

**CONTROL
CONCEPTS
INC.**

**INSTRUCTION MANUAL
MODEL 1024**

DESCRIPTION:

The model 1024 is a zero-cross, normally open solid state switch, capable of blocking up to 575Vac in the "OFF" state and conducting up to 70 amps in the "ON" state.

The device (known as an SCR module) is "ON" when a DC signal greater than 3.5 volts is applied to the input terminals. (Maximum allowable input voltage is 32 volts.) The input terminals are electrically isolated from the load and supply voltages. When the command or control signal is applied to the SCR module it will turn "ON" the next time that the sinusoidal applied voltage passes through zero. When the control signal is removed, the SCR module turns "OFF" the next time the instantaneous current through it is zero. The term zero-cross is derived from the fact that the SCR module can turn "ON" only when the instantaneous value of the applied voltage is zero and can turn "OFF" only when the instantaneous current through it is zero.

The SCR module is capable of being operated from numerous control circuits manufactured by Control Concepts Inc. (See section on control circuits.) These circuits accept a wide variety of industrial control signals and each will provide the DC control circuit to linearly control, with respect to the control signal, the power to the load. The SCR module may also be controlled directly as stated above by the applying DC voltage to the input terminals.

The SCR module consists of two silicon controlled rectifiers (SCRs) arranged as an inverse parallel pair allowing the SCR module to switch AC power. These SCR's, a dv/dt circuit and the circuit providing electrical isolation and zero-cross logic are contained in the SCR module. The mounting or base plate of the module is also electrically isolated. An aluminum heatsink is provided to dissipate the heat generated by the SCR module. The SCR module is protected from line voltage transients by metalized oxide varistors (MOV's) connected across the line and load terminals. The MOV's allow voltage transients to pass that would otherwise damage the SCR's.

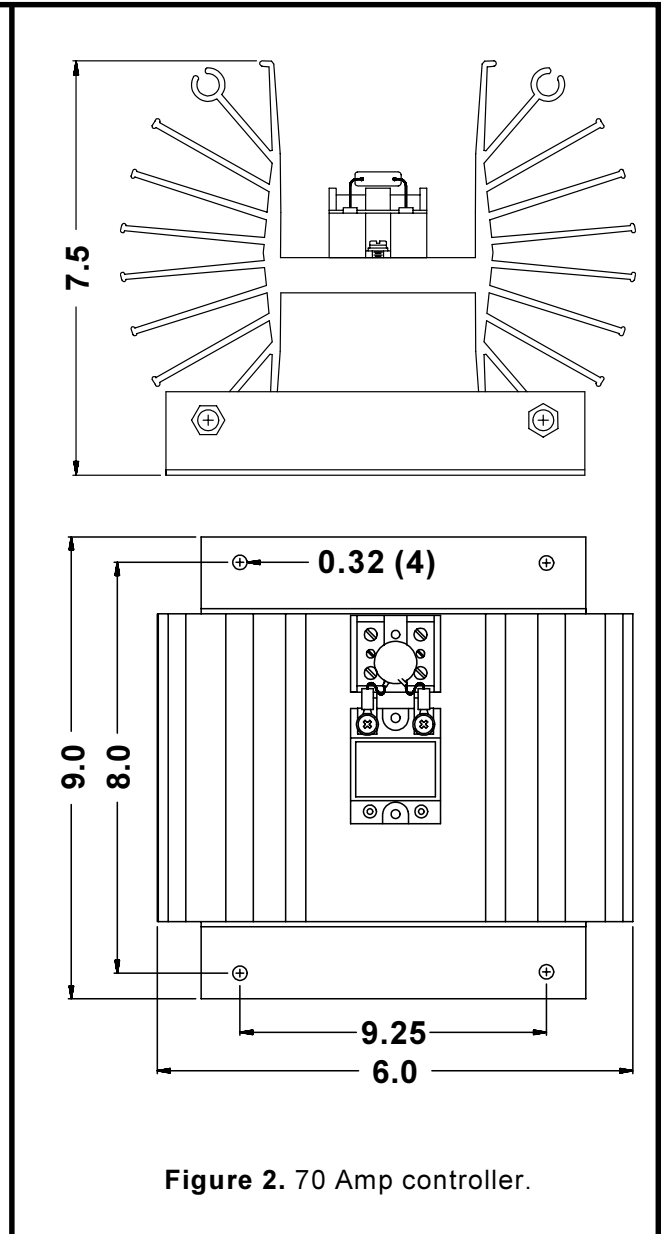
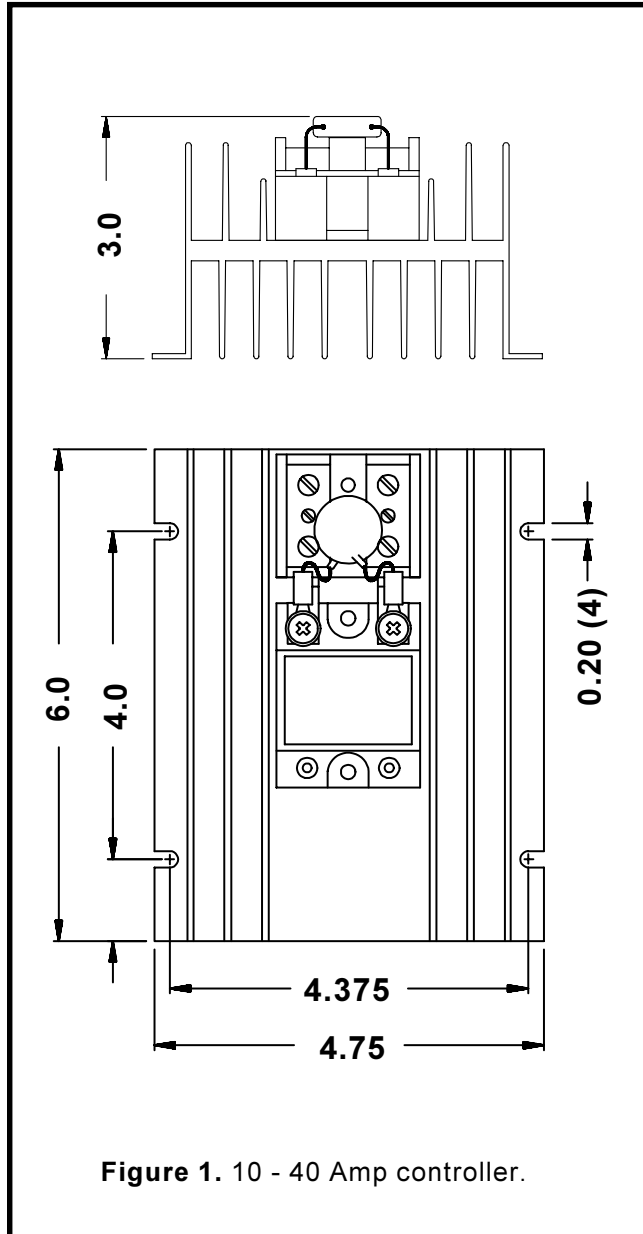
The 1024 power controller has no inherent wear out modes as do mechanical switching devices. The zero-cross feature provides transient free switching.

SPECIFICATIONS:

SURGE CURRENT:	1 cycle: 10 times rated current 1 second: 3 times rated current
AMBIENT TEMPERATURE:	Operating: 0 to +55°C Storage: -30 to +85°C
HUMIDITY:	Operating and Storage: 0 to 95% Noncondensing.
ELECTRICAL ISOLATION:	Dielectric strength: input/output/base 50/60 Hz (1-minute) 2500 volts. Insulation resistance: @ 500 Vdc 10^{10} Ohms Max. capacitance: input/output 16 pf
OFF STATE LEAKAGE CURRENT:	10 mA (RMS)
MINIMUM OFF-STATE dv/dt:	200 V/us
CONTROL SIGNAL:	Voltage range: 3.5 to 32 Vdc Impedance: 1500 ohms Must turn-on voltage: 3.5 Vdc Must turn-off voltage: 1.0 Vdc Max. reverse voltage: 32Vdc

INSTALLATION DRAWINGS:

The power controller must be mounted on a vertical surface, oriented such that the heatsink fins are vertical so that air may pass through them unrestricted. The controller can be mounted above, below or next to other controllers.



TORQUE TABLE FOR USD CONNECTORS



Wire Size	Recommended Torque
10 -14 ga	35 in-lbs
8 ga	40 in-lbs
4 - 6 ga	45 in-lbs
2-3 ga	50 in-lbs

ELECTRICAL CONNECTIONS:

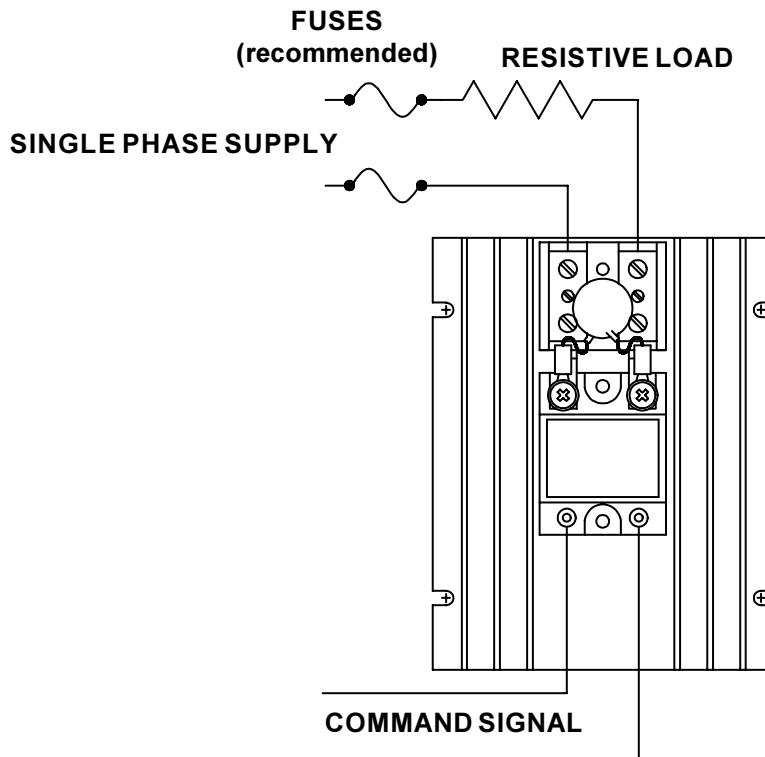


Figure 3. Single phase connections.

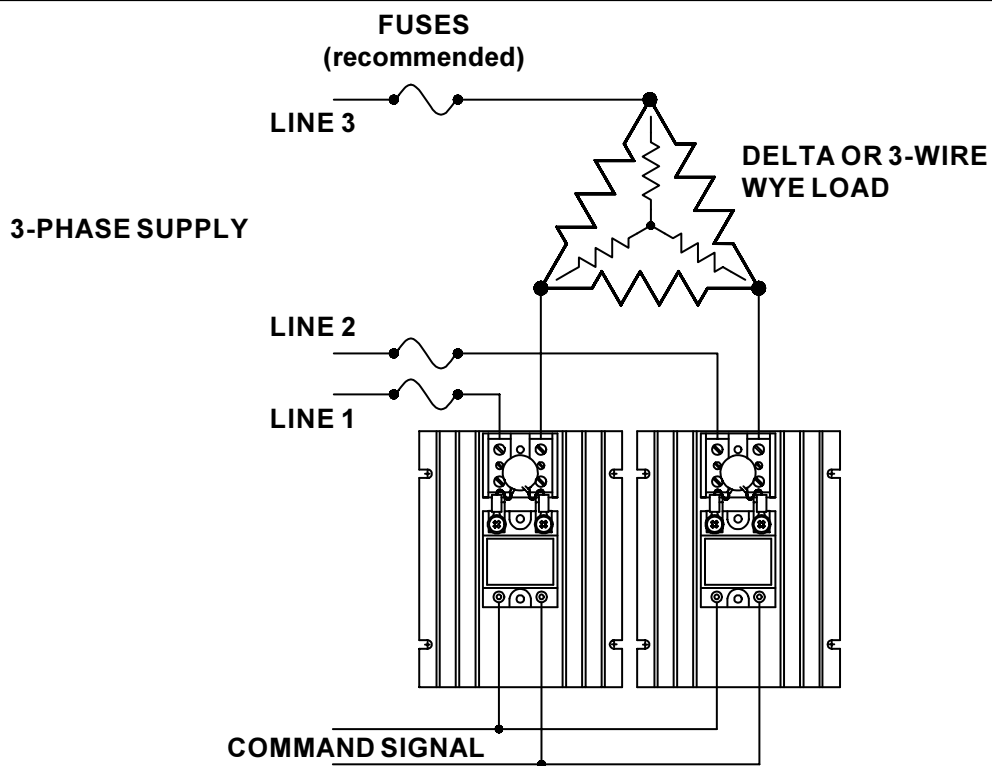


Figure 4. Three-phase, 2-leg Connections.

CONTROL CIRCUITS:

As an option, the model 1024 can be operated or controlled by any of the following Control Concepts circuits:

Model 1020-FC: Accepts a 4/20mA input and provides distributive zero-cross control.

Model 1021A-FC: Accepts 0/5Vdc, 0/10Vdc or a potentiometer command and provides distributive zero-cross control.

Model 1023-FC: Accepts 4/20mA input and provides time proportional zero-cross control with field adjustable time frame from 1 to 10 seconds.

Model 1026-XX-FC: Accepts either a 120Vac or a 240Vac ON-OFF control. Frequently used as a contactor replacement.

Model 1031-FC: Accepts a 1/5Vdc signal or a potentiometer input and provides distributive zero-cross control.

MODEL No. DESCRIPTION:

1024-VV-AA

VV = Nominal Line Voltage (+10% - 80%)

12 = 120 Vac 50/60 Hz

24 = 240 Vac 50/60 Hz

48 = 480 Vac 50/60 Hz

57 = 575 Vac 50/60 Hz

AA = Rated RMS current

10 = 10 Amps RMS

20 = 20 Amps RMS

30 = 30 Amps RMS

40 = 40 Amps RMS

70 = 70 Amps RMS

RECOMMENDED REPLACEMENT SCR:		RECOMMENDED FUSES (typical) (Alternative fuse size is 125% of max. load current)		
MODEL:	ASSEMBLY PART No. *	CCI PART #	BUSSMAN #	CCI FUSEKIT **
1024-12-10	1651-12-10	42110-0460-315	JJS-15	FK\62T15
1024-12-20	1651-12-20	42110-0460-325	JJS-25	FK\62T25
1024-12-30	1651-12-30	42110-0460-335	JJS-35	FK\62T35
1024-12-40	1651-12-40	42110-0460-350	JJS-50	FK\62T50
1024-12-70	1651-12-70	42110-0460-390	JJS-90	FK\62T90
1024-24-10	1651-24-10	42110-0460-315	JJS-15	FK\62T15
1024-24-20	1651-24-20	42110-0460-325	JJS-25	FK\62T25
1024-24-30	1651-24-30	42110-0460-335	JJS-35	FK\62T35
1024-24-40	1651-24-40	42110-0460-350	JJS-50	FK\62T50
1024-24-70	1651-24-70	42110-0460-390	JJS-90	FK\62T90
1024-48-10	1651-48-10	42110-0460-315	JJS-15	FK\62T15
1024-48-20	1651-48-20	42110-0460-325	JJS-25	FK\62T25
1024-48-30	1651-48-30	42110-0460-335	JJS-35	FK\62T35
1024-48-40	1651-48-40	42110-0460-350	JJS-50	FK\62T50
1024-48-70	1651-48-70	42110-0460-390	JJS-90	FK\62T90

* The assembly includes the SCR relay, a thermal conductive pad, an MOV and an instruction sheet.

** The fuse kit includes two fuses of appropriate rating for the frame size, and a fuseblock.

Control concepts recommends that fuses be rated at 120 to 125% of maximum load current.

TROUBLESHOOTING:

SYMPTOM: FULL OR PARTIAL POWER IS ALWAYS APPLIED TO THE LOAD.

Determine that the command signal is zero. (Remove the command signal if necessary to assure that the command is zero.) Note: If the controller is operated with one of Control Concepts circuits and the LED on the circuit is "ON" the problem is associated with the circuit card or the command signal applied to the circuit. If full power is applied with zero command signal, both SCR modules have probably failed. If partial power is applied and the command signal is zero, one of the SCR modules has failed.

To determine which module has failed, measure the voltage across each module with a volt meter. In the "OFF" state the voltage across each SCR module should be equal to the line or supply voltage. If the voltage across the module is 70% or less replace the SCR module.

SYMPTOM: NO POWER OR ONLY PARTIAL POWER CAN BE APPLIED TO THE LOAD.

If no power can be applied to the load, determine that a command signal of 3.5 Vdc or greater is applied to the input terminals. If a Control Concepts circuit is used to control the model 1024 power controller and the LED is not "ON" continuously, the problem is probably associated with the circuit or the control signal to the circuit. Determine that the correct supply voltage does exist on all three phases and that all fuses are satisfactory. The voltage across the line and load connections on the SCR module should be less than 10 volts when at least 3.5Vdc but no more than 32Vdc is applied to the control terminals.

The SCR module may have one of the following failure modes:

1. One of the SCRs is shorted and cannot be turned off.
2. The SCR module will not turn on and therefore no current will be conducted through the module.
3. One of the two SCRs fails to turn on. In this situation only DC current will pass through the SCR module and full load power will not be possible.

NOTE: Current and voltage measurements should be taken with true RMS measuring instruments. Averaging responding meters may not provide correct measurements.

CAUTION: USE EXTREME CARE DURING MAINTENANCE OR REPAIR TO AVOID ELECTRICAL SHOCK. ALWAYS REMOVE SYSTEM POWER BEFORE MAKING CONTACT WITH ANY HIGH VOLTAGE COMPONENTS.

SCR REPLACEMENT:

1. Remove power from the controller.
2. Remove electrical connections from SCR module. Mark the wires to insure that they will be returned to the correct terminal.
3. Remove the SCR module from the mounting surface. Be sure to retain ALL screws, and mounting hardware.
4. With a clean dry cloth or paper towel, remove the thermal compound from the surface of the heat sink. Determine that there are no particles of dirt or old thermal compound on the mounting surface.
5. A thermal conductive pad is supplied with the replacement SCR module. Remove the protective brown paper from both sides of the thermal conductive pad. Apply the thermal conductive pad to the surface on which the SCR module is to mount. Place the module in the mounting position.
6. Assemble the SCR module on the mounting surface. Use the spring washers to ensure a constant mounting force. Tighten the screws evenly applying as much torque as possible without damage.
7. Reassemble the electrical connections to the SCR module.

MANUFACTURED BY:



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