SCS-PB / SCS-SB

Installation and Operating Instructions

SPORLAN

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1. Introduction

The SCS family is an electronic superheat controller solution that is designed for refrigeration applications using either a Pulse Width or Stepper type expansion valve. It is designed to be mounted within the refrigerated space for ease of installation on existing equipment. SCS-PB is designed to operate pulse valves, while the SCS-SB is designed to operate stepper valves. Each of the controller types include a coil outlet temperature sensor, and connectors for the valve and pressure sensor compatible with Sporlan valves and pressure sensors and a 110/120-220/240 VAC power connection.

SCS-PB
Pulse System Control

SCS-SB
Step System Control

2. Installation

Tools required:

- Mobile iOS device with Bluetooth LE capability and either cellular or Wi-Fi connectivity
- Small flat screwdriver (for Pulse Valve connector)
- Wire cutters
- Two #10 (5mm) mounting screws
- Magnet or magnetized screwdriver
- Scotch-Brite™ pad

1. The SCS should be mounted in a UV protected location where the mounting location will be between -22°F and 120°F (-30°C and 50°C). The controller and connections should be hermetically sealed so the controller can be installed in wet environments. Take care not to mount the unit in such a way that it would block any air curtains of a refrigerated display case. Mount the unit in such a way that the Bluetooth ID on the label is visible for ease of connecting to the unit via Bluetooth.

The controller MUST be mounted on a flat surface. Mounting the controller on a surface that is not flat or bends may cause damage to the controller. Recommended torque varies by material, 13 to 17 in-lbs (1.47 to 1.92 Nm) should be sufficient.

2. Mount the coil outlet sensor that is included with the SCS on the outlet of the evaporator coil. See Appendix C for details.

3. Mount the suction pressure sensor and connect the transducer cable. See Appendix C for details.

4. Connect the valve. If using a stepper valve, connect the M12 connection to the valve and tighten to 10-14 in-lbs. (1.13 to 1.58 Nm). If using a pulse valve, connect the DIN connector to the pulse valve. Tighten the DIN connector mounting screw to 3.5 in-lb (0.40 Nm).

5. Connect the power wires. The power connection does not come with any connectors, so the connection to power must be made in compliance

with local, state and federal regulations. The power requirements are described below. See Appendix B for more details on specific power specifications.

- Voltage: 100-240 VAC, 50-60 Hz

- SCS-PB Power Requirement: 1.5W for controller + Pulse Valve Power Rating (31W max)

- SCS-SB Power Requirement: 4W

⚠**WARNING:** Route and secure cables away from hot surfaces, high voltage lines, and moving components. Use caution when working around high voltage components. Safety covers should be used for personal safety on high voltage panels. Ensure the wires are not placed close to any sharp or abrasive objects to avoid any nicking, scraping, or cutting of the wire insulation. Secure all wires to prevent pulling or applying tension to the wires.

3. Setup

Setup of the SCS series of controllers is done using the Tech Check app for Apple mobile devices. You will need a mobile device with Bluetooth LE capability.

A. TECH CHECK SETUP

1. Download the Sporlan Tech Check app. Search for 'Sporlan Tech Check' on the app store.

2. Click on the 'Register' tab and create an account by entering the following and then tapping 'Register' in the top right:

   a. Email Address (will need to be verified)

   b. Password

   c. Company name

   d. Your full name

3. A verification email is sent to the email address that you provided. Open your email application and click the link in the email to verify your account.

4. Once your email is verified, open the Tech Check app and either click 'Reload' or log in using your email address and password.

5. Once you are logged into the app you will need to request access to the various products that the Tech Check app supports. To do this, click on the gear icon at the top right of the screen.
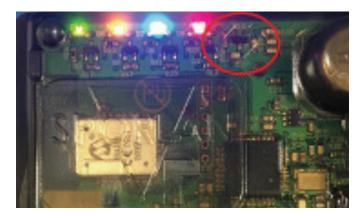
6. Tap on 'Request SCS access' and wait for the access to be granted. It should take less than a minute with an established cellular connection.

7. Once access is granted, the setup will be complete. Tap the back button to return to the home screen of the app.
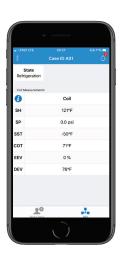
B. SCS SETUP

1. Power up the SCS controller.

2. Activate the Bluetooth Broadcasting on the SCS controller by briefly placing a magnetic screwdriver, or other magnet over the controller at the indicated location. Note that if it is successful, you will see the blue LED on the controller begin to blink.
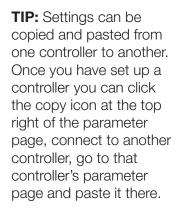
3. Open the Tech Check app. If the blue LED is blinking, the controller should appear on the Controller Inventory screen. The Bluetooth ID shown on the label of the controller will be displayed on the app.

4. Select and connect to the controller. Once the controller is connected, the blue LED on the controller will turn solid blue.

5. Upon connecting, the app will read the controller case ID and populate a tab on the bottom of the screen with the ID. The controller's case ID may be changed in the app.

6. Touch the upper left "Options" button and select the Parameters page. The key parameters needed to set up the controller are visible here. Change the parameters as desired for your application. See the Parameters section for more details on the parameters.

TIP: Settings can be copied and pasted from one controller to another. Once you have set up a controller you can click the copy icon at the top right of the parameter page, connect to another controller, go to that controller's parameter page and paste it there.

4. Parameters

The following tables describes the parameters that are available for this controller. The parameters can be accessed by connecting to the controller by using a mobile device such as a smart phone. See the Setup Section for more details on how to connect to the controller.

Parameter	Description	Range
Date/Time	Current date and time	Dates/Times
Superheat Target	The desired superheat	5°F to 45°F 2.78°C to 25°C
Refrigerant	Specifies what refrigerant is being used	See list of available refrigerants
Identification - Rack	Identifies the compressor rack the coil is connected to	4 characters, alphanumeric
Identification - Lineup	Identifies the lineup the coil is connected to	4 characters, alphanumeric
Identification - Case ID	Identifies the specific case/coil being controlled by the controller	4 characters, alphanumeric
Pressure Transducer - Range	Specifies the range of the pressure transducer being used	0 to 1000 PSI 0 to 68.95 bar
Pressure Transducer - Type	Specifies the pressure transducer type	Absolute or Gauge
Pressure Transducer - Offset	Offset from zero applied to the pressure sensor	-20 to 20 PSI -1.38 to 1.38 bar
Coil Outlet Thermistor - Type	Specifies the type of thermistor used The controller comes with a 10K thermistor	2K 3K 10K (default)
Coil Outlet Thermistor - Offset	Offset from zero applied to the thermistor	-10°F to 10°F -5.56°C to 5.56°C
Stepper Type - Number of Steps	Specifies the number of steps the stepper valve has – only applies to SCS-SB	100 to 10,000 steps
Stepper Custom Polarity	Specifies the valve polarity – only applies if "Custom" is chosen as the stepper type on the SCS-SB	Unipolar or Bipolar
Stepper Custom Step Rate	Specifies the valve movement rate in steps/second – only applies if "Custom" is chosen as the stepper type on the SCS-SB	30 to 400

Refrigerants available to use with the SCS controller:

R-22	R-134a	R-402A	R-404A	R-407A	R-407C	R-410A	R-417A
R-422A	R422D	R-507A	R-744	R-245fa	R-438A	R-401B	R-408A
R-508A	R-508B	R-407F	R-434A	R-444B	R-448A	R-450A	R-449A
R-452A	R-513A	R1336mzz	R-427A	R-422C			

Note: Additional refrigerants may be added over time. If your refrigerant is not listed, a new firmware package with additional refrigerants may be available. Please contact Sporlan Application Support or your local Sporlan Sales Representative for information.

5. LED Indicators

The controller has 4 LED indicators that allow you to quickly see some basic information about the controller status as shown in the table below.

Indicator	Action	Status
Green/PWR	LED On	Indicates the unit is powered
Yellow/VLV	LED Off	Valve is off or at 0% open
Yellow/VLV	LED On	Valve is on or at 100% open
Yellow/VLV	LED blinking periodically	Number of blinks indicates % of open. One blink for every ten percent of open. Only applies to the SCS-SB.
Yellow/VLV	LED blinking constantly	Fast blinking indicates a valve connection issue.
Blue/BT	LED blinking	Indicates the unit is advertising for Bluetooth. The unit is visible to mobile devices at this point.
Blue/BT	LED On	Indicates the unit is connected to a mobile device through Bluetooth.
Red/ALM	LED On	Indicates that an alarm is active. See the Alarms Section for more details.

6. Alarms

The controller has the capability to detect issues and alert the user of any issue it encounters via alarms. When any alarm is active, the red ALM LED will be on. To see what alarms are active, connect to the controller through a mobile device. In the app, there is an alarm bell icon on the top right of the screen. Tapping this icon moves to the alarm screen. The alarm screen will list all possible alarms. Currently triggered alarms will be highlighted. See the Setup Section for more details on how to connect to the device. The table below describes the possible alarms.

Alarm	Description
Transducer Voltage Low	Voltage on the pressure transducer is very low, indicating a potential issue with the connection or sensor.
Transducer Voltage Out of Range	Voltage on the pressure transducer is outside the expected range for normal operation. This may indicate a wiring issue or problem with the sensor.
Transducer Not Connected	This indicates the controller is not able to detect the pressure transducer. This typically points to a connection issue with the pressure transducer.
Coil Outlet Resistance Low	This indicates the resistance for the coil outlet thermistor is out of range and is low. This is typically cause by a short circuit on the thermistor.
Coil Outlet Resistance High	This indicates the resistance for the coil outlet thermistor is out of range and is high. This is typically cause by a connection problem or open circuit with the thermistor.
EEV No Continuity	This indicates that there is a connection problem with the stepper valve. This may also be caused by a damaged/defective valve.
EEV Overcurrent	This indicates the current for the pulse or stepper valve exceeds the expected range. This is typically due to a connection/wiring problem or a damaged/defective valve.
Low Superheat	This indicates that the superheat value is trending low (below 3°F / 1.67°C over the last hour).
High Superheat	This indicates that the superheat value is trending high (above 50°F / 27.78°C over the last hour).

7. Normal Operation

The operation of the controller can be checked using the Sporlan Tech Check app. First connect to the controller. For more details on how to connect to the controller, see the Setup Section. Once connected, the screen will show several process values as described in the table below. These values describe the current operation of the controller.

Process Value	Description
State	The current state of the controller.
SH	This is the current value of superheat being read by the controller.
SP	This is the current suction pressure being read by the controller.
SST	This is the current saturated suction temperature being calculated by the controller.
COT	This is the current coil outlet temperature being read by the controller.
EEV	This is the current valve position of the valve if it is a stepper valve. If it is a pulse valve, this indicates the current pulse duty cycle.
DEV	This indicates the current device temperature being measured by the controller. This is the temperature of the controller itself.

8. Overrides

The Tech Check app will allow you the ability to override some values of the controller for troubleshooting purposes. These overrides will remain active for 10 minutes before being relinquished and allowing the controller to control these values again. The values that can be overridden are the EEV Percent Open (This is duty cycle for a pulse valve), and the superheat.

9. Firmware Update

Firmware updates may be available from time to time to provide new features and improvements to the controller. Those firmware updates may be applied to the controller using the Tech Check app. First, connect to the controller using a mobile device. For more details on how to connect to the controller, refer to the Setup Section. After connecting, touch the icon on the upper left to access more options, and select firmware update. The update may take up to 5 minutes. The mobile device must not leave the proximity of the controller during this time for the update to complete successfully.

10. Data Logs/Graphing

The controller can store historical data, every 20 seconds for 30 days, in order to help with troubleshooting. This historical data is saved in the memory of the controller and can be retrieved and graphed using the Sporlan Tech Check app. In order to view graphs of historical data, simply connect to the controller and touch the numerical value on the row of the process value you wish to graph. It is also possible to request a CSV file of the logs and share through e-mail, text, etc.

Appendix A: Ordering Information

Description	Item Number	Notes
Superheat Controls SCS Pulse Valve SCS Stepper Valve	SCS-PB SCS-SB	
Pressure Transducers* PSPT0150SVSP-S PSPT0300SVSP-S PSPT0500SVSP-S PSPT0652SVSP-S	952572 952574 952576 952579	0 to 150 psis transducer (all other refrigerants) 0 to 300 psis transducer (R410A) 0 to 500 psis transducer (R744) 0 to 652 psis transducer (R744)

*Select one per controller based on refrigerant.

Appendix B: Technical Specifications

Electrical

• Supply Voltage: 100-240 VAC, 50-60 Hz

• SCS-PB Power Requirement: 1.5W for controller + Pulse Valve Power Rating (31W max)

• SCS-SB Power Requirement: 4W

Mechanical

• Operating Temperature: -22°F to 120°F (-30°C to 50°C)

• Storage Temperature: -40°F to 140°F (-40°C to 60°C)

• IP Rating: IPX6, IPX7

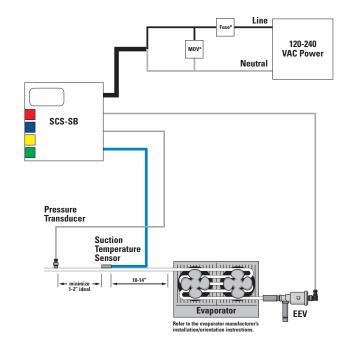• Operating Humidity: 10% to 100% RH

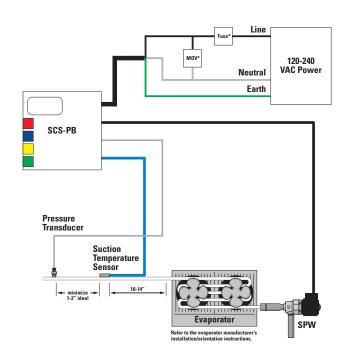• Storage Humidity: 10% to 100% RH

Compliance

• FCC (US)

• IC (CA)

• CE

• UL Recognized (US and CA), UL File Number: E75259

• RoHS

OV Category Application Data

SCS controls are designed for use in applications where the equipment is connected to the AC supply using a plug and socket (OV Category II applications). When applying the SCS controls in permanent wired equipment (OV Category III applications), a 1A inline fuse and MOV are required.

• Fuse 1A Littlefuse Type 3AG Slo-Blo® or similar.

• MOV 300V Littlefuse V300LA20AP or similar. Certified UL 1449

Appendix C: Sensor Installation

Mount the Pressure Transducer

1. Locate or install a ¼" SAE access fitting on the suction line near the outlet of the evaporator. Mount it at 12 o'clock on a free-draining horizontal line to decrease the possibility of oil trapping. **WARNING:** Remove pressurized refrigerant from the line before installing the fitting.

2. Install the transducer, tighten it to 8 ft-lbs, and check for leaks. Do not use a gasket or a washer. **WARNING:** For safety, ensure that the correct Schrader core is installed in the access fitting and use caution when removing Schrader cap/installing transducer to avoid contacting escaping refrigerant.

3. Connect the pressure transducer cable to the transducer.

4. Route and secure transducer cable away from hot surfaces and high power A/C voltage lines.

5. Ensure pressure range and type (gauge or absolute) are configured properly in the controller, See Section 3 - SETUP.

6. After startup, use a gauge set to verify proper pressure reading through the controller. An improperly installed Schrader core can cause erroneous pressure readings.

7. Check for leaks after system is in operation.

Mount the Suction Outlet Temperature Sensor

1. Per Appendix B - Wiring Diagram, the temperature sensor should be installed 10-14 inches (25-36 cm) from the heat exchanger, on a free-draining horizontal line. Minimize the distance from the pressure transducer.

2. Use Scotch-Brite™ to clean the copper line at the installation location. Removal of the oxides and dirt will increase sensor accuracy.

3. Fasten the suction temperature sensor as oriented in Figure 2. Mount the sensor on the suction line after the heat exchanger, near the pressure transducer.

4. Route the cable away from hot surfaces and high power A/C voltage lines.

5. Verify that the controller is configured properly for the temperature sensor used (2K, 3K, or 10K), See Section 3 - SETUP.

6. Wrap temperature sensor and copper tube with foam insulation to minimize ambient temperature effects (Figure 3).
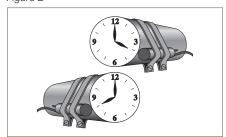
Figure 1

Figure 2

Figure 3