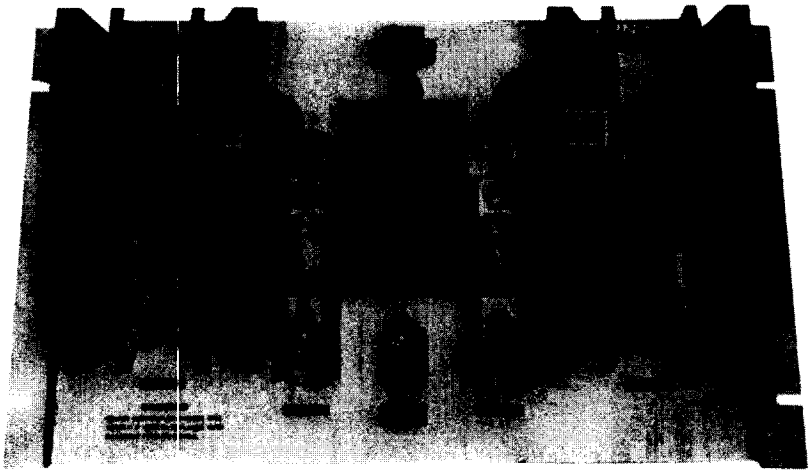
User's Guide



OMEGA®
An OMEGA Technologies Company

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SCR71 and SCR73 Series SCR Power Controllers

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CAUTION

Possible Shock Hazard

Exposed High Voltage exists on heat sinks and other parts of these units. The units must be enclosed and locked to prevent possible electrocution. Power must be removed before servicing by qualified personnel.

Possible Fire Hazard

Because these power controls or associated equipment may not always be fail safe, an approved temperature and or pressure safety control should be used for safe operation.

Solid State devices do not completely remove power from the load. Leakage current flows when the device is in the off state. This represents a potential shock hazard at all unit and load terminals.

UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department 1-800-622-2378 or (203) 359-1660.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

TABLE OF CONTENTS
SCR70 Series
Power Controller

SECTION 1 GENERAL INTRODUCTION

The OMEGA® SCR70 Series Power Controllers are designed to control AC power to electrical heating processes, such as ovens, furnaces, heat sealers, etc.

> **NOTE**
>
> They are NOT designed to drive transformers, coils, or inductive type loads

The controllers consist of silicon controlled rectifiers (SCRs), properly sized heat sinks, trigger circuitry, and rectifier protecting fuses, all mounted on a backplate for surface mounting.

The controller accepts an input signal such as 4-20 mA DC from some signal conditioning device such as an OMEGA temperature controller. As a complete temperature control package an OMEGA temperature controller and Series 70 power controller will provide very accurate temperature control of any process. The controllers can be supplies as manual controllers with the addition of the manual option module and remote pot.

Figure 1-1 shows the SCR controller.

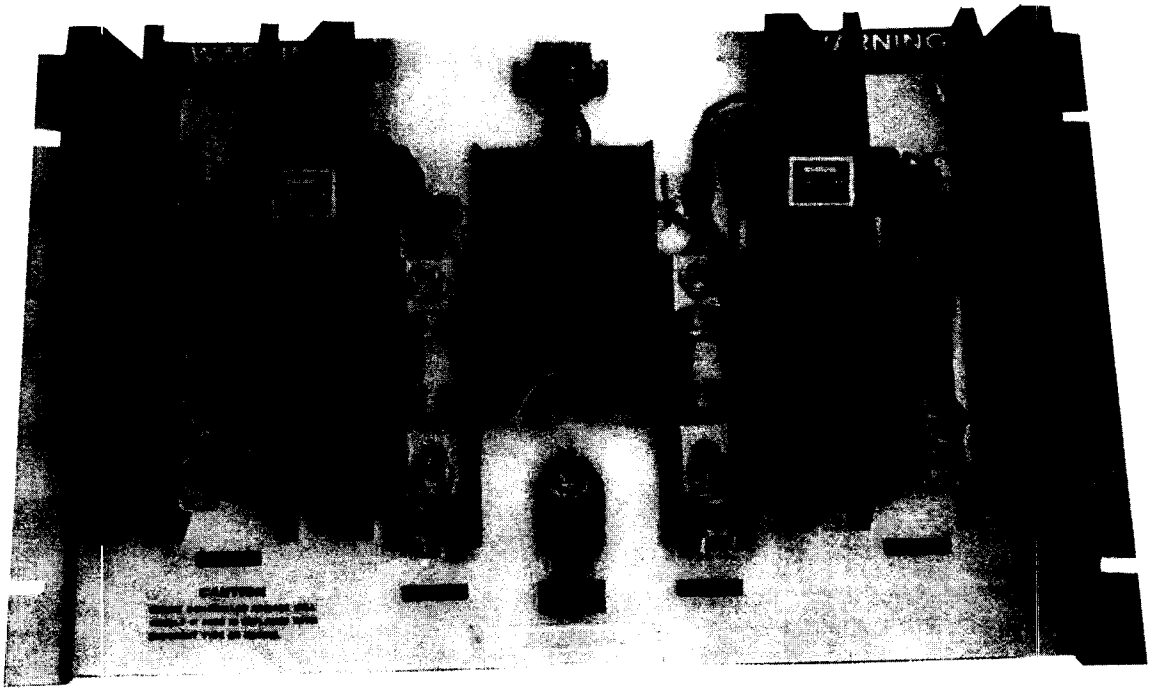


Figure 1-1. SCR Controller

The two methods of proportional control of AC power are phase-angle fired and zero-voltage switched (zero crossing).

Zero-Voltage-Switched

Power to load is controlled by governing the percentage of complete sine waves to the load. The point of turn on in the sine wave is at (or very near) zero voltage, thus no RFI is generated. OMEGA units feature a patented infinitely variable time base. They provide the ultimate resolution in power proportioning to the load. Also, because there are no time base adjustments to make, they are easy to use. The time base is infinitely and automatically adjusted while the SCR Power Controller is operating from a minimum 0.2 second time base at half-power output to a maximum 2 second time base at the 5% and 95% power outputs. Refer to Figure 1-2. Please note that values shown are typical, not exact values.

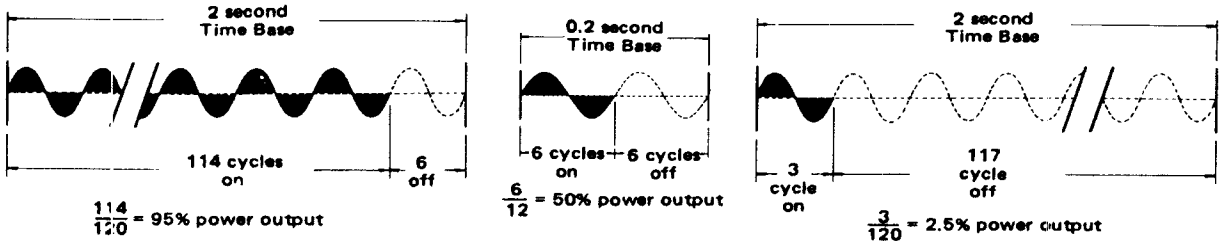


Figure 1-2. Zero-Voltage-Switched

Power to load = ratio of cycles absent to cycles present in any number of total cycles. OMEGA Zero-Voltage Switched SCR Power Controller with infinitely variable time base provides maximum closeness in temperature regulation by offering higher power resolution than fixed time base units, i.e., 20 cycle fixed = 1/20 = 5% power change minimum step change. Infinitely variable time base units also produce less power line disturbances.

Phase-Angle Fired

Power to load is controlled by governing the point of turn on (firing) of each half cycle of the full AC sine wave. After triggering, the remainder of the AC cycle is applied to the load. Phase-angle fired controller are available with soft-start and voltage limit options. When controlling temperature of low-mass heating elements such as infrared lamps and hot wire types, phase-angle fired controllers are recommended. Refer to Figure 1-3.

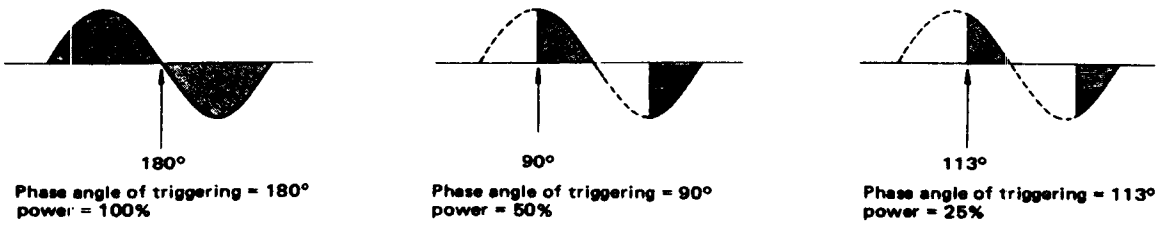


Figure 1-3. Phase-Angle-Fired Controller

SECTION 2 FEATURES

- Designed to allow the operation of multiple units by a single temperature controller.
- Unique circuitry in the three-phase units allows any phase connection–phases can not be incorrectly wired resulting in partial output power on or off.
- Optical coupler ensures the elimination of ground loops, high voltage potentials, or damage to drive controller of the SCR Power Controller.
- Completely solid-state, SCR70 Series SCRs have no moving parts to wear out. They are as effective as new, even after 100,000,000 operations.
- SCR70 Series SCRs offer smooth, rapid, proportional heating action. SCR control proportions only the power required to maintain exact temperature.
- SCR70 Series SCRs eliminate high/low cycling and, because the temperature of the heating element is constant, thermal shock is eliminated. Heater life is increased by up to 7 times.
- High efficiency – power conservation at set point
- No relay noise – contact arc noise eliminated
- Stable process temperature cuts product waste
- All terminals are push on or screw type

2.1 Typical Problems Solved Using SCR Power Controller

2.1.1 Problem 1: Excessive Energy Consumption

The cause: When the process temperature alternately falls below set point, then rises above it (cycling), more energy is consumed than if the temperature was stable. This unnecessary energy is dissipated through radiation. Furthermore, the radiation loss is exponential – the greater the temperature overshoot, the greater the radiation loss. When the temperature then falls below set point, additional energy is required to move it back to the set temperature.

The solution: OMEGA's SCRs offer smooth, rapid proportional heating action. SCR control proportions only the power required to maintain exact temperature. Energy savings can be as high as 30% when overshoot and undershoot are reduced in this way. Refer to Figure 2-1.

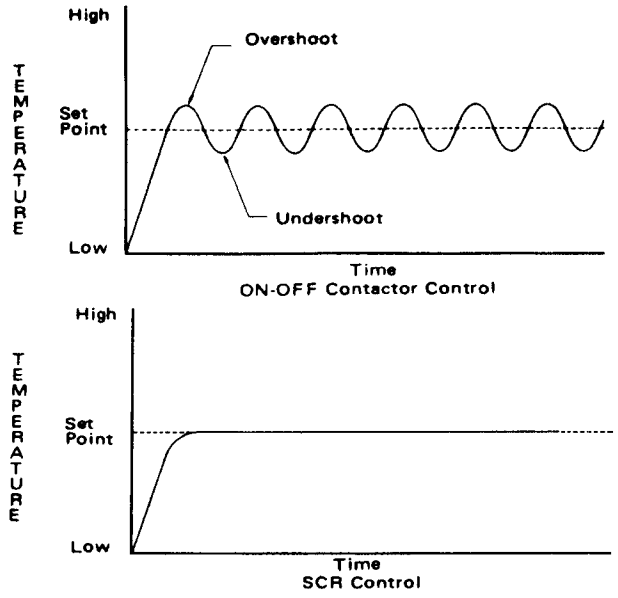


Figure 2-1. Mechanical Contact vs SCR Power Controller

2.1.2 Problem 2: Premature Heater Burn-out

The cause: Process temperature is generally lower than the heater element temperature. Heater element temperatures can oscillate to a much greater extent. Systems that use outdated mechanical contactors experience this cycling continually, and the resulting thermal shock greatly reduces heater element life.

The solution: OMEGA SCRs control eliminates high/low cycling and, because the temperature of the heating element is constant, thermal shock is eliminated. Heater life is increased by up to 7 times.

2.1.3 Problem 3: Contactor Maintenance and Replacement

The cause: Mechanically operated contacts open and close, leading to wear and failure. The continual arcing necessitates frequent contact replacement.

The solution: OMEGA's completely solid-state SCRs have no moving parts to wear out. They are effective as when new, even after 100,000,000 operations.

2.1.4 Problem 4: False Turn-on/Sympathetic Tracking

The cause: SCR units can turn on at inappropriate times because of line voltage disturbances produced by other SCR controllers, motor speed controllers, and random electrical transients. This sometimes leads to direct tracking of unwanted signals. The result is product degradation or irregular heating.

The solution: As a standard, OMEGA's SCR units are equipped with metal oxide varistor spike protectors, and soft-start units incorporate dV/dt resistance capacitor networks, to reduce inappropriate firing and sympathetic tracking.

SECTION 3 MODEL NUMBER IDENTIFICATION

Proper selection of your OMEGA Solid-State Power Controller will ensure many years of trouble free and precise temperature control.

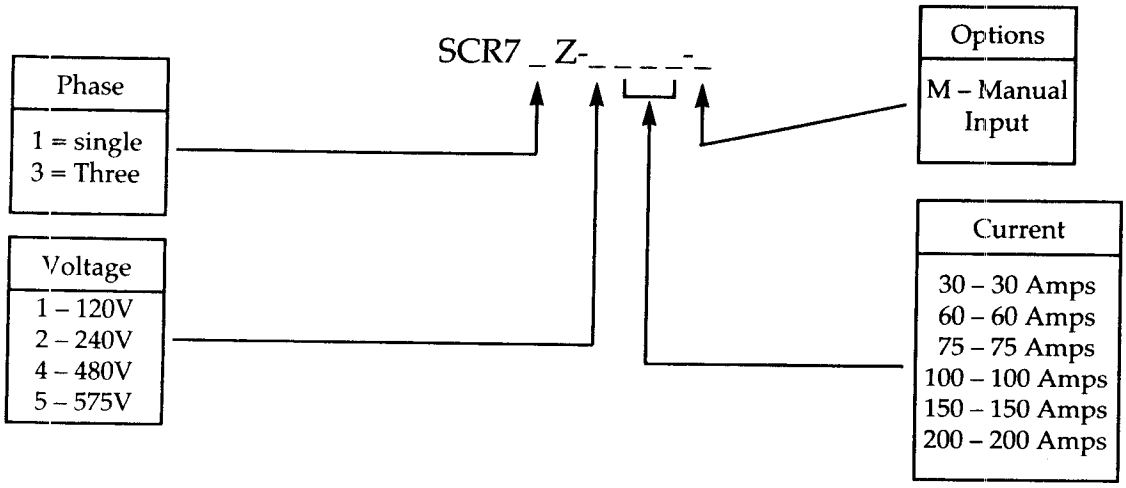
Series SCR71 and 73 Power Controllers are designed to proportion electric power to resistive loads only. Some resistive loads exhibit high inrush currents; e.g. quartz lamps, with or without tungsten elements. Power controllers used to drive these loads must be ordered with soft-start option 1 (specify time in seconds).

TO ORDER: Determine proper line voltage; load current; type of load; options required, if any; and input signal to power controller. For load currents above 200 amps, consult OMEGA. Use these equations to determine load current.

$$\text{Single-phase Load Current} = \frac{\text{watts (load)}}{\text{volts (line)}} = \text{Amps}$$

$$\text{Three-phase Load Current} = \frac{\text{watts (load)}}{1.73 \times \text{volts (line)}} = \text{Amps}$$

The following shows the ordering matrix for **Zero-Crossing.**

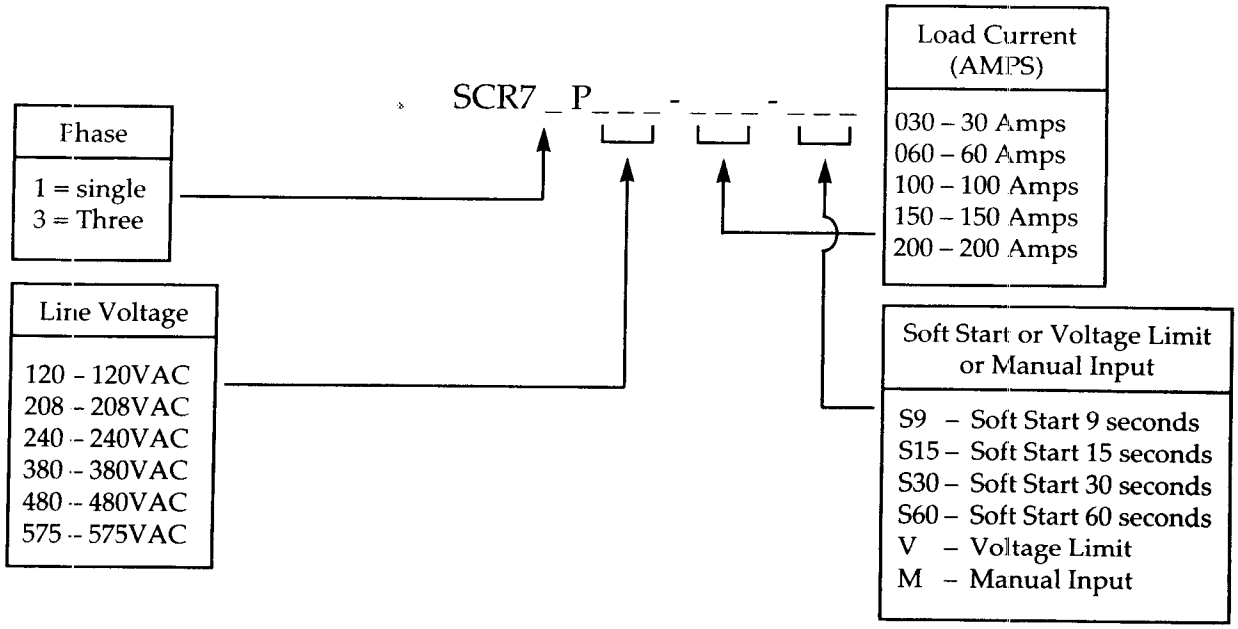


For an example, SCR71Z-230 is SCR70 Series Power Controller with zero crossing, 240V, single phase, 30 amps.

The following shows the ordering matrix for **Phase Angle.**

NOTE

Phase Angle Fired SCR power controllers should be used only when using low mass heating elements such as infrared lamps, hot wire types and tungsten filament types. Phase Angle SCRs must include the exact voltage used with heater and either soft-start option or voltage limit (see below).



For an example, SCR73P-120-150-S60 is an SCR70 Series Power Controller with three phase, phase angle, 120VAC, 150 amps, and soft start 60 seconds.

SECTION 4 OPERATION

4.1 Models SCR71Z and SCR73Z

The controllers operate in the ZERO VOLTAGE SWITCHING mode. The controller switches on complete cycles of the AC supply voltage. The patented trigger circuit is designed to turn on the SCRs as close as possible to the point where the AC sine wave crosses through zero. In effect, the line voltage is turned on and off and applied to the heaters in whole cycles. With an input of 4 to 20 milliamps, the output will be off below 4 mA and full on at 20 mA. Proportioning action is obtained by varying the number of cycles on to the number of cycles off. The output will vary from a few cycles on and a large number of cycles off at low input, through half the cycles and half off at half output, to all cycles on at maximum input. This output is integrated by the heaters which produce a smoothly proportioning heat output that varies directly with the input signal.

4.2 Models SCR71P and SCR73P

The controllers operate in the PHASE ANGLE FIRED mode and provide full proportional control to the load. The SCRs are turned on (fired) during each cycle at some point (phase angle) of the AC sine wave and remain on for the remainder of the cycle. By varying this turn-on point, we can vary the amount of voltage that reaches the load. The output voltage is proportional to the input signal, e.g., at 4 milliamps input, no voltage will be applied to the load, as the current is increased, the output voltage will increase until at 20 milliamps, the output voltage will be almost equal to the line voltage.

Both the SCR71P and SCR73P controllers use photocouplers to isolate the trigger circuits from the input signal. The SCR71P uses two SCRs in inverse parallel to control the full sine wave. Each SCR controls a half of the sine wave and each has its own trigger circuit. The SCR71P has two adjustments which are factory set, span and balance.

The SCR73P is a true three-phase controller. Each of its three legs has an SCR and a rectifier in parallel. Each SCR is controlled by its own trigger circuit. When one SCR turns on, the return path for the supply voltage is through one of the other rectifiers. The three adjustments are factory set balance adjustment between phases.

4.3 Voltage Limit Option (V) (Phase angle Units Only)

The output voltage of the controller can be limited by adjusting the trimmer on the printed circuit board. Turning the adjustment clockwise will increase the output voltage. This control will operate over a range of about 20% to full output. Ordinarily, this adjustment is used to protect heaters that cannot operate on full line voltage, or to limit the maximum heating of a process. Either voltage limit or soft start option is required for phase angle units.

4.4 Soft Start Option (S9, S15, S30, or S60) (Phase angle Units Only)

The soft start circuitry slowly turns on the voltage from the controller to the load on start up. It is used to protect the controller when it is operating into loads having high current turn-on characteristics; for example, quart/tungsten heaters. The output voltage will rise from zero to full output over various times depending on the time option selected.

The soft start circuit is initially a high impedance which is inserted between the signal source and the controller. This impedance decreases in value with time. Soft start action can be seen as the input signal slowly changes from 4 to 20 milliamps when full output is required. Either voltage limit or soft start option is required for phase angle units.

4.5 Manual Option (M)

To obtain this option, a module board is added to the standard controller which converts a variable resistance potentiometer to a 4 to 20 milliamp signal. This signal is then applied to the input of the standard trigger board and operates the controller in the standard manner.

The input potentiometer can be any three lead pot from 100 to 1000 ohms. The pot supplied with the manual option is 500 ohms. This pot has a 0 to 10 scale and knob. There will be no output at 0 setting and full output at 10 setting. Note this is only a rough pot. Setting are not exactly linear in between 0 and 10.

4.6 Fuses

The fuses supplied with this controller are designed to protect the SCRs under short circuit conditions. Ordinary fuses will not clear quickly enough to protect the SCRs. If it becomes necessary to replace a fuse, it should be replaced with the same type. Refer to Section 9 for replacement fuses' part numbers.

Since the fuses supplied with the controller are for the protection of the SCRs, standard fuses or a circuit breaker should be used on all power lines as electrical code dictates.

NOTE

The controller in the off-condition does not satisfy the electrical code for completely disconnecting the line from the load. The SCRs in the off state have a leakage current in the order of 10mA at the rated line voltage. Therefore, to meet the code, the controller should be operated from a circuit breaker or disconnect switch. SCRs can fail in a shorted mode, keeping power full on. Separate safety thermostats operating safety contactors are recommended.

SECTION 5 MOUNTING AND WIRING

SCR70 SERIES POWER CONTROLLERS ARE DESIGNED TO BE MOUNTED INSIDE AN ELECTRICAL CABINET OR ENCLOSURE. DO NOT MOUNT IN AN OPEN AREA. DANGEROUS HIGH VOLTAGE AND HIGH CURRENT ARE PRESENT.

The wiring of the OMEGA SCR70 Series Controllers is very simple. The controllers have no adjustments and they require no special wiring precautions. The units are wired as shown on the attached drawing, and as labeled on the backplate. Line voltage supply, heater load, and signal input wires are all that are required.

On the three phase controller (SCR73Z), it is not necessary to connect the phases to any particular terminal, and because this is a true phase controller, WYE or DELTA CONNECTED LOADS CAN BE USED. On WYE connected loads, do not connect the center terminal to the line or to ground.

Wire gauge for power and load connections will vary depending on the size of the load, and standard electrical code procedures should be followed. In operating the controller, voltage and ampere ratings as listed on the data tag must not be exceeded. Before connecting the controller to the heaters, it is recommended that the heaters be connected directly to the power line to determine that the current rating is correct and that there are no shorts.

The controllers should be mounted in a reasonably cool location (122°F, 50°C) maximum. They should be mounted with the heat sinks in a vertical position. Some space should be left above and below the units to allow for cooling. The controllers should not be placed in an environment where the ambient temperature is above 122°F (50°C). IF THIS OCCURS THE UNITS SHOULD BE DERATED, but, if derating is not possible, it will be necessary to supply vents or an exhaust fan in the enclosure, to keep the temperature below 122°F (50°C).

SCR71P AND SCR71Z (30/60/75, 100, & 150/200 AMP UNITS)

Model	Voltage	Load (Amps)	A	B	C	D	E	F	HT
SCR71P	240/480/575	35/60	10 1/4"	12 1/4"	9 5/8"	11 5/8"	5/16"	1/4"	4"
SCR71P	240/480/575	100	10 1/4"	12 1/4"	9 5/8"	11 5/8"	5/16"	1/4"	6"
SCR71P	240/480/575	150/200	13"	17"	11 1/4"	15 1/4"	7/8"	3/8"	10"
SCR71Z	240/480/575	35/60/75	10 1/4"	12 1/4"	9 5/8"	11 5/8"	5/16"	1/4"	4"
SCR71Z	240/480/575	100	10 1/4"	12 1/4"	9 5/8"	11 5/8"	5/16"	1/4"	6"
SCR71Z	240/480/575	150/200	13"	17"	11 1/4"	15 1/4"	7/8"	3/8"	10"

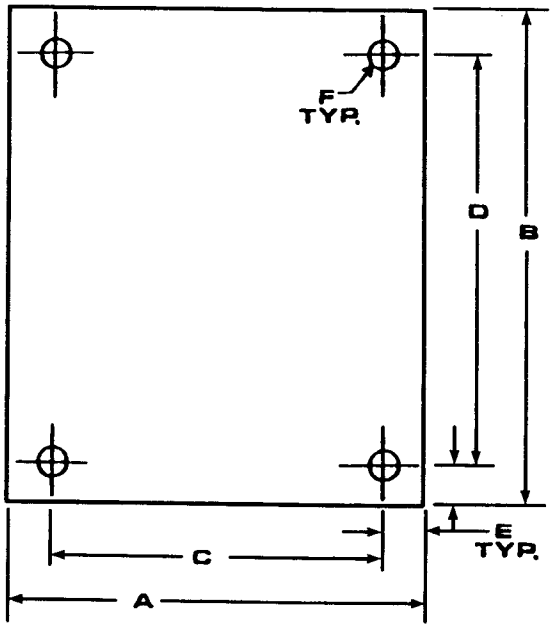


Figure 5-1. Mounting Dimensions

SCR73P AND SCR73Z (30/60/75, 100, & 150/200 AMP UNITS)

Model	Voltage	Load (Amps)	A	B	C	D	E	F	HT
SCR73P	240/480/575	30/60	19"	14"	*	1 1/2"	7/16"	1/4"	4"
SCR73P	240/480/575	100	19"	17 1/4"	4"	1 1/2"	7/16"	17/64"	6"
SCR73P	240/480/575	150/200	24"	19 1/4"	5 1/4"	1 1/2"	7/16"	17/64"	10"
SCR73Z	240/480/575	30/60/75	19"	8 3/4"	*	1 1/2"	1/2"	1/4"	4"
SCR73Z	240/480/575	100	19"	12 1/4"	*	1 3/4"	1/2"	1/4"	8"
SCR73Z	240/480/575	150/200	19"	17 1/2"	4"	1 1/2"	1/2"	1/4"	10"

*NO SLOT IN MARKED LOCATIONS

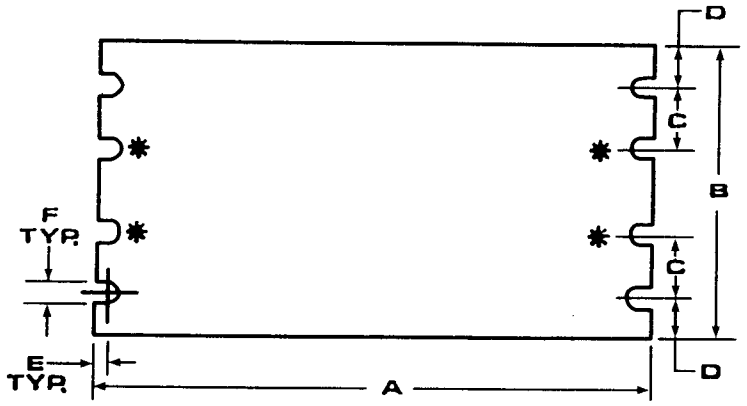


Figure 5-2. Mounting Dimensions

5.1 Wiring Diagrams

5.1.1 SCR71Z and SCR73Z (Zero-Crossing Models)

These controllers can be used only with constant resistance heaters, such as Nichrome wire heaters. They are not intended for high inrush loads. With these types of loads, it is necessary to use phase angle control with tungsten filaments, hot wire, quartz heaters or infrared heaters or soft start or voltage limiting such as the OMEGA SCR71P and SCR73P.

5.1.2 SCR71P and SCR73P (Phase Angle Models)

These controllers can be used with constant resistance heaters, such as Nichrome wire heaters but are primarily designed for use with tungsten filaments, hot wire, quartz heaters or infrared heaters. With high inrush loads, the soft start module must be added to the controller.

CAUTION

Possible Shock Hazard

Exposed High Voltage exists on heat sinks and other parts of these units. The units must be enclosed and locked to prevent possible electrocution. Power must be removed before servicing by qualified personnel.

Possible Fire Hazard

Because these power controls or associated equipment may not always be fail safe, an approved temperature and or pressure safety control should be used for safe operation.

Solid State devices do not completely remove power from the load. Leakage current flows when the device is in the off state. This represents a potential shock hazard at all unit and load terminals.

Figure 5-3 shows the wiring diagram for SCR71Z, SCR71P (single-phase, zero crossing or phase angle) with 30, 60, 75 and 100A units.

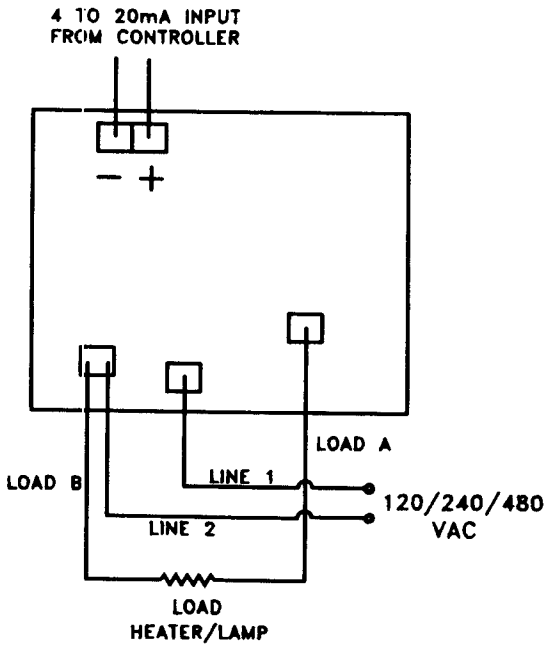


Figure 5-3.
30, 60, 75 & 100A Units.

Figure 5-4 shows the wiring diagram for SCR71Z, SCR71P (single-phase, zero crossing or phase angle) with 150 and 200A units.

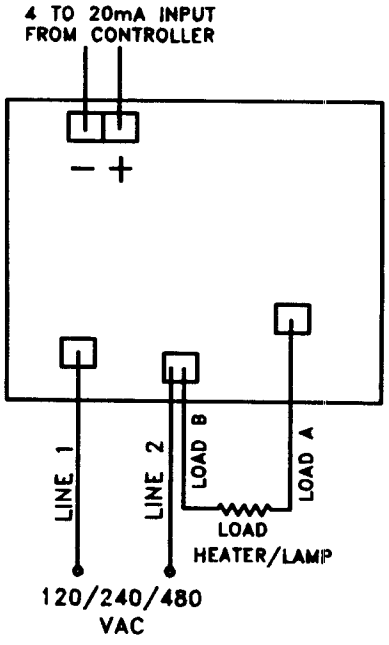


Figure 5-4.
150 & 200A Units

Figure 5-5 shows the wiring diagram for SCR73Z (three-phase zero crossing) with 30, 60, 75 and 100A units.

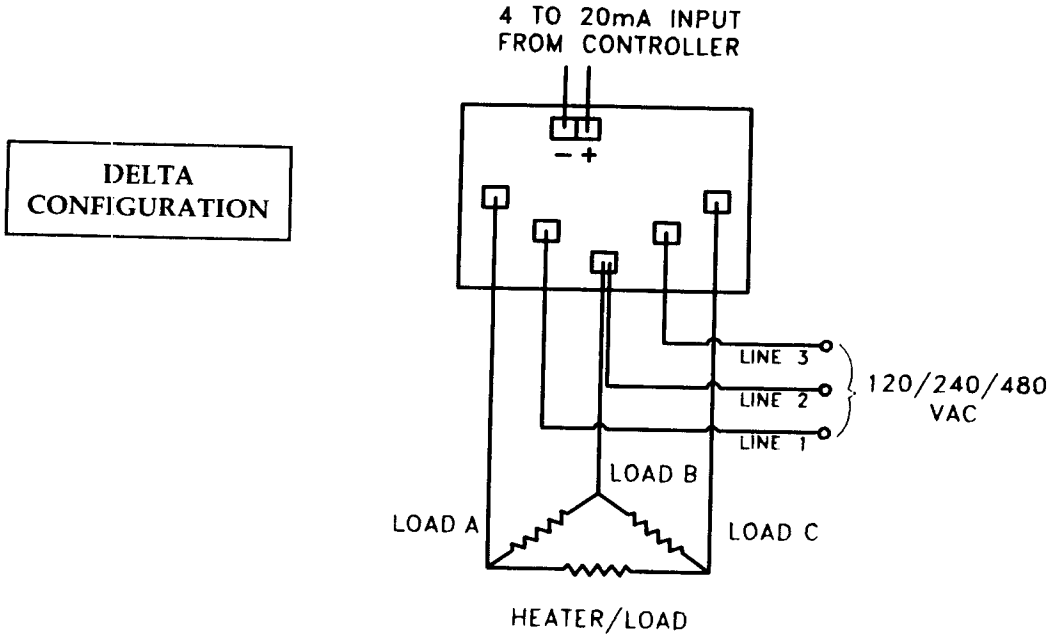


Figure 5-5. 30, 60, 75 & 100A Units

Figure 5-6 shows the wiring diagram for SCR73Z (three-phase zero crossing) with 30, 60, 75 and 100A units.

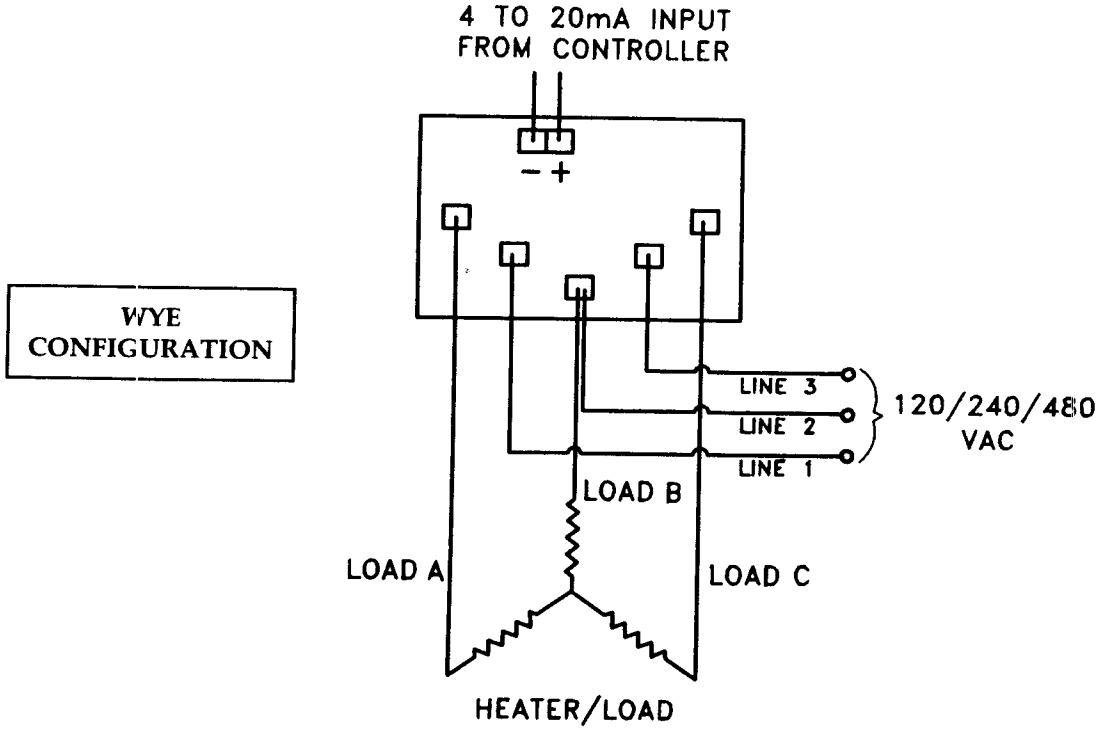


Figure 5-6. 30, 60, 75 & 100A Units

Figure 5-7 shows the wiring diagram for SCR73Z (three-phase zero crossing) with 150, 200A units.

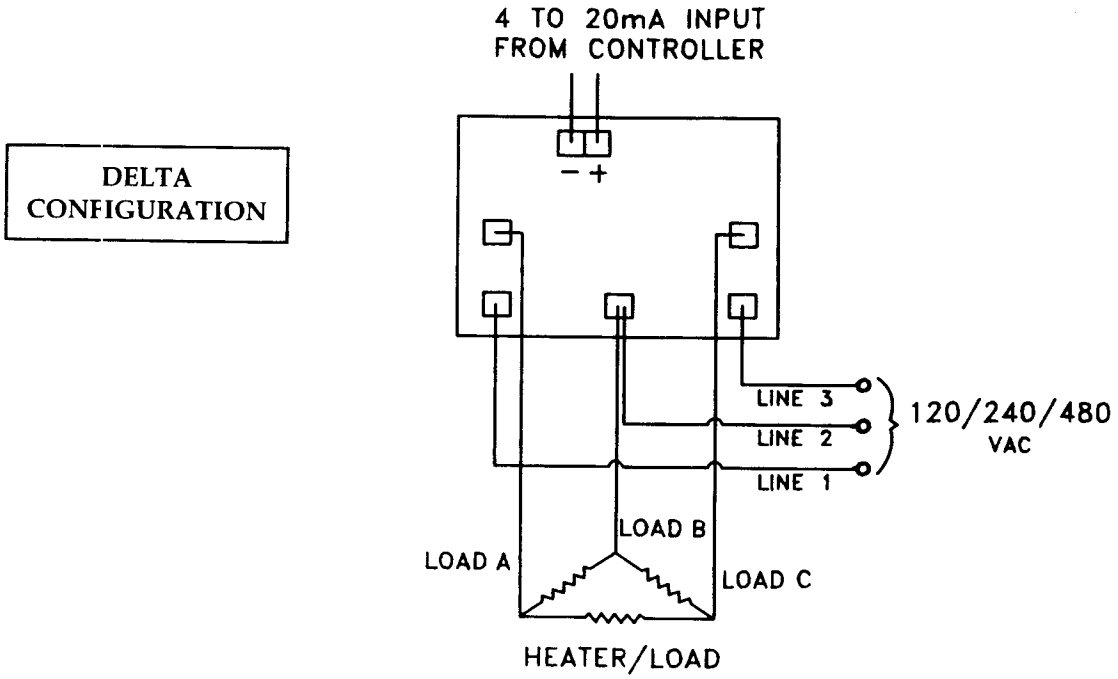


Figure 5-7. 150 & 200A Units

Figure 5-8 shows the wiring diagram for SCR73Z (three-phase zero crossing) with 150, 200A units.

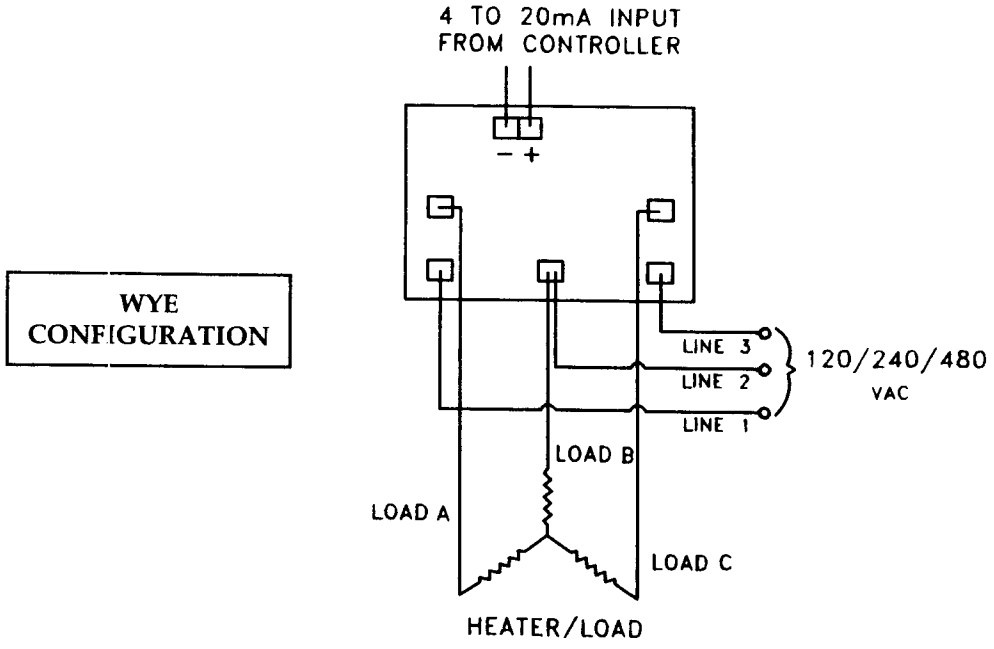


Figure 5-8. 150 & 200A Units

Figure 5-9 shows the wiring diagram for SCR73P (three-phase, phase angle) with 30, 60 and 100A units

DELTA CONFIGURATION

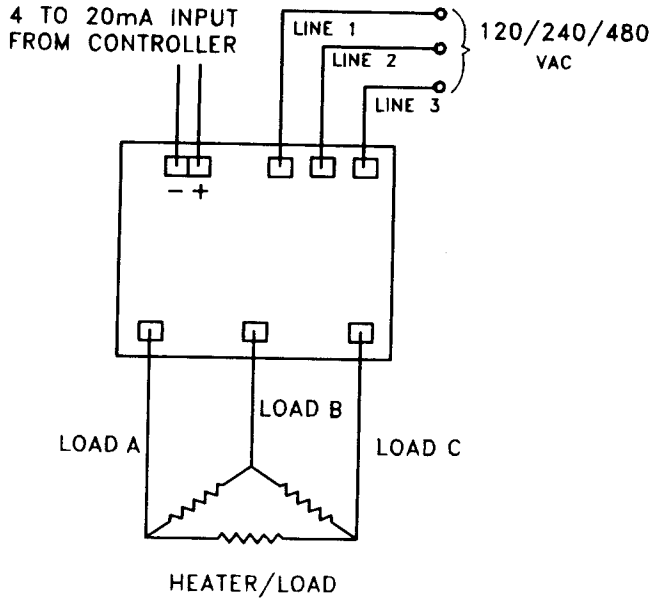


Figure 5-9. 30, 60, & 100A Units

Figure 5-10 shows the wiring diagram for SCR73P (three-phase, phase angle) with 30, 60 and 100A units.

WYE CONFIGURATION

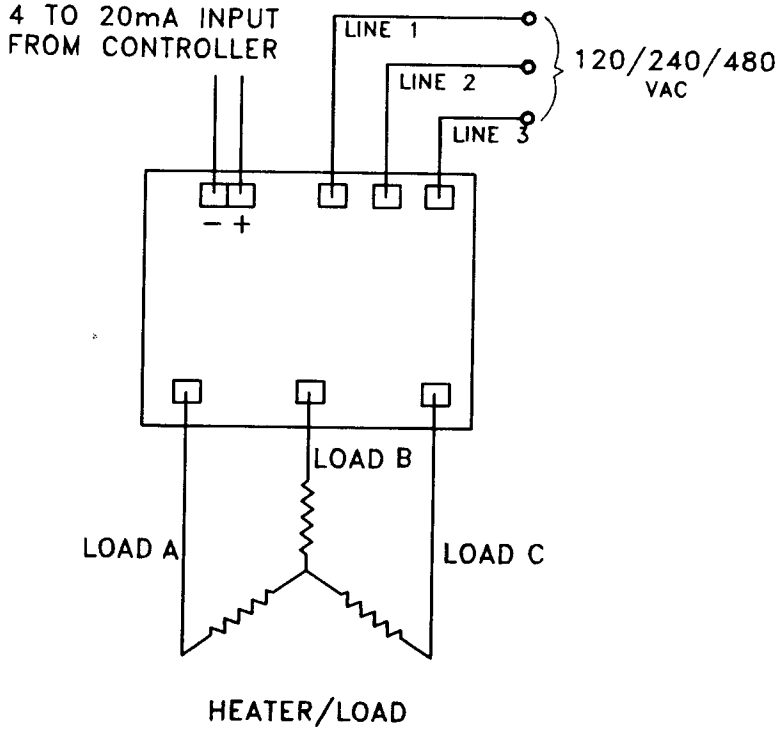


Figure 5-10. 30, 60, & 100A Units

Figure 5-11 shows the wiring diagram for SCR73P (three-phase, phase angle) with 150, 200A units.

DELTA CONFIGURATION

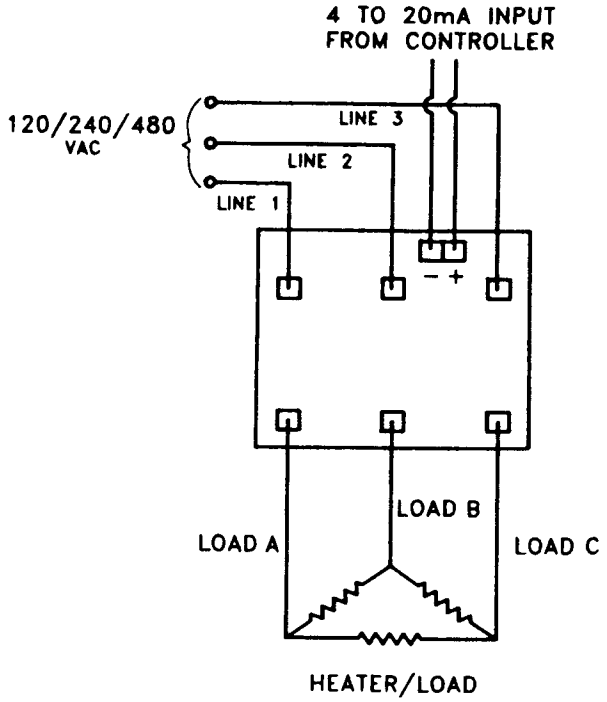


Figure 5-11. 150 & 200A Units

Figure 5-12 shows the wiring diagram for SCR73P (three-phase, phase angle) with 150, 200A units.

WYE CONFIGURATION

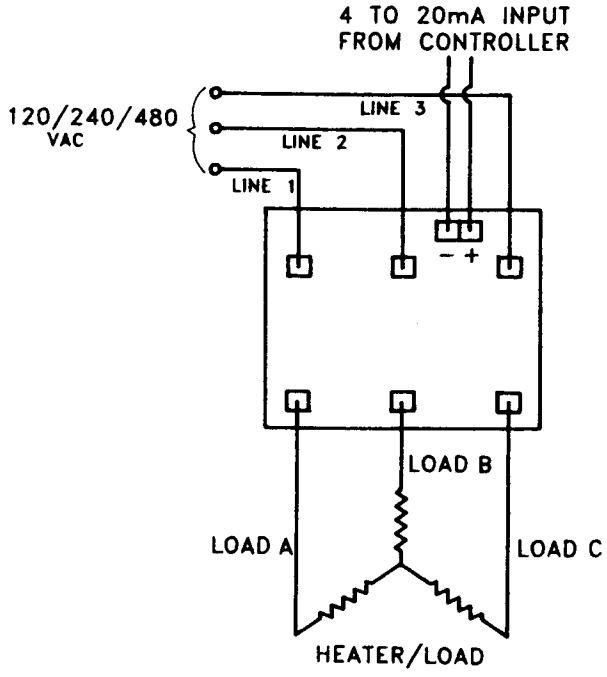


Figure 5-12. 150 & 200A Units

SECTION 6 TROUBLESHOOTING GUIDE

TROUBLESHOOTING SHOULD NOT BE PERFORMED EXCEPT BY QUALIFIED PERSONNEL DUE TO DANGEROUS HIGH VOLTAGE AND HIGH CURRENT. CALL OMEGA FOR ANY ASSISTANCE. RETURN WHOLE ASSEMBLY FOR REPAIR IF NECESSARY.

Problem	Condition	Solution
No heat output or reduced heat output.	– Loss of line voltage	– Check line voltages for phase. – Check heaters for short circuit whenever fuses blow.
	– One line fuse or one controller fuse blown • With delta connected heaters, full voltage will appear across one phase, and half voltage across the other two phases. • With WYE connected heaters, half voltage will appear across two of the heaters and no voltage will appear across the other heater.	– Replace fuse(s) if blown
	– No input from signal conditioner	–Check 4-20 mA from temperature controller
Heaters will not turn completely off	–One SCR module shorted • Half wave voltage will appear across heaters.	–Replace SCR and check for short circuit
	–Input from signal conditioner never drops below 4mA	–Check input from temperature controller

SECTION 7 MAINTENANCE

Some simple preventative maintenance steps on the power controller are:

1. Keep the controller fairly clean, and protect it from dirt, oil and corrosion.
2. Periodically tighten all electrical and mechanical connections, i.e., lugs, terminals, fuses, buss bars, etc. Tighten the heat sink lamps as described in Section 5.6.

SECTION 8 REPLACEMENT OF SCR

1. 30, 60, 75, and 100A controllers:
   a. Disconnect leads on SCR. Remove mounting bolts from SCR module.
   b. When inserting new SCR module, use heat sink compound between surface of SCR module and heat sink. Tighten bolts securely on SCR surface of SCR module and heat sink. Tighten bolts securely on SCR module, between 20 and 30 pound-inches. Reconnect wires on SCR module.
2. Higher Power Controllers:
   a. Remove two nuts holding mounting clamp in center of heat sink. Do not remove top clamp from heat sink. Move top heat sink aside and remove SCR, noting whether the flange is up or down.
   b. Spread heat sink compound on both sides of the new SCR and place the SCR in the center of the lower heat sink with the flange in the same direction as the original SCR. Place the top heat sink onto the SCR making sure that the centering pin from the clamp assembly falls into the locating hole in the SCR. Then push the stud bar up through the holes in the heat sinks and the clamp. Spin the hex nuts down on the clamp studs until finger tight. Using a socket wrench, tighten each nut alternately one half turn until the bottom side of the clamp is even with the appropriate notch on the pressure gauge – 1000 pounds for the SCR-C350D or SCR350N and SCR-C380D or SCR-380N.

      If the SCR is supplied with the two trigger signal wires, unplug the original wires from the trigger board and replace with those from the new SCR. If the SCR has no trigger wires, remove the wires from the original SCR and connect to the new SCR, observing the same color coding.

SECTION 9 REPLACEMENT PARTS FOR SCR71Z, SCR71P, AND SCR73Z SERIES

Amps	Volts	Phase	Fuse Part Number	SCR Module Part Number
30	120, 240, 480	↑	*SCR-A70P35-3	SCR-IRKT5710
60	120, 240, 480		*SCR-A70P60-3	SCR-IRKT5710
75	240, 480		SCR-A70P80	SCR-IRKT9210
100	240, 480	1 & 3	SCR-A70P100	SCR-IRKT9210
150	240		SCR-A70P150	SCR-C350D
150	480		SCR-A70P150	SCR-C350N
200	240		SCR-A70P200	SCR-C380D
200	480	↓	SCR-A70P200	SCR-C380N

*This is a three (3) inch long fuse used on newer units. Older units (with serial numbers lower than 18300, and sold before Aug '93) may have a 4.5 inch long fuse. Replacement for P/N are: SCR-A7035-4 (for 30 Amps), and SCR-A70P60-4 (for 60 Amps).

NOTE: For replacement fuses and SCR modules for phase angle units not listed, consult OMEGA. Replacement Printed Circuit Boards are also available – consult OMEGA for information.

SECTION 10 DIMENSIONS

SCR71P and SCR71Z	
Output Current	**Dimensions**
30A	12.25"H x 10.25"W x 4"D (311.2 x 260.3 x 101.6mm)
60A	12.25"H x 10.25"W x 4"D (311.2 x 260.3 x 101.6mm)
75A*	12.25"H x 10.25"W x 6"D (311.2 x 260.3 x 152.4mm)
100A	12.25"H x 10.25"W x 6"D (311.2 x 260.3 x 152.4mm)
150A	17"H x 13"W x 10"D (431.8 x 330.2 x 254mm)
200A	17"H x 13"W x 10"D (431.8 x 330.2 x 254mm)
*This row does not pertain to SCR71P	

SCR73Z	
Output Current	**Dimensions**
30A	8.75"H x 19"W x 4"D (222.3 x 482.6 x 101.6mm)
60A	8.75"H x 19"W x 4"D (222.3 x 482.6 x 101.6mm)
75A	12.25"H x 19"W x 6"D (311.2 x 482.6 x 152.4mm)
100A	12.25"H x 19"W x 6"D (311.2 x 482.6 x 152.4mm)
150A	17.5"H x 19"W x 10"D (444.5 x 482.6 x 254mm)
200A	17.5"H x 19"W x 10"D (444.5 x 482.6 x 254mm)

SCR73P	
Output Current	**Dimensions**
30A	14"H x 19"W x 4"D (355.6 x 482.6 x 101.6mm)
60A	14"H x 19"W x 4"D (355.6 x 482.6 x 101.6mm)
100A	17.5"H x 19"W x 6"D (444.5 x 482.6 x 152.4mm)
150A	19.25"H x 24"W x 10"D (489 x 609.6 x 254mm)
200A	19.25"H x 24"W x 10"D (489 x 609.6 x 254mm)

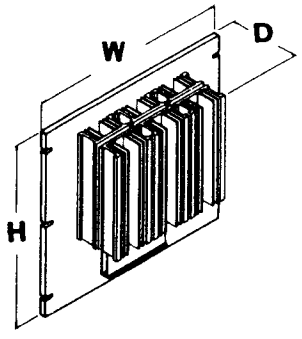


Figure 11-1. Dimensional Drawing

SECTION 11 SPECIFICATIONS

Specifications pertain to zero crossing units and phase angle units unless specified.

Supply Voltage

Zero Crossing:	120/240/480/575 VAC; 1 or 3 phase
Phase Angle:	120/208/240/380/480/575 VAC; 1 or 3 phase Phase connection not critical on 3-phase units.
Frequency:	50/60 Hz
Ambient Temperature:	32° to 122° F (0° to 50° C) for list power ranges
Cooling:	Convection to 200A
Input:	4 to 20mA (minimum voltage requirement–10V) all inputs electrically isolated via optical coupling. Optional manual potentiometer input available.
Protection Load:	Sub-cycle, current-limiting fuse. Transient voltage suppression Resistive, 3-phase - 3 wire WYE or DELTA

MADE IN USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

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