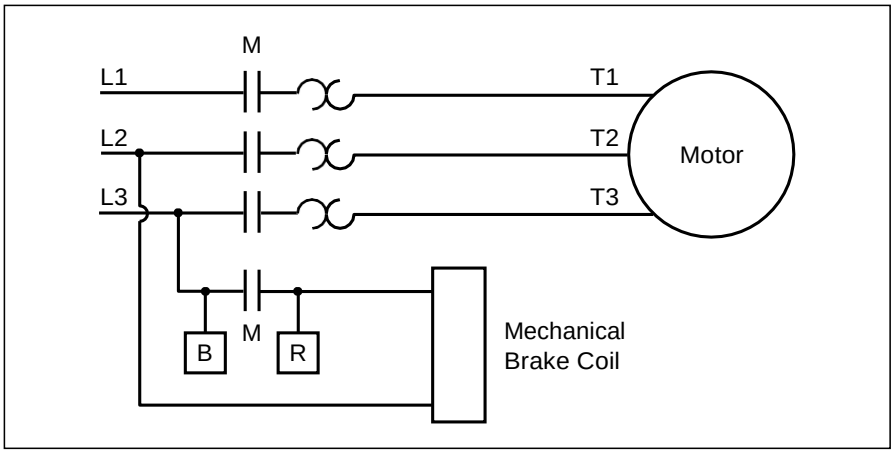


Figure 9: Control Wiring for Option BD in a Jogging Application



NOTE: If AC power is lost or the fuse blows (either of which will disable the SHORT-STOP brake), the mechanical brake will be applied immediately.

Figure 10: Power Wiring for Option BR3

Option BR3 also incorporates an overlap function. This function eliminates any motor freewheeling during the transition between electronic braking and application of the mechanical (holding) brake.

The overlap function operates by opening the contact across the B and R terminals at the end of the electronic braking cycle, which engages the mechanical brake. However, electronic braking remains active for an additional O.O5 to 5.O seconds (user-adjustable; see below) to provide an overlap of both brakes.

The time duration for the overlap function is set with the overlap potentiometer. This potentiometer is located approximately 1 inch (2.5 cm) above the SHORT-STOP logic board. To set the time appropriately, turn the potentiometer so that the red Brake LED on the SHORT-STOP brake stops illuminating approximately 1 second after the mechanical brake engages.

4.5.3 Option S

No additional wiring is needed to utilize **Option S**. However, the wiring connected to Terminals 1, 2, 5, and 6 should be capable of handling **twice** the motor current.

4.5.4 Option X185

Option X185 is required when the SHORT-STOP Type D brake is used with a pulse width modulated (PWM) inverter.

4.5.5 Option X198

Option X198 is **required** when the SHORT-STOP brake is used with a wye-delta starter. This option adds four additional terminals (X, K, C1, and C2) to the SHORT-STOP brake. Figure 8 on page 2O shows how these additional terminals are connected.

This option operates by closing the internal contacts between terminals X and K only during braking. These two terminals are also used to operate the S contactor. A sensor is located between terminals C1 and C2 to confirm that the S contactor is closed before braking is activated.

Section 5: Adjusting the SHORT-STOP Brake

5.1 Introduction

Four features of the SHORT-STOP Type D electronic motor brake may be adjusted to optimize braking characteristics to best fit your particular application:

- Braking torque
- For single-phase applications, the length of time that braking torque is applied (for three-phase applications, the Auto-Timeout feature senses when to terminate the braking current)
- Programmable Controller Mode switch
- Overlap control (if **Option BR3** is present)

The first three adjustments are discussed in this section; the overlap function is discussed on page 23.

5.2 Braking Torque Adjustment

5.2.1 How Braking Torque Is Adjusted

The amount of force applied to slow the motor is the braking torque. The amount of torque applied is controlled by a single-turn potentiometer. The torque value is at a minimum when the potentiometer is turned fully counterclockwise. Use care when adjusting the potentiometer; **do not force a potentiometer beyond its end stops**.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Do not use excessively high torque settings that may result in tools being loosened due to the rapid deceleration of intense braking.

Failure to follow this instruction can result in injury or equipment damage.

⚠ ATTENTION

RISQUE DE DOMMAGES MATÉRIELS

Ne pas utiliser des réglages de couple de serrage excessivement hauts qui pourraient desserrer les outils à cause de la décélération rapide d'un freinage intense.

Si cette directive n'est pas respectée, cela peut entraîner des blessures corporelles ou des dommages matériels.

5.2.2 Adjusting Braking Torque in Three-Phase Applications

If your application utilizes three-phase power, perform the following steps to set the braking torque:

1. Ensure that main power is off.
2. Using an insulated screwdriver, turn the torque potentiometer to its minimum position (fully counterclockwise). Figure 11 shows the location of the torque potentiometer.
3. Turn the main power on.
4. Turn the motor on; the green LED should illuminate.
5. Once the motor reaches full speed, turn it off. As the motor decelerates, observe how quickly it comes to rest. The braking action of the SHORT-STOP Type D brake is indicated by a slight hum from the motor and the illumination of the red Brake LED.

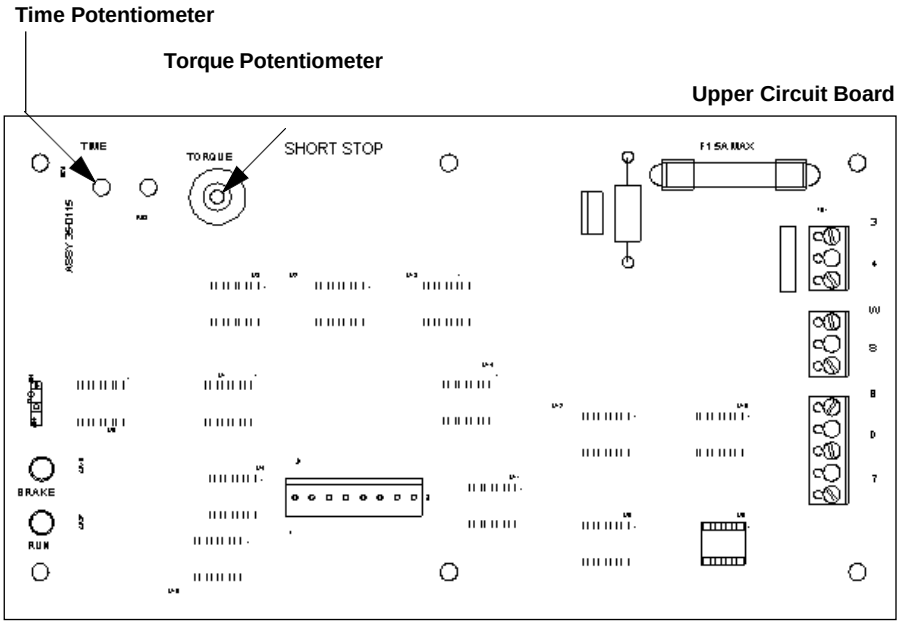


Figure 11: Location of the Time and Torque Potentiometers

6. If more braking power needs to be applied to achieve a safe braking rate, adjust the torque potentiometer 1/8 turn clockwise. Then repeat steps 5 and 6. Adjust the torque control further, if necessary, until a safe braking rate is achieved.

NOTE: The Auto-Timeout feature senses when the motor shaft comes to a full stop, and terminates the braking current within one second after sensing the shaft stop. This feature will only work if Terminal 7 is connected. Provided this feature is active, you do not need to set a braking time.

5.2.3 Adjusting Braking Torque in Single-Phase Applications

The principal difference between applications utilizing three-phase power and single-phase power is that the Auto-Timeout feature does not operate when single-phase power is used. Since the Auto-Timeout feature is inoperative, you must set a braking time as well as a braking torque. Follow these steps to set the braking torque and braking time:

1. Ensure that main power is off.
2. Using an insulated screwdriver, turn the torque potentiometer to its minimum position (fully counterclockwise). Figure 11 on page 26 shows the location of the torque potentiometer.
3. Using an insulated screwdriver, adjust the time potentiometer (shown in Figure 11) so that it is mid-way between its maximum value (15 seconds, fully clockwise) and minimum value (O seconds, fully counterclockwise).
4. Turn the main power on.
5. Turn the motor on; the green LED should illuminate.
6. Once the motor reaches full speed, turn it off. As the motor decelerates, observe how quickly it comes to rest. The braking action of the SHORT-STOP Type D brake is indicated by a slight hum from the motor and the illumination of the red Brake LED.
7. If more braking power needs to be applied to achieve a safe braking rate, adjust the torque potentiometer 1/8 turn clockwise. Then repeat steps 5 and 6. Adjust the torque control further, if necessary, until a safe braking rate is achieved.
8. Once a safe braking rate is achieved, adjust the time potentiometer so that the electronic brake shuts off one second after the motor comes to a full stop. (The electronic brake is shut off when the hum from the motor ceases and the red Brake LED goes out.)

5.3 Programmable Controller Mode Switch

The SHORT-STOP Type D brake incorporates a switch that should be in the On position if a programmable controller (or other solid-state switch) is used to control the motor starter. This switch is located directly above the red Brake LED on the logic board.

For this switch to be effective, Terminals S and W must be wired appropriately. See Section 4.3 on page 16 for further information.

5.4 Additional Considerations for Adjustments

The amount of torque applied will also vary with line voltage variations. These variations may require re-adjustment of the torque potentiometer to obtain better braking power.

When performing adjustments, bear in mind that applying the brake for a longer time than is absolutely necessary only serves to increase motor heating.

Section 6: Troubleshooting

⚠ DANGER

HAZARDOUS VOLTAGE

Disconnect all power before servicing the electrical system.

Failure to observe this instruction will result in death or serious injury.

⚠ DANGER

TENSION DANGEREUSE

Coupez toute source d'alimentation avant d'entretenir le système électrique.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

Once installed and adjusted, the SHORT-STOP electronic motor brake should not require any additional maintenance or adjustment (other than for the conditions described in Section 5.4 on page 28).

This section describes the SHORT-STOP brake's theory of operation, how to remedy problems that may occur during initial set-up, and fuse replacement information.

6.1 Theory of Operation

6.1.1 Basic Concept

The principle used by the SHORT-STOP brake to achieve braking is the injection of a controlled amount of direct current (DC) into an AC motor. The direct current in the motor stator sets up a stationary magnetic field in which the rotor is turning. The interaction between the rotor and the magnetic field tries to align the rotor with the field. Thus, the SHORT-STOP brake actually drives the rotor to zero speed.

Retarding torque is proportional to the field strength, and hence to braking current. By varying the braking current, the braking strength (torque) can be set.

6.1.2 Operation

When any START button is pressed, a small amount of current flows through the interlock sensor connected between Terminals 3 and 4. The logic senses this, and then closes the normally-open interlock switch connected between Terminals 3 and 4. The motor is now allowed to start, and the SHORT-STOP brake is primed.

When the STOP button is pressed, current stops flowing in the interlock, which is detected by the sensor. Terminals S and W confirm that the starter contactor is indeed open, and then (after a short delay) the electronic brake is activated and the brake cycle begins.

If the SHORT-STOP brake includes **Option BD**, the additional terminals B and D are checked during the run-to-brake transition. If they are found to be closed, the braking cycle will not begin. Instead, the motor will coast to a stop.

Once the brake cycle is activated, the sensor for the Auto-Timeout feature connected to Terminal 7 monitors the rotation of the motor shaft. When rotation is no longer detected, the brake cycle is terminated. (A timer limits braking to a maximum of 15 seconds in standard models.) Electronic braking will also terminate immediately, and the motor will start, if any START button is pressed during the brake cycle.

If the SHORT-STOP brake includes **Option BR3**, and a mechanical brake is connected to Terminals B and R, the mechanical brake will be applied shortly after the starter contactor opens.

6.2 Faulty Operation

6.2.1 Preliminary Checks

If a problem occurs on initial installation, or if the SHORT-STOP brake should fail to function properly, the following checks should be made:

- Check all wiring first.
- Verify that normal line voltage (SHORT-STOP rated voltage) is present across Terminals 1 and 2. Lack of voltage at these places may indicate a blown line fuse. (If the line fuses blow at high torque settings, the SHORT-STOP brake should be removed from the motor line and operated instead from a separate fused disconnect.)
- Check that the torque potentiometer is set properly, and is not at a minimum. See Section 5 starting on page 25 for a description of these controls.
- Check that terminals S and W are connected to dry, normally-open auxiliary contacts.

- Check that any options are correctly wired and are operated from the proper type of auxiliary contacts.
- Verify that the rated motor voltage for the SHORT-STOP brake is present at terminals 5 and 6 **when the motor runs**. If no voltage is present when the motor runs, the brake is wired incorrectly.

6.2.2 Motor Coasts to Stop (No Braking Occurs)

If the SHORT-STOP brake does not exert a braking force when the motor is turned off, examine the LEDs on the unit. Then consult the table below for advice on correcting the problem.

LED State	Corrective Action(s)
Green RUN LED remains on *--OR--* Red BRAKE LED illuminates momentarily and then the green RUN LED illuminates.	1. If you are using a programmable controller or other solid-state switch to control the motor starting contactor(s), check that the PC Mode switch is in the On position. Refer to page 28 for further information. 2. Determine if leakage current is flowing in the interlock/ starter circuit. This is accomplished by disconnecting Terminals 3 and 4, and then activating the SHORT-STOP brake by temporarily shorting and opening Terminals S and W with a jumper wire. If the brake activates, the source of leakage to Terminals 3 and 4 must be removed. Sources of leakage include a pilot light or similar device effectively connected across the STOP button. 3. Verify that Terminals S and W are connected to dry, normally-open starter contactor auxiliaries. These auxiliaries must not be used for any other purpose.
Red BRAKE LED illuminates, but no braking force occurs.	1. Check for blown fuses in the SHORT-STOP brake. See page 32 for further information on fuses. 2. Check connections between Terminals 5 and 6 and the motor. 3. Check that the torque potentiometer is not at its minimum setting (fully counterclockwise).
Red BRAKE LED illuminates momentarily.	Ensure that no external circuit shorts Terminals S and W (or tries to restart the motor) since this will instantly terminate the brake cycle.
Red BRAKE LED never illuminates.	1. Verify that Terminals B and D are open. 2. On single-phase installations, ensure that the time potentiometer is not at its minimum setting (fully counterclockwise).

6.2.3 Motor Will Not Start

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Never manually activate or “bump” the starter contactor.

Failure to follow this instruction can result in injury or equipment damage.

⚠ ATTENTION

RISQUE DE DOMMAGES MATÉRIELS

Ne jamais actionner manuellement ni «frapper» le contacteur du démarreur.

Si cette directive n’est pas respectée, cela peut entraîner des blessures corporelles ou des dommages matériels.

If the motor will not start, perform the following corrective actions:

1. Verify that line voltage is present on Terminals 1 and 2.
2. Check for blown fuses, including the fuses found on the printed circuit boards.
3. Determine of the problem is in the SHORT-STOP interlock by placing an AC voltmeter across Terminals 3 and 4 while trying to start the motor. If no voltage is found across Terminals 3 and 4, an open circuit in the **external** control wiring or power source exists. If voltage is found across Terminals 3 and 4, and is equal to the control voltage (which must be between 11O and 24O VAC), then the SHORT-STOP brake is faulty.

6.3 Fuse Information

The fuses in the SHORT-STOP brake are designed to protect the internal components. They are of a special fast-acting semiconductor type. If a fuse needs to be replaced, it must be replaced with the same type of equal current rating. The use of incorrect fuses will void the warranty and may result in further damage to the SHORT-STOP brake. Figure 12 on page 33 shows the location of the two PCB fuses (the semiconductor fuses are not shown).

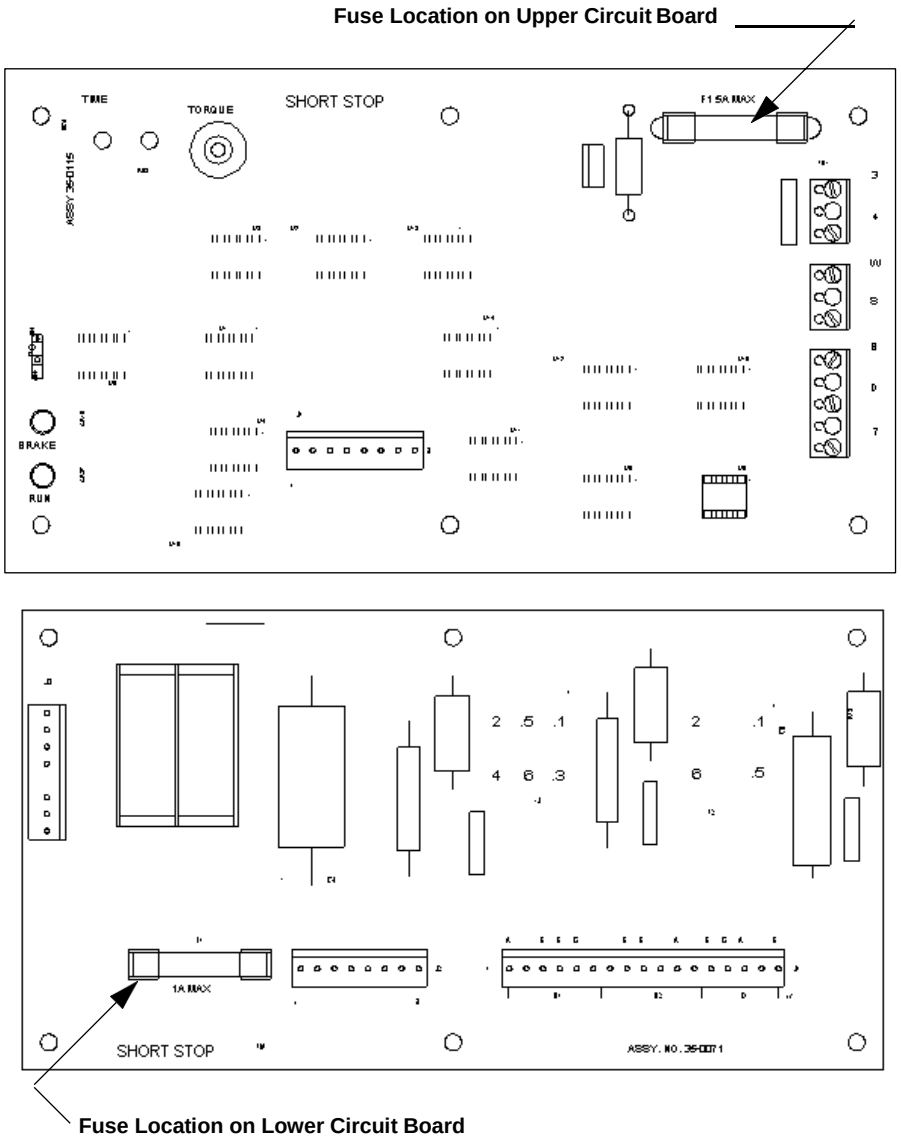


Figure 12: Location of PCB Fuses

If the fuses in the SHORT-STOP brake blow, consider the following:

- Never push the starter contactors by hand as this is sure to cause the fuses to blow.
- Power factor capacitors must not be used across the Load; instead, they should be on the Line side.
- If the fuses blow only at high torque settings, but remain intact at lower torque settings, the model of SHORT-STOP brake may be too small for the application. If the torque setting cannot be lowered sufficiently while maintaining safe braking, a larger model should be acquired.

NOTE: If the power line fuses blow, or breakers trip at high torque settings, remove the SHORT-STOP brake from the motor power line and operate it from a separate, fused disconnect.

Section 7: Warranty Information

7.1 Limited Warranty

Each SHORT-STOP is warranted by the factory for one year to be free from defects in materials and workmanship. Repairs will be made at the factory, on products that are returned postpaid to the factory after permission or authorization for return is granted.

The warranty is VOID if the unit has been tampered with without express permission: if fuses of an incorrect type or rating have been used; if power has been incorrectly applied to the interlock Terminals 3 and 4, or for any other type of mis-use.

Aside from the above statement of warranty, TIE Industrial, its agents, employees, dealers and distributors assume NO LIABILITY, AND SPECIFICALLY ASSUME NO LIABILITY FOR ANY CONSEQUENTIAL
DAMAGE due to malfunction, failure to function, improper application, or improper operation of these products.

No allowance can be made for removal or installation costs, machine downtime, transportation, etc.

THE USER ASSUMES FULL APPLICATIONS RESPONSIBILITY.

7.2 Procedure for Repairs

If a SHORT-STOP Type D electronic brake needs to be returned for repair, create a packing list for the brake to be returned. This packing list should be on your company's letterhead and should state, at a minimum, the model number, serial number, and the problem you are experiencing with the unit.

After creating the packing list, send the brake and packing list to our authorized repair center at the following address:

Ambi-Tech
Attention: Repairs
44810 Vic Wertz Drive
Clinton Township, MI 48036