

FOR YOUR SAFETY — An odorant is added to the gas used by this appliance.
If you smell gas:

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

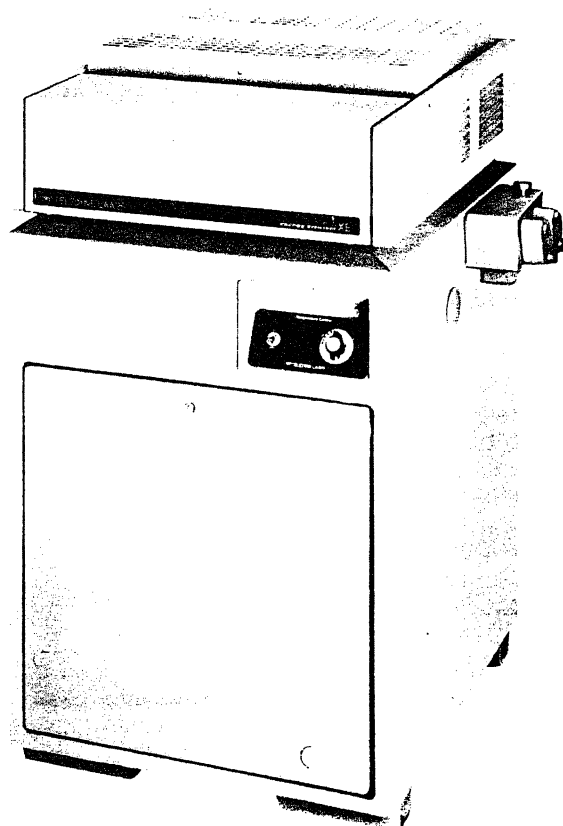
FOR YOUR SAFETY — Do not store or use gasoline or other flammable liquids or vapors in the vicinity of this or any other appliance.

WARNING: Elevated water temperature can be hazardous. Consult heater installation instructions for Consumer Product Safety Commission water temperature guidelines before setting temperature. Mix thoroughly before entering. Use an accurate thermometer to measure water temperature.

Installation, Operating and Servicing Manual for

XE POOL and SPA HEATER

TYPE EG



 **TELEDYNE LAARS**

CONTENTS	PAGE		PAGE
Section 1/General Information	3	5/10. High Limit Switch	19
1/1. Introduction	3	5/11. Removal of Gas Burners	19
1/2. Description	3	5/12. Periodic Inspection of Heat Exchanger	20
1/3. Warranty	3	5/13. Testing and Cleaning Heat Exchanger	21
1/4. Heater Capacity	3	5/14. Automatic Flow Control Valve	22
Section 2/Assembly Instructions	4	Section 6/Appendix	23
2/1. General	4	Trouble Shooting Chart, Fig. 30	23
2/2. Reversible Heat Exchanger	4	Parts List — Type EG	25
2/3. Assembly	5	How to Order Parts	25
Section 3/Installation Instructions	5	Capacities and Dimensions, Fig. 32	26
3/1. General	5		
3/2. Outdoor Installation	5	LIST OF ILLUSTRATIONS	PAGE
3/3. Indoor Installation	6	Sizing Chart, Fig. 1	3
3/4. Gas Supply and Piping	6	Installation of Top Assemblies, Fig. 2 & 3	5
3/5. Water Piping	6	Installation Draft Hood or Vent Cap/Stack, Fig. 4 & 5	5-6
3/6. Pressure Relief Valve	7	Suggested Piping Arrangements, Fig. 6 & 7	7
3/7. Adjustment of Pressure Flow Switch	8	PVC Pipe, Use of, Fig. 8	7
3/8. Automatic Chlorinators	8	Threaded Pipe Fittings, Fig. 9	7
3/9. Electric Wiring	8	Temperature Check, Fig. 10	7
3/10. Timeclock Wiring	8	Adjustment of Pressure Flow Switch, Fig. 11	8
Section 4/Operating Instructions	9	Thermostat Dial Face, Fig. 12	11
4/1. Lighting and Shutdown	9	Heater Drain Plugs, Fig. 13	11
4/2. Start-up Procedure	10	Gas Pressure Check, Fig. 14	13
4/3. Inlet-outlet Temperatures	10	Electrical System Checkout, Figs. 15-18A (Honeywell or General Controls Gas Valves)	14-16
4/4. Temperature Controls	10	Pilot Generator and Pilot Burner Replacement, Fig. 19	16
4/5. Spring and Fall Operation	11	Visoflame Removal, Fig. 20	17
4/6. Pool Water Chemistry	11	Gas Valve Removal, Fig. 21	17
4/7. Therapeutic Pools	11	Pressure Switch Testing and Removal, Fig. 22	17
4/8. Pool Energy Saving Tips	12	Thermostat Removal and Replacement, Fig. 23	18
4/9. Periodic Inspection	12	High Limit Switch Testing and Replacement, Fig. 24	19
Section 5/Maintenance	13	Gas Burner Replacement, Fig. 25	19
5/1. General Precautions	13	Heat Exchanger Inspection, Fig. 26	20
5/2. Regulated Gas Pressure	13	Heat Exchanger Removal, Fig. 27	20
5/3. Electrical Trouble Shooting	13	Heat Exchanger Cleaning, Fig. 28	21
5/4. Pilot Generator Replacement	16	Automatic Flow Control Valve Disassembly, Fig. 29	22
5/5. Visoflame Pilot Lighter	16	Exploded Drawing, Type EG, Fig. 31	24
5/6. Testing Fusible Link	16	Capacities and Dimensions of Heaters, Fig. 32	26
5/7. Gas Valve Replacement	17		
5/8. Testing Pressure Switch	17		
5/9. Testing Temperature Control	18		



Section 1 / General Information

1/1. INTRODUCTION

This instruction manual supplies assembly, installation, operation and maintenance information for the Teledyne Laars XE Swimming Pool and Spa Heater. A check-out procedure is included in Section 5 for quickly isolating troubles should they occur.

It is strongly recommended that the installation procedure in Section 3 be reviewed before a heater is installed. Experience has shown that most service calls are brought about by improper installation, rather than faulty operation of heater. Before installing check local and state codes.

1/2. DESCRIPTION

The XE is a compact, high performance pool and spa heater. The water velocity is carefully balanced in the heat exchanger to prevent both scale formation internally and generation of corrosive condensate externally. As equipped, the unit is suitable only for the heating of swimming pools and spas and should not be used under any circumstances as a heating boiler or as a general service water heater or for heating of salt water pools. Consult factory for the proper Teledyne Laars products applicable to these functions.

XE heaters are design certified by the American Gas Association as complying with the latest American National Standards Institute Standard Z 21.56b-1982 Gas Fired Swimming Pool Heaters.

1/3. WARRANTY

The XE is sold with a limited warranty. Details of the warranty are specified on the written warranty furnished with the heater. See written warranty furnished with heater for the length of the warranty period of various heater parts.

Warranty claims must be made to an authorized Laars representative or to the factory. Claims must include serial and model number, installation date and name of installer. Shipping costs are not included in warranty coverage.

1/4. HEATER CAPACITY

Before installing the heater, see Sizing Chart (Fig. 1) to make sure the heater to be installed has sufficient capacity for the pool size and expected use. Use the Intermittent Heating Selection Table for maximum operating economy, and particularly if fast pool heating is desired (24 to 48 hours). Use the Temperature Maintenance Selection Table if minimum pool heating is desired or if a longer heating period is acceptable.

SIZING CHART — POOL HEATERS

To use the table, first determine the temperature *rise* that will be required (that is, the difference between the desired pool temperature and the average air temperature during the coldest month you intend to use your pool). Next, calculate the square footage of your pool (length times width). The table lists the maximum square footage recommended for each heater model to accomplish a given temperature rise.

Temperature Maintenance Selection Table

TEMP. RISE	MODEL NUMBER				
	125	175	250	325	400
15°F	659	922	1318	1713	2108
20°F	494	692	988	1284	1581
25°F	395	553	790	1028	1265
30°F	329	461	659	856	1054
35°F	282	395	565	734	903

Use this table if you wish to keep your pool heated continuously during the swimming season. Table is based on 3½ mph average wind and average pool depth of 5.5 feet.

Intermittent Heating Selection Table (Thrift Heating)

TEMP. RISE	MODEL NUMBER				
	125	175	250	325	400
15°F	367	513	734	954	1174
20°F	275	385	550	715	880
25°F	220	308	440	572	705
30°F	183	256	367	477	587
35°F	157	220	315	409	503

Use this table if you wish to raise your pool temperature by a given amount within 24 to 48 hours. Table is based on 3½ mph average wind and average pool depth of 5.5 feet.

SIZING GUIDE — SPAS AND HOT TUBS

This guide is based on spa or hot tub gallonage and shows how many minutes are required for each 10-degree temperature rise. The rise is the difference between initial water temperature and desired spa or hot tub temperature.

Model	Time in Minutes to Raise Spa Temperature 10 Degrees *												
	250	300	350	400	450	500	550	600	650	700	750	800	850
125	13	15	18	20	22	25	28	30	32	35	38	40	42
175	9	11	12	14	16	18	20	21	23	25	27	29	30
250	6	8	9	10	11	12	14	15	16	18	19	20	21
325	5	6	7	8	9	10	11	12	13	14	15	16	17
400	4	5	5	6	7	8	9	9	10	11	12	12	13

FIG. 1

*This time does not take into account the surface loss during the heatup period.

Section 2/ Assembly Instructions

2/1. GENERAL

There are two types of XE heaters—the Low Profile and the Stacktop. The heaters are shipped in either two or three packages for assembly at poolside, or at the warehouse before delivery to the job site.

The **XE Low Profile Heater** (Outdoor Only) comes in two packages:

1. Heater Assembly.
2. Grate Top Assembly.

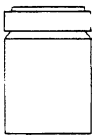
The **XE Stacktop Heater** (Indoor or Outdoor) requires three packages:

1. Heater Assembly
2. Stacktop Assembly
3. Draft Hood for *indoor* installation OR Vent Cap/Stack for *outdoor* installation.

See tables below for proper part numbers.

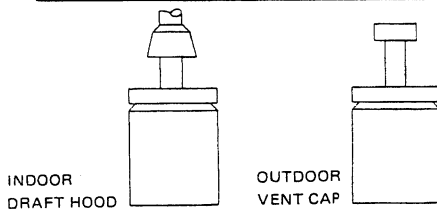
Low Profile Models —

OUTDOOR ONLY	
Model	Top Assembly
125	D155
175	D156
250	D157
325	D158
400	D159



Stack Top Models —

INDOOR/OUTDOOR			
Model	Top Assembly	Indoor Draft Hood	Outdoor Vent Cap/Stack
125	D160	D025	D005
175	D161	D026	D006
250	D162	D027	D007
325	D163	D032	D008
400	D164	D033	D009



2/2. REVERSIBLE HEAT EXCHANGER

Before assembling the Pool Heater and the selected Top Assembly, note that the XE heater can be installed with the water connections at either side.

The heater assembly is shipped with the water connections on the *right* side of the heater. Left side water connections can often simplify installation and improve access for heater service and maintenance. The change from *right* to *left* is easily made either at the warehouse or at poolside before installing the selected top assembly.

Follow these step-by-step instructions and the accompanying drawing:

1. Remove screws and lift out gap closures. (2 & 3)
2. Remove and discard shipping screw located between drain and plug on side of heater opposite water connections. (4)
3. Remove drain valve (large hex.) located under water connections. (5)
4. Remove all grommets (2 each side). (6 & 7)

5. In order, lift out the retainer and insulation (1) over the temperature sensing bulb, remove the lower flue collector (8) and the front and rear insulation block covers. (9).

6. Disconnect white wires at pressure switch and at gas valve. Pull wires through and coil them on top of heat exchanger.

7. Remove temperature sensing bulb from header by loosening cap screw and sliding retainer bracket off of bulb flange. Pull bulb away from heat exchanger, and carefully drape over front of heater.

8. Disconnect black wire from pressure switch and unfasten the location clip in the door opening. Disconnect pressure switch tube at header, and place pressure switch and tubing on top of heat exchanger.

9. Lift out heat exchanger, turn and replace with water connections on left side of heater.

10. Reconnect tubing to header, straightening the tubing as required to bring pressure switch to the top left of the door opening. Fasten tubing to inner panel and reconnect black wire to one of the pressure switch terminals.

11. Re-install temperature sensing bulb in header and route wire leads carefully against side of heater, cover bulb area with insulation and re-install insulation retainer.

12. Reroute black and white wires on left side of heater, fasten securely clear of the heat exchanger. Reconnect white wires at pressure switch and gas valve.

13. In order, replace front and rear insulation block covers (9) and lower flue collector (8).

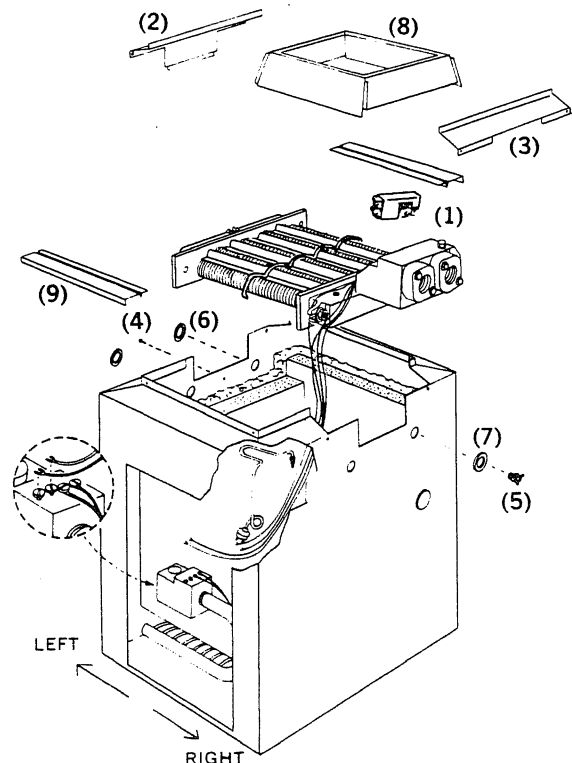
14. Replace gap closures* (2 & 3). Tighten screws securely.

15. Replace grommets* (6 & 7).

16. Reinstall drain plug* (large hex.) (5).

Complete the heater assembly by attaching the selected top assembly and install the heater according to the instructions which follow.

*Note: These items must be replaced *opposite* their original positions (they are relative to the heat exchanger).

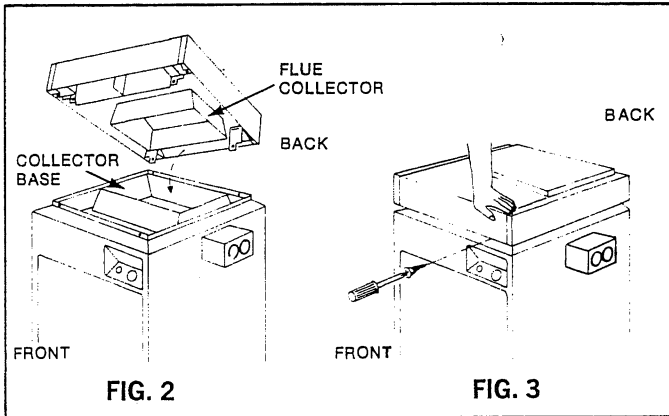


2/3. ASSEMBLING THE XE HEATER

(1) Place Top Assembly (Grate Top or Stack Top) on the Heater Assembly so that the flue collector (attached to the Top Assembly) seats on the lower flue collector (on the heater assembly). See Fig. 2. The flue collector is designed to seat loosely, allowing movement for alignment of the screw holes.*

(2) Align the two screw holes on the back and the two in front of the heater, insert self-threading screws (furnished) and tighten. See Figure 3.

**Do not remove the flue collector from the grate top or stack top assemblies under any circumstances. Removal of the flue collector voids the warranty.*



Section 3 / Installation Instructions

3/1. GENERAL

The heater must be installed in accordance with all local codes and ordinances and the latest National Fuel Code, ANSI Z223.1.

3/2. OUTDOOR INSTALLATION OF LOW-PROFILE AND STACK-TOP MODELS

Heater must be located in an open, unroofed area. Minimum clearances from combustible material and for service access must be maintained as follows:

Blank side and rear of heater:	6" Minimum clearance from combustible material.
Piping side:	12" Minimum clearance from combustible material and for service access.
Front of heater:	18" Minimum clearance for service access.

The above clearances also apply to non-combustible materials, because the heater requires air circulation for proper operation. The heater is design-certified for installation on a combustible floor surface.

The XE heater is design certified for installation on combustible floors.

Do not install the heater in locations which will permit the accumulation of leaves or other combustible material around the base of the heater.

Do not install heater in a location that will allow sprinklers to operate near heater equipment since the water may cause damage to the controls and/or electronics.

Do not install this appliance under an overhang less than 3 feet from the top of the appliance. The area under the overhang must be open on three sides. Overhangs must be such that flue products are not diverted into living spaces. Heaters installed under overhangs must be protected from

direct roof water drainage by gutters and the like. From the point where the flue products leave the heater, that point must be a minimum of 4 feet below, 4 feet horizontally from or 1 foot above any door, window or gravity inlet to a building.

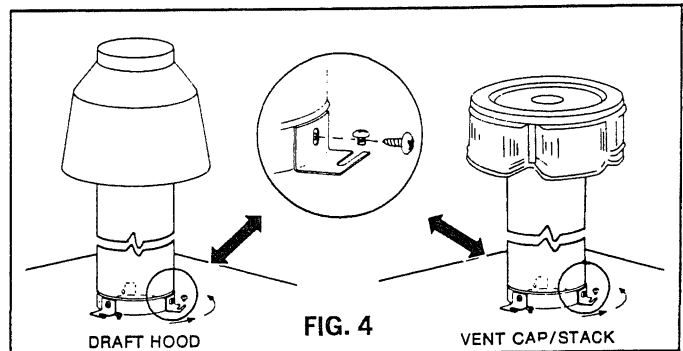
Low Profile (Grate Top) Models

IMPORTANT: When locating a low profile heater, consider that high winds can roll over or deflect off adjacent buildings and walls and create a draft reversal causing flame rollout which might damage the controls. Normally, placing the heater at least three feet from any wall will prevent this condition. (If conditions are severe, a heater with Stacktop and Vent Cap/Stack should be selected).

Stack Top Models

XE Stacktop heaters can be installed outdoors if equipped with the factory-supplied Vent Cap/Stack. Refer to Section 2/1 for the correct part number or check rating plate on the heater.

See Fig. 4 for proper installation of Vent Cap/Stack.



3/3. INDOOR INSTALLATION OF STACKTOP MODELS

XE heaters, when equipped with the Stacktop assembly and the proper draft hood, are design certified for indoor installation. The draft hood must be the one furnished by the factory and must be installed without modification. See Section 2/1 for correct draft hood part number or check rating plate on heater.

Install Draft Hood directly on top of heater. See Fig. 4 for proper installation of Draft Hood.

The Draft Hood must be connected to a vent of the same or larger size, terminating at least two feet (2') above any portion of the roof or other object which is within 10' of the stack. The vent should have a listed cap installed which permits a full equivalent opening for flue products. See Fig. 5.

Heater Clearance — Indoor Installations

Minimum clearances to combustible material and for service access must be maintained as follows:

Top of heater:	44" Minimum clearance from combustible material.
Blank side and rear of heater:	6" Minimum clearance from combustible material.
Piping side:	12" Minimum clearance from combustible material and for service access.
Front of heater:	18" Minimum clearance for service access.

The XE heater is design certified for installation on combustible floors.

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The above clearances also apply to non-combustible materials, because the heater requires air circulation for proper operation. The heater is design-certified for installation on a combustible floor surface.

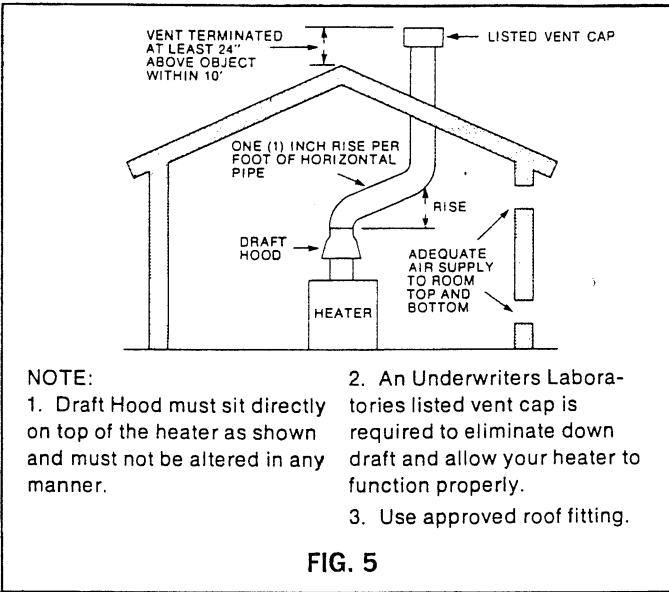


FIG. 5

Combustion and Ventilation Air Supply

When the heater is installed in a room or enclosure, there must be uninterrupted openings to outside air for combustion and ventilation. The table below shows the net free opening areas required at both ceiling and floor for each heater model. Teledyne Laars does not recommend installations which depend on infiltration for combustion.

Model	Net Free Opening Area	
	At Ceiling	At Floor
125/175	½ sq. ft. (72 sq. in.)	½ sq. ft. (72 sq. in.)
250	¾ sq. ft. (108 sq. in.)	¾ sq. ft. (108 sq. in.)
325	¾ sq. ft. (108 sq. in.)	¾ sq. ft. (108 sq. in.)
400	1 sq. ft. (144 sq. in.)	1 sq. ft. (144 sq. in.)

Special precautions for LP gas heaters

Liquified petroleum gas is heavier than air, and for that reason is especially hazardous. Pool heaters using LP gas should not be installed in pits, basements or the like.

Heaters should be located at a safe distance from LP gas storage or filling equipment. Consult local code and fire protection authorities relative to specific installation rules.

3/4. GAS SUPPLY AND PIPING

Heaters are normally fitted for operation at altitudes below 2,000 feet. Heaters fitted for higher altitudes are marked with a sticker or tag on manifold. CHECK RATING PLATE FOR CORRECT GAS. Provide gas pipe size as follows:

Distance from meter	Heater Model				
	125	175	250	325	400
0-50'	¾"	1"	1"	1¼"	1¼"
50-100'	1"	1"	1¼"	1¼"	1½"
100-200'	1"	1¼"	1¼"	1½"	1½"

For LP Gas use size smaller except 125 size which requires ¾" from 0'-50'.

The above are Teledyne Laars recommended pipe sizes. Check local code requirements for compliance.

Do not use a restrictive gas cock.

Provide a union in gas line outside the heater jacket. Provide mainline gas pressure as follows (measured in inches of water column):

Natural Gas:	Maximum 10"	Minimum 5"
LP Gas:	Maximum 14"	Minimum 11"

*5.5" minimum for Model EG-400.

The Pressure Regulator is pre-set at the factory and normally does not need adjustment.

For correct procedure for gas pressure measurement, see Fig. 14.

If mainline gas pressure is inadequate, check for too small a pipe size between meter and heater, or for gas meter with limited capacity.

Before operating the heater, test all gas connections for leaks.

Do not pressure test gas piping with heater connected or serious damage to the gas controls will result.

3/5. WATER PIPING

1. Figures 6 & 7 shows typical water piping for pool deck equipment.

2. You will notice that the figure shows the installation of a manual by-pass valve between the heater inlet and outlet. This valve is only to be installed if the system filter-flow rate exceeds 100 gallons per minute. The manual by-pass is not necessary when the water system flow rate is less than 100 gallons per minute, because under these conditions an automatic by-pass valve built into the heater maintains proper flow through the heater.

3. Pipe, fittings, grids and any other element of the filter system may be made of plastic materials, if acceptable by the authority having jurisdiction. However, they may be damaged by the momentary "back-syphoning" of hot water from the heater when the pump stops running. To prevent such a backflow, install a check valve and "heat sink" pipe in the piping between the filter and the heater, as shown in Figure 8. Teledyne Laars recommends the installation of a safety "Fireman's Switch" with a time clock, or allowing the pump to run 15 minutes after the heater is shut off, if operated manually, to dissipate the excess heat from the heater and the piping system.

a. PVC: DO NOT INSTALL PVC PLASTIC PIPING DIRECTLY TO THE HEATER INLET/OUTLET HEADER. PVC pipe does not have the high temperature capabilities required to insure safe and reliable operation of your heater. A check valve and "heat sink" as shown in Figure 8 is required whenever PVC is used.

b. CPVC: High Temperature plastic piping (CPVC), schedule 40, can be connected directly to the heater Inlet/Outlet header; however, a check valve as shown in Figure 8 is recommended.

NOTE: If galvanized piping is used, all joints between copper and galvanized piping must be made with dielectric insulated fittings. The Universal Flange Coupling furnished with the heater accepts threaded 1½" iron pipe, unthreaded 1¼" iron pipe and 1½" copper pipe without adapter. See Figure 9.

4. Anti-syphon protection is built into the heater. No separate Hartford loop is required.

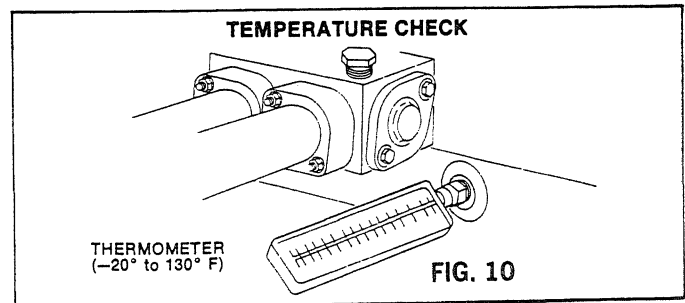
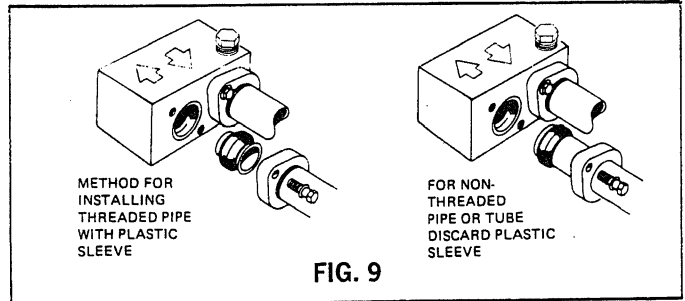
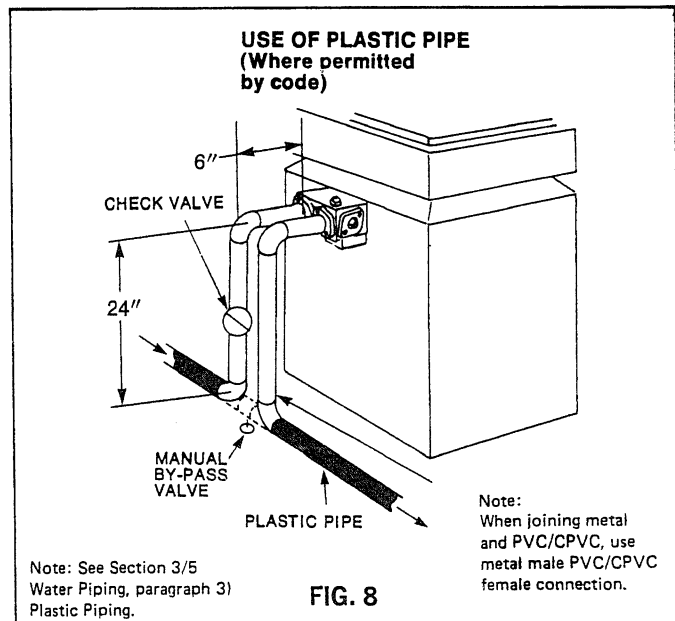
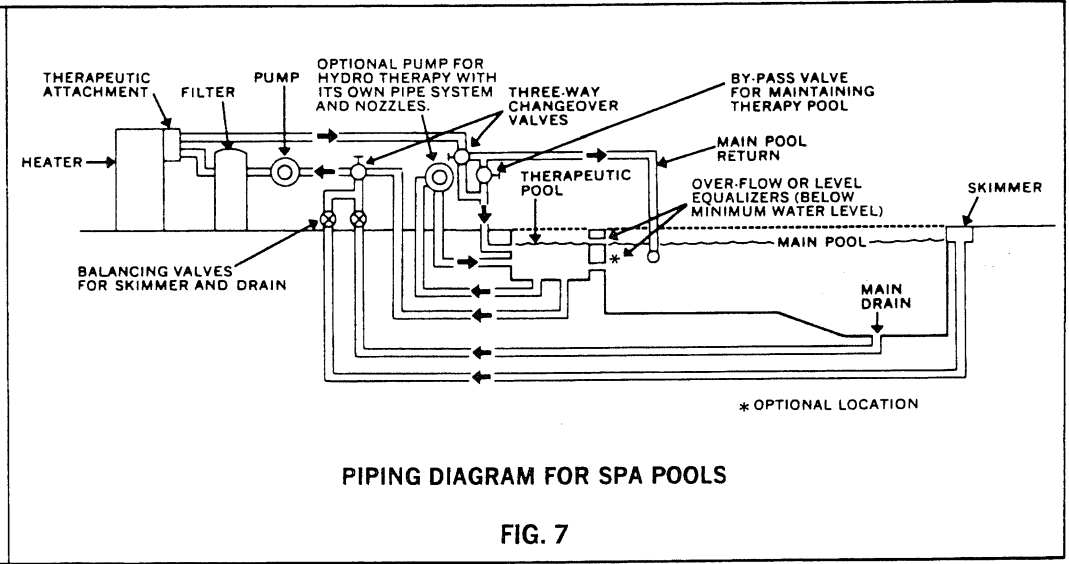
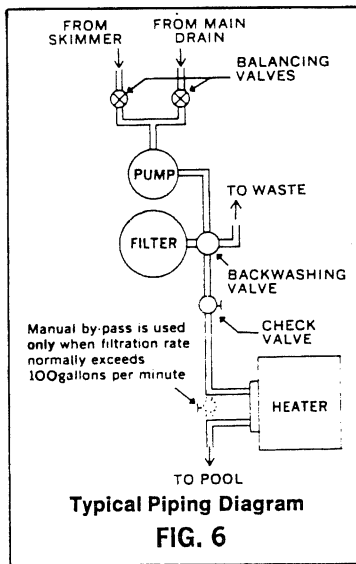
5. No water flow adjustments are necessary unless external by-pass valve is required.
6. Do not install any valve or other variable restriction in the return piping between heater outlet and pool.
7. If normal filtration rate exceeds 100 gpm:
 - a. Provide manual by-pass valve shown in drawings. (Figs. 6 & 8)
 - b. Install thermometer in threaded drain provision to the right of header casting. See Figure 10.
 - c. Set by-pass as follows:
 - (1) Clean filter.
 - (2) Close by-pass valve.
 - (3) Close heater main gas valve.
 - (4) Start filter pump.
 - (5) After 3 minutes note and record thermometer reading (this is pool temperature).
 - (6) Open heater main gas valve and start heater.
 - (7) Gradually open manual by-pass valve until thermometer reads the temperature differential shown in the table below. The valve must be as near closed as possible and still maintain this temperature rise.

MODEL	ABOVE POOL TEMP. TEMP. DIFF.		Minimum filter system flow in GPM
	MIN.	MAX.	
125	22	28	20
175	24	36	20
250	26	38	25
325	28	38	30
400	30	38	30

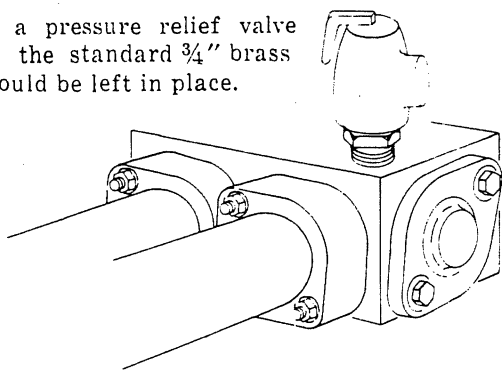
- The chart also lists the minimum flow rates for filter systems used with the heater.
- (8) Be sure thermometer reading remains constant for at least 3 minutes.
 - (9) Remove handle from by-pass valve, since this is now a permanent adjustment to your system.
- The automatic by-pass valve in the heater will take over and will maintain proper flow through the heater at all times.

3/6. PRESSURE RELIEF VALVE

A pressure relief valve is not furnished with the XE heater. Check local building and plumbing codes to determine whether a pressure relief valve is required. A 75 PSI rated relief valve is recommended for protection of components of the filtering system if there is a water shut-off valve installed between the heater and



the pool. If a pressure relief valve is *not* used, the standard 3/4" brass pipe plug should be left in place.



3/7. SPECIAL ADJUSTMENT OF PRESSURE FLOW SWITCH

The pressure flow switch has been pre-set at the factory for normal pool installations. *Do not tamper* with this switch, unless one of the following conditions prevail:

1. The heater is installed 3 feet or more *below* the surface of the pool, or
2. Any part of the filter system piping is 3 feet or more *above* the top of the heater jacket.

In such cases, follow the detailed instructions for adjusting the switch contained in Fig. 11.

On some installations the piping from the heater to the pool is short, therefore the back pressure is too low to activate the pressure switch. On this type of installation, install a directional fitting where return piping enters the pool. The back pressure will be increased and the heater will operate properly.

NOTE: If heater is installed more than 15 feet below the pool surface, or more than 6 feet above the pool surface, the adjustment shown in Fig. 11 should not be used. Consult factory.

POOL FILTER MUST BE CLEAN BEFORE ADJUSTMENTS ARE MADE

1. Turn heater ON/OFF toggle switch to OFF.
2. Set pool thermostat to MAX.
3. Clean filter thoroughly.
4. Start filter system.
5. Turn ON/OFF toggle switch to ON. Heater should come on.
6. Turn pressure switch adjustment screw counter-clockwise very slowly until the heater goes OFF.
7. Turn pressure adjustment screw clockwise 1/4 turn. Heater should come back ON.
8. **CAUTION:** Check pressure switch adjustment by turning filter pump OFF. Heater should shut off immediately. If it does not shut off, start filter pump immediately and repeat steps 6 and 7, then recheck.
9. Set pool thermostat to desired temperature.
10. When pressure switch is properly set, the heater should come ON about 10 seconds after filter pump is started, and should shut OFF immediately after pump shuts OFF.

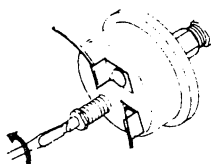


FIG. 11

3/8. AUTOMATIC CHLORINATORS

A concentration of chlorine in the heater can be very destructive. Heater damage caused by excessive concentrations of chlorine, for any reason, is not covered by the heater warranty.

IMPORTANT:

1. The chlorinator should be provided with an anti-syphoning device so that if the piping drains after the pump shuts off, chlorine will not syphon into the heater.
2. An electric chlorinator should be wired so it cannot operate unless the filter pump is running. If chlorinator has an independent clock control, be sure the filter and chlorinator clock are synchronized and chlorinator operates only within the filter cycle time period.
3. If the chlorinator is equipped with its own pump, it should be installed so it introduces the gas or solution downstream from the heater, and if possible, at a position lower than the heater outlet fitting.

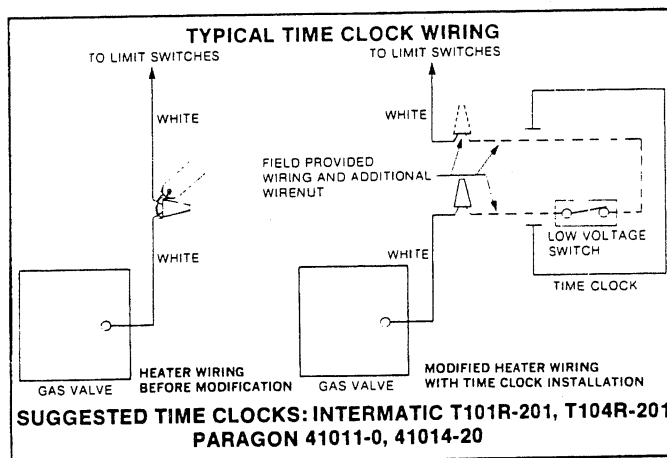
3/9. ELECTRIC WIRING — WARNING

Do not connect heater to any source of electricity.

The Teledyne Laars XE has a built-in Thermoelectric Generator. This provides a completely self-contained electrical system, and no external connections are required. Any attempt to make external electrical connections will damage the heater.

3/10. AUXILIARY TIME CLOCK WIRING

If a time clock is used to control filter pump operation it should have a separate low voltage switch to turn off heater *before* turning off pump. If the low voltage switch (fireman switch) timing is adjustable, set switch to shut off heater approximately 15 minutes ahead of filter pump. This allows the residual heat to be carried into the pool water and prevents excessive heat build-up in the heat exchanger.



To incorporate a timeclock auxiliary switch into the control wiring of the heater, do the following:

1. Remove door to gas valve compartment.
2. Remove factory-provided wire nut from white wire tagged "fireman switch", and separate the ends.
3. Connect the field installed wires from the timeclock auxiliary switch to these ends with wire nuts. Field provided wire should have at least 3/64" thick insulation and a temperature rating of 105°C. or greater.

Be sure that the run of wire between heater and switching device is fairly short or the resistance of the wire will reduce available millivoltage to a critical level for operating the gas valve. Also, the contact points of the switching device must be silver or some other low resistance alloy.

Section 4 / Operating Instructions

4/1. LIGHTING AND SHUTDOWN

Full lighting and shutdown instructions are included on the rating plate attached to the heater inside the controls compartment.

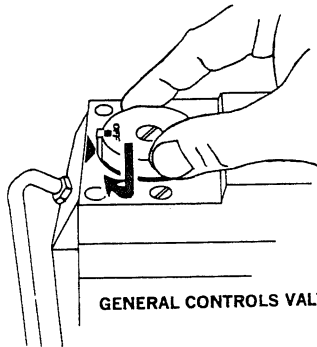
When lighting or relighting the pilot always turn the temperature control to its *lowest setting* and turn the gas valve and toggle switch to OFF. WAIT FIVE MINUTES.

It is always a safe practice to keep the head and face well away from the lower firebox opening when lighting the pilot should there be accumulated gas in the firebox, a reduced pilot flame or a pilot burner that is out of position.

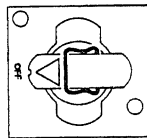
● Lighting

Step 1.

Press Gas Valve Knob and turn clockwise to OFF. WAIT FIVE MINUTES. NOTE: At least five minutes is required for the natural air flow to clear the accumulation of any unburned gases from the combustion chamber, which could flashback, if ignited.



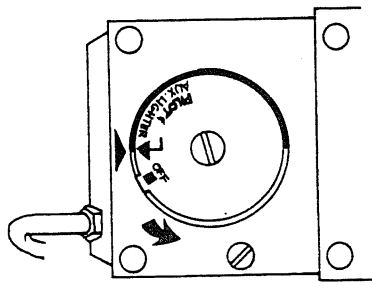
GENERAL CONTROLS VALVE



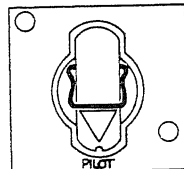
HONEYWELL VALVE

Step 2.

Turn Gas Valve Knob counter-clockwise to PILOT position.



GENERAL CONTROLS VALVE



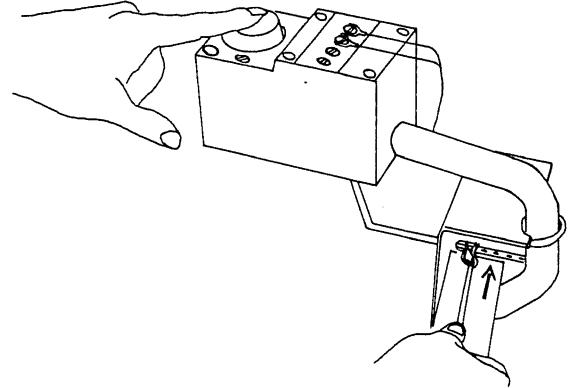
HONEYWELL VALVE

Step 3.

Light Pilot using VISOFLAME Lighter Tube.

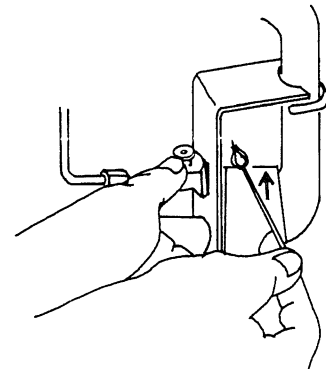
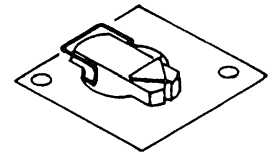
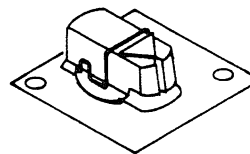
General Controls valve:

Press valve knob down and light gas at VISOFLAME tube. Hold valve knob down for 30 seconds, then release.



Honeywell valve:

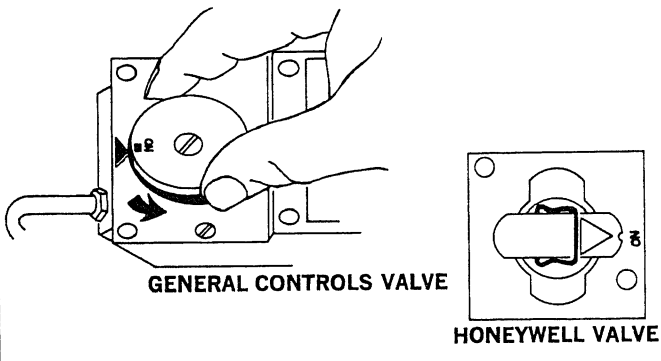
Depress gas valve knob and lock in place with wire latch. Immediately depress VISOFLAME button and light gas at VISOFLAME tube. Release wire latch on gas valve knob after 30 seconds.



The VISOFLAME lighter tube permits ignition of the pilot at arms length without bringing the head or face near the firebox opening or the burner tray. The VISOFLAME tube is also used to prove pilot ignition — depress gas valve knob (on General Controls valve) or VISOFLAME button (on Honeywell valve) and flame will return to the lighter tube and be visible if pilot is lit.

Step 4.

Turn on main burners by turning knob counter-clockwise to ON position.



5. Replace door.
6. Position toggle switch to ON.
7. Turn the Temperature Control to appropriate setting to bring on the main burners.

NOTE: The on/off toggle switch must be ON for heater to operate.

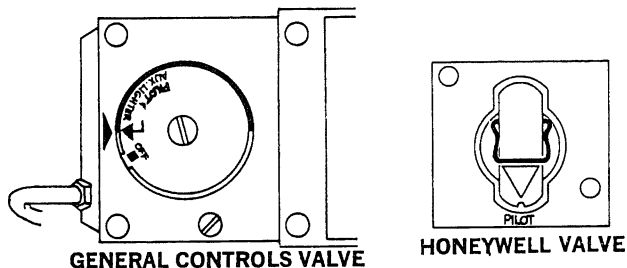
● Relighting

If pilot goes out, repeat steps 1 through 4.

● Shutdown

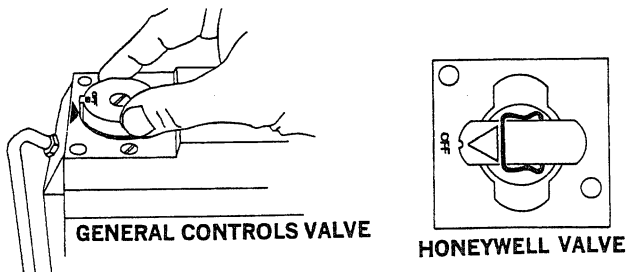
Step 1.

To shut off main burners, turn knob to pilot position. Or move toggle switch to OFF.



Step 2.

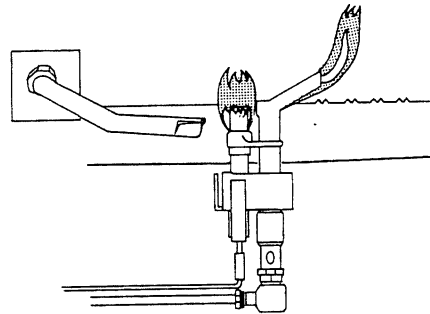
For complete shut off, press knob and turn to OFF position.



4/2. START-UP PROCEDURE

In a new pool, it is strongly recommended that the filter be operated with the heater off long enough to completely clean and clear the pool water and filter system. This action will remove construction residue and dirt from the water, and at the same time rapidly fill the filter with sediment. The resulting pressure variations in the system would cause the heater to cycle on and off severely. While this cycling would not damage the heater in any way, it is inefficient and uneconomical since little effective water heating would result. To start heater:

1. Start filter pump.
2. Make sure pilot has stable flame.



3. Turn gas valve knob to ON.
4. Position toggle switch to ON.
5. Set pool thermostat to fourth mark on dial. Heater should come on. Until the pool reaches approximately 70 degrees there will be a considerable amount of condensate dripping from the heat exchanger into the firebox. This will stop after pool reaches temperature.

CAUTION! Keep all objects off the vent screen. Blocking air flow will damage heater and invalidate warranty.

IMPORTANT: Special safety controls on the heater prevent heater from coming on unless the filter system is operating. When raising the temperature of a cold pool, remove all time clock stops so the filter system and heater can operate continuously until pool temperature reaches the selected temperature set on the thermostat. When the selected temperature is reached, the heater will automatically shut off and the filter system will continue to operate.

Replace time clock stops to provide for a single filter cycle each 24 hours according to the recommendations of the filter manufacturer.

This time cycle may not be long enough to keep the pool water at the desired swimming temperature. Adjust "ON" time until heater shuts off on its own controls before the time clock shuts down the filter system.

4/3. INLET-OUTLET TEMPERATURES

Do not be concerned about the fact that the outlet piping, carrying the heated water to the pool, does not feel hot. The outlet pipe on the XE carries a large volume of pool water, which has by-passed the heater, mixed with a relatively small volume of heated water; thus the temperature difference between inlet and outlet pipes is so small that it would be difficult to sense by touching them.

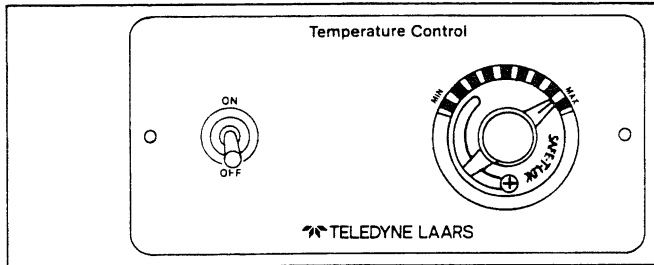
4/4. TEMPERATURE CONTROLS

The XE temperature control is factory-set to cover a range from approximately 70° at the lowest setting to 107° at the highest setting in increments of 5° as indi-

cated by the eight marks on the face of the dial. (See Fig. 12). Use a pool thermometer to determine the best swimming temperature for you and position the Safe-T-Lok at that setting.

The pool heater is equipped with an ON/OFF switch. This switch is intended to permit shutting off the heater without requiring access to the Main Gas Valve, but should be used with discretion. See paragraph 4/5 "Spring and Fall Operation."

IMPORTANT: The XE Temperature Control cannot be calibrated in the field. If the control is faulty, replace according to instruction in 5/8. Do not use the temperature control to shut off the heater. The ON/OFF switch will shut the heater off except for the pilot light. The heater can be completely shut off only by turning the main gas valve to OFF.



4/5. SPRING AND FALL OPERATION

During periods when pool is used intermittently, do not turn the heater "OFF." Best results will be obtained by turning the thermostat down to MIN. This will prevent the pool and surrounding ground from becoming "chilled," and also permit the pool to be raised to swimming temperature in a shorter time. If heater will not be used for a period of time, turn gas valve to OFF position or use ON/OFF toggle switch.

CAUTION: In areas where freezing weather occurs *drain heater before first frost. Shut off all gas valves.* Drain the heater by opening the drain cock(s), and removing all drain plugs. (See Fig. 13).

Disconnect copper tubing connected to the pressure switch when "winterizing" your pool heater. To reconnect tubing to pressure switch, see Section 5/5 "Testing Pressure Switch."

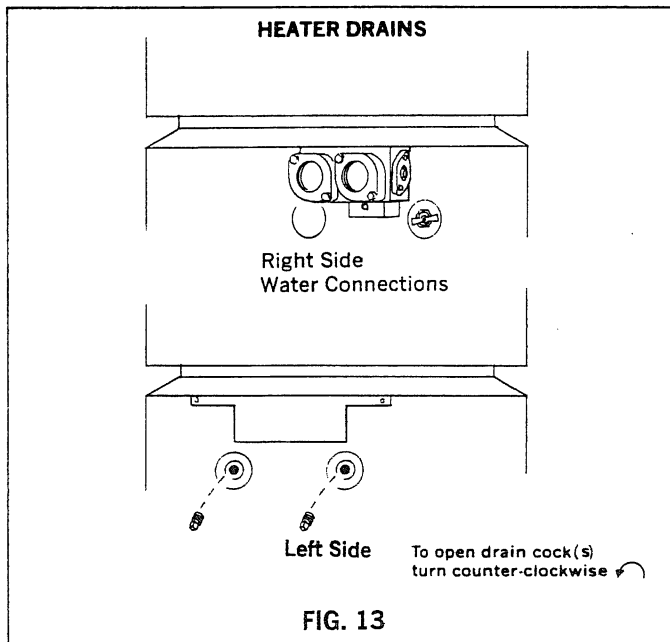


FIG. 13

Leave all drain cocks open and drain plug out until ready to use heater again. *Heater must be level to permit adequate draining.**

When compressed air is used to blow out lines it is still necessary to follow the above procedure. Be sure drains are left open after draining.

The XE pool heater is not designed to be used as a heating boiler and it will not function properly when so used. Consult factory for proper models for this application.

The XE is not designed for continuous use as an "anti-freezing" device for pools. And operating the heater for long periods at pool water temperatures less than 70°F. will seriously damage the heater and may create a dangerous condition by fouling the external heat exchanger passages, which results in incomplete combustion of the fuel.

If your area has only the occasional short cold snap, the stagnant water in the heat exchanger can still freeze any time the filter pump shuts down. To protect the heater during such periods, *run the filter pump continuously.* Remove all time clock stops during the danger period. Should you not wish to maintain pool temperature, shut down and drain your filter system and the pool heater as described above.

4/6. POOL WATER CHEMISTRY

The mineral content of your pool water increases every day. This is due to the natural evaporation which removes only distilled water and leaves the minerals behind. Also the regular addition of algaecidal and sanitizing chemicals adds greatly to the mineral content of the pool. If the concentration of minerals in the pool is permitted to become too high, the minerals will precipitate out of the water and deposit on the walls of the pool, in the filter and in the tubes of the heater.

For this reason it is very advantageous to drain the pool regularly (at least every two years). This precautionary measure will save you from expensive repairs to your pool finish, filter system and heater.

Another important safety precaution — always keep the pH of your pool water between 7.4 and 7.6. This will add years to the life of your pool finish, filter system and heater.

Algaecidal and sanitizing chemicals are either alkaline or acid. Sodium and calcium hypochlorites are alkaline. Chlorine gas and practically all other dry chlorine pool products are acid. Whichever type of chlorine is used, it is extremely important that pH be checked frequently and adjusted as indicated and that pool water be changed when dissolved solids become excessive. It is generally recommended by pool sanitation chemical suppliers that total alkalinity of pool water be kept in the 60 to 80 ppm range when sodium or calcium hypochlorites are used and the 80 to 100 ppm range when other dry (acid) chlorine products or chlorine gas are used.

4/7. THERAPEUTIC POOLS (SPAS)- SAFETY RULES

Therapeutic pools or "spa" pools are usually piped and controlled so that very warm or hot water, often with air injection, is forced at high velocity into a confined area of a swimming pool or into a small separate pool. Both the

energy of the water and the heat furnish certain hydrotherapeutic benefits. These pools are excellent for relaxation, body-conditioning and for arthritic and rheumatic problems, but can be hazardous. The Consumer Product Safety Commission has recommended the following "Safety Rules for Hot Tubs":

1. Spa or hot tub water temperature should never exceed 104F (40°C). A temperature of 100F (38°C) is considered safe for a healthy adult. Special caution is suggested for young children.
2. Drinking of alcoholic beverages before or during spa or hot tub use can cause drowsiness which could lead to unconsciousness and subsequently result in drowning.
3. Pregnant women beware! Soaking in water above 102F (39°C) can cause fetal damage during first three months of pregnancy (resulting in the birth of a brain-damaged or deformed child). Pregnant women should stick to the 100F (38°C) maximum rule.
4. Before entering the spa or hot tub, users should check the water temperature with an accurate thermometer; spa or hot tub thermostats may err in regulating water temperatures by as much as four degrees Fahrenheit (2.2°C).
5. Persons with medical history of heart disease, circulatory problems, diabetes or blood pressure problems should obtain their physician's advice before using spas or hot tubs.
6. Persons taking medications which induce drowsiness, such as tranquilizers, antihistamines or anticoagulants, should not use spas or hot tubs.

4/8. POOL ENERGY SAVING TIPS

The following recommendations are offered to assist in conserving fuel use, and in minimizing the cost of operating your pool heater without sacrificing pool comfort unduly.

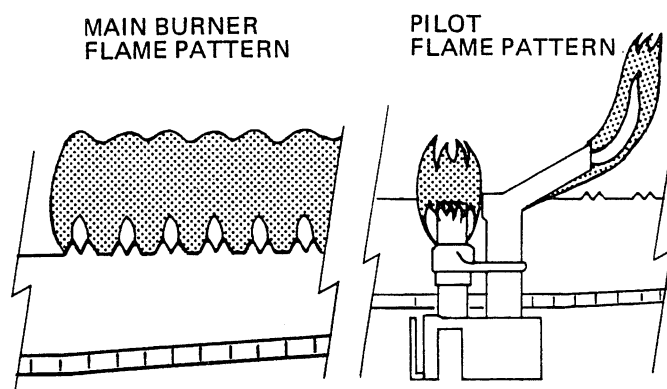
- (1) Reduce the heater thermostat setting to maintain a 78 degree or lower temperature. The National Swimming Pool Institute and the American Red Cross hold that the most healthful swimming temperature is 78 degrees. Be certain that you are using an accurate pool thermometer. A variance of four degrees — from 78 degrees to 82 degrees — will use as much as 40% more gas.
- (2) Heat pools only during the three month summer swimming season. Heating a pool for three rather than five months will reduce gas consumption by an additional 33%.
- (3) Note the proper setting for your pool heater temperature control and use the Safe-T-Lok to discourage further adjustment.
- (4) Set your filter time clock to start the pump no earlier than 6 a.m. during the pool heating season. This is the time when nightly heat loss stabilizes.
- (5) For pools which have only weekend use, heater thermostat setting should be reduced by eight or 10 degrees during the week. Thermostat should be reset to the 78 degree level before use.
- (6) During the winter and when on vacation for more than one week, turn off the pool heater, including the pilot light.
- (7) Shelter the pool where possible from prevailing winds by using well trimmed hedges or other landscaping, cabanas or fencing as windbreaks.
- (8) Use a pool cover where practical. This will reduce heat loss, conserve chemicals, and reduce dirt load on filtering systems.
- (9) Before relighting the pilot light and the heater at the beginning of each swimming season have a competent swimming pool heater technician inspect it and

make any needed adjustments. Follow a regular program of preventive maintenance. An annual inspection and de-liming of the heat exchanger when necessary will maintain heating efficiency.

4/9. PERIODIC INSPECTION

The XE has been designed and constructed for a long performance life when installed and operated properly under normal conditions. Regular inspections, as outlined below, are strongly recommended as a means of keeping your heater operating efficiently throughout the year.

1. Keep leaves and debris off of grate top on low-profile heaters. On outdoor stack-top models, check that vent cap/stack is fastened securely and is clear of debris. Check for and clear any accumulation of flammable debris, leaves, paper, etc. from beneath the heater or nearby.
2. Check venting of indoor stack-top heaters for looseness and leaks. Make certain that all openings to outside air are unobstructed.
3. *Inspect the internal wet surfaces of the heat exchanger annually*, and remove any accumulation of scale in the tubes. The XE has been designed for scale-free operation in most areas of the country, but extremely high mineral content in the water in some locales makes totally scale-free operation impossible. Instructions for this inspection are given in paragraph 5/11.
4. The external condition of the tubes can be inspected for soot accumulation by placing a mirror between and under the burners when the heater is firing. If soot has accumulated it must be removed and the bad combustion causing it corrected. If there are any questions contact the factory for instructions.
5. Check for spider webs in pilot and burner orifices especially at spring start-up.
6. Make a visual check of the burner and pilot flame. Flame pattern should be as shown.



7. *Inspect the gas and electric millivolt controls annually* to ensure safe and dependable operation.

Specifically, these include:

- a. High Temperature Limit Switch. See Par. 5/9.
- b. Water Pressure Switch. See Par. 5/7.
- c. Automatic Gas Valve. See Fig. 16.

Moisture and dust can infiltrate these controls after many years, and can eventually cause deterioration. A regular inspection schedule with repair or replacement as needed will keep your XE performing properly.

Keep this manual for reference by you or your service technician when inspecting or servicing the heater.

Section 5 / Maintenance

5/1. GENERAL PRECAUTIONS

This section contains instructions for use by a qualified serviceman in making tests and repairs to your XE. Step by step procedures are included for trouble shooting the electrical millivolt-control system, and it is strongly advised that these and other procedures be reviewed before undertaking actual repair.

Remember that most complaints about the heater are not related to the heater at all, but to other things that affect its operation. Most often these are things like improper heater installation, inoperative pump, clogged filters and strainers, closed valves in the circulating system, inadequate gas supply, improperly adjusted time clocks. A quick-reference Trouble Shooting Chart is included at the back of this manual. See Fig. 30.

5/2. REGULATED GAS PRESSURE

It is desirable to check the main line gas pressure and the regulated gas pressure in the heater manifold to make sure both are adequate to operate the heater. (See paragraph 3/4). A slack-tube manometer is a convenient way to check this, and a kit is available from factory. Instructions for operating the manometer are included with the test kit, but the proper connection is shown in Figure 14.

5/3. ELECTRICAL TROUBLE SHOOTING

The XE pool heater may have either a General Controls gas valve or a Honeywell gas valve. The electrical troubleshooting procedures in the following pages are illustrated with the General Controls valve. The procedure is the same with the Honeywell valve if it is understood that the two center terminals in the General Controls valve (with Jumper) are replaced by a single terminal on the Honeywell valve. See Fig. 18 for wiring hookup on each valve.

TESTING MAIN LINE GAS PRESSURE

1. Attach slack tube manometer to heater jacket.
2. Open both valves on manometer.
3. Shut off gas to heater by using shut-off cock ahead of heater controls.
4. Remove $\frac{1}{8}$ " NPT test plug in upstream shut-off valve as illustrated.
5. Screw in $\frac{1}{8}$ " NPT fitting from manometer kit. Attach manometer hose to fitting and to one of the manometer valves.
6. Open all gas valves, light pilot and bring on main gas burners.
7. Mainline gas pressure will register on the manometer. **With burners on**, readings should be as follows:
5" to 10" WC — Natural Gas
11" to 14" WC — LP Gas

TESTING MANIFOLD REGULATED GAS PRESSURE

1. Attach slack tube manometer to heater jacket.
2. Open both valves on manometer.
3. Shut off manual main gas valve.
4. Remove $\frac{1}{8}$ " NPT Plug on valve outlet face and screw in $\frac{1}{8}$ " fitting from manometer kit. Connect manometer hose to fitting and to one of the manometer valves.
5. Wait five minutes. Relight pilot as instructed on rating plate and bring on main burners.
6. Manometer should register as follows:
4" WC — Natural Gas
9" WC — LP Gas
7. To adjust gas pressure: Remove regulator cap screw on top of valve marked "Reg. Adj.". Turn screw adjustment clockwise to increase or counter-clockwise to decrease gas pressure.

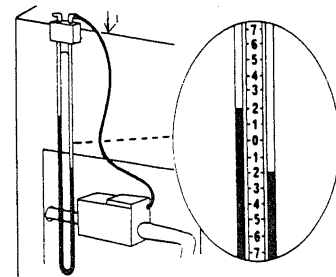
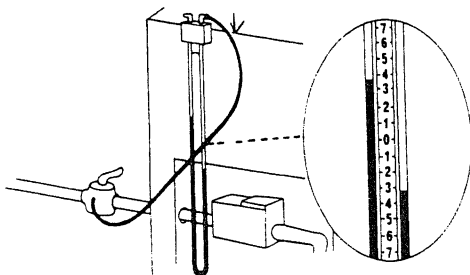


FIG. 14

ELECTRICAL SYSTEM TROUBLE SHOOTING SEQUENCE

Heater Does Not Come On.

If Heater Will Not Shut Off See Step 4.

Step 1.

Experience shows that most complaints about properly installed heaters not coming on have nothing to do with the heater itself. Usually something has happened to reduce water flow through the heater. The protective switches in the heater then operate to protect it.

Any of the following could keep the heater OFF. Check them first.

1. Be sure heater is properly installed. See Section 2.
2. Be sure filter is clean. Build-up of residue on the filter can lower the pressure through the heater and shut it off.
3. Make sure pump is not airlocked, clogged or inoperative.
4. Check main drain and skimmer valves to be sure they are open.
5. Be sure thermostat control is set at mid-range or higher. Move the control knob back and forth 6 or 7 times to free the contacts. Often this is all that is required to fix or clean thermostat contacts. Be sure that the toggle switch is in the ON position.

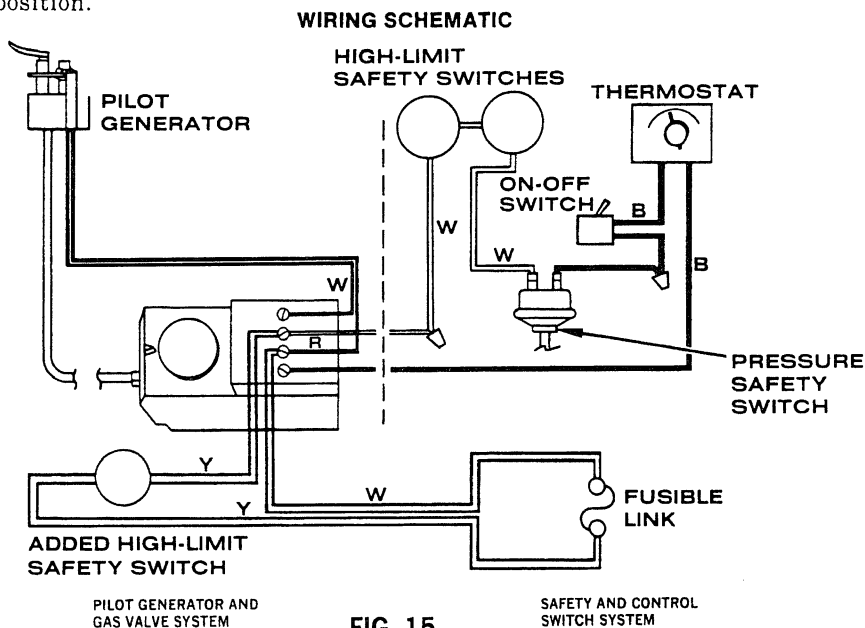
If Heater Still Does Not Operate, Remove Control Compartment Door And —

6. Make sure pilot is ON and adjusted properly. See Para. 4/2.
7. Make sure gas valve is ON and gas pressure is available.
8. Make a careful visual inspection of all electrical connections and wiring. Finding a loose connection or a charred wire can save a lot of time.

If the pump and filter system is properly circulating water and all the above items have been checked, the trouble is in the heater control systems. Go to Step 2.

NOTE: Keep the filter system running. The check-out procedures in Steps 1, 2, and 3 depend on the heater coming on to tell you when the trouble has been located.

CAUTION: If filter is off, DO NOT let burners come on for more than five seconds during service procedure. Shut off operating gas valve until you know what the trouble is.



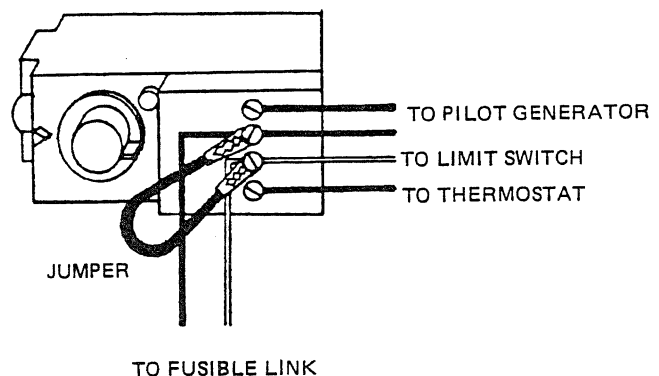
Step 2.

This step will isolate the trouble in the protective Fusible Link. (Part Number E-994)

Place jumper or any short circuit as shown.

If heater comes on with the jumper in place and shuts off when it is removed, the trouble is in the Protective Fusible Link. See Paragraph 5/6.

If heater does not come on, GO TO STEP 3.



ELECTRICAL SYSTEM TROUBLE SHOOTING SEQUENCE

Heater Does Not Come On.

If Heater Will Not Shut Off See Step 4.

Step 3.

This step will isolate the trouble area:

The protective controls or thermostat,

or

The gas valve, pilot generator or grounded wire harness.

Place jumper or any short circuit as shown below.

If heater comes on with jumper in place and shuts off when it is removed, the trouble is in the protective controls or thermostat. Go to Step 4.

If the heater does not come on, the trouble is either a grounded wire harness, the gas valve or the pilot generator.

To test for grounded wire harness, disconnect harness wires and replace jumper. If heater comes on, harness is grounded. Inspect for pinched or pierced insulation, a terminal touching a metal ground, loose strands of wire grounded, broken or burned wires, etc.

If heater does not come on, the trouble is in the pilot generator or gas valve.

To test pilot generator:

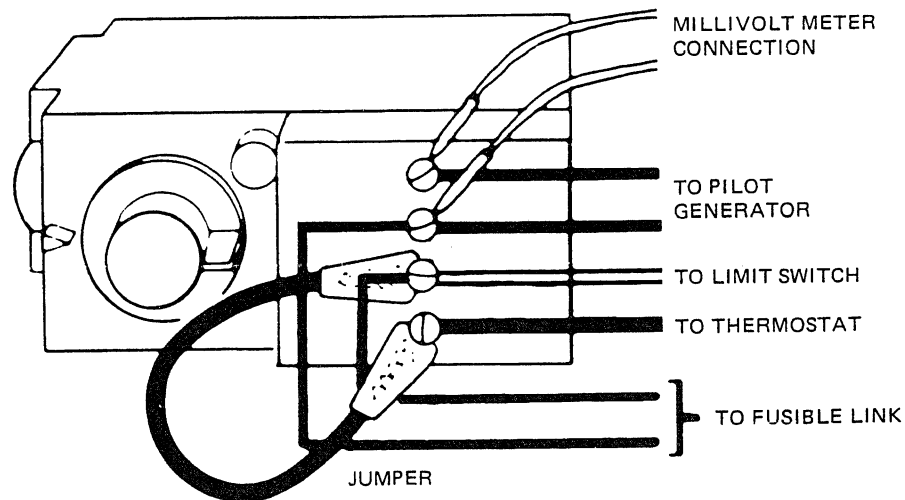
With jumper in place, connect leads from millivolt meter to gas valve as shown below. Reverse leads if needle deflects in opposite direction.

If meter reads more than 200 millivolts and the gas valve doesn't open, the gas valve is defective and should be replaced.

If meter reads less than 200 millivolts, disconnect pilot generator leads from valve and connect them directly to the millivolt meter. To prevent pilot from going out during this test the gas valve knob must be held down. If meter does not read over 500 millivolts, the pilot generator is out of position at the pilot burner (reposition and retest), or the pilot generator is weak and should be replaced. See paragraph 5/4. The generator must be properly enveloped in the pilot flame to generate its full potential.

If heater still does not come on after replacement of pilot generator cartridge, the problem is in the gas valve. Replace valve. See paragraph 5/7.

WARNING: Never leave a jumper on a heater control to keep the heater operating.



Note: The two jumpered center terminals on the General Control gas valve (illustrated) are replaced by a single terminal on the Honeywell gas valve. See Fig. 18 A.

FIG. 16

Step 4.

If the heater comes on when the jumper is installed as in Fig. 16 and shuts off when the jumper is removed, the problem is in one or more of the protective switches or their wiring.*

In this step, jumpers will be used to remove each of the protective switches from the circuit, one at a time, to determine which one is keeping the heater off.

* Check for terminals loose on wire end, loose terminal screws, cut or broken wires.

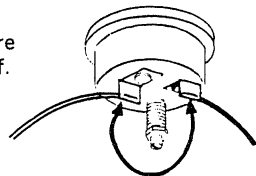
IMPORTANT: If water flow through the heater is stopped after the heater has been on for more than three (3) minutes, the residual heat in the firebox will heat the standing water in the tubes and travel to the pool thermostat and the high-limit switches. This may prevent the heater from coming ON for several minutes after starting water flow through the heater. Cool the heater by turning the Operating Gas Valve to OFF and let the pool water circulate through the heater for ten (10) minutes before proceeding with these tests.

NOTE: Keep filter pump running and turn the gas valve ON so that heater will come on when the troublesome switch is jumpered.

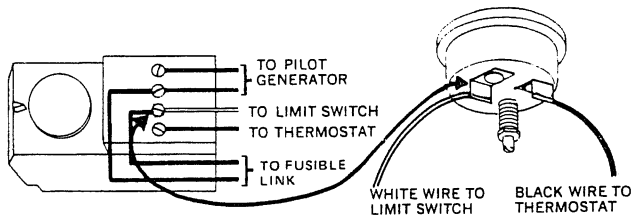
Remove control compartment door. Rotate thermostat shaft clockwise to the stop.

To find out which switch is keeping the heater off, add jumpers one at a time.

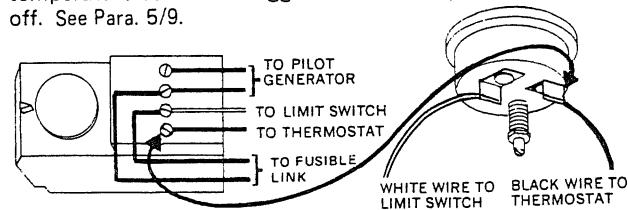
1. First put a jumper wire here.
If heater comes on, the Pressure Switch is keeping the heater off. See paragraph 5/8.



2. Connect jumper to the **white** wire terminal on pressure switch and the **white** wire of wiring harness that is connected to gas valve terminal block. If the heater comes on the High Limit Switches are keeping heater off. See Para. 5/10.

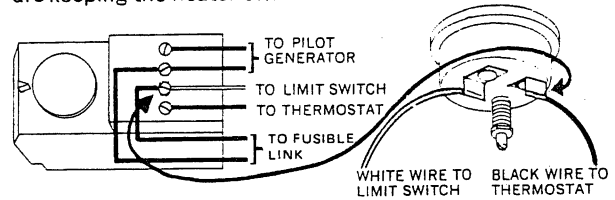


3. Connect jumper to the **black** wire terminal on pressure switch and the **black** wire of wiring harness that is connected to gas valve terminal block. If the heater comes on, the temperature control or toggle switch is keeping the heater off. See Para. 5/9.

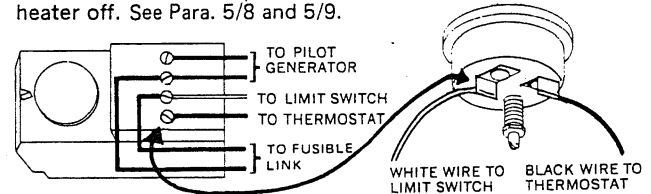


Note: The two jumpered center terminals on the General Control gas valve (illustrated) are replaced by a single terminal on the Honeywell gas valve. See Fig. 18A.

4. Connect jumper to the **black** wire terminal on pressure switch and **white** wire on gas valve terminal block. If heater comes on **both** the pressure switch and the high limit switch are keeping the heater off. See Para. 5/8 and 5/10.



5. Connect jumper to the **white** wire terminal on pressure switch and the **black** wire on gas valve terminal block. If heater comes on **both** the pressure switch and the temperature control (or toggle switch) are keeping the heater off. See Para. 5/8 and 5/9.



Testing for Voltage Loss in Safety Circuit

This test determines whether or not there is excessive voltage drop (resistance) in any contact or control.

High resistance in the safety circuit can cause intermittent operation and is a warning of future problems. This test must be done with filter pump and burners ON.

6. Attach the millivolt meter as shown below. Using the low range scale on the millivolt meter, the reading should be 20 mv or less. This is the total voltage drop through the safety controls and wire harness.

7. If the voltage drop is over 20 mv locate source of voltage drop by jumpering out the pressure switch, thermostat, and the high limits in turn, using the millivolt meter to jumper the controls instead of a jumper wire. See 1 thru 5. When all the voltage drops obtained in this manner are added up, the total should be the same as the mv reading obtained in 6.

8. If there is more than 10 mv drop across the **pressure switch**, make sure the 2 terminals are tight. If this doesn't eliminate the voltage drop, remove the adjustment screw (with spring) and rub the tip of the screw on a paper towel to remove any contamination. Replace screw and tighten until the heater comes on. Then turn the screw back and forth 1/2 turn about a dozen times to make sure the contacts are clean. Readjust the pressure switch by the procedure in Figure 11.

9. If there is more than a 10 mv drop in the **thermostat**, check and clean the spade terminals and retighten the terminal screws on the thermostat. If this does not eliminate the high voltage drop, replace the thermostat.

10. If there is more than 10 mv drop across the toggle switch, flip toggle several times. If this does not eliminate the excessive drop, replace the switch.

11. If there is more than a 10 mv drop in the **high limit switches** check each switch independently as shown in Fig. 24. Make sure the quick connect terminals are attached tightly to the wire and the limit switch. If more than a 5 mv drop appears to originate from inside a limit switch, replace it.

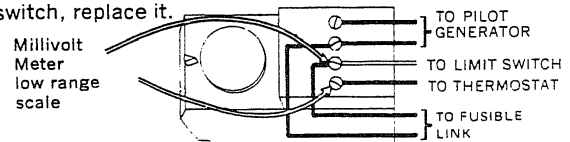


FIG. 17

ELECTRICAL TROUBLE SHOOTING SEQUENCE

Heater stays on — The controls will not shut it off . . .

Step 5.

This step will determine whether the controls or the gas valve is keeping the heater on. Keep filter pump running while conducting these tests.

First, disconnect one of the lead wires to the pressure switch, as shown. If heater goes off, turn off filter and reconnect pressure switch. If heater comes on the problem is in the switch assembly, causing delayed on-off action.

Check as follows:

1. *Switch may be out of adjustment.* See Para. 3/7 for proper adjustment procedure.
2. *Syphon loop may be clogged.* Disassemble switch assembly and blow out until clear. See Para. 5/8.
3. *Pressure switch may be defective.* See Para. 5/8 for testing and replacement procedure.

If heater still stays on with the pressure switch disconnected, (See illustration below) wiring may be at fault.

4. *Shorts in wire insulation.* Make visual inspection. Jiggle wires to detect loose connection. Disconnect one of the lead wires of the wire harness at the gas valve. If heater goes off, wiring is at fault. Repair or replace Wire Harness.

If heater still stays on with wiring disconnected at gas valve, (See illustration below) the gas valve is at fault.

5. *Debris may have collected under gas valve seat.* Replace gas valve. *Disassembly of valve will invalidate manufacturer's warranty.* See Para. 5/7 and Fig. 21 for replacement procedure.

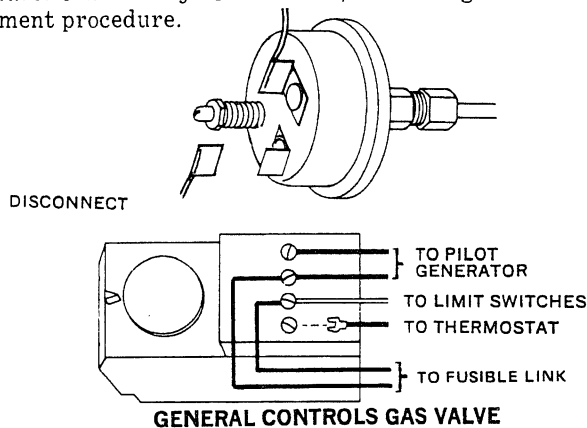
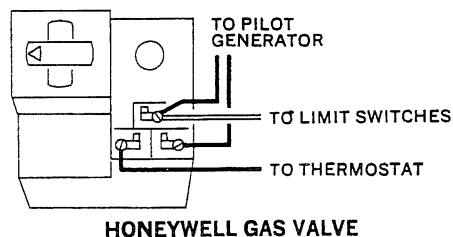


FIG. 18



Note: The two jumpered center terminals on the General Control gas valve (illustrated) are replaced by a single terminal on the Honeywell gas valve.

FIG. 18A

5/4. PILOT GENERATOR REPLACEMENT

The procedure for testing the pilot generator is found in Figure 16. To remove the pilot and generator assembly, follow the steps in Fig. 19.

PILOT GENERATOR UNIT REPLACEMENT

1. Disconnect pilot generator wires from gas valve and remove retainer bands.
2. Grasp shielded wire at base of pilot generator and pull down while deflecting spring clip.
3. To replace reverse procedure.

PILOT BURNER ASSEMBLY REPLACEMENT

1. Disconnect pilot generator wires from gas valve.
2. Disconnect pilot gas tube at pilot burner.
3. Disconnect pilot burner from its bracket by removing screw into pilot bracket.
4. Also, pilot burner attached to main burner can be removed by following procedure in Par. 5/10.

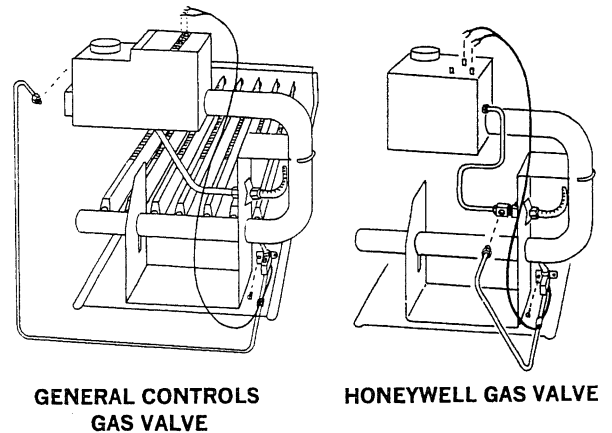


FIG. 19

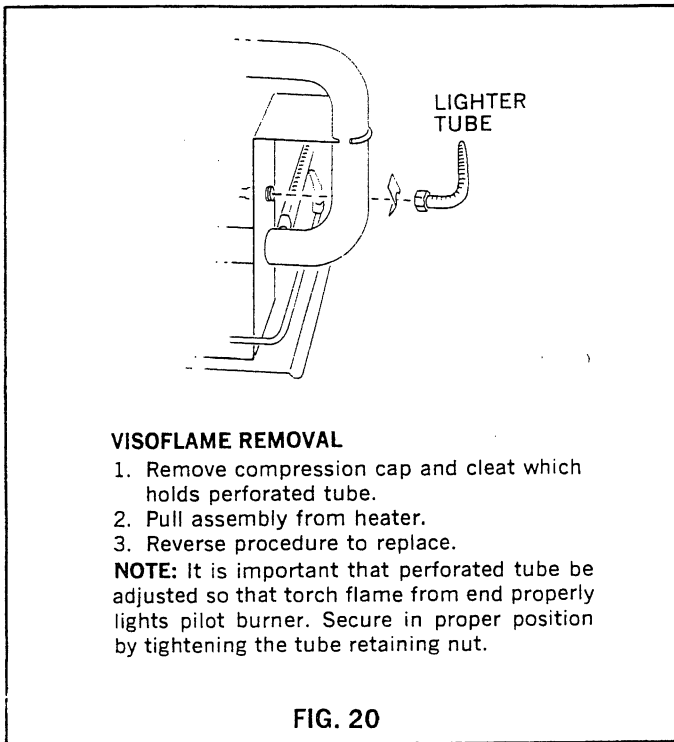
5/5. VISOFLAME PILOT LIGHTER

Visoflame pilot lighting is used to facilitate the lighting of the pilot and to make it easy to determine if the pilot is burning properly.

General Controls gas valve: With gas valve knob set on pilot position, pressing down on the knob sends gas through the lighter tube, escaping through the perforations for sure easy lighting of the pilot flame. To check for a lighted pilot, press gas valve down and flame will return along the perforations and be readily detectable, indicating the pilot is burning.

Honeywell gas valve: With gas valve knob set on pilot position, press red Visoflame button next to perforated lighter tube. To check for a lighted pilot, press Visoflame button and flame will return along the perforations and be readily detectable, indicating the pilot is burning.

See paragraph 4/1 for pilot lighting details.



5/6. TESTING FUSIBLE LINK

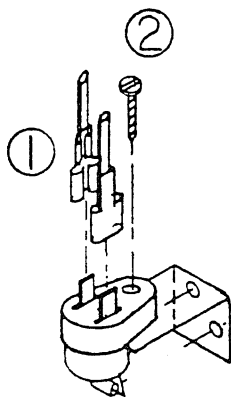
1. Turn thermostat to maximum warm position.
2. With filter pump running, if connecting a jumper across the fusible link (center terminal of the General Controls Gas Valve), the heater comes on, the fuse may be "open." However, first check for broken or loose terminals and/or wires.

Replacement of the Fusible Link

Note: The opening of this protective fuse may be an indication of an unsafe installation location or condition which may result in an adverse "roll-out" condition in your heater. Correct any unsafe condition before replacing Fusible Link assembly.

The Fusible Link is located along the inner panel, back below the gas valve. Replace "open" fuse with Teledyne Laars part E-994.

1. Disconnect wires from Fusible Link Assembly 1
2. Remove mounting screw 2
3. To replace, reverse procedure.



FUSIBLE LINK ASSY.

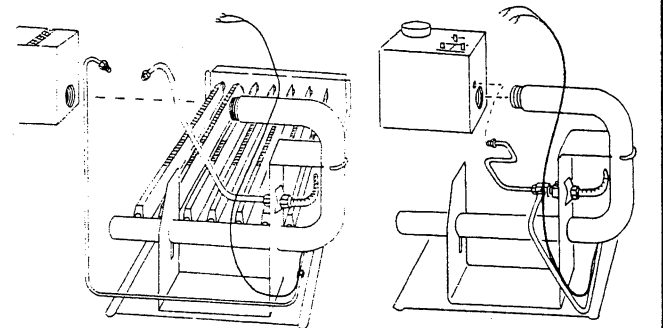
5/7. GAS VALVE REPLACEMENT

WARNING: Never attempt to repair the gas valve. When defective operation has been determined, replace it. Attempts to repair it can void the warranty and possibly lead to dangerous results.

Procedure for testing the operating gas valve is found in paragraph 5/3, Step 2. To remove and replace gas valve, follow steps in Fig. 21 Step 3.

REMOVING GAS VALVE

1. Turn off main line gas cock.
2. Disconnect main gas line.
3. Disconnect pilot tubing and all wiring from gas valve.
4. Detach burner shelf assembly and control assembly from heater inner panel and slide out.
5. Unscrew gas valve from manifold pipe.
6. Replace and reassemble.



GENERAL CONTROLS GAS VALVE HONEYWELL GAS VALVE
FIG. 21

5/8. TESTING PRESSURE SWITCH

1. Turn thermostat to maximum warm position.
2. With filter pump running, if connecting a jumper across the pressure switch (Fig. 17) brings the heater on, the contact points in the switch are open. This does not mean the switch is defective – check switch operation as follows:

Back wash filter before attempting to calibrate pressure switch. Verify correct flow by inserting hand in front of pool return line closest to equipment. If filter is clean you should feel a fast water flow on palm of hand.

Remove jumper (General Controls valve) or disconnect white wire (Honeywell), and connect millivolt meter to pilot generator terminals at the gas valve. See Figs. 22 and 18A.

Start and stop the filter pump. The meter should register 200 millivolts or more when the pump and heater come on under normal conditions and should jump cleanly to 500 millivolts or more when the pump is shut off.

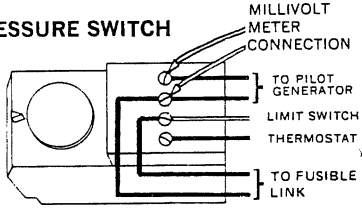
If the millivolt meter needle does not register, rises or falls slowly or hesitates going up or down, a defective pressure switch or clogged connector tube should be suspected.

- a. To clean connector tube, remove tube from heater and switch
- b. Blow out until clear

- c. Fill switch and tubing with heavy non-detergent oil, SAE 50 preferred, using a pump-type oil can. The connector must be completely filled with oil.
- d. Reinstall connector tube to heater and pressure switch. Tube must be *air tight*.
- e. Reconnect wire terminals, start filter pump and retest pressure switch.

If cleaning pressure switch tube does not correct the erratic millivolt meter readings, replace the switch.

TESTING PRESSURE SWITCH



Note: The two jumpered center terminals on the General Control gas valve (illustrated) are replaced by a single terminal on the Honeywell gas valve. See Fig. 18A.

REMOVAL AND REPLACEMENT OF PRESSURE SWITCH

1. Disconnect wires from pressure switch.
2. Disconnect pressure switch from pigtail tube fitting.
3. Reverse procedure to replace, being sure pigtail and switch are filled with oil.

REMOVE AND REPLACEMENT OF CONNECTOR TUBE

1. Remove top assembly.
2. Remove gap closure.
3. Remove copper tubing from header and remove switch from tubing.
4. Reverse procedure to replace, being sure pigtail and switch are filled with oil.

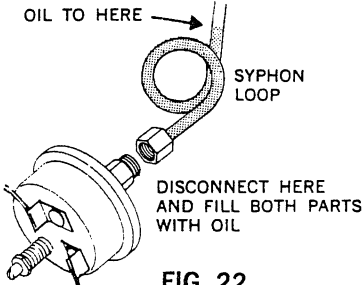


FIG. 22

5/9. TESTING TEMPERATURE CONTROL

The control dial does not have temperature markings other than the eight reference marks which cover an approximate range from 70°F to 107°F. Use an accurate pool thermometer to determine the dial setting which gives you the most comfortable swimming temperature and use the Safe-T-Lok to mark this setting.

The Mark V control can not be calibrated in the field, and if found to be defective, must be replaced or returned to the factory for checking and recalibration.

The condition of the control can be checked with a millivolt meter.

Make sure pump is on and has been circulating water through the heater for at least fifteen (15) minutes.

Rotate knob *counter-clockwise* to the stop to shut heater OFF. Connect millivolt meter to pilot generator terminals on the Operating Gas Valve. Meter should read between 500-750 millivolts.

Rotate knob *clock-wise* slowly, while watching the millivolt meter, until the thermostat turns "ON." This will be indicated by the millivolt needle moving to between 200-250 millivolts. The millivolt meter should move cleanly without hesitation. Now turn the thermostat knob slowly *counter-clockwise* until millivolt meter needle moves back without hesitation to between 500-750 millivolts. The thermostat knob should not have to be rotated more than one dial mark to obtain this. If knob has to be moved more than two marks, or the millivolt meter needle hesitates on the way up or down, the thermostat should be replaced. See Fig. 23.

REMOVAL AND REPLACEMENT OF TEMPERATURE CONTROL AND ON/OFF SWITCH

1. Remove two screws holding control plate in place.
2. Pull out control assembly for easy access.
3. Loosen set screw and remove knob.
4. Remove two screws holding thermostat in the spring clip.

ON/OFF SWITCH

- a) Disconnect black switch wire at terminal block of thermostat.
- b) Remove wire nut on other black switch wire.
- c) Loosen hex. nut behind control mounting plate and remove knurled flat nut on front of dial face.
- d) Replace and reconnect.

THERMOSTAT

- a) Disconnect both black wires at terminal block.
- b) Remove thermostat bulb from header.
- c) Replace and reconnect.

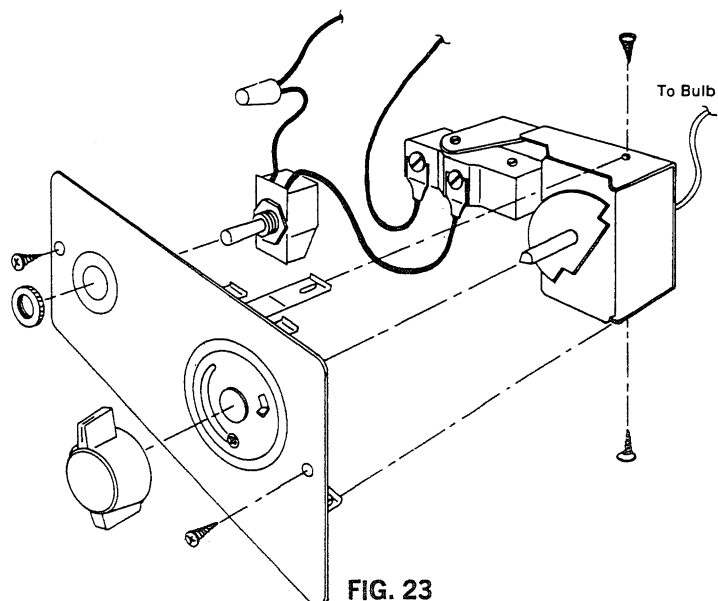


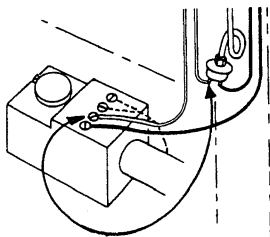
FIG. 23

5/10. HIGH LIMIT SWITCHES

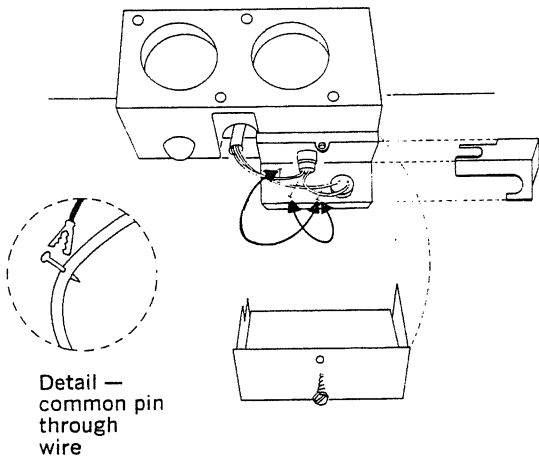
NOTE: The high limit safety switches are pre-set at the factory and no field adjustment should be attempted. Before replacing either of the high limit switches make sure they are not holding the heater off because of overheating in the heater tubes due to other causes. The limit switches may be performing their proper function. Follow steps in Fig. 24.

TESTING AND REPLACEMENT OF HIGH LIMIT SWITCHES

1. Install thermometer as shown in Fig. 10.
2. Install a jumper between the white wire terminal of the pressure switch and the gas valve to eliminate both switches from the circuit.



3. Let heater run 5-10 minutes, temperature should be approximately 30° higher than the pool water temperature. If this temperature is excessive, check the Automatic Flow Control Valve (paragraph 5/13). If temperature is normal:
 - a) Jumper each high limit switch in turn to determine which one is holding the heater off.



- b) Replace defective switch. Be sure that 135° F. limit is replaced in upper well and 150° F. limit in lower well.

NOTE: The high limit switches can be jumpered individually without removing them from the header.

REMOVE ALL JUMPERS WHEN TESTING IS COMPLETE.

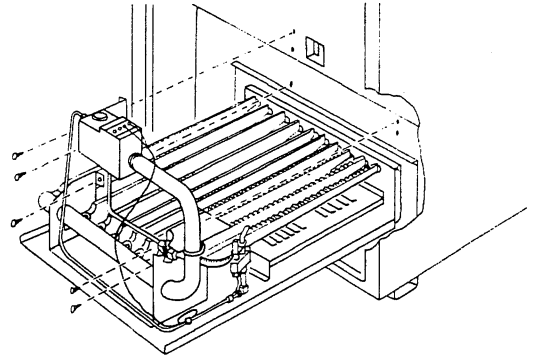
Note: The two jumpered center terminals on the General Control gas valve (illustrated) are replaced by a single terminal on the Honeywell gas valve. See Fig. 18A.

FIG. 24

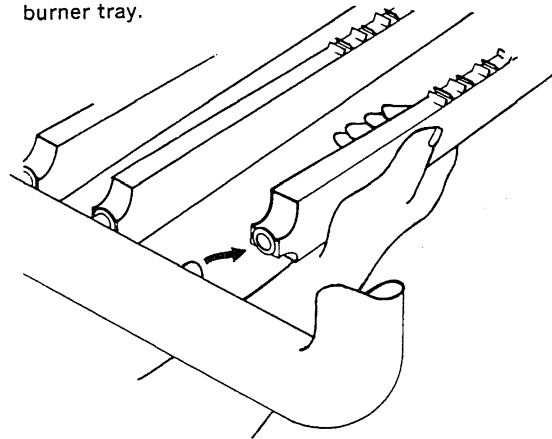
5/11. REMOVAL OF THE GAS BURNERS

REPLACEMENT OF GAS BURNER

1. Turn off main line gas cock.
2. Turn off gas valve.
3. Disconnect service union in gas line and unscrew gas pipe from gas valve.
4. Remove two screws holding gas valve bracket to inner panel and three screws holding manifold bracket to inner panel. Slide burner tray out of heater.



5. Grasp burner firmly and push away from manifold. (A screwdriver can be used to pry the burner retainer clip free of the orifice groove.) Push burner inward until clear of orifice. Now drop burner down and slide from burner tray.



6. To replace, insert burner into rear rail slot, line up with proper orifice and snap into position.
7. Reinstall burner tray and reconnect gas piping. Check for gas leaks.

NOTE: To remove burner with pilot attached:

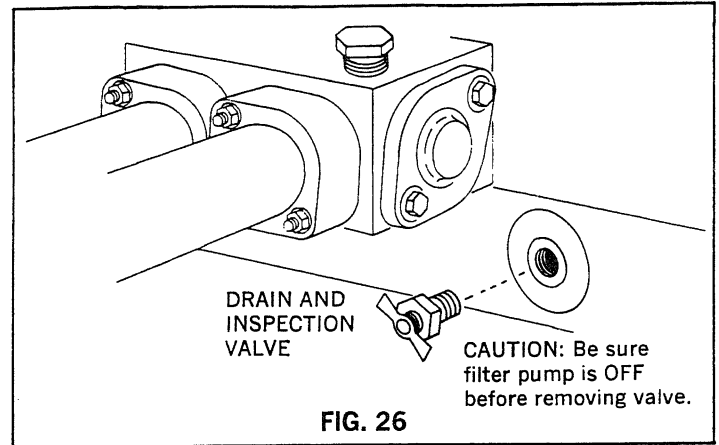
1. Remove burner tray from heater, per above.
2. Disconnect pilot gas tube from gas valve.
3. Detach pilot burner from bracket on main burner by removing screw into pilot bracket.
4. Grasp main burner firmly, push toward rear of tray until clear of orifice, drop down and remove.
5. Reinstall pilot burner and reconnect pilot gas tube after replacing main burner. Check for gas leaks.

FIG. 25

5/12. PERIODIC INSPECTION OF HEAT EXCHANGER WATER PASSAGES

Scale accumulation can be detected by a quick periodic inspection of heat exchanger tubes and should be made from time to time on the tube having the highest temperature. This tube is also the last pass through the heat exchanger. It is easily viewed by removing the drain valve and bushing shown in Figure 26. The complete heat exchanger inspection is accomplished by removing it from the heater as shown in Figure 27.

The tubes should be inspected after 60 days of operation, and then again after 120 days of operation. From the appearance of the tubes, it will then be possible to set up a regular inspection schedule.



REMOVAL OF HEAT EXCHANGER

1. Remove top assembly (1) by unscrewing four screws — two front and two back.
2. Remove screws and lift out gap closures (2 & 3).
3. Remove drain valve (large hex.) located under water connections (4).
4. Remove all grommets (2 each side) — (5 & 6).
5. In order, lift out the lower flue collector (7) and the front and rear insulation block covers (8).
6. Disconnect siphon loop fitting at heat exchanger (9).
7. Disconnect white wires at pressure switch and at gas valve. Pull wires through and coil them on top of heat exchanger.
8. Remove temperature sensing bulb from header by loosening cap screw and sliding retainer bracket off of bulb flange. Pull bulb away from heat exchanger and carefully drape over front of heater.
9. Disconnect water piping and lift out heat exchanger.

IMPORTANT — While heat exchanger is removed from the heater inspect the firewall refractory insulation blocks to check for wear, cracks and breakage. Replace where necessary.

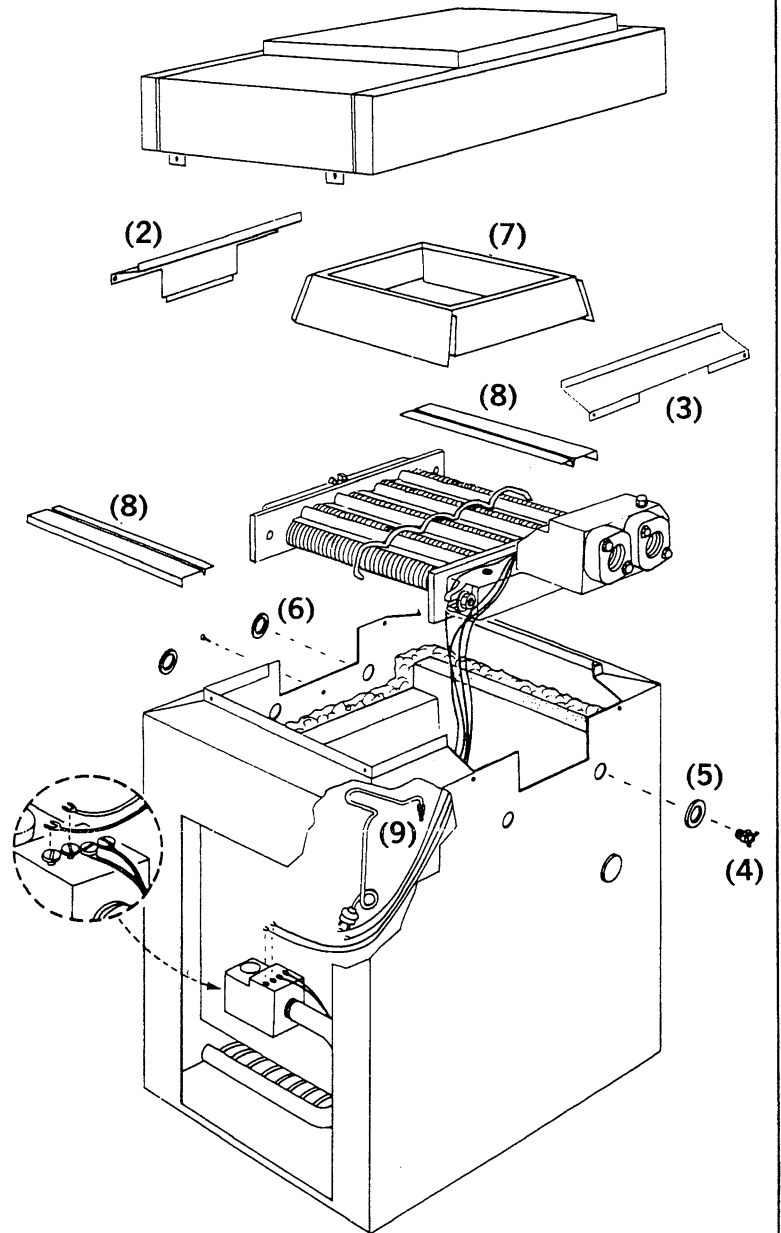


FIG. 27

5/13. TESTING AND CLEANING THE HEAT EXCHANGER

CAUTION: Black carbon soot on a dirty heat exchanger can, under certain conditions, be ignited by a random spark or open flame. To prevent this unlikely occurrence, dampen the soot deposits with a wet brush or fine water spray before servicing or cleaning the heat exchanger.

1. Light accumulation of soot or corrosion on the outside of the tubes can be readily removed with a wire brush if the tube heat baffles are removed. If soot or corrosion is heavy, remove the heat exchanger to allow thorough cleaning and to prevent any removed material from falling into the burners or blocking the burner ports.

2. There are two (2) ways to clean the inside of the tubes:

Acid Cleaning:

After removing the water header castings, bolts, gaskets, and Tube Heat Baffles, the exchanger can be immersed in a properly inhibited muriatic acid solution (3 part water to 1 part acid solution). The inhibited muriatic acid solution, however, will remove some copper, but at a slow rate. When tubes are clean, flush the assembly with soda-ash solution. Dry and

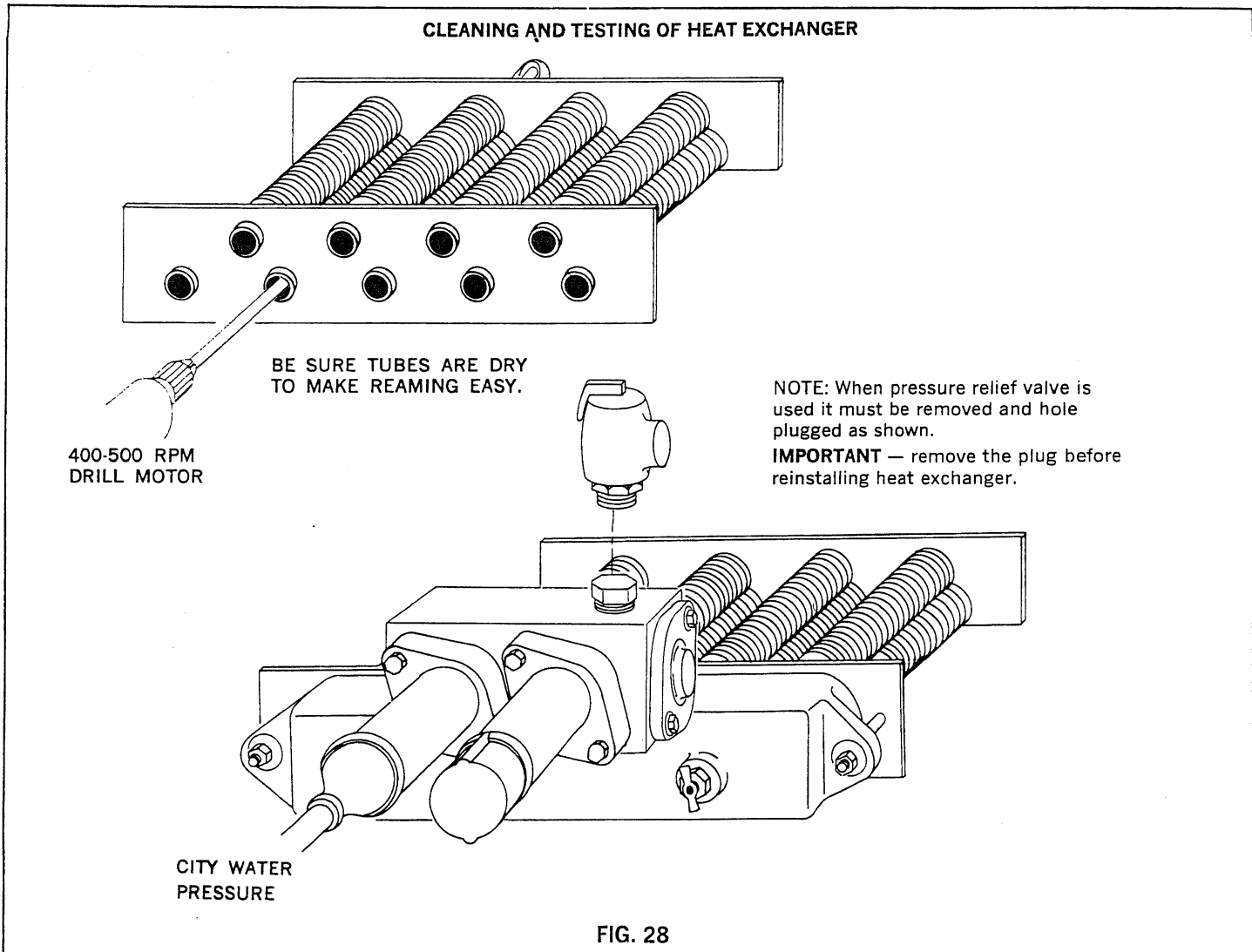
paint steel plates with a good quality rust inhibiting paint.

Reaming:

The tubes may be reamed out as shown in Fig. 28. For easy reaming, dry the heat exchanger first. Also, withdraw the reamer frequently to remove lime powder and prevent the drill bit from binding in the tube.

NOTE: Use *only* the correct size carbide tipped reamers which are available from the factory.

3. Install new gaskets. DO NOT use the old gaskets.
4. Tighten bolts progressively, starting with two center bolts, keeping header straight on the tube plate. Maximum torque is 20 foot pounds. DO NOT over-tighten.
5. Pressure test heat exchanger for leaks with city water pressure before re-installing. See Figure 28.
6. When re-installing the heat exchanger, carefully hold refractory insulation blocks apart and lower the heat exchanger into place. Be sure that the sheet metal covers which protect the insulation blocks are carefully replaced.
7. If a header bolt is stripped it may be driven out of header plate and replaced. See parts list, Page 25.



5/14. AUTOMATIC FLOW CONTROL VALVE

The automatic flow control valve maintains the correct flow of water through the heater over widely varying conditions of filter flow.

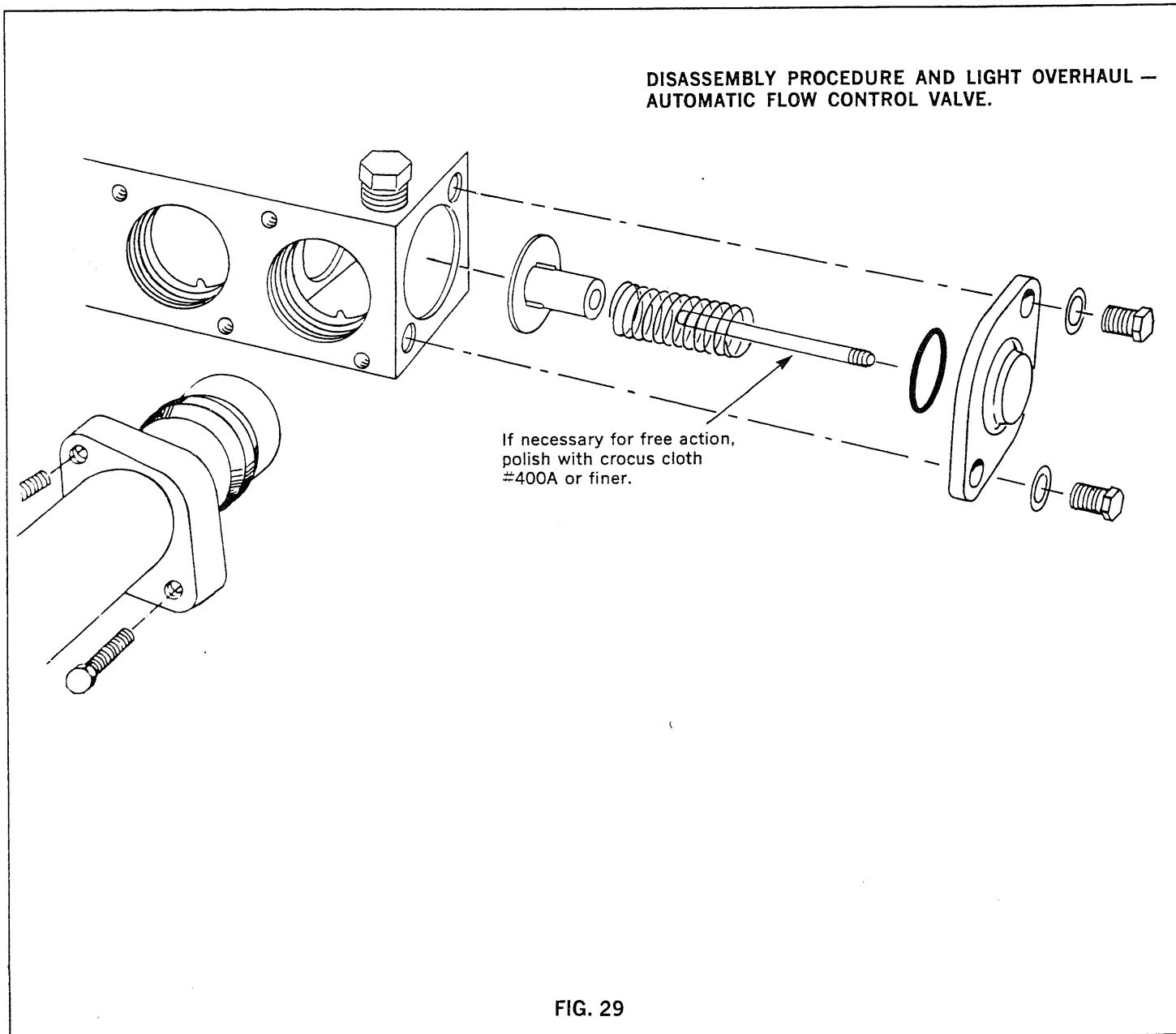
It is an extremely simple device, having only one moving part, and it ordinarily requires no service. The parts are made of polycarbonate, naval brass and stainless steel and will resist normal pool water for many years. Extremely high acid or chlorine concentration may, however, damage valve parts. Extreme hard water may leave deposits on valve parts which may make the valve sluggish or inoperative. Such a condition might overheat the water in the heater, but not heat enough water to raise the pool temperature as desired. If heater tube water is overheated because of a sticky valve, the high-limit switch will open to cycle the heater. If the automatic flow valve *stays* closed, too much water flows through the heater, causing

condensation on tubes. Either situation can result in inadequate heating.

The function of the automatic flow control valve may be tested by removing the drain valve and bushing below the water connection casting and inserting a thermometer (see Fig. 10.)

When the pool filter is delivering normal flow to the heater, the thermometer should read approximately 30°F ABOVE pool temperature.

To determine if valve is stuck in open position, shut off filter pump and remove flow control cap. Make visual inspection of disc. If not properly seated in flush position, disassemble the valve and overhaul. Figure 29 shows the procedure for removal and cleaning of the valve. If parts are pitted due to corrosion by excessive acid or chlorine in the pool water, they should be replaced. A parts list is shown on page 25.



Section 6/Appendix

TROUBLE SHOOTING CHART

Use this chart for quick reference to maintenance and service procedures.

HEATER WILL NOT COME ON

See Figs. 15, 16, & 17.

HEATER WILL NOT SHUT OFF — See Fig. 18.

What to look for	Why did this happen	What to do
1. Pressure switch is clogged.	Possible debris in gas line.	1. See Par. 5/8.
2. Short in wire harness.		2. Check wiring (see Fig. 16).
3. Defective gas valve.		3. Replace gas valve. See Par. 5/7.

SOOT HAS FORMED IN THE COMBUSTION CHAMBER AND/OR FLAMES ARE COMING OUT OF THE SIDES OF THE HEATER

What to look for	Why did this happen	What to do
1. Too much water flowing through heater.	Water flow valve out of adjustment causing heat exchanger fins to plug.	1. Clean heat exchanger. See Par. 5/13. Adjust water flow. See Par. 5/14.
2. Lack of adequate air supply.		2. Provide adeq. air supply to heater. See Par. 3/3.
3. Improper venting.	Possible restriction by small animal, lint or dirt.	3. Provide proper venting of heater. See Par. 3/3.
4. Burner air inlet throat.		4. Clean burners.
5. Gas burning at orifice (flashback).		5. Check name plate for correct gas. See Par. 3/4.
6. Time Clock out of adjustment.	Improper gas supply.	6. Adjust time clock properly. See Par. 4/2. Clean heat exchanger. See Par. 5/13.
7. Collapsed firebox.		7. Replace firebox. See Fig. 27 for access procedure.
8. Gas regulator out of adjustment.	If the clock prevents heater from bringing cold pool temp. up in one continuous operation, condensate damage may result.	8. See Fig. 14 for testing procedure.
9. Automatic flow control valve may be stuck shut.		9. Check for excessive hardness, acidity or chlorine. Par. 4/6. Clean heat exchanger. See Par. 5/13. Repair valve See Par. 5/14.

HEATER WILL NOT BRING POOL UP TO DESIRED TEMPERATURE

What to look for	Why did this happen	What to do
1. Filter not operating long enough to permit heater to heat pool.	Time clock incorrectly set.	1. Re-set time clock See Par. 4/2.
2. Filter clogging up rapidly, thus reducing flow and pressure and shutting off heater.	Filter is not being cleaned often enough.	2. Clean filter more frequently.
3. Thermostat out of adjustment or defective.	Damage in handling. Out of calibration.	3. Test thermostat -- replace if needed. See Par. 5/9.
4. Pressure switch inoperative.		4. Test Pressure Switch. Replace if necessary. See Par. 5/8.
5. Gas line too small.		5. Check gas pipe size chart. See Par. 3/4.
6. Heater too small.		6. Check pool sizing chart. Install larger heater if nec. See Fig. 1.

SCALE HAS FORMED IN ONE OR MORE TUBES IN THE HEATER

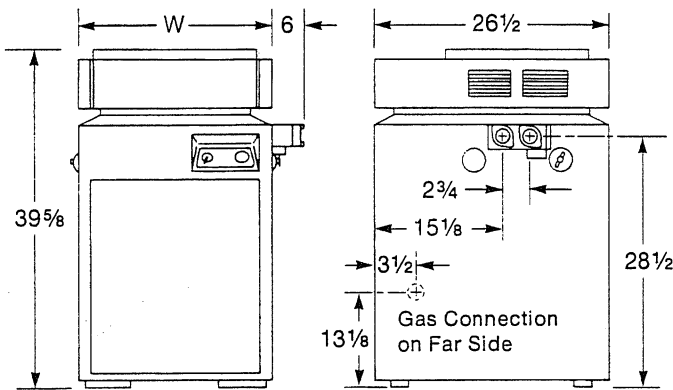
What to look for	Why did this happen	What to do
1. Unnecessary manual by-pass valve installed.	Water supply is hard. pH is too high. Calcium-hypochlorite is being used for chlorination. Concentration of scale forming minerals in pool due to evaporation.	1. Close by-pass valve and remove handle. See Par. 3/6.
2. Manual by-pass valve out of adjustment.		2. Adjust by-pass valve properly. See Par. 3/5.
3. Excessive hardness in pool water.		3. Empty pool and refill. If supply water causes rapid scale deposit, consult a local water treatment company. Inspect and clean boiler tubes regularly.
4. Heater improperly installed.	Total alkalinity of pool water should be kept in the 80 to 100 ppm range.	4. See Sec. 3.
5. Automatic flow control valve may be stuck open.		5. Check water for excessive hardness, acidity or chlorine. Also check if chlorine is being fed through heater. Repair valve. See Par. 3/8, 5/14.
6. Heater staying "on" when filter flow diminishes as a result of debris.	Mineral deposits on valve parts. Corrosion of valve parts.	6. Replace pressure switch or high limit switch. See Par. 5/8 and 5/10.
7. Chlorinator is connected upstream of heater.	Defective pressure switch or high limit switch.	7. Install Chlorinator downstream of heater. See Par. 3/8.

FIG. 30

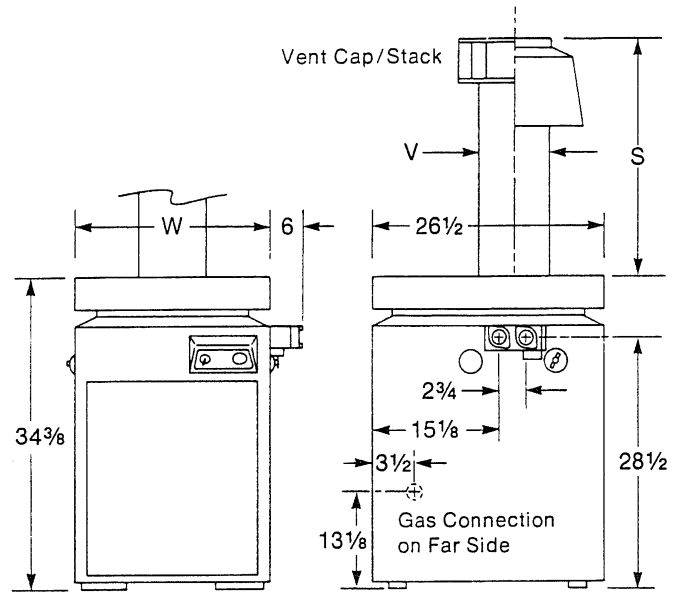
CAPACITIES AND DIMENSIONS

NOTE: SEE SECTION 3 FOR REQUIRED CLEARANCES

LOW PROFILE POOL HEATER



STACKTOP POOL HEATER



Model No.	Vent (V)	Width (W)	Stack (S)		BTU/Hr. Input ^{3, 5}	BTU/Hr. Output ^{3, 5, 9}	Shipping Weight ⁶
			Indoor	Outdoor			
125	5	15	20	17 3/8	125,000	87,500	215
175	6	18	20 3/4	18	175,000	122,500	240
250	7	22 1/2	28 1/2	23	250,000	175,000	270
325	8	26 3/4	29 1/2	23 1/2	325,000	227,500	310
400	9	31 3/4	30 3/4	26 1/4	400,000	280,000	345

1. The XE is design certified by A.G.A. as a swimming pool heater for both natural gas and LP gas.
2. The XE is constructed for 125 psi working pressure.
3. Derate BTU input and output 4% for every 1000 ft. installation altitude is above sea level. No derating necessary up to 2000 ft. elevation.
4. The XE is design certified by A.G.A. and C.G.A. for indoor or outdoor use.
5. Ratings are shown for natural gas. For LP gas, reduce input and output 5%. See rating plate.
6. Shipping weight includes heater and separate package for grate top or Stacktop with vent cap or draft hood.
7. A Universal Flange Coupling accepts threaded 1 1/2" iron pipe, unthreaded 1 1/4" iron pipe and 1 1/2" copper pipe without adapter.
8. Gas pipe size at valve is 3/4 NPT for natural gas and 1/2 NPT for LP gas. Gas supply pipe must be larger (see Paragraph 3/4).
9. Output ratings shown are based on National Standards thermal efficiency of 70%. Representative models of the Teledyne Laars series XE heaters for pools and spas were tested by Gas and Mechanical Laboratories, Inc. in accordance with ANSI Standard Z21.56B-1982 for Gas-Fired Swimming Pool Heaters, and the thermal efficiency of the heaters tested was found to be 78% or better.

FIG. 31

XE Pool and Spa Heater — Type EG

EXPLODED DWG. OF COMPONENTS

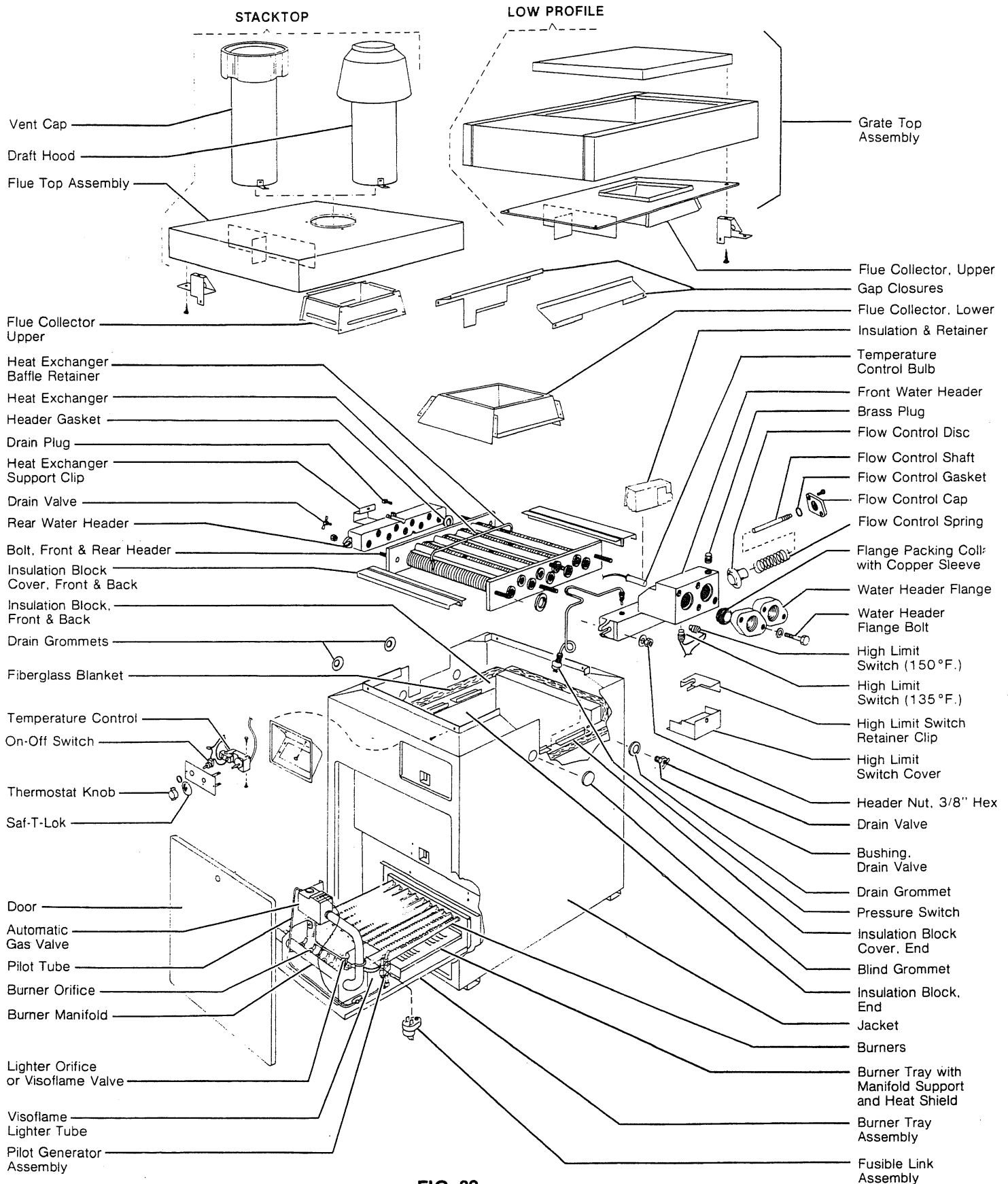


FIG. 32

Parts List for XE Heaters, Type EG

TO OBTAIN OR ORDER PARTS FOR THE XE HEATER —

Check with your nearest Teledyne Laars dealer or distributor. They have many of the commonly needed parts in stock. If your dealer cannot supply you contact Service Manager, Teledyne Laars, 13230 Saticoy Street, North Hollywood, Ca. 91605-3404. Telephone: 818/765-2277

DESCRIPTION	FOR MODEL SIZES	PART NUMBER
PILOT GAS SYSTEM		
Pilot Assembly, G/C, Nat.	All	R00568
Pilot Assembly, G/C, LPG	All	R00569
Pilot Generator Cartridge, G/C	All	W00125
Lighter Tube Orifice, Nat.	All	W00188
Lighter Tube Orifice, LPG	All	W00189
Visoflame Lighter Tube	All	W00162
Visoflame Valve w/orifice, Nat. (HW only)	All	W00163
Visoflame Tee Assembly (HW only)	All	W00164

MAIN GAS SYSTEM		
Gas Valve, G/C B69RG96 — ¾ x ¾ 100% Shut-off — Nat.	All	V00457
Gas Valve, G/C B69R9G98 — ½ x ¾ 100% Shut-off — LPG	All	V00532
Gas Valve, HW VS820Q — ¾ x ¾ 100% Shut-off — Nat.	All	V00492
Gas Orifice, Nat. (See Note 1)		L00322
Gas Orifice, LPG (See Note 1)		L00329
Burner, Main, w/Pilot Bracket	All	104572
Burner, Main	All	L00523

ELECTRICAL SYSTEM		
Thermostat Dial	All	H00657
High Limit Switch, set at 135°	All	E00722
High Limit Switch, set at 150°	All	E00639
Temp. Control, Laars, 70°-110°	All	E00971
Protector Sleeve, Bulb	All	104449
Wire Harness	All	R00580
Knob, Pointer, Black	All	E00945
Stop Plate, "Saf-T-Lok"	All	104567
Screw, Stop Plate	All	F00333
Pressure Switch, 2 PSI (Standard)	All	R00132
Pressure Switch, 1 PSI Consult Factory		R00113
Pressure Switch, 3 PSI Ref. Par. 3/8		R00130
High Limit Switch Retainer clip	All	104184
High Limit Switch Retainer	All	S00989
Cover, High Limit Switches	All	104183
"O" Ring (Temperature Control Bulb)	All	E00363
On-Off Switch	All	E00770
Fusible Link Assy.	All	E00994

VENT SYSTEM					
	MODEL SIZE				
	125	175	250	325	400
LOW PROFILE - OUTDOOR					
Grate Type Assembly	D00155	D00156	D00157	D00158	D00159
STACKTOP - OUTDOOR					
Stack Top Assembly	D00160	D00161	D00162	D00163	D00164
Vent Cap/Stack (Nat. Gas and Propane)	D00005	D00006	D00007	D00008	D00009
STACKTOP - INDOOR					
Stack Top Assembly	D00160	D00161	D00162	D00163	D00164
Draft Hood	D00025	D00026	D00027	D00032	D00033

NOTES:
1. For altitudes higher than 2000 feet above sea level consult factory for orifice size.

DESCRIPTION	FOR MODEL SIZES	PART NUMBER
WATER SYSTEM		
Pressure Relief Valve, ¾ NPT, 75 PSI*	All	A00633
In/Out Header (Casting S-686)	All	R00584
Return Header (Casting S-688)	All	R00583
Header Gasket	All	S00152
Packing Collar for Flange	All	S00531
Flange	All	S00533
Flange Bolts, 2" Long	All	F00317
Sleeve for Flange	All	S00280
Clip for Tube Baffles	All	S00697
Grommet for Drain Plug (7/8" Hole)	All	S00988
Grommet for Drain Plug (9/16" Hole)	All	S00699
Drain Cock, Rear Header (See Fig. 13)	All	P00587
Drain Plug, Rear Header (See Fig. 13)	All	P00268
Drain Cock, Front Header (See Fig. 13)	All	P00587
Bushing for P-587	All	P00185
Brass Pipe Plug ¾", Front Header	All	P00270
Restrictor	125	S00003
Flow Control Cap (Casting S-691)	All	104522-01
Flow Control Gasket ("O" Ring)	All	S00690
Flow Control Shaft	All	F00336
Flow Control Valve Spring, White	125, 175	S00614
Flow Control Valve Spring, Red	250	S00613
Flow Control Valve Spring, Blue	325	S00612
Flow Control Valve Spring, Black	400	S00701
Flow Control Disc	All	S00692
Bolt, Carriage, 2¾" for Headers	All	F00296
Bolt, Carriage, 2½", Front Header, Lower	All	F00283
Bolt, Csk, Sq. Neck, 2¾" for Headers	All	F00318
Washer, for Header	All	F00111
Nut, for Header	All	F00031
Heat Exchanger Tube Assembly	125	104518-01
Heat Exchanger Tube Assembly	175	104518-02
Heat Exchanger Tube Assembly	250	104518-03
Heat Exchanger Tube Assembly	325	104518-04
Heat Exchanger Tube Assembly	400	104518-05

FIREBOX COMPONENTS		
Insulation, Fibreglass Blanket for Sides	All	T00020
Insulation Block, Sides, 22-9/16 x 16-1/2	All	T00214
Insulation Block, Front, 9-1/8 x 18-9/16	125	T00215-01
Insulation Block, Front, 12-1/8 x 18-9/16	175	T00215-02
Insulation Block, Front, 16-5/8 x 18-9/16	250	T00215-03
Insulation Block, Front, 20-7/8 x 18-9/16	325	T00215-04
Insulation Block, Front, 25-7/8 x 18-9/16	400	T00215-05
Insulation Block, Rear, 9-1/8 x 22-13/16	125	T00216-01
Insulation Block, Rear, 12-1/8 x 22-13/16	175	T00216-02
Insulation Block, Rear, 16-5/8 x 22-13/16	250	T00216-03
Insulation Block, Rear, 20-7/8 x 22-13/16	325	T00216-04
Insulation Block, Rear, 25-7/8 x 22-7/8	400	T00216-05

JACKET COMPONENTS		
Door, w/Latch		
Jacket Assembly (less Top Assembly)		
Gap Closure, In/Out Side		
Gap Closure, Return Side		
Heat Exchanger Baffle (4504-01-05 & 4503-01-05)		
Flue Collector, Upper Half (2828-01 thru -05)		
Flue Collector, Lower Half (4532-01 thru -05)		
Clip, Draft Hood (No. 2110)		
Touch-up Paint Can	All	X00160

* See Par 3/6 regarding use of pressure relief valve.

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