



SMC PLUS™
Smart Motor Controller:

Pump Control Option Manual

Wiring and Set-up Procedures
24-1000 Amps
(Bulletin 150)

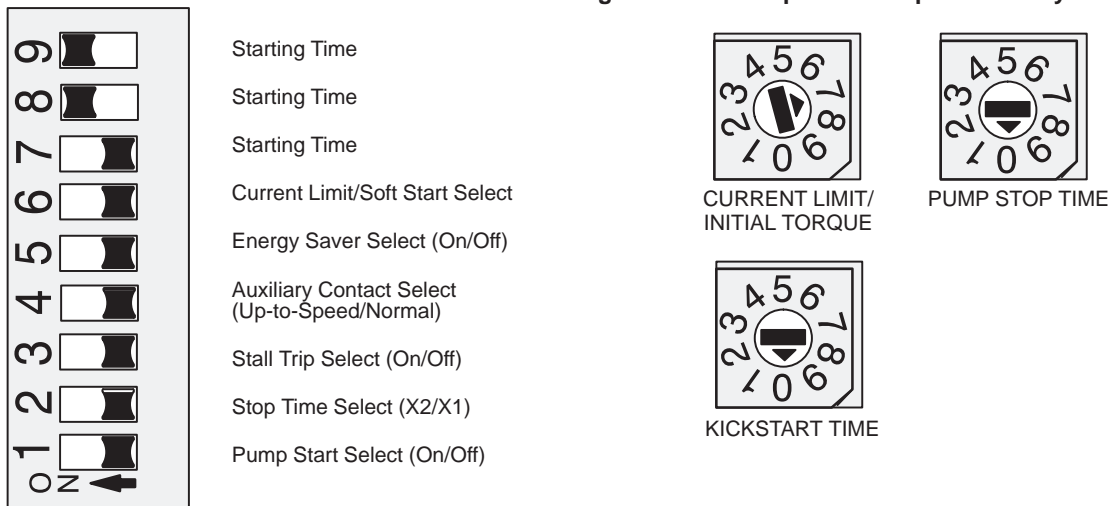
This is a supplementary guide for the Pump Control Option. It is intended to be used with the Installation Manual. This guide contains the information pertaining to the wiring and customer adjustment set-up procedures for the Pump Control Option. Other information specific to the operation and maintenance 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.

Pump Control Option

Figure 1.1 - Pump Control 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”
- Pump Start “OFF”
- Pump Stop “OFF”

NOTE: Pump Control 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.

Pump Control Option

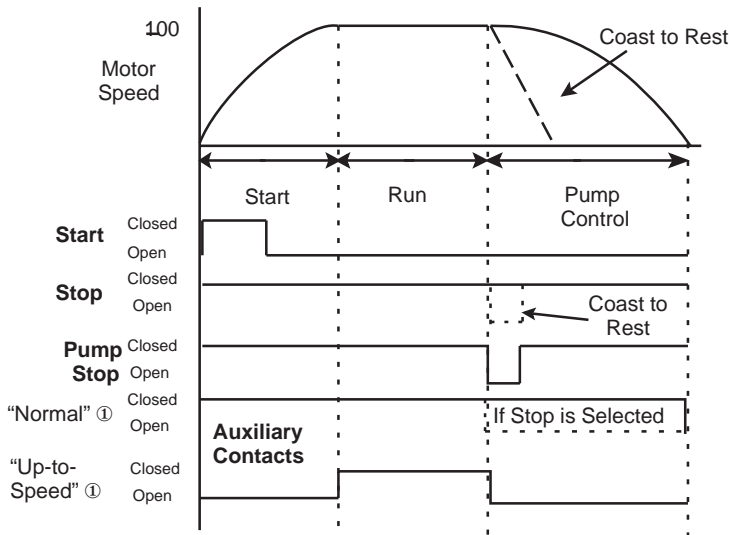
This function is used to reduce surges in a pumping system during starting and stopping of a centrifugal pump by smoothly accelerating and decelerating the motor at a selectable rate. The microcomputer analyzes the motor variables and generates control commands which control the motor in such a way to reduce the possibility of surges occurring in the system.

With the pump control option, pressing the start pushbutton signals the controller to initialize the start sequence. The STARTING LED turns on. When it has effectively reached full speed, the RUNNING LED is illuminated and the STARTING LED extinguishes.

By pressing the pump stop pushbutton, the controller will decrease the motor voltage as a function of pump loading. It will decrease the voltage until the pump has stopped. When this occurs, the controller logic will automatically shut off. Some applications may cause the pump to be rotating (i.e., backspin situations) even if the logic has commanded the pump to shut off.

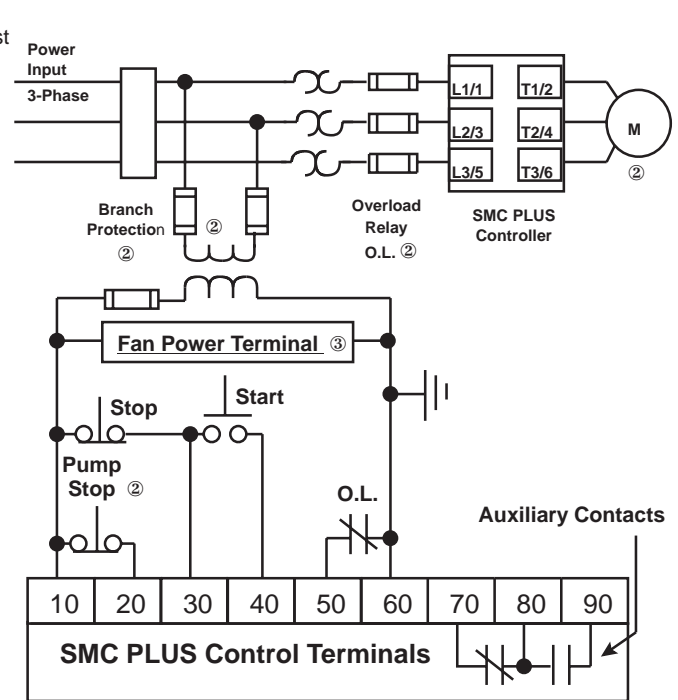
If the stop pushbutton is pressed, a normal (coast to rest) stop is initiated.

Figure 1.2 - Pump Control



NOTE: Refer to Figure 1.3 for Wiring Diagram
 ① Only the normally open auxiliary contact is being illustrated.

Figure 1.3 - Typical Pump Control Terminal Wiring



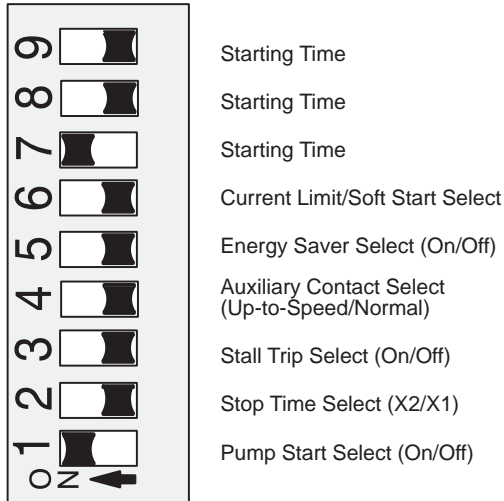
- ② Customer Supplied
- ③ Customer wires fan to control voltage supply. For 97A controllers and up, see installation manuals for jumper locations and wiring diagrams.



ATTENTION: Pump Stop is not intended to be used as an emergency stop. Refer to the applicable standards for emergency stop requirements.

**Pump Control
Starting and Stopping**

**Figure 1.4 - Set Up Procedures -
Pump Control Starting and Stopping**



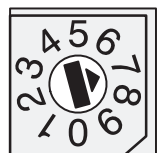
EXAMPLE: Above DIP switch is set for 20 second Pump Start.

- 1. Starting Time –**
Set switches 7-9 according to the time desired. **For example**, if you want a pump start of 20 seconds, switch 7 would be **ON** and switches 8 and 9 would be **OFF**.
- 2. Initial Torque –**
Set Initial Torque rotary digital switch to the value desired.
- 3. Kickstart Time –**
Set Kickstart Time rotary digital switch to the kickstart time desired.
- 4. Current Limit/Soft Start –**
For pump starting operation, switch 6 must be **OFF**.
- 5. Energy Saver Select –**
Set switch 5 **ON** if you want the energy saver feature (or **OFF** if you do not want this feature active).
- 6. Auxiliary Contact Select –**
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).
- 8. Pump Stop Time –**
Set Pump Stop Time rotary digital switch according to the time desired with DIP switch 2 **OFF**. Set DIP switch 2 **ON** to double pump stopping time. **For example**, if you want pump stop time of 40 seconds, set the rotary digital switch to 7. If you want pump stop time of 80 seconds, set the rotary digital switch to 7 and DIP switch 2 **ON**.
- 9. Pump Start Select –**
Set DIP switch 1 to **ON**.

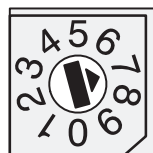
Switch Number	TIME (seconds)					
	2	5	10	20	25	30
9	ON	Off	ON	Off	ON	Off
8	Off	ON	ON	Off	Off	ON
7	Off	Off	Off	ON	ON	ON
6	Off					
5	ENERGY SAVER SELECT					
4	AUXILIARY CONTACT SELECT					
3	STALL SELECT					
2	STOP TIME SELECT					
1	PUMP START SELECT					



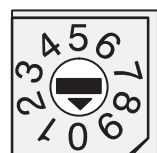
ATTENTION: The user has the ultimate responsibility to determine which stopping mode is best suited to the application and will meet applicable standards for operator safety on a particular machine.



CURRENT LIMIT/
INITIAL TORQUE



PUMP STOP TIME



KICKSTART TIME

EXAMPLE: Pump Stop Time rotary digital switch is set to 40 seconds.

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

Kickstart Time

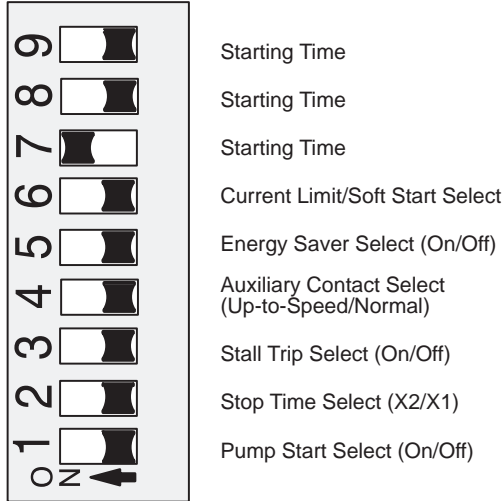
Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0

Pump Stop Time

Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	2	5	10	20	25	30	40	50	60

**Soft Start Selection with
Pump Control Stopping Option**

Figure 1.5 - Set Up Procedures - Soft Start Selection with Pump Control Stopping



EXAMPLE: Above DIP switch is set for 20 second ramp.

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	STOP TIME SELECT					
1	PUMP START SELECT					

- Starting Time –**
Set switches 7-9 according to the period desired for soft starting. **For example**, if you want a ramp of 20 seconds, switch 7 would be **ON** and switches 8 and 9 would be **OFF**.
- Kickstart Time –**
Set Kickstart Time rotary digital switch to the kickstart time desired.
- Initial Torque –**
Set Initial Torque rotary digital switch to the value desired.
- Current Limit/Soft Start –**
For soft start operation, switch 6 must be **OFF**.
- Energy Saver Select –**
Set switch 5 **ON** if you want the energy saver feature (or **OFF** if you do not want this feature active).
- Auxiliary Contact Select –**
Set switch 4 **OFF** if you want “normal” auxiliary contacts, **ON** if you want “up-to-speed” auxiliary contacts.
- 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**.
- Pump Stop Time –**
Set Pump Stop Time rotary digital switch according to the time desired with DIP switch 2 **OFF**. Set DIP switch 2 **ON** to double pump stopping time. **For example**, if you want pump stop time of 40 seconds, set the rotary digital switch to 7. If you want pump stop time of 80 seconds, set the rotary digital switch to 7 and DIP switch 2 **ON**.
- Pump Start Select –**
Set DIP switch 1 to **OFF** which allows soft starting and pump stopping.

Kickstart Time

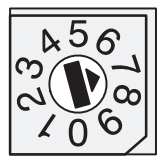
Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0

Initial Torque

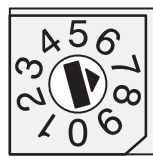
Position	0	1	2	3	4	5	6	7	8	9
% of Locked Rotor Torque	5	10	20	30	40	50	60	70	80	90

Pump Stop Time

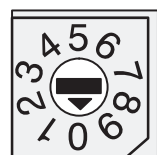
Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	2	5	10	20	25	30	40	50	60



CURRENT LIMIT/
INITIAL TORQUE



PUMP STOP TIME

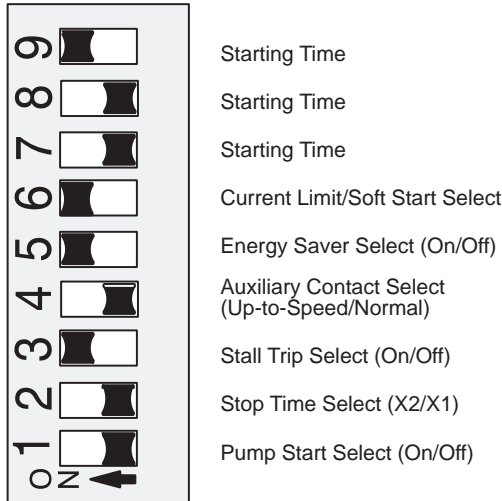


KICKSTART TIME

EXAMPLE: Pump Stop Time rotary digital switch is set to 40 seconds.

**Current Limit Selection with
Pump Control Stopping**

Figure 1.6 - Set Up Procedures - Current Limit Selection with Pump Control Stopping



EXAMPLE: Above DIP switch is set for 30 second current limit.

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	STOP TIME SELECT		
1	PUMP START SELECT		

- Starting Time –**
Set switches 7-9 according to the time 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**.
- Kickstart Time –**
Set rotary digital switch to **OFF**.
- Current Limit/Soft Start –**
Switch 6 must be **ON** in the current limit mode. Set Current Limit rotary digital switch accordingly. **For example**, if you want to restrict the starting current to 300% of full load amperes, set rotary switch to position 5.
- Energy Saver Select –**
Set switch 5 **ON** if you want the energy saver feature (or **OFF** if you do not want this feature active).
- Auxiliary Contact Select –**
Set switch 4 **OFF** if you want “normal” auxiliary contacts, **ON** if you want “up-to-speed” auxiliary contacts.
- Stall Select –**
Set switch 3 **ON** if you want the stall feature (or **OFF** if you do not want this feature active).
- Pump Stop Time –**
Set Pump Stop Time rotary digital switch according to the time desired with DIP switch 2 **OFF**. Set DIP switch 2 **ON** to double pump stopping time. **For example**, if you want pump stop time of 40 seconds, set the rotary digital switch to 7. If you want pump stop time of 80 seconds, set the rotary digital switch to 7 and DIP switch 2 **ON**.
- Pump Start Select –**
Set DIP switch 1 to **OFF** which allows for current limit starting and pump stopping.

Kickstart Time

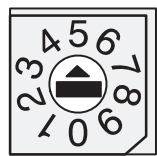
Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0

Current Limit

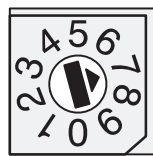
Position	0	1	2	3	4	5	6	7	8	9
% of Full Load Current	50	100	150	200	250	300	350	400	450	500

Pump Stop Time

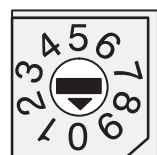
Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	2	5	10	20	25	30	40	50	60



CURRENT LIMIT/
INITIAL TORQUE



PUMP STOP TIME

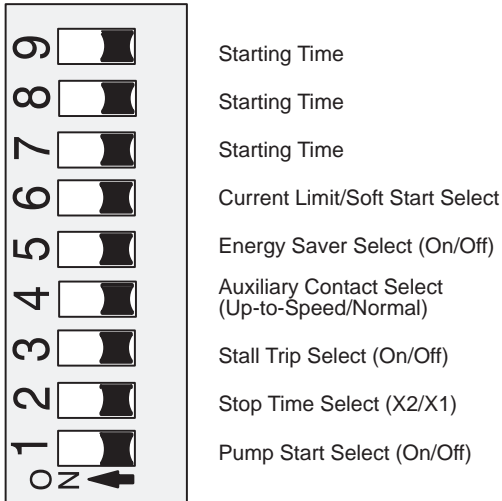


KICKSTART TIME

EXAMPLE: Pump Stop Time rotary digital switch is set to 40 seconds.

**Full Voltage Selection with
Pump Control Stopping Option**

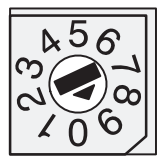
Figure 1.7 - Set Up Procedures - Full Voltage Selection with Pump Control Stopping



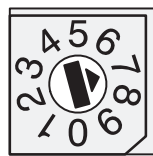
EXAMPLE: Above DIP switch is set for full voltage start.

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	STOP TIME SELECT
1	PUMP START SELECT

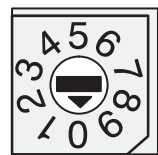
- Starting Time** – Set switches 7-9 **OFF** and switch 6 **OFF**.
- Kickstart Time** – Set to 0.
- Initial Torque** – Set to 9.
- Current Limit/Soft Start** – For full voltage operation, switch 6 must be **OFF**.
- Energy Saver Select** – Set switch 5 **ON** if you want the energy saver feature (or **OFF** if you do not want this feature active).
- Auxiliary Contact Select** – Set switch 4 **OFF** if you want “normal” auxiliary contacts, **ON** if you want “up-to-speed” auxiliary contacts.
- 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**.
- Pump Stop Time** – Set Pump Stop Time rotary digital switch according to the time desired with DIP switch 2 **OFF**. Set DIP switch 2 **ON** to double pump stopping time. **For example**, if you want pump stop time of 40 seconds, set the rotary digital switch to 7. If you want pump stop time of 80 seconds, set the rotary digital switch to 7 and DIP switch 2 **ON**.
- Pump Start Select** – Set DIP switch 1 to **OFF** which allows soft starting and pump stopping.



CURRENT LIMIT/
INITIAL TORQUE



PUMP STOP TIME



KICKSTART TIME

EXAMPLE: Pump Stop Time rotary digital switch is set to 40 seconds.

Kickstart Time

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

Pump Stop Time

Position	0	1	2	3	4	5	6	7	8	9
Time (seconds)	Off	2	5	10	20	25	30	40	50	60

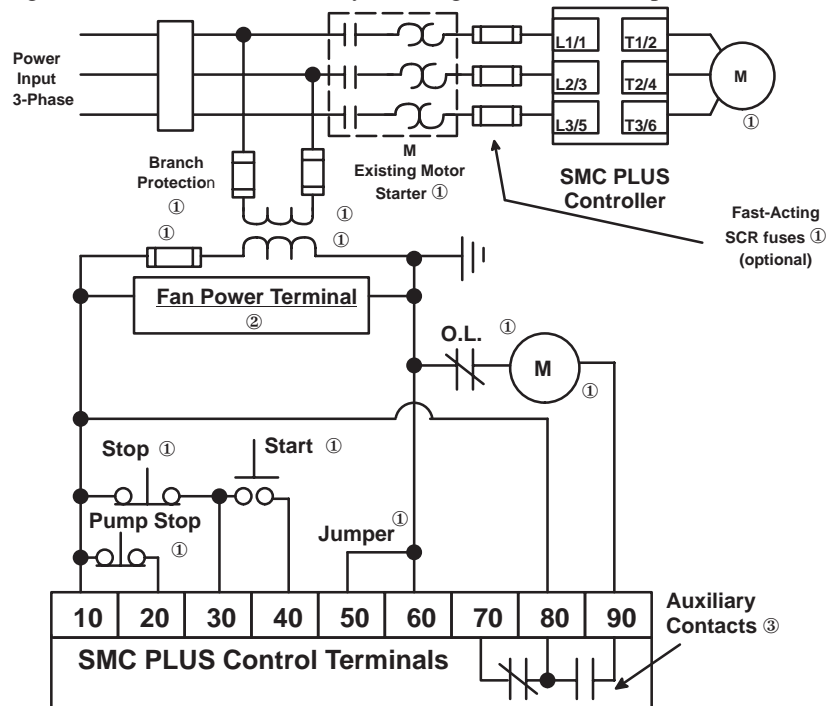
**Typical Connection
for Retrofit Application
with Pump Control Option**

**Figure 1.8 - Typical Connection
Diagram Retrofit Application**

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

- 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 Set auxiliary contacts for normal setting.

Typical connection diagram for retrofit applications: Figure 1.8 shows the typical diagram to use when retrofitting a SMC PLUS with Pump Control into an existing control scheme. Starting and stopping of the motor is handled by the controller. Be sure the outgoing side of the motor starter coil is routed through terminals 80 and 90 to insure the starter stays on long enough to allow pump stopping to occur and that the auxiliary is configured for normal operation.



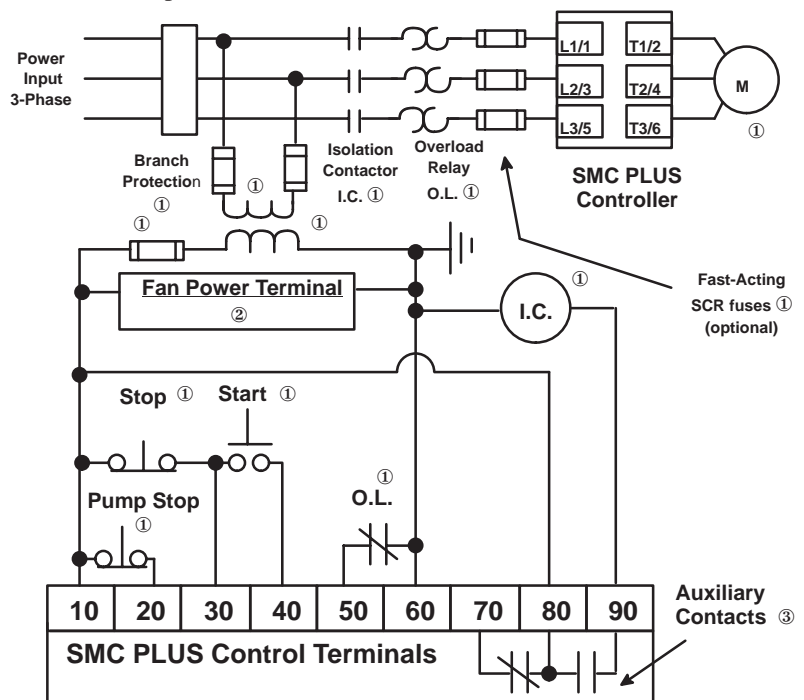
**Typical Connection
with Isolation Contactor**

**Figure 1.9 - Typical Connection
Diagram with Isolation Contactor**

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

- 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 Set auxiliary contacts for normal setting.

Typical connection diagram for Pump Control 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.



By-Pass Mode

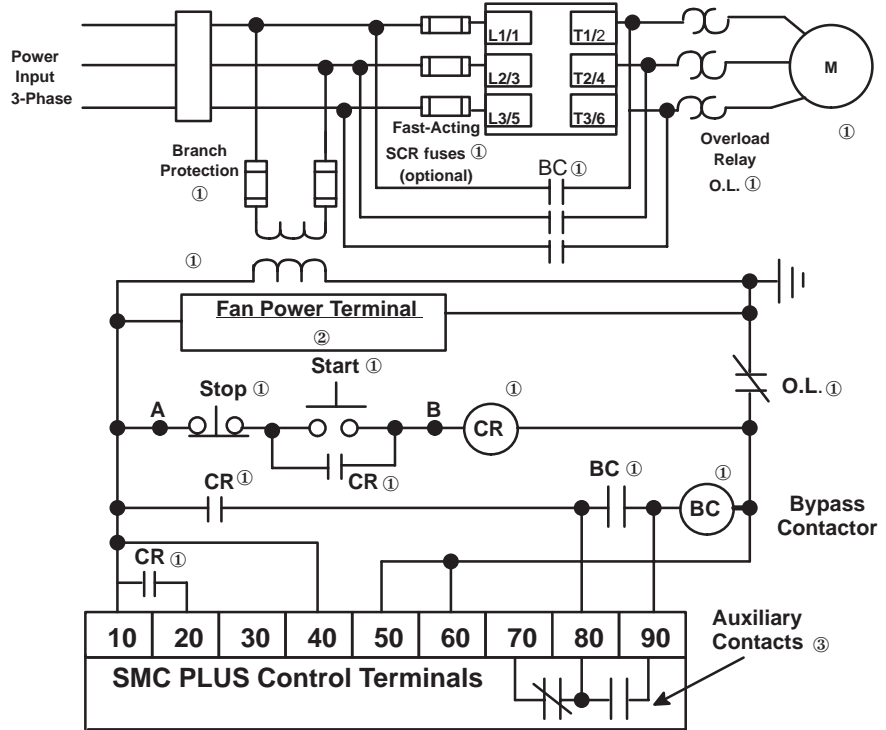
Typical connection diagram of a by-pass contactor: By using the following circuit starting and stopping can be realized with the controller bringing the bypass contactor on for normal full speed operation. **NOTE:** Because the controller is bypassed during this mode, controller features are not available when contactor is energized.

Figure 1.10 - Typical Application Diagram of a By-Pass Contactor

WARNING: 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.

NOTE: For two wire control, remove stop/start pushbuttons, jumper between 10 and 40, and connect two wire device between A and B.

- 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 Set auxiliary contacts for normal setting.



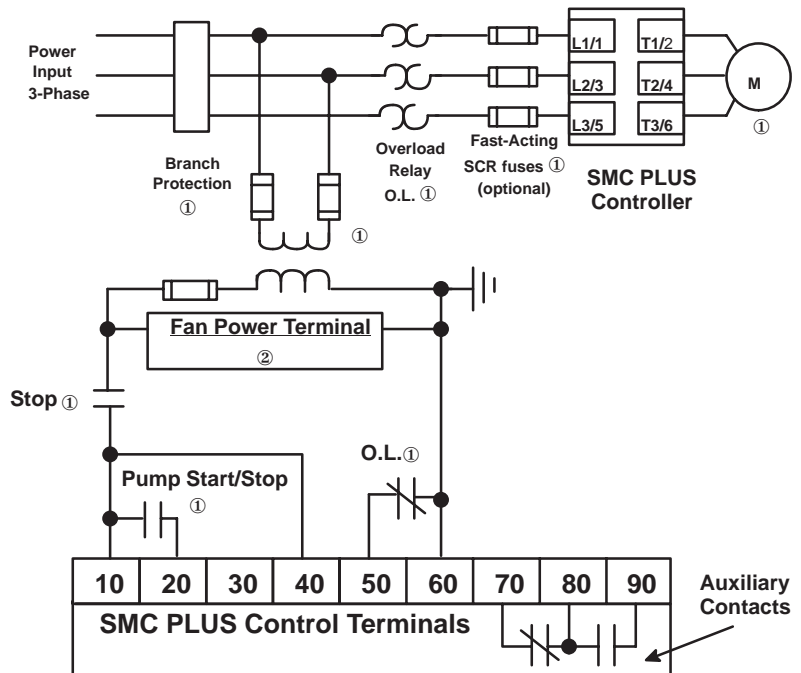
Programmable Controller and Sensor Interface

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 25mA at 120 VAC and 50 mA at 240 VAC.

Figure 1.11 - Typical Connection with PLC or other Logic Devices

WARNING: 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.

- 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 Set auxiliary contacts for normal setting.



**Typical Connection
with Shunt Trip
Circuit Breaker**

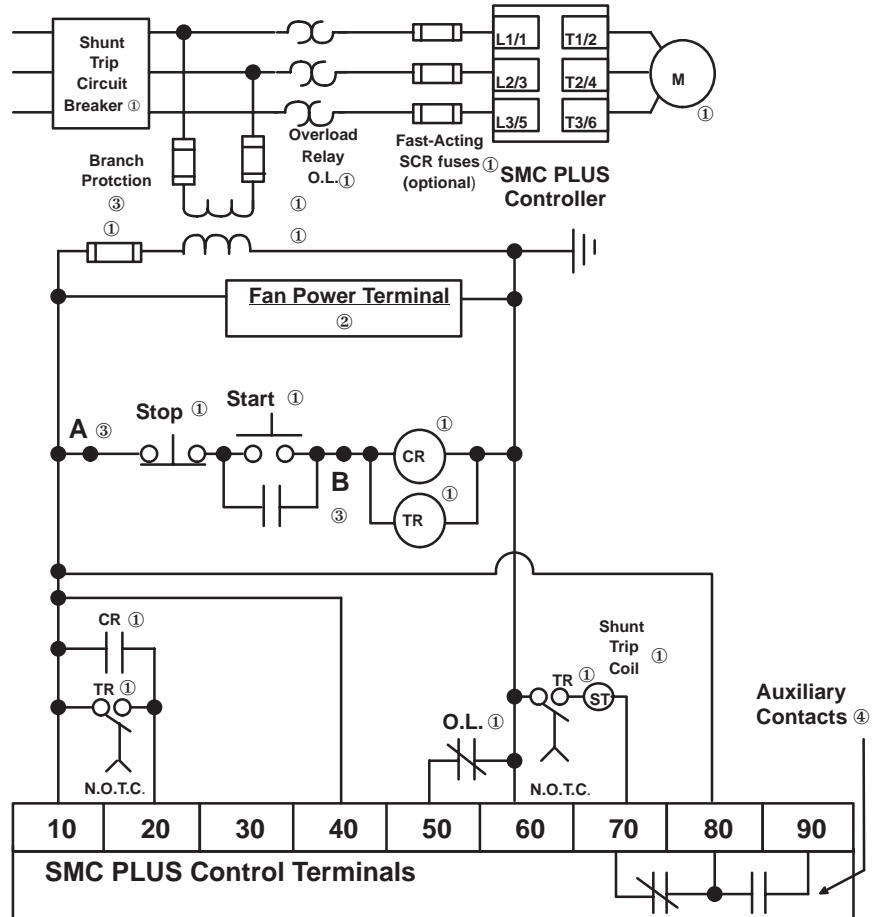
**Figure 1.12 - Typical Connection
Diagram with Shunt Trip
Circuit Breaker**

WARNING: 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.

NOTE: For two wire control, remove stop/start pushbuttons, jumper between 10 and 40, and connect two wire device between A and B.

- 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.

Typical connection diagram with shunt trip breaker: To use the Pump Control Option with a shunt trip breaker a control relay and a timing relay are required. The timing relays used to prevent tripping before the motor has had a chance to start and to prevent nuisance tripping of breaker for stopping.





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