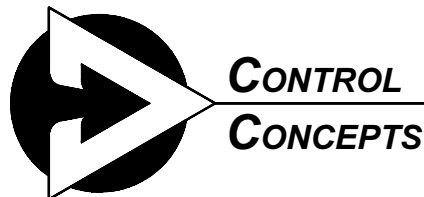


**CONTROL
CONCEPTS
INC.**

**INSTRUCTION MANUAL
MODEL 3024**



Distributed Worldwide By
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DESCRIPTION:

The model 3024 is a pair of zero-cross, solid state, normally open switches. These switches are capable of blocking up to 575 Vac in the "OFF" state and conducting up to 70 amps in the "ON" state. The devices are used to control two legs of a three-phase load.

3024 The device is "ON" when a DC signal greater than 3.5 volts is applied to the input terminals. (Maximum allowable input voltage is 32 Vdc.)

3024A This device is "ON" when an AC signal greater than 90 Vac is applied to the input terminals. (Maximum allowable input voltage is 280 Vac.)

Note: If the controller is intended to be operated with a solid state switch, the leakage current through the solid state switch may be enough so that the **3024A** will not turn off. It is recommended, in this case, that a **3026** controller be used to prevent this from happening.

The input terminals are electrically isolated from the load and supply voltages by optical isolators. When the command or control signal is applied to the device, it turns "ON" as the sinusoidal applied voltage passes through zero. When the control signal is removed, the device turns "OFF" as soon as the instantaneous current through it is zero. The term zero-cross is derived from the fact that the device 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 **3024** is capable of being operated from numerous control circuits manufactured by Control Concepts Inc. (See section on control circuits, Page 6.) These circuits accept a wide variety of industrial control signals and provides the DC control circuit to linearly control, with respect to the control signal, the power to the load. The **3024** may also be controlled directly as stated above by the applying DC voltage to the input terminals.

The solid state switching device consists of two silicon controlled rectifiers (SCRs) arranged as an inverse back-to-back pair allowing these unidirectional devices to switch AC power. These SCRs a dv/dt circuit and the circuit providing electrical isolation and zero-cross logic are contained in 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 device is protected from line voltage transients by metalized oxide varistors (MOV's) connected across the line and load terminals. The MOV's bypass voltage transients that would otherwise damage the SCRs.

The **3024** and the **3024A** power controller have no inherent wear out modes as do mechanical switching devices and 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% Non-condensing

ELECTRICAL ISOLATION:

- Dielectric strength: input/output/base 50/60 hz (1-minute) 2500 volts.
- Insulation resistance: @ 500 Vdc; 10¹⁰ Ohms
- Max. capacitance: input/output; 16 pf

PHYSICAL:

- Weight: 10 thru 40 Amp; 6 Lbs, incl. baseplate
- 70 amp; 12 amps

OFF STATE LEAKAGE CURRENT:

- 10 mA (RMS)

MINIMUM OFF-STATE dv/dt:

- 200 V/us

CONTROL SIGNAL:

	3024	3024A
Voltage range:	3.5 to 32 Vdc	90 to 280 Vac
Impedance:	1500 ohms	60K ohms
Must turn-on volts:	3.5 Vdc	90 Vac
Must turn-off volts:	1.0 Vdc	10 Vac
Max. reverse volts:	32 Vdc	N/A

MODEL No. IDENTIFICATION:

3024-VV-AA or 3024A-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

TROUBLESHOOTING:

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

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 and the command signal is zero both SCR modules have probably failed. If partial power is applied and the command signal is zero one of the SCR modules has failed. Remove the supply voltage from one of the modules. If the load power is now zero, replace this module. If partial load power still exists replace the supply voltage and remove the supply voltage from the other module. If the load power is now zero replace this module.

Alternate techniques to determine which module has failed include measuring 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 of the **3024**, or 90 Vac to the terminals of a **3024A**. If a Control Concepts circuit is used to control the model **3024** 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 3.5 to 32 Vdc is applied to the control terminals of a **3024** (or when 90 to 280 Vac is applied to the control terminals of a **3024A**).

Failure of the SCR module is extremely rare but if failure does occur it will have one of the following failure modes:

1. One of the SCRs is shorted and therefore the SCR is on continuously and can not be turned off.
2. The SCR module will not turn on and therefore no current can be made to be conducted through the module.
3. Only 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.

SCR REPLACEMENT:

1. Remove all power to the SCR module that is to be replaced.
2. Remove the SCR module from the mounting surface. Be sure to retain ALL screws, and mounting hardware.
3. With a clean dry cloth, remove as much of the thermal compound as possible from the surface where the replacement module is to be positioned. Ensure that there are no particles of dirt or old thermal compound on the mounting surface.
4. Apply a small amount of new thermal compound to the surface on which the SCR module is to be mounted. This should be applied as thin as possible. The purpose being, to fill the cavities on the surface to improve thermal conductivity. Smooth the compound being careful not to leave streaks or ridges on the surface. Then apply a thin coat to the SCR module in the same manner, and place the module in the mounting position.
5. 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.
6. Reassemble the electrical connections to the SCR module, do not apply thermal compound to any other electrical connections.

INSTALLATION:

The power controller must be mounted on a vertical surface, oriented such that the heatsink fins are vertical. Power controllers can be mounted directly above, below and adjacent to other controllers.

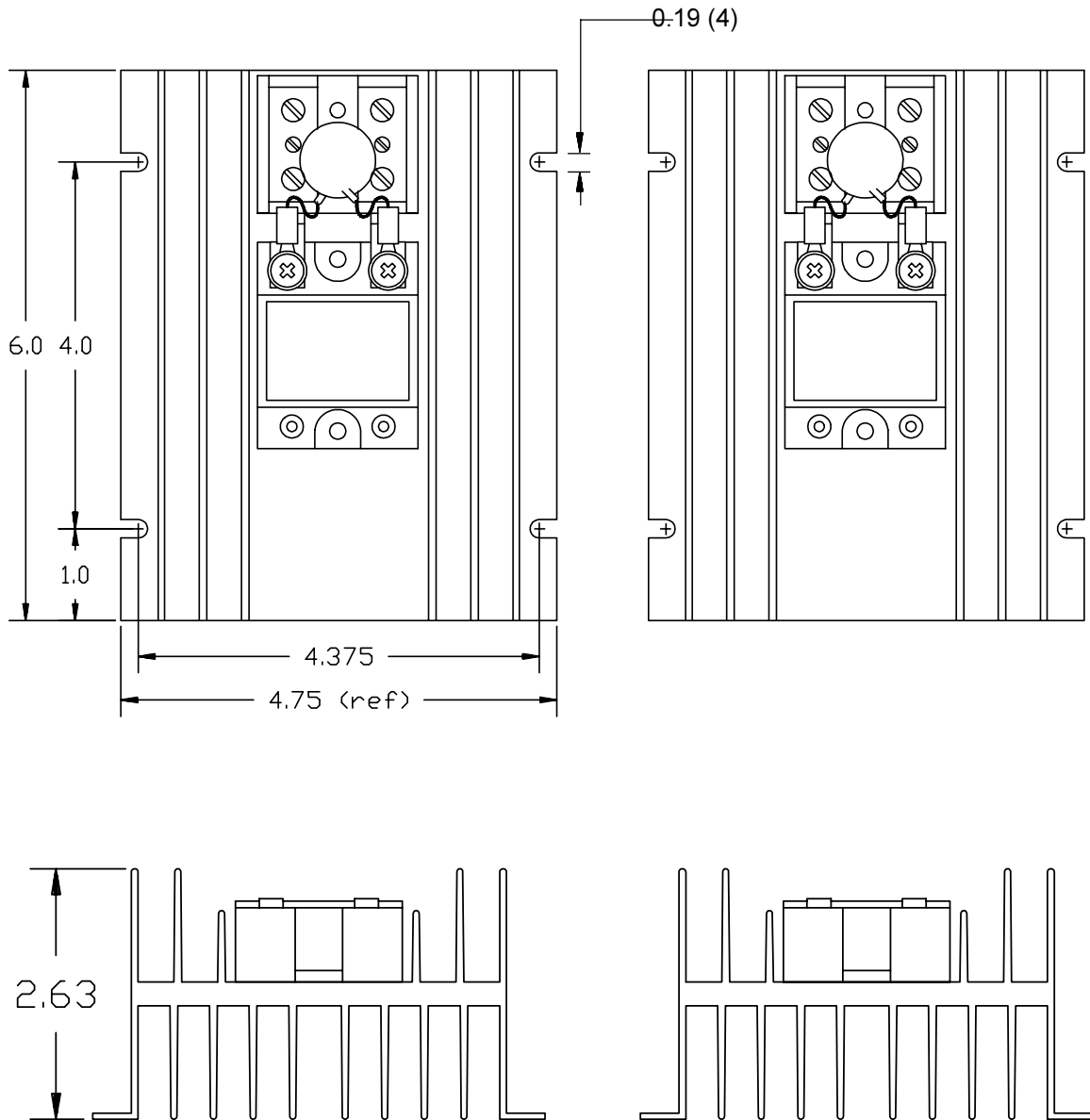


Figure 1. Model 3024, 10 to 40 AMP Installation Drawings.

INSTALLATION:

The power controller must be mounted on a vertical surface, oriented such that the heatsink fins are vertical. Power controllers can be mounted directly above, below and adjacent to other controllers.

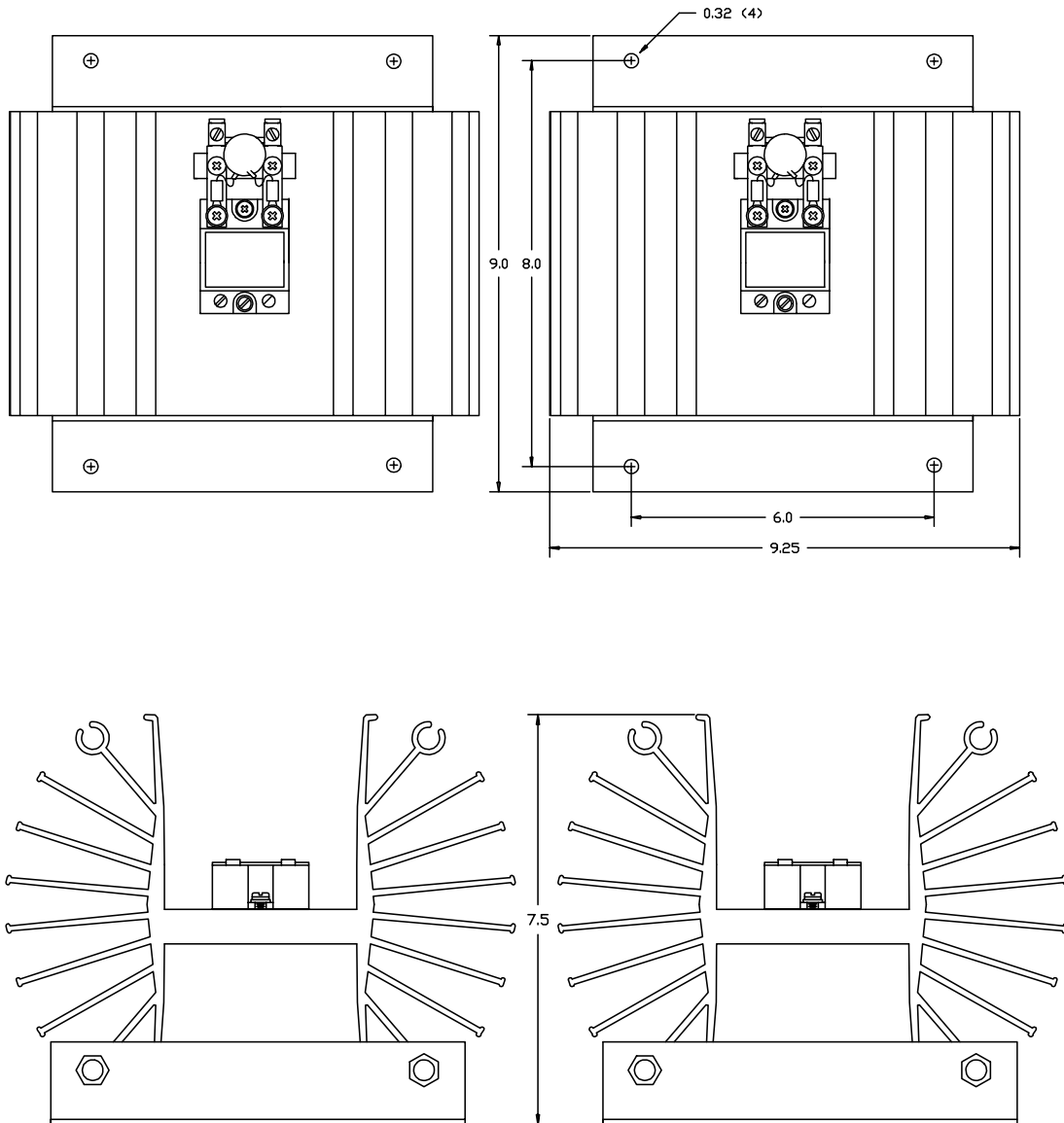


Figure 2. Model 3024, 70 AMP Installation Drawings.

ELECTRICAL CONNECTIONS:

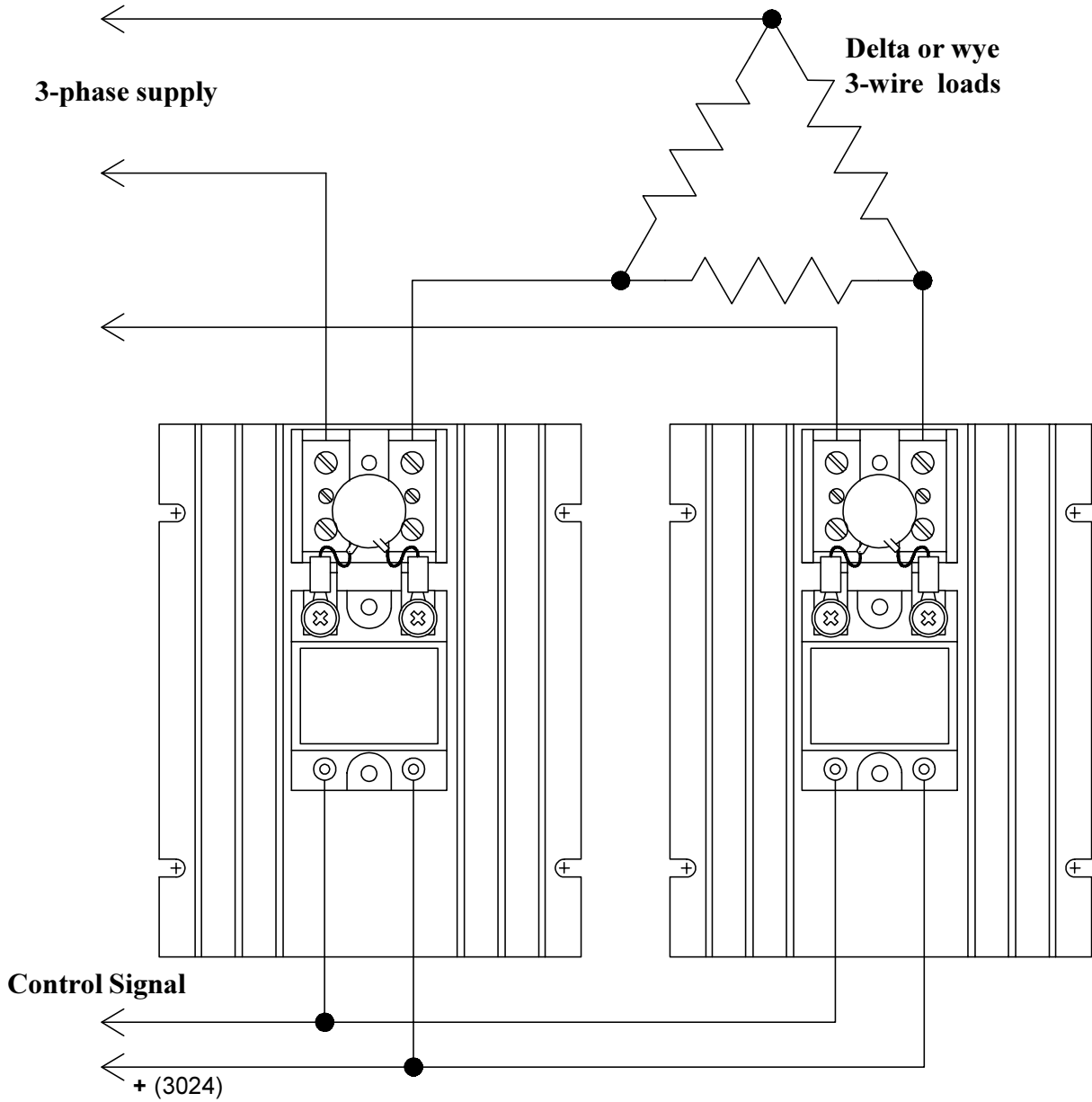


Figure 3. Three-Phase, 2-leg connections.

RECOMMENDED SPARE PARTS:				RECOMMENDED FUSES	
SCRMODULE:		SCRMODULE:		CCIPART#	BUSSMAN#
MODEL:	CCI PART #	MODEL:	CCI PART #		
3024-12-10	41000-412-310	3024A-12-10	41020-424-375	42110-0430-315	JJN-15
3024-12-20	41000-412-325	3024A-12-20	41020-424-375	42110-0430-325	JJN-25
3024-12-30	41000-412-340	3024A-12-30	41020-424-375	42110-0430-335	JJN-35
3024-12-40	41000-412-375	3024A-12-40	41020-424-375	42110-0430-350	JJN-50
3024-12-70	41000-412-375	3024A-12-70	41020-424-375	42110-0430-390	JJN-90
3024-24-10	41000-424-310	3024A-24-10	41020-424-375	42110-0430-315	JJN-15
3024-24-20	41000-424-325	3024A-24-20	41020-424-375	42110-0430-325	JJN-25
3024-24-30	41000-424-340	3024A-24-30	41020-424-375	42110-0430-335	JJN-35
3024-24-40	41000-424-375	3024A-24-40	41020-424-375	42110-0430-350	JJN-50
3024-24-70	41000-424-375	3024A-24-70	41020-424-375	42110-0430-390	JJN-90
3024-48-10	41000-448-310	3024A-48-10	41020-448-340	42110-0460-315	JJS-15
3024-48-20	41000-448-325	3024A-48-20	41020-448-340	42110-0460-325	JJS-25
3024-48-30	41000-448-340	3024A-48-30	41020-448-340	42110-0460-335	JJS-35
3024-48-40	41000-448-375	3024A-48-40	41020-448-375	42110-0460-350	JJS-50
3024-48-70	41000-448-375	3024A-48-70	41020-448-375	42110-0460-390	JJS-90
3024-57-10	41000-460-310			42110-0460-315	JJS-15
3024-57-20	41000-460-325			42110-0460-325	JJS-25
3024-57-30	41000-460-340			42110-0460-335	JJS-35
3024-57-40	41000-460-375			42110-0460-350	JJS-50
3024-57-70	41000-460-375			42110-0460-390	JJS-90

CONTROL CIRCUITS:

The model 3024 can be operated or controlled by any of the following Control Concepts circuits.

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

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

Model 1023-FC: Accepts a 4/20 mA 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 120 Vac or a 240 Vac ON-OFF control. Frequently used as a contactor replacement.

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

MANUFACTURED BY:

