SERVICE MANUAL

VSX24G SHOWN

VSX BOILER BASE SERIES CONVECTION STEAMERS

(GAS, ELECTRIC, DIRECT AND REGENERATED)

VSX24G	ML-52163	VSX24D	ML-52827
VSX36G	ML-52360	VSX36D	ML-52830
VSX42GT	ML-52376	VSX42DT	ML-52834
VSX24E	ML-52164	VSX36R	ML-52831
VSX36E	ML-52829	VSX42RT	ML-52835
VSX42ET	ML-52833		

- NOTICE -

This Manual is prepared for the use of trained Vulcan Service Technicians and should not be used by those not properly qualified. If you have attended a Vulcan Service School for this product, you may be qualified to perform all the procedures described in this manual.

This manual is not intended to be all encompassing. If you have not attended a Vulcan Service School for this product, you should read, in its entirety, the repair procedure you wish to perform to determine if you have the necessary tools, instruments and skills required to perform the procedure. Procedures for which you do not have the necessary tools, instruments and skills should be performed by a trained Vulcan Service Technician.

A product of VULCAN-HART LOUISVILLE, KY 40201-0696

Form 24627 (12/98)

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GENERAL

INTRODUCTION

General

This manual is applicable for all models listed on the cover page. A convection steamer on a 42 inch base with a tilting kettle is pictured below for reference.

VSX42RT SHOWN

Steam Cooking

Pressure-less steamers offer an efficient way to produce many foods in small portions or larger batches. Pressure-less, convection steam cooking will steam cook fresh foods or will steam defrost and cook frozen foods providing the maximum color, flavor and nutritional value with the least expenditure of energy and labor. The pressure-less steaming compartment allows the operator to open and close the door, anytime during a cooking cycle. The steam supply will shut off when the door is opened, then re-start when the door is closed.

Compartment Pan Capacity

NUMBER OF PANS PER COMPARTMENT	DEPTH (INCHES)
2	4.0
3	2.5
6	1.0
Pan Size 12" x 20"	

Boiler Code Descriptions

Vulcan-Hart incorporates redundant controls in compliance with California Code (Cal-Code) and CSD-1 as an option on steam equipment when required by state and/or local building code requirements. Descriptions of the codes are listed below.

Cal-Code Construction - Redundant controls in the electrical safety circuits that, if tripped, must manually be reset after the condition causing the trip subsides. These controls consist of - (1) dual function water level cycling and low level cut off control and (1) single function low water level cut-off control (Aux - LLCO) and a high pressure relief switch in conjunction with a mechanical pressure relief valve.

CSD-1 Construction - Redundant controls in the electrical safety circuits that, if tripped, must manually be reset after the condition causing the trip subsides. These controls consist of - (1) dual function water level cycling and low level cut off control and (1) single function low water level cut-off control (LLCO) and a high pressure relief switch in conjunction with a mechanical pressure relief valve. Additionally, both circuits have individual indicator lights that will illuminate for a visual verification of the shutdown mode.

Cal-Code and CSD-1 construction both require operator intervention in the event of a shutdown. CSD-1 is more informative by using indicator lights to show which safety system was shutdown.

Model Designations

V S X XX X X

- X: T - Tilting kettle (24 qt.) found on 42" wide cabinet base only.
- X: Heating System:
  - G - Gas
  - E - Electric
  - D - Direct
  - R - Regenerated
- XX: Cabinet Base Width (inches)
- X: Pressure-less
- S: Steamer
- V: Vulcan

SPECIFICATIONS

Gas Steamers

	INPUT (BTU/HR)		MANIFOLD PRESSURE (INCHES W.C.)		LINE PRESSURE (INCHES W.C.)					LOAD (WATTS)	AMPS (MAX)
					NATURAL		PROPANE		MAX		
MODEL	NAT.	PROP.	NAT.	PROP.	RECOMMEND	MIN	RECOMMEND	MIN			120V 60HZ
VSX24G	200,000	200,000	4.0	10.0	7.0	5.0	11.0	11.0	14.0	360	3.0
VSX36G	200,000	200,000	4.0	10.0	7.0	5.0	11.0	11.0		360	3.0
	240,000	240,000	4.0	10.0	7.0	5.0	11.0	11.0			
VSX42GT	200,000	200,000	4.0	10.0	7.0	5.0	11.0	11.0		360	3.0
	240,000	240,000	4.0	10.0	7.0	5.0	11.0	11.0			

Electric Steamers

		AMPERAGE					
		1 PHASE		3 PHASE			3 PHASE - 4 WIRE
MODEL	TOTAL KW	208V	240V	208V	240V	480V	220/380V & 240/415V
VSX24E	24*	116	100	67	58	29	34
VSX36E	24*			67	58	29	34
	36			100	87	44	50
	42			117			
	48				116	58	67
VSX42ET	24*			67	58	29	34
	36			100	87	44	50
*std							

Steam Supply

Dry steam must be provided to the steamer. If the steam is heavy with condensate, a Ball Float Trap must be used in the line and plumbed in before the pressure reducing valve. To ensure rapid heat up of heavy cold loads, the steam supply line must be sized to maintain pressure as outlined below.

	DIRECT STEAM STEAMERS (POTABLE)	REGENERATED STEAM STEAMERS (*NON-POTABLE)
Supply Pressure	15 psi (max.)	15 psi (max.)
Flow Rate	100 lb. per hour total (min.)	125 lb. per hour total (min.)
Pressure Reducing Valve Output	10 psi (furnished)	set accordingly for good steam generation but no higher than 15 psi. (furnished)
*Potable steam is not required for regenerated models but could be used.		

Water Supply

Supply pressure should be	20-80 psig
In line strainer for supply line	(Not Supplied)
Supply connection	cold
Total dissolved solids (TDS)*	less than 60 ppm
Total alkalinity	less than 20 ppm
Silica	less than 13 ppm
Chloride	less than 30 ppm
PH factor	7 to 8
(*17.1 ppm = 1 grain of hardness)	

TOOLS

Standard

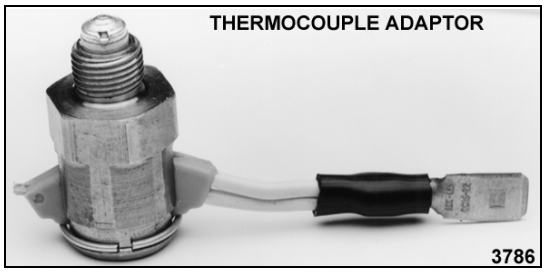
- Standard set of hand tools.
- Volt-Ohm-Meter (VOM) with AC current tester.

  (Any quality VOM with a sensitivity of at least 20,000 ohms per volt can be used)
- Gas leak checking equipment.
- Gas Pressure Manometer

Special

- CLR Treatment Kit - Used to remove Calcium/Lime/Rust from a boiler (Contact Vulcan Authorized Service Centers).
- Adaptor to test thermocouple closed circuit voltages (DC) on gas models with manual ignition (purchase locally).

  NOTE: Adaptors vary between manufacturers. An example of one adaptor type is pictured below.



WATER CONDITIONING

Furnishing the boiler with soft water to reduce scale formation is important. Scale formation will reduce steam output, cause premature component failure, and shorten equipment life. Most water supplies contain scale producing minerals such as Calcium and Magnesium. As steam is generated, the minerals remain and dissolve into the water. As the concentration of these minerals increases past a certain point, they precipitate from the water and coat the inside of the boiler, heating elements, thermostat bulbs and water level probes. Because of the high temperature of these surfaces, the precipitated minerals bake onto them and become very difficult to remove.

This causes several problems:

1. Reduce the heat transfer efficiency of the heating system.
2. Cause premature failure of Electric heaters.
3. Water level probes will give false readings.
4. Thermostat bulbs will sense temperature incorrectly.

These problems are common to any manufacturer's steamer regardless of design, but they can all be prevented by furnishing the boiler with soft water. Vulcan recommends the water contain less than 60ppm of “total dissolved solids” (TDS) and have a PH factor between 7 to 8. These water properties can be achieved by using a properly maintained water softener.

Other chemical properties in water supplies can also affect good steam generation and vary from within each state and locality.

The water level probes in the boiler use ions in the water to detect the water level. **Do not use** fully demineralized or de-ionized water since it is "non conductive" and the water level can not be detected.

NOTE: The use of strainers, or filters will not remove minerals from the water.

Vulcan recommends that a local water treatment specialist be consulted before the installation of any steam generating equipment.

Steamers that operate over a long period of time without the benefit of a water softener, which have developed a heavy scale build up, should be cleaned before using a water softener.

STEAMER OPERATION

WARNING: THE STEAMER AND ITS PARTS ARE HOT. USE CARE WHEN OPERATING, CLEANING OR SERVICING THE STEAMER. THE COOKING COMPARTMENT CONTAINS LIVE STEAM. STAY CLEAR WHEN OPENING EACH DOOR.

CABINET BASE BOILERS

Ensure that all utility connections to the steamer have been made and are turned on.

On models that are Cal-Code/CSD-1 equipped, amber colored lights for Hi pressure and low water level will illuminate and stay on until the boiler is full and the manual reset switch pressed.

Gas Powered Steam Boiler

1. Open the cabinet door and turn main power switch ON. The red light will illuminate, water will begin filling the boiler and the blowdown solenoid valve will close. The boiler should fill, in four to eleven minutes. Observe water level gauge glass to verify that water is in boiler and that the level in the gauge glass is about half full. Both valves on gauge glass assembly must be open to fill the gauge. Older models equipped with a manual “ball” type blowdown valve must be closed for the boiler to fill. The cycling pressure switch will maintain the proper steam pressure in the boiler by cycling the heating system on and off to generate steam pressure.

    A. **<u>On Models with Manual Ignition</u>** - The knob on the gas combination control valve has three positions (On-Pilot-Off) for control of main burners and pilot. Turn knob on gas combination valve to PILOT then depress and light pilot burner with a lit taper. Maintain knob in depressed position for about 30 seconds and release. Observe that pilot burner flame stays on. If the flame should go out, wait 5 minutes before relighting.

    Turn knob on gas combination control valve to ON. If the water level in the boiler has reached the minimum level, burners will ignite and begin to heat the water in the boiler. After approximately 15 minutes, steam should be present for cooking product. Observe that the boiler pressure gauge indicates steam pressure of 8-10 psi.

    B. **<u>On Models with Automatic Ignition</u>** - The knob on the gas combination control valve has two positions (On-Off) for control of main burners and pilot. For the automatic ignition system to work, the knob must be set in the ON position or gas for the pilot and main burners will not flow. Also, the ignition control module ON/OFF/RESET switch must be in the ON position to operate. This switch is located on the upper left side of the electrical control box for the ignition control module. A red light will illuminate when the switch is in the ON position. DO NOT ATTEMPT TO MANUALLY LIGHT THE PILOT IN AN AUTOMATIC TYPE IGNITION SYSTEM.

    After the main power switch is turned ON and the ignition control modules RESET switch is in the ON position, sparking will begin three seconds later to light the standing pilot. If the pilot lights, a signal is sent back through the ignition cable indicating the presence of pilot flame and sparking stops. If the water level in the boiler has reached the minimum level, the burners will ignite and begin to heat the water in the boiler. After approximately 15 minutes, steam should be present for cooking product. Observe that the boiler pressure gauge indicates steam pressure of 8-10 psi. If a pilot flame is not established immediately, sparking will continue for 90 seconds. After that duration, the ignition control module will lock out and needs to be reset to start the pilot and burner lighting cycle again.

Electrically Powered Steam Boiler

Open the cabinet door and turn main power switch ON. The red light will illuminate, water will begin filling the boiler and the blowdown solenoid valve will close. The boiler should fill, in 4 to11 minutes. Observe water level gauge glass to verify that water is in boiler and that the level in the gauge glass is about half full. Both valves on gauge glass assembly must be open to fill the gauge. Older models equipped with a manual “ball” type blowdown valve must be closed for the boiler to fill. If the water level in the boiler has reached the minimum level, the magnetic contactors will close, the heaters will energize and begin to heat the water in the boiler. After approximately 15 minutes, steam should be present for cooking product. Observe that the boiler pressure gauge indicates steam pressure of 11-13 psi.

Direct Steam Powered Cooker

1. Open the cabinet door and turn main power switch ON.
   A. The red light on the switch will illuminate.
   B. If steam pressure is above the minimum setting on the cooking compartment pressure switch then the switch will close, ready light will come ON and power to the other controls will be supplied.
   C. Observe that the steam pressure gauge in the cabinet base, indicates 10-12 psi.
2. Steamer is ready to cook product.

Regenerated Steam Powered Boiler

1. Open the cabinet door and turn main power switch ON. The pilot light will illuminate, water will begin filling the boiler and the blowdown solenoid valve will close. Models equipped with a manual “ball type” blowdown valve need to be closed for the boiler to fill. The boiler should fill, in approximately 15 minutes. Observe water level gauge glass to verify that water is in boiler and that the level in the gauge glass is about half full.

   Both valves on the gauge glass assembly must be open to fill the gauge. When the water reaches the minimum level, the steam solenoid valve will open, allowing steam to enter the steam coil in the heat exchanger tank and begin heating the water. After approximately 20 minutes, a sufficient amount of pressurized steam should be present for cooking product.

BOILER BLOWDOWN AND STEAMER SHUT OFF

Turn the steamer off at least once daily and blow down the boiler to remove sediments, scalants and lime build-up in the boiler. Always blowdown the boiler when it is under maximum pressure and no steam is being used.

1. **Automatic blowdown.**
   A. Newer Models - Open the cabinet door and turn main power switch OFF. The switches’ red light will go out, the blowdown/drain solenoid valve will be de-energized and the boiler will begin to drain. The cold water condenser solenoid will continue to operate, as needed, to condense steam and to cool the water going into the drain.
   B. Older Models - Turn power switch OFF and depress blowdown timer button. Blowdown timer will operate for 4 minutes. At the end of blowdown, turn fill switch to ON and allow boiler to fill.
2. **Manual blowdown.**
   A. All Models - Turn power switch OFF. Open blowdown valve located on the bottom front of the cabinet base. After the boiler has completely drained, close blowdown valve and turn fill switch to ON and allow boiler to fill.

COOKING COMPARTMENT CONTROLS

When the steam pressure in the cooking compartment manifold reaches approximately 3 psi, the cooking compartment pressure switch closes, suppling power to the other controls. The ready lights will illuminate and after approximately one minute, the steam pressure in the boiler will reach the upper limit of 10 psi. If the pressure drops below approximately 3 psi, the pressure switch will open, removing power from the cooking compartment controls.

NOTE: If a cooking timer is set immediately after the ready light comes on, a loud clanking sound will be heard (oil canning) and the ready lights will flash for several seconds. This condition is caused by the manifold pressure being on the “fringe” of the pressure switch set point. When a cook timer is set, the compartment steam solenoid valve opens causing the manifold steam pressure to drop, slightly below the pressure switch set point. At the same time, steam pressure is still increasing in the boiler. This opposing condition causes a pressure “bounce” to occur but after the steam pressure passes approximately 4 psi this condition subsides. Under normal steam cycling pressures, this condition will not be seen.

1. With both timer knobs at the off position, open the compartment doors and observe that no steam has entered the cooking compartments, then close the doors.
2. Set both timer knobs at 2 minutes. The ready lights will go off, the cooking lights will come on, and steam will begin to enter the compartments.
3. After one minute, open each door and observe that steam has ceased to enter each compartment, cooking lights go back to ready, and one minute is remaining on each cook timer.
4. Close doors and steam generation and cook timing will resume. Observe the floor drain to ensure that live steam from compartments is being cooled by cold water from the cold water condenser solenoid valve.
5. When timer knobs reach "0", buzzers will sound, steam generation will cease, cooking lights will go off and ready lights will come on. To silence buzzers, turn timer knobs to off position.
6. During a cooking cycle, the heating system will cycle on and off as necessary to maintain steam pressure in the boiler.

NOTE: On direct steam units, no steam cycling will occur due to the regulated constant steam supplied from the building. Steam will come on for cooking when a cook timer is set and go off at the end of that time.

7. Turn power switch off to remove power from the steamer and the red light will go out.
8. Blowdown boiler. See “BOILER BLOWDOWN AND STEAMER SHUT-OFF” under “STEAMER OPERATION”.

COMPONENT FUNCTION AND LOCATION

CABINET BASE BOILER CONTROLS

WARNING: THE STEAMER AND ITS PARTS ARE HOT. USE CARE WHEN OPERATING, CLEANING OR SERVICING THE STEAMER. THE COOKING COMPARTMENTS CONTAIN LIVE STEAM. STAY CLEAR WHEN OPENING EACH DOOR.

Water Level Gauge Assembly - permits visual confirmation that water level is being maintained in the boiler during operation. The correct water level is a point one-half of the height of the glass. The manual valves at the top and bottom of this assembly must be fully open and only closed if the glass tube is damaged.

Observe that the water is clean and clear in the glass tube. The appearance of extreme murkiness in the water indicates inadequate water quality and will cause failure of controls and the steamer. Warranty does not cover malfunction due to poor water conditions. Blowdown and/or clean out the boiler as outlined in “BOILER BLOWDOWN AND STEAMER SHUT-OFF” under “STEAMER OPERATION” and “BOILER” under “SERVICE PROCEDURES”.

Water Level Control and Level Sensing Probes - these controls allow water to enter the boiler to fill and maintain the proper water level. They will also shut off the heat source to the boiler if the water level drops too low.

The water level control works by using three different probe lengths to monitor the water level. The probes consist of a high level (HL), low level (LL) and low water cut-off (LLCO). The level sensing probes may easily be removed to inspect for lime build up. As a rule, the condition of these devices will indicate the overall water condition of the boiler. Clean the probes if needed.

NOTE: Controls may not function and serious clogging will occur if a daily blowdown procedure is not followed.

Boiler Fill Solenoid Valve - admits water to the boiler when demanded by the water level control to maintain the correct water level in the boiler.

Cold Water Condenser Solenoid Valve - allows cold water flow into the boiler blowdown drain box to condense steam and cool the hot water before its discharge into the drain.

Cycling Pressure Switch - controls boiler pressure between prescribed limits by turning the heat source on and off.

High Limit Pressure Switch - a switch of identical design to the cycling pressure switch but used as a high limit. The pressure settings are at higher and lower limits than the cycling pressure switch in order to turn off the heat source before the boiler pressure reaches its limit and automatically resets after the pressure drops below the lower limit set point.

Blowdown/Drain Solenoid Valve - this valve is plumbed into the drain pipe of the boiler. Newer steamer models will automatically blowdown when power is turned off by using a normally open solenoid valve. Older models can have a solenoid valve that is activated by depressing a separate blowdown timer button or have a manual “ball” type valve. Daily boiler blowdown is essential to proper operation and component life by removing sediment and scalants that may be lodged in the chamber of the boiler.

Strainers - a strainer is used in the water inlet line to prevent foreign matter from becoming lodged in the fill or cold water condenser solenoid valves and to keep unwanted particles out of the system. A "Y" strainer should be inserted upstream of the fill solenoid valve.

On models using a direct steam supply, a strainer is used in the pressure regulating valve.

Power Switch - when turned ON, power is supplied to the controls and the steam generating process is started in the boiler. The power switch is located on the front of the boiler control box.

Water Inlet Valve - the water inlet valve is used to stop water flow to the steamer when the steamer is being serviced. Newer models will have a small Petcock type valve while older models will be a “ball” type valve. This valve should remain open during normal operation.

High Limit Thermostat - a protective device that shuts off the heat source if the boiler temperature exceeds a specified limit. All standard models are equipped with a surface high limit.

Descaler - hangs submerged in water inside the boiler and is used to help control boiler surface scaling. Two descalers are used in each boiler.

Handhole Cover Assembly - when unbolted and removed, allows internal examination and cleaning of boiler shell and its components if required.

Pressure Gauge - indicates boiler steam pressure. Normal operating pressures are listed below.

STEAMER TYPE	PSI
Gas	8 -10
Electric	11 - 13
Direct	10 - 12
Regenerated	10 - 12

Drain - drains steam condensate and water from cooking compartments and boiler.

Check Valve - On models with the delime piping assembly option, prevents the ejection of hot water and steam out of the delime funnel if the manual delime fill valve were to be opened.

Delime Port Assembly - On models with the delime piping assembly option, allows the boiler and other internal components to easily be delimed to remove calcium, lime and rust build up. See ”BOILER” under “SERVICE PROCEDURES”.

Standing Pilot (Gas Boilers) - should always remain lit to light the main burners upon a call for heat unless the steamer will not be in use for an extended period. If the pilot flame goes out, wait 5 minutes before relighting.

Main Burners (Gas Boilers) - heats the water in the boiler to generate steam.

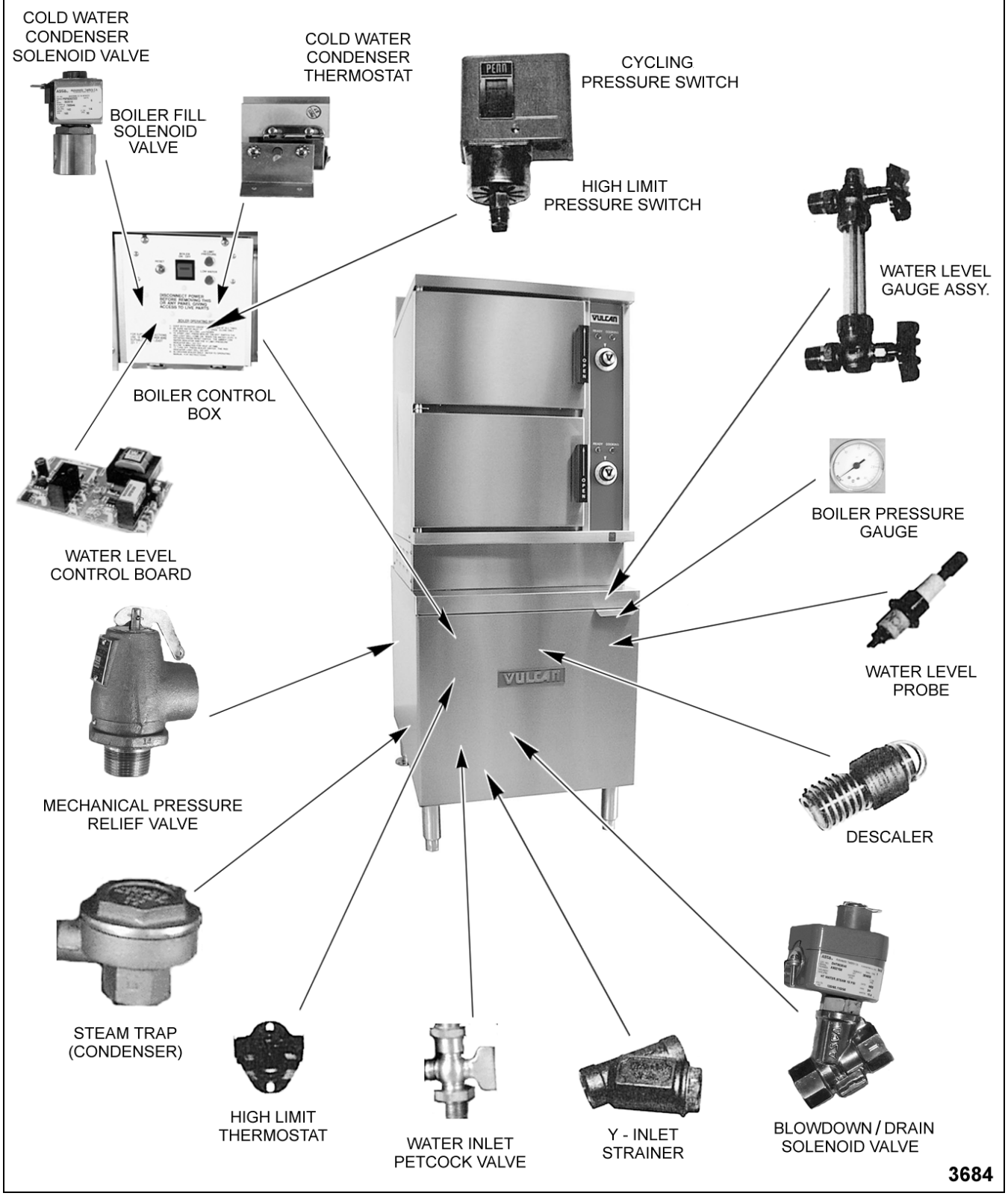
Combination Control Valve (Gas Boilers) - a gas solenoid that opens to allow gas flow when a call for heat is made and also regulates the manifold gas pressure.

Pressure Regulating Valve (Direct & Regenerated Steam) - regulates the manifold steam pressure between 10-12 psi.

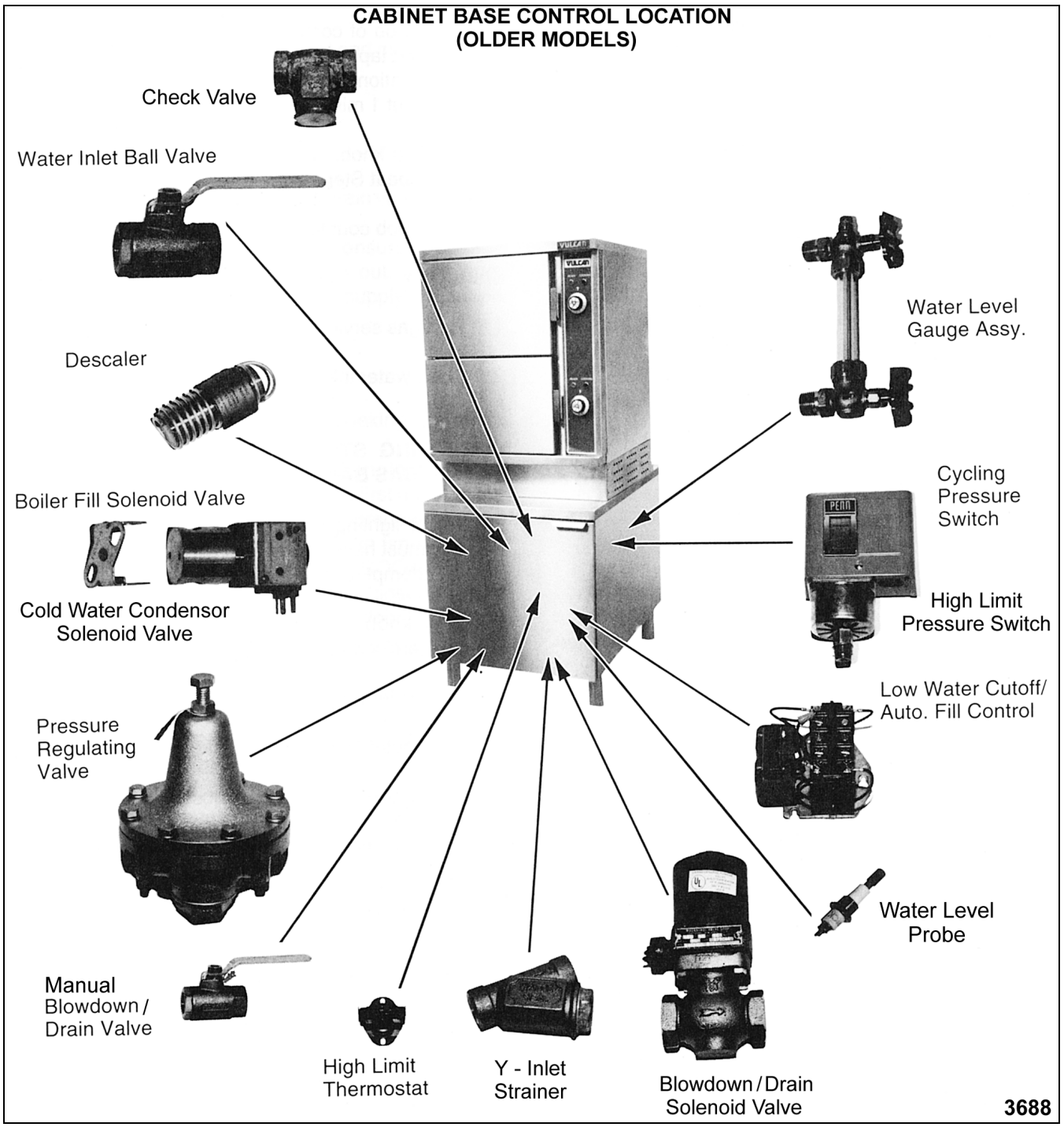
Magnetic Contactor (Electric Boilers) - when coil is energized, supplies power to the electric heating elements.

Heating Elements (Electric Boilers) - heats the water in the boiler to generate steam.

CABINET BASE CONTROL LOCATION (NEWER MODELS)



CABINET BASE CONTROL LOCATION
(OLDER MODELS)



COOKING COMPARTMENT CONTROLS

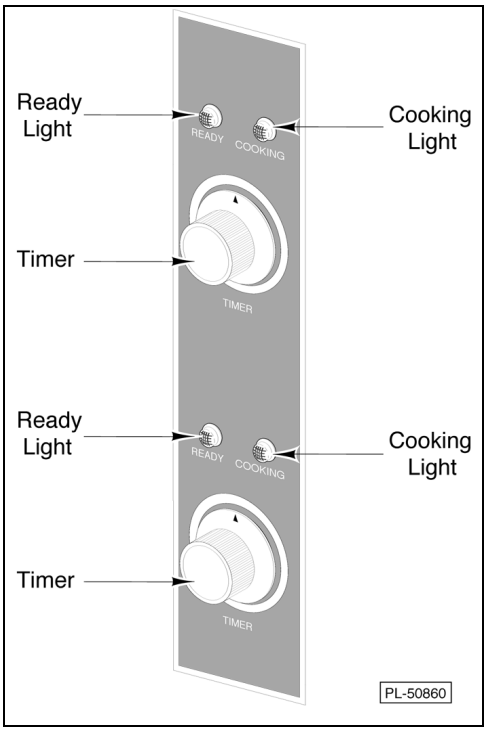
WARNING: THE STEAMER AND ITS PARTS ARE HOT. USE CARE WHEN OPERATING, CLEANING OR SERVICING THE STEAMER. THE COOKING COMPARTMENT CONTAINS LIVE STEAM. STAY CLEAR WHEN OPENING EACH DOOR.

The upper section of the steamer consists of two separate cooking compartments. Each compartment functions independently with its own set of controls. Power is supplied to the controls only after the steam pressure rises above 3 psi to close the compartment pressure switch. The switch remains closed as long as steam pressure stays above 3 psi but will open if the pressure drops below that setting.

Ready Light (Green) - when lit, indicates steamer is ready to cook.

Cooking Light (Red) - when lit, indicates steamer is in a cooking cycle.

Cooking Timer - use to set desired cooking cycle time between 0-60 minutes. When a timer is set, the steam supply solenoid valve is energized to allow steam into the cooking compartment but only after the boiler has reached its operating pressure. Also, energizes the buzzer when time expires.



Buzzer - signals end of a cook cycle, must be turned off manually.

Door Switch - removes electrical power to the timer.

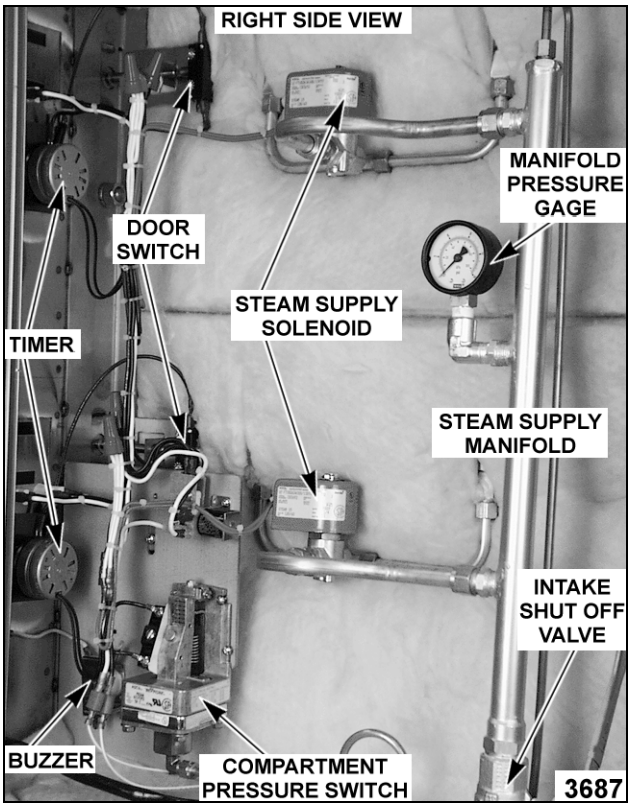
Steam Solenoid Valve - when energized, opens to allow steam into the cooking compartment (normally closed valve).

Compartment Pressure Switch - supplies power to the controls only after the steam pressure rises above 2.3 psi to close the compartment pressure switch. The switch remains closed as long as steam pressure stays above 2.3 psi but will open if the pressure drops below that setting.

Manifold Pressure Gauge - indicates the amount of steam pressure in manifold. The intake shut-off valve should be adjusted so manifold pressure remains at 9 psi with both compartments on.

Steam Supply Manifold - main steam supply line from the boiler for each cooking compartment. Supplies steam up to the steam solenoid valve.

Intake Shut-Off Valve - main steam supply shut-off from the boiler to the steam supply manifold. This valve should NOT be left fully OPEN to boiler steam supply. See “INTAKE SHUT-OFF VALVE ADJUSTMENT (STEAM FLOW) under “SERVICE PROCEDURES”.



SERVICE PROCEDURES

WARNING: CERTAIN PROCEDURES IN THIS SECTION REQUIRES ELECTRICAL TEST OR MEASUREMENTS WHILE POWER IS APPLIED TO THE MACHINE. EXERCISE EXTREME CAUTION AT ALL TIMES. IF TEST POINTS ARE NOT EASILY ACCESSIBLE, DISCONNECT POWER, ATTACH TEST EQUIPMENT AND REAPPLY POWER TO TEST.

CABINET BASES

BOILER

Inspection

It is recommended that the boiler be thoroughly inspected for excessive scale and lime build up on a quarterly basis. In hard water areas or for units heavily used, a more frequent interval should be used. This inspection consists of an internal examination and cleaning of the boiler shell, an examination and possible replacement of the descaler, a check of lime build up on the water level sensing probes, and a check of all boiler controls, including the pressure switches.

Periodic service must be performed as outlined in these procedures. See “WATER CONDITIONING” under “GENERAL”.

WARNING: READ AND FOLLOW THE INSTRUCTIONS ON THE CLR BOTTLE. USE PLASTIC OR RUBBER GLOVES TO AVOID SKIN CONTACT. IF CLR LIQUID COMES IN CONTACT WITH THE SKIN, RINSE WITH CLEAN WATER.

Clean-Out (All Boiler Models)

1. Turn steamer OFF and drain boiler.
2. Remove hand hole plate and gasket (top front) from the boiler by removing the nut and clamp, then tapping the cover lightly to free it while holding the cover stud. This prevents the cover from dropping into boiler.
3. Remove old descaler retaining springs if present.
4. With a wire brush, or equivalent, dislodge and remove all loose scale from boiler shell. The loose material must be either scooped from the boiler or flushed through the drain.
5. Check probe canister and float valve assembly (regenerated models) for a scale build up and clean as necessary.
6. Check drain hole for obstructions.
7. Install two new descalers.
8. Mix the deliming solution according to the instructions for the chemical in use then add solution to boiler.

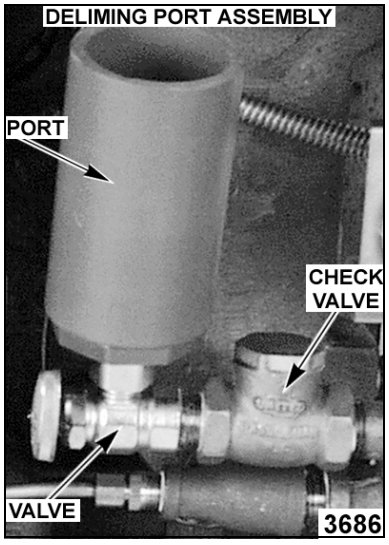
NOTE: Boiler water capacities vary between seven to nine gallons for both gas and electric models depending on the boiler size and BTU/KW rating.

NOTE: If deliming solution accidently comes in contact with steamer components, lightly rinse off with clean water.

A. Models with Blowdown Timer - Pour deliming solution into boiler shell. Mix the solution in accordance with the instructions on its container. Proceed to step 9.

B. Models without Blowdown Timer - Turn off the incoming water supply. Turn the unit ON to close the drain valve. Pour deliming solution into boiler shell. Mix the solution in accordance with the instructions on its container. Proceed to step 9.

C. Models with Deliming Port Assembly - Before mixing and pouring deliming solution into boiler, clean the seating surfaces for the hand hole gasket and then install a new gasket. Position the hand hole plate and tighten down. Turn off the incoming water supply. Turn the unit ON to close the drain valve. Open the deliming assembly valve and pour the deliming solution into the port. Mix the solution in accordance with the instructions on its container. Close the deliming assembly valve and proceed to step 10.



9. Clean the seating surfaces for the hand hole gasket and then Install a new gasket. Position and tighten the hand hole plate.

10. Cooking compartment timers are to be in the OFF position. Turn the boiler switch ON and open water valve if necessary.
11. Boiler is to operate under pressure for 90 minutes or per the instructions for the chemical in use.
12. Drain boiler by normal methods. Refill boiler and allow heat until fully pressurized.
13. Repeat step 12 three times.
14. The steamer is now ready for normal operation.

Deliming Only
(Models with Deliming Port Assembly)

Boiler deliming should be performed on a weekly, bi-weekly or monthly basis, depending on the quality of the local water supply.

On steamers using a water purification system, follow the instructions for that system to delime the boiler. Only use the type of chemical recommended or described in the instructions for deliming with this type of system.

1. Turn steamer OFF and drain boiler.
2. Mix the deliming solution according to the instructions for the chemical in use then add solution to boiler.

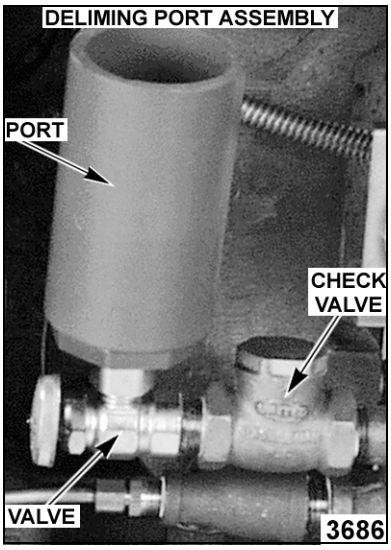
NOTE: Boiler water capacities vary between seven to nine gallons for both gas and electric models depending on the boiler size and BTU/KW rating.

NOTE: If deliming solution accidently comes in contact with steamer components, lightly rinse off with clean water.

A. **Models with Blowdown Timer** - Open the deliming assembly valve and pour the deliming solution into the port. Mix the solution in accordance with the instructions on its container. Close the deliming assembly valve and proceed to step 3.

B. **Models without Blowdown Timer** - Turn off the incoming water supply. Turn the unit ON to close the drain valve. Open the deliming assembly valve and pour the deliming solution into the port. Mix the solution in accordance with the instructions on its container. Close the deliming assembly valve and proceed to step 3.

3. Top compartments are to be in the OFF position. Turn the boiler switch ON and open water valve if necessary.
4. Boiler is to operate under pressure for 90 minutes or per the instructions for the chemical in use.



5. Drain boiler by normal methods. Refill boiler and allow to heat up and build steam pressure.
6. Repeat step 5 three times.
7. Unit is now ready for normal operation.

Descaler

The descaler is accessible through the hand hole opening. It is a coiled wire wound around a solid cylindrical core, and hangs by an open loop from the shell's horizontal stay rod, about 4 inches from the front of the shell. If the wire is eaten through, or if the core of the descaler is eaten away to half its original size, a new descaler should be installed.

To install a new descaler, stretch its wire coil so that the descaler hangs with its core completely below the minimum water level in the boiler, but hanging free. The descaler must not contact the bottom of the boiler shell, electric heating elements or the regenerating steam coils on units so equipped.

Water Level Controls
(Low Level Cut-Off and Differential)

Solid State

1. Ensure that water is filling the boiler.
2. Check for correct voltage being applied to the board.
3. Verify the water level control board operation as outlined in “WATER LEVEL CONTROLS” under “ELECTRICAL OPERATION”.

A. Does the HL LED light up and the HL relay energize to change the contact state at power on?

B. As the boiler fills, does the LLCO LED light up and the LLCO relay energize to change the contact state after the water level reaches the LLCO probe?

C. Does the HL LED go out and the HL relay de-energize, allowing the contact state to switch back to its starting condition after the water level reaches the HL probe?

4. If water is in the boiler but is not being detected by the water level probes, the probes may need cleaned and/or boiler delimed. See “BOILER”.

5. After checking the above items, if the water level control board does not appear to be functioning as outlined, then replace the board.

6. Check unit for proper operation.

Electro Mechanical

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

Loose electrical connections may prevent the heat from coming on or may cause the boiler to overfill. Accumulation of boiler scale on or near the sensing probes may cause them to retain water on the insulator surface. This may prevent the boiler from filling or cause dry firing. Dry firing will result in damage to heating elements or to the boiler. Verify the water level controls operation as outlined in “WATER LEVEL CONTROLS” under “ELECTRICAL OPERATION”.

With the individual probe lead wire removed, check the probes and contactors as outlined below:

1. With an ohmmeter, check the probe between the wire connection and shell. An open circuit should be present when the boiler is empty. If resistance is present, remove and clean the probes. Also check for a cracked insulator, then reinstall probes and check. When the boiler is full of water, a resistance reading should be measurable between the probes and shell only.

NOTE: Actual resistance reading will depend on water quality and probe condition.

2. Check low level and differential water level controls. With the power switch ON, use a voltmeter to check the input voltage across terminals 1 & 2. Meter should read 115V. With the boiler empty, across terminals 9 & 10, you should read 300 to 350V. If you do not read this voltage, then coil is bad and contactor should be replaced.

3. Remove sensing probe. First remove the bolted cover over the sensor cluster. Then remove the wire from the probe and unscrew the probe with a wrench. Be careful to note the location of each probe and the number of the wire connected to it. Incorrectly connected wires will cause the controls to malfunction.

4. Clean probe thoroughly, removing ALL deposits from the insulator. Do not use an abrasive on the insulator; use a soft cloth.

5. Inspect through the probe socket for the presence of water. Water must drain from the probe housing. If in doubt, pour water into the housing and observe that it drains quickly. If the housing fails to drain, remove the housing or housing cover and clean the interior mechanically.

Water Level Gauge Assembly

Close the valve at the top and at the bottom of the gauge assembly. Unscrew the packing nuts at the top and bottom of the glass tube. Slide the glass tube upwards, until the bottom of the tube is clear of the fitting and lift it out.

When reinstalling the tube, use new sealing washers. Do not over tighten the packing nuts; it could break the gauge glass. Check that both top and bottom valves are fully open.

Pressure Switches (Gas and Electric Models)

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

Remove the boiler control box cover to access the two controls. The pressure switch on the left is the cycling or primary control; the one on the right is the high limit control. They are identical switches, differing only in their settings.

Turn the power ON and let the boiler come up to pressure. After the ready light comes ON, turn one of the cooking compartment timers on to exhaust steam from the boiler. Observe boiler pressure gauge readings for several cycles and compare them with the pressure settings in the chart. If the readings differ, adjust the pressure settings as described below.

Two slotted and square headed adjustment screws extend through the top of the switch case with dials and pointers to indicate the approximate setting. The adjustment screw directly above the dial changes both the cut-out (off) and the cut-in (on) points. Set it first to give the proper off setting. Turning the screw clockwise increases the pressure. Then set the second adjustment screw to give the proper on setting. The pressure settings for each switch are listed below.

	PRESSURE SETTINGS (PSI)			
	CYCLING		HIGH LIMIT	
UNIT	ON	OFF	ON	OFF
Gas	8	10	6	15
Electric	11	13	6	15

High Limit Thermostat

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

Remove thermostat (bi-metallic disk type) and inspect flat surface of thermostat for corrosion or rust. Replace if rusted.

Clean thermostat mounting and thermostat surfaces before remounting or replacing. A good metal-to-metal contact is essential for proper functioning of the thermostat. This service must be performed at least once a year.

On gas boilers, the high limit thermostat is located on the face of the boiler close to the sight glass on the right side. For access, remove the small metal cover placed over the thermostat.

On electric boilers, the high limit thermostat is located behind the contactor box cover. On electric boilers with two heating elements, the thermostat is connected to one of the heating element lugs. On electric boilers with four heating elements, the thermostat is located between the center pair of elements at the top of the elements.

Removing The Boiler Assembly

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

WARNING: SHUT OFF THE GAS BEFORE SERVICING THE UNIT.

WARNING: ALL GAS JOINTS DISTURBED DURING SERVICING MUST BE CHECKED FOR LEAKS. CHECK WITH A SOAP AND WATER SOLUTION (BUBBLES). DO NOT USE AN OPEN FLAME.

A. CHECK ALL JOINTS PRIOR TO THE GAS VALVE (SOLENOID) BEFORE LIGHTING UNIT.

B. CHECK ALL JOINTS BEYOND GAS VALVE (SOLENOID) AFTER UNIT IS LIT.

Newer Steamer Models - Blow down the boiler and allow to cool, if necessary. Ensure that all utilities to the steamer are off. Drain any excess water from the boiler. Disconnect the steam supply line, power leads and drain lines from the cooking compartment top to the boiler base. Remove the cooking compartment top by unscrewing the bolts holding the cooking compartment top to the boiler base. The bolts are located behind the small louvered access panels on the left and right side of the steamer. Lift the top off the boiler base and place to the side. Remove the remaining plumbing and electrical connections from the boiler to the controls. Remove the bolts securing the boiler to the frame and lift it out. Reverse procedure to install a new boiler.

Older Steamer Models - Blow down the boiler and allow to cool, if necessary. Turn off all utilities to the steamer and disconnect supply lines. Drain any excess water from the boiler. Remove the screws holding any control box that would obstruct removal of the boiler through the front of the base.

Disconnect the 1/4 inch diameter water inlet tubing. Disconnect the wire and conduit from the low water cut-off probes, high limit thermostat, and the automatic blowdown valve (if so equipped). Uncouple the union on the steam outlet and blow down the lines.

Remove all the screws holding the flue and flue collector to the base. Remove the anchor screws holding the boiler to the frame. Slide the boiler forward. The burner box, anchored only by the boiler, must be prevented from sliding forward with the boiler.

Fill and Cold Water Solenoid Valves

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

Removal

1. Turn off the water supply to the steamer.
2. Open the base doors and remove the two screws from the top of the boiler control box.
3. Pull the quick connect power leads off the solenoid valve being serviced.
4. Disconnect the water lines for the valve being serviced and remove the valve from the unit.
5. Reverse procedure to install.

Disassembly

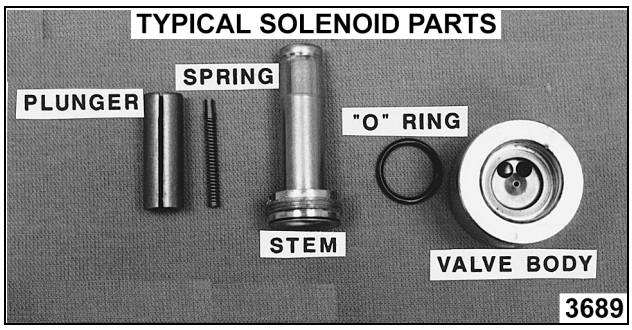
NOTE: It is recommended that the valve be removed from the unit for cleaning to prevent damage to the lines and fittings when the stem is removed from the body.

1. Remove the coil assembly from the valve stem by lifting up on the retaining cap at the top of the solenoid valve and sliding the metal cover plate off.
2. Clamp the body of the valve in a vise.
3. Mark a scribe line on the stem nut to the valve body for proper retightening.

4. Remove the stem locking nut to remove the stem from the valve body.
5. All parts are now accessible for inspection and cleaning.

NOTE: If internal solenoid parts appear to be damaged or worn, then replace the solenoid valve. Do not reuse damaged or worn parts. No internal solenoid parts are available as a service replacement. Pay careful attention to proper orientation and placement of parts during reassembly.

A. Check rubber seal on bottom of plunger.
B. Check plunger spring.
C. Check O-ring in valve body.
D. Check ports in valve body.



6. Reverse procedure to install.

Water Not Being Supplied to Boiler

Turn the steamer on. Check that water supply is available to the steamer. After approximately 10 minutes, if no water is observed in the water level gauge sight glass, then check for a problem with the water solenoid valve or water level control probe.

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

Scalants may be covering the water level control probe giving a false indication of a sufficient water level in the boiler. Detach, remove and thoroughly clean the water level probe and canister assembly to remove scalants and lime build up. This condition indicates extremely poor water quality being supplied to the boiler and/or boiler clean out/and deliming has not been performed. The water condition must be cleared up immediately with a proper water conditioner to avoid further problems with the steamer. Replace the water level probes and canister assembly. Perform a boiler clean-out and deliming procedure. See “BOILER”.

Water may be draining through an open boiler blowdown solenoid valve as quickly as it’s fed to the boiler. Loose wiring, a burned out coil or particles of scale trapped in the valve seat may prevent the valve from closing.

Newer steamer models use a plunger type rod that raises and lowers to permit steam/water flow out of boiler. If debris has accumulated around the water orifice, the plunger may not seat properly to close off the opening. If this symptom is suspect, remove the solenoid as outlined in “FILL AND COLD WATER SOLENOID VALVES”. Remove any debris found on sealing surfaces, reassemble and install. If the solenoid valve still does not function properly, replace it with a new valve and check for proper operation.

Older steamer models have a movable blade and when closed, the blade reacts as a guillotine that should be free to move fully down into the valve pocket (projection at bottom of valve) so that the pierced hole in the blade aligns perfectly with the body opening. If debris has accumulated in the bottom of the valve pocket, then the blade will not move into the pocket completely. If this symptom is suspect, remove the solenoid as outlined in “FILL AND COLD WATER SOLENOID VALVES”.

NOTE: On this valve body, remove the two assembly bolts holding the brass body together and remove the loose internal parts. Remove any debris found on sealing surfaces, reassemble and install. If the solenoid valve still does not function properly, replace it with a new valve and check for proper operation.

Blowdown Solenoid Valve Does Not Drain

If your steamer has an automatic blowdown drain valve.

Older Models - when the blowdown timer button is pressed, the boiler blowdown valve opens. If your steamer has a manual blowdown drain valve, close the valve.

Newer Models - are equipped with normally open solenoid valves that close when energized by the main power switch. When the main power switch is turned off, the solenoid valve is de-energized and the boiler blowdown valve re-opens.

The water contained in the boiler, being under pressure, should be blown through this valve and be noticeably visible exhausting out the steamer drain.

If the blowdown operation appears to function sluggishly or not at all, considerable scalants may be lodged in the drain pipe and/or the valve. Disconnect the valve from the drain line and inspect both the valve and the drain pipe fixed to the boiler. If considerable scalants or lime build up is apparent, then not only the valve, but also the boiler and water level control must be thoroughly cleaned. See “FILL AND COLD WATER SOLENOID VALVES” for a cleaning procedure of a solenoid valve and "BOILER” for a cleaning procedure of the boiler.

Steamer Achieves Pressure Slower Than Normal

If the boiler requires more than 15 minutes (20 minutes for regenerated models) to achieve normal operating pressure as listed in below, then check the following conditions.

NORMAL OPERATING STEAM PRESSURES	
UNIT	**RANGE (PSI)**
Gas	8 - 10
Electric	11 - 13
Direct	10 - 12
Regenerated	10 - 12

1. **All Models (With Boiler)**

   A. A heavy build-up of scalants has possibly coated the interior of the boiler. The insulating effect of the scalants hampers heat transfer. Unbolt and remove the hand hole cover plate and gasket assembly. Examine interior of boiler and if scalants and/or lime build up is apparent, perform a boiler clean-out and deliming procedure. See “BOILER”. If considerable scalants are evident, then both the boiler blowdown solenoid valve and the water level control must also be examined.

2. **Gas Models**

   A. Low incoming gas pressure causes reduced BTU output. Check incoming line and manifold gas pressures as outlined in “MANIFOLD PRESSURE ADJUSTMENT.”

   B. Gas combination control valve malfunction. Check incoming and manifold gas pressures as outlined in “MANIFOLD PRESSURE ADJUSTMENT.” If pressure adjustments are made and manifold pressure remains low, replace the combination valve and test unit for proper operation.

   C. Gas burner ports clogged or obstruction around air shutter. After a period of time, gas burners can accumulate carbon in their ports or become clogged by food and grease debris from kitchen cleaning, restricting performance. To clean burners, remove them from burner box and boil in water for 10 -15 minutes to dislodge clog. Clean-out any remaining debris from the gas ports using a wire brush, scribe or pic type metal instrument. Remove any other foreign objects that appear to be obstructing the gas ports or air shutters.

   D. Gas orifice clogged or obstructed around air shutter. It is possible for debris to become lodged in the small gas orifice opening over time. Clean-out the gas orifice using a round metal instrument of the same hole diameter or slightly smaller. Clean as needed. If clogging reappears, the orifice should be removed, cleaned and reinstalled. Remove any other foreign objects that appear to be obstructing the gas orifice or air shutters.

3. **Electric Models**

   A. Heavy scale build up on heating element causes reduced heating.

   B. One or more electric heating elements malfunctioning.

   C. One or more magnetic contactors not pulling in, to power heating elements.

   D. If unit operates under three phase power, then one of the phases might be lost.

4. **Direct Steam Models**

   A. Building steam supply pressure low.

   B. Cooking compartment steam solenoid valve malfunction.

   C. Steam pressure regulator adjusted too low.

   D. Clogging in the steam line reduces steam supply.

5. **Regenerated (Steam Coil) Steamers**

   A. Heavy scale build up inside copper steam coil.

   B. Building steam supply pressure low

   C. Cooking compartment steam solenoid valve malfunction.

Inlet Water Strainer

The in-line Y strainer should be located upstream of the fill valve solenoid. Unscrew the cap from the body on the leg of the Y that should be pointing downwards toward the floor. Remove the screen and any foreign particles trapped in the opening. Rinse the screen thoroughly to remove accumulated debris and replace the screen in the valve body. If screen can not be thoroughly cleaned, replace it with a new one. Reinstall the cap and ensure that the Y strainer is positioned with the cap pointing downward to catch debris.

The pressure regulating valve strainer will become clogged if dirty steam lines are connected to direct steam models. Remove the hex nut on the bottom of the pressure regulating valve to clean the strainer and valve seat.

GAS MODELS

Pilot, Thermocouple or Main Burners

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

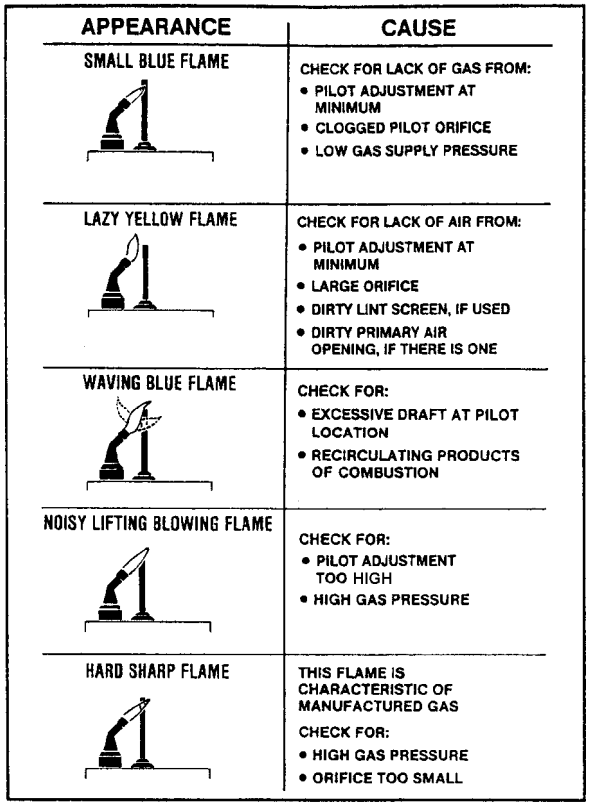
WARNING: SHUT OFF THE GAS BEFORE SERVICING THE UNIT.

The pilot thermocouple supplies a millivolt signal (DC) to an internal solenoid valve on the gas combination control valve when heated. This solenoid valve is designed to shut off the gas flow to the pilot and main burners in case of a malfunction in the system. When energized by the thermocouple voltage, the valve is held in the open position to permit gas flow. The pilot burner flame is controlled by an adjustable needle valve located under a small cap screw on the combination control valve.

When experiencing nuisance pilot outages, visually check pilot flame for the proper contact on thermocouple and the flame color. Also, check to see that unusually strong floor drafts are not interfering with proper heating of the thermocouple by the pilot flame.

The pilot flame should be a steady blue flame that envelopes the thermocouple tip. The flame should be about one inch long with half its length extending beyond the outer edges of the pilot shield. If the pilot flame does not appear to be this length and color, then an adjustment is necessary. See the diagram below for an example of un satisfactory pilot flames. Turn clockwise to decrease pilot flame and counterclockwise to increase.

NOTE: If adjustments in gas or pilot pressure settings are made, always replace the adjustment cover screw to assure proper gas control operation.



EXAMPLES OF UNSATISFACTORY PILOT FLAMES.

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If adjustment does not result in a pilot flame of proper size, then gas might not be flowing properly to the pilot. Check for a plugged pilot orifice, a kinked or plugged pilot gas supply tube and for low gas supply pressure. The pilot operates unregulated at gas supply pressures while the pressure regulator in the combination control valve regulates pressure to the main burners only. Visually check the thermocouple tip (hot end) and tube lead for kinks or pinches that might be causing a short between the tube and the wire inside. Also, check the threaded connector tip for corrosion, tarnish or dirt which can cause a poor connection. If the thermocouple shows either of these signs, it should be replaced with a new one.

NOTE: The connection of the tubing from the thermocouple tip to the control valve is an electrical connection and must be clean. Do not use any sealing compound on the threads or over tighten the threaded connection. Finger tighten the nut plus 1/4 turn with a wrench. Over tightening the nut could crush the insulator, shorting the thermocouple.

If the pilot flame is correct and there are no drafts, then the problem is in the thermocouple output voltage or the gas solenoid valve in the combination control.

Check the thermocouple output voltage (DC millivolts) with a VOM. If a meter is not available, replace the thermocouple with a new one and recheck operation. First, take a closed circuit reading (adaptor required) with the pilot on. Next, take an open circuit reading by disconnecting the thermocouple tube from the valve and connecting meter leads to the tube and threaded end. Manually press and hold down OFF/PILOT/ON knob and light the pilot. Allow the pilot to heat the thermocouple for one to two minutes and compare the readings with the chart below.

THERMOCOUPLE MV READINGS		
	CLOSED CIRCUIT	OPEN CIRCUIT
Typical	15	
Range	10 - 20	20 - 35

If either of the readings is less than the minimum or thermocouple is not operating as described, replace the thermocouple. To replace, remove the pilot assembly by disconnecting thermocouple and pilot gas supply tubing from the combination control valve and remove the two screws holding the pilot to its bracket. Replace the thermocouple or pilot assembly and check for proper operation. If after replacing thermocouple, the pilot or main burners are still not functioning properly, then a problem in the gas combination control valve exists as well. Replace the combination control valve as outlined in "GAS COMBINATION CONTROL VALVE REPLACEMENT" then check for proper operation.

NOTE: Gas combination control valves are not serviceable and should not be disassembled. Once you have isolated the problem to this control, replace it. Do not attempt to repair the assembly.

The main burners are lanced port steel burners (5 or 7 burners, depending on the unit) and have adjustable air shutters. Fixed orifice type hoods are used to establish the gas flow to each burner. Set each burner air shutter opening just large enough to eliminate any yellow tip in the burner flame.

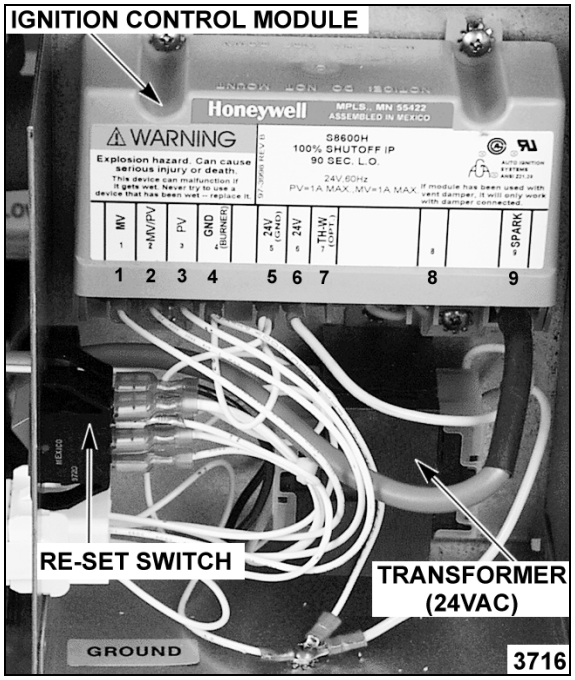
To remove main burners, lift burner and slide it to the rear just enough to clear the gas orifice hood. Lower the front end of burner and bring it forward under the manifold pipe. When reinstalling burners, ensure that locating pin is in the hole for proper positioning and to prevent burner from rolling over.

Automatic Ignition Systems

When the main power switch is turned ON and the ignition control modules reset switch is in the ON position, the ignition control module is energized with 24 volts between terminals five and six.

High voltage is sent from terminal nine to the spark electrode and an output of 24 volts is sent from terminals two and three to the pilot coil in the combination valve, allowing gas to flow to the pilot. The sparking will continue for 90 seconds or until the flame sensor has confirmed that an adequate pilot flame is present.

Once the pilot flame is confirmed, a 24 volt output from terminal one will be sent, allowing the cycling coil of the combination valve to operate at the request of the cycling pressure switch.

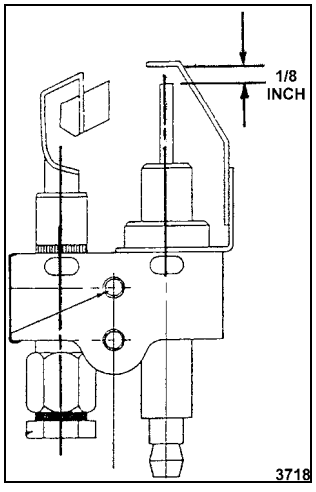


Terminals:

1. Main Voltage - 24V AC will be present on terminal #1 with the pilot sensing electrode sensing an adequate pilot fame. This output will remain present as long as the pilot flame remains adequate.
2. Common (MV/PV).
3. Pilot Voltage - 24V AC will be present on terminal #3 at the instant an input voltage is supplied to the module. This voltage will remain present on terminal #3 providing an adequate pilot flame is established within 90 seconds. In the event that an adequate pilot flame is not established within 90 seconds this output voltage will drop out.
4. Ground (burner).
5. Ground (24VAC Neutral).
6. 24V AC Input.
7. High Voltage to spark electrode (The pilot flame current is sensed by the Ignitor Module via the spark electrode high voltage wire and terminal #9).

Spark Ignition Control Test

1. If the ignition control module does not appear to be sparking to ignite gas, perform the following checks.
   A. Check to ensure that all electrical terminal connections on the ignition control module and the ignitor are clean and tight.
   B. Verify that the ignition control module and the ignitor have good ground wire connections. The ignitor mounting bracket should have good metal to metal contact to its mounting surface.
   C. Turn the main power switch ON. Turn the ignition control modules re-set switch OFF then ON.
   D. Check for 24VAC output on the ignition control module transformer.
      1) If 24VAC is present then replace ignition control module and re-test.
      2) If 24VAC is not present then ensure that transformer is receiving 120VAC input. If ignition control module transformer is receiving proper voltage, then replace ignition control module transformer and re-test.
2. If the ignition control module and transformer are functioning properly, then check the following ignitor conditions.
   A. The gap between the spark probe and the ground clip should be approximately 1/8 inch. If the gap appears to be excessive or poor sparking is occurring, remove the electronic ignition pilot and adjust gap.



   B. Inspect the ceramic flame rod insulator for cracks or evidence of exposure to extreme heat, which can permit leakage to ground. If either of these conditions exist, then replace the pilot ignitor assembly.
   C. Check the ignition cable for tightness or damaged insulation.
3. Check unit for proper operation.

Gas Combination Control Valve Replacement

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

WARNING: SHUT OFF THE GAS SUPPLY BEFORE SERVICING THE UNIT.

WARNING: ALL GAS JOINTS DISTURBED DURING SERVICING MUST BE CHECKED FOR LEAKS. CHECK WITH A SOAP AND WATER SOLUTION (BUBBLES). DO NOT USE AN OPEN FLAME.

A. CHECK ALL JOINTS PRIOR TO THE GAS VALVE (SOLENOID) BEFORE LIGHTING UNIT.
B. CHECK ALL JOINTS BEYOND GAS VALVE (SOLENOID) AFTER UNIT IS LIT.

NOTE: Gas combination control valves are not serviceable and should not be disassembled. Once the problem has been isolated to this control, replace it. Do not attempt to repair the assembly.

Remove the two screws on the control box cover. Disconnect electrical supply wires and conduit running to the combination control valve. Disconnect the thermocouple lead and pilot gas supply tube from control and pipe connections on each side of the control. Reverse procedure to install and check unit for proper operation.

Manifold Pressure Adjustment

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

WARNING: SHUT OFF THE GAS SUPPLY BEFORE SERVICING THE UNIT.

1. Open the front cabinet doors and turn the Gas Combination Control Valve OFF.
2. To measure the manifold pressure, remove the 1/8 inch NPT plug (pressure tap) on the outlet side of the valve and attach a manometer.
3. Turn the gas combination control valve and the main power switch to ON.
4. Observe the manometer pressure reading and compare to the pressure chart near the end of this procedure.

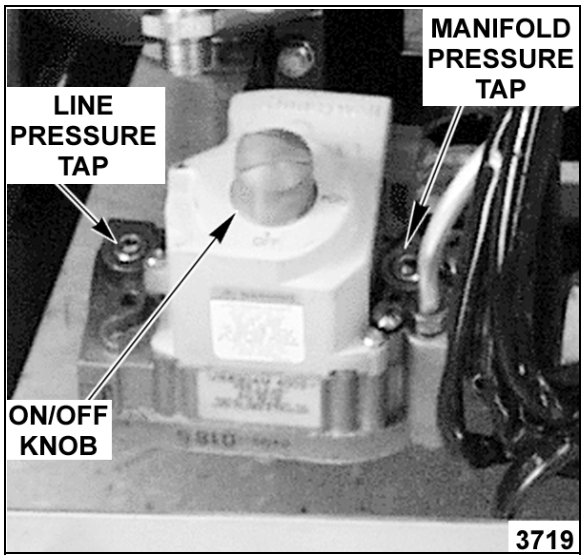
A. If other appliances are connected to the same gas line, turn them all ON and check manometer pressure reading again. If a pressure drop of ½ inch water column or more is observed, then the gas supply needs to be checked by the gas line installer or the local gas company for adequate sizing.

B. If no other gas appliances are connected to the gas line and the manifold pressure still requires adjustment, proceed to step 5.

5. Remove the adjustment screw cap to access the pressure adjustment screw.

   A. To increase pressure, turn the screw clockwise.

   B. To decrease pressure, turn the screw counterclockwise.



NOTE: Accurate gas pressure adjustments can only be made with the gas ON and the burner lit.

6. After the burner lights, set the pressure as outlined below:

GAS TYPE	PRESSURE READINGS (INCHES W.C.) MANIFOLD	LINE RECOMMENDED	LINE MIN	LINE MAX
Natural	4.0	7.0	5.0	14
Propane	10.0	11.0	11.0	

* If the incoming line pressure is **less than** the minimum stated, then the manifold pressure can not be set correctly.

7. Once the correct pressure has been set, turn the power switch OFF, replace the adjustment screw cap and 1/8 inch NPT plug (pressure tap) on the outlet side of the valve.

8. Check unit for proper operation.

ELECTRIC MODELS

Magnetic Contactor

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AT THE MAIN CIRCUIT BOX. PLACE A TAG ON THE CIRCUIT BOX INDICATING THE CIRCUIT IS BEING SERVICED.

The contactor can be serviced by removing the cover of the contactor box.

A noisy contactor (hum or chatter) is generally due to enough dust or dirt on the armature pole faces or around the armature core that the magnet coil cannot pull the armature into a completely sealed position. This can usually be corrected by blowing or wiping the pole faces clean. To inspect electrical contacts, remove cover at top of contactor by removing two screws which hold it in place. Replace contactor if the electrical contacts appear to be pitted or burned.

Heating Element

WARNING: THE FOLLOWING STEPS REQUIRE POWER TO BE APPLIED TO THE UNIT DURING THE TEST. USE EXTREME CAUTION AT ALL TIMES.

1. Measure the voltage at the heating element terminals and verify it against the data plate voltage.

   A. If voltage is correct then proceed to step 2.

   B. If voltage is not correct, check the following:

      1) Voltage supply to the unit.

         a. Fuses or breaker blown.

         b. Power to contactor coils.

         c. Contactors not pulling in. (Mechanical)

2. Check current draw (amps) through the heating element lead wires. **See table below for proper values.**

   A. If current draw is correct then heating element is ok.

   B. If current draw is not correct then proceed to step 3.

3. Remove the lead wires from the heating element and check the element resistance using a VOM.
   A. If resistance readings are not correct, replace heating element.
      1) To replace an element, drain water from boiler shell.
      2) Remove cover of contactor box, remove electric wires to that element's terminals, remove bolts through flange of element and pull element forward.

NOTE: When replacing an element, always use a new gasket and ensure that the flange and tube surfaces which contact the gasket are clean. If removed element shows a pronounced scale build-up on its heating tubes, the other elements should be removed and mechanically cleaned to remove the scale. This will prolong their life. DO NOT immerse elements in a chemical solution to descale.

4. After new element is installed, check unit for proper operation.

VOLTAGE	TOTAL KW	NUMBER OF ELEMENTS	KW PER ELEMENT	AMPERAGE PER LINE		RESISTANCE PER ELEMENT (OHMS)
				1 PH	3 PH	
208	18	2	9	87	50	14.42
240	18	2	9	75	44	19.20
480	18	2	9		22	76.80
*220/380 240/415	18	2	9		25	19.20
208	24	4	6	116	68	21.63
240	24	4	6	100	58	28.80
480	24	4	6		29	115.20
*220/380 240/415	24	4	6		57.8	28.80
208	24	2	12	116	68	10.82
240	24	2	12	100	58	14.40
480	24	2	12		29	57.60
*220/380 240/415	24	2	12		34	14.40
208	36	4	9		100	14.42
240	36	4	9		87	19.20
480	36	4	9		44	76.80
*220/380 240/415	36	4	9		50	19.20
208	42	4	10.5		117	12.36
240	48	4	12		116	14.40
480	48	4	12		58	57.60
*220/380 240/415	48	4	12		67	14.40

NOTES:
1. Values in the table are nominal. Tolerance is +/-10 %.
2. Asterisk (*) indicates 3 phase/4wire.
3. Each heater has three internal elements.
4. 6.0 KW heaters used on older models and included for reference.

DIRECT STEAM MODELS

These models consist of a pressure regulator and gauge that run off a buildings potable steam supply. The maximum input pressure to the regulator should be 15 psi. Incoming power (120VAC) for the compartment controls is supplied from a junction box in the base. See “COOKING COMPARTMENT CONTROLS” under “COMPONENT FUNCTION AND LOCATION” and “COOKING COMPARTMENT” under “SERVICE PROCEDURES”.

REGENERATED STEAM MODELS (STEAM COIL)

The steam coils are intended for use at a steam supply pressure of 15 psi maximum. A pressure regulating valve is available as optional equipment for steamers where the steam supply pressure exceeds 15 psi. The regulator used will be of the adjustable type and should be set for a discharge pressure of 15 psi. This pressure can be monitored by the supplied pressure gauge. The regulator should be set ONLY when steam is flowing (steam solenoid valve is open). If steam is heavy with condensate, install a ball float trap in the steam line before the pressure regulating valve.

To remove a steam coil, disconnect union in steam supply line to the coils and in the condensate discharge line from the coils. Remove header that supplies steam to coils by disconnecting union at each coil. In same way, remove coil condensate collection header. Remove four bolts clamping each coil flange in place and pull coil forward. Use a new flange gasket when replacing coil. The faces that mate with gasket must be clean.

Turn steamer power switch ON, allowing steam generation and, consequently, pressure to rise to normal operating level and then turn power switch OFF for a final purging of boiler and steam supply lines. Steamer is now ready for use.

COOKING COMPARTMENT

WARNING: CERTAIN PROCEDURES IN THIS SECTION REQUIRE ELECTRICAL TEST OR MEASUREMENTS WHILE POWER IS APPLIED TO THE MACHINE. EXERCISE EXTREME CAUTION AT ALL TIMES. IF TEST POINTS ARE NOT EASILY ACCESSIBLE, DISCONNECT POWER, ATTACH TEST EQUIPMENT AND REAPPLY POWER TO TEST.

Controls

For access to compartment controls, remove the right side compartment panel.

Check for failure of the control circuit in the following order:

1. Ensure that voltage is reaching control circuit through compartment pressure switch, when the main power switch is turned ON.
2. On electric heat models with a transformer, check step down transformer for proper operation.
3. Check door switch for proper operation.
4. Check cooking timer function and contact position. See “SCHEMATIC ALL MODELS - COMPARTMENT CONTROLS” under “ELECTRICAL OPERATION”.
5. Check that timer motor operates when connected to power. If a problem is found in timer, replace it, do not take timer apart.
6. Check wiring for damaged insulation. (no short circuit)
7. Check that all connections and terminals are securely fastened. (no open circuits)
8. Check that all connections are made according to compartment control wiring diagram.

Steam Supply Solenoid - Each cooking compartment is supplied steam by its own individual steam supply solenoid. These solenoid valves are a standard type and can be disassembled for cleaning.

1. **Newer Steamer Models** - The magnetic coil of a solenoid valve is removed from the valve by removing the snap catch at the top. Unions or compression fittings are provided to allow easy removal of the valve bodies. The solenoid valves must be removed for disassembly as outlined under “FILL AND COLD WATER SOLENOID VALVES”.
2. **Older Steamer Models** - Remove the two screws and remove the inlet part of the body, the compression spring on the back of it and the plastic part now exposed. Unscrew and remove the plunger tube. Remove the plunger (the valve blade is pinned to the lower end of the plunger). The plastic seat at the exhaust side of the valve blade may now be removed from the body. This is a direct acting valve.

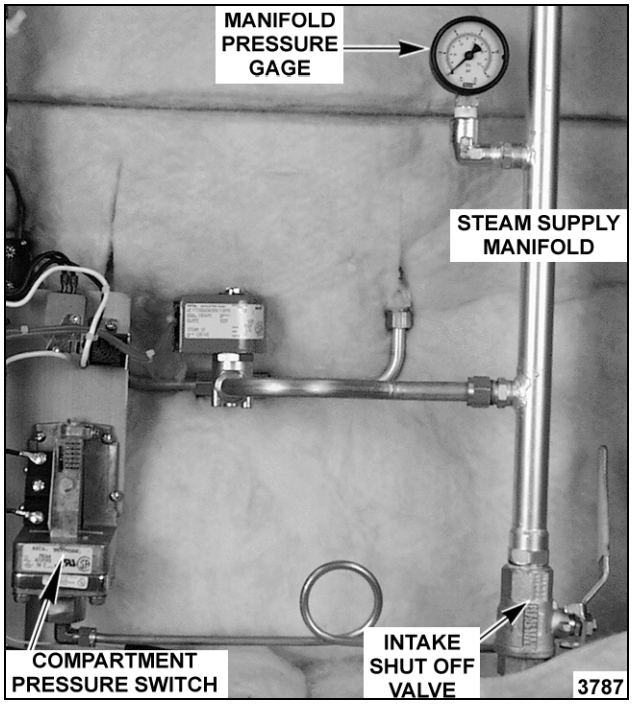
   The blade must be clean and the blade mating surfaces of the plastic seat members must be flat and undamaged. The plunger and plunger tube must be clean and the plunger must slide freely in the tube. The compression spring which fits in the hole in the top of the plunger must be clean and move freely.

Water Accumulating in Compartment - Water accumulation on the bottom of the cooking compartment(s) is primarily condensed steam. Failure to drain out quickly and completely, may be due to clogged debris in the compartment drain screen. Pull screen straight out and thoroughly clean, then replace. Failure to drain completely may also be due to improper leveling of the steamer.

Cooking Cycle Cannot Be Activated - Inspect all wire terminations to ensure they are positive and secure before assuming any other problem. When the power switch on boiler control box is ON, set the timer knob to 2 minutes. Both READY lights should go off, COOKING lights should come on and steam should be entering both compartments.

Intake Shut-Off Valve Adjustment (Steam Flow)

1. Remove right side control panel.
2. Open the intake shut-off valve completely.
3. If the steamer ready light is on, then proceed to step 5.
4. If the boiler is off, then turn main power switch ON and allow boiler to heat up until steamer ready light comes on. Turn both cooking timers on and allow boiler to cycle 2 to 3 times, then proceed to step 6.



5. Turn both cooking timers on.
6. Monitor the boiler until heat source turns off.
7. At that time, adjust the intake shut-off valve until the manifold pressure gauge reads 9 ±1 psi. The valve setting should be made while the boiler pressure is at the upper cycling limit.
8. Monitor gauge reading 1 to 2 cycles to ensure pressure is set correctly.
9. Once the valve is set, turn both cooking timers off and reinstall right side control panel.

DOOR

Removal

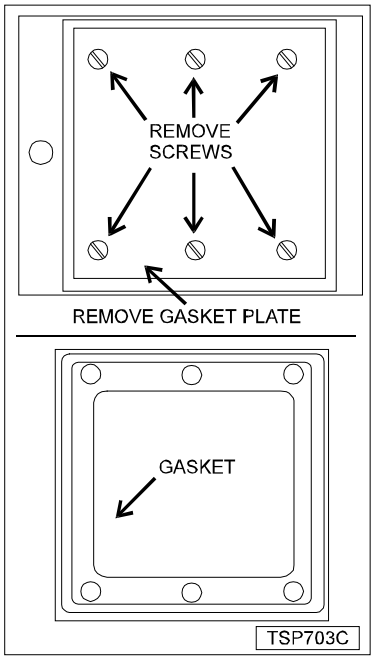
1. Remove top cover.
2. Open the door.
3. Pull hinge rod up.
4. Reverse the procedure to install, making sure the door bushings are in place.

Gasket

1. Open the door.
2. Remove screws from the gasket plate.
3. Pull the gasket plate out from the door housing and remove the gasket.
4. Position the new gasket on the gasket plate and reverse the procedure to install. Adjust the door as outlined in “SEALING ADJUSTMENT under "DOOR".

NOTE: Do not over tighten gasket plate screws as this will compress the gasket excessively and interfere with proper door sealing.

NOTE: Damage to the gasket sealing surface, such as nicks or cuts, will cause steam leakage.



Sealing Adjustment

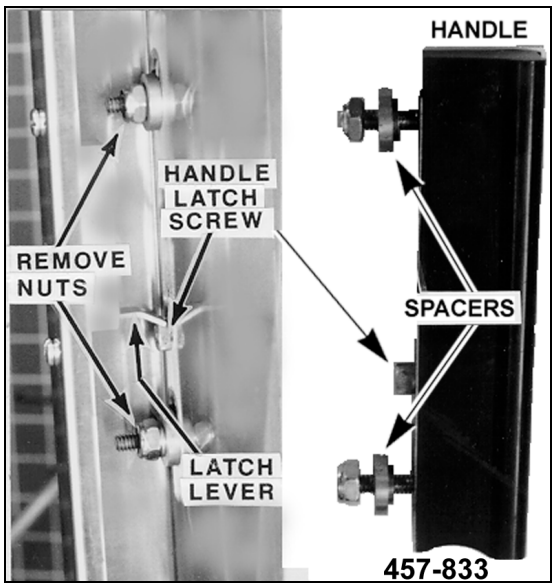
1. Check the door gasket quality. If damaged or worn, replace as outlined in “REMOVAL” under “DOOR”.
2. Loosen screws until the screw heads no longer touch the gasket plate.
3. Tighten screws until screw head touches gasket plate and at that point begin counting turns.
4. Tighten all screws approximately two turns.
5. Close the door and check unit for proper operation.
6. If necessary, tighten all screws an additional ½ turn and repeat step 5.
7. Repeat step 6 until the door closes properly and no steam leaks are seen around the gasket seal.

Handle

1. Open the door.
2. Remove screws from the top and bottom of the door.
3. Pull the inner door panel out from the door housing with the gasket plate and gasket still attached.

4. Remove the nuts and spacers from the handle screws and remove the handle from the door.

NOTE: When installing the spacers, the smaller diameter fits into the slot in the door and the latch lever must rest on top of the handle latch screw.



5. Reverse procedure to install.

Latch Assembly

1. Open the door.
2. Remove screws from the top and bottom of the door.
3. Pull the inner door panel out from the door housing with the gasket plate and gasket still attached.
4. Remove the screws from the side edge of the door that secure the latch mechanism and remove the latch from the door.

NOTE: When installing, the latch lever must rest on top of the handle latch screw.

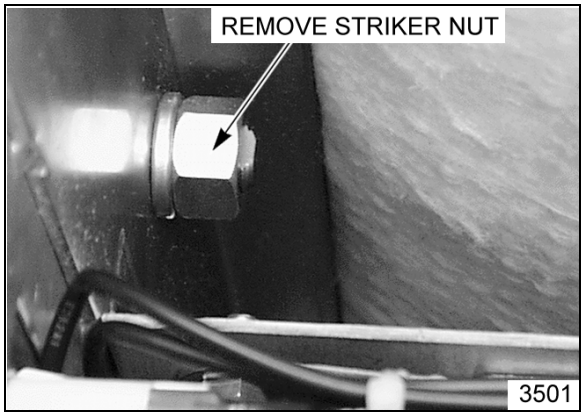
5. Reverse procedure to install.

Latch Adjustment

Should the cooker door jam and can not be opened, DO NOT FORCE OR PRY the door as damage will occur.

First, try lifting up on the bottom of the door at the handle end to disengage the latch. If that does not work, remove the right side panel.

The striker that catches on the door latch is located behind the front face of the cooking cavity. Remove the nut from the striker and this will release it from the panel.



Once the nut and washer have been removed, door will open freely.

Remove any burrs on the striker that may cause the latch to stick. Reinstall the striker and adjust, so door will not jam.

To adjust:

1. Reinstall the striker with the slot pointing upwards and hand tighten nut only.
2. Close the door to center the striker in the oval mounting hole.
3. Open the door and check the strikers' slot for horizontal alignment. The slot on the striker must be kept horizontal in order for the door latch to catch it properly and latch.

4. Once the proper slot alignment has been set, hold the striker close to its base using a rag and vise grips, then tighten the striker nut. Be careful not to damage the striker slot when tightening or door may not latch properly.

NOTE: Do not over tighten as the striker will begin to turn and change alignment.

ELECTRICAL OPERATION

WATER LEVEL CONTROLS

Solid State -
Low level Cut-Off & Differential Control

The steamer is equipped with three water level sensing probes (high, low and low level cut-off) and a single water level control board. The water level control board performs two functions: 1) Provide low level cut-off protection to shut off the heat source in case the water level drops below the low level cut-off (LLCO) probe. 2) Perform as a differential level control to maintain the water level between the low and high water level probes.

The water level control (WLC) has input voltage (120VAC) across terminals 11 and 12 which powers the primary side of the transformer. On one side of the transformer secondary, power is provided to the control by a series path through chassis ground (terminal 10). The other side of the transformer secondary (12VAC) is attached to the probe that directs power to the other side of the internal relays (LLCO, HL and ILR). As water enters the boiler, it becomes part of the water level control's circuit. When the water level in the boiler reaches a probe, that circuit is completed.

The inverse latching relay of the board is de-energized, leaving the ILR-1 (N.O.) and ILR-2 (N.C.) contacts in their shelf state.

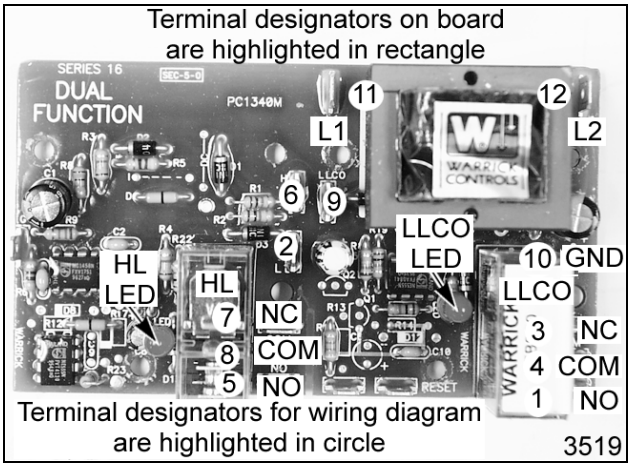
When the main power switch is turned ON, power is supplied to the WLC board which energizes the high level (HL) relay and illuminates the HL relay LED. With the HL-3 contacts closed, the boiler fill solenoid is energized and water begins filling the boiler.

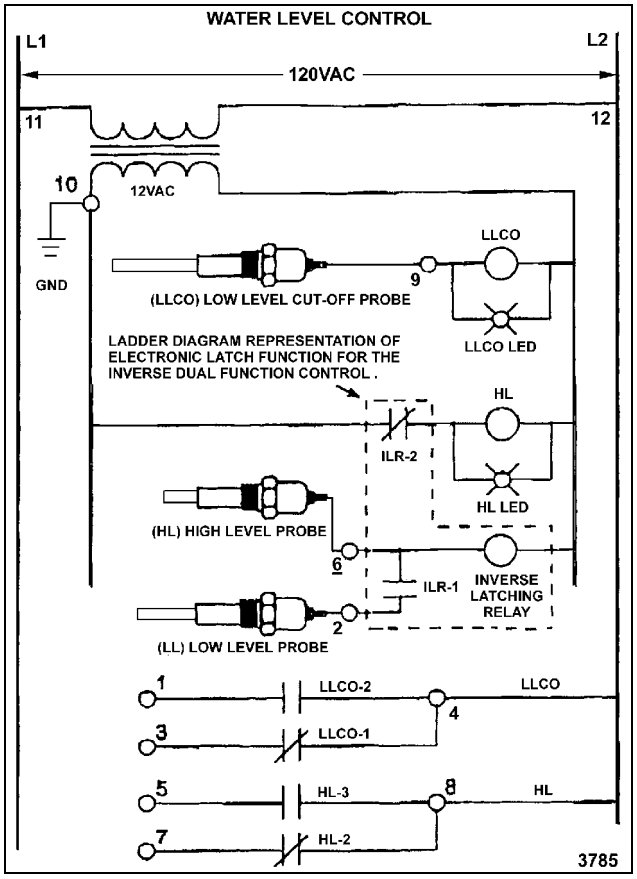
When the water level reaches the low level cut-off (LLCO) probe, the LLCO relay is energized and illuminates the LLCO LED. With the LLCO-2 contacts closed the heat source is then energized. The LLCO relay will remain energized and its LED will stay lit until the water level in the boiler drops below the LLCO probe.

When the water level reaches the low level (LL) probe, power to terminal 2 on the WLC board is present but no switching occurs.

After the water level reaches the high level (HL) probe, the inverse latching relay of the board is energized and locked through the low level probe (LL) and ILR-1 contacts. With ILR-2 contacts open, this de-energizes the HL relay and the HL LED goes out. With the HL-3 contacts open, the boiler fill solenoid is de-energized, stopping the flow of water into the boiler.

When the water level drops below the low level (LL) probe, power is removed from the inverse latching relay, the HL relay energizes through ILR-2 and HL contacts change state. The fill solenoid is energized through HL-3 to refill the boiler and the HL LED is lit. The HL relay and LED will toggle ON and OFF during a cooking cycle as needed.





Solid State - Auxiliary Low Level Cut-Off

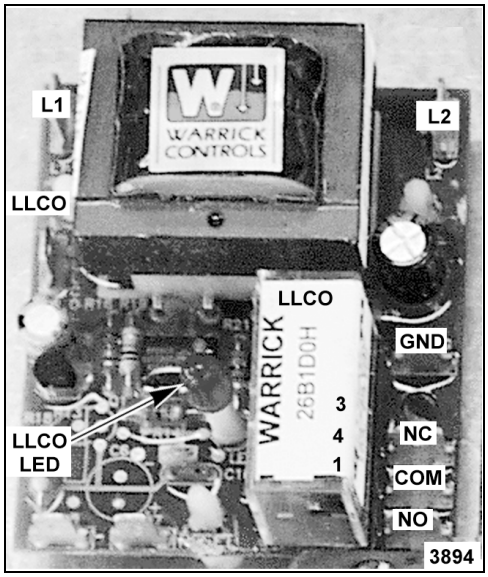
This control serves as a safety backup to the main water level control (WLC) board to meet Cal-Code and CSD-1 code requirements. The operation of the auxiliary control is identical to the low level cut-off (LLCO) function of the main WLC board but performs a single function: 1) Provide auxiliary low level cut-off protection to shut off the heat source in case the water level drops below the low level cut-off (LLCO) probe. A single LLCO probe, identical to the LLCO probe on the main WLC board, is connected to the auxiliary control.

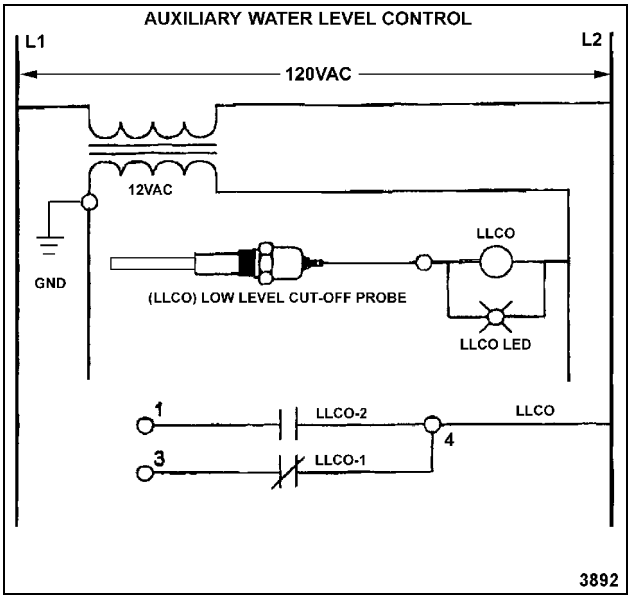
The auxiliary water level control (WLC) has input voltage (120VAC) across terminals 11 and 12 which powers the primary side of the transformer. On one side of the transformer secondary, power is provided to the control by a series path through chassis ground (terminal 10). The other side of the transformer secondary (12VAC) is attached to the control that directs power to the other side of the internal relay (LLCO). As water enters the boiler, it becomes part of the auxiliary water level control's circuit. When the water level in the boiler reaches the LLCO probe, the circuit is completed.

When the main power switch is turned ON, power is supplied to the auxiliary WLC board but no switching occurs. On CSD-1 models, the low water level indicator light (amber) on the boiler control box comes on.

When the water level reaches the low level cut-off (LLCO) probe, the LLCO relay is energized (LLCO-2 close) and the LLCO LED lights up. The LLCO relay will remain energized and its LED will stay lit until the water level in the boiler drops below the LLCO probe.

When the boiler stops filling, press the manual reset button on the boiler control box. On CSD-1 models, this energizes the low water relay, turns off the low water light and energizes the heat source auxiliary control. On Cal-Code models, this closes and locks the manual reset switch contacts to energize the heat source auxiliary control.





Electro Mechanical - Low level Cut-Off & Differential Control

The steamer is equipped with three water level sensing probes (high, low and low level cut-off), a differential level control (1G1GO) and a low level cut-off control (1D1DO). The low-level cut-off is an additional control that is identical to the differential level control but serves as the safety backup to shut off the heat source in case the water level drops below the low level cut-off (LLCO) probe. The differential level control maintains the water level between the low and high water level probes.

Each control is powered by input voltage (120VAC) on terminals 1 and 2 which also connect to the primary side of the internal transformer. The transformer secondary (300VAC) will provide power to the internal contactor coil through a series path going from one side of the secondary winding, through the contactor coil, through the water level control probe, through the water in the boiler and to the boiler for ground. The other side of the transformer secondary is attached to the probe that directs power to the other side of the internal contactor coil.

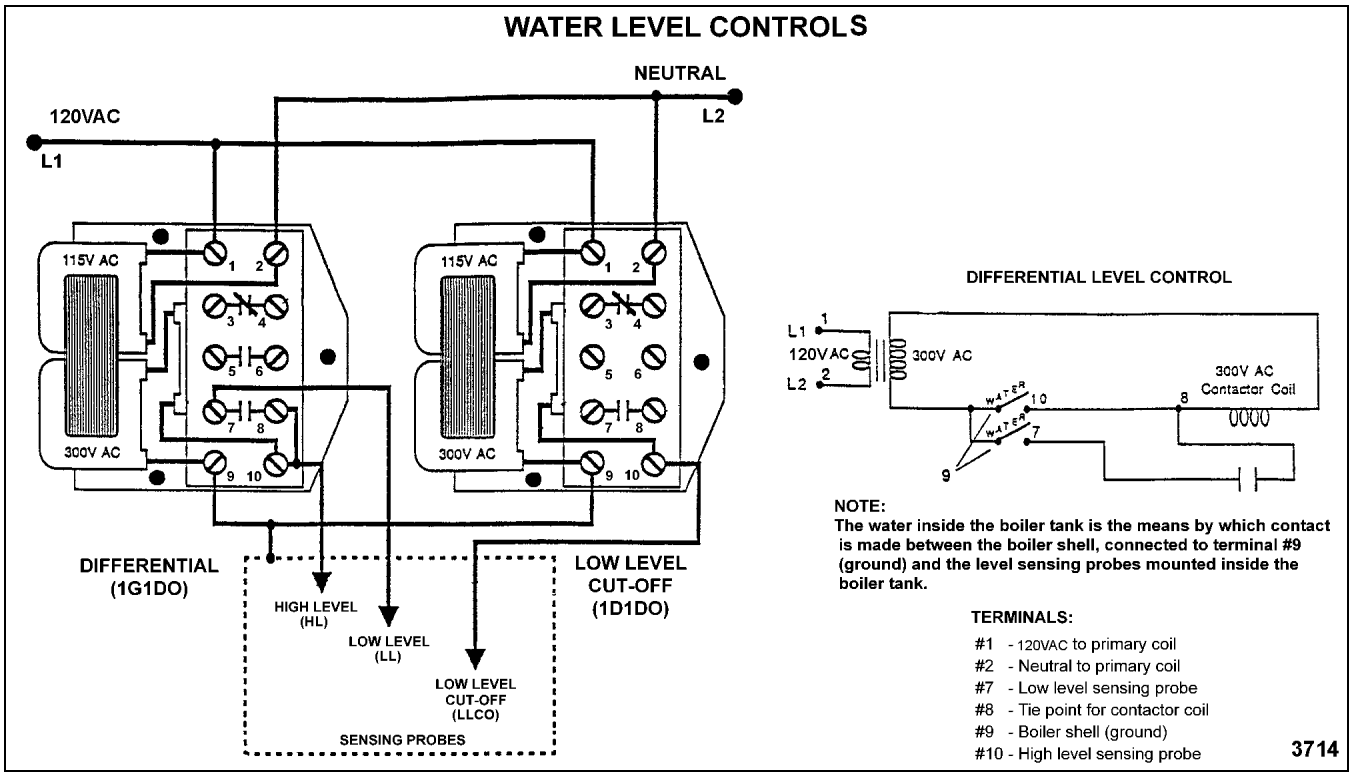
When the main power switch is turned ON, both water level controls are energized. The boiler fill solenoid is then energized through the normally closed contacts (terminals 3 & 4) on the differential level control and water begins filling the boiler.

When the water level reaches the low level cut-off (LLCO) probe, the internal contactor coil on the low water level control is energized. With the contacts on terminals 7 & 8 now closed, the heat source is then energized. The internal contactor coil will remain energized until the water level in the boiler drops below the LLCO probe.

When the water level reaches the low level (LL) probe, power to terminal 7 on the differential level control will be present but no switching occurs.

After the water level reaches the high level (HL) probe, the differential control contactor coil is energized and the normally closed contacts on terminals 3 & 4 open, which de-energizes the boiler fill solenoid and stops the flow of water into the boiler. The internal contactor coil will have a locking path through contacts 7 & 8 to the low level probe to keep the coil energized after the water level drops below the high level probe.

When the water level drops below the low level (LL) probe, the internal contactor coil is de-energized, returning contacts 3 & 4 back to their normally closed state and energizing the boiler fill solenoid to refill the boiler. The water level must then fill to the high level probe again, to energize the internal contactor coil. The differential control will toggle ON and OFF during a cooking cycle as needed.



Electro Mechanical - Auxiliary Low Level Cut-Off

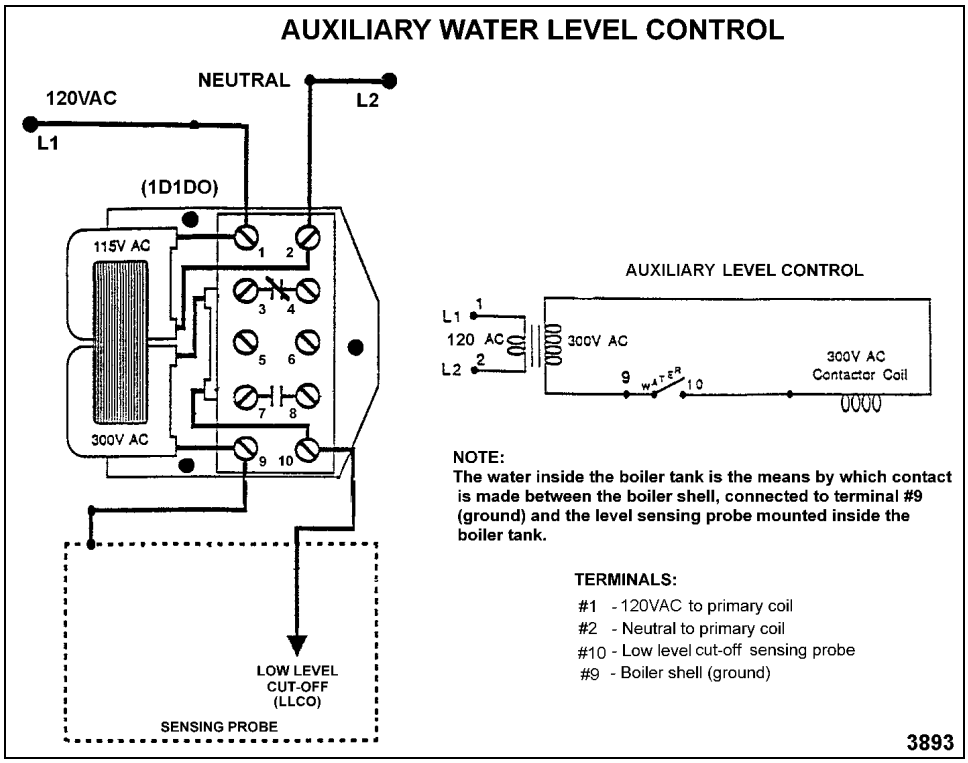
This control serves as a safety backup to the main low level cut-off (LLCO) control to meet Cal-Code requirements. The operation of the auxiliary control is identical to the main low level cut-off control but performs a single function: 1) Provide auxiliary low level cut-off protection to shut off the heat source in case the water level drops below the low level cut-off (LLCO) probe. A single LLCO probe identical to the LLCO probe on the main low level cut-off control is connected to the auxiliary control.

The auxiliary control is powered by input voltage (120VAC) on terminals 1 and 2 which also connect to the primary side of the internal transformer. The transformer secondary winding (300 VAC) will provide power to the internal contactor coil through a series path going from one side of the secondary winding, through the contactor coil, through the water level control probe, through the water in the boiler and to the boiler for ground. The other side of the transformer secondary is attached to the LLCO probe which directs power to the other side of the internal contactor coil.

When the main power switch is turned ON, the auxiliary low level control is energized but no switching occurs.

When the water level reaches the low level cut-off (LLCO) probe, the internal contactor coil on the low level control is energized, closing the contacts on terminals 7 & 8. The internal contactor coil will remain energized until the water level in the boiler drops below the LLCO probe.

When the boiler stops filling, press the manual reset button on the boiler control box. This closes and locks the manual reset switch contacts to energize the heat source auxiliary control.



SEQUENCE OF OPERATION

GAS MODELS

This sequence of operation is written for steamers with automatic ignition, solid state water level controls and the CSD-1 (code) option. Refer to schematic diagram number 3707.

INITIAL FILL AND PREHEAT

1. Conditions.
   - A. Power switch OFF.
   - B. Ignition module reset switch ON
   - C. Doors shut (closes the N.O. door switch contacts).
   - D. Cooking timers OFF.
   - E. Unit connected to correct voltage (120VAC).
     1) L1 to one side of the cooking compartment pressure switch (N.O.), then to the other compartment controls; to one side of the cold water condenser thermostat; to one side of the power ON/OFF switch.
     2) NEUTRAL to one side of the cooking compartment controls; to one side of the cold water condenser (CWC) solenoid valve; to one side of the power ON/OFF switch.
   - F. Unit properly grounded. (Boiler and water level control share a common ground)
   - G. Water supply valve on.
   - H. Gas supply valve on.
   - I. Gas combination control valve on.
   - J. Control (cycling) pressure switch closed.
   - K. High limit pressure switch closed.
   - L. Cold water condenser (CWC) thermostat open.
   - M. Blowdown solenoid valve (drain) open and boiler empty.
2. Power switch turned ON. (located on boiler control box)
   - A. Power switch indicator light (red) comes on.
   - B. Hi pressure indicator light (amber) comes on.
   - C. Low water level indicator light (amber) comes on.

NOTE: The high pressure indicator light will remain on and the safety circuit de-energized until boiler steam pressure is within operational limits (high limit pressure switch closed) and the manual reset button is pressed. The low water indicator light will remain on and the safety circuit de-energized until the water level in the boiler reaches the low level cut-off probes (minimum level) for the water level control, the auxiliary low level cut-off control and the manual reset switch is pressed. The gas burners will not light until these conditions are satisfied.

   - D. Water level control (WLC) is powered.
     1) High level (HL) relay is energized, HL-3 (N.O.) contacts close and HL LED lights up.
     2) The inverse latching relay of the board remains de-energized, leaving the ILR-1 (N.O.) and ILR-2 (N.C.) contacts in their shelf state.
   - E. Auxiliary low water level cut-off control is powered, LLCO-2 (N.O.) contacts remain open.
   - F. With the HL-3 and ILR-2 contacts closed, the fill solenoid is energized and water boiler begins filling.
   - G. Blowdown solenoid valve is energized and closes.
   - H. Ignition module begins sparking to light pilot after a 3 second delay.
     1) If pilot ignition is established (pilot lit) then a micro amp flame sense current is sent back to the ignition control module through the ignition cable. Sparking stops, pilot remains lit and is ready to ignite burners.
     2) If pilot ignition is not established after 90 seconds, sparking stops and the ignition control module locks out power to the combination gas valve (pilot valve and main valve remain closed). The module remains locked out until the reset switch on the ignition control module box is switched to off then on to re-start the ignition trial cycle.

NOTE: If the modules re-set switch is in the off position, no sparking will occur or if it's turned off while in ready or cook mode then pilot and burners will go out and not re-ignite upon call for heat by the cycling pressure switch.

3. Water level reaches LLCO (low water level cut-off) probe for the water level control and to the auxiliary LLCO probe for the auxiliary low level cut-off control.

A. Power to terminal 9 on the water level control.

1) LLCO relay energizes, LLCO-2 (N.O.) contacts close and LED lights.

B. Power to terminal LLCO on the auxiliary low water level cut-off control.

1) LLCO relay energizes, LLCO-2 (N.O.) contacts close and LED lights.

NOTE: LLCO relays will remain energized and LLCO LED'S will remain lit until the water level drops below the LLCO probes or the power switch is turned off.

4. Water reaches LL (low level) probe.

A. Power to terminal 2 on the water level control is present but no switching occurs.

5. Water reaches HL (high level) probe.

A. Power to terminal 6 on water level control.

1) The inverse latching relay of the board is energized, changing the state of ILR-1 (N.O.) and ILR-2 (N.C.) contacts. The inverse latching relay will remain energized through the alternate latching path of ILR-1 contacts until the water level recedes below the low level probe.

2) With ILR-2 contacts open, HL relay is de-energized, HL-3 (N.O.) contacts open and HL LED goes out.

3) Water fill solenoid is de-energized. (boiler fill time 4-11 min.)

6. Manual re-set switch is pressed, energizing the coils on the high limit and low water relays.

A. Contacts 1 & 9 on the high pressure relay change state and lock from N.C. to N.O. and turn off the high pressure indicator light. Concurrently, Contacts 1 & 9 on the low water relay change state and lock from N.C. to N.O. and turn off the low water indicator light.

B. Contacts 5 & 9 on the high pressure relay change state and lock from N.O. to N.C., supplying power (NEUTRAL) to one side of the auxiliary gas solenoid valve. Concurrently, Contacts 5 & 9 on the low water relay change state and lock from N.O. to N.C., supplying power (L1) to the other side of the auxiliary gas solenoid valve.

NOTE: For both relays to energize, the high pressure switch must be closed and the water level in the boiler must be above the low level cut-off probes in order for LLCO-2 (N.O.) contacts to close.

C. Auxiliary gas solenoid valve is energized and opens to allow gas flow.

D. As long as the ignition control module is sensing a pilot flame, the internal main valve (MV) contacts close (N.O.) on the ignition control module. The main gas valve is energized and gas begins flowing.

E. Burners light and boiler begins to heat up.

7. Cooking compartment pressure switch closes as boiler steam pressure reaches 3 PSI. (Approximately 14 min.)

A. Cooking compartment ready light (green) comes on.

NOTE: If a cooking timer is set immediately after the ready light comes on, a loud clanking sound will be heard (oil caning) and the ready lights will flash for several seconds. This condition is caused by the manifold pressure being on the fringe of the pressure switch set point. When a cook timer is set, the compartment steam solenoid valve opens causing the manifold steam pressure to drop, slightly below the pressure switch set point. At the same time, steam pressure is still increasing in the boiler. This opposing condition causes a pressure bounce to occur but after the steam pressure passes approximately 4 psi this condition subsides. Under normal steam cycling pressures, this condition will not be seen.

8. Boiler steam pressure reaches upper limit set point of 10 PSI. (Approximately 15 min.)

A. Cycling pressure switch opens, main gas solenoid valve de-energizes, gas flow shuts off and burners go out.

B. As boiler heats up and builds pressure, some by-pass water/steam is produced which runs into the steam drain box. This causes the cold water condenser (CWC) solenoid to cycle, cooling the drain water. This solenoid is powered by the CWC thermostat.

NOTE: Steam should not be seen entering either compartment until a cook time is set. This energizes the steam solenoid valve of the cooking compartment to allow steam flow.

9. Boiler steam pressure drops below lower limit set point of 8 PSI and the cycling pressure switch closes.

A. Boiler steam pressure is maintained by the cycling of the pressure switch between the upper and lower set point limits. The cycling pressure switch continues to energize and de-energize the main gas solenoid valve starting and stopping the flow of gas, which in turn, cycles the burners on and off. This sequence continues until one of the following occurs:

1) Boiler pressurizes to 15 PSI, causing the high limit pressure switch to open. At that time, the auxiliary gas valve de-energizes, shutting off the gas flow to the burners and the high limit failure light will come on. This light will stay lit until the pressure drops below the lower limit set point of 6 PSI and the manual re-set switch is pressed.

2) Boiler water level drops below the LLCO probes for the water level and the auxiliary low level cut-off controls which then de-energizes the LLCO relays, changing the contact state of LLCO-2 (N.O.) back to open. This de-energizes the main and auxiliary gas solenoid valves. The gas solenoid valves will remain off and the low water level light will come on and stay lit until the water level rises above the LLCO probes and the manual re-set switch is pressed.

COOK CYCLE

1. A Cook cycle should not be started, until the initial fill and preheat is completed, in order for the boiler steam pressure to be within operational limits.
   A. Ready light (green) is lit.
   B. Product is inserted into steamer.
   C. Door is closed.
   D. Timer is dialed on timer.
2. Contacts 1/3 of cook timer close.
   A. Ready light (green) goes out.
   B. Cooking light (red) comes on.
   C. Timer motor is energized.
   D. Compartment steam solenoid valve energized and steam begins to enter the compartment.

NOTE: Burners will re-light after the boiler pressure drops below the low pressure set point limit (8 psi) and will stay on until the high pressure set point (10 psi) is reached. As long as steam pressure is within limits, even while cooking, burners can go off. The boiler is able to re-pressurize to the upper set point limit even with both compartments in cook mode.

NOTE: The cold water condenser thermostat remains closed and cold water condenser solenoid stays energized while cooking. If main water is shut off after boiler fill, then no cold water is present to condense steam/hot water and steam vapors exit the floor drain.

3. Time expires on timer.
   A. Timer contacts 1/3 open.
   B. Steam solenoid valve de-energized, stopping the flow steam into compartment.
   C. Cooking light goes out.
   D. Timer contacts 4/1 close and energize buzzer until manually turned off.
   E. Ready light (green) comes on.
   F. Timer motor de-energized.
4. Timer manually turned off.
   A. Contacts 1/4 open
   B. Alarm Buzzer de-energized and stops buzzing.
5. Steamer reverts to preheat cycle until time is dialed into timer and the door is shut, water level drops below low level cut-off probe or the power switch is turned off.

WATER REFILL (AFTER INITIAL FILL)

1. Water level drops below low level probe (LL).
   A. Power is removed from terminal 2 on the water level control .
      1) The inverse latching relay is de-energized, returning ILR-1 (N.O.) and ILR-2 (N.C.) contacts back to their original state.
   B. HL relay is energized.
      1) Contacts HL-3 close.
      2) HL LED comes on.
      3) Fill solenoid is energized and water flows into tank.
2. Water reaches LL (low level) probe.
   A. Power to terminal 2 on the water level control is present but no switching occurs.
3. Water reaches high level probe.

A. The inverse latching relay of the water level control is energized, changing the state of ILR-1 (N.O.) and ILR-2 (N.C.) contacts.

B. HL relay is de-energized.

1) HL-3 opens.

2) Fill solenoid de-energized and water stops flowing into tank.

3) HL LED goes out.

4. The water refill cycle will occur whenever the water level is below the low level probe and will not affect the operation of either the preheat or cook cycle.

BOILER BLOWDOWN/DRAIN

1. Main power switch turned OFF.

A. Boiler blowdown sequence starts.

B. The blowdown solenoid valve (N.O.) is de-energized and valve opens to drain the boiler.

C. Power is removed from all components except cold water condenser (CWC) thermostat and solenoid valve. The CWC thermostat cycles as necessary to lower the discharge temperature of the water and condense steam going into the drain.

ELECTRIC MODELS

This sequence of operation is written for steamers with solid state water level controls and the Cal-Code option. Refer to schematic diagram number 3699.

INITIAL FILL AND PREHEAT

1. Conditions.

A. Power switch OFF.

B. Doors shut. (closes the N.O. door switch contacts)

C. Cooking timers off.

D. Unit connected to correct voltage supply.

1) L1 (HOT) to in-line fuse (10 amp.); to one side of the primary on the step down transformer (H1); from one side of the secondary winding (X1) to one side of the cooking compartment pressure switch (N.O.), then to the other compartment controls; to one side of the cold water condenser (CWC) thermostat (N.O.); to one side of the power ON/OFF switch.

2) L2 (NEUTRAL) to in-line fuse (10 amp.); to the other side of the primary on the step down transformer (H2); from the other side of the secondary winding (X1) to the other side of the cooking compartment controls; to the other side of the cold water condenser (CWC) solenoid valve; to the other side of the power ON/OFF switch.

E. Unit properly grounded. (Boiler and water level control share a common ground)

F. Water supply valve on.

G. Control (cycling) pressure switch closed.

H. High limit pressure switch closed.

I. Cold water condenser (CWC) thermostat open.

J. Blowdown solenoid valve (drain) open and boiler empty.

2. Power switch turned ON. (located on boiler control box)

A. Power switch indicator light (red) comes on.

B. Water level control (WLC) is powered.

1) High Level (HL) relay is energized, HL-3 (N.O.) contacts close and HL LED lights up.

2) The inverse latching relay of the remains de-energized, leaving the ILR-1 (N.O.) and ILR-2 (N.C.) contacts in their shelf state.

C. Auxiliary low water level cut-off control is powered, LLCO-2 (N.O.) contacts remain open.

D. With the HL-3 and ILR-2 contacts close, the fill solenoid is energized and boiler begins filling.

E. Blowdown solenoid valve is energized and closes.

3. Water level reaches LLCO (low water level cut-off) probe for the water level control and to the auxiliary LLCO probe for the auxiliary low level cut-off control.

A. Power to terminal 9 on the main water level control.

1) LLCO relay energizes, LLCO-2 (N.O.) contacts close and LLCO LED lights.

B. Power to terminal LLCO on the auxiliary low level cut-off control.

1) LLCO relay energizes, LLCO-2 (N.O.) contacts close and LLCO LED lights.

NOTE: LLCO relays will remain energized and LLCO LED'S will remain lit until the water level drops below the LLCO probes or the power switch is turned off.

4. Water reaches LL (low level) probe.
    A. Power to terminal 2 on the water level control is present but no switching occurs.
5. Water reaches HL (high level) probe.
    A. Power to terminal 6 on the water level control.
        1) The inverse latching relay of the is energized, changing the state of ILR-1 (N.O.) and ILR-2 (N.C.) contacts. The inverse latching relay will remain energized through the alternate latching path of ILR-1 contacts until the water level recedes below the low level probe.
        2) With ILR-2 contacts open, HL relay is de-energized, HL-3 (N.O.) contacts open and HL LED goes out.
        3) Water fill solenoid is de-energized. (boiler fill time 4-11 min.)
6. Manual re-set switch is pressed.
    A. Manual reset switch contacts (N.O.) close and lock.
    B. Heater contactors are energized, suppling power to the heating elements.
    C. Water in boiler heats up.
7. Cooking compartment pressure switch closes as boiler steam pressure reaches 3 PSI. (Approximately 14 min.)
    A. Cooking compartment ready light (green) comes on.

NOTE: If a cooking timer is set immediately after the ready light comes on, a loud clanking sound will be heard (oil caning) and the ready lights will flash for several seconds. This condition is caused by the manifold pressure being on the fringe of the pressure switch set point. When a cook timer is set, the compartment steam solenoid valve opens causing the manifold steam pressure to drop, slightly below the pressure switch set point. At the same time, steam pressure is still increasing in the boiler. This opposing condition causes a pressure bounce to occur but after the steam pressure passes approximately 4 psi this condition subsides. Under normal steam cycling pressures, this condition will not be seen.

8. Boiler steam pressure reaches upper limit set point pressure of 13 PSI. (Approximately 15 min.)
    A. Cycling pressure switch opens, heater contactors de-energize and power to heating elements is removed.
    B. As boiler heats up and builds steam pressure, some by-pass water/steam is produced which runs in to the steam drain box. This causes the cold water condenser (CWC) solenoid to cycle, cooling the drain water. This solenoid is powered by the CWC thermostat.

NOTE: Steam should not be seen entering either compartment until a cook time is set. This energizes the steam solenoid valve of the cooking compartment to allow steam flow.

9. Boiler steam pressure drops below lower limit set point of 11 PSI and the cycling pressure switch closes.
    A. Boiler steam pressure is maintained by the cycling of the pressure switch between the upper and lower set point limits. The cycling pressure switch continues to energize and de-energize the heating element contactor(s), which in turn, cycles the heating elements on and off. This sequence continues until one of the following occurs:
        1) Boiler pressurizes to 15 PSI, causing the High Limit pressure switch to open. At that time, the auxiliary heating element contactors are de-energized, shutting off power to the heating elements. The pressure switch will remain open until the pressure drops below the lower limit set point of 6 PSI and the manual re-set switch is pressed.
        2) Boiler water level drops below the LLCO probes for the water level and the auxiliary low level cut-off controls which de-energizes the LLCO relays and changes the contact state of LLCO-2 (N.O.) back to open. This de-energizes the main and auxiliary heating element contactors, shutting off power to the heating elements. The heating elements will remain off until the water level rises above the LLCO probes and the manual re-set switch is pressed.

COOK CYCLE

1. A Cook cycle should not be started, until the initial fill and preheat is completed, in order for the boiler steam pressure to be within operational limits.

A. Ready light (green) is lit.

B. Product is inserted into steamer.

C. Door is closed.

D. Timer is dialed on timer.

2. Contacts 1/3 of cook timer close.

A. Ready light (green) goes out.

B. Cooking light (red) comes on.

C. Timer motor is energized.

D. Compartment steam solenoid valve energized and steam begins to enter the compartment.

NOTE: Heating elements will come on after the boiler pressure drops below the low pressure set point (11 PSI) and will stay on until the high pressure set point (13 PSI) is reached. As long as steam pressure is within these limits, even while cooking, heating elements can go off. The boiler is able to re-pressurize to the upper set point, even with both compartments in cook mode.

NOTE: The cold water condenser thermostat remains closed and cold water condenser solenoid stays energized while cooking. If main water is shut off after boiler fill, then no cold water is present to condense steam/hot water and steam vapors exit the floor drain.

3. Time expires on timer.

A. Timer contacts 1/3 open.

B. Steam solenoid valve de-energized, stopping the flow steam into compartment.

C. Cooking light goes out.

D. Timer contacts 4/1 close and energize buzzer until manually turned off.

E. Ready light (green) comes on.

F. Timer motor de-energized.

4. Timer manually turned off.

A. Contacts 1/4 open

B. Alarm Buzzer de-energized and stops buzzing.

5. Steamer reverts to preheat cycle until time is dialed into timer and the door is shut, water level drops below low level cut-off probe or the power switch is turned OFF.

WATER REFILL (AFTER INITIAL FILL)

1. Water level drops below low level probe (LL).

A. Power is removed from terminal 2 on the water level control.

1) The inverse latching relay is de-energized, returning ILR-1 (N.O.) and ILR-2 (N.C.) contacts back to their original state.

B. HL relay is energized.

1) Contacts HL-3 close.

2) HL LED comes on.

3) Fill solenoid is energized and water flows into tank.

2. Water reaches LL (low Level) probe.

A. Power to terminal 2 on the water level control is present but no switching occurs.

3. Water reaches high level probe.

A. The inverse latching relay of the is energized, changing the state of ILR-1 (N.O.) and ILR-2 (N.C.) contacts.

B. HL relay is de-energized.

1) HL-3 opens.

2) Fill solenoid de-energized and water stops flowing into tank.

3) HL LED goes out.

4. The water refill cycle will occur whenever the water level is below the low level probe and will not affect the operation of either the preheat or cook cycle.

BOILER BLOWDOWN/DRAIN

1. Main power switch turned OFF.

A. Boiler blowdown sequence starts.

B. The blowdown solenoid valve (N.O.) is de-energized and valve opens to drain the boiler.

C. Power is removed from all components except cold water condenser (CWC) thermostat and solenoid valve. The CWC thermostat cycles as necessary to lower the discharge temperature of the water and condense steam going into the drain.

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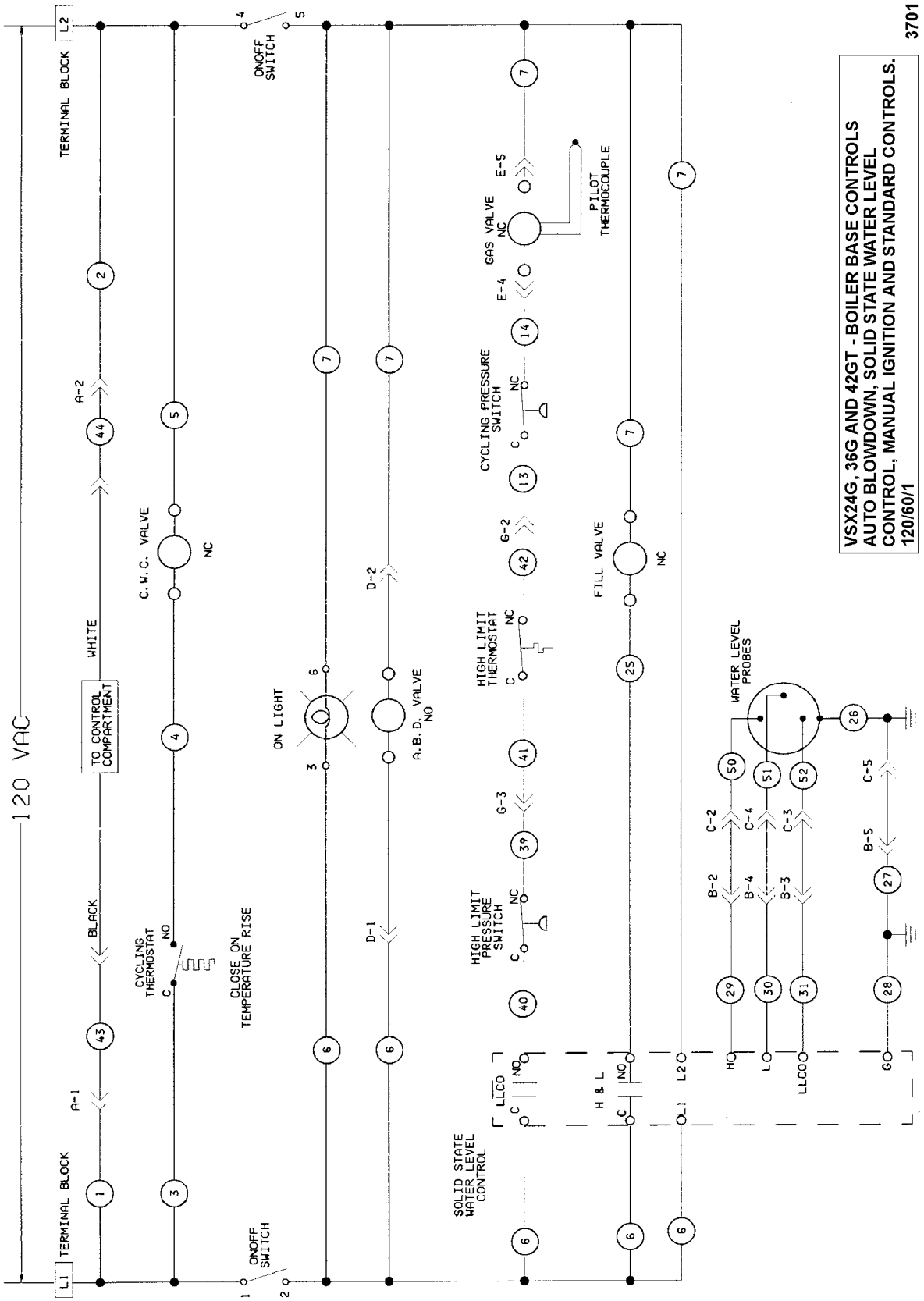
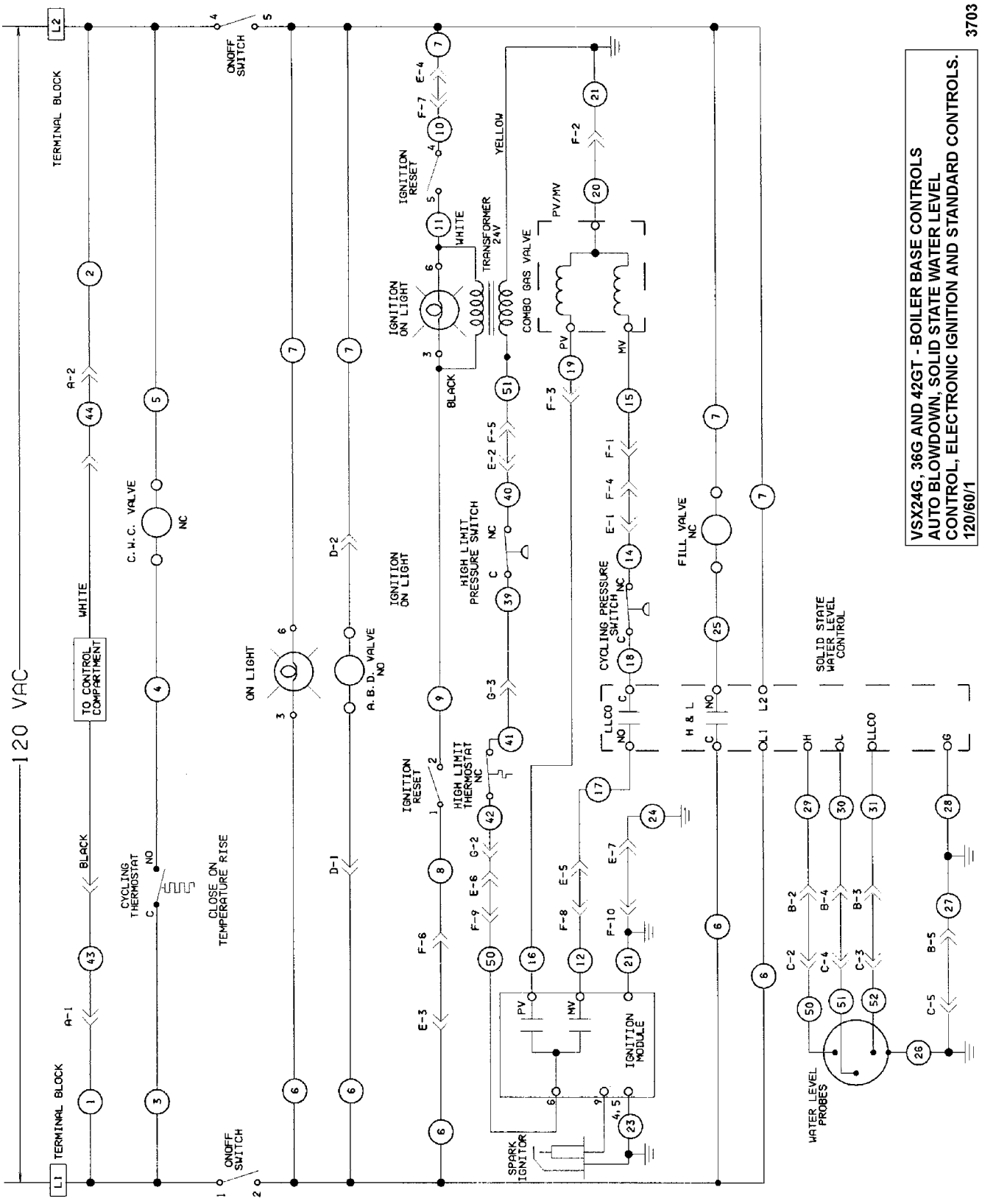
SCHEMATICS, GAS STEAMERS, BOILER CONTROLS VSX24G, 36G AND 42GT

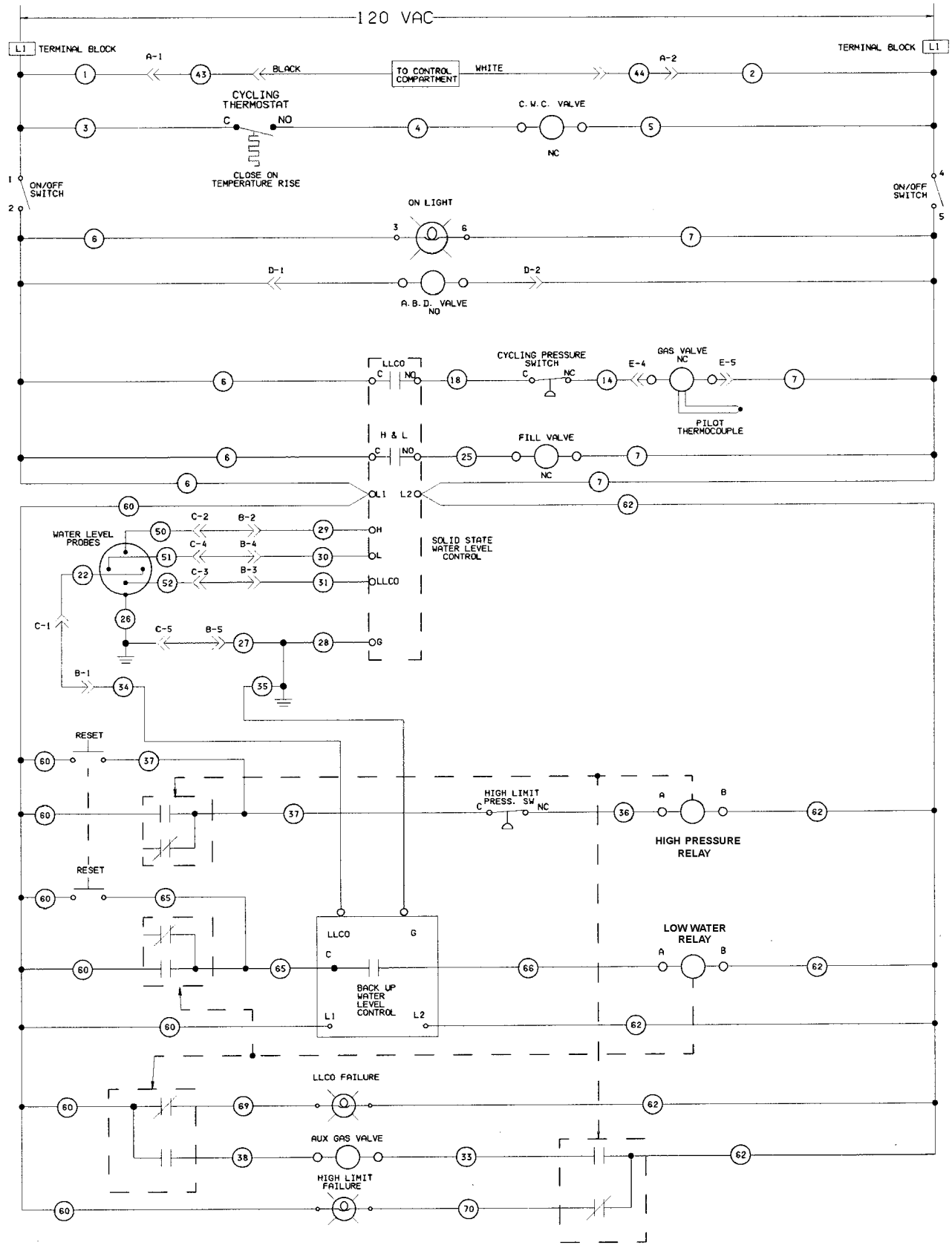
Manual Ignition, Standard Controls



Electronic Ignition, Standard Controls



Manual Ignition, CSD-1 Code Controls

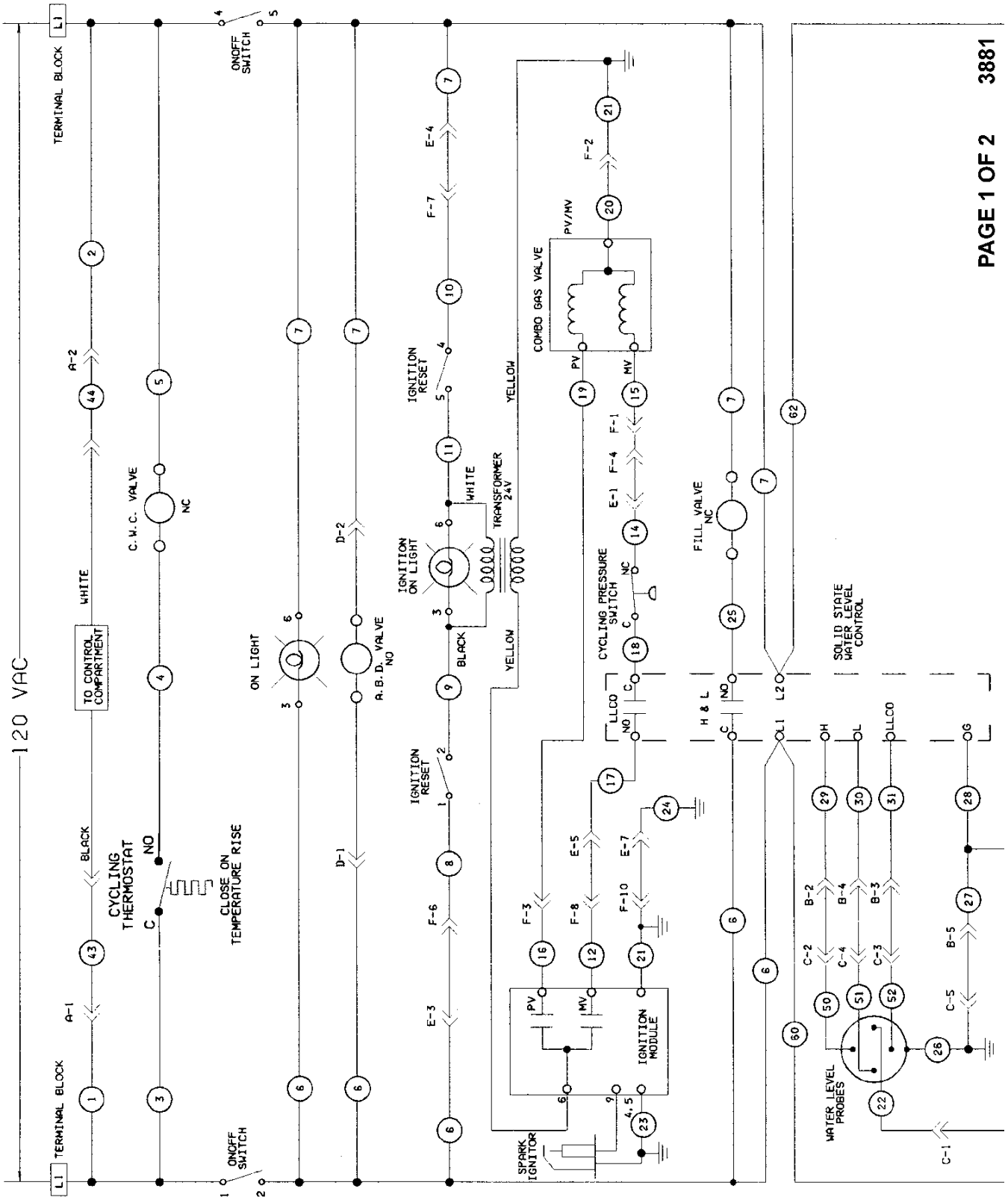


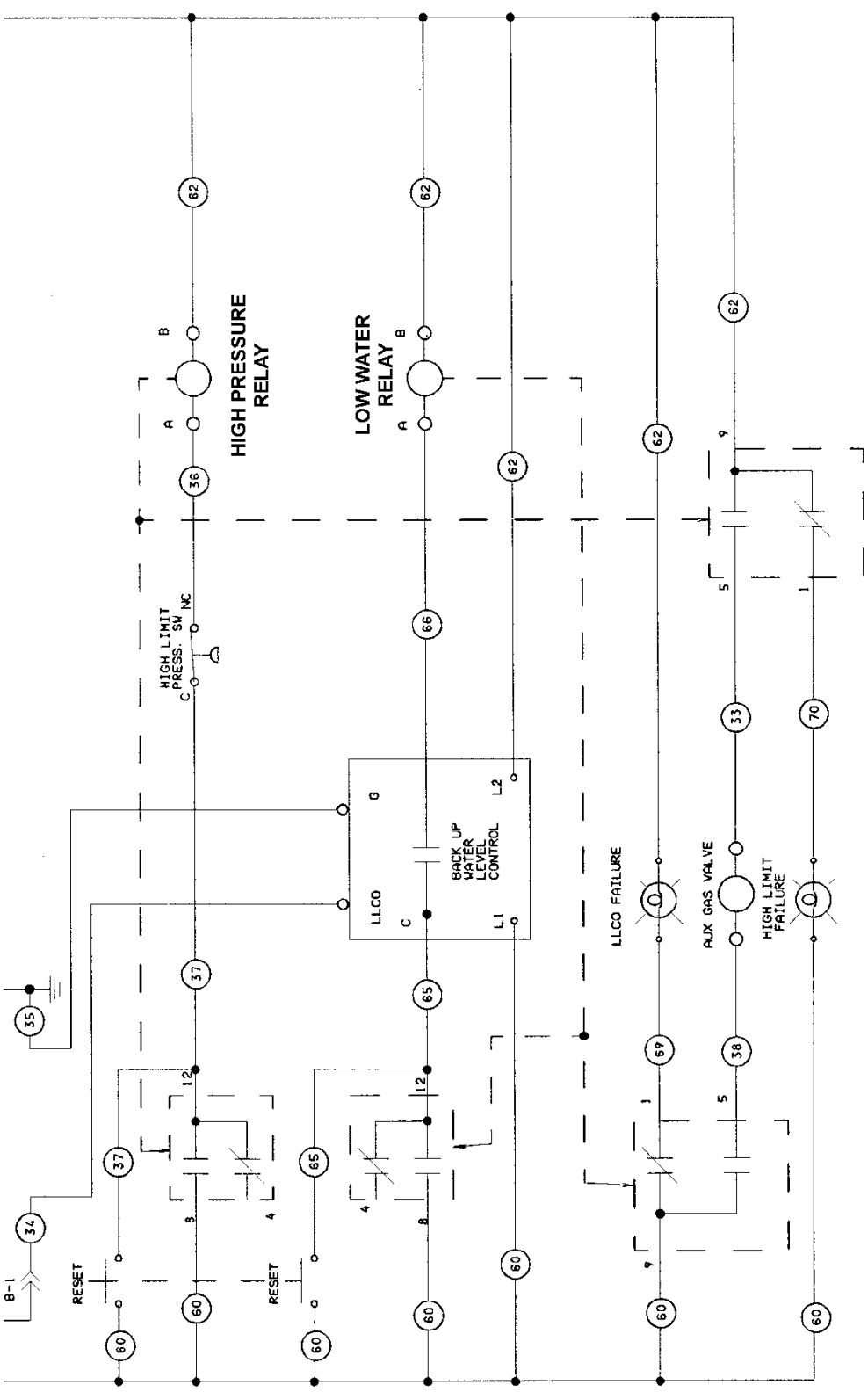
NOTE:
CSD-1 MEETS AND EXCEEDS CAL-CODE REQUIREMENTS AND IS OFTEN REFERRED TO AS CAL-CODE/CSD-1.

VSX24G, 36G AND 42GT - BOILER BASE CONTROLS AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL, MANUAL IGNITION AND CSD-1 CONTROLS.

3705

Electronic Ignition, CSD-1 Code Controls





PAGE 2 OF 2

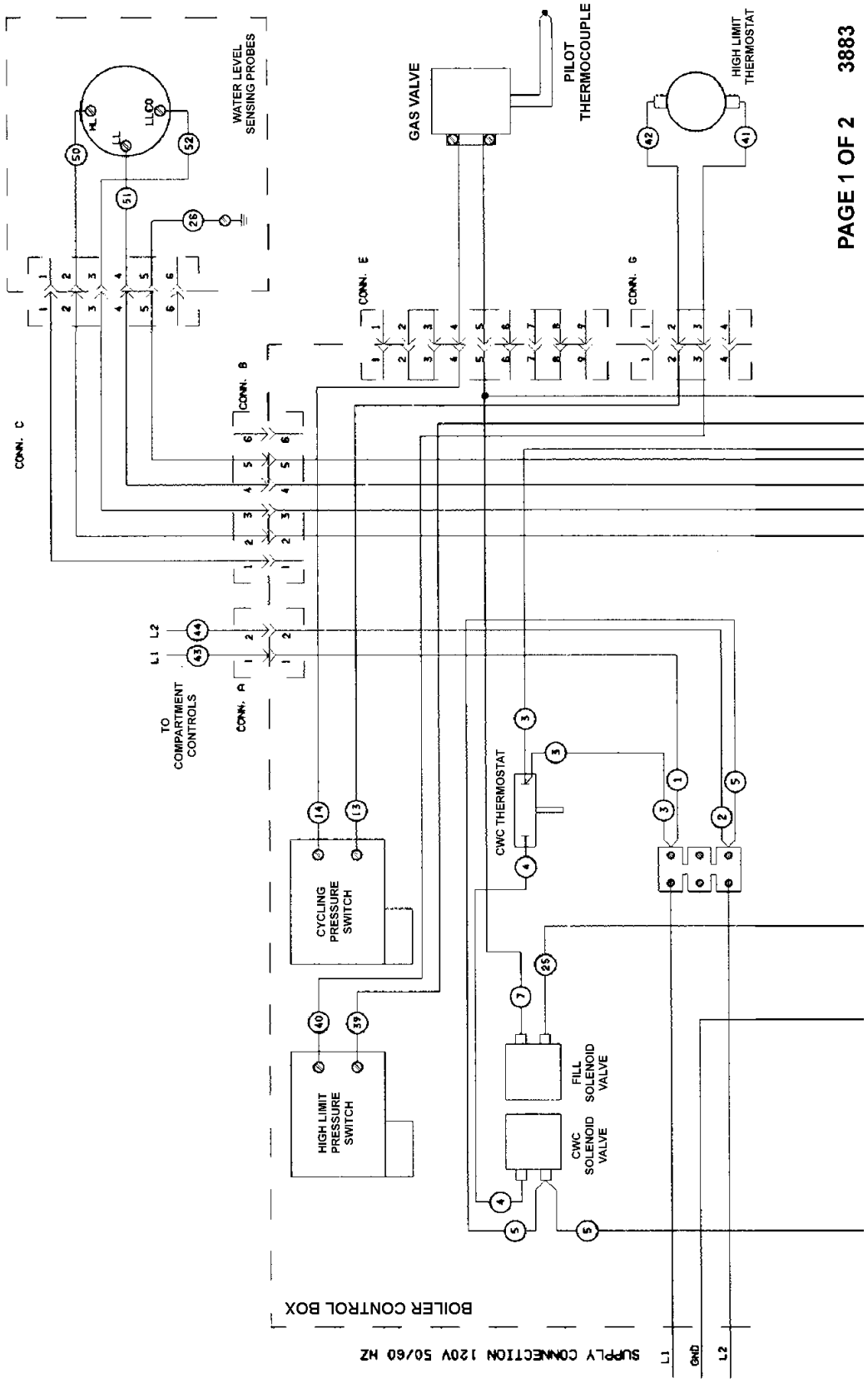
VSX24G, 36G AND 42GT - BOILER BASE CONTROLS
AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL, ELECTRONIC IGNITION AND CSD-1 CONTROLS.
120/60/1

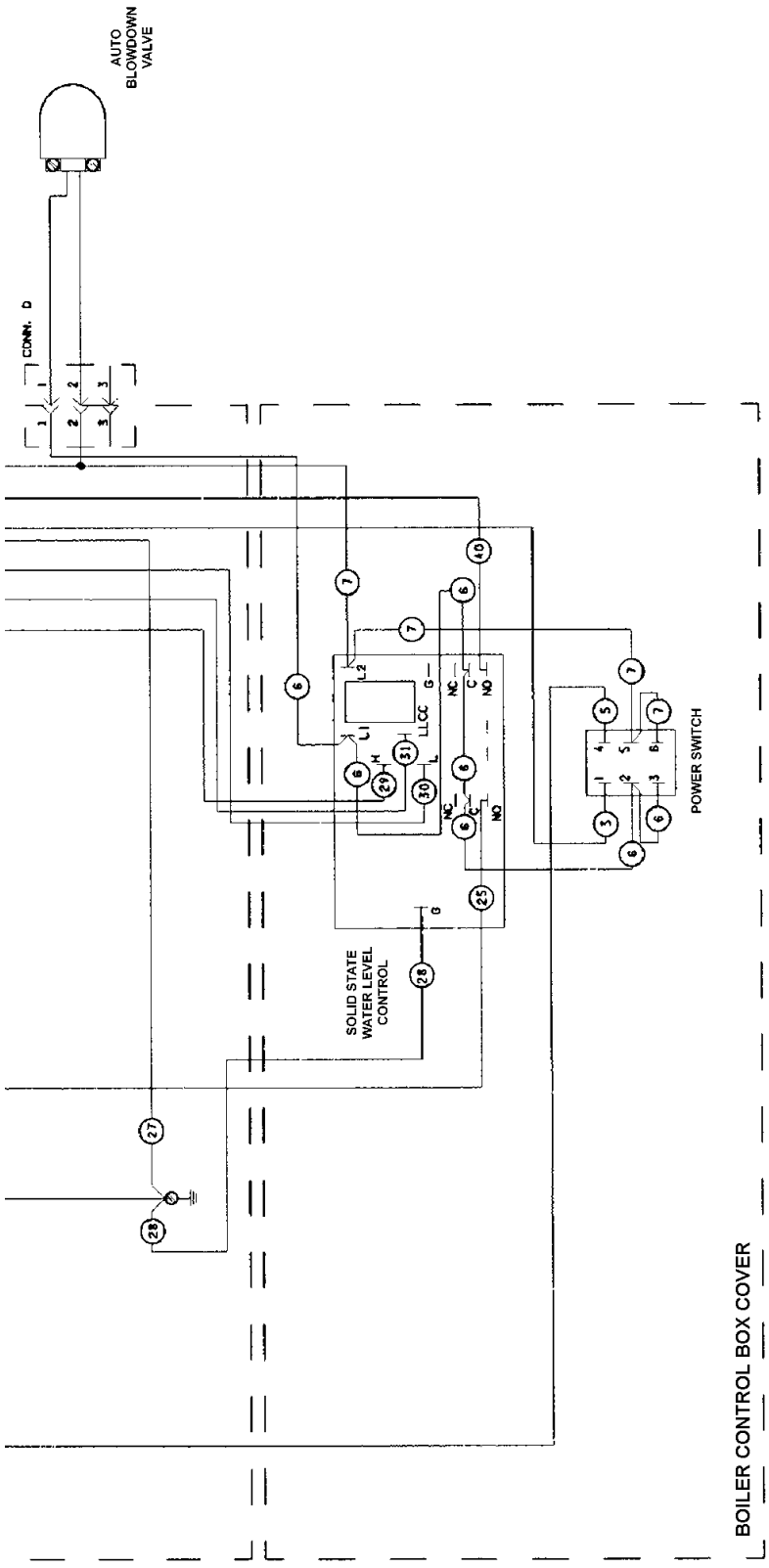
3707

NOTE:
CSD-1 MEETS AND EXCEEDS CAL-CODE REQUIREMENTS AND IS OFTEN REFERRED TO AS CAL-CODE/CSD-1.

WIRING DIAGRAMS, GAS STEAMERS, BOILER CONTROLS VSX24G, 36G AND 42GT

Manual Ignition, Standard Controls





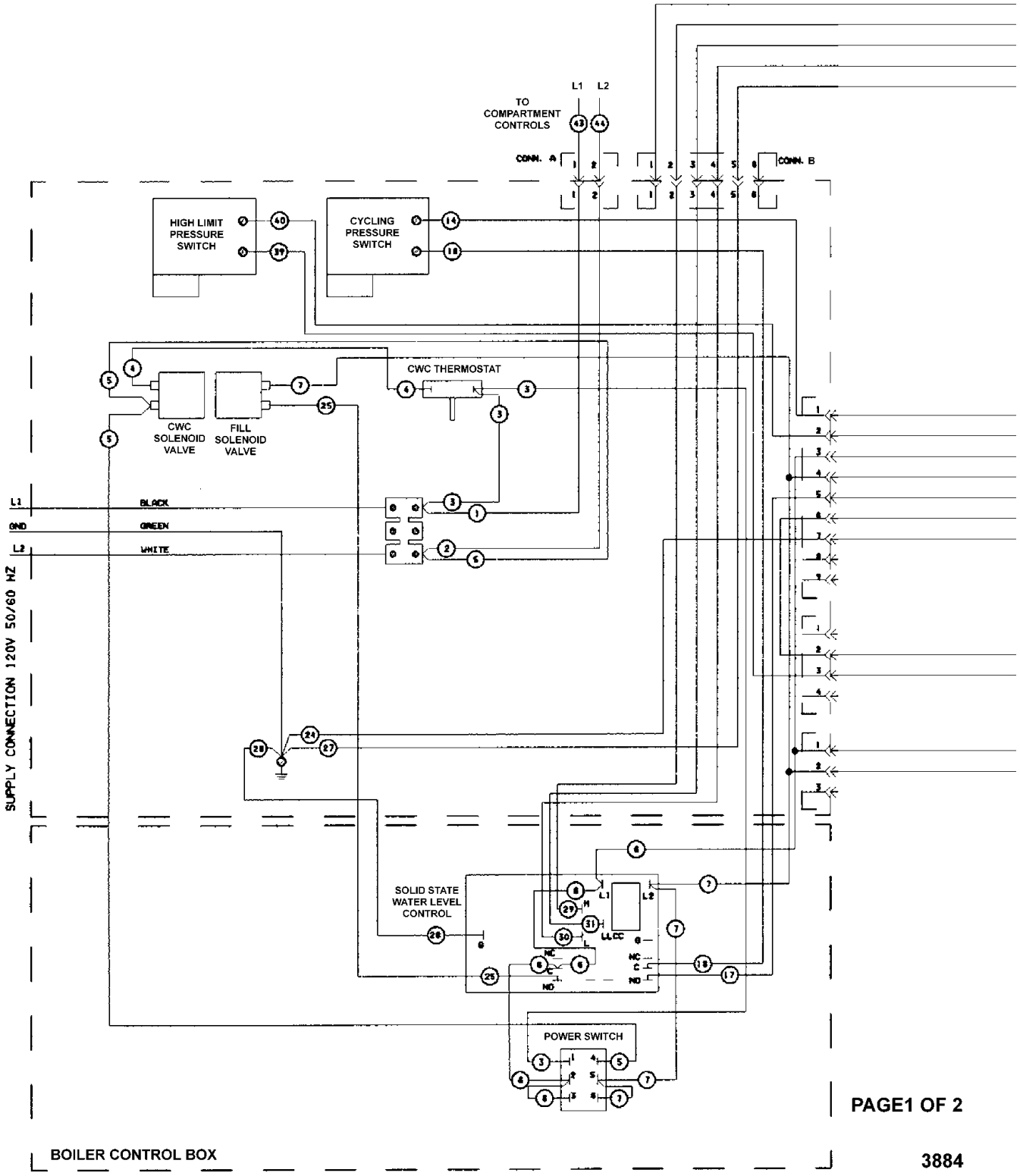
NOTE:
HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY.
SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

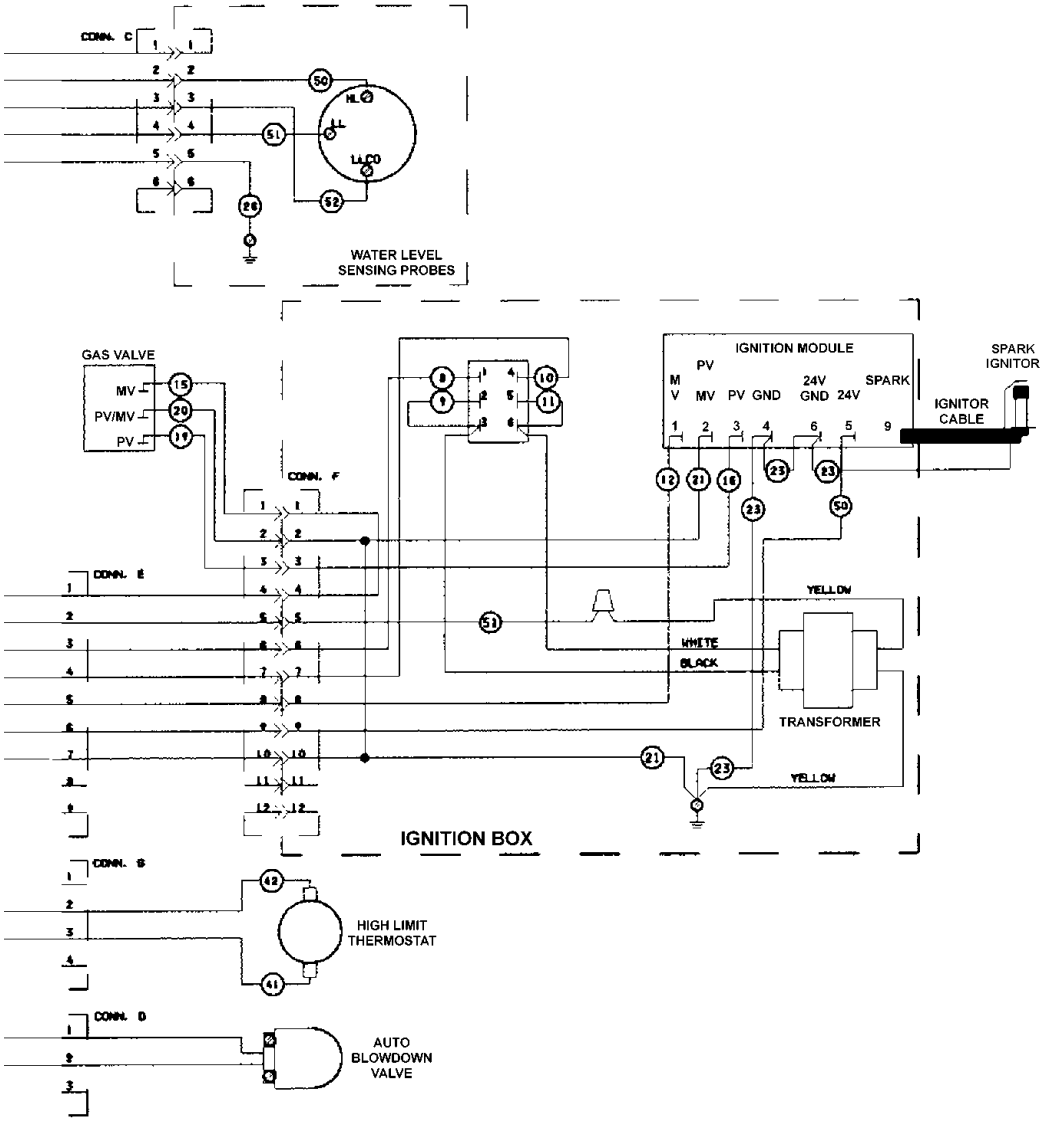
PAGE 2 OF 2

VSX24G, 36G AND 42GT - BOILER BASE CONTROLS
AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL, MANUAL IGNITION AND STANDARD CONTROLS.
120/60/1

3702

Electronic Ignition, Standard Controls





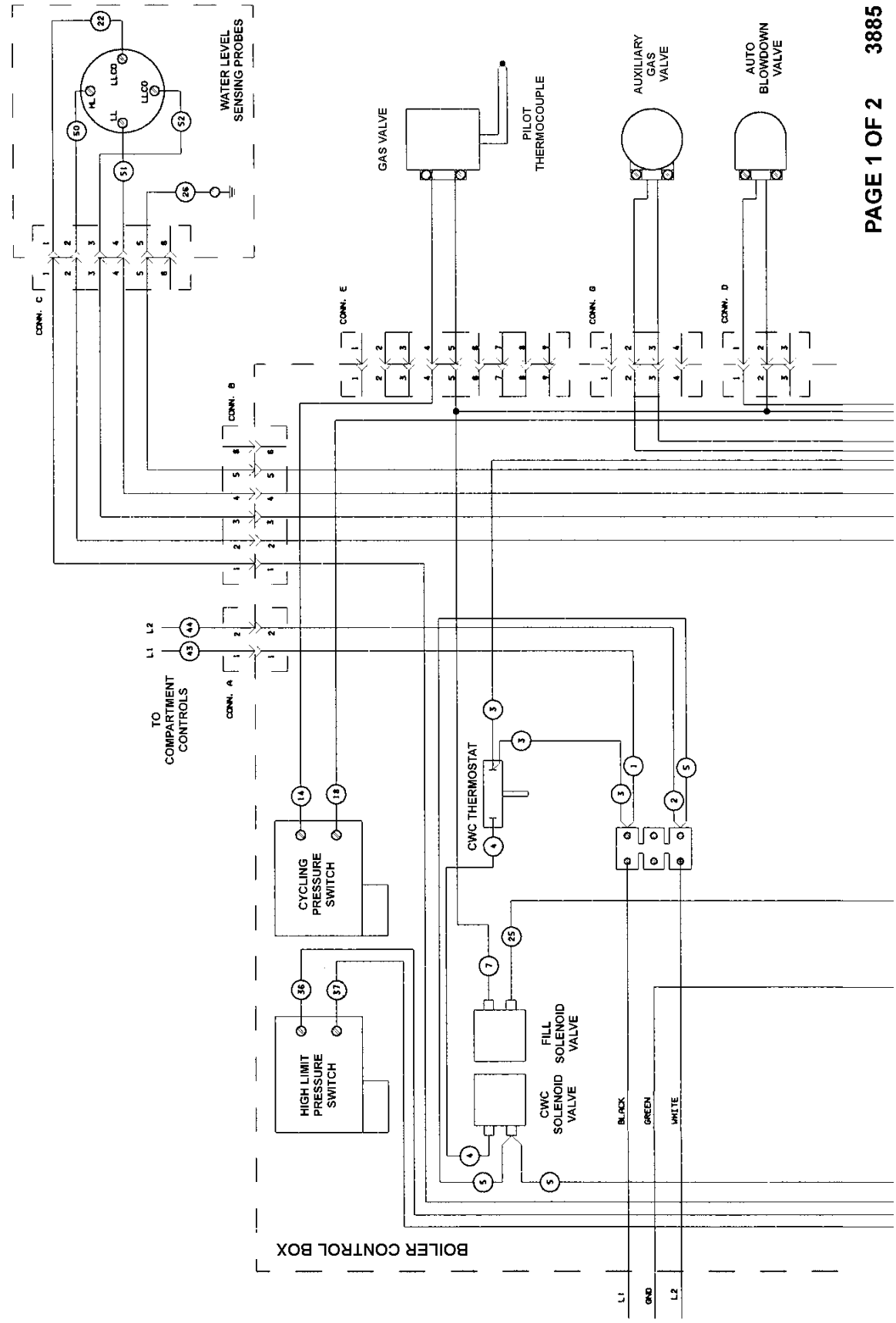
NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY.
SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

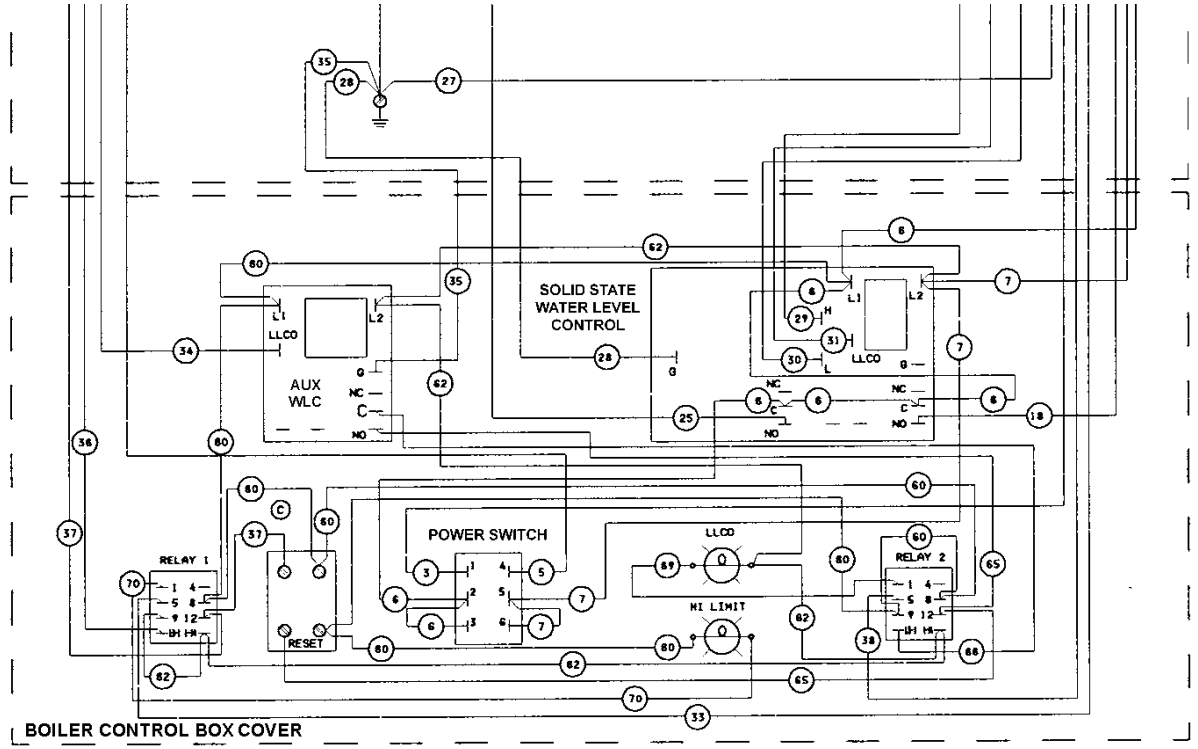
PAGE 2 OF 2

**VSX24G, 36G AND 42GT - BOILER BASE CONTROLS
AUTO BLOWDOWN, SOLID STATE WATER LEVEL
CONTROL, ELECTRONIC IGNITION AND STANDARD CONTROLS.
120/60/1**

3704

Manual Ignition, CSD-1 Code Controls



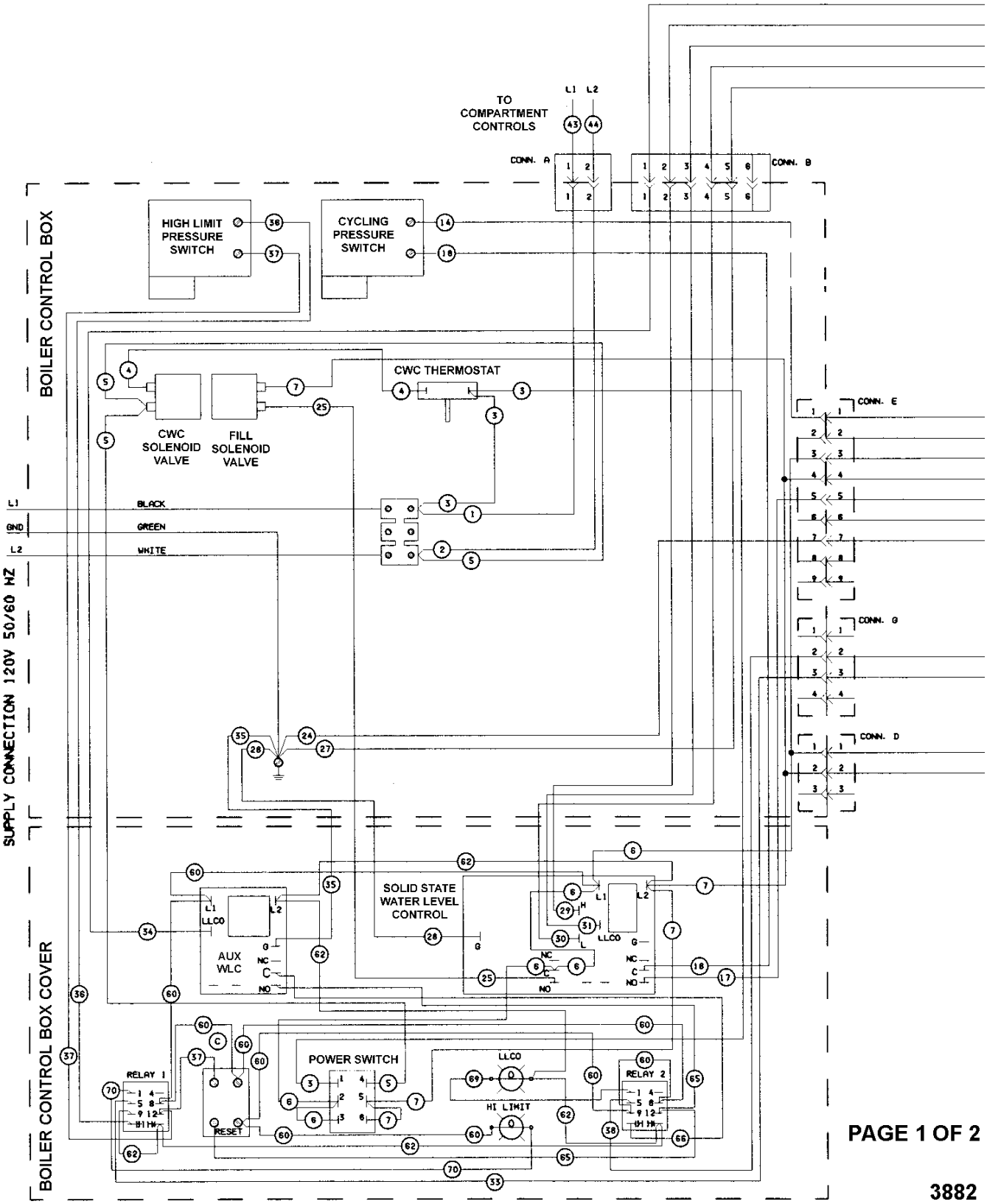


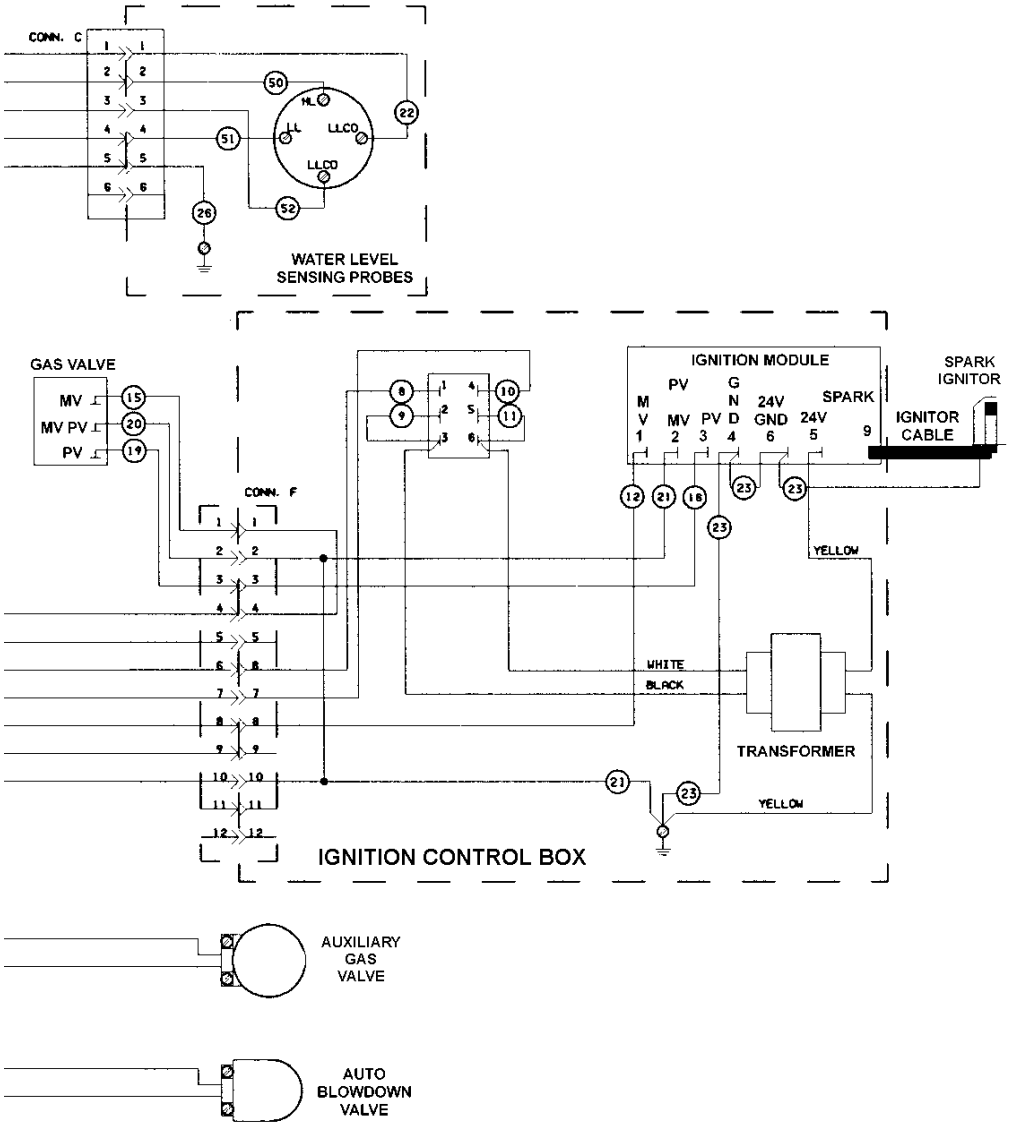
NOTE:
CSD-1 MEETS AND EXCEEDS CAL-CODE REQUIREMENTS
AND IS OFTEN REFERRED TO AS CAL-CODE/CSD-1.

NOTE:
HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY.
SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

VSX24G, 36G AND 42GT - BOILER BASE CONTROLS AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL, MANUAL IGNITION AND CSD-1 CONTROLS.

Electronic Ignition, CSD-1 Code Controls





NOTE:
CSD-1 MEETS AND EXCEEDS CAL-CODE REQUIREMENTS
AND IS OFTEN REFERRED TO AS CAL-CODE/CSD-1.

NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY.
SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

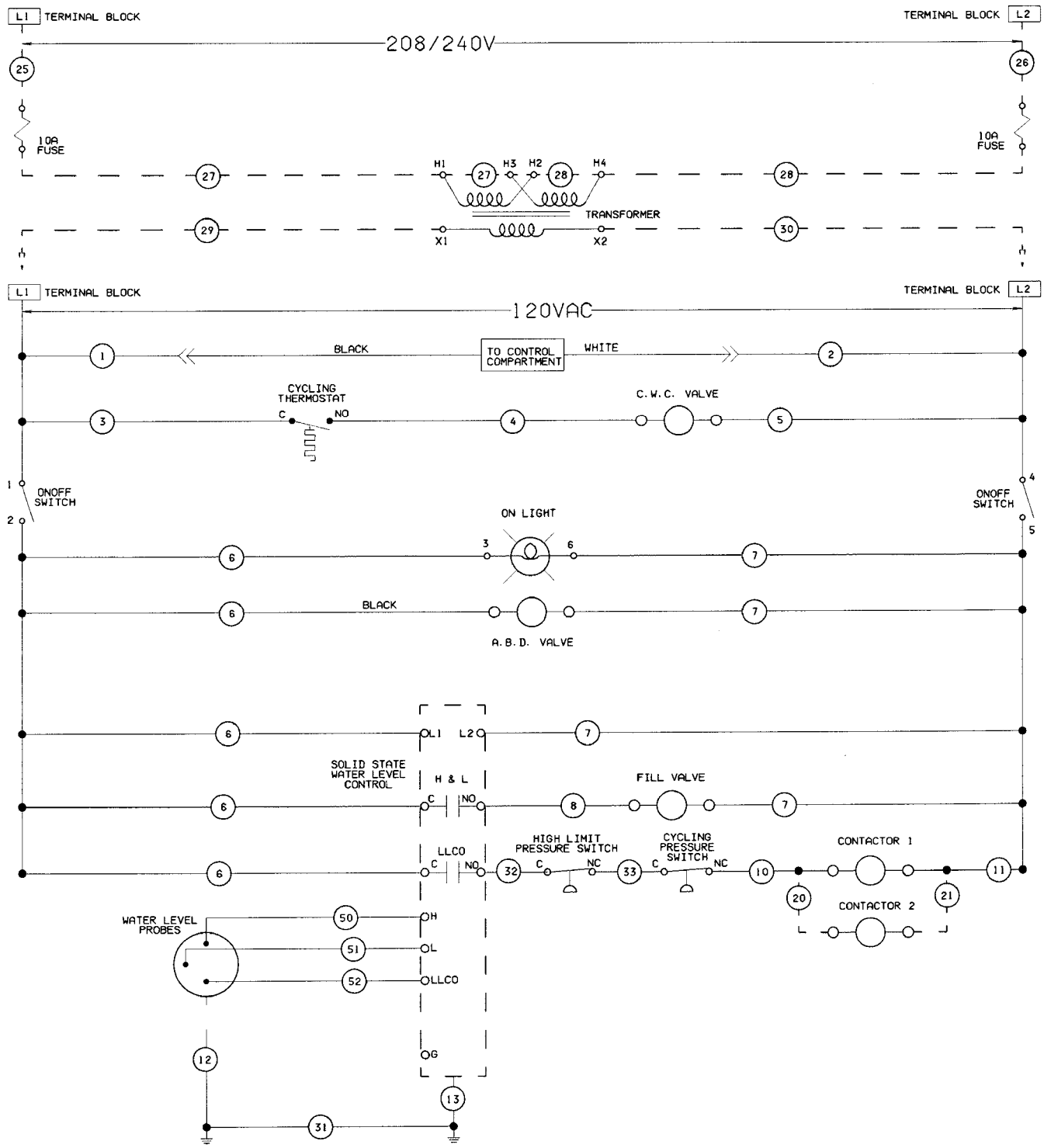
PAGE 2 OF 2

**VSX24G, 36G AND 42GT - BOILER BASE CONTROLS
AUTO BLOWDOWN, SOLID STATE WATER LEVEL
CONTROL, ELECTRONIC IGNITION AND CSD-1 CONTROLS.
120/60/1**

3708

SCHEMATICS, ELECTRIC STEAMERS, BOILER CONTROLS VSX24E, 36E AND 42ET

Auto Blowdown, Standard Controls



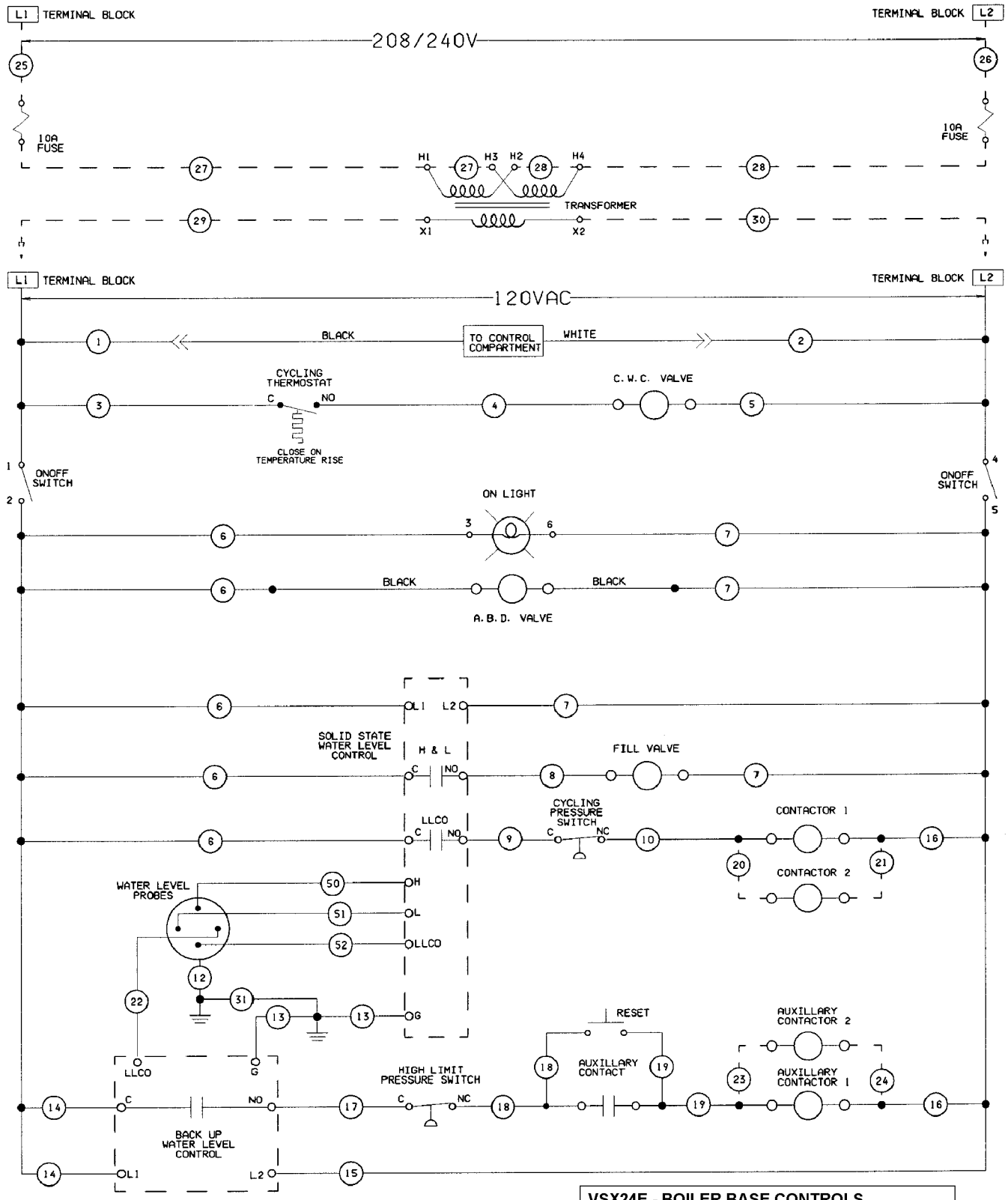
NOTE:

1) IF STEP DOWN TRANSFORMER IS NOT USED FOR CONTROL CIRCUIT POWER THEN A 120V SERVICE HOOK IS REQUIRED. THIS CONNECTION IS MADE AT THE TERMINAL BLOCK IN THE CONTROL BOX.

VSX24E - BOILER BASE CONTROLS AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL AND STANDARD CONTROLS. 120/60/1

3697

Auto Blowdown, Cal-Code Controls

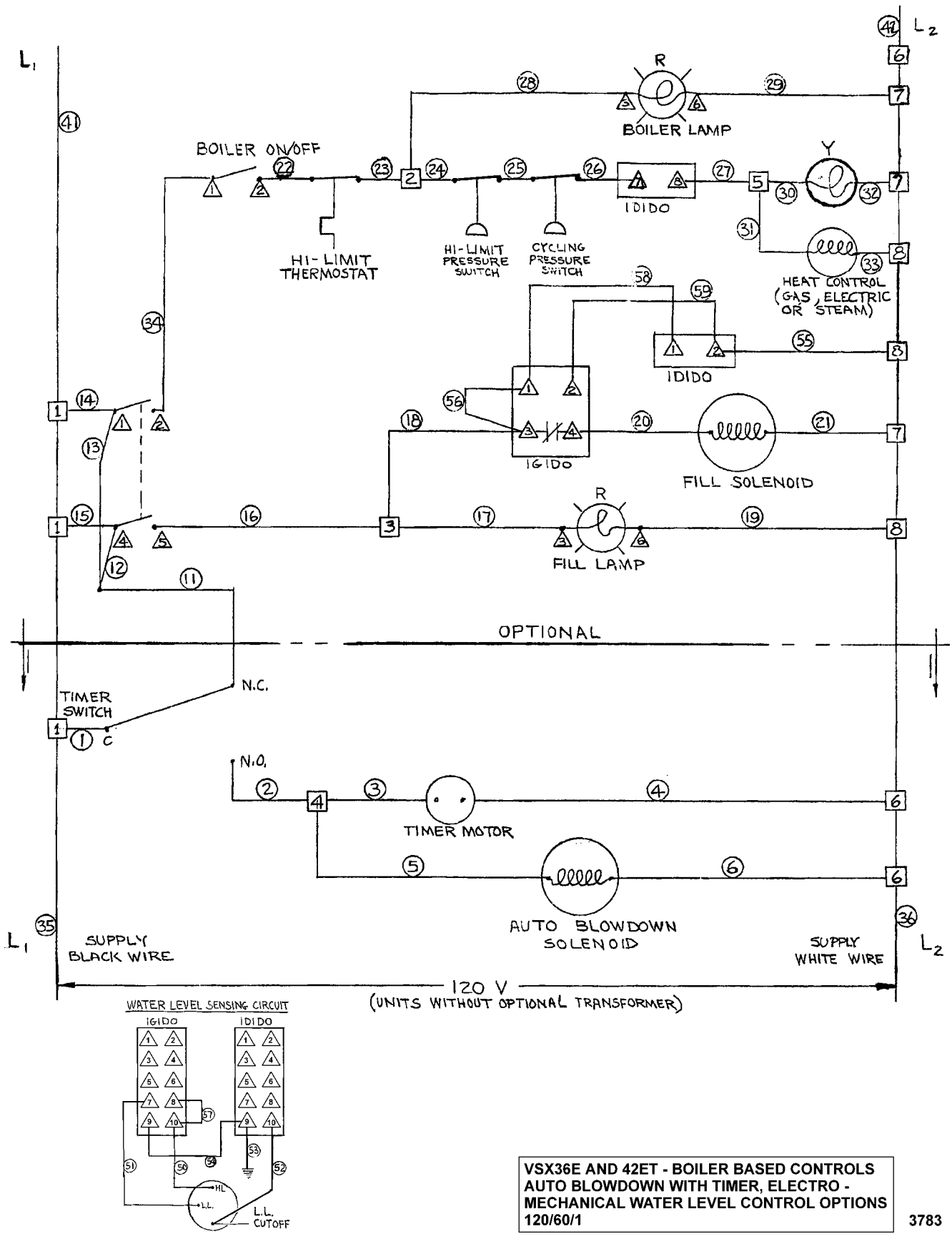


NOTE:
1) IF STEP DOWN TRANSFORMER IS NOT USED FOR CONTROL CIRCUIT POWER THEN A 120V SERVICE HOOK IS REQUIRED. THIS CONNECTION IS MADE AT THE TERMINAL BLOCK IN THE CONTROL BOX.

VSX24E - BOILER BASE CONTROLS AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL AND CAL-CODE CONTROLS. 120/60/1

3699

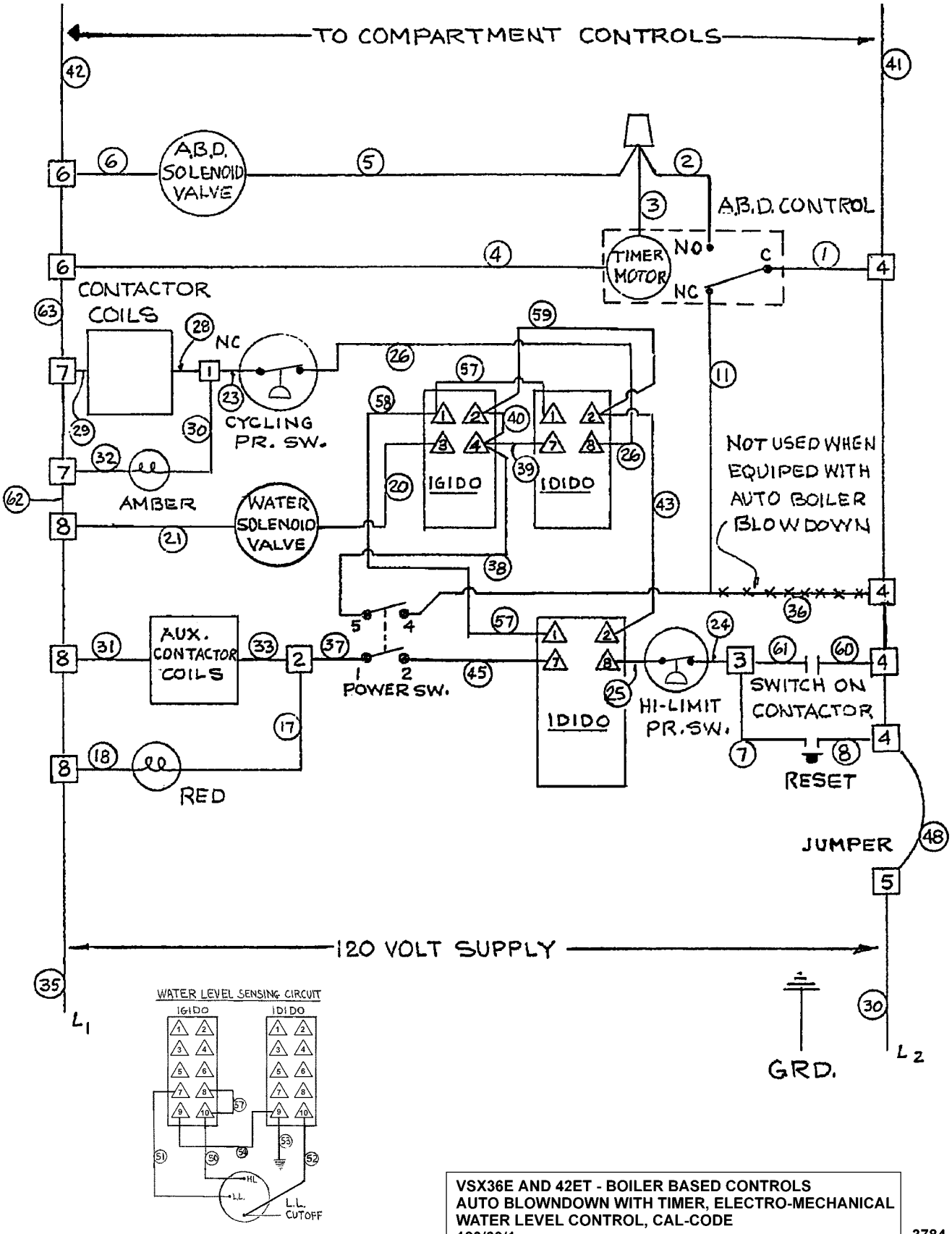
Auto Blowdown, Standard Controls



VSX36E AND 42ET - BOILER BASED CONTROLS AUTO BLOWDOWN WITH TIMER, ELECTRO - MECHANICAL WATER LEVEL CONTROL OPTIONS 120/60/1

3783

Auto Blowdown, Cal-Code Controls

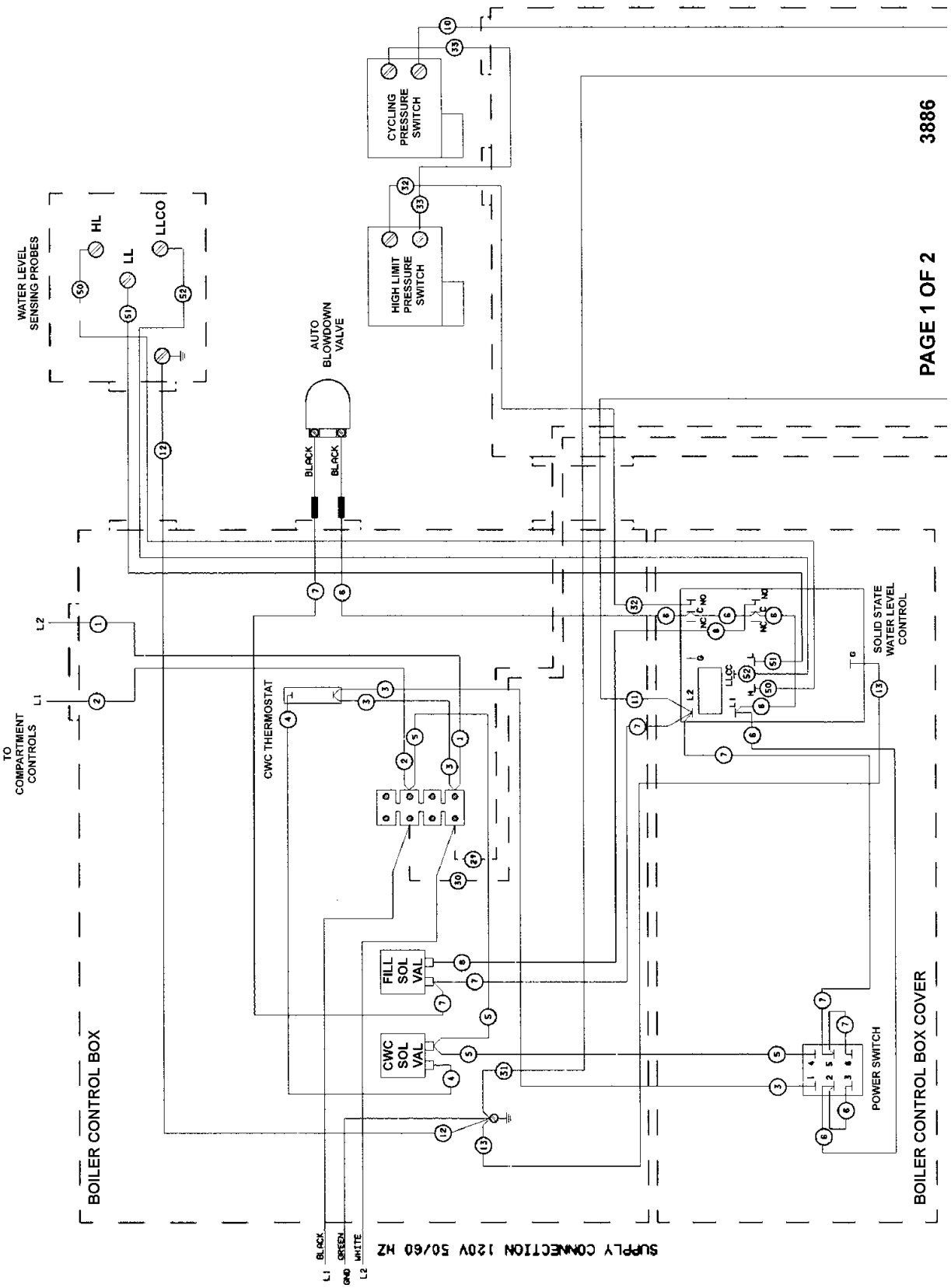


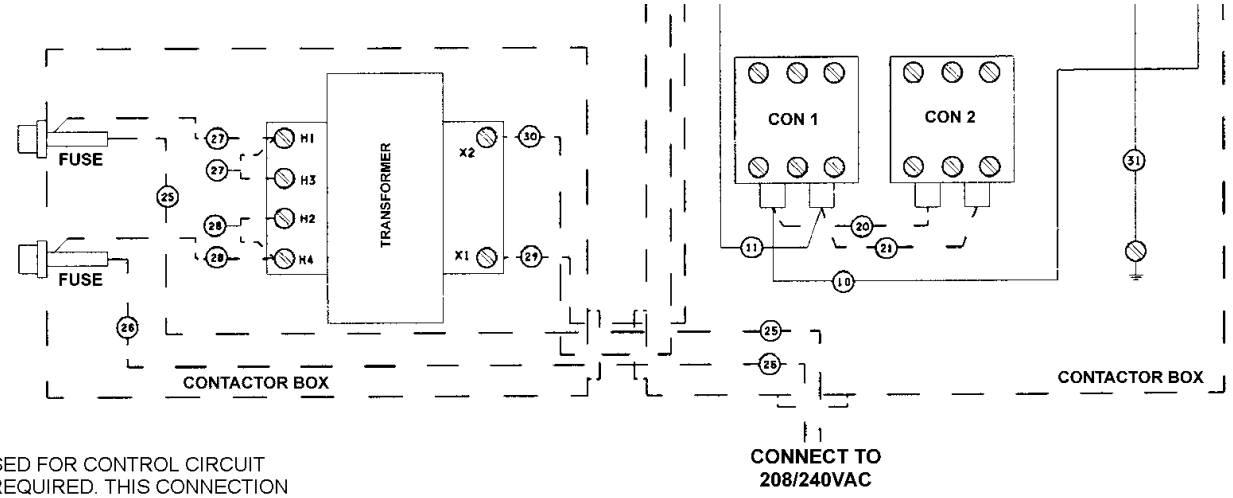
VSX36E AND 42ET - BOILER BASED CONTROLS
AUTO BLOWNDOWN WITH TIMER, ELECTRO-MECHANICAL WATER LEVEL CONTROL, CAL-CODE
120/60/1

3784

WIRING DIAGRAMS, ELECTRIC STEAMERS, BOILER CONTROLS VSX24E, 36E AND 42ET

Auto Blowdown, Standard Controls





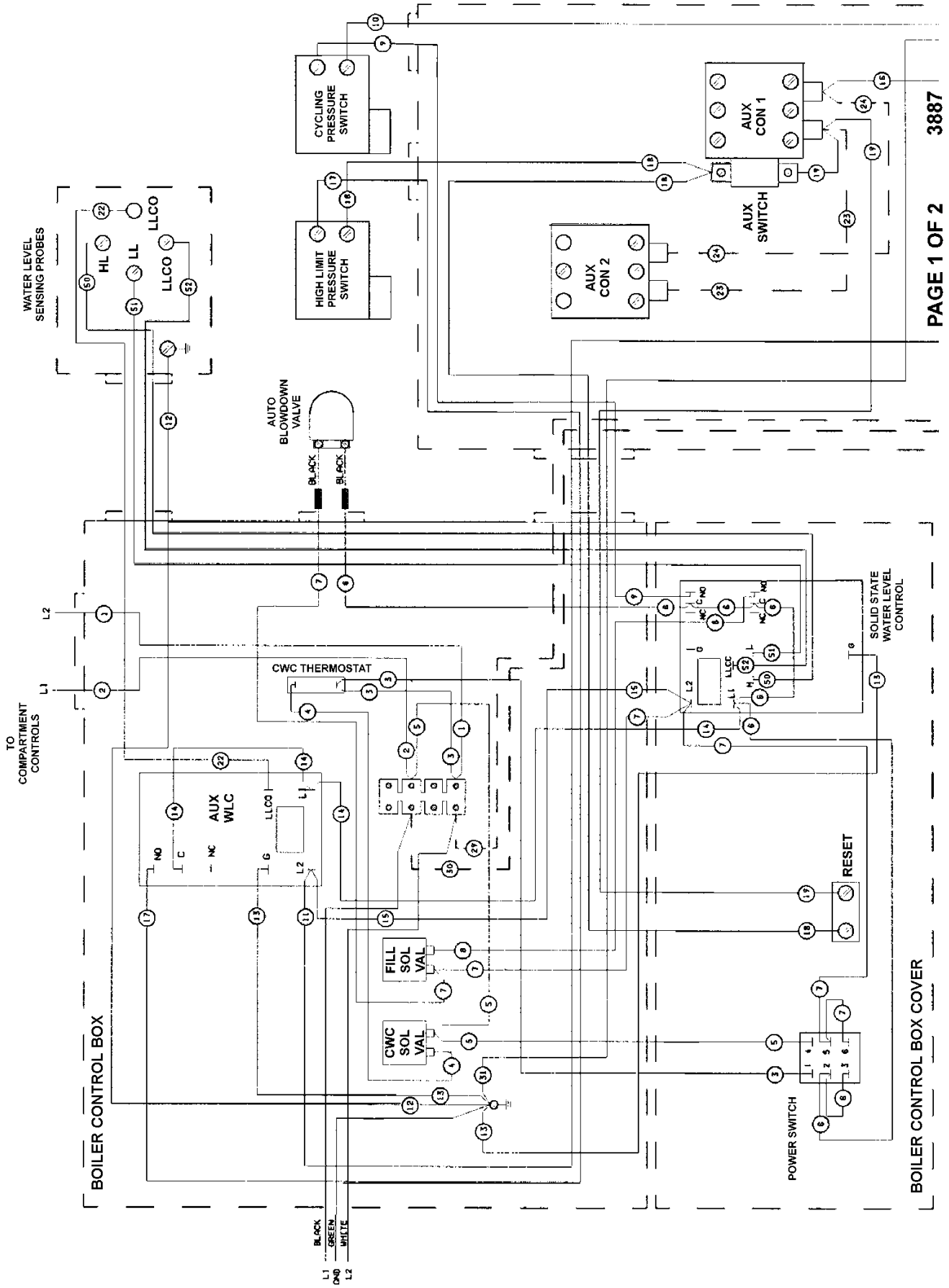
NOTE:
IF STEP DOWN TRANSFORMER IS NOT USED FOR CONTROL CIRCUIT POWER THEN A 120V SERVICE HOOK IS REQUIRED. THIS CONNECTION IS MADE AT THE TERMINAL BLOCK IN THE CONTROL BOX.

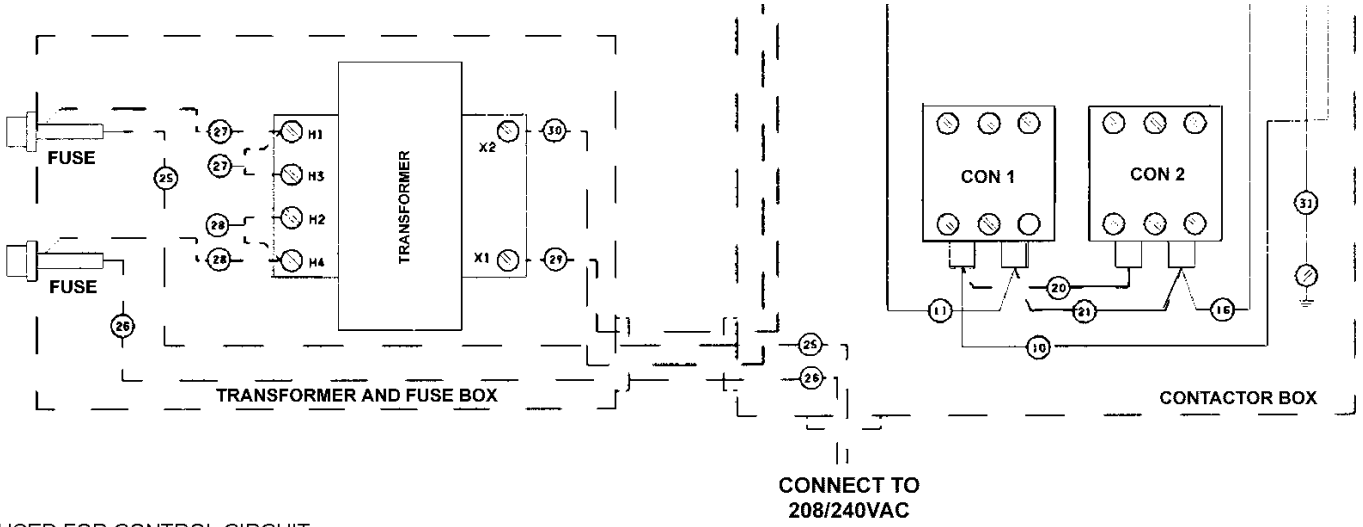
NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY. SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

**VSX24E - BOILER BASE CONTROLS
AUTO BLOWDOWN, SOLID STATE WATER
LEVEL CONTROL AND STANDARD CONTROLS.
120/60/1**

3698

Auto Blowdown, Cal-Code Controls





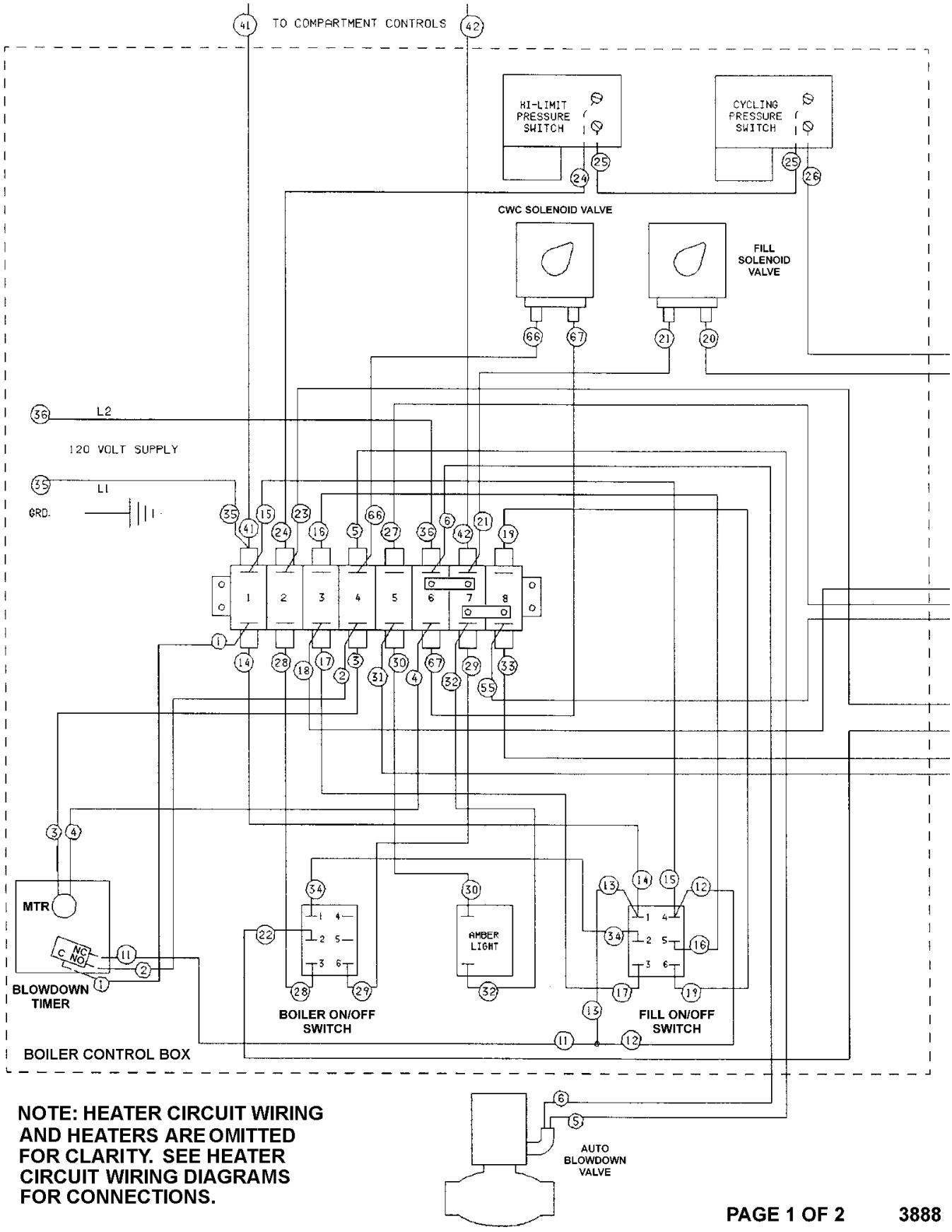
NOTE:
IF STEP DOWN TRANSFORMER IS NOT USED FOR CONTROL CIRCUIT POWER THEN A 120V SERVICE HOOK IS REQUIRED. THIS CONNECTION IS MADE AT THE TERMINAL BLOCK IN THE CONTROL BOX.

NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY. SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

VSX24E - BOILER BASE CONTROLS
AUTO BLOWDOWN, SOLID STATE WATER LEVEL CONTROL AND CAL-CODE CONTROLS.
120/60/1

3700

Auto Blowdown, Standard Controls



NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY. SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

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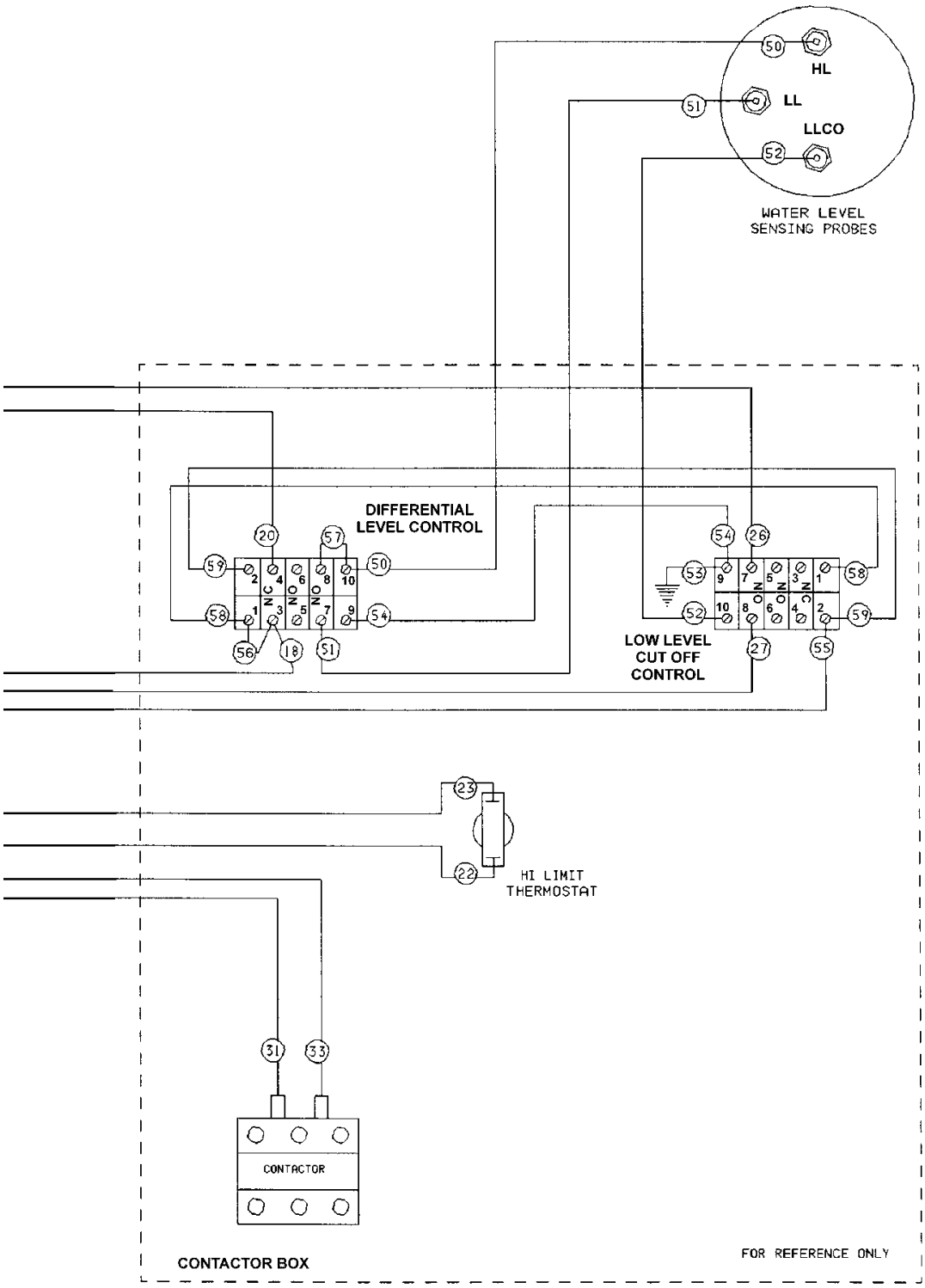
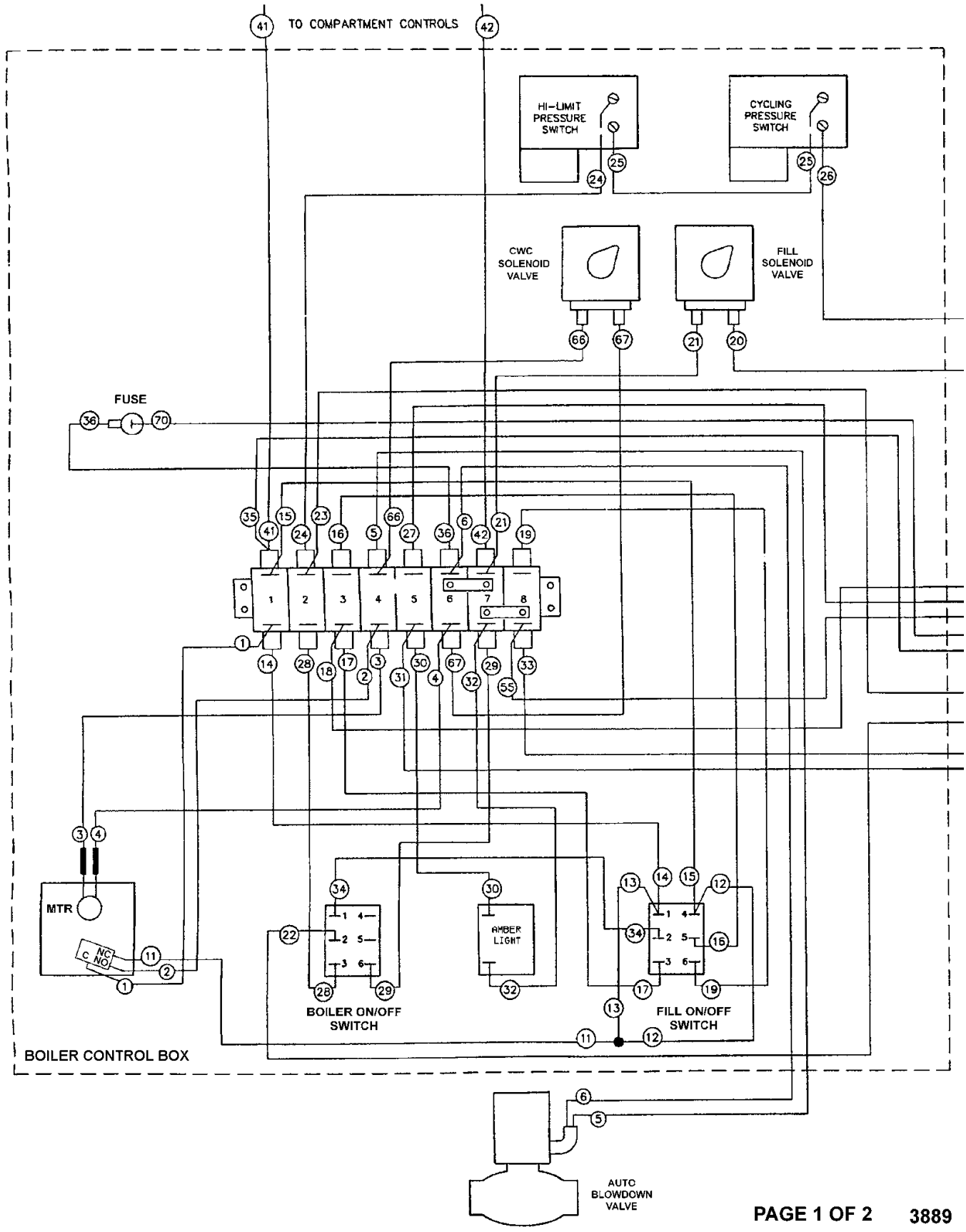


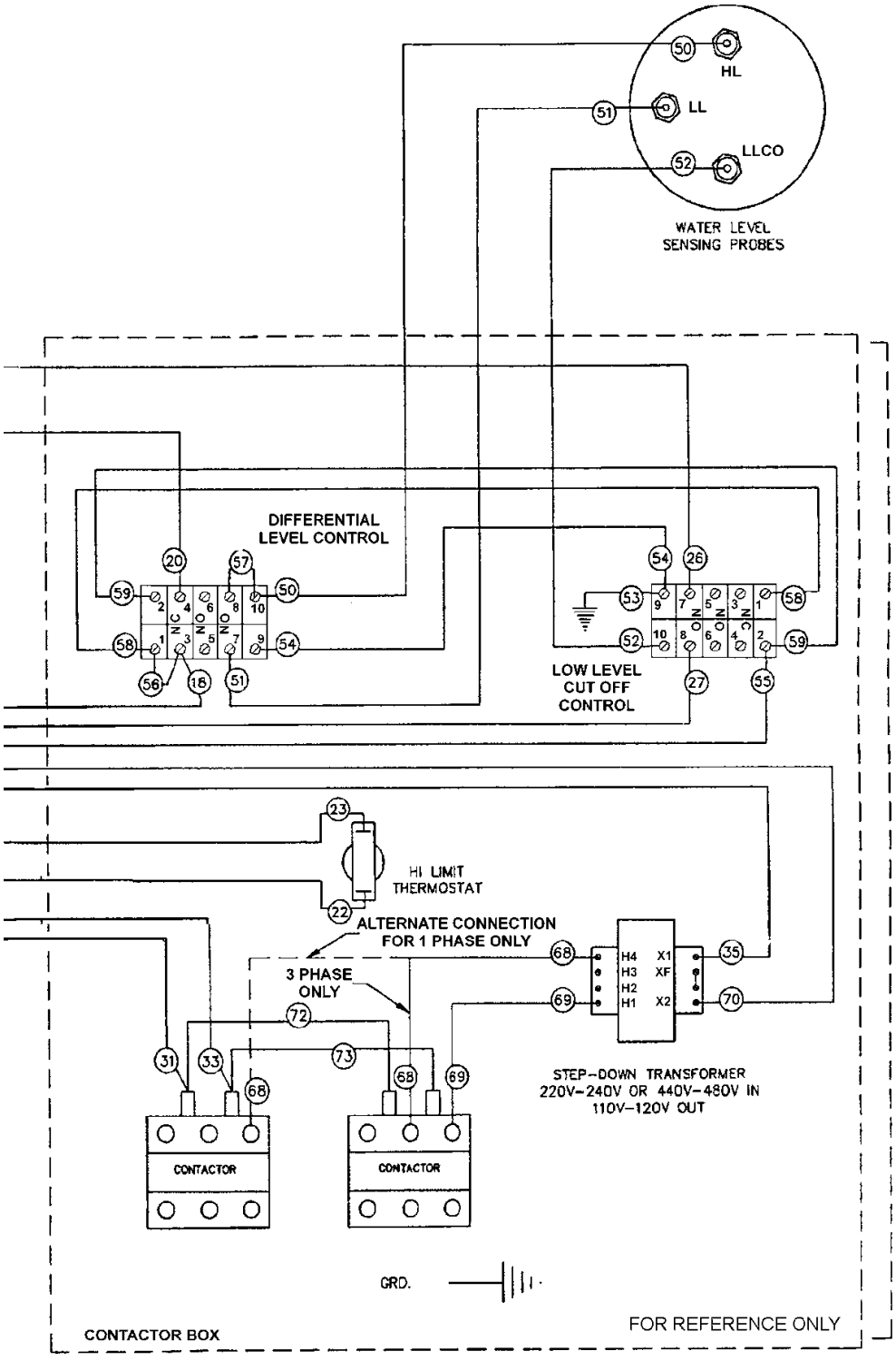
PAGE 2 OF 2

VSX36E AND 42ET - BOILER BASED CONTROLS
AUTO BLOWDOWN WITH TIMER, ELECTRO-MECHANICAL WATER LEVEL CONTROL OPTIONS.
120/60/1

3709

Auto Blowdown, Step Down Transformer, Standard Controls



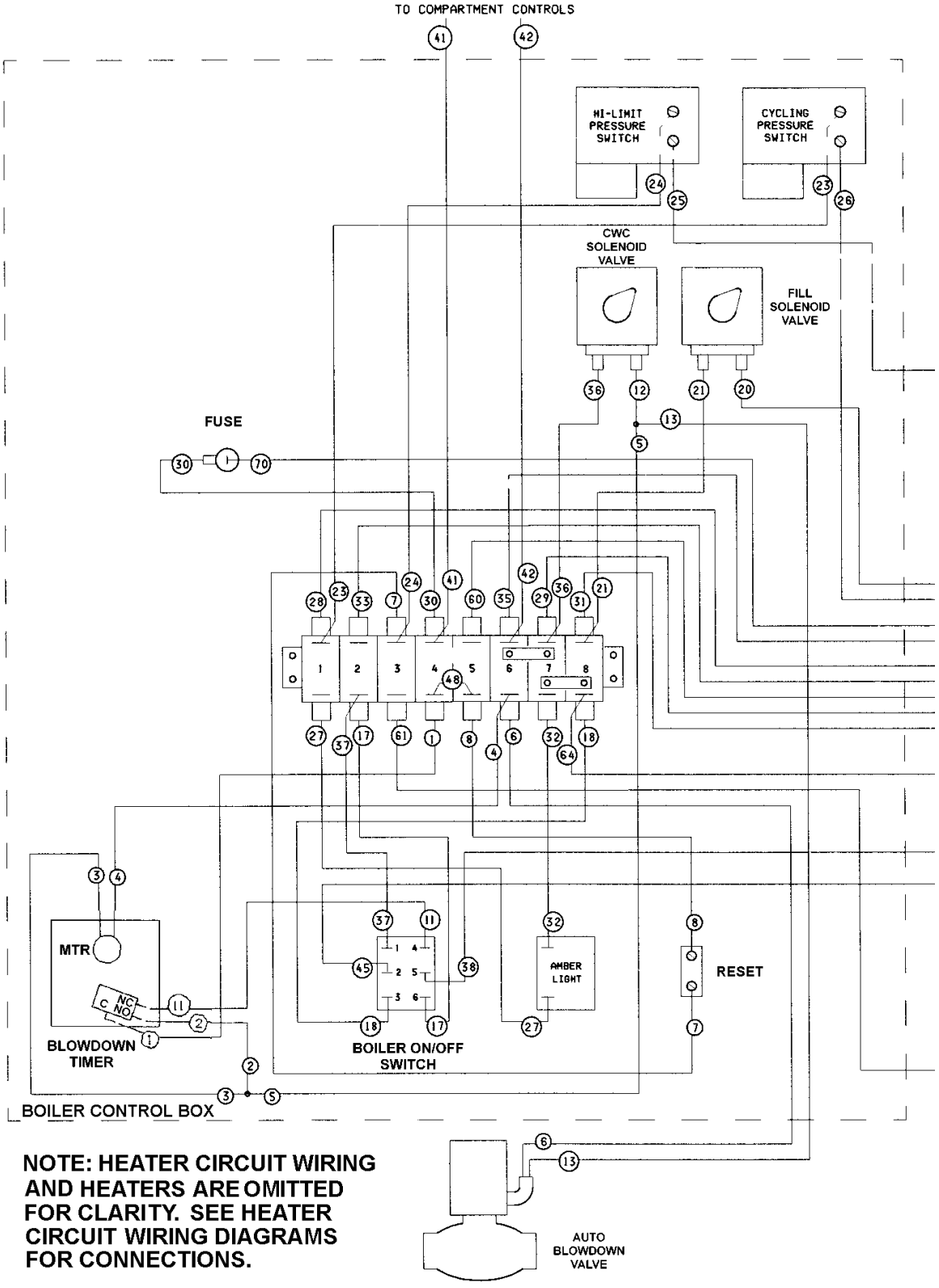


PAGE 2 OF 2

VSX36E AND 42ET - BOILER BASED CONTROLS
AUTO BLOWDOWN, STEP DOWN TRANSFORMER
AND STANDARD CONTROLS.
120/60/1

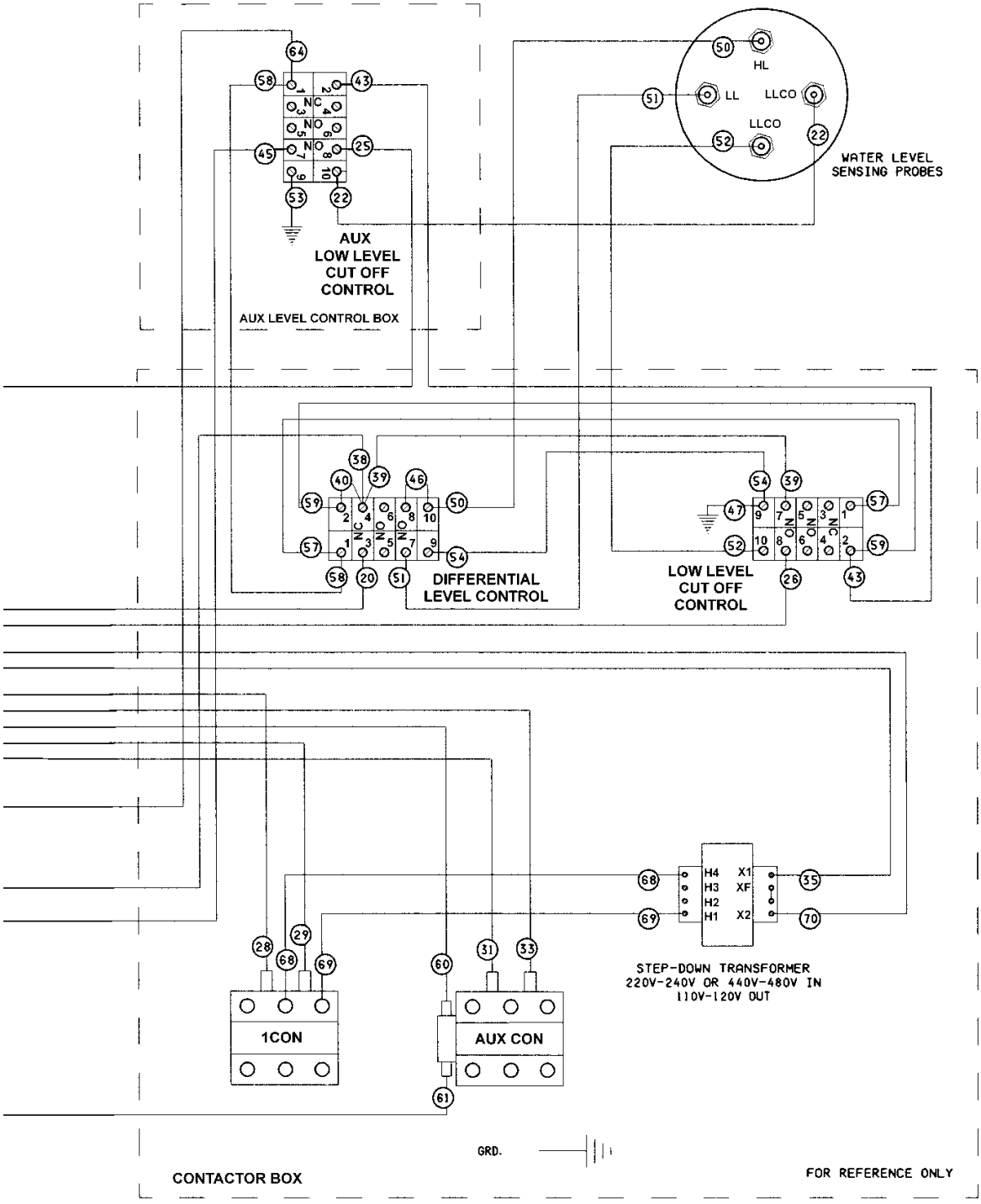
3711

Auto Blowdown, Step Down Transformer, Cal-Code Controls (2 contactors)



NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY. SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

PAGE 1 OF 2 **3890**

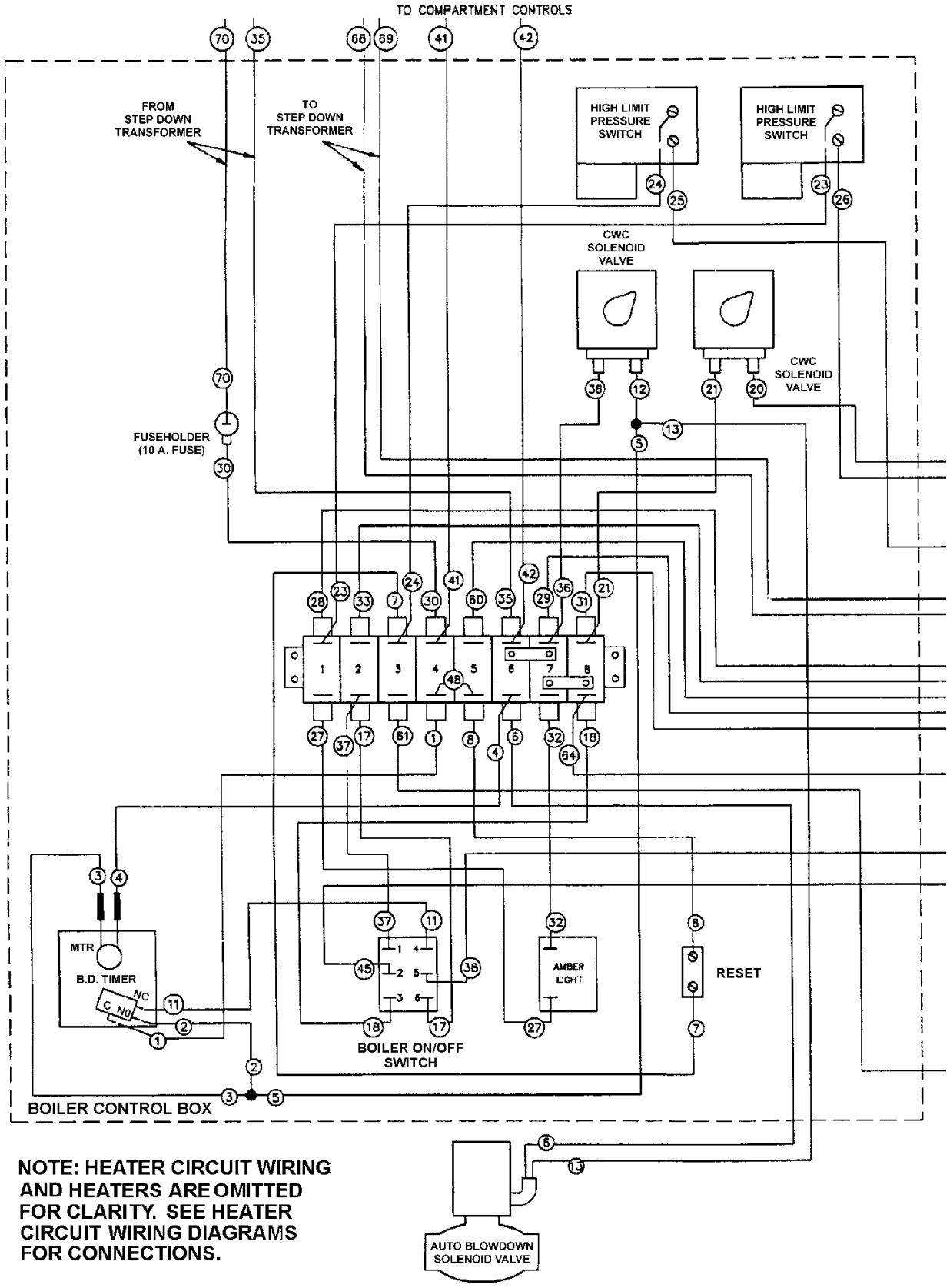


PAGE 2 OF 2

VSX36E AND 42ET - BOILER BASED CONTROLS
AUTO BLOWDOWN WITH TIMER, ELECTRO-MECHANICAL WATER LEVEL CONTROL, CAL-CODE AND STEP DOWN TRANSFORMER OPTIONS.
120/60/1

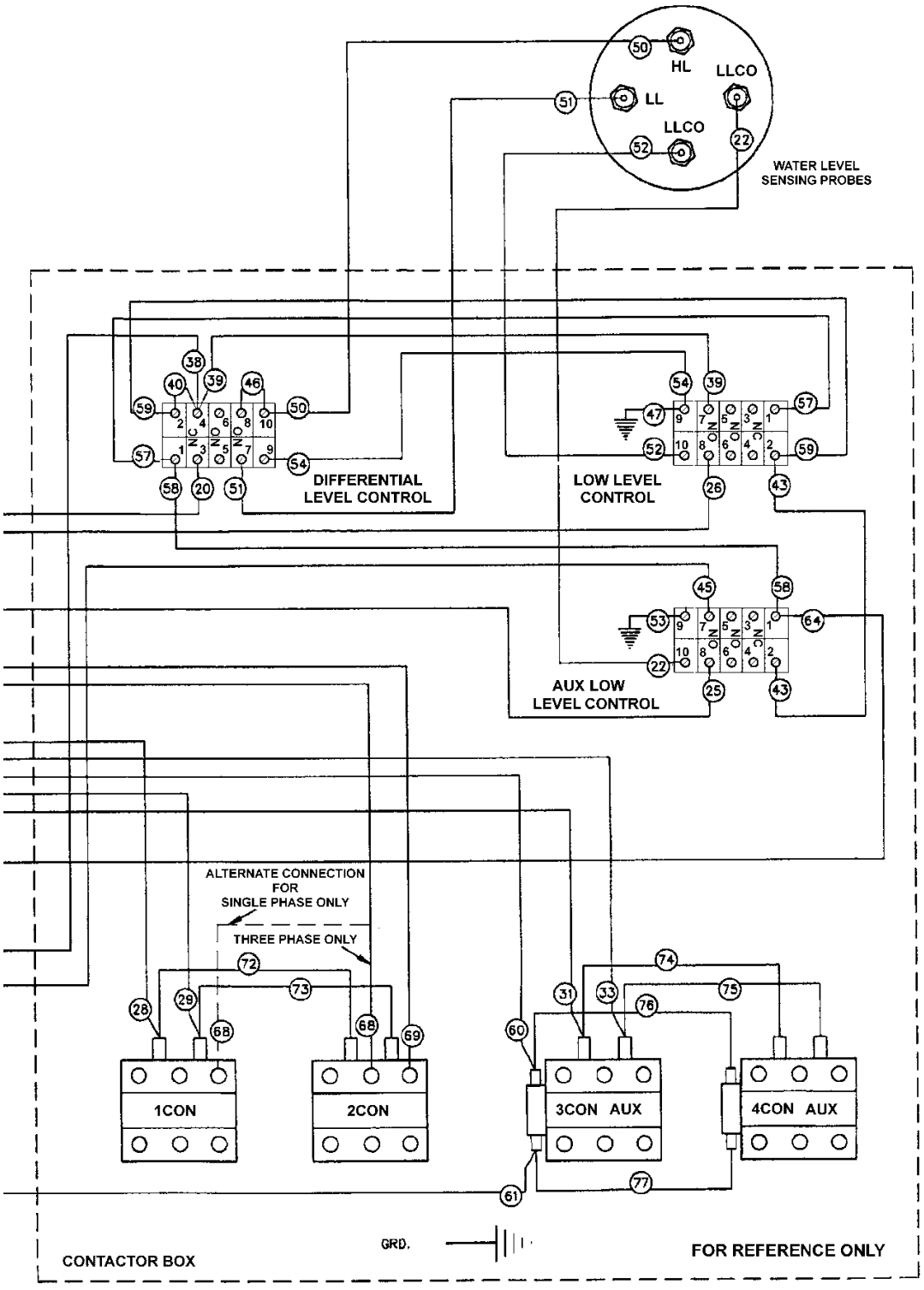
3694

Auto Blowdown, Step Down Transformer, Cal-Code Controls (4 contactors)



NOTE: HEATER CIRCUIT WIRING AND HEATERS ARE OMITTED FOR CLARITY. SEE HEATER CIRCUIT WIRING DIAGRAMS FOR CONNECTIONS.

PAGE 1 OF 2 **3891**



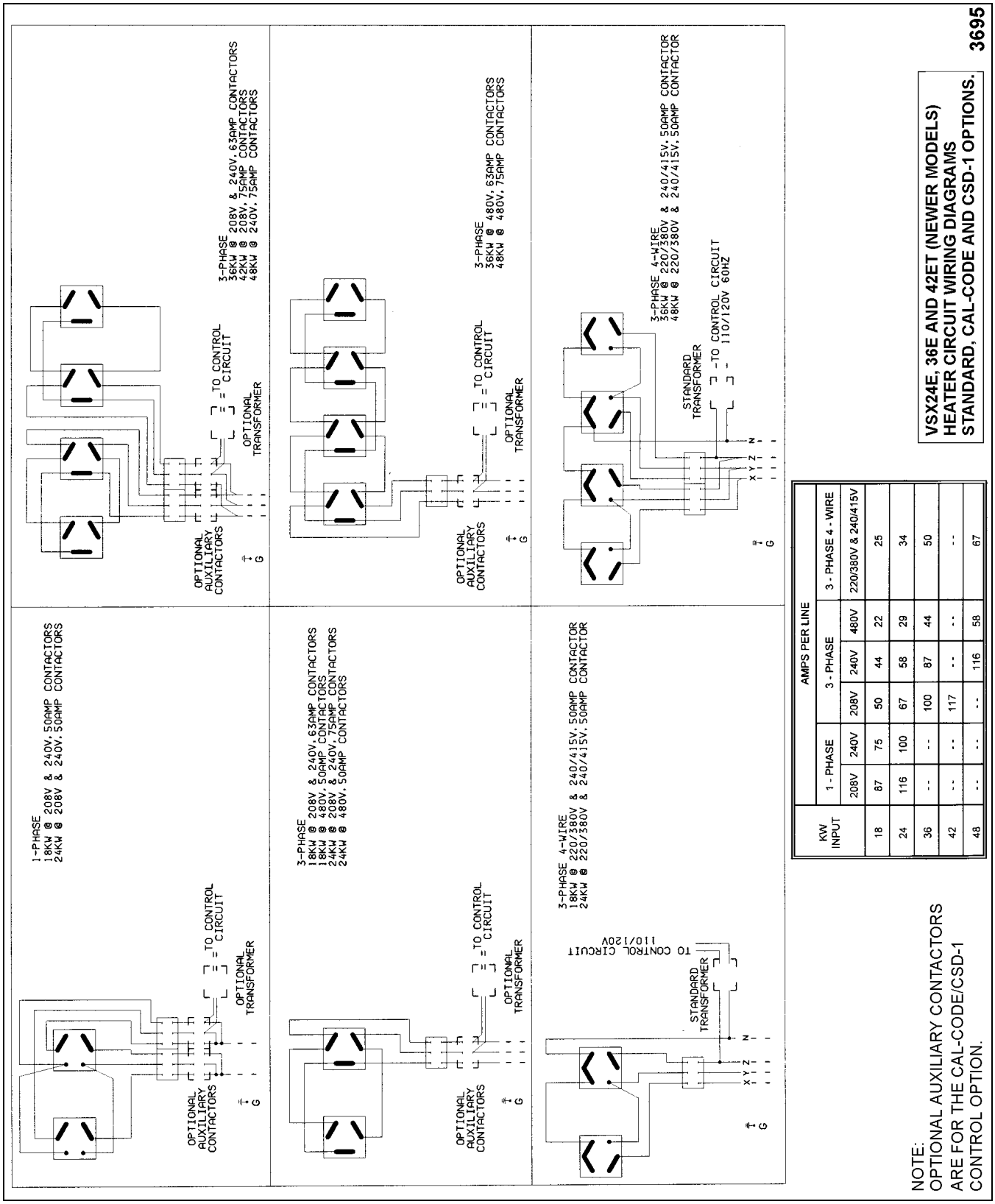
PAGE 2 OF 2

VSX36E AND 42ET - BOILER BASED CONTROLS
AUTO BLOWDOWN WITH TIMER, ELECTRO-MECHANICAL WATER LEVEL CONTROL, CAL-CODE AND STEP DOWN TRANSFORMER OPTIONS.
120/60/1

3693

WIRING DIAGRAMS, ELECTRIC HEATER CIRCUITS
VSX24E, 36E AND 42ET

Standard and Cal-Code/CSD-1 Controls (Newer Models)



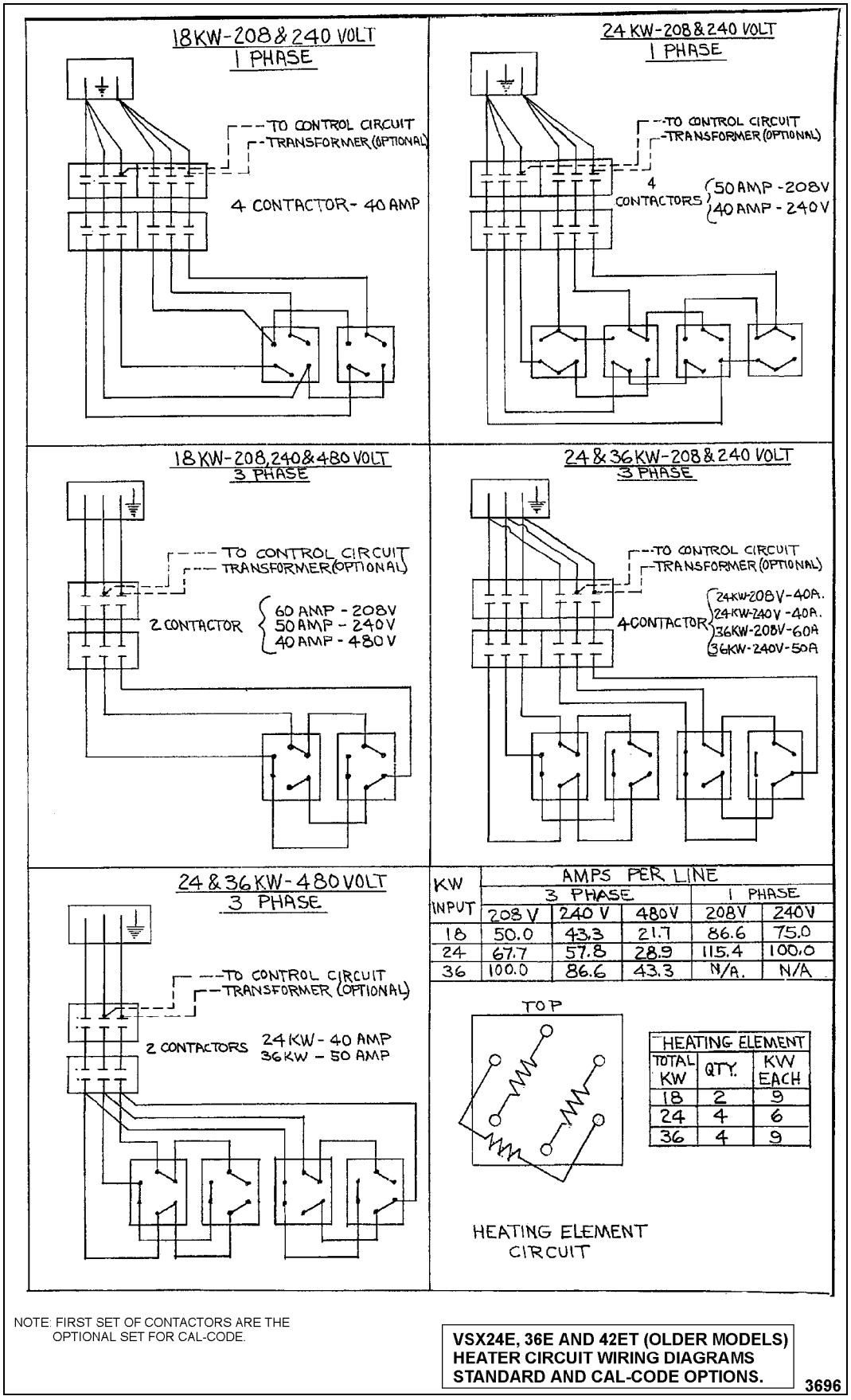
KW INPUT	AMPS PER LINE							
	1 - PHASE		3 - PHASE			3 - PHASE 4 - WIRE		
	208V	240V	208V	240V	480V	220/380V & 240/415V		
18	87	75	50	44	22	25		
24	116	100	67	58	29	34		
36	--	--	100	87	44	50		
42	--	--	117	--	--	--		
48	--	--	--	116	58	67		

VSX24E, 36E AND 42ET (NEWER MODELS)
HEATER CIRCUIT WIRING DIAGRAMS
STANDARD, CAL-CODE AND CSD-1 OPTIONS.

3695

NOTE:
OPTIONAL AUXILIARY CONTACTORS ARE FOR THE CAL-CODE/CSD-1 CONTROL OPTION.

Standard and Cal-Code Controls (Older Models)



KW INPUT	AMPS PER LINE				
	3 PHASE			1 PHASE	
	208 V	240 V	480V	208V	240V
18	50.0	43.3	21.7	86.6	75.0
24	67.7	57.8	28.9	115.4	100.0
36	100.0	86.6	43.3	N/A.	N/A

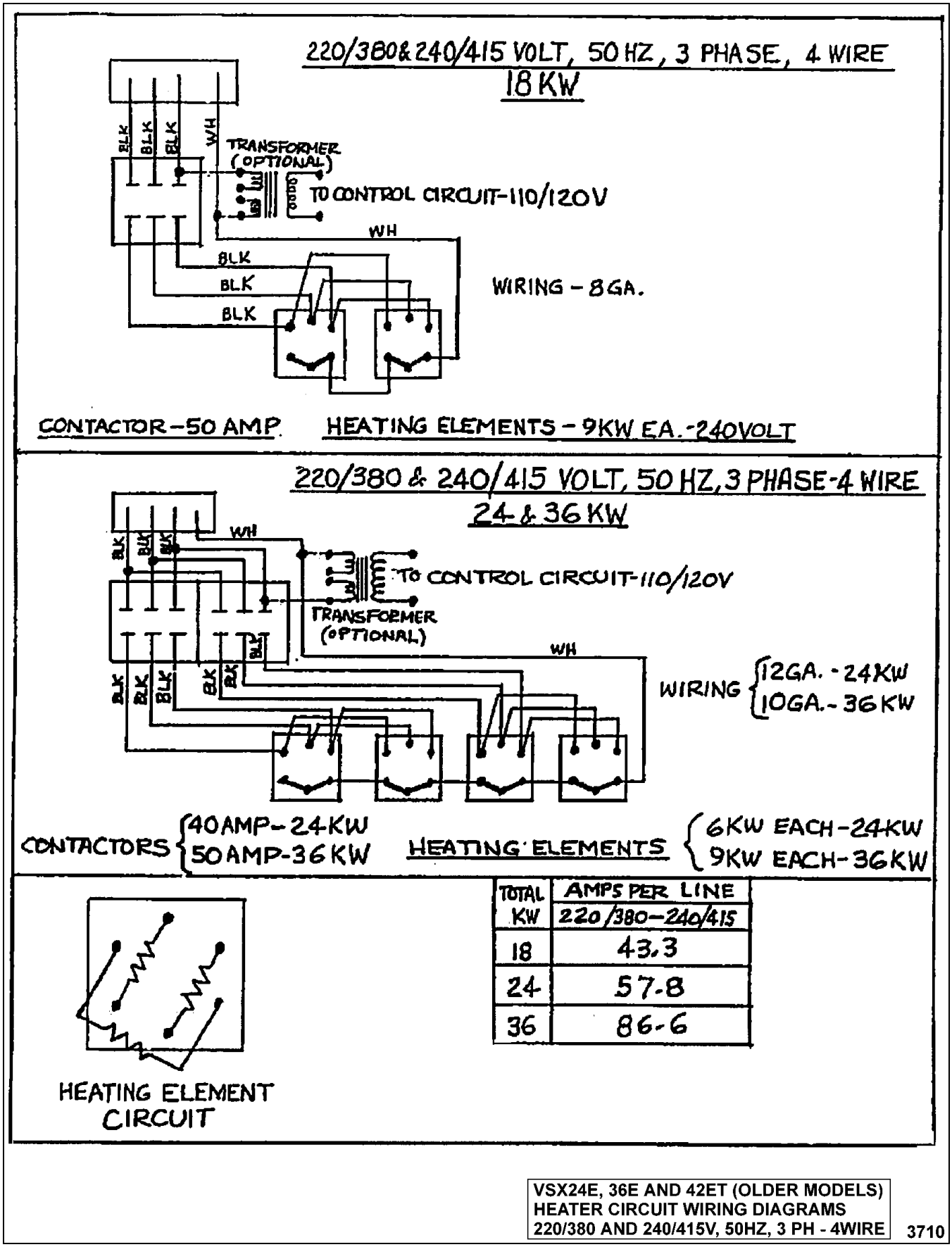
HEATING ELEMENT		
TOTAL KW	QTY.	KW EACH
18	2	9
24	4	6
36	4	9

NOTE: FIRST SET OF CONTACTORS ARE THE OPTIONAL SET FOR CAL-CODE.

VSX24E, 36E AND 42ET (OLDER MODELS) HEATER CIRCUIT WIRING DIAGRAMS STANDARD AND CAL-CODE OPTIONS.

3696

3 Phase, 4 Wire (Older Models)



TOTAL KW	AMPS PER LINE 220/380-240/415
18	43.3
24	57.8
36	86.6

VSX24E, 36E AND 42ET (OLDER MODELS)
HEATER CIRCUIT WIRING DIAGRAMS
220/380 AND 240/415V, 50HZ, 3 PH - 4WIRE

3710

SCHEMATIC, DIRECT STEAMERS, CABINET BASE VSX24D, 36D AND 42DT

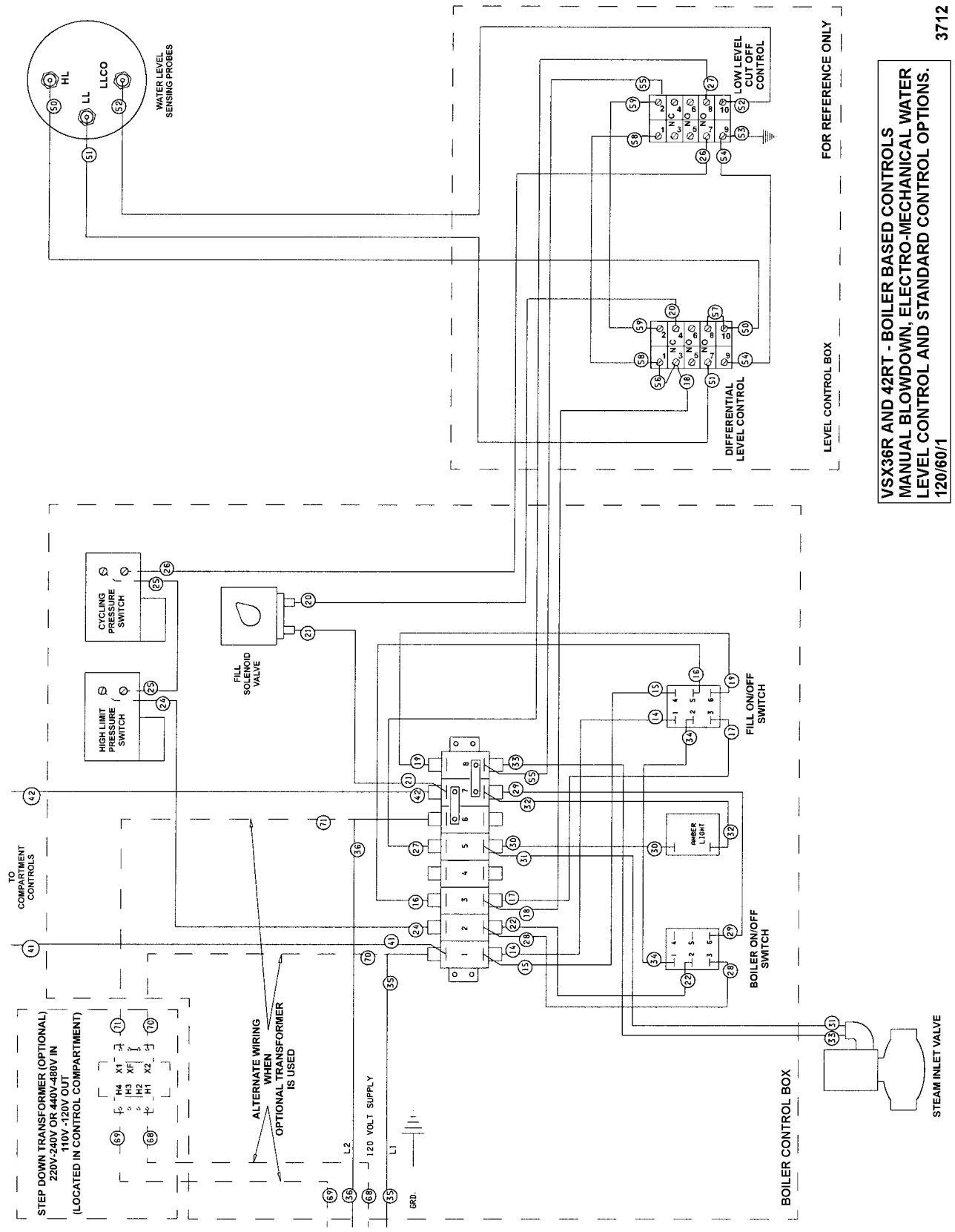
See “SCHEMATIC ALL MODELS - COMPARTMENT CONTROLS”

WIRING DIAGRAM, DIRECT STEAMERS, CABINET BASE VSX24D, 36D AND 42DT

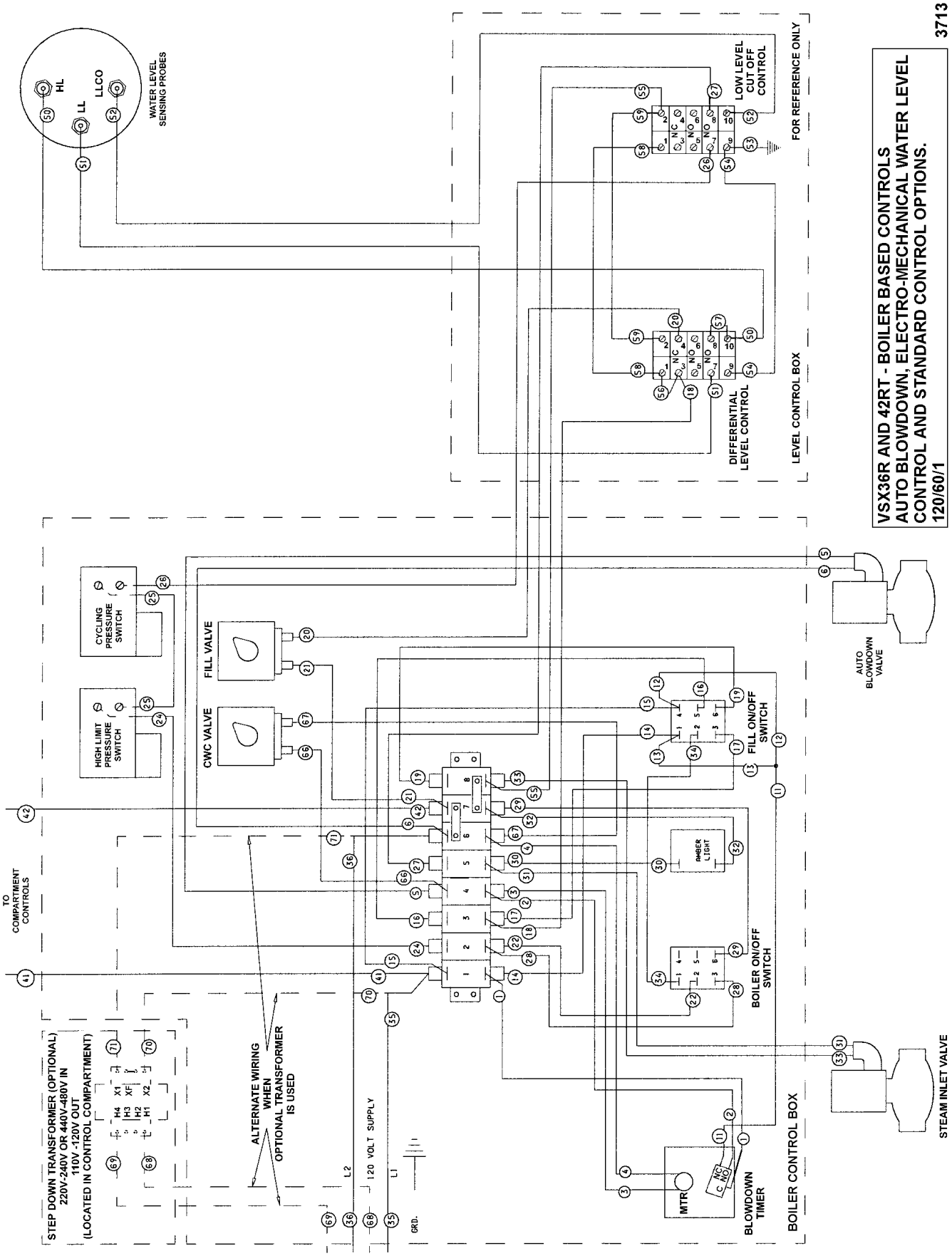
See “WIRING DIAGRAM ALL MODELS - COMPARTMENT CONTROLS”

WIRING DIAGRAMS, REGENERATED STEAMERS, BOILER CONTROLS VSX36R AND 42RT (OLDER MODELS)

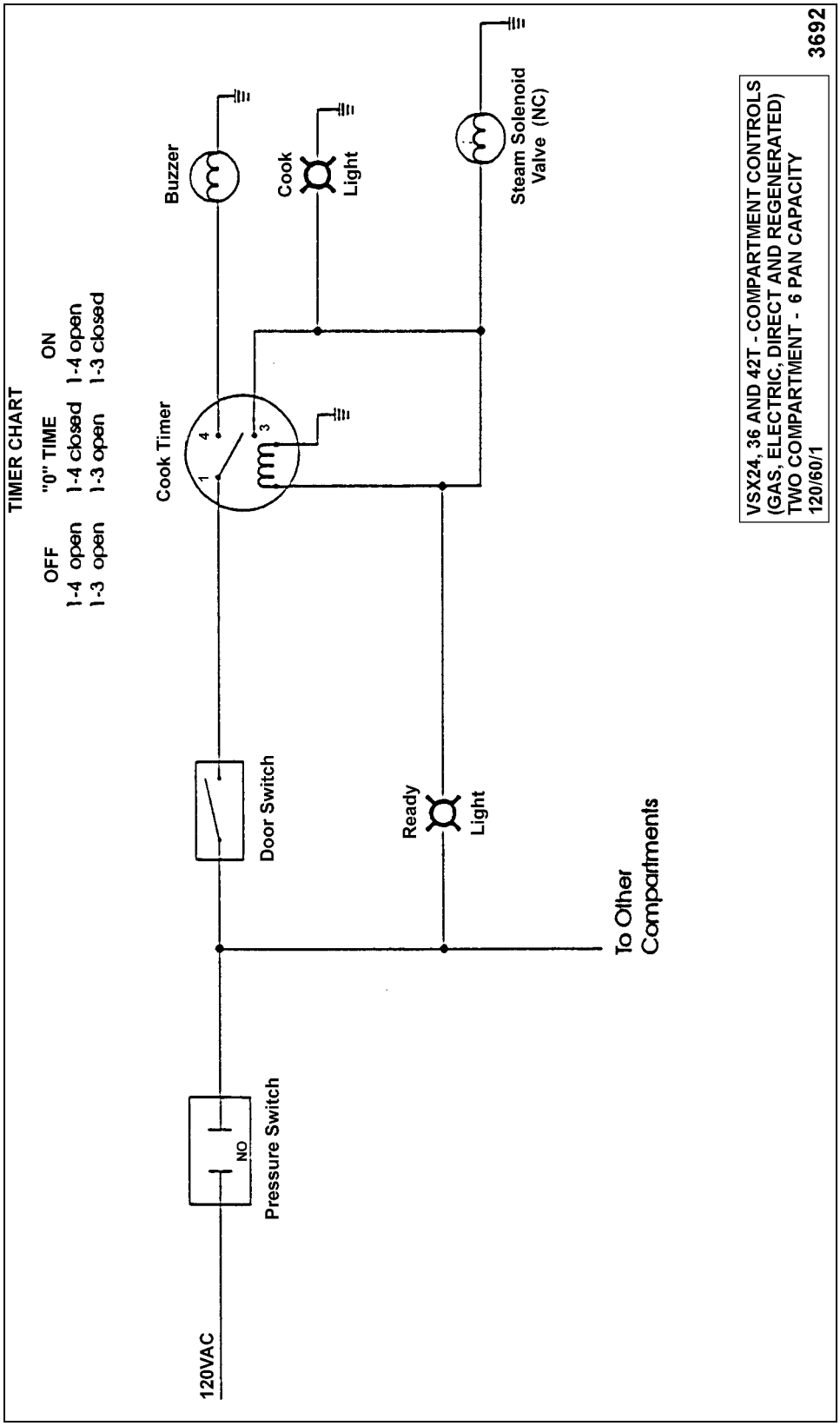
Manual Blowdown



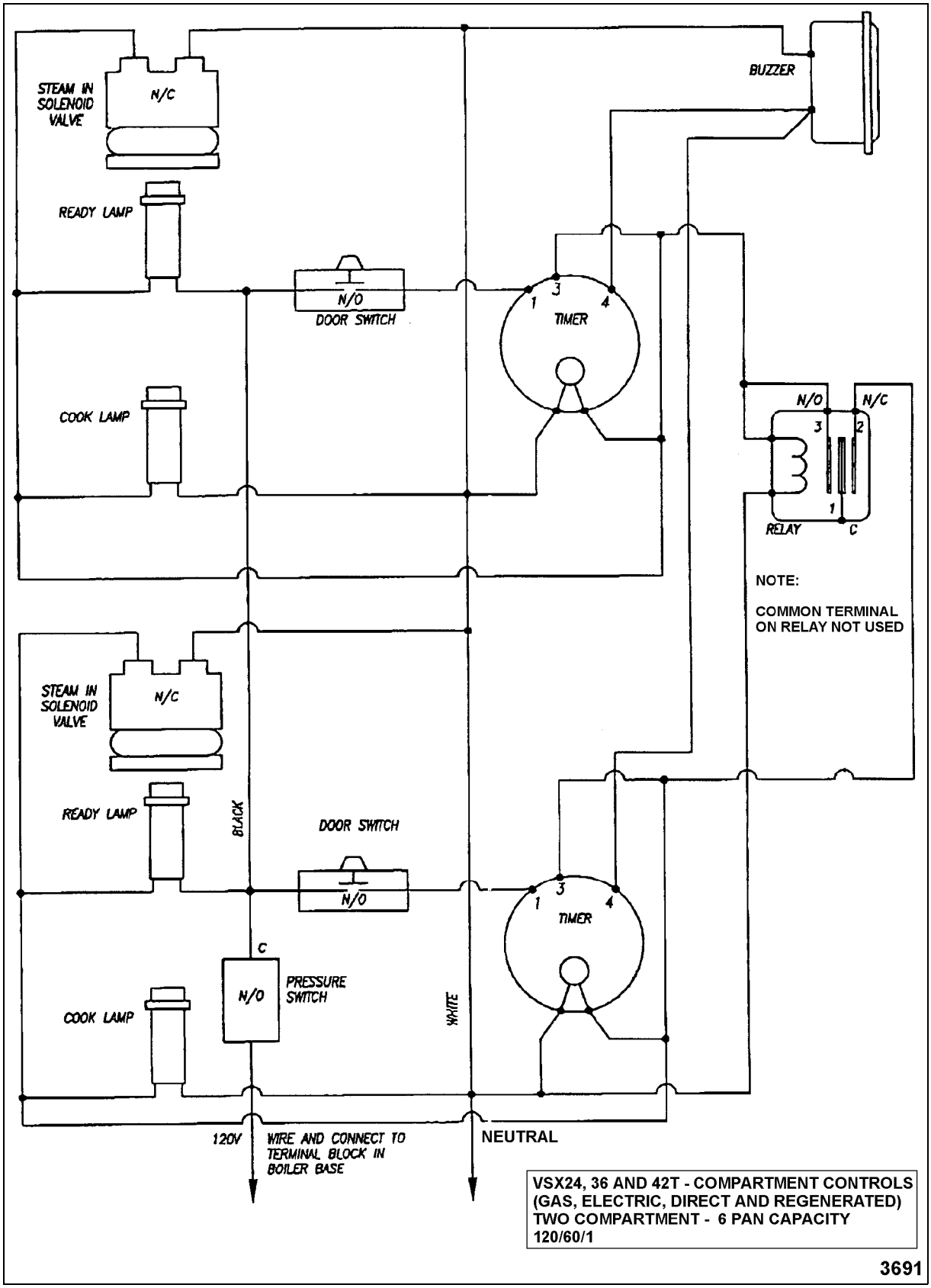
Auto Blowdown



SCHEMATIC ALL MODELS - COMPARTMENT CONTROLS



WIRING DIAGRAM, ALL MODELS - COMPARTMENT CONTROLS



TROUBLESHOOTING

ALL MODELS

WARNING: CERTAIN PROCEDURES IN THIS SECTION REQUIRE ELECTRICAL TESTS OR MEASUREMENTS WHILE POWER IS APPLIED TO THE MACHINE. EXERCISE EXTREME CAUTION AT ALL TIMES. IF TEST POINTS ARE NOT EASILY ACCESSIBLE, DISCONNECT POWER, ATTACH TEST EQUIPMENT AND REAPPLY POWER TO TEST.

SYMPTOM	POSSIBLE CAUSES
Compartment leaks water around door.	1. Steamer not level. 2. Drain line obstructed or not to an open gap drain.
Cold water condenser not operating properly.	1. Cold water condenser solenoid inoperative or plugged. 2. Lack of water supply. 3. Cold water condenser thermostat malfunction or needs adjustment. 4. No power to cold water condenser solenoid. 5. Plugged spray nozzle.
Steam leaks around door.	1. Worn gasket - See “DOOR” in “SERVICE PROCEDURES ”. 2. Damaged gasket. 3. Drain line obstructed or not to an open drain.
Steam generated inside compartment when timer is off.	1. Steam supply solenoid not fully closing (clogged or dirty). See “FILL AND COLD WATER SOLENOID VALVES” in “SERVICE PROCEDURES”. 2. Timer contacts 1 & 3 closed.
Heat coming on without water in boiler (Dry firing).	1. Dirty water level probes (shorted to ground). 2. Retention of water in probe canister assembly. 3. Water level control malfunction.
Pressure relief valve opening or leaking.	1. Cycling pressure switch set to high. See “PRESSURE SWITCHES (GAS AND ELECTRIC MODELS)” in “SERVICE PROCEDURES”. 2. Pressure relief valve malfunction.
Base unit will not heat or build pressure.	1. Check incoming voltage. 2. Boiler not filled - check fill solenoid for power, clogging or malfunction. 3. Water Level Control malfunction. 4. Water too “pure” for probes to properly conduct electricity. 5. Contactor malfunction (electric only). 6. Heating element inoperative (electric only). 7. Cycling pressure switch open or set too high. Unit is cycling on high limit. 8. High limit thermostat open. 9. Problem with auto blowdown timer (older models). 10. Power switch malfunction. 11. Pressure reducing valve malfunction or needs cleaned (direct or regenerated units only). 12. Low or no steam supply to unit (direct or regenerated units only).

SYMPTOM	POSSIBLE CAUSES
Steam output low or slow cooking.	1. Blocked steam injector ports. (Open door, press door switch button and verify good steam flow into compartment) 2. Steam solenoid valve not fully opening or blocked. 3. Steam intake shut-off valve closed or out of adjustment. See “INTAKE SHUT-OFF VALVE ADJUSTMENT (STEAM FLOW)” in “SERVICE PROCEDURES”. 4. Cycling pressure switch malfunction or needs adjustment. 5. Steam header line (supply) blockage. 6. Heavy amount of condensate in the pressure controls steam supply line. 7. Pressure relief valve leaking. 8. Steam supply lines leaking badly.
Unit leaks water.	1. Loose water, steam or drain line connections (top or base). 2. Boiler hand hole gasket not sealing. 3. Leak at gauge glass.
Boiler water level too high.	1. Fill solenoid does not shut off. 2. High level probe dirty (open circuit). 3. Water level control malfunction.
Boiler does not fill.	1. Water supply not on. 2. Fill solenoid not opening or plugged. 3. Water level control malfunction.
Timer motor does not run.	1. Door open or door switch inoperative. 2. Timer not getting power. 3. Timer motor inoperative.
Door not closing properly.	1. Door latch assembly malfunction or out of adjustment. See “DOOR” in “SERVICE PROCEDURES” 2. Striker adjustment. See “DOOR” in “SERVICE PROCEDURES”
Door won’t open.	1. Latch won’t release see “DOOR” in “SERVICE PROCEDURES”.
Buzzer not operating.	1. Timer malfunction. 2. Buzzer malfunction.

GAS MODELS ONLY

SYMPTOM	POSSIBLE CAUSES
Burner won't light.	1. Gas not on. 2. Ignition control module reset switch in the OFF position or malfunctioning. 3. Ignition module not receiving power. Check ignition module transformer for 24VAC output to module on automatic ignition systems. 4. Unit not properly grounded and/or polarity of incoming power is incorrect on automatic ignition systems. 5. Low incoming gas pressure. See "MANIFOLD PRESSURE ADJUSTMENT" in "SERVICE PROCEDURES". 6. Ignition module malfunction. 7. Gas combination control valve malfunction. 8. Boiler not filling. Check fill solenoid for power, clogging or malfunction. 9. Water level control malfunction. 10. Water too "pure" for probes to properly conduct electricity. 11. High limit thermostat open (if equipped). 12. High limit pressure switch open. 13. Cycling pressure switch open or set too high. Unit is cycling on high limit. See "PRESSURE SWITCHES (GAS AND ELECTRIC MODELS) in SERVICE PROCEDURES".
Burner won't stay lit.	1. Gas pressure low. See "MANIFOLD PRESSURE ADJUSTMENT" in "SERVICE PROCEDURES". 2. Ignition module malfunction. 3. Check gas orifice for obstruction.
Pilot not lit or goes out.	1. Gas not on. 2. Low incoming gas pressure. 3. Check thermopile millivolts. 4. Pilot going out due to drafts, excess steam from drain or unit not level. Improper venting can direct the pilot flame away from thermopile or flame sensor. 5. Pilot not adjusted correctly. See "PILOT, THERMOCOUPLE OR MAIN BURNERS" in "SERVICE PROCEDURES". 6. Burners ignite too violently. Check gas pressure to the unit. See "MANIFOLD PRESSURE ADJUSTMENT" in "SERVICE PROCEDURES". 7. If auto ignition and no sparking - ignition module malfunction. 8. Wrong pilot assembly used.
Spark Ignitor not sparking.	1. Incorrect spark gap setting. See "AUTOMATIC IGNITION SYSTEMS" in "SERVICE PROCEDURES". 2. Poor ground between pilot bracket and burner. 3. Loose, broken or damaged lead wires (including ground) from ignition module to ignitor. 4. Ignitor boot on ignition cable loose, damaged or missing causing excessive ignition voltage leakage. 5. Ceramic flame rod insulator on ignitor cracked or damaged from extreme heat. 6. Ignition module not receiving power. 7. Ignition module malfunction.