a nudyne company

Storage Water Heater
Steam-to-Water Mega-Pack System

Operating and Maintenance Manual

Designed and Manufactured in Accordance with
ASME Code Section VIII, Div 1

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Dec 2025

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Operating and Installation Instructions (Pneumatic / Pilot-Operated)

Congratulations on your purchase of a new Ace Boiler, Packaged Storage Water Heater. In this book, we have included installation and maintenance instructions that, if followed, will provide you with many years of service from your new unit. Also included are instruction manuals for each of the controls furnished with the heater. Please read them carefully. They should be helpful in both the installation and service of this unit. Keep these instructions with the heater for future reference.

The Ace Packaged Storage Water Heater is of rugged construction, yet of simple design. The heater uses steam (or water) from a boiler to heat domestic hot water in the tank. The storage heater's temperature control system enables it to control the heated water within the tank at the desired temperature. This close control is accomplished by placing the temperature control element directly in the constant flow path of the circulated domestic water. The integral circulator constantly recirculates water over the heat exchanger.

Lined Packaged Storage Water Heaters feature construction with rust free austenitic stainless fittings and copper tubes for all domestic water contact surfaces, providing a high quality, low maintenance and an extremely cost effective domestic water heating package.

The heat exchanger tubes are rolled and flared into a carbon or stainless steel tube sheet. Each storage heater is constructed and stamped in accordance with Section VIII of the ASME Code, which is stamped on the vessel nameplate.

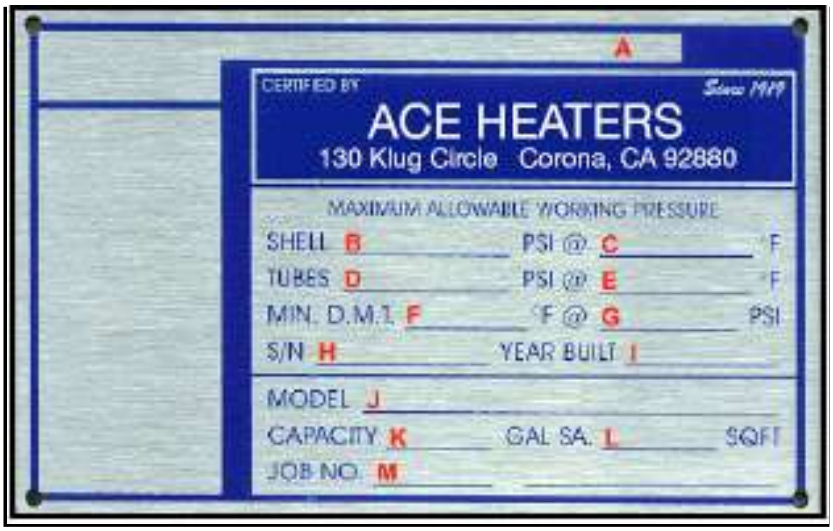
Experience in the field has proven that the Ace Packaged Storage Water Heater, if properly applied and maintained, will give many years of efficient, dependable and economical service.

The Packaged Storage Water Heater Nameplate And Model Number

The Packaged Storage Water Heater Nameplate

The following illustration is an accurate depiction of the nameplate found on the Packaged Storage Water Heater.

A. NB or serial number
B. Shell pressure
C. Shell temperature
D. Tube pressure
E. Tube temperature
F. Min. Atmospheric Pressure
G. Atmospheric temperature
H. Serial number
I. Year built
J. Model number
K. Capacity
L. Square feet
M. Job number



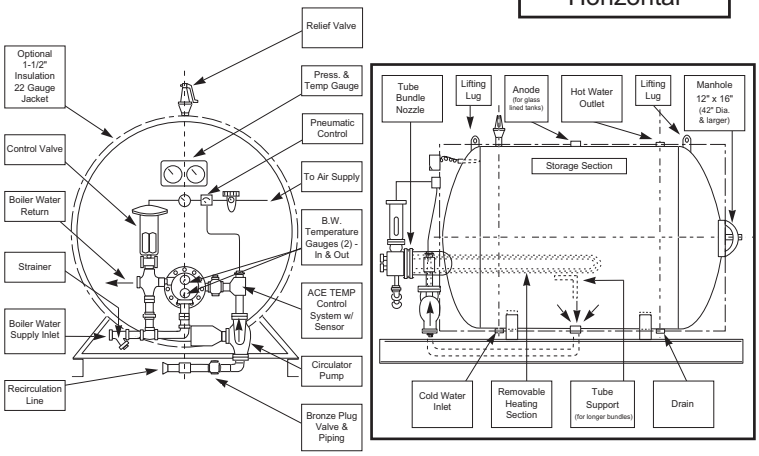
The Packaged Storage Water Heater Model Number

P H G 72 10 - G – 2. 1066 S A

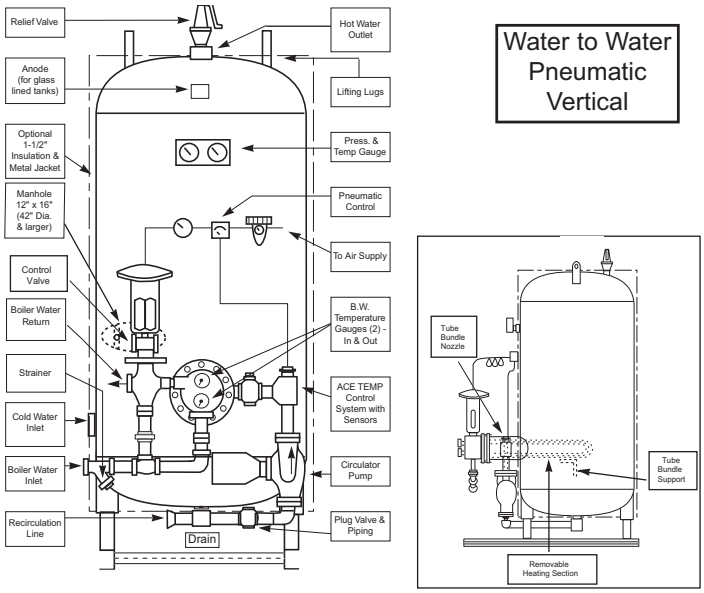
P = Packaged
H = Type (H = Horizontal, V = Vertical)
G = Tank Design Pressure (G = 125, J = 150)
72 = Tank Diameter
10 = Shell Length in feet
G = Lining Code (G = glass, K = prekrete, U = unlined, C = cement, X = special, S = stainless)
2. = # of Passes
1066 = Coil model number (10 = diameter, 66 = length
S = Heating medium (S = steam, W = water, H = hi-temp water)
A = Valve control (A = pneumatic, S = self-contained, P = pilot-operated)

Parts of the Packaged Storage Water Heater (Pneumatic / Self-Contained)

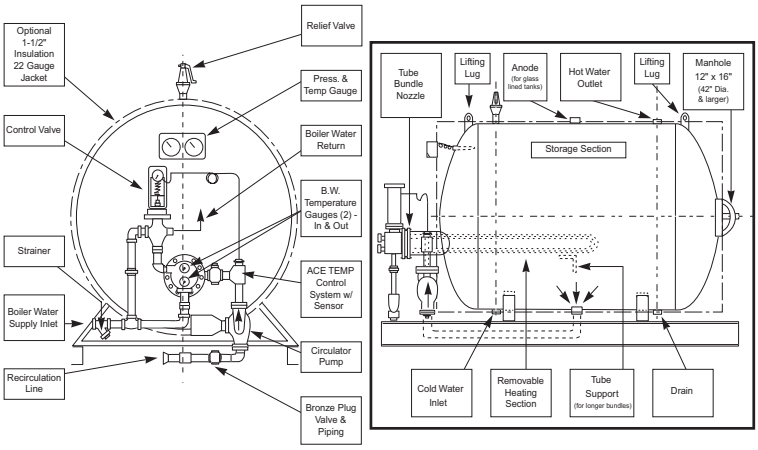
Water to Water Pneumatic Horizontal



Water to Water Pneumatic Vertical



Water to Water Self-Operating Horizontal



Water to Water Self-Operating Vertical

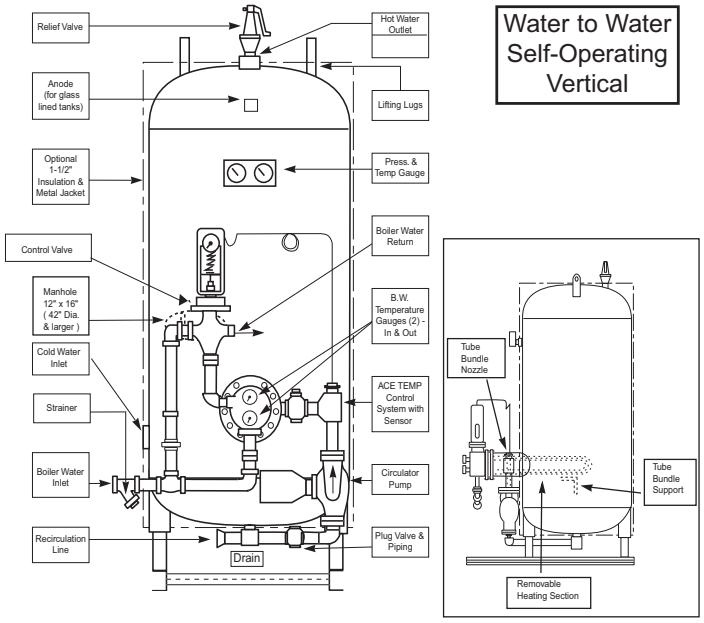


Diagram may vary from actual model

How It Works!

The Packaged Storage Water Heater is designed to heat domestic hot water using existing plant steam or hot water. The control valve regulates the heating medium through the tube bundle.

As there is a demand for domestic hot water, the temperature control bulb will sense the drop in water temperature. The temperature bulb sends a signal to the control valve to open and allow steam or hot boiler water into the heat exchanger tube bundle. As the steam or hot water passes through the tubes, the domestic water in the tank is heated.

The circulator constantly circulates the domestic water over the heat exchanger coil, contributing to the heat transfer.

Receiving Your Packaged Storage Water Heater

Check Equipment Received. Inspect the unit for any shipping damage. Make sure you have received all loose parts, such as listed on the "Bill of Lading". Larger strainers and valves, usually 2-1/2" and above, are shipped loose. Note any damages or shortages on the bill of lading prior to signing it. If the unit is received damaged or missing parts, it is your responsibility to notify the shipping company and file a freight claim. Ace Boiler cannot send replacement parts for freight damaged or missing equipment as warranty items. Permission to return goods must be received from the factory prior to shipping. Goods returned without a Returned Goods Authorization number will not be accepted. Purchased parts are subject to replacement only under the manufacturer's warranty. The warranty does not include the cost for labor, removal, or installation of the warranted part.

General Installation Instruction

NOTE: ***All electrical and piping installation should only be accomplished by qualified personnel following all applicable local, and state codes required for their installation.***

Code Requirements: It is very important that your installation comply with all federal, state and local codes as well as meet good industry practices as shown in publications issued by ASME, AGA, UL, ASHRAE, ABMA, etc.

Placement: The storage heater was either fabricated as a vertical or horizontal unit. It should be installed on a solid foundation, preferably a concrete pad. Provide adequate clearance for normal inspection and maintenance purposes and allow tube pull clearance to remove the exchanger for servicing. A minimum clearance of 24" is recommended from all accessories for ease of maintenance. Make sure the heater is level, from side to side and front to back. Use metal shims if necessary.

Piping: All piping to and from the heater must be provided with adequate supports and expansion compensation so that pipe stresses are not transmitted to the unit. The relief valve and the double-safety solenoid valve, if supplied, should be piped to a safe drain.

Stud Nuts: During shipment, the bonnet and shell flange nuts may loosen and should be re-tightened before start-up. Tighten these nuts to the torques specified later in this manual. After the unit has been in operation for a few days, check and retighten. Note: Bolting is independent on the bonnet and shell-side flanges through the use of a threaded tube sheet flange(s). Therefore, stud bolt nuts must be re-tightened on both sides. See Figure 1.1 for single wall bolting arrangement and Figure 1.2 for double wall bolting arrangement.

Torque's: The following are recommended bolt torque requirements

Bolt Size	Min Torque	Max Torque
1/2"	45 ft-lbf.	60 ft-lbf.
5/8"	90 ft-lbf.	120 ft-lbf.
3/4"	150 ft-lbf.	200 ft-lbf.
7/8"	240 ft-lbf.	320 ft-lbf.
1"	368 ft-lbf.	490 ft-lbf.
1 1/8"	533 ft-lbf.	710 ft-lbf.
1 1/4"	750 ft-lbf.	1000 ft-lbf.
1 1/2"	1200 ft-lbf.	1600 ft-lbf.

Notes:

* Spray each stud bolt and nut generously with penetrating oil before re-torque.

** Gasket thickness before compression. All partition gaskets are ⅛" in width before compression. All gaskets expand twice their width after compression.

*** These are recommended torque values. Stud bolts must not be stressed above 60% of their yield strength.

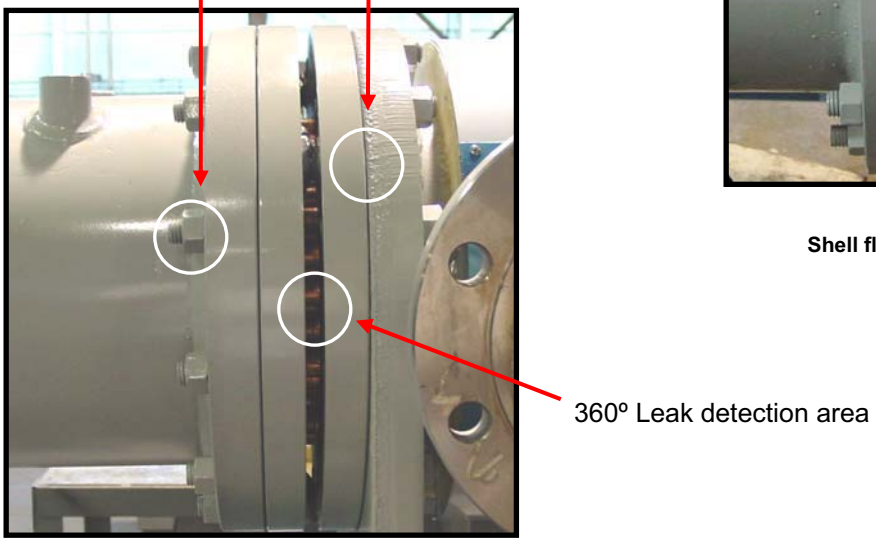


Figure 1.1
Shell flange to bonnet flange joint – SW Tube Bundle

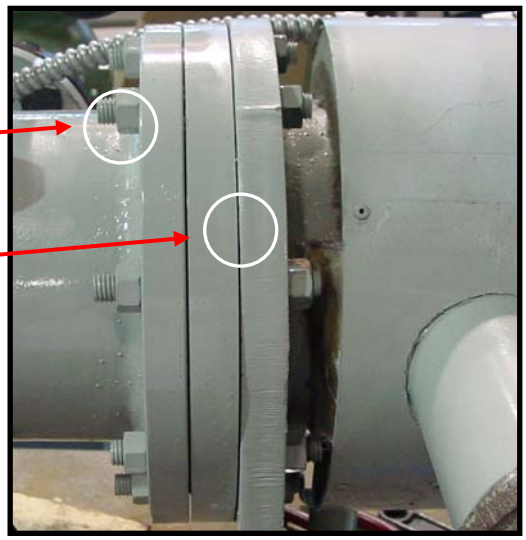


Figure 1.2
Shell flange to bonnet flange joint – DW Tube Bundle

Water Connections: Pipe cold domestic water in, hot out, and drain according to the cover drawing.

Steam Piping: Check the steam supply pressure. The steam supply pressure should not exceed the maximum pressure specified on the control valve, relief valve, or vessel nameplate.

Condensate: The condensate outlet of the steam trap is to be connected to condensate return line.

Relief Valve: The relief valve discharge must be piped to a floor drain to eliminate the potential of scalding burns. The drain line must be the same size as the relief valve outlet and have a downward slope to insure proper drainage. The drain line termination should be visible to see discharge. Check the relief valve nameplate. The unit's operating pressure cannot exceed that listed on the relief valve.

Electrical: Standard units only require power to the circulation pump. If optional electrical equipment such as a safety solenoid is included, power is to be wired according to the wiring diagram. Verify the electrical supply using a voltmeter. The voltage tie-in leads are indicated on the wiring diagram. This unit contains sensitive control components and should be protected by a suitable commercial grade surge protection device. The Packaged Storage Water Heater must be installed in accordance with the National Electric Code and in accordance with all state and local codes.

Water Treatment: We, the manufacturer of your Packaged Storage Water Heater, wish to call to your attention the necessity for a sound approach to proper water treatment. The Packaged Storage Water Heater uses boiler steam or hot water as its heating medium. On steam systems, boiler makeup water continuously introduces contaminants; scale forming solids, corrosive minerals and oxygen, which can cause corrosion or scale formation inside the Packaged Storage Water Heater tube bundle. Whenever appreciable amounts of raw makeup water are continuously added to your system, we recommend that the problem be brought to the attention of a qualified water consultant. Proper treatment will insure longer product life and reduced maintenance.

Before Start-up

Installation and Hook-up

1 Place tank in location desired, and level tank carefully to insure levelness of heating coil loops which are installed in the tank. Provide sufficient clearance in front to permit removal of the tube bundle.

2 Remove temporary pipe plugs and caps from all tapping and discard. Inspect and clean all openings.

3 Install cold water supply line to bottom connection marked Cold Inlet on drawing. Install a gate valve and union for supply shut-off as desired.

4 Install hot water supply line to service from top connection marked Hot Outlet on drawing. A valve at this connection is desirable but not necessary.

5 Install relief valve(s) in top connection of tank, and pipe relief valve outlet(s) to a safe drain area.

6 Hook warm return circulation line to tee provided near pump if return line is to be used. A check and gate valve should be installed in return line, with flow through check valve toward generator.

7 Hook hot water or steam supply to upper coil supply line. A gate valve should be installed.

8 Hook up hot water return to boiler, or for steam, hook up condensate return to boiler condensate return tank. Pipe size to correspond to opening size provided. This pipe must run horizontal, or pitch gradually to condensate tank, with condensate level to be below tube or coil level in generator.

9 **CAUTION:** Do not introduce steam or water without having the safety relief valves installed on tank, as excessive pressure may result, with damage to tank or heating coil.

10 Water circulating pump should be wired to run continuously.

11 Storage water heaters are hydrostatically tested in accordance with code requirements, and are certified as satisfactory by inspection agencies agree upon by manufacturer and purchaser. However, normal yielding of gaskets will occur in the interval between hydrostatic testing in the manufacturer's shop and installation at the job site. Therefore, all external bolted joints should be properly retightened after installation and again after the exchanger has been heated, to prevent leaks and blowing out of gaskets. Follow industry recognized flange bolt tightening practices

12 In all installations, care should be taken to eliminate or minimize transmission of fluid pulsations and mechanical vibrations to the tank or tube bundle.

13 Install anodes (shipped loose) on all glass lined tanks. ***Failure to install anodes will void warranty.***

Start-up Instruction

1 It is assumed that installation is complete and that all connections have been made, including: electrical, steam, domestic water, instrument air, vents, drains and safety valve discharge lines.
2 If an optional control box is included, make sure the power switch is in the “off” position.
3 Set the temperature controller on the pilot to a minimal water temperature output, following instruction in the technical data sheet provided (factory does not present).
4 If option is provided, adjust the high limit control 12º to 15ºF higher than the desired hot water outlet temperature.
5 Ensure the shut-off valve on the bonnet side (heating medium side) is closed.
6 Slowly fill the packaged storage water heater with domestic water, making sure all air is evacuated prior to start-up.
7 Plant steam, used as the heating medium, is controlled by a pilot operated control valve. The pilot utilizes upstream steam pressure to modulate the control valve based on the temperature of the thermostatic element. Steady upstream supply steam pressure is imperative to the temperature control.
8 If an optional control panel is included, turn the control panel switch to “On” position (the manual steam supply valve should be closed). The green light should come on. At the same time, it will energize the solenoid to open the pilot control line to the valve. Make sure the circulator pump is running. (Please refer to the pump instruction manual for details.)
9 Manually open the main steam shut-off valve upstream of the control valve and SLOWLY allow steam to pass through the control valve. Continue until the shut-off valve is 100% open.
10 The packaged storage water heater will now function automatically, reacting according to demand fluctuations and will stabilize once limits are met.
11 Observe the entire system over a period of large demand fluctuations and readjust as necessary by adjusting the pilot control wheel. (See enclosed technical instruction on the temperature pilot).
12 After initial start-up, it is recommended to inspect the upstream strainer for any dirt or debris that may have accumulated. This should be done in accordance with company recommended safety procedures.

Shut Down Instructions

1 Close the main upstream shut-off valve to the packaged storage water heater.
2 De-energize all electrical power to the packaged storage water heater.
3 Allow the unit to cool down (Approximately 24 hours).
4 Close domestic water inlet and outlet shut-off valves.

Safety Features

1 The pilot-operated steam control valve is designed to fail closed in the event of an over-temp condition or power failure.
2 The relief valve is designed to relieve the pressure in the packaged storage water heater in the event the system pressure exceeds its set point.
3 The double safety solenoid (Optional) is designed to dump the domestic water in the shell in the event that the water temperature exceeds the set point on the high limit control (Optional).

Operation of Storage Water Heater

1 The entire system should be clean before starting operation to prevent plugging of tubes. Under some conditions, the use of strainers in the pipe may be required.

2 When placing unit in operation, open a vent and start to circulate the cold medium only. Be sure that the passages in the tank are entirely filled with cold fluid before closing the vents. The hot medium should be introduced gradually until all passages are filled with liquid or steam. Then close vents and slowly bring the unit up to temperature. (Relief valve or faucet may be used as a vent.)

3 Start operation gradually. Do not admit hot fluid to the unit suddenly when empty or cold. Do not stock unit with cold fluid when unit is hot.

4 Start the circulating pump (to run constantly). ***Note: Do not run the circulating pump without water in the system, as this may damage the pump.***

5 Slowly turn on manual hot water or steam supply valve to coil and check for possible leaks in piping, flanges and gaskets.

6 Make sure the gate valve on auxiliary air vent and steam trap is open (if provided on the equipment).

7 Return line out of coil should start to warm up quickly, indicating boiler water or steam is heating tank.

8 The automatic hot water or steam control valve may require adjustment to set to desired tank temperature. If the tank does not get hot enough, the steam valve should be adjusted (screwed in) to a higher number. If the tank temperature is too hot, screwing out to a lower number will be necessary. See valve catalog for further instructions regarding maintenance and adjustments of the control valve. Once the temperature regulator is set, it will maintain a constant tank temperature by modulating the hot water or steam supply to any demand or temperature change of the water stored in the tank, up to the capacity of the coil to produce hot water.

9 Ordinarily, once the temperature regulator is set properly, and the strainers and valves are clean and operating properly, no further attention is needed for several months of operation.

10 Do not operate equipment under conditions in excess of those specified on nameplate.

11 In shutting down, flow of hot medium should be shut off first. If it is necessary to stop circulation of cooling medium, the circulation of hot medium should also be stopped, by bypassing or otherwise.

12 When shutting down the system, all fluids should be drained to minimize the possibility of freezing and corrosion. To guard against water hammer, condensate should be drained from steam heaters and similar apparatus when starting up or when shutting down. To minimize water retention after draining the tube side of water cooled exchangers should be blown out with air.

Trouble-shooting Guide

a **Water temperature too high**
1. Check the setting of the pilot controller and adjust the hand wheel as necessary.
2. Confirm steam supply pressure to the valve does not exceed that specified in the List of Materials.
3. Bad sensing element.
4. Check bleed port for proper orifice fitting (No. 4A) and/or plugging.
5. Check for dirt under valve seats.
6. Valve disc is worn.

b **Banging or pinging**
1. Check steam traps for proper operation.
2. Check for proper condensate drainage. Clean out all dirt and debris.
3. Check for back pressure in the condensate line.

c **Erratic temperature control**
1. Make sure the circulator pump is pumping.
2. Check for proper direction of the circulator pump. The pump should be flowing from the tank to the nozzle neck.
3. Check steam traps for debris and proper operation.
4. Confirm steam supply pressure to the valve is steady and agrees with that specified in the List of Materials.
5. The hand wheel on the pilot controller needs adjustment.
6. Check the control temperature bulb for exterior scale or build up and clean if necessary.
7. Check for debris in pilot and valve.

d **Poor recovery**
1. Check the setting of the pilot controller and adjust the hand wheel as necessary.
2. Confirm steam supply pressure to the control valve meets that specified in the list of materials. Check for a clogged strainer, a partially closed supply valve or other obstructions.
3. Make sure the packaged storage water heater is not trying to supply more hot water than it was designed for. (See performance listed in List of Materials).
4. Check to make sure that the proper bleed port orifice fitting (No. 4A) is on the unit. (See the pilot Technical Data Sheets enclosed).
5. Check for plugging of the control pipe and the orifice in the No. 5A restriction flow elbow.
6. Check the steam trap for any foreign matter and functionality.
7. Main valve diaphragm may be broken. Test with air or water before dismantling.
8. Shut unit down, remove bonnet and coil. Inspect for scale and fouling, which restrict heat transfer. Clean with an approved chemical treatment

e **Control valve not closing**
1. Check the setting of the pilot controller and adjust the hand wheel as necessary.
2. Confirm steam supply pressure to the valve does hot exceed that specified in the List of Materials.
3. Check bleed port No. 4A for proper orifice fitting and/or foreign matter.
4. Check the thermostatic sensing element for kinks & operability.
5. Main valve or pilot may be held open by foreign debris.
6. Valve disc is worn.

Maintenance Instruction

The following service is recommended for proper and safe use of this equipment monthly or more often.

1 Open relief valve(s) momentarily by lifting try lever to be sure valve(s) will open and are operational.
2 Check tank pressure gauge. Pressure of system should not exceed pressure rating on tank or relief valve name plate.
3 Check steam pressure gauge to confirm steam supply is adequate. (Gauge will not show pressure except while system is heating, as pressure connection down stream of automatic steam valve.) Check tank thermometer, preferably when hot water demand is low, to verify that the steam valve is functioning to control temperature of tank within desired limits.

NOTE: Tank is supplied with temperature or pressure relief valve(s) which will open automatically should the water temperature exceed 2100ºF or rated relief valve pressure.

4 Open drain valve at rear of tank for about ½ minute, and flush to drain to remove any mud or sludge from circulation line and bottom of tank.
5 Oil pump motor with 6 to 10 drops of S.A.E. 30 non-detergent motor oil, in each of 2 oil cups on motor.
6 Oil pump bearing housing with 1 or 2 teaspoons of oil of S.A.E. 30 motor oil as above, in pump baring oil cup. **CAUTION:** Do not over-oil motor bearings, as this will result in rapid dust collection and overheating of motor.
7 Clean pump motor air intake and exhaust slots with a soft brush or vacuum cleaner.
8 Inspect anodes on glass lined tanks. Replace anodes if 5/8" or less in diameter. Failure to maintain anodes will void warranty. Keep all records of anode inspection and replacement for warranty guarantee.

Yearly Maintenance

A thorough cleaning of interior of tank and exterior of tank coil surfaces should be performed as required, or after the first year's service, to establish a basis for future need of services.

TO CLEAN TANK, PROCEED AS FOLLOWS:

1 Shut off steam or boiler water supply to tank coil.
2 Shut off cold water supply to bottom of tank.
3 Shut off hot water supply valve at top of tank if one is used.
4 Turn off electric supply to circulating pump.
5 Open drain valve at bottom rear of tank and relieve pressure on tank.
6 Open relief valve on top of tank, or remove it by unscrewing valve, to allow air to enter tank so water will drain freely, and drain tank fully.
7 Remove one manhole bolt and crab assembly, and loosen other bolt about ½"
8 With a block of wood about ½" long and a #2 hammer, hold the manhole cover and tap to break the gasket loose, and dislodge cover from manhole ring. This cover may now be pushed into the tank and remove to outside, by rotating the manhole cover after removing the crab from bolt, and using the bolt for a handle to prevent dropping the cover within tank. The interior of tank may be viewed thru the open manhole. If the tank is cement lined, any sludge, mud, or other deposits may be washed out thru the drain, and lining scrubbed off with a coarse brush or wire brush. The copper tank coil should be inspected for buildup of sediment or lime deposits on the tubes.

9 A new manhole gasket will probably be required when replacing the manhole cover. To facilitate replacement of the manhole gasket, and cover, it will be helpful to tape the gasket to the cover with 4 pieces of adhesive tape, to avoid slippage of gasket from cover. Gasket and cover should be centered carefully before tightening bolts, to avoid gasket leaking or blowing out.

10 Oil and tighten bolts moderately, refill tank and allow pressure to build up on tank before attempting to fully tighten bolts, as the water pressure will help seal the gasket.

Maintenance of Tube Bundle

Inspection of Unit

Frequently and at regular intervals, observe interior and exterior conditions of all tubes and keep them clean. Tube cleaning negligence may result in complete stoppage of flow through some tube, with consequent overheating of these tubes and compared to surrounding tubes, resulting in severe expansion strains and leaking tube joints.

Indication of Fouling

Tube bundles subject to fouling scaling should be cleaned periodically. A light sludge or scale coating on the tube greatly reduces its effectiveness. A marked increase in pressure drop and/or reduction in performance usually indicate cleaning is necessary. (Assuming the unit has been checked for air or vapor binding and this has been found not to be the cause.) Since the difficulty of cleaning increases rapidly as the scale thickens or deposit increases, the intervals between cleaning should not be excessive.

Access to Tubes

To clean or inspect inside of tubes, remove the cap. **CAUTION:** Do not loosen heads until you are sure all pressure is off equipment, and the unit is drained.

Tube Bundle Removal

When removing the tube bundle from the tank for inspection or cleaning, care should be exercised to see it is not damage by improper handling. Tube bundles are often of great weight, yet the tubes are small and of relatively thin metal. The bundle, therefore, should rest on parts designed to carry it, i.e., on the tube sheets, baffles, or support plates. For withdrawing tube bundles from the tank, the use of steel eye bolts which are screwed into the tube sheet is recommended for the attachment of the cable or other pulling devices. Steel rods inserted through the tubes, and bolted to a bearing plate at the end of the bundle may also be used. When steel cables are used for lifting vertical tube bundles, the cable should be attached to the lifting eyes where possible. An alternate method is to use steel rods as described above. If the tube bundle has been in service for a considerable length of time without being removed, it may be necessary to use a hydraulic jack on the tube sheet to get it started. A good-sized steel bearing plate should be inserted between jack and tube sheet and tube ends should be protected by means of a filler board.

Handling Tube Bundles Outside Shell

Do not handle tube bundles with hooks or other tools, which might damage tubes. Bundles should be moved out on cradles or skids. Horizontal tube bundles should be lifted by means of suitable slings. Baffles can be easily bent and damaged by dragging a bundle over a rough surface. Since the proper functioning of the apparatus depends upon a close fit between the outside of the baffle and the inside of the shell, any damage to the baffles must be carefully avoided.

Cleaning Procedures

1 Do not attempt to clean tubes by blowing steam through individual tubes. This over heats the tube and results in the same expansion strains and leaks as for plugged tubes.

2 Do not blow out tube bundle with air when fluids normally handled are inflammable.

3 In cleaning a tube bundle, tube should not be hammered on with any metallic tools. In case it is necessary to use a scraper, care should be exercised to see that the scraper is not sharp enough to cut the metal of the tubes.

Tube Rolling

To tighten a loose tube joint, use a suitable roller type tube expander. Do not roll tubes that are not leaking, as it needlessly thins and work hardens the tube wall.

Gasket Replacement
Gasket and gasket surfaces should be thoroughly cleaned and should be free of scratches and other defects. Gasket should be properly positioned before attempting to retighten bolts. It is recommended that when a heavy heat exchanger is dismantled for any purpose, it needs to be reassembled with new gaskets. This will tend to prevent future leaks and/or damage to the gasket-seating surface of the heat exchanger. Composition gaskets become dried out and brittle so that they do not always provide an effective seal when re-used, they may provide an imperfect seal or result in deformation and damage to the gasket contact surface of the exchanger. Follow industry recognized flange bolt tightening practices.

Lifting and Pulling Mechanisms
The following are safe loads for steel rods and eye bolts:

Rods:

Size Tubes	Size Rods	Safe Load per Rod
5/8”	3/8”	1,000lbs.
3/4"	1/2"	2,000lbs.
1” – larger	5/8”	3,000lbs.

Eye Bolts:

Size	Safe Load
3/4"	4,000lbs.
1”	6,000lbs.
1 ¼”	10,100lbs.
1 ½”	15,000lbs.

Cleaning Methods
Provide convenient means for cleaning tube bundle frequently as suggested below:

1 Circulating hot wash oil or light distillate through and over the tube at high velocity will effectively remove sludge or other similar soft deposits.
2 Circulating hot fresh water may wash out soft salt deposits.
3 Some commercially available cleaning compounds may be used to assist in removing sludge or coke, provided hot wash oil or water, as described above, does not give satisfactory results.
4 Removal of various scales and foreign material by chemical cleaning is now being quite extensively practiced. Certain qualified organizations will check the nature of deposits to be removed, furnish proper acid solutions containing inhibitors, and provide equipment and personnel for a complete apparatus and piping cleaning job.
5 If none of the above methods are effective for the removal of a hard scale, coke, or other deposits, mechanical means may be used.

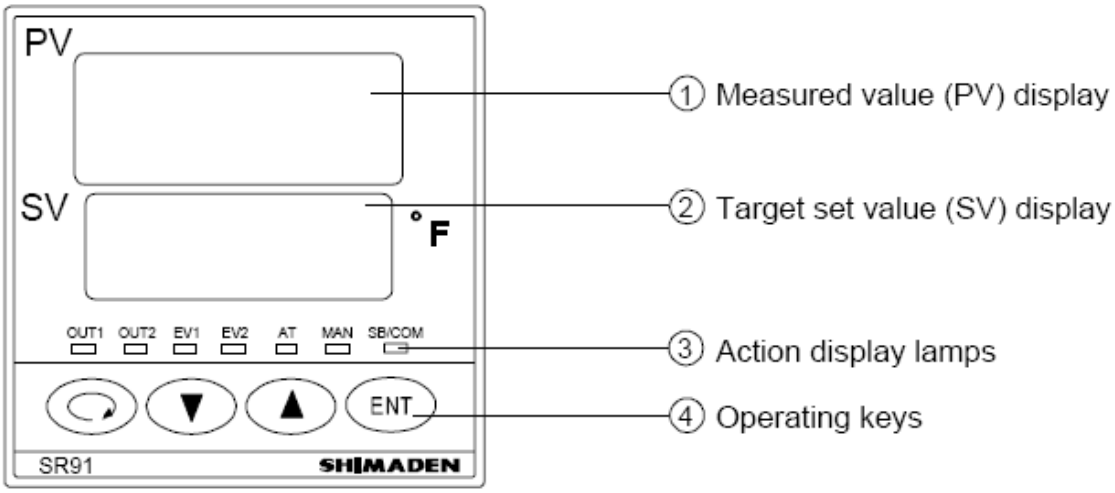
Material Safety Data Sheets

Some of Ace Heaters products contain materials that have been recognized as posing health risks. Material Safety Data Sheets for these materials are available from your local Manufacturer’s rep. When requesting this information, be sure to have the model number and serial number available.

If you do not know who your local Manufacturer’s Rep is, you can find out by logging into the www.aceheaters.com website, and clicking on the Representative tab found in the table of contents.

Ace Heaters, LLC
130 Klug Circle
Corona, CA 92878
Phone: 951.738.2230
www.aceheaters.com

ACE Mini-Pack/SWH Digital Panel (Water)
ACE USB Digital Panel (Steam)



	Parameter key:	Used to get to the next parameter or different modes. Hold to scroll to the first screen.
	Arrow keys:	Used to change parameters.
	Enter key:	Used to set the parameter after it has been changed.

This instruction should be used with

ACE Mini-Pack/SWH Digital Panel (Water)
SHIMADEN Controller Model **SR93-8I-N-90-1400** (AJAX P/N: **CASR931400**)

Or

ACE USB Digital Panel (Steam)
SHIMADEN Controller Model **SR93-4I-N-90-1400** (AJAX P/N: **CASR96140**)

Entering Setup Mode

1) When the power is applied to the unit, display will show temperature or pressure on the PV screen. If not check wiring.
2) Hold the key for **3** seconds to get to the **Setup Mode**.
3) Press the key to go through the different parameters, and the and keys to change parameters and to save the change.

Programming in Setup Mode

4) In **Setup Mode**, change the following parameters below.
   *Start programming from **rAnG** parameter
   ** Indicates Steam Controller parameters

Upper Display	Lower Display	Description
PArA	Set	Setup Mode initial screen
LoCK	oFF	Key lock setting
P	10.0 (Water) 10.0 (Steam)	Output proportional band setting
I	60 (Water) 60 (Steam)	Output integral time
D	15 (Water) 50 (Steam)	Output derivative time
ñr	0.0	Output manual reset
SF	0.40	Output target value function
o_L	0.0	Output lower limit **Amuract Wiring Rev.D (Before 3/30/11) – 18.0
o_H	100.00	Output high limit
StEV	oFF	Event at Standby
E1_ň	Hd	High deviation alarm
E1_d	5.0 (Water) **3.0 (Steam)	High alarm differential
E1_i	1	High alarm event standby action
E2_ ň	Ld	Low deviation alarm
E2_d	0.1	Low alarm differential
E2_i	1	Low alarm event standby action
Ao_ñ	PV	Analog Output Type
Ao_L	40.0 (Water) **0.0 (Steam)	Analog Output Low Limit
Ao_H	200.0 (Water) **150.0 (Steam)	Analog Output High Limit
Act	rA	Reverse acting control
SoFt	oFF	Soft start time
SV_L	40.0 (Water) **0.0 (Steam)	Setpoint lower limit
SV_H	180.0 (Water) **Vessel – 8 (Steam)	Setpoint high limit
PV_b	0	Outlet temperature/pressure bias value

PV_F	0	Outlet temperature/pressure filter time
*** rAnG**	**34 (Water)** ****92 (Steam)**	**Sensor and measuring range** *** Start Here***
Unit	F (Water Only)	Temperature unit
Sc_L	0.0	Input scale lower limit
Sc_H	400.0 (Water) **150.0 (Steam)	Input scale high limit
Scdp	0.0	Input decimal point position
Disp	Pb	Temperature/pressure display at standby

5) When **PArA** shown, press the key to review the programmed parameters for the second time to check all parameters are set correctly.
6) Scroll until **PArA** shown on the display again, hold down the key for 3 seconds to get to **Operation Mode**.
7) Use and key to change the **SV** (setpoint value) to within ± 2 F/PSI off the **PV** value. Press the key to save the new setpoint value.

Programming High and Low Deviation Alarm

8) Press the until **E1Hd** is shown. Using the and key to change the value to **20** (for water) or **6** (for steam)
and press the key to save the new High Deviation alarm value.
9) Press the until **E2Ld** is shown. Using the and key to change the value to **-10** and press the key to save the new Low Deviation alarm value.
Note: The High Temperature/Pressure Alarm is activated when **PV** is **E1Hd** above **SP** and Low Temperature/Pressure Alarm is activated when **PV** is I**E2Ld**I below SP.
10) Hold the key for 3 seconds to display **PV** (measured temperature/pressure) and **SV** (setpoint value).

Testing Manual Valve Control

11) Press the key once to get to valve position screen.
12) Hold down the key until the **MAN** light starts to flash.
13) Change the parameter to **99.9** using the and key. Check to see that valve opens fully. (Valve should be at 90°)
14) Change the parameter to **50** using the and key. Check to see that valve opens to half way. (Valve should be at 45°)
15) Hold down key until **MAN** light stops flashing.

Testing Operating Control (Water Only)

16) Change the **SV** (setpoint value) so that it is 20° below the **PV** (measured temperature). High Temperature Alarm will activate (dump valve if included) and light will come on.
17) Check to see that valve closes fully.
18) Deactivate High Temperature Alarm by raising the setpoint value to 10° above the **PV** (measured temperature).

Testing Operating Control (Steam Only)

19) Remove Pressure Transducer and apply 15 PSI pressure.
20) Change the **SV** (setpoint value) so that it is 7 PSI below the **PV** (measured Pressure). High Pressure Alarm will activate and light will come on.
21) Check to see that valve closes fully.
22) Deactivate High Pressure Alarm by raising the setpoint value to 5 PSI above the **PV** (measured pressure)

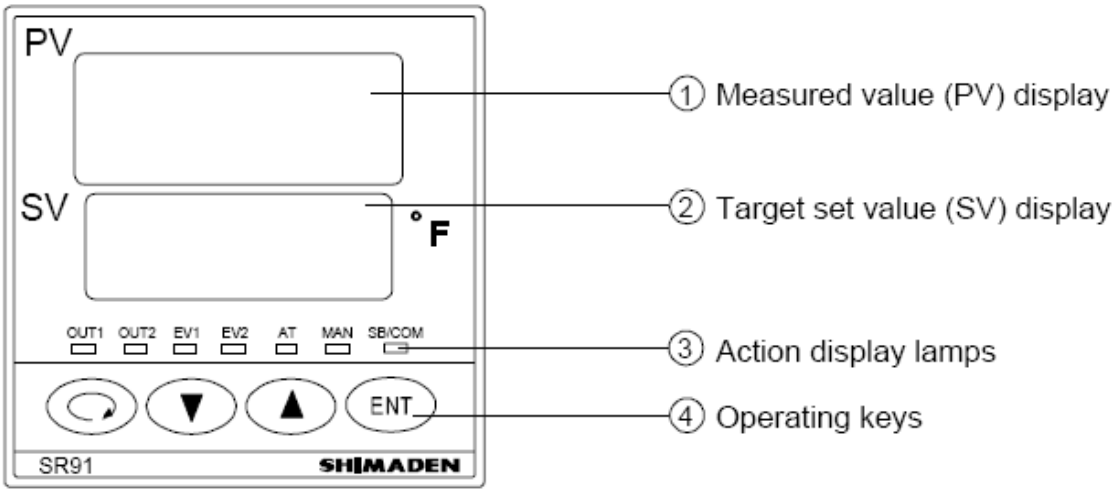
Change Setpoint

23) Change the **SV** (setpoint value) 120 F for Water and 10 PSI for Steam.

Enable Key Lock

24) Hold down key until you get see the Setpoint and Process Variable.
25) Hold down the key for 3 seconds to get to the **Setup Mode**.
26) Press the key until you see **LoCK** on the PV screen.
27) Change this parameter to **2** and press the ENT key to save the new parameter.
28) Hold down the key until you PV display shows **PArA**.
29) Hold down the key for **3** seconds to get back to the **Operation Mode**.
30) Fill out the **Safety System Test Check Sheet**.

ACE Mini-Pack/SWH BMS Panel (Water)
ACE USB BMS Panel (Steam)



	Parameter key:	Used to get to the next parameter or different modes. Hold to scroll to the first screen.
	Arrow keys:	Used to change parameters.
	Enter key:	Used to set the parameter after it has been changed.

This instruction should be used with

ACE Mini-Pack/SWH BMS Panel (Water)
SHIMADEN Controller Model **SR93-8I-N-90-1050** (AJAX P/N: **CASR931050**)

Or

ACE USB BMS Panel (Steam)
SHIMADEN Controller Model **SR93-4I-N-90-1050** (AJAX P/N: **CASR931050A**)

Entering Setup Mode

1) When the power is applied to the unit, display will show temperature or pressure on the PV screen. If not check wiring.
2) Hold the key for **3** seconds to get to the **Setup Mode**.
3) Press the key to go through the different parameters, and the and keys to change parameters and to save the change.

Programming in Setup Mode

4) In **Setup Mode**, change the following parameters below.
   *Start programming from **rAnG** parameter
   ** Indicates Steam Controller parameters

Upper Display	Lower Display	Description
PArA	Set	Setup Mode initial screen
LoCK	oFF	Key lock setting
P	10.0 (Water) 10.0 (Steam)	Output proportional band setting
I	60 (Water) 60 (Steam)	Output integral time
D	15 (Water) 50 (Steam)	Output derivative time
ñr	0.0	Output manual reset
SF	0.40	Output target value function
o_L	0.0	Output lower limit **Amuract Wiring Rev.D (Before 3/30/11) – 18.0
o_H	100.00	Output high limit
StEV	oFF	Event at Standby
E1_ň	Hd	High deviation alarm
E1_d	5.0 (Water) **3.0 (Steam)	High alarm differential
E1_i	1	High alarm event standby action
E2_ ň	Ld	Low deviation alarm
E2_d	0.1	Low alarm differential
E2_i	1	Low alarm event standby action
coññ	Loc	Communication mode
Prot	rtu	Communication protocol
Addr	1	Communication address
dAtA	8n1	Communication data format
SchA	Stx	Start character
bcc	1	BCC operation type
bPS	9600	Communication speed
dELY	20	Communication delay time
ñEñ	EEP	Communication memory mode
Act	rA	Reverse acting control
SoFt	oFF	Soft start time

SV_L	40.0 (Water) **0.0 (Steam)	Setpoint lower limit
SV_H	180.0 (Water) **Vessel – 8 (Steam)	Setpoint high limit
PV_b	0	Outlet temperature/pressure bias value
PV_F	0	Outlet temperature/pressure filter time
*** rAnG**	**34 (Water) **92 (Steam)**	**Sensor and measuring range * Start Here***
Unit	F (Water Only)	Temperature unit
Sc_L	0.0	Input scale lower limit
Sc_H	400.0 (Water) **150.0 (Steam)	Input scale high limit
Scdp	0.0	Input decimal point position
Disp	Pb	Temperature/pressure display at standby

5) When **PArA** shown, press the key to review the programmed parameters for the second time to check all parameters are set correctly.
6) Scroll until **PArA** shown on the display again, hold down the key for 3 seconds to get to **Operation Mode**.
7) Use and key to change the **SV** (setpoint value) to within ± 2 F/PSI off the **PV** value. Press the key to save the new setpoint value.

Programming High and Low Deviation Alarm

8) Press the until **E1Hd** is shown. Using the and key to change the value to **20** (for water) or **6** (for steam)
and press the key to save the new High Deviation alarm value.
9) Press the until **E2Ld** is shown. Using the and key to change the value to **-10** and press the key to save the new Low Deviation alarm value.
Note: The High Temperature/Pressure Alarm is activated when **PV** is **E1Hd** above **SP** and Low Temperature/Pressure Alarm is activated when **PV** is I**E2Ld**I below SP.
10) Hold the key for 3 seconds to display **PV** (measured temperature/pressure) and **SV** (setpoint value).

Testing Manual Valve Control

11) Press the key once to get to valve position screen.
12) Hold down the key until the **MAN** light starts to flash.
13) Change the parameter to **99.9** using the and key. Check to see that valve opens fully. (Valve should be at 90°)
14) Change the parameter to **50** using the and key. Check to see that valve opens to half way. (Valve should be at 45°)
15) Hold down key until **MAN** light stops flashing.

Testing Operating Control (Water Only)

16) Change the **SV** (setpoint value) so that it is 20° below the **PV** (measured temperature). High Temperature Alarm will activate (dump valve if included) and light will come on.
17) Check to see that valve closes fully.

18) Deactivate High Temperature Alarm by raising the setpoint value to 5° above the **PV** (measured temperature).

Testing Operating Control (Steam Only)

19) Remove Pressure Transducer and apply 15 PSI pressure.
20) Change the **SV** (setpoint value) so that it is 7 PSI below the **PV** (measured Pressure). High Pressure Alarm will activate and light will come on.
21) Check to see that valve closes fully.
22) Deactivate High Pressure Alarm by raising the setpoint value to 5 PSI above the **PV** (measured pressure)

Change Setpoint

23) Change the **SV** (setpoint value) 120 F for Water and 10 PSI for Steam.

Enable Key Lock

24) Hold down key until you get see the Setpoint and Process Variable.
25) Hold down the key for 3 seconds to get to the **Setup Mode**.
26) Press the key until you see **LoCK** on the PV screen.
27) Change this parameter to **2** and press the ENT key to save the new parameter.
28) Hold down the key until you PV display shows **PArA**.
29) Hold down the key for **3** seconds to get back to the **Operation Mode**.
30) Fill out the **Safety System Test Check Sheet**.

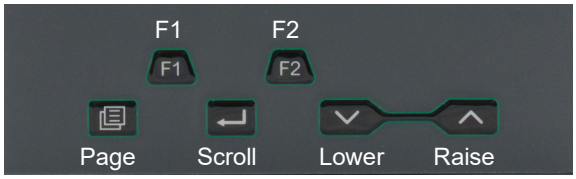
EPC3004

The start up display depends on the controller configuration and is described in subsequent sections.

General Description of Operator Buttons

On EPC3016 only the 4 navigation buttons (Page, Scroll, Down, Up) are available.
On EPC3008 and EPC3004 all 6 buttons (4 navigation and 2 function) are available.

Button Layout



Button Operation

Raise

The raise button increments parameter values to limits.

Parameter enumerations, however, do wrap-around.

Lower

The lower button decrements parameter values to limits.

Parameter enumerations, however, do wrap-around.

Page

In Operator levels 1 or 2 the Page button will select between the Home display or the Programmer Edit and Run lists (if one of the programmer features is enabled).

In Levels 3 or Config the Page button will scroll through list headers (no auto-repeat). If the Page button is pressed within a list, the display reverts to the top of the list. The top of the list shows the list header only with no initial parameters.

Page (held for >3 seconds)

The Goto parameter is selected directly. This operation can be performed from any display. If the Page is held for >3 seconds at power-up the Quick Start Mode is selected following the entry of a password.

Page+Raise

Scroll back the list headers (with auto-repeat).

Scroll

Select parameters in turn, returning to the first parameter in the list or to a list header if Level 3 or Configuration level is selected. If the button is held down the list will auto-repeat. In levels 1 and 2 this button also scrolls through promoted parameters when the HOME screen is selected.

Scroll+Raise

Scroll back through parameters from bottom to top (with auto-repeat).

Page+Scroll - all variants

Jump directly to the "HOME page". The current operating level remains unchanged. If the HOME page is already selected, these buttons will perform the custom function as detailed in "Functionality of the F1 and F2 and Page + Scroll buttons" on page 196. The default is Alarm Acknowledge.

Raise+Lower (Run/Hold)

If a programmer option is enabled and a program is configured, a momentary press of these keys toggles between Run and Hold modes.

Raise+Lower (hold for >3 seconds - Mode)

If a programmer option is enabled and a configured program is running, holding these buttons will abort the program.

If the HOME page is selected and the Programmer is not running, holding these buttons will invoke the 'Mode' display where the Loop Mode parameter will allow selection of Auto or Manual mode.

F1 and F2

F1 and F2 buttons are not available in EPC3016.

The functionality of these buttons is set by the Instrument function block. The default settings are:

- F1: Auto/Man.
- F2: Run/Hold.

Note: A time-out applies to all displays. If no button presses are detected within a timeout period (default 60s), the display will revert back to the Level 1 "HOME page".

Start Up—New Unconfigured Controller

If the controller is new and ordered as unconfigured it will start up in 'Quick Start Mode'. This is a built in tool which is provided to allow users to configure the product for the most commonly used functions such as the application type, input type, range, and digital input functions. The Quick Configuration code consists of two ‘SETS’ of five characters each. The upper section of the display shows the set selected, the lower section shows the five digits which make up the set. Each digit may result in multiple parameter values being set. The opening set is SET1 as shown.

Initially all characters are shown as an ⁜. This is generally the default character for ‘not fitted/none’ or ‘use default’. The first character, initially flashing, selects the Application Type as listed in the Quick Start Tables in the following sections. To select the required application type press or .

Note: Quick Code 1 will only be available if the correct hardware is fitted for the application. For example, the VPU application must have IO1 and IO2 as relay, triac or logic outputs.

Press to select the second character. The second character selects the ‘Input 1 Type’ as listed in the Quick Start Tables in the following sections. If hardware or features are not available then the character is skipped over when pressing scroll.

Continue to set up all 5 characters using the Quick Start Tables.

When the last character in SET1 has been entered the display will automatically go to SET2.

Adjust these in the same way as SET1.

At any time to return to the start of SET1, press .

⚠ WARNING

HAZARD OF INCORRECT CONFIGURATION

Incorrect configuration can result in damage to the process and/or personal injury and must be carried out by a competent person authorized to do so. It is the responsibility of the person commissioning the controller to ensure the configuration is correct.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

More detailed features available in the product may also be configured by entering a Configuration Level. This is explained in "Configuration Level" on page 95, or by using iTools as explained in "Configuration Using iTools" on page 212. iTools is a configuration package available free of charge from Eurotherm by accessing www.eurotherm.com.

Quick Start Tables

The first digit in SET 1 will select an application which automatically configures relevant function block parameters and creates connections between them to make a complete control strategy relevant to that application.

The *Configuration Using iTools* chapter has a section called "Applications" on page 228, which provides a general description of the available applications and their associated graphical wiring (as diagrams).

Further more, descriptions of each application are available in additional addendum's to this manual and are listed below:

- Application '1' - Heat only controller.
- Application '2' - Heat/Cool controller.
- Application 'V' - VPU Heat only controller - addendum part number HA033033 EPC3000 Temperature Control Applications.
- Application 'C' - carbon potential - addendum part number HA032987.
- Application 'D' - dew point control - addendum part number HA032994.

They are available from www.eurotherm.com.

Note: The controller must be fitted with the correct hardware otherwise the application code will not be selectable. For example, a VPU controller must have a digital output fitted in both IO1 and IO2.

The digits will present "X" when not fitted and the HMI will skip over that field. Similarly, entering a value of "X" in a field will disable that feature, if appropriate.

Quick Code Set 1

Digit 1	Digit 2	Digit 3	Digit 4	Digit 5
Application	**Analog Input 1 Type**	**Analog Input 1 Range**	**Analog Input 2 Type**	**Analog Input 2 Range**
X = None 1 = PID Heat Only Control 2 = PID Heat/Cool Control V = VPU Heat Only Control C = Carbon Potential Control* D = Dew Point Control*	X = Use Default **Thermocouple** B = Type B J = Type J K = Type K L = Type L N = Type N R = Type R S = Type S T = Type T **RTD** P = Pt100 W = Pt1000 **Linear** M = 0-80mV V = 0-10V 2 = 0-20mA 4 = 4-20mA	X = Use Default 1 = 0-100°C 2 = 0-200°C 3 = 0-400°C 4 = 0-600°C 5 = 0-800°C 6 = 0-1000°C 7 = 0-1200°C 8 = 0-1300°C 9 = 0-1600°C A = 0-1800°C F = Full range	X = Not fitted or Use Default **Thermocouple** B = Type B J = Type J K = Type K L = Type L N = Type N R = Type R S = Type S T = Type T **RTD** P = Pt100 W = Pt1000 **Linear** M = 0-80mV V = 0-10V 2 = 0-20mA 4 = 4-20mA Z = HiZ	X = Not fitted or Use Default 1 = 0-100°C 2 = 0-200°C 3 = 0-400°C 4 = 0-600°C 5 = 0-800°C 6 = 0-1000°C 7 = 0-1200°C 8 = 0-1300°C 9 = 0-1600°C A = 0-1800°C F = Full range

Notes:

1. If no application is selected (1st character in SET 1 = X) the display will go directly to the EXIT screen. If accepted the controller will take on a set of default values. Any further configuration may be carried out by accessing the Configuration Level ("Configuration Level" on page 95) or through iTools configuration software ("Configuration Using iTools" on page 212).

2. For linear inputs the minimum/maximum input voltage/current will cause the display to read range low/high respectively.
3. If the input 2 is not fitted Set 2 will be selected immediately after Input 1 Range has been set.

* Temperature, Carbon potential and dew point control are described as separate supplements to this manual and are available from www.eurotherm.com. Part numbers HA033033, HA032987 and HA032994 respectively.

Quick Code Set 2

Digit 1	Digit 2	Digit 3	Digit 4	Digit 5
CT Input Range	**LA Function**	**LB Function**	**Option DIO Function**	**Temperature Units**
X = Not fitted or not used 1 = 10A 2 = 25A 5 = 50A 6 = 100A 7 = 1000A	X = Not used W = Alarm Acknowledge M = Auto/Manual R = Program Run/Hold L = Key Lock P = Setpoint Select T = Program Reset U = Remote/Local Select V = Recipe Load Select K = Loop Track	X = Not fitted or not used W = Alarm Acknowledge M = Auto/Manual R = Program Run/Hold L = Key Lock P = Setpoint Select T = Program Reset U = Remote/Local Select V = Recipe Load Select K = Loop Track	X = Not fitted or not used 1 = Config 1 2 = Config 2 3 = Config 3 4 = Config 4 5 = Config 5 6 = Config 6 7 = Config 7 8 = Config 8 9 = Config 9	X = Use Default C = Celsius F = Fahrenheit K = Kelvin

Notes:

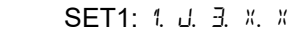
1. The Quick Code assumes that the CT input is monitoring the current of the heat channel load which in all applications is wired to IO1.PV.
2. If IO.1 module is a DC Output module then CT Input digit is not alterable.
3. If CT input is not set to X, the CT Input will be enabled and will monitor the current; however, CT alarms will not be configured. This means that if CT alarms are required they must be wired by the user. A typical example of wiring alarms is shown in section "Example 1: To Wire an Alarm" on page 224.

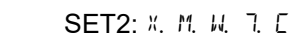
Quick Codes DIO

If the Options module has been fitted then the function of the module is defined by fixed configurations. These are selected by Digit 4 in the previous table. The fixed configurations are listed in the table below:

Config	Function	Config	Function	Config	Function
Config 1	DIO1 = Programmer Event Output 1 DIO2 = Programmer Event Output 2 DIO3 = Programmer Event Output 3 DIO4 = Programmer Event Output 4 DIO5 = Programmer Event Output 5 DIO6 = Programmer Event Output 6 DIO7 = Programmer Event Output 7 DIO8 = Programmer Event Output 8	Config 4	DIO1 = BCD Input 1 DIO2 = BCD Input 2 DIO3 = BCD Input 3 DIO4 = BCD Input 4 DIO5 = Programmer Run/Hold DIO6 = Programmer Reset DIO7 = Programmer Advance DIO8 = Not Used BCD Output wired to Program Number	Config 7	DIO1 = Programmer Run DIO2 = Programmer Hold DIO3 = Programmer Reset DIO4 = Programmer Advance DIO5 = Not Used DIO6 = Not Used DIO7 = Not Used DIO8 = Not Used
Config 2	DIO1 = Programmer Event Output 1 DIO2 = Programmer Event Output 2 DIO3 = Programmer Event Output 3 DIO4 = Programmer Event Output 4 DIO5 = BCD Input 1 DIO6 = BCD Input 2 DIO7 = BCD Input 3 DIO8 = Programmer Run/Hold BCD Output wired to Program Number	Config 5	DIO1 = BCD Input 1 DIO2 = BCD Input 2 DIO3 = BCD Input 3 DIO4 = BCD Input 4 DIO5 = BCD Input 5 DIO6 = BCD Input 6 DIO7 = BCD Input 7 DIO8 = BCD Input 8 BCD Output wired to Recipe Load	Config 8	DIO1 = Programmer Run DIO2 = Programmer Hold DIO3 = Programmer Reset DIO4 = Not Used DIO5 = Not Used DIO6 = Not Used DIO7 = Not Used DIO8 = Not Used
Config 3	DIO1 = Programmer Event Output 1 DIO2 = Programmer Event Output 2 DIO3 = Programmer Event Output 3 DIO4 = Programmer Event Output 4 DIO5 = Programmer Run DIO6 = Programmer Hold DIO7 = Programmer Reset DIO8 = Programmer Advance	Config 6	DIO1 = BCD Input 1 DIO2 = BCD Input 2 DIO3 = BCD Input 3 DIO4 = BCD Input 4 DIO5 = Not Used DIO6 = Not Used DIO7 = Not Used DIO8 = Not Used BCD Output wired to Recipe Load	Config 9	DIO1 = Programmer Event Output 1 DIO2 = Programmer Event Output 2 DIO3 = Programmer Event Output 3 DIO4 = Programmer Event Output 4 DIO5 = Not Used DIO6 = Not Used DIO7 = Not Used DIO8 = Not Used

Example of Quick Codes

SET1: 

SET2: 

The controller is configured for PID Heat Only, Input 1 Thermocouple Type J, Range 0–400℃, Input 2 and Range not used, CT Input not used, Digital Input LA will select Auto/Manual, Digital Input LB will select Global Acknowledge of Alarms, the optional digital IO will be configured in accordance with ‘Config 7 in the above table,Temperature Units Degrees Celsius.

To Save or Discard Quick Codes

When all characters have been entered the display will show:

If no is selected (by pressing ↵) the display returns to SET1.

Press ^ or v to select SAVE then either press ↵ to save immediately or wait for 2 seconds to save automatically. This accepts the Quick Configuration Codes and the controller enters Operator Level 1.

OR

Press ^ or v to select diSc then either press ↵ to select or wait for 2 seconds to accept. This discards the last entered codes and returns the controller to its previous settings.

Selecting either SAVE or diSc will result in the instrument performing a restart.

Configure the Communications Protocol

From firmware versions V3.01 and above, the communications protocol and associated selections may be chosen during the start-up sequence. This is to simplify access to Digital Communications when the instrument is being configured. When the controller is new and first switched on, or following a cold start, the following sequence is displayed at start up and after the Quick Codes have been saved:

Operation	Action	Display	Notes
Digital comms setup is selected		COmm SETUP	
Select the required serial protocol	1. Press ↵ to select the serial Protocol to be used for your process	NONE S. PROT	NONE - No serial comms mrtu - ModbusRTU EI bS - EI-Bisynch This list only appears for serial comms (EPC3004, EPC3008, EPC3016 with Serial Option board).
If Modbus or EI-Bisynch is selected	2. Press ↵ to select the node address	1 ADDR	
Select Ethernet protocol	3. Press ↵ to select Ethernet Protocol	NONE E. PROT	NONE = No Ethernet mtCP - ModbusTCP Slave only EI Pm - EtherNet/IP Slave and Modbus TCP Slave bACm - BACnet Slave and Modbus TCP Slave mmSt - Modbus TCP Master and Slave This list only appears if the Ethernet option module is installed and the features have been purchased.
Turn Auto discovery on or off	4. Press ↵ to select Auto Discovery	OFF A. DISC	See "AutoDiscovery" on page 320. OFF - No auto discovery On - Auto discovery enabled
Save and exit comms set up	5. Press ↵	no EXIT	no - Return to comms set up SAvE - Save the comms settings di Sc - Discard comms settings. The questions will be asked again at the next power up.

Note: In all cases the option is selected using ^ or v .

To Re-Enter Quick Code mode

It is possible to re-enter Quick Start mode, by holding down the Page key during power up. Enabling Comms Protocol does not appear when the quick code is re-entered.

It is then necessary to enter the configuration level password. See "To Select Configuration Level" on page 97.

If the configuration of the instrument is subsequently modified by a change made via Configuration Mode this will be shown by the quick code digits being separated by the decimal place dot (indicating that the codes shown may not reflect the current configuration). If the codes are then accepted the instrument is re-configured to satisfy the code settings.

Notes:

1. If the config clip is connected the instrument may be powered from the USB port of the PC. In this case it is necessary to disconnect the config clip to re-enter Quick Start Mode. Alternatively, disconnect the power pins from the config clip. See "Using the Configuration Clip" on page 213.
2. If a Cold Start (See "Cold Start" on page 244) has been invoked the instrument will always start in Quick Code Mode without the need to enter the configuration password. Enabling Comms Protocol will then be displayed.

Start Up - New Configured Controller

If a product has been ordered using the Order Code it will already be configured. When new, ‘out of the box’, it will then power up in operating Level 1.

Also, if it has previously been configured, for example, using the Quick Codes then it will start up in Operating mode.

The start up display is dependent upon the application or the way in which the controller is configured, see ‘Start-up Modes’ in the following section.

The view shown above is generally referred to as the ‘HOME’ Display.

In EPC3008 and EPC3004 the HOME display normally consists of three lines. The upper line normally shows the Process Value "PV",

The center line normally shows the Working Setpoint "WSP" if the controller is working in its normal Auto Mode or the Output demand if it is in Manual Mode. (Auto/Manual control is explained in section "Auto/Manual Mode" on page 79.

The lower line shows a scrolling message providing a longer description of the selected parameter. It may also display a further parameter value if this has been set up in the instrument block, see "Display Functionality Sub-List (HmI)" on page 195.

Bar Graph

In EPC3008 and EPC3004 a bargraph may also be configured using iTools. The bargraph may be ‘soft’ wired to any convenient source such as PV input or output demand, see "Example 4: To Configure a Bargraph" on page 225.

EPC3016 has two lines of display. The line below the top one alternates between a mnemonic and the scrolling message. A bargraph is not available.

Setpoint

The Setpoint is defined as the value which the process is required to attain. The value of the setpoint may be obtained from a number of sources, for example, manually using the front panel keys, via the programmer function block, via an external analog source, via digital communications. The working setpoint is, therefore, defined as the current setpoint derived from any of these sources.

Subsequent Start-ups

When the controller is no longer new and has been in normal use it will start up in Level 1, even when it has been powered down in Operator level 2 or 3. If, however, it was powered down when in Configuration level it will power up in ‘Standby’ and show a message - ‘POWERED DOWN WHILST IN CONFIG MODE’. To clear the message re-enter configuration level (with password - see "To Select Configuration Level" on page 97), then, either continue with changes to the configuration or accept existing changes by exiting configuration level. The reason for this is that the controller may have been part configured prior to shut down and either needs completion of the configuration or confirmation that no further changes are required.

Start-up Modes

The controller may start in Manual or in Auto Mode depending on the setting of the ‘Recovery Mode’ parameter, see section "Configuration Sub-List" on page 119.

If the Recovery Mode has been set to Manual (default) the controller will start in ‘Man’ mode. It will show the letter ‘M’ and the ‘hand’ symbol in the display. Initially the output will be at the ‘Fallback Value’, see section "OP Sub-list" on page 131, but may then be changed using the raise or lower buttons. Auto mode may also be selected.

If the Recovery Mode has been set to ‘Last’ the controller will start in either in Manual mode or Auto mode depending on whatever mode it was in prior to being powered off. ‘Auto’ mode is shown in the EPC3004 controller view in the previous section.

For further information on start up modes see section "Start-up and Recovery" on page 302.

Standby

Standby is the term given when the instrument strategy is not controlling due to the following reasons:

- If the instrument is being configured i.e. in Quick Code Mode, Configuration Mode or a clone file is being loaded.
- If the instrument has detected an unexpected condition (for example, was powered down whilst in configuration mode, or fitted hardware does not match expected hardware). See "Start up Diagnostic mode" on page 62 for more information on unexpected conditions that will place the instrument into standby.
- If the instrument is forced into standby via the Instrument.Diagnostics.ForceStandby parameter, see "Subsequent Start-ups" on page 75.

When the instrument is in standby, the following occurs:

- All relay, logic or triac outputs are placed into their 'Off' state, unless being used as Valve Raise (Up) / Lower (Down). In this case the Standby Action is configurable by the ‘StandbyAction’ parameter (Rest, Up, Down) found in the ‘IO’ list, (section "I/O List (io)" on page 107).
- Analog outputs will go to the ‘OutputLow’ limit found in the ‘IO’ list.
- The control loop will be placed into Hold.
- If an alarm has the ‘StandbyInhibit’ parameter set to ‘On’ (section "Alarms List (ALm)" on page 141), then the alarm is inhibited (active alarms will be turned Off and new alarm conditions will not be acted upon).
- If in standby due to the instrument being configured, a running program will reset.

⚠ WARNING

LOSS OF COMMUNICATIONS

If an output is not internally wired by the application, but is written to by communications, ensure that the appropriate action is taken in the event that communications is lost.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Auto-scaling of decimal point

The range of values displayed on the ‘top line’ will vary for each instrument version. If a value exceeds the display capabilities, the resolution will automatically be reduced by a factor of 10, up to the display limit in the table below. If the value cannot be displayed, HHHH or LLLL will be shown.

Auto-scaling is applied to parameter values being edited via the HMI.

Instrument	Decimal points	Minimum	Maximum
EPC3016	0	−1999	9999
	1	−199.9	999.9
	2	−19.99	99.99
	3	−1.999	9.999
EPC3008	0	−1999	19999
	1	−199.9	1999.9
	2	−19.99	199.99
	3	−1.999	19.999
EPC3004	0	−19999	99999
	1	−1999.9	9999.9
	2	−199.99	999.99
	3	−19.999	99.999
	4	−1.9999	9.9999

Operator Levels

What is in this Chapter?

This chapter describes the different operator levels:

- Operator Level 1.
- Operator Level 2.
- Introduction to Operator Level 3.
- Return from a higher level to a lower level of operation.

Overview

There are 5 levels of operation:-

1. LEu 1 - Level 1 has no password, the control is active and only the home list is accessible.
2. LEu2 - Level 2. The control is active and an extended home list is accessible.
3. LEu3 - Level 3. The control is active and the complete operator parameter set is shown and modifiable; the complete Configuration parameter set is shown, (read only); the user calibration (two point cal) facility is available.
4. ConF - Configuration level is used to setup the whole controller; the configuration parameters are accessible; the operator parameters are available, without the need to switch to operator mode. The instrument calibration parameters are also available in this mode. See "User Calibration" on page 369.

Levels 2, 3 and Configuration can be restricted by passwords.

5. In addition the Quick Start Mode (See "Start Up—New Unconfigured Controller" on page 67) is provided to allow users to configure the product in the minimum number of operations. It is only available at power up after the instrument is cold started or by holding the Page key during power up.

Operator Level 1

Operator Level 1 is entered:

1. After the Quick Code has been entered for those controllers supplied unconfigured.
2. After power up when the controller has been configured.

The display shown below is for a typical temperature controller.

Process Value (PV)

Manual output level (%) or Setpoint (SP) (Required Temperature)

Scrolling messages (when applicable)

Bargraph (not EPC3016)

Press ^ to increase the setpoint

Press v to decrease the setpoint

The new setpoint is entered when the button is released and is indicated by a brief flash of the SP value

In general the current value of the process is shown in the upper display.

By default the controller will start in' Manual' Mode. This is shown by 'M' in the display, the 'Hand' symbol, the value of the output (in %) and the bargraph (if available).

In 'Auto' mode, the required value (Setpoint) is shown in the lower display.

Additional scrolling messages are shown, for example, when operator parameters are selected (see section "Level 1 Operator Parameters" on page 81). These may be standard descriptions of the parameter currently selected or they may be user specific messages which have been set up using iTools. (See "Parameter Promotion" on page 233).

Auto/Manual Mode

In Manual mode the value of the output is increased or decreased directly by the operator using the Up and Down buttons.

In Auto mode the process is adjusted automatically by the controller in response to differences between the setpoint and the actual measured value.

In Operator Level 1 the controller may be placed into manual operation as follows:

- By default in EPC3008 and EPC3004 controllers, Auto/Manual may be selected by the user by toggling the F1 button.
- By default in EPC3016 controller Auto/Manual may be selected by the user by pressing and holding the ^ and v buttons for longer than 3 seconds. This will show the A-M (Auto-manual select) parameter. Then press ^ or v to toggle between auto and manual.

Manual is indicated in the HMI by showing the ‘Hand’ symbol and the character ‘M’.

The current level of the output demand is shown as a percentage. This may be increased or decreased by pressing the or buttons respectively.

Note: Alternative ways to select Auto/Manual may be configured and will be explained in subsequent chapters of this manual.

System Messages

In addition to standard (or customized) scrolling messages, System Messages may be shown at any time. A list of these is shown in "Notification Messages" on page 378. The following two messages are typical and could appear at start up.

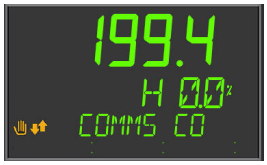
Setting the Comms Password

If the comms password has not been set and either Fixed comms or Option comms has been configured then this notification message will be scrolled across the HMI 'PLEASE SET THE COMMS PASSWORD VIA ITOOLS'. Until the comms password is set, Fixed comms and Option comms will have a limited parameter read/write access. This security feature is described in section "Comms Configuration Level Password" on page 21.

Comms Configuration Active

The scrolling message ‘COMMS CONFIGURATION ACTIVE’ will be displayed if, for example, iTools is connected to the controller and has been placed in configuration mode by iTools. The controller will be placed into standby mode.

The character ‘H’ signifies that the controller has been placed into Hold mode and is displayed as shown below.



Note: The displays shown above also apply if the controller is in Operator Levels 1, 2 or 3.

Bargraph

In EPC3008 and EPC3004 a bargraph may also be shown which displays the configured value as a horizontal bar. This is set up in Configuration Level (See "Display Functionality Sub-List (Hmi)" on page 195).

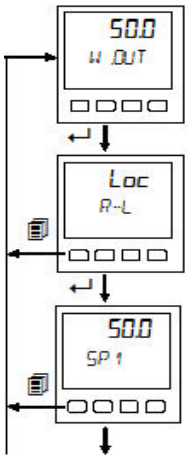
Level 1 Operator Parameters

A minimal list of parameters is available in Operator Level 1 which is designed for day to day use. Access to these parameters is not restricted by a password.

Press ↵ to step through the list of available parameters. The mnemonic of the parameter is shown in the lower display. Alternatively, press and hold ↵ then press ∧ to scroll forward through parameters and ∨ to scroll back.

Press ⧉ to return to the Home display.

The value of the parameter is shown in the upper display. If the value is read/write press ∧ or ∨ to adjust. If no key is pressed for 60 seconds the controller returns to the HOME display. The navigation is shown diagrammatically for the first two parameters in the example below:



The parameters that appear depend upon the functions configured. The list can also be customized using iTools by adding or removing parameters. The table below shows an example of the list of parameters in Level 1. Parameters may be added to or deleted from this list, see "Parameter Promotion" on page 233.

Parameter Mnemonic	Scrolling name	Description	Further information
W.OUT	WORKING OUTPUT	The output demand – 0% to 100% or −100% to +100%.	
R-L	REMOTE-LOCAL SELECT	Selects the Remote or Local setpoint source.	"Loop - Main Sub-list" on page 117.
SP 1	SETPOINT 1	The value which the process is required to attain as set by setpoint 1.	
SP2	SETPOINT 2	The value which the process is required to attain as set by setpoint 2 if selected.	
AI 1.PV	PV	The current value of the process (read only) read by the primary input IP1.	
AI2.PV	PV	The current value of the process (read only) read by the secondary input IP2.	If the secondary input is used.
LBA.I	CT LOAD CURRENT	The current being supplied to the heater as measured by the CT.	If the CT is being used.

Level 1 Programmer Display

By default, if the controller has the programmer installed, the status of a running program can be displayed.

Programmer List

Press the page button , the display will show

Repeatedly press to read the currently running program.

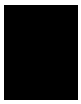
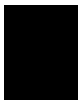
Parameters displayed depend on the program and the type of segment configured but generally include the following:

Parameter Mnemonic	Scrolling name	Description
P.NUM	PROGRAM NUMBER	Alterable but does not affect the running program.
P.NAME	PROGRAM NAME	Read only. This parameter is available in firmware versions V3.01 and above.
P.CUR	CURRENT PROGRAM	Read only.
C.NAME	CURRENT PROG NAME	Read only.This parameter is available in firmware versions V3.01 and above.
P.MODE	PROGRAM MODE	Displays the current mode e.g. Run, Hold, Reset.
P.SP	PROGRAM SETPOINT	Read only.
P.TIM.L	PROGRAM TIME LEFT	Read only.
P.CYC.L	PROGRAM CYCLES LEFT	Read only.
S.NUM	CURRENT SEGMENT NUMBER	Read only.
S.NAME	SEGMENT NAME	Read only.This parameter is available in firmware versions V3.01 and above.
S.TYPE	CURRENT SEGMENT TYPE	Read only.
S.TIM.L	SEGMENT TIME LEFT	Read only.
TSP	TARGET SETPOINT	Read only.
R.RATE	RAMP RATE	Read only.
EVT.x	EVENT x	Event off or on. Further events are shown if configured.
P.ADVN	PROGRAM ADVANCE	Read only.

By default the programmer parameters available in Level 1 are read only. It is possible, however, to provide programmer edit access to Level 1, see "Programmer List (PROG)" on page 135. If this has been done the lists of parameters is shown in section "Level 2 Programmer Display" on page 87.

Programmer Status Indicator

The current status of the running program is displayed as follows:

State	Ramp/Step Up		Dwell		Ramp/Step Down	
Reset						
Run						
Hold/Holdback		Flashing (1 second period 66% duty cycle)		Flashing (1 second period 66% duty cycle)		Flashing (1 second period 66% duty cycle)
Complete (Dwell End)	Not applicable			Flashing (2 seconds period 66% duty cycle)	Not applicable	

Operator Level 2

To Select Operator Level 2

Operator level 2 is normally restricted by a password. By default the password is 0002 in a new controller. Enter Level 2 as follows:

Operation	Action	Display	Notes
Select Level 2	1. Press and hold until GOTO is shown. 2. Press to choose LEu 2 (Level 2). 3. Press to enter.		
Enter the password	4. Press or to enter the correct digit value of the password. 5. Press to accept the value and move to the next digit. 6. The controller will now show the top of the HOME list in Level 2.		Press to move to the next digit. The default password for level 2 is '0002'. A special case exists if a security code has been configured as '0000'. If this has been done it is not necessary to enter a code and the controller will enter the chosen level immediately. If an incorrect code is entered the display will return to HOME. After three wrong attempts the password entry system will lock out for a time set by the 'password Lockout Time' set in the "Security Sub-List (SEC)" on page 197.
Select Level 2 parameters	7. Repeatedly press .		The list of available parameters is given in the table in the next section.

Level 2 Operator Parameters

Parameters available in level 1 are also available in level 2, but level 2 includes additional parameters for commissioning purposes and for more detailed operation.

Press ↵ to step through the list of available parameters. The mnemonic of the parameter is shown in the lower display. Press ⧉ to return to the previous parameter.

The value of the parameter is shown in the upper display. If the value is read/write press ∧ or ∨ to adjust. If no key is pressed for 60 seconds the controller returns to the top of the HOME list.

By default the following table lists all possible parameters available in both Levels 1 and 2. Parameters associated with a particular feature will only be shown if that feature is configured.

Parameter Mnemonic	Scrolling name	Description	Further information
W.OUT	WORKING OUTPUT	The output current demand – 0% to 100% or -100% to +100%.	Level 1 & 2
R-L	LOOP REMOTE/LOCAL	Selects the Remote or Local setpoint source.	Level 1 & 2
SP.HI	SETPOINT HIGH	Maximum value allowed for the local setpoints (SP1 and SP2).	
SP.LO	SETPOINT LOW	Minimum value allowed for the local setpoints (SP1 and SP2).	
SP 1	SETPOINT 1	The value which the process is required to attain as set by setpoint 1	Level 1 & 2
SP2	SETPOINT 2	The value which the process is required to attain as set by setpoint 2 if selected.	Level 1 & 2
SP.UP	SETPOINT RATE UP	Limits the maximum rate at which the working setpoint can change in an increasing (upwards) direction. Setpoint rate limiting is often used to prevent rapid bumps in controller output that may damage equipment or product, or cause upset to downstream processes.	
SP.DWN	SETPOINT RATE DOWN	Limits the maximum rate at which the working setpoint can change in an increasing (downwards) direction.	
AI 1.PV	PV	The current value of the process (read only) read by the primary input IP1.	Level 1 & 2
AI2.PV	PV	The current value of the process (read only) read by the secondary input IP2.	Level 1 & 2
TUNE	AUTOTUNE ENABLE	Starts an autotune.	"Autotuning" on page 309
PB.H	CH 1 PROPORTIONAL BAND	Channel 1 (heat) proportional band.	
PB.C	CH2 PROPORTIONAL BAND	Channel 2 (cool) proportional band.	
TI	INTEGRAL TIME	Integral time.	
TD	DERIVATIVE TIME	Derivative time.	
CBH	CUTBACK HIGH THRESHOLD	High cutback.	
CBL	CUTBACK LOW THRESHOLD	Low cutback.	

Parameter Mnemonic	Scrolling name	Description	Further information
MR	CONTROL MANUAL RESET	If the integral parameter is turned off the controller is working in proportional only or proportional + derivative. This parameter allows the output to be adjusted manually to offset and difference between SP and PV.	
HYS.H	CONTROL CH1 ON OFF HYSTERESIS	If channel 1 is configured for On/Off control this parameter allows a difference to be set between the output being on or off.	
HYS.C	CONTROL CH2 ON OFF HYSTERESIS	If channel 2 is configured for On/Off control this parameter allows a difference to be set between the output being on or off.	
C.DB	CONTROL CH2 DEADBAND	The Ch1/Ch2 Deadband is a gap in percent between output 1 going off and output 2 coming on and vice versa. For on/off control this is taken as a percentage of the hysteresis.	
OUT.HI	OUTPUT HIGH LIMIT	To limit the maximum controller output.	
OUT.LO	OUTPUT LOW LIMIT	To limit the minimum controller output.	
LD.I	CT LOAD CURRENT	This is the sampled RMS current measured during the on time of the heater.	Level 1 & 2
LK.I	CT LEAK CURRENT	The RMS current measured flowing through the load during the off states of the controller.	
LD.SP	CT LOAD THRESHOLD	Sets a threshold to trigger an alarm if the load current is exceeded.	
LK.SP	CT LEAK THRESHOLD	Sets a threshold to trigger an alarm if the leak current is exceeded.	
OC.SP	CT OVERCURRENT THRESHOLD	Sets a threshold to trigger an over current alarm if the current measured exceeds a maximum limit set by the process.	
CS.ID	CUSTOMER ID	A user configurable non-volatile identification parameter.	
REC.NO	DATASET TO LOAD	Selects which recipe dataset to load.	
STORE	DATASET TO SAVE	Selects which of the 5 recipe dataset in which to store the current active parameters.	

The home list can be customized by adding up to 60 parameters; iTools will be required to configure the promoted parameters, see "Parameter Promotion" on page 233.

Level 2 Programmer Display

If the controller has the programmer installed, by default, the programmer can be edited and operated from the HMI. A step by step guide to setting up a program is given in "To Setup a Program from the HMI" on page 268.

Programmer List

Press the page button , the display will show

Repeatedly press to read the currently running program. The program can be Run, Held or Reset from this list.

Parameters displayed are (but not limited to depending on the program):

Parameter Mnemonic	Scrolling name	Description
P.NUM	PROGRAM NUMBER	Alterable, but does not run a program.
P.NAME	PROGRAM NAME	Read only.This parameter has been added in firmware versions V3.01 and above.
P.CUR	CURRENT PROGRAM	Read only.
C.NAME	CURRENT PROG NAME	Read only.This parameter has been added in firmware versions V3.01 and above.
P.MODE	PROGRAM MODE	The programmer can be changed to Run, Hold, Reset,
P.SP	PROGRAM SETPOINT	Read only.
P.TIM.L	PROGRAM TIME LEFT	Read only.
P.CYC.L	PROGRAM CYCLES LEFT	Read only.
S.NUM	CURRENT SEGMENT NUMBER	Read only.
S.NAME	SEGMENT NAME	Read only.This parameter has been added in firmware versions V3.01 and above.
S.TYPE	CURRENT SEGMENT TYPE	Read only.
S.TIM.L	SEGMENT TIME LEFT	Read only.
TSP	TARGET SETPOIN	Read only.
R.RATE	RAMP RATE	Read only.
EVT.X	EVENT X	Event off or on. Further events are shown if configured.
P.ADVN	PROGRAM ADVANCE	Alterable YES/NO. Advances the program to the next segment.

Program Setup List

By default programs can be set up in Level 2.

Press the page button , the display will show

Repeatedly press to read the currently running program. Programs can be edited from this list.

Parameter Mnemonic	Scrolling name	Description
P.NUM	PROGRAM NUMBER	Alterable but does not run a program. If the program is running WORk is shown signifying the working program.
P.NAME	PROGRAM NAME	Read only.This parameter has been added in firmware versions V3.01 and above.
HB.STY	HOLDBACK STYLE	Alterable: PROG (holdback applies to the whole program). SEGm (holdback applies to each segment).
HB.TYP	HOLDBACK TYPE	Alterable: OFF, LOW, HIGH, bANd. For a full definition see "Holdback" on page 261.
RAMP.U	RAMP UNITS	Alterable: P.SEC (per second), P.mIN (per minute), P.HR (per hour).
DWEL.U	DWELL UNITS	Alterable: SECS, mINS, HrS.
P.CYC	PROGRAM CYCLES	Alterable: The number of time a program repeats. CONt (continuous) or 1 to 9999. **Default 1**
P.END	PROGRAM END TYPE	Alterable: Behavior when the program ends dWEL (dwell at current setpoint). RSEt (reset). tRAk (track).
S.NUM	CURRENT SEGMENT NUMBER	Alterable:
S.NAME	SEGMENT NAME	Read only.This parameter has been added in firmware versions V3.01 and above.
S.TYP	SEGMENT TYPE	RAtE, tImE, dWEL, Step, CALL, ENd.
TSP	TARGET SETPOINT	Alterable:
R.RATE	RAMP RATE	Alterable:
EV.OP	EVENT OUTPUT	Alterable:
DUR	DURATION	Alterable: Appears if the segment type is Dwell or Time.
R.TIME	TIME TO TARGET	Alterable: Appears if the segment type is Time.
C.PROG	CALL PROGRAM	Alterable: Appears if the segment type is Call.
C.CYC	CALL CYCLES	Alterable: Appears if the segment type is Call.

The above is a summary the parameters which are displayed (but not limited to) and depends on the program. A full description of the parameter meanings and how to set up programs is given in the following sections:

- Configuration chapter "Programmer List (PROG)" on page 135.
- Programmer chapter "Programmer" on page 257.

Operator Level 3

In Operator level 3 (and in Configuration Level) all parameters are organized in lists (or groups). Only parameters related to enabled functions are shown.

Each list may contain operator level and configuration parameters; the parameters are only shown when the instrument is in the appropriate mode. If a list does not contain at least one displayable parameter, it is skipped completely.

During navigation, the lower display shows the mnemonic code of the parameter or the List header. After 6 seconds, a scrolling string with either the parameter or the List description will be displayed.

To Enter Level 3

Operation	Action	Display	Notes
Select Level 3	1. Press and hold ⧉ until LEu 3 is shown. 2. Press ↵ to enter.	LUL3 GOTO	LEu 1 is displayed first. Continue to hold the button to obtain LEu3.
Enter the password	3. Press ∧ or ∨ to enter the correct digit value of the password. 4. Press ↵ to accept the value and move onto the next digit. 5. If the correct password has been entered the message PASS will be displayed momentarily. The controller is now operating in Level 3.	0___ CODE LEU3 PASS	Press ↵ to move to the next digit. The default password for level 3 is '0003'. A special case exists if a pass code has been configured as '0000'. If this has been done it is not necessary to enter a code and the controller will enter the chosen level immediately. If an incorrect code is entered the display will return to HOME. If an incorrect code is entered the display will return to HOME. After three wrong attempts the password entry system will lock out for a time set by the 'password Lockout Time' set in the "Security Sub-List (SEC)" on page 197.
Select list headers	6. Repeatedly press ⧉	A1 LIST	This shows the Analog Input List. Press ⧉ + ∧ to return to the previous list header.
Select parameters in the list	7. Repeatedly press ↵	tC IN. TYP	This shows the Input Type.

To return to the HOME page relevant to the controller mode press the 'Home' key combination (Page+Scroll).

The HOME display is also selected after a timeout period with no key presses. The timeout defaults to 60 seconds but can be adjusted between 0 and 60 seconds. A setting of 0 means no timeout (see "Display Functionality Sub-List (HmI)" on page 195), so that the HMI remains in the selected level.

Level 3 Operator Parameters

The Operator Level 3 lists are essentially the same as configuration level. These are shown in the next chapter.

To Return to a Lower Level

From Level 3 you can select Level 1 or Level 2 as follows:

1. Press and hold until GOTO is displayed.
2. Press or to select LEu 1 (or LEu2).
3. Press to accept.

The display will briefly show PASS and will return to the selected level default display.

A security code is not required when going from a higher level to a lower level.

Note: if the controller had been switched off whilst operating in levels 2 or 3 it will return to operator level 1 when switched on again. If it was switched off when in configuration level it will start up with a message - PCnF - POWERED DOWN WHILST IN CONFIG MODE. See section "Subsequent Start-ups" on page 75.

Eurotherm Complete Manual Refer to the following link

https://www.htsei.com/wp-content/uploads/2021/06/EPC3000-User-Guide.pdf

FACTORY LIMITED WARRANTY POLICY

The Ace Factory limited warranty provides assurance that all products are free from manufacteres defects at the time of shipment and meet specifications and performance described in the product literature.

It is important to understand the difference between a factory warranty and an installed warranty. There are many factors that can occur to the products after they are shipped that the company has no control over and can not fully verify. These includes:

1. Hidden damage during the shipping.
2. Handling damage.
3. Damage during storage.
4. Installation conditions.
5. Other unknown variables in the system design: maintenance, pulsation and vibrations.

The installed warranty is the responsibility of the architech, specifying engineer, contractor and/or owner who jointly have control over the application, installation, location, operating and maintenance conditions.

The Ace Heaters, LLC warranty excludes extended liabilities. Extended liability typically occurs when products are installed without proper drainage, flooding containment or when safety devices are not tested and repaired or replaced when needed.

Product problems are often caused by the condition of the water, the lack of water treatment and/or the improper treatment of the water, insufficient combustion air, improper draft conditions, bolts not re-tightened, pipes not flushed and cleaned of oil, metal chips, rags, vibration and pulsation etc. These are installation, operating and/or maintenance conditions that are beyond the seller's responsibility and are not covered by the factory warranty, but may be covered by the installer's warranty.

The factory warranty covering company products is based upon extensive product development and testing. Combustion products under go certification testing and approvals to Underwriters Laboratory (UL) standards. Auditing of the production of combustion products is conducted by a nationally recognized testing laboratory.

Pressure vessel products are designed and manufactured to American Society of Mechanical Engineering (ASME) and National Board (NB) Design standards. Design reviews, factory product manufacturing quality inspections and testing are carried out by a third party National Board authorized inspection agency.

Ace Heaters, LLC products have proven themselves in service for over 85 years which indicates that the company products perform exceedingly well when normal installation, operating and maintenance conditions exist.

The following is a review from the terms and conditions of sale. Also included in paragraph two, below, is the Ace Heaters LLC nonconformance policy.

1. Ace Heaters, LLC warrants its products against defective material and/or workmanship only. The warranty does not apply to operational failures, electrical failures, gasket leaks, and/or other malfunctions caused by improper application, installation and/or maintenance.

2. It is the buyer's responsibility to inspect and accept the product, when received, as conforming to their purchase order, specifications and approved drawings. All claims for non-conformance, errors, shortages, etc. must be made within 10 days after receipt of the shipment.

3. Ace Heaters, LLC do not provide a warranty or guarantee, express or implied, in any manner, form, usage of trade, merchantability or fitness which extend beyond the product description and quotation.

4. Ace Heaters, LLC liability is limited to the factory repair or replacement of warranty failures, or non-conformance, upon the return of the product to the factory.

5. Ace Heaters, LLC is not liable for any direct or consequential damages.

6. Ace Heaters, LLC warranty is based upon section 23161(2) of the uniform commercial code and is printed in the term s and conditions of sale which is referenced in every quotation, on the back of sales order acknowledgements and invoices. It is legally correct and is an industry standard policy.

Water Heater – Water Quality Requirements

Properly ensuring the water within the water heater is treated is essential for maintaining the water heaters performance over time and preserving the components connected to the system. It is advisable to manage any water treatment program under the guidance of a water treatment specialist.

Water heaters can suffer from scale buildup and chemically induced corrosion due to poor water quality. Among these problems, the most common is the formation of scale inside the unit, which predominantly occurs on the hottest surface; the u-tube bundle heat exchanger. The accumulation of scale in the unit can lead to a reduction in the water heater's capacity as it coats the heat exchanger surface.

Poor water quality can contribute to chemically induced corrosion of the heat exchanger or the vessel. Different forms of chemically induced corrosion may arise, including general corrosion, pitting corrosion, and stress corrosion. Such corrosion has the potential to significantly decrease the lifespan of the vessel or the tube bundle. General corrosion might manifest as a uniform deterioration of the tube, tubesheet, or vessel material, eventually causing material failure. Pitting corrosion involves the creation of small pits on the tubes, tubesheet, or shell, which can ultimately lead to material failure. Stress corrosion results in stress corrosion cracking. This refers to the development of brittle cracks along the metal's stress lines and grain boundaries. Stress corrosion cracking is more likely to affect materials like austenitic stainless steel, such as the grade 316L commonly used in the water heater's vessel, tubes, and tubesheet. This type of corrosion is associated with the presence of chlorides in the water. The likelihood of stress corrosion cracking increases with higher concentrations of chlorides and temperatures.

Under normal design and operating conditions, the water temperatures within a water heater usually remain below the threshold required for stress corrosion to occur.

Ace Heaters, LLC requires all water heaters to be operated within the following ranges to help control corrosion and scaling:

Water Property	Range
Alkalinity (CO_3, HCO_3)	Less than 300 ppm
Chlorides	Less than 100 ppm
Conductivity	Less than 1,500 ppm (3,000 uS/cm)
pH	6-8
Silica	Less than 150 ppm
Sulfates	Less than 250 ppm
Total Dissolved Solids	Less than 50 ppm
Total Hardnes (Ca and Mg)	Less than 150 ppm

WARRANTY

Limited

Ace Heaters, LLC provides a limited warranty on its products against **defective material and/or workmanship only**. This limited warranty is not applicable to operational failures, electrical failures, gasket leaks, wear or malfunctions caused by improper application, storage, installation, and/or maintenance.

Product Period - The following Limited Warranty period are from date of shipment:

Tanks

Tanks - Carbon Steel: One Year
Tanks - Stainless Steel: Three Years
Storage Water Heaters Single-wall or Double-wall Tank/Exchanger Coils: One Year
Clean Steam Generators: One Year
Linings: (Pro-rated Warranty)
Magnesium Anodes must be used at all times to maintain the Limit Warranty
Section VIII Tanks:
Epoxy: 30" dia. and above (Three years)
Glass: 24" dia. and under (One year).
Glass: 30" dia. and above (Five years).
Cement: (Five years).
Pre-Krete: (Ten years).
Section IV Tanks: SW Model Only
Glass (One year) & Epoxy (Three years).
Minipacks™ Single-wall or Double-wall: One Year
Shell & Tube Heat Exchangers Single-wall or Double-wall: One Year
Atlas™ Series Condensing Boiler (Heat Exchanger): One Year
Triton™ Series Near Condensing Boiler (Heat Exchanger): Twelve Years
Liberty™ Series Condensing Boiler (Heat Exchanger): Ten Years
B-Series Copper Fin Boiler: Three Years

Controls: Components manufactured by other than Ace Heaters, LLC such as controls, instruments, forced draft burner, etc., provided with the boilers and packaged products are not covered by the Ace Heaters, LLC Warranty. However, Ace Heaters, LLC extends to the customer the same warranty provided by the manufacturer to Ace Heaters, LLC. The customer shall receive the full benefits of adjustments made to Ace Heaters, LLC by the manufacturer.

Any claim for adjustment under this limited warranty must be made within the warranty period. Ace Heaters, LLC's liability shall be limited to factory repair or, at Ace Heaters, LLC's option, replacement of all parts which, upon test and examination by Ace Heaters, LLC, prove to be defective material and/or workmanship and within the above limited warranty. If required by Ace Heaters, LLC, parts which are claimed to be defective must be promptly delivered to the Ace Heaters, LLC facility, transportation charges prepaid. This warranty does not cover the cost of labor, removal, or installation of the warranted item during the limited period. This warranty is limited to the above and applies only for the period set forth. Ace Heaters, LLC will not be liable for any loss damage, direct, incidental or consequential damages of any kind, whether based upon warranty, contract, negligence or strict liability and arising in connection with the sale, use or repair of the products. Ace heaters's maximum liability shall exceed the contract price for the product's merchantability or fitness for any particular purpose and in no event shall be held responsible for any consequential damages.

For complete Limited Warranty conditions see Section G and H under terms and condition of sale.

Ace Heaters, LLC, also doing business as Ace Heaters, LLC, is referred to herein as Ace Heaters, LLC

Ace Heater, LLC
130 Klug Circle, Corona CA 92878
PHONE: (951) 738-2230 • FAX: (951) 281-4959
www.aceheaters.com

Ace Heaters, LLC

WARNING

PRODUCT
SAFETY NOTICE

ACE BOILER AND WATER HEATER PRODUCTS OPERATE AT HIGH TEMPERATURE AND PRESSURES

- Before using this product, read and understand instructions. Save these instructions for future use.
- Before servicing, to prevent serious burns or injury, the boiler and water heater products must be cooled to less than 80°F (27°C) and the pressure must be 0 psi (0 bar).
- Turn off the electrical power before making electrical connections to prevent electrical shock.
- These products must be placed in a controlled location where untrained or unqualified personnel cannot access the operating or safety controls, must not be able to come in contact with high temperature or high pressure parts and must not perform maintenance or demolition work.
- All work performed must be by qualified properly equipped personnel trained in the proper application, installation, and maintenance or demolition of plumbing, steam, and electrical equipment and/or systems in accordance with all applicable codes and ordinances.
- ACE Boilers and Water Heaters are complete package units with safety and operating controls and are constructed with non ASBESTOS materials. Any replacement gaskets, refractory, insulation, etc used must not contain Asbestos.
- No additional insulation is required on the Boilers and Water Heaters.
- Additions or replacement of insulation on any connecting pipes or accessories to the Boilers and/or Water Heaters must be of "NON-ASBESTOS" and contain only non-hazardous materials.
- Crystalline Silica, a material known to cause cancer, may be encapsulated in some refractory or insulation materials and must be handled only by authorized trained personnel. Crystalline Silica as used is encapsulated and is not harm full in this form. Care must be taken during removal or replacement of refractory or insulation to remove it in bulk form and avoid generation or inhalation of dust. Removal must be properly performed by trained, qualified and equipped personnel. This is also true of Asbestos not contained in ACE products but may be otherwise contained in replacement materials or parts, in connecting piping or other nearby products.
- All safety and operating controls must be set within the specified operating limits and tested periodically to assure proper operation. All limit and operating controls must be installed in series on the boiler.
- Connect drain pipes to a safe drain to prevent serious personal injury from relief valve discharge and or from boiler blow down discharge.
- After installation, check for proper operation of all limit and operating controls before leaving the site.
- Perform scheduled and annual inspections including checking Controls for proper calibration and performance.

Failure to follow these warnings, to allow access by unauthorized persons and the use of non-properly trained and equipped personnel in the operation, service, modification, removal or demolition of these products or replacement of parts with non-authorized factory non-asbestos materials could cause damage, personal injury or death.

ACE
a nudyne company

Ace Heaters. LLC
www.aceheaters.com

N O T I C E

This owners & operation manual provides warnings of risk of harm from improper installation, operation and/or maintenance of Ace Products. Ace Heaters, LLC used ordinary care and complied with UL and ASME Standards in the design and manufacture of Ace Products. Proper installation, operation and maintenance are covered in the manual supplied with the product. All equipment must comply with local codes.

W A R N I N G

THIS PRODUCT CONTAINS CRYSTALLINE SILICA, A CHEMICAL KNOWN TO CAUSE CANCER. CONTAINS NO ASBESTOS.

Ace Heaters, LLC

www.aceheaters.com

SO # _____

Serial No. _____

Model No. _____

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The brand and product names contained within this document are trademarks or registered of their respective holders.

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