sprecher+schuh

PG Softstarter Installation Manual for 24A, 35A, 54A, 68A and 97A

Revised 5/1/99

Important User Information

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Sprecher + Schuh cannot assume responsibility or liability for actual use based on the examples and diagrams. In no event will Sprecher + Schuh be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment. Reproduction of the contents of this manual, in whole or in part, without written permission of Sprecher + Schuh is prohibited.

Precautionary Notes

In this manual you will see the following types of precautionary statements: **Bold type** points out specific areas of concern that are critical to your understanding or use of the product.

WARNINGS: tell you where people may be hurt if procedures are not followed propery.

CAUTIONS: tell you where machinery may be damaged or economic loss can occur if procedures are not followed properly.

Section A:
Specifications

CONTROLLER	RATINGS	
Dielectric Withstand	AC: 2.5 kV	
Utilization Category	AC-3	
SCPD Performance	Type 1	
SCPD List	Fuses and circuit breaker selection	
Device Rating	Non-Time Delay Fuses	Inverse Time Circuit Breaker
24A	80A	80A
35A	125A	125A
54A	200A	200A
68A	250A	250A
97A	350A	350A
Rated Operation Voltage (U_e)	AC: 500V	
Rated Insulation Voltage (U_i)	AC: 500V	
Rated Impulse Voltage	3.4kV	
Operating Frequency	50Hz/60Hz	
Control Circuit Voltage	AC: 240V, 50/60Hz or AC: 120V, 50/60Hz	
Protection Against Electric Shock	Protection Class I (Open device)	
Installation Category	Installation Category III	
Overvoltage Class	Overvoltage Class II	
Operating Temperature Range	0°C to 50°C (open) 0°C to 40°C (enclosed)	
Storage and Transportation Temperature Range	-40°C to 85°C	

AUXILIARY CONTACT	RATINGS
Dielectric Withstand	AC: 2.0 kV
Utilization Category	AC-15 and DC-13
SCPD Performance	Type 1
SCPD List	Fuse: Class CC8 Amp
Rated Operation Voltage (U_e)	AC: 240V
Rated Insulation Voltage (U_i)	AC: 300V
Operating Frequency	50Hz/60Hz
Control Circuit Voltage	AC: 240V, 50/60Hz, PU and DO
Pollution Degree	Pollution Degree 2
Operating Temperature Range	0°C to 50°C (open) 0°C to 40°C (enclosed)
Storage and Transportation Temperature Range	-40°C to 85°C
Rated Impulse	2000 volts

Section B: Installation and Wiring

Inspection

Before installing the controller, make a complete visual check of the controller for damage in shipment or handling. Claims for damaged or missing parts must be made to the carrier as soon as possible after receipt of shipment.

Enclosures

The following are guidelines for installing the open-style device in an enclosure:

Table B.1 - Enclosure Recommendations

Amp Rating		Minimum NEMA 1 Vented	Vented Area (Top & Bottom-Door)	Minimum Type 12/4 W/100 CFM Circulating Fan
24	mm	610 H x 305 W x 230 D	142 cm^2	610 H x 305 W x 230 D
	inch	24" H x 12" W x 9" D	22 in^2	24" H x 12" W x 9" D
35	mm	610 H x 410 W x 230 D	142 cm^2	610 H x 305 W x 230 D
	inch	24" H x 16" W x 9" D	22 in^2	24" H x 12" W x 9" D
54	mm	610 H x 610 W x 305 D	142 cm^2	610 H x 610 W x 305 D
	inch	24" H x 24" W x 12" D	22 in^2	24" H x 24" W x 12" D
68	mm	762 H x 610 W x 305 D ❶	142 cm^2	762 H x 610 W x 305 D
	inch	30" H x 24" W x 12" D ❶	22 in^2	30" H x 24" W x 12" D
97	mm	762 H x 610 W x 305 D ❶	142 cm^2	762 H 610 W X 305 D ❷
	inch	30" H x 24" W x 12" D ❶	22 in^2	30" X 24" X 12"D ❷

❶ For the 68A and 97A controllers in NEMA Type 1 enclosures, ventilated openings are required above and below the controller. An outlet should be placed above the controller. The inlet should be placed near the bottom of the enclosures. It should be capable of accepting a fan rated 100 CFM or greater. A filter is required to prevent contaminants from entering the enclosure. The minimum vent area should be 5.6 square inches.

❷ For the 97A controller in type 12/4 enclosure, a by-pass contactor is required instead of a circulating fan.

The following table shows the maximum heat dissipation at rated current for the controllers.

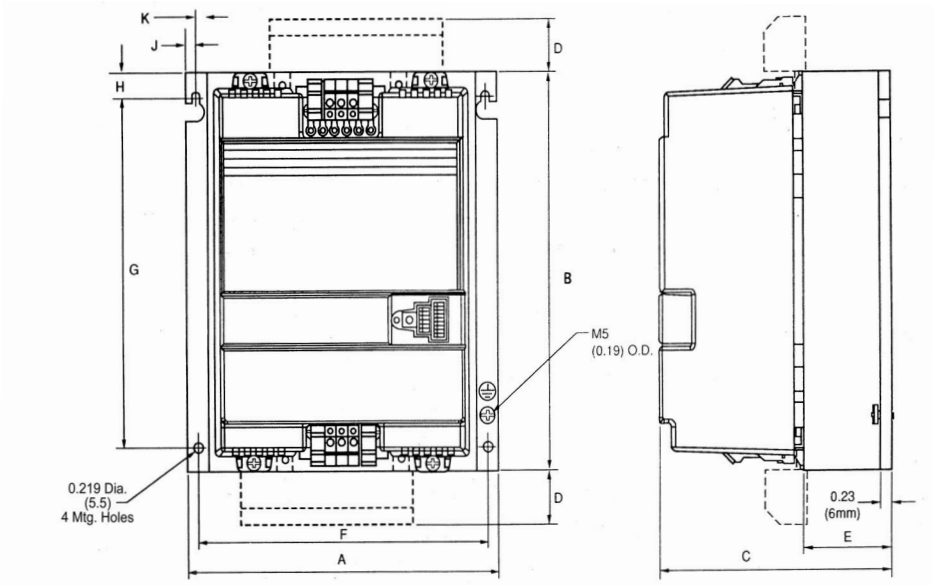
Table B.2 - Maximum Heat Dissipation

	Controller Current Rating				
	24A	**35A**	**54A**	**68A**	**97A**
Maximum Watts	80	120	170	215	285

Mounting

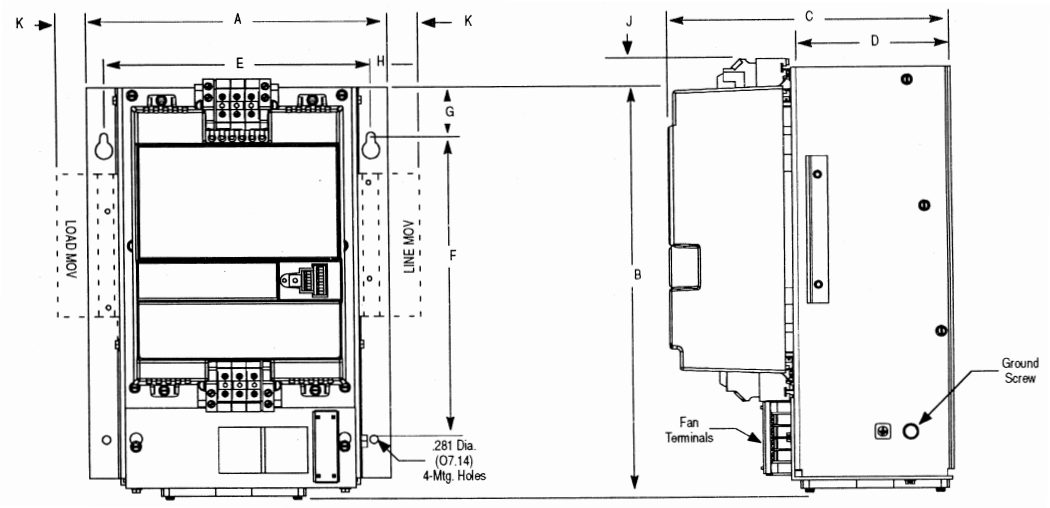
The controller is convection cooled. It is important to locate the controller in a position that allows free air flow vertically through the controller. The controller must be mounted with heatsink fins in a vertical plane for maximum cooling. See Figures B.1 and B.2.

Figure B.1 - 24A to 68A Dimension Drawing (Dimensions are approximate and not intended for manufacturing.)



Controller	Unit	A Width	B Height	C Depth	D	E	F	G	H	J	K	Approx. Ship Wt.
24-35A	mm	214	250	160	34	60	200	220	15	7	8	4.5 kg
	inch	8.42	9.84	6.29	1.34	2.36	7.87	8.66	0.59	0.27	0.32	10 lbs
54-68A	mm	244	290	190	34	90	230	250	20	7	8	6.8 kg
	inch	9.61	11.42	7.48	1.34	3.54	9.06	9.84	0.79	0.27	0.32	15 lbs

Figure B.2 - 97A Dimension Drawing (Dimensions are approximate and not intended for manufacturing.)



Controller	Unit	A Width	B Height	C Depth	D	E	F	G	H	J	K	Approx. Ship Wt.
97A	mm	248	336	230	128	220	250	40	14	9.5	25.4	10.5 kg
	inch	9.78	13.24	9.00	5.05	8.67	9.86	1.62	.55	0.38	1.00	23 lbs

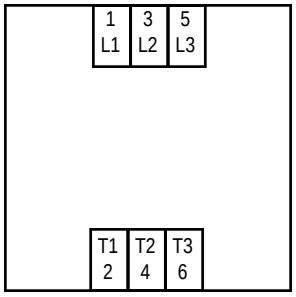
Wiring

The controller wiring terminal locations are shown in Figure B.3. Make wiring connections as indicated in the typical connection diagrams shown in Figures B.5, B.6, B.8, B.9, B.10, B.11 and B.12. Connect the line to terminals L1/1, L2/3, and L3/5. Connect the load to terminals T1/2, T2/4, and T3/6. A provision is available for grounding the isolated heatsink per applicable codes. Use Table B.3 as a guide for wiring. Select exact wire per applicable electrical codes.

Table B.3 - Power and Control Terminal Block Wire Size and Tightening Torque

Controller	Power				Control
	24A/35A	54A	68A	97A	24-97A
Wire Size	0.96 - 10mm^2 18 - 8 AWG	0.38 - 25mm^2 18 - 4 AWG	35mm^2 18 - 2 AWG	50mm^2 18 - 1/0 AWG	2.1 - 3.3mm^2 22 - 14 AWG
Torque	1.6N-m 14 lb-in	2.3N-m 20 lb-in	5.7N-m 50 lb-in	5.7N-m 50 lb-in	0.8N-m 7 lb-in

Figure B.3 Power Wiring

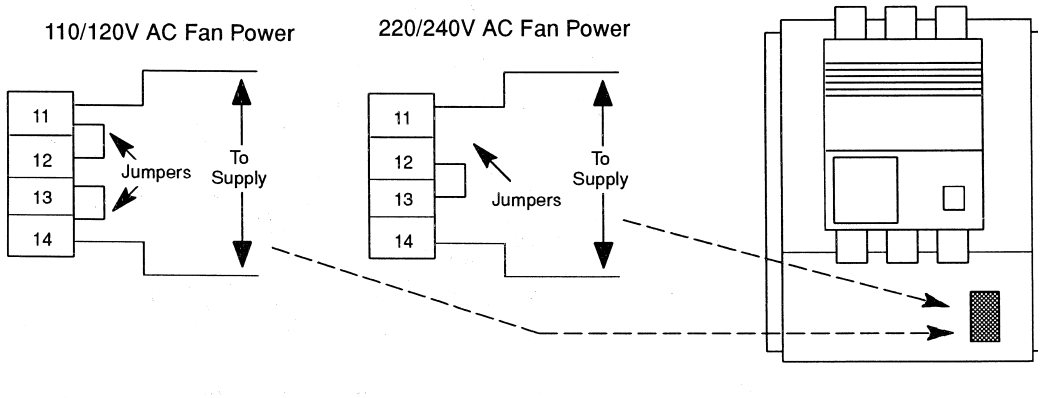


Fan Power

The 97 Amp controllers have a heatsink fan that requires an additional 45VA capacity. To gain access to the fan connection, see Figure B.4.

WARNING: Fan jumpers on "Open" units will be factory installed for 220/240V AC, Optional 110/120V AC. Refer to Figure B.4 for fan wiring. After control wiring is complete, replace control terminal strip cover.

Figure B.4 - Location of Fan Wiring and Jumpers for 97A Controller

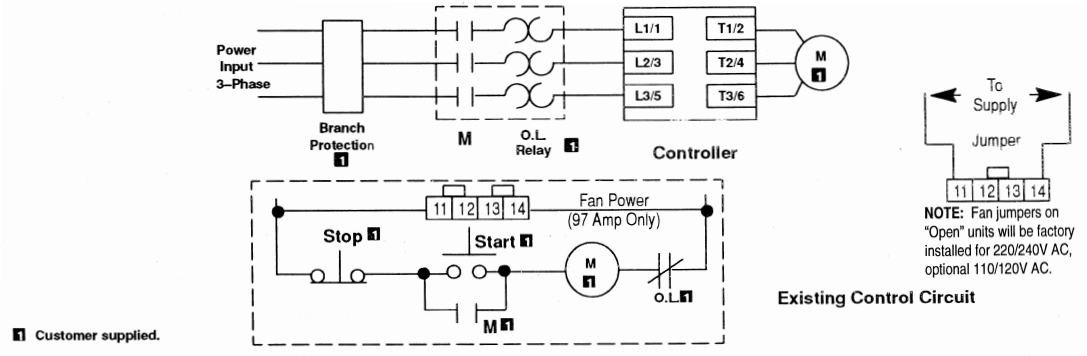


NOTE: Fan jumpers on "Open" units will be factory installed for 220/240V AC, optional 110/120V AC.

Series Controller Mode

This design requires an electromechanical starter on the line side of the unit. The controller requires no control voltage input. See Figure B.5.

Figure B.5 - Series Controller Mode



Description of Interface Option

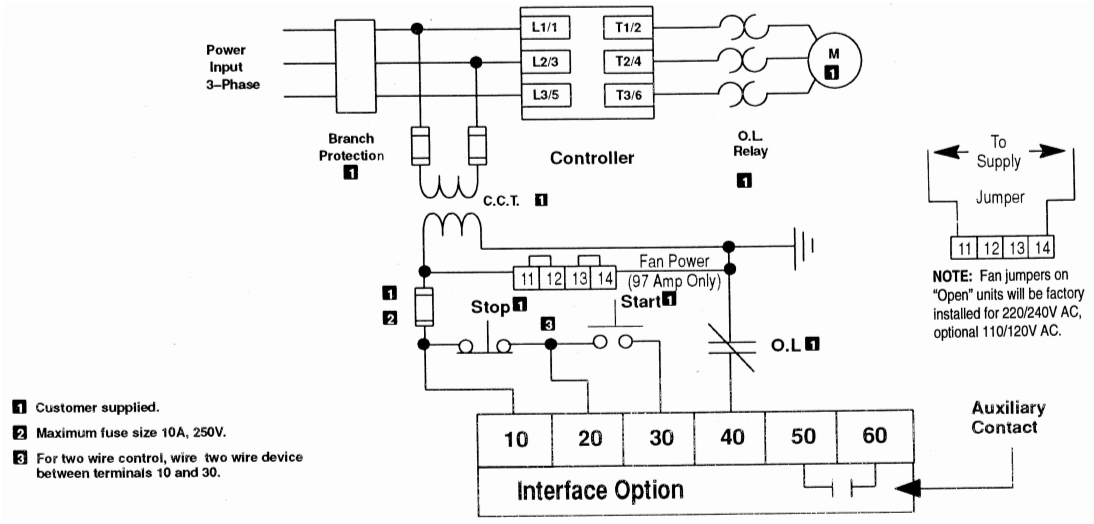
The PG controller is designed to be operated by an external device. An interface option can be supplied that enhances the capabilities of the PG controller. This option can be field or factory installed and offers the following features:

- Provides ON/OFF control directly to the controller through an external device. In many applications using the interface option may eliminate the need for an additional contactor if electrical isolation or soft stop is not required. This reduces required panel space.
- Provides a selectable auxiliary contact which operates as either an instantaneous or up-to-speed contact making it available for a wide variety of control schemes.
- Provides a Soft Stop feature that extends stopping time to minimize load shifting or spillage during stopping.

Wiring with Interface Module

Control power requirement for interface module is 5VA at 120V and 15VA at 240V. Auxiliary contact rating is NEMA C300, 2.5 Amps, 20-250V AC; 1 Amp, 12-30V DC. In addition, 45VA capacity is required to operate the heatsink fan on the 97 Amp controller.

Figure B.6 Typical Connection Diagram



Programmable Controller and Sensor Interface

When using solid-state devices to operate the PG controller with the interface module, the ON-state voltage range and frequency will be 100-120V, 50/60 Hz, if the 120 volt interface module is used. The ON-state voltage and frequency range will be 200-240V, 50/60 Hz, for the 240 volt interface module. The OFF-state leakage current from the solid-state device must be less than 6mA. The nominal input current is 25mA at 120 VAC and 50mA at 240 VAC.

Grounding Provision

Provisions for connecting a field installed grounding conductor is provided on each controller. It is shown in Figure B.7 and is located on the heatsink. This symbol is the ground connection identification symbol as defined by IEC Publication 417, Symbol 5019.

If the protective conductor is not connected to the heat sink, then the plating and/or paint must be cleaned from the four mounting holes or four star washers (tooth lock washers must be used).

Figure B.7 Grounding Provision

Isolation Contactor

An isolation contactor is used to provide electrical isolation of the controller and motor circuit when the controller is shut down by either manually pressing the stop button, or automatically by the occurrence of abnormal conditions.

WARNING: When not using an isolation contactor, hazardous voltages are present at the load terminals of the controller even when the controller is turned off. Warning labels must be attached to the motor terminal box, the controller enclosure, and the control station. Additional circuitry must be included to provide automatic isolation.

Figure B.8 - Typical Connection with Interface Option and Isolation Contactor

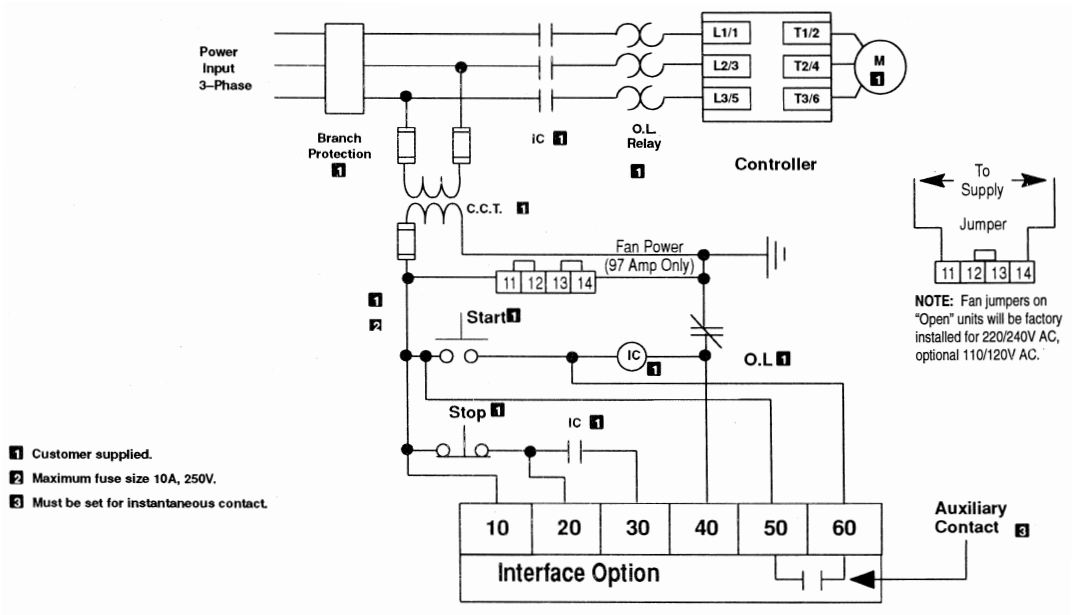


Figure B.9 - Typical Connection with Two-Wire Control Scheme for Soft Start and Soft Stop

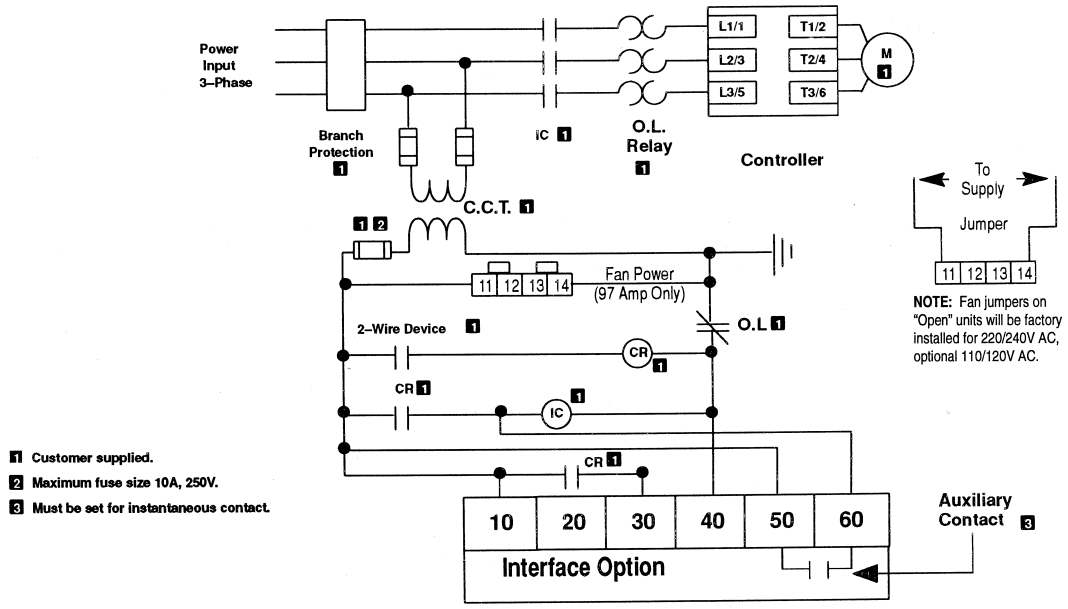
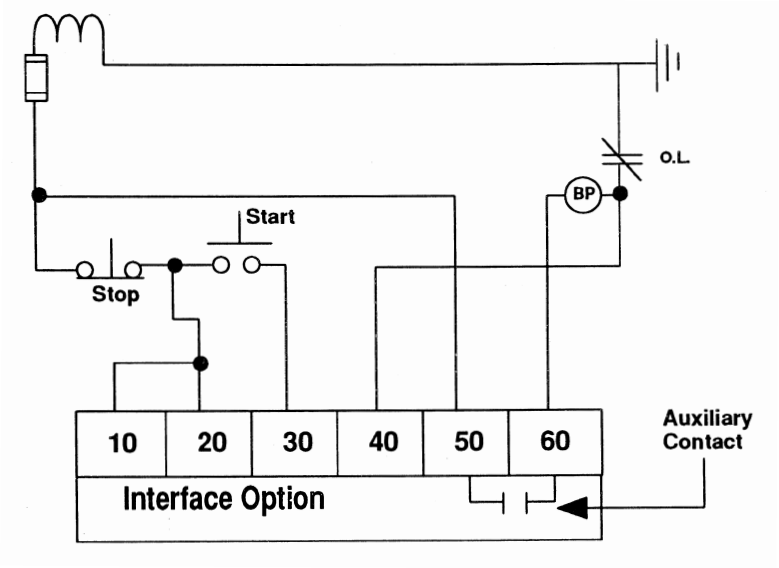


Figure B.10 - Typical Connection with Bypass Contactor for 24-97A Units Only.



NOTE: For two wire control, replace the stop button with a two wire device. Jumper terminals 10 and 30. Remove the wire from terminal 20.

Power Factor Capacitors

The controller can be installed on a system with power factor correction capacitors. The capacitors must be located on the line side of the controller. This must be done to prevent damage to the SCRs in the PG controller.

Fast Acting Current-Limiting Fuses

Fast acting current limiting fuses are coordinated with the SCRs for protection of the SCRs in the event of short circuits in the load. Refer to Table B.4 for recommended fast acting current limiting fuses.

Table B.4 - Fast Acting Current-Limiting Fuses

Fuse Manufacturer	PG Controller Rating				
	24 AMP	35 AMP	54 AMP	68 AMP	97 AMP
Shawmut	A70P60	A70P80	A70P175	A70P175	A70P175
Buss	SPP-4F60	SPP-4F80	SPP-4F150	SPP-4F150	SPP-4F150
Brush	XL70F060	XL70F070	XL70F150	XL70F150	XL70F150

NOTES:
1. Fuse numbers are manufacturer's catalog number.
2. Fuse size listed is for 230, 460, or 575 volt.

CAUTION: The fast acting current-limiting fuses specified in the above table do not provide branch circuit protection. Branch circuit protection in accordance with applicable electrical codes is required even though fast acting current-limiting fuses are used.

Motor Overload Protection

Thermal motor overload protection is not provided. It should be separately provided. The overload trip time should be greater than the acceleration time to avoid nuisance tripping.

CAUTION: Overload relays should be properly coordinated with the motor.

Protective Module (optional)

A protective module containing metal oxide varistors (MOVs) and snubbers can be installed to protect the power components from electrical transients and/or high electrical noise. The protective modules clip voltage transients generated on the lines and prevent such surges from damaging the SCRs. The snubbers in the protective modules are used to shunt noise energy away from the controller electronics.

There are two general situations that can occur which would indicate the need for utilizing the protective modules.

1. Transient voltage spikes can occur on the lines feeding the controller (or feeding the load from the controller). Lightning can cause these spikes. These spikes are also created on the lines when devices are attached to the same lines with current carrying inductances that are then open-circuited. The energy stored in the magnetic field is released when the contacts open the circuit. Examples of these are lightly loaded motors, transformers, solenoids, and electromechanical brakes.

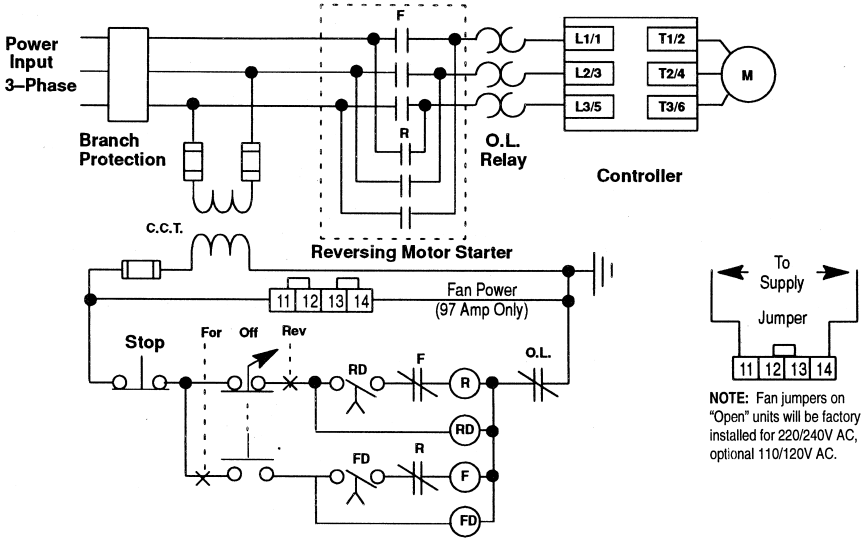
2. The second situation arises when the controller is installed on a system which has fast-rising wavefronts present, although not necessarily high peak voltages. Lightning strikes can cause this type of response. Additionally, if the controller is on the same bus as AC/DC drives, induction heating equipment, and welding equipment, the firing of the SCRs in those devices can cause voltage induced noise. This high frequency noise can penetrate the controller through stray capacitance always present in real systems.

WARNING: When installing or inspecting the protective module, make sure the controller has been disconnected from the power source. The protective module must be checked periodically for damage. Inspect for damage or discoloration. Replace if necessary.

Single-Speed, Reversing Starters (Series Controller Mode)

By using the controller as shown in Figure B.11, the motor accelerates under a controlled start mode in either direction. **NOTE:** Minimum transition time for direction change is 1/2 second.

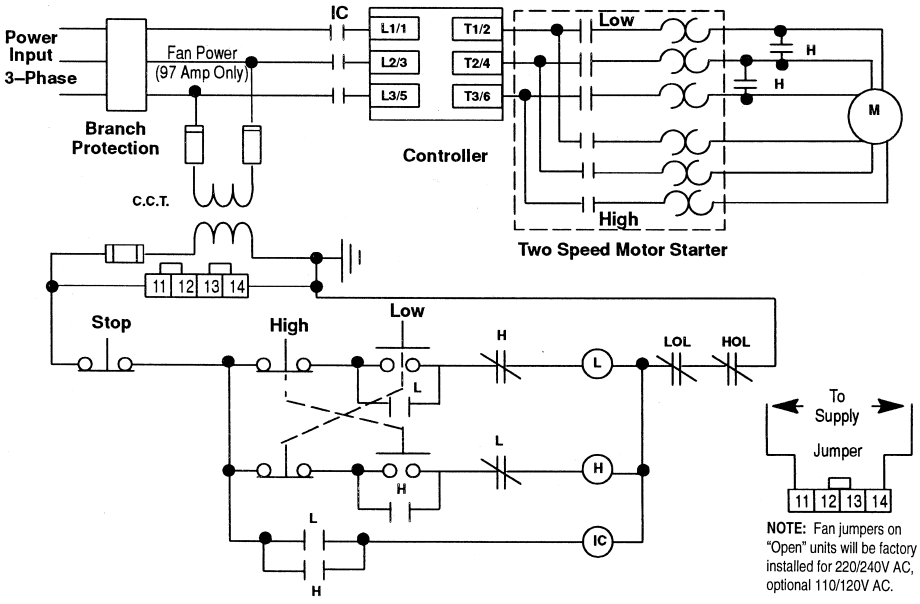
Figure B.11 - Typical Application with a Single Speed, Reversing Starter



Two-Speed, Two-Winding, Non-Reversing Starters (Series Controller Mode)

By using the controller in this fashion, the motor accelerates in a controlled manner when in "Low" or "High" speed. The isolation contactor is used to provide automatic isolation from the power source. Recommendations for an isolation contactor are detailed on page 7.

Figure B.12 - Typical Application with a Two-Speed Motor Starter



Section C: Set-Up Procedures

Start and Stop Sequences Without Interface Option

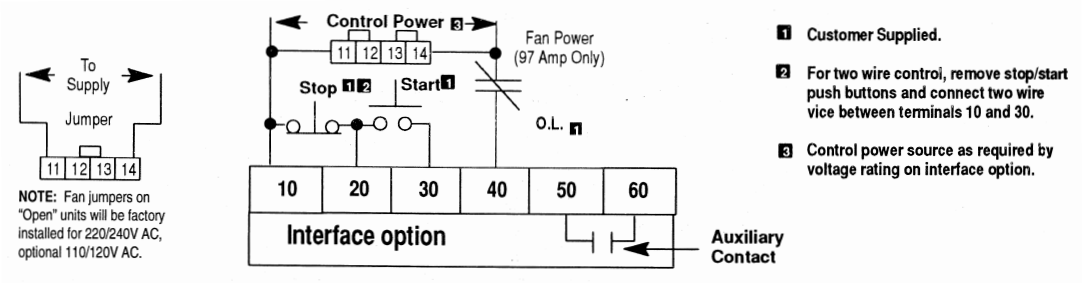
The PG controller, without the interface option, is designed to operate as a series controller. Refer to Figure B.5 on page 6. It is wired between an electromechanical starter and the motor. When the starter is energized, three-phase power is delivered to the line side of the PG controller. This causes it to automatically go through the start sequence. No control inputs are required.

Without the interface option, all that is required to stop the PG controller is to remove three-phase power from the line side of the unit. This is accomplished by de-energizing the electromechanical starter.

With Interface Option

When the PG controller has the interface option installed, the controller operates using 3-wire control. See Figure C.1 below.

Figure C.1 - Typical Connection Diagram when Interface Option is Used



In this mode, the controller can operate with or without an electromechanical contactor. The unit is operated by pressing the start button. The internal hold-in circuit latches across terminals 20 and 30, and the auxiliary contact changes state (if so selected on the DIP switches). The controller then goes through the selected start sequence. See Figure B.6 and B.8 for complete wiring.

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.

With the interface option, there are two methods of stopping: normal coast-to-stop and Soft Stop. To use coast-to-stop, the Soft Stop DIP switches (1 and 2) must be turned off. Simply pressing the stop button initiates stop.

Soft Stopping requires that the unit be preset, that is the Soft Stop DIP switches (1 and 2) must be in the ON position, and the appropriate DIP switches must be set for the time required for stopping.

Overload Trips

When an overload trip occurs, the normally closed contact (wired into terminal 40) opens, causing the controller logic to shut off immediately.

Fault Trips

There is a single red LED on the front of the PG controller for diagnostic indication. When three-phase power is applied to the controller, the LED will be on.

The PG controller monitors the following fault conditions:

- Shorted SCR (pre-start only)
- Phase Loss (line side and pre-start only)
- Stalled Motor (when stall switch is on)

If a shorted SCR or phase loss exists, the PG controller will not start and the LED will flash. If a stalled motor condition exists, the controller shuts down and flashes the LED. In the event three-phase input power is lost, the LED turns off.

Stalled Motor

The controller is designed to sense motor stall in both the "Starting" and "Running" modes. If during the "Starting" cycle, the controller senses that the motor is stalled and if the motor remains stalled, the controller shuts down in a predetermined time based on the selected ramp time. In the "Running" mode, the controller will trip in 4 seconds in the event of a locked rotor condition. The LED flashes in either case. Starting stall trip times are illustrated in Table C.1.

Table C.1 - Starting Stall Trip Characteristics

Maximum Stall Trip Times from Start (sec)		4	6	9	14	24	29	34	19	34
Start Times (sec)	Soft Start	-	2	5	10	20	25	30	-	-
	Current Limit	-	-	-	-	--	-	-	15	30
	Full Voltage	1/10	-	-	-	-	-	-	-	-

Energy Saver

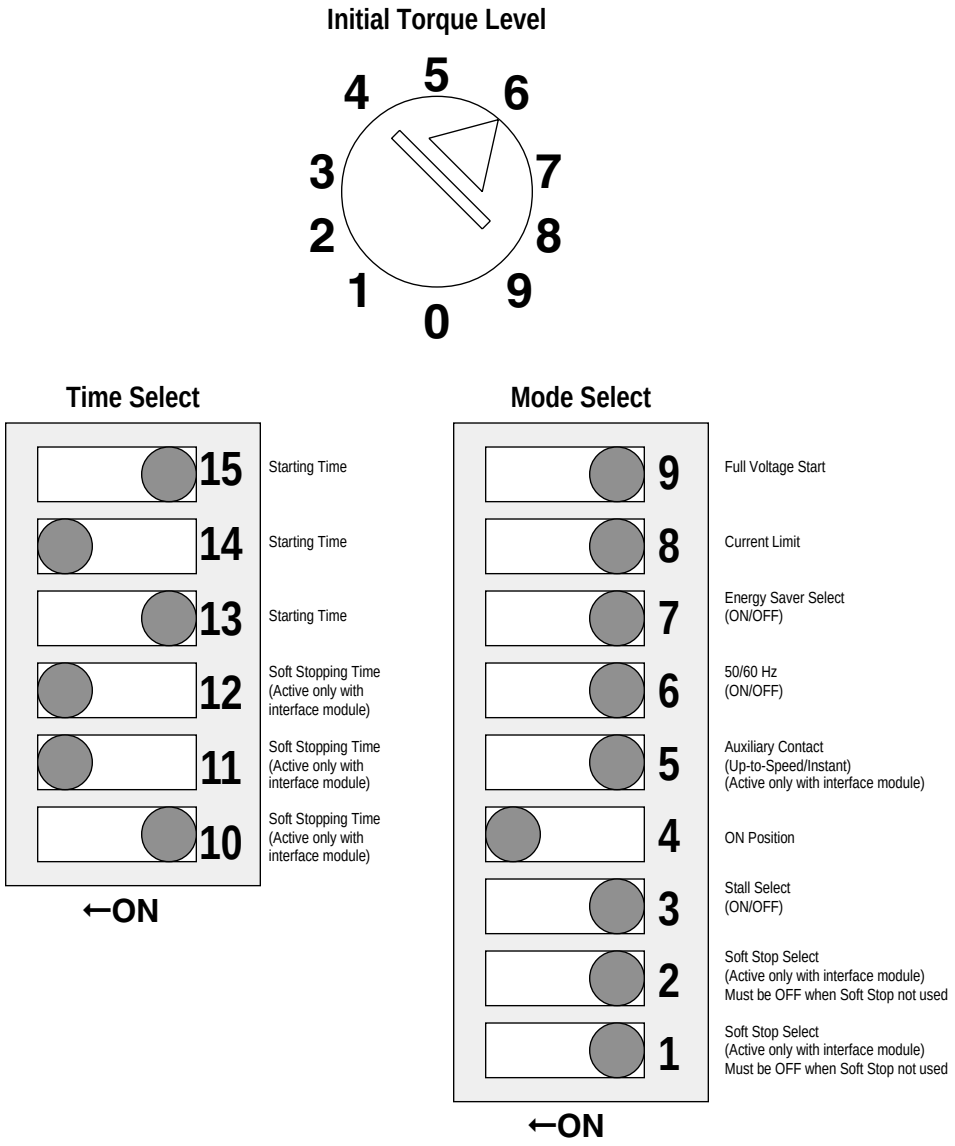
This is a built-in feature with the PG controller. It is used to save energy on applications where the motor is lightly loaded or unloaded for long periods of time.

Factory Settings

The controller has been factory set for the following parameters (refer to Figure C.2):

- 10 Second Soft Start
- Initial Torque 30%
- Current Limit "OFF"
- Energy Saver "OFF"
- 60 Hz
- Auxiliary Contact "OFF"
- Stall feature "OFF"
- Full Voltage "OFF"
- Soft Stop "OFF"

Figure C.2 - Factory Switch Settings



Customer Settings

After the controller has been installed, further set-up may be necessary. This set-up is accomplished through DIP and rotary digital switches located on the front of the controller. If the factory settings are not suitable for the specific application, pages 14 through 19 describe how to set the unit for Soft Start, Current Limit and Full Voltage Starting.

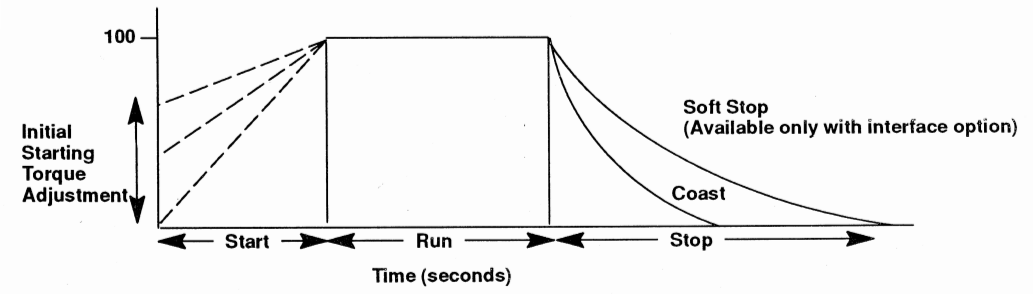
WARNING: Disconnect power before making adjustments to DIP and rotary digital switches.

Soft Start

This method has the most general application. The motor voltage gradually increases during the acceleration ramp period, which can be adjusted from 2 to 30 seconds nominal. The controller is shipped with the acceleration ramp period set for 10 seconds. Therefore, in most cases, resetting the controller is not required.

NOTE: The time it takes for the motor to come up to speed or come down to rest will differ from the time set dependent upon frictional and inertial characteristics of the system.

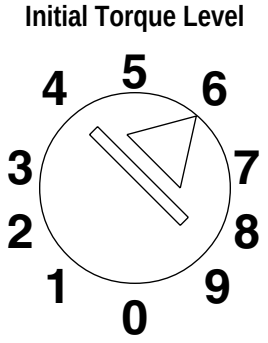
Figure C.3 Soft Start

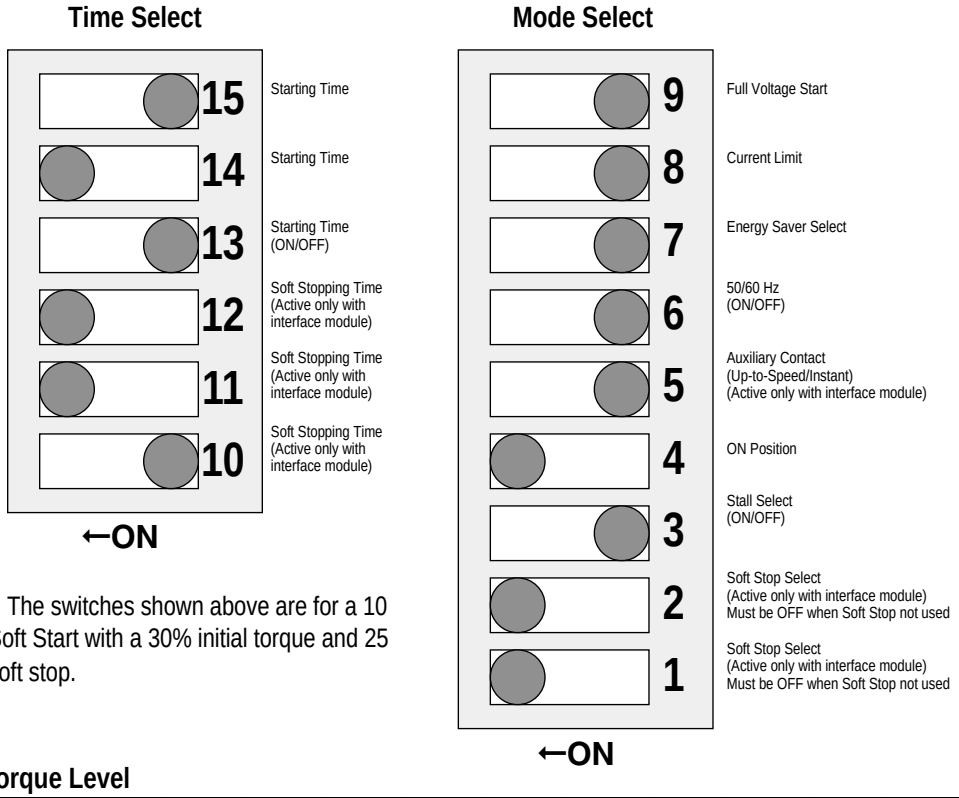


Soft Start Selection

1. Set Initial Torque rotary digital switch to the desired setting. Refer to the next page.
2. Adjust DIP switches, 13, 14 and 15 for soft start time. Refer to the next page for settings.
3. Set Energy Save DIP switch 7 to ON for energy savings. Set Stall DIP switch 3 to ON for stall protection.
4. Soft Stop is only available with the interface option. Set Soft Stop Select DIP switches 1 and 2 to ON for soft stop. Set DIP switches 10, 11, and 12 for stopping time. Refer to the next page for settings.
5. Auxiliary contact is only available with the interface option. Set mode of the auxiliary contact with DIP switch 5. Set to OFF for instantaneous, ON for up-to-speed.
6. Switch 4 should be ON.
7. Switches 8 and 9 should be OFF.
8. Set switch 6 for line frequency (ON for 50 Hz, OFF for 60 Hz).

Figure C.4 - Soft Start Settings





NOTE: The switches shown above are for a 10 second Soft Start with a 30% initial torque and 25 second soft stop.

Initial Torque Level

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

Soft Stop (Available only with interface module)

Switch Number	Time (seconds)							
	5	10	15	25	35	45	55	110
12	Off	**ON**	Off	**ON**	Off	**ON**	Off	**ON**
11	Off	Off	**ON**	**ON**	Off	Off	**ON**	**ON**
10	Off	Off	Off	Off	**ON**	**ON**	**ON**	**ON**

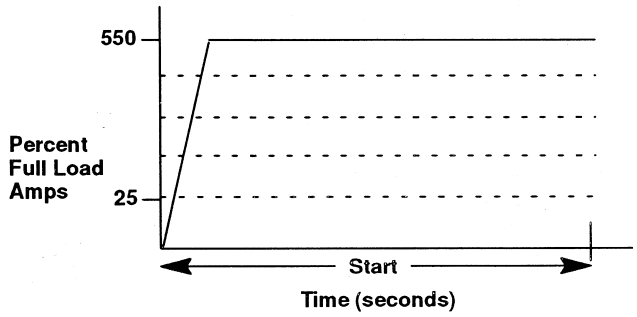
Soft Start Time

Switch Number	Time (seconds)						
	2	5	10	15	20	25	30
15	Off	**ON**	Off	**ON**	Off	**ON**	Off
14	Off	Off	**ON**	**ON**	Off	Off	**ON**
13	Off	Off	Off	Off	**ON**	**ON**	**ON**

Current Limit

This starting mode is used when it is necessary to limit the maximum starting current. The current limit is adjusted according to starting current restrictions. This can be adjusted from 25 to 550% of nominal full load amperes.

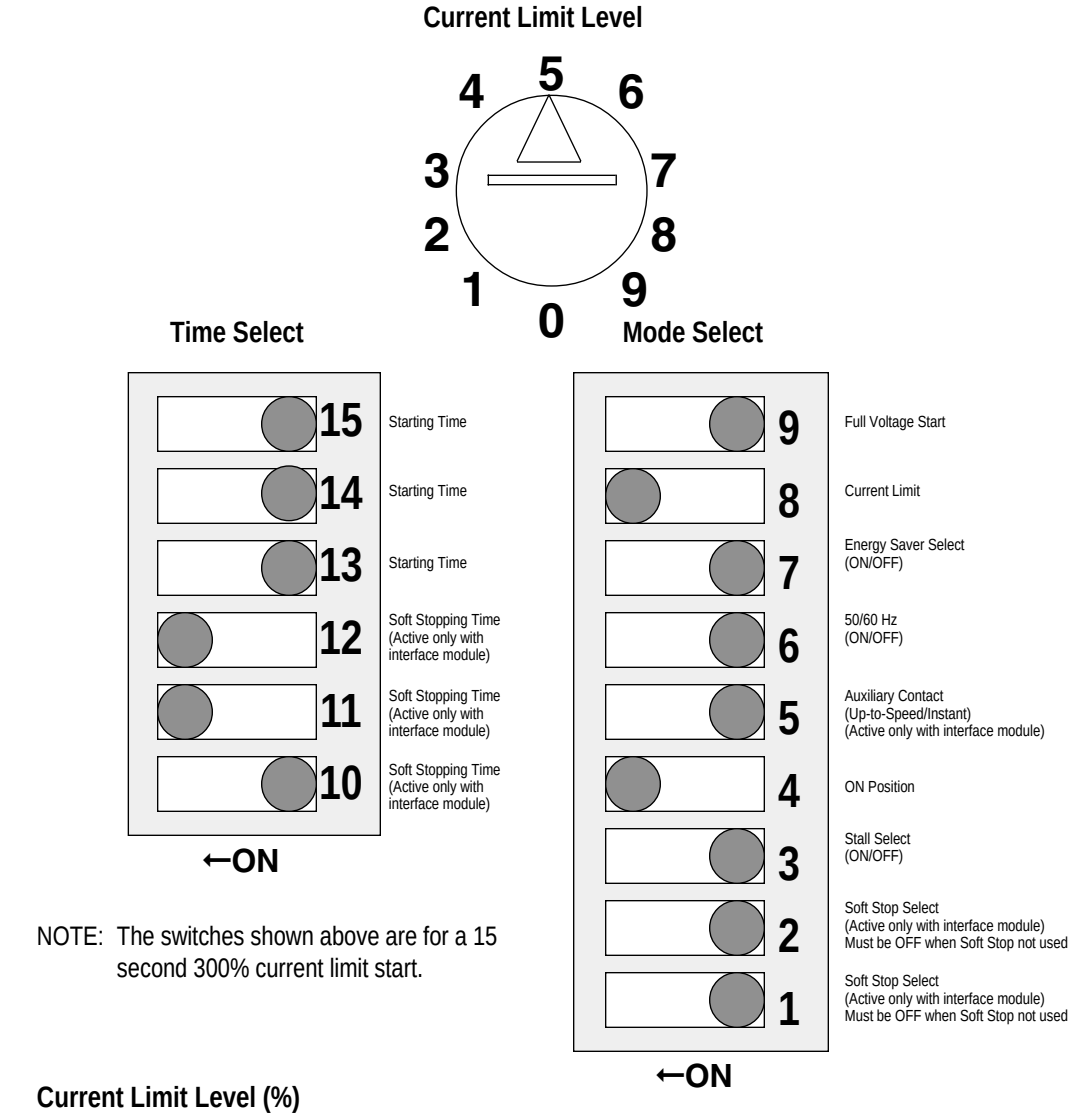
Figure C.5 Current Limit



Current Limit Selection

1. DIP switch 8 must be ON for current limit mode. Refer to next page.
2. Set rotary digital switch for current limit level. Refer to next page for settings.
3. Set switches 13, 14 and 15 for current limit start time.
4. Set Energy Saver DIP switch 7 to ON for energy savings. Set Stall DIP switch 3 to ON for stall protection.
5. Soft Stop is only available with the interface option. Set Soft Stop Select DIP switches 1 and 2 to ON for soft stop. Set DIP switches 10, 11 and 12 for stopping time. Refer to next page for settings.
6. Auxiliary contact is only available with the interface option. Set mode of the auxiliary contact with DIP switch 5. Set to OFF for instantaneous, ON for up-to-speed.
7. Switch 4 should be ON.
8. Switch 9 should be OFF.
9. Set switch 6 for line frequency (ON for 50 Hz, OFF for 60

Figure C.6 - Current Limit Settings



NOTE: The switches shown above are for a 15 second 300% current limit start.

Current Limit Level (%)

Rotary Position	0	1	2	3	4	5	6	7	8	9
% of Full Load Amps	25	50	100	200	250	300	350	450	500	550

Current Limit Start Time

Switch Number	Time (sec)	
	15	30
15	Off	**ON**
14	Off	Off
13	Off	Off

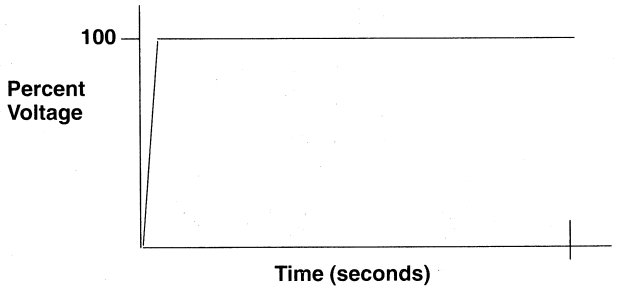
Soft Stop (Available only with interface module)

Switch Number	Time (sec)							
	5	10	15	25	35	45	55	110
12	Off	**ON**	Off	**ON**	Off	**ON**	Off	**ON**
11	Off	Off	**ON**	**ON**	Off	Off	**ON**	**ON**
10	Off	Off	Off	Off	**ON**	**ON**	**ON**	**ON**

Full Voltage

For applications requiring a full voltage start, the acceleration ramp time is set to minimum (1/10 second). This allows the controller to start the load across-the-line.

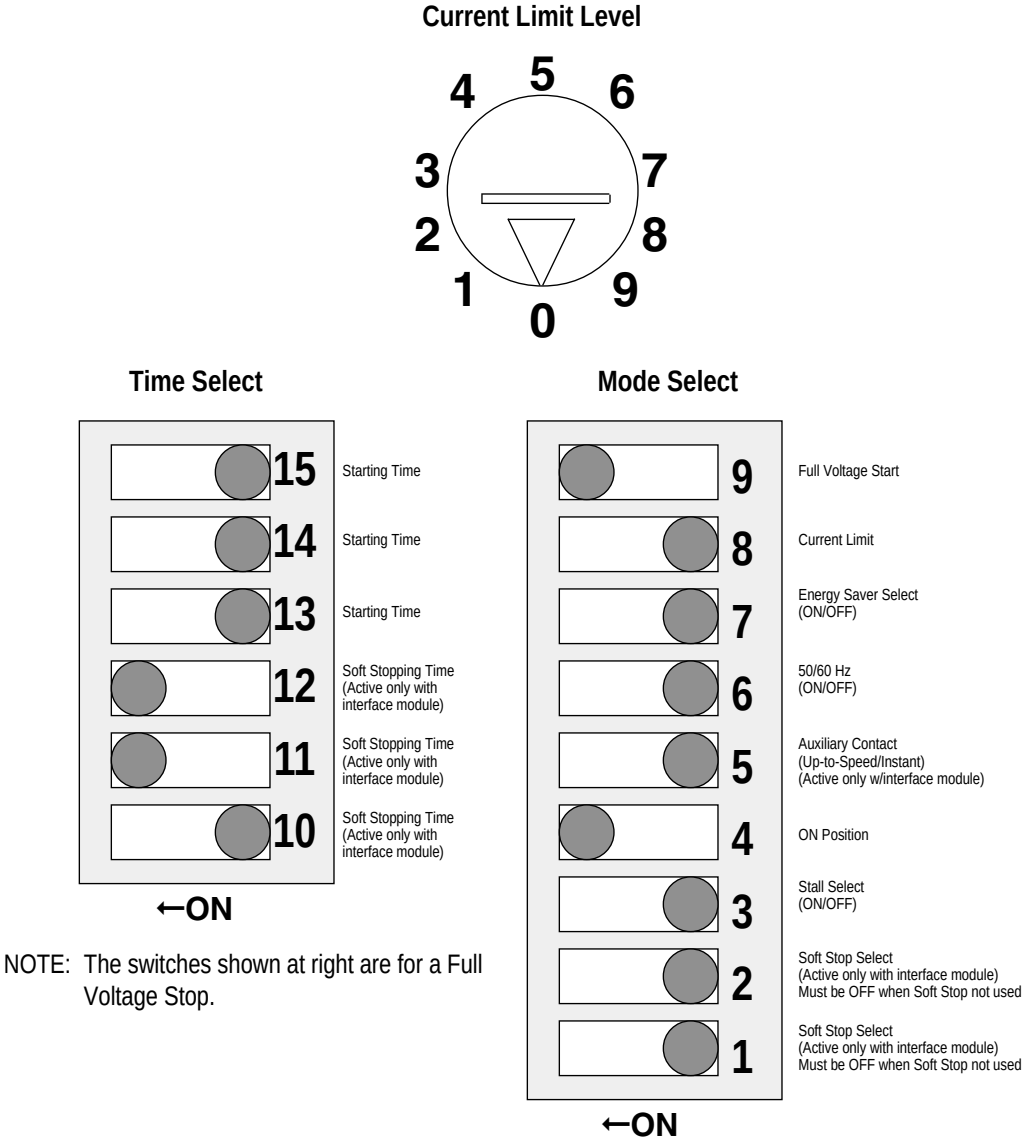
Figure C.7



Full Voltage Selection

1. For full voltage starting, switch 9 must be ON and switches 13, 14 and 15 must be OFF. This results in a full voltage start of approximately 1/10 second.
2. Set Energy Saver DIP switch 7 to ON for energy savings. Set Stall DIP switch 3 to ON for stall protection.
3. Soft Stop is only available with the interface option. Set Soft Stop Select DIP switches 1 and 2 to ON for soft stop. Set DIP switches 10, 11, and 12 for stopping time. Refer to chart below for settings.
4. Auxiliary contact is only available with the interface option. Set mode of auxiliary contact with DIP switch 5. Set to OFF for instantaneous, ON for up-to-speed.
5. Switch 4 should be ON.
6. Switch 8 should be OFF.
7. Set switch 6 for line frequency (ON for 50 Hz, OFF for 60 Hz).

Figure C.8 - Full Voltage Settings



NOTE: The switches shown at right are for a Full Voltage Stop.

Soft Stop (Available only with interface module)

Switch Number	Time (seconds)							
	5	10	15	25	35	45	55	110
12	Off	**ON**	Off	**ON**	Off	**ON**	Off	**ON**
11	Off	Off	**ON**	**ON**	Off	Off	**ON**	**ON**
10	Off	Off	Off	Off	**ON**	**ON**	**ON**	**ON**

Section D: Troubleshooting and Renewal Parts

For safety of maintenance personnel as well as others who might be exposed to electrical hazards associated with maintenance activities, the safety related work practices of NFPA 70E, Part II, should always be followed when working on electrical equipment. Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to their respective job assignments.

WARNING: To avoid shock hazard, disconnect main power before working on the controller, motor, or control devices such as Start/Stop pushbuttons.

CAUTION: Disconnect the controller from the motor before measuring insulation resistance (IR) of the motor windings. Voltages used for insulation resistance testing can cause failure to SCRs. Do not make any measurements on the controller with an IR tester (megger).

In case of a short circuit event: The PG controller may not operate after a short circuit fault. Remove all power from the controller. Visually inspect the device for signs of damage. Check resistance of the power modules (See Table D.1). Replace power module if necessary.

NOTE: The time it takes for the motor to come up to speed may differ from the Start Time setting and will vary depending on the frictional load and inertial characteristics of the system.

Table D.1 Motor will not start - Series Controller Configuration (Figure B.5 on Page 6)

Symptom	Possible Cause		Remedy
LED off	● No three-phase power ● Failed overload		● Check three-phase line voltage ● Check overload relay
LED on	● DIP switch 2 on		● Turn DIP switch 2 off
LED flashing	● Fault condition:	Single phase Shorted SCR Motor stalls	● Check that all three-phase voltages are present. ● Check resistance between L1 & T1, L2 & T2 and L3 & T3. Less than 50 Ohms indicates shorted SCR. Replace power module. ● Check for stalled motor.

TableD.2 Motor Attempts to Start - Series Controller Configuration

Symptom	Possible Cause	Remedy
Motor does not accel to full speed	● Motor overload ● Motor stall ● Initial torque too low	● Check motor load ● Check if LED is flashing and DIP switch 8 is on. If so, motor stalled. ● Adjust initial torque
Motor accels to full speed too fast	● Switch settings	● Adjust initial torque/start time

Table D.3 Motor Will Not Start with Interface Option (Figure B.8 on Page 7)

Symptom	Possible Cause	Remedy
LED off	● No three-phase power ● Failed overload	● Check three-phase line voltage ● Check overload relay
LED on	● Tripped overload ● No control voltage ● No start signal ● Interface module requires control voltage	● Check overload relay ● Check control voltage between terminals 10 and 40 ● Check that start signal is present from 10 to 30 ● Check for control voltage
LED flashing	● Fault condition: Single phase Shorted SCR Motor stall	● Check that all three-phase voltages are present. ● Check resistance between L1 & T1, L2 & T2 and L3 & T3. Less than 50 Ohms indicates shorted SCR. Replace power module. ● Check for stalled motor.

Table D.4 Motor Attempts To Start With Interface Module

Symptom	Possible Cause	Remedy
Motor does not accel to full speed	● Motor overload ● Motor stall ● Initial torque too low	● Check motor load ● Check if LED is flashing and DIP switch 8 is on. If so, motor stalled. ● Adjust initial torque
Auxiliary contact will not pick up	● Auxiliary contact not working	● Check terminals 50/60 for proper operation. Replace control board. ● Check DIP switch 5 setting
Motor accels to full speed too fast	● Switch settings	● Adjust initial torque/start time

Renewal Parts

Description	Controller Rating	Line Voltage Rating	Part Number
Power Modules	24A	240 480 600	PGL-024-240V PGL-024-480V PGL-024-600V
	35A	240 480 600	PGL-035-240V PGL-035-480V PGL-035-600V
	54A-97A	240 480 600	PGL-097-240V PGL-097-480V PGL-097-600V

FIELD INSTALLED MODIFICATION			
Description	**Controller Rating**	**Line Voltage Rating**	**Part Number**
Control Board w/o Interface Option	N/A	240 480 600	PGS-XXX-240V PGS-XXX-480V PGS-XXX-600V
Control Board w/Interface Option	120	240 480 600	PGE-120-240V PGE-120-480V PGE-120-600V
	240	240 480 600	PGE-240-240V PGE-240-480V PGE-240-600V
24A to 54A Protective Module	24-54 Amp	240 480 600	PGP-054-240V PGP-054-480V PGP-054-600V
68A Protective Module	68 Amp	240 480 600	PGP-068-240V PGP-068-480V PGP-068-600V
97A Protective Module	97 Amp	240 480 600	PGP-097-240V PGP-097-480V PGP-097-600V

sprecher+
schuh

Divisional Headquarters

Sprecher+Schuh US Division Headquarters
15910 International Plaza Dr., Houston, TX 77032
Tel: (281) 442-9000 Fax: (800) 739-7370

Sprecher+Schuh Canadian Division
3610 Nashua Dr., Unit 10, Mississauga, Ontario LV4 1L2
Tel: (905) 677-7514 Fax: (905) 677-7663

Publication No: TECH-PG24 05/99