

DATE

April 26, 1982

36315

ADDRESS

3591 Fairway Drive

NUMBER

LOCATION

OWNER

Allen Wildermuth

BUILDER

owner

TYPE OF STRUCTURE

solar hot water heater

REMARKS

INSPECTIONS:

Temp. power:

P.G.E. Notified:

Plot Plans:

Septic final:

Health Dept. I.D. finalized:

Permit released: 4-26-82

Final all: 7/20/82 SS

EL DORADO COUNTY BUILDING DEPARTMENT

CONSTRUCTION PERMIT

36315

☐ Bldg
 ☐ Plumb
 ☐ Elec
 ☒ Mech
 ☐ Gas
 ☐ Sewage
 ☐ Mobile Home Site

Date April 26, 1982
 Owner Allen Wildermuth
 Address 3591 Fairway Drive
 City & State Shingle Springs, Ca.
 Zip 95682 Telephone 677-2896
 Contractor owner
 Address _____
 City _____
 Zip _____ Telephone _____
 Contractor's License No. _____ Class _____
 Workmen's Comp No. _____
 Lending Agency _____
 Branch _____

Assessor's Parcel No. 082-082-07 TAC 100-14
 Section 3 Township 9 Range 9
 Parcel Map No. _____ County Rd _____
 No. of Bedrooms _____ Perc Test _____
 Water Source _____ Supplier _____
 Public Sewer _____

PLANNING DEPARTMENT USE			
Lot Size	15,000 sq. ft. +/-	Zone	R1
Min. Setbacks: FR	20	RS	5
		LS	5
House No.	3591 Fairway Drive		
School Dist.	Rescue/Ponderosa		
Super. Dist.	1	C.T.	302
Variance or Spec Use No.		Date	/ /

15

DRIVING DIRECTIONS Exit Cameron Park Drive - .9 mile north, left on Townhouse 2 blocks to Fairway - 3rd lot on right - 3591 Fairway Drive

Permission is hereby granted to build, occupy and use as specified, the building or structure listed below:

DESCRIPTION	GROUP & DIV.	TYPE RATING	SQUARE FEET	COST/SQ.FT	VALUATION
solar hot water heater				contrprice,	1,900.00
Type of Heating			Data Code	Total Valuation \$	1,900.00

Remarks and Conditions:

on existing structure

	Fees
CONSTRUCTION	\$ 20.00
M.H. SITE	_____
SEWAGE	_____
ENCROACHMENT	_____
ISSUANCE	_____
PENALTY	_____
TOTAL	\$ 20.00

NOTE: PERMIT EXPIRES IF WORK IS NOT BEGUN WITHIN 6 MONTHS OR IS SUSPENDED MORE THAN 6 MONTHS.

RECEIPT NO.

52388(14)

This Work Permit Authorized
 and permit issued by Rowland Maddox Date 4-26-82 Clerk ls

STRUCTURAL	DATE	INSP	ELEC	DATE	INSP	PLUMB	DATE	INSP	MECH	DATE	INSP
Setbacks Found			U-Ground			U-Ground Waste			Heat Duct		
Slab			Rough			Rough			Cold Air Duct		
Frame			Main Panel			Vents			Heater Furnace		
Lath			Well Pump			Sewer			Flues		
Sheetrock			Sub Panel			Water Supply			Ex Fan		
Stucco			Base Heat			Int. P.V. Pipe			A/C Unit		
Roof Deck			Fixtures			Tub Shower			Hood		
Roof Cover			Pedestal			W/M			Vents		
Stair-Rail						Gas Pipe					
U-Floor Vent											
Attic Vent											

CORRECTION NOTICE POSTED

Mech.	Date	Insp.	M/H	Date	Insp.
Deck-rail			Site		
Fireplace Throat			Supp. Struct		
Fireplace Roof			Ramada		
Swim. Pool					
Septic Tank					
Leach Line-Pit					
Rock & Pipe					
D-Box					

Date	Insp.	Approved	Insp.	Stop Work	Insp.

P.P. Tag # _____ T.P. Tag # _____
Gas Tag # _____ Test # _____ Lbs.
Final Meter Set Tag # _____

FINAL INSPECTION

INSP. _____ INSP. _____ INSP. _____ INSP. _____
Bldg. _____ Mech. _____ Fireplace _____ Septic Sys. _____
Elec. _____ M/H Site _____ Swim. Pool _____ E.R.C. _____
Plumb. _____ Deck-Rail _____ Grading _____ Road Encl. _____

CERTIFICATE OF OCCUPANCY ISSUED _____ DATE _____ BY INSP. _____
COMMENTS: _____

Solar water -- OK 7-20-92 SJS

ROUTED TO	DATE
Health Dept.	
Road Dept.	
Fire Dept.	
E.I.D.	
Plans Returned	

EL DORADO COUNTY BUILDING DEPARTMENT APPLICATION FOR CONSTRUCTION PERMIT

916
Plan Check Number
36315
Permit Number

APPLICANT TO COMPLETE

Date April 23, 1982
Owner Allen Waldenmuth
Address 3591 Fairway Dr.
City & State Skidmore Springs, Ca.
Zip 95682 Telephone 677-2896
Contractor Owner
Address Same
City & State _____
Zip _____ Telephone _____
Class & License # _____
Workmen's Comp. No. _____
Lending Agency _____
Branch _____

A.P. # 082-082-07 TAC# 100014
Section 3 Township 9 Range 9
Parcel Map No. _____ County Road _____
No. of Bedrooms _____ Perc. Test _____
Water Source _____ Supplier _____
Public Sewer _____

PLANNING DEPARTMENT USE			
Lot Size	<u>15,000 sq ft</u>	Zone	<u>R1</u>
Min Setbacks:	FR <u>20</u>	RS <u>5</u>	LS <u>5</u> Rear <u>15</u>
House No.	<u>3591</u>		
School Dist.	<u>RESERVE</u>		
Super. Dist.	<u>1</u>	C.T.	<u>308</u>
Variance or Special Use No.	_____	Date	<u>1/1</u>

DRIVING DIRECTIONS: Exit Camarillo Park Dr. 9 mi north,
left on townhouse 2 blocks to Fairway - 3rd lot
on right.

DESCRIPTION OF WORK

Building Use: Solar Water Heater Data Code _____ Mobile Home Make _____
Electric _____ Amps _____ Size _____ State Mfg. _____ Year _____
Plumbing _____ Serial No. _____
Type of Heating _____ License No. _____
Sewage _____ For Period of _____

OWNER/CONTRACTOR/AGENT-SIGN ON REVERSE SIDE OF APPLICATION

on existing structure								FOR OFFICE USE ONLY	
APPROVALS	APP. BY	DATE	Q.U.	TYPE	SQ. FT.	COST	VALUATION	FEES	
Health								Construction	<u>20-</u>
Planning	<u>SW</u>	<u>4/23</u>		<u>Const</u>	<u>1900.00</u>			M.H. Site	
Fire Dist.								Sewage	
Sewer								Encroachment	
Water								Issuance	
Road Dep.								Penalty	
Total Valuation \$								SUB TOTAL	
								High School	
								Elementary School	
								TOTAL FEES	<u>20</u>

Rec. By _____ Plans Approved By [Signature] Date 4/23/82 Plan Check Fee _____ Rec. No. _____

Building-White

Health-Yellow & Pink

Road Department-Green

E.I.D.-Goldenrod

DATE

1. LICENSED CONTRACTORS DECLARATION — I certify that I am licensed under provisions of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code, and my license is in full force and effect.

License Class & No. _____

(a) I, as owner, of the property, will do the work myself without hiring any employees, and the building or structure is not intended or offered for sale. (Proof of sale or offering for sale of the structure by the owner-builder within one year is presumptive evidence that such structure was undertaken for the purpose of sale). Complete Section #4 below. (Section 7031.5)

(c) I, as owner of the property, will employ workers with wages as their sole compensation. Complete Section #3 below.

(d) I am exempt under Section _____ Reason _____

3. WORKMEN'S COMPENSATION INSURANCE — I hereby affirm that I have a certificate of Workmen's Compensation Insurance, and or a certified copy thereof.

 Certified copy is hereby furnished.

— Certified copy is on file with the Building Department.

Date _____ Applicant _____

If you do not intend to employ any person so as to become subject to the Workmen's Compensation Law, complete the following:

4. CERTIFICATE OF EXEMPTION FROM WORKMEN'S COMPENSATION INSURANCE -- I certify that in the performance of the work for which this permit is issued I shall not employ any person in any manner so as to become subject to the Workmen's Compensation Laws of California.

Date April 23, 1982 Applicant Ellen Wildermuth

NOTE: If, after making this Certificate, you should become subject to Workmen's Compensation provisions of the Labor Code, you must forthwith comply or the permit shall be deemed revoked.

County of El Dorado

BUILDING DEPARTMENT



360 Fair Lane — Placerville, CA 95667

Phone (916) 626-2511

1359 Johnson Blvd. — P. O. Box 14506

So. Lake Tahoe, Ca. 95702

Phone: 544-1564

OWNER-BUILDER VERIFICATION

ATTENTION: PROPERTY OWNER

PLAN CHECK # 916

An "owner-builder" building permit has been applied for in your name and bearing your signature.

Please complete and return this information at your earliest opportunity to avoid unnecessary delay in processing and issuing your building permit. No building permit will be issued until this verification is received.

1. I personally plan to provide the major labor and materials for construction of the proposed property improvement (yes or no) YES.
2. I (have/~~have not~~) _____ signed an application for a building permit for the proposed work.

3. I have contracted with the following person (firm) to provide the proposed construction:

Name N/A
Address _____ City _____
Phone _____ Contr. Lic. No. _____

4. I plan to provide portions of the work, but I have hired the following person to coordinate, supervise, and provide the major work:

Name N/A
Address _____ City _____
Phone _____ Contr. Lic. No. _____

5. I will provide some of the work but I have contracted (hired) the following persons to provide the work indicated:

Name	Address	Phone	Type of Work
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Property Owner's Signature

Allen Waldenmuth

Serial Security number

Date

April 23, 1982

bam/eff. 7/1/80

DEED RESTRICTION CERTIFICATE

County of El Dorado

The undersigned declares that he has read and understands the deed restrictions and that the improvement herein applied for does not violate any private deed restrictions.

Dated: April 23, 1982

1s/ Allen Wildermuth
Owner's signature

WILDERMUTH
Print owner's name
Revised Jan. 1982

INSTALLATION & OPERATING INSTRUCTIONS

NUMBER 6500026

August 1981

SDS-2 SOLAR CONTROL SYSTEM

for Residential Applications Electric or Gas Types
DRAIN DOWN (OPEN) SYSTEM

**INSTALLER: AFFIX THESE INSTRUCTIONS
TO OR ADJACENT TO SOLAR
HEATER.**

**OWNER: RETAIN THESE INSTRUCTIONS
AND THE WARRANTY FOR FUTURE
REFERENCE.**

FOR YOUR SAFETY

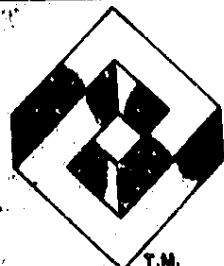
Do not store or use
gasoline or other
combustible materials or
liquids near or adjacent to
this heater or any other
appliance. This appliance
shall not be installed in any
location where flammable
liquids or vapors are likely
to be present.

IF YOU SMELL GAS

1. Open Windows.
2. Don't touch electrical switches.
3. Extinguish any open flames.
4. Immediately call your gas supplier.

Check rating (data plate of heater, before installing, to make certain voltage shown is the same as electric supply to which the heater is going to be wired.

**ELECTRIC POWER SHOULD
ALWAYS BE TURNED OFF
BEFORE WORKING ON
THIS HEATER.**



T.M.
MOR-FLO/AMERICAN
Water Heaters

MOR-FLO 18450 SOUTH MILES ROAD
INDUSTRIES, INC. CLEVELAND, OHIO 44128
(216) 663-7300

AMERICAN 2341 MICHIGAN AVENUE
APPLIANCE MFG. CORP. SANTA MONICA, CA. 90404
(813) 629-1766 • (213) 870-9541

Foreward

These instructions for installation of Solar Water Heating Systems are intended for use by persons familiar with the installation of Solar Systems and are to be used in conjunction with good trade practice. They do not supercede any applicable codes or standards. Installation must comply with local codes. The control assembly package contains additional instructions pertaining to the pump, controller and valve assembly. Please read these instructions in their entirety before installation is begun and retain for future reference.

Function

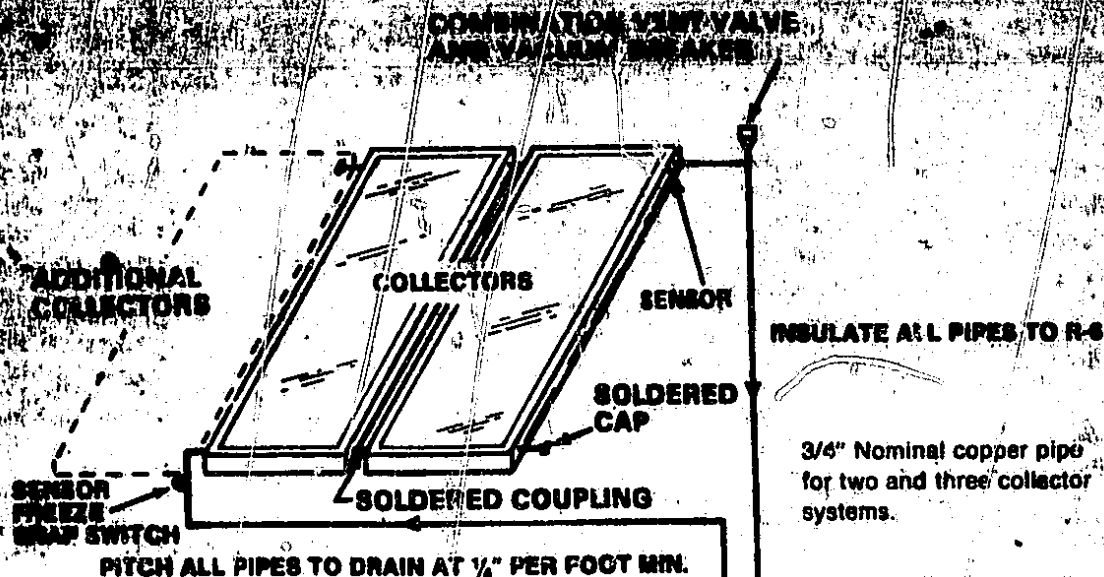
FUNCTION OF SYSTEM

Water is pumped from bottom of storage tank to collectors where it absorbs heat from solar radiation. This happens when the collector sensor is 20°F warmer than the sensor at the tank. The pump will continue to flow water from the tank to the collectors until the temperature difference is within 5°F, that is, the solar sensor is less than 5°F warmer than the tank sensor. The pump will then shut off. In addition, the sensors provide high temperature protection by shutting off the pump and placing the valve into drain down position when the tank sensor exceeds 140°F. Freeze protection is also provided when the collector sensor drops below 40°F. The valve will go into a drain mode to prevent freezing of water in the collector and piping.

The solar heated water is displaced by colder city water and flows as hot water to the domestic water fixtures, showers, lavs etc. In the one tank system and preheats or completely provides water of the proper temperature in the two tank system.

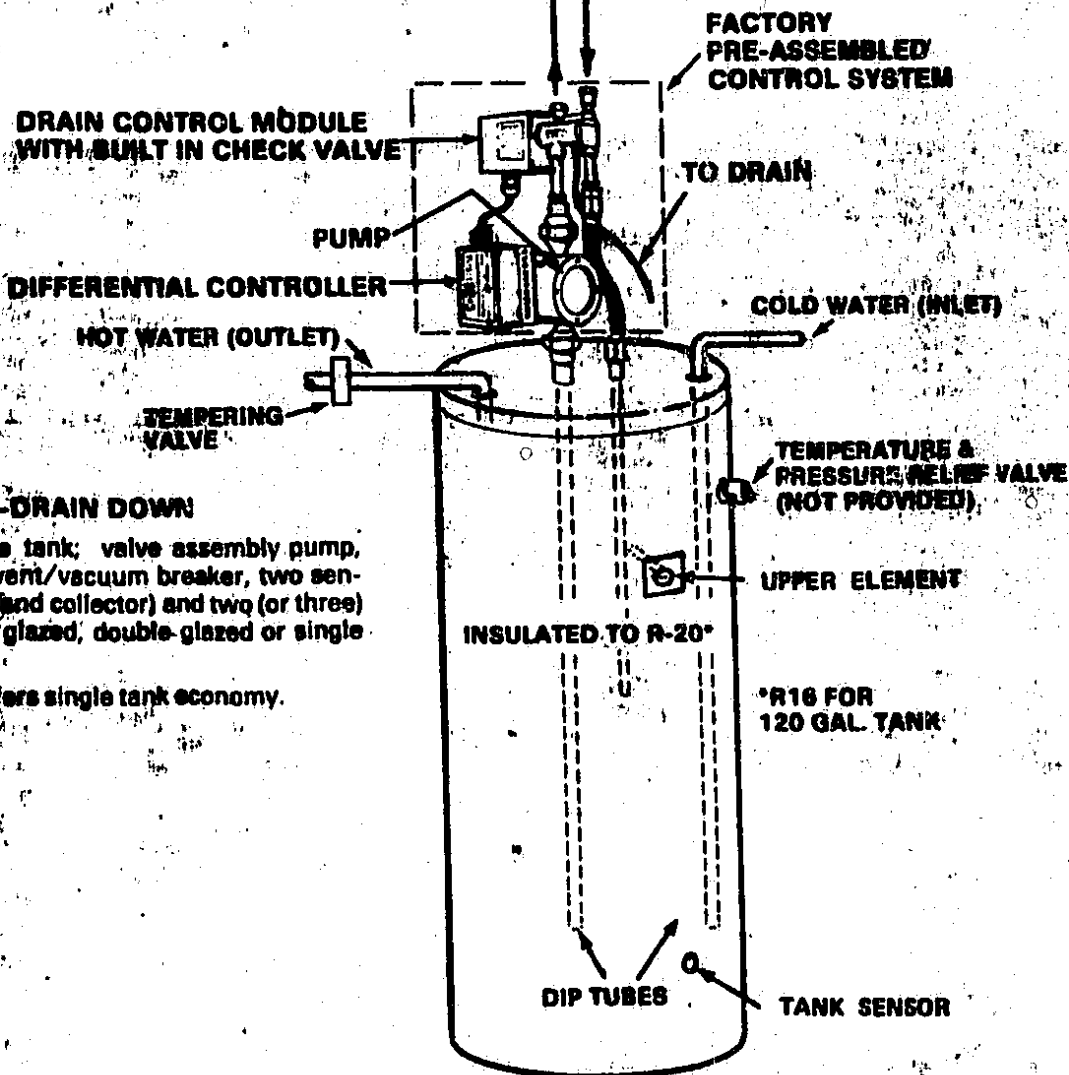
The upper electric element or burner (in one tank system) allows the water to be heated by electricity or gas in the top of the tank so colder water can be heated by the solar collectors.

NOTE: The control assembly package contains additional literature pertaining to the pump, controller and valve assembly. Retain those instructions along with this manual for future reference.



One Tank System

ELECTRIC ASSISTED TYPE



ONE TANK SYSTEM—DRAIN DOWN

System consists of one tank; valve assembly pump, differential controller, vent/vacuum breaker, two sensors (one each for tank and collector) and two (or three) solar collectors (single glazed, double-glazed or single plastic glazed.)

This one tank system offers single tank economy.

COMBINATION VENT VALVE
AND VACUUM BREAKER

TWO TANK SYSTEM ELECTRIC ASSISTED TYPE

TWO TANK SYSTEM—DRAIN DOWN

The two tank system can be used with new or existing conventional gas, oil or electric water heaters. Any solar energy collected by the collectors raises the temperature of the incoming water so the conventional water heater uses less fuel. The electric element on the solar tank is not connected.

ADDITIONAL
COLLECTORS

COLLECTORS

SENSOR

SOLDERED
CAP

SOLDERED COUPLING

SENSOR
WIRE
AND SWITCH

PITCH ALL PIPES TO DRAIN AT 1/4" PER FOOT MIN.

INSULATE ALL PIPES TO R-8

FACTORY
PRE-ASSEMBLED
CONTROL SYSTEM

DRAIN CONTROL MODULE
WITH BUILT-IN CHECK VALVE

TO DRAIN

PUMP

DIFFERENTIAL CONTROLLER

COLD WATER
(INLET)

TEMPERING
VALVE

TEMPERATURE
& PRESSURE
RELIEF VALVE
(NOT
PROVIDED)

ELECTRIC BACK-UP
HEATING ELEMENT
(NOT USED IN TWO
TANK SYSTEMS)

WATER
HEATER

TANK SENSOR
AND TANK SENSOR
MOUNTING STUD

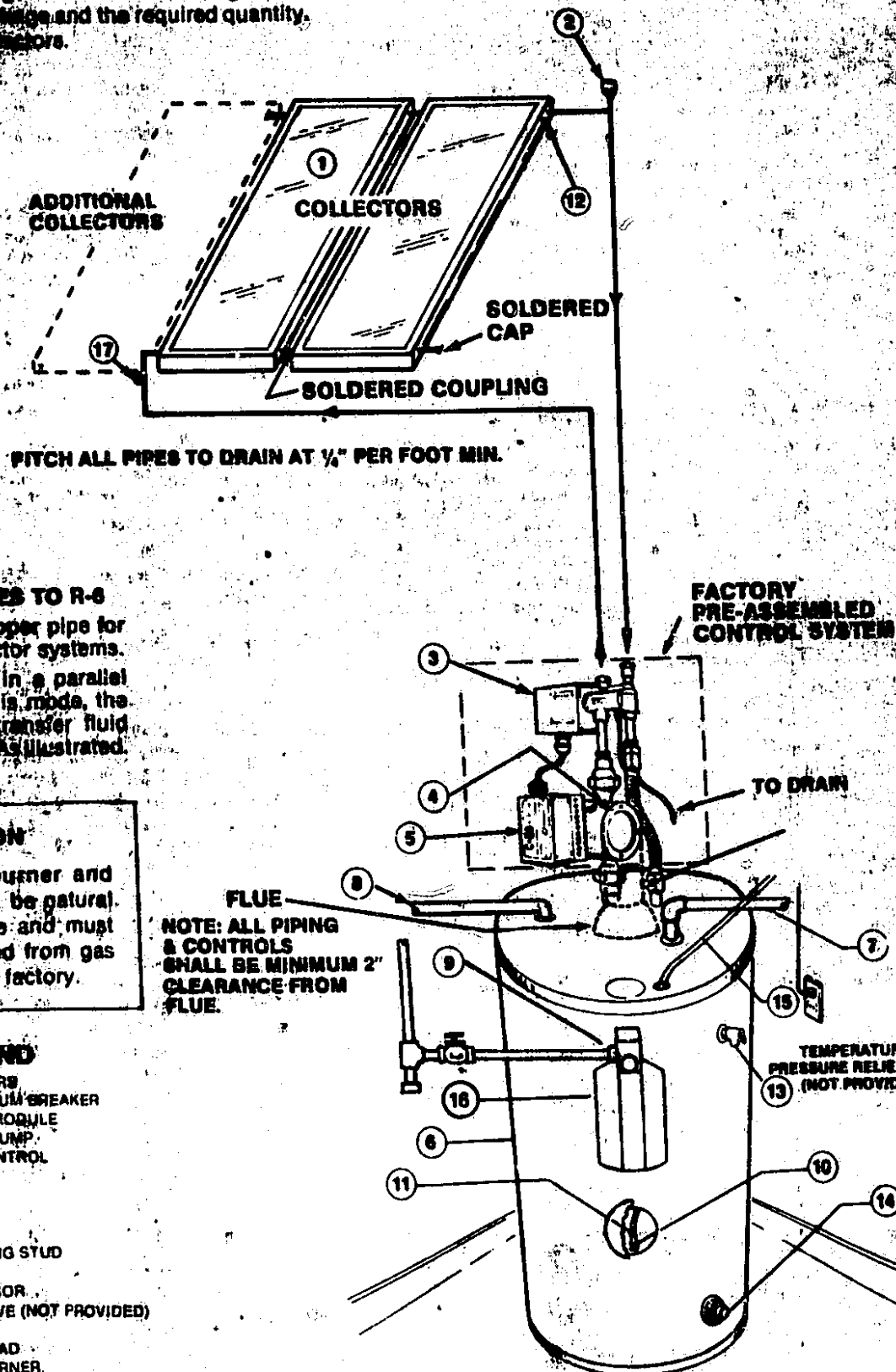
DRAIN VALVE

ONE TANK SYSTEM

GAS ASSISTED TYPE

ONE TANK SYSTEM - DRAIN DOWN

System consists of one gas assisted solar storage tank, one GCS-2 control package and the required quantity of all other solar collectors.



INSTALL ALL PIPES TO R-6

Use 3/4" nominal copper pipe for two and three collector systems.

Connect collectors in a parallel reverse mode. In this mode, the reverse the heat transfer fluid flow is equalized. As illustrated.

CAUTION

Gas back-up burner and manifold must be natural or propane type and must not be converted from gas type installed at factory.

NOTE: ALL PIPING & CONTROLS SHALL BE MINIMUM 2" CLEARANCE FROM FLUE.

LEGEND

1. SOLAR COLLECTORS
2. VENT VALVE/VACUUM BREAKER
3. CONTROL VALVE MODULE
4. REGULATION PUMP
5. DIFFERENTIAL CONTROL
6. WATER TANK
7. COLD IN
8. HOT OUT
9. THERMOSTAT
10. SENSOR MOUNTING STUD
11. TANK SENSOR
12. COLLECTOR SENSOR
13. T & P RELIEF VALVE (NOT PROVIDED)
14. DRAIN VALVE
15. TANK SENSOR LEAD
16. GAS BACK-UP BURNER
17. FREEZE SNAP SWITCH (SENSOR)

Included in GCS-2 Control Package

TECHNICAL SPECIFICATIONS **SDS-2, 5-GAL DOMESTIC HOT WATER CONTROL PACKAGE**

TYPE - Pre-plumbed, Pre-wired, Drain Down, Open Loop Control Package

MODEL - SDS-2, PART 904000 85

APPLICATION - Domestic Hot Water (Drain Down)

MAJOR COMPONENTS

- Circulation Pump (Stainless Steel, 1/35 H.P.)
- Differential Controller with Adjustable High Limit Control and Separate Output for High Temperature Protection
- Circulation Valve Asm. (with built-in anti-therm-syphon device)
- Vinyl Drain Tubing
- Flexible Return Piping with 3/4" Conn.
- Vacuum/Vent Breaker (shipped loose)
- Sensors for Collectors and Tank (shipped loose)
- Tempering Valve

REQUIREMENTS - 1/2" Piping Connections

OPERATION

OPERATION OF SYSTEM

The pre-plumbed control package (pump/valve/controller) is designed to operate automatically in all modes.

DIFFERENTIAL CONTROLLER

1) Mode

The C-30 Controller has a 3-position mode switch which provides the following:

- Off: Power Energized
- Auto: System Controlled Automatically
- Off: Power Removed

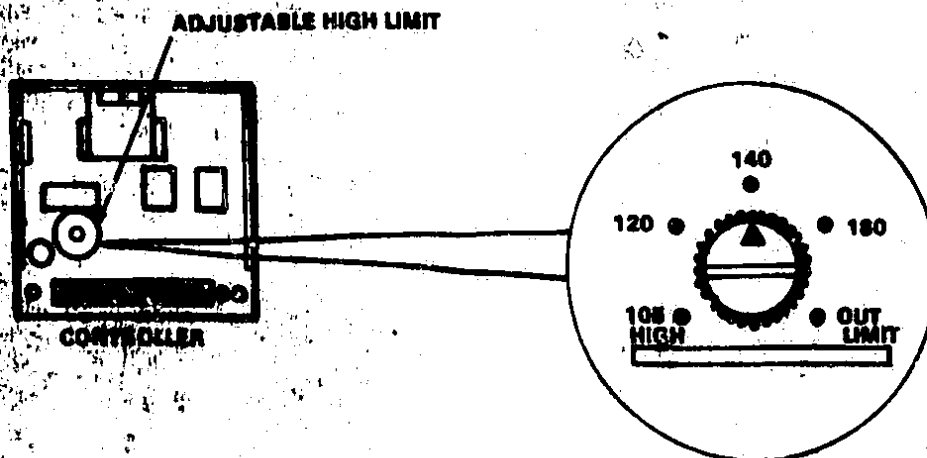
For normal operation place switch in "auto" mode.

2) Light Indicators:

- Red Light (Left of Terminal Strip): "Power On"
- Green Light (Right of Terminal Strip): "Valve Operating"
- Red Light (Next to Green Light): "Pump Operating"

(3) Adjustable Storage Tank High Limit CAUTION

Solar systems can generate dangerously high water temperatures. The C-30 controller therefore has been designed with an adjustable high limit. This limit should be set before initial operation of system. Procedure: a) make sure that electric power to control is disconnected; b) remove cover from C-30 controller; c) rotate trimpot knob (see detail) until molded-in arrow points to desired temperature (recommended 180°F Max.) Use small screwdriver. NOTE: The storage high temperature limit is compared to the temperature of the storage sensor which is located near the bottom of the tank. Stratification will create higher temperatures at the top of the tank than at the bottom. If a lower temperature limit is desired, reset the knob as outlined above.



(4) Troubleshooting:

The C-30 is not designed for field servicing or repair. If you believe that your control is malfunctioning, perform the following procedures to identify the faulty component.

- Check that the pump responds properly to the C-30 AUTO-ON switch. If not, check the line voltage wiring.
- Disconnect the sensors from the control and measure the sensor resistance using a volt-ohm meter. If the resistance does not match the chart (shown below) then replace the sensor.
- If the C-30 is OFF when it should be ON: (check that the storage temperature is not above the high limit). Remove one of the "storage" sensor wires and the control should turn on. If not, contact your local dealer/installer for a control replacement.
- If the C-30 is ON when it should be OFF: Use a short jumper wire to short circuit the "storage" sensor - the control should turn off. If not, contact your dealer/installer for a control replacement.

IE Temp. Sensors	
Temp. °F	Resistance
80	14.9
90	9.3
100	5.8
120	3.75
140	2.49
160	1.66
180	1.17
200	0.83

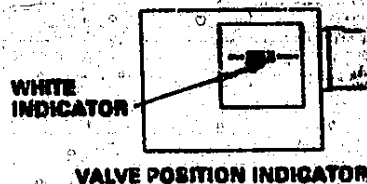
DRAIN DOWN VALVE

a) OPERATION

The operation of the valve can be easily confirmed. With voltage applied to the unit, it will drive to the "operate" position in about 5 minutes. This deliberately slow fill operation limits hydraulic shock to the air vent-vacuum breaker combination and also helps keep the standby operating power low. In the "operate" position, the small white indicator will be to the right hand side of the viewing port (see detail). If the storage tank is filled and pressurized, and the pump is turned on, full circulation will be permitted through the collectors.

A spring returns the valve to the drain position when the power is interrupted by the control system or in the event of a power failure (fail-safe feature). The valve will take approximately 3 minutes to move from the "operate" to the "drain" position. As the drain position is reached, the drain port will open and drain the collectors.

NOTE: The valve is designed to discharge a small amount of water through the drain port during both the fill cycle and the drain cycle. This feature provides a pressurized flushing action to remove accumulated scale and particulates from the valve porting during each operation.



b) MAINTENANCE

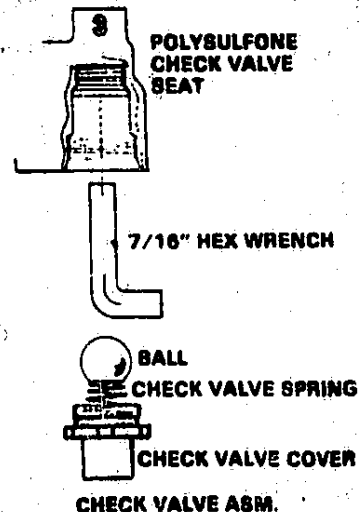
The valve features a simple and reliable mechanical design which should provide fail-safe service for years. Nevertheless, at the onset of each winter season, it is good practice to observe the draining and filling of the entire system to insure that the air vent/vacuum breaker, controller, drain line, and valve are all functioning properly. Ideally, this inspection can be coincident with the flushing of the water storage tanks which is also recommended.

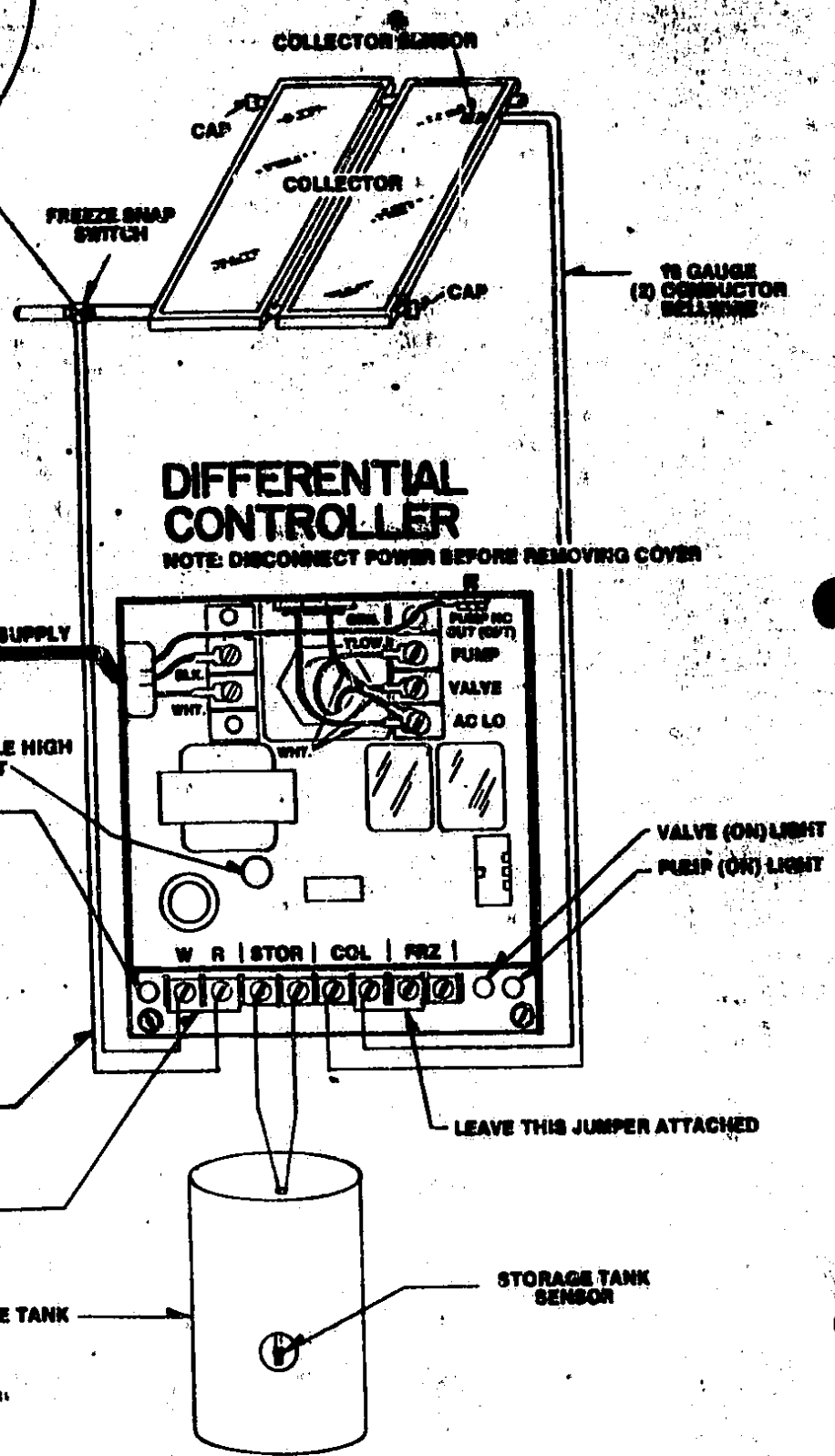
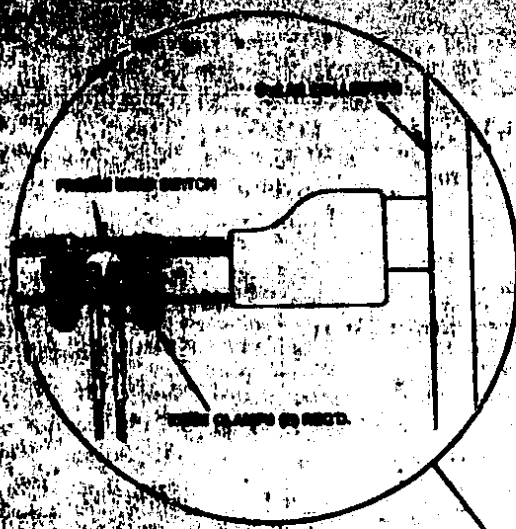
The condition of the spool and cartridge can be periodically checked by depressurizing the collector loop and removing the allen head set screw. The entire cartridge/spool/housing assembly can then be removed from the casting and examined.

The heater circuit which drives the valve assembly actuation can be checked for continuity with a simple ohm meter. The approximate resistance value should be:

Voltage	Ohms (approx.)
115 VAC	1800-2200

The check valve assembly can be inspected by unscrewing the check valve cover. When the check cover is removed, the check valve spring and rubber check ball can be accessed. If necessary, the polysulfone check valve seat can be unscrewed from the casting with a 7/16" hex wrench. When reinserting the seat, be sure to coat the threads with a suitable thread compound.





DIFFERENTIAL CONTROLLER

NOTE: DISCONNECT POWER BEFORE REMOVING COVER

115 VOLTS AC

POWER SUPPLY

ADJUSTABLE HIGH
LIGHT

POWER (ON) LIGHT

18 GAUGE
(2) CONDUCTOR
BELLWIRE

REMOVE JUMPER
WHEN INSTALLING
FREEZE SNAP SWITCH

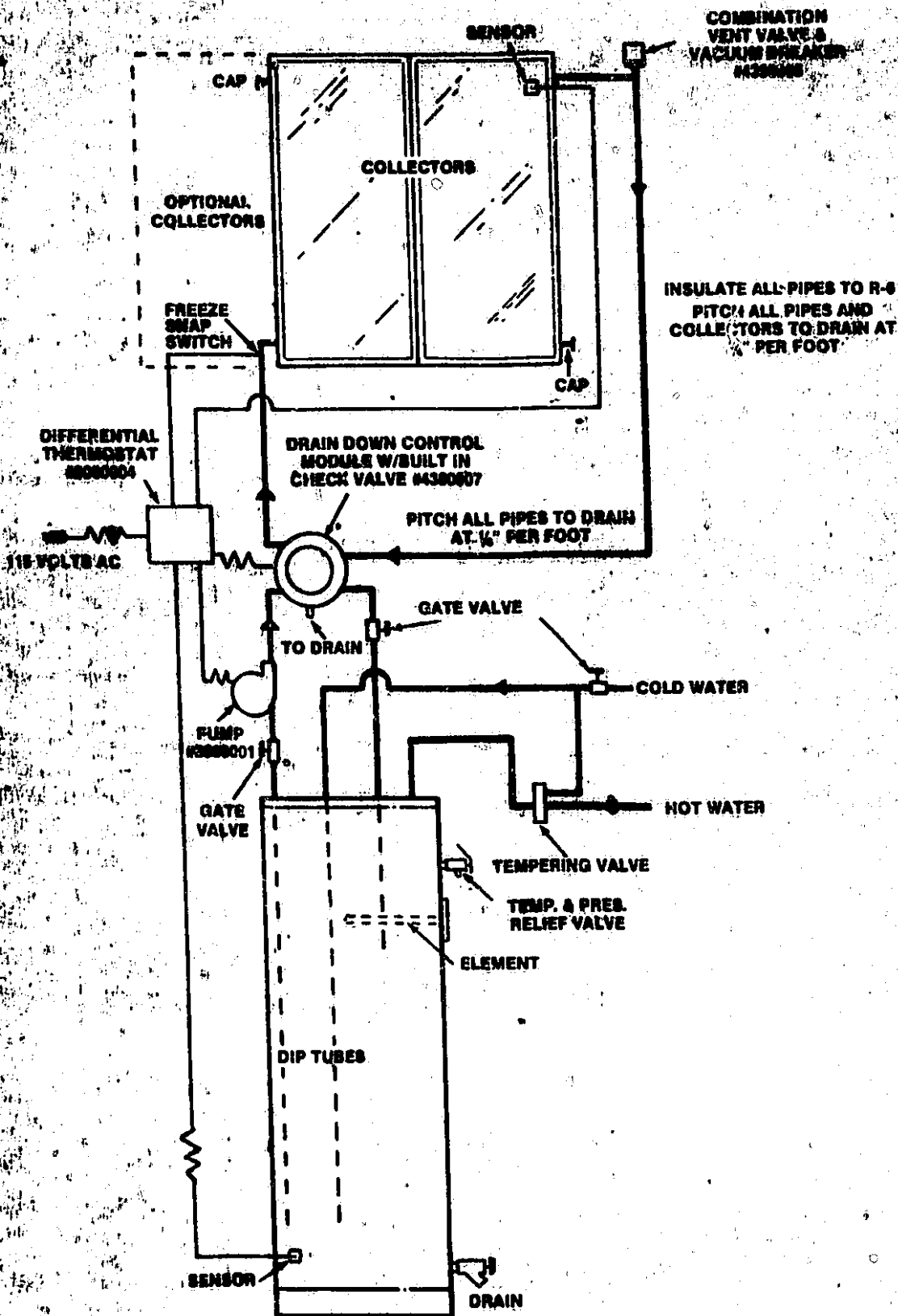
STORAGE TANK

STORAGE TANK
SENSOR

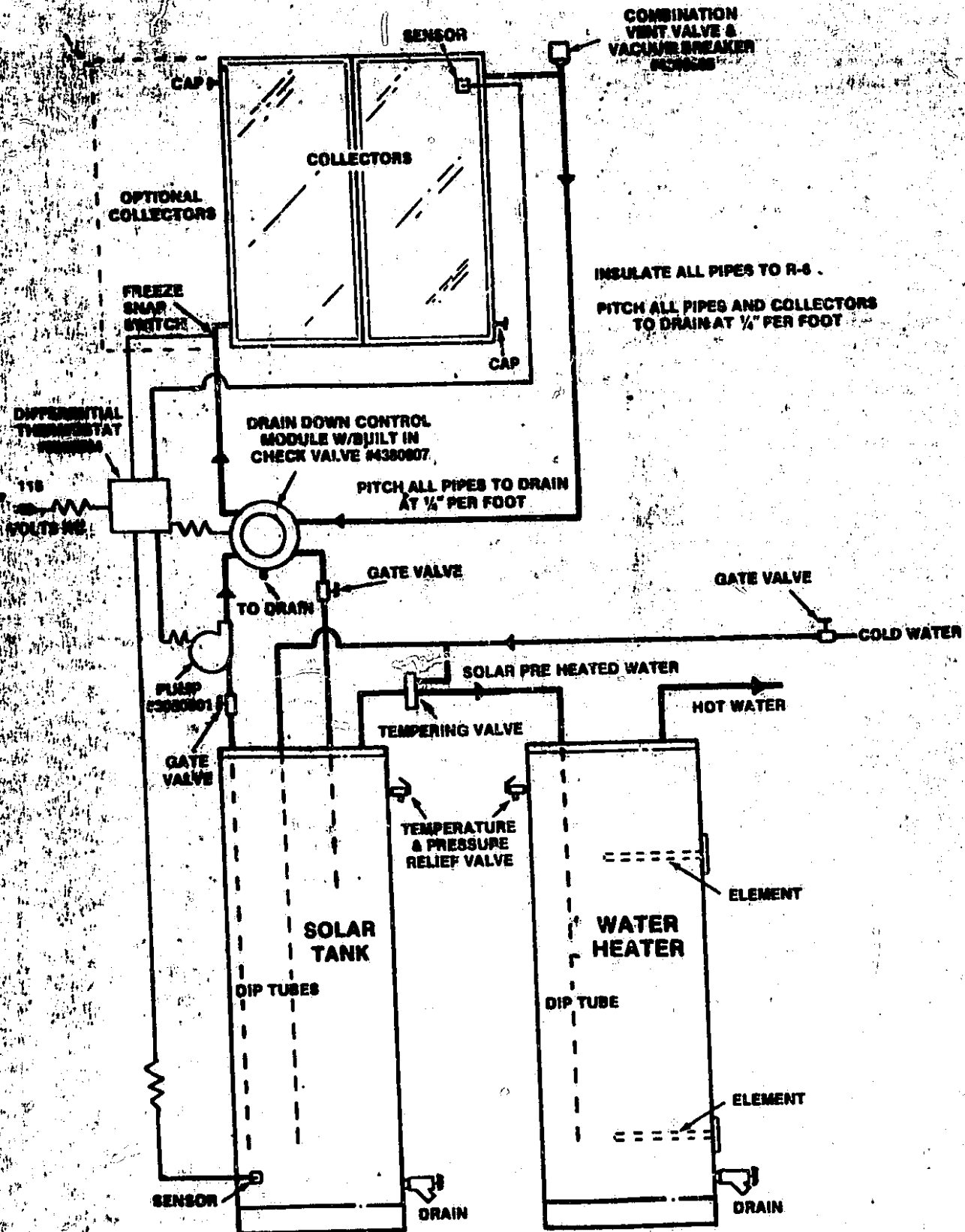
LEAVE THIS JUMPER ATTACHED

VALVE (ON) LIGHT
PUMP (ON) LIGHT

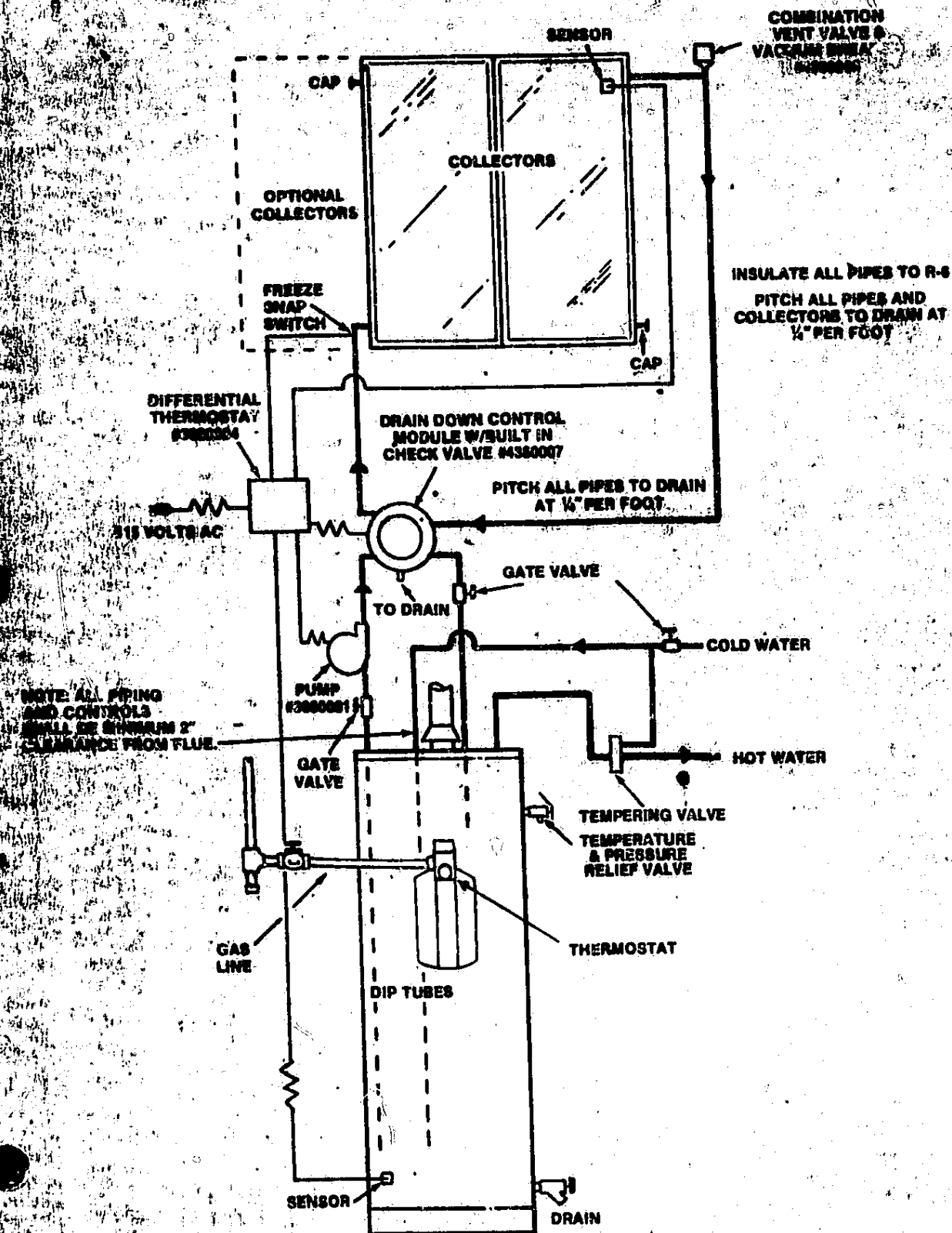
GENERAL PIPING AND WIRING LAYOUT ONE TANK SYSTEM ELECTRIC ASSISTED TYPE



GENERAL PIPING AND WIRING LAYOUT TWO TANK SYSTEM ELECTRIC ASSISTED TYPE



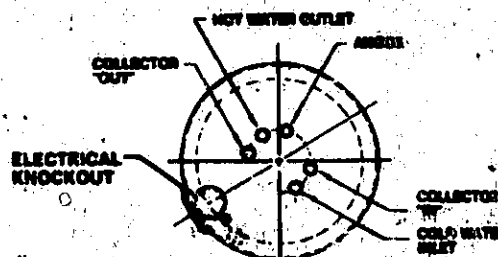
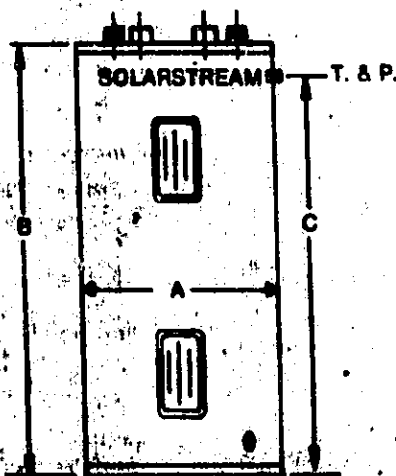
GENERAL PIPING AND WIRING LAYOUT ONE TANK SYSTEM GAS ASSISTED TYPE



ELECTRIC ASSISTED SOLAR STORAGE TANK

SPECIFICATIONS:
ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model No.	Tank Capacity U.S. Gallons	Data Processing Number	A	B	C	Insulation Factor	WT.
ESTARSEX	52	0410504	23"	52"	43-1/2"	R-20	140
ESTARSEX	88	0410501	25"	63"	45-1/2"	R-20	182
ESTARSEX	92	0400060	25"	63"	55-1/4"	R-20	231
ESTARSEX	180	0410503	25-1/4"	86-1/2"	60"	R-16	362



Nipple Spread:

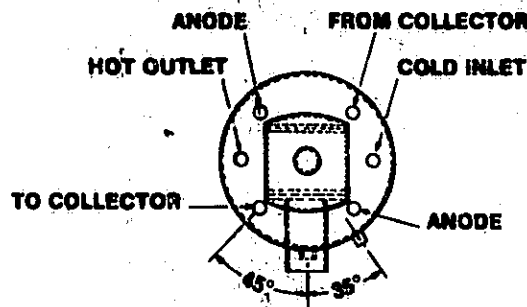
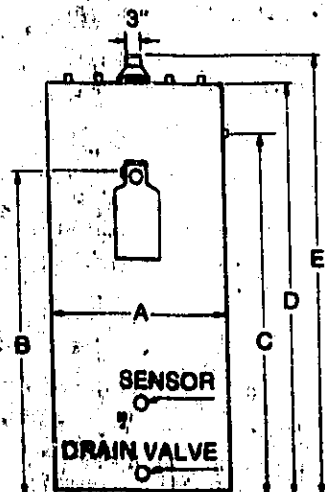
- Cold In — Hot Out: 8"
- Collector In — Collector Out: 8"

All Water Connections Are
3/4" N.P.T.

G.A.S. GAS ASSISTED SOLAR STORAGE TANK

SPECIFICATIONS:
ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model No.	Tank Capacity U.S. Gallons	A	B	C	D	E	Input Rating BTU/Hr	Flow Rate U.S. Gal. per Hr	Insulation Factor	WT.
Gas 73	73	25"	48 1/2"	54 1/2"	63 1/2"	69 1/2"	27,000	33.3	R-20	204
Gas 115	115	28 1/4"	62 1/4"	61 1/4"	67"	73 1/2"	27,000	36.5	R-17	308



Nipple Spread:

- Cold In — Hot Out: 16"
- Collector In — Collector Out: 16"
- Gas Vent — 3"

All Water Connections Are 1/2" N.P.T.
Gas Connection 1/2" N.P.T.

INSTALLATION & OPERATING INSTRUCTIONS

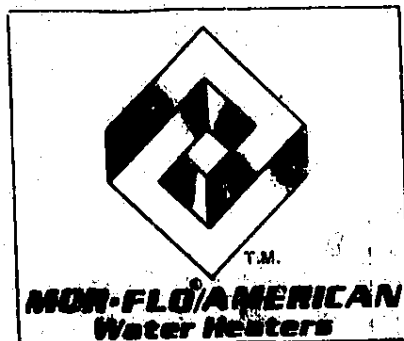
NUMBER 6500027

August 1981

SOLAR COLLECTORS

**INSTALLER: AFFIX THESE INSTRUCTIONS
TO OR ADJACENT TO SOLAR
HEATER.**

**OWNER: RETAIN THESE INSTRUCTIONS
AND THE WARRANTY FOR FUTURE
REFERENCE.**



MOR-FLO 18480 SOUTH LILES ROAD
INDUSTRIES, INC. CLEVELAND, OHIO 44128
(216) 663-7300

AMERICAN 2341 MICHIGAN AVENUE
APPLIANCE MFG. CORP. SANTA MONICA, CA 90405
(213) 829-1754 • (213) 870-0643

SOLAR COLLECTOR INSTALLATION

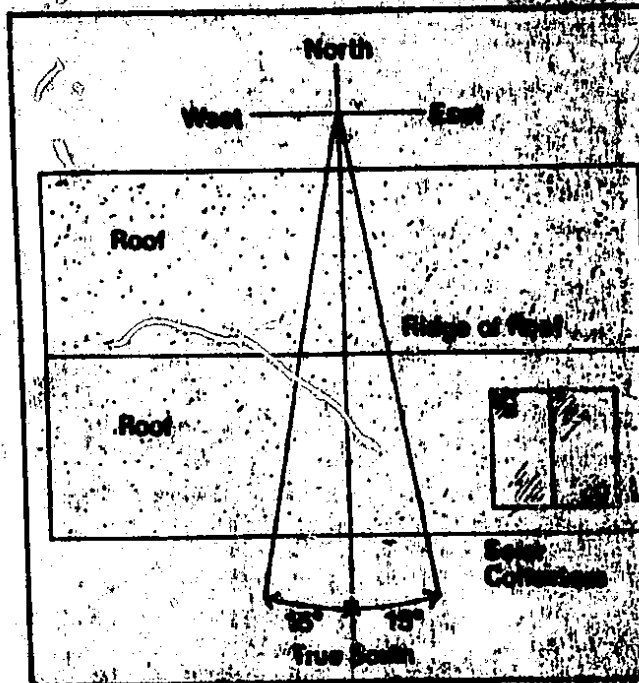
COLLECTOR ORIENTATION

Collectors should be positioned to receive the maximum amount of sunlight available in your location. Solar collectors may be mounted on roofs, patio covers, open slopes, adjacent to fences or on a rack. They must not be shaded by nearby trees or buildings and must never be installed facing north.

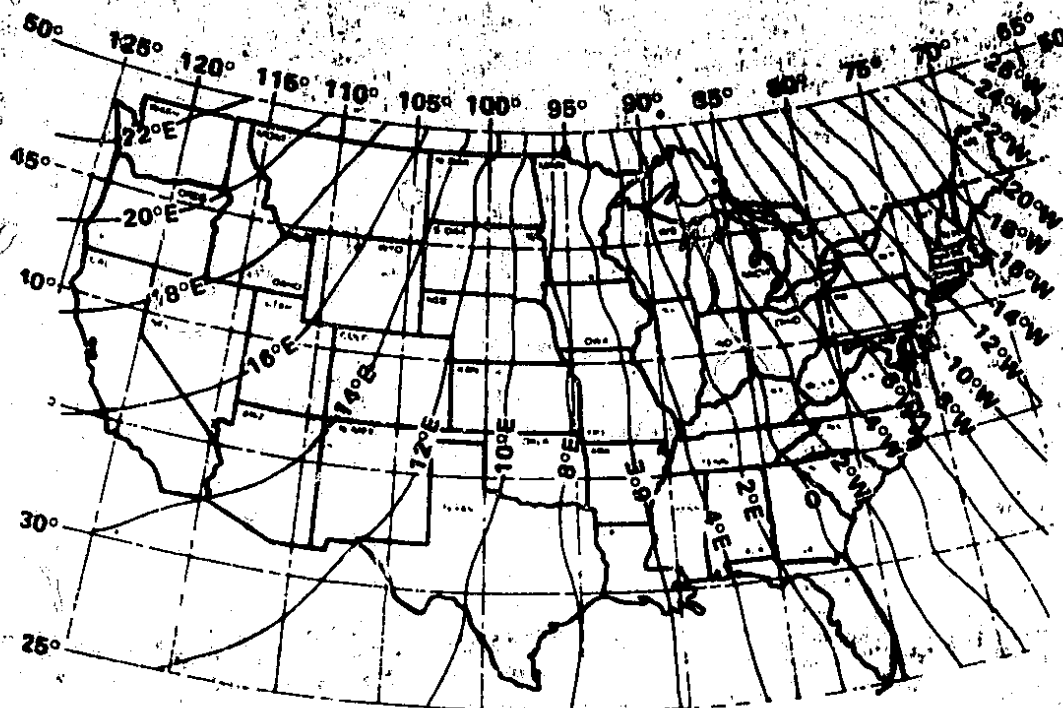
Ideally the collectors should be installed within 15° east or west of facing "true south", not magnetic south. (The earth's magnetic field is not aligned parallel with the earth's axis and therefore some parts of the U.S. have compass readings which vary as much as 20° east or west of "true north"). Refer to the isogonic chart below.

EXAMPLE: Northern California has a compass needle reading which is 18° east of true north. In that situation, the compass should be rotated so that the needle points to 18° east of true north. In that situation, the compass should be rotated so that the needle points to 18° east of north. Then position the collectors opposite the "N" direction (true south).

Polaris, the North Star is True North



TYPICAL ORIENTATION



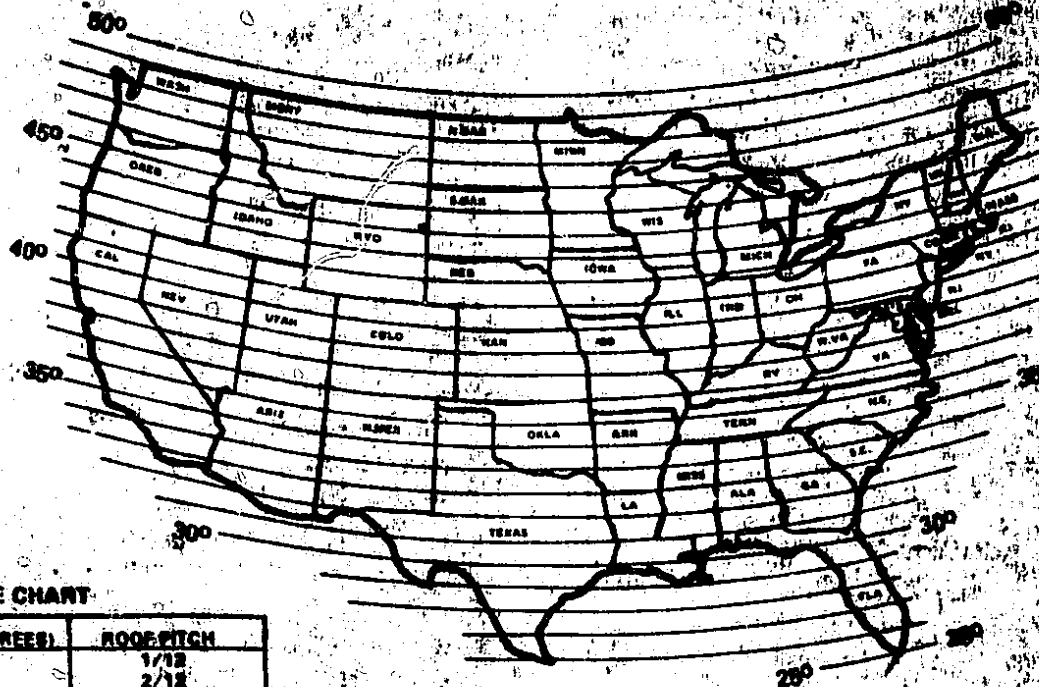
ISOGONIC CHART OF U.S.

SOURCE: U.S. COAST & GEODETIC SURVEY, U.S. DEPT. OF COMMERCE

COLLECTOR TILT

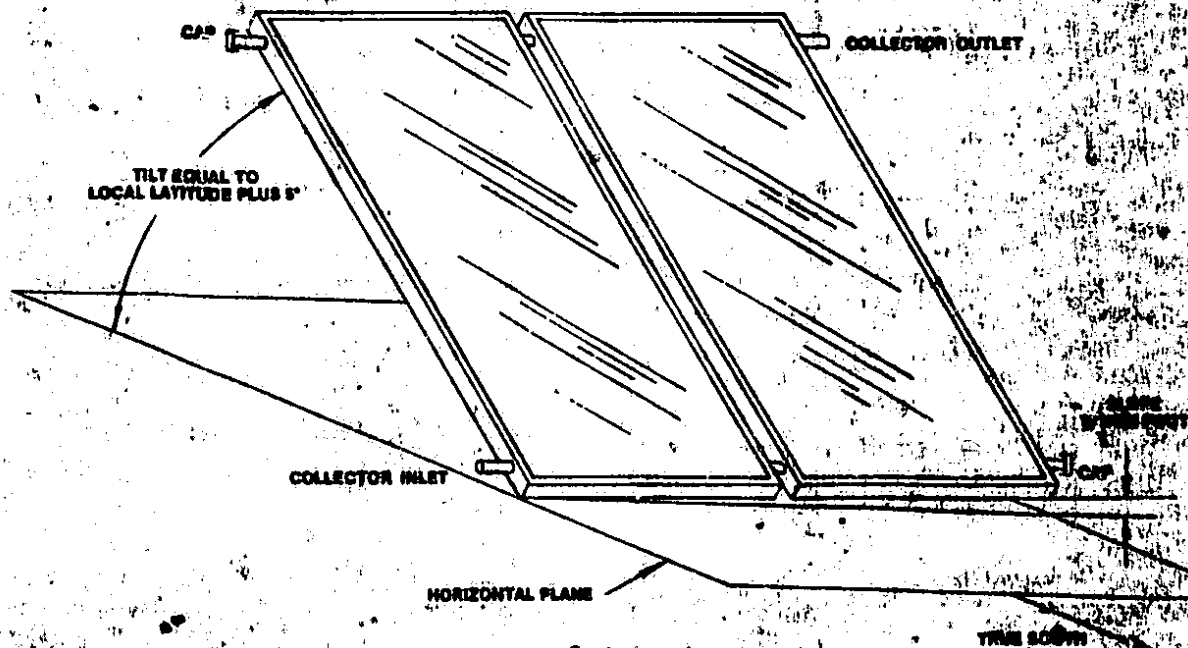
It is recommended that the solar collectors be installed at an angle as nearly perpendicular to the sun's hottest rays as possible. Use the optimum angle (Latitude) plus 5° to allow for winter system operation when the sun is low in the sky. Refer to latitude map and roof angle reference chart below.

Note: Regardless of solar positioning, all solar collectors must slope at least 5° from inlet to outlet for proper draining and air elimination within the collectors and piping.



ROOF ANGLE CHART

ANGLE (DEGREES)	ROOF PITCH
5	1/12
10	2/12
14	3/12
18	4/12
23	5/12
27	6/12
30	7/12
34	8/12
37	9/12
40	10/12
43	11/12
46	12/12
47	13/12
49	14/12
51	15/12
53	16/12



DRAIN DOWN SYSTEM

Use Nominal Pipe for 2 and 3 collector systems. Because all lines must drain completely by gravity, it is required that all pipes are pitched $\frac{1}{4}$ " per foot minimum.

WIND LOADS

The mounting structure should be built to withstand winds of at least 100 mph (which impose a wind load of 40 pounds per square foot on a vertical surface or an average of 25 pounds per square foot on a tilted roof).

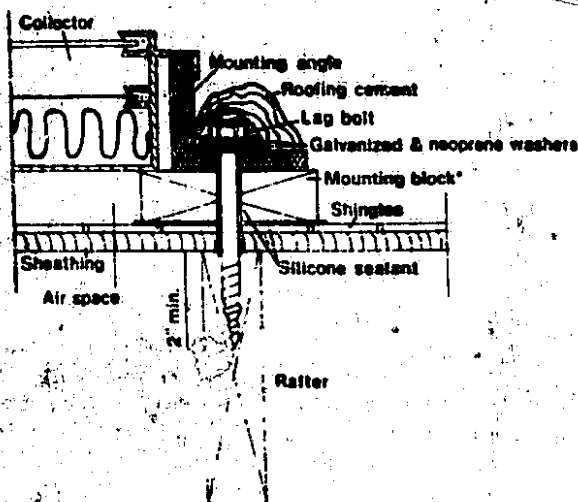
When mounted on racks, the collector array becomes more vulnerable to wind gusts as the angle of the

mount increases. Collectors can be damaged by wind striking the undersides. This wind load, in addition to the equivalent roof-area wind loads, should be determined according to accepted engineering procedures.

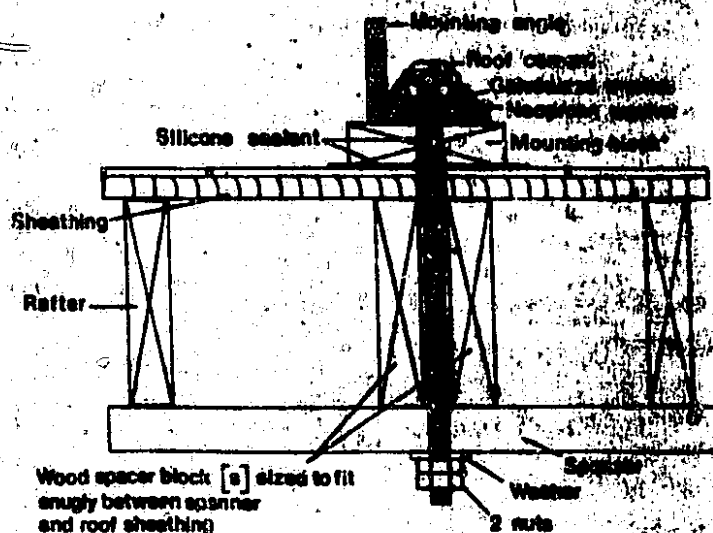
ROOF MOUNTING METHODS

The following details show typical collector mounting methods. (Source: U.S. Dept. of Housing & Urban Development.)

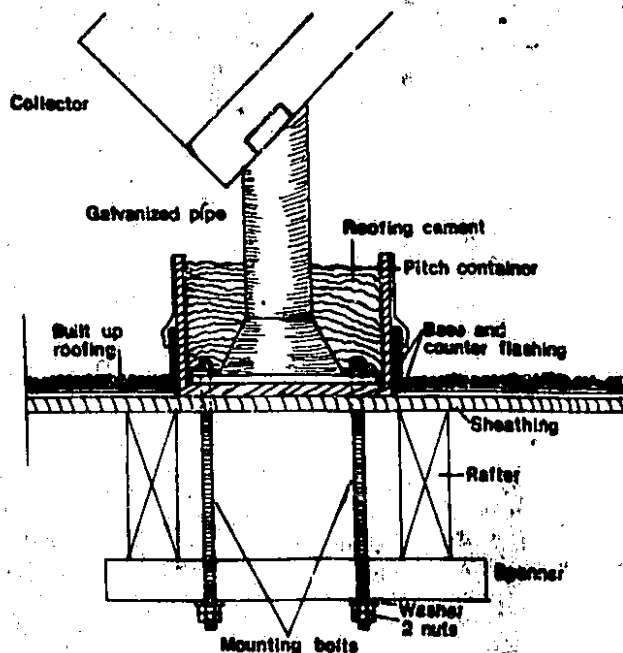
NOTE: Local codes may have special requirements for collector mounting. Investigate before making mounting arrangements.



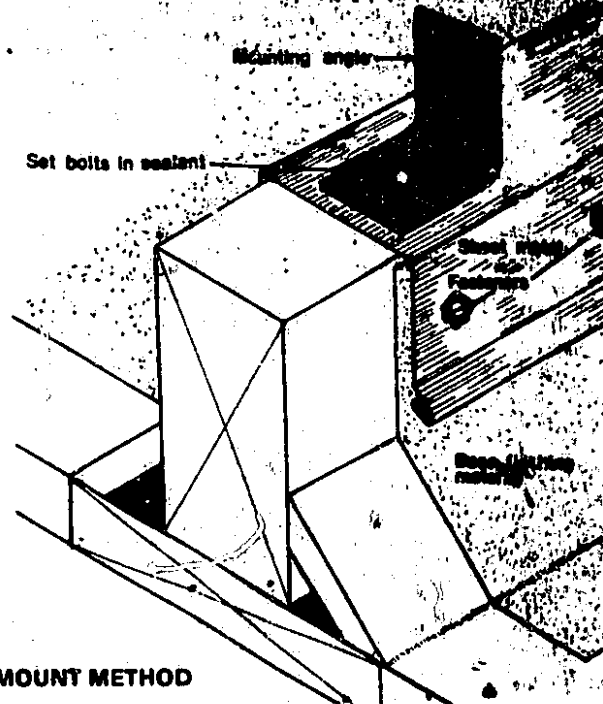
LAG BOLT MOUNTING



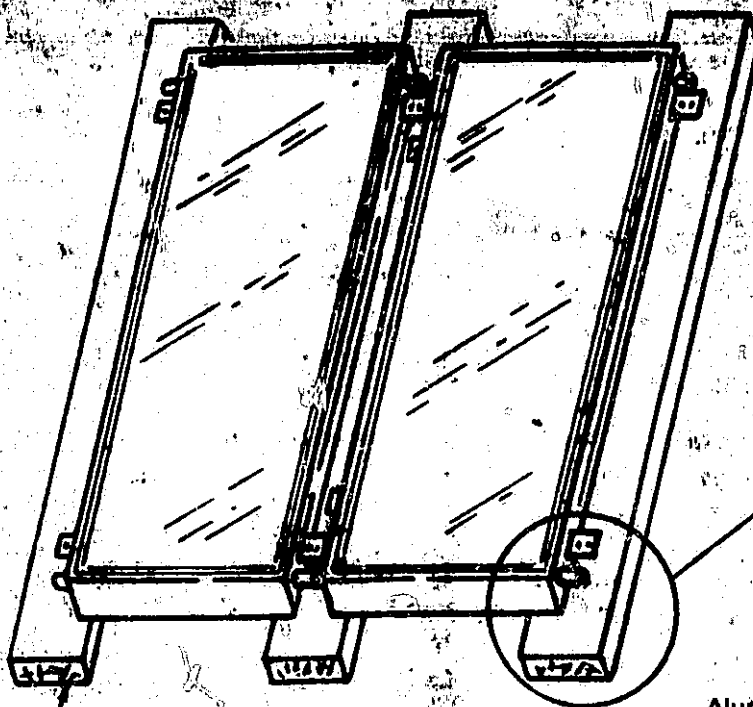
SPACER BLOCK WITH SPANNER MOUNT



PITCH POT METHOD



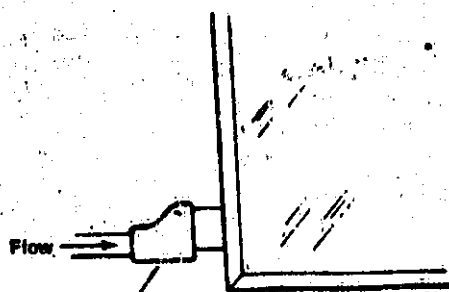
CURB MOUNT METHOD



Wood should be treated to resist insects, fungi and weather

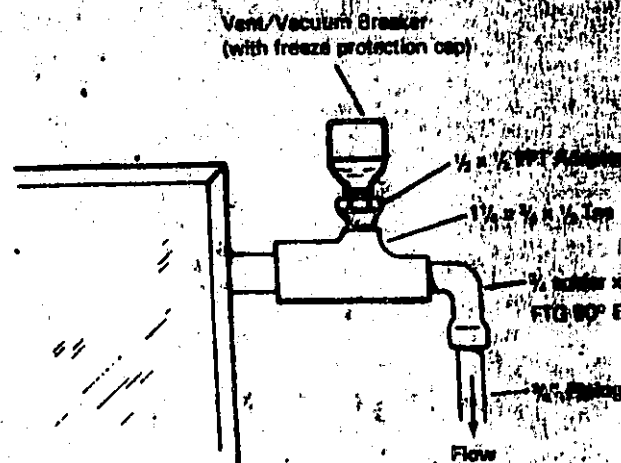
COLLECTOR MOUNTING CLIPS SUPPLIED WITH COLLECTORS

Aluminum hold down clips (4 per collector) may be mounted with the aluminum lag bolts attached to 2"x4" runners. Stagger clips between collectors as required.



1 1/4 x 3/4 Eccentric Coupling (Required To Permit Full Drain Down)

RECOMMENDED CONNECTION AT COLLECTOR INLET.



RECOMMENDED INSTALLATION FOR VENT VALVE/VACUUM ASSEMBLY.

NOTE: This arrangement is necessary to insure that vent/vacuum breaker is installed as close to the water flow as possible.

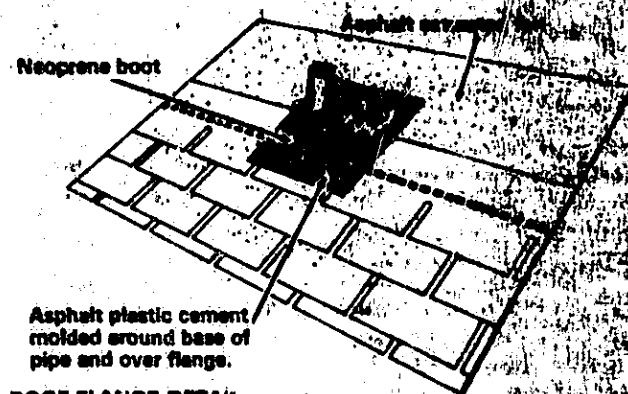
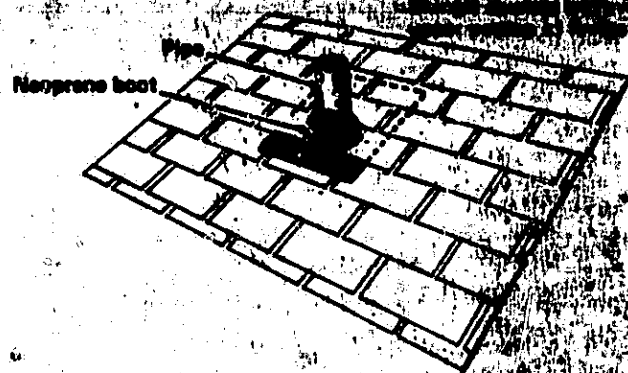
(To Prevent FREEZING)

ROOF PENETRATION FOR PIPES

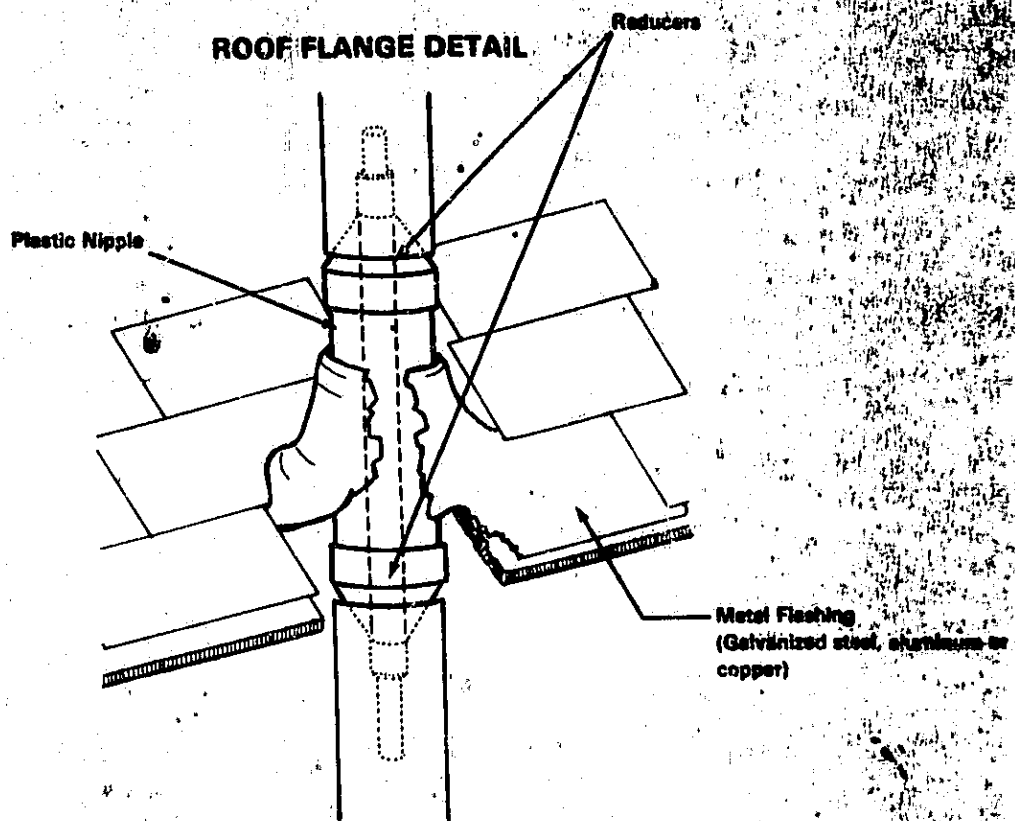
It usually will be necessary to run pipes as well as fasteners through the roof surface. Keep the number of penetrations to a minimum. Pipes are flashed using the same methods as for vent pipes or soil stacks. The most common way is to use a roof flange (See Detail).

Roof flanges are readily obtained from roofing or building supply yards with the most common sizes ranging between 1 1/4 and 4 inches. They are available in galvanized steel, aluminum, neoprene, or copper, and some have neoprene collars. The neoprene collar flanges do not require a sealant where the pipe passes through, and the collars are adjustable to any roof pitch.

Select a roof flange that will make a tight fit over the pipe. Remember that pipe insulation also must pass through the roof. Coat the bottom of the flange with sealant before fastening to the roof surface. The top of the flange must be completely under the shingles and the bottom over the shingles. Apply more sealant between shingles and flange. If the insulation does not have a rigid casing, an alternative method is to insulate up to the penetration and use reducers and a plastic nipple for the penetration.



ROOF FLANGE DETAIL



ALTERNATE METHOD

INSULATION

Insulating the solar plumbing prior to system startup is an important part of the installation procedure. You will be expected to supply the pipe insulation. Pipe insulation often will be of the closed-cell foam type. Insulate all exposed pipes in the collector loop and all parts of the conventional system except the city cold water supply. Insulate all elbows, tees, valves, and plumbing, butting right up to the collectors and storage tank. Gouge out insulation to fit over plugs and other hard-to-fit components.

Do not insulate the pump motor housing, tempering valve, tops of air vents or openings in vacuum breakers and relief valves.

The most common pipe insulation materials are: elastomers (Armaflex®, Rubatex®, etc.), urethane, and isocyanurates.

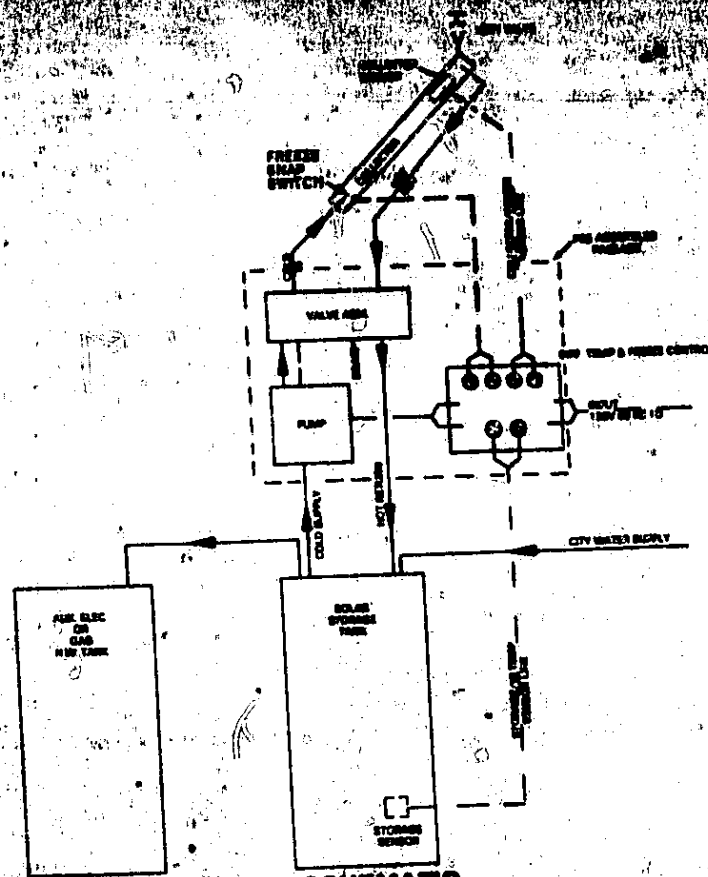
Caution: Elastomeric insulation when exposed to the weather will rapidly crack and crumble unless jacketed or coated with a paint approved by the manufacturer. (Non-oil based) use silicone sealant at joints.

IMPORTANT: INSULATE ALL HOT WATER PIPES TO MINIMUM R-6 RATING.*

CAUTION!

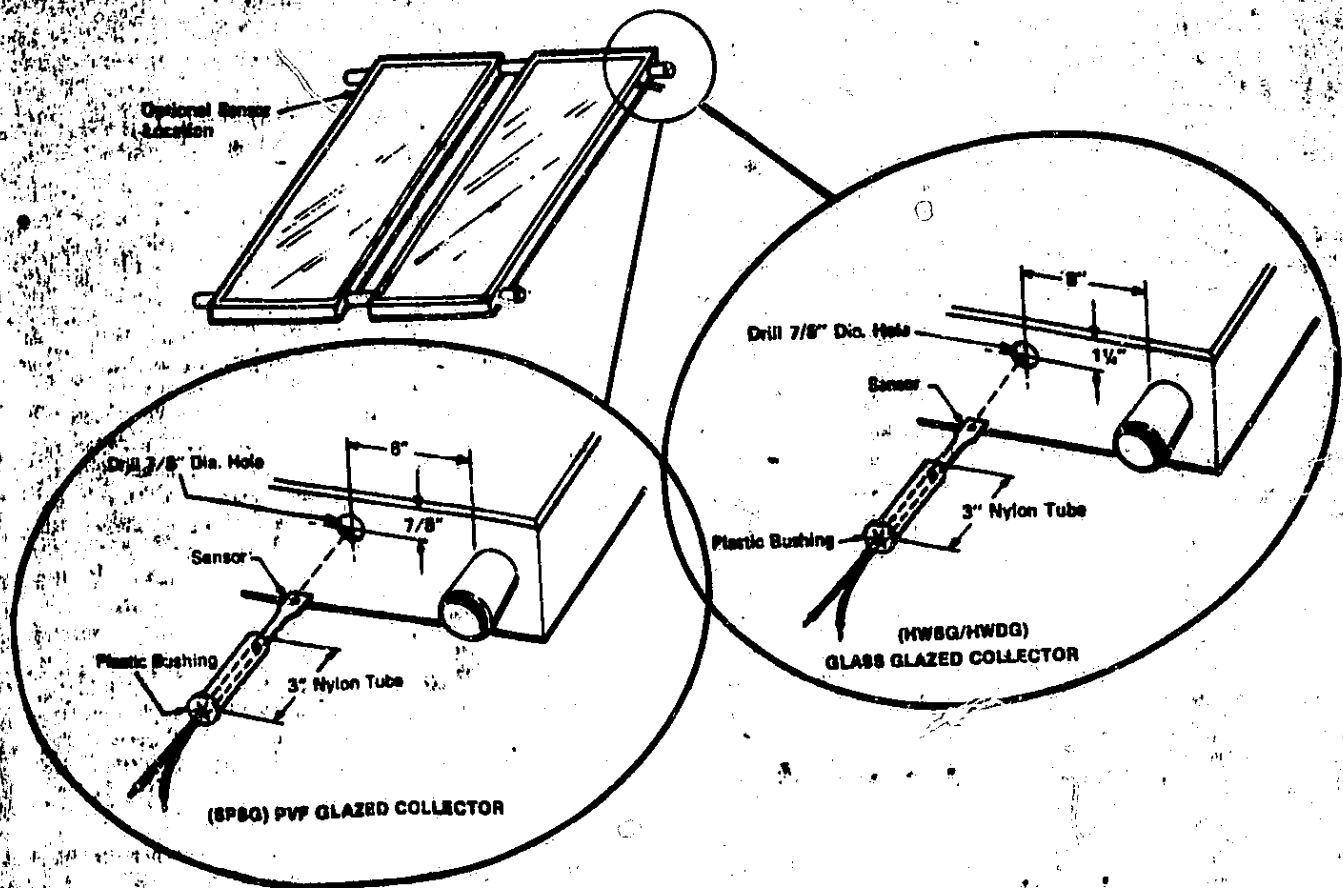
1. A tempering valve should be installed to limit the exit temperature of the solar storage tank to prevent scalding.
2. Vent Valve/Vacuum Breaker must not be allowed to freeze. See page 5 for Installation Instructions.
3. Piping insulation should be R6*.
4. Collectors and connection piping must be pitched a minimum of $\frac{1}{4}$ " per foot to allow gravity drain down.
5. If city water pressure is above 80 PSI, install a pressure reducing valve.
6. All sensors must be installed per instructions.
7. All electrical and plumbing installation should be done by qualified installers and must be in accordance with all applicable local codes.
8. Care must be taken to insure collectors are not shaded during hours of 9:00 a.m. to 4:00 p.m.
9. Collectors should be positioned facing within 15% of true south and tilted at an angle equal to north latitude plus 5° to provide optimum radiation collection.
10. Collector mounting structure must be built to withstand minimum 100 mph wind. If your area experiences greater wind speeds and/or special local codes apply, collector mounting design must meet requirements accordingly. (additional cross bracing, etc.)
11. Cleaning—normal rainfall will clean glazing of collector. However, if long dry periods occur with accompanying dust, it is recommended that the collector glazing be cleaned with mild soap and water.
12. Snow—the angle of collector tilt is usually sufficient to cause snow to slide off the glazing. However, if heavy wet snow build up occurs, the collectors should be cleaned off accordingly.
13. Collectors must be installed higher than the drain down control module to allow for proper drain down.
14. Control system with pump and control module should not be installed in area where freezing could occur. Freezing conditions could damage valve or pump.
15. This Water Heater requires a temperature and pressure relief valve, certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for relief valves and automatic gas shut off devices for hot water supply systems, ANSI Z21.22-1971. This valve must be marked with a maximum set pressure not to exceed the marked hydrostatic working pressure of the water heater. Install the valve in the opening provided and marked for this purpose in the water heater. Orient the valve or provide tubing so that any discharge from the valve will exit only within 6 inches above, or at any distance below the structural floor. The discharge cannot contact any live electrical part. The discharge opening must not be blocked or reduced in size under any circumstances.

*As recommended by U.S. Dept. of Housing & Urban Development Installation Guidelines.



WIRING SCHEMATIC

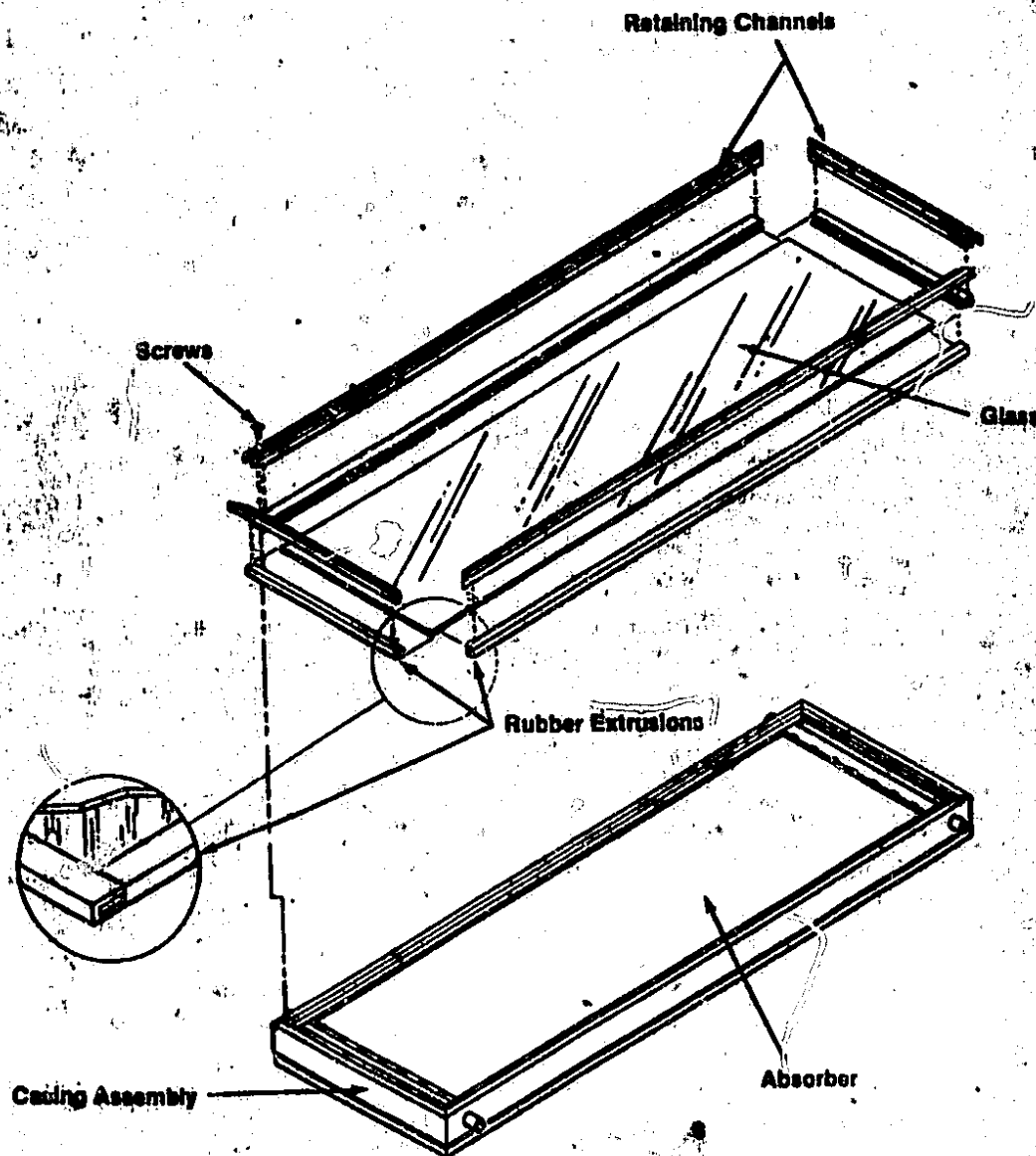
Mounting For Glazed Collector Systems



PROCEDURE FOR REPLACING GLASS FOR HWSG/HWDG 124

1. Disassemble retaining channels by removing screws.
2. Remove damaged glass.
3. Remove rubber extrusions from damaged glass.
4. Attach rubber extrusions to new glass as shown below.
5. Place glass (w/rubber extrusions) on casing assembly.
6. Reassemble retaining channels.

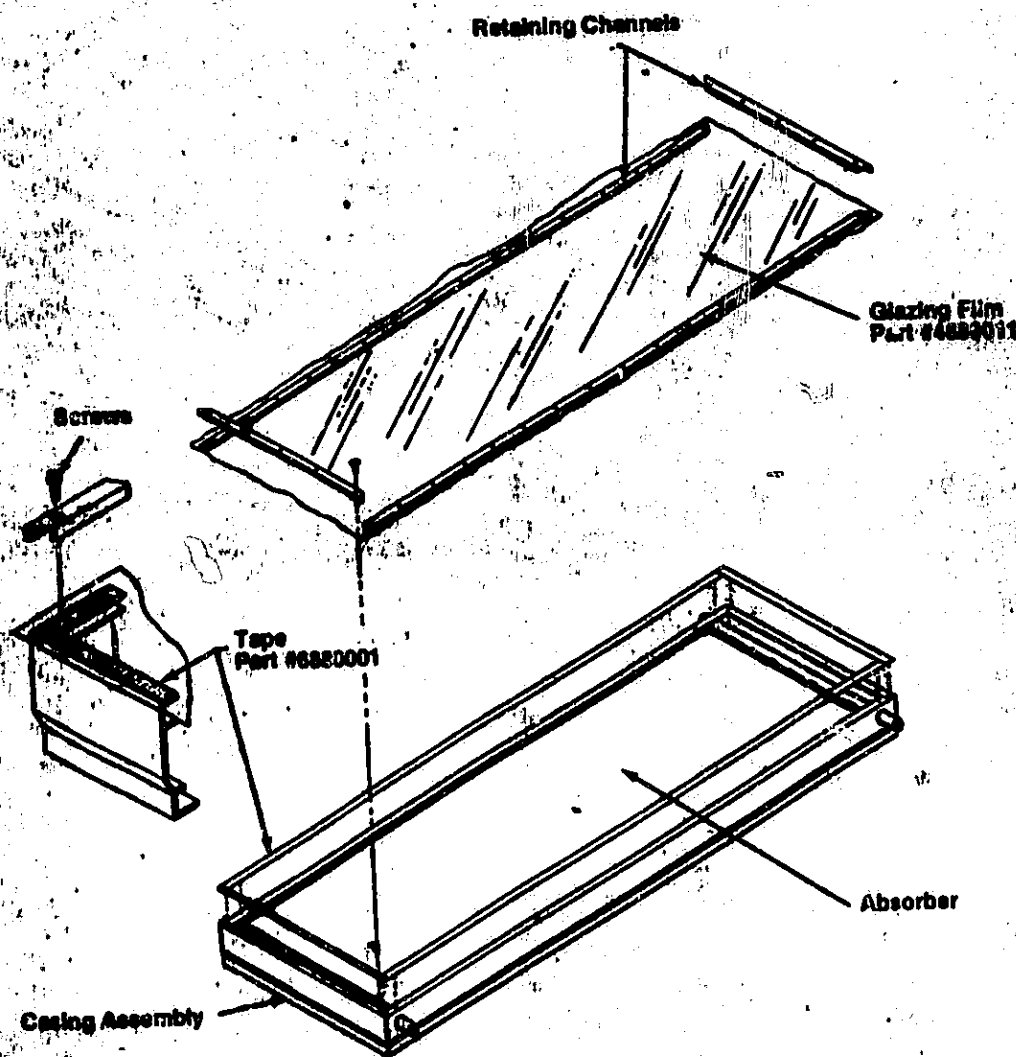
NOTE: View shown below is for single glass model (HWSG 124). Double glass model (HWSG 124) is handled similarly except top and bottom layers of glass have different types of rubber extrusions. Reassemble with extrusions and channels in same positions as prior to disassembly.



HWSG 124/HWDG 124

PROCEDURE FOR REPLACING GLAZING FILM FOR SPSG 130

1. Disassemble retaining channels by removing screws.
2. Remove damaged glazing.
3. Apply double-faced glazing tape along upper edges of casing assembly as shown below (over original tape).
4. Stretch new replacement glazing onto casing assembly so that it is centered and as wrinkle free as possible.
5. Reassemble retaining channels (this last step should complete the stretching of the film and eliminate wrinkles).



SPSG 130

Troubleshooting System — Operational Problems

Problem	Category	Cause	Action
Low or no water pressure at faucets and outlets	Collector	Leak in absorber	Repair leak. Replace absorber. Replace collector.
	Piping	Leak from soldered joint	Resew joint.
		Leak from threaded joint	Tighten/replace Teflon tape; add pipe dope.
		Leak from clamped joint	Tighten hose clamp.
	Valves (gate, globe, etc.)	Leak from valve packing	Tighten packing nut; replace packing.
	Drains	Leak from drain	Close drain tightly; add cap.
	Air Vents	Leak from needle Valve	Inspect, clean mechanism, repair or replace.
		Leak from coin vent	Inspect, tighten.
	Pressure relief valve	Pre-set relief valve has expelled excess pressure	Install relief valve with higher setting. Recharge system to operating pressure. Lower pressure in system.
		Adjustable relief valve has expelled excess pressure	Set for higher temperatures, recharge system. Lower pressure in system.
Drop in water pressure at faucets and outlets	Expansion tank (Diaphragm)	Bladder exceeded	Inspect for fluid in air chamber, replace.
	Expansion tank (Standard)	Inadequate air space	Adjust water level.
	Heat exchanger	Leak from exchanger	Inspect, repair, or replace.
	Inlet water pressure	Well pump problems	Check wiring; check pressure tank and controls; check water level in well; check pump motor and impellers; repair or replace.
		Frozen inlet pipe	Thaw frozen section. Keep water running until hard freeze is over.
		Strainer in house supply line clogged	Clean basket.
		Problem with community water supply	Notify local water department.
		Broken or compressed pipe between main and house	Replace pipe.
		Pressure reducing valve	Check for plugged ports, and proper operation. Clean, repair, and replace.
	Obstruction in domestic hot water system	Valve improperly closed	Open manual valves.
			Check controls for automatic valves, check automatic valve operation; repair or replace.
			Look at flow direction arrows on check valves and backflow preventer. Reinstall correctly. Check for jammed elements. Repair and replace.
		Strainers clogged	Clean basket.
		Bent or crushed pipe, restricting flow	Repair or replace.
No water or no adequate water pressure	Collector	Passages clogged	Remove collector, backflush passages.
	Pump	Air locked	Install air vents at all high points.
		Undersized	Check specs, add larger motor and/or impeller, change pump if necessary.
		Air locked	If present, loosen vent on pump head.
		Impeller bound	If possible, turn impeller manually to free it; repair or replace.
		Installed backwards	Check flow direction arrow and reverse.
		Installed incorrectly	Check manufacturer literature for proper operating position.
		Pump isolated	Make sure all shut off valves are open.
		Inadequate number	Install additional vents at high points.
		Improperly placed	Install at correct positions.
		Faulty . . . causing air lock	Operate needle valve manually; check float control, inspect, clean, repair or replace.
Pump functioning improperly (cycles excessively, or stays active or inactive). Freeze protection mode not operating	Air vents	Shut-off valves	Closed
		Automatic valves	Closed
		Piping	Air locked
			Too small
		Check valve	Installed backwards
			Jammed
		Differential controller and control system	Sensors improperly located
			Sensor improperly secured
			Break in wire
			Wired incorrectly
			Controller settings

Troubleshooting System — Operational Problems

Symptom	Source	Cause	Action
Pump functioning improperly (cycles excessively, or always active or inactive). Freeze protection modes not operating	Differential controller and control system	Sensors faulty	Test by heating one sensor, cooling other(s). Use Ohm meter to determine if sensor is producing proper resistance at various temperatures.
		Controller faulty	Check fuses. Check relays. Check for loose circuit boards; repair, replace.
	Power wiring	No power to controller	Inspect electrical connections and wiring; repair.
		No power to pump	Inspect electrical connections and wiring; repair.
Decrease in performance of solar portions of systems	Collectors	Outgassing	Clean surface; contact supplier.
		Condensation	Inspect and repair glazing seal. Inspect and repair pipe gaskets. Inspect weep holes for clogging and proper location. Replace dessicant.
		Absorber coating degradation	Recoat absorber. Contact installer.
		Dirt on glazing	If rain or dew offers inadequate washing, rinse cover (check with manufacturer for suggested methods).
	Piping	Night losses—reverse thermosiphon	Install check valve on collector supply.
		Insulation seams and joints deteriorated	Reglue, tape, or staple pipe insulation.
Excessive vibration noise in system	Pipe hanger	Vibration from equipment transmitted to framing members	Locate area of noise; disconnect hangers from framing, replace with flexible type or wrap hanger on outside insulation.
	Pump	Impeller shaft misaligned	Inspect, repair, replace.
		Pump vibrates excessively	Clean and rebalance impeller. Install vibration isolators on both sides of pump (strainers and check valves between isolators increases mass).
	Fluid noise	Piping	Entrapped air
Air purge installed backwards			Check flow direction arrow and reverse.
Gravity return line oversized, creates waterfall noise.			Replace with smaller diameter tubing.
Air vents		Not venting	Check for tight cap, vent manually.
	Air locked	Force purge, vent pump if it has bleeder.	
Water hammer	Piping	Pressure	Install shock suppressor.
		Loose support of pipes	Secure pipe supports to structure.
		Entrapped air	Install additional vents.
	Automatic valves	Open or close too fast	Install valves with slower action. Modify controls to slow valve action.
Whistling noise	Piping	Pipe expansion in contact with building materials	Cut holes for pipes 1/2" larger than pipe O.D. Pack penetration with insulation.
Humming or mechanical equipment noise	Differential controller or control system	Controller is not fully deactivating component, allows slight continuous current to motors	Use differential controls troubleshooting procedure. Check solenoid at motor starter for complete break; Adjust or replace.
Insufficient hot water	Collector loop	Failure in fluid system circulators, controls	Use appropriate troubleshooting procedure.
	Tank	Too small	Install second tank.
		Conventional heater problems	Check backup source, wiring, gas, oil lines, burners, and set point. Check for deposits on heater.
		High storage losses	Insulate tank with additional layer.
	Piping	Reverse thermosiphon	Install check valve on collector supply.
	Mixing valve	Improperly adjusted	Check adjustment temperature indicator, set higher.
		Faulty	Replace.
Hot water in cold water lines	Mixing valve	Hot water from top of tank expanding into cold feed of mixing valve	Increase distance so that top of tank to bottom of mixing valve is at least 16 inches. Install check valve in cold water line at mixing valve.



T.M.

MOR-FLO/AMERICAN
Solar Heating Systems

MOR-FLO®
INDUSTRIES, INC.

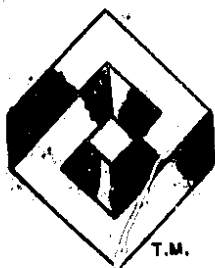
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AMERICAN
APPLIANCE MFG. CORP.

2341 MICHIGAN AVENUE
SANTA MONICA, CA. 90404
(213) 829-1755 • TELEX: 652-422

Troubleshooting System — Operational Problems

Problem	Source	Cause	Action
Pump functioning improperly or excessive vibration or excessive noise or excessive power consumption	Differential controller and control system	Sensors faulty	Test by heating one sensor, cooling other(s). Use Ohm meter to determine if sensor is producing proper resistance at various temperatures.
		Controller faulty	Check fuses. Check relays. Check for loose circuit boards; repair, replace.
	Power wiring	No power to controller	Inspect electrical connections and wiring; repair.
		No power to pump	Inspect electrical connections and wiring; repair.
Decrease in efficiency and/or excessive noise or vibration	Collectors	Outgassing	Clean surface; contact supplier.
		Condensation	Inspect and repair glazing seal. Inspect and repair pipe gaskets. Inspect weep holes for clogging and proper location. Replace dessicant.
		Absorber coating degradation	Recoat absorber. Contact installer.
		Dirt on glazing	If rain or dew offers inadequate washing, rinse cover (check with manufacturer for suggested methods).
	Piping	Night losses-reverse thermosiphon	Install check valve on collector supply.
		Insulation seams and joints deteriorated	Reglue, tape, or staple pipe insulation.
Excessive vibration, noise or excessive power	Pipe hanger	Vibration from equipment transmitted to framing members	Locate area of noise; disconnect hangers from framing; replace with flexible type or wrap hanger on outside of insulation.
	Pump	Impeller shaft misaligned	Inspect, repair, replace.
		Pump vibrates excessively	Clean and rebalance impeller. Install vibration isolators on both sides of pump (strainers and check valves between isolators increases mass).
Fluid noise	Piping	Entrapped air	Force purge system, install additional vents.
		Air purge installed backwards	Check flow direction arrow and reverse.
		Gravity return line oversized, creates waterfall noise.	Replace with smaller diameter tubing.
	Air vents	Not venting	Check for tight cap, vent manually.
		Air locked	Force purge, vent pump if it has bleeder.
		Pressure	Install shock suppressor.
	Piping	Loose support of pipes	Secure pipe supports to structure.
		Entrapped air	Install additional vents.
	Automatic valves	Open or close too fast	Install valves with slower action. Modify controls to slow valve action.
Excessive noise	Piping	Pipe expansion in contact with building materials	Cut holes for pipes 1/4" larger than pipe O.D. Pack penetration with insulation.
Humming or mechanical sound at motors	Differential controller or control system	Controller is not fully deactivating component, allows slight continuous current to motors	Use differential controls troubleshooting procedure. Check solenoid at motor starter for complete break. Adjust or replace.
Insufficient hot water	Collector loop	Failure in fluid system circulators, controls	Use appropriate troubleshooting procedure.
	Tank	Too small	Install second tank.
		Conventional heater problems	Check backup source, wiring, gas, oil lines, burners, and set point. Check for deposits on heater.
		High storage losses	Insulate tank with additional layer.
	Piping	Reverse thermosiphon	Install check valve on collector supply.
	Mixing valve	Improperly adjusted	Check adjustment temperature indicator, set higher.
		Faulty	Replace.
Hot water in cold water lines	Mixing valve	Hot water from top of tank expanding into cold feed of mixing valve	Increase distance so that top of tank to bottom of mixing valve is at least 18 inches. Install check valve in cold water line at mixing valve.



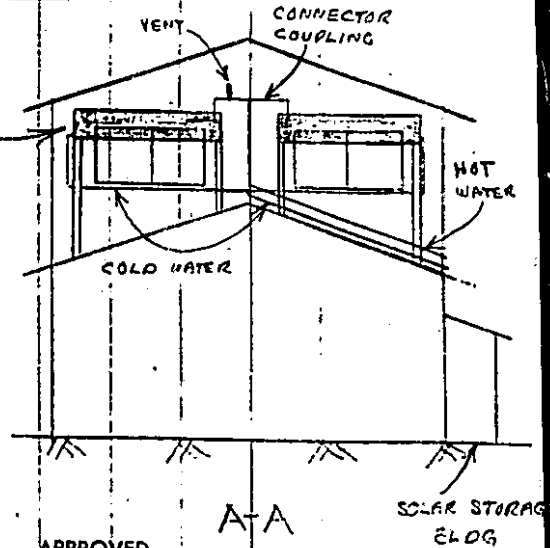
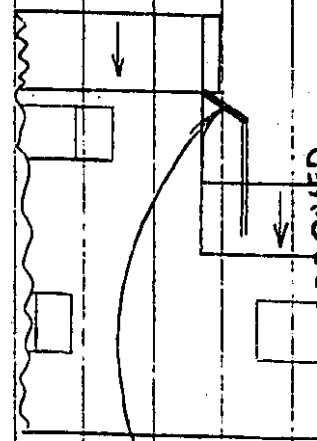
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MOR-FLO/AMERICAN
Solar Heating Systems



APPROVED
Omissions & Errors on Plans
shall not be valid and all codes

APR 23 1982

all laws must be complied with
Permit #

APPROVED
EL DORADO COUNTY
PLANNING DEPARTMENT
DATE 4/23
BY SCH
THE APPROVAL OF THIS
PERMIT IS MINISTERIAL AND
NOT SUBJECT TO C.E.Q.A.

ALLEN WILDERMUTH
3591 FAIRWAY DR.
SMITH SPRINGS, CA
95682

DETAILS

(A)

BRACKET LARGED
INTO STUD

WALL STUD

SHIP LAP SIDING

LAG BOLTS

COLLECTOR

1 1/2" SQUARE

STEEL TUBING
(HORIZONTAL MEMBER)

(B)

ASPHALT
SHINGLES

1/2" Plywo

1 1/2" SQ STEEL
TUBING (VERTICAL MEMBER)

4"x4" LAGGED INTO
ROOF RAFTERS

2"x6" ROOF RAFTERS
(EXISTING)

SEE DETAIL

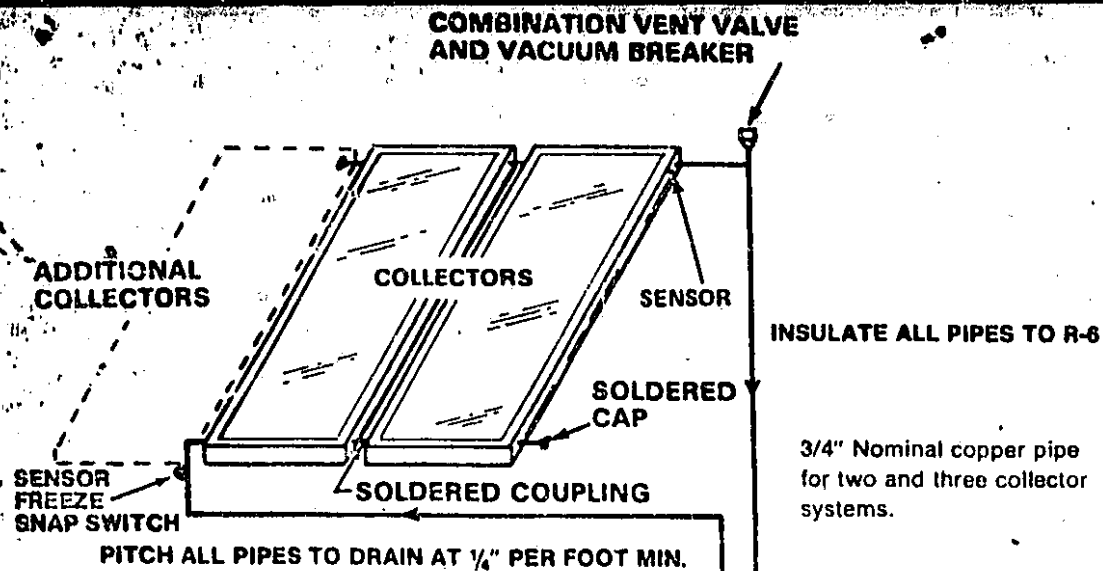
(A)

COLLECTOR (3'x8')

6'-0"

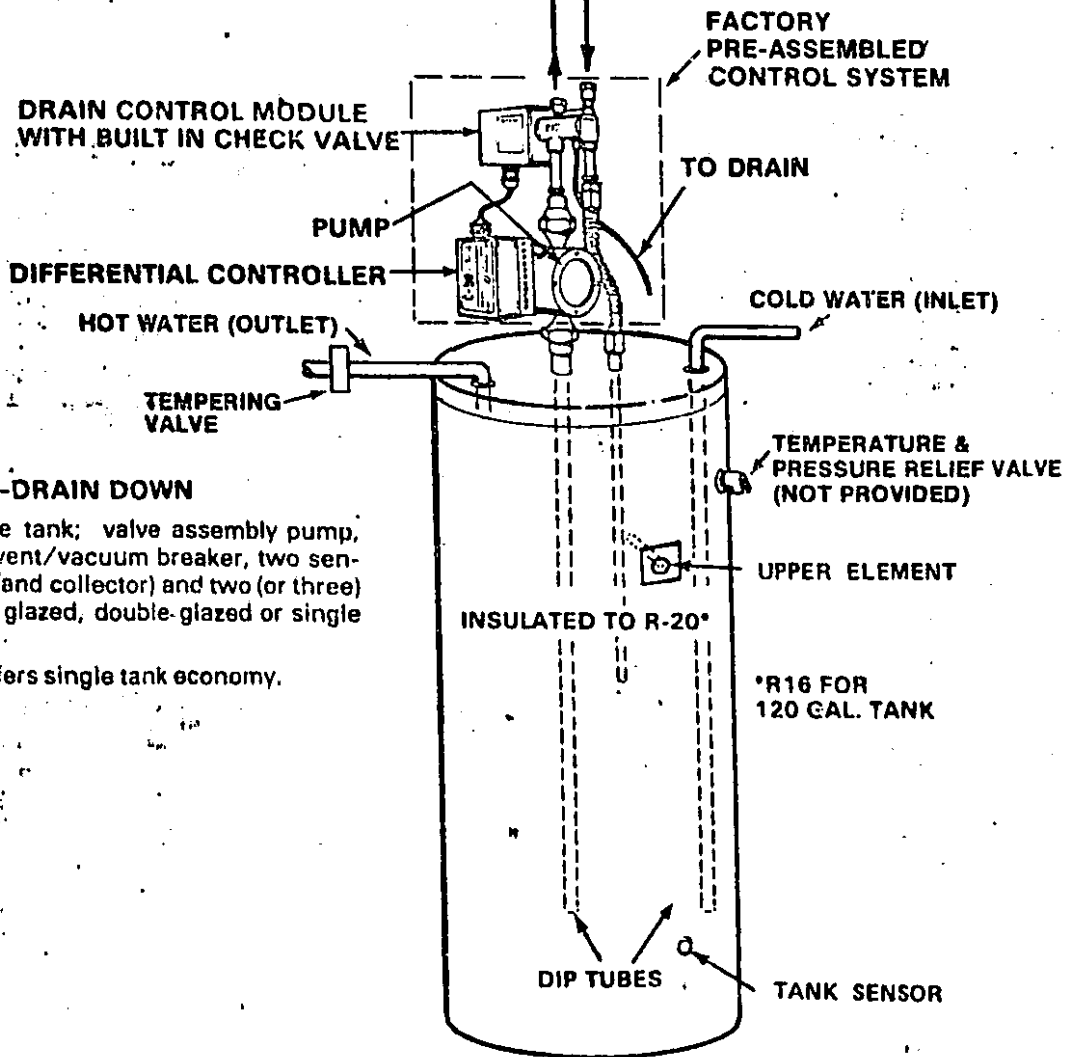
SEE DETAIL

(B)



One Tank System

ELECTRIC ASSISTED TYPE



ONE TANK SYSTEM—DRAIN DOWN

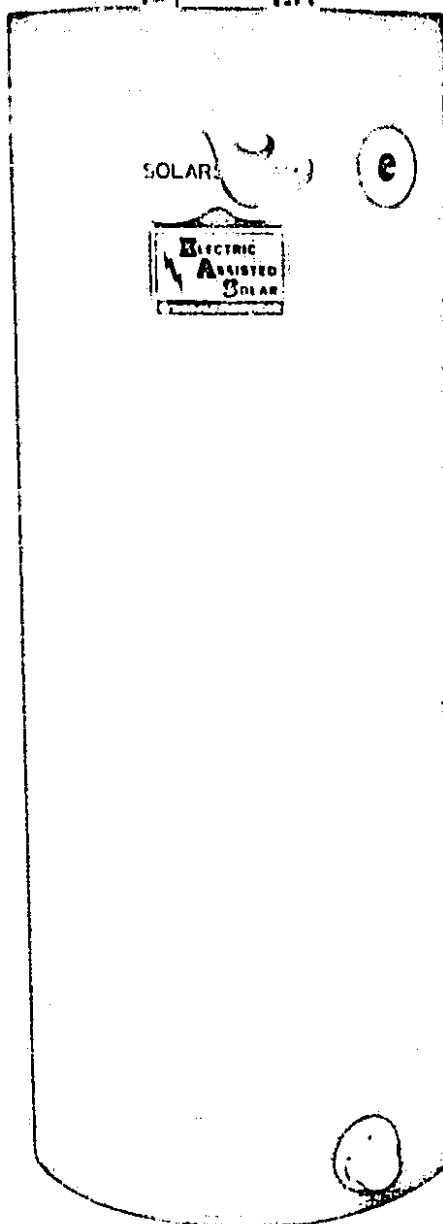
System consists of one tank; valve assembly pump, differential controller, vent/vacuum breaker, two sensors (one each for tank and collector) and two (or three) solar collectors (single glazed, double-glazed or single plastic glazed.)

The one tank system offers single tank economy.

S.S.T.A. ELECTRIC STORAGE TANK:

- **CAPACITIES** — Solar Storage Tanks are available in 52, 66, 82 and 120 gallon capacities to meet each climate and water usage requirement.
- **INTERNALLY MANIFOLDED** — Factory installed Internal Manifolds insure proper distribution of hot and cold water. All piping connections located at top of tank for easy installation.
- **OVERCOAT INSULATION** — Exclusive special formula Foam Insulation is the ultimate insulation for retaining heat stored in a storage tank. It completely fills the voids that are created by less sophisticated materials. The OVERCOAT maximizes heat retention with a R20* insulation value and provides maximum economy for the life of the water heater.
- **GLASS LINING** — Exclusive Ameri-Glass tank liner, oven cured at 1600°F to assure the best tank liner in the industry.
- **QUALITY COMPONENT PARTS** — Direct Immersion 4500 Watt Heating Element provides highly efficient supplemental water heating. Also included is a 100,000 cycle approved Close Tolerance Thermostat and Energy Cut Off (ECO) High Limit Control. Tank Heat Sensor is factory installed.
- **ANODE ROD** — Specially designed Anode Rod protects solar storage tank from corrosion. Separate tapping for easy access.
- **APPROVED DIP TUBES** — Formulated to give extra years of trouble-free service, withstands high temperatures for dependable operation.
- **TEMPERATURE AND PRESSURE RELIEF VALVE OPENING** — Located at side of tank for easy and economical installation.
- **BAKED ENAMEL FINISH** — Exclusive Baked Enamel Finish provides the ultimate in durability and beauty.

*Model SSTA 120EX has a R16 insulation value.



Solarmax
TM

COPPER FLUIDWAY SOLAR COLLECTOR

Dimensions: 30 sq. ft. collectors. Dry weight: 65 lbs. A variety of types and sizes available.

Glazing: High optic property gives years of dependable service with protection against ultraviolet degeneration.

Heat absorber panel: Copper fluidway with heat absorber panels attached. Includes side outlet water connections and internal headers for parallel flow pattern, pressure tested to 150 PSI. Absorber plate coated with high absorption flat black. Collector heat sensor is factory installed on absorber plate.

Insulation: Sides, ends and bottom are insulated with double foil rigid urethane board for maximum heat retention.

Testing: Procedures outlined in ASHRAE 93-77 Standards 1977.

Mounting stands: Ordered separately.