

Models 930/935



Model 935 Shown

Three-phase Control Solutions

The Model 930 and 935 Power Control Systems are complete three-phase power control solutions designed specifically for Research Inc. heating solutions. These standard packages are equipped with the appropriate power control and alarm functions to ensure proper heater function and long heating lamp life.

Model 930 - Designed for use with 4554/4765 PanellIR[®] systems or multiple 4069 ChambIR[®] systems. Amperage capability of 120 or 160 amps.

Model 935 - Designed for use with the 4069 ChambIR[®] heating system. Amperage capability of 50 or 80 amps.

High Reliability/Low Maintenance

Solid-state electronic technology designed for long service life and low maintenance.

Precise Control

Control current or voltage from 0 to 97% with 0.1% resolution resulting in highly accurate, smooth process control capability.

Multiple Line Voltages/Amperages

Multiple models available from 240 to 600 volts and 50 to 160 amperes.

Phase Angle Power Control

Provides precise and stable voltage control. Includes soft-start to ensure long lamp life.

Fast

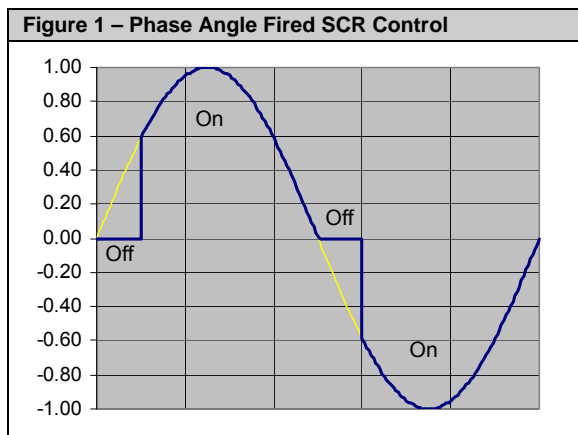
Switch load power on and off quickly providing the means to respond rapidly to command and load changes.

Control Options

Manual or closed loop control with thermocouple or pyrometer input capability.

Phase Angle Control

Phase angle power control is a specific technique for turning on (firing) SCRs. The term phase angle refers to the timing of the firing. For applications requiring low-power output, the SCRs are fired late in each AC half-cycle so that the SCRs conduct only briefly. For applications requiring higher power, the SCRs are fired earlier in each AC half-cycle to provide longer SCR on time. Figure 1 illustrates the application of power using phase angle power control. The output with phase angle power control is very constant since the SCR 'on time' is adjusted within each AC half-cycle. The proportioning of every cycle allows gradual application of voltage to the load. The SCR controls used within the 930/935 are equipped with a soft-start feature to optimize lamp life.



Standard features

The Model 930/935 Power Control Solutions are equipped with numerous standard features specifically designed for Research Inc. heaters, as described below:

Enclosure (Both 930 and 935)

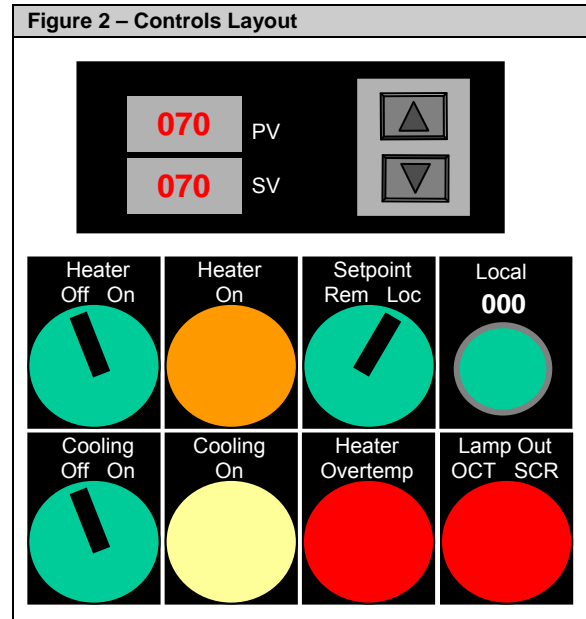
The enclosure used on both models is an industrial, wall-mount NEMA 12 type enclosure. The following features are included:

- Front-opening door mechanically-interlocked with main disconnect switch
- Door-mounted print and manual pocket

Operator Panel (Both 930 and 935)

The operator panel (see Figure 2) is designed for simple and safe operation. PLC logic is used to ensure cooling is actuated before the heaters are energized. Cooling continues to run for several minutes after the heaters are de-energized. The operator panel includes the following features:

- Heater On/Off control switch and indicator light
- Cooling on/off control switch and indicator light
- Set-point local/ remote control switch
- 10-turn potentiometer with digital dial for precise, repeatable local control
- Heater over-temperature indicator
- Mechanically interlocked doors with main power disconnect switches
- Optional lamp-out and SCR over-current trip
- Optional temperature controller with either thermocouple or pyrometer input. Note – if a digital voltmeter is supplied, it is mounted in the position of the temperature controller.



The control box contains a PLC control, which allows “smart” alarming. Table 1 displays the function of the indicator lights.

Indicator Lamp	Lamp On Constant	Lamp Flashes
Heater 'On'	Heater is on	Heater interlock is open
Cooling 'On'	Cooling is on	Cooling off delay – One minute
Heater over-temp	Heater thermostat is open	Temperature controller alarm - optional
Lamp out - OCT SCR	Over current trip or shorted SCR	Lamp out - optional

Control Hardware (Both 930 and 935)

The SCR power control included is the Model 3629B three-phase, SCR power controller. The 3629 has the following features:

- Phase angle control for T3 lamp loads
- Shorted SCR detection
- Over Current Trip w/ field adjustable current limit
- Linear load voltage with respect to command signal

Other standard control features include:

- 0-5 VDC command signal (remote mode) Class T- type fuses with fast acting, SCR protection
- Fused, 120 VAC control transformer for all control wiring and relay logic
- Terminal connections for field wiring
- Pre-wired from terminal blocks to all installed devices and options
- Remote command signal 0-5 VDC connection
- Terminal block contacts for remote E-stop switch, remote heater On/Off switch. Process interlocks for heater thermostat, water and airflow switches
- Integrated contactor controls AC line power to SCR controller

Electrical Ratings

Both the Model 930 and 935 are rated for three-phase, 50/60 Hz. Operation. The units each handle a single zone of three-phase control. Table 2 shows the individual ratings.

	Model 930	Model 935
Voltage	240 or 480V, 3 Φ	240 or 480V, 3 Φ
Amperage	120 or 160 Amps	50 or 80 Amps

Options

In addition to the standard features previously listed, several options are available to enhance the functionality of the systems. Options must be specified when ordering. Refer to Tables 3 and 5 for ordering information.

Control Options (Both 930 and 935)

Three options are available for enhanced system control. A maximum of one of the three control options may be selected.

- **TCT** - Temperature control with thermocouple input enables user-selectable automatic or manual power control. Pre-wired for 'K' type thermocouple.
- **TCP** - Automatic temperature control with pyrometer input enables user-selectable automatic or manual power control. Pre-wired for 4-20 mA pyrometer input.
- **VM** - Digital voltmeter indicates system load voltage level as controlled by either the 10-turn potentiometer or an external, remote control source.

Lamp-out Detection (LL)

- Detects a lamp failure or load loss using multiple infrared heaters or zones of lamps in a single heater.
- Alarm indicator lamp included on front door of power control system.

Product Detection (PD)

- Adjusts lamps between run and idle when product is detected
- Adjustment provided on front panel

High Voltage DC (HV) - 935 only

- Converts a 480 VAC, three-phase input to a variable, single-phase.
- 0 – 600 VDC output
- Loads up to 50 amps
- The system also has the ability to 'balance' three-phase loading on 'uneven' loads.

Table 3: Model 930 Ordering Information	
Model	Product Description
930	Three-phase SCR Power Control System Model 3629B power controller / fan cooling Local/Remote switch w/10 turn pot (local) Remote - 0-5 VDC command signal Interlocks - air flow, thermostat, operator E-stop Fused disconnect - interlocked with door Heater "On" switch - energizes load contactor Cooling "On" - energizes heater cooling fans
Code	Enclosure
A	Wall Mount
Code	Line Voltage
240	240 Volts AC
480	480 Volts AC
Code	Current Capacity / per phase
120	120 Amperes
160	160 Amperes
Code	Options
TCT ¹	Temperature controller with thermocouple input
TCP ¹	Temperature controller with pyrometer input
VM ¹	Digital Volt Meter (w/ Load voltage transducer)
LL	Lamp-out Detection (w/ panel indicator light)
PD	Product Detection (w/ Idle potentiometer)
00	None
<i>(1) Select one only</i>	

Table 5: Model 935 Ordering Information	
Model	Product Description
935	Three-phase SCR Power Control System Model 3629B power controller / fan cooling Local/Remote switch w/10 turn pot (local) Remote - 0-5 VDC command signal Interlocks - air flow, thermostat, operator E-stop Fused disconnect - interlocked with door Heater "On" switch - energizes load contactor Cooling "On" - energizes heater cooling fans
Code	Enclosure
A	Wall Mount
Code	Line Voltage
240	240 Volts AC
480	480 Volts AC
Code	Current Capacity / per phase
50	50 Amperes
80	80 Amperes
Code	Options
TCT ¹	Temperature controller with thermocouple input
TCP ¹	Temperature controller with pyrometer input
VM ¹	Digital Volt Meter (w/ Load voltage transducer)
LL	Lamp-out Detection (w/ panel indicator light)
PD	Product Detection (w/ Idle potentiometer)
HV	High Voltage DC output (0-600 VDC @ 50 amps)
00	None
<i>(1) Select one only.</i>	

Table 4: Dimensions and Weight		
	Model 930	Model 935
A	48.00 in (1219 mm)	30.00 in (762 mm)
B	49.50 in (1257 mm)	31.50 in (800 mm)
C	51.15 in (1299 mm)	33.15 in (842 mm)
D	22.50 in (572 mm)	22.50 in (572 mm)
E	25.00 in (635 mm)	24.00 in (610 mm)
F	16.50 in (419 mm)	14.34 in (364 mm)
Weight	190 lb (418 kg)	150 lb (330 kg)

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