

MODEL 1020

INSTALLATION & MAINTENANCE MANUAL

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WARNING: The Control Concepts, Inc. power controllers use power thyristors to switch voltage to the connected load. Line voltage must be assumed at the output terminals at all times, even when the control signal has been removed and the load voltage appears to be off. It has been mandated by the National Electrical Code and the Occupational Safety and Health Act of 1970 that a physical disconnect be opened ahead of all remotely actuated controls before performing any maintenance work on the controller or its connected load.

PROPRIETARY DATA

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DESCRIPTION

The model 1020 controls the electrical power applied to a single phase load, proportional to a 4-20mA command signal, by zero-cross operation of a pair of SCRs. The controller is available with current ratings from 10 to 70 amps and voltage ratings from 120 to 575Vac. Other Voltages may be available, call the factory.

The SCRs (Silicon Controlled Rectifiers) are contained in a module which electrically isolates the line and load voltage from the heat sink and the command signal, and which contains the circuitry allowing the SCRs to be turned on or off only when the instantaneous value of the applied voltage is zero. The circuit card which is powered by the 4-20mA signal controls the ON and OFF time of the SCRs, causing the load power to be directly proportional to the command signal.

THEORY OF OPERATION

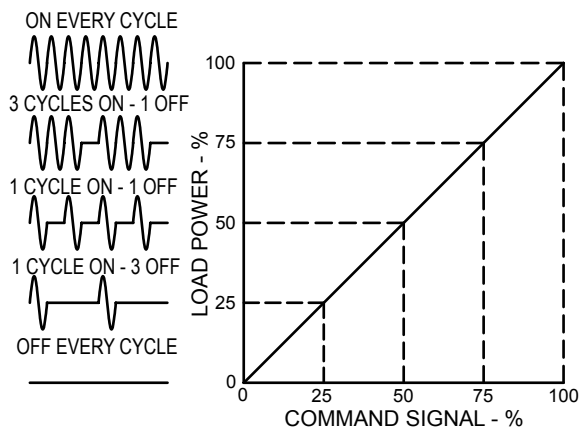


Figure 1. Distributive Control.

The model 1020 is a zero-cross distributive controller. Zero-cross implying that load power can be turned ON or OFF only at the beginning or end of each electrical half cycle when the instantaneous value of the applied voltage is zero. Distributive control provides rapid ON-OFF cycling of the load power and combines various cycling rates to obtain the desired load power with infinite resolution. At 50% power the 1020 controller is ON for 3 electrical cycles and OFF for 3 electrical cycles.

At lower power levels load power is applied for 3 cycles and the number of OFF cycles is increased. At power levels above 50% power is removed for 3 cycles and the number of ON cycles is increased. For example, at 75% power the controller is on for 9 cycles and off for 3 cycles. At 60% power the controller is ON for 4 cycles, OFF for 3 cycles then ON for 5 cycles followed by 3 OFF cycles, providing 9 ON cycles out of a total of 15 cycles.

INSTALLATION

The controller must be mounted on a vertical surface such that the heat radiating fins are vertical and located in an environment that will not exceed 55°C and is protected from dirt and dust. See Installation Drawings.

The wiring to the controller must be per local electrical codes. See Electrical Connections.

The supply and load terminals will accept up to # 6 wire. The terminals for the 4-20mA control signal accept wire up to # 18. The terminal provided for the 4-20mA command signal is a plug-in connector and can be removed by pulling it straight off from the circuit card.

CAUTION: Do not over-tighten the wire connections.
See torque table below.

NOTE: It is recommended that the controller and the load be protected with fast acting class "T" fuses such as described in the specification portion of this instruction manual.

RECOMMENDED TIGHTENING TORQUE USD CONNECTORS:



WIRE SIZE (AWG)	TORQUE
14 - 10 GA	35 IN-LBS
8 GA	40 IN-LBS
4 - 6 GA	45 IN-LBS
2 - 3 GA	50 IN-LBS

RECOMMENDED TIGHTENING TORQUE FOR GREEN CONNECTOR:



WIRE SIZE (AWG)	TORQUE
12 TO 26GA	5.0 IN-LBS

SPECIFICATIONS

Control Mode	Single-phase zero-cross - distributive control.
Command Signal	4/20 milliAmps, (unless specified otherwise) 7 volt minimum compliance; input impedance equivalent to 350 ohms at 20 milliamp.
Control Range	0 to 100% of line voltage.
Linearity	Average load power is linear within 2% of the command signal.
Zero and Span Adjustments	User adjustable over range of $\pm 20\%$ of span.
Isolation	Dielectric strength input/line & load voltage/heatsink 2500V(RMS) Insulation resistance input/line & load voltage/heatsink 10^{10} ohms. Maximum capacitance input to output 8pf.
Cooling	Convection.
Mounting	Must be mounted on vertical surface with fins vertical. Units may be mounted adjacent to each other. Heat sink is electrically isolated.
Line Voltage	120, 240, 480, 575Vac $+10\%$, -50% 50/60 Hertz.
Diagnostic Indicator	An LED is ON whenever power is applied by the SCR module and therefore the frequency varies as a function of the 4/20 mA command signal.
Physical	Weight: 10 thru 40 amp 2 lbs , 70 amp 6 lbs Dimensions: Refer to Installation Drawings.
Environment	Operating: 0 to 55°C (32 to 131°F) Storage: -40 to 80°C (-40 to 176°F) Humidity: 0 to 95% Non-condensing.
DV/DT & Transient Voltage	200 volts/usec minimum. A dv/dt snubber and a metal oxide varistor (MOV) are provided to protect against high frequency transients (dv/dt) and voltage spikes.
Dissipation	1.5 watt per amp of controlled current.
Recommended Fusing	Special semiconductor fuses are not required. It is recommended that the controller and load be protected with fast acting class "T" fuses such as Bussmann type JJS fuses (600V). Control Concepts maintains an inventory of fuses and fuse holders for your convenience. See Figure 4 on Page 3, and fuse recommendations on Page 4. For optimum protection, use fuses rated at 125% of maximum load current.

RATINGS

CURRENT CAPACITY				KW				
Continuous RMS rating	RMS 1 Second	Peak 1 Cycle (Non-Repetitive)	(I ²)t rating	120 Vac	240 Vac	277 Vac	480 Vac	575 Vac
10	22	140	81	1.20	2.40	2.77	4.80	5.75
20	40	250	260	2.40	4.80	5.54	9.60	11.55
30	80	625	1620	3.60	7.20	8.31	14.40	17.31
40	150	1000	4150	4.80	9.60	11.08	19.20	23.08
70	150	1000	4150	8.40	16.80	19.39	33.60	40.39

INSTALLATION DRAWINGS

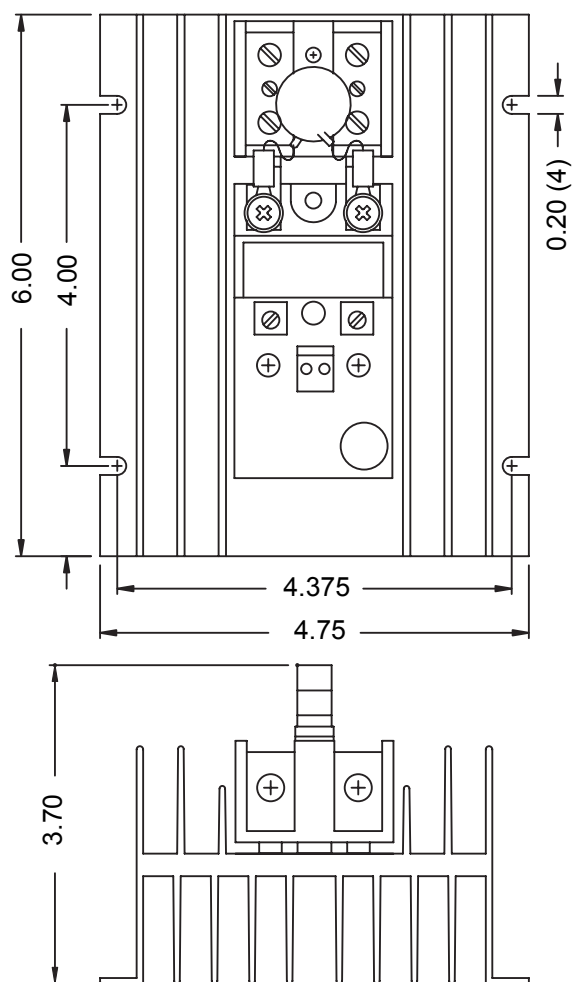


Figure 2. 10 - 40 Amp Dimensions.

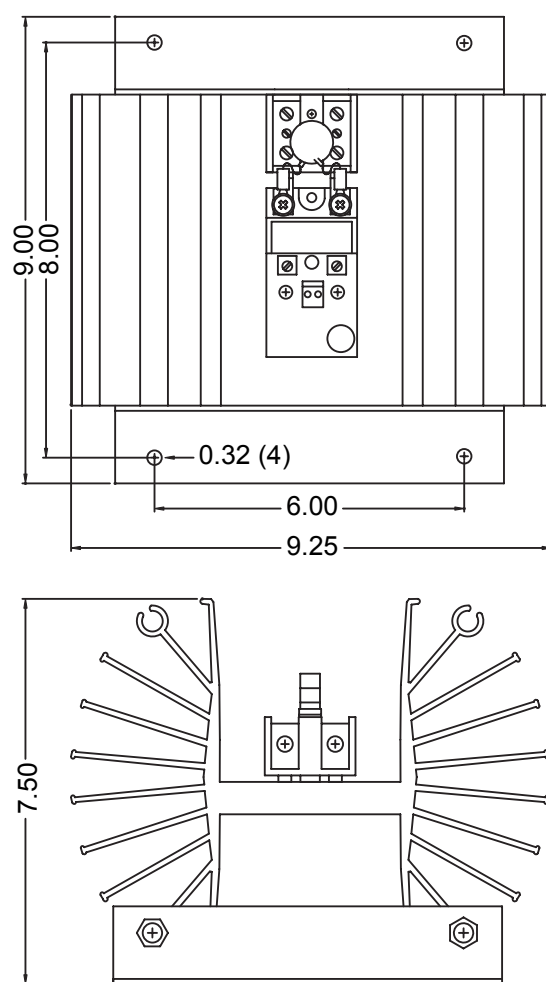


Figure 3. 70 Amp Dimensions.

ELECTRICAL CONNECTIONS

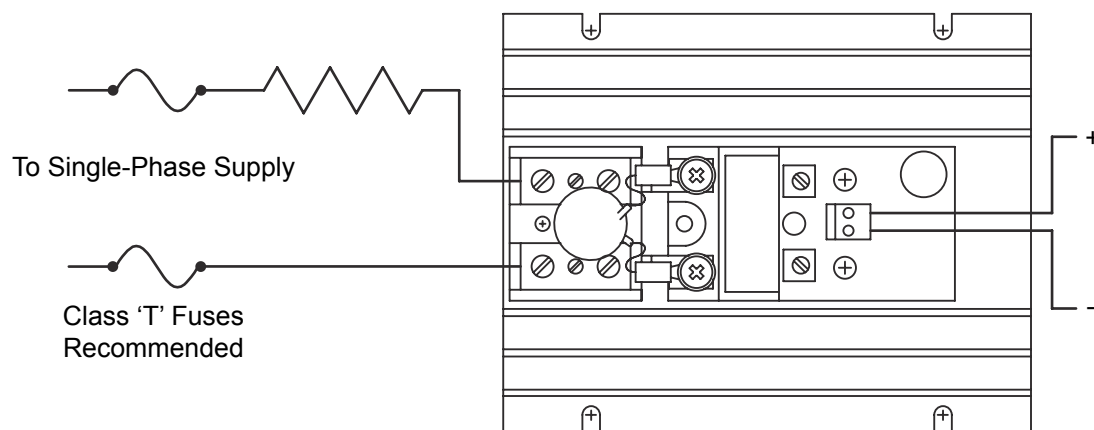


Figure 4. Typical electrical wiring.

TROUBLE SHOOTING

CAUTION:

High voltage exists on the supply and load terminals of this controller and may exist on other equipment located near controller. Use extreme caution to avoid electrical shock.

The LED located on the controller circuit can be used to aid in determining problems. This LED should be ON whenever the SCR Module is ON and therefore whenever power is being applied to the load. The potentiometer labeled "zero" is used to adjust the value of the command signal at which the controller just begins to operate. The potentiometer labeled "span" is used to adjust the value of the command signal at which the controller is full on. These potentiometers have been factory adjusted such that the LED will be OFF and therefore no power will be applied to the load when the command signal is 4mA or less. The span potentiometer has been factory adjusted such that when 20mA is applied the LED will be on continuously and maximum load power will be applied. At command signals greater than 4mA and less than 20mA the LED will blink.

The following are symptoms and possible causes:

LED DOES NOT FUNCTION AND NO LOAD POWER CAN BE OBTAINED:

Determine that the positive output of the process controller is connected to the positive input of the 4/20mA input terminal. The voltage from the negative input to the positive input will be approximately 6Vdc. If the voltage and polarity are correct, circuit has probably failed.

LED OPERATES BUT NO LOAD POWER CAN BE OBTAINED:

Determine that power has been applied and that all fuses are OK. If the SCR module is not ON the supply voltage should exist across the line and load terminal of the SCR module. If a fuse has opened, determine the cause prior to replacing the fuse and reapplying power.

LED IS OFF BUT POWER IS APPLIED TO THE LOAD:

Determine if the SCR module has failed as a short and therefore allows power to be continuously applied to the load.

MODEL No. IDENTIFICATION

Basic Model Number _____ 1020-VV-AA

VV = Rated voltage: _____

12 = 120Vac 50/60 Hz +10%, -15%

24 = 240Vac 50/60 Hz +10%, -15%

48 = 480Vac 50/60 Hz +10%, -15%

57 = 570Vac 50/60 Hz +10%, -15%

AA = Rated amps: _____

10, 20, 30, 40, or 70 amps

MANUFACTURED BY



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REPLACEMENT PARTS

RECOMMENDED REPLACEMENT SCR:		RECOMMENDED FUSES (typical) (Alternative fuse size is 125% of max. load current)		
MODEL	ASSY No.*	CCI PART #	BUSSMANN #	CCI FUSE KIT**
1021-12-10	1651-12-10	42110-0460-315	JJS-15	FK\62T15
1021-12-20	1651-12-20	42110-0460-325	JJS-25	FK\62T25
1021-12-30	1651-12-30	42110-0460-335	JJS-35	FK\62T35
1021-12-40	1651-12-40	42110-0460-350	JJS-50	FK\62T50
1021-12-70	1651-12-70	42110-0460-390	JJS-90	FK\62T90
1021-24-10	1651-24-10	42110-0460-315	JJS-15	FK\62T15
1021-24-20	1651-24-20	42110-0460-325	JJS-25	FK\62T25
1021-24-30	1651-24-30	42110-0460-335	JJS-35	FK\62T35
1021-24-40	1651-24-40	42110-0460-350	JJS-50	FK\62T50
1021-24-70	1651-24-70	42110-0460-390	JJS-90	FK\62T90
1021-48-10	1651-48-10	42110-0460-315	JJS-15	FK\62T15
1021-48-20	1651-48-20	42110-0460-325	JJS-25	FK\62T25
1021-48-30	1651-48-30	42110-0460-335	JJS-35	FK\62T35
1021-48-40	1651-48-40	42110-0460-350	JJS-50	FK\62T50
1021-48-70	1651-48-70	42110-0460-390	JJS-90	FK\62T90

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

**The fuse kit includes two fuses of appropriate rating for the frame size, and a fuse block. CCI recommends fuses rated at 120-125% max load current.