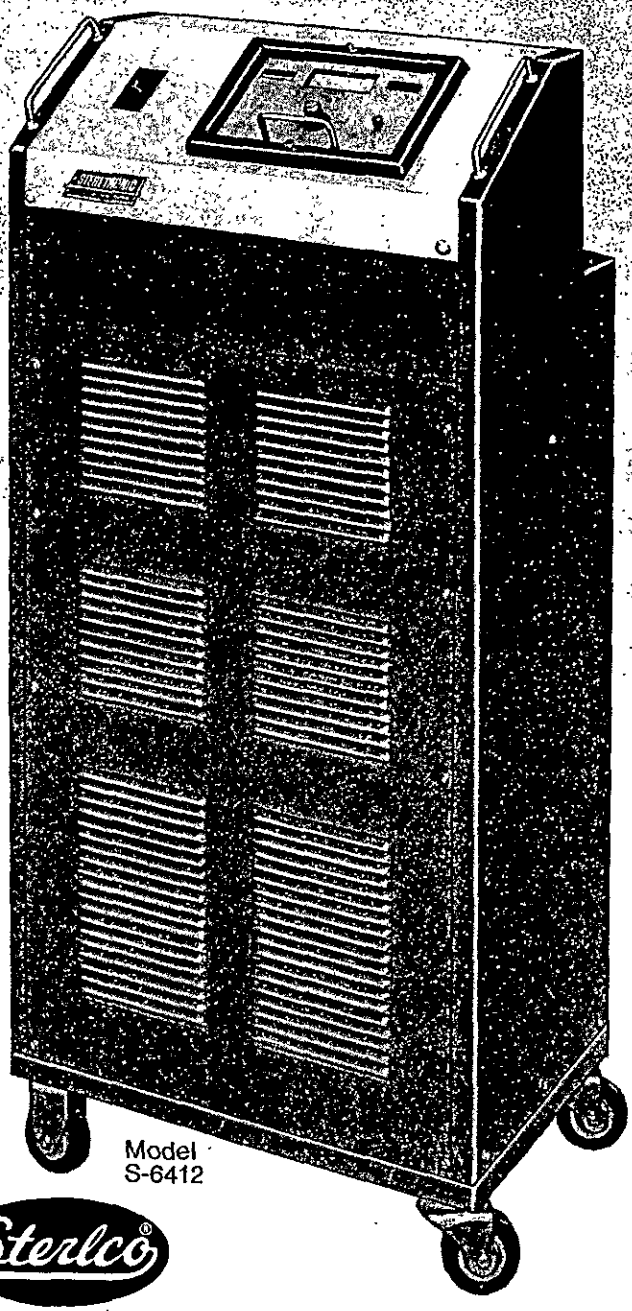
BULLETIN
644

STERL-TRONIC S-series

TEMPERATURE CONTROL SYSTEMS



Model
S-6412

sterl-tronic water circulating temperature system

direct injection type

- Circulates water at precisely controlled temperatures—up to 250°F. Responds to the demands of the process and heats or cools as required—automatically and precisely with *anticipated* and *proportioned* control.
- Engineered to perform precisely and dependably... and for maximum convenience in operation and upkeep. Design excellence is the result of many years of development. A product of Sterlco leadership and excellence in engineering.
- Solid-state electronic thermostat—designed by Sterling specifically for this application and built by Sterling to rigid standards of quality. An *on-purpose* design, with positive control over quality and performance.
- Available with standard circulating capacity, and also available as high-capacity "Muscle Unit" for accelerated heat transfer.

Sterlco®

Model	Zones	Width	Depth	Height	Shipping Wt.
S-6412	1	20¾"	15"	47"	210 lbs.
S-6422	2	41½"	15"	48"	405 lbs.
S-6432	3	62¼"	15"	48"	680 lbs.

STERLCO TEMPERATURE CONTROL UNIT
SERVICE AND INSTRUCTION MANUAL
MODELS: 6412, 6422, 6432

Engineered and Manufactured by INDUSTRIAL CONTROL DIVISION
STERLING, INC.
5200 West Clinton Avenue, P.O. Box 23435, Milwaukee, Wisconsin 53223-0435
Manufacturers of Temperature Control Equipment Since 1916

MODELS: 6412, 6422, 6432

INTRODUCTION:

We are pleased to provide a Water Circulating Temperature Control Unit for your application. It is built by skilled craftsmen with the most modern and precision machines available today. The simplicity of design and compactness engineered into the unit resulted in less maintenance and less floor space.

The Sterltronic Temperature Control Unit, designed and tested over a period of many years, represents one of the most significant advances ever in the field of self-contained, closed systems - portable units for heating water and circulating it at controlled temperatures - through molds, rolls or jackets of processing equipment.

The Model 6412-A is a single zone heating, circulating and control unit with one delivery and one return line, plus a water supply line and a drain line for cooling.

The Model 6422-A and 6432-A are two and three zone units with a delivery and return line for each zone but with a single common water supply and drain line per unit.

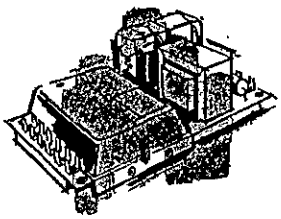
The Sterltronic Temperature Control Unit is designed to circulate water through your process and to precisely, automatically, and reliably maintain this water at the selected temperature. The operating range of the Sterltronic Unit is from supply water temperature up to 250° F. maximum. The unit is well suited for use with a city water supply, water from portable or central chillers, towers or with well water.

Many new improved designed features have been incorporated into the Sterltronic; among them are solid-state electronic thermostat, automatic mechical proportioning of heating and cooling, dual electronic sensing probes, push button air vent.

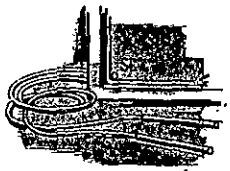
The relatively small total amount of water, rapidly circulated by the Sterltronic, provides assurances of a close and uniform temperature relationship between the delivery and return lines of the unit. This assures uniform and stable temperature control as well as a very even temperature throughout the work area. Also, the high rate of circulation, combined with the large immersion heater and high cooling rate, gives the unit exceptionally fast response in bringing the process up to temperature and in making changes of settings when necessary.

These standard units may have many variations or optional features added to them, relative to the customers application or specific needs.

Leadership and research provide these dividends for you



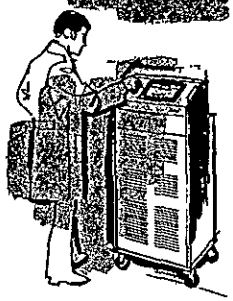
Solid-State Thermostat for precise control. This rugged, modern control will automatically respond to the needs of the process—can give either *full output* or *proportioned output* as required by the user's process. Has an adjustable dead-band and plug-in relays.



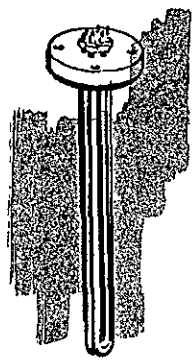
Dual Sensors for each thermostat provide the means for anticipation and proportioned control.

Temperature Indication via meter-readout which is part of the thermostat. Fast acting and easily read.

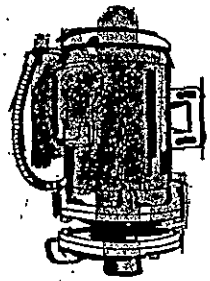
Pilot Lights show when the unit heats and when it cools—operation can be checked at a glance.



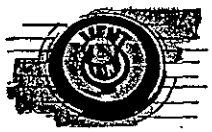
Controls Ideally Located for easy and convenient operation, and they are *protected.* No stooping or bending needed to check or operate this unit.



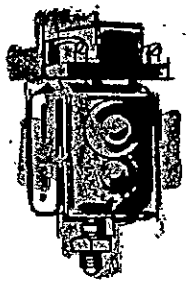
Heater is flange mounted and vertically suspended, without any bending stress. A 9000 watt heater is standard, although 4500 watt or 12,000 watt can be supplied. Water is *caused* to flow along the surface of the element to absorb heat at fastest rate, and to give long heater life and minimum fouling.



Pump is straight centrifugal, bronze fitted. Standard is ½ horsepower giving 15 gpm at 20 psi usable *unit rating,* which is satisfactory for many medium and small sized processes. For high production or production of large pieces, we suggest consideration of our "Muscle" option as detailed below. All pumps have seal flush to lengthen the usable life of the high temperature, ceramic faced seal.



Push Button Air Purge enables the user to purge the unit, hoses and his process from entrapped air before start-up. Reliable and thorough.



Pressure Switch protects against damage from operation without water. It has adjustable setting.

The Most Efficient Use of Cooling Water (fewest gallons) is assured by Sterlco design, which causes cooling water to take maximum temperature rise before going to drain.

Increase in Pressure Differential across the user's process takes place when the unit "cools." This gives added boost and increased cooling ability—unmatched anywhere.

Optional

MUSCLE UNITS designed to give high volume "turbulent water flow" through the user's process. This turbulent flow can greatly improve heat transfer, improve product quality, reduce tendencies for sweating and increase efficiency of operation. Muscle units can be fitted with larger total cooling capacity. Sterlco engineering advances pay off handsomely for you at very modest extra cost. These "years ahead" standards are proved and available now. The "Muscle Units" use the same cabinets and instruments, but employ much greater circulating capacity and cooling ability.

Sterling inc.

Sterlco®

5200 WEST CLINTON AVENUE, MILWAUKEE, WISCONSIN 53223
TELEPHONE (414) 354-0970 TELEX 2-6805

MODELS: 6412, 6422, 6432

DESCRIPTION:

WATER HEATING:

Heating of the water is accomplished through the specially designed low watt density electrical immersion heater inserted into the heater tank. The immersion heater temperature is controlled by the solid state thermostat mounted on the front of the control panel.

These Models can be supplied with either 4-1/2, 9 or 12 KW low watt density immersion heaters; the higher the ratings, the faster the fluid will heat up - relative to the setting of the indicating thermostat.

KW ratings of the immersion heaters are rated at the following standard voltages:

208V, 240V, 380V, 415V, 480V, 600V

4-1/2 KW	15,368 BTU/hr.
9 KW	30,717 BTU/hr.
12 KW	40,968 BTU/hr.

PUMP:

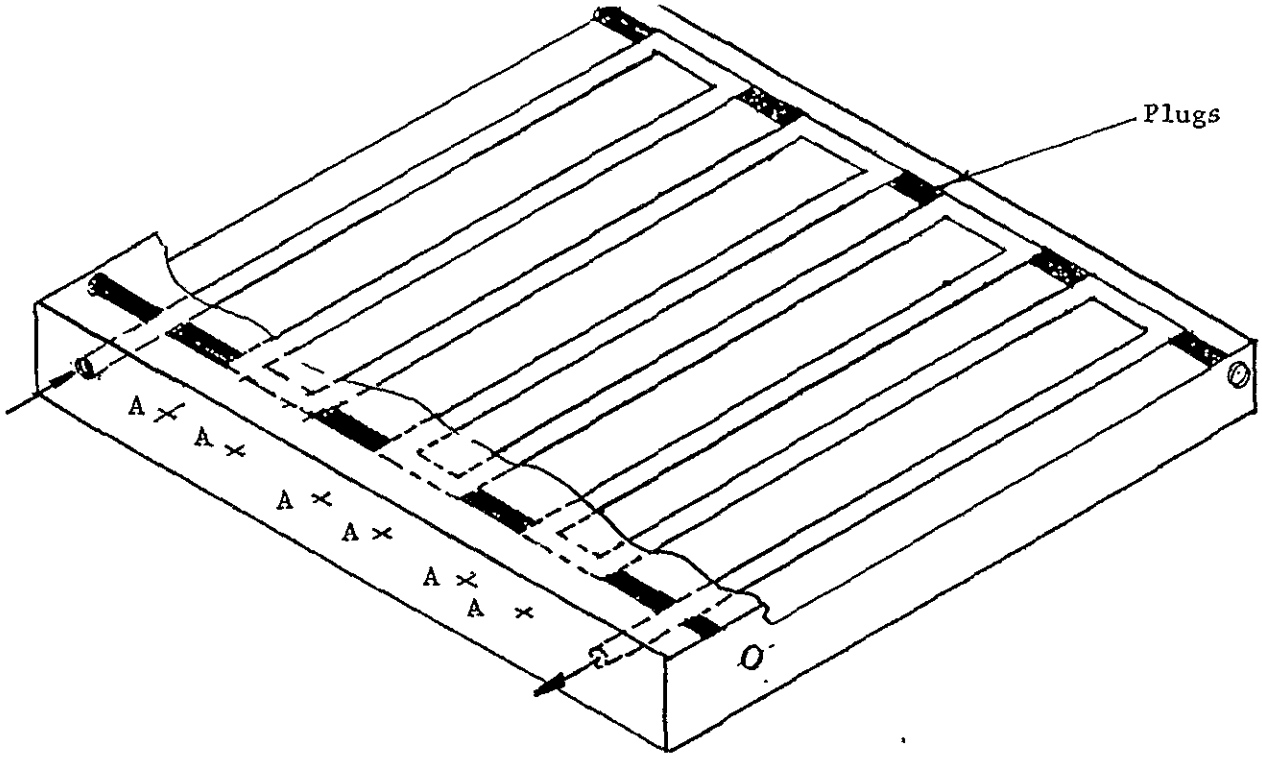
The pump is a 1/2 HP straight centrifugal type, bronze-fitted. It has a high output capacity with good discharge pressure and is well suited for the conditions under which the unit is designed to operate. The circulating capacity available at the delivery connection of the unit is 15 GPM @ 20 PSI. A special seal-flush system in the pump keeps the seal clean thereby extending seal life. The seal itself is the finest type available for this type of service and provides an excellent combination of long wearing ability, high abrasion resistance and heat resistance.

COOLING:

Cooling is accomplished by automatic release of the required amount of warm water from the system to the drain. This permits an equal amount of cool water to enter the system from the plant water supply. Naturally, the plant water supply temperature will govern the minimum operating temperature of the unit. The cool water enters the system immediately ahead of the pump which blends it with system water.

300° F UNITS

If the unit is expected to operate at temperatures of 290° F. (143° C), usable water supply pressure should be in excess of 45 PSIG (3.2 KG/CM^2) and preferably 50 PSIG (3.4 KG/CM^2).



Modification of Platen
For Manifold

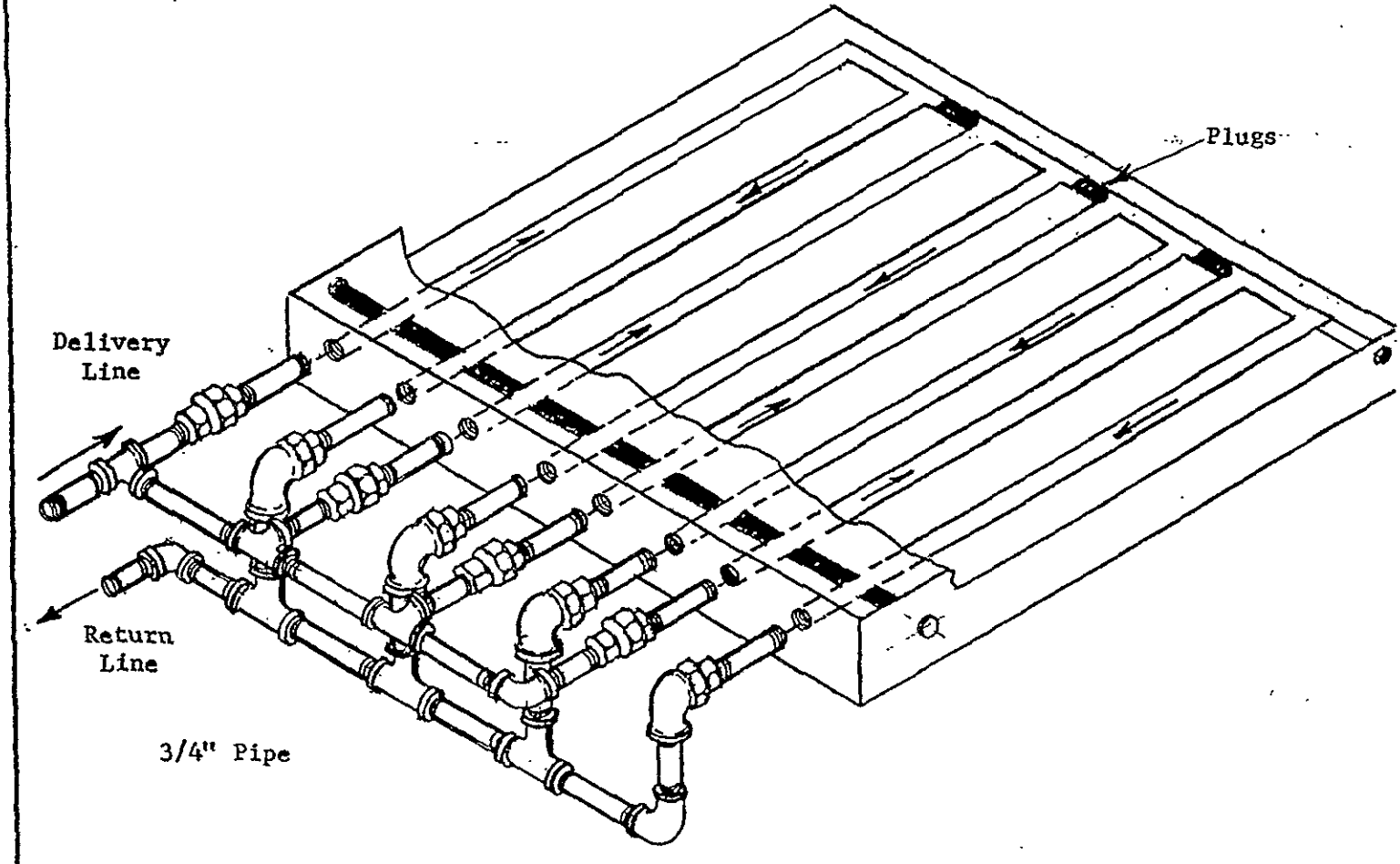


Fig.1

DESCRIPTION (Cont.):

CIRCULATING CONNECTION LINES:

On the Model 6412-A, the water supply and drain lines are 1/2" N.P.T. The return and delivery lines are 3/4" N.P.T. On the Model 6422-A and Model 6432-A all lines are 3/4" N.P.T.

Connection lines and connectors between the Temperature Control Unit and the process should be selected by the customer to suit the needs and requirements of the application.

1) If your unit has a maximum operating temperature of 250°f, the connection lines and connectors should have a service rating of at least 250°F and 150 PSIG.

2) If your unit has a maximum operating temperature of 300°F the connection lines and connectors should have a service rating of at least 300°F and 150 PSIG.

These connection lines and connectors should be inspected frequently to insure that the original service rating has not been reduced by age and/or deterioration. If the flow is restricted by small connections, the pressure will increase and the flow through the process will be greatly reduced.

If your mold or platens have already been made with serpentine channeling, we would like to suggest modifications as shown in Dwg. A682-03844 and using a manifold, preferably of 3/4" N.P.T. pipe.

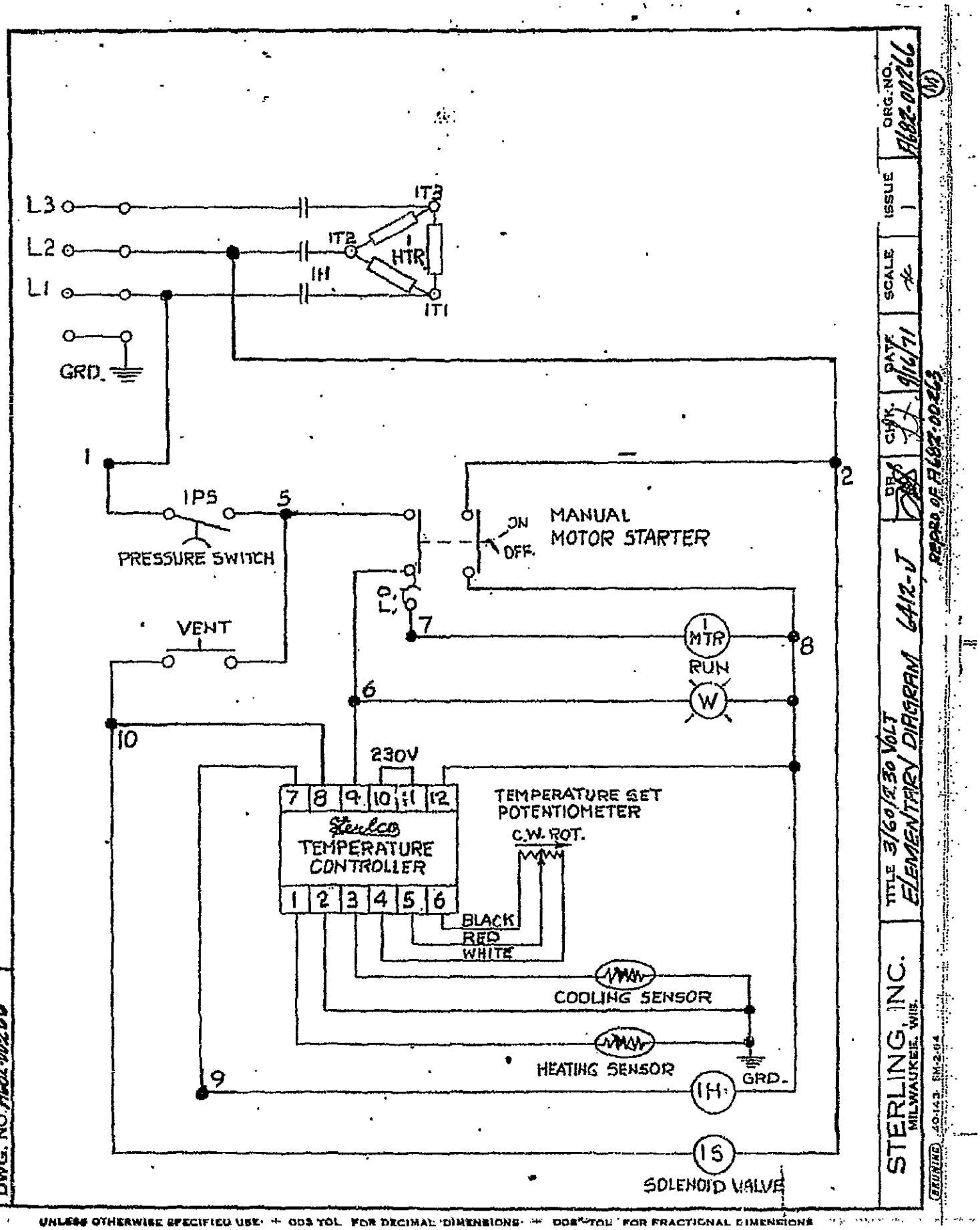
In order to eliminate excessive back pressure - it would be advisable to drill holes at points "A" and tap for 3/4" pipe.

Several parallel runs are far more practical than one long serpentine run and in many cases, can make a difference between uniform control and erratic operation.

WATER SYPPLY:

It is very important that the water supply to the unit meet certain requirements. We recommend a full sized connection, equal to the pipe size of our water supply connection and without restriction fittings. Usable supply pressure should be in excess of 20 PSI (1.4 kg/cm^2) and preferably over 25 PSI (1.7 kg/cm^2) at the unit. If the unit is expected to operate at temperatures over 200°F. (93° C.). This minimum pressure is necessary to keep the process water from flashing to steam at the pump inlet where water pressure is the lowest in the system. The pressure switch inside the unit will not allow the unit to run until the unit has been subjected to a minimum water supply pressure.

The water supply line should be open to the unit whenever the unit is running. While a certain minimum supply pressure is necessary as stated above, supply pressures over 75 PSI (5.27 kg/cm^2) while serving no useful purpose may indeed cause damage to the unit and shorten its life. If your water pressure is excessibely high it is recommended that a pressure regulator be installed in the supply line with a relief downstream from the regulator and set slightly higher than the regulator.



DESCRIPTION (cont.):

WATER SUPPLY (cont.):

Hard or corrosive water can be damaging to the unit and your equipment, especially since the temperatures at which the system operate tend to accelerate deposits or corrosion. This build up on the surfaces of the unit can reduce the water flow and cause control problems and eventual damage to equipment. Since the corrective maintenance and downtime often caused by bad water are costly, it is worthwhile to analyze and treat your water.

In general, we have found that people with good water seldom buy parts. Industrial water treatment to neutralize these conditions is relatively inexpensive and in many cases is truly a wise investment.

HEATER:

The heater is a three phase immersion heater, 9 KW capacity of low watt density construction to minimize fouling and to promote longer heater life. A 4-1/2 or 12 KW low watt density heater may be provided as an alternate.

ELECTRICAL:

A single phase transformer provides 115 volt single phase current for the control circuit and motor. A manual starting switch with an electrical overload protects the motor. The control circuit is fuse protected. The immersion heater is operated at the three phase level of the incomming supply power.

VENT PUSH BUTTON:

The vent push button located on the operators panel permits quick and complete purging of air from the unit, before the unit is started. The "VENT" push button actuates the solenoid valve which permits the flow of trapped air and water out through the drain, insuring that the unit is properly filled and primed prior to start-up.

PRESSURE SWITCH:

The Pressure Switch is built into each unit to insure that the unit will not start until the water supply has been turned "ON" and the unit subjected to adequate supply pressure. This is intended to provide a positive measure of protection for the pump seal and the heater so that they will not be damaged by operating the unit without water. The final measure of protection must come from the operator in venting before start-up. The pressure switch itself is set at approximately 10 PSI prior to leaving Sterling.

300° F. UNITS

The pressure switch itself is set at approximately 45 PSIG prior to leaving Sterling.

STERL-TRONIC

Series 6300 & 6400

TROUBLESHOOTING

TEMPERATURE FLUCTUATIONS. Alternate Overheating and Overcooling.

While the user might be inclined to believe the trouble to be in the controller, this fluctuation can most always be traced to poor water flow, resulting from one or more of the following conditions:

1. Small connectors or small water passages. Slow water flow will create a long reaction time which causes overheating and overcooling.

2. Very long connecting lines or long serpentine flow of water in and out of the mold in series rather than in parallel. Refer to the page on installation.

3. Blocked water line in the mold. New molds sometimes contain metal chips or other foreign particles inside the water lines. Old molds sometimes contain lime or rust accumulations.

4. Quick disconnect fitting with check valves. (A source of very serious obstruction.) The check valves should be removed.

5. Lime buildup in the piping or fittings.

NOTE: The unit itself can be checked out for normal control by the use of a short line of 3/4" or 1/2" hose connected directly from the delivery to the return line. This will provide a condition of very good flow and will establish whether the blockage is in the unit or the piping.

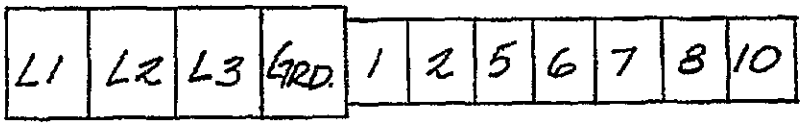
RAPID CYCLING FROM HEAT TO COOL

This condition is traceable to the same causes as the temperature fluctuations indicated above.

UNABLE TO HEAT PROPERLY

When the temperature will not rise above a certain temperature, the cause will generally be traced to continuous loss of water from the system (allowing cooling water to enter). This can be checked by observing the drain. Under some conditions it is possible to have the solenoid valve close on a particle of grit which, of course, will allow the valve to continuously leak. This solenoid valve can be flushed out easily by having the operator adjust the "set point" up and down scale several times to open and close the solenoid. If it continues to leak, the unit should be stopped and the electric power and water turned off and the solenoid valve should be taken apart and cleaned or replaced, as required.

DWG. NO. A682-00268



POWER SUPPLY

FIRST USED: G412-J

STERLING, INC. MILWAUKEE, WIS.	TITLE TERMINAL BLOCK LAYOUT	DR.	CHK.	DATE	SCALE	ISSUE	DRG. NO.
				9/16/71	NTS	1	A682-00268

BRUNING 40-143 5M-2 64

TROUBLESHOOTING

HEATER BURN OUT

A direct visual indication of heater burn out is the presence of scorched or discolored paint on the heater tank. In most cases, the water level inside the tank at the time of burn out can be determined because the paint on the exterior of the tank below the water level will not be scorched. Causes of heater burn out are generally traceable to:

1. The unit not being filled with water and purged of air prior to startup.
2. A faulty heater (tank discoloration not always present).
3. A plugged system or badly obstructed flow.

PUMPS AND SEALS

Before leaving our factory, each unit is operated for a considerable period of time and calibrated. After this test, the unit is drained and blown out with warm air to remove most of the water from the piping systems. If the unit is allowed to stand idle for a long time before being installed in your factory, the housing gasket at the pump can dry out and will possibly leak when the unit is started. In many cases these gaskets will soon swell and form a tight seal, while in other cases it may be necessary for you to tighten the pump screws to stop a leaking condition.

It is possible to have the pump seal surface separate slightly because of rough handling or considerable vibration during transit from our plant to yours. This, of course, would cause a leak at the pump seal when the pump is started, but in most cases the surface will mate again after the pump is allowed to run for short periods of time. If they do not mate, you might find it necessary to open the pump and free the seal by hand. It is seldom necessary to install a replacement seal in a new unit unless the seal has been damaged because the unit has been started without water.

Our pump seals should give a long period of service life. There are conditions, of course, which tend to shorten the seal life - such as presence of grit, operation of the unit without water, sustained high water temperatures or the presence of certain chemicals in the water. Our pump seal assembly has been developed to resist abrasive particles which we find present in many water systems. It is also fitted with high temperature flexible components for a maximum amount of heat resistance. These same components remain flexible even at low temperatures. Thus, the standard seal has a fine combination of heat resistance and wear resistance.

Another cause would be traceable to a leaking hose or fitting somewhere in the system. It is also possible that the immersion heater might be inoperative or defective. Most any qualified electrician can check this out readily. Heater terminals are readily accessible for checking.

NO HEAT AT ALL

Check to be sure that the contactor goes "in" and "out" in response to signals from the controller. This can be done by adjusting the controller up and down the scale. The contactors should be made to go in and out as the setting passes unit temperature. If it does not function, the controller may be faulty and the section of this manual dealing with controller diagnosis should be studied and followed. If the contactor does function, but if no heat is produced, the problem is likely within the heater itself, assuming of course that the steps listed under "Unable to Properly Heat" have been followed first.

UNABLE TO COOL

In order to cool, the unit must pass water to the drain directly, or through the heat exchanger if the unit has a heat exchanger. Therefore, if your unit does not provide cooling, the following steps should be taken to help locate the cause.

1. Check to see that the water supply is open at all times while the unit is in operation.

2. Check to see if water flows to the drain when the unit calls for cooling.

3. Check the solenoid valve for proper operation - observe the drain. Water should flow to drain in response to solenoid action. If the drain cannot be seen, a simple method of check is by "feel" of the drain piping at the unit, with the solenoid alternately open and closed.

4. If the solenoid valve is operating properly, a "no flow" condition could be the result of a plugged heat exchanger which could reduce or stop the cooling water flow on those units which contain heat exchangers.

5. High back pressure from the drain could easily cause a limited ability to cool, since the unit depends upon the pressure differential between the water supply and drain for the amount of cooling which it can provide.

S SERIES CONTROLLER
TROUBLE SHOOTING

The following is a general outline for diagnosing possible problems in the temperature control system. By following the checkout procedure given below, one should be able to determine what the problem is and what steps to take to correct it.

I. PROBLEM - NO HEAT OR COOL:

1. Loss of Power
   a. Check control circuit voltage between terminals #9 and #12 on solid state unit. Correct voltage is shown on metal nameplate of the unit.

2. No connection on terminal #5 or broken wire from set pot wiper (red wire).

3. Faulty contactor and solenoid on output of solid state unit.
   a. Rotate set pot to its maximum clockwise position and check for proper control circuit voltage across terminals #7 and #12.
   b. If voltage is present but contactor does not energize, coil is open and should be replaced.
   c. If no voltage appears across these terminals, visually, check the heat relay on the solid state controller for operation by rotating the set pot above and below the indicated temperature. If relay operates, but no voltage appears across the contactor coil, the contacts on the relay are probably burned and should be cleaned with very fine sandpaper. This applies to the solid state unit with open type relay. If the unit has plastic covered plug-in type relays, simply remove the faulty one and replace with new. If relay does not operate, return defective solid state unit to Sterling, for repair.
   d. Repeat set 1-3 for solenoid valve operation by rotating set pot counter clockwise and checking voltage across terminals #8 and #12.

II. PROBLEM - COOLING STAYS ON, HEATING STAYS OFF REGARDLESS OF SETTING

1. No connection to terminal #2 on solid state unit.

2. No connection to terminal #4 on solid state unit or broken wire from set pot (white wire).

TROUBLESHOOTING

After the unit has been in service for a period of years where abrasive conditions are present, you may find that the pump casting, which is designated as our "bracket", can be eroded away in the area around the seat of the rotary seal. This area should provide a straight, smooth surface against which the O-ring of the seal seat should bear. Should your casting show signs of erosion in this area, we would strongly recommend that the casting be replaced, since the replacement cost of the casting is a very modest investment when compared with downtime and maintenance cost for replacing a seal which has been installed in a worn out pump. A small puddle underneath the unit is a sign of rotary seal wear, and if your investigation confirms the pump as the source of the leak we would recommend that the seal be replaced as soon as practical. If allowed to leak, the water will eventually find its way to the lower motor bearing and cause further damage. The water slinger is intended to provide temporary protection against this possibility, but a continued and substantial leak will, undoubtedly, ruin the motor bearing.

Even though your maintenance people may have had many years of experience in dealing with pumps in general, we would strongly suggest that they follow our Form I-4100-E1 when overhauling the pumps. Careful attention to these instructions will help assure a proper installation and minimum downtime.

Under some conditions users find that the pump will not start. After turning off the power supply it would be well to check the motor shaft to be certain that it is free to turn. By removing the drip cover atop the motor, access is provided to the end of the shaft, which has been slotted so that it might be turned with a screwdriver. If the shaft is found free to turn, we would suggest that the power supply to the unit be checked on all legs to be certain that the power is available to the motor. If these two items have been checked, we would then recommend that a competent electrician be called upon to check the motor and its circuit.

MODELS: 6412, 6422, 6432

INSTALLATION:

INITIAL PROCEDURE:

These units are supplied for three phase operation for a selected voltage. Caution must be taken to provide a correctly sized and protected power supply to this unit. These units must be correctly grounded.

All connections must be secure and should be checked before starting.

ELECTRICAL:

Knockouts are provided for entry for electrical service on each side of the cabinet.

HEATER CAP. EACH CIRCUIT KW	TOTAL AMPS. 3/60/220	TOTAL AMPS. 3/60/440
4-1/2 KW	15 AMPS.	8 AMPS.
9 KW	27 AMPS.	14 AMPS.
12 KW	33 AMPS.	17 AMPS.

PERFORMANCE:

The Model 6412-A, 6422-A, and 6432-A, are easy units to operate.

The simplicity of design and the highly engineered controller make these units almost self-operated. The "ON-OFF" control, the "VENT" and the "TEMPERATURE CONTROLLER" are all that is required to operate these units.

After the water supply has been connected to the "WATER SUPPLY LINE" (the pressure should be in excess of 20 PSI and preferably not to exceed 75 PSI). The "VENT" button is depressed and held for at least one minute, opening the solenoid valve electrically.

The water enters "WATER SUPPLY LINE" allowing the water to flow through the pump and into the bottom of the tank, up through the tank and out through the "DELIVERY LINE", through the process, back through the "RETURN LINE" and through the open solenoid valve and out the "DRAIN LINE".

At this time, watching the drain for bubbles or erratic flow will indicate whether or not the system has been properly "purged". If a steady stream flows from the drain line, it is certain that all the air is out of the system.

"ON-OFF" SWITCH:

"ON" POSITION:

When the switch is in the "ON" position, the starter is manually energized and supplies the power to the motor and the temperature controller which in turn regulates either "heating" or "cooling".

"OFF" POSITION:

When the switch is in the "OFF" position, the starter is de-energized, cutting the voltage to the motor and the temperature controller.

CONTROL FUSE:

This fuse protects the complete 115 volt control circuit.

CIRCULATION

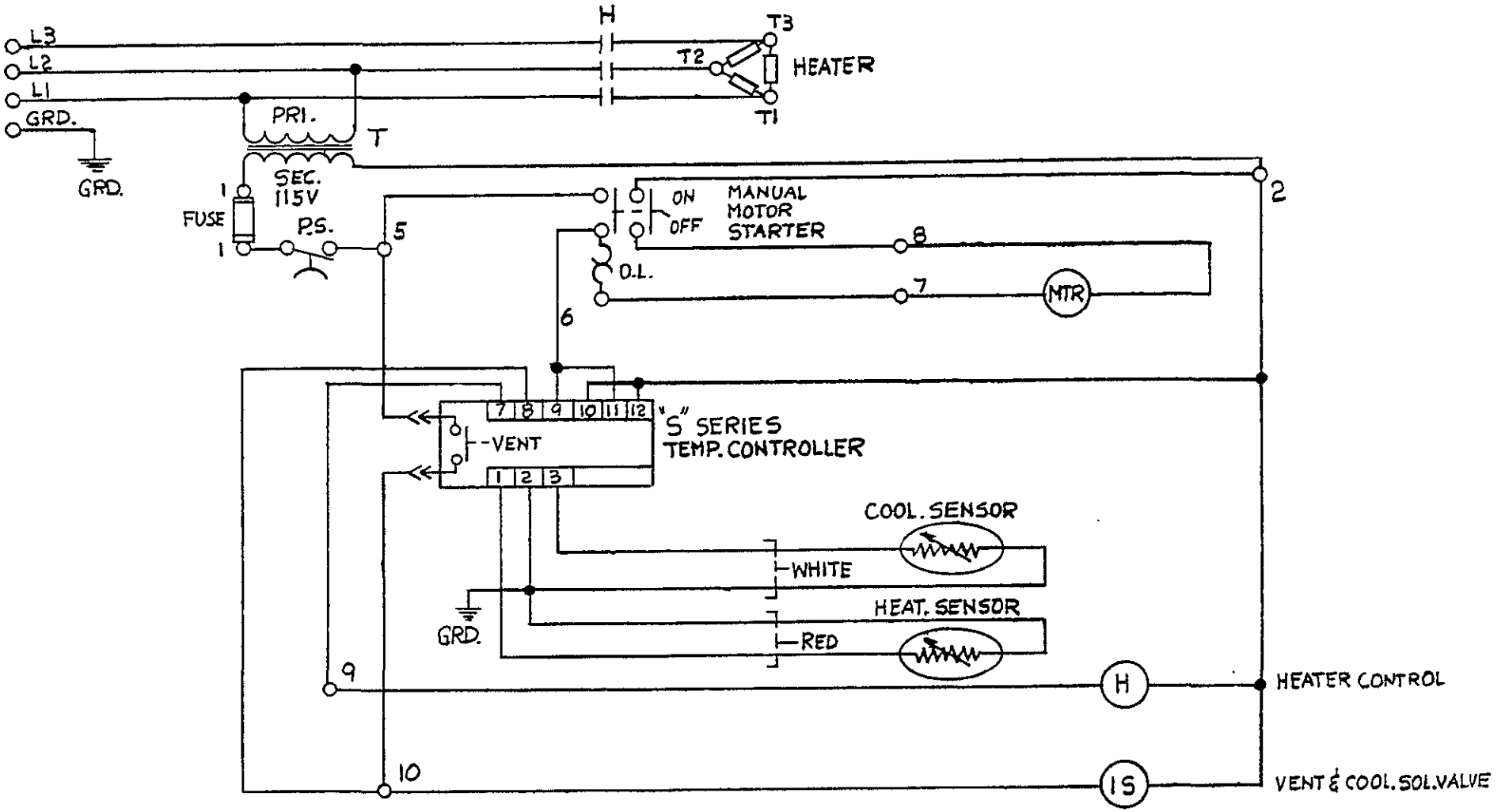
FLOW DIAGRAM

With the "ON-OFF" switch in the "ON" position and the temperature controller set to the required temperature, the water is drawn into the pump past the cooling sensor, out into the bottom of the tank.

As the water is circulated up through the tank, it is heated by the immersion heater, where it passes the heating sensor, which is indicated on the temperature controller, and out to the delivery line.

After it is routed through the process, the water comes back to the unit through the return line.

The by-pass line is a safety feature in the event there is a malfunction in the system, external of the unit power. The by-pass line allows a small amount of water to circulate internally to the unit.



USED ON: S6412-A

REV.		STERLING, INC. MILWAUKEE, WIS.	TITLE 3/60/208 THRU 600 V ELEMENTARY DIAGRAM	DR. M.R.	CH'K.	DATE 2-14-73	SCALE	DWG. NO. B682-00830

OPERATION:

Vent the unit for at least one (1) minute, position the "ON-OFF" switch to the "ON" position and set the desired temperature on the temperature controller.

When the unit is in the heating cycle, the Heat Indicator Light will illuminate. If the temperature of the water rises above the set point, the unit will automatically switch to the cooling cycle and the Cooling Indicator Light will illuminate.

SHUTDOWN:

Prior to shutdown, the water supply to the unit should be shut off.

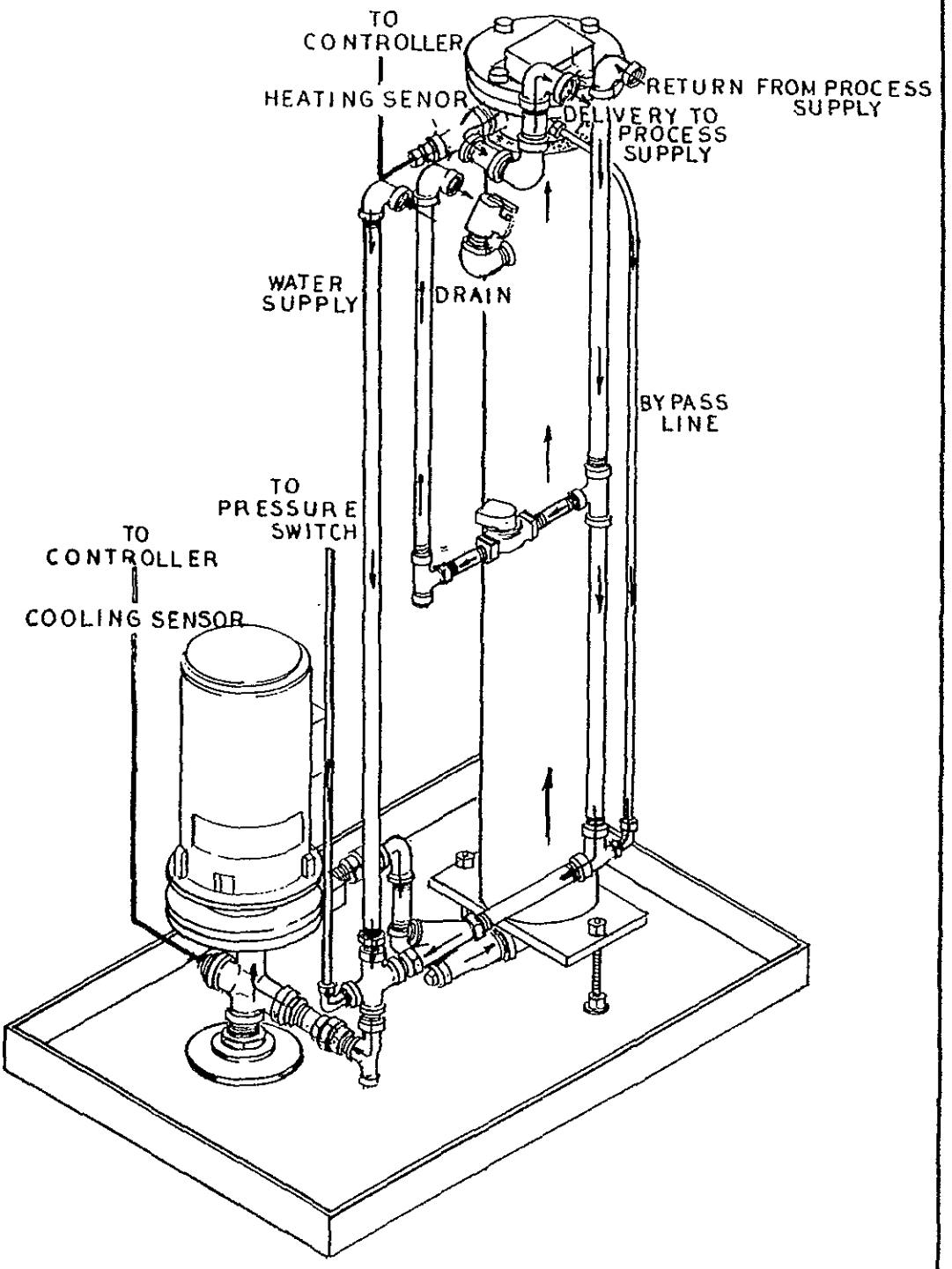
Position the "ON-OFF" switch to "OFF" and depress the "VENT" button for a few seconds to relieve the internal pressure. Water supply and drain lines, delivery and return lines and the electrical supply may be disconnected.

DRAINING:

If your Sterltronic is to be taken out of service for a long time or it will be exposed to freezing, it should be throughly drained. Drain plugs are provided at the base of the heater tank and water supply and drain lines.

OPERATION OF ONE ZONE ONLY OF DUAL OR TRIPLE ZONE UNIT:

When one zone of a dual or triple zone unit is to be operated while the other remains idle, it is necessary to run a by-pass line from the delivery to the return line of the idle zone.



REV.		
	STERLING, INC. MILWAUKEE, WIS.	
	TITLE	MODEL S-6412
	DR.	B J M
	CK'K	
	DATE	6/15/78
	SCALE	
	DWG. NO.	B-682-03870

CALIBRATIONS

The following sequence of steps should be followed to properly and effectively calibrate your Sterlco Temperature Control Unit.

A. Be certain that the unit is connected to allow for good water flow. If necessary, use an extra jumper hose, or at least use large diameter hose to allow for good flow of water through the system.

B. Turn the pump off and "Zero" the temperature indicator as shown by drawing B681-00031 of this manual.

C. Check the sensor wires at terminals 1, 2, and 3 of the solid state control to make sure that they are very securely attached. If they are somewhat loose or oxidized, a false thermostat reading will be given. We recommend that these connectors be soldered to the solid state board at terminals 1, 2 and 3.

D. Check the dead-band span by turning the front set-knob up scale and down slowly to determine the amount of span between heating and cooling. Next, refer to drawing B681-00031 of this manual for the location of the dead-band adjustment. That adjustment should be rotated gently a few times clockwise and counter clockwise to clean its internal surfaces. Then, the dead-band should be properly set for a total span of 3° to 4° or whatever is required by your process. A wide span will put the whole instrument out of proper calibration.

E. Re-adjust the temperature meter to agree with the dial setting of the thermostat (see drawing B681-00031 for location of meter adjustment).

F. We recommend that every 3 or 4 months you check the dead-band span to be certain that atmospheric conditions haven't corroded the surfaces to where the span has become too wide for proper operation. As mentioned above, wide span will also cause the temperature meter to provide a false reading.

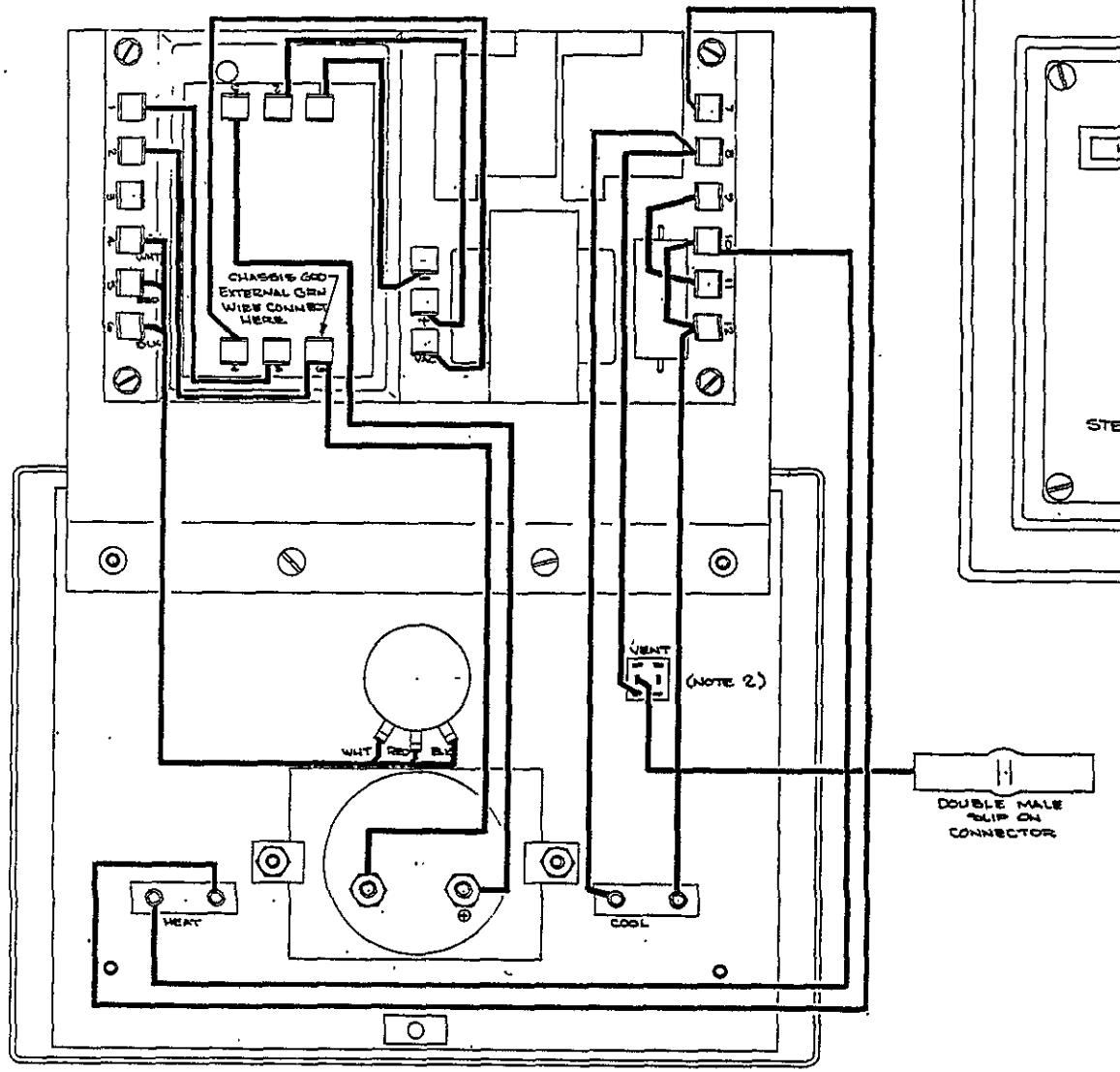
PREVENTATIVE MAINTENANCE:

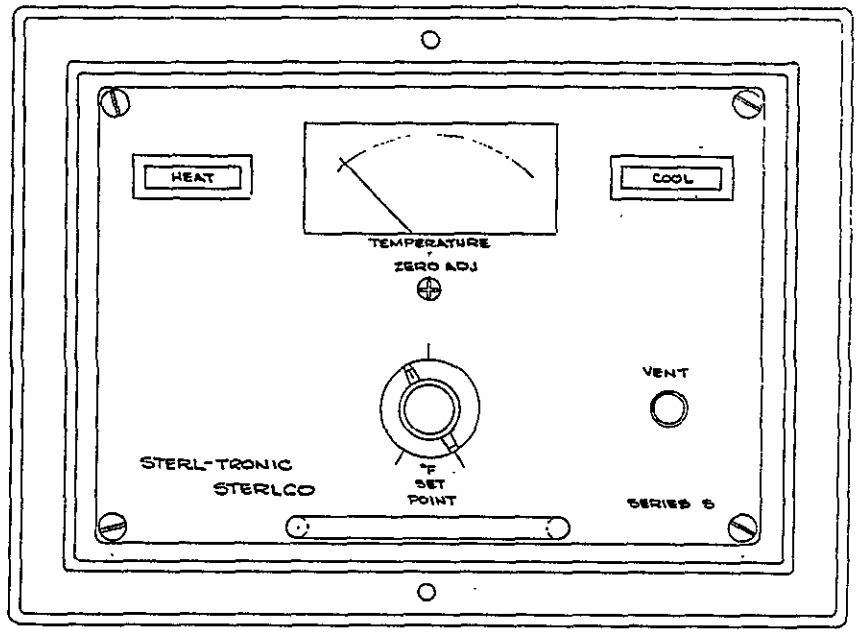
EVERY 6 MONTHS:

Inspect all electrical connections for secure attachment and for safe and secure ground connections. Inspect the power cable, especially at entrance point to the unit.

EVERY 4 MONTHS:

Check to be sure that all removable panels are in place and securely attached especially those which enclose the electricals. Check the calibration of the thermostat, partically the "span" between "Heat and Cool" - correct as required per the Calibration section of this manual.



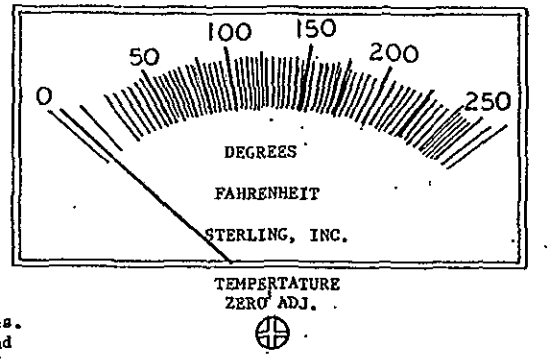


NOTES:
1. ONLY INTERNAL WIRING SHOWN. FOR EXTERNAL CONNECTIONS SEE APPROPRIATE ELEMENTARY DIAGRAM FOR RESPECTIVE UNIT.
2. CHECK TO INSURE NORMALLY OPEN VENT SWITCH CONTACT IS USED. VENT SWITCH SHOWN WIRED FOR S6400 UNIT, ON S6500 UNIT BOTH WIRES INTERCONNECTED EXTERNALLY WITH DOUBLE MALE SLIP ON CONNECTORS.

USED ON: 'S' SERIES CONTROLLER (C601-00002)

REV.		STERLING, INC. MILWAUKEE, WIS.	TITLE 'S' SERIES CONTROLLER WIRING LAYOUT (115 VAC)	DRN.	DATE 3/27/73	SCALE FULL	DWG. NO. C681-00013

REV. 1. User Note Added - 6-24-81 R.M.



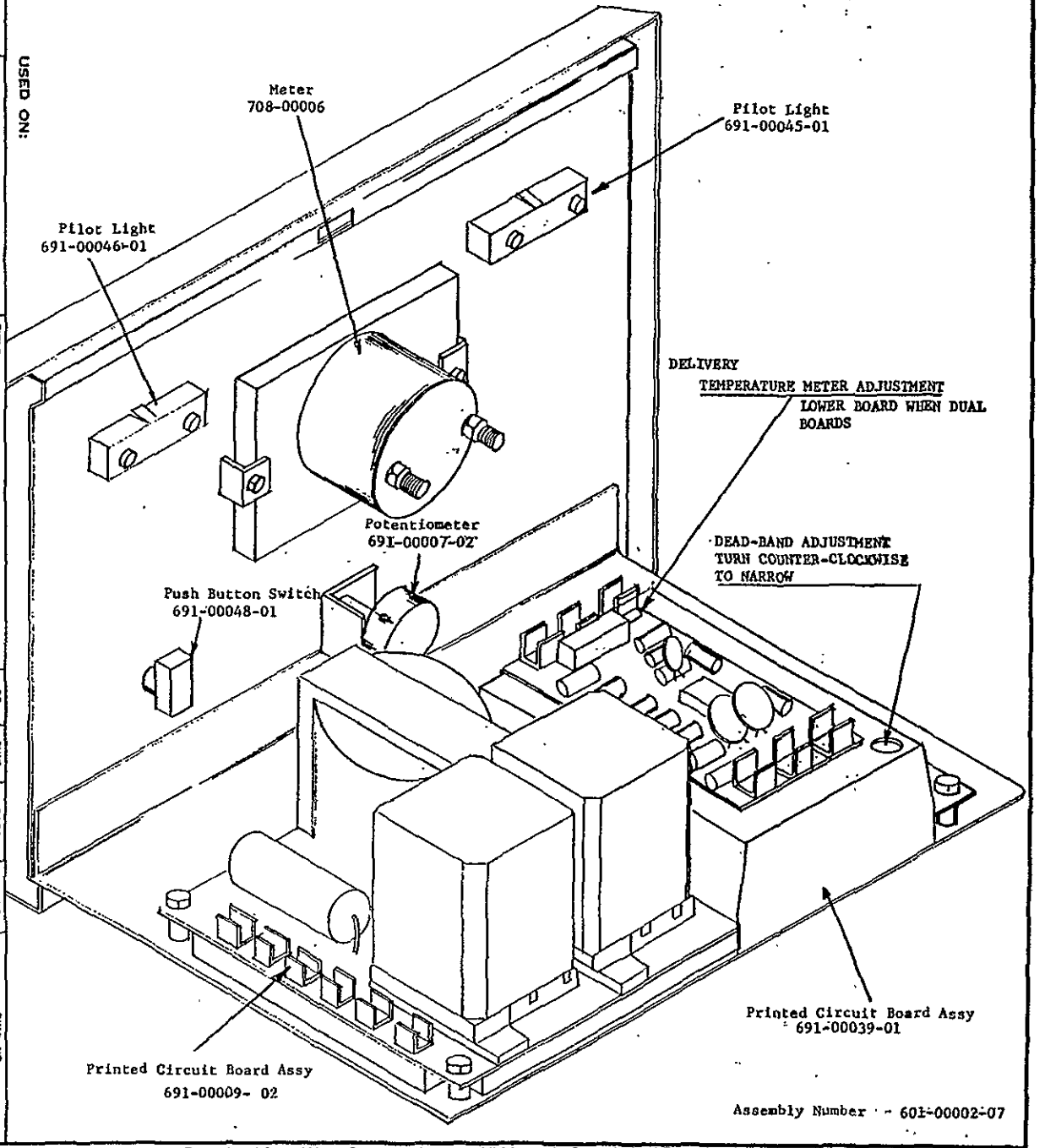
USER NOTE!

Drawing shown for typical layout & location of devices. Meter adjustment & Dead-Band adjustment are the same and located similiarly for specials.

(0-250° F. Controller)

WITH THE UNIT STOPPED, THE TEMPERATURE INDICATOR SHOULD POINT TO ZERO. IF IT DOES NOT, THE "ZERO ADJUSTMENT" SHOULD BE USED TO BRING THE INDICATOR TO "ZERO". IF THE CORRECT TEMPERATURE IS NOT SHOWN WHEN THE UNIT IS OPERATED, PLEASE MAKE ADJUSTMENT FOR CORRECT TEMPERATURE ON THE POTENIOMETER OF THE SOLID STATE BOARD, AS SHOWN BELOW

USED ON:



Assembly Number - 601-00002-07

STERLING, INC. MILWAUKEE, WIS.

TITLE: MODEL: S-6410A, S-6412A, S-6422A S-6432A SI CONTROLLER

DR.	CHK.	DATE	SCALE	DWG. NO
BJM		6/13/78	B-6	681-00031

VII. HEATING STAYS OFF - COOL REACTS NORMALLY

1. Open circuit between terminals 1 and 2. Short terminals 1 and 2 - if heating turns on, replace faulty probe.

2. Check output circuits as in (I-3a,b,c) above.

VIII. OUTPUT RELAY CHATTER

1. Check for loose connections on terminals 1 through 6 on solid state unit.

2. Broken or intermittent connection on pot or probe wires.

IX. DEAD BAND ADJUSTMENT: (see Dwg. B681-00031 or C681-00013)

The Dead Band Adjustment is used to vary the span between Heat "OFF" and Cooling "ON". The adjustment only affects the cool output, thereby, not changing the set point temperature. In the lower left corner of the black plastic cover of the solid state board is a small hole which provides access to the dead band adjustment. Adjustments should be made slowly and in small amounts. Do not force the adjustment beyond its stops.

NOTE: The "TROUBLE SHOOTING" guide applies to the thermostat board only. The trouble shooting for the temperature meter board attached to the main board is as follows: In the event of disagreement between the potentiometer and the temperature meter, adjust the meter first.

TEMPERATURE METER "TROUBLE SHOOTING"

1. Turn off all electrical power to the unit.

2. Remove two (2) hold-down screws from top of panel and remove controller top panel leaving all wires connected. Caution is urged in this, especially on right side of controller which is the power side. Exercise great care to avoid shorting this side of controller.

After removal of controller, the following steps should be followed in locating the difficulty:

3. Check power supply to main board terminals #9 and #12. Should be 115 volt.

4. Meter does not read -
   a. Remove meter and shunt wire - If there is one in place.
   b. Check for tight connections to terminals #3 and #6 on meter board.
   c. Check positive (+) terminal on main board and terminal #2 on meter board for tight connections.

3. Faulty probes - If both probes are open-circuited, the cooling will stay on and heating will be off. Short out terminals #1 and #2 - If heat comes on, the heat probe is faulty.
Short out terminals #2 and #3 - If cool turns off, the cool probe is faulty.

If problem persists after checking 1 through 3 above, return solid state unit to Sterling, Inc., for repair.

III. HEATING STAYS ON, COOLING STAYS OFF REGARDLESS OF SETTING

1. No connection to terminal #6 or broken wire from set pot (black wire).

2. Short between terminals #4 and #5 indicating faulty set pot. Remove wire #5 - If heating goes off, set pot is defective or connecting wires are shorted.

3. Shorted probes on both the heating and cooling. Disconnect probe wires from terminals #1 and #2 and #3, the cooling should turn on and heating turn off.

If problem persists after checking 1 through 3 above, return solid state unit to Sterling, Inc.

IV. COOLING STAYS OFF - HEAT REACTS NORMALLY
TURN SET POT TO LOWEST SETTING

1. Short circuit between terminals #2 and #3 indicating faulty probe; disconnect wires #2 and #3, if cooling turns on, the probe should be replaced.

2. Check output circuit as in (I-3d) above.

V. HEATING STAYS ON - COOLING REACTS NORMALLY
TURN SET POT TO LOWEST SETTING

1. Short circuit between terminals #1 and #2 indicating faulty probe. Disconnect wires from 1 and 2 if heating turns off, the probe should be replaced.

2. Check output "heat" relay of solid state unit for welded contacts.

VI. COOLING STAYS ON - HEAT REACTS NORMALLY

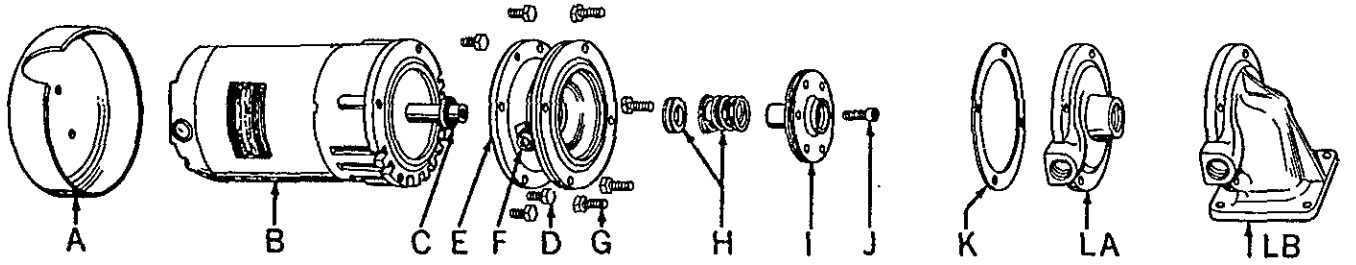
1. Open circuit between 2 and 3. Short terminals #2 and #3; if cooling turns off, probe should be replaced.

2. Check output "cool" relay of solid state unit for welded contacts.

REPLACING ROTARY SEAL ASSEMBLY ON STERLCO PUMP AND MOTOR: ½ AND ¾ HP

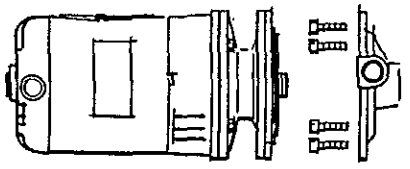
PARTS

A. Drip Cover
B. Motor
C. Water Slinger
D. Motor Screws
E. Bracket
F. Prime Cock
G. Pump Screws
H. Rotary Seal Assembly
I. Impeller
J. Impeller Screw
K. Housing Gasket
L. Volute - A or B

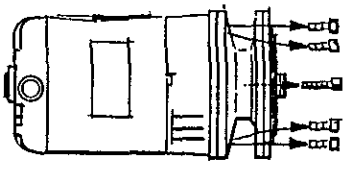


Step No. 1 — Dis-assembling (Removal of old seat assembly)

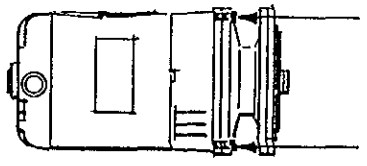
Step No. 2 — Re-assembly (Installation of new seat assembly)



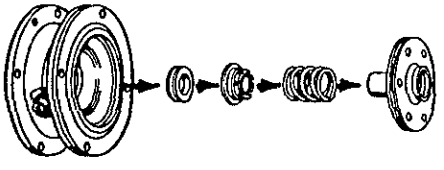
a) Remove volute from motor bracket and impeller assembly by removing pump screws.



b) Remove impeller screw and motor screws. (Note: opposite end of motor shaft is fitted with screw driver slot to hold shaft securely while impeller screw is being removed. Drip cover must be removed to get at screwdriver slot).

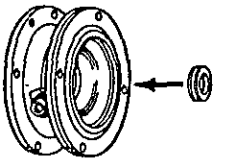


c) Insert two of the pump screws into the two threaded holes in the bracket. Tighten them slowly and evenly to force the impeller and bracket off the shaft. **Do not pry the impeller or bracket!**

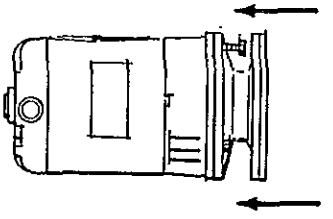


d) Remove old seal parts from impeller hub and bracket. Be sure water slinger is in place.

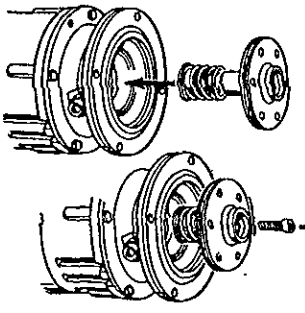
e) Clean impeller hub thoroughly . . . remove all loose particles of dirt, grease, etc. Use fine emery cloth if necessary. Also clean the recess in the bracket so the new seat will fit perfectly. Remove all particles and dirt on gasket surfaces of the two castings.



f) Coat outside edge of new seat with 3% detergent solution and slip it into the bracket. Press into bracket with thumbs or wooden dowel. Handle seat carefully so seating surfaces are not scratched or chipped . . . be sure it is squarely seated.

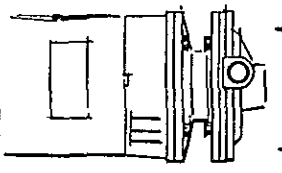


g) Remount bracket on motor.



h) Lubricate impeller hub. 3% detergent solution . . . slip new bellows and spring onto impeller hub. Be sure bellows slides freely on impeller hub.

i) Replace impeller on motor shaft extension and secure with impeller screw. Hold shaft with screw driver slot while tightening screw.



j) Replace volute onto bracket, using new housing gasket. Use one gasket for condensate pump and for temperature control units. Secure with pump screws. Be certain gasket is seated properly.

NOTE: When ordering parts please indicate pump model number and serial number.

STERLCO® **Sterling, Inc.**

5200 W. Clinton Avenue • Milwaukee, WI 53223-0435 • 414-354-0970 • (FAX) 414-354-6421

Revised 9/92

TEMPERATURE METER "TROUBLE SHOOTING"

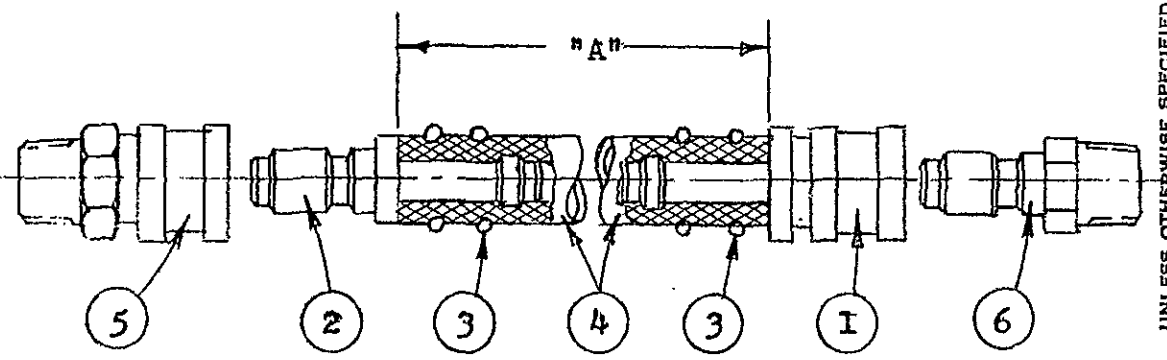
If all wires are correct and secure, check voltage between terminals 1 and 6 on meter board (+15 volt D.C.) and between 2 and 6 on meter board (+15 volts). Also voltage between #4 and #6 (2.5 volts A.C.). If, at this point, there is no voltage the problem is in the main board. If voltage is present the meter is faulty.

5. Meter check off scale (high end)
   a. Check (VAC) terminal on main board and terminal #4 on meter board for tight connection.
   b. Check for tight connection to terminal #1 on main board.
   c. Check negative (-) terminal on main board and terminal #1 on meter board all for tight connection.
   d. Check terminals #1 and #2 on main board for tight connection.

If all wires are correct and secure the heat sensing probe is faulty.

6. Meter reading does not correspond to known temperatures.
   a. Too Low - Turn potentiometer on top of meter board counter clockwise to correct temperature. This potentiometer is long and rectangular, with the adjusting screw at one end.
   b. Too High - Turn the potentiometer on top of meter board clockwise to correct temperature.

CHANGE NO.	BY	DATE	USED ON



UNLESS OTHERWISE SPECIFIED USE
± .005" TOLERANCE ON DECIMAL DIMENSIONS.
± .010" TOLERANCE ON FRACTIONAL DIMENSIONS.

DR.	CH'K.	DATE	SCALE	ISSUE	DRG NO.
HWS	EWS	1-25-54	None	3	A-692-14289

Item No.	No. Parts Req.	Purch. Part No.	Name	Material
1	1	091-00003	Socket	Hansen #4-S27, Type ST, Brass, 1/2" Hose Con.
2	1	091-00002	Plug	Hansen #4-T27, Type ST, Steel, 1/2" Hose Con.
3	2	091-00005	Hose Clamp	Wedgon Or Staput, Narrow Width, to Fit 27/32"O.D. Hose.
4	See Chart	091-00006	Hose	Ortac 1/2"I.D. X 27/32" O.D. 1 Braid, (200°)
5	1	091-00001	Socket	Hansen #4-S25, Type ST, Brass, 1/2"M.P.T. Con.
6	1	091-00004	Plug	Hansen #4-T25, Type ST. Steel, 1/2"M.P.T. Con.

Sub. Assembly Part No.	"A" Hose Length
692-14289-1	17" Lg.
692-14289-5	5' 0" Lg.
692-14289-10	10' 0" Lg.
692-14289-15	15' 0" Lg.

TITLE 1/2" Hose S.A. For Temp. Control Units

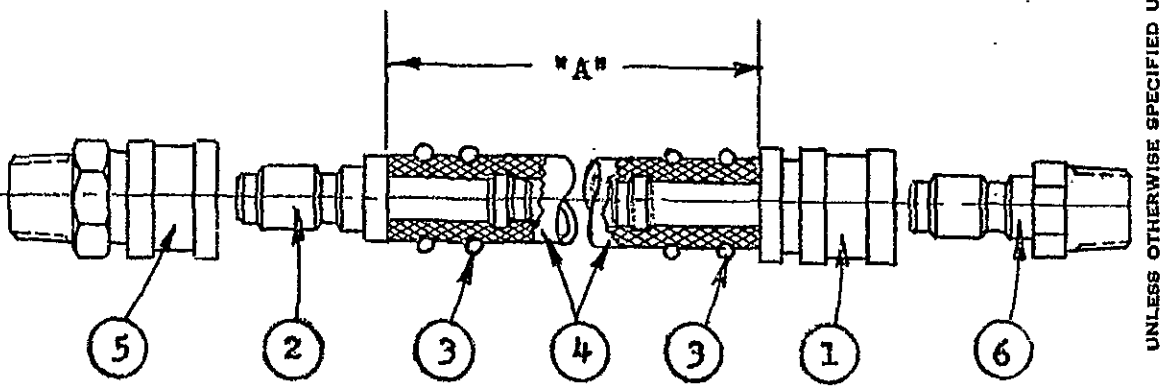
MATERIAL
FINISH

STERLING, INC.
MILWAUKEE, WIS.

DWG. NO. 692-14289

CHANGE NO.	BY	DATE
1	DJK	8-29-77

Dwg. No. & Part Nos. Updated



UNLESS OTHERWISE SPECIFIED USE
± .005" TOLERANCE ON DECIMAL DIMENSIONS.
± .010" TOLERANCE ON FRACTIONAL DIMENSIONS.

Item No.	No. Parts Req.	Purch. Part No.	Name	Material
1	1	091-00018	Socket	Hansen #6-S32, Type ST, Brass With 3/4" Hose Stem Connection.
2	1	091-00016	Plug	Hansen #6-T32, Type ST, Steel, 3/4" Hose Stem Con.
3	2	091-00020	Hose Clamps	Wedgon Or Sta put, Narrow Width, to Fit 1 9/32" O.D. Hose.
4	See Chart	091-00021	Hose	#21W86 Creamery Type, 3/4" I.D. X 1 9/32" O.D. 4 Ply,
5	1	091-00014	Socket	Hansen #6-S30, Type ST, Brass, 3/4" M.P.T. Con.
6	1	091-00019	Plug	Hansen #6-T30, Type ST, Steel, 3/4" M.P.T. Con.

Sub. Assembly Part No.	"A" Hose Length
692-14339-5	5' 0" Lg.
692-14339-10	10' 0" Lg.
692-14339-15	15' 0" Lg.

NO.	CHANGE	DATE	BY
1	Dwg. No. & Parts No's. Updated	3/30/79	RC

DWG. NO. ...692-14339

USED ON

DATE | BY

CHANGE

NO.

DATE | CH'K. | ISSUE | DRG. NO.
1-25-56 | HWS | 3 | 692-14339

SCALE None

DR. HWS

TITLE 3/4" Hose 3 Ft. For Manu. Control Units

STERLING, INC.

MATERIAL

FINISH

MODELS: S6412-A, S6422-A, S6432-A

PART NO.	DESCRIPTION
691-00003-09	Sensor, Heating & Cooling
147-00009	Knob, Potentiometer
732-00007	Solenoid Valve, 1/4" (9/32" Orfice)
732-00024	Solenoid Valve, 1/4" (5/32" Orfice)
162-00001-18	Coil, Solenoid Valve
605-00030-01	Pump, 1/2 HP complete, 1/60/115-230
695-00007-01	Motor Impeller, Seal Assembly 1/2 HP 1/60/115-230
720-09159	Motor, 1/2 HP, 1 PH, 60 HZ, 115/230
081-00024	Rotary Seal Assembly
545-00001	Housing Gasket
615-13341-01	Bracket
542-10404	Water Slinger
615-14921	Volute
695-18409	Impeller
714-00002	Relay, Plug-in Controller
717-04003	Toggle Switch (Quick Cool Down)