



ABC SERIES
50 - 1000 Amp Models
Electronic Brake

**INSTALLATION & OPERATION
MANUAL**

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ABC Series Electronic Brake 50 - 1000A

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Your Role in Product Safety

This equipment is designed and manufactured to the highest standards to provide safe and reliable operation for its intended use. Only qualified personnel should install, maintain, and service this equipment, and only after reading and fully understanding all of the information in this manual. All instructions should be strictly followed. All Warnings, Cautions, and Notes must be taken into account for your particular installation. Users should consult Motortronics or a Motortronics distributor/service center if there are any questions.

All installation instructions may be superceded by applicable local, regional, or national electrical codes. Drawings, application information, and technical representations included in this manual are for typical installations, and should not in any way be considered specific to your application or conditions. Consult Motortronics for supplemental information if necessary.

Contents of this manual are believed to be correct at the time of printing. In following with our ongoing commitment to meeting customer needs and developing our products to suit them, Motortronics reserves the right to change specifications of this product and/or the contents of this manual without notice. As a result, supplemental data sheets and/or drawings may be associated with this equipment. Please contact Motortronics and have the unit serial number available if you notice conflicts with what is depicted in the manual and what is installed in the field.

Phasetronics (dba Motortronics) accepts no liability for any consequences resulting from inappropriate, negligent, or incorrect installation, application, adjustment, or maintenance of this equipment.

Notice Label Explanation:



WARNING!

Warning labels such as this denotes specific concerns for life/safety/damage issues associated with this area of the manual. These statements are intended to be followed without exception.



CAUTION!

Caution labels are intended to alert the user to specific issues that MAY cause damage or personnel risks under circumstances as described. These items are critical in some installations but not all. The user is responsible for identifying the applicable installation issues.

NOTE: *Notice labels are intended to alert the user to issues that require particular attention with regard to the proper use and long term reliability of the equipment.*

Chapter 1: Introduction

1.1 General

The **ABC Series** is a solid state DC injection brake for stopping three-phase AC induction motors. This full-wave DC brake design offers smooth, low peak level braking for quiet, steady operation and optimal performance. Designed to handle even high inertia loads, the **ABC Series** eliminates costly and potentially dangerous “coast-to-stop” times. A built-in microprocessor provides system supervision that includes digital timing control for jogging and braking. The integral Operator Interface Module provides LED indication of the unit’s operating status and easy adjustments for quick setup. Standard features include interlocks and mechanical brake release relays, a brake disable input and zero speed sensing with override.

1.2 Theory of Operation

Incoming AC power is fed to terminals L1 and L2 directly from the line side of the motor starter terminals and is converted to DC within the **ABC Series**. Once the motor starter has been turned off (opened) and the residual energy in the motor has dissipated, the DC current from the **ABC Series** is applied (injected) to starter terminals T1 and T2 respectively. This creates a stationary magnetic field in the AC motor stator windings. The braking torque will increase in proportion to the amount of current allowed to flow. (The DC injection level can be adjusted using the Brake Current Potentiometer on the operator interface module. This modulates the applied voltage based upon an “RMS” closed loop current feedback signal from the integral sensors.) The rotor then pulls into alignment with this stationary field and brings the load to a stop faster than if it coasted to a stop.

1.3 Brake Sizing and Selection

ABC Series brakes are suitable for use in most AC motor applications where coast-to-stop times are undesirable or unacceptable. The **ABC Series** is a current controlling brake, so various sizes of brake units can be applied to various motor sizes. Because DC injection means applying power to the AC motor after turning it “Off”, motor heating (although minimal) will continue during the braking cycle and should be considered when selecting the motor. AC motor manufacturers recommend that each braking cycle over 100% FLA be considered as an additional starting cycle when calculating the starts-per-hour ratings for the selected motor. If the selected **ABC Series** is sized to deliver 200% of motor rated current, consider each brake cycle to be 2 start cycles for these calculations (and 300% FLA = 3 “starts” per brake). Never size any DC injection brake to exceed 400% of the motor nameplate FLA without first consulting the motor manufacturer. Additional guidelines for applying **ABC Series** brakes follow:

1.3.1 Standard Duty Sizing

Applying an **ABC Series** brake that is rated for $\leq 115\%$ of the FLA (Full Load Amp) rating of the motor allows maximum length of braking time without exceeding the thermal capacity of the stator windings. Since current is controlled by the **ABC Series** throughout the braking cycle, braking torque will vary as the motor circuit impedance decreases with speed. Braking torque will be highest at the beginning of the cycle, and can be as much as 100% of the FLT (Full



Load Torque) when set to motor FLA. As the motor slows, the braking torque slowly decreases, reducing the mechanical stresses as much as possible. Sizing a brake in this manner is typically good for machine tools, saws, conveyors, lumber machinery, and most chippers where the coast-to-stop time does not exceed 5 minutes. Stop times vary greatly with load and friction, but can be expected to be 1/2 of the coast-to-stop time or less. Keep in mind that the maximum brake time is setting is 127 seconds. In heavily loaded, high inertia machines and long coast-to-stop times, the Standard Duty model may not stop the load. Consider using the Extra Duty rating instead.

1.3.2. Extra Duty Sizing

For heavier machine loads such as large chippers, punch presses and other flywheel based machines, selecting an **ABC Series** brake based on 200-250% of the motor nameplate FLA allows faster braking. The maximum developed braking torque can be as much as 200% of the motor rated Full Load Torque. In this case, the load can typically stop in *twice the Across-the-Line starting time*. Duty cycling of the motor is a much more important consideration in applications since additional thermal stresses due to higher current levels are applied to the motor.

1.3.3 Custom Sizing

Extreme loads (such as overhauling conveyors or large centrifuges), or short stop times (approaching the across-the-line starting time of the motor) may require sizing the **ABC Series** for 300% of the motor FLA or greater, and should be done with careful consideration of motor heating, duty cycle, and limitations of mechanical stress on the drive train components.

1.3.4 Emergency Stopping

An **ABC Series** brake used in conjunction with a mechanical brake should be considered if the stop times must be equal to or shorter than the across-the-line start time, consider using and **ABC Series** brake in conjunction with a mechanical brake.

1.4 Applications

The **ABC Series** electronic brake is ideal for machine and process equipment control applications for efficiency, increased safety, and reduced equipment maintenance costs. Among the benefits:

Efficiency is improved because you no longer have to wait through long coast-to-stop times for blade changes, batch loading, or maintenance shutdowns. Productive time increases as overall operating costs decrease because the load stops more quickly. The **ABC Series** eliminates the common practice of jamming the load to a stop which seriously reduces the life and effectiveness of saw blades, molding heads, and knives.

Increase Safety by eliminating the need to “jam-stop” equipment. This will prevent any personnel injuries caused by kickbacks and broken blades. Use the **ABC Series** in conjunction with safety interlock devices to stop the motor as quickly as possible, reducing the risk of contact with dangerous rotating elements of machinery. Pre-

vent premature wear or component failure and eliminate the need for hasty repairs that can put maintenance personnel in potentially dangerous situations. **ABC Series** brakes can be used as part of a system to facilitate OSHA General Industry Standards (29 CFR 1910 Subpart O) requiring that workers not be exposed to hazardous moving parts. They can also be utilized to satisfy braking requirements of the British Columbia Workers Compensation Amendment Act (Book 3 Part 27.42) for rotating knife machinery such as planers, chippers, and hogs.

Reduce Maintenance Costs by using the **ABC Series**. Eliminate the need to plug-reverse a load and reduce the associated damage to gear boxes and other power train components. The **ABC Series** can be used to stop or slow down the load in one direction before reversing to the other. On machines where mechanical brakes are used to stop or hold a load, use the **ABC Series** to stop it first, then set the mechanical brake as a “parking brake”. This eliminates the normal wear and tear to the brake pads or shoes. On loads such as vibrating feeders, screens, or separators, damage from mechanical harmonics that occur during coast-down can be eliminated by using an **ABC Series**. It allows the motor/load to quickly pass through any dangerous speeds and come to a stop.

1.5 Where Mechanical Brakes Should be Used

Power loss during braking - The **ABC Series**, like all DC injection brakes, requires power to be applied during the braking cycle. If the incoming line power is lost from the utility, an upstream circuit protective device trips, or an emergency shutdown routine is initiated, no braking will take place. If braking is still necessary for safety reasons (even in the event of a power failure), consider using mechanical brakes as a backup device. Under normal operation conditions, the **ABC Series** stops the load and the mechanical brake holds it.

Holding the load after it comes to a stop - All DC injection brakes inherently lose braking torque when the motor comes to a complete stop and therefore **CANNOT BE USED A HOLDING BRAKE**. If braking must be applied continuously while the load is at rest, mechanical “Parking Brakes” are required. The **ABC Series** includes a Mechanical Brake Release Relay to facilitate proper coordination of the mechanical brake in these applications.

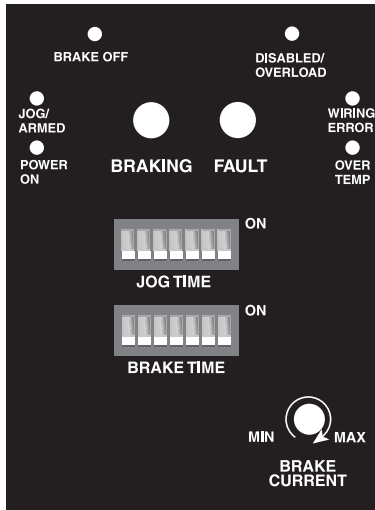
Stop times shorter than start times - Like all DC injection brakes, the **ABC Series** waits for the residual motor energy to dissipate from the windings before DC current can be applied (otherwise damage to the brake or circuit devices may occur). The length of this “wait state” depends on the motor’s residual magnetism and the motor frame size, but can be as much as 5 seconds. This, combined with the limits on braking torque, makes DC injection braking ineffective if braking time must be shorter than the starting time (Across-the-Line).



WARNING!

DC Injection brakes cannot be used for holding a load after it comes to a stop. The ABC Series includes a Mechanical Brake Release Relay that can be used to coordinate the operation of a mechanical brake for use in these applications.

Chapter 2: Operation



2.1 Sequence of Operation

The **ABC Series** brake becomes “Armed” when the motor starter turns “On”, and then braking occurs when the starter is turned “Off”. An Operator Interface Module has two large LEDs to indicate “Braking” or “Fault” condition, plus six smaller LEDs to indicate the following modes of operation:

2.1.1 “POWER ON”

The **ABC Series** brake is self powered from the available motor branch circuit as derived from Terminals L1 and L2. If fuses are used, this LED will indicate a blown fuse condition in either of these circuits by being Off when power is applied to the starter (see section 4.2.1). This LED does NOT indicate motor starter or **ABC Series** brake unit operational status.

2.1.2 “JOG / ARMED”

The **ABC Series** receives a Brake Command from an input wired to the motor starter which indicates the starter status (see section 4.3.1). The **ABC Series** can be programmed to wait a period of time before going into the “Armed” condition using the “Jog” feature. This feature allows for user setup and testing of systems during the jog time without the braking cycle interfering. (The “Jog” time is set via the “Jog Time” dip switches.) This LED will flash once per second until the end of the jog time. If the Motor Starter is turned off again while the **ABC Series** is still in the “Jog” mode, the brake will *not* arm and DC injection will not take place (setting this time to zero will turn off this feature). After the “Jog Time” expires, the **ABC Series** will enter the “Armed” mode (indicated when the JOG/ARMED LED illuminates in a steady state). The **ABC Series** is now ready to begin DC injection braking the next time the motor starter is turned off. The “Armed” mode has no time limit and will be maintained for the duration of the motor run time.

2.1.3 “BRAKING”

The **ABC Series** will enter the braking mode when the motor is given a stop command after being “Armed” (see “JOG / ARMED” above). To prevent damaging current spikes, a factory programmed delay allows the existing motor magnetic field to decay before DC is applied (see section 5.5.1). During the “BRAKING” mode, a set of N.C. interlock contacts change state and disable the motor starter control circuit during the braking cycle (see section 4.2.2). The **ABC Series** begins injecting a regulated DC braking current and simultaneously digitally times, controls the Interlock Relay and monitors the Zero Speed Sense Circuit. Braking will continue until the first one of three events occur: 1) the Zero Speed Sense circuit determines the motor has stopped, 2) the “Brake Time” expires, or 3) the unit receives a “Brake Disable” signal input. When braking is complete, the **ABC Series** releases the Interlock Relay and is ready for another cycle.

2.1.4 “BRAKE OFF”

This LED illuminates whenever the **ABC Series** is not actively braking (either because the motor is on or the previous braking cycle has been completed). The **ABC Series** provides a built-in, closed-loop sensing circuit that accurately determines when the motor has stopped

based on the subtle signals received from the unused motor winding. If the Zero Speed Sensing circuit determines that the motor has come to a stop before the Brake Time has expired, it will override the brake time setting and shut the **ABC Series** off. The “BRAKE OFF” LED will then illuminate. *NOTE: Since the Brake Time may expire prior to the Zero Speed override coming into play, this circuit should not be used as a true Zero Speed indicator.*



WARNING!

The ABC Series DC Injection Brake requires AC power for braking. Power loss before or during braking will result in the loss of braking ability, which can be hazardous to personnel and/or equipment. If braking to a stop is critical regardless of the availability of electrical power, mechanical braking should be provided as a backup system. The ABC Series brake offers a Mechanical Brake Release Relay specifically for this purpose.

2.2 Fault Conditions

The “FAULT” LED will illuminate when any of the following conditions occur:

2.2.1 “DISABLED”

The “DISABLED” mode is activated when the **ABC Series** receives a command on the Brake Disable input (a N.O. dry contact at TB1) (see section 4.3.2). This mode can be used to remove the electronic brake from the system, and is useful in applications that only require braking at certain times during the process and during system setup. **Note:** The **ABC Series** is a “smart brake” and will sense a running motor and automatically arm itself if released from the “DISABLED” mode. Under these circumstances, the **ABC Series** will go through the “JOG” and “ARMED” sequence again. If the unit has determined the motor is stopped, the brake will return to the normal ready state.

NOTE: The ABC Series Mechanical Brake Release Relay will set the mechanical brake if the ABC Series brake unit is disabled during the braking mode.

2.2.2 “WIRING ERROR”

The **ABC Series** unit will recognize when the interface connections or monitored signals are not correct with respect to the proper operation sequence. If the brake detects a miswire or an improper sequence of events, it will “self-disable” to prevent any conflicts with the existing systems and indicate “WIRING ERROR”. If this occurs, the “Fault” LED and “Wiring Error” LEDs will illuminate. Once the miswire or wrong sequence is corrected, the brake will automatically enable itself and resume normal operation.

2.2.3 “OVER TEMP”

The **ABC Series** has thermal sensors built into the heat sink assembly. If the heat sink approaches temperatures too high for the SCRs, the sensors will cause a Fault and illuminate the “Fault” and “Over Temp” LEDs.

2.3 Mechanical Brake Control

The **ABC Series** includes a Mechanical Brake Release Relay that can be utilized to control an electro-mechanical brake coil. This relay has Form A contact (1 N.O.) that changes state as follows (see section 4.3.4):

OPERATION	RELAY STATUS
Power On	No Change (de-energized)
Jog / Armed	Energizes (follows motor starter coil)
Braking	Remains energized
Brake Time Complete/ Zero Speed Override	De-energizes
Disabled - Before or During Jog / Armed	Remains Energized (follows motor starter coil)
Disabled - During Braking	De-energizes
Fault	De-energizes

2.4 Specifications

Voltage Rating	Models rated from 208 - 600V \pm 10% Selectable for 50/60Hz \pm 2 Hz
Current Ratings	10 - 1000A in 10 sizes: 10, 24, 50, 100, 200, 300, 400, 550, 800, 1000A
Output Capacity	25% duty cycle at 100% unit rating
Power Circuit	Full wave bridge, 4 SCRs, designed for use without isolation contactors
Transient Protection	RC snubber dv/dt circuit on each SCR device
Fusing	Approved for use with existing motor starter fusing when unit is sized for motor FLA. Consult NEC for any other fusing requirements.
Control Circuit	Self-powered directly from line terminals. No separate control voltage required
Control Method	Microprocessor unit controls sequencing, I/O monitoring and status annunciation. Braking current is adjustable via true RMS regulated control using phase angle firing of SCRs.
Operator Adjustments	Brake Time and Jog Time = 7 position binary dipswitch Brake Current = potentiometer
Adjustment Ranges	Brake Jog Times = 0 - 127 seconds in 1 sec. increments Brake Current = Up to 100% unit rating
Inputs	Starter Monitor = Dry input for auxiliary contact from motor starter. Jumper selectable for N.O. or N.C. contact.
	Brake Disable = Dry input for N.O. contact to disable braking before or during operation. Can be wired to the starter thermal overload N.O. auxiliary contact to prevent braking of overloaded motor.
	Motor Power Sensor (T3) = voltage input used for sensing motor power presence in sequencing/status circuit and for zero speed sensing during braking
Outputs	Starter Coil Interlock = Two sets of FORM "C" relay contacts for use in interlocking the starter coil and/or other devices to prevent energizing as the braking power is applied.
	Mechanical Brake Release = N.O. relay contact for use in controlling electro-mechanical brake as a holding brake. When the ABC Series is "disabled," this circuit controls the mechanical brake normally as if it is the only brake in the system.
Aux Contact Ratings	5 amps, 250VAC max
LED Status Indicators	Large LEDs: Braking = green; Fault = red
	Small LEDs: Power On, Jog/Armed, Brake Off, Disabled, Over Temp, and Wiring Error
Operating Design Temperature	0 - 50 C (32-122 F) open 0 - 40 C (32 - 104) enclosed
Ambient Conditions	0 - 95% relative humidity 0 - 3300ft (1000M) elevation
Approvals	UL, cUL Listed

Chapter 3: Installation



WARNING!

Be sure that you are completely familiar with the operation of the ABC Series Brake, the starter, and the equipment to which they are connected. This equipment may have rotating parts and/or parts that are controlled by other machinery which may start independently. Improper installation of the ABC Series may cause fatal injury. Only qualified personnel should attempt installation, setup adjustment, and service of this equipment.



CAUTION!

Many tools such as sawblades and grinding wheels are fastened with left-hand threaded nuts. If not secured with double nuts or other positive locking devices, they may loosen when the motor is stopped quickly. Take proper precautions and test for safe operation during braking. Recheck locking devices periodically with use.

3.1 Receiving and Unpacking

Upon receipt of the product you should immediately do the following:

- Carefully unpack the unit from the shipping carton and inspect it for shipping damage.
- Verify that the model number on the unit matches your purchase order.
- Check all electrical terminals to be sure screws are tight.

3.2 Initial Unit Inspection

Complete a visual check of the unit for damage which may have occurred during shipping and handling. Report any damage immediately and file a claim with the freight carrier within 15 days of receipt. Do not attempt to continue installation.



CAUTION!

Do not operate or install the ABC Series Brake if it appears to be damaged or visually defective. Doing so may result in personnel injury or equipment damage.

3.3 Location

Proper location of the **ABC Series** is necessary to achieve specified performance and normal operation lifetime. The unit should always be installed in an area where the following conditions exist:

- Ambient operating temperature:
 - Chassis unit: 0 to 50°C (32 to 122°F)
 - Enclosed unit: 0 to 40°C (32 to 104°F)
- Humidity: 5 to 95% non-condensing
- Free from metallic particles, conductive dust and corrosive gas
- Free from excessive vibration (below 0.5G)
- Open panel units must be mounted in the appropriate type of enclosure. Enclosure size and type must be suitable to dissipate heat generated by the unit. Contact factory for details.

3.4 Mounting and Cleaning

The unit is air cooled and must be properly mounted to allow for unrestricted airflow across the heat sink. The unit should be mounted with the heat sink fins in a vertical plane, with a minimum of five (5) inches of free space around the unit for adequate ventilation. The ambient air should be free of any contaminants which can clog louvers or coat the unit. As with all electrical equipment, the unit must be protected from water and condensing humidity to prevent damage to the unit. In damp or cold environments, space heaters may be required.



WARNING!

Remove All Sources of Power Before Cleaning the Unit.

In dirty or contaminated atmospheres the unit should be cleaned on a regular basis to ensure proper cooling. Do not use any chemicals to clean the unit. To remove surface dust, use 80 to 100 psi clean, dry compressed air only. A three inch, high quality, dry paint brush is helpful to loosen up the dust prior to using compressed air on the unit.

Chapter 4: Wiring

4.1 Introduction

- Installation of the brake unit should be done by properly qualified personnel.
- Check local and other applicable codes to ensure that all installation requirements are met prior to operation.
- Prior to beginning the installation, verify that the motor and brake unit have the same voltage ratings.
- Check the unit to verify that it is rated for the appropriate current (approximately equal to the motor FLA if sized for Standard Duty - see section 1.3).



WARNING!

Do not service equipment with voltage applied! Unit can be source of fatal electrical shocks! To avoid shock hazard, disconnect main power before working on the unit. Warning labels must be attached to terminals, enclosure and control panel to meet local codes.

4.2 Line and Load Connections

Power conductors for the Line and Load connections should be, at a minimum, sized at 125% of the current rating. Brake sizing and duty cycling should be considered when determining if conductors should be oversized for your application. For example, high torque, fast stop applications with maximum duty cycle may require conductors sized for the maximum output capability of the **ABC Series**, and motor lead wires should match.

4.2.1 Line Power Connections

Connect the line leads to the input terminals L1 and L2 provided on the unit. The line power must be supplied from a source with suitable Short Circuit Protective Devices (SCPD) conforming to local and national electric codes. Additional fusing is necessary only when the motor circuit is fused at a level too low to protect the **ABC Series** per code. Recommendations for commonly available SCPDs are as follows:

UNIT RATING	SCPD	SCPD SIZED AS % OF ABC UNIT RATING
10 - 100 Amps	Class RK5 Fuse	No greater than 250%
	Class J Fuse	No greater than 400%
	Circuit Breaker	Not allowable (fuses required)
200 - 1000 Amps	Class RK5 Fuse	No greater than 250%
	Class J Fuse	No greater than 400%
	Circuit Breaker	No greater than 250%



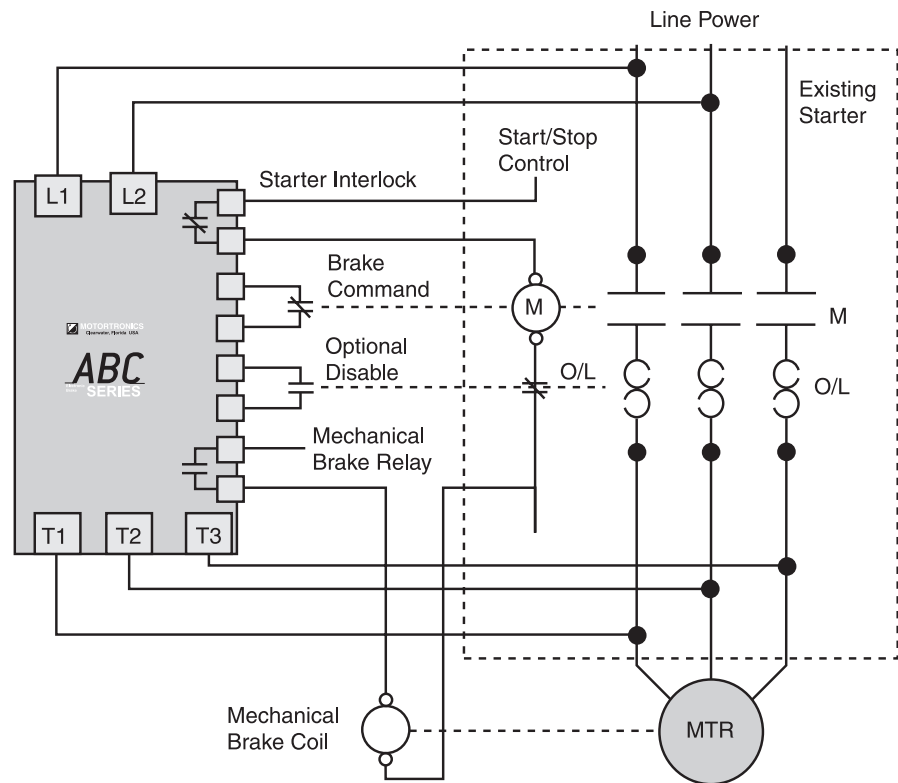
WARNING!

Many motor safety disconnect switches are not rated to interrupt DC current. Replace any load side safety disconnect switch with one that is rated for DC voltage at the motor line voltage rating or greater. As an alternative, disconnect incoming line power before opening any load side disconnect switches in the motor circuit during braking, and post warning labels at all affected devices. Failure to observe this precaution may result in damage to the disconnect and /or bodily injury.

4.2.2 Load Power Connections

Connect the motor leads to the output terminals T1 and T2 provided on the unit. The unit will operate on either a Wye or a Delta connected motor. An additional control wire must be run from motor lead T3 of the starter to the voltage sensing circuit of the **ABC Series**. The terminal for this is marked "T3". This terminal carries very little current so #20 wire (or higher) can be used. Fuse protection adequate for the field wiring used must be provided per code.

NOTE: If the ABC Series brake is being used with 2-speed, Wye-Delta or Reduced Voltage starter, consult factory for additional load connection information.

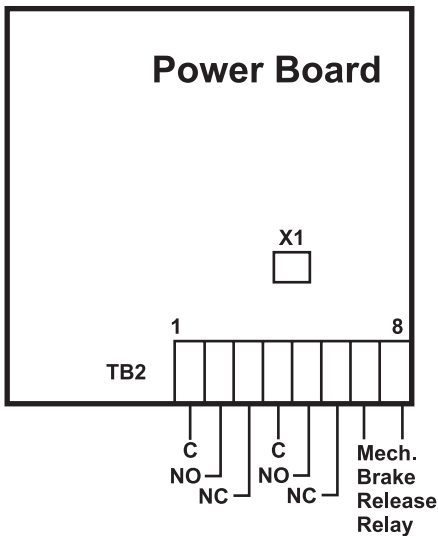
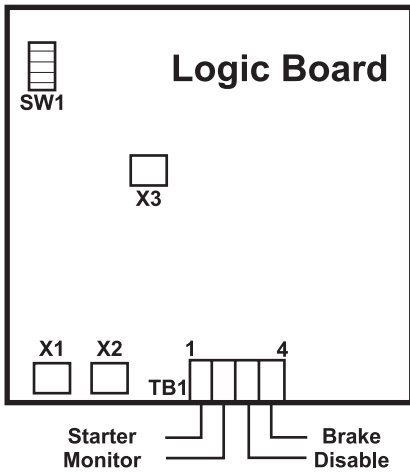


CAUTION!

Power Factor Correction Capacitors should NOT be connected to the load side of the motor starter when used with an ABC Series brake. PFC Capacitors should only be connected to the line side and must include a separate isolation contactor.

4.3 Control Connections

Control wire should be run in a separate conduit from power lines (twisted, shielded cable should be adequate). Whenever possible, conduits containing control and power conductors should cross at right angles to each other. Control connections are made to terminal blocks mounted on the printed circuit boards inside the unit case. TB1 is on the Logic Board (see page 11) with the terminals for Starter Monitor (Brake Command) and Brake Disable. TB2 is located on the



Power Board, and contains terminals for the Interlock Contacts and Mechanical Brake Relay.



WARNING!

The motor starter must never be operated manually when the brake unit is connected. Blown fuses and/or damage to the unit may result.

4.3.1 Starter Monitor Input

Provides a brake command signal from the motor starter (refer to section 2.1.3). Connect either the normally open, or normally closed (user preference) dry auxiliary contact on the motor starter to TB1, terminals 1 and 2 on the logic board. To utilize a normally closed contact, select Jumper X1 (factory default). For normally open contact, move the Jumper to X2. For reversing starters, use 2 N.O. contacts in parallel or 2 N.C. contacts (1 from each contactor) in series to this input. *Circuit voltage potential: 15VDC maximum.*

4.3.2 Brake Disable Input

Disables electronic braking functions before, during, or after operation (refer to section 2.2.1). To utilize this feature, wire a N.O. dry contact to TB1 terminals 3 and 4 on the logic board. The disable feature will activate as long as the contact is closed, and will resume operation sequence only when the disable command is released (i.e. the contact is opened). Once the **ABC Series** has resumed operation, it will evaluate the status of the motor and re-enter the “JOG” mode if conditions are correct. *Circuit voltage potential: 15VDC maximum.*

Note: The Brake Disable can and should be used to disable the ABC Series brake in the event of a motor thermal overload by wiring normally open contacts from the overload relay to these terminals. This will prevent the brake from operating if a motor overload trip condition occurs.

4.3.3 Interlock Contacts

The **ABC Series** unit must be interlocked with the motor starter coil circuit to disable the motor starter during the braking cycle for proper operation (refer to 2.1.3). Two sets of “FORM C” contacts are provided on TB2 on power board to interlock the motor starter with the brake. Terminals 1, 2, and 3 are the first set and terminals 4, 5, and 6 are the second. Use both sets for reversing starters, each in one of the contactor coil circuits. The second set may be used as a status indicator in non-reversing starter applications. Never connect the interlock contacts parallel to the contactor coil or across the power line. *Circuit voltage potential: same as starter control circuit, 240VAC maximum.*



WARNING!

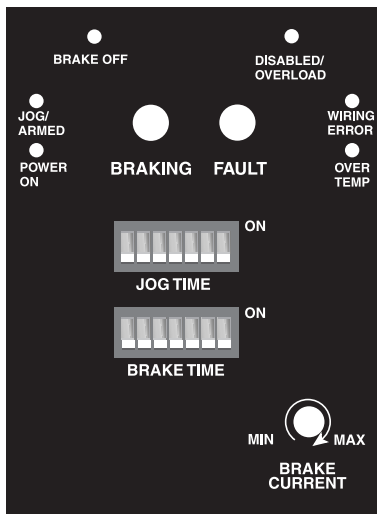
If this wiring is done incorrectly or not at all, severe damage to the unit may occur and the warranty on the unit may be voided.

4.3.4 Mechanical Brake Release Relay

The **ABC Series** brake unit can work in conjunction with a mechanical brake by interfacing with the motor and allowing for mechanical brake control. The **ABC Series** brake can be used for stopping, and the mechanical brake can be used for holding. The Mechanical Brake Release contacts are N.O. relay contacts rated for 5A, 250VAC and are located at terminals 7 and 8 of TB2 on the Power Board (see section 2.3 for additional operating details).

The unit will detect the motor start command and release the mechanical brake. When the stop command is given, the **ABC Series** brake unit will continue to keep the mechanical brake released, proceed with the DC injection braking sequence, then engage the mechanical brake at the end of the braking cycle. If the disable feature is engaged while in "BRAKING" mode, the **ABC Series** will automatically set the mechanical brake.

CHAPTER 5: Adjustments



Operator Interface Module

5.1 Time Adjustment Procedures

Time settings for “Jog Time” and “Brake Time” are adjusted by use of dip switches on the front mounted Operator Interface Module. Time settings are in seconds (set in binary code). Each switch denotes a binary digit from 1 - 7 positions, totaling 127 seconds maximum when all are switched to the “On” position.

5.2 Jog Time Setting

Factory Setting: 7 seconds

The jog time is adjustable from 0-127 seconds and is made using the 7 position dip switch SW2, labeled “Jog Time”. Set the switches according to the jog time required. Setting all the switches to the “Off” position (Jog Time = 0) will disable this function.

Example:
Setting dip switch positions 1, 2, and 3 to “on” = 1+2+4 = 7 seconds total jog time.

Switch Positions															
Jog Time	<table border="1"> <tr> <td>On</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table>	On							1	2	3	4	5	6	7
On															
1	2	3	4	5	6	7									
Time (seconds)	1 2 4 8 16 32 64														



CAUTION!

Damage to the motor, equipment, brake and/or electrical circuit may occur if this adjustment is not correct. Setting this switch to less than the factory setting may involve risk to the equipment and affect normal operations. Setting the jog time too long may result in equipment operating without the benefit of the DC injection brake. The jog time should typically be set to equal the time it takes the motor to accelerate the load on start (across-the-line) plus approximately two seconds.

5.3 Brake Time Setting

Factory Setting: 7 seconds

The brake time is programmable from 1 to 127 seconds. Set the switches marked “Brake Time” to the brake time required. Typical brake time settings should be 1/2 of the load’s coast-to-stop time or less, as necessary. Each dip switch represents a binary time value. Add the times together for the final brake time setting

Example:
Setting dip switch positions 1, 2, and 3 to “on” = 1+2+4 = 7 seconds total brake time.

Switch Positions															
Brake Time	<table border="1"> <tr> <td>On</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table>	On							1	2	3	4	5	6	7
On															
1	2	3	4	5	6	7									
Time (seconds)	1 2 4 8 16 32 64														

NOTE: Stop times shorter than 4 seconds will not allow enough time for the Zero Speed Sensing circuit to accurately sense that the motor has stopped. Brake Time must be used to turn the ABC Series off (1-2 seconds) to insure proper stopping.

5.4 Brake Current Adjustment

Factory Setting: 50% of Unit Rating

It is strongly recommended that you try the factory settings first before making any adjustments. If adjustments are necessary, a "true" RMS AC clamp-on ammeter should be used to check the current supplied to the motor while braking. Place the meter on one of the **ABC Series'** input power lines. Start the motor by energizing the motor starter contactor. Allow the motor to come up to full speed with the normal load. Engage the brake by de-energizing (stopping) the motor starter contactor. Then, increase the brake current, if necessary, by slowly adjusting the brake torque potentiometer (P1)(located in the Operation Interface Module) in a clockwise direction. The braking torque should be adjusted so that the braking time expires at the same time the motor stops. Adjust the brake current and/or brake time until acceptable. Start and stop the motor several times to verify proper operation.



WARNING!

Never exceed the RMS full load current rating of the motor without first checking with the motor manufacturer for the maximum allowable amount of DC current that can be supplied to the motor during braking application.

Application Specific Adjustments

These settings are factory preset to provide optimum performance in a wide variety of applications, and should not be changed unless the user is specifically aware of the risks and consequences (contact factory for details).

Brake On Delay (Switch SW1)

This DIP switch controls the amount of time that the **ABC Series** brake waits prior to applying DC current to the motor windings in order to allow the magnetic field to decay. The rate of decay varies with motor frame size, so this **SHOULD NOT BE CHANGED**. Changing this setting could result in damage to the **ABC Series** components and circuit protective devices. If your application requires a specific delay time, please contact the factory for assistance.

Zero Speed Sensing Disable (Jumper X3)

If for some reason you need to disable the Zero Speed Sensing, remove this jumper. The **ABC Series** will then continue braking for the entire Brake Time setting, even if the motor has already come to a complete stop. Disconnecting the sensing lead to the "T3" terminal, will cause a "Wiring Error" fault, and therefore should not be used as a means of disabling the Zero Speed Sense circuit.

50 Hz Operation (Power Board Jumper X1)

Remove this jumper on units ordered as 60 Hz, but required to operate at 50 Hz. Units ordered as 50 Hz will not have this jumper, so it must be installed for testing on 60 Hz systems.



CAUTION!

Some adjustments and devices visible on the ABC Series boards are preset at the factory and should NOT be field adjusted without specific instructions from factory authorized service personnel. These devices include: P1 and P2 potentiometers, and push button PB1. Tampering or altering these devices may void your warranty.

Chapter 6: Start-up

6.1 Start-up Check List

- Verify that the supply voltage matches the supply voltage of the **ABC Series** brake.
- Confirm that the power lines are attached to the input terminals.
- Verify that the output leads are connected to the output terminals.
- Complete the appropriate control and interlock connections.
- Clear the area of people and extra parts before start up.

NOTE: For 50 Hz operation, be sure that Jumper X1 on the Power Board is removed.

6.2 Equipment

The following equipment will be needed for start-up:

- A "true" RMS AC clamp-on ammeter to check braking current.
- A small screw driver to adjust braking torque (if necessary).
- A digital volt meter.
- Stop watch or other means of measuring time.

6.3 Setup Sequence

- Start the motor by energizing the motor starter.
- Allow the programmed jog time to expire. (Factory set for 7 sec.)
- De-energize the motor starter to initiate brake mode.
- Monitor the input current to the **ABC Series** unit on any one of its input leads with the "true" RMS AC clamp-on ammeter.
- Adjust the brake current if necessary.
- If the brake times out before the motor stops, increase the value of the brake time switch, or increase the brake current (Note: Never exceed the RMS rating of the motor without checking with the motor manufacturer).
- If the Zero Speed Sense option engages and turns off the brake before the programmed brake time expires, adjust the brake time dip switch for approximately two (2) seconds longer than the actual stop time.

6.4 Check Normal Sequence of Operations

- Apply power to the system. The "Power On" LED should indicate that the line power is correct. Both the "Power On" and the "Brake Off" LED should be illuminated.
- Start the motor. The "Jog / Armed" LED should flash once per second to indicate programmed Jog Time.
- Allow the motor to run. The "Jog / Armed" LED should light solid.
- Initiate the motor stop command. The "Brake Off" LED should go out and the "Brake On" LED should illuminate. The unit should continue braking until the motor comes to a stop or the programmed brake time expires.

Warranty Policy

Motortronics warrants its products to be free from defects in material and/or workmanship for a period of one year from the date of installation, to a maximum of 18 months from the date of shipment as indicated by the unit's date code. The Company reserves the right to repair or replace any malfunctioning units under warranty at their option. All warranty repairs must be performed by the Company factory, or on site by factory authorized service firms or personnel approved by the Company.

Solid state controls have different operating characteristics from those of electromechanical equipment. Because of these differences and the wide variety of applications for solid state controls, each application designer must verify that the solid state equipment is acceptable for his application. In no event will Motortronics be liable or responsible for indirect or consequential damages resulting from the use or application of this equipment. The diagrams and illustrations in this document are included solely for illustrative purposes. Because of the number of different applications, Motortronics can not be responsible or liable for actual use based on the examples or diagrams.