D. C120 TYPE -3I-4B OR -3D-4D

a) Functional Description: Outputs 3 & 4 on C120 controls are dedicated to the control of solar heat distribution. There are two different control logic options.

***-3I-4B** controls solar space heating from storage (Output 3) and also controls the backup heat source in the event of insufficient storage temperature (Output 4, W2). Control logic:

Thermostat calling for heat **AND** Stor. ref.* greater than "stor min"	INDIRECT SOLAR HEATING FROM STORAGE TANK OUTPUT 3 ON OUTPUT 4 OFF
Thermostat calling for heat **AND** Stor. ref.* less than "stor min"	NO SOLAR HEAT AVAILABLE--HEAT WITH BACK-UP FURNACE OUTPUT 3 OFF OUTPUT 4 ON
Thermostat **not** calling for heat	OUTPUT 3 OFF OUTPUT 4 OFF

*The storage reference is "aux 1" if the **A** option is selected, "aux 2" if **A** is not selected.

-3D-4D controls solar space heating directly from the solar collectors (top priority) or indirectly from solar storage (second choice). Back up control must be controlled from a second stage of the thermostat. Control logic:

Thermostat calling for heat **AND** "collector" greater than "stor min" +5°F	"DIRECT" SOLAR HEAT FROM COLLECTORS OUTPUT 1 ON OUTPUT 3 OFF OUTPUT 4 ON
Thermostat calling for heat **AND** "collector" less than "stor min" -5°F **AND** stor ref* greater than "stor min"	"INDIRECT" SOLAR HEAT FROM STORAGE TANK OUTPUT 3 ON OUTPUT 4 OFF
Thermostat calling for heat **AND** "collector" less than "stor min" -5°F **AND** stor ref* less than "stor min" -5°F	NO SOLAR HEAT AVAILABLE, THERMOSTAT SECOND STAGE WILL TURN ON BACK-UP FURNACE OUTPUT 3 OFF OUTPUT 4 OFF
Thermostat **not** calling for heat	OUTPUT 3 OFF, OUTPUT 4 OFF

*The storage reference is "aux 1" if the **A** option is selected, "aux 2" if **A** is not selected.

Refer to Section VIII for additional C120 application information.

b) Programming: C120...**-3I-4B** A7 = off
C120...**-3D-4D** A7 = on

(The position of switch A7 is not important for C100).

c) Test: Follow the test procedure in the **QC-1** Manual, or use variable resistors as follows:

For C120-**3I-4B**:

Connect 24VAC to "R" & "C"
Open circuit W1 input — Output 3 off, Output 4 off
Short "W1" to "R"

Set storage ref* to "stor min"	Output 3 on,	Output 4 off
"stor min"-4°	Output 3 on,	Output 4 off
"stor min"-5°	Output 3 off,	Output 4 on
"stor min"-1°	Output 3 off,	Output 4 on
"stor min"	Output 3 on,	Output 4 off

*The storage reference is "aux 1" if the **A** option is selected, "aux 2" if **A** is not selected.

For C120-**3D-4D**:

Connect 24VAC to "R" & "C"
Open circuit "W1" input — Output 1 & 4 off, Output 3 off
Short "W1" to "R"

Set storage ref* to "stor min"-5°

Set collector to "stor min"-5°	Output 1 & 4 off	Output 3 off
"stor min"+4°	Output 1 & 4 off	Output 3 off
"stor min"+5°	Output 1 & 4 on	Output 3 off
"stor min"-4°	Output 1 & 4 on	Output 3 off
"stor min"-5°	Output 1 & 4 off	Output 3 off

Set storage ref* to "stor min"-1°	Output 1 & 4 off	Output 3 off
"stor min"	Output 1 & 4 off	Output 3 on
"stor min"-4°	Output 1 & 4 off	Output 3 on
"stor min"-5°	Output 1 & 4 off	Output 3 off

*The storage reference is "aux 1" if the **A** option is selected, "aux 2" if **A** is not selected.

E. °C Temperature Display in Celsius

a) Functional Description: The digital temperature display will be displayed in °C. Note that all of the temperatures discussed in this manual are °F and will not change - only the display units change.

b) Program: (Enable °C) A6 = off
(Disable, default to °F display): A6 = on

c) Test: There are many simple ways to verify this function, choose the one that is easiest for you to do:

*Put a 10Kohm resistor across any sensor terminals - that position should display as 25±1°.

*Open circuit any set of sensor terminals - that position should flash 0°.

*Short circuit any set of sensor terminals - that position should flash 100°.

V. HIGH LIMIT THRESHOLDS

Whenever a high limit (**H**) or nocturnal cooling (**N**) function is programmed, the threshold must be set by installing a resistor at the proper terminals.

Function	Threshold Channel
Output 1 High Limit	"aux 4"
Output 2 High Limit Without **A**	"aux 4"
Output 2 High Limit With **A**	"aux 3"
Output 1 Nocturnal Cooling	"aux 4"

The resistor value (ohms) will determine the threshold (temperature). This relationship is identical to the resistance/temperature curve for IE's 10K thermistor sensors. There are three options for this resistor.

A. Fixed Threshold Resistor Kit

Two fixed threshold kits are shipped with each C100. Each kit consists of an explanatory card with 4 resistors that correspond to 140, 160, 180 and 200°F.

Select the desired resistor and insert directly into the proper terminals. It is very important to tighten the terminals - otherwise erratic operation may result.

B. Model **H(ADJ)** Adjustable Threshold Kit

The Model **H(ADJ)** Adjustable Threshold Kit is purchased separately from the C100 or C120. The H(ADJ) kit contains two adjustable threshold channels with the range of each threshold channel individually selectable (either 65-120°F or 80-212°F). A **C100-1SH-2SHA** where both "aux 3" and "aux 4" are threshold inputs needs only 1 **H(ADJ)** Kit!

WIRING:

Channel	Range	Wires
A	65-120°	Black & White
A	80-212°	Black & Red
B	65-120°	Blue & Green
B	80-212°	Blue & Orange

IMPORTANT: Clip off or tape the unused wires to prevent accidental shorting to sensor terminals or case. No permanent damage will occur but erratic readings may result.

C. User Supplied Fixed or Variable Resistor

If neither of the above options fit your needs: Any fixed or variable resistor may be installed on the threshold channel terminals.

CAUTION: Never connect any electronic equipment or component (except for fixed or variable resistor) to the C100/C120 sensor terminals. Permanent damage may occur.

Resistor Requirements:
- Type: Any (carbon composition, carbon film, etc.)
- Power: 1/4 watt or greater
- Tolerance: resistor ±1% = ±.4°F; resistor ±5% = ±2°F; resistor ±10% = ±4°F
- Value: Refer to chart below.

°F	10K	°F	10K
32	32.6K	125	3.38K
35	30.0K	130	3.05K
40	26.1K	135	2.75K
45	22.8K	140	2.49K
50	19.9K	145	2.35K
55	17.4K	150	2.04K
60	15.3K	155	1.85K
65	13.5K	160	1.69K
70	11.9K	165	1.54K
75	10.5K	170	1.40K
80	9.29K	175	1.28K
85	8.25K	180	1.17K
90	7.33K	185	1.07K
95	6.53K	190	.982K
100	5.83K	195	.901K
105	5.21K	200	.828K
110	4.66K	205	.761K
115	4.18K	210	.701K
120	3.76K	212	.679K

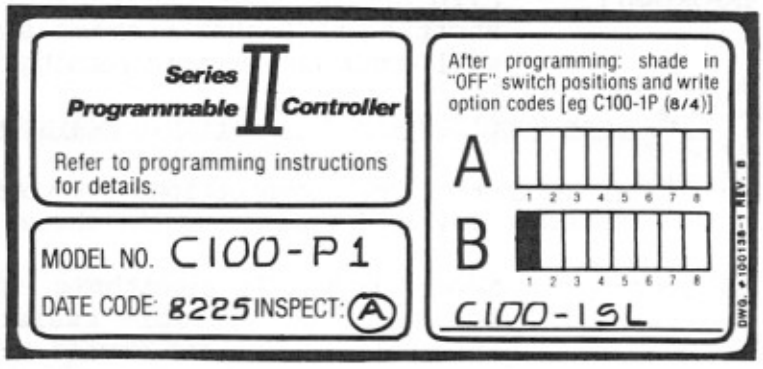
VI. PROGRAMMING EXAMPLES

A) Simple Solar System with recirculate freeze protection: C100-1SL

Model: **C100-P1**
Program: B1 = off
All other switches on

Thresholds: None

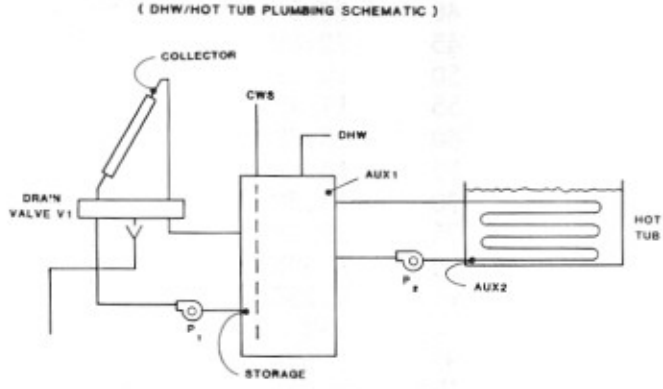
Documentation:



Sensor Wiring: "collector" = solar collector outlet
"storage" = storage tank (bottom)
"aux 1"
"aux 2" optional - for
"aux 3" monitoring only
"aux 4"

Power Wiring: Black & White = Power Input
Yellow & White = Out. 1 (pump)

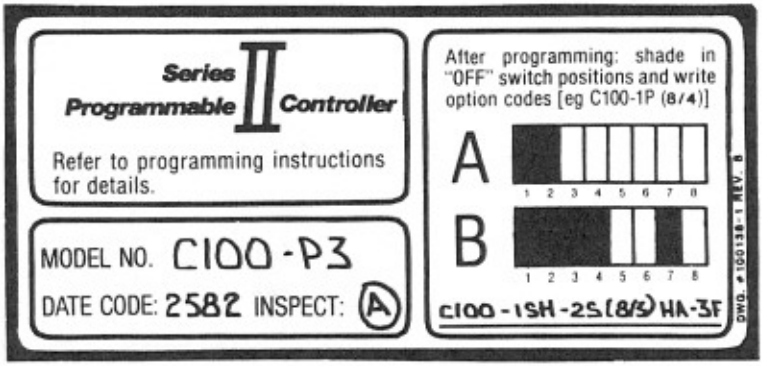
B. DHW/Hot Tub Solar System with draindown on high limit or freeze: C100-1SH-2S(8/3)HA-3FH.



Model: **C100-P3**

Program: B4 = off (Output 1 **H** High Limit)
B7 = off (**-2S(8/3)**)
B3 = off (Output 2 **H** High Limit)
A1 = off (Output 2 **A**)
A2 = off
All other switches on

Documentation:



Sensor Wiring:

"collector"	solar collector outlet
"storage"	storage tank (bottom)
"aux 1"	storage tank (top)
"aux 2"	hot tub
"aux 3"	**H(ADJ)** Kit (optional)
"aux 4"	fixed resistor (160°) (standard)

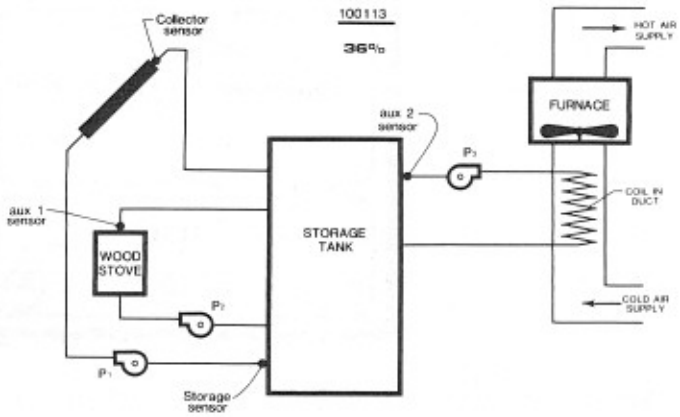
Thresholds: Set Output 1 high limit threshold at 160° by installing resistor from fixed threshold resistor card shipped with C100 to the "aux 4" terminals.

Make Output 2 (tub) high limit adjustable by connecting the black and white wires of the **H(ADJ)** kit to the "aux 3" terminals. Verify the 65-120 range by selecting "aux 3" display and rotating the "A" knob.

Power Wiring:

Black & White	= Power Input		
Yellow & White	= Output 1	=	Pump 1
Red & White	= Output 2	=	Pump 2
Orange & White	= Output 3	=	Valve 1

C. Space Heating System with 2 sources of heat: **C120-1S-2PW-3I-4B.**



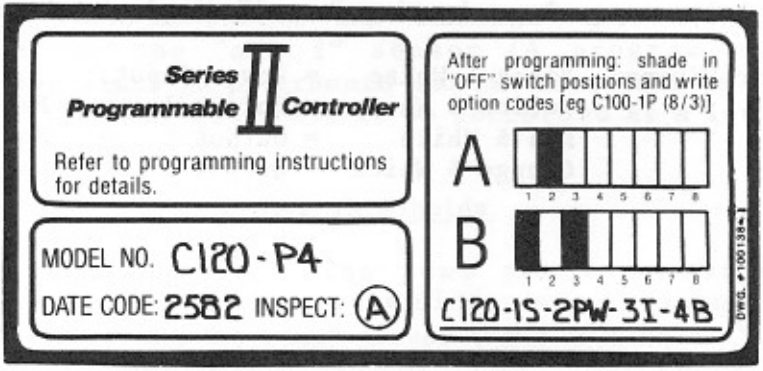
Model: **C120-P4**

Program: B1 = off (2P)
B3 = off (W)
A7 = off (-3I-4B)
All other switches on.

Thresholds: The "stor min" is adjustable from 65-120 via the knob on top of the C120.

The "stor max" is also adjustable, however since no high limit function is programmed this threshold is not used.

Documentation:



Sensor Wiring:
Thermostat Wiring: SEE SECTION VII, C120 APPLICATION EXAMPLES
Power Wiring: