TECHNICAL BULLETIN

Part #: 026-2903 Revision 2 Date: 04/29/2003

COMPUTER PROCESS CONTROLS

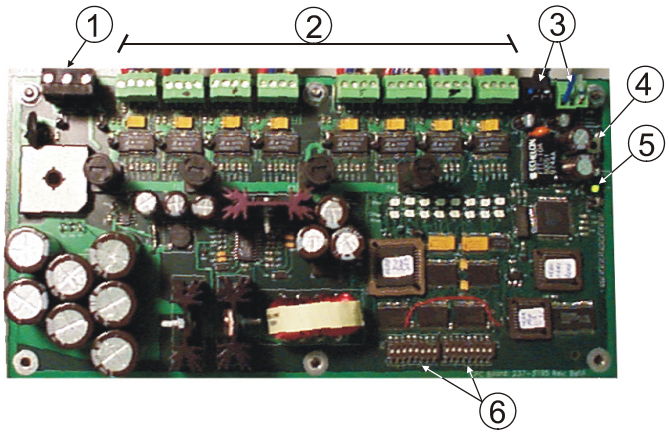
Installation Instructions: ESR8 Valve Regulator (P/N 810-3195)

Introduction

The ESR8 Valve Regulator board (P/N 810-3195), shown in *Figure 1,* is a LonWorks® Echelon™ based electronic stepper valve regulator capable of controlling temperature in up to eight refrigeration circuits.

The ESR8 uses suction side variable-position evaporator regulators (ESRs) to vary evaporator pressure for an entire circuit. The ESR8 offers an economical, more efficient alternative to TXV control.

The ESR8 receives input data from an CPC Einstein or E2 controller (via the Echelon Network) and then regulates the stepper valves according to the data from the Einstein or E2.



LEGEND			
1	Power Input	4	Termination Jumper
2	Valve Inputs (8)	5	Status Light
3	Network Inputs	6	DIP Switches

Figure 1 - ESR8 Board Layout

Installation

The ESR8 control board is designed to be located in a central location, preferably near the Einstein controller. See *Figure 2*.

Panel Mounting and Heat Dissipation

The ESR8 generates a substantial amount of heat (58 W) during operation. If an enclosure contains multiple ESR8s, you may be required to ventilate the enclosure by installing air circulation fans or other devices to aid in heat dissipation.

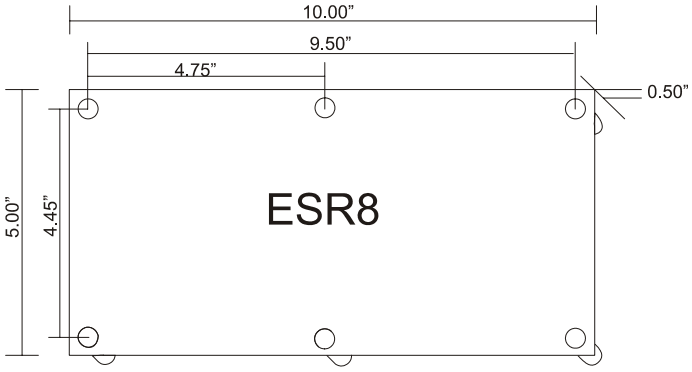


Figure 2 - ESR8 Dimensions

Wiring

Power

The ESR8 is powered by a Class 2, 75VA 24 VAC transformer (110VAC P/N 640-0050, and for 220 VAC P/N 640-0045). J13 is located in the top left corner of the board. Connect the two wires from the transformer to the outside terminals and the middle terminal to earth ground. See *Figure 3*.

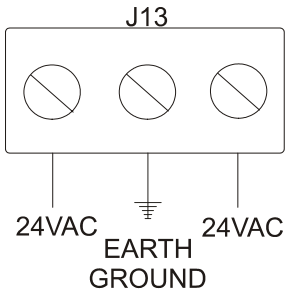


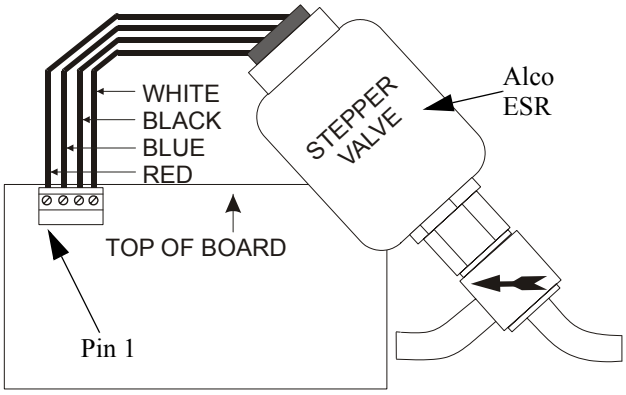
Figure 3 - Power Wiring

Network

In the top-right corner of the board are two three-pin plugs. These are the Echelon Network plugs, and they are used to connect the ESR8 to the Einstein controller, other ESR8s, and other Echelon Network devices. One jack is the network input and the other is the network output. It makes no difference which jack is used for the in or out, but to keep things simple in multiple ESR8 installations, do the connections the same way for each board.

Valve Wiring

The stepper valves are wired to the board by connecting the four-conductor wire from the stepper valve to a connector plug and then plugging in to one of eight jacks along the top of the board (*Figure 4)*. Use the cable harnesses supplied with the valves or use Belden #9418 four-conductor 18AWG wire (Note: a wire run may not be longer than 150 ft using Belden #9418). If the stepper valves have block-style connectors, cut the ends off and attach the terminal plugs supplied with the ESR8 to the wire ends.



Note: For Sporlan CDS and SEI valves, connect GREEN wire where BLUE is shown in picture.

Jumper Setting

Set the termination jumper (JP1) to the UP position if the ESR8 is the last device on a daisy chain. See the Echelon network wiring section in your site controller's user manual for more information about network configuration and termination.

Commissioning the ESR8 and Programming Einstein and E2

Successful installation of an ESR8 will require you to perform four main programming tasks in the Einstein or E2 software:

1. **Add and commission ESR8 Board(s)** - The Einstein or E2 refrigeration controller must be programmed to communicate and utilize the ESR8 board(s) on the network.
2. **Case Circuit Setup** - A Standard Circuit application must be set up as normal (with all case types, set points, and other parameters defined) EXCEPT the Temperature Control Strategy must be set up as

"LINEUP/DEFROST." Also, the physical address of the EEPR valve must be specified in the Standard Circuit application.

3. **ESR8 Setup** - Physical properties of the valves connected to the ESR8 will need to be specified in the ESR8 Controller application in the Einstein software.

Step 1: Adding and Commissioning an ESR8 Board

Adding ESR8s

An ESR8 board must be added to Einstein or E2 in the same manner than an 8RO or a 16AI is added to the network setup section of the controller. This is done from the "Connected I/O" screen of Einstein or E2 (*Figure 5).*

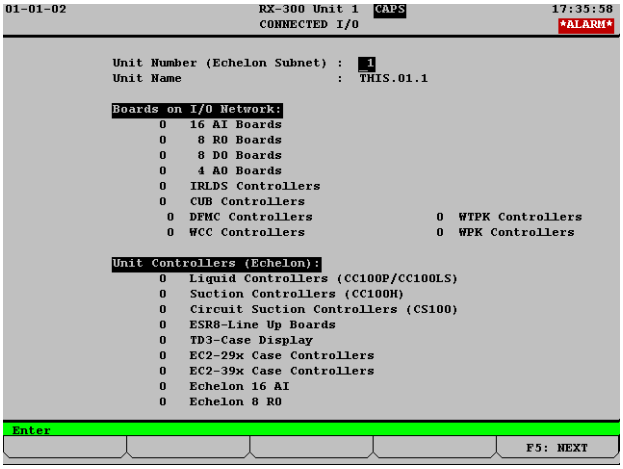


Figure 5 - Connected I/O Screen (E2 Shown)

Einstein	E2
1. From the Home screen, press F8 Y 4 2 2. Press the DOWN ARROW key until the ESR8 field is highlighted. 3. Enter the number of ESR8s to be connected to the Einstein and press Enter. 4. Press F9 to return to the Home Screen.	1. Press Menu. 2. Press & 7 & 7 @ 2 . 3. Press the DOWN ARROW key until the ESR8 field is highlighted. 4. Enter the number of ESR8s connected to the E2 and press Enter. 5. Press to save changes and exit the screen.

Commissioning ESR8s

Once all the ESR8 boards have been added, navigate to the Controller Network Configuration/ Setup screen (*Figure 6)* to begin the commissioning process.

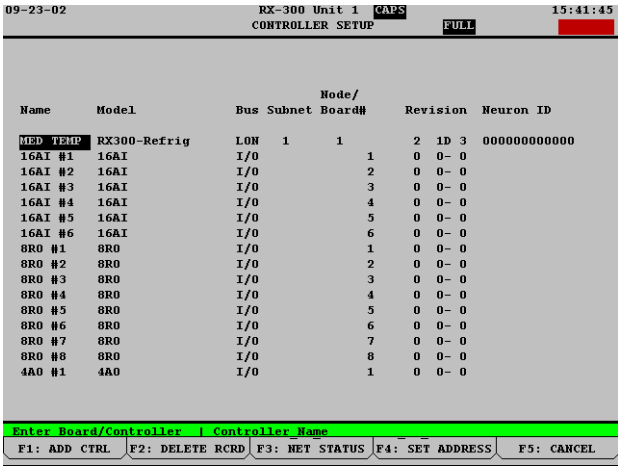


Figure 6 - Controller Setup screen (E2 Shown)

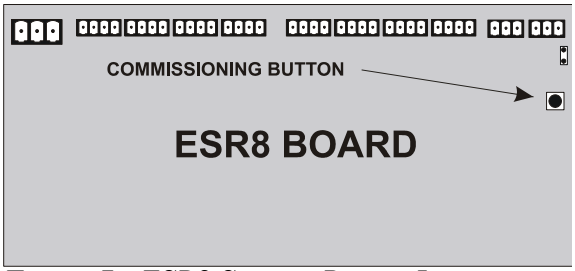


Figure 7 - ESR8 Service Button Location

Einstein	E2
1. From the Home screen, press F8 Y 4 1	1. Press Menu.
2. Use the UP ARROW and DOWN ARROW keys to highlight the ESR8 you wish to commission.	2. Press & 7 & 7 # 3.
3. Press F6 - Set Address.	3. Use the UP ARROW and DOWN ARROW keys to highlight the ESR8 you wish to commission.
4a. If commissioning using the service pin on the ESR8, press 1 from the menu, then press Enter. The controller will wait for one minute for you to press the ESR8 Service Button (*Figure 7*). Press and hold this button for five seconds. If "Error - No Controller Responded" appears on the screen, check Echelon network connection and try again.	4. Press F4 - Set Address.
4b. If commissioning by hand-entering the Echelon ID numbers for each board, press 2 from the menu, then press Enter. Locate the 12-digit number on a sticker near the bottom of the board, enter it in the Neuron ID field, and press Enter.	4a. If commissioning using the service pin on the ESR8, press ! 1 from the menu, then press Enter. The controller will wait for one minute for you to press the ESR8 Service Button (*Figure 7*). Press and hold this button for five seconds. If "Error - No Controller Responded" appears on the screen, check Echelon network connection and try again.
5. Repeat steps 2 through 4 for each ESR8.	4b. If commissioning by hand-entering the Echelon ID numbers for each board, press @ 2 from the menu, then press Enter. Locate the 12-digit number on a sticker near the bottom of the board, enter it in the Neuron ID field, and press Enter.
	5. Repeat steps 2 through 4 for each ESR8.

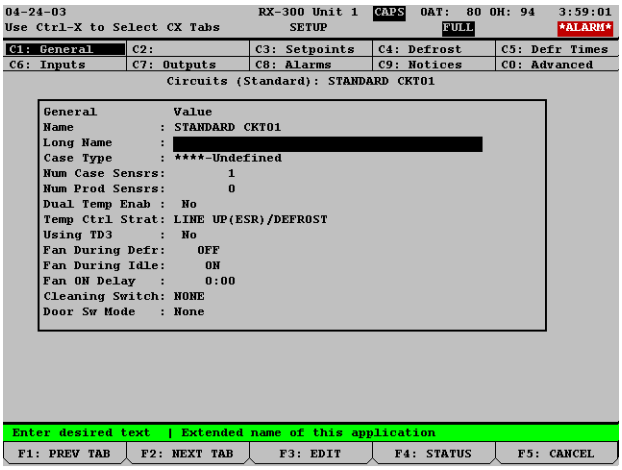
Step 2: Case Circuit Software Setup

An ESR8 works in conjunction with a Standard Circuit application in Einstein to control case circuit temperature. Each Standard Circuit application should be programmed as documented in the Einstein's installation guide or the E2's user manual and/or on-line help.

To specify that the case circuit is going to be controlled by a valve on an ESR8 board, there are three important screens in the Standard Circuit application that you will need to alter. To edit a Standard Circuit application:

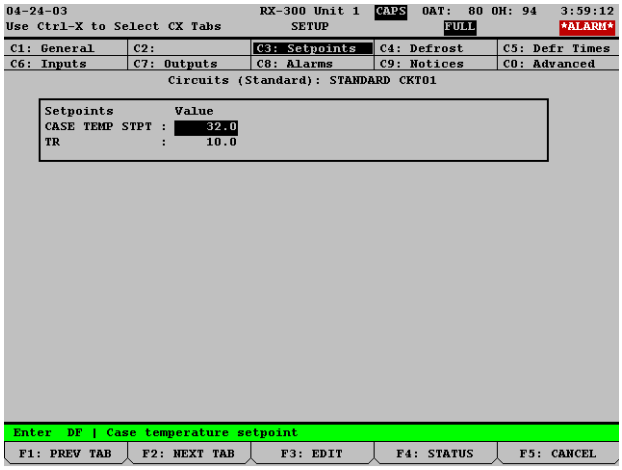
Einstein	E2
1. From the Home screen, press F3 -CIRCUITS. 2. Use the arrow keys to highlight the circuit you wish to edit, and press Enter. 3. From the status screen, press F8 B to enter setup. *Use the F1 and F2 keys to scroll between screens.*	1. Press Menu. 2. Press # 3 -CIRCUITS . 3. Use the arrow keys to highlight the circuit you wish to edit, and press Enter. 4. From the status screen, press F5 - SETUP. *Use the F1 and F2 keys to scroll between screens.*

Screen 1: General



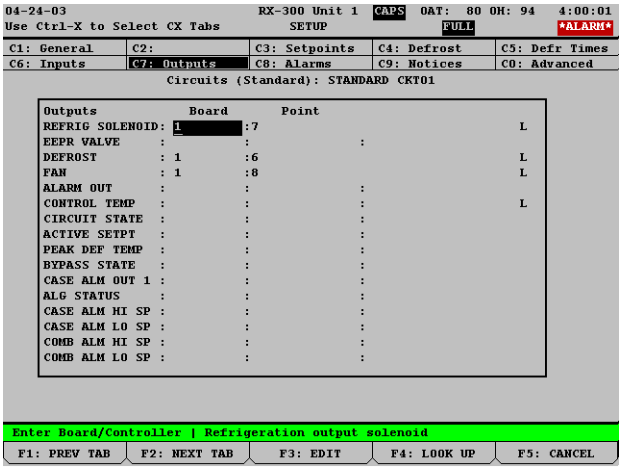
In **Screen 1: General,** there will be a field called **Temp Ctrl Strat**. This field tells Einstein what method of control will be used. This field should be set to "LINE UP(ESR)/DEFROST" to indicate an ESR8 will control temperature.

Screen 3: Setpoints



In **Screen 3: Setpoints,** the **TR** field sets the throttling range of the ESR8 temperature control. The throttling range is the number of degrees between a 0% and 100% valve aperture in the Proportional mode of PID control. In most cases, the default value (10°F) is sufficient. If a different TR is desired, enter it here.

Screen 7: Outputs



In **Screen 7: Outputs,** the EEPR VALVE output must be set up to point to a valve output on an ESR8 board. Use the "LOOK UP" function key (F7 for Einstein, F4 for E2) and select the following values for the Controller, Application, and Input fields:

- Controller: Choose the name of the ESR8 board you wish to point to.
- Application: You will be given one choice named ESRxxx, where xxx is a number. Choose this one.
- Input: You will see eight choices named VALVE CMDx, where x is a number from 1 to 8. These correspond to points 1 through 8 on the ESR8 board. Choose the number of the point you wish to use.

Step 3: ESR8 Setup

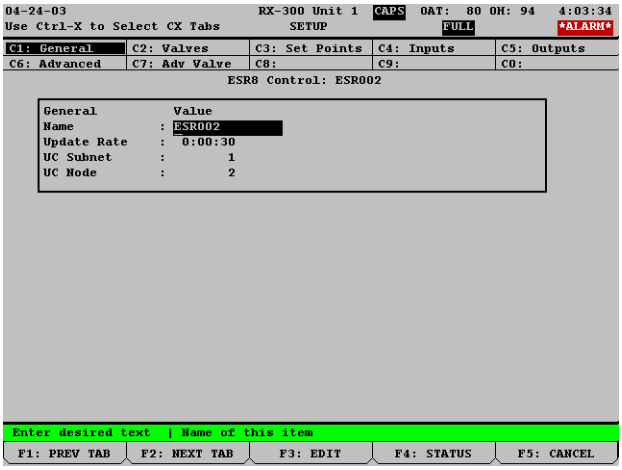
Before setting up your ESR8 evaporator stepper regulator, you must have completed steps 1 and 2, so that your ESR8 boards are added, commissioned, and configured correctly in your Standard Circuit applications. In this step, you must specify the type of valves being used and (if necessary) the specifics of the valve such as step rate and maximum number of steps.

It is important to note most of the more advanced functions of ESR8 applications (especially valve parameters) can only be accessed when Einstein is operating in Full Options display mode. You may toggle on the Full Options display mode by pressing F8 followed by ?Q in Einstein, or by simply pressing Alt+F in E2. If the word "FULL" appears highlighted at the top of the screen, you are in Full Options mode.

To edit an ESR8 application:

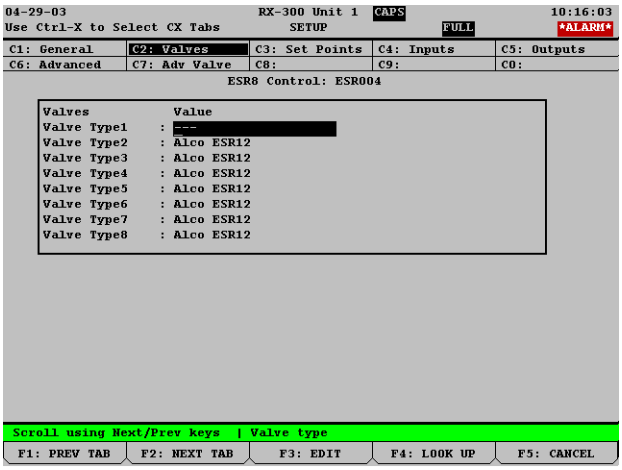
Einstein	E2
1. From the Home screen, press F5 ^S. 2. Use the arrow keys to highlight the ESR8 you wish to edit, and press Enter. 3. From the status screen, press F8 *B to enter setup. *Use the F1 and F2 keys to scroll between screens.*	1. Press Menu. 2. Press F5 -Configured Applications . 3. Use the arrow keys to highlight “ESR8”, and press Enter. 4. If more than one ESR8 is listed, choose the one you wish to edit, and press Enter >. 5. From the status screen, press F5 - SETUP. *Use the F1 and F2 keys to scroll between screens.*

Screen 1: General



The General screen is where general properties of the ESR8 application are specified. The only field on this screen you need to concern yourself with is the Name field; if you want to assign a name to this ESR8 application, enter it in this field.

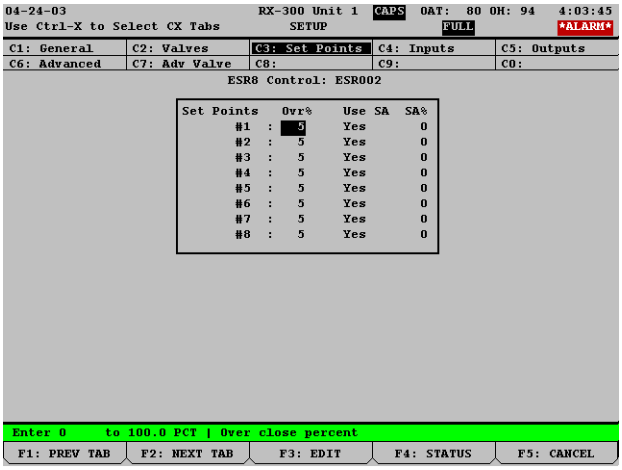
Screen 2: Valves



The Valves screen allows you to specify the type of valve connected to each output on the ESR8 board. If you are using Alco ESR12 or ESR20 valves, selecting the valve type in the approprate field will automatically enter the correct valve settings in the "Adv Valve" screen. If using any other type of valve, change the Valve Type to "---".

Screen 3: Set Points

Note: You will only see this screen if Full Options Mode is ON. Press F8 ?Q *in Einstein or* Alt+F *in E2 to toggle between regular and full options.*



This screen is where you will enter specifics about the valves that are connected to the ESR8. All fields on this screen are listed in eight rows numbered one through eight. The number on each row corresponds to the similarly numbered point on the ESR8. For each ESR8 point that has a valve attached to it, define the following fields:

Ovr% The Over Close Percentage is the percentage of the total number of valve steps the valve will attempt to travel past its "0%" threshold to ensure the valve is fully closed when the valve is called to be fully closed.

Take for example a valve with an Over Close Percentage of 5% and a Maximum Steps value of 500. When this valve is called upon to close (i.e. move to 0%), the valve will travel to the step that it counts as 0% and then attempt to close 25 more steps. By doing this, any error that may cause the valve to be slightly open at 0% will be avoided.

It is recommended that this value be set to 5% for all ALCO valves and to 10% for all Sporlan valves. Refer to the Valve Specifications tables at the end of this technical bulletin.

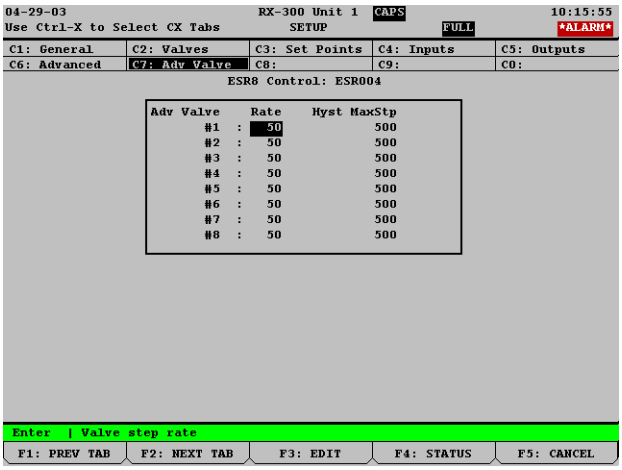
If using an Alco ESR-12, enter 500 in this field. If using an Alco ESR-20, enter 800 in this field.

Use Stand-Alone By default, when the ESR8 loses communication with its parent Einstein, it will remain open and fixed at the percentage last ordered by the Einstein before communication loss occurred. However, in certain control strategies (such as hot gas defrost), it may be more appropriate to fix the valve to a user-specified “safety” percentage when communications loss occurs. If you wish to do this, enter “Yes” in this field. **It is recommended that if using hot gas defrost, this field should be set to Yes.**

Stand Alone % If the Use Stand Alone field is set to “Yes,” the Stand Alone % is the percentage

to which the valve will be fixed when communications are lost between the ESR8 and the Einstein. **It is recommended that if using hot gas defrost, this field should be set to 0%.**

Screen 7: Adv Valve



Rate The Rate field corresponds to the maximum step change rate of the valve (in steps per second). The default, 50 steps/second, is the correct maximum step change rate for the Alco ESR-12 and Alco ESR-20 valves. If using different types of valves, consult the Valve Specifications tables at the end of this technical bulletin and enter the rate listed for your valve type.

Hyst The Hysteresis is the number of steps the valve will continue to travel when the valve changes direction. That is, when the valve is opening and is suddenly called to close, or when the valve is closing and is suddenly called to open, the valve will continue to move for a few steps in the direction it was moving before changing direction. This is a physical property of the valve, and when the correct hysteresis for the valve is entered in this field, the Einstein will be able to compensate for the hysteresis and modify the valve operation accordingly.

Alco ESR-12 and ESR-20 valves have a hysteresis of zero (0). For all other valves, refer to the Valve Specifications tables at the end of this technical bulletin.

Max Number of Steps The MaxStp field is where you must enter the total number of steps the valve travels between fully closed (0%) and fully open (100%). This is a physical property of the valve. Consult the Valve Specifications tables at the end of this technical bulletin to determine the total number of valve steps.

Valve Specifications Tables

ALCO Stepper Valves

TYPE	ALCO ESR 12	ALCO ESR 20	Sporlan CDS-8	Sporlan CDS-16 CDS-17	Sporlan CDS-9
Voltage	12 VDC / **24 VDC**	12 VDC / **24 VDC**	12 VDC	12 VDC	12 VDC
Control	Suction	Suction	Suction	Suction	Suction
Step Rate	50	50	200	200	200
Max Steps	500/800*	800	3064	6386	3193/6386
OverClose	5%	5%	10%	10%	10%
Total Watts	10	10	4	4	4
Phase *** Resistance	29 ohms / **115 ohms**	29 ohms / **115 ohms**	75 ohms	75	75
Hysteresis	0	0	0	0	0
Motor	Bipolar	Bipolar	Bipolar	Bipolar	Bipolar

* - 500 steps for valves manufactured before year 2001,

date code before 0100(ex. 0052, 9902, 9848, etc.)

*** - +/- 10% @ 75 degF TDC 10/25/02