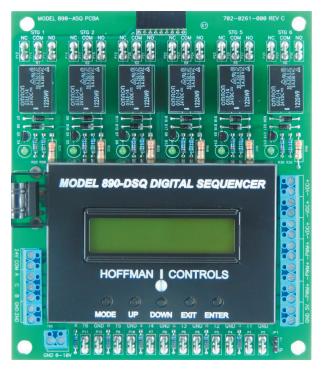# Hoffman|Controls
Product Data

890-DSQ Series Sequencer

Description

The 890-DSQ Series universal sequencer is a microcontroller based step and vernier controller for managing multiple loads (condenser fan motors, heater elements, compressors etc).

The sequencer has six resistance or 0-5 VDC inputs which can be used to sense temperature, pressure, voltage, or resistance. There is also an additional 0-10 VDC input for those devices that require a wider voltage range.

The number and type of sensors used can be selected. The sequencer's sensor inputs can operate over a 0.0°F to 115.0°F temperature range, a 0 to 1000 PSI range, or the single 0-10 VDC range.

The 890-DSQ Series has two types of outputs, fixed relay stages and a variable stage used to modulate EC motors or SCRs. Only the fixed relay stages are activated when a traditional stepped output is required. Both the fixed stages and variable stage are activated when a continuously variable output is desired.

The 890-DSQ Series has up to 6 staged outputs along with a 0-10 VDC, 10-0 VDC and a 17.5 volt, 80 Hz PWM variable stage output. The number of outputs used can be selected. For those applications that require more capability, a plug-in expansion board with up to 6 additional staged output stages (in increments of 2 stages) is available (total 12 stages).

The sequencer can be monitored and set either locally using the 32 character LCD screen and 5 push buttons or remotely using a Modbus RTU master control. Either operating method allows access to all the sequencer's parameter choices and sensor readings.

The 890-DSQ Series is available in 4 or 6 stage models with isolated SPDT relay outputs. The sequencer operates the relays in incremental steps, in sequence, by referencing the input sensor's values. Each stage's turn on and turn off point can be individually selected for the application. The fixed output stage's operation may be monitored by observing the LED indicator as each relay energizes. The operation of the EC motor or SCR output may be monitored by watching the LCD screen's variable stage (VS) value (0 - 100%).

The 890-DSQ has a secondary set of programmable set points which can be activated by closing an external contact. The sequencer also has a settable Emergency ON feature. If any of the sensor input values exceed the Emergency ON value, all the sequencer's stages will come on.

When all sequencer stages are concurrently called to be on, they will sequence on, one at a time, over a 0.1 to 10 second selectable interval. The amount of control differential (hysteresis) is also selectable.

When used with an EC motor or SCR as the variable stage, the 890-DSQ Sequencer becomes a true vernier control. The EC motor or SCR modulates between stage activations and deactivations to provide a continuously variable output.

The variable stage's 0-10 VDC, 10-0 VDC and 17.5 volt 80 Hz PWM outputs provide a modulating signal for either EC motors or SCRs. The PWM output can also be scaled to match the selected EC motor's operating specifications. A total of nine (9) EC motors may be driven from either (or both of) the VDC or PWM outputs. A total of 90 mA is available to operate the SCRs. The 0-10 VDC, 10-0 VDC and 17.5 volt 80 Hz PWM signals are derived from either the 0-10 VDC input or the six 0-5 VDC inputs (temperature or pressure).

The 890-DSQ Sequencer incorporates a loss of power, auto reset feature. If 24 VAC power is not present for less than 15 milliseconds, then no disconnection occurs. A power loss of 15ms or greater will result in an auto reset of all stages. When power is restored, the appropriate stages will systematically sequence back on line based on the sequencer input signal. This feature eliminates "relay chatter".

The 890-DSQ Sequencer is a direct-acting controller (energizes on a sensor input rise) and is factory calibrated for A/C liquid line sensing.

EC Motor Selection

The selection of EC motors depends upon the end use of the EC motor. When the EC motors will be used as variable stage modulating motors they must be continuously variable EC motors that accept a 0-10 Vdc, 10-0 VDC or 17.5 volt 80 Hz PWM control signal. These EC motors do not need to have the same horsepower and maximum rpm as the fixed rpm, staged PSC or EC motors. The ratio of max performance can be set in the controller.

When the EC motors will be used as staging motors they should provide the same performance as the other staged motors.

When updating a bank of 4 or 6 PSC condenser fan motors for vernier operation, two of the PSC motors should be replaced with continuously variable EC motors to supply enough modulating airflow to achieve smooth airflow thru the condenser over the full operating range.

When installing the 890-DSQ Sequencer in a heating system, and the vernier capability will be implemented, be sure to size the vernier's SCRs to carry twice the KW capacity as a single fixed stage. This ensures smooth heating functionality.

Applications

When using replacement EC motors, review the system's current protection device's capability to be sure the devices can handle the much larger inrush current experienced during EC motor power up.

A/C Liquid Line Sensing — Condenser control may be accomplished by liquid line sensing. On an initial cold, low ambient temperature start up, each stage will energize only after that stage reaches its preset °F, PSI or voltage setting. This function provides system temperature/pressure build up before ambient control regulation is initiated.

When using the sequencer's variable stage, in addition to the fixed stages, the control will modulate the EC condenser fan motor(s) between stage activations and de-activations to provide a continuous variable airflow across the condenser coil.

Electric Heating — A heating system's electric heating elements may be sequenced using the 890-DSQ's fixed output stages. The control's variable stage can also be used to modulate SCRs to provide a smooth continuous flow of heat to a space.

Compressors — A bank of fixed and variable compressors can be controlled to provide continuous variable output for any application which requires sequencing of fixed stages and possible use of a variable stage to achieve continuously variable output.

Specifications

Voltage, Input (Nominal)	22-30 VAC
Power Requirements	
890-4DSQ	1 VA
890-6DSQ	1 VA
890-2EXP	<1 VA
890-4EXP	<1 VA
890-6EXP	<1 VA
Output	Isolated
Current	
NO @ 24 VAC	4 Amps
NC @ 24 VAC	4 Amps

Differential	Adjustable
Ambient, Operating Temp.	−20°C to 70°C
	−4°F to 158°F
Dimensions – 4 or 6 Stage	8.0" (L) x 5.0" (W) x 1.5" (H)
Models Available	
890-4DSQ and 890-6DSQ	4 & 6 Stage Sequencers
890-2EXP, 890-4EXP and 890-6EXP	2, 4, & 6 Stage Expansion Boards

Features

- Lockout Code.
- A/C liquid line temperature sensing using up to 6 sensors.
- A/C line pressure sensing using up to 6 sensors.
- Manual or remote operation.
- Continuous or stepped output capability that can be combined to achieve continuously variable output.
- PSC and/or EC motor operation capability.
- Up to 12 stepped output stages, all with settable hysteresis.
- Emergency ON set point (all stages on).
- Secondary set of set points.
- FIFO, LIFO or Binary Encode staging methods.
- Individually selectable stage turn on and turn off points.
- Large 32 character LCD screen for readout of values and setting parameters using menu system.
- Low voltage pilot duty isolated relay outputs.
- Multiple input/output functions.
- Adjustable staging.
- Momentary Loss of Power protection.
- Relay stage LED indicators.
- Optional staging intervals.
- Loss of Power Auto Reset.

Modbus Communications

The 890-DSQ comes with a Modbus RTU slave built into the sequencer. A Modbus master controller can communicate with the 890-DSQ over a standard RS-485 three wire connection. The slave ID, bit rates and parity can be set with the sequencer's push buttons or remotely using Modbus.

The operator has the choice to operate and set the sequencer locally or remotely using Modbus. All settable values and sensor information are available over Modbus.

Wiring Diagrams

Due to the 890-DSQ's versatility, it can be wired in many different ways. See the 890-DSQ Installation & Operating Instructions for the selection of wiring diagrams available.