HEATING AND TEMPERATURE CONTROL

SERVICE AND INSTRUCTION MANUAL
MODELS: 8000 SERIES
Revision #8
August 1993

Engineered and Manufactured by INDUSTRIAL CONTROL DIVISION

STERLING, INC.
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Customer Service: (800) 783-7835

Manufacturers of Temperature Control Equipment Since 1916

Please note that our address and phone information has changed. Please reference this page for updated contact information.

⚠CAUTION These manuals are obsolete and are provided only for their technical information, data and capacities. Portions of these manuals detailing procedures or precautions in the operation, inspection, maintenance and repair of the products may be inadequate, inaccurate, and/or incomplete and shouldn't be relied upon. Please contact the ACS Group for more current information about these manuals and their warnings and precautions.

Parts and Service Department

The ACS Customer Service Group will provide your company with genuine OEM quality parts manufactured to engineering design specifications, which will maximize your equipment's performance and efficiency. To assist in expediting your phone or fax order, please have the model and serial number of your unit when you contact us. A customer replacement parts list is included in this manual for your convenience. ACS welcomes inquiries on all your parts needs and is dedicated to providing excellent customer service.

For immediate assistance, please contact:

- North, Central and South America, 8am – 5pm CST +1 (800) 483-3919 for drying, conveying, heating and cooling and automation. For size reduction: +1 (800) 229-2919.
  North America, emergencies after 5pm CST (847) 439-5855
  North America email: acsuscanadacustserv@corpemail.com
- Mexico, Central & South America
  Email: acslatinamericacustserv@corpemail.com
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- Asia/Australia +86 512 8717 1919
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Sales and Contracting Department

Our products are sold by a worldwide network of independent sales representatives. Contact our Sales Department for the name of the sales representative nearest you.

Let us install your system. The Contract Department offers any or all of these services: project planning; system packages including drawings; equipment, labor, and construction materials; and union or non-union installations.

For assistance with your sales or system contracting needs please Call:
North, Central and South America +1 (262) 641-8600 or +1 (847) 273-7700 Monday–Friday, 8am–5pm CST

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TABLE OF CONTENTS

CUSTOMER SERVICE

Your unit was engineered and carefully assembled to give you excellent quality and years of trouble free operation. However, if an unknown condition occurs, Sterling, Inc. has a well trained customer service group to assist you. We suggest the following to request quick service:

Contact Sterling, Inc.

The Customer Service Group is available from 7 AM to 6 PM (CST), Monday through Friday. The numbers to call are:

(800) 783-7835
(414) 354-0970
Fax #: (414) 354-6421

Before you call, be sure to do the following:

1. Refer to the "Troubleshooting" section of this manual.
2. Be sure to have this manual in front of you when you call.
3. Write down the symptoms or problem that you are experiencing.
4. Have your unit's model number and serial number when you call.

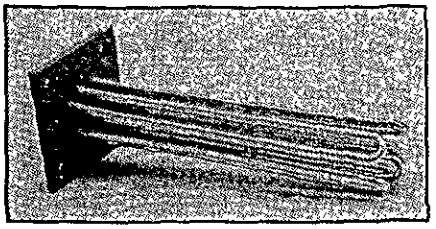
These few tips should result in quick and easy service for your Sterlco Unit.

STERLING RETURN GOODS POLICY

In order to better serve our customers' needs, we would ask that before returning material or equipment of any kind, for any reason, to please call Sterling at 1-800-783-7835 for a return goods authorization number (RGA). This is a mandatory policy to help us identify returned goods, the reason for their return and to help Sterling to expedite their processing. Failure to obtain this RGA# and mark it on the goods may result in their immediate return at your cost without being processed.

We thank you for your cooperation and understanding.

Immersion Heaters

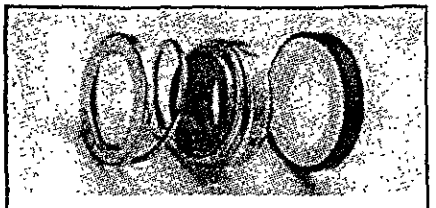


The water is heated by the specially designed three-phase low watt density electrical immersion heater, and regulated by the controller. The standard heater has a copper sheath for the best heat transfer. Incoloy and Stainless Steel heaters are offered as options, but are not as efficient.

These models can be supplied with 4.5kW, 9kW, 12kW, 18kW, or 24kW low watt density immersion heaters, depending upon the heating needs of the process. All of the models are built to provide "full" or "partial" heat as required by the process and determined by the controller, to provide more precise control.

Pump

The pump is a bronze-fitted straight centrifugal type. It features a split case design to facilitate replacement of the seal. It has a high output capacity with excellent discharge pressure helping it facilitate turbulence to maximize heat transfer, and is well suited for the conditions under which it was designed to operate. The circulating capacity outside the unit, for each size pump, is as stated below.



"SterlSeal™" Pump Seal

A special seal-flush system in the pump keeps the SterlSeal™, a ceramic seal, clean; extending the seal life. The seal itself is the finest type available for this service and provides an excellent combination of long wear, high abrasion resistance, and heat resistance. Pump outlet water is used to continuously flush and keep cool the seal surface. The wear of the seal is determined by the water quality and temperature of the water running through the pump. The following table is a listing of true pump capacities.

PUMP INPUT (Hp)	PUMP OUTPUT (GPM @ psi)	PUMP INPUT (Hp)	PUMP OUTPUT (GPM @ psi)
1/2	15 @ 20	2	50 @ 30
3/4	20 @ 20	3	45 @ 40
1	30 @ 25	5	60 @ 50
1 1/2	40 @ 35		

Cooling

The controller automatically regulates cooling by opening and closing the solenoid valve, our exclusive Variable Timed Cooling (VTC™). For the 9400 Series (direct injection), cooling is accomplished by removing the required amount of warm water from the system.

This permits an equal amount of cool plant water to enter the system well ahead of the pump, allowing it to blend with the system water. Naturally, the water supply temperature will govern the minimum operating temperature of the unit. For the 9300 Series (closed circuit), cooling is accomplished by the automatic release of cooling water through the shell of the specially designed shell and tube heat exchanger in each zone. The process fluid, i.e. water, glycol, or other similar fluid is circulated through the tubes of the heat exchanger. Naturally, the plant water supply temperature will govern the minimum operating temperature of the unit.

Electrical

The pump motor and the immersion heater operate on three-phase, 50/60 cycle, nominal voltages with the control circuit operating at 115V single phase. The control circuit voltage is provided by a single phase machine tool transformer with a grounded secondary. The 115V control circuit and controller outputs are fuse protected. The pump motor is controlled by a full voltage magnetic non-reversing motor starter, with fused branch circuit overcurrent and thermal overload protection.

Automatic Vent (M-3 Only)

This feature automatically permits quick and complete purge of air from the system before the unit is started. The "vent" actuates the solenoid valve forcing trapped air and water out through the drain, properly filling and priming the unit prior to start-up. Complete venting is necessary to prevent damage to the pump and heater. The M-3 controller allows for several programmable inputs to control the "Auto Vent" feature; for example, the duration of the venting. (See controller programming section)

Manual venting is featured with a unit utilizing the S-3 controller. See Chapter 3 for more details.

Pressure Switch

A pressure switch built into each unit will not allow the system to start until the water supply has been turned "On" and subjected to the minimum water supply pressure. This is intended to protect the pump seal and the heater from damage through operation without water. The pressure switch is set at approximately 10 PSI (for 250 °F unit) or 25 PSI (for 300 °F unit) prior to leaving the factory.

Safety Thermostat

The safety thermostat mounted on the side of the heater tank protects against thermal runaway. This is to guard against the unlikely event of "runaway" heating. If overheating

INSTALLATION REQUIREMENTS

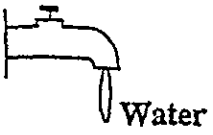
The 8000 series Temperature Control Systems must have certain requirements met for proper operation.

Surroundings

The 8000 series is designed to be located as close as possible to the process for proper circulation and temperature control.

Proper care must be used in selecting a unit location. The area surrounding the unit must be free of obstructions to ensure proper ventilation of the internal components.

The ambient temperature range for storage is -40 °F (-40 °C) to 185 °F (85 °C). The ambient temperature range for operation is -4 °F (-20 °C) to 158 °F (70 °C).



It is recommended that the 8000 series have at least 25 psi water supply pressure to prevent pump cavitation that can be caused by the water "flashing" to steam. A maximum 75 psi supply pressure is recommended so as not to damage the pump or other components.

Hard or corrosive water can build layers of scale or lime within the unit, slowing down water flow and possibly causing temperature control problems. Since the corrective maintenance and downtime caused by poor water quality is costly, it is worthwhile to treat your water. In general, we have found that customers who use quality water only occasionally need to buy spare parts.

Proper inlet pipe sizing is suggested to keep restrictions to a minimum. If the water supply piping is larger than 3/4", reduce the size at the unit. The table below contains the pipe sizes that are used in the unit.

	PIPE SIZES	
	1/2 & 3/4 HP	1 - 5 HP
Process delivery	3/4"	1 1/2"
Process return	3/4"	1 1/2"
Water supply	3/4"	3/4"
Drain	3/4"	3/4"

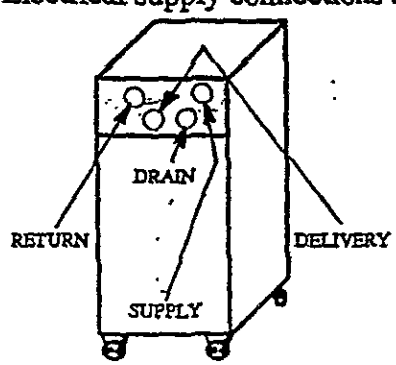
Electrical

Check unit nameplate for required voltage and amperage before making any electrical connections.

DANGER

Improper electrical connections can damage the unit and cause serious operator injury or death!

Electrical supply connections are made in the back of the unit. At the top, an access panel covers all of the electrical connections. Customer connections can be run to the supply terminals from either side of the unit. Be sure that all three phases are wired correctly. If not wired properly, the pump will run backwards. **Again, check the unit nameplate for the correct voltage and amperage.**



S-3

UNIT START-UP

The simplicity of design and the highly engineered controller make this unit almost self-operating.

The "ON-OFF" control, the "VENT" button and the "TEMPERATURE CONTROLLER" are all that is required to operate this unit.

After all the connections have been made, turn the water supply "ON", turn control power "ON", and then turn the setpoint down to zero. Let the unit run for at least one minute depending on the size of the process.

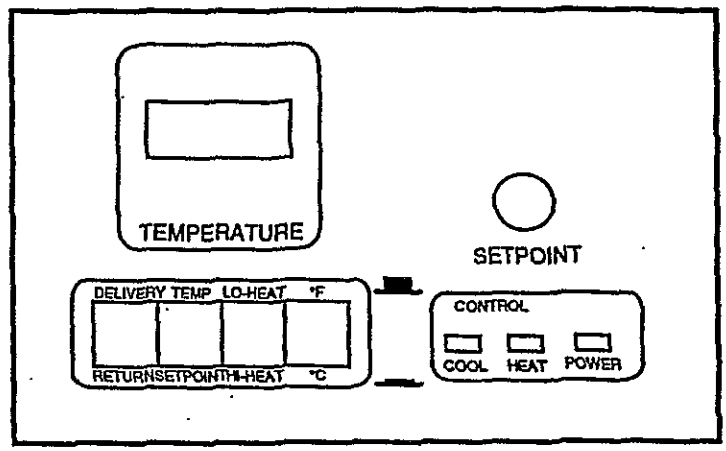
As the water comes in the water supply line, the water must enter the pump, up through the tank and out through the delivery line, through the process, back through the return line, and through the solenoid line and out the drain line.

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

FUNCTIONS OF THE CONTROL PANEL

This section will deal with each controller separately, including description and functions.

S-3



The S-3 controller is a analog based circuit temperature controller, specifically designed for use with the Sterlco Temperature Control units. The unit is extremely easy to use and the temperature readings are highly visible. The controller has been enhanced with the digital readout, completely solid state output drivers, and improved control circuitry for tighter control around the setpoint temperature. This controller, when used with the Sterlco Temperature Control system, monitors the temperature of the water in any given customer process to a selected setpoint. The Temperature Control system will heat or cool the water as required by the individual processes.

The analog based solid state circuit design provides for quick response to system demands.

The display is readable at a glance, using the latest in LCD backlit technology. The controller constantly displays the Delivery temperature and with a push of a button, the Return temperature or the Setpoint temperature is displayed. The heating/cooling mode indicator is continuously displayed, depending on the operating condition.

The temperature can be displayed in either °F or °C with a push of a button.

The controller offers manual control for the selection of half or full heat for better process heating.

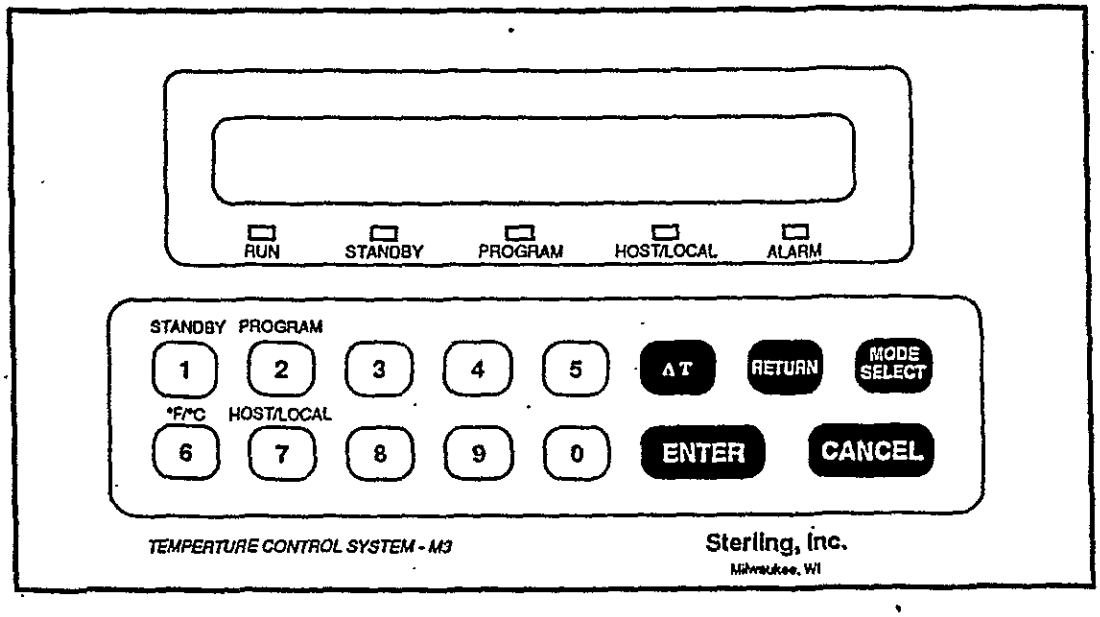
The front panel shows the system status as well as the selections for High or Low heat, Setpoint Temperature, Return and Delivery temperatures. The controller indicates when the unit is in a heating mode (red), or a cooling mode (yellow). The controller has a green indicator when there is power applied to the controller.

The set-up for the S-3 controller requires three basic settings for operation. The first is the selection of the setpoint temperature. This is accomplished by pressing and holding the setpoint button (this is a momentary switch and must be held while changing the setpoint in order to read the temperature on the display) on the front panel and adjusting the setpoint

Temperature Sensing using a Type J thermocouple, and Remote mounting of the controller module using the thermocouple.

The controller includes self diagnostics to check all internal software and hardware functions. Each section of diagnostics will display "OK" or "FAIL". The controller will come up in the run mode if all the diagnostics were "OK", or in a standby mode if any of the diagnostics were "FAIL".

The self diagnostics are the following: RAM memory, timers, keyboard, jumper selection, battery backup, clock, and A/D converter.



In this next section **BOLD** faced type designates the keypads on the control panel, and "QUOTED" words are the screen displays.

Functions

ΔT - Displays the difference between the delivery and return temperatures. (Shows in place of the delivery temperature field.)

RETURN - Displays the return temperatures on the screen in place of the delivery temperature.

MODE SELECT - Displays the command functions, and allows the user to view each sub menu label. To select a particular function, hold down **MODE SELECT** while pressing one of the other keys.

ENTER - Selects a specific menu subheading or saves a changed value.

CANCEL - Backs out of a particular menu subheading or returns to the run mode.

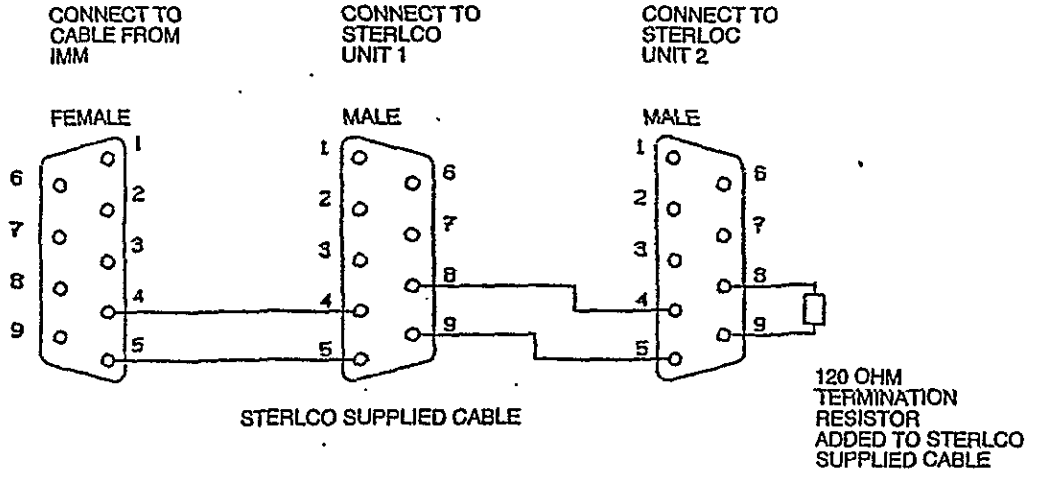
"COMMUNICATION" (FACTORY INSTALLED OPTIONAL) - This sub menu allows the operator to change communication parameters. A sub menu is displayed with Protocol, Baud, Device ID, and Device Address. Each option can be displayed by pressing **MODE SELECT**. The option can be selected by pressing **ENTER**.

"PROTOCOL" - The controller can have either SPI or GEN protocol programs. The protocol is factory installed and cannot be changed within the controller menu.

SPI - This protocol specifies a connection management protocol, a packetized communication format, and communication error mechanisms for passing commands and data between a host computer and a slave. A host computer initiates all communications. The protocol used corresponds to the 3.01 version of the SPI communication protocol specification dated October 1990. The data is transmitted via a multi-drop EIA-485 (half duplex) hookup. The character format required is 1 start bit, 8 data bits, no parity, and 1 stop bit. EIA-422 and EIA-232 hardware handshakes are also available.

The M-3 controller will support a number of commands that allows the host computer to retrieve status and assign setpoints. The commands correspond to mold temperature controller device.

SPI TERMINATION RESISTOR INSTALLATION DETAIL



GEN - This protocol is the same as SPI except that it corresponds to ANSI-X3.28 revision 1976, sub categories 2.5 and A4. The data is transmitted via a multi-drop EIA-422 (bi-directional) hookup. The character format required is 1 start bit, 7 data bits, even parity, and 1 stop bit. EIA-422 and EIA-232 hardware handshakes are also available

The M-3 controller will support a number of commands that will allow the host computer to retrieve status and assign setpoints.

M-3 CONTROLLER
SAMPLE PROGRAM

3. Low Alarm (Press **MODE SELECT** until "LOW ALARMS" appears)
   - Press **ENTER**
   - Change the Low Alarm by pressing **1 2 0**
   - Press **ENTER** to save change.
   - Press **CANCEL** to return to program menu.

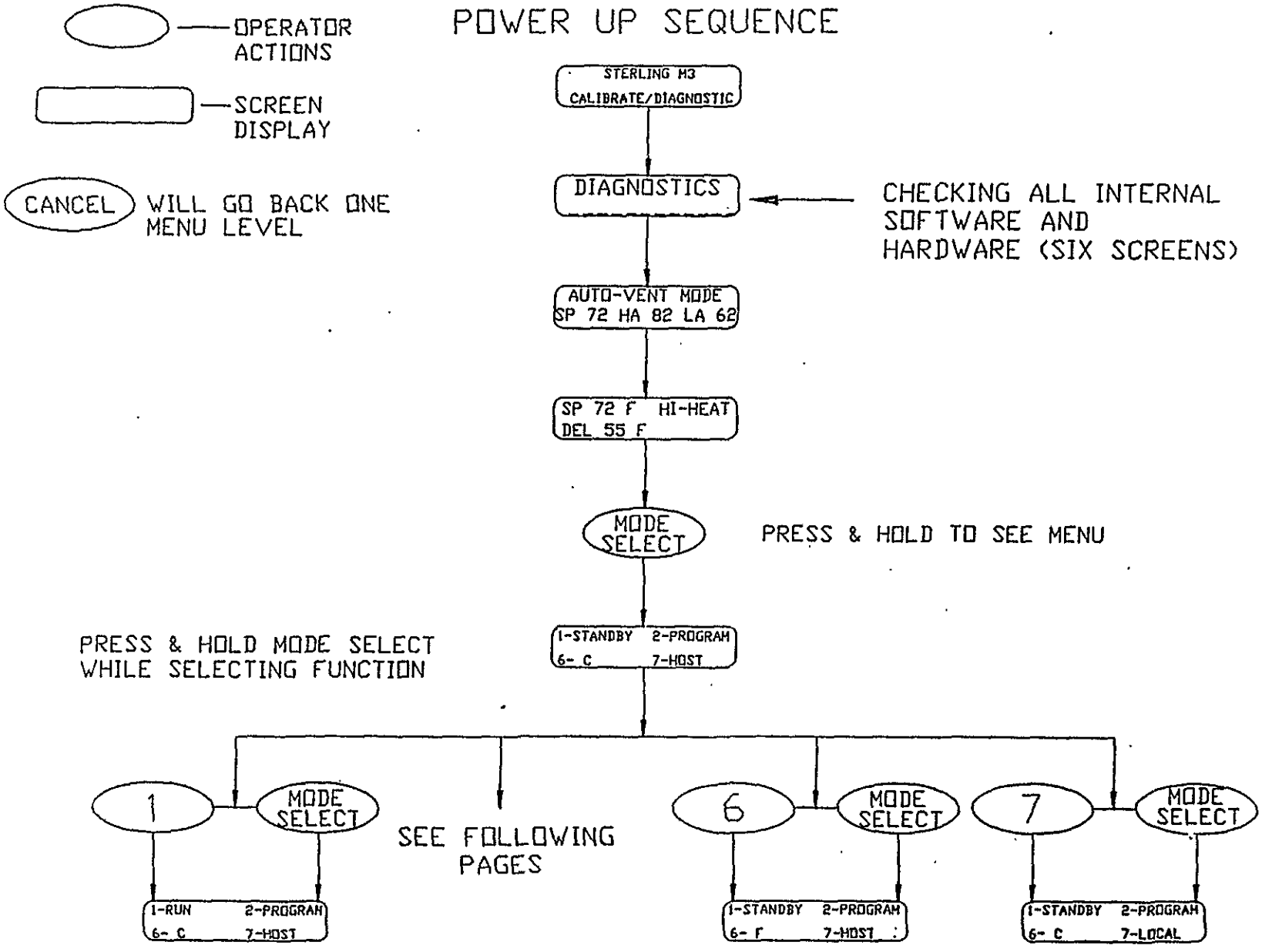
4. Vent (Press **MODE SELECT** until "VENT" appears)
   - Press **ENTER**
   - Press **MODE SELECT** (to go to "TIME" of vent)
   - Press **ENTER**
   - Change the duration time by pressing **2 0**
   - Press **ENTER**
   - Press **CANCEL** (to go back to program menu)

5. Dead Band (Press **MODE SELECT** until "DEADBAND" appears)
   - Press **ENTER**
   - Press **MODE SELECT** (to change to ±1.0 °F)
   - Press **ENTER** to save change.
   - Press **CANCEL** (to go back to run mode)

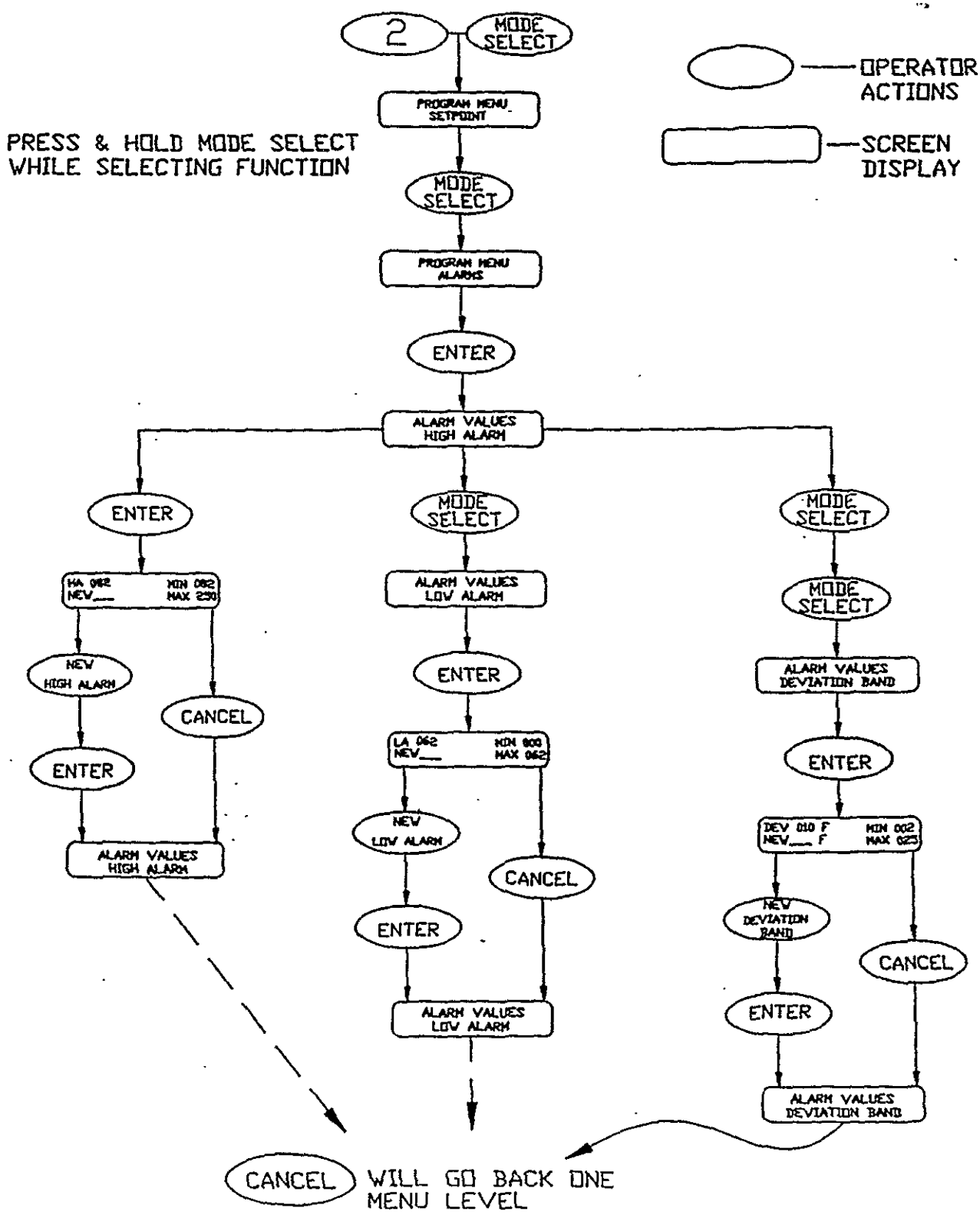
If you enter into a menu and you do not wish to make any changes to the current setting, press **CANCEL**. Pressing **ENTER** in a menu screen will load zero's in for a value.

*NOTE: The communications setup is a factory installed option to your specifications, if you are running/monitoring your unit by a host computer.

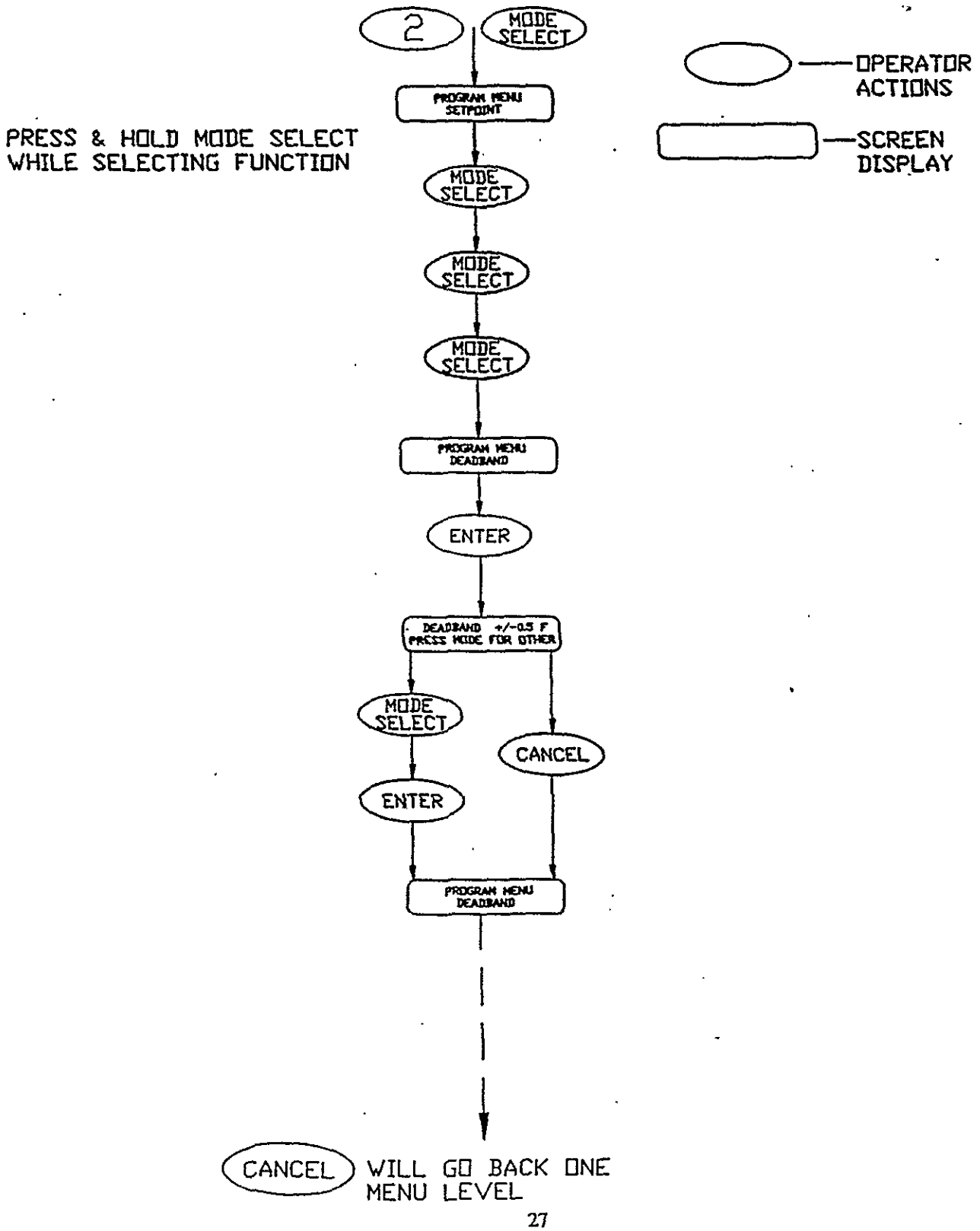
POWER UP SEQUENCE



ALARMS


2
MODE SELECT
OPERATOR ACTIONS
SCREEN DISPLAY
PRESS & HOLD MODE SELECT WHILE SELECTING FUNCTION
PROGRAM MENU SETPOINT
MODE SELECT
PROGRAM MENU ALARMS
ENTER
ALARM VALUES HIGH ALARM
ENTER
HA 062 MIN 002
NEV___ MAX 250
NEW HIGH ALARM
CANCEL
ENTER
ALARM VALUES HIGH ALARM
MODE SELECT
ALARM VALUES LOW ALARM
ENTER
LA 062 MIN 000
NEV___ MAX 062
NEW LOW ALARM
CANCEL
ENTER
ALARM VALUES LOW ALARM
MODE SELECT
MODE SELECT
ALARM VALUES DEVIATION BAND
ENTER
DEV 010 F MIN 002
NEV___ F MAX 025
NEW DEVIATION BAND
CANCEL
ENTER
ALARM VALUES DEVIATION BAND
CANCEL
WILL GO BACK ONE MENU LEVEL

DEADBAND


2
MODE SELECT
PROGRAM MENU SETPOINT
MODE SELECT
MODE SELECT
MODE SELECT
PROGRAM MENU DEADBAND
ENTER
DEADBAND +/-0.5 F PRESS MODE FOR OTHER
MODE SELECT
ENTER
CANCEL
PROGRAM MENU DEADBAND
OPERATOR ACTIONS
SCREEN DISPLAY
PRESS & HOLD MODE SELECT WHILE SELECTING FUNCTION
CANCEL WILL GO BACK ONE MENU LEVEL

PROGRAMMING THE M-2

Depressing any program keypad (**PROGRAM PROCESS, PROGRAM HI ALARM, PROGRAM LO ALARM**) deletes the stored value. The controller will idle and the "Program" LED will flash, allowing the limits to be reset. The following programmable features are allowed by the M-2:

- **PROGRAM PROCESS-** Depress the **PROGRAM PROCESS** keypad and the up or down arrow simultaneously to increase or decrease the setpoint display.
- **PROGRAM HI ALARM-** Depress the **PROGRAM HI ALARM** and the up or down arrow to set the alarm high limit. To disable the function, set the limit out of range.
- **PROGRAM LO ALARM-** Depress the **PROGRAM LO ALARM** and the up or down arrow to set the alarm low limit. To disable the function, set the limit out of range.

OTHER KEYPAD FUNCTIONS

- **RETURN TEMP-** Depressing the **RETURN TEMP** keypad will cause the returning fluid temperature to be displayed on the digital "temperature" LED display. The display will revert to delivery temperature when the keypad is released.
- **ΔT TEMP DIFF-** Depressing the **ΔT TEMP DIFF** keypad will cause the ΔT, or difference between delivery and return temperature, to be displayed on the digital "temperature" LED display. When the keypad is released, the display will revert to delivery temperature.

HIGH ALARM-	Indication of process fluid temperature exceeding high setpoint limit.
LOW ALARM-	Indication of process fluid temperature exceeding low setpoint limit.

PREVENTIVE MAINTENANCE

Prior to any servicing, disconnect all power to the unit, let the unit cool down, and turn off the water. Failure to do so can result in serious injury or death.

Draining

The Sterlco unit should be thoroughly drained if it is to be taken out of service for a long period of time, or exposed to freezing. Drain plugs are provided at the base of the heater tank and at the base of the pump pedestal.

Periodic Checks

Every six months, inspect all electrical connections for secure attachment and for safe and secure ground connections. Inspect the power cable, especially at the entrance point to the unit. This inspection should be made by a qualified electrician. Check for leaks, especially under the pump, as this may indicate a worn pump seal.

CORRECTIVE MAINTENANCE

Pumps and Seals

Before leaving our factory, each unit is completely tested for a considerable period of time and calibrated. Afterwards, the unit is drained and blown out with warm air to remove 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 can possibly leak when the unit is started. In most cases these gaskets will soon swell and form a tight seal. In other cases, it may be necessary for you to tighten the pump bolts to stop a leaking condition.

It is possible to have the pump seal surfaces separate slightly because of rough handling or vibration during transit. This could cause a leak at the pump seal when the pump is started, but in most cases the surfaces will mate again after the pump is allowed to run for a short period of time. If they do not reseal, it may be 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 was started without water.

Our pump seals 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 temperature, or presence of certain chemicals in the water. Our pump seal assembly has been developed to resist abrasive particles that are present in many water systems. This is done by a special flushing system that uses water exiting the pump to constantly wash the seal area. It is also fitted with high temperature flexible components for

UNIT SYMPTOM	POSSIBLE CAUSE	SOLUTION
Temperature fluctuations/rapid cycling from hot to cold.	Undersized connectors/water lines.	Increase size of connectors/water lines.
	Long connecting lines between unit and mold.	Move the unit closer to the mold and shorten connecting lines.
	Serpentine flow through mold.	Connect lines for parallel flow instead of series flow.
	Blocked water line in mold.	Check mold for metal chips or lime build-up. Clean mold.
	Quick disconnect fitting with check valve.	Remove and replace fitting or valve.
	Lime buildup in unit piping or fittings.	Clean or replace.
	Faulty Sterlco TCU	Check unit by connecting 3/4" line directly from delivery to return line. Run unit to determine if TCU controls setpoint temperature.
	Reversed Probes	Switch Return & Delivery Probes
Unit does not heat properly/ cannot achieve setpoint.	Loss of water in process.	Check all lines/connections/ fittings.
	Faulty/dirty solenoid valve*	Depress "vent" button several times to flush valve. **
Unit will not heat.	Defective heater contactor.	Visual inspection of coil and contacts. Repair/ replace defective contactors.
	Defective immersion heater.	Check resistance on all 3 legs of heater with an ohm meter. If not all equal, contact factory for replacement heater.
	Heater burnout.	Check heater tank for scorched/discolored paint. Check resistance on all 3 legs of heater with an ohm meter. Replace heater as required.
	Controller heat output open	Check the heater output with an ohm meter to ground. It should read in the mega-ohm range. Infinite or zero readings indicate a defective output.

* Usually detected when there is a steady stream/trickle of water out of the drain line.
** If the leak continues, disconnect the power to the unit, turn off the water supply, and clean or replace the solenoid.

DIAGRAMS

FLOW &
ELEMENTARY ELECTRICAL

PUMP SEAL REPLACEMENT

WARRANTY

OPTION EXPLANATIONS

TECHNICAL MANUAL REVISONS

ADDENDUM: STERLING, INC.

TEMPERATURE CONTROL UNIT: M8415AX0101

REPLACEMENT PARTS

Part Number	Description
729-00062	Contactor
601-00405-04	Controller "M-3"
542-00007-08	Flange Gasket
720-09019-04	Motor 3/60/460V
732-00013	Solenoid Valve 3/4" 115V Coil
044-00138-00	Pressure Relief Valve
724-00221	Safety Thermostat
701-00066	Rev. Phase Relay
704-00089	Transformer
714-00080	Relay
726-00100	Starter, Size "0"
728-00088	Disc. Switch
715-00006	Pilot Light
721-00010	Push Button
721-00003	Push Button
722-00126-01	Immersion Heater 9KW @ 460V
733-00001	Pressure Switch
721-00036	Push Button
724-00122	Contactor
708-00037	Current Transformer
707-00038	Ammeter
725-00547	Fuse #FRS, 600V, 15 AMP Main
725-00756	Fuse #ATDR, 2.0 AMP
725-00674	Fuse #JJS-14, 600V, 15 AMP, Heater
725-00752	Fuse #ATMR, 80AMP,Transformer
725-00504	Fuse #FNM, 250V, 2-8/10AMP, Controller
725-00587	Fuse #FNM, 250V, 0.5AMP, Solenoid
692-07369-04	Probe
731-00329-00	Overload
720-09019-04	Motor, 1/2HP,3/60/230-460V, TEFC
542-10404-00	Water Slinger
001-06355-00	Socket Head Screw
615-13341-03	Bracket, Brass
039-00049-00	Comp. Fitting
081-00034-01	Rotary Seal Assembly

695-18409-00	Impeller, Brass, 1/2HP
001-06850-00	Impeller, Screw
615-00016-00	Volute, Brass
695-00019-15	Motor, 1/2HP, 3/60/230-460, TEFC

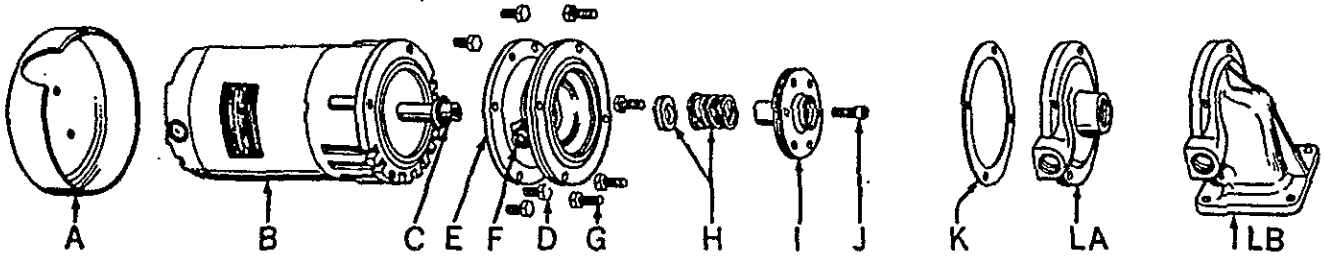
NOTE: Please give Model & Serial numbers when ordering parts. Part numbers are listed as a guide, but many units have special parts or features not covered by this list. Prices are subject to change without notice. Net 30 days, F.O. B. Milwaukee, Wisconsin.

STERLING, INC., 5200 West Clinton Avenue, Milwaukee, Wisconsin 53223-0435
Phone: (414) 354-0970

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

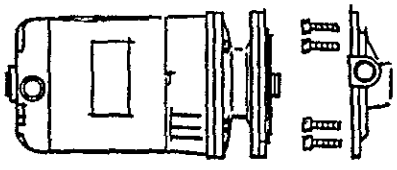
PARTS

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

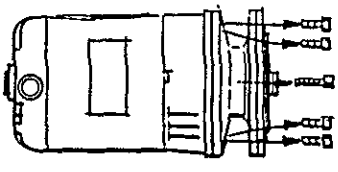


Step No. 1 — Dis-assembling (Removal of old seal assembly)

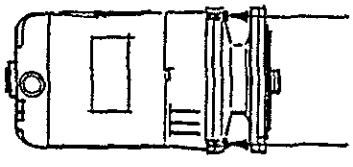
Step No. 2 — Re-assembly (Installation of new seal assembly)



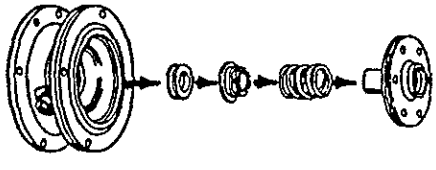
a) Remove volute from motor bracket and impeller assembly by removing pump screws.



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).

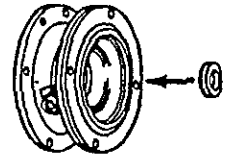


c) Insert two of the pump screws into the two threaded holes in the bracket. Tighten them slowly and evenly to force the impeller and bracket off the shaft. Do not pry the impeller or bracket!

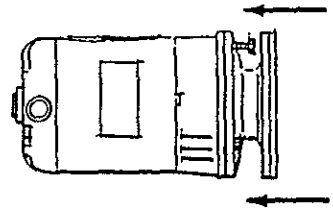


d) Remove old seal parts from impeller hub and bracket. Be sure water slinger is in place.

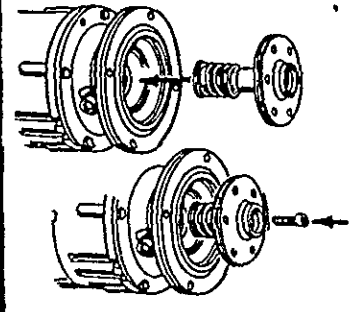
e) Clean impeller hub thoroughly . . . remove all loose particles of dirt, grease, etc. Use fine emery cloth if necessary. Also clean the recess in the bracket so the new seat will fit perfectly. Remove all particles and dirt on gasket surfaces of the two castings.



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.

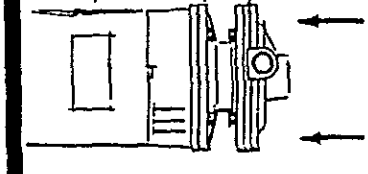


g) Remount bracket on motor.



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.

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RM 1-4100-E1

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Revised 9/92

The "COMMUNICATION" selection from the program menu allows the operator to change the communication parameters. A communication submenu is displayed with "PROTOCOL", "BAUD", "DEVICE ID", and "DEVICE ADDRESS" options. The different communication submenu options can be viewed one at a time by pressing **ENTER**.

The "PROTOCOL" selection from the communication submenu allows the operator to view the current communication protocol between the controller and a host. Pressing **CANCEL** exits the menu and returns to the communication submenu without making any changes.

The "BAUD" selection from the communication submenu allows the operator to change the communication BAUD rate. A menu of possible BAUD rates is displayed with 1200, 2400, 4800, and 9600 BAUD option. The baud rate currently being used is displayed first. The baud rate options can be viewed one at a time by pressing **MODE SELECT**. The baud rate option displayed can be selected by pressing **ENTER**. The **CANCEL** key is used to exit the menu and return to the communication submenu without making any changes.

The "DEVICE ID" selection from the communication submenu allows the operator to view the device identification number for SPI only.

The "DEVICE ADDRESS" selection from the communication submenu allows the operator to change the device address. There are two different screens, one for the SPI protocol and one for the GEN protocol. Enter the new device address and press **ENTER** to save the change, or press **CANCEL** to return to the "DEVICE ADDRESS" submenu without making any changes.

SPI PROTOCOL

The Society of the Plastics Industry (SPI) communication protocol specifies a connection management protocol, a packetized communication format, and communication error mechanisms for passing commands and data between a host computer and a slave. A host computer initiates all communications. The protocol used corresponds to the 3.01 version of the SPI communication protocol specification dated October, 1990. The data is transmitted via a multi-drop EIA-485 (half-duplex) hookup. The character format required is 1 start bit, 8 data bits, no parity, and 1 stop bit.

The M-3 controller will support a number of commands that will allow the host computer to retrieve status and assign setpoints. The commands correspond to a mold temperature controller device.

Commands	Descriptions
(34H)	Alarm, low temperature deviation poll - Returns the low temperature deviation setpoint value in numeric format. This value when subtracted from the process setpoint gives the temperature at which a low alarm will occur.
(35H)	Alarm, low temperature deviation select - Assigns a value to the low temperature deviation setpoint in numeric format.
(40H)	Status process poll - Returns the status of the process as 16 flag bits in the open format. The following bits are supported. The rest are set to 0. Bit 0 - Processing Bit 1 - Alarm, System Bit 2 - Alarm, Process Bit 3 - Alarm, Machine Bit 4 - Alarm, High Temperature Bit 5 - Alarm, Low Temperature Bit 7 - Alarm, Low Pressure
(42H)	Status, machine 1 poll - Returns the status of the machine as 16 flag bits in the open format. The following bits are supported. The rest are set to 0. Bit 0 - Processing Bit 1 - Alarm, System Bit 2 - Alarm, Process Bit 3 - Alarm, Machine Bit 4 - Alarm, High Temperature Bit 7 - Alarm, Low Pressure Bit 14 - Alarm, Phase Reversed or Lost
(44H)	Status, machine 2 poll - Returns the status of the machine as 16 flag bits in the open format. The following bits are supported. The rest are set to 0. Bit 0 - Processing Bit 1 - Alarm, System Bit 2 - Alarm, Process Bit 3 - Alarm, Machine Bit 4 - Fault, Sensor
(70H)	Temperature, to process poll - Returns the delivery temperature in numeric format.
(72H)	Temperature, from process poll - Returns the return temperature in numeric format.

The "REMOTE TEMPERATURE" selection from the program allows the operator to change the remote temperature option. A menu of possible selections is displayed with "IGNORE", "PROCESS MONITOR", and "PROCESS CONTROL" options. The remote temperature selection currently in use is displayed first. The remote temperature selection currently in use is displayed first. The remote temperature options can be viewed one at a time by pressing **MODE SELECT**. The remote temperature option displayed can be selected by pressing **ENTER**. Press **CANCEL** to exit the menu and return to the program menu without making any changes.

"IGNORE" - This option allows the operator to ignore the remote temperature Type J thermocouple. This disables the thermocouple and the controller reads the RTD's within the unit.

"PROCESS MONITOR" - This option allows the operator to monitor the remote temperature Type J thermocouple. The controller shows the temperature of the thermocouple in place of the delivery temperature.

"PROCESS CONTROL" - This option allows the operator to control the process at the remote temperature thermocouple once the process is up to temperature. The controller automatically switches control to the thermocouple once the process reaches the setpoint temperature entered.

THE STERLCO EDGE

Customer Satisfaction Warranty Program for 9000 Series Temperature Control Systems

For more than seven decades, Sterlco Temperature Control Systems have built an enviable reputation for **PRECISION, RELIABILITY AND DEPENDABILITY.** Our commitment for total quality in manufacturing and support services has one primary goal — we want you to be completely satisfied with our products so we back them with an unmatched temperature control system warranty program.

RISK FREE WARRANTY

With the purchase of a new 9000 Series Sterlco Temperature Control System, you receive a *one year risk free warranty program.* If for any reason the unit does not perform as designed, we will repair or replace it with another unit of equal or greater value — no questions asked for a period of 12 months from ship date.

5 YEAR WARRANTY

Heater tank, pump casting, pressure switch and sensing probes are covered for a period of five years from ship date.

3 YEAR WARRANTY

Controller, heater element, motor, transformer, starter, phase relay and heater contactors are covered for a period of three years from ship date.

DOWNTIME ELIMINATORS

To help keep your operation running smoothly and efficiently, we provide backup service and support, including:

— NEXT DAY PARTS SERVICE —

To get you up and running, we provide, by request, overnight shipment of replacement parts for standard units. (NOTE: Orders must be received by 1:00 pm CST.)

— TEMPERATURE CONTROL SYSTEM LOANER PROGRAM —

Should your unit require service at the Sterling factory, we can supply free of charge, a loaner unit (if available when requested). Loaner units are limited to standard, non-custom systems from our loaner supply stock. Customers are responsible for freight.

— TELEPHONE CONSULTATION —

Because many problems can be diagnosed and resolved quickly and efficiently over the telephone, our sales engineer staff is trained and prepared to provide free and immediate consultation.

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ADDENDUM: STERLING, INC.

TEMPERATURE CONTROL UNIT: M8415AX0101

REPLACEMENT PARTS

Part Number	Description
729-00062	Contactor, AB #500L AOD-93
601-00405-04	Controller "M-3", Sterling
542-00007-08	Flange Gasket, Sterling
732-00013	Solenoid Valve 3/4" 115V Coil, ASCO#8210-G9
044-00138	Pressure Relief Valve, Cash Acme #FWL-2 150 PSI
724-00221	Safety Thermostat, Fenwal #18002-0
701-00066	Rotation Sensor Relay, Sterling
704-00089	Transformer, Olson Electrics #MT025M6
714-00080	Relay, AB #700-P400-A1
726-00100	Starter, Size "0", AB #509AOD
728-00088	Disc. Switch, AB #1494V-DR633
715-00006	Pilot Light, AB #800T-PT16
721-00010	Push Button, AB #800T-A2D1
721-00003	Push Button, AB #800t-B6D2
722-00126-01	Immersion Heater 9KW @ 460V, Watlow
733-00001	Pressure Switch, AB #836T 253-J
721-00036	Push Button, AB #800TXD2
729-00122	Contactor, AB #500L-A0D92
708-00037	Current Transformer, Simpson #01297
707-00038	Ammeter, RCA #CDP 1802CE
725-00547	Fuse #FRS, 600V, 15 AMP Main, Buss
725-00756	Fuse #ATDR, 2.0 AMP, Buss
725-00674	Fuse #JJS-14, 600V, 15 AMP, Heater, Buss
725-00752	Fuse #ATMR, 80AMP,Transformer, Buss
725-00504	Fuse #FNM, 250V, 2-8/10AMP, Controller, Buss
725-00587	Fuse #FNM, 250V, 0.5AMP, Solenoid, Buss
692-07369-04	Probe, Sterling
731-00329	Overload, AB #W-29
720-09019-04	Motor, 1/2HP, 3/60/230-460V TEFC, Delco #2J7224CFQ
542-10404-00	Water Slinger, Sterling
001-06355-00	Socket Head Screw, 3/8 - 16 x 3/4"
615-13341-03	Bracket, Brass, Sterling
039-00049-00	Comp. Fitting, 3/16 TB6 x 1/8 MPT
081-00034-00	Rotary Seal Assembly, Sterling

695-18409-00	Impeller, Brass, 1/2HP, Sterling
001-06850-00	Impeller, Screw, 1/4 - 20 x 7/8 SKT HD
615-00016-00	Volute, Brass, Sterling
695-00019-15	Bracket and Seal Assembly 1/2 HP TEFC Motor, Impeller, 3/60/230-460V

NOTE: Please give Model & Serial numbers when ordering parts. Part numbers are listed as a guide, but many units have special parts or features not covered by this list. Prices are subject to change without notice. Net 30 days, F.O. B. Milwaukee, Wisconsin.

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