

VII. C100/C120 INSTALLATION & OPERATION

**A. Application:** The Models C100 and C120 offer a broad range of control capabilities. See Section IV for details.

**B. Installation:** Installation must be performed by trained service personnel, and in accordance with NEC and local codes.

**CAUTION**

**Disconnect all power during C100/C120 installation.**

1. **Mounting:** Choose a centralized location which minimizes wiring runs. Ensure sufficient side to side clearance to allow for conduit or romex wire runs to the side knockouts. Actual mounting to wall is via four wood or sheet metal screws.

2. **Line Voltage Wiring:** Wire size and type depends on load size, horsepower and local codes. Label shown is for 120VAC model. For 230VAC model, see label on wiring cover of C100/C120.

**IMPORTANT:** Line cord and outlet models (**LCO**) are intended for use with portable systems only. Do not mount or install with stationary or permanent systems. For LCO models, ensure there is a grounded (3-wire) outlet with adequate power capacity. Do not use extension cords. Refer to rating label on side of C100 for output rating.

**INPUT POWER:** 120VAC  $\pm 10\%$ , 60 Hz, 230VAC optional. See model label on C100/C120.

**OUTPUT POWER:** Pump; 1/10HP, 3.0A Max. @ 115VAC.

	Standard C100/C120 (115VAC)	-230VAC Factory Option	-LCO Factory Option
Input Power	Black & White	Black & Red	Line Cord
1	Yellow & White	Yellow & Black	Left Outlet
2	Red & White	Brown & Black	Center Outlet
3	Orange & White	Orange & Black	Right Outlet

**CONNECT ALL GROUNDS TO THE GREEN GROUND SCREW.**

**CAUTION**

**Do not short any wires to each other or to case - permanent damage will occur.**

3. **Sensor Mounting/Location & Wiring:** Sensor mounting/location and wiring is critical for reliable and proper functioning of the system. Any sensor positions that are not used for control may be left open or used for temperature mounting.

**SENSOR MOUNTING AND LOCATION**

It is best to mount sensors directly on collectors or storage tank. If not possible, mount strap-on sensor to piping as close as possible to collector or tank. The accuracy of SB or SW sensors is enhanced when thermally conductive grease (e.g. Radio Shack 276-1372 or Wakefield #120-2) is applied between sensor and mounting surface. Mechanically mount sensors (e.g. bolt, hose clamp, etc.) do **not** tape or solder. **Always insulate sensor and adjacent plumbing to minimize the effects of ambient temperature.**

**IMPORTANT:** IE sensors are designed and tested to withstand temperatures up to 400° - degradation of performance will occur above 400°F. Do not expose sensors to soldering or open flame whereby temperatures of 400° may be reached. Protect the wire/epoxy end of the sensors from direct rain exposure - **never submerge sensors.**

**WIRING:** A good connection between wiring and sensor leads is crucial to accurate, reliable control operation. Using wire nuts, twist the sensor connections together. To ensure a weatherproof connection, fill the wire nuts with a sealant (silicone, bathtub caulk, GE RTV, etc.) The splice should be enclosed in a small box, or enclosed so that it is not exposed to weather.

**TYPES OF WIRE:** Sensor wire should be an 18 AWG insulated pair (thermostat Belden 8461 or equivalent). Sensor wires that are exposed to weather should be suitable for the purpose (neoprene jacket). For sensor wiring runs that travel near other electrical equipment, wiring to electrical equipment, ham/CB radio transmitters or other sources of electrical interference, shielded wire is recommended. For indoor wiring use 18 AWG, two conductor polyethylene jacketed wire (i.e. Belden #8760). For outdoor wiring use a neoprene jacketed type (i.e. Belden #8428). If shielded wire is used, ground the shields to the C100 enclosure via circuit board mounting screws (next to sensor terminals). Do not ground the shields at the sensor end of sensor wiring.

**LIGHTNING PROTECTION:** Though little can be done to protect any control from a direct lightning strike, grounding the collector array will prevent possible damage from "near strikes" that can produce high energy static discharges.

**COLLECTOR GROUNDING:** Ensure that there is a good electrical ground path between the collector array and the cold water service pipe. This path should be via copper plumbing that is uninterrupted by teflon taped fittings, dielectric unions, plastic fittings, etc. If you are not positive that the system plumbing provides a good electrical ground path, connect the collector array (including all large metal frame parts) to a ground rod using #8 AWG copper wire. Locate the ground rod as close to the collector array as possible.

4. THERMOSTAT AND 24VAC WIRING (C120-P3 AND C120-P4 ONLY)

1. SELECT THERMOSTAT FOR USE WITH DESIRED APPLICATION. A C120 WITH 3I-4B suffix model number can be used with a single or dual stage thermostat. C-120 models with a 3D-4D suffix require the use of a dual stage thermostat. Typical thermostats:

Single Stage - Honeywell T87F with optional Q539 subbase

Multi-Stage - Honeywell T872 with Q672 subbase

NOTE: There are many variations available on these thermostats - make sure you get one that will control your system properly.

2. SELECT 24VAC CLASS 2 TRANSFORMER WITH OUTPUT RATING CAPABLE OF DRIVING AUX HEAT AND FAN CONTACTORS. CAUTION: Output 4 on the C-120 controls the Aux heat contactor for indirect systems, and a diversion valve for DIRECT/INDIRECT systems. In either case, the 24VAC valve or contactor must not exceed 1 AMP rating.

3. The thermostat, back-up heat, and blower wiring varies depending on the C120 type (-3I-4B or -3D-4D) and the particular system components used. Refer to Section VII, Application Examples.

General:	"R" & "C"	24 VAC input
	"W1"	thermostat input
	"W2"	output 4, may be wired also to second stage of a thermostat

C. OPERATION (C100 & C120)

Because of the many types of applications for C100/C120 units, only basic operation is described (for detail operating modes refer to Section IV.)

1. The power "ON" indicator illuminates when AC input power is applied to control.

2. The C100/C120 features monitoring capability. To monitor a temperature at a desired sensor location depress the sensor select button until the desired sensor indicator illuminates. To single step sensor monitoring points, momentarily depress button.

3. The temperature display flashes when the monitored temperature is greater than 212°F/100°C (or shorted sensor) or less than 32°F/0°C (or open sensor).

4. The temperature display blanks automatically 7 minutes after the sensor select button is last depressed. Output indicators do not blank.

5. Output indicators are illuminated when control outputs are on or when applicable, flash at the proportional control rate.

VIII. APPLICATION EXAMPLES

C120-1S-2S-3I-4B

(NOTE: "AUX 2" sensor is referenced for space heating)

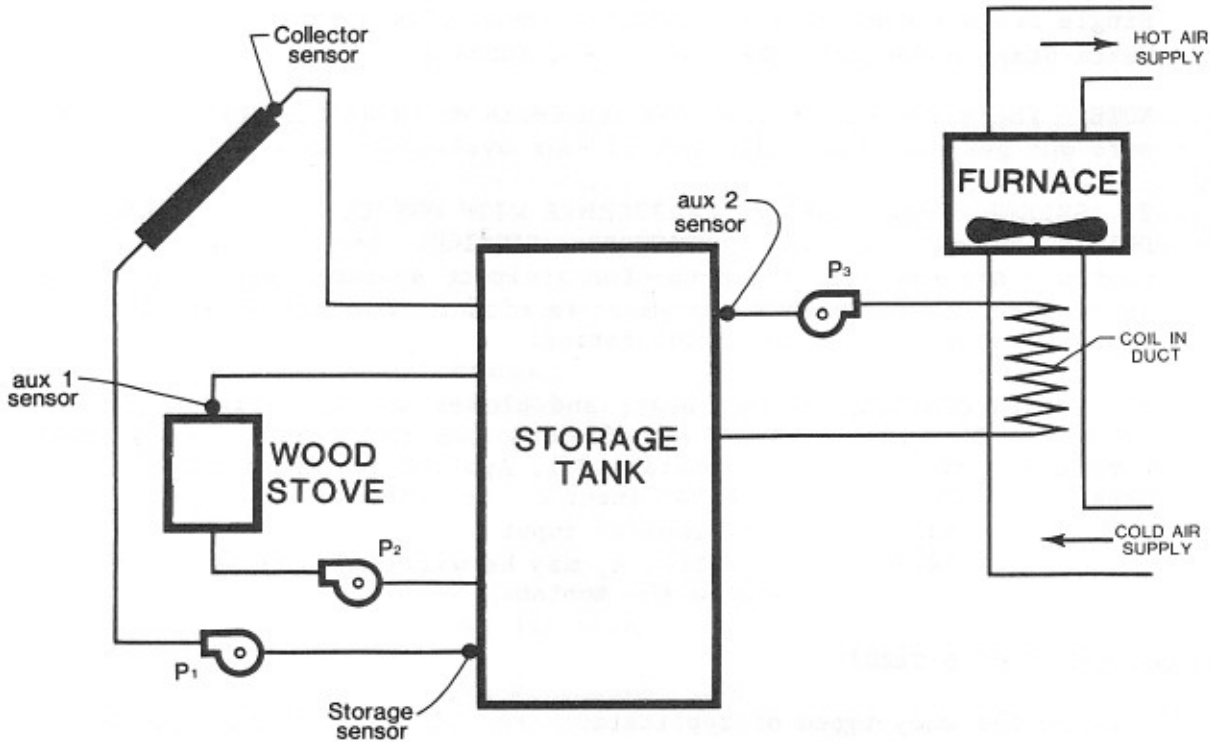


FIGURE 1: PLUMBING SCHEMATIC

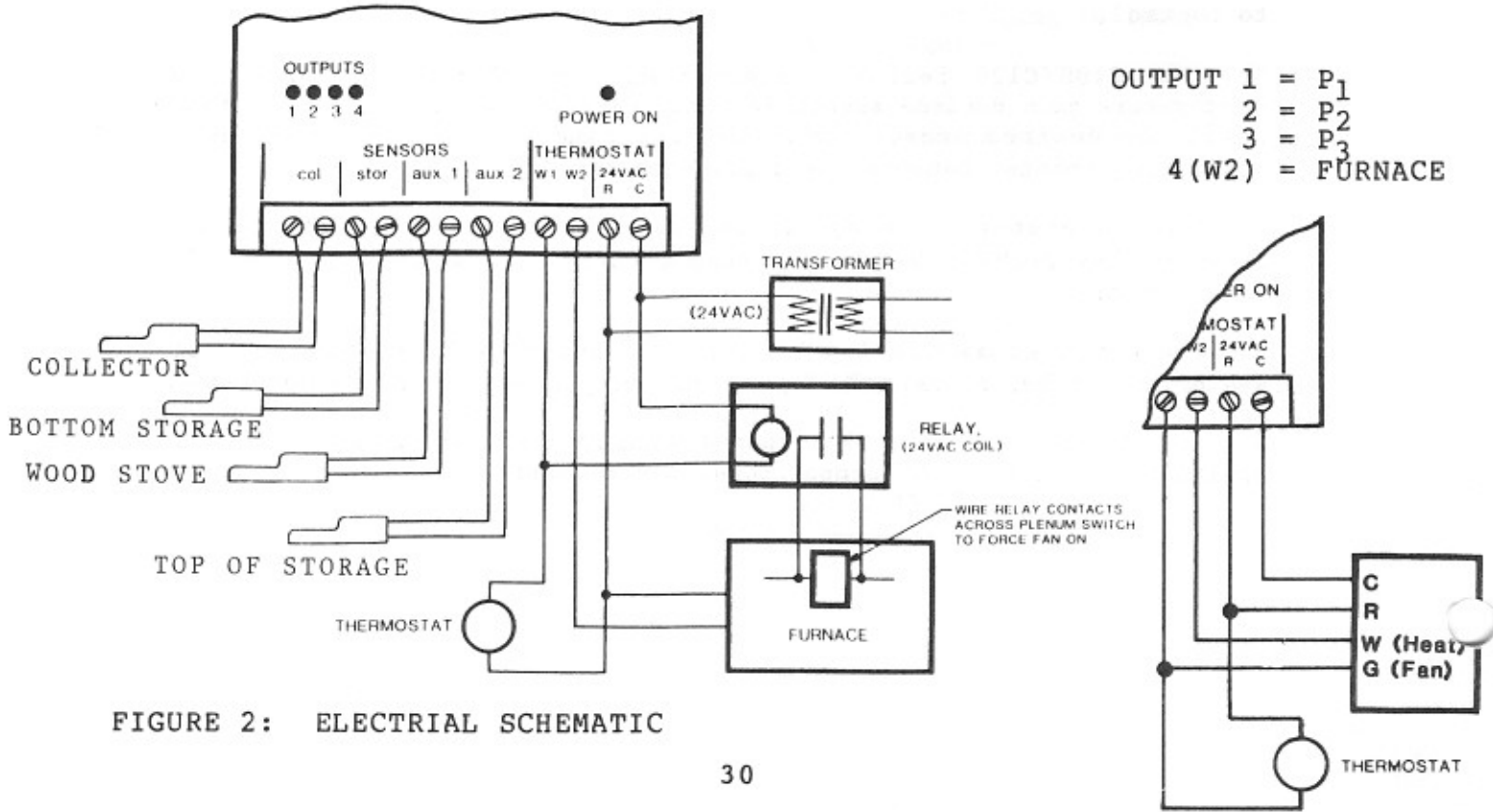


FIGURE 2: ELECTRICAL SCHEMATIC

### C120-1S-2SA-3I-4B

(NOTE: "AUX 1" Sensor is referenced for space heating)

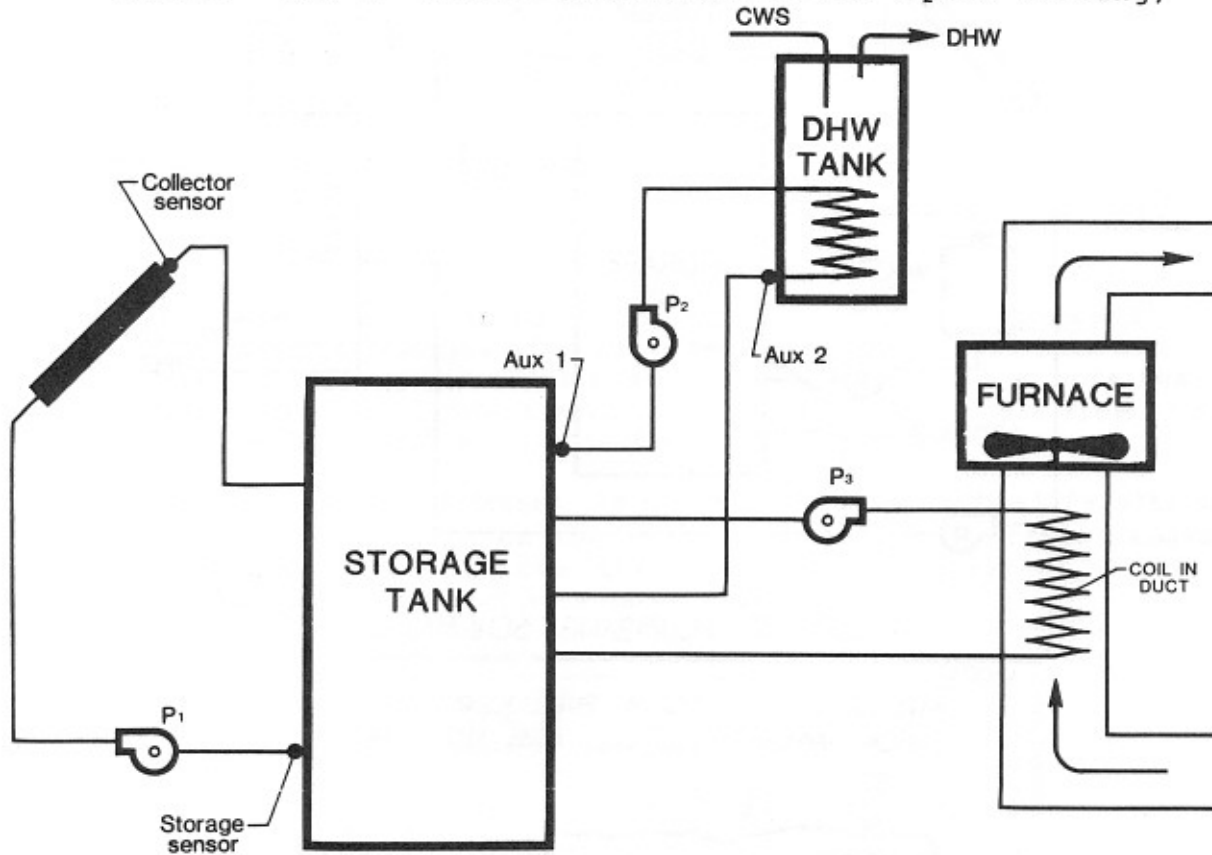


FIGURE 3: PLUMBING SCHEMATIC

OUTPUT 1 =  $P_1$   
 2 =  $P_2$   
 3 =  $P_3$   
 4 = FURNACE

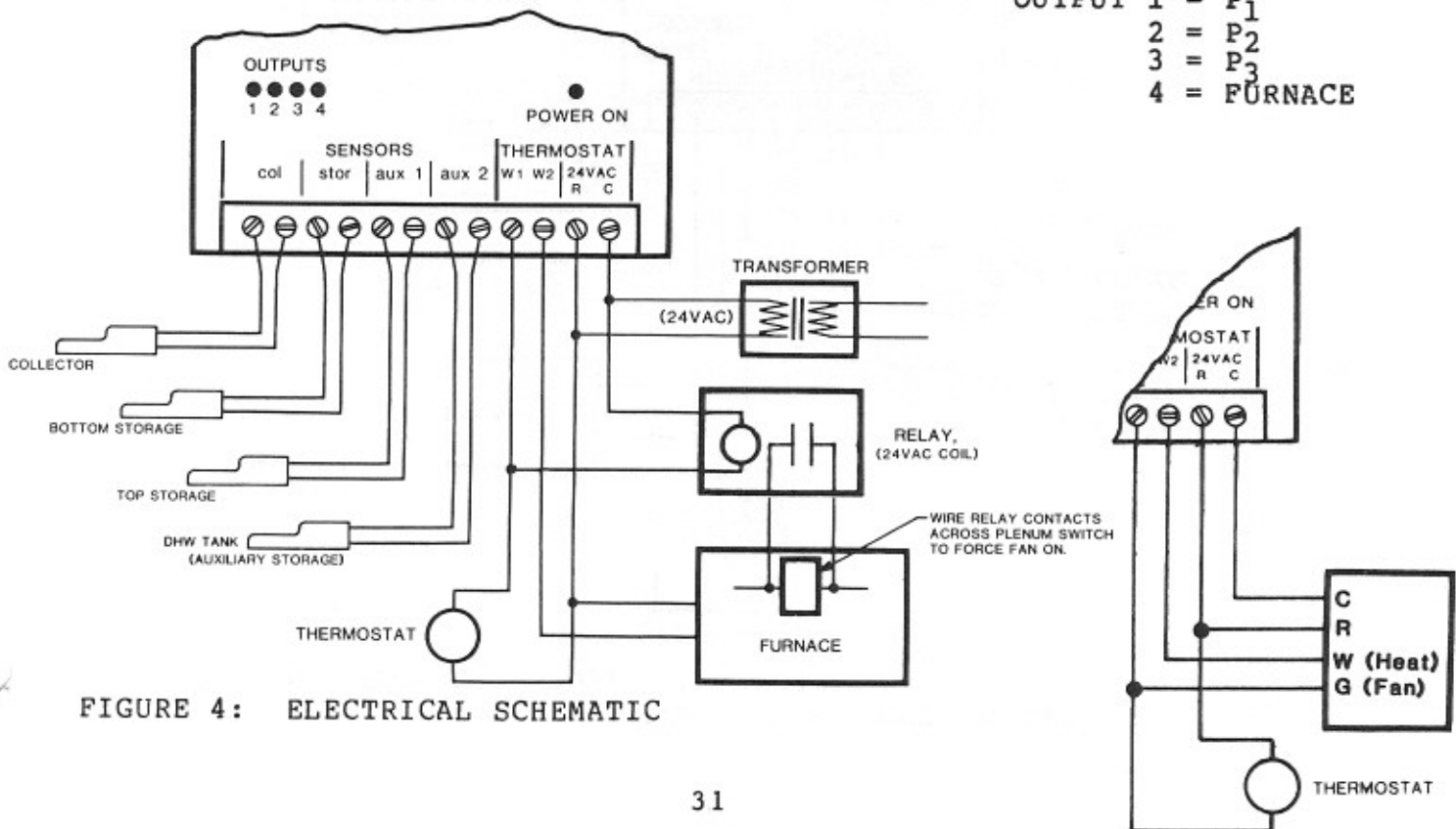


FIGURE 4: ELECTRICAL SCHEMATIC

## C120-1S-2S-3D-4D

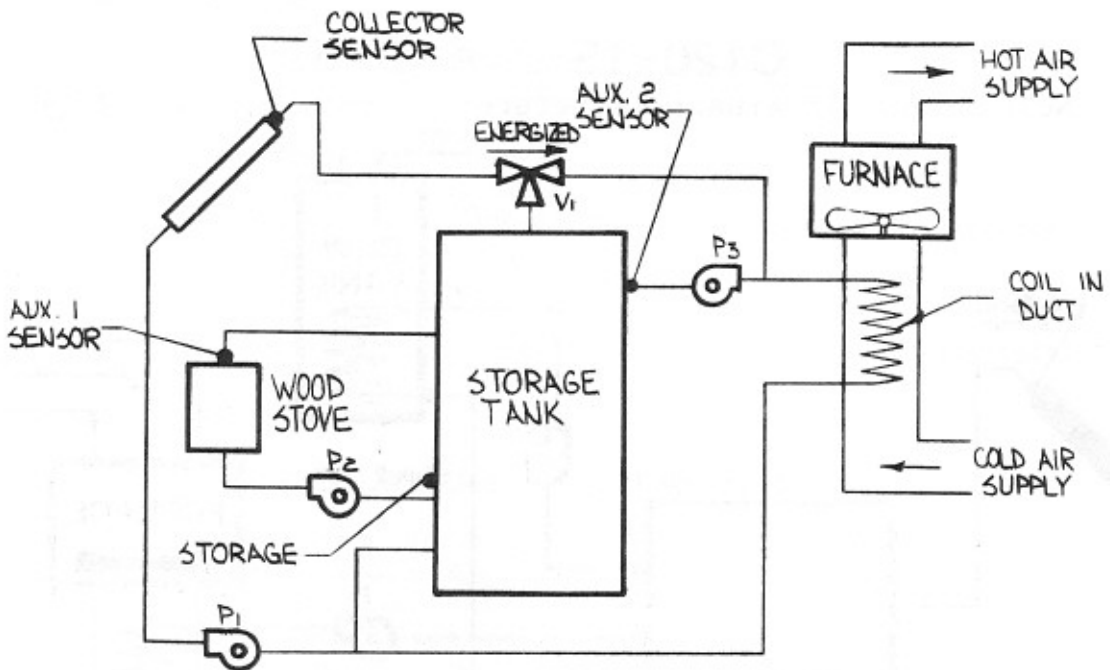
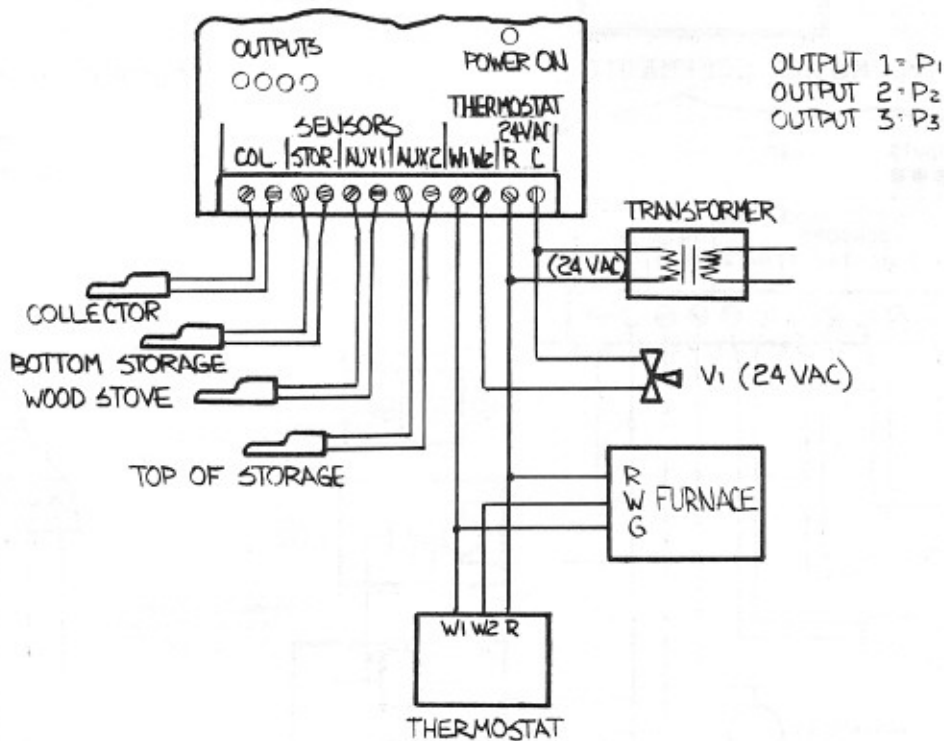


FIGURE 5: PLUMBING SCHEMATIC

NOTE:

AIR VENTS, VACCUM BREAKERS, FLOW-CHECK VALVES, ETC... ARE NOT SHOWN.



(2 STAGE) TYPICAL HONEYWELL T872/Q672

FIGURE 6: ELECTRICAL SCHEMATIC

## SHORT FORM PROGRAMMING REFERENCE

Begin with all switches "on".

Option Code	Description	Enable	Disable
-1S	20/5 on/off differential	A3=on,A4=on	(note 1)
-1S(8/3)	8/3 on/off differential	A3=off,A4=on	(note 1)
-1P	16/5 proportional control	A3=on,A4=off	(note 1)
-1P(8/4)	8/4 proportional control	A3=off,A4=off	(note 1)
H	High Limit	B4=off	B4=on
N	Nocturnal Cooling	B5=off	B5=on
L	Recirculate Freeze Prot.	A5=on,B1=off,B2=on	(note 2)
-2S	20/5 on/off differential	B7=on,B8=on	(note 3)
-2S(8/3)	8/5 on/off differential	B7=off,B8=on	(note 3)
-2P	16/5 proportional control	B7=on,B8=off	(note 3)
-2P(8/4)	8/4 proportional control	B7=off,B8=off	(note 3)
A	"aux 2" storage reference	A1=off, A2=off	A1=on,A2=on
H	High Limit	B3=off	B3=on
W	Wood Stove "aux 1" high limit	B6=off	B6=on
-2F	Draindown freeze protection	A5=off,B1=off,B2=off	(note 2)
-2FH	Draindown on freeze or hi-limit	A5=off,B1=on,B2=off	(note 2)
-3F	Draindown freeze protection	A5=on,B1=off,B2=off	(note 2)
-3FH	Draindown on freeze or hi-limit	A5=on,B1=on,B2=off	(note 2)
-3E	Back-up element interlock	A8=off	A8=on
-3I-4B	C120 Indirect Heating	A7=off	(note 4)
-3D-4D	C120 Direct Heating	A7=on	(note 4)
°C	°C Display	A6=off	A6=on
-LCO	Line Cord & Outlets	NOT PROGRAMMABLE	
-230VAC	230VAC input	NOT PROGRAMMABLE	

- NOTES:
1. -1S, -1S(8/3), -1P or -1P(8/4) must be selected for Output 1.
  2. Only one type of freeze protection ( L, -2F, -2FH, -3F, or -3FH) may be selected. If no freeze protection is desired, put switches A5, B1 and B2 in the on position.
  3. If Output 2 is used for differential control then -2S, -2S(8/3), -2P, or -2P(8/4) must be selected. If Output 2 is used for draindown freeze protection then either -2F or -2FH must be programmed and switches A1, B3, B6, B7 and B8 will be ignored.
  4. On C120's: Program either -3I-4B or -3D-4D.