DYNATECH
ENERGY CONTROLS

INSTALLATION INSTRUCTIONS

SC90-C DIFFERENTIAL TEMPERATURE CONTROLLER

APPLICATION

The SC90-C is an ON/OFF electronic differential temperature controller designed for use in hydronic and air solar domestic hot water and space heating systems. It is shipped from the factory for direct application to closed loop anti-freeze protected systems and drain back systems. The SC90-C is field adaptable for recirculation systems by installation of STS-SMFP-NO freeze sensor(s).

CONTROLLER MOUNTING

The SC90 must be installed by a trained and experienced service technician and installed in accordance with NEC and local codes.

CAUTION

Disconnect all power to the controller during installation to prevent electrical shock and damage to the controller.

Choose a centralized location which minimizes wiring runs. Ensure sufficient side to side clearance to allow screwdriver access to cover screws and access to the mode switch. (See Fig. 1)

For controls ordered with line cord, ensure there is a grounded (3-wire) outlet with adequate power capacity. Do not use extension cords.

The SC90 can be directly mounted to Grundfos and Taco pumps via model PK mounting accessory packages.

PK-1	: For Grundfos Models UPS20-42F, UP25-42SF, UP26-64F, UP25-64SF, UM25-18SU
PK-G3	: For Grundfos 3 Speed Pumps
PK-TC	: For Taco Models 006, 007, & 008
PK-DV	: For Sunspool drain valve mounting

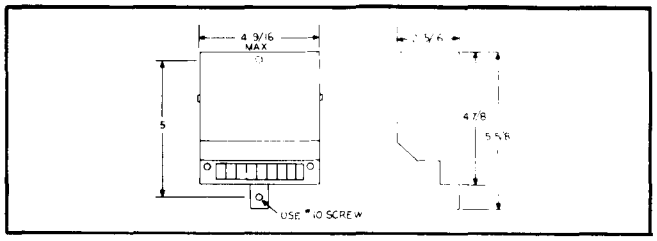
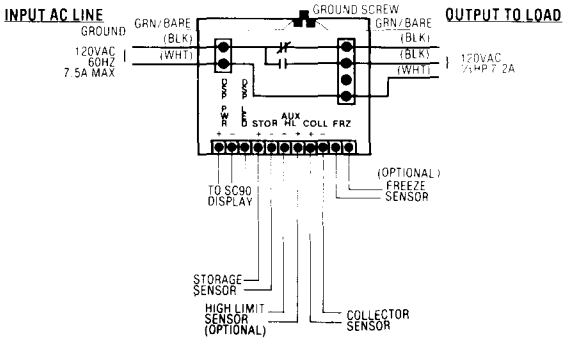


FIG. 1 - INSTALLATION DIMENSIONS FOR SC90-C IN INCHES

CONTROLLER WIRING

All wiring must conform to local and NEC codes. Wiring hook-ups must be completed as shown. When routing ground wires care should be taken to prevent contact with line and output terminals.



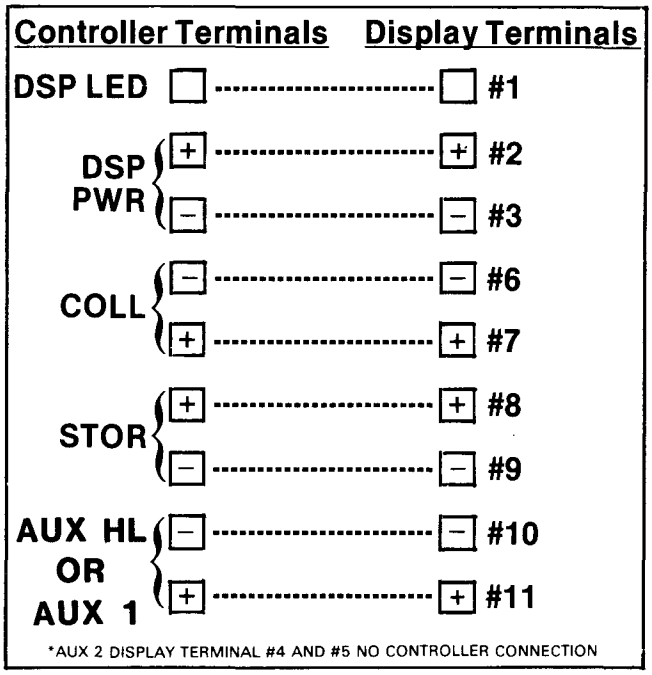
When wiring SC90 display with SC90 controller, complete wiring hook-ups as shown on next page.

IMPORTANT

When wiring SC90 display with SC90 controller, insure orange-striped plug-in resistor bank is removed from controller. Wiring between controller and display must follow terminal to terminal polarity i.e. (+) wired to (+) and (-) wired to (-). See form #100263 for SC90 display installation instructions.

The SC90 display obtains its power supply and three temperature inputs directly from the SC90 controller. Numbering of the display terminals are not complete. Terminal numbering on the circuit board is left to right, 1-17.

WIRING CONNECTIONS BETWEEN CONTROLLER AND DISPLAY



SENSOR MOUNTING AND LOCATION

IMPORTANT

Proper sensor installation is critical to insuring reliable controller operation. Thoroughly review the following instructions or refer to STS Sensor Specifications Form #100063 before installing sensors.

CAUTION

Do Not Solder Or Expose STS Sensors To Open Flame During Installation. All Sensors Should Be Mechanically Attached To Piping, Collectors And Storage Tanks. Sensors Will Be Damaged If Exposed To Temperatures In Excess of 400 °F.

COLLECTOR SENSOR: To assure accurate temperature input to the SC90 control, collector sensors should be mounted on the absorber plate of the collector. If absorber plate mounting is not possible, the collector sensor must be installed on the collector outlet piping as close to the absorber plate as possible. When mounting sensors to the absorber plate or collector piping use model STS-SM Sensors. DO NOT use tape or solder for mounting sensors.

Long-term sensor performance and accuracy is enhanced by the use of thermal conductive compound and proper insulation of the sensor. All collector mounted sensors must be properly insulated and protected from ambient temperatures and weather conditions. Care should be taken to avoid exposing sensors to rain.

RECIRCULATION FREEZE SENSORS:

IMPORTANT

At least two (2) freeze sensors are recommended to provide minimum freeze protection. Additional sensors may be needed for collector arrays in excess of 3 panels or 120ft². Responsibility for selecting the number of additional freeze sensors and their location, is with the installing contractor. Dynatech Energy Control accepts no responsibility for system failures due to freezing as a result of improper field installation of freeze detection sensors.

To provide freeze protection on SC90-C controllers, STS-SMFP-NO sensors must be wired to the FRZ terminals. The STS-SMFP-NO freeze sensor is a "normally open" snap switch sensor which closes its contacts at 44 °F ± 5 °F to activate the pump and opens its contacts at 54 °F ± 5 °F to deactivate the pump. (See Fig. 2)

CAUTION

Never connect freeze sensors to collector sensor wiring. When installing multiple STS-SMFP-NO sensors only connect to the FRZ terminals and wire sensors in parallel. (See Fig. 2)

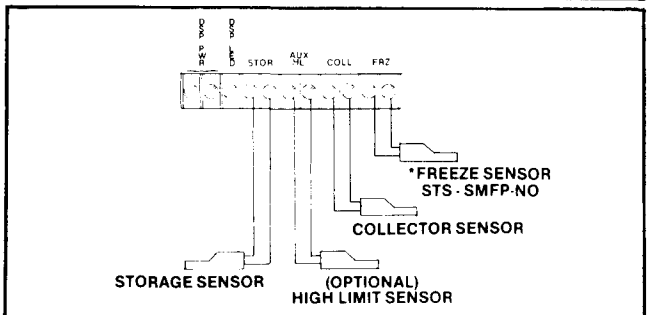


FIG. 2 SENSOR WIRING CONNECTIONS FOR RECIRCULATION FREEZE PROTECTION AND OPTIONAL HIGH LIMIT PROTECTION.

STORAGE SENSOR: The SC90 is designed to accept storage temperature input from a storage tank sensor. In some models the storage sensor also functions as the high limit sensor. SC90's with the suffix 2 in the model number provide this dual function of:

(1) temperature differential input

(2) high limit safety input

EXAMPLE:

SC90-C0312-2
indicates a controller with dual function storage sensor

IMPORTANT

When installing SC90 controllers with suffix 2 in the model number, proper selection of storage sensor location is important. Since higher temperatures occur at the top of the tank, proper sensor location is critical to insuring safe high limit cutout. Consult tank manufacturer and local plumbing codes for recommendations on:

1. **sensor location and mounting**
2. **pressure safety control requirements**

Whenever possible the storage sensors should be mounted directly to the lower portion of the tank. Model STS-SM sensors can be used for surface mounting to the tank exterior. If the storage tank is provided with a well, use model STS-WT sensor (.328" OD X 1" copper insertion.) For tanks with ¼", ½" or ¾" NPT female connections for sensor insertions, use model STS-ST sensors.

The use of thermal conductive compounds (i.e. Wakefield #120-2 or General Electric Insulgrease) will aid sensor performance. Always insure that sensors are covered with insulation.

NEVER SUBMERGE SENSORS

SEPARATE HIGH LIMIT SENSOR: SC90-C controllers with the suffix 3 in the model number provides over temperature "high limit" input to the controller via a separate STS-SM sensor wired to the AUX HL terminals.

EXAMPLE:

SC90-CO312-3
indicates a controller requiring separate high limit and storage sensors.

The separate high limit sensor should be mounted at the top of the storage tank. Select a location on the exterior of the tank or on the "Hot Water Out" piping exiting the tank. Since this sensor provides high limit protection, proper location is critical to insuring safe operation.

SENSOR WIRING

IMPORTANT

All wiring must conform to local and NEC codes. Disconnect all power to the controller before installing sensor wiring.

Wiring of sensors to the SC90-C should be made as shown in figure 2.

All SC90's have circuit protection from lightning and electrical interference. To insure consistent sensor inputs to controller the following precautions should be followed:

1. All sensor wiring should be run with twisted pair wires

2. Ground collector array

STORAGE TANK HIGH LIMIT ADJUSTMENT

The output relay of the SC90-C will be deactivated when the storage tank reaches the set point of the high limit. The high limit is adjustable and is factory set at 160 °F.

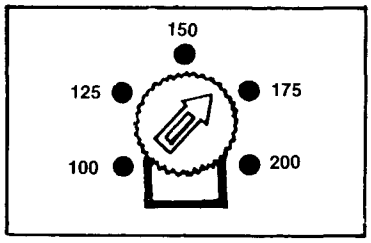


FIG. 3 HIGH LIMIT

A small screwdriver or fingers can be used to change high limit settings (See Fig. 3). Before making adjustments to the high limit make sure the controller system switch is in the "AUTO" position.

TROUBLE SHOOTING AND SERVICE

The SC90 is not field serviceable. The entire circuit board is field replaceable by removing two screws located at the extreme lower right and left hand corners of the circuit board. Use the following procedures to determine if controller malfunction is a result of faulty sensors, sensor installation, or a failed controller.

The SC90 is available in 10K and 3K models. When servicing the controller check the model number on the switch side of the controller to determine the type being serviced. The second set of numerals listed in the model number indicate the sensor type required.

EXAMPLE:

SC90-CO302-3
indicates a controller requiring 3K sensors.

SC90-C1002-3
indicates a controller requiring 10K sensors.

When servicing SC90 controllers, sensor inputs to the controller can be measured with a VOLT-OHM meter. Disconnect the sensor lead wires from controller terminals STOR, COLL and AUX HL and measure sensor resistance. Compare the reading on the meter to the values below to determine temperature levels.

TEMPERATURE VS RESISTANCE

TEMP. °F	RESISTANCE (3K)	RESISTANCE(10K)
32	9796(OHM)	32660(OHM)
40	7834	26109
50	5971	19906
60	4595	15314
70	3565	11884
80	2790	9299
90	2200	7333
100	1748	5827
110	1400	4663
120	1128	3757
130	915	3048
140	746	2488
150	613	2043
160	506	1687
170	420	1401
180	351	1170
190	294	982
200	248	828

NO PUMP OR FAN OPERATION

1. Check circuit breaker and line voltage wiring for loose connections.

2. Check operation of pump/fan by switching the SC90 system switch through its three modes (OFF-AUTO-ON). In the ON position use a volt meter and measure voltage across the AC IN and AC OUT terminals. If pump/fan does not operate, or voltage readings are not correct, proceed to step 3.

3. In the "ON" position, if the AC IN voltage is correct, but the AC OUT is not, replace the controller. If the AC IN and AC OUT voltages are correct but the pump/fan does not operate, check the pump/fan for failure and pump/fan wiring. Proceed to step 4.

4. Check the storage tank temperature with the switch in the "AUTO" position; if the storage temperature is above the high limit set point on the SC90-C the pump/fan will not operate. If the storage temperature is below the set point, go to step 5.

5. In the "AUTO" position remove one sensor lead wire from the storage terminals on the SC90-C. The pump LED should light. If pump LED does not light, replace controller.

CONTINUOUS OR ERRATIC PUMP/FAN OPERATION

1. Disconnect all sensor leads from the SC90 terminal strip and measure sensor resistance with a volt-ohm meter. Compare measured readings with the tables above. If sensor readings do not approximate these values, check sensor wiring or replace faulty sensors and reconnect to SC90 and proceed to step 2.

2. Place the SC90 switch in the "AUTO" position. If the pump/fan continues to operate when it should be off (i.e. at night) system may be in recirculation freeze protection mode. If not in recirculation mode, jumper "storage" terminals on SC90. Pump/fan should deactivate. If pump/fan continues to run, replace controller.

ABBREVIATED VERSION OF 5 YEAR LIMITED WARRANTY

Dynatech Energy Controls, expressly warrants their controllers to be free from defects in workmanship and materials, and malfunctions and failure to perform under normal use and service for a period of five (5) years, provided that said controller is installed in accordance with Dynatech Energy Controls installation instructions. If a defect in workmanship or materials becomes evident during the FIRST YEAR of the five-year warranty period, Dynatech Energy Controls will repair, or at its option, replace the control without charge for shipping costs and parts. If after a reasonable number of attempts to repair the control, it is determined that repair cannot be completed, a refund or replacement device will be provided without charge. If during years 2-5 of the five-year warranty, a defect in workmanship and material is found as described above, Dynatech Energy Controls will repair or replace the control for a nominal service fee.

The above warranties do not constitute the entire warranty policy of Dynatech Energy Controls and does not contain the complete limitations of liability. For a complete copy of the warranty policy and limitations of liability, write or call for Form #100062 at: Dynatech Energy Controls, 12860 W. Cedar Dr., Lakewood, Co. 80228, (303) 986-2292.

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