



SMC PLUS™

Allen-Bradley

Smart Motor Controller:

SMB™ Smart Motor Braking Option Manual

Wiring and Set-up Procedures

24-1000 Ampere

(Bulletin 150)

This is a supplementary guide for the SMB Smart Motor Braking Option, it is intended to be used with the Installation Manual. This guide contains the information pertaining to the wiring and customer adjustment set-up procedures for the SMB Smart Motor Braking Option. Other information specific to the operation and maintenance of the SMC PLUS is given in the following Installation Manuals:

150-811 (24, 35, 54, 97, 135 Amps)

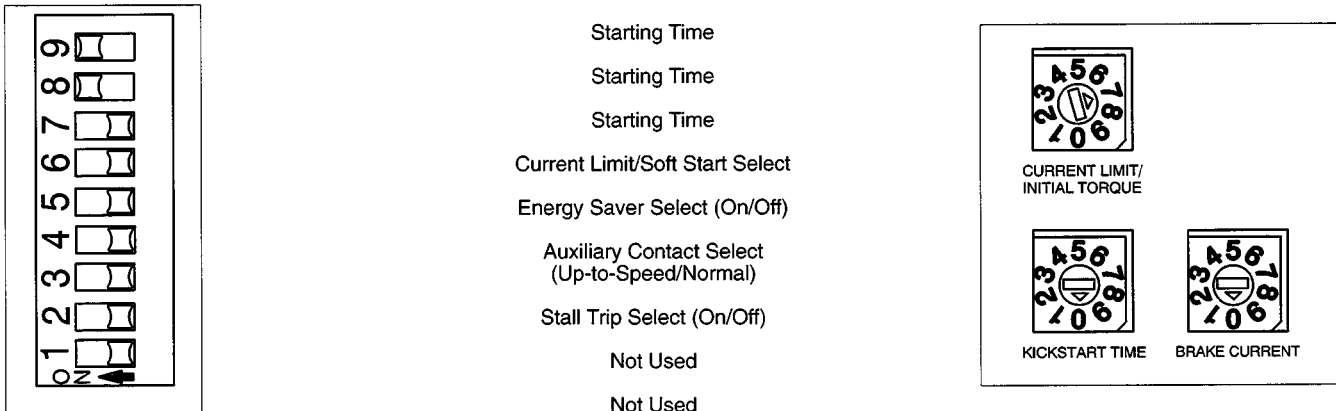
150-812 (180, 240, 360 Amps)

150-813 (500, 650, 720, 850, 1000 Amps)

For Bulletin 150 SMC Smart Motor Controller technical support on start-up or existing installations, contact your Allen-Bradley representative. In the United States you can also call **1-800-765-SMCS (765-7627)** for assistance during the hours of 8:00 am to 12:00 noon and 1:00 pm to 4:30 pm (Central Time Zone) from Monday through Friday.

SMB Smart Motor Braking Option

Figure 1.1 - SMB Smart Motor Braking Option Factory Settings



Factory Settings

The controller has been factory-set for the following as shown in Figure 1.1 above:

- 10 second ramp
- Energy Saver "OFF"
- Auxiliary Contacts "Off" (Normal)
- Stall feature "OFF"
- Initial Torque 70%
- Kickstart "OFF"
- Brake Current "OFF"

NOTE: SMB Smart Motor Braking feature is deactivated with factory settings.

Application Considerations

For multispeed, reversing and multimotor applications, consult your nearest Sales Offices or the Sales Department in Milwaukee

SMB Smart Motor Braking

This function provides motor braking for applications which require the motor to stop faster than a coast to rest. It is a microcomputer based braking system which applies three phase braking current to a standard squirrel cage induction motor. The strength of the braking current is adjustable from 150% to 400% of full load current.



WARNING: This option is used to decrease motor coasting time. It is not intended to be used as an emergency or safety stop. In case of power loss, the motor will coast to a stop.

NOTE: Depending on the application, the SMB Smart Motor Braking, Accu-Stop, and Slow Speed with Braking options may cause some vibration or noise during the stopping cycle and this may be minimized by lowering the braking current. If this is a concern in your application, consult the factory prior to applying these options.

With the Smart Motor Braking option, pressing the brake pushbutton signals the controller to implement the brake. The RUNNING LED turns off and the STOPPING LED flashes. Braking will occur until the near-zero speed is detected, at which point the control will turn off and reset. This is accomplished without the use of a tachometer or zero speed switch or timer.

If the stop pushbutton is pressed while braking or running, a normal (coast to rest) stop is initiated.



WARNING: SMB Smart Motor Brake is not intended to be used as an emergency stop. Refer to the applicable standards for emergency stop requirements.



CAUTION: Braking may cause motor heating depending on braking current, frequency of braking and duration of braking cycle. Therefore, select the lowest brake current setting that will brake satisfactorily.

SMB Smart Motor Braking

(continued)

Figure 1.2 - SMB Smart Motor Braking Option

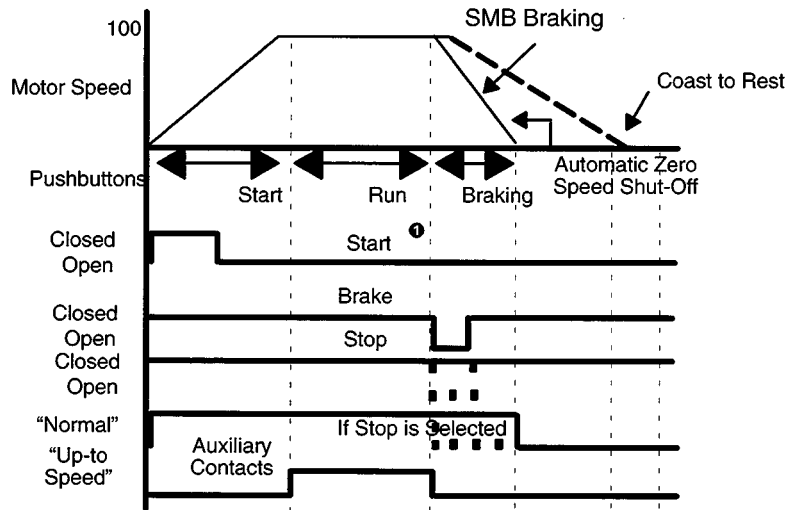
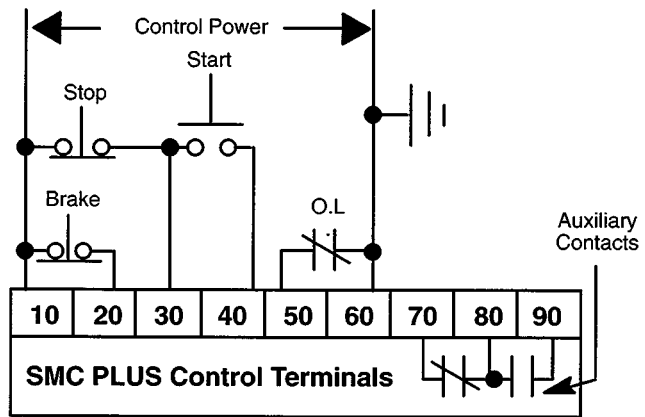
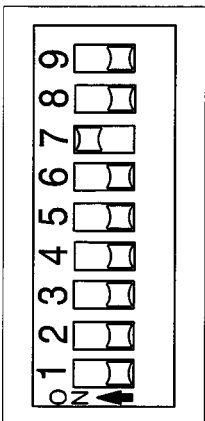


Figure 1.3 - SMB Smart Motor Braking Terminal Wiring



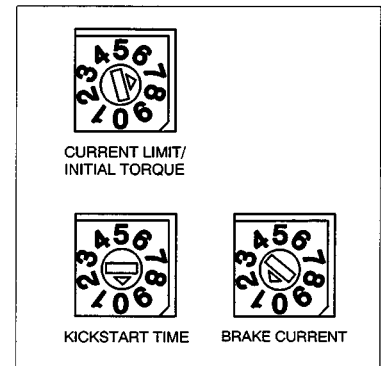
Soft Start Selection with SMB Braking Option

Figure 1.4 - Set Up Procedures - Soft Start Selection with SMB Braking Option



EXAMPLE: Above DIP switch is set for 20 second ramp

- Starting Time
- Starting Time
- Starting Time
- Current Limit/Soft Start Select
- Energy Saver Select (On/Off)
- Auxiliary Contact Select (Up-to-Speed/Normal)
- Stall Trip Select (On/Off)
- Not Used
- Not Used



EXAMPLE: Brake Current rotary digital switch is set to 150% of full load current

Soft Start Selection with SMB Braking Option

(continued)

1. **Starting Time -**
Set switches 7-9 according to the period desired. For example, if you want a ramp of 20 seconds, switch 7 would be **ON** and switches 8 and 9 would be **OFF**.
2. **Kickstart Time -**
Set Kickstart Time rotary digital switch to the kickstart time desired.
3. **Initial Torque -**
Set Initial Torque rotary digital switch to the value desired.
4. **Current Limit/Soft Start -**
For soft start operation, switch 6 must be **OFF**.
5. **Energy Saver Select -**
Set switch 5 **ON** if you want the energy saver feature (of **OFF** if you do not want this feature active).
6. **Auxiliary Contact Selection -**
Set switch 4 **OFF** if you want “normal” auxiliary contacts, **ON** if you want “up-to-speed” auxiliary contacts.
7. **Stall Select -**
Set switch 3 **ON** if you want the stall feature (or **OFF** if you do not want this feature active)
NOTE: For resistive load operation, switch 3 must be **OFF**.
8. **Brake Current -**
Set Brake Current rotary digital switch to desired setting. Start at 1 and increase until satisfied. **For example**, if you want brake current of 150% of full load current, set rotary digital switch to 1.



WARNING: The user has the ultimate responsibility to determine which stopping mode is best suited to the application and will meet applicable standards for operator safety on a particular machine.

| Switch Number | TIME (seconds) | | | | | |
|---------------|--------------------------|-----|-----|-----|-----|-----|
| | 2 | 5 | 10 | 20 | 25 | 30 |
| 9 | ON | Off | ON | Off | ON | Off |
| 8 | Off | ON | ON | Off | Off | ON |
| 7 | Off | Off | Off | ON | ON | ON |
| 6 | Off | | | | | |
| 5 | ENERGY SAVER SELECT | | | | | |
| 4 | AUXILIARY CONTACT SELECT | | | | | |
| 3 | STALL SELECT | | | | | |
| 2 | NOT USED | | | | | |
| 1 | NOT USED | | | | | |

Kickstart Time

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time (seconds) | Off | 0,4 | 0,6 | 0,8 | 1,0 | 1,2 | 1,4 | 1,6 | 1,8 | 2,0 |

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Soft Start Selection with SMB Braking Option

(continued)

Initial Torque

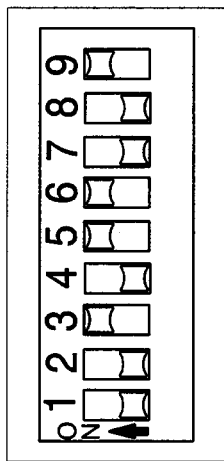
| | | | | | | | | | | |
|--------------------------|---|----|----|----|----|----|----|----|----|----|
| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| % of Locked Rotor Torque | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |

Brake Current

| | | | | | | | | | | |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| % of Full Load Current | off | 150 | 175 | 200 | 225 | 250 | 275 | 300 | 350 | 400 |

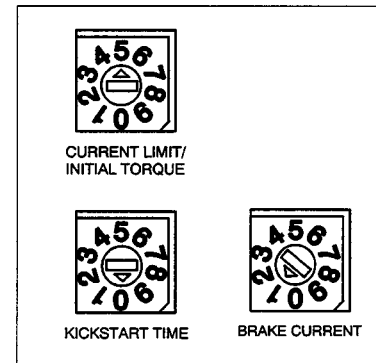
Current Limit Selection with SMB Braking Option

Figure 1.5 - Set Up Procedures - Current Limit Selection with SMB Braking Option



EXAMPLE: Above DIP switch is set for 30 second ramp

- Starting Time
- Starting Time
- Starting Time
- Current Limit/Soft Start Select
- Energy Saver Select (On/Off)
- Auxiliary Contact Select (Up-to-Speed/Normal)
- Stall Trip Select (On/Off)
- Not Used
- Not Used



EXAMPLE: Brake Current rotary digital switch is set to 150% of full load current

1. **Starting Time -**
Set switches 7-9 according to the period desired. **For example**, if you want current limit active for 30 seconds, switch 9 would be **ON** and switches 7 and 8 would be **OFF**.
2. **Kickstart Time -**
Set Kickstart Time rotary digital switch to **OFF**.
3. **Current Limit/Soft Start -**
Set Current Limit rotary digital switch accordingly. Switch 6 must be **ON** in the current limit mode. **For example**, if you want to restrict the starting current to 300% of full load amperes, set rotary switch to position 5.
4. **Energy Saver Select -**
Set switch 5 **ON** if you want the energy saver feature (of **OFF** if you do not want this feature active).
5. **Auxiliary Contact Selection -**
Set switch 4 **OFF** if you want "normal" auxiliary contacts, **ON** if you want "up-to-speed" auxiliary contacts.
6. **Stall Select -**
Set switch 3 **ON** if you want the stall feature (or **OFF** if you do not want this feature active).
NOTE: For resistive load operation, switch 3 must be **OFF**.
7. **Brake Current -**
Set Brake Current rotary digital switch to desired setting. Start at 1 and increase until satisfied. **For example**, if you want brake current of 150% of full load current, set rotary digital switch to 1.

Current Limit Selection with SMB Braking Option

(continued)

| Switch Number | TIME (seconds) | | |
|---------------|--------------------------|-----|----|
| | | 15 | 30 |
| 9 | | Off | ON |
| 8 | Off | | |
| 7 | Off | | |
| 6 | ON | | |
| 5 | ENERGY SAVER SELECT | | |
| 4 | AUXILIARY CONTACT SELECT | | |
| 3 | STALL SELECT | | |
| 2 | NOT USED | | |
| 1 | NOT USED | | |

Kickstart Time

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time (seconds) | Off | 0,4 | 0,6 | 0,8 | 1,0 | 1,2 | 1,4 | 1,6 | 1,8 | 2,0 |

Current Limit

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| % of Full Load Current | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |

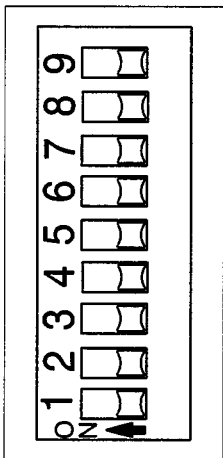
Brake Current

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| % of Full Load Current | Off | 150 | 175 | 200 | 225 | 250 | 275 | 300 | 350 | 400 |

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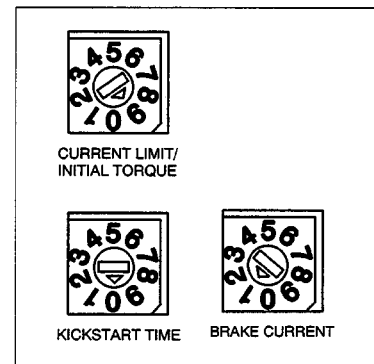
Full Voltage Selection with SMB Braking Option

Figure 1.6 - Set Up Procedures - Full Voltage Selection with with SMB Braking Option



EXAMPLE: Above DIP switch is set for full voltage start

- Starting Time
- Starting Time
- Starting Time
- Current Limit/Soft Start Select
- Energy Saver Select (On/Off)
- Auxiliary Contact Select (Up-to-Speed/Normal)
- Stall Trip Select (On/Off)
- Not Used
- Not Used



EXAMPLE: Brake Current rotary digital switch is set to 150% of full load current

Full Voltage Selection with SMB Braking Option

(continued)

1. **Starting Time** -
Set dip switches 7-9 OFF and switch 6 off.
2. **Kickstart Time** -
Set to 0.
3. **Initial Torque** -
Set to 9.
4. **Current Limit/Soft Start** -
For fully voltage operation, switch 6 must be **OFF**.
5. **Energy Saver Select** -
Switch 5 must be **OFF**. Energy Saver not available with full voltage start.
6. **Auxiliary Contact Selection** -
Set switch 4 **OFF** if you want “normal” auxiliary contacts, **ON** if you want “up-to-speed” auxiliary contacts.
7. **Stall Select** -
Set switch 3 **ON** if you want the stall feature (or **OFF** if you do not want this feature active).
NOTE: For resistive load operation, switch 3 must be **OFF**.
8. **Brake Current** -
Set Brake Current rotary digital switch to desired setting. Start at 1 and increase until satisfied. **For example**, if you want brake current of 150% of full load current, set rotary digital switch to 1.



WARNING: The user has the ultimate responsibility to determine which stopping mode is best suited to the application and will meet applicable standards for operator safety on a particular machine.

| Switch Number | TIME (seconds) |
|---------------|--------------------------|
| | 1/4 |
| 9 | Off |
| 8 | Off |
| 7 | Off |
| 6 | Off |
| 5 | ENERGY SAVER SELECT |
| 4 | AUXILIARY CONTACT SELECT |
| 3 | STALL SELECT |
| 2 | NOT USED |
| 1 | NOT USED |

Kickstart Time

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Time (seconds) | off | 0,4 | 0,6 | 0,8 | 1,0 | 1,2 | 1,4 | 1,6 | 1,8 | 2,0 |

Initial Torque

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------|---|----|----|----|----|----|----|----|----|----|
| % of Locked Rotor Torque | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |

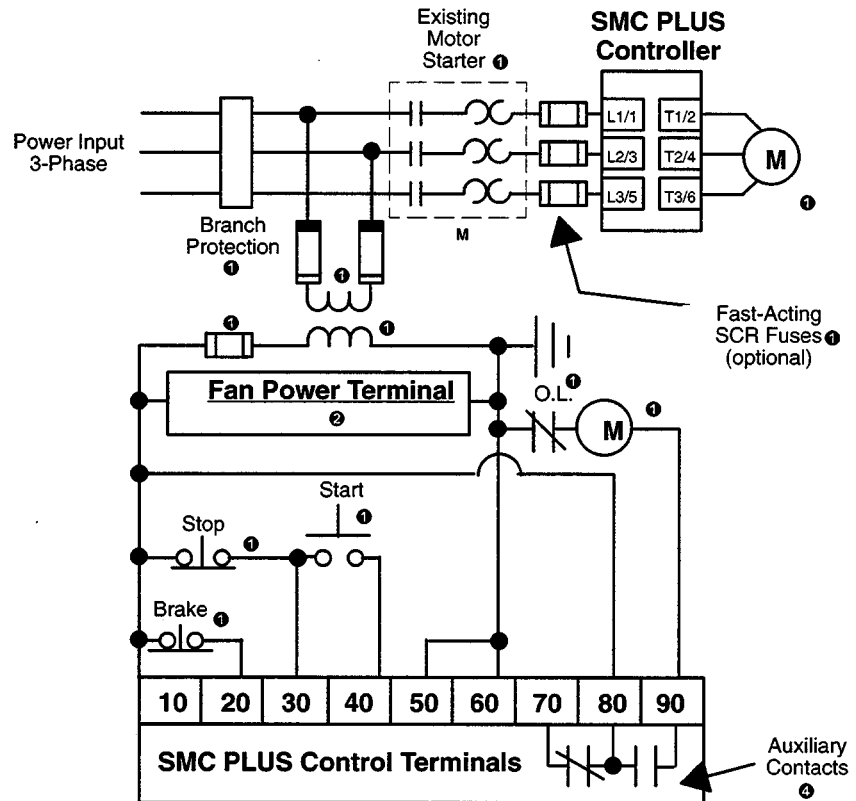
Brake Current

| Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| % of Full Load Current | off | 150 | 175 | 200 | 225 | 250 | 275 | 300 | 350 | 400 |

Typical Connection for Retrofit Application

Typical connection diagram for retrofit application: Figure 1.7 shows the typical diagram to use when retrofitting a SMC PLUS with SMB Smart Motor Braking into an existing control scheme. Starting and stopping of the motor is handled by the controller. Be sure the incoming side of the starter coil is routed through terminals 80 and 90 to insure the starter stays on long enough to allow braking to occur and that the auxiliary is configured for normal operation.

Figure 1.7 - Typical Connection Diagram Retrofit Application



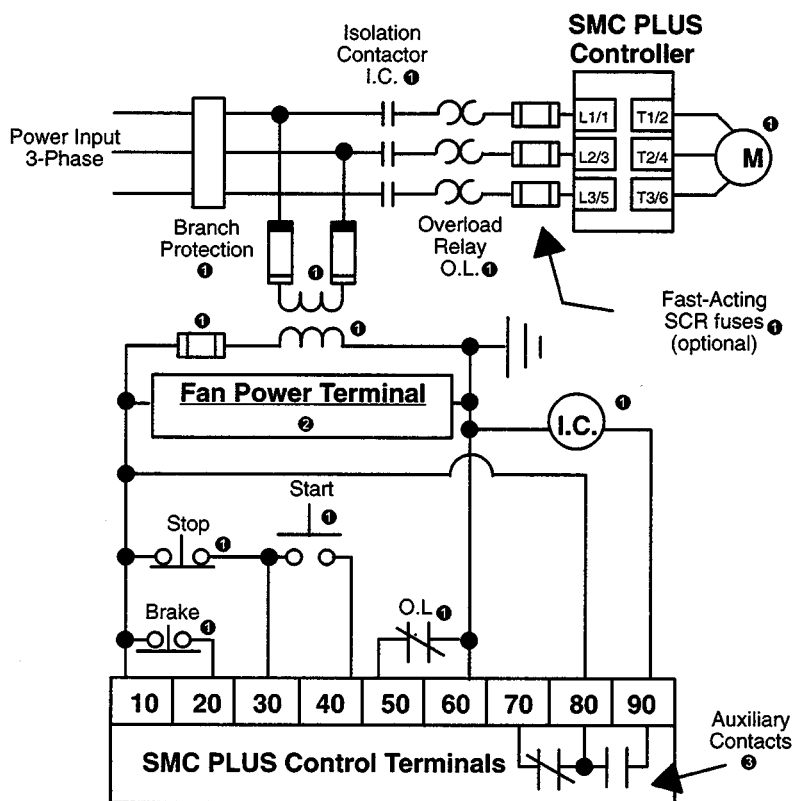
NOTE: For two wire control, remove stop/start pushbuttons and connect two wire device between terminals 10 and 20 and with 10 and 40 hard wired.

- ❶ Customer Supplied.
- ❷ Customer wires fan to control voltage supply. For 97A controllers and up, see installation manuals for jumper locations and wiring diagrams.
- ❸ Set auxiliary contacts for normal setting.

Typical Connection with Isolation Contactor

Typical connection diagram for SMB Braking with isolation contactor: Both starting and stopping of the motor is controlled by the controller. The controller also controls the electromechanical contactor. The contactor provides isolation between the motor and power lines when controller is OFF.

Figure 1.8 - Typical Connection Diagram with Isolation Contactor



NOTE:

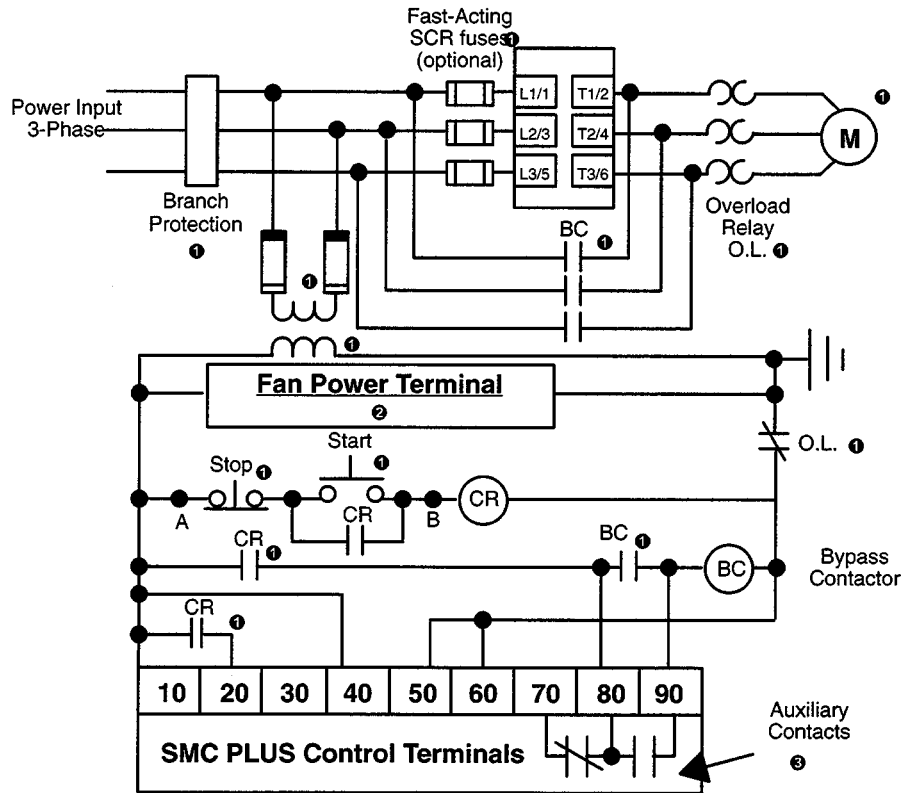
- ❶ Customer Supplied.
- ❷ Customer wires fan to control voltage supply. For 97A controllers and up, see installation manuals for jumper locations and wiring diagrams.
- ❸ Set auxiliary contacts for normal setting.

By-pass Mode

Typical connection diagram of a by-pass contactor: By using the following circuit, a starting and stopping can be realized with the controller bringing the bypass contactor on for normal full speed operation.

NOTE: Because the controller is bypassed during this mode, controller features are not available when contactor is energized.

Figure 1.9 - Typical Application Diagram of a By-Pass Contactor



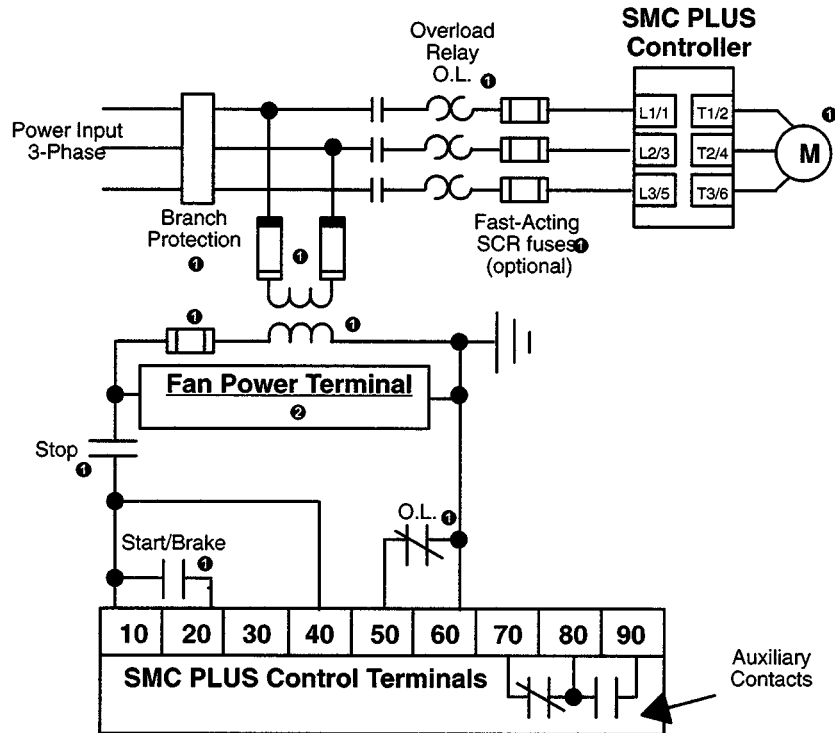
NOTE: For two wire control, remove stop/start pushbuttons and connect two wire device between A and B.

- ❶ Customer Supplied.
- ❷ Customer wires fan to control voltage supply. For 97A controllers and up, see installation manuals for jumper locations and wiring diagrams.
- ❸ Set auxiliary contacts for up-to-speed setting.

Programmable Controller and Sensor Interface

When using solid-state devices to operate the SMC PLUS controller the voltage and frequency range will be 100-240V, 50/60 Hz. The OFF state leakage current from the solid-state device must be less than 6 mA. The nominal input current is 25 mA at 120 VAC and 50 mA at 240 VAC.

Figure 1.10 - Typical Connection with PLC or other Logic Devices



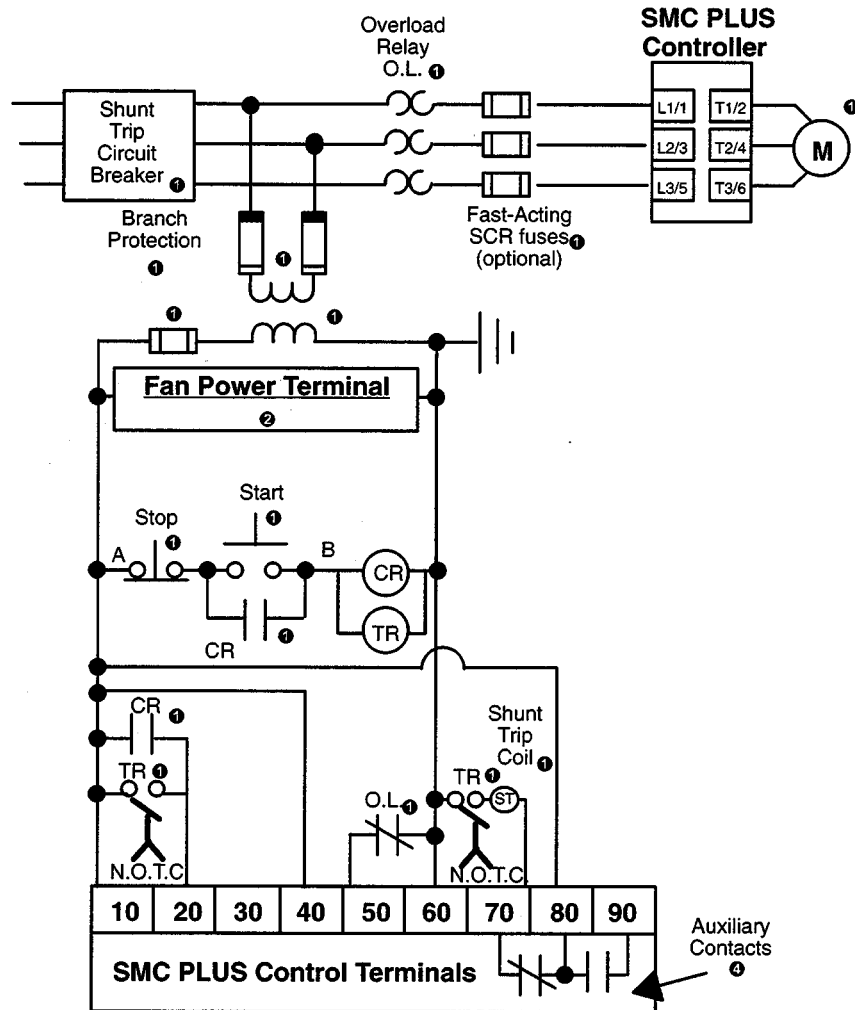
NOTE:

- ① Customer Supplied.
- ② Customer wires fan to control voltage supply. For 97A controllers and up, see installation manuals for jumper locations and wiring diagrams.
- ③ Disconnect main power before servicing motor controller or associated wiring. Hazardous voltages are present in the motor circuit even when the solid-state controller is off.

Typical Connection with Shunt Trip Circuit Breaker

Typical connection diagram with shunt trip breaker. To use the SMB Braking Option with a shunt trip breaker, a control relay and a timing relay are required. The timing relay is used to prevent tripping before the motor has had a chance to start and to prevent nuisance tripping for braking and stopping.

Figure 1.11 - Typical Connection Diagram with Shunt Trip Circuit Breaker



- ① Customer Supplied.
- ② Customer wires fan to control voltage supply. For 97A controllers and up, see installation manuals for jumper locations and wiring diagrams.
- ③ For two wire control, remove stop/start pushbuttons and connect two wire device between points A and B..
- ④ Set auxiliary contacts for normal setting.

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