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DOE/NASA CONTRACTOR
REPORT

DOE/NASA CR-161561

**SOLAR HOT WATER SYSTEM INSTALLED AT DAY'S INN MOTEL,
SAVANNAH, GEORGIA**

Prepared from documents furnished by

Day's Inn of America, Inc.
2751 Buford Highway
Atlanta, Georgia 30324

Under Contract DOE EG-77-G-01-1632

Monitored by

National Aeronautics and Space Administration
George C. Marshall Space Flight Center, Alabama 35812

For the U. S. Department of Energy



(NASA-CR-161561) SOLAR HOT WATER SYSTEM
INSTALLED AT DAY'S INN MOTEL, SAVANNAH,
GEORGIA Final Contractor Report (Days Inn
of America, Inc.) 44 p HC A03/MF A01

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U.S. Department of Energy



Solar Energy

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4. TITLE AND SUBTITLE Solar Hot Water System Installed at Days Inn Motel, Savannah, Georgia		5. REPORT DATE September, 1980		6. PERFORMING ORGANIZATION CODE	
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10. WORK UNIT NO.		11. CONTRACT OR GRANT NO. EG-77-G-01-1632		12. SPONSORING AGENCY NAME AND ADDRESS U.S. Department of Energy Conservation and Solar Energy Washington, DC 20585	
13. TYPE OF REPORT & PERIOD COVERED Contractor Report Final		14. SPONSORING AGENCY CODE		15. SUPPLEMENTARY NOTES This work was done under the technical supervision of Mr. Valmore Fogle, George C. Marshall Space Flight Center, Alabama.	
16. ABSTRACT This final report describes the solar energy hot water system installed in the Days Inns of America, Inc., Days Inn Motel (122 rooms), Abercorn and Mall Boulevard (Oglethorpe Mall), Savannah Georgia. This Solar Hot Water System is one of eleven systems planned under Grant EG-77-G-01-1632. The Solar System was designed by Natural Power, Inc., to provide 50 percent of the total Domestic Hot Water (DHW) demand. Solar Energy Products Model CU-30 WW Liquid Flat Plate Collectors (900 square feet) are used for the collector subsystem. The collector subsystem is closed-loop, using 50 percent Ethylene Glycol solution anti-freeze for freeze protection. The 1,000 gallon fiber glass storage tank contains two heat exchangers. One of the heat exchangers heats the storage tank with the collector solar energy. The other heat exchanger preheats the cold supply water as it passes through on the way to the Domestic Hot Water (DHW) tank heaters. Electrical energy supplements the solar energy for the DHW. The Collector Mounting System utilizes guy wires to structurally tie the collector array to the building. The solar components were partly funded (\$14,657 of \$29,314 costs) by the Department of Energy Grant. Technical Management was done by NASA/George C. Marshall Space Flight Center, Huntsville, Alabama. This system was turned on in June, 1979.					
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Designed by
Natural Power, Inc.
P. O. Box 6069
North Augusta, S. C. 29841
803-278-0074

Operational
June 22, 1979

Installed by
M. O. Seckinger Co.
412 Whitaker St.
Savannah, GA. 31401
912-233-3087

DAYS INN
SOLAR WATER
HEATING SYSTEM

Report by
James A. Grissett, Jr.

System Location
Days Inn Motel
114 Main Street
Savannah, GA. 31406
912-352-4455

- SOLAR HOT WATER SYSTEM -
DAYS INNS OF AMERICA, INC.
ABERCORN AND HALL BLVD.
SAVANNAH, GEORGIA

SYSTEMS DESCRIPTION

EXHIBIT "A"

SECTION I

PREPARED BY:

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DESCRIPTION OF SOLAR ENERGY SYSTEM AND BUILDING

I DESIGN PHILOSOPHY

The Days Inn property at Abercorn and Hall Boulevard was chosen to retrofit with a solar hot water heating system. This location has three electric hot water heaters to supply service hot water for motel rooms. The following assumptions were made to calculate load data:

1. 122 rooms
2. 25 gallons per room of hot water per day
3. 80% occupancy per day
4. gallons per day = 2440
(gallons per day = $122 \times 25 \times .8$)

Based on a water set temperature of 140°F a solar system was designed to supply 45 - 50% of load requirements for hot water.

II SOLAR SYSTEM, GENERAL

This system is composed of thirty (900 ft^2 net) Solar Energy Products, Inc. CU30-W (4 x 8) flat plate collectors. This panel was chosen for it's high performance, ease of installation and history of good service. The CU30-W has a 120 MPH wind rated mounting system, that eliminates structural steel mounting supports and reduces the installed cost. The collectors were divided into three arrays. Each array is composed of ten collectors coupled with side outlets. An automatic air vent is located at the end of each collector array. Each array is mounted on two 4 x 4 treated sleepers. These sleepers are placed on "carry tread" roof membrane protector. The collector arrays have 2 x 3/8" wire guy cables running through the mounting hardware. These cables are connected to the roof with 1" all thread rod and to 4" x 4" x 8' angle steel. There are no roof penetrations over occupied space.

The freeze protection is afforded by fifty percent inhibited ethylene glycol solution. The heat exchange is accomplished on

the solar loop by 240 feet of 1 1/2" soft copper coil located in the 1,000 gallon storage tank. The solar loop has the typical flow meter, expansion tank, ball valves, check valves, filler ports and F & T valves. The pump is controlled by a differential controller of the usual design with 165°F high limit protection. The thermal storage is a 1,000 gallon fiber glass storage tank located in the laundry room. Insulation is foil backed with R-19 insulation value. The tank is equipped with an over flow piped to drain. Potable water is maintained in the tank. The domestic hot water is supplied by a coil of 1 1/2" copper pipe located in the storage tank. When cold water flows from the main through this coil, it is preheated before going to the existing hot water heaters.

This system is equipped with an eight point digital thermometer. The temperature of the following eight points are scanned every five seconds.

1. collector plate
2. solar heat exchanger in
3. solar heat exchanger out
4. domestic cold water in
5. domestic cold water out
6. tank
7. room temperature
8. outside temperature (ambient)

Also, the system is equipped with an alarm system. A plate sensor set at 190°F will send a signal to a controller that activates an alarm bell before stagnation temperatures are achieved.

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OF POOR QUALITY

ACCEPTANCE TEST DATA

July 6, 1979

1. Pressure Test:

The system was placed under fifty pounds water pressure and allowed to run for two weeks. During this time, several small leaks were repaired. No further corrective action was required.

2. Thermal Performance Testing

On Friday, July 6, 1979, with over cast skies, the following data was recorded:

	Eastern Daylight Saving Time					<u>Average</u>
Time:	2:11	2:16	2:20	2:35	2:52	
Collector Plate:	109°F	107	108	107	107	107.6
Solar Heat Exchange: (in)	109	105	104	107	105	107.2
Solar Heat Exchange: (out)	94	92	92	93	93	92.8
T (Ambient):	79	79	79	79	79	79

From the Hottel-Bliss equation

$$(1) \quad Q_u = FRUL I_T a - FRUL (T_i - T_a)$$

Q_u = rate of useful energy collection BTU/hr

A = area

FRa = heat removal factor = .74

$FRUL$ = heat loss coefficient = 1.1

T_i = collector inlet

T_a = collector ambient

I_T = BTU/hr ft² radiation on collector and from

$$(2) \quad Q = MC_p \Delta T$$

Useful collected energy rate is as follows:

$$Q \text{ (BTU/hr)} = (20 \text{ g/min})(60 \text{ min/hr})(1 \text{ BTU/}^\circ\text{F lb})(8.33 \text{ lb/gal})(14.4^\circ\text{F}) =$$

$$Q \text{ (BTU/hr)} = 143,942.4 \text{ BTU/hr}$$

Substituting (2) Q (BTU/hr) into (1) and solving for I_T (radiation on the collector) we get $143,942.4 = .74 (I_T)(900) - 1.1 (92.8 - 79)$

$$I_T = 216.15 \text{ BTU/hr}$$

And from the Ashrae 93-77 efficiency equation

$$n = .74 - 1.1 \left(\frac{93.6 - 79}{216.5} \right)$$

$$n = .74 - 1.1 (.0633)$$

$$n = .74 - .070$$

$$n = .67 = 67\% \text{ efficiency}$$

under these conditions.

Conclusion: Under the above noted conditions this system is 67% efficient in delivering solar energy to storage. From this data it can be concluded the system is operating as expected and no corrective actions are required.

MAJOR PROBLEMS ENCOUNTERED AND RESOLUTIONS THEREOF

There were no major problems encountered and no corrective action was required.


LESSONS LEARNED AND RECOMMENDATIONS

This system is the result of five years of experience. The installation went smoothly and as planned. There were no design changes after the project was started. The contractor did not experience any difficulty in following the construction documents.

ORIGINAL PAGE 2
OF FOUR TOTALS

VERIFICATIONS

- a) Natural Power, Inc. verifies that the solar hot water system at Days Inn, Hall Boulevard, Savannah, Georgia was installed per the as-built drawings.
- b) and: met the acceptance test plan provisions.
- c) and: meets the Interim Performance Criteria requirements.



Davis G. Coley, Jr.
Natural Power, Inc.

ANALYSIS IS FOR
 Dr. S. INNS OF AMERICA
 BERKMAN HALL
 SAVANNAH, GEORGIA

THIS PROGRAM IS BASED ON THE FCHART SYSTEM DEVELOPED
 AT THE UNIVERSITY OF WISCONSIN.
 THIS BASIC LANGUAGE VERSION OF F CHART WAS WRITTEN BY
 NAWIS COLEY
 ENTEGY DESIGNS
 PO BOX 6069
 NORTH AUGUSTA, SOUTH CAROLIA 29841

THE DOMESTIC HOT WATER LOAD IS CALCULATED MONTHLY
 COLLECTOR AREA IS 900 SQUARE FEET
 THE COLLECTOR EFFICIENCY RATE IS PER FOLLOWS (ASHRAE 95-77)
 FRTA IS .74
 FRAU IS 1.09
 THE LATITUDE IS 32.1
 THE COLLECTOR TILT IS 32.1
 THE MONTHLY WATER SURPLY TEMPERATURES ARE AS FOLLOWS 52 53 53 67
 75 81 85 82 80 72 64 54
 THE NUMBER OF GALLONS OF HOT WATER REQUIRED PER DAY IS 2448
 THE WATER SET TEMPERATURE IS 140

SAVANNAH, GEORGIA

MONTH	PERCENT SOLAR	INCIDENT SOLAR (BTU/FT ² /MT)	LOAD BTU/MONTH
JANUARY	31.95%	42657.6	35.5107
FEBRUARY	37.75%	43669.6	48.5716
MARCH	43.15%	54147.7	31.0878
APRIL	57.23%	58611.9	44.3656
MAY	61.96%	58494.7	41.0044
JUNE	63.33%	54269.0	36.0188
JULY	64.33%	48422.1	32.1571
AUGUST	65.24%	40000.0	29.1571
SEPTEMBER	56.79%	43193.5	30.8430
OCTOBER	51.06%	51236.8	42.897
NOVEMBER	38.91%	43191.2	46.3971
DECEMBER	27.95%	30010	54.352
	46.37%		363.765

THIS ANALYSIS INDICATES THAT 980 SQUARE FEET
 OF COLLECTOR WILL SUFFICE FOR 3773 F-ROOMS PER YEAR

OPERATION AND MAINTENANCE MANUAL
FOR "CLOSED" SOLAR HOT WATER SYSTEM

SECTION II

PREPARED BY:

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GENERAL DISCUSSION

This solar system, Days Inn, Mall Boulevard, Savannah, Georgia is a "closed" system. This total system can best be described by breaking it into component parts. Reference to the as built drawings are made through this manual, which are furnished with it.

This system is composed of thirty (900 ft² net) Solar Energy Products, Inc. CU30-WW (4 x 8) flat plate collectors. These collectors are mounted in three rows of ten collectors each. The collectors are piped for reverse return.

The collector loop contains an inhibited glycol solution for heat exchange. In this loop isolation valves, check valves, expansion tanks, flow meter, pump and a heat exchanger will be found. The collected solar heat will be transferred to storage by a coil of copper in the 1,000 gallon storage tank, which is located in the laundry room.

Useful solar energy is transferred to the existing hot water heaters that serve as a back-up.

SPECIFIC SYSTEM COMPONENTS

LOCATION AND FUNCTION

<u>COMPONENT</u>	<u>LOCATION</u>	<u>FUNCTION</u>
1. plate sensors A) delta temp. B) plate temp. C) upper limit	collector no. 30	A) to sense plate temperature for differential control B) to sense plate temperature for temperature scanner C) 190°F upper limit switch for alarm system.
2. tank sensors A) delta temp. B) upper limit	bottom of tank: top of tank:	A) to sense tank temperature for differential control B) 165°F upper limit switch to protect FRP tank from over-heating.
3. differential controller	equipment room	to start and stop pump when useful solar energy can be gained.
. digital temperature sensors		
1. plate sensors	collector no. 30	to sense plate temperature
2. solar heat exchange inlet sensor	top of storage tank:	to sense the temperature of the solar heated fluid.
3. solar heat exchange outlet sensor	top of storage tank:	to sense the temperature of the solar fluid after exchange with the tank.
4. domestic cold water heat exchange in	" " " " " " " "	to sense the incoming water main temperature.
5. domestic hot water heat exchange out	" " " " " " " "	to sense the temperature rise of the cold water heated by the solar thermal storage.
6. tank sensor	top of water level (tank)	to sense tank temperature.
7. room sensor	adjacent to digital thermometer	to sense the room temperature.
8. outside sensor	outside laundry room	to sense collector ambient temperature.
5. digital thermometer	equipment room	to indicate the temperatures of the solar system and determine it's performance.
6. activator control for alarm bell	equipment room	to produce alarm signal if pump fails.
7. collector plates	roof top	to collect solar energy.
8. air vent valves	end of each collector row	to allow collectors to vent any trapped air.

<u>COMPONENTS</u>	<u>LOCATION</u>	<u>FUNCTION</u>
9. ball valves at collector inlets (3)	at the inlet of each collector row	flow regulation
10. guy cables and turn buckles	roof, two per collector row	to hold collectors down.
11. flow meter	equipment room	to determine the flow of fluid through collectors.
12. pressure gauge	equipment room	to measure pressure on solar heat transfer loop.
13. pump	equipment room	to pump the transfer fluid through the collectors.
14. relays (2)	equipment room	allows low amperage control to operate 220V 3/4 hp pump.
15. check valve	equipment room	to prevent reverse flow.
16. hose connections	equipment room	to allow make-up water to be admitted to solar loop.
17. expansion tank	equipment room	to allow for expansion of heat transfer fluid.
. ball valves	equipment room	flow regulation
19. tank overflow	top of FRP tank	tank overflow protection.
20. float valve	inside top of tank	to replace water from storage tank lost due to evaporation.
21. solar loop heat exchanger	inside storage tank	heat exchanger for solar loop.
22. domestic hot water heat exchanger	inside storage tank	heat exchanger for domestic hot water pre-heat.

MAINTENANCE REQUIREMENTS

ONCE EACH MONTH

- a) check water level in tank by opening man-way on top of tank. Float valve should allow water level to remain constant. Adjust if necessary.
- b) periodically check that controller power light is on.
- c) check pressure guage on solar loop. Should read 20 - 25 psig cold. If pressure drops check for leaks.
- d) check float in flow meter should read 90 - 95% of full scale. (20 gpm) If flow is not correct, adjust using ball valve located at pump.
- e) check temperature scanner to insure that readings are nominal.

ONCE EACH YEAR

- a) check pump seals for leakage, replace if necessary.
- b) check collectors on roof, tighten any loose connections, tighten guy cables if necessary.
- c) check air vents caps should be tight.
- d) check pH of tank water, should be 7 - 9, if not, drain and replace with fresh water.
- e) check pH of solar heat transfer fluid, should be 7 - 9, if it is not drain and replace if necessary.

This solar system has been designed for long and trouble free operation. However, if trouble should occur, please refer to Trouble Shooting Guide in next section.

TROUBLE SHOOTING GUIDE

<u>CONDITION</u>	<u>CORRECTIVE ACTION</u>
1. Power indicator on controller is out	a) check: fuse b) check: power supply to controller
2. Power indicator is "on" on controller, but pump does not run with sunny conditions	a) test the controller using a control tester b) check: sensors c) check: high limit d) check: for loose or shortened sensors e) test pump
3. Pump starts but will not stop	check: controller using control test procedure.
4. Alarm bell sounds	a) check: to insure pump is running, if not take corrective action listed above. b) check: to insure that tank has not exceeded 165°F. The alarm system is to allow time for corrective action in case stagnation conditions occur. If the plate temperature is allowed to rise unchecked, the pressure in the system will rise to the preset relief pressure and the antifreeze will be lost.

WARRANTY INFORMATION

- (1) Materials supplied by Natural Power, Inc. are guaranteed for one year from date of installation.
- (2) Please refer to additional enclosed warranty information on the collector.
- (3) Material and workmanship supplied by L. O. Seckinger is guaranteed for one year.

NAMES, ADDRESSES, PHONE NUMBERS OF PROJECT MEMBERS

PROJECT COORDINATOR

Mr. James Grissett
Vice President of Construction
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(404) 325-4000

PROJECT DESIGNER

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PROJECT SOLAR SYSTEM SUPPLIER

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North Augusta, S. C. 29841
(803) 278-0074

PROJECT INSTALLING SUB-CONTRACTOR

Mr. M. O. Seckinger
412 Whitaker Street
Savannah, Georgia 31401
(912) 233-3087

OPERATING MODE AND CONTROL LOGIC NARRATIVE

This system is controlled by a Hawthorne 1503-A flow control. This controller activates the Teel 1P833 collector loop pump whenever the plate temperature is 16°F higher than storage. The control turns the pump off when the plate and tank are within 3°F of each other. There are no other control points in this system, all other heat exchange is by natural convection.

**EQUIPMENT INFORMATION
BY MANUFACTURER**

SECTION III



OPERATING INSTRUCTIONS & PARTS LIST

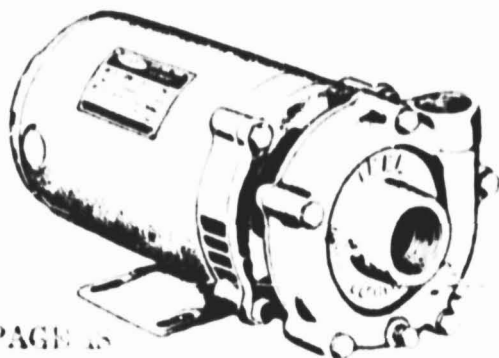
CLOSE-COUPLED CENTRIFUGAL PUMPS (Bronze)

MODELS 1P831 THRU 1P837 (Cast Iron)

FORM 551643

DAYTON ELECTRIC MANUFACTURING CO. CHICAGO 60548

0474/153 5/ 2



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Description

Teel Centrifugal Pumps use an open type, curved vane impeller centrally located and rotating in an efficiently designed volute housing. The medium to be pumped enters the eye of the impeller and is picked up by the vanes. It is then accelerated to a high velocity by rotation of the impeller and discharged by centrifugal force into the volute and out the discharge. This simplicity of operation affords operation under a wide variety of conditions. Centrifugal pumps when properly installed and maintained will operate trouble-free over long periods of time.

Quiet, continuous, high volume flow are features of your Teel Pump. The complete absence of contacting parts assures long life. The Close-Coupled Pump and Motor Unit operates at 3450 RPM to give maximum design efficiency. Maximum horsepower is required with a wide open discharge line. Increasing the pressure head (discharge restriction) decreases the power required.

Specifications

Model	Dayton Motor		60 Hz Volts	Inlet	Outlet	High	Wide	Long
	HP	Type						
1P831	1/3	Split Phase	115	3/4	1/2	6	6 1/2	12 1/2
1P832	1/2	Capacitor	115 230	1	3/4	6 1/4	6 3/4	12 1/2
1P833	3/4	Capacitor	115 208 230	1	3/4	6 1/4	6 3/4	13 1/4
1P834	1	Capacitor	115 208 230	1 1/4	1	8 1/2	6 3/4	14
1P835	1 1/2	Capacitor	115 208 230	1 1/4	1	6 1/4	6 3/4	14
1P836	3/4	3 Phase	208 220 440	1	3/4	6 1/2	6 3/4	13 1/4
1P837	1 1/2	3 Phase	208 220 440	1 1/4	1	6 1/2	6 3/4	14

Performance

Model	PUMP HEAD IN FEET								
	5	10	15	20	30	40	50	60	70
1P831	29	26	25	23	17	12	2	—	—
1P832	43	37	32	28	20	2	—	—	—
1P833	83	78	75	68	57	47	22	1	—
1P834	89	86	83	76	67	54	37	16	—
1P835	95	94	92	88	77	66	52	32	—
1P836	83	78	75	68	57	47	22	1	—
1P837	95	94	92	88	77	66	52	32	—

Safety

When wiring motor, follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

Motor must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame, or other suitable means.

Always disconnect power source before working on or near a motor or its connected load. If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.

Be careful when touching the exterior of an operating motor — it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage — modern motors are built to operate at higher temperatures.

Do not insert any object into motor.

Thermal Protection

Motor is equipped with an automatic reset thermal protector, and may restart unexpectedly when motor and protector cools after tripping. Protector tripping is an indication of motor overloading as a result of operating the pump at low heads (low discharge restriction), excessively high or low voltage, inadequate wiring, incorrect motor connection, or a defective motor or pump.

Installation

Improper installation may cause poor pump efficiency, increase power consumption and decrease operating life. Position your pump as close as possible to the source of liquid. Keep the suction line as short and direct as possible. Plan and install the suction line so that air pockets cannot form in it. Use a minimum of elbows and fittings and use a length of straight pipe at least 6" long for the entrance into the pump suction. Never use pipe smaller than the pump port sizes and preferably use the next larger size. A suitable strainer should be installed in the suction line. The net area of the strainer must be at least four (4) times that of the suction pipe.

Location

Locate pump close to and below the liquid level supply so that there will always be a positive supply of fluid at the pump inlet. If necessity demands that the pump be located above the liquid level, a positive sealing foot valve or check valve must be installed in the suction line below the liquid level.

Open, dripproof motors are designed to be used in clean, dry location with access to an adequate supply of cooling air. Ambient temperature around the motor should not exceed 104°F (40°C). For outdoor installations, motor must be protected by a cover that does not block air flow to and around the motor. For hazardous locations (explosive atmosphere), an explosion-proof motor may be required; consult your local governmental inspection agency for guidance.

Suction

Proper suction is the most important part of your pump installation. Most centrifugal pump problems can be traced to improper suction conditions. Flooded suction conditions have been outlined above. On a suction lift installation, install a foot valve at least 3 feet below the liquid level. Make sure there are no air leaks in this line. Suction lifts of more than 15 feet should be avoided.

Power

Voltage, frequency and phase of power supply must be that shown on the motor nameplate. On three phase systems, voltage on all three lines must be balanced. Unbalance greater than a 2 volt variation line-to-line can result in reduced torque, increased heating and noise, and premature motor failure. Low voltage can reduce performance and cause overheating.

Motor current may exceed rated value because of overloading or high voltage. Voltage 5% or more above rated will cause both no load and full load current to increase, frequently above nameplate value.

Wiring

All wiring and electrical connections must comply with the National Electrical Code (NEC) and local electrical codes. In particular, refer to Article 430, "Motors, Motor Circuits and Controllers," of the NEC.

Use of a motor starter, either manual or magnetic, incorporating thermal protection, is advisable and may be required by local electrical codes. Follow motor starter manufacturer's recommendations on thermal overload relay heater selection. Do not oversize heaters. On three phase systems, three heaters must be used.

Wherever possible, each motor should be powered from a separate branch circuit of adequate capacity to keep voltage drop, during starting and running, to a minimum. Increase wire size where the motor is located a distance from the power source.

Where extension cords are used, they should be as short as possible, for minimum voltage drop. Long or inadequately sized cords, especially on hard starting loads, can cause motor failure. Always use grounding-type (3 conductor) extension cords in conjunction with a properly connected, grounding-type receptacle.

MINIMUM WIRE SIZES FOR WIRING AND EXTENSION CORDS

MOTOR HP	25 FT.		50 Ft.		100 Ft.		150 Ft.		200 Ft.	
	115V	230V	115V	230V	115V	230V	115V	230V	115V	230V
1/3	14	18*	12	16*	10	16*	8	14	6	12
1/2	14	16*	12	16*	8	14	6	12	6	12
3/4	12	16*	10	16*	8	14	6	12	4	10
1	12	16*	10	14	6	12	4	10	4	10
1 1/2	10	14	8	14	6	12	4	10	2	8

*Use only #14 AWG or larger wire for permanent installations)

To connect motor for proper voltage, refer to the connection diagram located on the nameplate or inside the terminal box. On three phase motors, interchange any two line leads to reverse rotation. On centrifugal pump applications involving a three phase motor with threaded shaft, motor rotation must be counterclockwise as viewed facing shaft end.

Operation

Priming

Your centrifugal pump must be satisfactorily primed before it will pump. Satisfactory priming requires that all air must be removed from the pump and suction lines and that these areas be completely filled with liquid. This must be accomplished with the pump at a standstill. A priming cup installed in the discharge line just above the pump is recommended.

Maintenance

Routine:

Pump should be drained if subjected to freezing temperatures. A drain plug is provided on the pump casing.

Clean the suction line strainer at regular intervals.

Properly selected and installed electric motors are capable of operating for years with minimal maintenance. Periodically clean dirt accumulations from open-type motors, especially in and around vent openings, preferably by vacuuming (avoids imbedding dirt in windings).

Pump motor is provided with sealed ball bearings. Normal relubrication of the bearings is not required.

Periodically check that electrical connections are tight.

Mechanical Seal

All Teel pumps are furnished with a precision mechanical seal. This seal is installed and checked at the factory and should require no adjustment at the time of the installation of the pump. Running the pump without water will result in rapid seal failure.

Maintenance (Cont.)

After the pump has been in service for a long period of time, or if the pump has seen severe service on abrasive materials, it may be necessary to replace this seal (the seal may leak). Leakage can be detected by a dripping or flow of liquid from the area around the motor shaft.

The following instructions cover the removal and replacement of the mechanical seal:

CAUTION: The precision lapped faces of the mechanical seal are easily damaged. Handle your replacement seal carefully and read these instructions before attempting to replace the seal.

Removal of Old Seal

1. Disassemble the centrifugal housing (Ref. 8) from the pump by removing five (5) hex head capscrews (Ref. 11).
2. Unscrew the impeller (Ref. 7). A screwdriver slot is provided in the rear end of the motor shaft (remove bearing cap for access). To hold the shaft from turning, insert a large screwdriver blade into the slot. Thread is standard right hand. Turn the impeller counterclockwise to remove.
3. Grasp the ceramic seal seat (Ref. 5) and slip from the motor shaft.
4. Remove the pump body (Ref. 3) from the motor by removing four (4) hex head capscrews (Ref. 4)
5. Remove the spring seal (Ref. 5) by pushing from

the direction of the pump body mounting flange (Ref. 3). Care must be exercised with pusher so as not to damage the seal cavity area.

Installation of Replacement Seal

1. Clean the centrifugal body seal cavity before inserting a new seal.
2. Using a clean cloth wipe the shaft and make sure that it is perfectly clean.
If removed, slide the rubber shaft slinger washer (Ref. 2) on the shaft until it is located about $\frac{1}{8}$ " from the face of the motor bearing hub.
3. Carefully wipe the surface of the ceramic seat with a clean cloth.
4. Wet the rubber portion of the ceramic seat with a light coating of oil, bore only.
5. Press the brass cap, bellows, and spring squarely into the cavity in the casing cover. Do not distort the brass cap. Press uniformly around its flange.
6. After the seal is in place, insure that it is clean and has not been scratched or cracked.
7. Mount the centrifugal body (Ref. 3) on the motor mounting face. Carefully guide motor shaft through seal.
8. Apply a light coating of oil on the motor shaft. Slide the seal seat onto the shaft (with the sealing face first). Use a $\frac{5}{8}$ " I.D. tube, or $\frac{1}{2}$ " drive socket to aid in pushing the rubber portion on to the shaft.

HOW TO ORDER REPLACEMENT PARTS

Please provide following information:

- Model Number
- Serial Number (if any)
- Part Description and Number as shown in Parts List.

Address order to:
Dayton Electric Mfg. Co.
CUSTOMER SERVICE DEPT.
5959 W. Howard St.
Chicago, Illinois 60648

WARRANTY

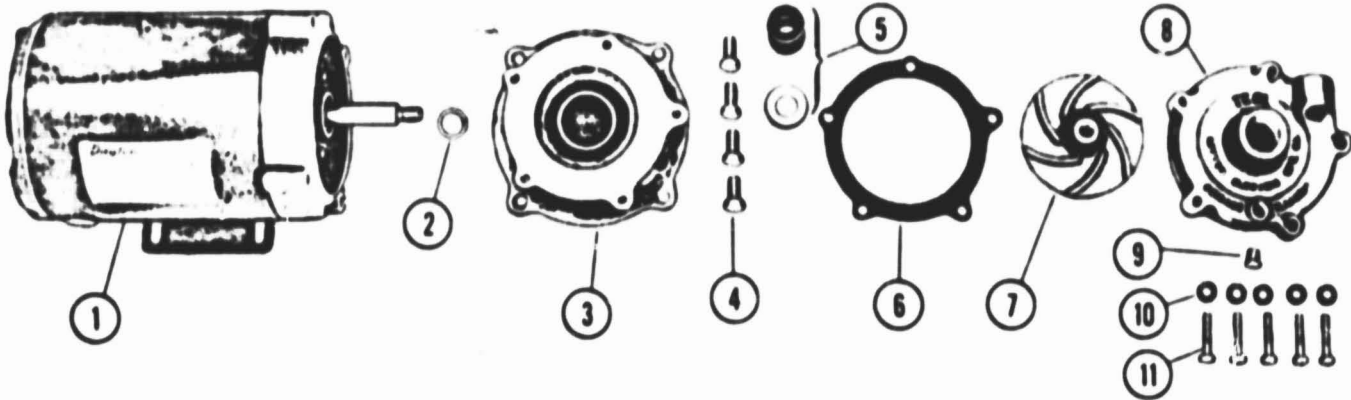
Teel Centrifugal Pumps are warranted against defects in workmanship or materials, under normal use (rental excluded) for one year from date of purchase.

Liability in all events is limited to the purchase price paid and liability under the aforesaid warranty is limited to replacing or repairing any part or parts which are defective in material or workmanship and returned to our Factory or Authorized Service Station, shipping cost prepaid. No warranty, expressed or implied, other than the aforesaid is made or authorized by Dayton Electric Mfg. Co.

PROMPT DISPOSITION will be made if item proves to be defective, within warranty. Before returning any item, write or call Dayton Electric Mfg Co or dealer from whom product was purchased, giving date and number of original invoice, and describe nature of defect. If damage was incurred during transit to you, file claim with carrier.

DAYTON ELECTRIC MFG. CO., 5959 W. HOWARD STREET,
CHICAGO, ILLINOIS 60648

Replacement Parts List



Ref. No	Description	Qty Req'd	Part Number For Model						
			1P831	1P832	1P833	1P834	1P835	1P836	1P837
1	Motor	1	6K492	6K497	6K507	6K511	5K687	3N088	3N090
2	Slinger	1	6150	6150	6150	6150	6150	6150	6150
3	Centrifugal Body	1	11968	11969	11969	11969	11969	11969	11969
4	3/8-16 x 3/4 Long Hex Head Bolt	4	(*)	(*)	(*)	(*)	(*)	(*)	(*)
5	Seal and Seat Ass y	1	12315	12315	12315	12315	12315	12315	12315
6	Gasket	1	11616	11618	11618	11618	11618	11618	11618
7	Impeller	1	11970	11971	11972	11973	11974	11972	11974
8	Centrifugal Housing	1	11965	11966	11966	11967	11967	11966	11967
9	1/8 Cast Iron Pipe Plug	1	(*)	(*)	(*)	(*)	(*)	(*)	(*)
10	1/4 Light Lockwasher	5	(*)	—	—	—	—	—	—
10	5/16 Light Lockwasher	5	—	(*)	(*)	(*)	(*)	(*)	(*)
11	1/4-20 x 1-1/4 Long Hex Head Bolt	5	(*)	—	—	—	—	—	—
11	5/16-18 x 1-1/4 Long Hex Head Bolt	5	—	(*)	(*)	—	—	(*)	—
11	5/16-18 x 1-3/4 Long Hex Head Bolt	5	—	—	—	(*)	(*)	—	(*)

(*) Standard hardware items available locally.

TEEL

PRODUCT INFORMATION

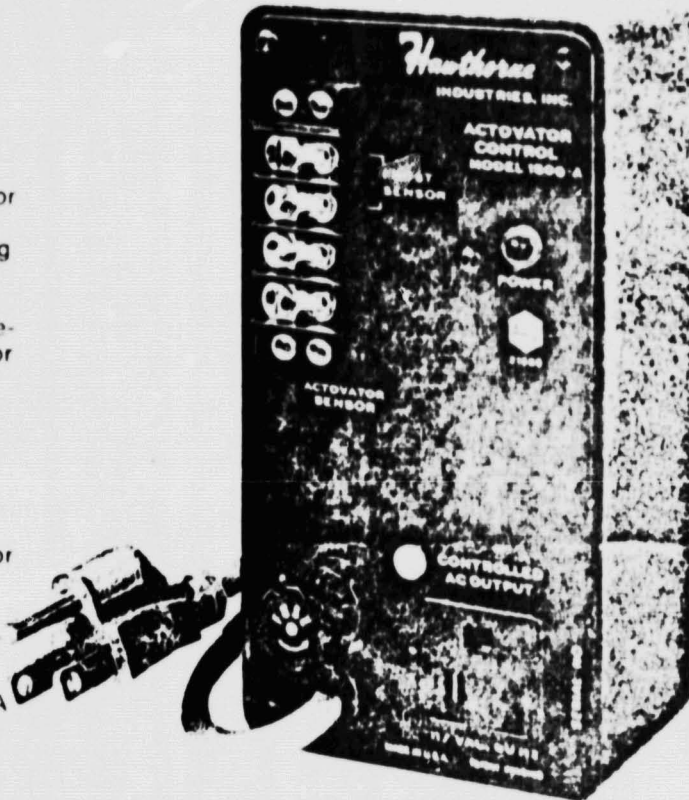
MODEL NO.
H-1500-A

ACTOVATOR CONTROL

The Actovator is a solid-state switch designed for the purpose of absolute temperature sensing control, bringing in backup systems, establishing limits of operation, or draining collectors for freeze protection in active or passive systems. Using a thermostat-type sensor or a temperature-sensing reed switch (not included), the Actovator couples low-voltage, low-current sensing to a 117V AC output at 6 amps. A short across the sensor terminals removes power from the controlled output, an open circuit causes power to be applied.

Low-voltage sensing eliminates the time and expense involved in the installation of conduit for sensor leads. The low-to-high-voltage control within the Actovator eliminates the need for installing transformers and relays in a separate package to perform the same function.

The Actovator is available either as the H-1500-A or in combination with differential control in the H-1504-A, H-1506-A, and H-1511-A controls.



SPECIFICATIONS:

- Power requirement: 4 watts.
- Power supply regulation for stable operation on line voltages from 105-130V AC, 60 Hz.
- Transformer isolation from power line: 1600 volts.
- Sensor Voltage: 5V AC, 60 Hz, 4 ma. maximum.
- Controlled AC output fused at 6 amperes with 6A 3AG fuse.
- Varistor line spike and lightning protection.
- "Power On" light emitting diode indicator.
- Neon indicator lamp shows power is removed from controlled output.

- Controller case durable phenolic thermoplastic with black anodized aluminum faceplate and white epoxy silkscreen lettering.
- Case dimensions 6" x 3 1/2" x 2 1/4".
- Modular construction for ease of installation and servicing.
- Shipping weight, 2 lbs.
- Applied Research Laboratories approved, Test #21588.

INSTALLATION:

Pressure-sensitive foam tape mounting. Plug-in line voltage connections. Terminal screw low-voltage (sensor) connections.

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SOLAR ENERGY DIVISION

CONTROL SYSTEMS • RESEARCH & DEVELOPMENT

1501 South Dixie • West Palm Beach, Florida 33401 • Phone 305 / 659-5400

PRODUCT INFORMATION

MODEL NO.
H-1503-A
and
H-1505-A

FIXFLO CONTROL

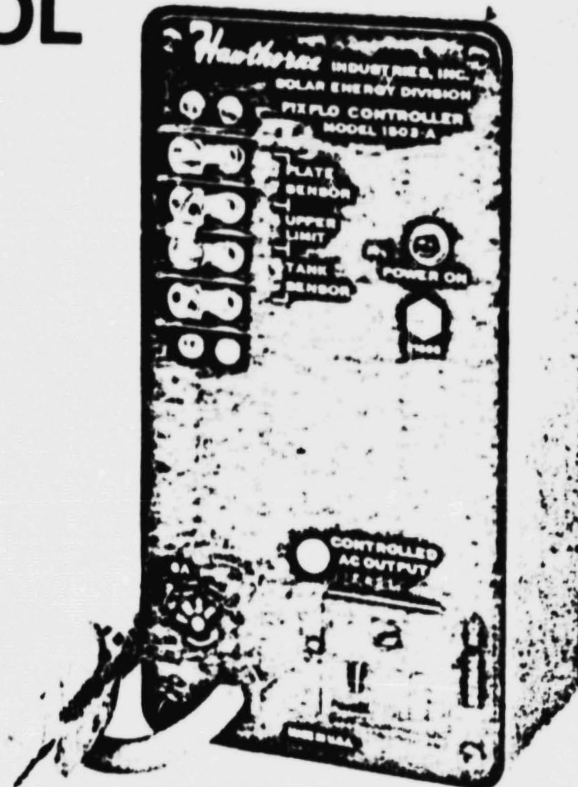
The Fixflo differential thermostat gives positive on / off control for a wide range of applications. Sensing collector and storage temperatures, the Fixflo applies line voltage to the circulator pump or blower when energy is to be gained from the solar collector panel. Power is removed when no more energy is to be gained.

In domestic hot water, commercial hot water, space heating, and swimming pool applications, the Fixflo has proved itself to be of high quality and reliability. The versatility of this control has been demonstrated by its use in heat recovery systems and as a precision thermostat. Available features such as recirculating frost protection and upper temperature limit are incorporated into the circuitry of every control and require only the addition of the appropriate optional sensors. Any number of sensors may be wired in parallel (frost) or in series (upper limit) for simultaneous monitoring of multiple points. Hysteresis is also incorporated into the circuitry for stability of operation and minimization of system cycling.

Also available with dual parallel outlets (model H-1505-A).

SPECIFICATIONS:

- Power requirement: 4 watts
- Power supply regulation for stable operation on line voltages from 105-130V AC, 60 Hz.
- Transformer isolation from power line, 1600V.
- Thermistor sensor voltage: 8.3V DC. Maximum short-circuit current: 4.15 ma.
- All sensor terminals are short-circuit overload protected.
- Controlled AC output: 6 amps (720 watts) at 120V AC. Overload protected with 6A 3AG fuse.
- Varistor line spike and lightning protection.
- Zener diode static charge bleed-off protection at sensor terminals.
- Turn-on differential: 16° F. Turn-off Differential: 3° F.
- "Power On" light emitting diode indicator.



- Neon indicator lamp shows power applied to output
- Controller case durable phenolic thermoplastic with black anodized aluminum faceplate and white epoxy silkscreen lettering
- Case dimensions 6" x 3 1/4" x 2 1/4"
- Modular construction for ease of installation and servicing
- Shipping weight — 2 lbs
- Applied Research Laboratories approved. Test #21588

INSTALLATION:

Pressure-sensitive foam tape mounting. Plug-in line voltage connections. Terminal screw low-voltage (sensor) connections.

SOLAR ENERGY DIVISION

CONTROL SYSTEMS • RESEARCH & DEVELOPMENT

1501 South Dixie • West Palm Beach, Florida 33401 • Phone 305 / 659-5400
Dial Toll free 1-800-327-3380 except Alaska, Florida, Hawaii

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Solar Energy Products, Inc.

INTRODUCTION

SOLAR ENERGY PRODUCTS, INC. has actively supported the developing solar energy industry by supplying high quality equipment. Our role has been to research, manufacture, market and maintain **SEP's SUNFIRED™ ENERGY SYSTEMS.**

Solar Energy Products, Inc. has chosen to establish its corporate identity and merchandise **SUNFIRED™ Energy Systems** through a national **Sales and Service Network of Solar Specialists.**

SUNFIRED™ Energy Systems are carefully designed and constructed of the finest quality materials to provide dependable performance with a maximum service life.

Included in the product line are solar collectors, pumps, controls, storage tanks, heat exchangers, and convection heating equipment.

SERVICES

Solar Energy Products, Inc. is qualified to assist in specifying the most cost effective solar equipment for your application. **SEP** offers:

- COMPUTERIZED SOLAR COLLECTOR PANEL PERFORMANCE ANALYSIS - "PPA"
- COMPUTERIZED ENERGY SYSTEM ECONOMIC LIFE CYCLE COST ANALYSIS - "ECO"
- Coordination, notice and descriptions of federally sponsored solar demonstration programs as they are released.
- Quotation assistance on pre-engineered projects.

TRAINING PROGRAM

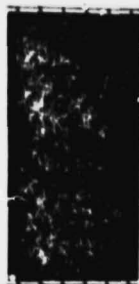
Monthly seminars have been established to train the key personnel of **SEP Dealerships.** The Seminar emphasizes the fundamentals of solar engineering, applications of **SUNFIRED™ Energy Systems** and the recommended installation, operation and maintenance procedures.

CERTIFICATIONS AND APPROVALS

- **SEP's SUNFIRED™ Energy Systems** have been approved for use in **HUD's SOLAR DOMESTIC HOT WATER INITIATIVE** by the Poly-Technic Institute of New York and the Florida Solar Energy Center.
- **SEP's SUNFIRED™ Energy Systems** meet the Intermediate Standards for Solar Domestic Hot Water Systems - (NBSiR 77-1272).
- **SEP's Systems** satisfy the **HUD Minimum Property Standards for Solar Heating and Domestic Hot Water Systems (4930.2)**.
- **SEP's SUNFIRED™** collector has been approved by the Research Committee of the International Association of Plumbing and Mechanical Officials (IAPMO) S-1888.

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SUNFIRED™ SOLAR COLLECTORS



UNGLAZED
Order No. CA29



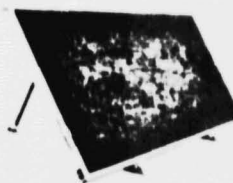
SINGLE GLAZED
Order No. CA32-1W



DOUBLE GLAZED
Order No. CA32-2W



ELECTROSOL™ PHOTOVOLTAIC
POWER MODULE
Order No. PV-20



SUNFIRED™ CIRCULATORS



1.20 H.P. Cast Iron
Order No. UPS 20 42



1.12 H.P. Cast Iron
Order No. UP 26 64



1.35 H.P. Stainless
Order No. UM25 18



1.20 H.P. Stainless
Order No. UP 25 42



1.12 H.P. Stainless
Order No. UP 25 64

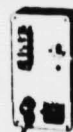
SUNFIRED™ CONTROL SUBSYSTEMS



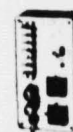
FIX-FLO
Order No. DC-1603



FIX-FLO w/ Actuator
Order No. DC-1606



PRO-FLO
Order No. DC-1610



PRO-FLO w/ Actuator
Order No. DC-1611



TIMER
Order No. TC-12

SUNFIRED™ STORAGE SUBSYSTEMS

FEATURING WRAP AROUND DOUBLE WALL HEAT EXCHANGER



66 GALLON
Order No. E-66 SE



82 GALLON
Order No. E-82 SE

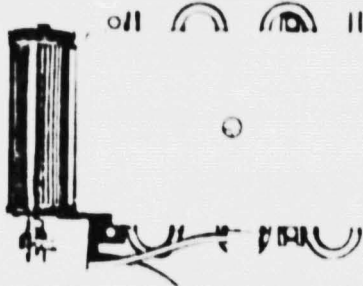


120 GALLON
Order No. E-120 SE



The basic function of a solar heating and domestic hot water system is the collection and conversion of solar radiation into usable thermal energy. **Solar Energy Products, Inc.** provides the equipment to achieve this conversion dependably and economically. Each product has been designed specifically for easy installation, simplified servicing, low cost and excellent performance.

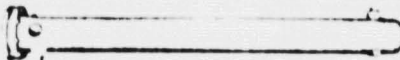
HOT WATER FAN COIL



BASEBOARD RADIATOR



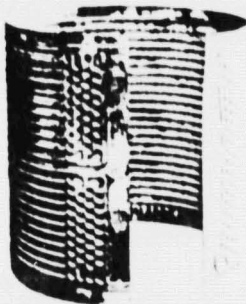
SHELL AND TUBE HEAT EXCHANGER



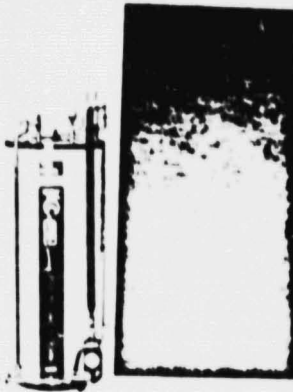
FLAT PLATE HEAT EXCHANGER



ROLLED HEAT EXCHANGER



SUNFIRED™ OPFN DOMESTIC HOT WATER SYSTEMS



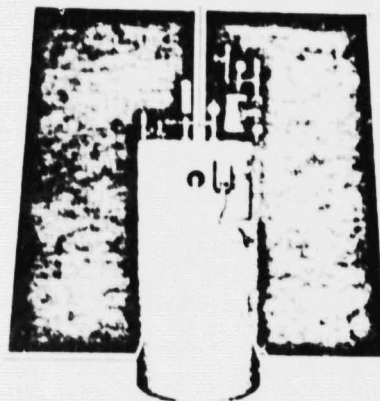
SUNFIRED™ Open Domestic Hot Water Systems are among the most economical and dependable solar water heating systems available today. **SEP's** solar equipment can be added to existing hot water systems and will provide many years of energy savings.

These systems are freeze protected by either circulating water through the collector(s) and exposed piping or draining them respectively. **SEP** offers two Fluid Handling Packages for open system freeze protection: FHP-OMT Manual Drain System and FHP-OA Automatic Drain System.

Solar Energy Products, Inc. is a leader in supplying solar energy equipment and complete **SUNFIRED™ Energy Systems** to enrich your future with solar savings and energy independence.

ORDER NUMBER		OSM-1	OSM-2	OSM-3	OSM-4	
Collector Area (SQ FT)		32	64	96	128	
Storage Capacity (GAL)		40-66	66-120	100-180	120-240	
ITEM	DESCRIPTION	WT.	QUANTITY			
CA-32-1W	Solar Collector	180	1	2	3	4
HM-200	Hinge Mounting System	10	1	2	3	4
CA-32-FO	Collector Fittings & Accessories	2	0	1	2	3
DC-26-PO	Immersion Sensor & Accessories	4	1	1	1	1
DC-PO	Pro-Flu Control Package	3	1	1	1	1
FHP-OMT	Fluid Handling Package	30	1	1	1	1
TOTAL SHIPPING WEIGHT (LBS.)			247	459	671	883

SUNFIRED™ CLOSED DOMESTIC HOT WATER SYSTEMS



SUNFIRED™ Closed Domestic Hot Water Systems eliminate the possibility of freeze damage to your solar system. Antifreeze heat transfer fluid is circulated through the solar collectors where it absorbs heat from the sun and returns to a heat exchanger surrounding the storage tank. The heat is then transferred to the water within the tank. Closed **SUNFIRED™ Energy Systems** also protect from corrosion and mineral build up in the collectors. To learn how easily and economically solar energy can be a part of your future, call today and let our staff of Solar Specialists show you the many ways solar energy can work for you.

ORDER NUMBER		CS-66-2	CS-82-2	CS-82-3	CS-120-3	CS-120-4
Collector Area (SQ FT)		64	64	96	96	128
Storage Capacity (GAL)		66	82	82	120	120
ITEM	DESCRIPTION	QUANTITY				
CA-32-1W	Solar Collector	2	2	3	3	4
HM-200	Hinge Mounting System	2	2	3	3	4
CA-32-FO	Collector Fittings & Accessories	1	1	2	2	3
DC-26-PO	Immersion Sensor Package	1	1	1	1	1
DC-PO	Pro-Flu Control Package	1	1	1	1	1
FHP-CT	Fluid Handling Package	1	1	1	1	1
E-SL	Closed-System Storage Tank	1	1	1	1	1
SHIPPING WEIGHT (LBS.)		865	873	1085	1215	1430



Solar Energy Products, Inc.

SUNFIRED™ "CA SERIES" CA32-1W CA32-2W

OUTSIDE DIMENSIONS (inches):	47.75 x 97.75 x 2.75	47.75 x 97.75 x 3.31
GROSS PROJECTED AREA (sq. ft.):	32.36	32.36
NET APERTURE AREA (sq. ft.):	29.93	29.93
DRY WEIGHT (lbs.):	179	262
COVER PLATE:	Single Glazed	Double Glazed
Lights per Panel:	1	2
Material:	Tempered Water White Glass	
Dimensions (inches/light):	46 x 96 x 3/16	
Weight (lbs./light):	74	
Solar Transmission (% light):	91.3 (ASTM E424-71)	
Tensile Strength (psi):	6400	
Elastic Modulus (x10 ⁶ psi):	10.5	
Federal Specifications:	DD-G-451c & DD-G-1403b	

COVER PLATE GASKET SEAL

Material: Extruded ethylene propylene diene monomer (EPDM) channel with molded corners

Durometer (shore A): 60

Tensile Strength (psi): 2000 minimum

Elongation (%): 400 minimum

Specification: ASTM D2000 4BA520 A14 B13

Weight: 0.81 lbs (CA32-1W), 1.62 lbs (CA32-2W)

BACK PLATE

Material: 0.032" mill finish aluminum sheet

Weight: 13.0 lbs

FRAMEWALL AND BATTEN

Material: 6063-T5 aluminum extrusion

Finish: Clear anodized unless specified otherwise

Weight: 25.66 lbs (CA32-1W), 36.06 lbs (CA32-2W)

ABSORBER PLATE

Material: 1/2" nominal copper flow tubes mechanically expanded into 6063-T5 aluminum extruded wings. Flow tubes are brazed to collared 1" nominal copper headers. All wetted surfaces are copper or brass.

Flow Characteristics: "CA Series" may be specified with parallel or series flow. Internal baffles direct flow uniformly to optimize collector efficiency when mounted in the horizontal position. Vertically mounted panels require parallel flow to allow fluid drainage.

Fluid Capacity: 0.94 gallons

Surface: Assembled plate is chemically treated and coated flat black unless specified otherwise.

Solar Absorptivity: 0.98

Emissivity: 0.89

Weight: 55.6 lbs

INSULATION

Material: 1 1/4" glass reinforced isocyanurate rigid foam board with foil facings

Thermal Conductivity: 0.125 Btu-in./ft²•°F•hr

R Value: 10 (ASTM C-236)

Flame Spread Classification: 25 (ASTM E-84)

Weight: 7.0 lbs

MAXIMUM WIND LOADING: 130 mph (42.5 psf)

MAXIMUM OPERATING OR NO-FLOW TEMPERATURE: 300°F

MAXIMUM OPERATING OR NO-FLOW PRESSURE: 150 psi

RECOMMENDED FLOW RATE: 0.75 gpm

MAXIMUM FLOW RATE: 8 gpm

FLUID CONNECTIONS: Standard panel is supplied with connections at points A. Optional connections may be supplied at points B and C-D (see dimension drawing).

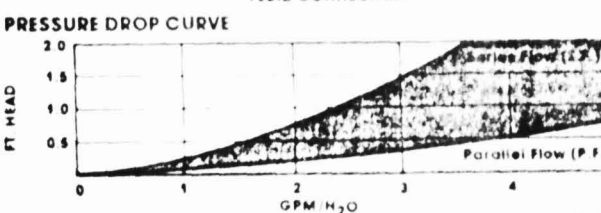
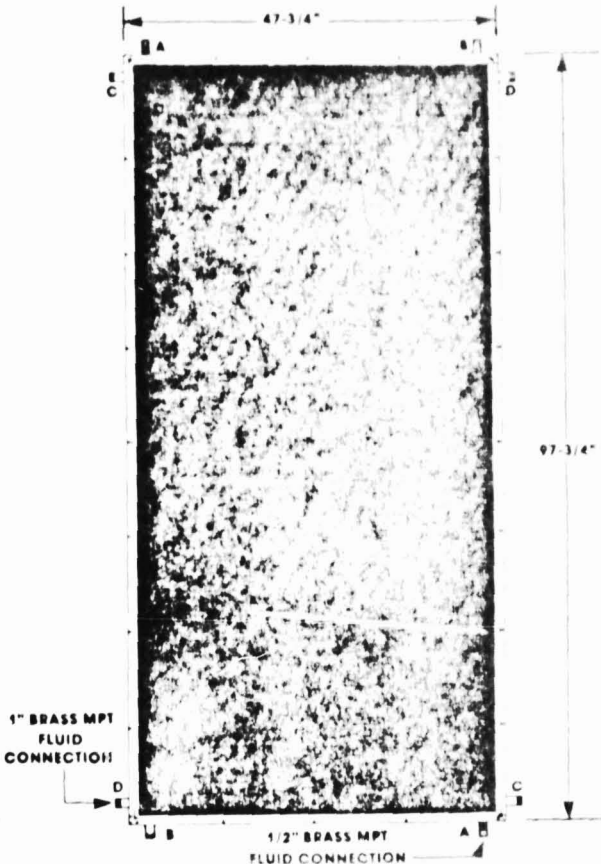
RECOMMENDED HEAT TRANSFER FLUIDS

- Domestic water (ph between 7.0 and 9.4)
- Inhibited glycol with deionized or distilled water (ph between 7.0 and 9.4)
- Silicone fluids
- Hydrocarbon oils

SPECIFICATIONS AND DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

CA32-1W 47-3/4" 23-1/4"

CA32-2W 47-3/4" 35-1/16"



OPTIONS

Glazings

- Single Water White Coverplate
- Double Water White Coverplate

Flow Characteristics

- Series Flow (Horizontal)
- Parallel Flow (Vertical)

Fluid Connections

- (2) 1/2" MPT End Outlets - AA
- (2) 1/2" MPT End Outlets - BB
- (4) 1" MPT Side Outlets - CD

FrameWall Colors

- Clear Anodize
- Black Acrylic
- Bronze Acrylic

Factory Installed Sensors

- Temperature Sensor
- High Limit Switch
- Low Limit Switch

ORDER NO.

CA32-1W-
CA32-2W-

CA32-1W-SF-
CA32-1W-PF-

CA32-1W-F-AA
CA32-1W-F-BB
CA32-1W-PF-CD-

CA32-1W-F-CL-
CA32-1W-F-BL-
CA32-1W-F-BR-

CA32-1W-F-TS-15
CA32-1W-F-HL-
CA32-1W-F-LT-



FEATURE FOR FEATURE...

The "CA-Series" SUNFIRED™ Solar Collector Panel is designed for DURABILITY, DEPENDABILITY, and COST EFFECTIVENESS.

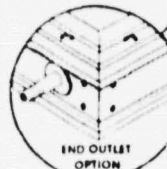
THE ABSORBER PLATE CONSISTS OF COPPER FLOW TUBES MECHANICALLY EXPANDED INTO HOLLOW ALUMINUM EXTRUDED WINGS. FOIL FACED CLOSED CELL RIGID FOAM BOARD INSULATION IS ROUTED TO RECEIVE FLOW TUBES AND MINIMIZE HEAT LOSS.



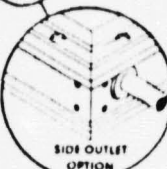
STRUCTURAL FRAMEWORK IS PRECISION MITRE-CUT AND SECURELY FASTENED TO A RIGID CORNER BRACE.



COPPER FLOW TUBES ARE BRAZED INTO INTEGRAL COLLARS DRAWN FROM COPPER HEADERS.



END OUTLET OPTION



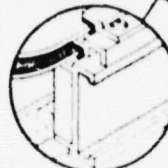
SIDE OUTLET OPTION

REMOVABLE THERMALLY ISOLATED BRASS MPT FLUID CONNECTIONS ALLOW SERVICEABILITY WHILE MINIMIZING PIPING COSTS.

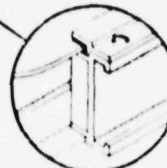
*PATENT PENDING PROCESS

THE HIGH TRANSMISSION "WATER WHITE" TEMPERED GLASS HAS A STIPPLED PATTERN WHICH GREATLY REDUCES SPECULAR REFLECTANCE AND INCREASES AESTHETIC APPEAL

LOW COST HM-200 HINGE MOUNTING SYSTEM BOLTS TOGETHER TO INTERLOCK WITH THE STRUCTURAL FRAMEWORK ALLOWING THE COLLECTOR TO BE MOUNTED AT ANY TILT ANGLE WITH STABILITY IN WIND LOADS TO 130 MPH. THE LOWER JAW OF THE HINGE MOUNT IS DESIGNED TO GRIP THE NUT AND FACILITATE SPEEDY INSTALLATIONS USING A RATCHET SOCKET DRIVER WITHOUT THE NEED FOR A BACK-UP WRENCH. INSTALLATION COSTS ARE GREATLY REDUCED THROUGH THE USE OF STANDARDIZED ENGINEERED MOUNTING SYSTEMS.



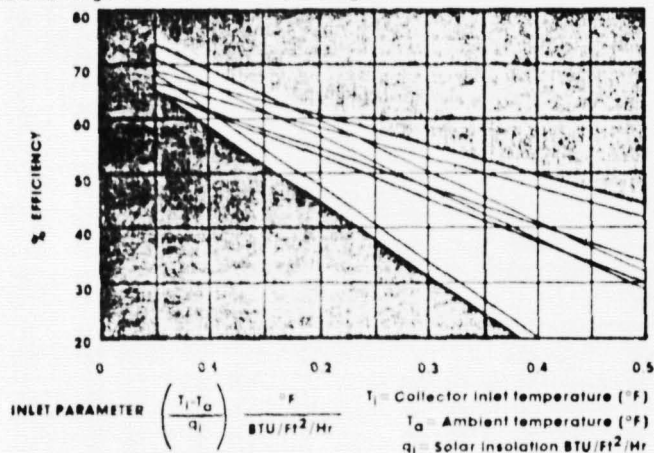
REMOVABLE COVERPLATE BATTENS ARE DESIGNED TO CLAMP THE "U" SHAPED GASKET AROUND THE COVERPLATES. SECURELY FASTEN TO THE FRAMEWORK AND SEAL OUT MOISTURE. BOTH SINGLE AND DOUBLE GLAZED OPTIONS ARE INTERCHANGEABLE.



SPECIFICATION SUMMARY: SUNFIRED™ "CA SERIES" SOLAR COLLECTOR

THERMAL PERFORMANCE CHART

The Thermal Performance Chart illustrated below is derived from statistically averaged instantaneous efficiency results of rigorous computer modeling from a broad range of environmental operating conditions.



The "CA SERIES" solar collector panel is ideally suited for medium temperature applications such as domestic hot water, process heat, spas, hot tubs, and space heat. For use in either open or closed systems, the "CA SERIES" panel will provide years of outstanding performance when integrated into a properly designed system. The CA32-1W performs best in the lower ΔT range while the CA32-2W is more efficient in the higher ΔT range (see thermal performance curve). The choice of solar collector should be determined by system performance requirements and energy system economics.

The collector panel shall be constructed with the finest quality materials and workmanship. The overall dimensions shall be approximately 4' x 8'. The coverplate(s), gasket seal, absorber plate and insulation shall be site replaceable with the use of hand tools.

The coverplate shall be 3/16" tempered water white glass with a minimum transmissivity of 0.9 per cover and shall comply with the requirements of federal specifications DD-G-451c and DD-G-1403b for fully tempered glass. The coverplate shall be sealed with a continuous "U" shaped gasket and the batten secured with stainless steel nut and bolt type fasteners to allow service of the collector and absorber plate from the front.

The absorber plate shall consist of six hollow extruded aluminum wings with 1/2" nominal copper tubes mechanically expanded inside thereby providing intimate bonding for the entire flow tube surface. The absorber shall be coated with a high absorptivity flat black paint and baked to provide a durable, long lasting absorber surface. The flow tubes shall be brazed into integral collars drawn from 1" nominal copper pipe headers. The absorber plate shall allow fluid drainage for freeze protection and shall allow working pressures to 150 psi. Panel fluid connections shall be removable brass pipe threads thermally isolated from the frame. The collector shall be insulated with foil faced closed cell rigid foam board with a R value of 10. The collector back plate shall be a 0.032" aluminum sheet secured to the frame with stainless steel fasteners. Framework shall be 6063-T5 anodized aluminum extrusion with a continuous mounting flange that interlocks with a standardized, structurally certified mounting system capable of withstanding wind loads to 130 mph when properly mounted.

The solar collector panel shall be capable of thermal performance stability with periodic stagnation temperatures to 300°F for a minimum service life of thirty (30) years.



Solar Energy Products, Inc.

SUNFIRED™ "SC SERIES" SC19-1W SC19-2W

OUTSIDE DIMENSIONS (inches):	35.75x77.75x4.50	35.75x77.75x5.06
GROSS PROJECTED AREA (sq. ft.):	19.26	19.26
NET APERTURE AREA (sq. ft.):	17.38	17.38
DRY WEIGHT (lbs.):	113	150
COVER PLATE:	Single Glazed	Double Glazed
Lights Per Panel:	1	2
Material:	Tempered Water White Glass	
Dimensions (inches/light):	34 x 76 x 1/8	
Weight (lbs./light):	29	
Solar Transmission (%/light):	91.6 (ASTM E424-71)	
Tensile Strength (psi):	6400	
Elastic Modulus (x 10 ⁶ psi):	10.5	
Federal Specifications:	DD-G-451e & DD-G-1403b	

COVER PLATE GASKET SEAL

Material: Extruded ethylene propylene diene monomer (EPDM) channel with molded corners

Durometer (shore A): 60

Tensile Strength (psi): 2000 minimum

Elongation (%): 400 minimum

Specification: ASTM D2000 4BA620 A14 B13

Weight: 0.9 (SC19-1W), 1.8 lbs. (SC19-2W)

BACK PLATE

Material: 0.032" mill finish aluminum sheet

Weight: 8.1 lbs.

FRAMEWALL AND BATTEN

Material: 6063-15 aluminum extrusion

Finish: Clear anodized unless specified otherwise

Weight: 26 lbs. (SC19-1W), 34 lbs. (SC19-2W)

ABSORBER PLATE

Material: 2 sheets of .020 inch 122 copper metallurgically bonded by The Roll-Bond® process. All flow tubes and headers are integrally formed to insure uniform flow distribution and maximum wetted surface area.

Fluid Capacity: 0.48 gallons

Surface: Absorber plate is chemically treated and electroplated with a thin film of selective surface black chrome

Solar Absorptivity: 0.95

Emissivity: 0.10

Weight: 32 lbs.

INSULATION

Material: 1" unbonded borosilicate fiber blanket over 2" glass reinforced isocyanurate rigid foam board with foil facings

R Value: 20 (ASTM C-236)

Flame Spread Classification: 25 (ASTM E-84)

Weight: 17 lbs.

MAXIMUM WIND LOADING: 130 mph (42.5 psf)

MAXIMUM OPERATING OR NO-FLOW TEMPERATURE: 400°F

MAXIMUM OPERATING OR NO-FLOW PRESSURE: 125 psi

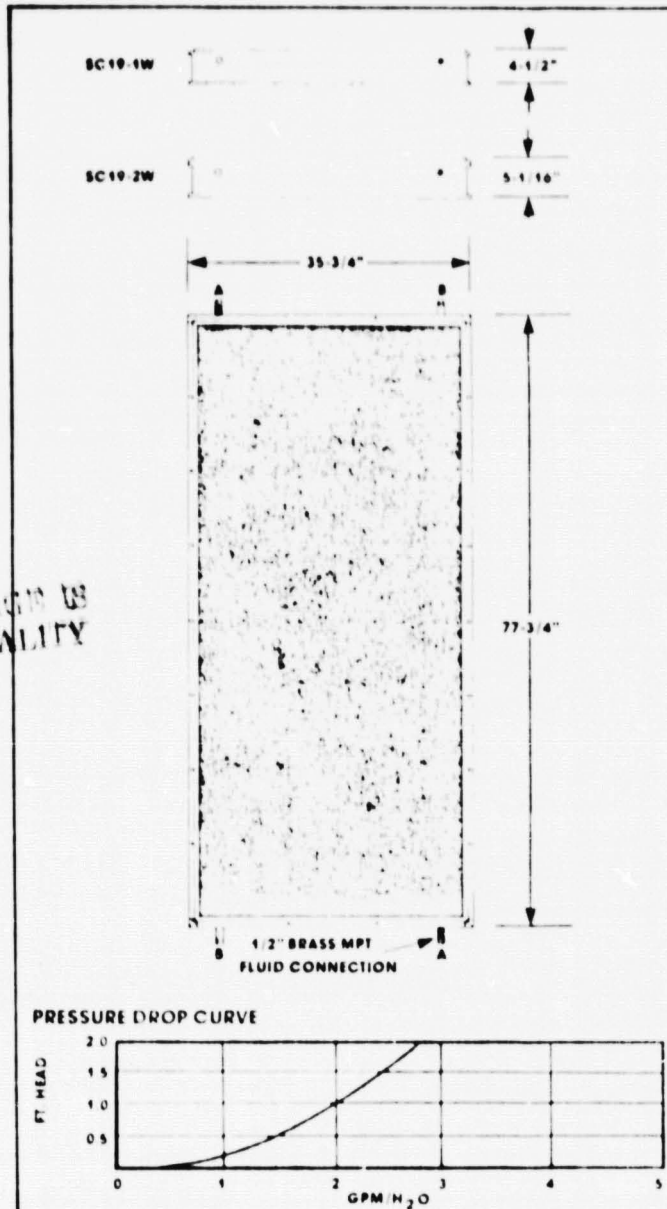
RECOMMENDED FLOW RATE: 0.50 gpm

MAXIMUM FLOW RATE: 5 gpm

RECOMMENDED HEAT TRANSFER FLUIDS

- Domestic water (ph between 7.0 and 9.4)
- Inhibited glycol with deionized or distilled water (ph between 7.0 and 9.4)
- Silicone fluids
- Hydrocarbon oils

DESIGN LIFE: Material selection and design consideration allows for an expected service life of thirty (30) years when collector is maintained and operated properly.



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SPECIFICATIONS AND DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.

• Registered Trademark of OLIN BRASS

OPTIONS

Glazings

- Single Water White Coverplate
- Double Water White Coverplate

Flow Characteristics

- (33) Parallel Flow Tubes

Fluid Connections

- (2) 1/2" MPT End Outlets - AA
- (2) 1/2" MPT End Outlets - BB

FrameWall Colors

- Clear Anodize
- Black Acrylic
- Bronze Acrylic

Factory Installed Sensors

- Temperature Sensor
- High Limit Switch
- Low Limit Switch

ORDER NO.

SC19-1W

SC19-2W

SC19-1W-PF

SC19-1W-PF-AA

SC19-1W-PF-BB

SC19-1W-PF-C-L

SC19-1W-PF-B-L

SC19-1W-PF-B-R

SC19-1W-PF-T-S

SC19-1W-PF-H-L

SC19-1W-PF-L-L



FEATURE FOR FEATURE...

The "SC-Series" SUNFIRED™ Solar Collector Panel is designed for DURABILITY, DEPENDABILITY, and COST EFFECTIVENESS

THE ABSORBER PLATE CONSISTS OF 0.040 INCH COPPER WITH 33 INTEGRALLY FORMED PARALLEL FLOW TUBES DESIGNED TO EVENLY DISTRIBUTE FLOW AND ALLOW FLUID DRAINAGE. A BLACK CHROME SELECTIVE SURFACE IS USED TO MAXIMIZE COLLECTOR EFFICIENCY AT HIGH TEMPERATURES. FOUR LAYERS OF UNBONDED BOROSILICATE FIBER INSULATION IS COMBINED WITH A FOIL FACED CLOSED CELL RIGID FOAM BOARD TO PROVIDE A MINIMUM R VALUE OF 20.

THE STRUCTURAL FRAMEWORK IS PRECISION MITRE-CUT AND SECURELY FASTENED TO A RIGID ALUMINUM CORNER BRACE. FLUID CONNECTIONS ARE REMOVABLE THERMALLY ISOLATED 1/2" NOMINAL BRASS PIPE NIPPLES THREADED INTO A 1/2" FEMALE PIPE THREAD ADAPTER INTEGRALLY BRAZED TO THE ABSORBER PLATE.

REMOVABLE COVERPLATE BATTENS ARE DESIGNED TO CLAMP THE "U" SHAPED GASKET AROUND THE COVERPLATES TO SECURELY FASTEN TO THE FRAMEWORK AND SEAL OUT MOISTURE. BOTH SINGLE AND DOUBLE GLAZED OPTIONS ARE INTERCHANGEABLE.

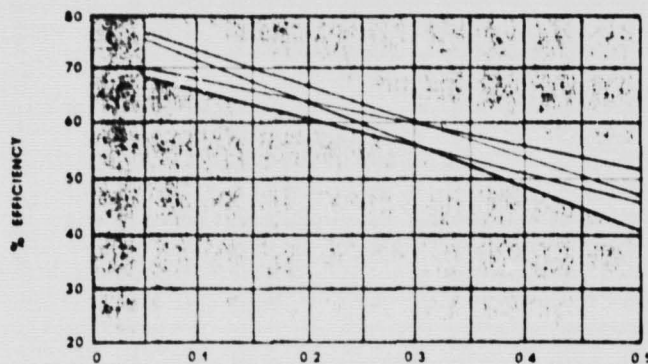
THE HIGH TRANSMISSION "WATER WHITE" TEMPERED GLASS HAS A STIPPLED PATTERN WHICH GREATLY REDUCES SPECULAR REFLECTANCE AND INCREASES AESTHETIC APPEAL.

LOW COST HM-200 HINGE MOUNTING SYSTEM BOLTS TOGETHER TO INTERLOCK WITH THE STRUCTURAL FRAMEWORK ALLOWING THE COLLECTOR TO BE MOUNTED AT ANY TILT ANGLE WITH STABILITY IN WIND LOADS TO 130 MPH. THE LOWER JAW OF THE HINGE MOUNT IS DESIGNED TO GRIP THE NUT AND FACILITATE SPEEDY INSTALLATIONS USING A BATCHET SOCKET DRIVER WITHOUT THE NEED FOR A BACK-UP WRENCH. INSTALLATION COSTS ARE GREATLY REDUCED THROUGH THE USE OF STANDARDIZED ENGINEERED MOUNTING SYSTEMS.

SPECIFICATION SUMMARY: SUNFIRED™ "SC SERIES" SOLAR COLLECTOR

THERMAL PERFORMANCE CHART

The Thermal Performance Chart illustrated below is derived from statistically averaged instantaneous efficiency results of rigorous computer modeling from a broad range of environmental operating conditions.



INLET PARAMETER $\left(\frac{T_1 - T_a}{q_i} \right) \frac{^\circ\text{F}}{\text{BTU/ft}^2/\text{hr}}$

T_1 = Collector inlet temperature (°F)
 T_a = Ambient temperature (°F)
 q_i = Solar Insolation BTU/ft²/hr

The "SC SERIES" solar collector panel is ideally suited for medium-high temperature applications such as space heat, space cooling, refrigeration and process heat. Typically used in a closed loop collection system, the SC19-1W performs best in the lower ΔT range while the SC19-2W is more efficient in the higher ΔT range (see thermal performance curve). The choice of solar collector should be determined by system performance requirements and energy system economics.

The collector panel shall be constructed with the finest quality materials and workmanship. The overall dimensions shall be approximately 3' x 7'. The coverplate(s), gasket seal, absorber plate and insulation shall be site replaceable with the use of hand tools.

The coverplate(s) shall be 1/8" tempered water white glass with a minimum transmissivity of 0.9 per cover and shall comply with the requirements of federal specifications DD-G-451c and DD-G-1403b for fully tempered glass. The coverplate shall be sealed with a continuous "U" shaped gasket and the batten secured with stainless steel nut and bolt type fasteners to allow service of the collector and absorber plate from the front.

The absorber plate shall be made of 0.040" copper with 33 integrally formed parallel flow tubes interconnected with an integral header designed to evenly distribute fluid flow. The absorber plate shall have a selective surface of Black Chrome with a minimum absorptivity of 0.95 and a maximum emissivity of 0.10. The absorber plate shall allow fluid drainage for freeze protection and withstand fluid pressures to 150 psi. Fluid connections shall be removable brass pipe threads thermally isolated from the frame. The collector shall be insulated with a combination of unbonded borosilicate fiber blanket layered on foil faced closed cell rigid foam board to provide a minimum R value of 20. The collector back plate shall be 0.032" aluminum sheet secured to the frame with stainless steel fasteners. Framework shall be 6063-T5 anodized aluminum extrusion with a continuous mounting flange that interlocks with a standardized, structurally certified mounting system capable of withstanding wind loads to 130 mph when properly mounted.

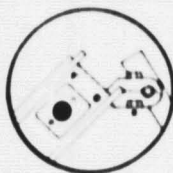
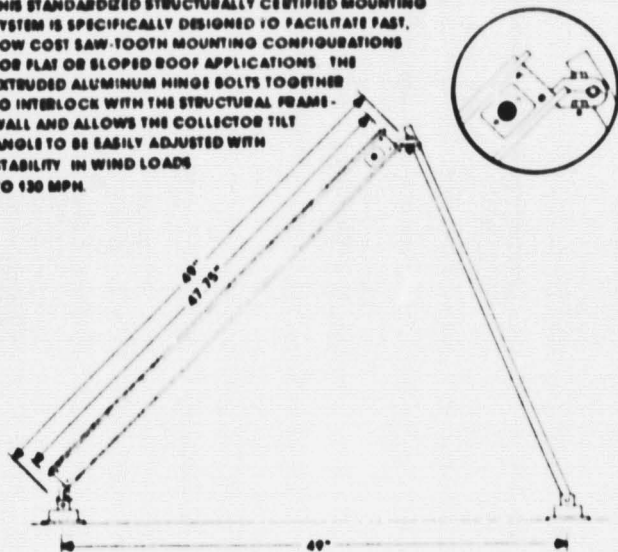
The solar collector panel shall be capable of thermal performance stability with periodic stagnation temperatures to 400°F.



Solar Energy Products, Inc.

HM-200 HINGE MOUNTING SYSTEM

THIS STANDARDIZED STRUCTURALLY CERTIFIED MOUNTING SYSTEM IS SPECIFICALLY DESIGNED TO FACILITATE FAST, LOW COST SAW-TOOTH MOUNTING CONFIGURATIONS FOR FLAT OR SLOPED ROOF APPLICATIONS. THE EXTRUDED ALUMINUM HINGE BOLTS TOGETHER TO INTERLOCK WITH THE STRUCTURAL FRAME-WALL AND ALLOWS THE COLLECTOR TILT ANGLE TO BE EASILY ADJUSTED WITH STABILITY IN WIND LOADS TO 130 MPH.



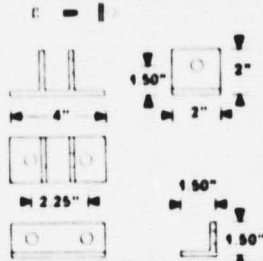
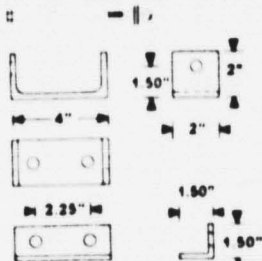
HM-211 FRONT HINGE

HM-221 REAR HINGE

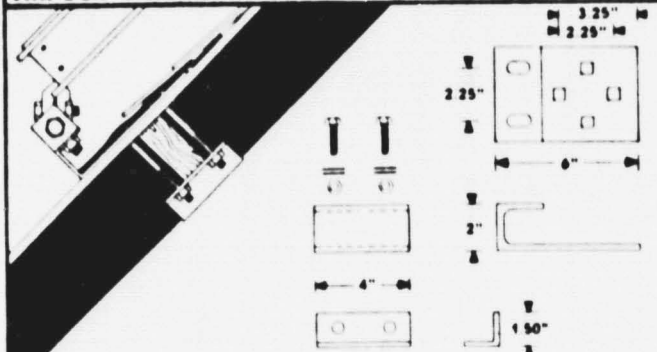


HM-212 FRONT MOUNT

HM-223 REAR MOUNT

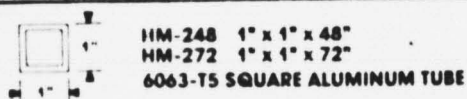


HM-234 J-BRACKET™ ROOF MOUNT



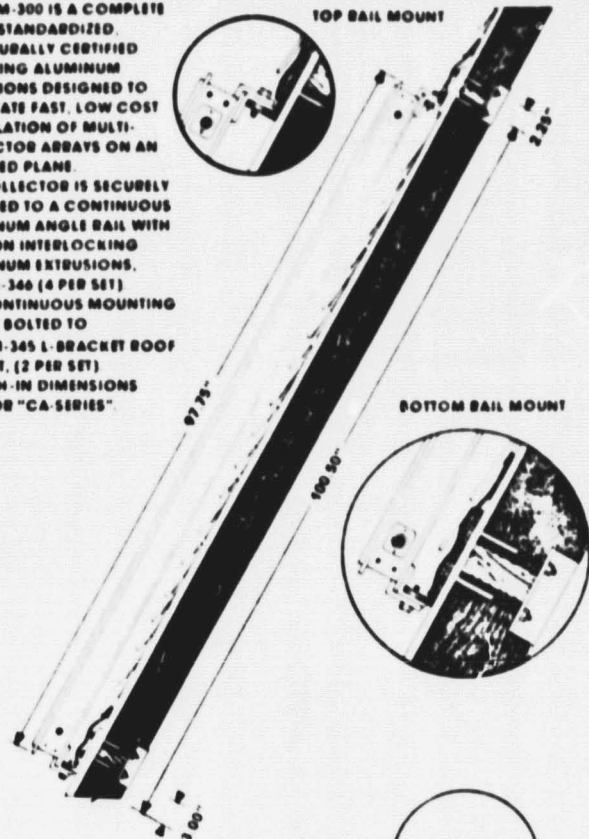
THE J-BRACKET™ IS DESIGNED TO ALLOW OVERLAP FLASHING OF COLLECTOR MOUNT ROOF PENETRATIONS ON INCLINED ROOFS

STANDOFFS

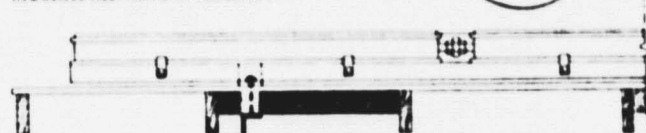


RM-300 RAIL MOUNTING SYSTEM

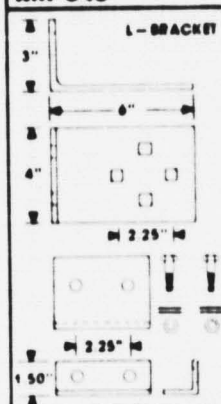
SEP'S RM-300 IS A COMPLETE SET OF STANDARDIZED, STRUCTURALLY CERTIFIED MATCHING ALUMINUM EXTRUSIONS DESIGNED TO FACILITATE FAST, LOW COST INSTALLATION OF MULTI-COLLECTOR ARRAYS ON AN INCLINED PLANE. THE COLLECTOR IS SECURELY FASTENED TO A CONTINUOUS ALUMINUM ANGLE RAIL WITH BOLT-ON INTERLOCKING ALUMINUM EXTRUSIONS. NO RM-346 (4 PER SET) THE CONTINUOUS MOUNTING RAIL IS BOLTED TO NO RM-345 L-BRACKET ROOF MOUNT. (2 PER SET) ROUGH-IN DIMENSIONS ARE FOR "CA-SERIES".



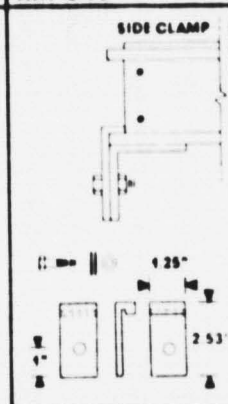
SIDE OUTLETS ALLOW COLLECTOR HEADERS TO BE INTERCONNECTED TO MINIMIZE PIPING COSTS AND INCREASE AESTHETIC APPEARANCE



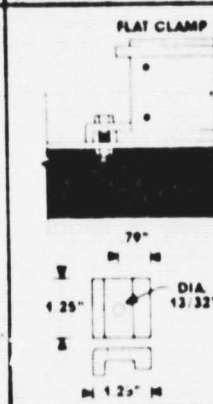
RM-345



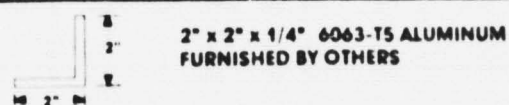
RM-346

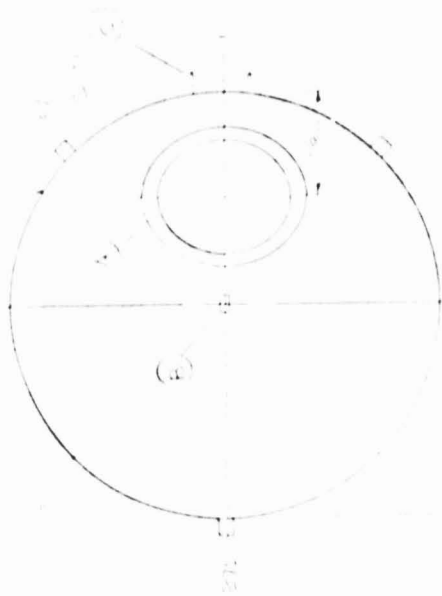


RM-347



CONTINUOUS MOUNTING RAIL





FRP TANK

NO.	DESCRIPTION	LOCATION	DATE
1	FRP TANK	INDUSTRIAL AREA	1/1/79
2	FRP TANK	INDUSTRIAL AREA	1/1/79
3	FRP TANK	INDUSTRIAL AREA	1/1/79
4	FRP TANK	INDUSTRIAL AREA	1/1/79
5	FRP TANK	INDUSTRIAL AREA	1/1/79
6	FRP TANK	INDUSTRIAL AREA	1/1/79
7	FRP TANK	INDUSTRIAL AREA	1/1/79
8	FRP TANK	INDUSTRIAL AREA	1/1/79
9	FRP TANK	INDUSTRIAL AREA	1/1/79
10	FRP TANK	INDUSTRIAL AREA	1/1/79

CERTIFIED FOR

CONSTRUCTION

DESIGN DATA

DESIGNER: 1000 S.W. 10th St. SUITE 200
 PROJECT: 1000 S.W. 10th St. SUITE 200
 DRAWING NO.: 1000 S.W. 10th St. SUITE 200
 SHEET NO.: 1000 S.W. 10th St. SUITE 200

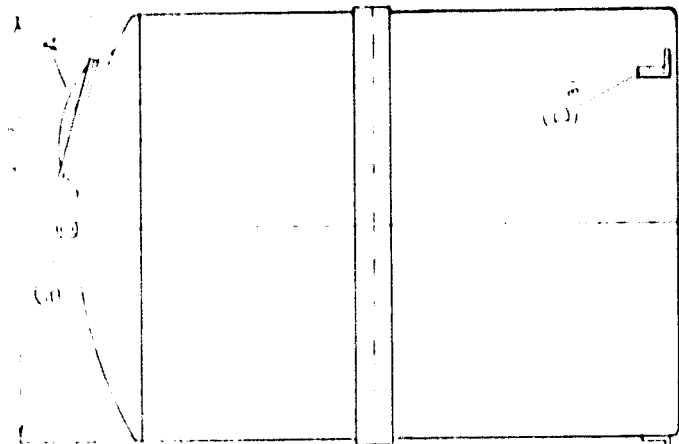
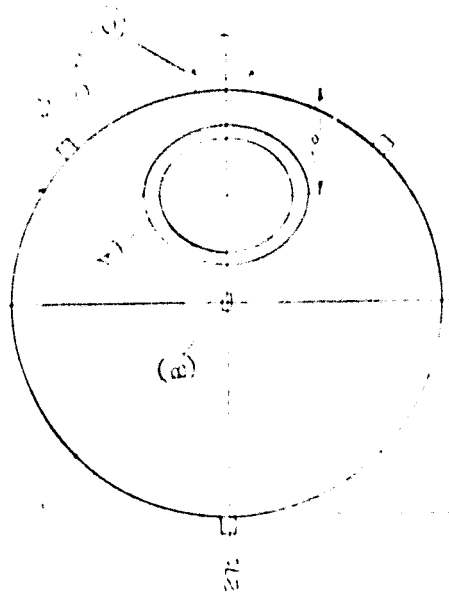
CONSTRUCTION DATA

APPROX. VOLUME: 1000 GAL
 DESIGN: 1000 S.W. 10th St. SUITE 200
 MATERIAL: 1000 S.W. 10th St. SUITE 200
 MANUFACTURER: 1000 S.W. 10th St. SUITE 200
 INSTALLATION: 1000 S.W. 10th St. SUITE 200
 INSULATION: 1000 S.W. 10th St. SUITE 200
 FINISH: 1000 S.W. 10th St. SUITE 200

BEDEN-BAUGH PRODUCTS, Inc.
 1000 S.W. 10th St. SUITE 200
 MIAMI, FL 33135
 PHONE: (305) 351-1111
 FAX: (305) 351-1112

DATE: 1/1/79
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]

FRP TANK 79-045



DATE	LOCATION	PKT.
10/15/78	INDIA A 02	1
10/15/78	INDIA B 01	1
10/15/78	INDIA C 01	1
10/15/78	INDIA D 01	1
10/15/78	INDIA E 01	1
10/15/78	INDIA F 01	1
10/15/78	INDIA G 01	1
10/15/78	INDIA H 01	1
10/15/78	INDIA I 01	1
10/15/78	INDIA J 01	1
10/15/78	INDIA K 01	1
10/15/78	INDIA L 01	1
10/15/78	INDIA M 01	1
10/15/78	INDIA N 01	1
10/15/78	INDIA O 01	1
10/15/78	INDIA P 01	1
10/15/78	INDIA Q 01	1
10/15/78	INDIA R 01	1
10/15/78	INDIA S 01	1
10/15/78	INDIA T 01	1
10/15/78	INDIA U 01	1
10/15/78	INDIA V 01	1
10/15/78	INDIA W 01	1
10/15/78	INDIA X 01	1
10/15/78	INDIA Y 01	1
10/15/78	INDIA Z 01	1

CERTIFIED FOR CONSTRUCTION
 MAP 20-219

DESIGN DATA
 CAPACITY 1000 GAL
 DIA. INSIDE 24.00
 DIA. OUTSIDE 24.12
 LENGTH 24.00
 STRAINING TIME 182 F
 PRESSURE 100 PSI
 HEIGHT 1.2

CONSTRUCTION DATA
 JAWNIT VRS 1509
 TYPE OF RESIN BARRIER GOM 518
 TYPE OF RESIN ATLAS 382-USA
 TYPE OF FABRIC ATLAS 382-USA
 TYPE OF FABRIC ISOTHRAL
 TYPE OF FABRIC C-GLASS
 INSULATION TYPE 1/2" STYREFOAM
 TYPE OF FABRIC 1/2" THICKNESS
 EST. WEIGHT

BEDEN-DRUGH PRODUCTS, INC.
 101 S. GARDEN STREET, SUITE 100, GARDEN CITY, N.Y. 11530
 PHONE (516) 461-1111
 FAX (516) 461-1112
 TELEX 980000
 CABLE BEDEN
 BOSTON OFFICE: 100 STATE STREET, SUITE 100, BOSTON, MA 02109
 PHOENIX OFFICE: 1000 N. CENTRAL AVENUE, SUITE 100, PHOENIX, AZ 85004
 SAN ANTONIO OFFICE: 1000 N. CENTRAL AVENUE, SUITE 100, SAN ANTONIO, TX 78204
 TAMPA OFFICE: 1000 N. CENTRAL AVENUE, SUITE 100, TAMPA, FL 33604
 WASHINGTON OFFICE: 1000 N. CENTRAL AVENUE, SUITE 100, WASHINGTON, DC 20004
 WICHITA OFFICE: 1000 N. CENTRAL AVENUE, SUITE 100, WICHITA, KS 67202
 YUKON OFFICE: 1000 N. CENTRAL AVENUE, SUITE 100, YUKON, AK 99581

DATE: 10/22/78
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 APPROVED BY: [Signature]
 PROJECT: FRP TANK
 DRAWING NUMBER: 79-045



DOMESTIC HOT WATER SYSTEMS WARRANTY

SYSTEM WARRANTY

Solar Energy Products, Inc. warrants its Solar Domestic Hot Water Systems with the following conditions and limitations:

A. Conditions of System Warranty

1. This warranty is extended to consumers who purchase Solar Domestic Hot Water Systems directly from **SEP** or from any of **SEP's** Authorized Dealerships and to all subsequent owners of these systems, so long as the system remains in its original installation.
2. This warranty covers **Authorized** installations only when they are installed, operated and maintained according to the procedures described in the **SEP Installation, Operation and Maintenance Manual** and the **Authorized SEP Dealer Policy Manual**.
3. This warranty covers **Unauthorized** installations only when they are installed, operated and maintained according to the procedures described in the **SEP Installation, Operation and Maintenance Manual**.
4. The **Warranty Registration Card** for Solar Domestic Hot Water Systems must be completed and completed by the Purchaser and the Installer and returned to the Purchaser within (10) days of the completion of each of the Warranty Validation Inspections.
5. The **Warranty Validation Inspection** form must be completed by the Installer, approved by the Purchaser and returned within (10) days of completion of each of the Warranty Validation Inspections.

B. Coverage of System Warranty

1. Authorized Installations

Warranty applies when the system is installed by an Authorized **SEP Dealer**, properly licensed to install Solar Domestic Hot Water Systems:

- a. **One year full warranty** from date of initial installation completion against failure of the Solar System, including any component or assembly where such failure is caused by a defect in materials, manufacture, installation, or corrosion of the absorber plate or coolant passages. This warranty covers the full cost of parts, labor and shipping (to the site), handling (necessary to remedy the defect), replacement of the site (if necessary), and field inspection (within a reasonable time of the complaint to verify failure, establish probable cause, and determine corrective action by the **Authorized SEP Dealer**.)

2. Unauthorized Installations

Warranty applies when the system is installed by a properly licensed contractor, but **not** by an **Authorized SEP Dealer**.

- a. **One year limited warranty** from date of initial installation completion against failure of the solar system, including any component or assembly where such failure is caused by a defect in materials, manufacture, or corrosion of the absorber plate or coolant passages. This warranty covers the full cost of all parts and shipping (to the site).

3. Unwarranted Installations

System is installed by unlicensed personnel and/or those with no building permit.

II. COMPONENTS WARRANTY

SEP co. warrants the following components, along with each component's manufacturer. Please refer to the manufacturer's warranty cards:

Collector Limited Warranty

Solar Energy Products, Inc. warrants the Solar Energy Products, Inc. Collector including any component or assembly for a period of **five years** from date of installation against failure of the collector caused

by a defect in materials or manufacture, but not glass breakage. The warranty covers the full cost of all parts, labor, shipping (to the site), handling (necessary to remedy defect), replacement of the site (if necessary) and is unaffected by change of ownership as long as the collector remains in the original installation.

NOTE: Collector is not warranted against damage from exposure to freeze conditions.

B. Absorber Plate and Coolant Passages

Solar Energy Products, Inc. warrants the Solar Energy Products, Inc. Collector absorber plate and coolant passages for a period of **five years** from the date of installation, against failure due to corrosion **ONLY** when, in Closed Systems original fluid and any makeup consists of 50/50 mixture of Prestone II[®] manufactured by Union Carbide Corp. (or any copper compatible heat exchange fluid as determined by the Copper Development Association) and distilled water or water, testing from 9.4 to 7.0 ph. In Open Systems water having a ph between 9.4 and 7.0 is acceptable. This warranty covers, for the first year only, the full cost of all parts (including the cost of furnishing a new absorber plate), labor, shipping (to the site), handling (necessary to remedy the defect) and replacement of the site (if necessary). The warranty covers for the **second through fifth years** the full cost of all parts (including the cost of furnishing a new absorber plate), labor and shipping to the site. The warranty goes with the collector and is unaffected by change of ownership so long as the collector remains in the original installation.

C. Differential Controls Limited Warranty

Solar Energy Products, Inc., and Hawthorne Industries warrant Solar Energy Products, Inc. differential controls for a period of **one year** from date of purchase against failure due to defect in materials or manufacture, provided that the product has not been repaired, serviced, altered, subjected to misuse, neglect, accident or improper installation (by anyone other than the manufacturer). This warranty covers the full cost of parts, labor and shipping, and is unaffected by change in ownership, so long as the controller remains in the original installation.

D. Pumps Limited Warranty

Solar Energy Products, Inc., and Grundfos Corp. warrant all Grundfos Pumps sold by Solar Energy Products, Inc. for a period of **eighteen months** from date of purchase against failure caused by defect in materials or manufacture, provided that they are properly installed and used with manufacturer's recommendations, and have not been repaired or altered outside the Grundfos Pumps Corporation factory. This warranty covers the full cost of all parts, labor and shipping and is unaffected by the change in ownership, so long as the pump remains in its original installation.

E. Storage Tanks and Storage Tanks With Built-In Heat Exchangers Limited Warranty

Solar Energy Products, Inc., Mor-Flo Industries, Inc., Ruid Manufacturing Co. and Rheem Manufacturing Co. warrant storage tanks and storage tanks with built-in heat exchangers sold by Solar Energy Products, Inc., for a period of **five years** from date of completion of installation against failure caused by defect in material, manufacture, or natural corrosion provided that the heat exchanger solution is maintained per instructions. This warranty covers the full cost of parts, labor and shipping and is unaffected by change in ownership, so long as the storage tanks and storage tanks with built-in heat exchangers remain in their original installations.

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III. AUTHORIZED SEP DEALER WARRANTY REQUIREMENTS

Authorized SEP Dealers are responsible and obligated to comply with all local, state and federal consumer warranty requirements.

Installations must be performed by properly licensed personnel in accordance with all known governing building ordinances.

Authorized SEP Dealers are responsible and obligated to be adequately insured for all liability requirements.

Authorized SEP Dealers are responsible and obligated to perform 30 day warranty inspections and 365 day inspection at the end of 365 days of system operations.

WARRANTY SCHEDULE FOR SOLAR ENERGY PRODUCTS, INC., DOMESTIC HOT WATER SYSTEMS

ITEM	System Including All Components and Assemblies		Collector	Absorber Plate Coolant Passages Collector		Differential Controls	Pumps	Storage Tank and Heat Exchanger
	WARRANTOR	Authorized Dealer/Installer		Mfg Vendor	Mfg Vendor		Mfg Vendor	Mfg Vendor
WARRANTOR'S NAME			SEP	SEP		Hawthorne, SEP	Grundfos, SEP	Mor-Flo, RHEEM, SEP
INSTALLATION	Auth	Unauth						
WARRANTY PERIOD	1 yr	1 yr	5 yrs	1 yr	2-5 yrs	1 yr*	18 mos*	5 yrs*
WARRANTY COVERS FAILURE DUE TO:								
Defect Material	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manufacture,	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Installation,	Yes	No	No	No	No	No	No	No
CORROSION:								
Absorber & Passages	Yes	Yes	No	Yes*	Yes*			
COSTS COVERED BY WARRANTY:								
Parts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labor	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Shipping	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Handling	Yes	No	Yes	Yes	No	No	No	No
Inspection	Yes	No	No	No	No	No	No	No
Replace at Site	Yes	No	Yes	Yes	No	No	No	No
SUBSEQUENT OWNER COVERED	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Not warranted when damage is caused by use of unacceptable transfer fluid

WARRANTOR'S NAME

Solar Energy Products, Inc
Grundfos Pumps Corporation
Mor Flo Industries, Inc
RHEEM Water Heating Division, City Inv. Co
RUUD Water Heating Division, City Inv. Co

ADDRESS

1208 N.W. 8th Avenue, Gainesville, FL 32601
2555 Clovis Avenue, Clovis, CA 93612
18450 South Miles Road, Cleveland, OH 44128
7600 South Kedzie Avenue, Chicago, IL 60652
7600 South Kedzie Avenue, Chicago, IL 60652

PHONE

(904) 377-6527
(209) 299-9727
(216) 663-7323
(312) 434-7527
(312) 434-7527

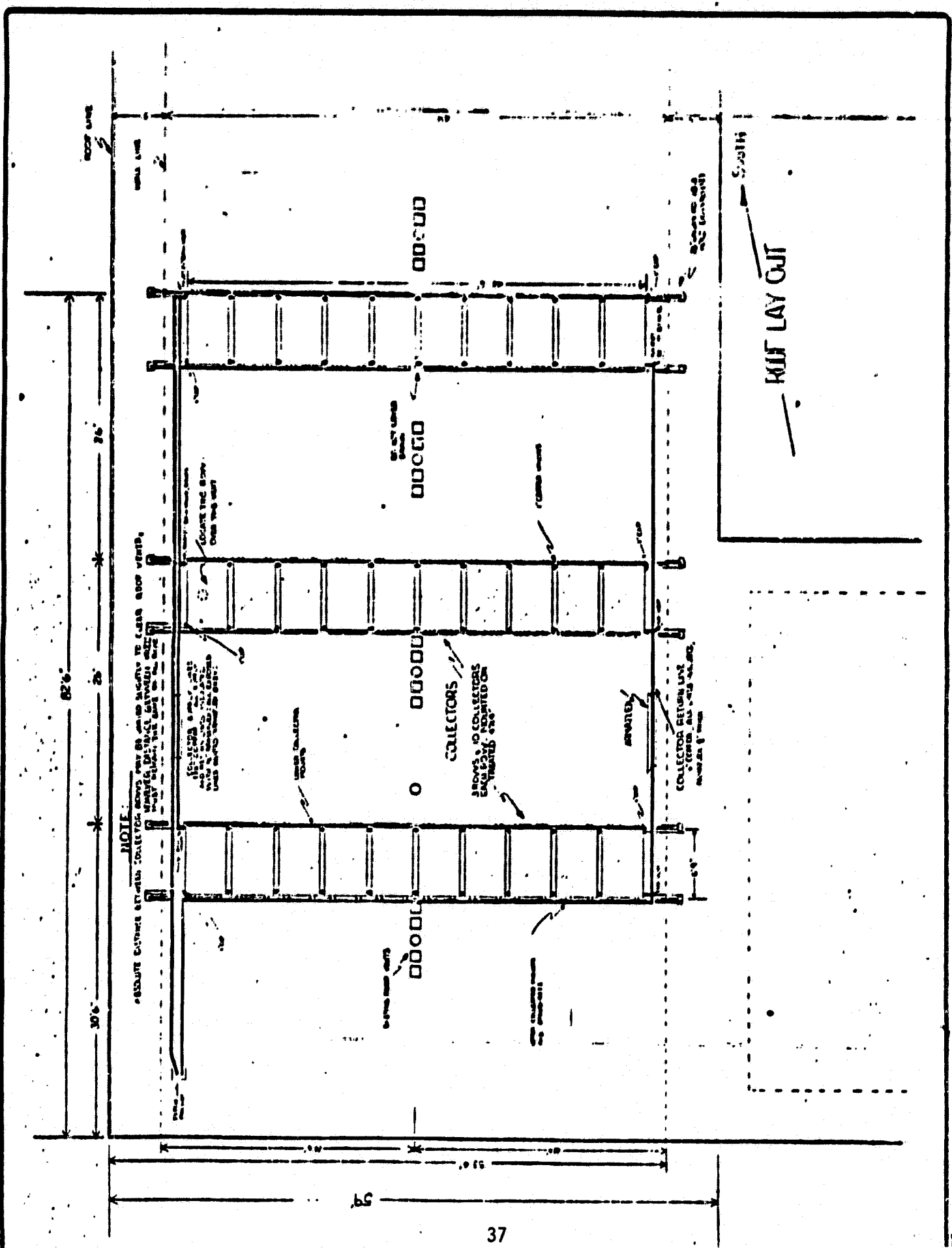


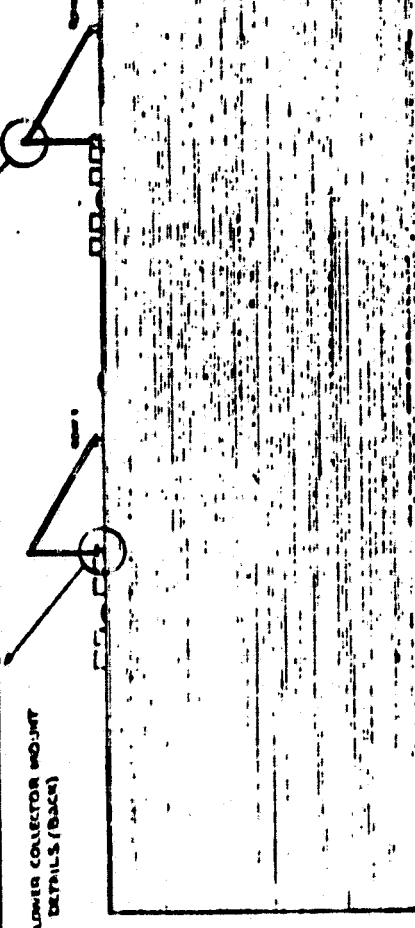
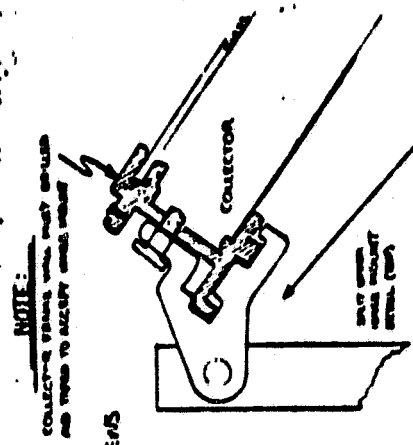
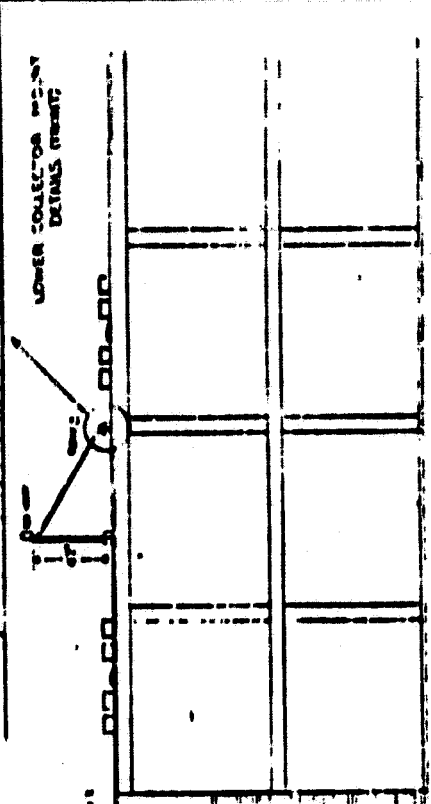
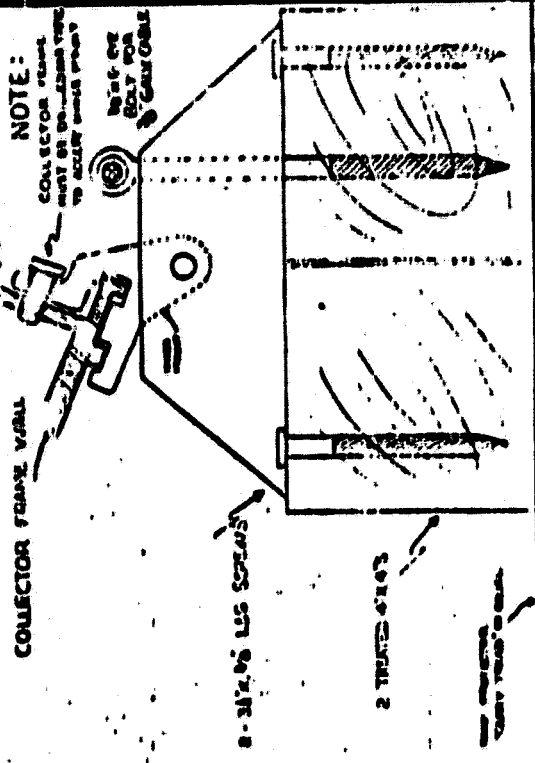
Solar Energy Products, Inc.

Supplier of Solar Energy Equipment

1208 N.W. 8th Avenue • Gainesville, FL 32601 • (904) 377-6527

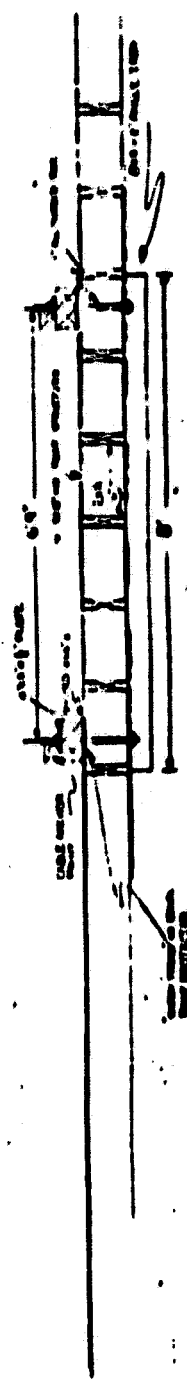
NO.	DATE	REVISION





EAST

CABLE HOLD DOWN DETAIL

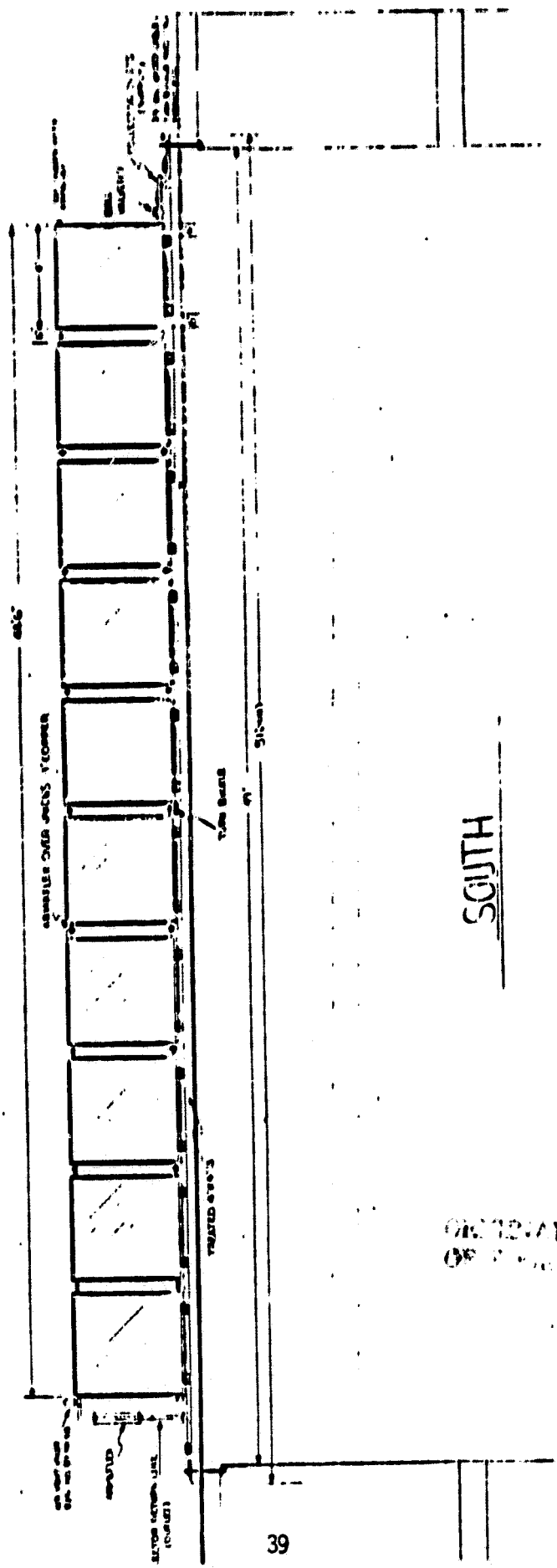


ORIGINAL PAGE 2 OF FOUR QUALITY

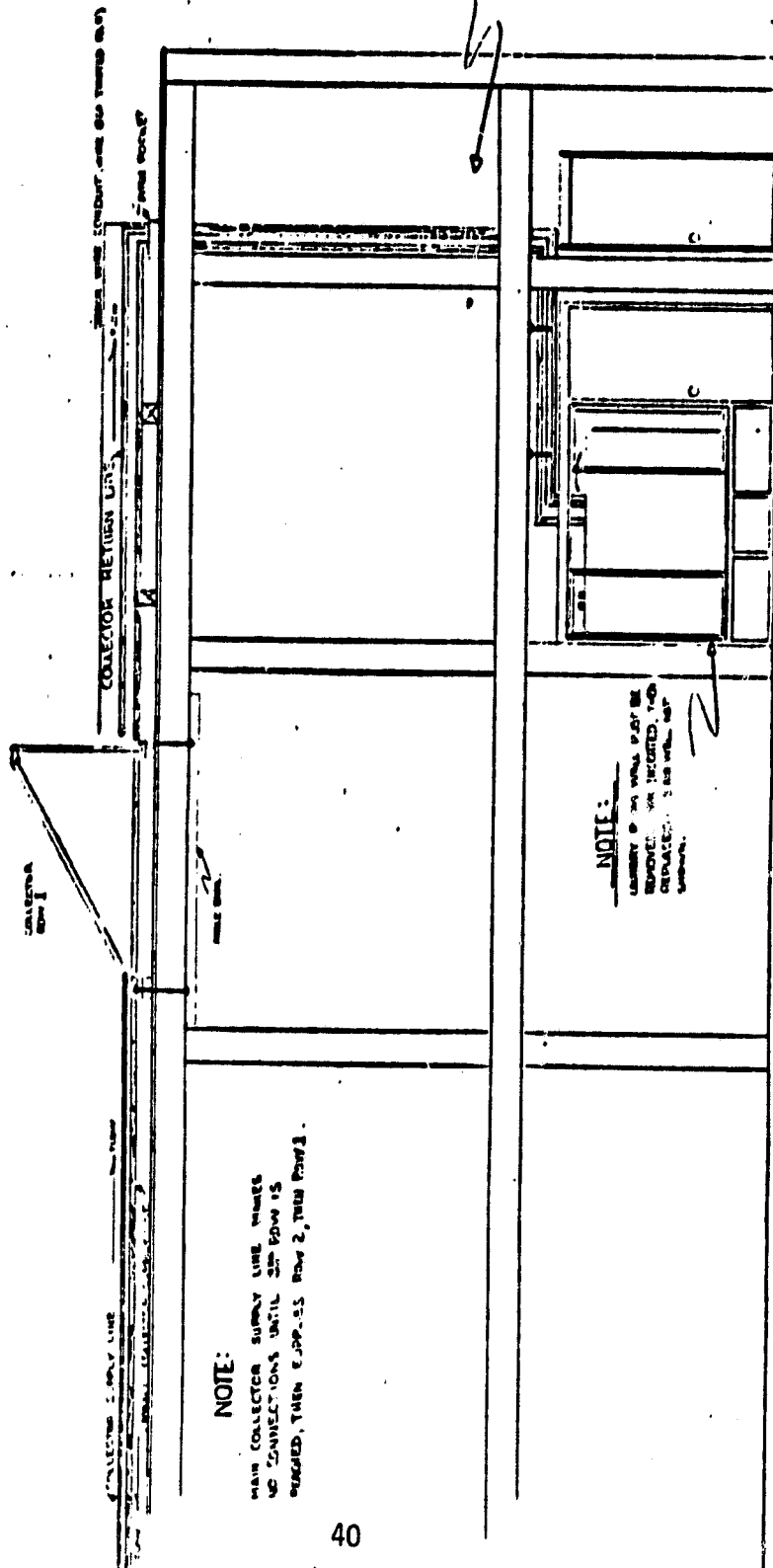
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COLUMBIAN HOTEL SYSTEM FOR DAYS INN HOTEL BUILD
1110 N. W. 10th St. Miami, Fla. 33136

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ORIGINAL PLAN OF



NOTE:

MAIN COLLECTOR SUPPLY LINE MAKES NO CONNECTIONS UNTIL 2ND FLOOR IS RIGGED, THEN E.J.P.-SS FROM 2, THEN FROM 1.

NOTE:

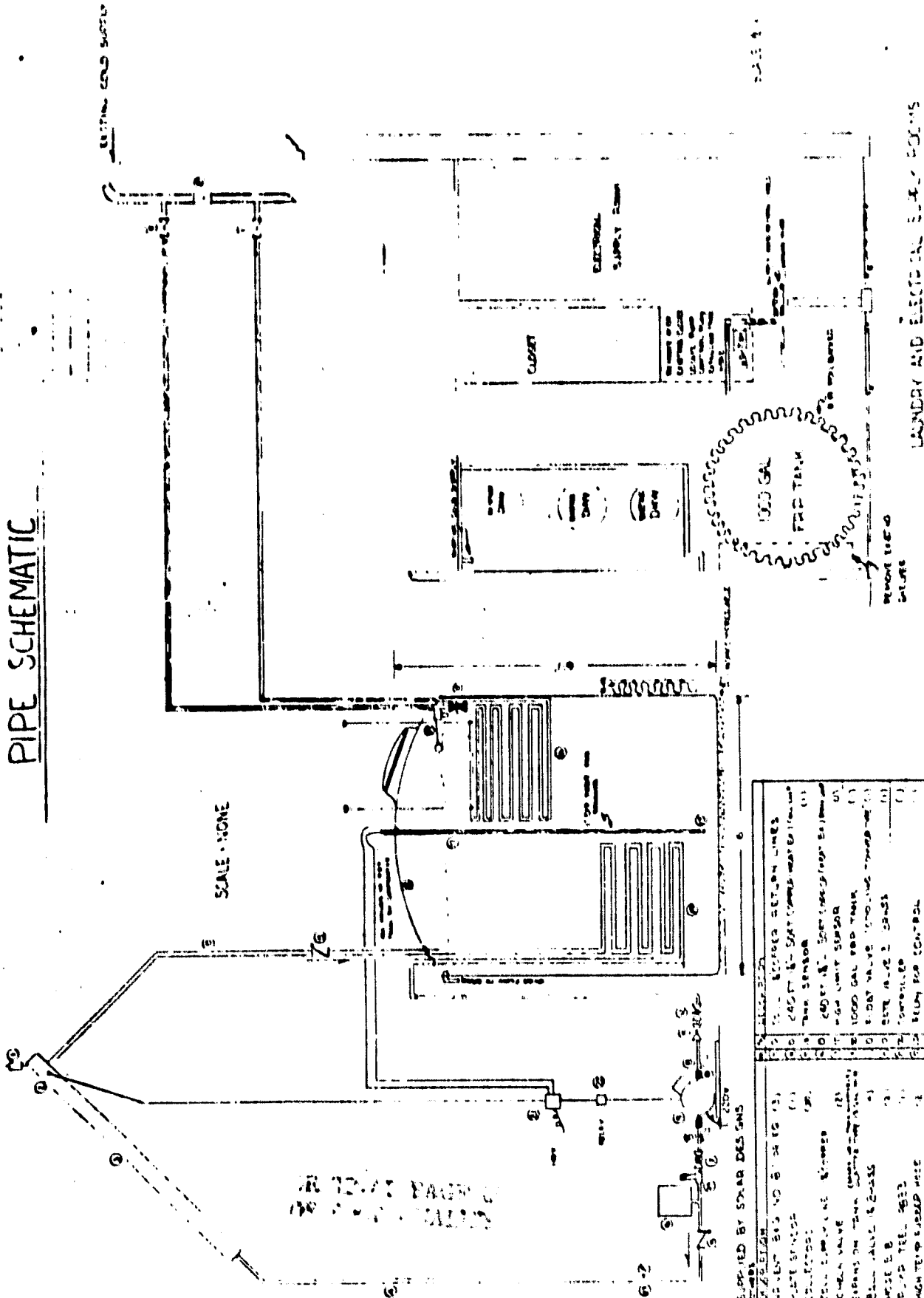
VERIFY THE WALL PLAT BE REMOVED FOR REFRIG. TO BE REPAIRED. SEE WALL PLAT.

NOTE:

ABOVE COLLECTOR SUPPLY LINE AND RETURN LINE SHALL BE INSTALLED IN THE WALL SPACE BETWEEN THE WALLS AND SHALL BE SUPPORTED BY BRACKETS.

WEST

PIPE SCHEMATIC



NO.	DESCRIPTION	QUANTITY	UNIT
1	1/2" BRASS RETURN LINES	10	FT
2	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
3	TANK SENSOR	1	EA
4	2400 GAL. TANK (MFG. BY 2400)	1	EA
5	1000 GAL. FEED TANK	1	EA
6	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
7	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
8	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
9	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
10	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
11	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
12	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
13	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
14	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
15	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
16	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
17	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
18	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
19	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT
20	1/2" BRASS 1/2" SWG COMP. W/ 1/2" DIA. TUBING	10	FT