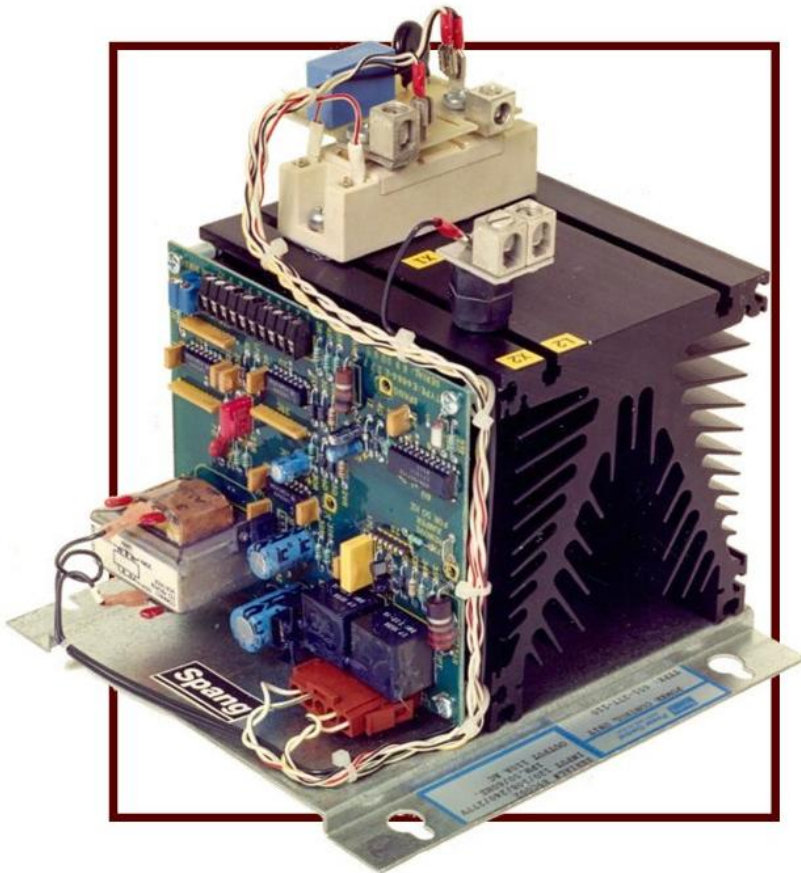


651 SERIES POWER CONTROL UNITS **Single Phase, Phase Angle SCR Controller**



STANDARD FEATURES

- Electronic design utilizing Large Scale Integration.
- Phase lock loop for firing pulse synchronization.
- Standard ratings designed for 50°C maximum ambient.
- Stepless control for proportional electric power.
- Immunity to line distortions and fluctuations.
- Accepts all standard control signals.
- Convection heatsinks up to 110AAC.
- Pulse transformer gate isolation.

Compact, Economical, Reliable Control of Single Phase AC Power.

Primarily used to control dynamic resistive, or transformer-coupled loads:

- **Small Electric Furnaces**
- **Electric Ovens and Heaters**
- **Vibratory Feeders**
- **Extrusion and Forming Equipment**

General Description

The 651 Series are definite purpose SCR Power Control Units, offering economical phase angle power control in a compact package. The latest advances in integrated circuit technology and power semiconductors have made this possible while maintaining the high quality and reliability that are traditional for Spang Power Electronics products.

The firing circuit utilizes CMOS integrated circuits and digital logic to ensure immunity from power line distortions. Large Scale Integration (LSI) allows for a compact design with improved reliability.

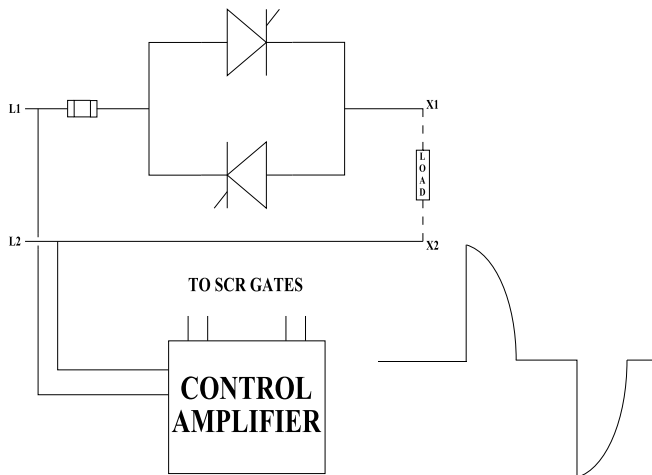
All units in the 651 Series utilize isolated semiconductor power modules. The power module contains two SCRs connected in inverse parallel to control one line of a single phase load. The other line is connected directly through to the load.

These definite purpose units offer the most frequently used options, current limit and voltage regulation. These are available factory installed or in easy-to-add kit form.

Also available from Spang Power Electronics is a complete line of SCR Power Control Units offering phase angle and synchronous (zero voltage) control in both three phase and single phase configurations.

Phase Angle Firing Advantages

- Conventional voltmeters and ammeters can be used for instrumentation over 0 to 100% voltage range
- Infinitely variable output
- Operation into dynamic loads (i.e., transformers)



Specifications

Input Voltage

The 651 Series units are available in two voltage ranges of 120 through 277 volts or 380 through 575 volts. They are shipped connected for the most popular voltages of 240 or 480 volts. Other voltages may be selected by simply moving a plug-in jumper. On the 277 volt units, input voltages of 120VAC, 208VAC, 240VAC or 277 VAC may be selected. On the 575 volt unit, input voltages of 380VAC, 416VAC, 480VAC and 575VAC are available.

Input Frequency

All units are shipped connected for 60 Hertz operation. Conversion to 50 Hertz is achieved by simply removing a jumper.

Connections

U.L. listed compression terminals are provided for both power and control connections.

Ambient

All ratings are designed for 50°C maximum operating temperature. For operation at higher temperatures (to 65°C maximum), some derating is necessary; please consult factory.

Input Signals

0-5, 2-12, 4-20, 10-50ma or 0-10V inputs (all standard temperature controller outputs) or a manual potentiometer. See Control Connections.

Control Connections		
DC Control Signal	Input Control Terminal Points	Input Impedance
0-5 ma	1 (+) - 5 (-)	1000 ohms
2-12 ma	2 (+) - 5 (-)	400 ohms
4-20 ma	3 (+) - 5 (-)	250 ohms
10-50 ma	4 (+) - 5 (-)	100 ohms
0-10 V	7 (+) - 5 (-)	200K ohms
Contact Closure	6 and 7	Close Contact to turn PCU on
Manual Control: End of Pot Slider of Pot	6 and 8 7	Connect a 10kΩ 2Watt Potentiometer
Lockout (Shutdown Contact)	8 and 10	Close Contact to turn PCU off

Adjustments

High resolution, 20 turn potentiometers are provided for all adjustments.

- a. Gain adjustments provide full output for 50% to 200% standard control signal
- b. Bias adjustment for manual control to 100% output

Voltage Protection

- a. Transient voltage suppression is provided by an R-C snubber network and metal oxide varistor (MOV) which clamps high voltage spikes to within the PRV rating of the semi-conductors.
- b. Standard PRV ratings:
380-575 volt units – 1200 volts
120-277 volt units – 1200 volts

Reference Supply

A 12 volt DC regulated reference supply is available from the firing circuit for connection to a remote potentiometer, from which the Power Control Unit can be controlled manually. This supply is regulated to within $\pm 1/2\%$ for line voltage variations. Maximum current rating from this reference source is 10 milliamperes.

Cooling

The 651 Series Power Control Units are convection cooled. Use of isolated power modules provides electrical isolation of the heatsinks.

TIP (Soft Start)

An integral soft start ramp is provided on all 651 Series units. Upon initial energization, gate firing is inhibited for a short dead time to allow for circuit stabilization. After this time the SCR output is ramped in response to the input control signal. The Transformer Inrush Protection (TIP) feature allows smooth, reliable control into the primary of the transformer, thus eliminating inrush currents which can occur if power is applied too rapidly to a transformer.

Available Options

The most frequently used options are available for the 651 Series Power Control Units. These plug-in options can be supplied factory installed or in kit form easily added to an existing unit in the field.

The field installable kits include a plug-in option board, current or voltage transformers and complete installation instructions. They can easily be installed in just a few minutes. The option kits provide for faster delivery and reduced equipment costs. In addition, they allow the user to reduce inventory costs by stocking the basic units and option kits separately, combining them as required for the specific application.

For added convenience the options can be provided factory installed at a nominal extra charge.

Each 651 Series unit will accept one plug-in option board with either one, or a combination of the options listed below:

Current Limit

Current Limit senses RMS current and limits output. Current limit adjustment is from 5% to over 100% of rating by a potentiometer on the option card.

Voltage Regulation

Voltage Regulation adds RMS voltage feedback to the standard model. Voltage regulation is $\pm 1\%$ for line voltage excursions of +10%, -15% of nominal. This option also improves control linearity to $\pm 1\%$ from 0 to 100% output.

Ordering Information

ORDERING INFORMATION					
Amp Rating	CATALOG NUMBER		OPTIONS		
	120-277 VAC	380-575 VAC			
15	651-277-15-00	651-575-15-00	To order options with the PCU replace last two digits with code shown for desired option.		
40	651-277-40-00	651-575-40-00			
60	651-277-60-00	651-575-60-00			
80	651-277-80-00	651-575-80-00	Option	Factory Installed	Field Installable
110	651-277-110-00	651-575-110-00	Current Limit	1A	1K
200	651-277-200-00	651-575-200-00	Voltage Regulation	2A	2K
400	651-277-400-00	651-575-400-00	Current Limit & Voltage Regulation	3A	3K
600	651-277-600-00	651-575-600-00	Option and Fusing Kits are also available separately. Please refer to next page		
1000	651-277-1000-00	651-575-1000-00			

Field Installable Options

The kits include a plug in accessory board and current / voltage transformers as required for current limit or voltage regulation.

PCU Amp Rating	Catalog Number		
	Current Limit	Voltage Regulation	Current Limit And Voltage Regulation
15	651-CL-15	651-VR *	651-CLVR-15 *
40	651-CL-40	651-VR *	651-CLVR-40 *
60	651-CL-60	651-VR *	651-CLVR-60 *
80	651-CL-80	651-VR *	651-CLVR-80 *
110	651-CL-110	651-VR *	651-CLVR-110 *
200	651-CL-200	651-VR *	651-CLVR-200 *
400	651-CL-400	651-VR *	651-CLVR-400 *
600	651-CL-600	651-VR *	651-CLVR-600 *
1000	651-CL-1000	651-VR *	651-CLVR-1000 *

* Must specify application voltage at time of order.

Fuse Kits

Each Fuse Kit includes one I2T current limiting fuse. Fuse holders and wirings lugs are provided for PCUs up through 200 Amps.

15 to 110 Amp

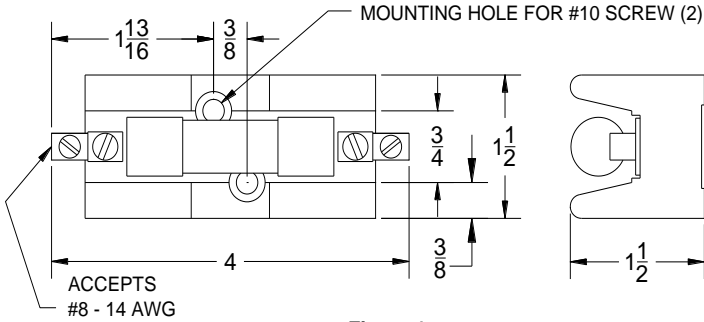


Figure 1

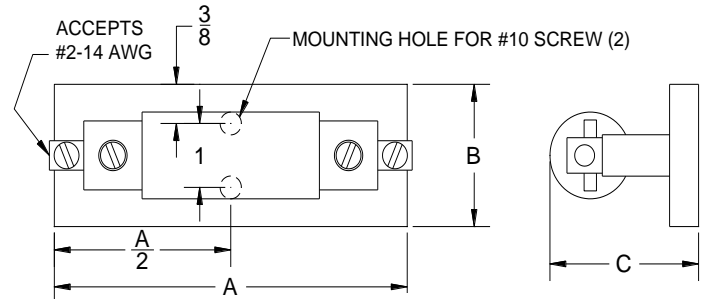


Figure 2

Catalog Number	Fig	A	B	C
650-FA1-15	1	N/A	N/A	N/A
650-FA1-40-277	2	5	1 3/4	1 3/4
650-FA1-40-575	2	5 3/4	1 3/4	1 3/4
650-FA1-60-277	2	5 3/4	1 3/4	1 3/4
650-FA1-60-575	2	5 3/4	1 3/4	1 3/4
650-FA1-80-277	2	5 3/4	1 3/4	1 3/4
650-FA1-80-575	2	5 3/4	1 3/4	2 1/8
650-FA1-110-277	2	5 3/4	1 3/4	1 3/4
650-FA1-110-575	2	5 3/4	1 3/4	2 1/8
650-FA1-200-575	3	N/A	N/A	N/A

200 Amp

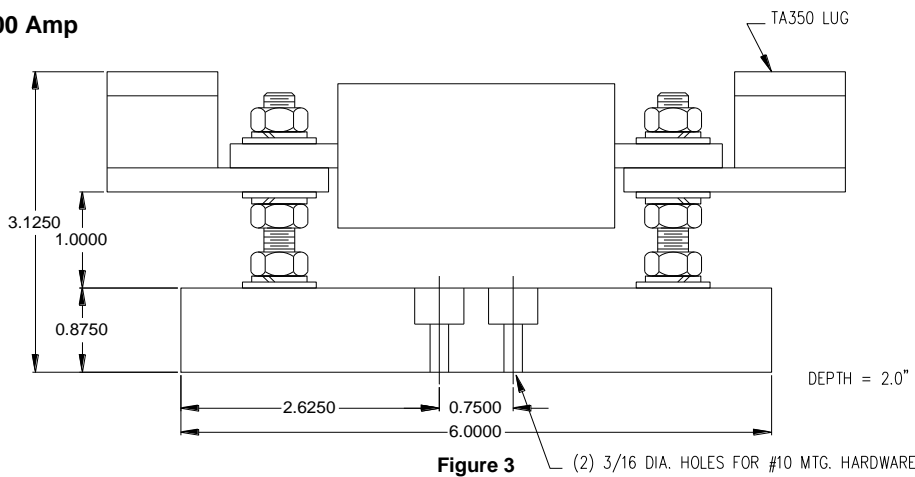


Figure 3

400 to 1000 Amp

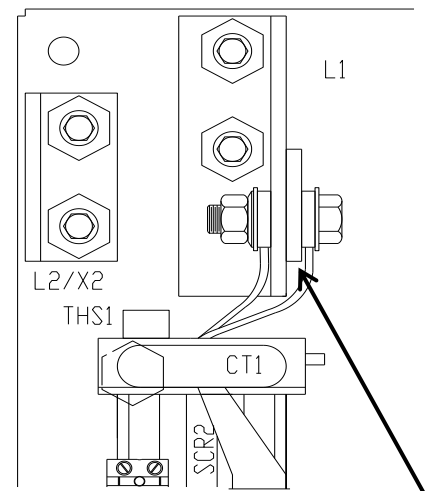
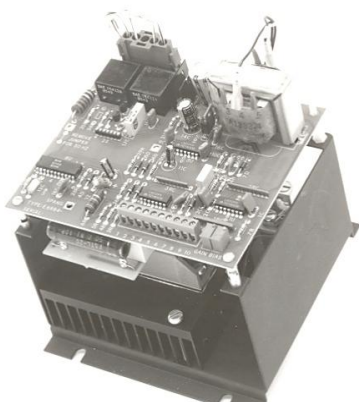
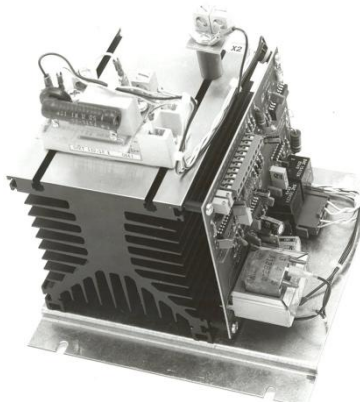


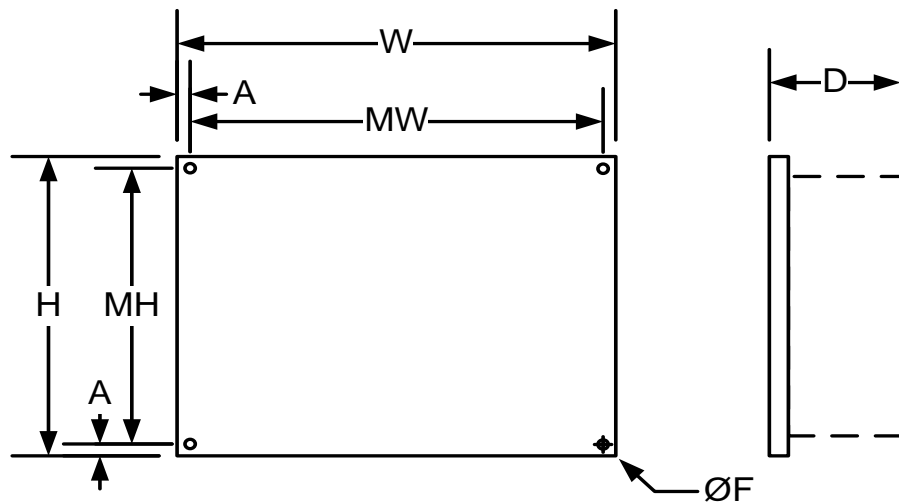
Figure 4 Remove the Bus Link and replace with appropriately sized fuse.

Catalog Number	Fig	Description
650-FA1-400-575	4	Fuse only. Replaces internal Bus Link.
650-FA1-600-575	4	Fuse only. Replaces internal Bus Link.
650-FA1-1000-575	4	Fuse only. Replaces internal Bus Link.

Physical Dimensions

PHYSICAL DIMENSIONS																											
15 - 40 Amp		60 - 110 Amp																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #333; color: white;"> <th colspan="2" style="text-align: left; padding: 2px;">Dimensions</th> </tr> </thead> <tbody> <tr><td style="padding: 2px;">Height</td><td style="padding: 2px;">6.5</td></tr> <tr><td style="padding: 2px;">Width</td><td style="padding: 2px;">6.0</td></tr> <tr><td style="padding: 2px;">Depth</td><td style="padding: 2px;">6.0</td></tr> <tr><td style="padding: 2px;">MH</td><td style="padding: 2px;">5.5</td></tr> <tr><td style="padding: 2px;">MW</td><td style="padding: 2px;">4.0</td></tr> </tbody> </table>	Dimensions		Height	6.5	Width	6.0	Depth	6.0	MH	5.5	MW	4.0		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #333; color: white;"> <th colspan="2" style="text-align: left; padding: 2px;">Dimensions</th> </tr> </thead> <tbody> <tr><td style="padding: 2px;">Height</td><td style="padding: 2px;">8.5</td></tr> <tr><td style="padding: 2px;">Width</td><td style="padding: 2px;">8.0</td></tr> <tr><td style="padding: 2px;">Depth</td><td style="padding: 2px;">8.0</td></tr> <tr><td style="padding: 2px;">MH</td><td style="padding: 2px;">7.5</td></tr> <tr><td style="padding: 2px;">MW</td><td style="padding: 2px;">6.0</td></tr> </tbody> </table>	Dimensions		Height	8.5	Width	8.0	Depth	8.0	MH	7.5	MW	6.0	
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200 - 1000 Amp



CHASSIS DIMENSIONS							
Amperage	W	MW	H	MH	A	D	F
200 Amp	9	7	13 ½	13	1	9	¼
400 Amp	15	13 ½	20	18 ½	¾	12	½
600 Amp	15	13 ½	20	18 ½	¾	12	½
1000 Amp	18	16 ½	26	24 ½	¾	14 ¾	½

NOTE: All dimension listed in inches.