Slide Valve Capacity Controller (SVCC)

Version 7 Note: Version 7 reflects a vendor change in the controller which now uses a different style of memory card. For this reason the module, card, and kit part numbers have been revised.

Overview
BITZER offers dedicated modules (SVCC) to control the slide valve of BITZER CS (Compact Screw) and HS'85 screw compressors. The slide valve can move between 100% and either 25%, 50% or 75% depending on application limits (consult literature or application engineering).

On new systems, the SVCC can also be used in conjunction with existing controls that output 0-10V analog signals.

When retrofitting an existing system to replace a non-BITZER compressor with a BITZER compressor, it is important to properly select the SVCC that will interface with the existing controls so the slide valve can adjust accordingly.

Control Options (Retrofit / Existing Controllers)
The SVCC can use either a 0-10V analog signal or digital inputs (120V) to control the slide valve of other compressor brands such as Hitachi, McQuay, and York chillers. By intercepting a voltage signal, our mini-controller will give the compressor "Infinite Capacity Control" or "Step Control" by moving the slide valve to load or unload the compressor in a similar fashion to the original compressor load.

ATTENTION:
This document does not replace or override the information provided by the original factory manuals for the SVCC control or power supply. All safety information for these products should be observed.

Document Sections:
- Page 2: Kit Numbers for Retrofit / Existing Controller Applications
- Page 2: Kit / Part Numbers for New Applications (No Control Signal Available)
- Page 3: Wiring Instructions / Directions
- Page 4 to 6: Wiring Diagram (#1 to #3)
- Page 7: Dimensions
- Page 8: General Mounting Guidelines
- Page 9: Installing the SD card
- Page 10: Mounting and Wiring Guidelines for 855-2001-01 (Pressure/Temp Control Device)
- Page 11: Verifying proper function

Retrofits / Existing Controller:

If retrofitting a compressor into an existing system, with an existing controller. Choose from the list below that best matches the application. The SVCC will intercept the existing controller's signal to appropriately control the new BITZER Compressor.

SVCC Components for Retrofits / Interfacing with Existing Controllers

Retrofit Description	Control Scheme	Module Required	Program Required	Wiring Diagram
Hitachi SC to Bitzer CSH	Infinite	835-0004-02	837-1017-HI1	1
McQuay ALS to Bitzer CSH	Infinite	835-0004-02	837-1017-M1	1
McQuay ALS to Bitzer CSH	4 STEP	835-0004-02	837-1017-M2	2
York YCAS/YCWS Bitzer CSH	Infinite	835-0003-02 & 837-0006-01	837-1017-Y1	3
Controller with 0-10V Signal*	Infinite	835-0003-02 & 837-0006-01	837-1017-B1	3

*The 0-10V output from the existing system controller will be used as an input.

New Applications (No Master Controller Signal Available):

If the SVCC needs to act as a stand-alone controller, it requires a 0-10V signal to be provide. The below kits include an Additional Control Device to read either process temperature or suction pressure to output an analog 0-10V control so that the SVCC can control the BITZER slide valve.

SVCC for New Installations (No Master Controller Signal Available)

Sensor Input	Control Scheme	Module Required	Program Required	Wiring Diagram
Temperature	Infinite	999-0031-01	B1 Included	3
Pressure	Infinite	999-0030-01	B1 Included	3

999-0031-01 Contents

Part Number	Description
855-2001-01	Control Device, Pressure/Temperature Input, 0-10V Output
837-0015-01	Power supply, 120-240 to 24VAC
860-0010-01	Temperature Sensor (-46°F to 255°F)
999-0030-01	SVCC,24VDC,0-10VAI,W/DISPLAY
837-0006-01	SVCC PWR SPLY,24VDC OUT,100-240V IN, 1.3A
837-1017-B1	Program Card for 0-10V signal

999-0030-01 Contents

Part Number	Description
855-2001-01	Control Device, Pressure/Temperature Input, 0-10V Output
837-0015-01	Power supply, 120-240 to 24VAC
860-0020-01	Pressure Sensor (0-200 psig)
999-0030-01	SVCC RLY,24VDC,0-10VAI,W/DISPLAY
837-0006-01	SVCC PWR SPLY,24VDC OUT,100-240V IN, 1.3A
837-1017-B1	Program Card for 0-10V signal

Wiring Instructions:
- Wire incoming power to the power supply or directly L1 & N on the SVCC depending on the SVCC type.
- If using a 24V control module:
  - Connect output power from the power supply + & - to the control module L+ & M.
  - Connect a wire from the +24VDC power supply to the auxiliary relay on the contactor and then from the relay to the I1 input of the module.
  - Bring the 0-10VDC analog signal into input M and I7.
- If using control device 855-2001-01 in conjunction with the 24V control module:
  - Wire incoming power (120/240V) to 837-0015-01 power source and connect it to the control device 855-2001-01.
  - Bring the 0-10VDC analog signal from the 855-2001-01 to input M and I7.
- Wire one leg of the power (115/240V) to terminal 1 of Q1, Q2, Q3, & Q4 of the SVCC.
- For applications using wiring diagram 1:
  - Wire from terminal 2 of: Q1 to coil #3, Q3 to coil #4, and Q2 to coil #2 or coil #3 depending on how low the compressor is able to safely unload for this application.
  - Wire the original run proof to I1. See wiring diagram for inputs I2, I3, and I4.
- For applications using wiring diagram 2:
  - Wire from terminal 2 of: Q1 to coil #3, Q2 to coil #2, Q3 to coil #4, and Q4 to coil #1.
  - Wire the original run proof to I1. See wiring diagram for inputs I2, I3, and I4.
- For applications using wiring diagram 3:
  - Wire from terminal 2 of: Q1 to coil #3, Q2 to coil #2, Q3 to coil #4, and Q4 to coil #1.
- Wire the other side of the coils back to the common (L2 or neutral).

Optional Wiring:
- Wire a light, solenoid valve or any other device that requires a compressor run proof to Q1 (Q1 closes when compressor is on).
- Wire a crankcase heater or any other device that should be on when compressor is off to Q4 for applications using wiring diagram 1 (Q4 closes when compressor is off).

Directions:
Install the memory stick into the SVCC prior to powering it up (or cycle power after installing). This will allow the program to load. The screen will then display one of four statuses:
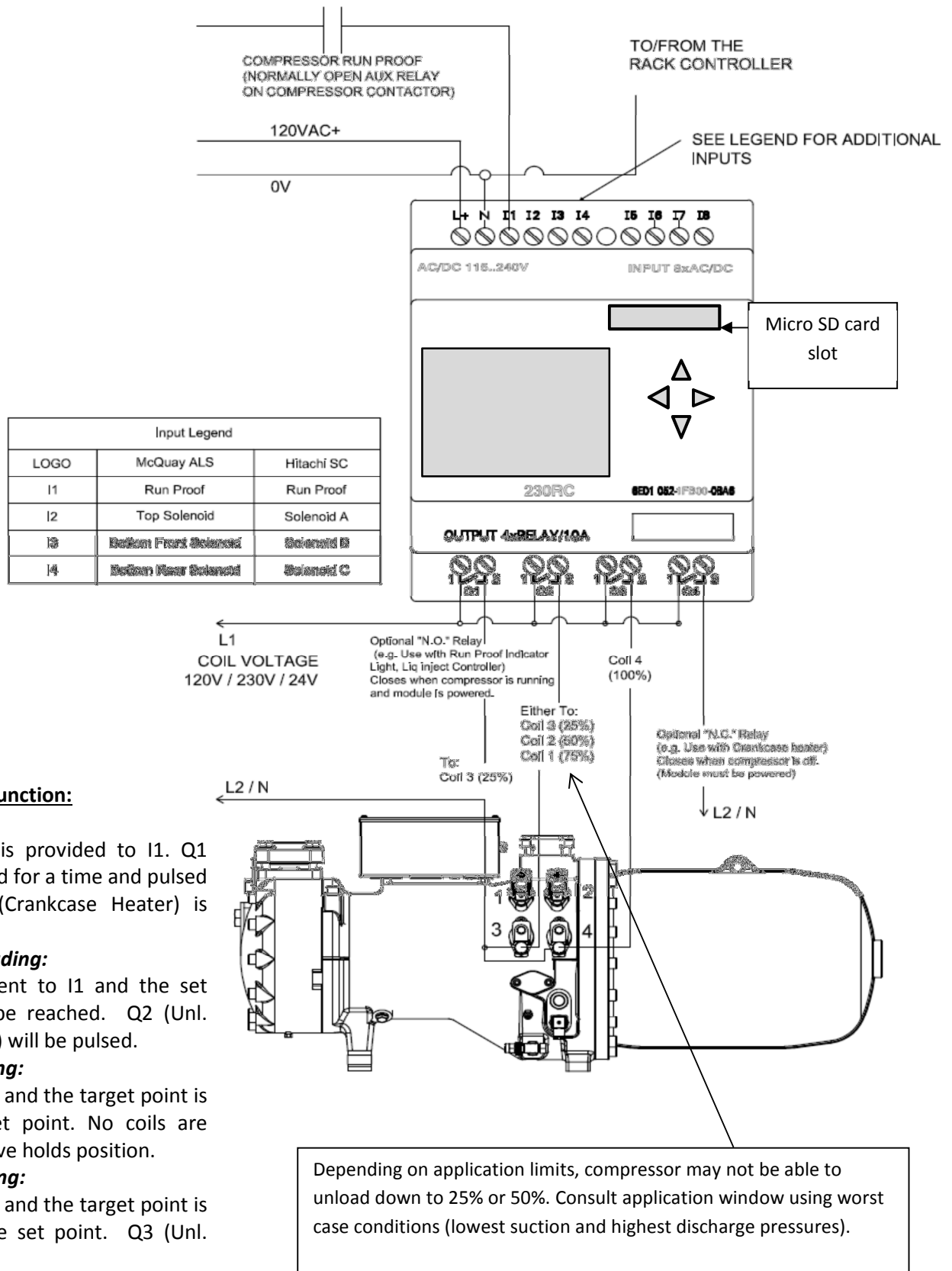- Compressor Off
- Compressor On-Unloading
- Compressor On-Holding
- Compressor On-Loading

The SVCC will read the signal, and control the slide valve of the compressor with the appropriate timing sequence to pulse the solenoid coils.

For many applications, it is acceptable to drive the slide valve to 25% by utilizing the #3 coil. However, depending on the operating conditions (consult compressor operating instructions) the compressor may not be able to go past 50% or even 75%. In these cases, utilize coil #2 or #1.

PLEASE NOTE – ALL WIRING SHOULD BE PERFORMED BY TRAINED ELECTRICIANS WHO OBSERVE SAFE WORK PRACTICES

Diagram #1: Control Option – Infinite Control

Input Legend		
LOGO	McQuay ALS	Hitachi SC
I1	Run Proof	Run Proof
I2	Top Solenoid	Solenoid A
I3	Bottom Front Solenoid	Solenoid B
I4	Bottom Rear Solenoid	Solenoid C

COMPRESSOR RUN PROOF (NORMALLY OPEN AUX RELAY ON COMPRESSOR CONTACTOR)

120VAC+

0V

TO/FROM THE RACK CONTROLLER

SEE LEGEND FOR ADDITIONAL INPUTS

L+ N I1 I2 I3 I4 I5 I6 I7 I8

AC/DC 115..240V   INPUT 8xAC/DC

Micro SD card slot

230RC   6ED1 052-1FB00-0BA6

OUTPUT 4xRELAY/10A

L1 COIL VOLTAGE 120V / 230V / 24V

Optional "N.O." Relay (e.g. Use with Run Proof Indicator Light, Liq Inject Controller) Closes when compressor is running and module is powered.

Either To: Coil 3 (25%) Coil 2 (50%) Coil 1 (75%)

Coil 4 (100%)

Optional "N.O." Relay (e.g. Use with Crankcase heater) Closes when compressor is off. (Module must be powered)

L2 / N

To: Coil 3 (25%)

L2 / N

Basic Description of Function:

Compressor Off:

No run proof signal is provided to I1. Q1 (Unl. Coil 3) is powered for a time and pulsed afterwards and Q4 (Crankcase Heater) is powered.

Compressor On-Unloading:

Run proof is being sent to I1 and the set point should nearly be reached. Q2 (Unl. Coil 3, Coil 2 OR Coil 1) will be pulsed.

Compressor On-Holding:

Run proof is sent to I1 and the target point is a little above the set point. No coils are powered and slide valve holds position.

Compressor On-Loading:

Run proof is sent to I1 and the target point is much higher than the set point. Q3 (Unl. Coil 4) will be pulsed.
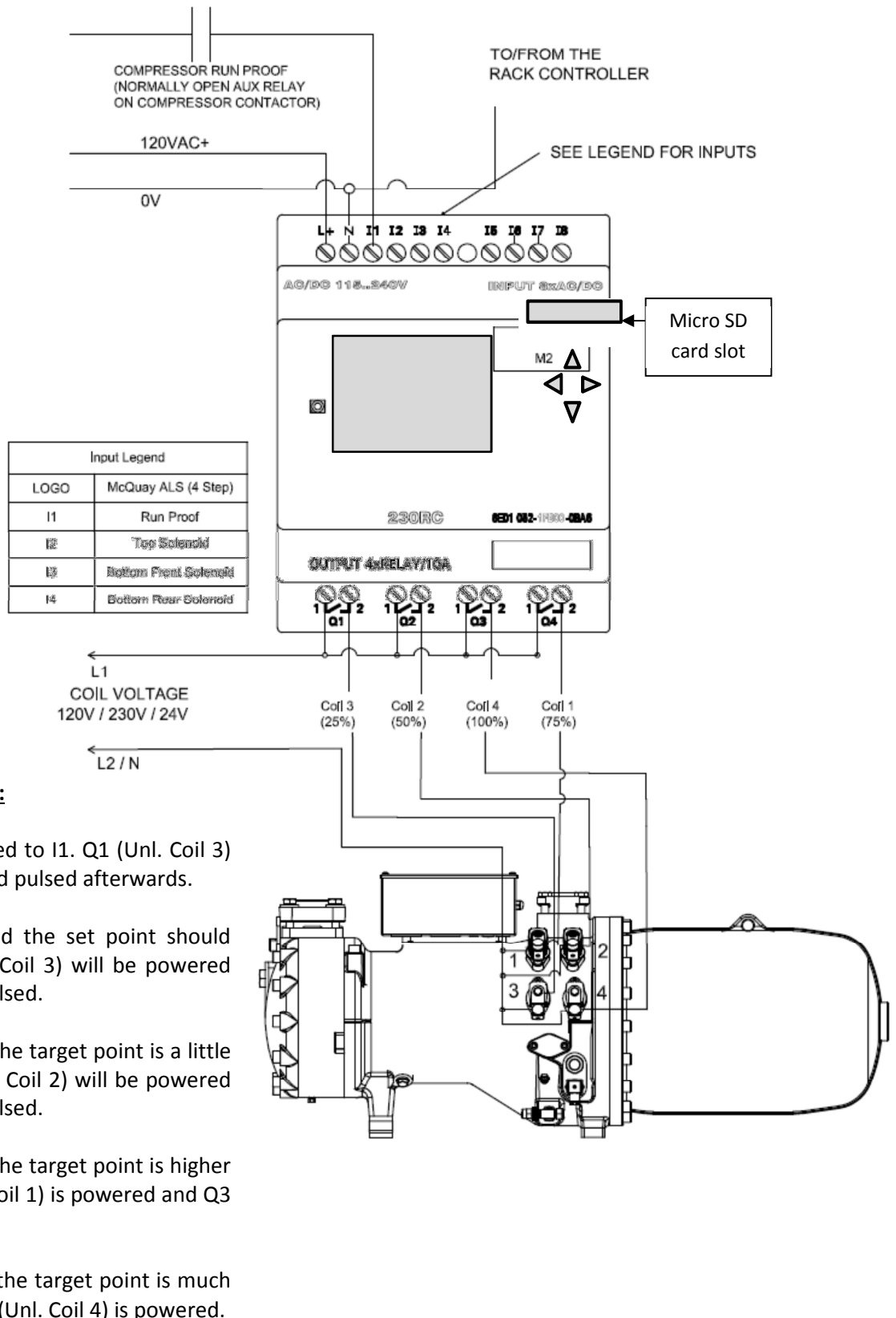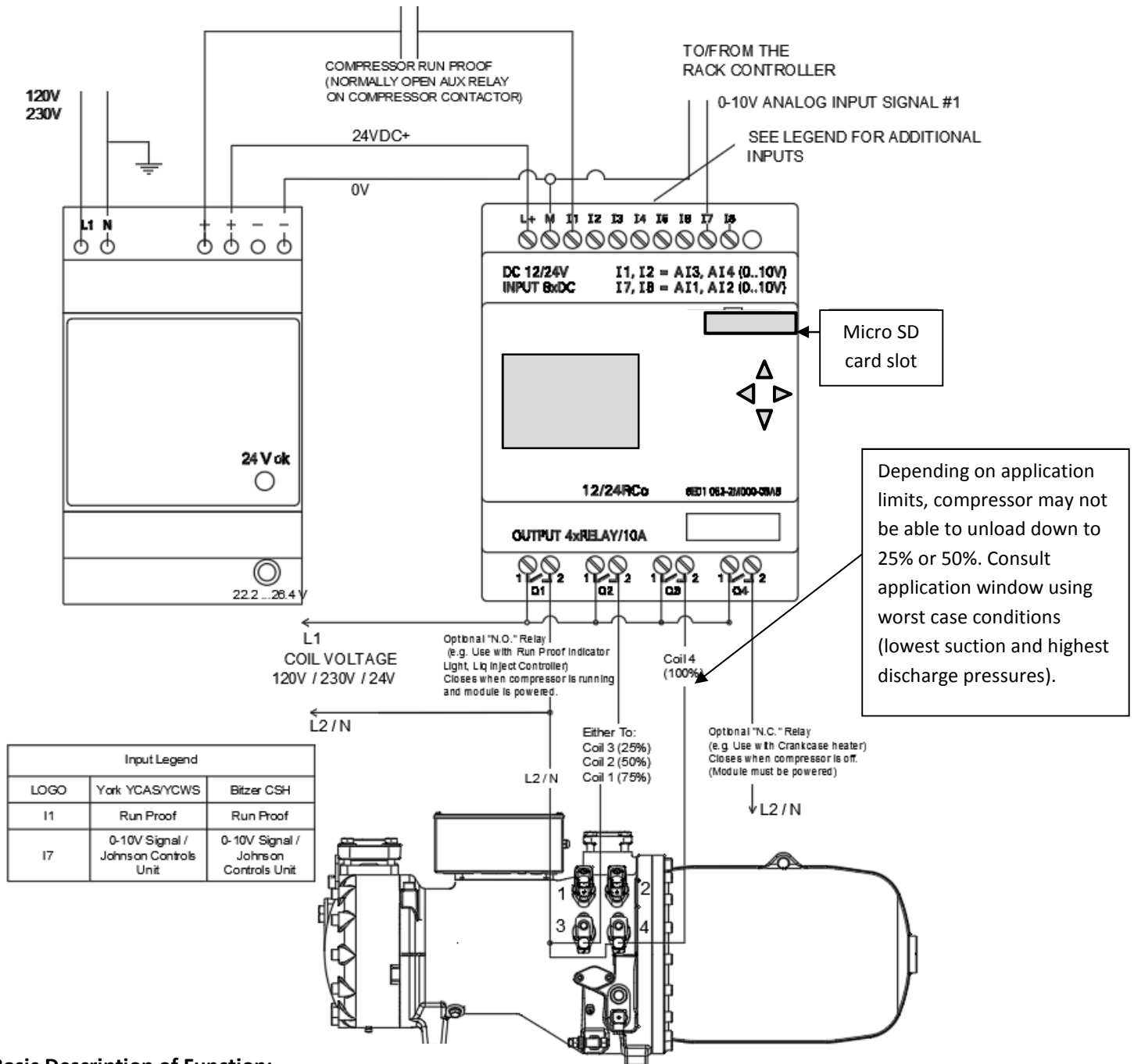
Depending on application limits, compressor may not be able to unload down to 25% or 50%. Consult application window using worst case conditions (lowest suction and highest discharge pressures).

Diagram #2: Control Option – Step Control

Input Legend	
LOGO	McQuay ALS (4 Step)
I1	Run Proof
I2	Top Solenoid
I3	Bottom Front Solenoid
I4	Bottom Rear Solenoid

Basic Description of Function:

Compressor Off:
No run proof signal is provided to I1. Q1 (Unl. Coil 3) will be powered for a time and pulsed afterwards.

Compressor On - 25% Load:
Run proof is sent to (I1) and the set point should nearly be reached. Q1 (Unl. Coil 3) will be powered and Q3 (Unl. Coil 4) will be pulsed.

Compressor On – 50% Load:
Run proof is sent to (I1) and the target point is a little above the set point. Q2 (Unl. Coil 2) will be powered and Q3 (Unl. Coil 4) will be pulsed.

Compressor On - 75% Load:
Run proof is sent to (I1) and the target point is higher than the set point. Q4 (Unl. Coil 1) is powered and Q3 (Unl. Coil 4) will pulse.

Compressor On - 100% Load:
Run proof is sent to (I1) and the target point is much higher than the set point. Q3 (Unl. Coil 4) is powered.

Diagram #3: Control Option – Infinite Control 0-10V Signal

COMPRESSOR RUN PROOF
(NORMALLY OPEN AUX RELAY
ON COMPRESSOR CONTACTOR)

TO/FROM THE
RACK CONTROLLER

0-10V ANALOG INPUT SIGNAL #1

SEE LEGEND FOR ADDITIONAL
INPUTS

120V
230V

24VDC+

0V

L1 N

L+ M I1 I2 I3 I4 I5 I6 I7 I8

DC 12/24V   I1, I2 = AI3, AI4 (0..10V)
INPUT 8xDC   I7, I8 = AI1, AI2 (0..10V)

Micro SD card slot

24 V ok

12/24RCo   6ED1 052-2MD00-0BA5

OUTPUT 4xRELAY/10A

22.2 ...26.4 V

Q1 Q2 Q3 Q4

L1
COIL VOLTAGE
120V / 230V / 24V

L2 / N

Depending on application limits, compressor may not be able to unload down to 25% or 50%. Consult application window using worst case conditions (lowest suction and highest discharge pressures).

Optional "N.O." Relay
(e.g. Use with Run Proof Indicator Light, Liq Inject Controller)
Closes when compressor is running and module is powered.

Coil 4
(100%)

Either To:
Coil 3 (25%)
Coil 2 (50%)
Coil 1 (75%)

L2 / N

Optional "N.C." Relay
(e.g. Use with Crankcase heater)
Closes when compressor is off.
(Module must be powered)

L2 / N

Input Legend		
LOGO	York YCAS/YCWS	Bitzer CSH
I1	Run Proof	Run Proof
I7	0-10V Signal / Johnson Controls Unit	0-10V Signal / Johnson Controls Unit

Basic Description of Function:

Compressor Off:
No run proof signal is provided to I1. Q2 (Unl. Coil 3) is powered and Q4 (Crankcase Heater) is powered.

Compressor On-Unloading:
Run proof is being sent to I1 and the set point should nearly be reached. Q2 (Unl. Coil 3, Coil 2 OR Coil 1) will be pulsed and Q1 (Run proof indicator) is powered.

Compressor On-Holding:
Run proof is sent to I1 and the target point is a little above the set point. No coils are powered and slide valve holds position. Q1 (Run proof indicator) is powered.
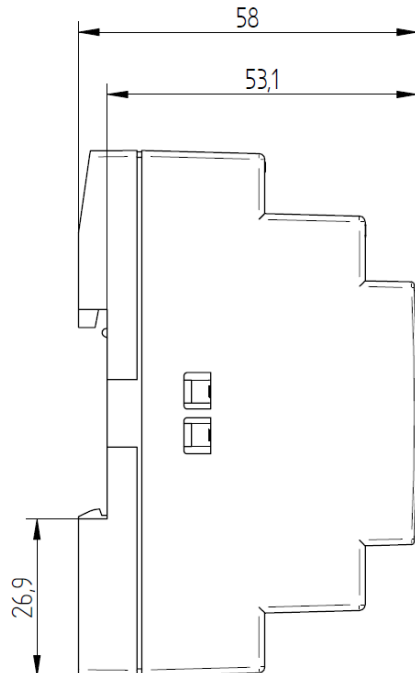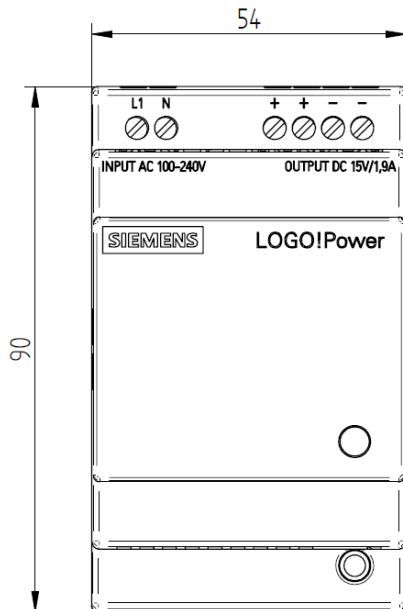
Compressor On-Loading:
Run proof is sent to I1 and the target point is much higher than the set point. Q3 (Unl. Coil 4) will be pulsed and Q1 (Run proof indicator) is powered.

Dimensions

SVCC
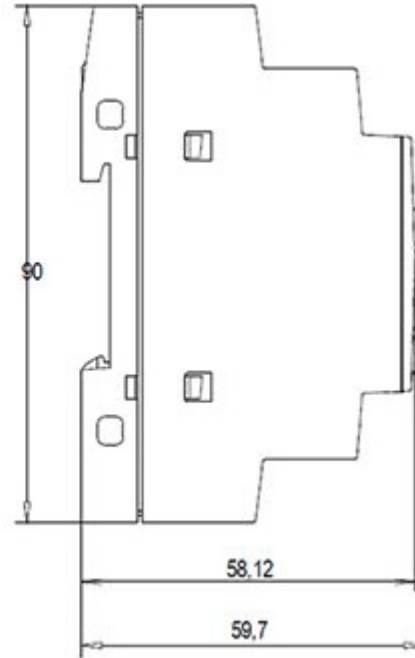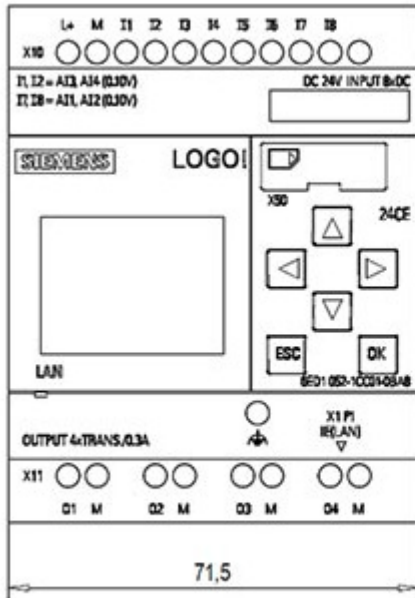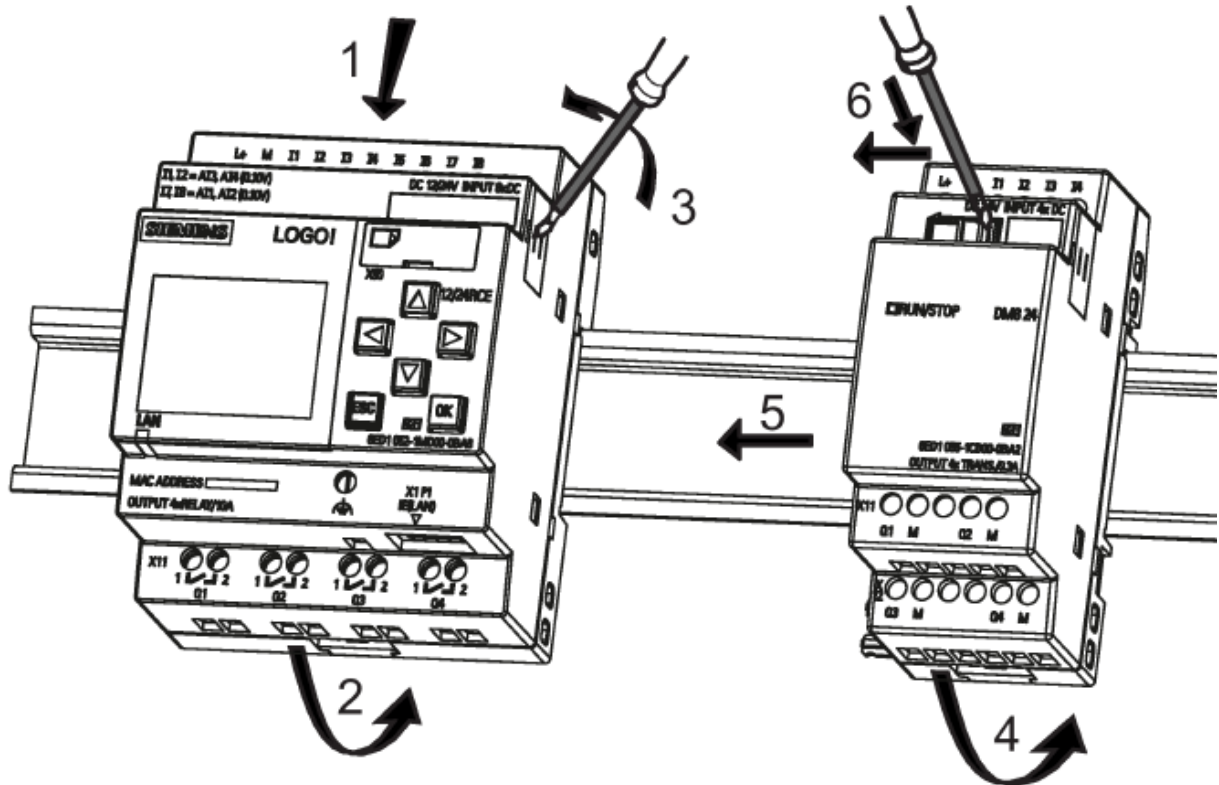

837-0006-01 (Power Supply)

Please note – All dimensions are provided in millimeters

Mounting

Both the power supply and SVCC can be mounted to 35mm DIN rail.

1. Hook the SVCC module onto the rail.
2. Push down the lower end to snap it on. The mounting interlock at the rear must engage.
3. The power supply attaches to the DIN rail in a similar fashion.

Please note - Items in picture are not identical to power supply or SVCC. The SVCC does not include a display or buttons. Both the power supply and SVCC can be wall mounted as well.

Additional Information

For more information on the SVCC, please refer to OEM manual (SIEMENS document number A5E33039675-AC). The power supply operating instructions are found in SIEMENS document number C98130-A7561-A2-5-6419).

Inserting the Micro SD Card

Make sure that you insert the card into the right position in the socket until you hear an audible sound of a snap or click.

1. The entry of the card slot is chamfered on the bottom right. The edge of the card is chamfered to match. This prevents you from inserting a card in the wrong direction.
2. Using a screwdriver, insert the tip into the groove on the front of the SD card socket and slightly pry the cover out of the slot.
3. Pull the socket out to the position as the below figure shows.
4. Insert the card into the holder, label face down, contact pins up, and push it in until it engages.
    a. **Note**: To avoid any possible damage to the SD card socket, Do Not pull the socket completely out from the module.
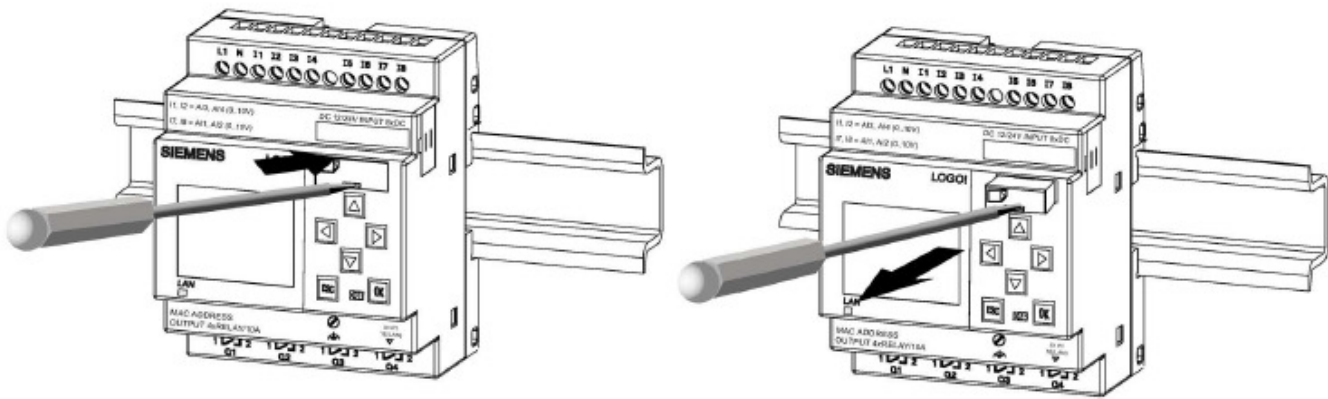
    b. **Note**: If the SD card socket cannot be pushed in smoothly, don't push hard.
       Pull the card, re-adjust the direction and push it in again.
       Correct Alignment is critical to avoid damage to tray pins.
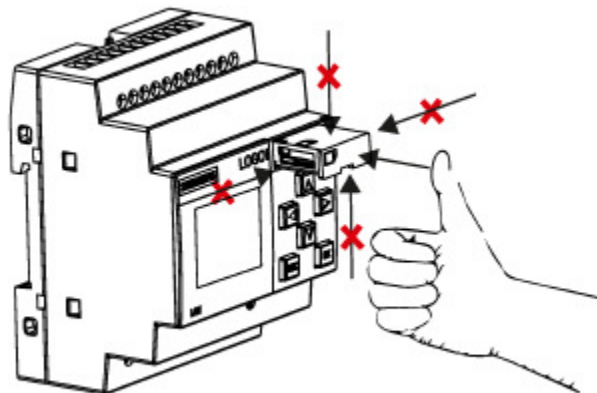
Starting the SVCC

Automatic copying during the start-up of the LOGO:
SD card program will load during power-on boot of LOGO 8 device, and program will start automatically.

ATTENTION:

All service on compressors and refrigeration systems must be carried out by trained and qualified refrigeration technicians. Follow all safety guidelines found in BITZER literature and any other safety instructions associated with other refrigeration equipment.

Pressure/Temperature Control Device (855-2001-01) Mounting and Wiring:

The power supply, 837-0015-01, and control device, 855-2001-01, can be mounted to 35mm DIN rail. (Not required but modules must be connected together per step 4.) Please be sure to reference the additional documentation sent with the controllers.

1. Hook the control module onto the top of the DIN rail.
2. Push down the lower end to snap it on. The mounting interlock at the rear must engage.
3. The power supply attaches to the DIN rail in a similar fashion.
4. Snap the modules together using the connections on their sides.
5. Mount the appropriate sensor in a suitable location such as:
   a. Temp. Sensor into the entering / leaving process air stream
   b. Temp. Sensor onto a pipe of entering or leaving process fluid (note: insulate pipe)
   c. Pressure transducer to appropriate suction pipe connection (note: pressure test for leak. Mount in vertical position where possible.)
6. Wire the sensor / transducer to the input terminals on the control module (C-Sn* for temp, C-5v-S* for pressure transducer).
7. Connect output wiring 0-10V to Com – AO1 terminals on the control module.
   This output signal should be supplied to the SVCC.

NOTE: <u>This signal wire should not run beside or inside the same conduit as high voltage wire as transient signal may alter control performance</u>.

8. Connect main power of 120 or 240 Volts to bottom terminals on power module.

Sensor Wiring

Temp

Pressure

Module Arrangement

Power Wiring

Output Wiring

0-10V Analog Signal
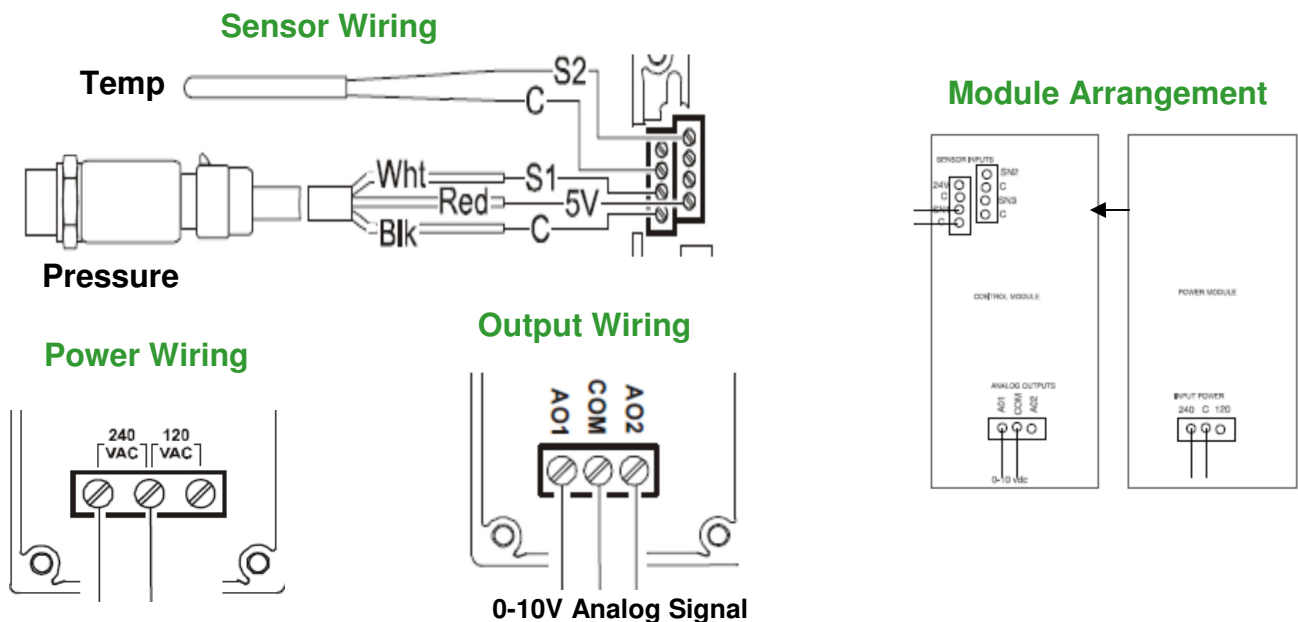
Proper Function

The following checks should be made in order to help ensure the SVCC has been wired correctly and is functioning properly. The table below contains results based upon the voltage the SVCC receives and is separated by program number. While completing these checks, input voltage must be relatively constant (±0.5 V) and 10 or more seconds must have elapsed before results are realized.

Program Number	Digital Input Energized	Input Voltage I7 (V)	Result Outputs Energized
B1 / Y1	None	N/A	2, 4
B1 / Y1	I1	0-4	1, (2)*
B1 / Y1	I1	4-8	1
B1 / Y1	I1	8-10	1, (3)*
M1	None	N/A	1, 4
M1	I1, I3 or I1, I4	N/A	(2)*
M1	I1, I2, I3	N/A	None
M1	I1, I2, I4	N/A	(3)*
M2	None	N/A	1
M2	I1, I3	N/A	1, (3)*
M2	I1, I4	N/A	2, (3)*
M2	I1, I2, I3	N/A	(3)*, 4
M2	I1, I2, I4	N/A	3
H1	None	N/A	(1)*, 4
H1	I1	N/A	None
H1	I1, I4	N/A	(2)*
H1	I1, I3	N/A	(3)*

*( ) signifies intermittent or pulsed signal. Pulse rate is 1 second on, 10 seconds off for all programs except B1. Pulse rate for B1 program is 2 seconds on, 5 seconds off.