



ABC Combi Electric Oven

ABC7E

ML-137716

- NOTICE -

This Manual is prepared for the use of trained Vulcan Service Technicians and should not be used by those not properly qualified.

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.

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TABLE OF CONTENTS

SERVICE UPDATES	4
SERVICE UPDATES - ABC COMBI ELECTRIC OVEN	4
GENERAL	5
INTRODUCTION	5
OPERATION, CLEANING AND MAINTENANCE	5
TOOLS	5
LUBRICATION	5
WATER QUALITY STATEMENT	5
SPECIFICATIONS	6
UPGRADE ABC COMBI FIRMWARE	8
FIRMWARE VERSION HISTORY	8
FIRMWARE UPDATE PROCEDURE	8
USB ERROR MESSAGES	9
REMOVAL AND REPLACEMENT OF PARTS	10
PANELS	10
INNER DOOR	11
INNER DOOR LATCH	11
DOOR LAMP	12
DOOR LATCH	12
DOOR SWITCH	13
CONVECTION FAN MOTOR	14
CONVECTION FAN BAFFLE	15
MAIN CONTROL BOARD	15
OXYGEN SENSOR	16
OXYGEN SENSOR BOARD	17
FERRITE	17
MOTOR CONTROL BOARD	18
CONTROL PANEL	18
ON / OFF SWITCH	19
DISPLAY BOARD	20
CONTROL PANEL COOLING FAN	21
CONTROL BOX COOLING FAN	22
REAR COOLING FAN	22
KNOB & ENCODER	23
HI-LIMIT THERMOSTAT	23
CAVITY INTAKE TUBE ASSEMBLY	24
CAVITY VENT MOTOR	25
CAVITY VENT SWITCHES	25
TRANSFORMER	26
TEMPERATURE SENSOR (RTD1)	27
DRAIN WATER CONDENSATE VALVE	28
DRAIN WATER THERMOCOUPLE	28
HUMIDITY VALVE	29
HEATING ELEMENTS	30
CONTACTORS	31
SERVICE PROCEDURES AND ADJUSTMENTS	32
CONFIGURATION MODE (1972)	32
LOG INTO CONFIGURATION MODE 1972	32
TO REVIEW / CHANGE CONFIGURATION MODE 1972 SETTINGS	32
LOGGING OUT OF CONFIGURATION MODE 1972	38
CALIBRATING OXYGEN SENSOR BOARD	38
TEMPERATURE SENSOR (RTD1) TEST	39
TEMPERATURE CALIBRATION	39

CAVITY VENT SWITCH TEST AND ADJUSTMENT	40
DOOR SWITCH ADJUSTMENT	41
HEATING ELEMENTS RESISTANCE CHECK	42
ELECTRICAL OPERATION	43
COMPONENT FUNCTION	43
CONTROL PANEL COMPONENT LOCATIONS	45
SEQUENCE OF OPERATION	46
CONDITIONS	46
ON/OFF SWITCH (SW4) TURNED ON, (NO CALL FOR HEAT)	47
ON/OFF SWITCH (SW4) ON & WITH CALL FOR HEAT	47
ON/OFF SWITCH (SW4) ON & WITH CALL FOR HEAT & CALL FOR HUMIDITY	49
OTHER SEQUENCES	49
CIRCUIT BOARD LAYOUTS	51
MAIN BOARD CONNECTIONS	51
MOTOR BOARD	54
WIRING DIAGRAMS	55
TERMINAL BLOCKS	55
T1 TRANSFORMER	56
HEATING ELEMENTS	57
MAIN BOARD	58
MOTOR BOARD	59
COOLING FANS	60
WIRING CHANGES FOR SINGLE PHASE	61
DIAGNOSTICS / TROUBLESHOOTING	62
SERVICE MODE (1963)	62
ERROR CODES	67
OVEN TROUBLESHOOTING	70
QUICK OVER ALL CHECK	70
TROUBLESHOOTING USING ERROR CODES	70
TROUBLESHOOTING BY SYMPTOM	74

SERVICE UPDATES

SERVICE UPDATES - ABC COMBI ELECTRIC OVEN

January, 2015

1. New Heating Element Wiring Diagram - 05-20-15
2. New Software version - 08-11-14
 - A. FIRMWARE VERSION HISTORY
 - B. FIRMWARE UPDATE PROCEDURE
 - C. USB ERROR MESSAGES

GENERAL

INTRODUCTION

General

This manual is for ABC7 Combi ovens. Ovens feature a powered vent damper, advanced digital control panel with digital display for setting cook TEMPERATURE, TIME, and HUMIDITY.

Heating

The ABC Combi oven reaches baking temperature of 350°F at 0% humidity in approximately 5 ½ to 6 minutes; however, a 20 minute preheat is recommended.

Combi Ovens

Combi ovens provide convection heat, steam heat or a combination of both in a single compartment cooking chamber. Humidification is provided by water injection into oven cavity. Water is injected by means of an internal nozzle, it vaporizes on contact with hot interior surfaces.

Steam System

All combi ovens come with a boiler less flash steaming system which provides a quick response time as well as excellent cooking results.

All information, illustrations and specifications contained in this manual are based on latest product information available at time of release.

OPERATION, CLEANING AND MAINTENANCE

Refer to [Installation & Operation Manual \(F47110\)](#) for specific operating instructions.

TOOLS

Standard

1. Standard set of hand tools.
2. Metric set of hand tools.
3. VOM with measuring micro amp current tester. (Any VOM with a sensitivity of at least 20,000 ohms per volt can be used.)
4. Temperature tester (thermocouple type)
5. Field service grounding kit.

Special

1. M6 socket head cap screw 3" long (hardened black oxide finish) for removing convection fan from motor shaft.
2. Gear puller to remove convection fan.
3. USB Drive (Part # 00-443444)

LUBRICATION

1. Ovens have self-lubricating composite bearings. No lubrication required.
2. Anti seizing compound.

WATER QUALITY STATEMENT

The fact that a water supply is potable is no guarantee that it is suitable for steam generation. Proper water quality can improve the taste of the food prepared in the oven, reduce scale build-up or corrosion, and extend equipment life. Local water conditions vary from one location to another and can change throughout the year. The recommended water treatment for effective and efficient use of this equipment will vary depending on the local water conditions. Your water supply must be within the general guidelines outlined in the chart below at all times during use of this machine or service issues not covered under warranty may result.

Water hardness should be treated by removing the impurities (water softener with carbon block or dechlorinator and/or in-line water treatment). Low water hardness may also require a water treatment system to reduce potential corrosion. Water treatment has been shown to reduce costs associated with machine cleaning, reduce deliming and reduce corrosion of metallic surfaces.

Daily washing and rinsing of the cavity is required. In some cases it may be needed more than once a day to prevent compounding of contaminants deposited inside cavity even with acceptable filtration. Failure to wash and rinse down the cavity daily could result in damage of the oven cavity and interior parts. A Reverse Osmosis water treatment system can be installed to eliminate chlorides or other contaminants from the water if needed.

NOTE: Failure to properly maintain water quality or preventative procedures for water can lead to issues not covered under warranty.

WATER SUPPLY GENERAL GUIDELINES ¹	
Supply Pressure (dynamic flow)	30-60 psig
Hardness	less than 3 grains (17.1 ppm = 1 grain of hardness)
Silica	less than 13 ppm
Chloramines ²	zero
Chlorides ²	less than 30 ppm ³
Total Chlorine ⁴	zero
PH	range 7-8
Un-Dissolved Solids	less than 5 microns

¹ Testing of water is always done AFTER water filter or water treatment used. Water quality does change with usage and should be checked after idle times to see if the condition worsens .

² A carbon block filter system should always be used to remove Chlorine and Chloramine. If a

water softener is used, a carbon block is still required. Check with your local water treatment specialist for proper sizing and replacement intervals for the carbon block cartridge.

³ If the Chlorides exceed 30 ppm and the oven is used more than 8 hours during the day in steam or combination mode the cavity will require rinsing every 8 hours. Failure to do so will result in corrosion and rusting of the oven cavity and interior parts. A Reverse Osmosis water treatment system can be installed to eliminate chlorides from the water and reduce the hardness. Preventative washing and rinsing may be needed more than once a day to prevent compounding of contaminants inside cavity.

⁴ Total Chlorine of 4.0 ppm is the max limit for the building water supply. A carbon block filter must still be used to remove all Chlorine and Chloramines from the water. Failure to do so will result in corrosion and rust in the cooking cavity which is not covered under warranty.

SPECIFICATIONS

Data

⚠ WARNING Electrical and grounding connections must comply with the applicable portions of the National Electrical Code and / or other local electrical codes.

Supply Voltage							
Model	Phase	208V		240V		480V	
		KW	AMP	KW	AMP	KW	AMP
ABC7E	1	18	86.5	24	100	-	-
	3	18	50	24	57.8	24	28.9

NOTE: Single-phase blower motors are user on these ovens, so there is no need to check direction of motor rotation. The fan will rotate in the proper direction.

Water Supply

A cold water supply with a flow pressure of 30 to 60 psi is required.

There is a 3/4" garden hose fitting located on rear of machine labeled FILTERED. This inlet must be connected to approved filter system. Failure to connect oven to approved filter system will void warranty.

There is also a 3/4" garden hose fitting located on rear of machine labeled NON-FILTER.

⚠ WARNING Plumbing connections must comply with the applicable sanitary, safety and plumbing codes.

Supply water requirements:

- 2.0 to 6.0 grains of hardness per gal.
- pH 7.0 to 8.0.
- Chlorides less than 30 PPM.

Drain Connection

Plumbing Connections

The drain connection must be plumbed with a minimum of 1" air gap. Drain water can not be greater than 140°F, upon discharge. There is a 1" NPT male port for drain. The drain plumbing, not supplied, should have a constant slope towards the floor drain. Do not connect solidly to floor or other drains.

UPGRADE ABC COMBI FIRMWARE

FIRMWARE VERSION HISTORY

This section contains the history of the ABC7 Combi Oven Firmware. The release date of the Firmware is how it is identified. The table below will list the release date along with a short explanation of the features /

fixes which were introduced with that particular version.

NOTE: The current version of firmware loaded in to the oven can be identified in Service Mode (1963) - location P0.

Firmware Version / (Release Date)	Comments
022514 (02-25-14)	First production release.
081114 (08-11-14)	<p>Fixed an issue with the E6 error. Motor current sense circuit would lock up and the oven could not sense current going to the convection fan motor, causing an E6 error.</p> <p>Fixed an issue with the P4, P5 and P6 custom temperature settings. It fixes an issue with custom temps feature, in which initial lowest temp value when turning up from standby could be out of P15/16 range, if the only enabled custom temps are above/ below P15/16.</p> <p>In Configuration Mode (1972) Increases the maximum temperature setting in Parameter P15 to 482F.</p> <p>NOTE: Ovens with Serial Numbers prior to 541073334 must have their High Limit Thermostat changed before the setting of the maximum temperature can be set above 450F.</p> <p>Starting Serial Numbers</p> <ul style="list-style-type: none"> • 541074355 (480V) • 541074349 (208V)

FIRMWARE UPDATE PROCEDURE

1. Obtain a copy of ABCCombi.bin file from the Hobart Service Resource Center and load it onto a USB drive (thumb drive).

NOTE: The file must be loaded in the root directory of the thumb drive.

2. Remove the Right Panel.
3. Re-apply power to the oven and insure that the door is closed.
4. Place the Oven in Idle Mode. (Temperature display ---)
 - A. No Set Temperature.
 - B. Not in Service Test Mode (1963).
 - C. Not in Configuration Mode (1972).
5. Insert the USB drive into the oven's USB-A port.

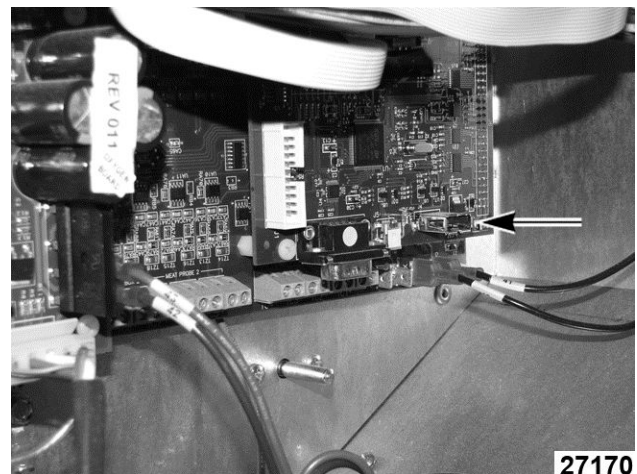


Fig. 1

NOTE: The Convection Fan Motor may or may not come on when the flash drive is inserted.

6. View the LED displays on the front of the oven.
7. "Usb Flash n_y" appears on the display.

- If something other than Usb Flsh n_y is displayed, then refer to USB ERROR MESSAGES.
 - If n is selected with the Humidity knob (turned to the left, ccw), the oven will return to Idle Mode.
 - If y is selected (turned to the right, cw), the Humidity display briefly changes to show Yes, then Del as the necessary flash is deleted, then begins showing a percentage complete from 0 – 100 as the software image is flashed. When flashing is complete (usually after only a few seconds), the Humidity display briefly shows Don. Don indicates the software flashed correctly. Oven returns to the Idle Mode (Temperature display ---)
8. Enter Service Mode (1963),
 - Verify that location P0 now shows 08-11-14 as the firmware revision code.
 - Record (HRS) oven hour count.
 - E6 error before the recorded oven hour count can be ignored.

USB ERROR MESSAGES

Error Message	Corrective Action
Usb Host Con or Usb Host Enu	Removing the USB drive, once the Temperature display returns to "---", reinsert the USB drive.
Usb No Fil:	The ABCombi.bin file was not found on the USB drive. Reload the ABCombi.bin file.
USB Fail < 1, 2 or 3 >	USB drive needs to be formatted in FAT32 format. If this fails use a different USB drive.
USB Fail < 4-5, 7-8 or 15-18 >	Removing the USB drive, once the Temperature display returns to "---", reinsert the USB drive. If error persists, use a different USB drive.
USB Fail < 9-14 >	Removing the USB drive, once the Temperature display returns to "---", reinsert the USB drive. If error persist, replace Main Control Board

REMOVAL AND REPLACEMENT OF PARTS

PANELS



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

Right Panel

1. Remove four right panel screws.
2. Lift right panel up and back using handles.

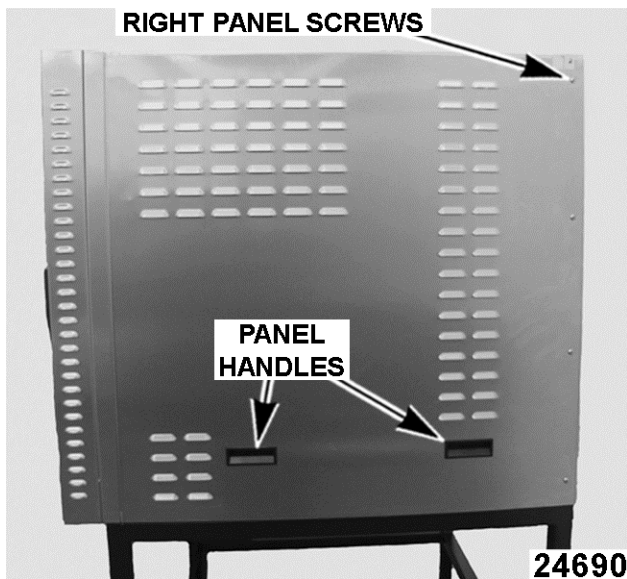


Fig. 2

3. Reverse procedure to install.

Rear Panel

1. Remove Right Panel.
2. Remove two fan screws.
3. Remove six utility panel screws.

NOTE: Bottom 2 utility screws only support utility panel and can be left assembled.

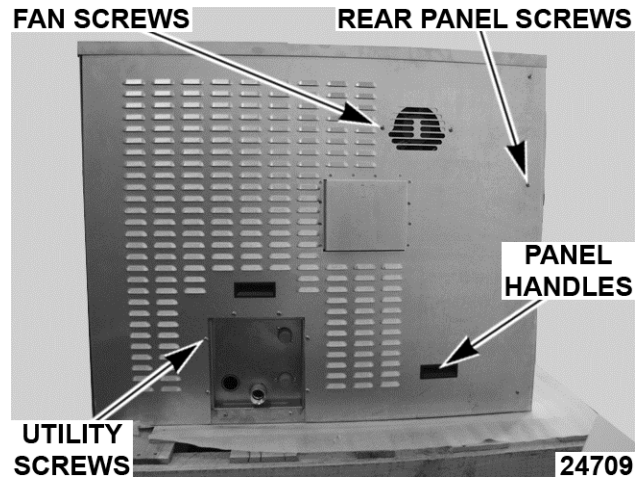


Fig. 3

4. On the right side, remove the screw in the upper right hand corner.

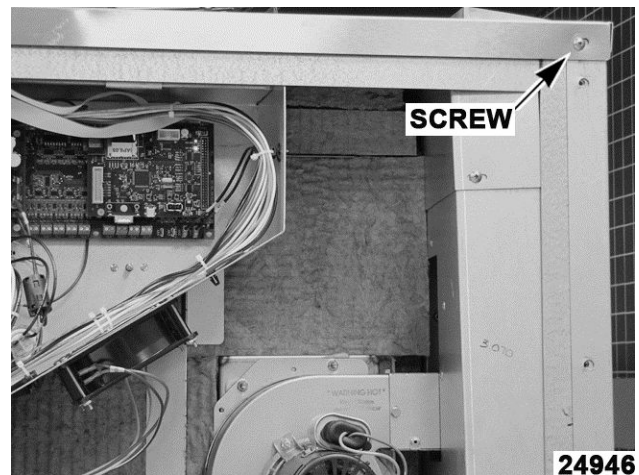


Fig. 4

NOTE: Gas Unit shown.

5. Remove four rear panel screws.

NOTE: Hold onto one panel handle to prevent rear panel from falling.

6. Lift with handles to remove.
7. Reverse procedure to install.

Left Panel

1. Remove Right Panel.
2. Remove Rear Panel.
3. On the left side, remove the screw in the upper left hand corner.
4. Lift left panel up and back towards the rear of the unit.



Fig. 5

5. Reverse procedure to install.

INNER DOOR

1. Open oven door.
2. Unlatch inner door using inner door latch.

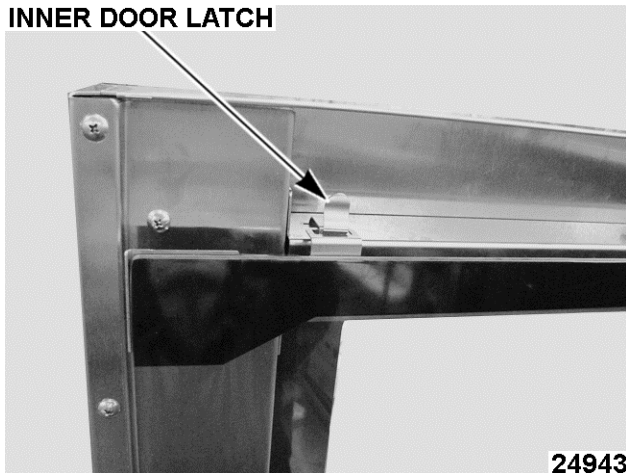


Fig. 6

3. Lift inner door up off door hinge.

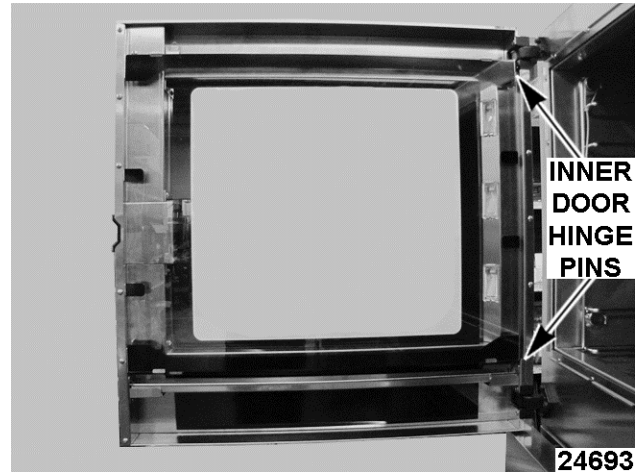


Fig. 7

4. Place inner door in a secure location to prevent damage.
5. Reverse procedure to install.

INNER DOOR LATCH

1. Remove upper door stiffener screws and remove upper door stiffener.

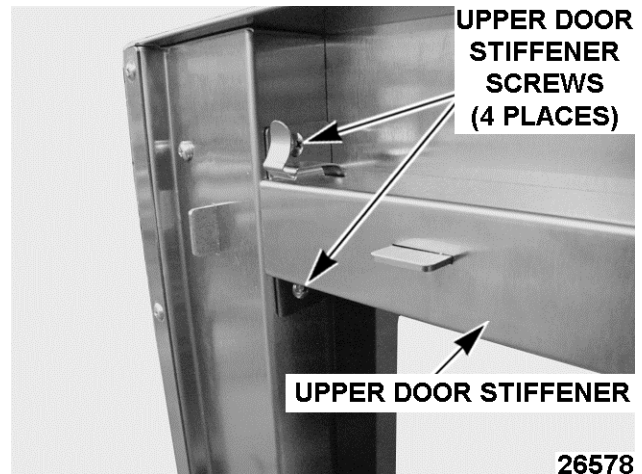


Fig. 8

2. Remove inner door latch screws.

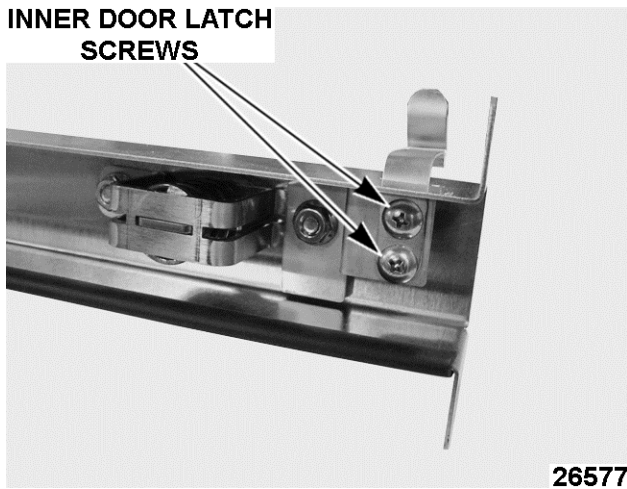


Fig. 9

3. Reverse procedure to install.
4. Check for proper operation.

DOOR LAMP



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove INNER DOOR.
2. Insert screwdriver in slot just above the screw.

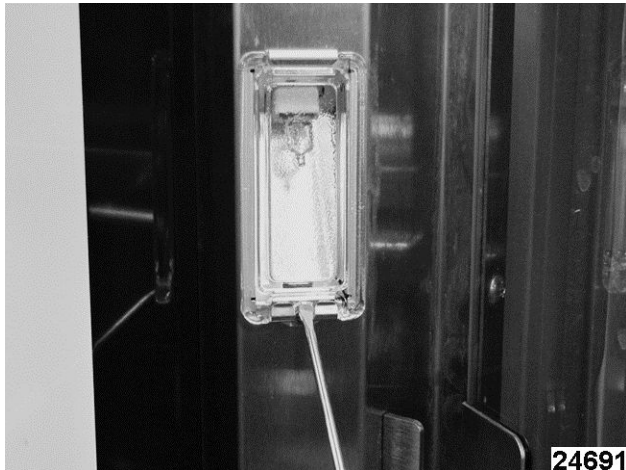


Fig. 10

3. Push in tab to free the glass cover from lamp holder
4. Grasp lamp using cloth and remove from lamp socket.

NOTICE Do not touch the Halogen lamp with bare hands. If lamp is exposed to oil from skin, life of the Halogen lamp will be reduced. Skin oil may be removed with alcohol while lamp is cold.

NOTE: Use a clean rag or paper towel to handle replacement lamp. Ensure lamp is free from oil and dirt before replacing.

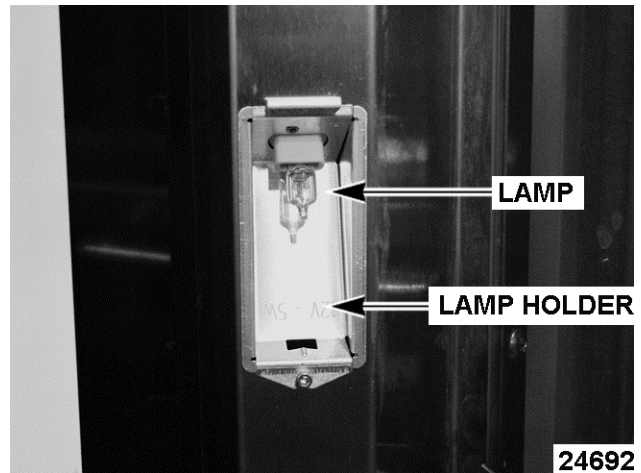


Fig. 11

5. Reverse procedure to install.

DOOR LATCH

WARNING The oven and its parts are hot. Use care when operating, cleaning or servicing the oven. The cooking compartment contains live steam. Stay clear when opening door.

Door Cam

1. Open door and remove INNER DOOR.
2. Remove door lock cover.

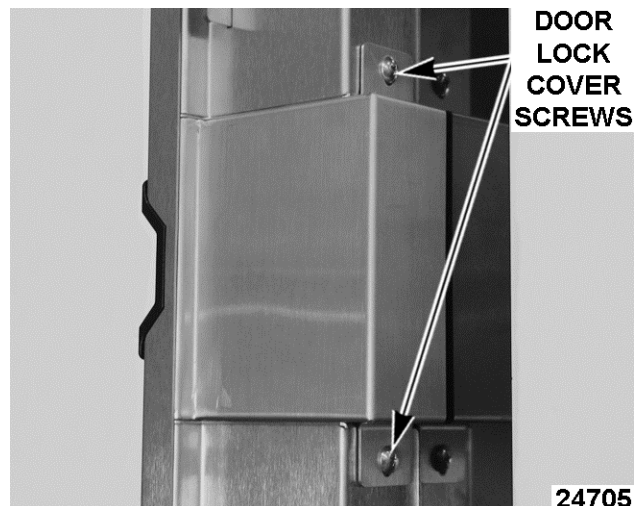


Fig. 12

3. Remove cam screw and washer.

- Press torsion springs ends together to unlatch from the door lock clamp bracket.

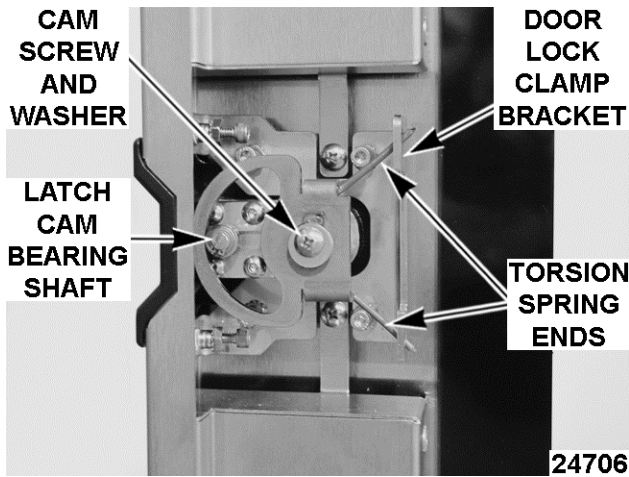


Fig. 13

- Press latch into door to remove cam.
- Reverse procedures to install.
- Check for proper operation.

Latch Assembly

- Remove Door Cam.
- Remove retaining ring, shim, and ball bearing.

NOTE: Press in latch for better access to retaining ring.

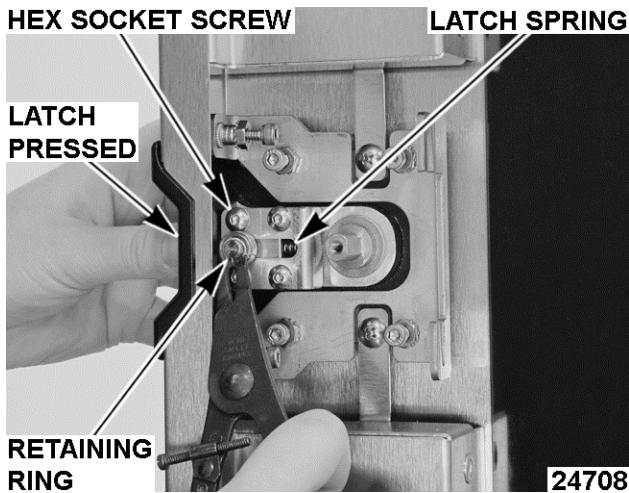


Fig. 14

- Remove hex socket screws (x4).
- Latch spring and wear latch plate are now accessible for replacement.
- Reverse procedure to install.
- Check for proper operation.

DOOR SWITCH



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

- Remove CONTROL PANEL.

NOTICE Do not place control panel on knobs. Doing so will damage encoders. Lift one side of control panel up to prevent knobs from touching surface.

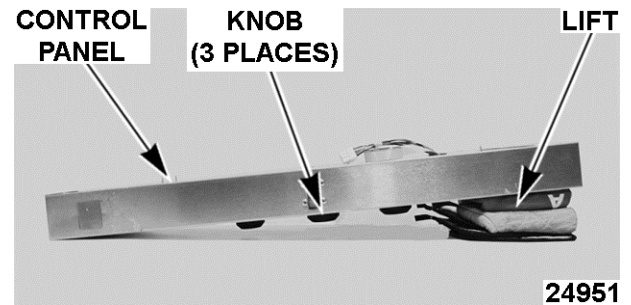


Fig. 15

- Remove back control panel.
- Remove lock nuts.

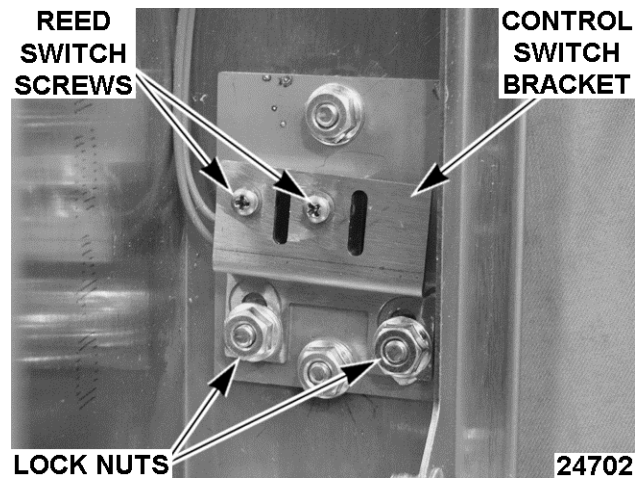


Fig. 16

- Slide reed switch out from control switch bracket.
- Remove reed switch screws.
- Reverse procedures to install.
- Check for proper operation.

CONVECTION FAN MOTOR

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

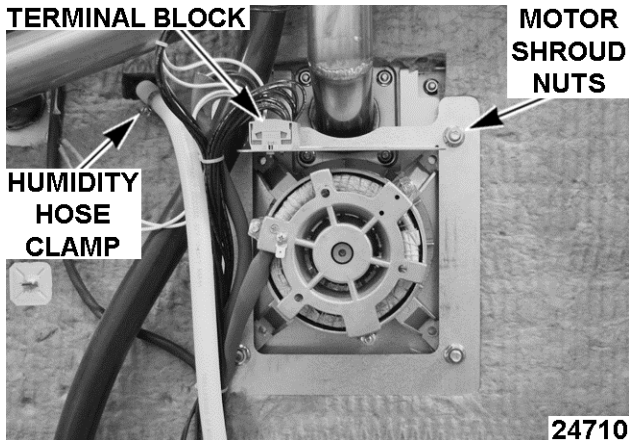


WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTE: When using gear puller to remove convection fan, do not use factory stainless steel cap screw or damage to the screw head may occur. Use a spare M6 cap screw as listed under Tools.

Convection Fan

1. Remove Right Panel.
2. Remove Rear Panel.
3. Remove humidity hose clamp.



Convection Fan Motor

4. Remove CONVECTION FAN BAFFLE.
5. Remove humidity cavity nozzle nuts to remove humidity cavity nozzle.

NOTE: Replace nozzle gasket if necessary.

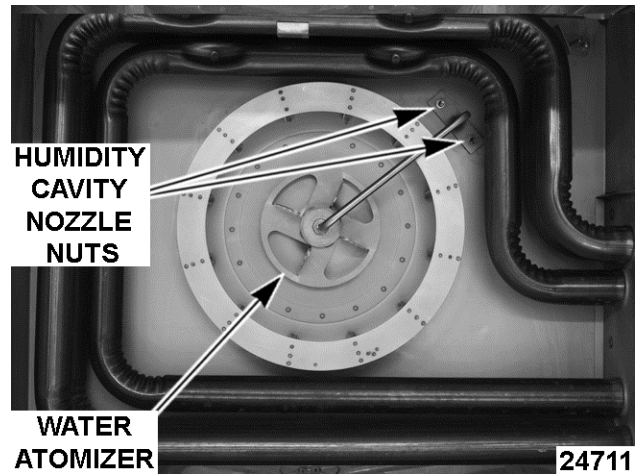


Fig. 18

NOTE: Gas Unit shown.

6. Remove socket head cap screw.

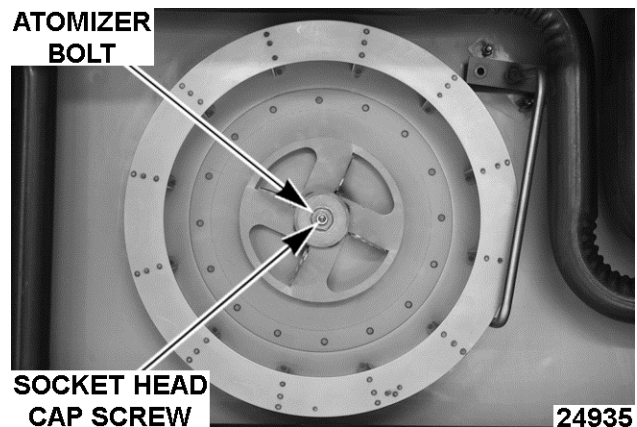


Fig. 19

NOTE: Gas Unit shown.

7. Remove atomizer bolt.

NOTE: Atomizer bolt is a left handed bolt. Turn clockwise to remove.

8. Remove water atomizer.
9. Thread atomizer bolt by hand into convection fan motor shaft. Leave approximately 1/8" space between hex head on left hand thread atomizer bolt and convection fan hub.
10. Insert spare M6 cap screw into convection fan motor shaft. **Hand tighten only.**

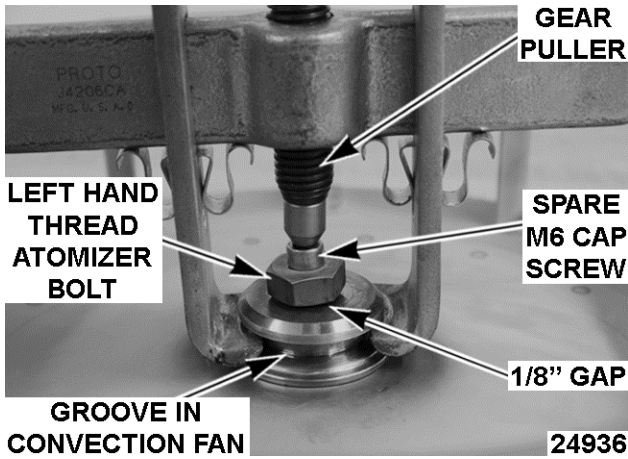


Fig. 20

11. Install gear puller.
12. Tighten gear puller to separate convection fan from the motor shaft.

NOTE: Applying heat uniformly to groove in convection fan will assist with separation of convection fan and motor shaft.

13. Disconnect motor wires from convection fan terminal block.

Convection Fan Terminal Block (TB2) Connection Call-outs	
A	TB Block Number
White	10
Blue	9
Black	8
Red	7
Brown	6
Brown	5

14. Remove convection motor shroud bolts. Refer to graphic 24710 Convection Fan Motor.

NOTE: Apply anti seizing compound to bolts.

15. Reverse procedure to install.
16. Check for proper operation.

CONVECTION FAN BAFFLE

⚠ WARNING The oven and its parts are hot. Use care when operating, cleaning or servicing the oven.

1. Remove all oven racks.
2. Remove left and right oven rack holders.
3. Lift baffle up off bottom baffle supports.
4. Lift baffle over bottom rack guides.

5. Lift baffle up off baffle hangers.

NOTE: Verify convection fan baffle is lifted over bottom and top rack guide supports.

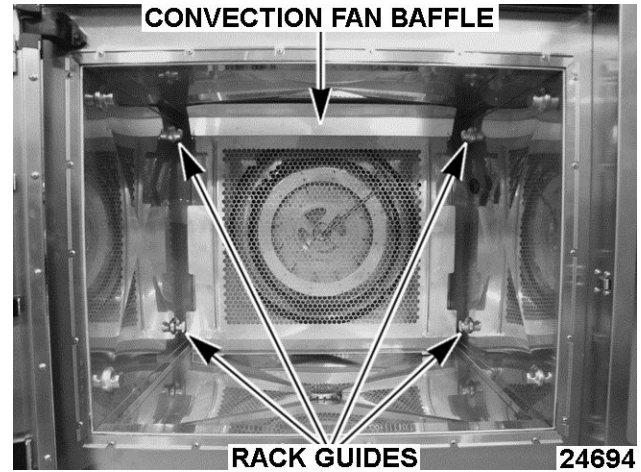


Fig. 21

6. Pull towards front of oven to remove.
7. Reverse procedures to install.

NOTE: Verify convection fan baffle is hooked on top baffle hangers and supported behind the bottom baffle support guides.

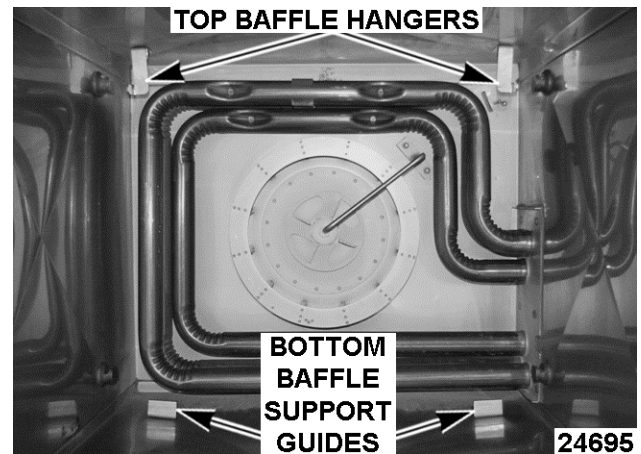


Fig. 22

NOTE: Gas Unit shown.

MAIN CONTROL BOARD

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

1. Check CONFIGURATION MODE (1972) for customer's current parameter settings.
Document customers parameter settings.

NOTE: This step can only be accomplished if main control board is still operational.

NOTE: Oven hour counter (P18), water counter values (P19, P20), and error log will start new, with replacement main control board.



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

2. Remove Right Panel.
3. Remove electrical connections from main control board and oxygen sensor board.
4. Remove main control board.

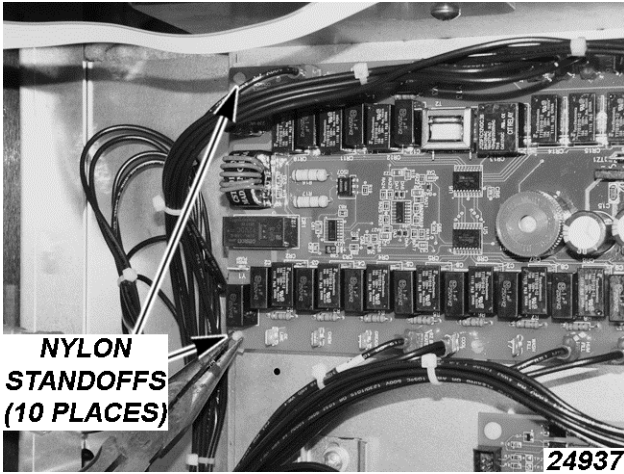


Fig. 23

NOTE: Squeeze nylon standoffs to release board.

5. Remove OXYGEN SENSOR BOARD from main control board.

Installation of Replacement Control Board

1. Install OXYGEN SENSOR BOARD onto replacement main control board.

NOTE: Oxygen sensor board is easier to install onto main control board before installing main control board.

2. Line up holes on new main control board with nylon standoffs (x10).
3. Press board onto standoffs.
4. Follow diagram MAIN CONTROL BOARD CONNECTIONS to rewire replacement board.
5. Configure board to customer's preferred parameter settings, noted prior to removing main control board. See CONFIGURATION MODE (1972) for configuration settings.

6. Refer to OXYGEN SENSOR BOARD.
7. Check for proper operation.

OXYGEN SENSOR



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

WARNING Oxygen sensor is very HOT. Use care when servicing oxygen sensor.

NOTE: Remove power from unit before replacing oxygen sensor. Having power to board when installing sensor, will cause damage oxygen sensor.

NOTE: Sensor can be damaged by water. Do not get wet.

1. Remove Right Panel.
2. Remove Rear Panel.
3. Disconnect oxygen sensor cable at plug.

NOTE: Do NOT disconnect cable from Oxygen Sensor Board.

WARNING Allow Oxygen Sensor to cool completely before removing. Sensor, when powered and operating, is very HOT.

4. Remove all wire ties from oxygen sensor cable.
5. After oxygen sensor has cooled, loosen hex and carefully remove sensor from fitting.

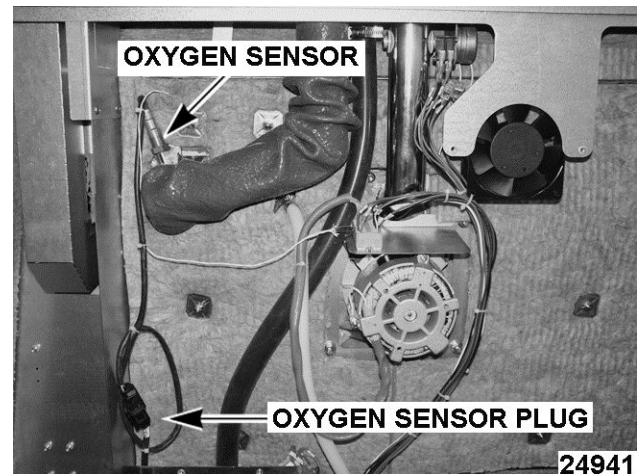


Fig. 24

6. Reverse procedures to install.
7. When installing, wire tie oxygen sensor cable as previously installed.

NOTICE Oxygen Sensor cable can not lay on the bottom of the oven.

NOTICE Oxygen Sensor cables are sensitive to electrical noise and must be routed away from other wires.

8. Power unit on.
9. CALIBRATING OXYGEN SENSOR BOARD.
10. Check for proper operation.

OXYGEN SENSOR BOARD



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

1. Remove Right Panel.
2. Remove electrical connections from oxygen sensor board.

NOTE: Note locations of wires.

3. Remove oxygen sensor board screws. Retain screws for installation of replacement oxygen sensor board.

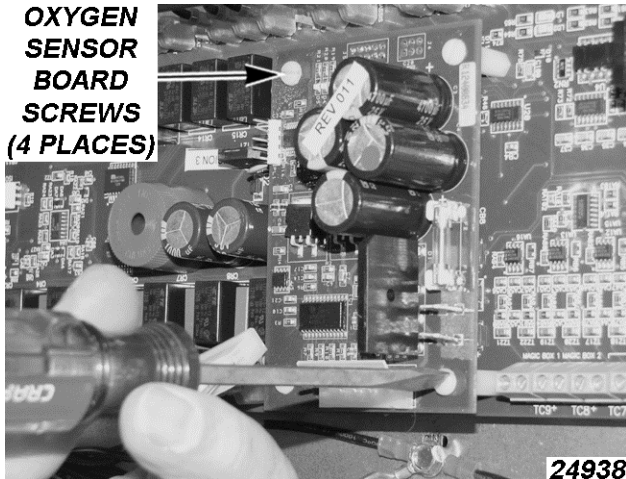


Fig. 25

NOTICE Oxygen sensor board must be installed while unit is unplugged. Failure to Do so will cause permanent damage to oxygen sensor board.

Installation of Oxygen Sensor Board.

1. Verify oxygen sensor board holes line up with the main control board holes.

NOTE: Connect 9 pin connection on back side of oxygen board header to 9 pins located on main control board oxygen board header.

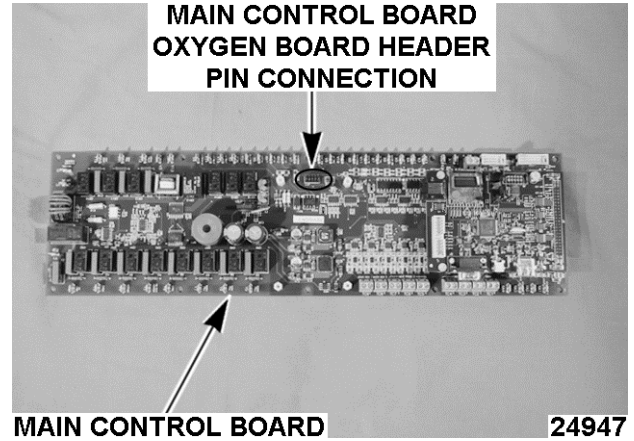


Fig. 26

2. Secure using screws from replaced board.
3. Power on unit.
4. CALIBRATING OXYGEN SENSOR BOARD.
5. Check for proper operation.

FERRITE



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Lift ferrite clip with flat screw driver (2 places).

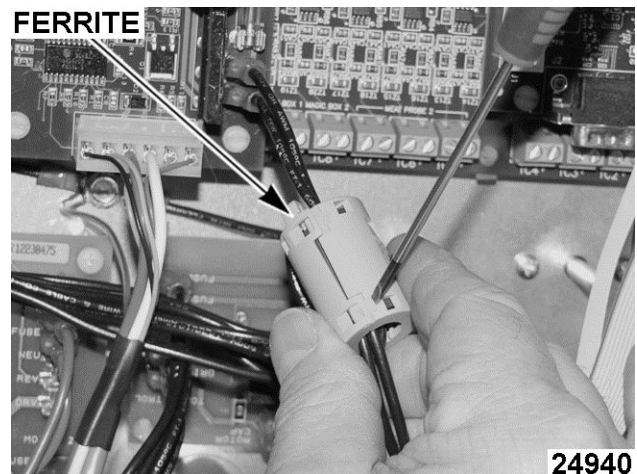


Fig. 27

3. Reverse procedures to install.

NOTE: When installing, place ferrite approximately 3 inches from oxygen sensor board.

NOTE: Loop ferrite wires around the ferrite to keep ferrite in place.

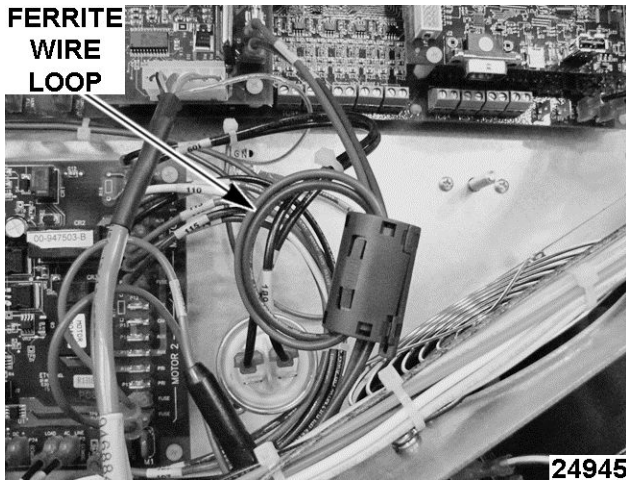


Fig. 28

MOTOR CONTROL BOARD



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

1. Remove Right Panel.
2. Document wire locations.
3. Remove electrical connections from board.
4. Remove motor control board. (4 Nylon screws)

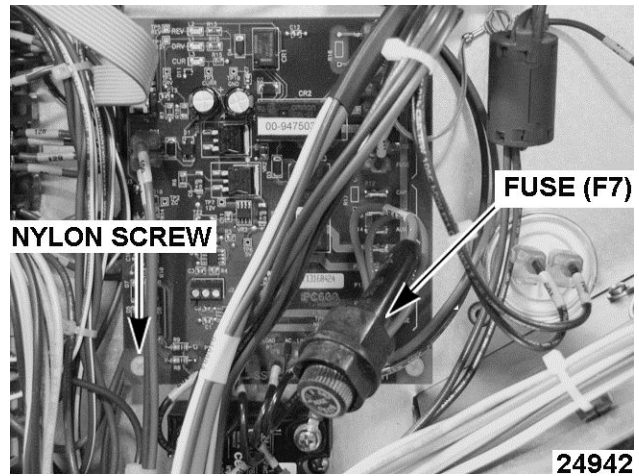


Fig. 29

CONTROL PANEL



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

Control Panel

1. Remove Right Panel.
2. Disconnect multi pin connectors.
3. Disconnect control board ribbon cable.

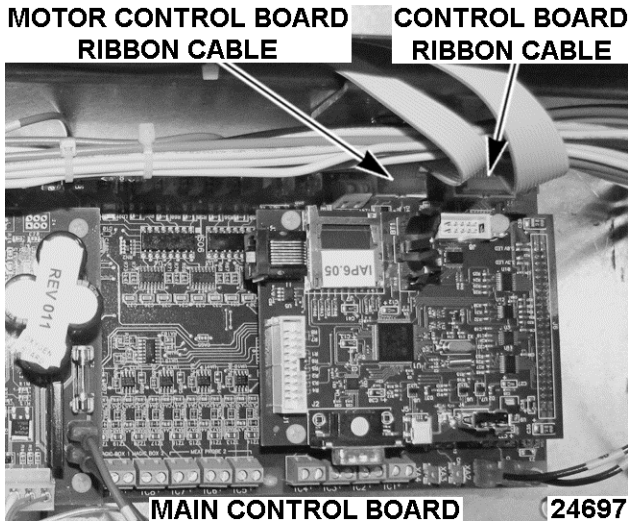


Fig. 30

- Remove ribbon cable wire tie.
- NOTE:** Replace wire tie on install.

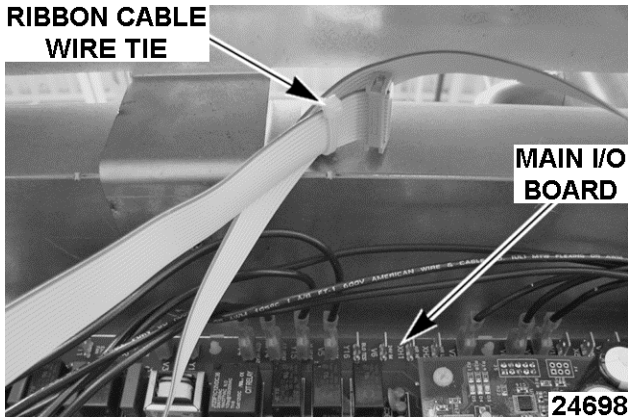


Fig. 31

- Remove 6 recessed control panel screws.

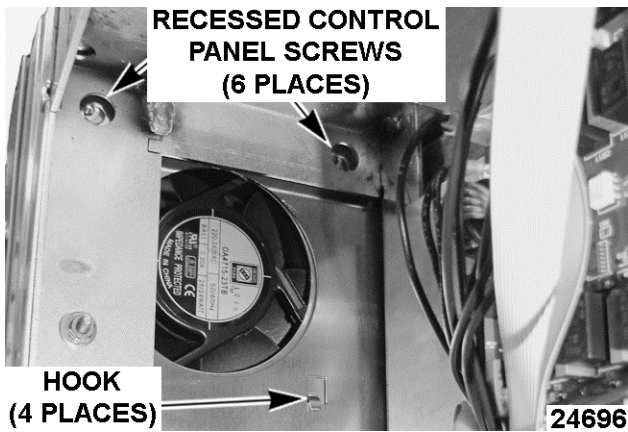


Fig. 32

- Lift control panel up off hooks.
- NOTE:** Carefully pull connector and ribbon cable through hole when removing control panel.

- Place control panel on a clean, flat surface.
- Place in a secure location.

NOTICE Do NOT place control panel flat on knobs. Doing so will cause damage to encoders.

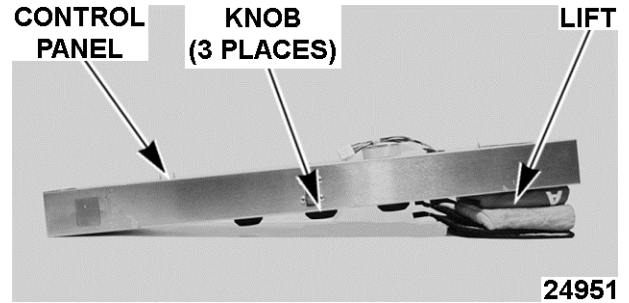


Fig. 33

- Reverse procedures to install.

NOTE: The motor control board ribbon cable will fit in J1 as well as J8, make sure it gets plugged in to J1 on Main board.

- Verify proper operation.

ON / OFF SWITCH



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

On / Off Switch

- Remove CONTROL PANEL from unit.
- Place control panel in a secure location on a clean, flat surface.

NOTE: Do NOT place control panel flat on knobs. Doing so will cause damage to encoders.

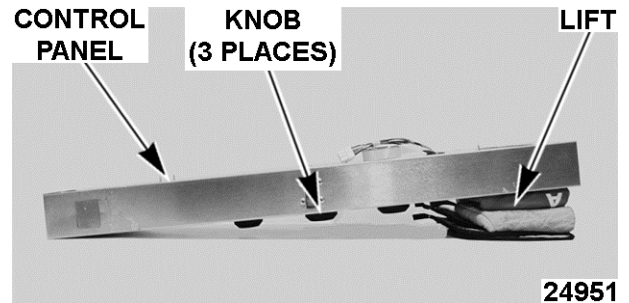


Fig. 34

- Remove screws from back of control base panel.

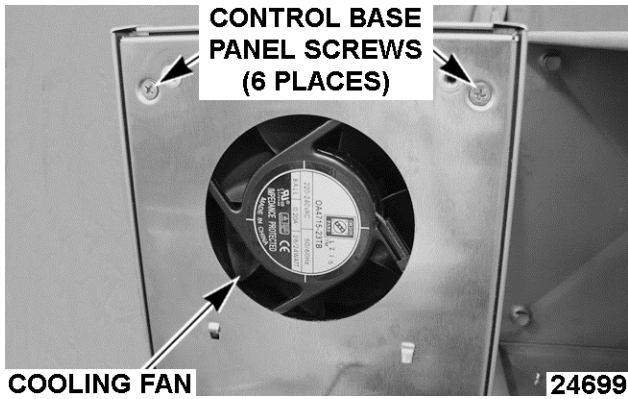


Fig. 35

NOTE: Use care when removing back of control panel cover. Wires are attached.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

4. Unplug wires from back of On/Off switch

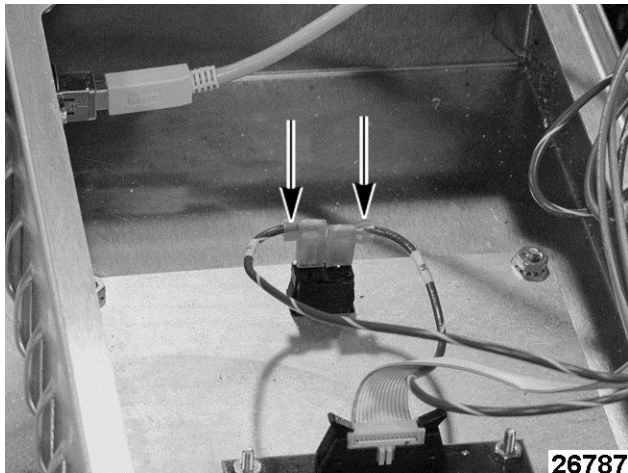


Fig. 36

5. Using a pair of channel locks, squeeze in the sides and press the switch out the front of the panel.
6. Reverse procedures to install.
7. Check for proper operation.

DISPLAY BOARD



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

Display Board

1. Remove CONTROL PANEL from unit.
2. Place control panel in a secure location on a clean, flat surface.

NOTE: Do NOT place control panel flat on knobs. Doing so will cause damage to encoders.

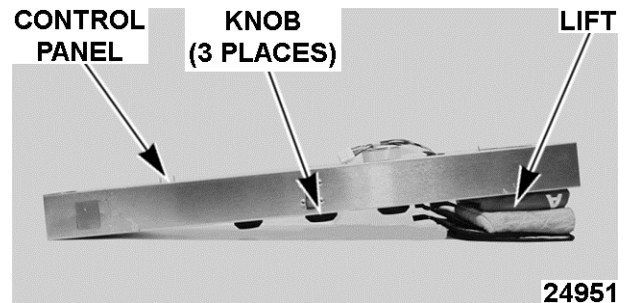


Fig. 37

3. Remove screws from back of control base panel.



Fig. 38

NOTE: Use care when removing back of control panel cover. Wires are attached.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

4. Remove display board ribbon cable.
5. Remove encoder ribbon cables.
6. Remove display board nuts.

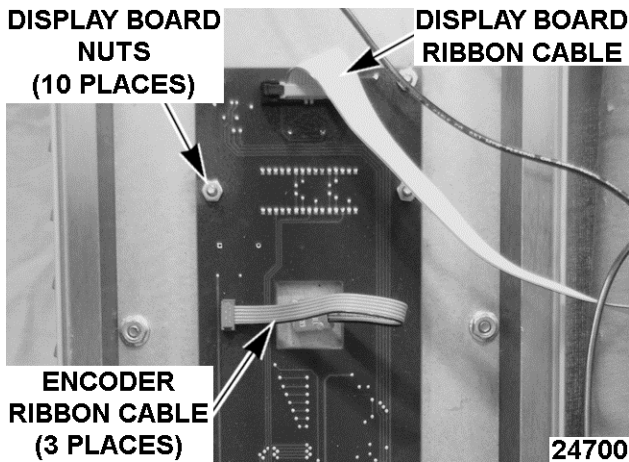


Fig. 39

7. On the new display board, make sure that jumper J5 on the back of the display board is installed and on the correct two pins. (The two closest to the edge of the board.)

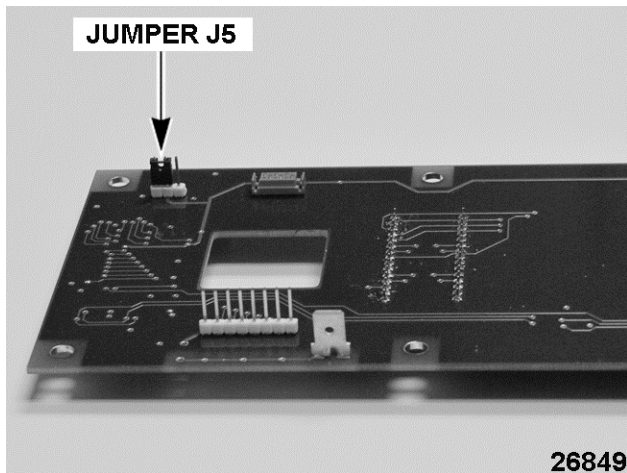


Fig. 40

8. Reverse procedures to install.
9. Check for proper operation.

CONTROL PANEL COOLING FAN



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

Display Board Fan

1. Remove CONTROL PANEL from unit.
2. Place control panel in a secure location.

NOTE: Do NOT place control panel flat on knobs. Doing so will cause damage to encoders.

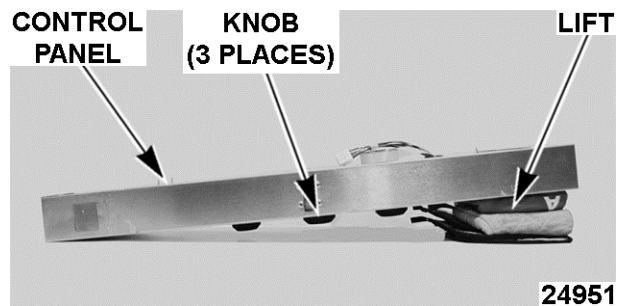


Fig. 41

3. Remove screws from back of control base panel.



Fig. 42

4. Disconnect cooling fan wire connection.
5. Remove cooling fan nuts.

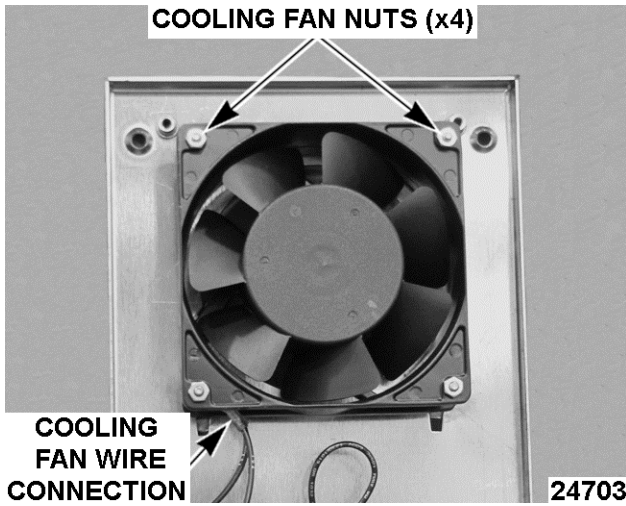


Fig. 43

- When installing fan, verify arrows are facing the correct direction.

NOTE: Air to exhaust out of control panel.

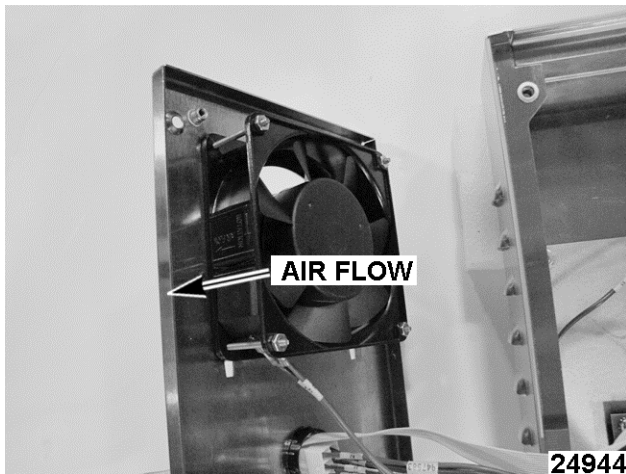


Fig. 44

- Reverse procedure to install.
- Check for proper operation.

CONTROL BOX COOLING FAN



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

- Remove Right Panel.
- Unplug two wires going to fan.
- Remove two screws securing fan to frame.
- Reverse procedure to install.
- Check for proper air flow.

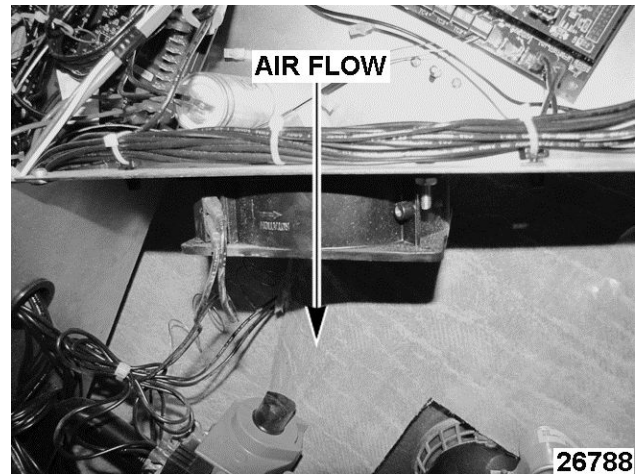


Fig. 45

REAR COOLING FAN



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

- Remove Rear Panel.
- Remove two wires going to fan.
- Remove nuts securing fan to frame.
- Reverse procedure to install.
- Check for proper air flow.

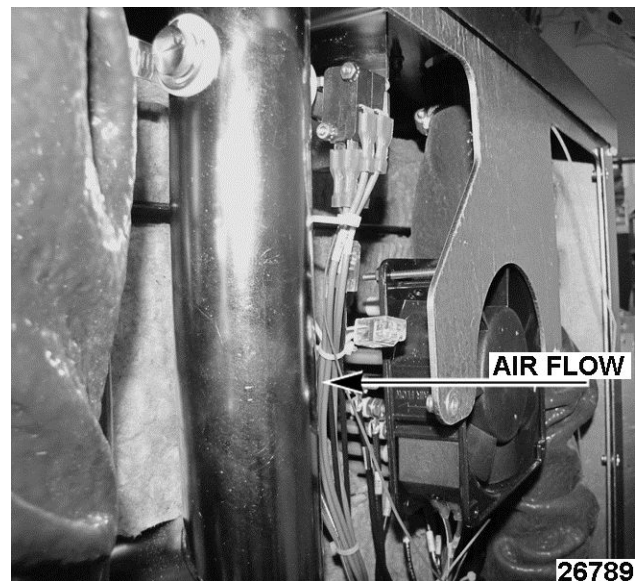


Fig. 46

KNOB & ENCODER



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

NOTICE Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service kit must be used anytime the control board is handled.

Control Knob & Encoder

1. Remove CONTROL PANEL.
2. Place control panel in a secure location.

NOTE: Do NOT place control panel flat on knobs. Doing so will cause damage to encoders.

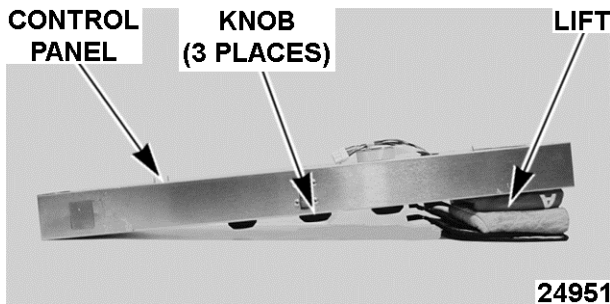


Fig. 47

3. Remove control base panel.
4. Disconnect encoder ribbon cables.

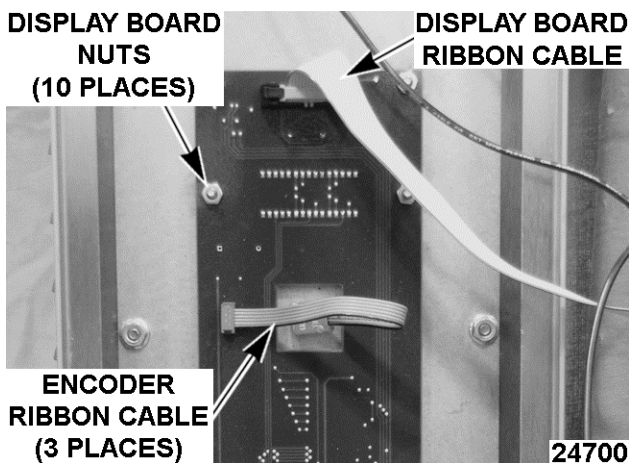


Fig. 48

5. Loosen set screw in tapped hole on knob.

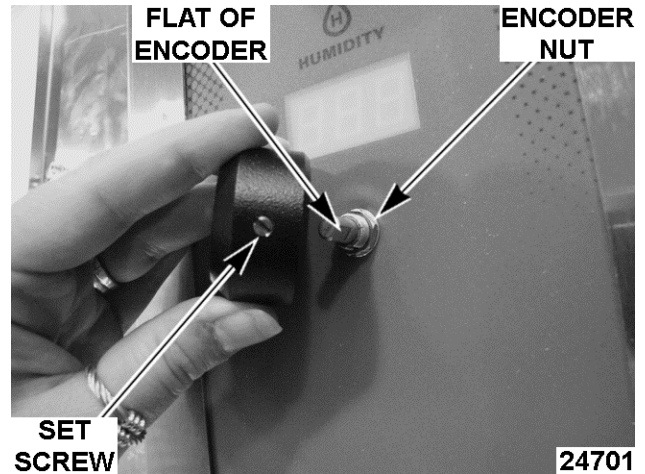


Fig. 49

6. Remove encoder nut to remove encoder.
7. Reverse procedures to install.

NOTE: Tapped hole needs to be aligned with flat part of encoder.

8. Check for proper operation.

HI-LIMIT THERMOSTAT



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove hi-limit thermostat screws.

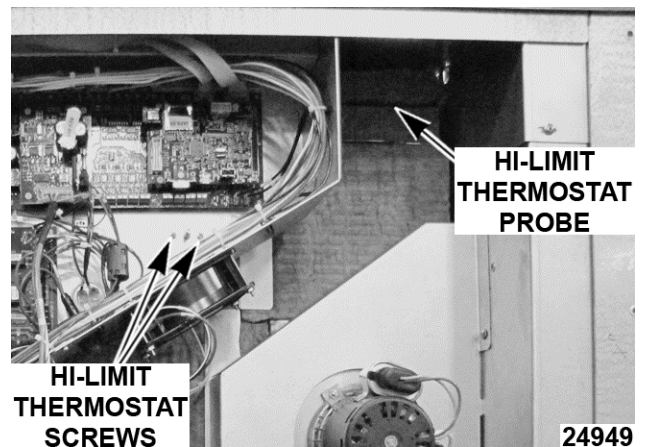


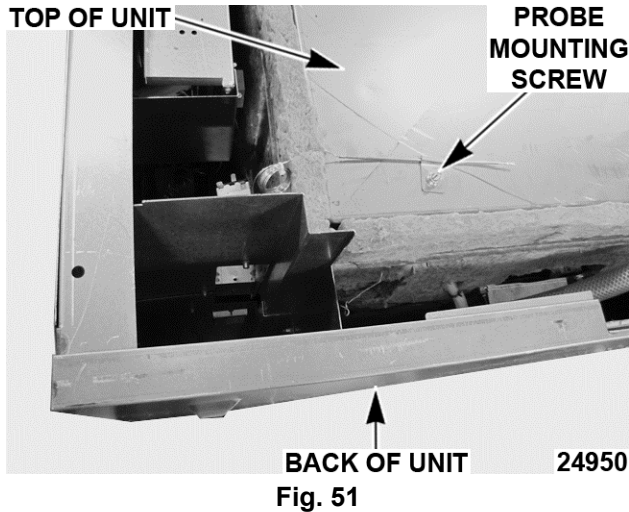
Fig. 50

NOTE: Gas Unit shown.

2. Remove hi-limit thermostat probe.

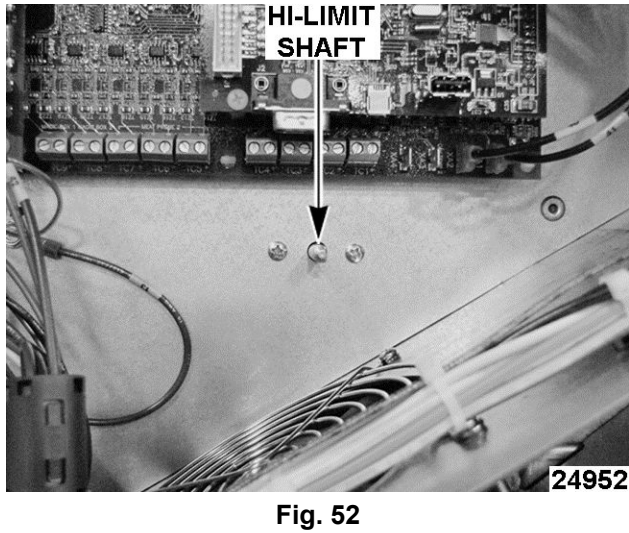
NOTE: Hi-limit thermostat probe is located on top of unit, under insulation.

NOTE: Turn Probe Mounting Screw quarter turn to loosen. Do not remove probe mounting screw and bracket.



- Reverse procedures to install.

NOTE: When installing hi-limit thermostat verify hi-limit shaft is turned clockwise until it stops.



- Check for proper operation.

CAVITY INTAKE TUBE ASSEMBLY



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

- Remove Rear Panel.
- On right side of unit, disconnect plug P3.

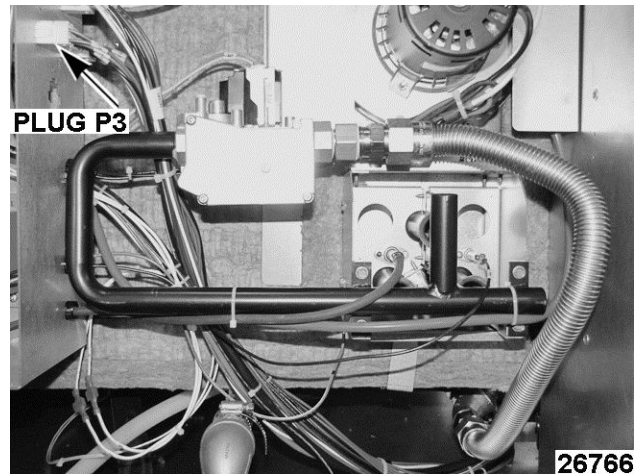


Fig. 53

NOTE: Gas Unit shown.

- Cut cable ties as needed to free wiring harness back to vent motor and switches.

NOTE: Be sure to keep track of the routing of the wiring harness and cable ties.

- Remove (4) nuts securing intake vent tube assembly to back of cavity.

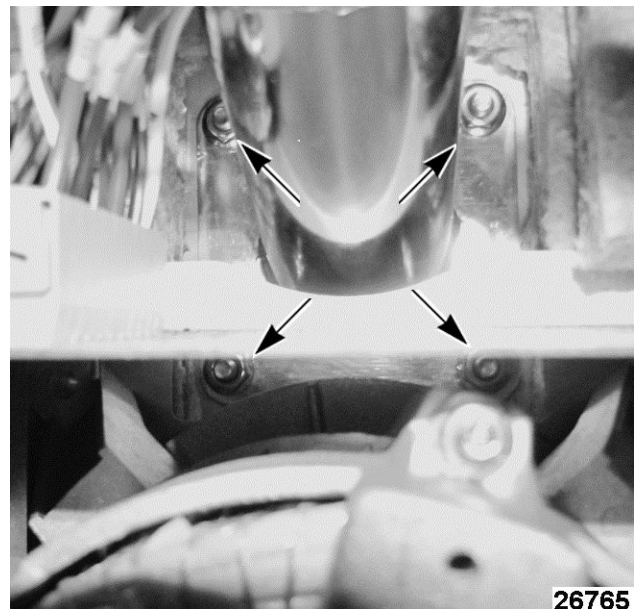


Fig. 54

- Replace parts as needed.
- Reverse procedure to install.

NOTE: There is a gasket between cavity intake tube and the cavity. This gasket should be replaced .

CAVITY VENT MOTOR



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Rear Panel.
2. Remove CAVITY INTAKE TUBE ASSEMBLY.
3. Rotate damper camshaft until set screw faces the rear of the cavity intake tube assembly.

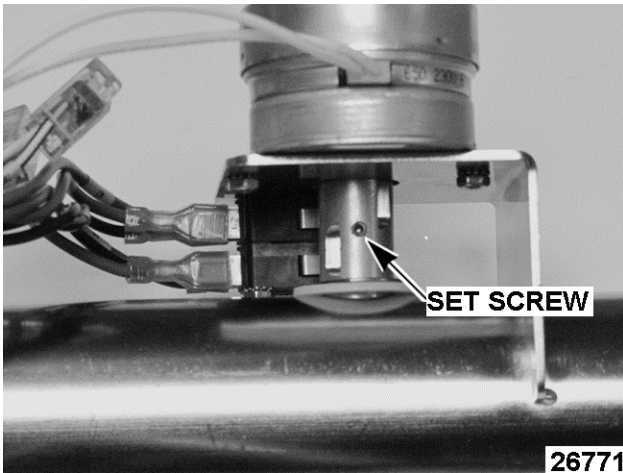


Fig. 55

4. Loosen set screw.
5. Remove two screws securing the vent motor to the frame.
6. Pull motor free from assembly.
7. Insert blade of small screwdriver into wire nuts to release motor wires.

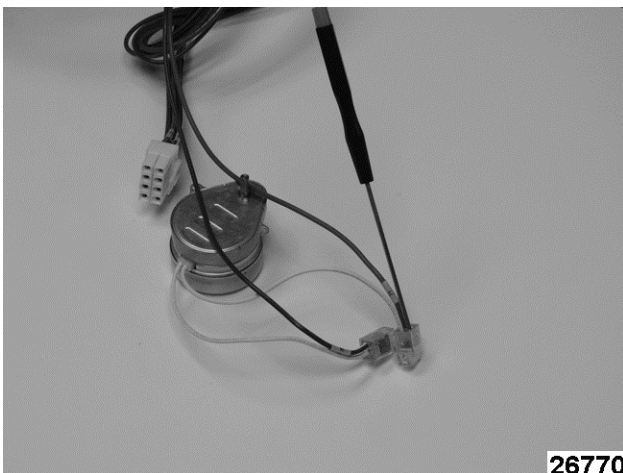


Fig. 56

NOTE: A small straight blade screwdriver (Jeweler screwdriver) is needed.

NOTE: If a small screwdriver is not available, cutting the wires and using a standard wire nut is acceptable.

8. Reverse procedure to install.

NOTE: When inserting the new motor, insure the flat side of the motor shaft faces the set screw.

9. Check CAVITY VENT SWITCH TEST AND ADJUSTMENT.
10. Check for proper operation.

CAVITY VENT SWITCHES



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Rear Panel.
2. Remove wires going to cavity vent switches.

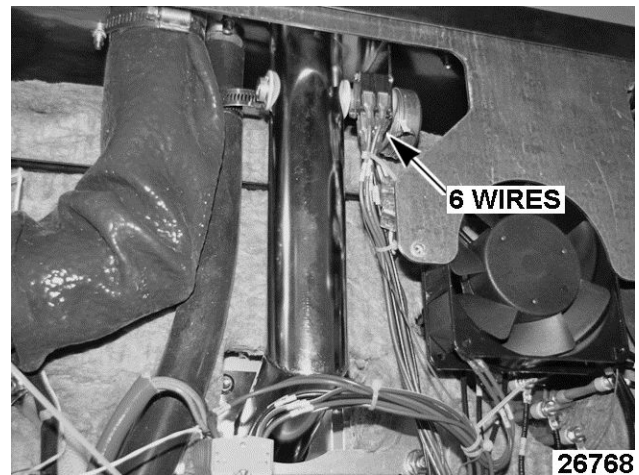


Fig. 57

3. Remove bottom screw securing switches to frame.

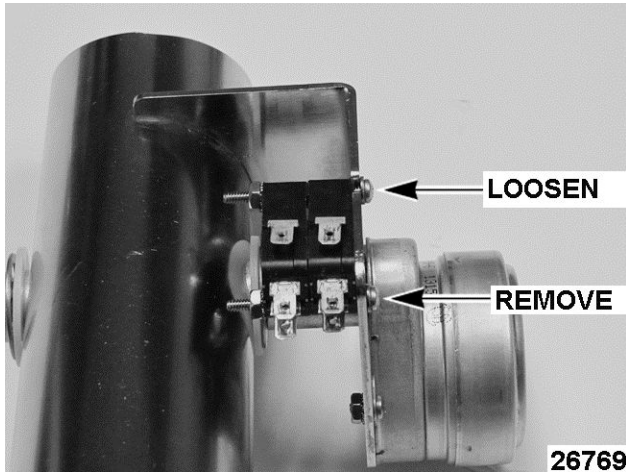


Fig. 58

4. Loosen top screw and remove switches from frame.
5. Replace switch or switches as needed.
6. Reverse procedure to install.
7. Attach wires to switches.

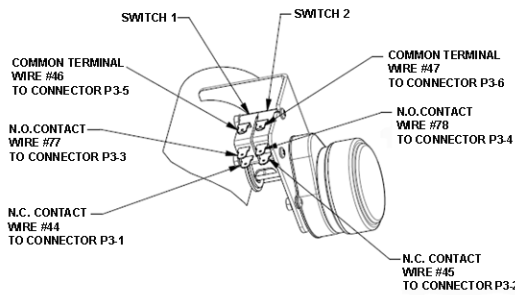


Fig. 59

8. Perform CAVITY VENT SWITCH TEST AND ADJUSTMENT.

TRANSFORMER



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Disconnect Plugs 7 and 8 going to Transformer.

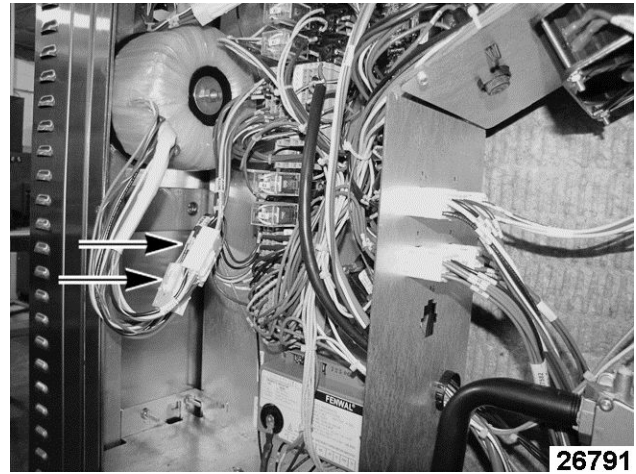


Fig. 60

3. Remove two nuts on the left hand side of transformer bracket.

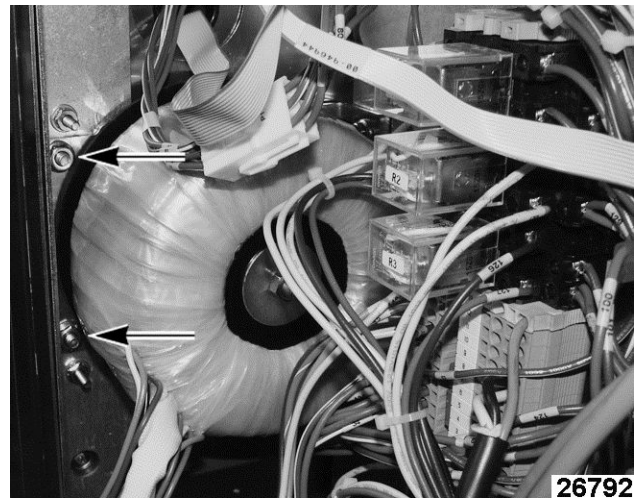


Fig. 61

4. Remove nut on the right hand side of transformer bracket.



Fig. 62

CAUTION Transformer weighs 12.5 pounds and has a strong magnetic pull to the frame of oven.

- Slide transformer off of studs and down to the bottom of the oven.

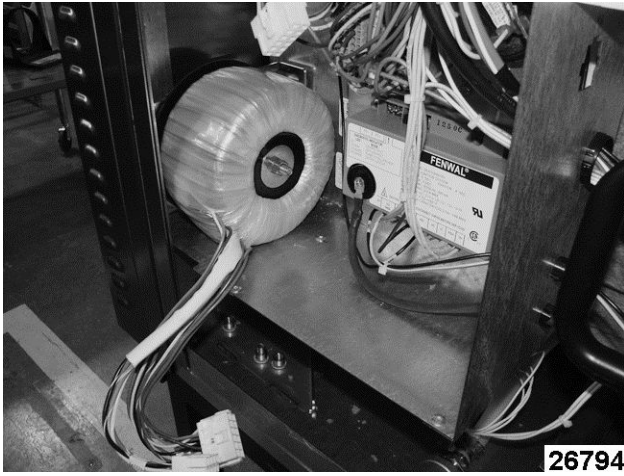


Fig. 63

- Remove transformer and bracket from oven.
- Remove nut and washer securing transformer to bracket.

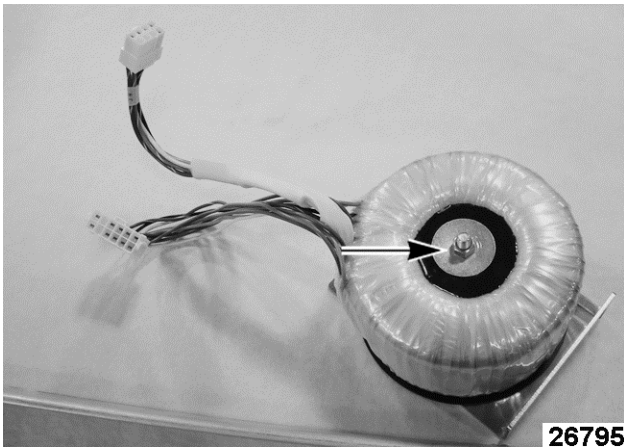


Fig. 64

- Replace transformer.
- Reverse procedure to install.

TEMPERATURE SENSOR (RTD1)



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

- Remove Right Panel.
- Remove Rear Panel.

- Remove wire ties attaching wires going to temperature sensor to the oxygen sensor cable.

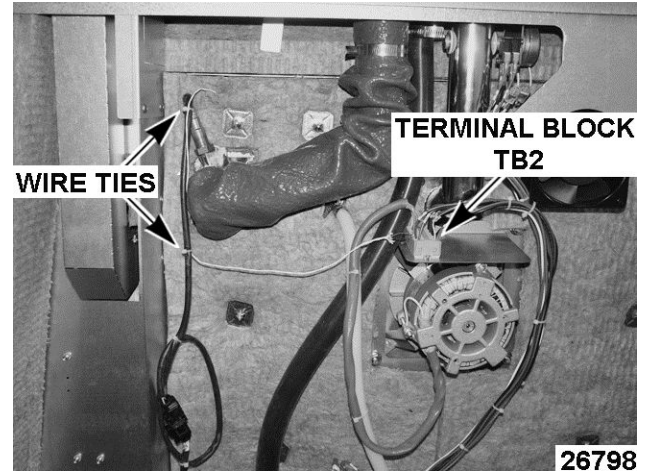


Fig. 65

- Remove black wire from TB2-3 and red wire from TB2-4.

NOTE: Insert small screwdriver in square next to the wire to release the wire from terminal block.

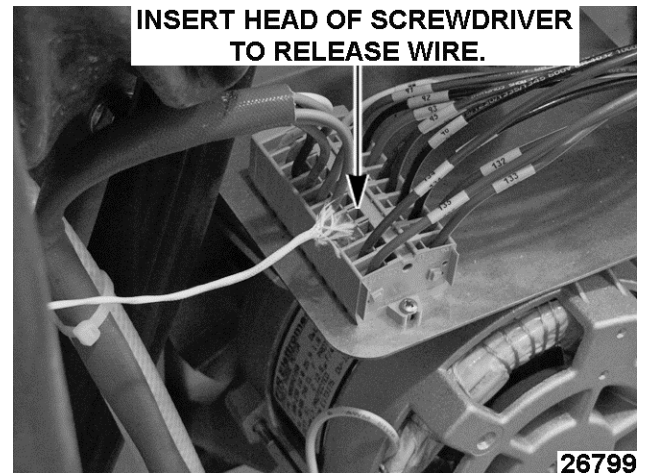


Fig. 66

- Push back installation to get access to the nuts securing the probe.

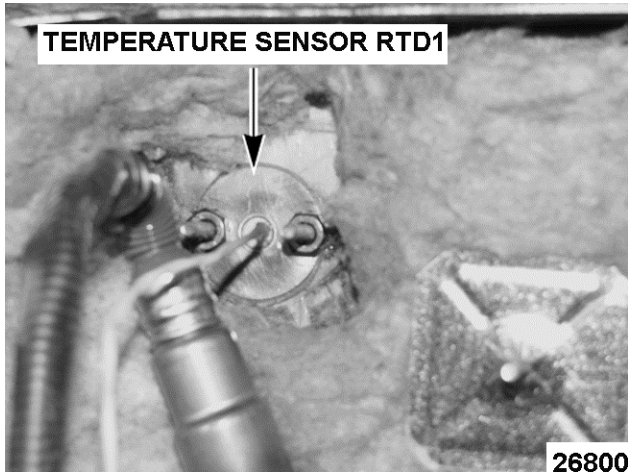


Fig. 67

6. Remove the two nuts.
7. Remove temperature sensor RTD1 from unit.
8. Install new probe.
9. Reverse procedure to install.

NOTE: Attach wire ties in same spots as before.

DRAIN WATER CONDENSATE VALVE



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Remove Rear Panel.
3. Remove two screws securing valve to utility panel.

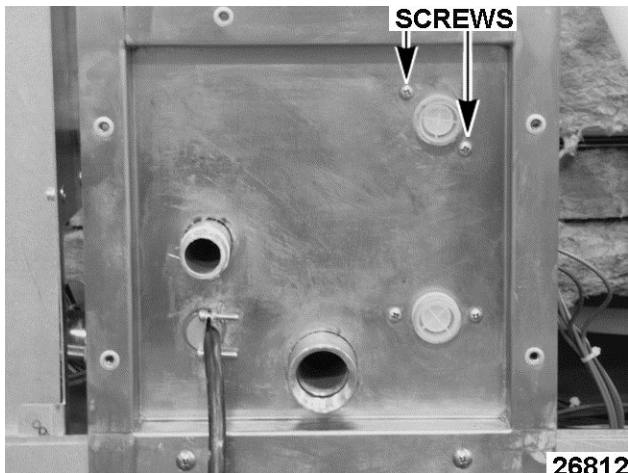


Fig. 68

NOTE: Gas Unit shown.

4. Remove two wires going to valve.
5. Loosen hose clamp and pull valve free of hose.

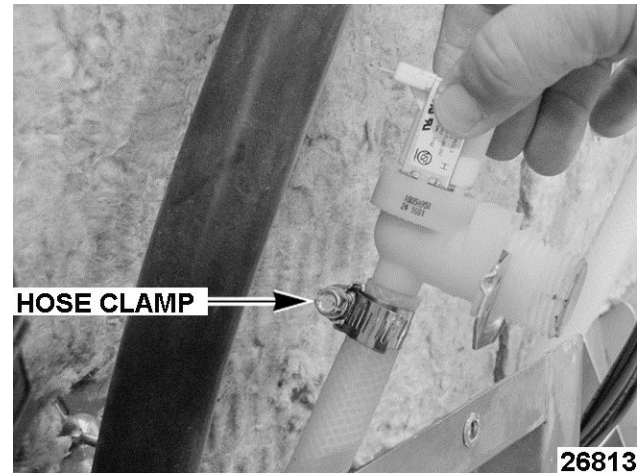


Fig. 69

6. Replace valve.
7. Reverse procedure to install.

DRAIN WATER THERMOCOUPLE



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Loosen screws for terminal TC1 and remove wires.

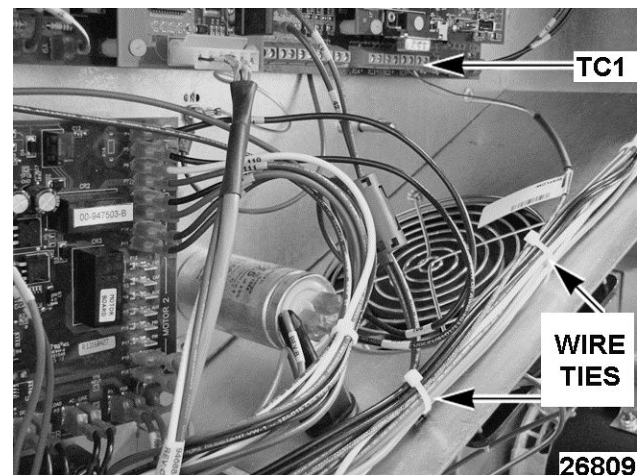


Fig. 70

3. Cut cable ties securing wires going to drain water thermocouple.
4. Loosen nut securing the thermocouple.

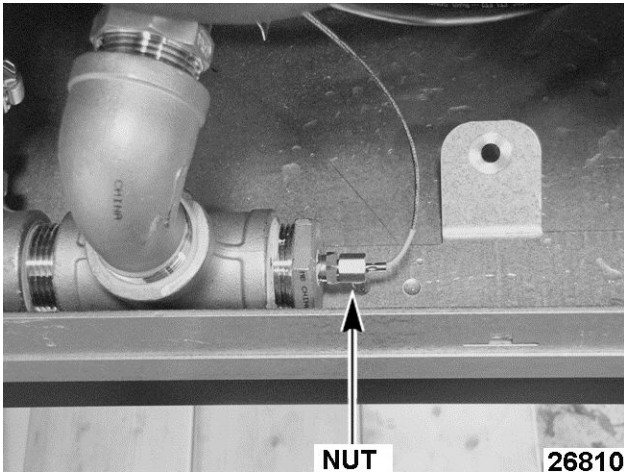


Fig. 71

5. Pull thermocouple from housing.

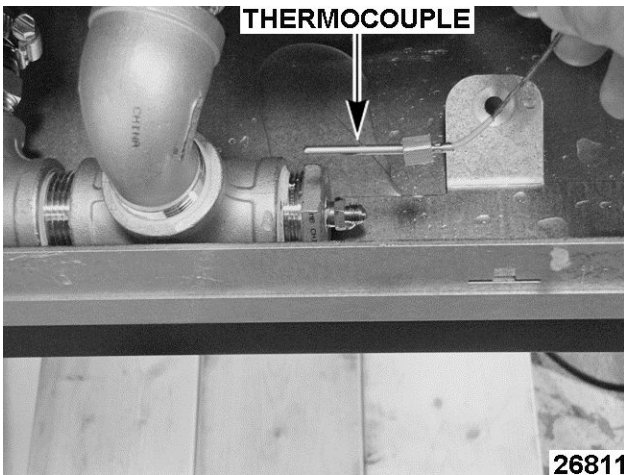


Fig. 72

6. Replace thermocouple.
7. Reverse procedure to install.

HUMIDITY VALVE



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Remove Rear Panel.
3. Remove two screws securing humidity valve to utility panel.

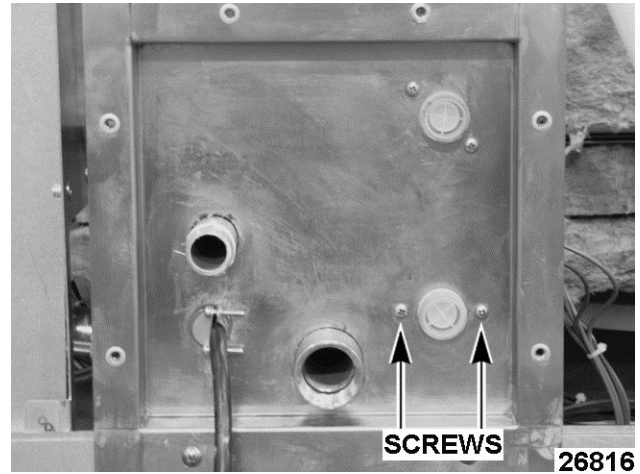


Fig. 73

NOTE: Gas Unit shown.

NOTE: The humidity valve is a double valve.

4. Remove two wires going to drain water condensate valve.

NOTE: This makes it easier to pull the humidity valve out from behind the utility panel.

5. Remove the four wires going to humidity valve.

NOTE: Make sure to note which wire goes to which terminal.

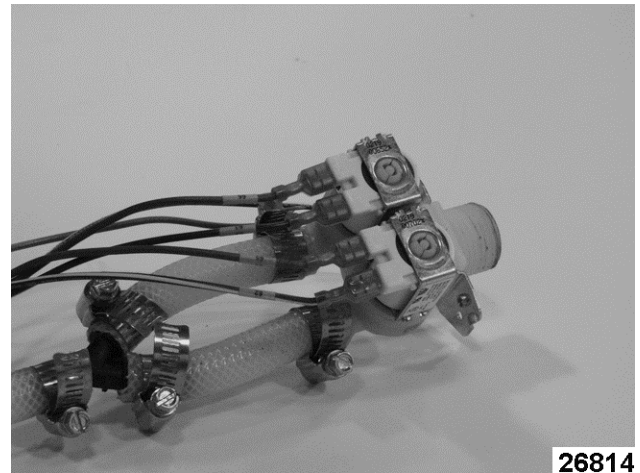


Fig. 74

6. Loosen the two hose clamps securing the valve and free the valve from the two hoses.

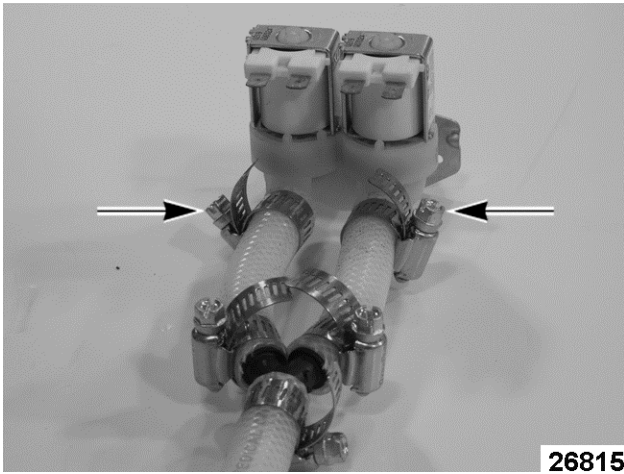


Fig. 75

7. Replace valve.
8. Reverse procedure to install.

HEATING ELEMENTS



⚠ WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Wire Rackets.
2. Remove Fan Cavity Baffle.
3. Remove Right Panel.
4. Remove Rear Panel.
5. Remove REAR COOLING FAN.

NOTE: The rear fan is attached to a bundle of wires, it is OK to let the fan hang from the wire tie for this procedure.

6. Remove the nut securing the support bracket of the heating element(s) to be removed.

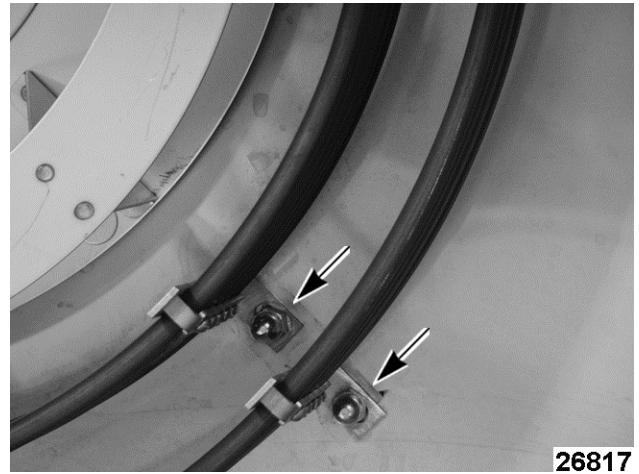


Fig. 76

7. If replacing the inner heating element.
 - A. Remove two nuts securing nozzle to oven cavity.

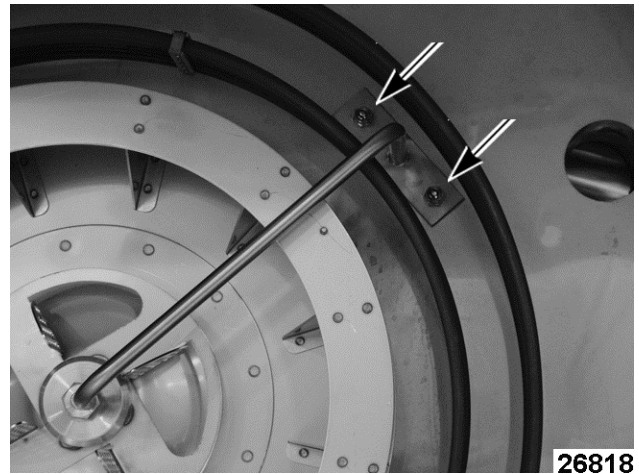


Fig. 77

- B. Loosen hose clamp securing hose to nozzle.

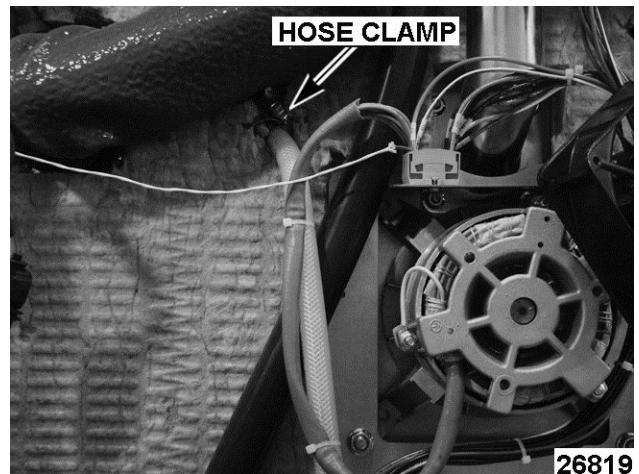


Fig. 78

- C. Pull hose free of nozzle.

D. The nozzle is now loose, but it is easier to remove the nozzle and heating element at the same time.

8. Remove leads going to the heating element to be removed.

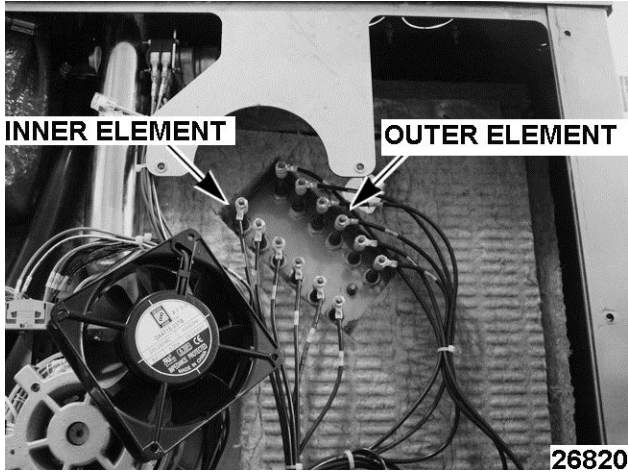


Fig. 79

NOTE: On each lead there is the following, nut / washer / terminal lead / washer / nut / ceramic insulator. All of which needs to be removed.

9. Remove the nuts and lock washers securing heating element.

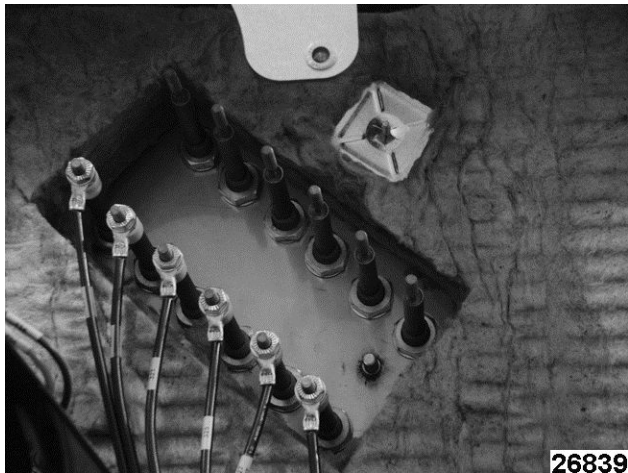


Fig. 80

NOTE: This will require either a pass thru socket and ratchet or several 11/16" deep well sockets welded together.

10. Remove heating element.

11. Reassemble in reverse order.

CONTACTORS



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Remove wires going to T1, T2 and T3 of the contactor to be replaced.
3. Using a flat blade screwdriver, pull out the orange tab releasing the contactor from the din rail.



4. Remove wires from back side of contactor.
5. Replace contactor and reassembly in reverse order.

SERVICE PROCEDURES AND ADJUSTMENTS



⚠ WARNING Certain procedures in this section require electrical test or measurements while power is applied to the machine. Exercise extreme caution at all times and follow Arc Flash procedures. If test points are not easily accessible, disconnect power and follow Lockout/Tagout procedures, attach test equipment and reapply power to test.

CONFIGURATION MODE (1972)

Log Into Configuration Mode 1972

1. Check with customer to verify settings have not been altered from factory settings.
2. Turn unit on.

NOTE: Oven must have no temp set to enter configuration.
3. Turn Timer knob counterclockwise until Timer display shows "set".
4. Turn Humidity knob counterclockwise until Humidity display shows "PAS".
 - A. Timer display will show "2000".
5. Turn Timer display counterclockwise to 1972.
 - A. Timer display will flash "1972".
 - B. Timer and Humidity display will flash twice.
 - C. Humidity display changes from "PAS" to "CFg" when logging into Configuration Mode.
 - D. Temperature Display will go to P0, which is the first configuration setting.

To review / change Configuration Mode 1972 settings

1. Turn the Temperature knob clockwise one step at a time, to go to the next configuration setting.

NOTE: Currently addresses P21, P22, P29, P30, P31 and P32 are blank.
2. Presently P35 is the last address, the counter will continue to go higher, but the Time display and the Humidity display will be blank.
3. Turn the Humidity Knob to change the values as needed.
4. The following chart list the options for each address.

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P0	Current firmware code revision (Month, day, year). Time and Humidity show example.	0225 (Month: 02, Date: 25)	14 (Year: 2014) Letter after number = Rev within date
P1	Set temperature to Fahrenheit or Celsius.	Unlt	F or C

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P2	Temperature knob increments. Temperature increment can be adjusted by 1, 5, or 10 degrees.	tInC	1, 5, 10, 25
P3	Humidity knob increments. Humidity can be adjusted by 1 or 10 percent increments.	HInC	1 and 10
P4	Custom Operator Interface		Turn Hum knob between Factory (FACT) and Custom (CUST)
	Factory Default UI Setting	FACT	
	Custom UI Setting	CUST	
	NOTE: Operator can flip between P4 FACT and P4 CUST. Custom settings will be remembered. NOTE: Only when P4 is set to custom can settings in P5 and P6 be configured.		
P5	Define Temperature Selection in UI NOTE: Only when P4 is set to custom can settings in P5 and P6 be configured.	FACT	
		CUST (Indicates customer settings are currently loaded.)	SEt Turn knob to edit custom settings.
		ALL	oN <u>TIP:</u> Select "ALL on" to begin customizing if minimal changes needed to FACT settings.
		ALL	oFF <u>TIP:</u> Select "ALL oFF" if you want to start customizing from scratch.
		80 (min) 482 (max) Turn Timer knob through temperature choices.	oFF / on Hum knob can be toggled to change individual temperature on or off.

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P6	Define Humidity Selection in UI NOTE: Only when P4 is set to custom can settings in P5 and P6 be configured.	FACT	
		80 (F) . . . 482(F) Turn Timer knob through temperature choices.	90 (% humidity) . . . 0 (%) Hum knob can be used to change humidity mapping to selected temperature.
NOTE: The following is an example of customizing the P4 through P6 settings.			
P4	P4 set to CUS _t Example 1. Toggle Hum knob to select CUS _t settings.	CUS _t	
P5	2. Turn Temperature knob to P5. 3. Toggle Hum knob oFF.	ALL	oFF
	4. Scroll timer knob to temperature of 212. 5. Toggle humidity knob to on.	212(F)	on
	6. Scroll timer knob to 325. 7. Toggle humidity knob to on.	325(F)	on
P6	8. Turn Temperature knob to P6.		
	9. Scroll timer knob to 325. 10. Toggle knob to 0%	212(F) 325(F)	100(%) 0(%)
	11. At completion, user interface is customized so user can only select 212F @ 100% or 325F @ 0%		
End of example.			
P7	Allows users to manual adjust humidity settings during operation.	HAdJ	on / oFF
P8	Oven Buzzer ON - Buzzer stops after 5 seconds. OFF - Buzzer turns on until door is opened or timer is turned off.	b 5	on / oFF
P9	Door Lights ON - Door lights flash at end of timer countdown. OFF - Door lights do not flash at end of countdown.	FLSH	on / oFF

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P10	<p>Batch Timer.</p> <p>Timer recalls last operated value when door is open and closed after buzzer. User does not need to reset timer.</p> <p>For example, User removes a batch of fries from oven and puts in a second batch of fries.</p>	trCL	on / oFF
P11	<p>Clean reminder.</p> <p>"CLn good bYE" shown when on/off switch is toggled off.</p>	CLn	on / oFF
P12	Convection Fan Speed. (not adjustable)	FSPd	7
P13	Convection Fan Breaking Speed. (not adjustable)	F br	5
P14	<p>Reversing fan timing.</p> <p>Number of minutes cavity fan turns before breaking and turning in opposite direction.</p>	FrEU	Off, 1 , 2, 3, 4, 5
P15	<p>Define maximum temperature knob setting in UI.</p> <p>Maximum temperature that can be set by user. Minimum setting limited by P16.</p>	t_HI	80 thru 450 increments of 10.
P16	<p>Define minimum temperature knob setting in UI.</p> <p>Minimum temperature that can be set by user. Maximum setting limited by P15.</p> <p>NOTE: Must be less than P15.</p> <p>NOTE: Settings at P15 and P16 are only in effect if P4 is set to FACt.</p>	t_Lo	80 thru 450 increments of 10.
P17	<p>Cavity Automatic Steam Reduction:</p> <p>Reduces the cavity's steam build up before end of timed cook. Vent intake is opened "selected" seconds before end of timer countdown.</p> <p>NOTE: Steam reduction is not engaged mid-cook or during a "non-timed" cook when door opened.</p> <p>Example: P17 = 30 seconds (default). As the cook time counts down, the vent opens allowing the steam to dissipate.</p>	AUto	oFF, 30 , 60, 90

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P18	<p>Oven hour counter. Total hours oven has been cooking.</p> <p>Example: Timer: 0009, Humidity: 999 = 9,999 hours.</p> <p>NOTE: Counters will zero when Main I/O board is replaced.</p>	oVEn / 0009	HrS / 999
P19	<p>Humidity water counter. Total amount of water used to humidity oven in gallons.</p> <p>Example: Timer: 0009, Humidity: 999 = 9,999 gallons.</p> <p>NOTE: Counters will zero when Main I/O board is replaced.</p> <p>NOTE: Add P19 & P20 for total water usage.</p>	HUn / 0009	gAL / 999
P20	<p>Condensate tempering water counter. Total amount of water used to cool drain water in gallons.</p> <p>NOTE: Counters will zero when Main I/O board is replaced.</p> <p>NOTE: Add P19 & P20 for total water usage.</p>	Cond / 000	gAL / 00
P23	<p>Demo Mode</p> <p>Used for sales. All functions operable except for heat.</p> <p>Disables critical errors.</p> <p>NOTE: Display will show "ABC trY it" after on/off switch is turned off.</p>	dEno	on
P24	<p>Temperature calibration (Temperature Offset)</p> <p>Refer to <u>TEMPERATURE CALIBRATION</u> in service and adjustment procedures.</p>	oCAL	<p>Turn humidity knob clockwise for positive offset, to lower overall cavity temperature.</p> <p>Turn humidity knob counter clockwise for negative offset, to raise overall cavity temperature.</p> <p>-15 thru 15 increments of 1.</p> <p>Default 0</p>
P25	<p>Maximum drain discharge temp.</p> <p>Temperature at which to run cooling water into the drain.</p>	dron (drain on, cooling water)	<p>tC1 =120 thru 160 increments of 1.</p> <p>140</p>

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P26	<p>Target maximum drain discharge temp. Temperature at which to stop cooling water into the drain.</p> <p>NOTE: P25 and P26 are dependant on each other. The system will not allow them to be set closer than 5°.</p>	<p>droF (drain off, cooling water)</p>	<p>115 thru 155 increments of 1. tC1 = 130</p>
P27	<p>Condensate tempering probe.</p> <p>Enabled: Tempering of drain water based on condensate probe temperature(Energy efficient). See P25 & P26.</p> <p>Disabled: Continuous time based tempering when in steam mode. (Less energy efficient.)</p>	<p>StPr</p>	<p>EnA / d15</p>
P28	<p>Additional Humidity knob operator interface.</p> <p>Enabled: Customer has option to turn humidity knob below 0, to a "---" setpoint. In this mode, vent is forced closed and no humidity water valve operation.</p> <p>Disabled: Humidity knob choices are set between 0 to 100%.</p>	<p>AStn</p>	<p>EnA / d15</p>
P32	<p>Oxygen board calibrate / zero</p>	<p>ZEro</p>	<p>no Turning knob to "yes" indicates a multi step procedure.</p>
P33	<p>Oxygen Sensor Data</p> <p>Shown in % of Absolute Humidity. This value will not match the % Relative Humidity value shown on User Interface at oven cavity temperatures < 212°F.</p> <p>ONLY USED WHEN CALIBRATING OXYGEN SENSOR. (Refer to <u>CALIBRATING OXYGEN SENSOR BOARD.</u>)</p>	<p>51 NOTE: Combine the two numbers to get 51.2%.</p>	<p>.2</p>

Temp. Display ("---")	Description	Time Display ("----")	Humidity Display ("---")
P35	<p>Reset parameters to factory default values.</p> <p>To reset values to factory default:</p> <ol style="list-style-type: none"> 1. Turn humidity knob clockwise to YES. Timer display flashes "----". 2. Turn timer knob clockwise to spell "rSET", one letter at a time. <p>NOTE: Humidity display will read don, when the parameters have been reset.</p> <p>NOTE: This will reset P4,5,6 Custom settings</p>	rSET	no / YES don

Logging out of Configuration Mode 1972

1. Turn Temperature knob counterclockwise until "---" displayed.

CALIBRATING OXYGEN SENSOR BOARD

Oxygen sensor board needs to be calibrated when:

1. Oven is installed.
2. Main board is replaced.
3. Oxygen sensor board is replaced.
4. Oxygen sensor is replaced.

Preparation

1. Check oven temperature to insure that Oven temperature is below 100°F.
2. Open cavity door and keep open.
3. Towel dry cavity floor to ensure no standing water or steam in cavity.

NOTE: May need to remove racks to dry cavity floor.

4. Turn oven on and wait at least 3 minutes for sensor to warm up.

Log Into Configuration Mode 1972

1. Turn unit on.
2. Turn Timer knob counterclockwise until Timer displays "SEt".
3. Turn Humidity knob counterclockwise until Humidity displays "PAS".

- A. Timer displays "2000".
4. Turn Timer display counterclockwise to 1972.
 - A. Timer display will flash "1972".
 - B. Timer and Humidity display will flash twice.
 - C. Humidity display changes from "PAS" to "CFg" when logging into Configuration Mode.

Oxygen Sensor Board Check (P33)

1. Turn Temperature knob clockwise to "P33".
 - Timer display should read between 0 and 24.
 - Humidity display should read between .00 and .99

NOTE: If timer displays "----" when viewing P33, oxygen sensor is warming. Wait 3 minutes. When ready, Timer / Humidity display will change to a numeric value.

Calibration of Oxygen Sensor Board (P32)

1. Turn Temperature knob counterclockwise to P32.
 - Timer displays "ZEro".
 - Humidity displays "no".
2. With cavity door still open, turn Humidity knob clockwise to "yes".

NOTE: Timer display will toggle between "OPEN" and "DOOR", and beeps if door is closed.

3. Timer displays "dry", Humidity "no" after confirming cavity is dry. Turn Humidity knob to "yes".

- Convection fan turns on.

NOTE: Oven cavity temperature must be below 100°F.

4. If temperature not less than 100°F / 38°C, timer display toggles cool/xxx°F (xxx°F / xxx°C= current temperature), until temperature is below 100°F / 38°C.
5. Timer display flashes "---" when conditions are ready for calibration.

NOTE: If conditions are not met: ("P33" less than or equal to 24, cavity temperature less than 100°F / 38°C, with door open, and convection fan up to speed.) Time knob will not enter 0000 and beep.

6. Turn Timer knob clockwise to "0000", one digit at a time.
7. Timer displays "donE" and Humidity displays "yes" when complete.
8. Convection fan turns off.

NOTE: To exit out of calibrating oxygen sensor board before calibrating, turn Humidity knob to "no" or turn Temperature knob to exit.

Oxygen Sensor Board Check

1. Turn Temperature knob clockwise to "P33".
 - Timer display should read between 0 and 2.
 - Humidity display should read between .00 and .99

NOTE: This value should be near 0%. For example, timer = 2, humidity = .99, represents 2.99%.

Exit out of Configuration Mode 1972

1. Turn Temperature knob counterclockwise until "---" displayed.

TEMPERATURE SENSOR (RTD1) TEST



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove Right Panel.
2. Remove probe lead wires from Main I/O board.
3. Test probe with an ohmmeter.

TEMPERATURE in °F	RESISTANCE ±5 OHMS
60	530

TEMPERATURE in °F	RESISTANCE ±5 OHMS
70	541
80	552
90	563
100	573
125	600
150	627
200	680
250	732
300	785
350	836
400	887
450	938

TEMPERATURE CALIBRATION

1. Place temperature tester probe in geometric center of oven cavity.
2. Program a setpoint of 350°F. Allow oven temperature to cycle 3 times.

NOTE: Oven's temperature display shows setpoint. To view actual cavity temperature as it cycles around setpoint, slightly turn temperature knob clockwise one notch or counter clockwise one notch and actual cavity temperature will blink three times.

NOTE: Turning temperature knob more than one notch will change temperature setpoint.

3. Record **temperature tester** readout for an additional 3 cycles. It should cycle around setpoint.

Temperature Tester Heater Turn On	Actual Average (Turn On + Turn Off) divide by 2	Temperature Tester Heater Turn off
_____	_____	_____
_____	_____	_____
_____	_____	_____

4. Calculate amplitude. Amplitude = (Turn Off - Turn On). An amplitude of more than 40°F may indicate a problem with heat source. For example, poor combustion, see combustion analysis.

5. Calculate average. Actual average = (Turn On + Turn Off) divided by 2. Variance (between actual average and programmed setpoint) of greater than 5 degrees indicates that adjustment is needed.

6. To adjust:

- A. Enter CONFIGURATION MODE (1972), scroll temperature knob to P24. Turn humidity knob to enter offset.

NOTE: Turn humidity knob *clockwise* for positive offset, to *lower* overall cavity temperature.

NOTE: Turn humidity knob *counter clockwise* for negative offset, to *raise* overall cavity temperature.

- B. If actual average temperature is higher than programmed setpoint, enter a positive offset value of same amount. (For example if oven is cycling around an actual average of 360 degrees, adjust by entering an offset of +10.)
- C. If the actual average temperature is lower than programmed setpoint, enter a negative offset value of the same amount. (For example if oven is cycling around an actual average of 340 degrees, adjust by entering an offset of -10.)

- 1) The offset can be adjusted + or - 30 degrees, but is only functional within the operating limits of the oven. Factory setting is 0.

7. To save setting, exit configuration mode by turning temperature knob back to "----" (idle mode) and listen for beep.

8. To recall offset value, enter CONFIGURATION MODE (1972), turn temperature knob to P24. Verify the value set is visible in humidity.

CAVITY VENT SWITCH TEST AND ADJUSTMENT

Y10 TEST

Y10 test measures several things. Motor current, conditions of the two vent switches and the time it takes for the two switches to indicate a change for the vent. Each time the test runs, the motor should turn ¼ of a turn. A ¼ turn is what it takes to make the vent to go from fully closed to fully open, or from fully open to fully closed. It is recommended that the test be run eight times to make the motor go thru 2 full cycles. If no errors are encountered, the vent switches and vent motor are operating properly.

1. Go into reference.
2. Turn the temperature knob until Y10 comes on the display.
3. Turn the Humidity knob one step clockwise.

NOTE: The test should take about 15 seconds.

NOTE: The Timer display will go from (VEnt / CLSd, to SPin / = 5, to VEnt / oPEn) or (VEnt / oPEn, to SPin / = 5, to VEnt / CLSd)

4. If test ran successfully, turn Humidity knob one step to run test again. Do this till test has been run 8 times.

If an error occurs:

1. If the Timer Display shows "Err", this means the vent switches are in an error state and need adjusted or replaced.
2. If the Timer Display shows "=Err", this means the vent motor did not draw current.
3. If after 75 seconds the vent switches do not indicate a ¼ has been made the Humidity display shows "Err".

VENT SWITCH ADJUSTMENT



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

1. Remove reference
2. Loosen screws securing the vent screws to the frame (by 1/4 turn) to allow the top of the switches to be adjusted in or out.

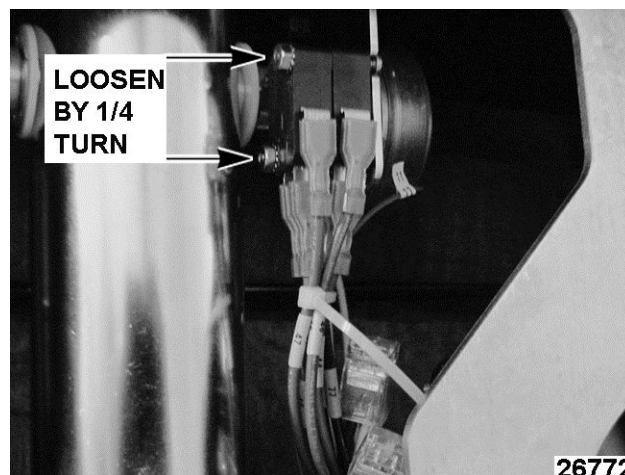
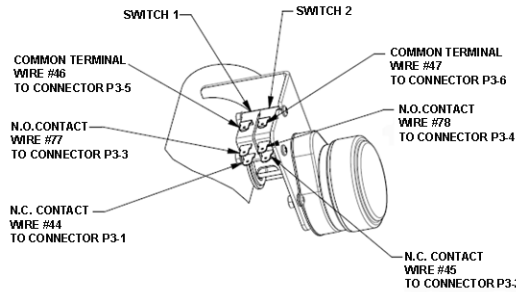


Fig. 82

3. Remove wires 44, 45, 46, and 47 from the vent switches



26767

Fig. 83

4. Rotate the damper camshaft (using a pair of channel locks) until the indicator on the end of the camshaft is at diagonal. (as shown in figure 26786)



Fig. 84

5. Connect a meter set to check resistance to the common terminal and the N.C. contact of switch 1.
If reading on the meter indicates an open then pull the top of the switch away from the camshaft. If the meter reading indicates continuity, continue to next step.
6. Press the top side of the switches towards the camshaft until the meter indicates an open.
7. Tighten the screws securing the switches.

8. Use the meter to check the common terminal and the N.C. contact of both switches. Both switches at this point should read open.
9. Quick check
 - A. Connect a meter set to check resistance to the common terminal and the N.C. contact of switch 1.
 - B. Using a pair of channel locks rotate the damper camshaft through one revolution.
 - C. During one revolution of the Cam shaft, the meter should indicate continuity at two different spots. These two spots should be 180° from each other.
 - D. Repeat this check for switch 2
10. Reconnect wires to both vent switches.
11. Reattach panels.

DOOR SWITCH ADJUSTMENT

1. In SERVICE MODE (1963), run (Y6) Door test.

NOTE: If the door test reports that the door is open when it is closed it may be because the door reed switch is not lined up with the magnet in the door.

To adjust the door reed switch:



WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures.

- A. Remove Right Panel.
- B. Remove Control Panel.
- C. Loosen the two screws securing the Reed Switch to the bracket to adjust the Reed Switch side to side.

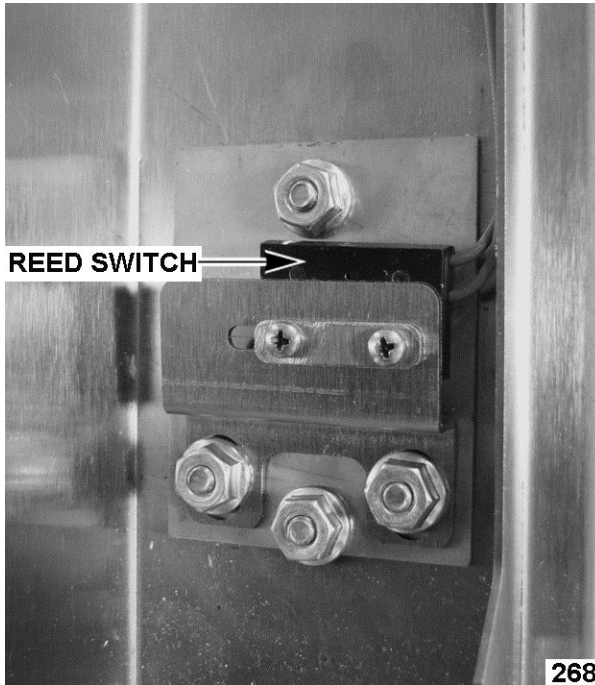


Fig. 85

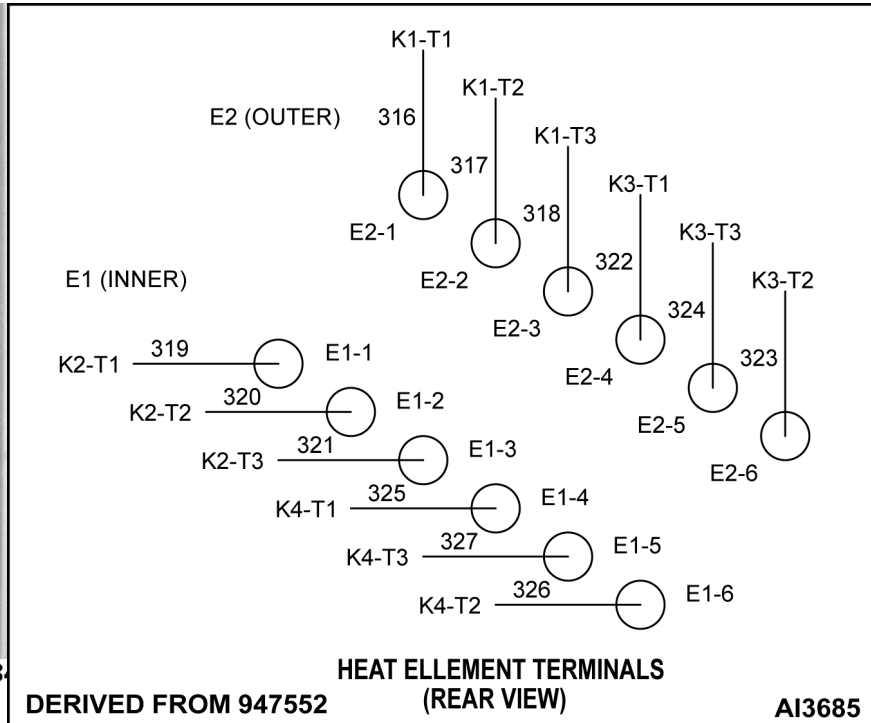


Fig. 86

- D. Loosen the two bolts securing the Reed Switch bracket to the control panel to adjust the Reed Switch up and down.

HEATING ELEMENTS RESISTANCE CHECK



⚠ WARNING Disconnect the electrical power to the machine and follow lockout / tagout procedures. There may be multiple circuits. Be sure all circuits are disconnected.

There are two sets of Heating Elements (E1 - Inner) and (E2 - Outer), each set is made up of three individual elements. Measure between terminals (E1-1 and E1-6), (E1-2 and E1-5) and (E1-3 and E1-4) to check the three elements making up the Inner set. Measure between terminals (E2-1 and E2-6), (E2-2 and E2-5) and (E2-3 and E2-4) to check the three elements making up the Outer set.

Element Voltage	Resistance Measurement
208 / 240 Volts	14 Ohms ± 2 Ohms
480 Volts	55 Ohms ± 5 Ohms

ELECTRICAL OPERATION

COMPONENT FUNCTION

Main Board	Manages all input/output functions of oven as required for combi cook operation. Monitors oven temp RTD probe, and outputs call for heat to contactors. Monitors oxygen sensor board and outputs to humidity valves. Monitors condensate tempering thermocouple probe and outputs to condensate valve, monitors door switch and controls cavity lights. Outputs to motor control board to control speed and direction of Convection Fan motor. Rotates the cavity vent intake damper from open/closed using the cavity vent motor output and two cavity vent switch inputs. Monitors on/off switch to change operator interface from sleep/wake mode. Enables cooling fans. Monitors the display board for customer input from knobs, and sends time, temperature, and humidity information to display board. Monitors N.O. Aux contactor contacts for high limit errors; and monitors oxygen board and motor board for oxygen sensor and convection fan motor errors.
Display Board	Processes signals from each encoder mounted to each of the three control knobs. Then sends signal to Main board. processes input signals from Main board to refresh displays with Time Temperature and Humidity cooking information.
Motor Control Board	Low voltage portion of the board processes drive signal (amber led) and reverse signal (green led) from the Main board to control an on board reversing relay and external solid state relay. The reversing relay contacts on the high voltage side of the board reverses voltage phases to change the motor rotation direction; The solid state relay wired to the motor board, power the convection fan motor. The motor neutral phase is daisy chained with convection fan motor's thermal fuse and F7 motor current protection fuse at the motor board. The motor board's current sense circuit monitors the current through the fuses and sends a low voltage signal back to the main board (viewed on the RED led) on the low voltage side. The current sense circuit is also responsible for detecting E1 and E6 errors.
Encoders (SW7,SW8,SW9)	Optically coupled rotary encoder switch that is mounted behind the control knob and sends signal to display board as knob is turned in any direction.
Oxygen Board	Heats and controls the oxygen sensor, and reports back oven cavity humidity information to the Main board. also receives calibration command from Main board.
Oxygen Sensor (SW5)	Measures the amount of humidity in the oven cooking cavity and is controlled by the Oxygen Sensor Board.
Door Switch (SW3) ...	Magnetic reed switch it senses the presence of the magnet in the door and closes. Monitored by the main board which starts stops the cook cycle and activates the lights based on the state of the door switch.
ON / OFF Switch (SW4)	Is a toggle switch that is monitored by main board to put unit from sleep to cooking idle mode. It provides 230 VAC to the following relays on the main board: cavity vent motor, high and low humidity valve, condensate tempering valve, cooling fans.
Transformer (T1)	Transformer with 480, 240 or 208 VAC inputs. Multiple secondary voltages as follows : 230 VAC to motor board and convection fan motor, vent motor, all water solenoids and cooling fans. 12 VAC to oxygen board and oxygen sensor. 12 VAC to cavity lamps. 24 VAC to main board, motor board, vent switches, door switches high limit sensing contacts
Terminal Block (TB1)	Incoming voltage supply connection from 20A fuses (F5 and F6). Transformer to 230 VAC connections.
Terminal Block (TB2)	Convection Fan Motor (MTR1) and Temperature Sensor (RTD1) connections

Terminal Block (TB3)	Incoming voltage supply line (480, 240 or 208) to contactors (K1, K2, K3, K4) and to fuses F5 and F6. Configure for either 3 Phase or single phase.
Terminal Block (TB4)	Low voltage outputs from transformer connection.
Fuse (F1)	4A - Protects 12 VAC oven Oxygen Sensor Board circuit.
Fuse (F2)	4A - Protects 12 VAC oven Cavity Light circuit.
Fuse (F3)	4A - Protects 24 VAC Main Board, Motor Board, Vent Switches, Door Switches, High Limit Sensing Contacts.
Fuse (F5)	20A fuse to transformer primary.
Fuse (F6)	20A fuse to transformer primary (Common).
Fuse (F7)	6.25A fuse - motor current protection fuse. F7 protects from a malfunction of the motor control boards on board reversing relay.
Fuse (F8)	5 A fuse. Protects Oxygen Sensor Board. (Mounted on Oxygen Sensor board).
Oven Door Lights (L1, L2, L3)	Provides light for the oven cavity (located in door frame). Voltage to light circuit. (12 Volt, 5 Watt Bulbs).
Cavity Vent Motor (MTR2)	Controls the oven cavity vent intake damper inside the cavity vent intake tube.
Cavity Vent Open (SW1)	Reports the position (open/closed/spin) of the cavity vent intake damper. Works in conjunction with SW2.
Cavity Vent Closed (SW2)	Reports the position (open/closed/spin) of the cavity vent intake damper. Works in conjunction with SW1.
Humidity Valve Cavity (Low Flow) (SOL2)	Admits water into the injection nozzle (in a slow stream) that drips onto water atomizer to vaporize the water droplets and provide steam for combi mode or cool the oven temperature
Humidity Valve Cavity (High Flow) (SOL3) ...	Admits water into the injection nozzle (in a slow stream) that drips onto water atomizer to vaporize the water droplets and provide steam for combi mode or cool the oven temperature
Cooling Fans (CF1, CF2, CF3)	Circulate air through the oven control panel, display panel, and convection fan motor area for component cooling.
Convection Fan Motor (MTR1)	Circulates air through the oven cavity. Driven by motor control board, through capacitor C1. Reverses direction at programmed intervals.
Oven Sensor Input (RTD1)	Senses oven cavity temperature and sends the data to the Main board.
High Limit (TS1)	Removes power from element safety contactors K1 and K2 if oven cavity overheats. The status of the High Limit is sent to the main board by aux contacts on K1.
Cold Water Condensate (SOL1) ...	Admits water to p-trap on power up to seal oven cavity. Admits water p-trap to mix with drain water to cool drain discharge water to 140°F before exiting oven.
Drain Water Sensor Input (TC1)	Monitors drain water temperature and is monitored by Main board.
Motor Interlock Relay (R1)	Removes 230 VAC to the motor control board when the On/Off switch is Off..
Heat Interlock Relay (R2)	Is used to disable the call for heat signal from the main board to the contactor coils of K3 and K4 when On / Off switch is off.
Contactor (K1)	Safety Outer. Provides voltage to outer heating elements. Removes voltage when high limit is tripped.

- Contactor (K2)** Safety Inner. Provides voltage to inner heating elements. Removes voltage when high limit is tripped.
- Contactor (K3)** Hi Heat Outer. Provides voltage to the outer heating element and is controlled by the high heat relay on main board.
- Contactor (K4)** Contactor Low Heat Inner. Provides voltage to the inner heating element and is controlled by the low heat relay on main board.
- Oxygen Board Interlock Relay (R3)** Removes power to the oxygen board and sensor when the On/Off switch is Off.
- Fan Motor Relay (R6)** Solid State Relay used to drive the convection fan motor. Is controlled by the motor control board.
- Ferrite** Passive electric component used to suppress high frequency noise from the oxygen sensor board.

CONTROL PANEL COMPONENT LOCATIONS

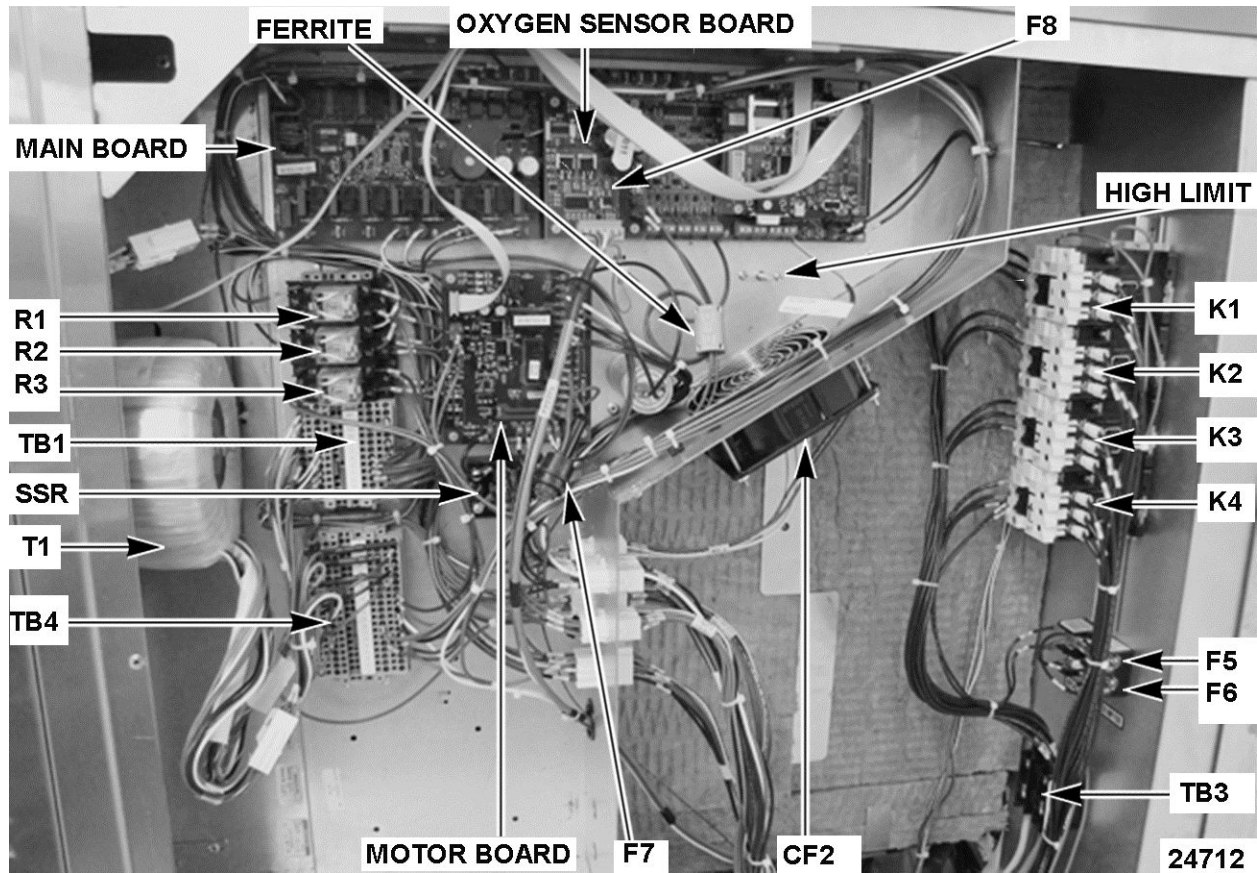


Fig. 87

SEQUENCE OF OPERATION

CONDITIONS

1. Unit plugged into incoming power supply and is properly grounded.
2. ON/OFF switch (SW4) off.
3. Door switch closed (SW3).
4. High limit switch closed.
5. 208 VAC (or 240 VAC or 480 VAC) to TB3 (either 3 phase or 1 phase).
 - A. 208 VAC (or 240 VAC or 480 VAC) as Supply Voltage to:
 - 1) Contactor K1, terminals L1,L2, and L3.
 - 2) Contactor K2, terminals L1,L2, and L3.
 - 3) Contactor K3, terminals L1,L2, and L3.
 - 4) Contactor K4, terminals L1,L2, and L3.
 - 5) Fuse F5 to TB1-10 for 208 VAC, (-11 for 240 VAC), (-12 for 480 VAC).
 - 6) Fuse F6 to TB1-8.
6. Supply Voltage to Transformer T1 (TB1-10, or -11, or -12 and TB1-8) for correct oven voltage on primary input of T1.
 - A. Transformer step up from or down from the Supply Voltage to 230 VAC providing voltage for oven components (solenoid valves, motor board (convection fan motor), vent intake motor, and cooling fans).
 - B. Transformer steps down from Supply Voltage to 24 VAC on two secondaries, 24 VAC and 24 VAC (IM).
 - 1) 24 VAC providing voltage for main bd, motor bd, vent switches, door switch.
 - C. Transformer steps down Supply Voltage to 12 VAC on two secondaries, 12 VAC (Lite) and 12 VAC (Oxy).
 - 1) 12 VAC (Lite) Light providing voltage for the cavity door lights.
 - 2) 12 VAC (Oxy) providing voltage for oxygen sensor board and oxygen sensor.
7. 230 VAC
 - A. 230 VAC from transformer through TB1-6 and TB1-7 to:
 - 1) On/Off Switch (SW4).
 - 2) Motor Interlock Relay (R1.2) Common contact.
 - 3) V5 on Main Board.
 - 4) High Limit switch (TS1).
 - a. 230 VAC to Contactor K1.
 - b. K1 energizes sending Supply Voltage to one side of (E2) outer heating element (Pins 1,2,3).
 - a. 230 VAC to Contactor K2.
 - b. K2 energizes sending Supply Voltage to one side of (E1) inner heating element (Pins 1,2,3).
 - B. 230 VAC (Com) from transformer through TB1-2, -3, -4 and -5 to:
 - 1) Cavity Vent (M2).
 - 2) V2 Main Board.
 - 3) Heat Interlock (R2-B).
 - 4) Motor Interlock (R1-B).
 - 5) Interlock relay (R1.1) Common Contact.
 - 6) Cold Water Condensate (SOL1).
 - 7) Humidity Valve Cavity (Low Flow) (SOL2).
 - 8) Humidity Valve Cavity (Hi Flow) (SOL3).
 - 9) Cooling Fans (CF1, CF2, CF3).
 - 10) V4 Main Board (call fro heat common).
8. 24 VAC
 - A. 24 VAC from transformer to TB4-16 through 4A fuse (F3) to:
 - 1) Cavity Vent Switch (SW1-COM).
 - 2) Cavity Vent Switch (SW2-COM).
 - 3) Door Switch (SW3).
 - 4) V9 connection on Main I/O Board.
 - 5) P21 connection on Motor Control/ Reversing Board.
 - 6) Hi Limit sensing K1 auxiliary Contact (COM).

- B. 24 VAC (Com) from transformer to TB4-5 and TB4-6 to:
 - 1) P22 connection on Motor Control/ Reversing Board.
 - 2) V8 connection on Main I/O Board.
- 9. 12 VAC (oxy)
 - A. 12 VAC (oxy) from transformer to TB4 through 4A fuse F1 to:
 - 1) Oxygen board interlock relay COM contact (R3.1).
 - B. 12 VAC (oxy) COM from transformer to TB4 to:
 - 1) Oxygen board interlock relay COM contact (R3.2).
- 10. 12 VAC (lite)
 - A. 12 VAC (lite) from transformer to TB4 through 4A fuse (F2) to:
 - 1) V3 (Lamp) on Main board
 - B. 12 VAC (lite) COM from transformer to TB4 to:
 - 1) Cavity lights Lamps (L1, L2, L3) COM.

**ON/OFF Switch (SW4) turned ON,
(No Call for Heat)**

- 1. Motor Interlock relay coil (R1) energizes.
 - A. Provides 230 VAC across P1 (wire 106) and P20 (wire 107) on Motor Board.
 - B. Convection fan motor (M1) energizes.
- 2. Heat Interlock relay coil (R2) energizes.
 - A. R2.1 closes allowing the Call_For_Heat signal input from the Main I/O board to pass to High Heat relay K3.
 - B. R2.2 closes allowing the Call_For_Heat signal input from the Main I/O board to pass to Low Heat relay K4.
- 3. R3 oxygen sensor board interlock relay coil (R3) energizes.
 - A. Providing 12 VAC (Oxy) to Oxygen Board across J1 (wire 42) and J2 (wire 43).
 - B. D3 (amber), D4 (red), D5 (green) LEDs energized for 2 seconds.
 - C. D3 (amber) LEDs energized for 3 seconds confirming calibration of electronics on board.

- D. D4 (red) LEDs energized for 3 MINUTES while the oxygen board is heating up the oxygen sensor.
- E. D5 (green) LEDs blinks indicating transmission of Humidity data from Oxygen sensor board through piggy back connection to Main I/O board.
- 4. 230 VAC to V1 on Main board.
 - A. Main I/O board sends Control signals through the ribbon cable to display board and illuminates the Temp (---) Time (--:--) and humidity (---) displays (---) .
 - B. Y6 energizes the 3 cooling fans. (CF1, CF2 and CF3).
 - C. Y9 energizes the cold water condensate Valve (SOL1) to fill the p-trap for 6 seconds so cold air does not get sucked up into the cooking cavity through the drain.
 - D. Y10 Cavity Vent Intake motor (MTR2) energizes to close the vent (if previously open).
 - E. Main board monitor SW1 and SW2 for the closed position, and de-energizes Y10, cavity vent intake motor .
 - F. Y13 energizes turning on the cavity lights.

**ON/OFF Switch (SW4) ON & with
Call for Heat**

- 1. Temperature knob turned, to enter Temperature setpoint. Sending signal from SW7 encoder to Main I/O board through the ribbon cable (for example 350°F).

NOTE: All temperature setpoints between 212°F and 220°F are treated as 220°F.

NOTE: Humidity knob automatically changes to the mapped humidity for that setting, or humidity can be changed by the user.(SW9 input).

NOTE: Timer (SW8 input) has no effect on the call for heat. no timed cooking.

Motor Control Board

- 1. Main I/O board sends controls signals through the ribbon cable to the motor board.
- 2. Amber colored LED turns on to indicate that a drive signal is being sent to the external solid state relay.

3. Green colored LED indicates the direction of the motor and toggles its state from on to off (or off to on) every 2 minutes during a cooking cycle.

NOTE: The state of the on-board reversing relay changes every two minutes (as indicated by the green led). This reverses the phases of the motor to reverse the direction of the motor.

4. Red LED indicates the presence of current in the convection fan motor, and signals the main I/O board through the ribbon cable.
5. The Solid State Relay (R6) energizes.
6. Convection Fan Motor (MTR1) energizes.

HI /LO HEAT OPERATION

1. Y14 Call for heat low relay energizes on main board.
2. Contactor K4 energizes providing supply voltage to inner elements (E1), pins 4, 5, 6.

NOTE: Inner elements begin to heat since K2 is already energized.

3. Y15 Call for heat high relay energizes on main board.
4. Contactor K3 energizes providing supply voltage to outer elements (E2), pins 4, 5, 6.

NOTE: Outer elements begin to heat since K1 is already energized.

5. Rate of Rise Check

- A. Cavity temperature probe (RTD1) is monitored by the main board at xa1 and xa2, and turns off the call for heat (both high and low) when cavity temperature on RTD1 is satisfied (same as setpoint on SW7 encoder).

- 1) During the initial heating cycle, the rate of temperature rise is checked. As temperature rises, at setpoint - 15°, if the temperature is rising faster than 2° per second, both heating elements call for heat (Y14 and Y15) are turned off before the RTD1 temperature is satisfied. This is done to prevent too big of a temperature overshoot.

The “initial heating cycle” is defined as the first time the control board calls for heat after:

- a. First time a temperature setpoint is entered in cook mode.
 - When temperature is set from "----".

- When the On/Off switch is toggled and temperature setpoint is automatically recalled.
- b. When it is detected that the door goes from being opened to closed in cook mode.

Overshoot Feature

- A. When trays of frozen product are placed in the oven, and the oven is recovering up to setpoint, the temperature in the center of the oven and the temperature in the upper corner where the temperature probe is located are going to be different. To make up for this, the first time the oven tries to reach setpoint, the control board will keep calling for heat until the temperature at the temperature probe is 50°F higher than the setpoint. This feature automatically kicks in if the following conditions exist.

- 1) The temperature setpoint is higher than 250°F.
- 2) It takes longer than 8 minutes to reach setpoint.
- 3) This must be the “first call for heat cycle”.

The “first call for heat cycle” is defined as the first time the control board calls for heat after:

- a. First time a temperature setpoint is entered in cook mode.
 - When temperature is set from "----".
 - When the On/Off switch is toggled and temperature setpoint is automatically recalled.
- b. When the temperature setpoint is changed.
- c. When it is detected that the door goes from being opened to closed in cook mode.

6. Y15 call fro heat relay (high) is de-energized on main board.
 - A. K3 contactor opens
 - B. Voltage removed from outer heating elements.
7. Y14 call for heat relay (low) is de-energized on main board.

- A. K4 contactor opens.
 - B. Voltage removed from inner heating elements.
8. Subsequent Cycles.
- A. When temperature as monitored by RTD1 drops 1° below the setpoint on SW7 encoder.
 - 1) Y14 low heat only turns back on.
 - B. If temperature continues to fall and reaches setpoint - 15°.
 - 1) Y15 high heat turns back on to assist.

NOTE: If the temperature does not fall 15° below setpoint, the oven will regulate on the low heat inner elements only.

NOTE: The high heating element control relay is never turned on without the low heat element control relay being turned on.

- C. When RTD1 is satisfied (at setpoint) both Y14 and Y15 are turned off by main board.

ON/OFF Switch (SW4) ON & with Call for Heat & Call for Humidity

Humidification Sequence.

1. Humidity knob automatically changes to the mapped humidity for that setting, or humidity knob can be changed by the user (SW9 input).
2. Humidity knob sending signal from SW9 encoder to Main I/O board through the ribbon cable (for example 70%).
3. After Main I/O board senses the cavity temperature on RTD1 is within 50° degrees of setpoint.
4. Y8 Low humidity water valve, SOL2, energizes.
5. Y5 High humidity water valve, SOL3 energizes.
6. Main I/O board monitors SW5, Oven humidity on oxygen sensor, when humidity satisfied.

NOTE: All humidity setpoints between 90% and 100% are treated as 90%.

- A. Y5 Humidity high water valve off.
- B. Y8 Low humidity water valve off.

NOTE: If the oxygen sensor is not functioning, oven will enter a “limp along mode” and will steam in an inefficient open loop mode at setpoint between 212 and 220°F, and / or a humidity setpoint of 100%. both

water valves (Y8, SOL2 & Y5, SOL3) energized continually without regulation.

Hysteresis - Cavity vent intake motor (during cook cycle).

1. Main I/O board monitor SW5, oven humidity oxygen sensor and compares it to humidity setpoint.
2. Y10 energizes to open the vent (until Main I/O board detects SW1, SW2 open position) when oxygen sensor SW5 > setpoint +10% (for example 80%).
3. Y10 de-energizes to close the vent (until Main I/O board detects SW1, SW2 closed position) when oxygen sensor SW5 <= setpoint (for example 70%).

Automatic Venting

1. When Timer counts down to 30 seconds (defined in P17), then the vent will be opened to release steam in the cavity prior to the presumed opening of the door when the timer expires.
2. Y5 Humidity high water valve off.
3. Y8 Low humidity water valve off.
4. Y10 Cavity Vent Intake motor (MTR2) energizes.
5. Main I/O board monitors SW1 and SW2 for the open position, and de-energizes Y10, cavity vent intake motor.

OTHER SEQUENCES

Timer expires

1. Timer sends a signal from SW8 encoder to Main I/O board through the ribbon cable (for example 01:15 is 1 hour 15 minutes).
2. Main board energized the on board buzzer for 5 seconds (or continuously if so programmed in P8 in CONFIGURATION MODE (1972)).
3. The time function does not control or affect the heating, so the oven will continue to heat after time expires.
4. Humidity function not re-enabled until the timer is reset and/or the door is opened and closed.

Door Open (SW3 open)

1. Y14 call_for_heat_low is off.
2. Y5 Humidity high water valve off.
3. Y8 Low humidity water valve off.

NOTE: At any time in the operation, if door is opened, the Cook timer pauses.

Electronic Motor Break (When door opens)

- A. Main board sends controls signals through the ribbon cable to the motor board.
- B. AMBER (L1) and RED (L3) LEDs turn off.
- C. The Solid State Relay (R6) de-energizes.
- D. Green colored LED (L2) indicates the direction of the motor and toggles its state from on to off (or off to on).
- E. Amber colored LED (L1) pulses (faint glow) to indicate that a break signal is being sent to the external solid state relay.
- F. The Solid State Relay (R6) pulses.
- G. Convection Fan Motor (MTR1), electronically breaks.
- H. Amber (L1) and Red (L3) LED's off.
- I. The Solid State Relay (R6) OFF.
- J. Convection Fan Motor (MTR1) energizes.

- B. Humidity (high flow) water valve (SOL3) is energized.
 - C. Humidity (low flow) water valve (SOL2) is energized.
2. When the RDT1 temperature drops to within 70°F of the temperature setting.
- A. Humidity (high flow) water valve (SOL3) is de-energized.
 - B. Humidity (low flow) water valve (SOL2) is de-energized.

Cold water condensate sequence

- 1. Drain water temperature is monitored by Main I/O board using the drain water sensor TC1.
- 2. When the drain water temperature is above 140°F.
 - A. Cold water condensate valve (SOL1) is energized, allowing cold water in.
- 3. When the drain water temperature is below 135°F.
 - A. Cold water condensate valve (SOL1) is de-energized.
- 4. Every two hours, Cold water condensate valve (SOL1), energized for 6 seconds to ensure the p-trap remains full of water so that cold air can not be sucked into drain and into cooking cavity.

Rapid Cool Feature

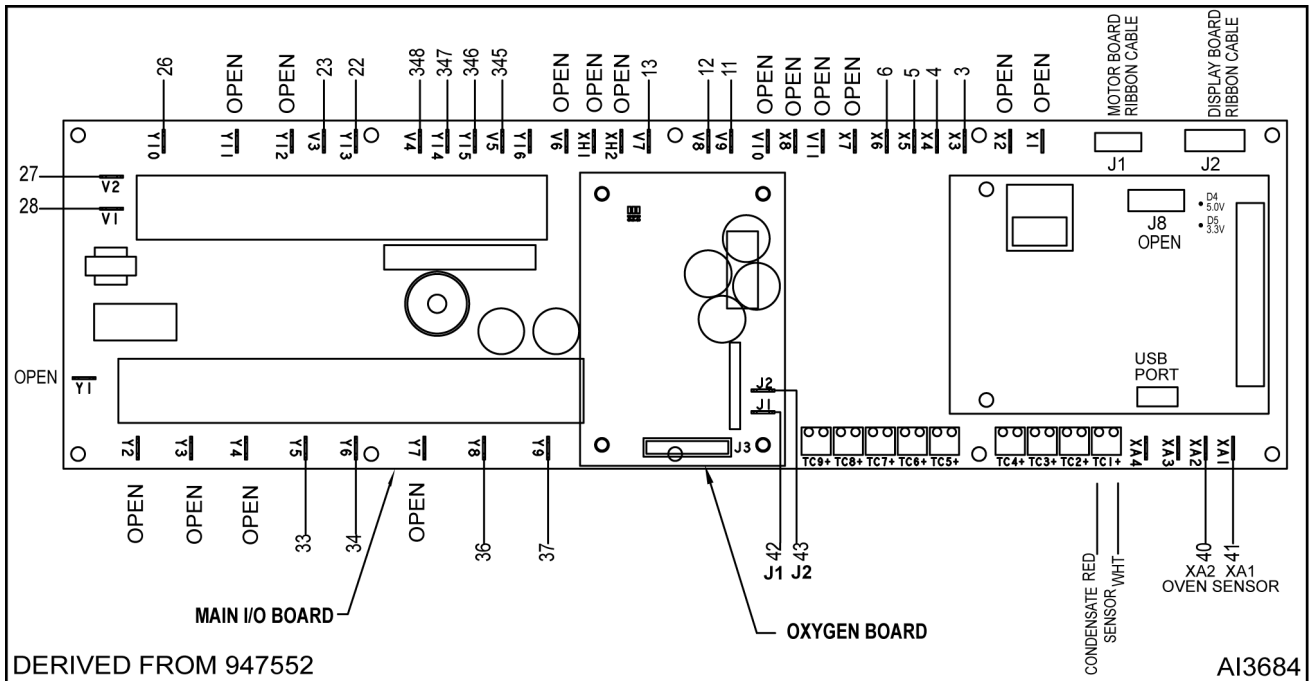
- 1. Temperature setpoint is turned down by operator, so that the RDT1 temperature is now 70°F higher than the temperature setpoint.
 - A. Main board checks the status of the SW1 and SW2 (Cavity Vent switches).
 - 1) If the switches indicate that the vent is closed, the cavity vent intake motor is energized.
 - 2) When the switches indicate the vent is fully opened, the cavity vent intake motor is de-energized.

CIRCUIT BOARD LAYOUTS

MAIN BOARD CONNECTIONS

Meter readings for different settings on unit.

NOTE: Temperature knob presets to best set humidity. However, humidity can be adjusted.



MAIN CONTROL BOARD CONNECTIONS

Oxygen Board Connections (Function)		
Designation	Wire number connected	Function
J1	Wire 42	12 VAC (OXY) input
J2	Wire 43	12 VAC (OXY) (COM)
J3	Cable	Wire harness connected to Oxygen sensor (SW5)

Oxygen Board voltage readings			
Designation	Reference Point	ON/OFF Switch (OFF)	ON/OFF Switch (ON)
J1	J2	0 V	12 VAC

MAIN I/O BOARD CONNECTIONS (FUNCTION)		
Designation	Wire number connected	Function
J1	Ribbon Cable	Ribbon cable connection for Motor Board.
J2	Ribbon Cable	Ribbon cable connection for Display Board.
TC1+	White wire	Condensate tempering probe input
TC1-	Red wire	Condensate tempering probe input
V1	Wire 28	230 VAC input. (From On / Off switch)
V2	Wire 27	230 VAC (COM) input.
V3	Wire 23	12 VAC (Lite) input.
V4	Wire 348	230 VAC (COM) input.
V5	Wire 345	230 VAC input.
V6	Wire 16	24 VAC (IM) input.
V7	Wire 13	Chassis Ground input.
V8	Wire 12	24 VAC (COM) input.
V9	Wire 11	24 VAC input
V11	Wire 8	24 VAC (IM) (COM) input.
XA1	Wire 41	Oven Sensor RDT1 input.
XA2	Wire 40	Oven Sensor RDT1 input.
X3	Wire 3	Cavity Vent Switch (SW1) input.
X4	Wire 4	Cavity Vent Switch (SW2) input.
X5	Wire 5	Hi Limit Sense Switch input.
X6	Wire 6	Door Switch input.
Y5	Wire 33	Output for Humidity fill valve (high) relay.
Y6	Wire 34	Output for Cooling Fans (CF1, CF2 and CF3) relay.
Y8	Wire 36	Output for Humidity fill valve (low) relay.
Y9	Wire 37	Output for Condensate tempering valve relay.
Y10	Wire 26	Output for Cavity Vent Intake Motor relay .
Y13	Wire 22	Output for Cavity Lamp relay.
Y14	Wire 347	Output for low Heat relay.
Y15	wire 346	Output for high Heat relay.

Main I/O Board Connection Points (Output Voltage readings)					
Designation	Reference Point	ON/OFF Switch (OFF)	ON/OFF Switch (ON)		
			Temperature Knob Set to "----" (0°F)	Temperature Knob > 80°F	Service Tests Mode
Y5	V2	0 VAC	0 VAC	230 VAC as needed Controlled by temp or humidity settings.	230 VAC

Main I/O Board Connection Points (Output Voltage readings)					
Designation	Reference Point	ON/OFF Switch (OFF)	ON/OFF Switch (ON)		
			Temperature Knob Set to "----" (0°F)	Temperature Knob > 80°F	Service Tests Mode
Y6	V2	0 VAC	230 VAC	230 VAC	230 VAC
Y8	V2	0 VAC	0 VAC	230 VAC as needed when temp is within 50° of setpoint Controlled by oxygen sensor and humidity setting.	230 VAC
Y9	V2	0 VAC	230 VAC for 6 seconds when on/off switch turned on.	230 Vac for 6 seconds every 2 hours to fill p-trap; and if Drain Water Sensor Input calls for cold water	230 VAC
Y10	V2	0 VAC	230 VAC for 15 seconds when on/off switch turned on to close vent.	230 VAC for 15 seconds controlled by oxygen sensor & humidity setting.	230 VAC for 15 seconds
Y13	TB4-9	0 VAC	12 VAC when door is open	12 VAC when door is open	12 VAC when door is open
Y14	V4	0 VAC	0 VAC	230 VAC when low heat called for.	230 VAC
Y15	V4	0 VAC	0 VAC	230 VAC when high heat called for.	230 VAC

MOTOR BOARD

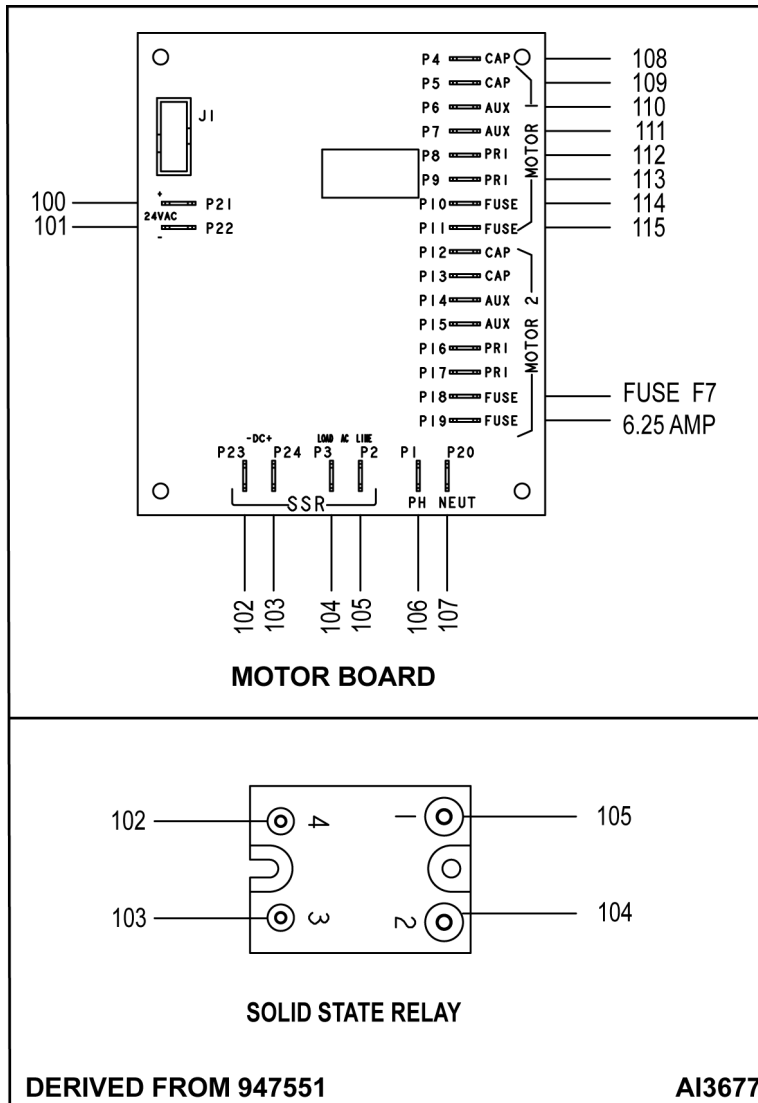


Fig. 89

WIRING DIAGRAMS

TERMINAL BLOCKS

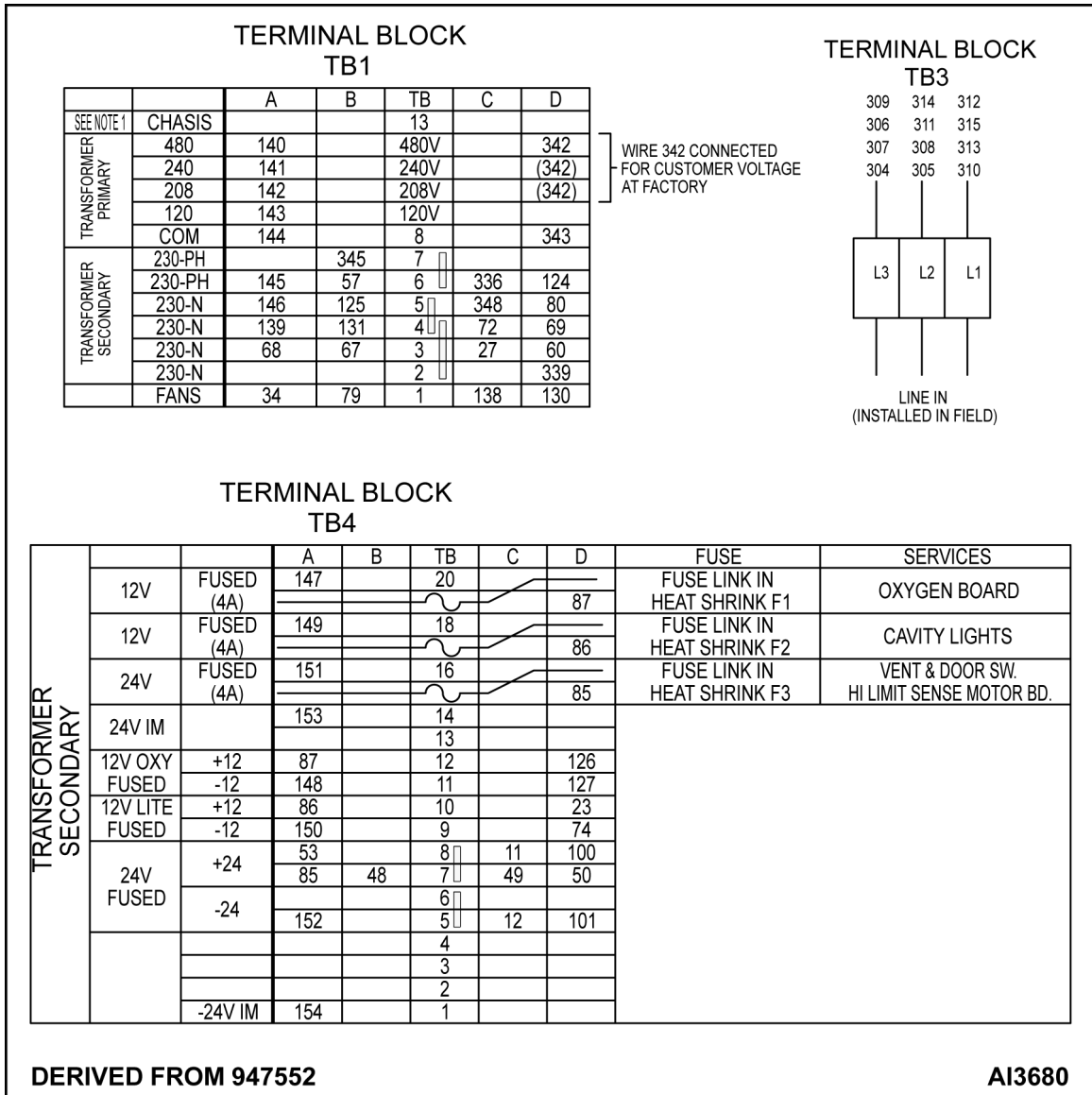


Fig. 90

T1 TRANSFORMER

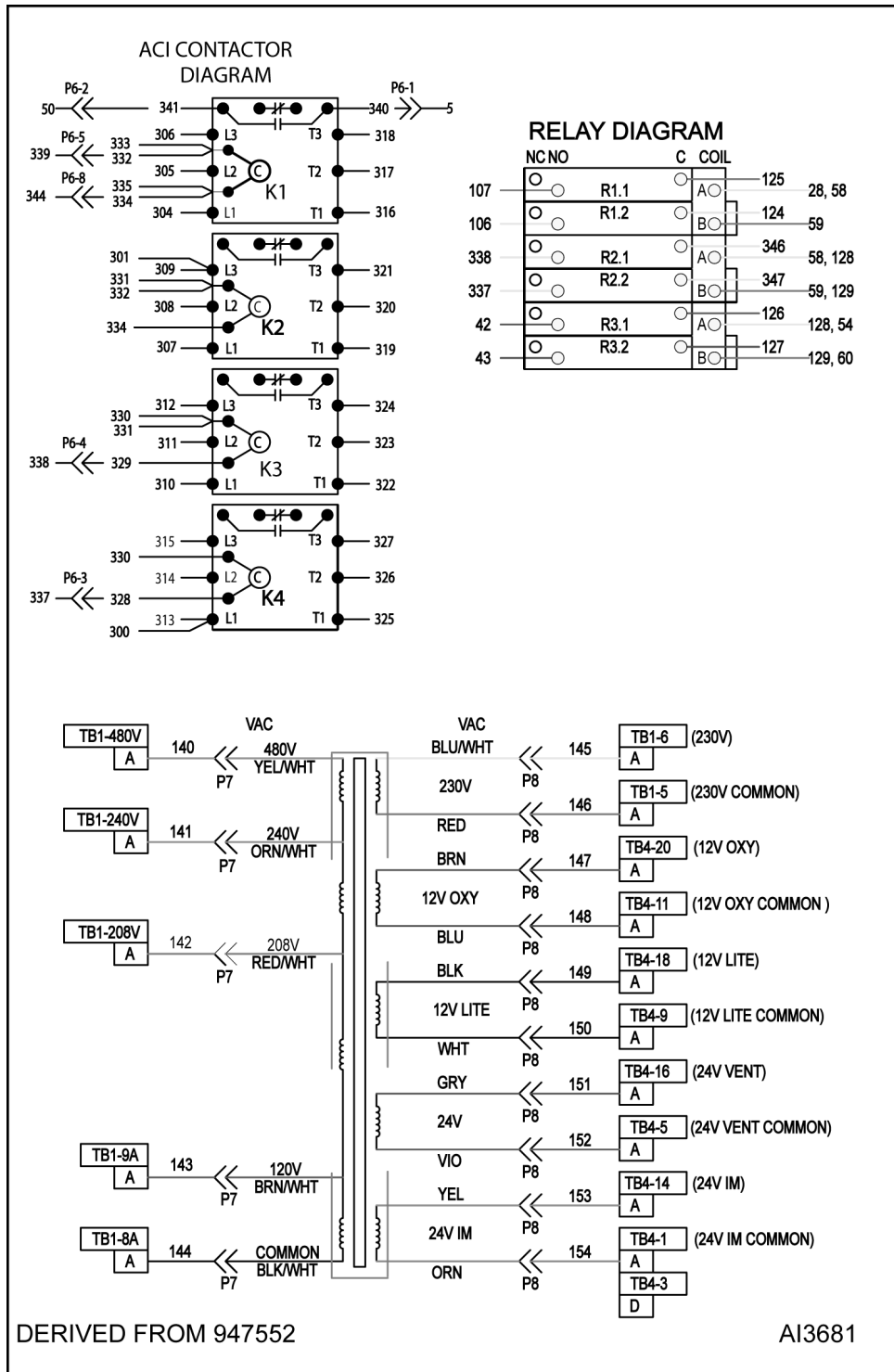


Fig. 91

HEATING ELEMENTS

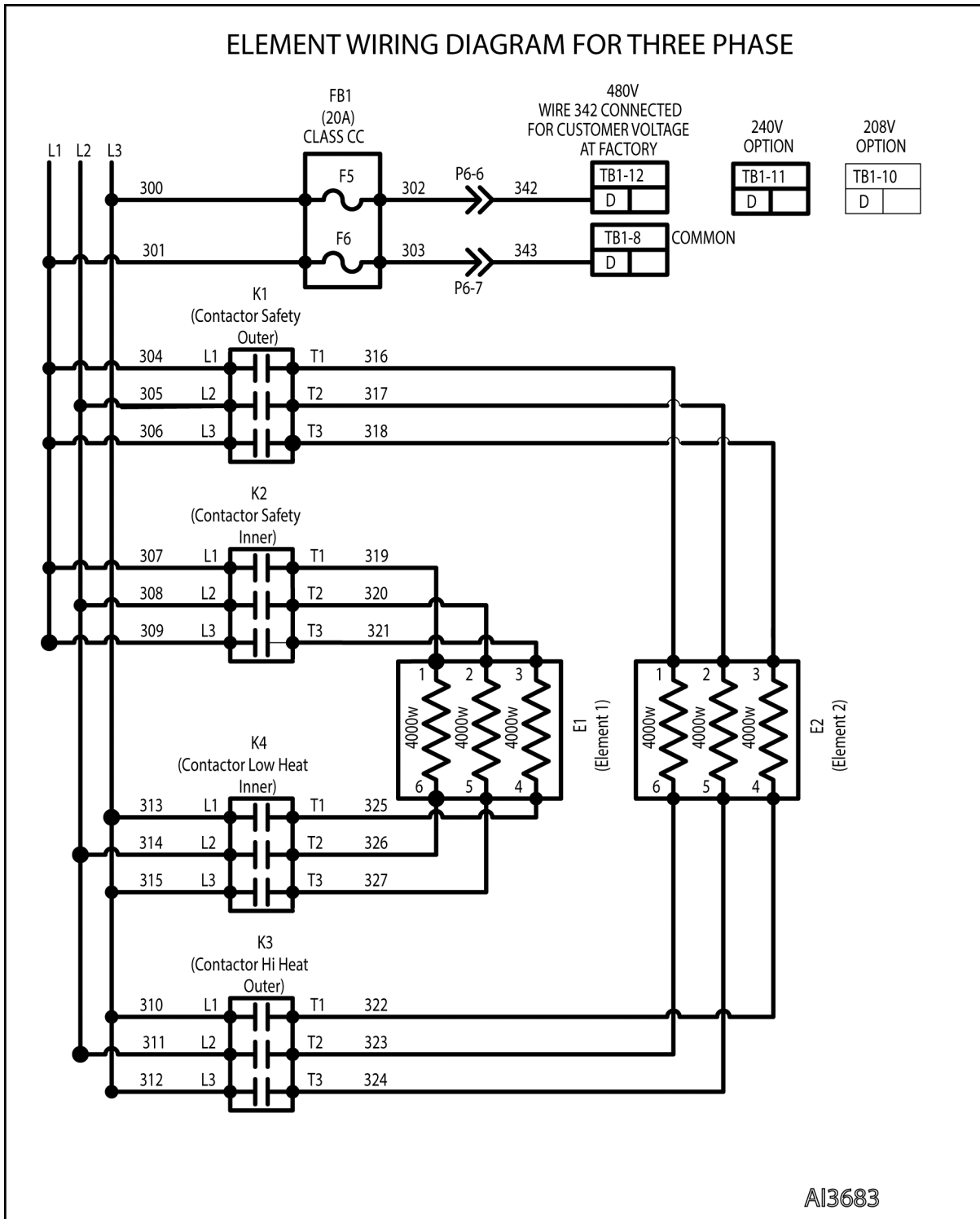


Fig. 92

NOTE: Heating Elements derated to 3000 W at 208 V.

MAIN BOARD

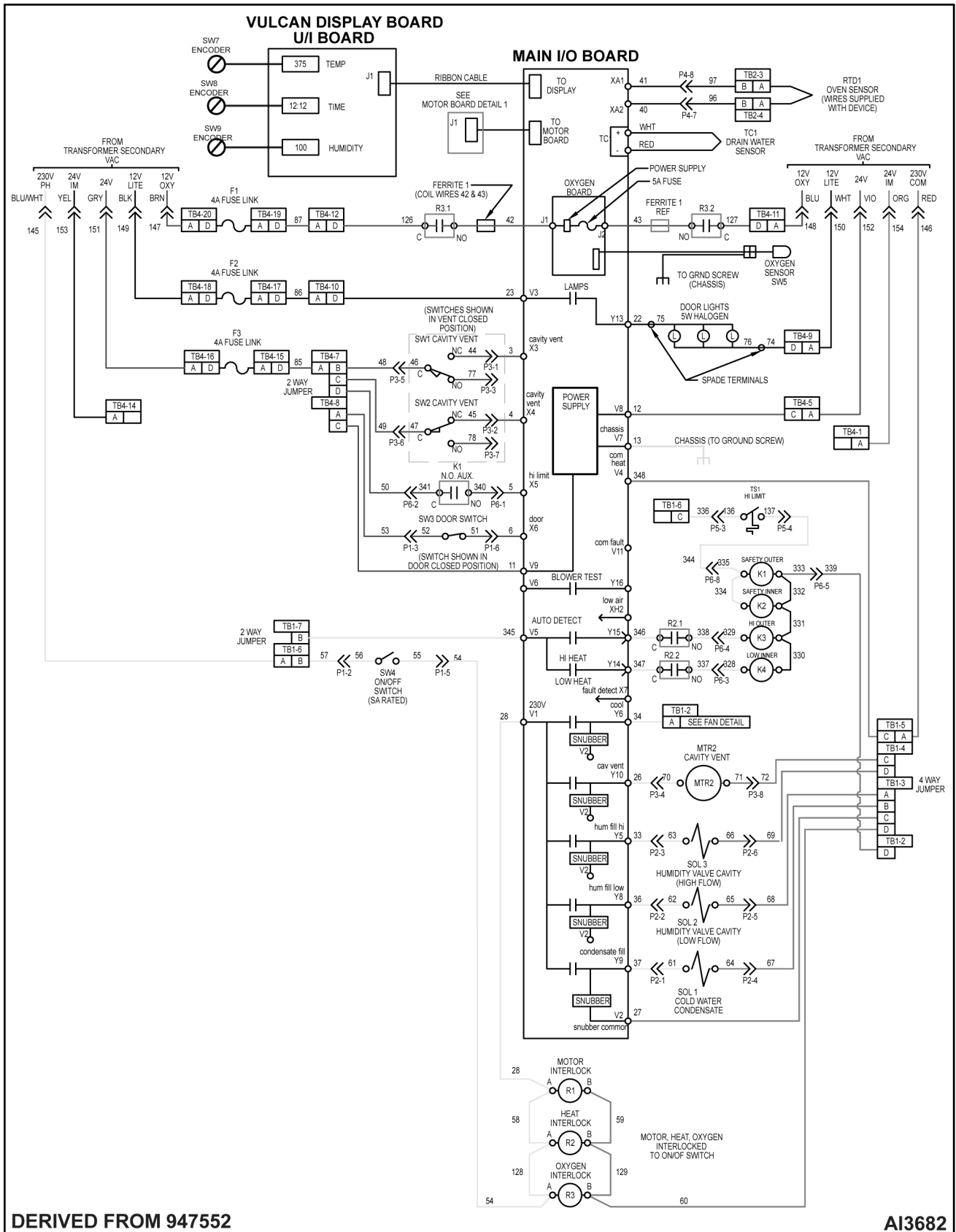


Fig. 93

MOTOR BOARD

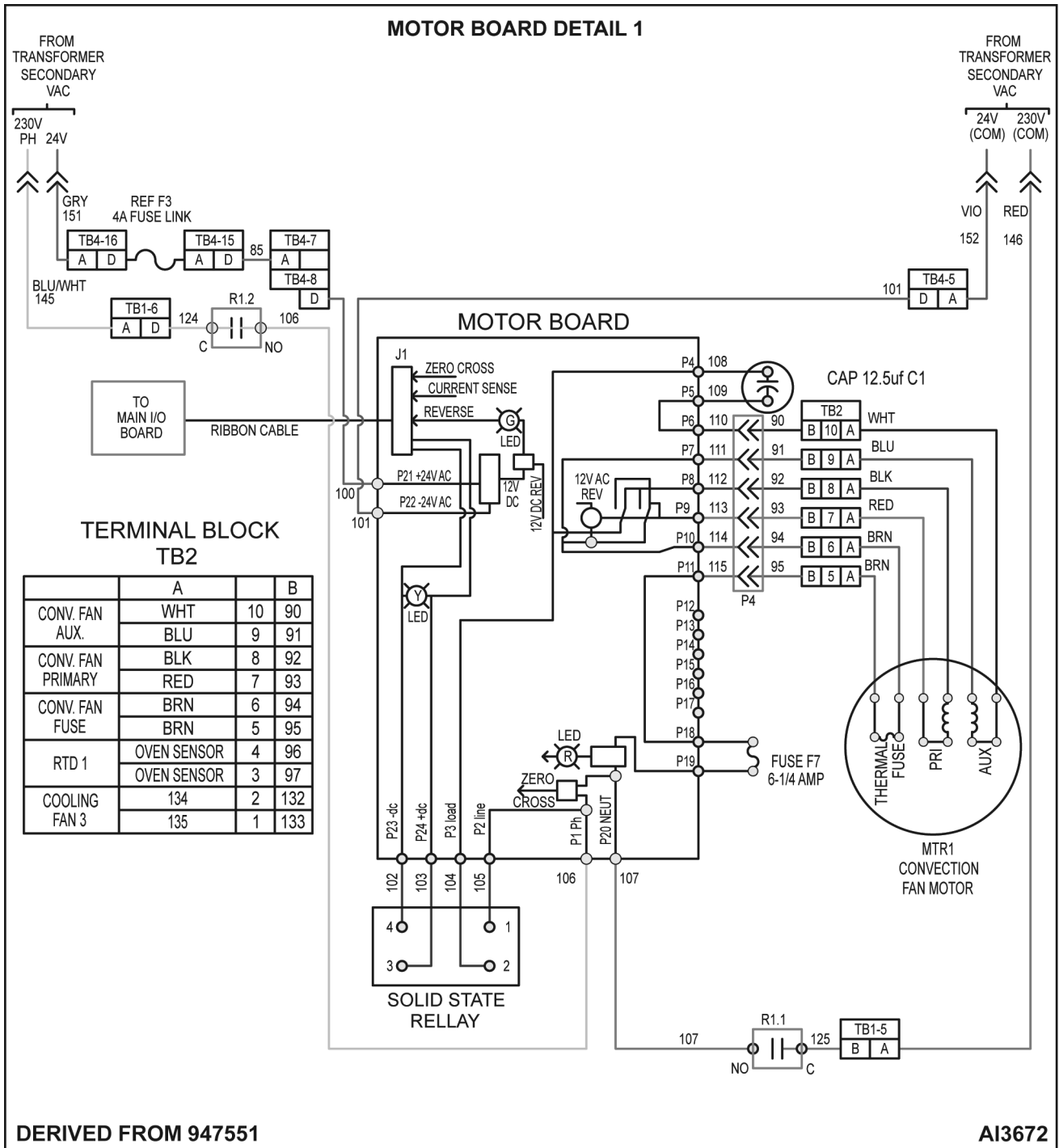


Fig. 94

COOLING FANS

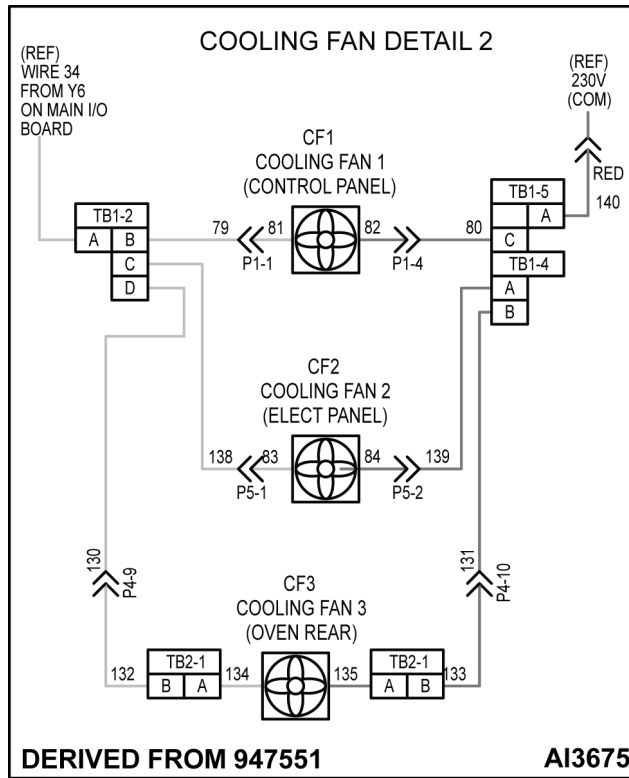
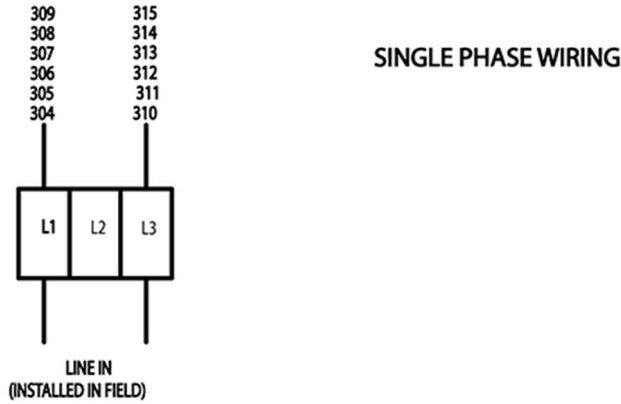
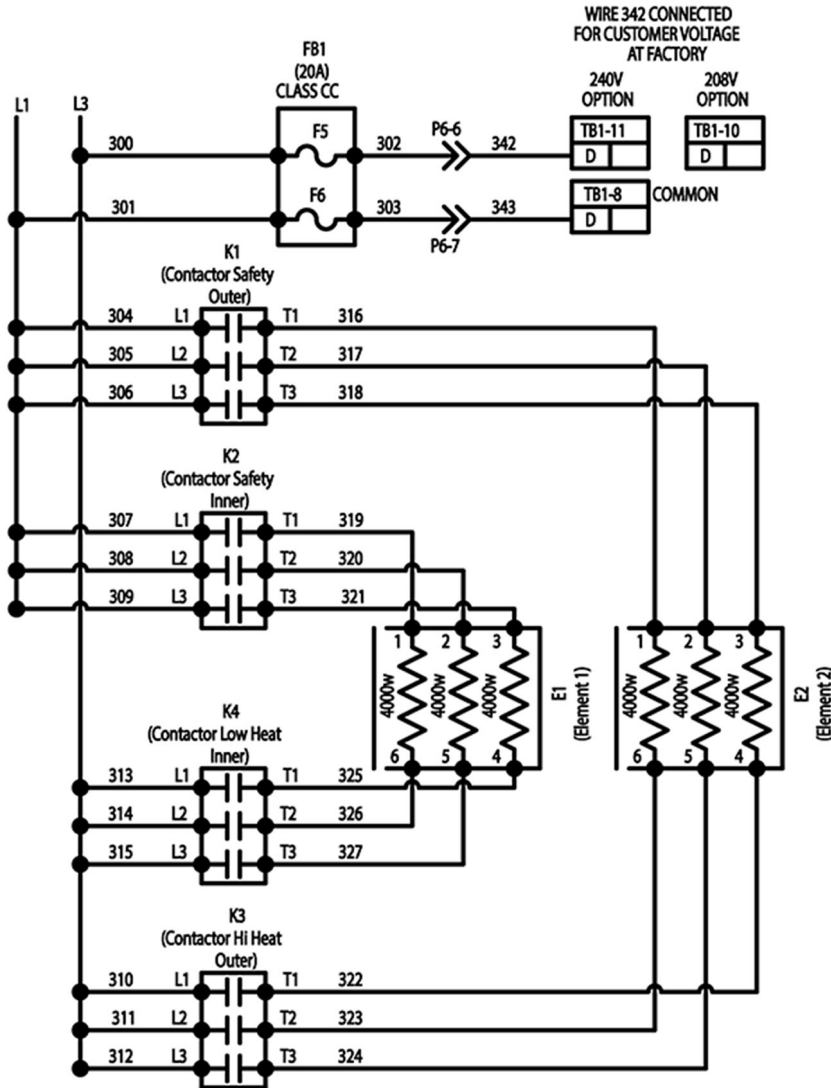


Fig. 95

WIRING CHANGES FOR SINGLE PHASE



ELEMENT WIRING DIAGRAM DETAIL 3 ALTERNATE



AI3723

Fig. 96

DIAGNOSTICS / TROUBLESHOOTING

SERVICE MODE (1963)

Log Into Service Mode 1963

1. Turn unit on.
 - NOTE:** Oven must have no temperature set to enter Service Mode.
2. Turn Timer knob counterclockwise until Timer display shows "SEt".
3. Turn Humidity knob counterclockwise until Humidity display shows "PAS".
 - A. Timer display will show "2000".
4. Turn Timer display counterclockwise to 1963.
 - A. Timer display will flash "1963".
 - B. Timer and Humidity display will flash twice.
 - C. Humidity display changes from "PAS" to "tst" when logging into Service Mode.

NOTE: Humidity knob used to change setting.

NOTE: Tests function with door open or closed.

NOTE: For some tests (Y5 - Y13), Time display toggles between test number and data reading. For example: current, temperature, etc.

Temp. Display ("---")	Description	Timer Display ("--:--")	Humidity Display ("---")
P0	Current firmware code revision (Month, day, year). Time and Humidity show example.	0225 (Month: 02, Date: 06)	14 (Year: 2014)
S5	High limit thermostat status.	HILt	HI / CLS (Switch closed) LO / oPn (Switch open)
S6	State of Door Switch Open / Close door to test switch.	door	HI / CLS (Switch closed) Lo / oPn (Switch open)
S10	State of O/I Switch. Toggle front panel switch to test.	AC	on / off
S11	Electric vs Gas Auto detects if oven is gas or electric.	tyPE	HI / ELE
rd1	Oven Cavity Temperature	(current oven temp)	oVn
o 1	Oxygen sensor power. Verifies 12VAC is supplied to Oxygen Sensor Board.	o2Pr	on/Err on - Oxygen board is powered. Err - Oxygen board is not powered.

Temp. Display ("---")	Description	Timer Display ("--:--")	Humidity Display ("---")
o2	Oxygen sensor board revision number.	orREV	example: 011 (If no revision number seen - power off / on to recognize revision date) NOTE: Must be revision 011 or higher.
o 3	Oxygen Board /Oxygen Sensor status NOTE: Reported as a pair.	02bd	00 / oFF <ul style="list-style-type: none"> Oxygen board not transmitting a status. Check connections. 01 / HT <ul style="list-style-type: none"> Oxygen board is heating the oxygen sensor Wait 3 minutes for warming after power is applied. 02 / rdY <ul style="list-style-type: none"> Oxygen board is ready and transmitting humidity data from sensor. 03 / Cal <ul style="list-style-type: none"> Oxygen board can't calibrate itself. Damaged Oxygen board. 04 / Cur (Current error) <ul style="list-style-type: none"> Oxygen board can't sense current in oxygen sensor heater. Check for disconnected sensor.
o 4	Oxygen sensor data Shown in % of Absolute Humidity. This value will not match the % Relative Humidity value shown on User interface at oven cavity temperatures less than 212°F. Same value as P33 in Configuration Mode (1972) NOTE: Combine the numbers in the two displays to get the complete percentage.	051 Combine the two numbers to get 51.2 %	.2

Temp. Display ("---")	Description	Timer Display ("--:--")	Humidity Display ("---")
F1	<p>Convection fan Test.</p> <p>1. Checks fan speeds 3 through 7.</p> <p>Visually check for change in fan speed.</p>	SPd / Ion	oFF, 3, 4, 5, 6, 7
	<p>2. Checks current sensing of motor.</p> <p>Visually check for display to change from IoFF to Ion in Timer display.</p>	SPd / Ion SPd / IoFF	
	<p>3. Checks breaking of motor.</p> <p>Visually check for convection fan breaking to a stop and not coasting to a stop.</p>	SPd / IoFF	
F3	<p>Convection Fan Reverse Test.</p> <p>Turn humidity knob to initiate test. Note direction of fan. For example, clockwise.</p> <p>Turn humidity knob to reverse motor. Note direction of fan has changed. For example, counter clockwise.</p> <p>NOTE: Turning humidity knob too quickly during breaking sequence, will cause oven to beep.</p>	rEV Ion / IoFF	HI / Lo
Y5	<p>Humidity High flow Water Valve.</p> <p>When turned on, water will flow out of water atomizer.</p> <p>NOTE: Valve flow rate = 15 liters / hour (.25 liter / min)</p>	<p>H2HI</p> <p>When on, Timer display toggles between H2H1 and a value to indicate solenoid is energized.</p> <p>Expected value = 6 ± 1</p> <p>NOTE: Wait 10 seconds for proper value reading in timer display.</p> <p>NOTE: When Timer displays "=Err", indicates that the valve is not drawing the proper current.</p>	on / oFF

Temp. Display ("---")	Description	Timer Display ("--:--")	Humidity Display ("---")
Y6	<p>Cooling fans.</p> <p>Fan 1 (control panel), fan 2 (display panel), fan 3 (oven rear).</p>	<p>CFAn / (Current Sense value)</p> <p>When on, Timer display toggles between CFan and a value to indicate fans are energized.</p> <p>Expected value = approximately 99 for 3 fans, 66 for 2 fans.</p> <p>NOTE: When Timer displays "=Err", indicates that the fans are not drawing the proper current.</p>	<p>on / oFF</p>
Y8	<p>Humidity Low flow Water Valve.</p> <p>When turned on, water will flow out of water atomizer.</p> <p>NOTE: Valve flow rate = 15 liters / hour (.25 liter / min)</p>	<p>H2Lo</p> <p>When on, Timer display toggles between H2Lo and a value to indicate solenoid is energized.</p> <p>Expected value = 6 ± 1</p> <p>NOTE: Wait 10 seconds for proper value reading in timer display.</p> <p>NOTE: When Timer displays "=Err", indicates that the valve is not drawing the proper current.</p>	<p>on / oFF</p>
Y9	<p>Water drain Condensate valve</p> <p>When turned on, water will flow out drain.</p> <p>NOTE: Valve flow rate = 300 liters / hour (5 liters / min).</p>	<p>H2dr / Drain Temp</p> <p>When on, Timer display toggles between three things. H2dr which is the name of the test, a value to indicate solenoid is energized (settles at a value of 6 ± 1 and the drain tempering probe's temperature.</p> <p>NOTE: When Timer displays "=Err", indicates that the valve is not drawing the proper current.</p>	<p>on / oFF</p>

Temp. Display ("---")	Description	Timer Display ("--:--")	Humidity Display ("---")
Y10	<p>Cavity Vent Intake Current sense and Vent operation test.</p> <p>1. Checks state of vent switches. 2. Checks rotation of vent motor, quarter turn at a time.</p> <p>NOTE: Properly check cavity vent intake by turning humidity knob between oPn and CLS a minimum of 4 times to get full rotation.</p> <p>3. Times rotation of quarter turn, to verify vent switches seat properly on shaft. 4. Checks for current feedback to verify motor is energized.</p>	<p>VEnt / CLSd SPIn / =5</p> <p>Display toggles. SPIn indicates switches are in spinning state. "=5" is an approximate number which indicates motor is energized properly.</p> <p>When complete: VEnt / oPEn</p> <p>NOTE: "Err/=5", switches are in an error state, see <u>CAVITY VENT SWITCH TEST AND ADJUSTMENT</u></p> <p>NOTE: When timer display "=Err" indicates that the vent motor is not drawing the proper current.</p>	<p>Humidity display shows CLS CLS, turn humidity knob to initiate test.</p> <p>Display counts up to 15 seconds, if operating properly.</p> <p>When complete: Humidity knob will read oPn.</p> <p>NOTE: Counts past 15 indicate switches have not seated properly, "Err" displays after 75 seconds. Test continues to run.</p>
Y13	Oven cavity door light.	<p>LtE</p> <p>when on, Timer display toggles between LtE and a value to indicate lights are energized.</p> <p>Expected values: 75 for 3 lights 50 for 2 lights 25 for 1 light 0 for no lights on</p>	on / oFF
Y14	Low Heat Inner Elements	<p>Lo Ht</p> <p>Display toggles between Lo Ht and the temperature reading from RTD1 temperature probe.</p>	on / oFF
Y15	High Heat Outer Elements	<p>Hi Ht</p> <p>Display toggles between Hi Ht and the temperature reading from RTD1 temperature probe.</p>	on / oFF
d1	<p>Display Test - assure led light segments operate.</p>	<p>Temperature, Timer, Humidity displays sequence thru dots and digits 0 - 9. (Example: ..., 000, 111, etc.)</p>	oFF / on
HUn gAL	<p>Humidity Water Counter</p> <p>NOTE: Same value as P19 in <u>CONFIGURATION MODE</u> (1972).</p>	Example: 0009	<p>Example: 999 Example: Total gallons: 9,999.</p>

Temp. Display ("---")	Description	Timer Display ("--:--")	Humidity Display ("---")
Cnd gAL	Condensate Tempering Water Counter NOTE: Same value as P20 in <u>CONFIGURATION MODE (1972)</u> .	Example: 0009	Example: 999 Example: Total gallons: 9,999.
HRS	Cooking Hours NOTE: Same value as P18 in <u>CONFIGURATION MODE (1972)</u> . (Hour counter does not increment in idle mode.)	Example: 0009	Example: 999 Example: Total hours: 9,999.
LOg	(Refer to <u>ERROR CODES</u>)		
E0 thru E21	(Refer to <u>ERROR CODES</u>)		

Logging out of Service Mode 1963

1. Turn Temperature knob counterclockwise until "---" displayed.

ERROR CODES

In cook mode, the oven always checks for errors. The oven does not check for errors in idle mode, (all displays show ----). All errors are stored into a log in SERVICE MODE (1963). Some errors are considered critical, that the oven cannot operate and if detected, everything is shut down and error number is displayed and oven beeps continually.

NOTE: E6 error is the exception to the rule and is the only error logged during idle time.

To turn off continuous beep, toggle on/off switch. If condition still exist error will reappear immediately. If error beep turns back on, turn Timer knob counter clockwise, back to idle mode "---".

NOTICE ERRORS 0 - 2 below are "critical" errors. Oven will not function in this condition. All processes are stopped and oven is shut down.

Some errors are considered non-critical, where something requires service, but oven can still cook. Some of these errors are displayed in operator interface, so customer knows to call for service. Other non-critical errors are logged as a diagnostics tool for service.

When an error code is logged, the hour that the error occurred is recorded. The hours in the log are cooking hours. Cooking hours are the number of hours the oven has been in use. Cooking hours do not increase during idle time (all displays show ----). So if a school uses an oven 6 hours a day, 5 days a week. The cooking hours will increase 30 hours a week.

Log Into Service Mode 1963

1. Turn unit on.
2. Turn Timer knob counterclockwise until Timer display shows "SEt".
3. Turn Humidity knob counterclockwise until Humidity display shows "PAS".
 - A. Timer display will show "2000".
4. Turn Timer display counterclockwise to 1963.
 - A. Timer display will flash "1963".
 - B. Timer and Humidity display will flash twice.
 - C. Humidity display changes from "PAs" to "tst" when logging into Service Mode.
5. Turn Temperature knob clockwise through all tests in service mode, until "HRS" is displayed in the Temperature display.

This displays the current number of cooking hours in the Timer and Humidity displays. Make a note of the hour listed. This is important so that you can tell how long it has been since the error has occurred.

To read the current number of hours

- A. With HRS displayed in the temperature display.
 - B. 0009 in the Timer display.
 - C. 999 in the humidity display.
 - D. The oven would have 9,999 cooking hours.
6. Turn Timer knob clockwise one more click and "LOg" is displayed in the Temperature display.

There are two ways error codes are stored, sequential log and error bucket.

Sequential log: A quick timed ordered list on errors recorded.

Error buckets: Each bucket, E0...E21, displays an individual error and every hour that the error occurred.

How to read sequential Log

When Log is shown in Temperature display, sequential error log is being displayed. The last stored error is shown in the Timer display. Then the Timer display, in conjunction with the Humidity display toggles the hour count when error occurred.

Sequential Log

1. With Log displayed in the temperature display.
2. Timer Display toggles between E1 and 0009.
3. Humidity display flashing 999
4. Means that an E1 error occurred at cooking hour 9,999.

This is a sequential log. To view the next error recorded, turn Timer knob clockwise. If no more errors have been recorded, Timer displays "ErrS" and Humidity displays "End". If multiple errors have been recorded, "--]" will be displayed in Temperature display when Timer knob is turned. The next error in the sequential log is shown in the Timer display. Then the Timer display in conjunction with the humidity display toggles between error code and hour in which the error occurred.

NOTE: As the sequential log stores multiple error logs, only view the last few error codes to know what errors have occurred to prevent oven from working properly.

How to Read Error Buckets

To view bucket list, turn Temperature knob clockwise to start error buckets, starting at E0. If no errors have been recorded for E0, then Temperature displays "E0 (error code)", Timer displays "ErrS", Humidity displays "End". If no errors are displayed in error bucket, turn Temperature knob clockwise to next error.

If errors are recorded in error bucket, Temperature displays "E0 (error code)", Timer and humidity displays oven hour count the error last occurred. If multiple errors have been recorded, "--]" will be displayed in Temperature display when Timer knob is turned clockwise, the oven will display each recorded event and associated hour count. The next hour count is shown in Timer and Humidity displays. To view multiple hours recorded, continue turning Timer knob clockwise. Timer knob will show "ErrS" and Humidity display will show "End" when all recorded hours have been displayed.

NOTE: Multiple errors can be recorded during the same hour, turning the Humidity knob clockwise will skip hour by hour, not displaying each individual recorded event.

- E0** High Limit Error (Critical Error): Oven overheats, tripping high limit thermostat, and removes voltage from Contactors K1 and K2.
- E1** Convection Fan Motor Error (Critical Error): Motor Board does not sense current to motor. Possible causes: 1) Convection fan has overheated and fan's thermal fuse has tripped or 2) motor board's 6-1/4 fuse amp has been blown.
- E2** RTD Probe Error(Critical Error): Probe RTD readings are out of range.
- E3** (Future Use)
- E4** Controls Compartment Ambient Error: Operating temperature of controls has exceed recommenced temperature limits for more than 15 minutes.
- E5** Drain Tempering Probe Error: Drain tempering probe readings are out of range of 32°F to 250°F range.

- E6** Convection Fan Current Error: Control board reads current to convection fan motor, when convection fan should be off.
Error E6 is the only error that can be logged during idle mode
- E7** Auto Electric or Gas Detection Error: Control board cannot auto detect type of unit or state of auto detect pin has changed.
- E14** (Future Use)
- E15** Vent Error: Either vent motor has a problem and cannot rotate, or the vent switches are out of adjustment and cannot tell vent motor when to stop its rotation at the open or closed position. This means the system cannot humidify efficiently. Although switches should seat into position within 15 seconds for a quarter turn, error will not be logged until vent motor runs 75 seconds without completing.
- E16** In cook mode, where oxygen sensor / oxygen sensor board has fallen out of its **ready** status.
 1. Stuck in warming.
 2. Communication error.
 3. Internal oxygen board heating or calibration error.
- E17** (Future Use)
- E18** In cook mode, where oxygen sensor board has lost 12V supply.
- E19** (Future Use)
- E20** **Cooling Fan Dropout:** Current not sensed in one or more of the cooling fans. Check cooling fans to ensure fans are functioning properly.
- E21** **Motor Board AC Power Frequency Check:** Error triggers if 60 Hertz is not detected by motor board.

Logging out of Service Mode 1963

1. Turn Temperature knob counterclockwise until "---" displayed.

OVEN TROUBLESHOOTING

Quick over all check

The ABC7 Combi oven automatically records error conditions that may occur during use. Also the Service Mode provides a quick way of checking the condition of the oven. It is recommended that any time an ABC7 oven is to be serviced, the service tech starts by running the all the test in SERVICE MODE (1963) and to look at the in the error log to make note of any recent error codes that have been saved.

Troubleshooting using Error Codes

Check which (Link to error codes section) are logged.

NOTE: When an error has been corrected, that error code still remains in the log. It is important to note what

the current cooking hour is and what cooking hour the error code was recorded.

Example

1. The current number of cooking hours on the oven is 100.

NOTE: Temperature display shows HRS, Timer display is flashing 0000 and the humidity display is flashing 100.

2. The school uses the oven 6 hours a day.
3. Error E1 happened at hour 75.
4. This means the error occurred 4 working days earlier.

Error Code	Symptom	Possible Cause	Action
E0	Oven does not operate. When the error occurs the oven shuts down and E0 shows in the temperature display along with a constant error beep.	<ol style="list-style-type: none"> 1. High limit thermostat open. 2. K1 Contactor Aux contacts 3. Oven installed with not enough clearance. 	<ol style="list-style-type: none"> 1. Verify High limit shaft is turned clockwise until it stops. 2. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (S5) to check the current status of the high limit. B. Run (rd1) to check the current temp of the oven cavity. 3. In Configuration Mode (1972). <ol style="list-style-type: none"> A. Check the setting of (P15). <ol style="list-style-type: none"> 1) If the setting of (P15) is set to 482 the high limit must be the 582° high limit thermostat. <p>NOTE: The older version of the high limit thermostat had yellow painted on the tip of the shaft.</p> <ol style="list-style-type: none"> 4. Check to make sure there is restriction to air flow for cooling and no other heat source that would raise the temperature of the oven.
E1	Oven does not operate. When the error occurs the oven shuts down and E1 shows in the temperature display along with a constant error beep.	<ol style="list-style-type: none"> 1. Convection fan motor is getting too hot and it's thermal overload trips. 2. 6.25 amp fuse (F7) blows on the Motor Drive Board. 3. Cooling fan F3 not running or running in the wrong direction. 4. R1 interlock relay. 5. R6 solid state relay. 6. Motor Drive board. 7. C1 capacitor. 	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (F1) Convection Fan test. B. Run (F3) Convection Fan reverse test C. Run (Y6) Cooling fans test. <ol style="list-style-type: none"> 1) The Timer display alternates between CFan and a value. A value of 99 means all three fans are running. 2) Make sure cooling fan F3 is blowing in towards the convection fan motor. 2. With no power applied, check to see if the convection fan turns freely. 3. Check to make sure there is restriction to air flow for cooling and no other heat source that would raise the temperature of the oven.
E2	Oven does not operate. When the error occurs the oven shuts down and E2 shows in the temperature display along with a constant error beep.	<ol style="list-style-type: none"> 1. RTD Probe. 2. Main board. 	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (rd1) to check the reading from the temperature probe. <ol style="list-style-type: none"> 1) If the reading from the temperature probe reads zero degrees check the <u>resistance of the temperature probe.</u>

Error Code	Symptom	Possible Cause	Action
E4	Oven not operating properly, (Intermittent or erratic).	1. Cooling fan F2 not running or running in the wrong direction.	1. <u>Service Mode (1963)</u> A. Run (Y6) Cooling fans test. 1) The Timer display alternates between CFan and a value. A value of 99 means all three fans are running. 2) Make sure cooling fan F2 is blowing down, drawing air thru the electrical panel. B. Check to make sure there is restriction to air flow for cooling and no other heat source that would raise the temperature of the oven.
E5	Uses too much water, or does not temper drain water.	1. Drain tempering probe. 2. Water drain condensate valve. 3. Main board.	1. <u>Service Mode (1963)</u> A. Run (Y9) Water drain condensate valve test. 1) When the test is running the Timer display toggles between three things. H2dr which the name of the test, the drain tempering probes temperature reading. and a value that indicates the valve is energized,(should be a valve of 6 plus or minus 1).
E6	Not cooking properly. (Convection fan not working)	1. Motor board. 2. Solid State relay.	1. <u>Service Mode (1963)</u> A. Run (F1) Convection Fan test. 1) Check LEDs on motor board. • If red LED is on when the motor is not running, replace motor board. 2) If yellow LED is on and motor does not run, replace Solid State Relay.
E7	AN electric oven thinks it's gas.	1. Main board.	1. <u>Service Mode (1963)</u> A. Run (S11) Auto Detect test.
E8	Gas only		
E9	Gas only		
E10	Gas only		
E11	Gas only		
E12	Gas only		
E13	Gas only		

Error Code	Symptom	Possible Cause	Action
E15	Poor cooking, Error dot in the upper left hand corner of the humidity display.	<ol style="list-style-type: none"> 1. Vent motor. 2. Vent switches. 3. Vent blocked. 	<ol style="list-style-type: none"> 1. Perform <u>CAVITY VENT SWITCH TEST AND ADJUSTMENT</u>. 2. Inspect the vent tube to make sure it is not blocked in someway.
E16	Does not steam in Combi mode. Error dot in the upper left hand corner of the humidity display.	<ol style="list-style-type: none"> 1. Oxygen sensor. 2. Oxygen sensor board. 3. Main board. 4. Missing Ferrite 	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (o3) Oxygen board / Oxygen sensor status. <p>O0 / oFF</p> <ul style="list-style-type: none"> • Oxygen board not transmitting a status. • Check connections. • <u>Service Mode (1963)</u> <ol style="list-style-type: none"> 1. Run (o1) oxygen sensor power test. <ul style="list-style-type: none"> • If test passes,(board has power, but can not communicate), replace Oxygen sensor board. <p>O1 / HT</p> <ul style="list-style-type: none"> • Oxygen board is heating the oxygen sensor • Wait 3 minutes for warming after power is applied. <ul style="list-style-type: none"> • Check sensor connections. • Check to see if ferrite is in place. • Check routing of cable going to Oxygen Sensor. • Replace sensor. <p>O2 / rdY</p> <ul style="list-style-type: none"> • Oxygen board is ready and transmitting humidity data from sensor. <p>O3 / Cal</p> <ul style="list-style-type: none"> • Oxygen board can't calibrate. • Replace Oxygen board. <p>O4 / Cur (Current error)</p> <ul style="list-style-type: none"> • Oxygen board can't sense current in oxygen sensor heater. • Check for disconnected sensor. • Replace sensor.

Error Code	Symptom	Possible Cause	Action
E18	Does not steam in Combi mode. Error dot in the upper left hand corner of the humidity display.	<ol style="list-style-type: none"> 1. Fuse F1 (fuse link in terminal block) 2. Fuse F8 (on Oxygen board). 3. R3 relay. 	<ol style="list-style-type: none"> 1. Check fuses
E20	No obvious symptom.	<ol style="list-style-type: none"> 1. Cooling Fan 	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (Y6) Cooling fans test. <ol style="list-style-type: none"> 1) The Timer display alternates between CFan and a value. A value below 65 means at least one fan is not running.

Troubleshooting by Symptom

NOTE: It is highly recommended that you check the error log, and run the test available in reference.

SYMPTOM	POSSIBLE CAUSE
Oven completely inoperative. No display on display board.	<ol style="list-style-type: none"> 1. Facilities main circuit breaker open. 2. Oven power cord unplugged. 3. Fuse F3 4. Incorrect wiring of On/Off switch. 5. Ribbon cable going from Main board to Display board not seated correctly. 6. Display board inoperative. 7. Transformer T1 malfunctioned. 8. Control board inoperative.
Oven does not operate. Display is on.	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Check error log for E0, E1 and E2 errors. <p>NOTE: If any of the 3 errors are logged, follow <u>Troubleshooting using Error Codes</u>.</p> 2. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (S6) Door test. 3. Encoder malfunction. 4. Check that the jumper (J5) on back of Display Board is on the correct set of pins. <ol style="list-style-type: none"> A. The jumper should be on the two pins closes to the edge of the board. <p>NOTE: This is the 5V position</p>

SYMPTOM	POSSIBLE CAUSE
Oven operates. Door closed and convection fan inoperative.	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Check error log for E1 errors. <p>NOTE: If any E1 errors are logged, follow Troubleshooting using Error Codes.</p> <ol style="list-style-type: none"> 2. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (S6) Door test.
Oven operates. Door closed and oven cavity lights inoperative.	<ol style="list-style-type: none"> 1. Reset control by powering oven off and unplugging from the wall outlet. Then restarting. 2. Check fuse F2. 3. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (Y13) Oven Cavity door light test. <ol style="list-style-type: none"> 1) If all cavity light inoperative. <ul style="list-style-type: none"> • Check 12 volts from transformer. • Main Board. 2) If only one light out. <ul style="list-style-type: none"> • Halogen light burned out.
Oven operates. Door closed. Oven convection fan operates. Control heat on but oven does not heat. Possible error messages on Timer display. <ol style="list-style-type: none"> 1. No heat 2. door 	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (S6) Door test. B. Run (Y14 and Y15) Heating Element test. 2. Heating circuit malfunction.
Oven cavity vent inoperative. There is dot in the upper left corner of the humidity display.	<ol style="list-style-type: none"> 1. Perform <u>CAVITY VENT SWITCH TEST AND ADJUSTMENT</u> . 2. Inspect the vent tube to make sure it is not blocked in someway.
No steam.	<ol style="list-style-type: none"> 1. Check water supply to unit. 2. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (Y5) High Humidity test. B. Run (Y6) Low Humidity test. C. Run (S6) Door test. D. Run (o1) Oxygen sensor power test. E. Run (o3) Oxygen Board / Oxygen sensor status test. 3. <u>Configuration Mode (1972)</u> <ul style="list-style-type: none"> • Check the setting of P28, if enabled, "---" in humidity display during operation means steam is turned off. 4. Inadequate oven preheat. (Oven must be within 50° of setpoint for steam.

SYMPTOM	POSSIBLE CAUSE
Excessive moisture in oven, or not enough moisture in oven.	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (Y5) High Humidity test. B. Run (Y8) Low Humidity test. C. Run (Y10) Cavity vent intake test. D. Run (o1) Oxygen sensor power test. E. Run(o3) Oxygen Board / Sensor status test. F. Run (o4) Oxygen Sensor data test. 2. Perform <u>CALIBRATING OXYGEN SENSOR BOARD</u>. 3. Drain clogged or plumbed incorrectly. 4. Water pressure regulator malfunction.
Incorrect heat / Oven temperature does not match setpoint.	<ol style="list-style-type: none"> 1. <u>CONFIGURATION MODE (1972)</u> <ol style="list-style-type: none"> A. Check P1 and P24. See <u>CONFIGURATION MODE (1972)</u> for details. 2. Perform <u>TEMPERATURE CALIBRATION</u>. 3. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (Y5) High Humidity test. B. Run (Y6) Low Humidity test. C. Run (F1) Convection Fan test. D. Run (S6) Door test. E. Run (Y14) Low Heat test. F. Run (Y15) High Heat test. 4. Do a <u>HEATING ELEMENTS RESISTANCE CHECK</u> 5. Heating circuit malfunction. <p>NOTE: Remember that the Overshoot feature engages during the first call for heat, and will overshoot the setpoint temporarily.</p>
Uneven Baking.	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (F1) Convection Fan test. B. Run (F3) Convection Fan reverse test. C. Run (Y10) Cavity vent intake test. 2. Check intake vent and exhaust vents for blockage. 3. With no power applied, check to see if the convection fan turns freely. 4. Incorrect air baffle position. 5. Poor seal on door.
Temperature of drain water too high.	<ol style="list-style-type: none"> 1. <u>Service Mode (1963)</u> <ol style="list-style-type: none"> A. Run (Y9) Water drain condensate valve test.

SYMPTOM	POSSIBLE CAUSE
Convection Fan not running	<ol style="list-style-type: none"> 1. In Service Mode (1963) <ol style="list-style-type: none"> A. Check (P0) Firmware revision. <ul style="list-style-type: none"> • If earlier than 08-11-14 follow <u>FIRMWARE UPDATE PROCEDURE</u> B. Run (F1) Convection Fan test. <ul style="list-style-type: none"> • If red LED is on when the motor is not running, replace motor board. • If yellow LED is on and motor does not run, replace Solid State Relay.