

**CONTROL
CONCEPTS
INC.**

INSTRUCTION MANUAL

MODEL 1035

DESCRIPTION:

The model 1035 is a single phase, phase-angle SCR firing circuit. It controls the "ON TIME" within each electrical half cycle of two SCR's such that, depending upon the specific model number either the RMS or the AVERAGE voltage applied to an electrical load is maintained constant with respect to a control or command signal.

The solid state circuit uses a digital phase-locked timing technique and provides electrical isolation between the command signal and the line and load potential. The circuit also has soft-start and missing cycle detection. These features provide the means by which on start-up and momentary power interruptions the "ON-TIME" of the SCR's is set to zero and then increased at a preset rate until the load voltage is at the correct value. The circuit also has a "RUN" feature which provides a means by which the controller can be conveniently turned ON or OFF by the application of a low voltage signal. If purchased with the "R" option, the controller will apply a 120Vac output capable of a 1 amp load when the circuit is in RUN. The feature is useful in applications requiring the operation of contacters, relays etc. when in the RUN mode.

The various options and operating characteristics of the 1035 are specified in the model number

MODEL NUMBER:

1035[SP1]-[SP2]-[SP3] as follows;

1035 Specifies a single phase, phase-angle SCR firing circuit.

[SP1] Specifies the type of control provided. The letter A Specifies that the AVERAGE value of the load voltage will be proportional to the command signal. The letter V specifies that the RMS value of the load voltage will be proportional to the command signal.

[SP2] Specifies the type of command signal. The letters PV specifies that either a potentiometer or a 0 to 5Vdc signal may be used. When the controller is intended for use with milliamp commands the minimum and maximum range of the command signal is used. For example a 4 to 20mA command signal would be - [4-20].

[SP3] The letter R specifies that the controller is provided with a 120Vac 1 amp output that is turned on when the controller is placed in the RUN mode. The letter N specifies that the controller is provided without the 120Vac output. This term may be omitted if the feature is not provided.

MOUNTING:

CAUTION: PORTIONS OF THE CIRCUIT ARE AT THE

INSTALLATION:

SUPPLY AND LOAD VOLTAGE. SUFFICIENT SPACE MUST BE PROVIDED BETWEEN THE CIRCUIT BOARD AND ANY METALLIC SURFACE.

The circuit card can be mounted on any flat surface using the six mounting holes in the circuit card.

ELECTRICAL CONNECTIONS:

120 Vac Terminal

The circuit must be supplied with 120Vac referenced to the same phase as the SCR and load. The 120Vac must also be of the same polarity (as shown in figure 2).

NOTE: If the polarity is not correct, the load voltage will not be controlled smoothly from 0 to 100% as a function of the command signal. Reversal of the leads connected to the 120Vac terminals will correct this problem.

COMMAND SIGNALS

(Ref. Figure 3, Page 4.)

POTENTIOMETER: A 1K linear potentiometer may be used to manually set the desired load voltage. (Higher resistance potentiometers may be used, however, the linearity of the load voltage with respect to the command signal will be reduced.) The circuit provides 5Vdc to the potentiometer. Connect the counterclockwise end of the potentiometer to the circuit board terminal labeled CCW. Connect the potentiometer wiper to the terminal labeled W, and connect the clockwise end of the potentiometer to the terminal labeled CW.

VOLTAGE COMMANDS: Connect the common of the 0 to 5Vdc signal to the circuit board terminal labeled CCW and the positive output of the 0 to 5Vdc signal to W on the circuit board.

CURRENT INPUT: Connect the return (common) of the milliamp source to the CCW terminal and the positive or input of the milliamp source to terminal W.

RUN COMMAND: The RUN command provides a convenient ON-OFF control. To enable the operation of the circuit card a 5 to 10Vdc signal must be applied to the RUN terminal. If the RUN feature is not used a jumper must be placed between terminal CW and RUN (figure 2, page 3).

SPECIFICATIONS:

The following specifications apply over an ambient temperature range of 0°C to 55°C and a voltage range of +10% to -15%.

TYPE OF CONTROL:	Single phase, phase-angle control of two SCRs.												
TYPE OF LOADS:	The circuit may be used to operate SCRs which control the power to resistive, lamp, inductive and transformer coupled loads.												
LINEARITY:	The specified load voltage (RMS or AVERAGE) is proportional to within 1% of the value represented by the command signal.												
RANGE OF CONTROL:	0 to 98 % of nominal line voltage.												
ELECTRICAL ISOLATION:	Supply and load voltage to command signal electrical isolation is 1500 volts peak. SCR gate to SCR gate 1500 Volts peak.												
SLEW RATE:	0.22 Seconds. (Slew rate is the time required for the load voltage to change 63% of the value represented by a step change in the command signal.)												
CONTROL SIGNALS:	<table> <tr> <td></td><td>Input Impedance</td></tr> <tr> <td>Potentiometer:</td><td>1K ohms.</td></tr> <tr> <td>Voltage: 0 to 5Vdc</td><td>100K ohms.</td></tr> <tr> <td>Milliamp: 1 to 5mA</td><td>1200 ohms.</td></tr> <tr> <td>4 to 20 mA</td><td>300 ohms</td></tr> <tr> <td>10 to 50 mA</td><td>120 ohms</td></tr> </table> Multiturn potentiometers allow zero and span adjustments of $\pm 25\%$ of span.		Input Impedance	Potentiometer:	1K ohms.	Voltage: 0 to 5Vdc	100K ohms.	Milliamp: 1 to 5mA	1200 ohms.	4 to 20 mA	300 ohms	10 to 50 mA	120 ohms
	Input Impedance												
Potentiometer:	1K ohms.												
Voltage: 0 to 5Vdc	100K ohms.												
Milliamp: 1 to 5mA	1200 ohms.												
4 to 20 mA	300 ohms												
10 to 50 mA	120 ohms												
ZERO & SPAN:	Upon start up or momentary power interruption, the load voltage is increased, at the slew rate, from zero to the value set by the command signal.												
MISSING CYCLE DETECTION & SOFT START:	The gate drive to the SCRs is 300mA for a duration of 60 electrical degrees. The supply for this signal is a current source which provides the proper gate current independent of the SCR impedance.												
GATE DRIVE:	The intensity of an LED on the circuit card is proportional to the magnitude of the command signal.												
COMMAND INDICATOR:	The application of a 5V to 10Vdc signal to the RUN terminal enables the operation of the SCRs. This feature can be used as an ON-OFF control.												
RUN/ON-OFF CONTROL:	Removal of the RUN signal causes the SCRs to turn off. Application of the RUN signal causes load voltage to increase at the slew rate to the value set by the command signal. The impedance of the RUN signal input is approximately 470 ohms.												
120VAC OUTPUT:	When the controller has the R option; a 120Vac output signal, capable of supplying up to one amp to a load such as a contactor, is turned on when the circuit is in the RUN mode.												

INSTALLATION DRAWING:

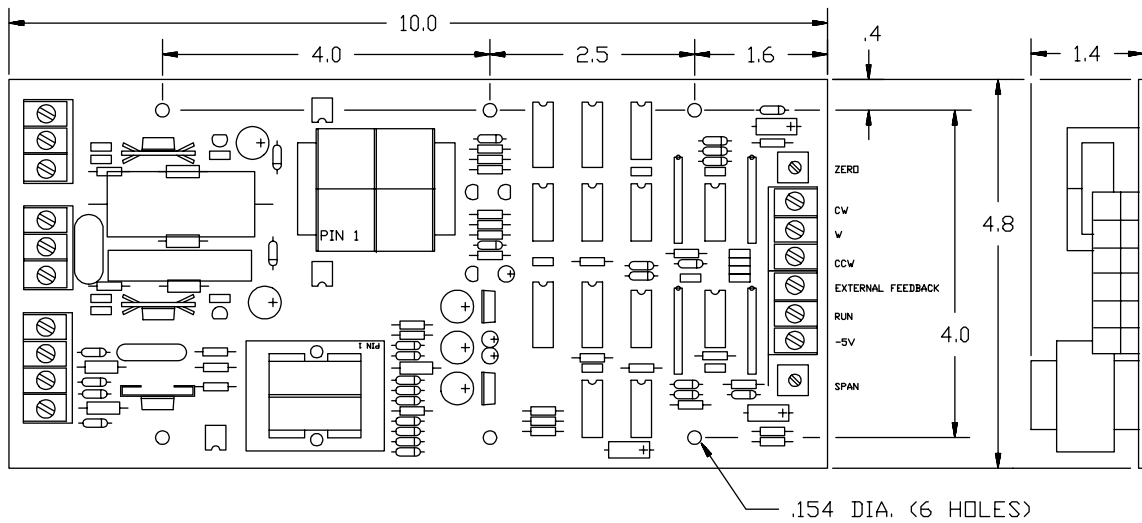


Figure 1. Dimensions and hole locations.

ELECTRICAL CONNECTIONS:

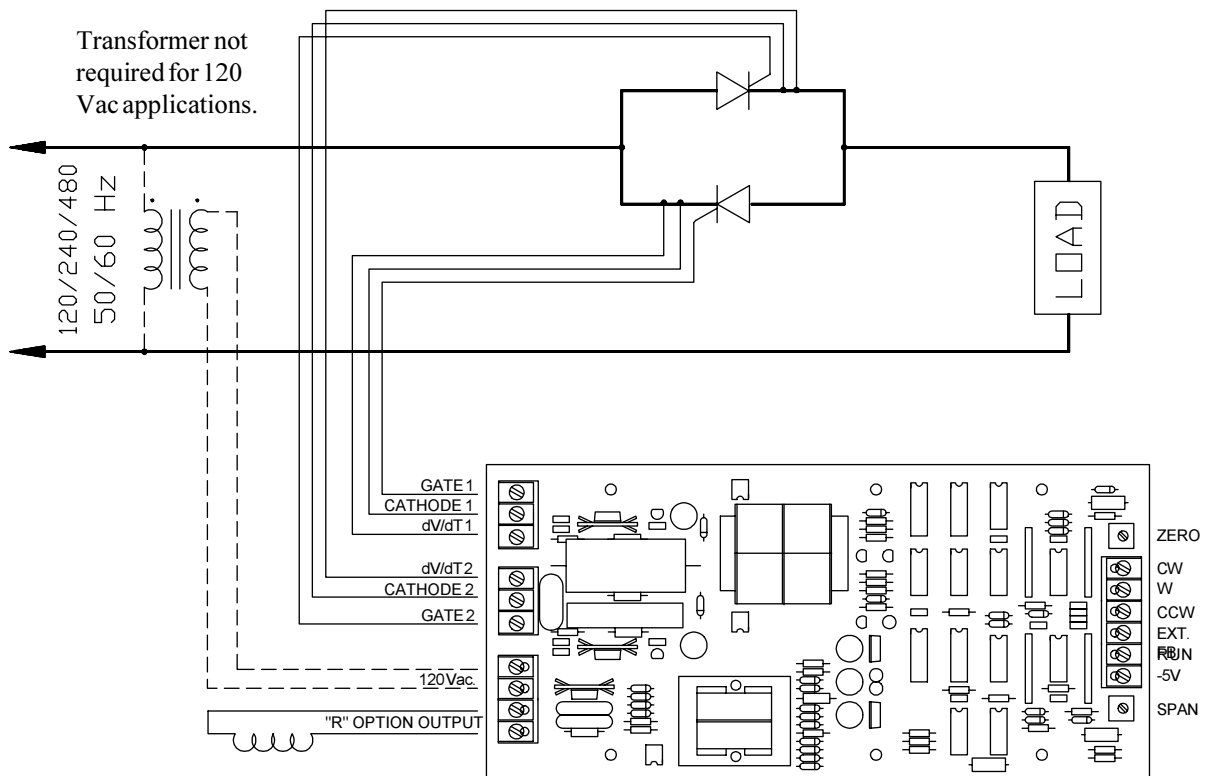


Figure 2. Electrical connections.

TROUBLE SHOOTING:

CAUTION: USE EXTREME CARE DURING TROUBLE SHOOTING TO AVOID ELECTRICAL SHOCK.

Because of the non-sinusoidal wave-form applied by the SCR's, a true RMS indicating meter is recommended for measurements.

START-UP PROBLEMS:

LOAD VOLTAGE NOT LINEAR WITH THE COMMAND:

If the load voltage is not linear with the command signal it is possible that the 120 volt supply to the controller is not in phase with the load supply. Check that the 120Vac supply is referenced from the load supply and/or reverse the two 120Vac connections to the circuit board.

NO LOAD VOLTAGE:

If the LED on the circuit card is OFF check that the command signal is correctly applied to the circuit board. The intensity of the LED should vary as a function of the command. Also determine that 5 to 10Vdc is present between the RUN and CCW terminals. Determine that 120Vac is applied to the circuit card and that the connections to the SCRs are as shown in Figure 2.

If the led is ON determine that the connection to the SCRs and load are installed correctly. Refer to the "no load voltage section" under "failures after the unit has been operating" for a method to check the SCR gate signals.

LOAD VOLTAGE FULL ON OR CAN NOT BE CONTROLLED CORRECTLY:

Determine if the LED intensity changes with the command signal. If the LED is ON the problem is associated with the circuit card or the connections to it. If the LED is OFF the problem is associated with a wiring error or an SCR may have failed.

FAILURES AFTER THE UNIT HAS BEEN OPERATING:

NO LOAD VOLTAGE:

If the Led is ON, the problem is likely due to SCR failures or the wiring to the load. The signals to operate the SCR's can be checked by removing the leads at gate 1 and 2 and cathode 1 and 2 and measuring the voltage between the gate and cathode terminals on the circuit board when the command is maximum. If a voltage is present the circuit board is operating satisfactorily.

MAX. LOAD VOLTAGE 50% TO 70% OF SUPPLY:

This problem is due to one SCR not being turned on. Check the gate drives as described above. If both gate drives are functional determine which SCR has failed and replace it.

FULL LOAD VOLTAGE:

If the load voltage is equal to the supply voltage and the LED is off the problem is likely due to an SCR that has failed shorted.

CONTROL CONNECTIONS:

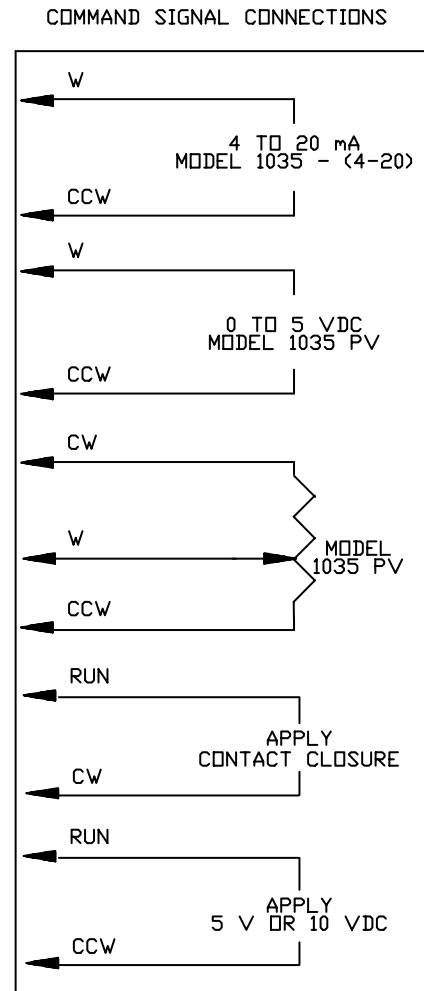


Figure 3. Command signal connections

REFERENCE DRAWINGS:

D1000202C8

Circuit Schematic Drawing

MANUFACTURED BY:



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