

INTELLIGENT STEAM MANAGER



MIURA XJ1

**MICRO-COMPUTER BOARD SPECIFICATION OF
OIL & GAS BOILER CONTROLLER**



**BOILER CO., LTD.
BRANTFORD, ONTARIO**

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1 GENERAL ARTICLES

1.1 EQUIPMENT

This specification describes the UL approved MIURA Steam Boiler Control Equipment.

Name: Boiler Control Microcomputer System

Model: XJ1

Components: • CPU Board Assembly, Part Number BG1-200-CPU

- Master Relay Board Part Number XJ1-120
- Switch Board Part Number BG1-200-SW
- Display Board Part Number CX-009-E

1.2 ENVIRONMENT SPECIFICATIONS

Power Requirements: Single phase, 120 VAC, 60 Hz. Supplied by boiler control power circuit.

Allowable Voltage Variation: 90 to 132 VAC

Power Failure Actions: For loss of power greater than 0.2 seconds, the power failure sequence program will activate and stop the boiler, requiring a manual restart. For power failures of less than 0.2 seconds, but greater than 10 milli-seconds, the boiler will automatically re-start. If the power failure is less than 10 milli-seconds, the boiler will continue to run.

Line Voltage Spike Tolerance: The CPU is tolerant of line voltage spike up to 1500 V for 60 seconds or 1800 V for 1 second with no effect on CPU. Voltage measured between hot and common (ground) of CPU power supply.

Insulation Resistance: Dielectric resistance is 500M Ω as measure between line and ground when measured by 500VDC Megger.

Electrical Noise Tolerance: The equipment will operate without adverse effect when subjected to no more than 2kV voltage spike between power supply lines or between power supply and ground.

Memory Backup: No loss of alarm settings and operating history will occur for up to 240 hours when AC power is lost to the boiler. Time is based on maximum ambient temperature and no backup battery waning at time of loss of power.

Ambient Conditions:

- Operating Temperature (“OPERATION” switch on): -4°F to 140°F
- Storage Temperature (“OPERATION” switch off): -4°F to 158°F
- Humidity: 20% to 90% relative humidity provided that dew or ice does not form on the circuit boards

Vibration Tolerance: In operation, vibration shall be less than 0.4g with complex amplitude less than 0.5mm peak to peak, frequency less than 20Hz. In transport, vibration shall be less than 2.0g with complex amplitude less than 0.5 mm peak to peak, frequency less than 20Hz.

2 HARDWARE CONFIGURATION

2.1 BOARD CONFIGURATION

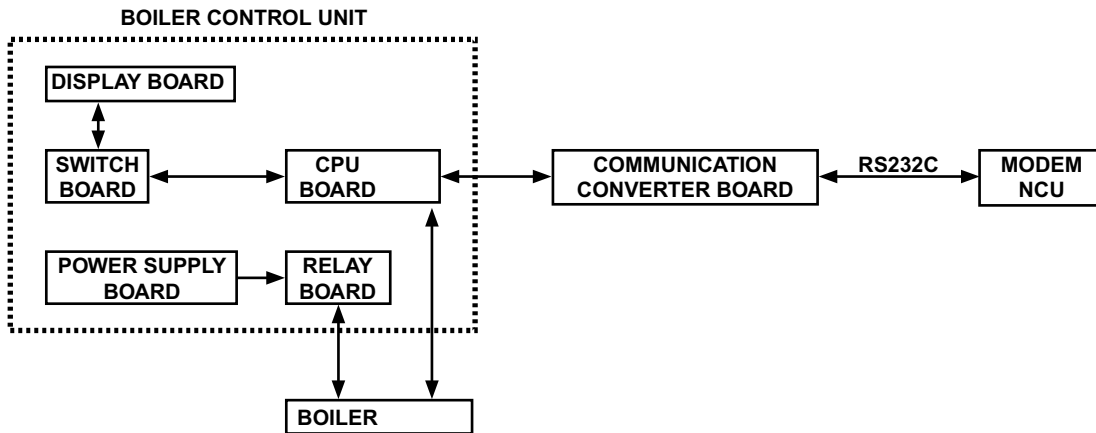
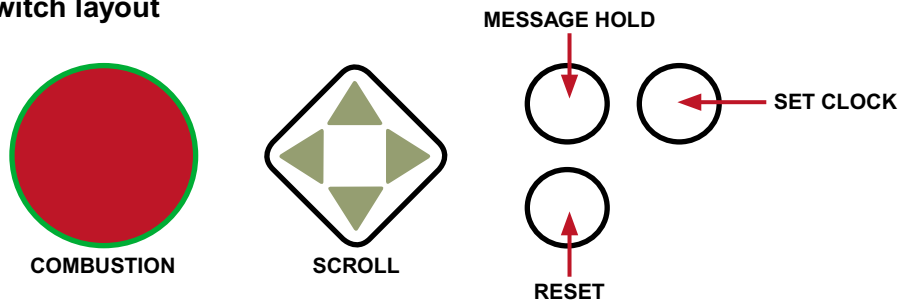


Figure 1 XJ1 Micro-Computer Components

2.2 DISPLAY & OPERATING UNIT

2.2.1 Names and switch layout



2.2.1.1 Switchboard

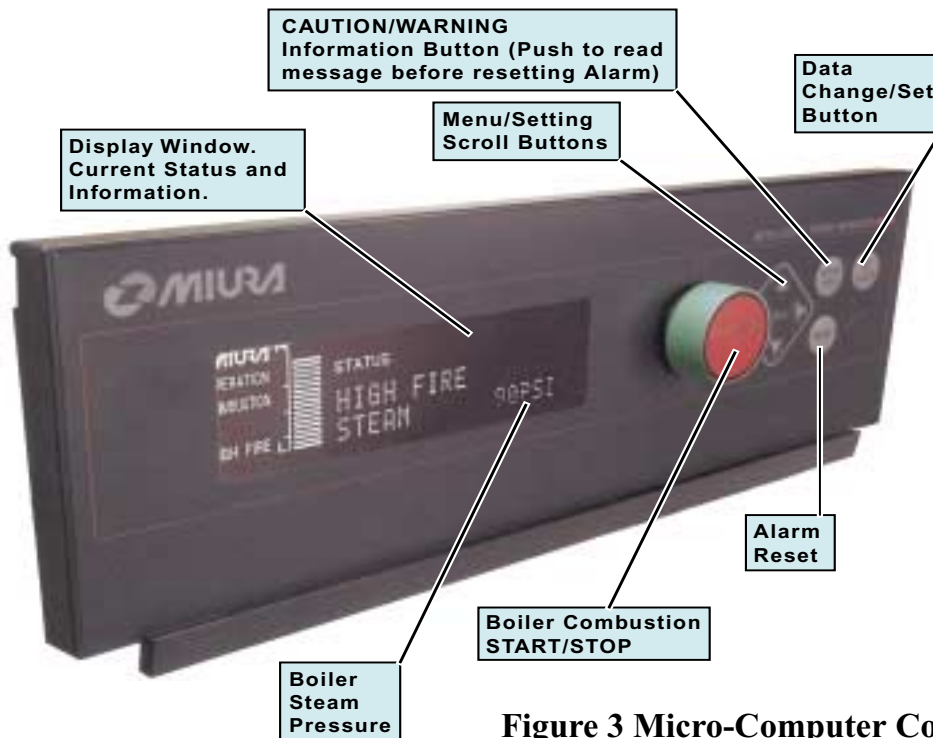


Figure 3 Micro-Computer Control Panel

Note: An audible beep sounds when any button is pushed to verify input.

2.2.1.2 Display Board

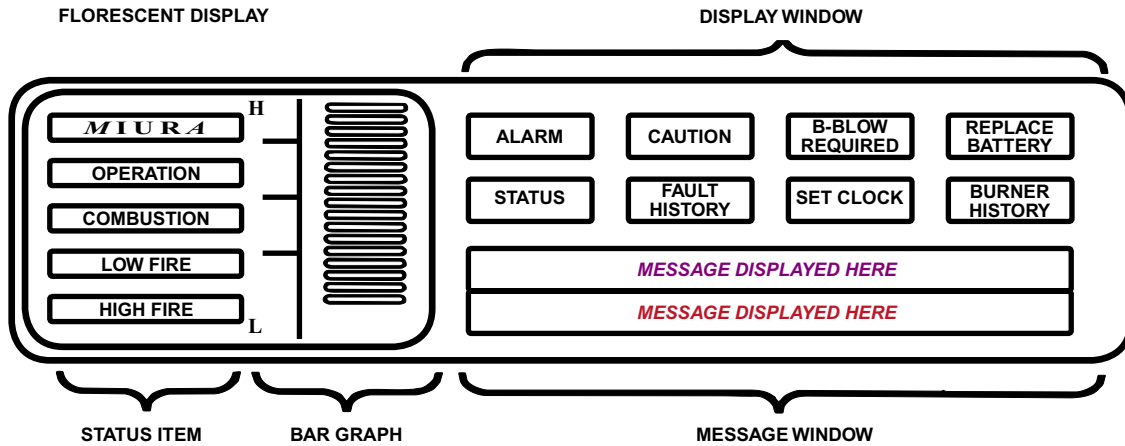


Figure 4 Fluorescent Display Unit

Display Window: Red (Alarms, Cautions, B(ottom)-Blow Required, Replace Battery)
White (Status, Fault History, Set Clock, Burner History)

Message Window: White

Bar Graph: White (Water Level and Conductivity)

Status Messages: White

2.2.2 Functions

1. Operation Switch

When operation switch is placed in the "ON" position, the boiler control power is supplied to the control circuits. Boiler feed water pump and chemical pump (if used) will operate to prepare the boiler for combustion. The boiler combustion protect relay is energized and starts the 10 second self-test routine. When this switch is placed in the "OFF" position, the boiler control circuits are de-energized except for the XJ1 microcomputer.

2. Operation Lamp (White)

This lamp is lighted when the operation switch is on and the boiler control circuit is energized. (Circuit breaker CB5 must be shut.)

3. Combustion Lamp (White)

This lamp is lighted when the combustion switch is pushed to start combustion. The lamp remains on when the boiler is in the standby mode due to steam pressure above the set point or MP1-200 control has ordered the boiler into standby mode.

4. Low Fire Lamp (White)

This lamp is lighted when the boiler has established combustion in the low fire rate

5. High Fire Lamp (White)

This lamp is lighted when the boiler has established combustion in the high fire rate.

6. Combustion Switch (Red, Momentary type, labeled “COMBUSTION ON/OFF”)

Used for starting/stopping combustion cycle. Pushing this button will change the display from “ENABLE” to “STAND-BY” until a call for heat is detected. When call for heat is detected, the combustion sequence will start. When the operation switch is turned “OFF,” the status of this switch changes to “OFF.” Unless automatic restart on loss of power is enabled and power is off for less than one minute.

7. Reset Switch (Momentary Type)

This switch is for clearing the alarm and caution messages. The alarm message remains until combustion is turned “OFF” and the alarm condition is cleared AND the reset button is pushed. The CAUTION message remains until the caution condition clears and the reset switch is pushed. If the caution condition is cleared, the display will return to normal. The red CAUTION light will remain on until the boiler operation switch is turned “OFF” and then back “ON.” This condition is designed to remind the operator that a problem has occurred. For example, the surface blow down strainer is plugged. That requires stopping the boiler to correct safely.

8. Message Hold Switch (Momentary Type)

When the alarm or caution occurs, pushing this button will display the recommended action to correct the alarm or warning. For example, if the ALARM condition is “LOW GAS PRESS” then pushing the message hold button will display “OPEN GAS VALVE & RESET SWITCH.”

9. Set Clock Switch (Momentary Type)

This button is for adjusting the clock. Push and hold when the date and time are displayed, then change number by using UP/DOWN scroll buttons. Use LEFT/RIGHT scroll buttons to move to the next character in the display. This button is also used to set conductivity, thermocouple, and blow down settings.

10. Scroll Switches (Momentary Type)

Operate the same as the scroll buttons on a computer keyboard. Used to scroll horizontally to select one of the four menus. The menu choices are:

STATUS FAULT HISTORY SET CLOCK BURNER HISTORY

Operating the up or down buttons will scroll up and down the list of items under the selected menu.

NOTES:

1. When the alarm or caution condition occurs, the STATUS, FAULT HISTORY, and BURNER HISTORY lights are turned off.
2. Any time the buttons are not used for five minutes, the display returns to STATUS and defaults to the first menu item, which is steam pressure. This occurs unless the ALARM or CAUTION condition has not been reset.
3. When scrolling left or right, the selected menu displays the first item by default. For example, if the operator has scrolled down the STATUS menu to look at conductivity, and then wants to return to indicating steam pressure. The operator can scroll right (or left) and back to STATUS and the display will indicate steam pressure. The operator can scroll up or down to return to steam pressure. Or the operator can walk away for 5 minutes, and the display will automatically return to the STATUS menu and display steam pressure.
4. Some settings have prescribed limits. For example the high fire steam setting cannot be changed to less than 000. Pushing the scroll down button will not have any effect once the lower limit is reached. The operator must use the scroll up button in this example to reach the proper setting.

2.2.3 Display Window



2.2.3.1 ALARM Indication

The ALARM lamp is turned on when an alarm condition occurs. The lamp remains on until the alarm condition is cleared the COMBUSTION switch has been pushed to stop the boiler, and the RESET button is pushed. When the ALARM lamp is on, the displayed message is the name of the alarming condition. For example, if the alarm condition is due to the loss of combustion air, the display will indicate “AIR PRESSURE FAULT”. Pushing the “MESSAGE HOLD” button will display the recommended action for the alarm or warning. In this example, the message is “CHECK AIR SWITCH & PIPE & BLOWER”. The alarm bell continues to ring until the COMBUSTION ON/OFF switch is pushed.

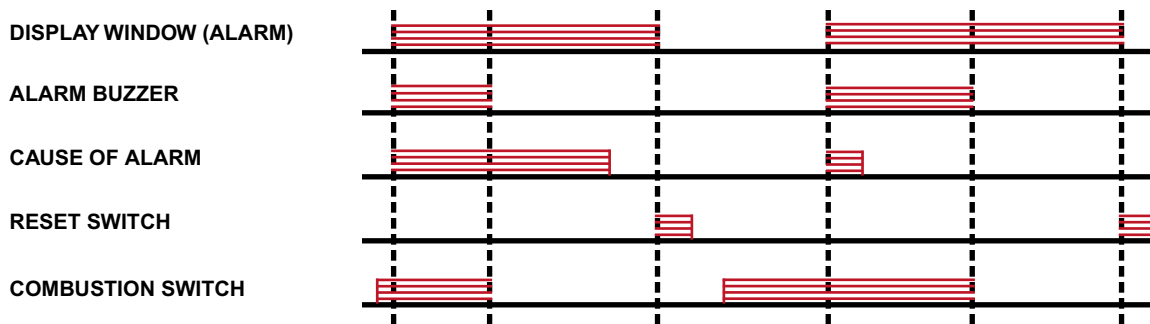


Figure 5 Alarm Action Sequence of Events

2.2.3.2 CAUTION Indication

The CAUTION lamp is lighted when a caution condition occurs. The cause of the caution is displayed. The display will not return to normal indication until the RESET button is pushed. The CAUTION light remains on until the boiler is stopped and the OPERATION light is turned off. If the CAUTION lamp is on, the same caution condition will not cause another warning. However, a different caution condition will be displayed until the RESET button is pushed. For example, if the water softener hardness monitor alarms, a CAUTION message will be displayed telling the operator to check the softener. When the condition is corrected, the operator can return to normal operation by pushing the RESET button. If the OPERATION switch is NOT cycled ON--OFF--ON, then a second hardness alarm will NOT cause an additional CAUTION warning message. A different warning condition, such as air filter clogged, will cause a display message. In this case the display will read “AIR FILTER”, pushing the MESSAGE HOLD button will display “CLEAN & INSPECT AIR FILTER.”

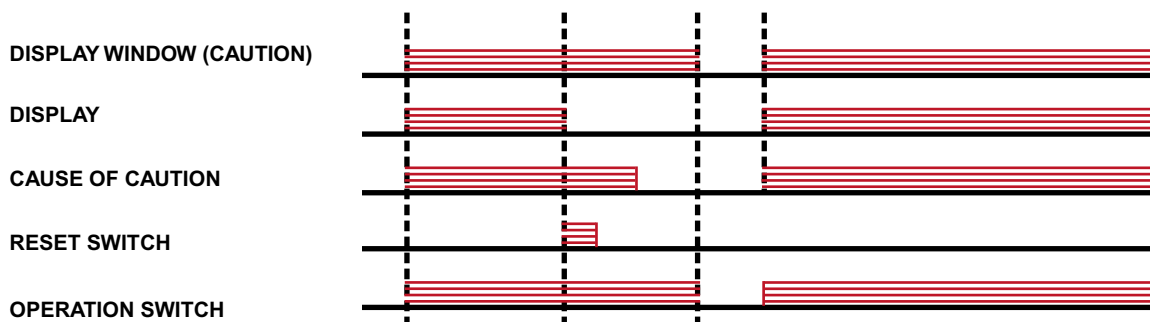


Figure 6 Caution Action Sequence of Events

NOTE: Some CAUTION conditions, such as steam pressure sensor fault, will force the boiler into low fire operation and the boiler will cycle ON-OFF in low fire only until the steam pressure sensor problem is corrected, and the boiler OPERATION switch is turned OFF.

2.2.3.3 B-Blow Required

This lamp is lighted when the boiler requires a bottom blow down due to combustion time or the blow down percentage is reached. This lamp will also cause a message “B/DOWN REQUIRED”. In addition, if the conductivity reaches the high limit, the light will come on. This latter condition can occur if the automatic surface blow down valve is shut, or the strainer is plugged. In this situation, the CAUTION lamp will also light and the display will indicate “CHECK S B/DOWN.”

2.2.3.4 Replace Battery

The lamp is lighted when the memory backup voltage indicates the memory backup battery requires replacement. Turning the lamp off requires replacing the battery.

2.2.3.5 Bar Graph

When DIP switch 1-1 is ON and the OPERATION switch is ON, the bar graph indicates water level and conductivity.

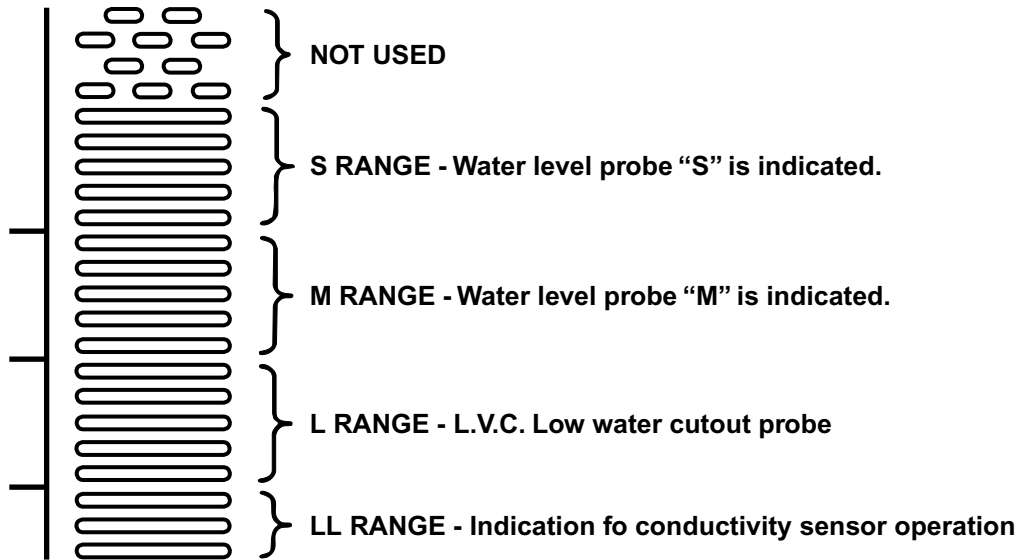


Figure 7 Water Level Indication Bar Graph

NOTES:

1. The water level indicating bars will be OFF when the boiler is in the “STANDBY” mode. Basically, under any condition other than PRE-PURGE through POST PURGE.
2. In the L and LL range, the lamps are switched ON/OFF directly with the associated probe changing from wet to dry. For example, when the boiler is empty, all bars will be off (dark). As the water pump fills the boiler, first the LL range (bottom three bars) will come ON indicating that the conductivity sensor probe is covered (Wet). Then as the boiler water reaches the LWCO probe, the “L” range lights will come on indicating minimum safe water level.

In the “M” and “S” range the bars operate on a time delay. When the “L” electrode is covered by water, the lights are turned ON from bottom to top in 0.5 second intervals. When the “L” electrode is uncovered, or dry, the lights are turned OFF in order top to bottom in 0.5 second intervals

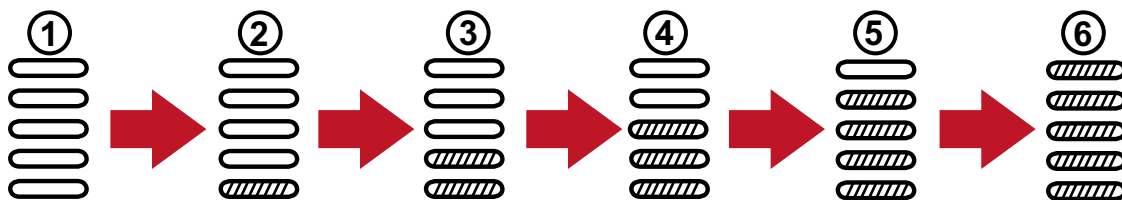


Figure 8 Example of Water Level Bar Graph segments in operation

2.2.4 Message Window

The message area is a two line, sixteen character display. This is the section immediately under the menu lights.

2.2.4.1 Status Mode

The status of the control equipment is indicated in the upper section of the display. Each monitored item is indicated on the line below. When the boiler is operating normally, the status messages indicated show the current step in the combustion sequence.

Top line, operating messages displayed

NO	STATUS CONDITION OR SEQUENCE STEP TO BE DISPLAYED:	MESSAGES		
		NORMAL	ABNORMAL	
1	OPERATION switch OFF	DISABLE	DISABLE	##,##,##
2	OPERATION switch ON	ENABLE	ENABLE	##,##,##
3	Standing by (waiting for call-for-heat)	STAND-BY	STANDBY	##,##,##
4	Low Water Level Interlock	LOW WATER	L WATER	##,##,##
5	Pre-Purge	PREPURGE	PREPURGE	##,##,##
6	Trial for Ignition	IGNITION	IGNITION	##,##,##
7	Pilot burner Only	PILOT	PILOT	##,##,##
8	Low Fire	LOW FIRE	LOW FIRE	##,##,##
9	High Fire	HIGH FIRE	HIGH FIRE	##,##,##
10	Post Purge	POSTPURGE	POSTPURGE	##,##,##
11	Low Fire Hold	LOWFIREHOLD	LFHOLD	##,##,##

Table 1 Operation Status Messages

NOTE: “##,##,##” indicates the date and time of the Alarm or Caution occurred.

Item #11 time indicates the time the boiler executed the order to remain in low fire. Not in the time the switch was placed in low fire hold.

Bottom line, status lamp on, status messages selectable by UP/DOWN scroll buttons.

NO	MONITORED ITEM:	MESSAGE
1	Steam Pressure	STEAM 999PSI
2	Scale Monitor Temperature	SCALE MNTOR 999F
3	Overheat Thermocouple Temperature	HIGH LIMIT 999F
4	Flame Voltage	FLAME SIGNAL 5.0V
5	Remaining time to Blow Down	NEXT B/D 999H
6	Surface Blow Valve	SFCE B/DOWN ON/OFF
7	Water Conductivity	CONDUCT 999μS
8	Date and Time	1/10/98 24:00

Table 2 Caution Status Messages

Example:

PREPURGE <-operation status (Top Line)
 STEAM 80PSI <-monitored item (Bottom Line)

Notes:

1. Temperature Indications

The range of indicated temperature is -58°F to + 932°F (-50°C to +500°C) with increments of 1°F. The accuracy in the range of common use is within ± 4°F (2°C). The temperature over 932°F is indicated as HH.

THERMOCOUPLE INPUT	COMMON RANGE
Overheat Thermocouple	-58°F to +932°F (-50° to 500°C)
Scale Monitor	-58°F to +932°F (-50° to 500°C)
Stack Temperature	-58°F to +932°F (-50° to 500°C)
Feed Water Temperature	-58°F to +932°F (-50° to 500°C)

Table 3 Thermocouple Range

- 2. When the Steam Pressure Sensor, Conductivity Sensor or a Thermocouple has a detected fault, the indication message is "--". If the thermocouple output rises over -58°F, the temperature is indicated again.
- 3. When the steam pressure is less than 0 PSI, the indicated pressure is 000 PSI.

Flame voltage, indicated on the display, is twice the voltage indicated on the RM7800L inside the electrical cabinet due to analog/digital conversion and impedance balance.

2.2.4.2 Fault History Mode

The controller maintains the 5 most recent alarms and cautions in memory. The fault name, the operating condition at the time of the fault and the time the Alarm/Caution occurred are retained. Use the Left/Right scroll buttons until the FAULT HISTORY menu lamp is on. The display will indicate the most recent fault. Using the Up/Down scroll buttons will display the 5 most recent faults. When all faults have been shown, the top line will indicate "END" and the bottom line will indicate the ROM version of the CPU. If there are no faults, the top line will indicate "NO DATA" and the bottom line will indicate ROM version.

When an ALARM or CAUTION condition occurs, the display will only indicate the name of the condition. To read the message associated, push the MESSAGE HOLD button before pushing the RESET button. For example, if the ALARM is High Water Level, the display will read:

HIGH WATER LEVEL

Pushing the MESSAGE HOLD button before pushing the RESET button will display:

CHECK FW CONTROL
& LVC & PROBES

The ALARM/Caution message display takes precedence over all other menu selections EXCEPT Clock Set Mode. When in CLOCK Set Mode, the ALARM or CAUTION lamp is lighted immediately, the operator must exit Clock Set Mode by pushing the Clock Set Button and then the ALARM/CAUTION message will be displayed immediately.

CODE	ITEM	TITLE	MESSAGE
A07	Emergency stop	EMERGENCY STOP	EMERGENCY STOP RESET
A10	Flame failure	FLAME FAILURE	INSPECT BURNER & OPEN FUEL VALVE
A13	Air pressure fault	AIR PRESS FAULT	CHECK AIR SWITCH & PIPE & BLOWER
A20	Low water level	LOW WATER LEVEL	CLEAN W STRAINER VENT & AIR
A30	Overheat thermocouple actuated	HIGH W TUBE TEMP	CHECK FW CONTROL & LVC & PROBES
A31	Overheat thermocouple fault	O. HEAT T.C. FAULT	CHECK OVERHEAT THERMOCOUPLE
A40	Power failure	POWER FAILURE	CHECK POWER RESTART BOILER
A152	Scale monitor actuated	SCALE WARNING	CHECK W HARDNESS & TUBE FOR SCALE
A252	Scale monitor disconnection	SCALE T.C. FAULT	CHECK SCALE THERMOCOUPLE
A502	Low oil pressure	LOW OIL PRESS	CHECK OIL PIPING & OIL PUMP
A171	Economizer differential pressure fault	ECON DIFF PRESS	CHECK SWITCH & INSPECT ECON
A214	Low gas pressure	LOW GAS PRESSURE	OPEN GAS VALVE & RESET SWITCH
A114	High gas pressure	HIGH GAS PRESS	CHECK GAS PRESS & RESET SWITCH
A029	High water level	HIGH WATER LEVEL	CHECK FW CONTROL & LVC & PROBES
A449	Flue damper fault	CHIMNEY DAMPER	CHECK MIC SWITCH
A49	FGR damper fault	FGR DAMPER FAULT	CHECK MIC SWITCH

Figure 4 Alarm Message Table

CODE	ITEM	TITLE	MESSAGE
F05	Air filter clogged	AIR FILTER	CLEAN AND INSPECT AIR FILTER
F33	High board temperature	HI AMBIENT TEMP.	REDUCE ROOM TEMP
F39	Water softener fault	CHECK SOFTENER	CHECK WATER HARDNESS
F44	Steam pressure sensor fault	STEAM SENSOR FLT	CHECK STEAM PRES SENSOR
F50	Blow timing	B/DOWN REQUIRED	PERFORM BLOW DOWN PROCEDURE
F54	Low battery	LOW BATTERY	CHANGE BATTERY
F55	Surface blow line trouble	CHECK S/DOWN	CHECK SURFACE B/DOWN STRAINER
F56	Conductivity sensor fault	CONDUCT SNSR FLT	CONDUCTIVITY SENSOR CHECK
F90	Communication error	COMM. ERROR	CALL FOR SERVICE
F32	Exhaust gas temperature sensor disconnection	FLUE GAS TC	CHECK FLUE GAS THERMOCOUPLE

Table 5 Caution Message Table

2.2.4.3 Set Clock Mode

Clock, Calendar and Set point data are entered and adjusted in this mode.

When this mode is selected by the horizontal Left/Right scroll buttons, the date and time are displayed on the top line. The Calendar and set point data can be modified by pushing the SET CLOCK switch. The clock is in 24 military time format.

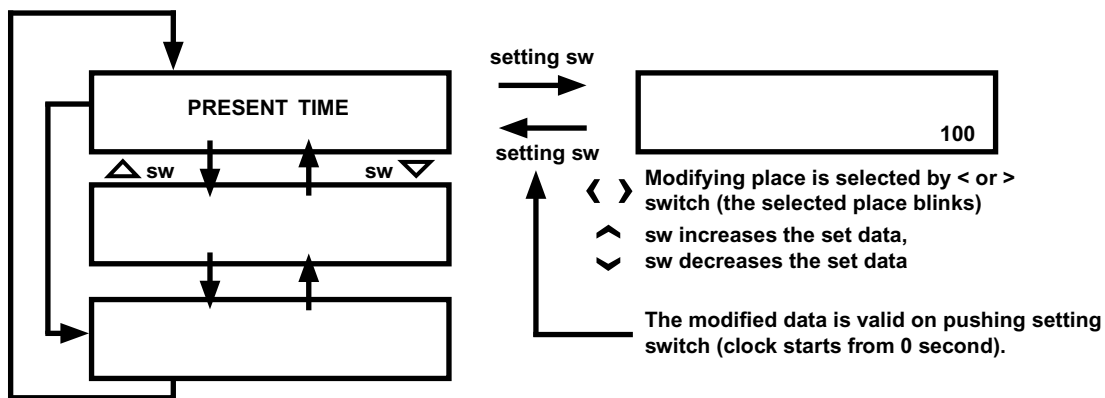


Figure 9 Micro-Computer Clock set operation

NO.	ITEM	MESSAGE	INITIAL VALUE	RANGE	INC.
1	Time Set	TIME SET MM/DD/YY HH:MM	1/1/98	-	-
2	Conductivity Set	CONDUCTIVITY SET 9900µS	3500	1000-9000	100
3	High Conductivity Set	HI CONDUCTIVITY 9900µS	5000	1000-9000	100
4	Blow Down Set Time	B/DOWN SCHEDULE 999HR	10	0-999	1
5	Auto Surf. Blow Down Ratio	AUTO BLOW RATE 99%	10	0-20	1
6	Steam Pressure (Low)	STEAM SET LOW 999PSI	500	40-500	1
7	Steam Pressure (Differential)	STEAM DIFFER LOW 99PSI	20	5-45	1
8	Steam Pressure (High)	STEAM SET HIGH 999PSI	500	40-500	1
9	Steam Press. Differential on High Fire	STEAM DIFFER HIGH 99PSI	20	5-45	1
10	Scale Monitor (Low Fire)	SCALE MONITOR L 999F	450	300-850	1
11	Scale Monitor (High Fire)	SCALE MONITOR H 999F	450	300-850	1
12	Overheat Thermocouple	OVERHEAT TEMP. 99F	660	300-850	1
13	Equivalent Output Steam Volume	EQUIV. OUTPUT 9990 LB/HR	6900	1000-20000	10
14	Display Brightness Adjustment	BRIGHTNESS ADJ. 3	3	1 ~ 4	1
15	Commissioning Date	START UP DATE MM/DD/YY	1/1/98	1/1/98	
16	Date Changed Data	CHANGE DATA DATE MM/DD/YY	1/1/98	1/1/98	

Table 7 Burner History List

NOTE:

- If the blow down timer is set to zero, the B/DOWN REQUIRED warning will not operate.
- The brightness of the display can be adjusted in four steps, and the status is indicated and modified by the up/down switch

2.2.4.4 Burner History

The burner history is indicated on the top line of the display, and each boiler data item is indicated on the lower line.

FOR EXAMPLE:

PREPURGE
H FIRE TOT 15924

The available history items are:

ITEM	MESSAGE DISPLAYED	UNIT
Total time of High Fire Burner Operation	H FIRE TOT 99999	Hour
Total time of Low Fire Burner Operation	L FIRE TOT 99999	Hour
Total number of Burner Combustion Start Cycles	CYCLES 999999	Hour

Table 7 Time Set Display Data List

NOTE: Time is rounded to the nearest whole hour.

2.3 CPU BOARD

2.3.1 DIP Switch Settings

DIP SW	FUNCTION	ON/OFF
DIP 1-1	Indicate water level	yes/no
1-2	FGR Damper present	yes/no
1-3	Automatic restart after power failure <60 seconds	yes/no
1-4	High Conductivity Surface blow valve installed	yes/no
1-5	reserved	
1-6	reserved	
1-7	reserved	
1-8	reserved	
DIP 2-1	Enable Communication	ON/OFF
2-2	Baud rate	1200/4800
2-3	Transmit failure messages	yes/no
2-4	reserved	
2-5	reserved	
2-6	reserved	
2-7	reserved	
2-8	reserved	

Table 8 Micro-Computer DIP Settings

2.3.2 DIP Switch Functions

1. Indicating Water Level

DIP1-1 ON (up) enables bar graph display for water level.

2. FGR Damper

DIP 1-2 ON (up) enables FGR damper control for Flue Gas Recirculation option.

3. Restart after power failure

DIP 1-3 ON (up) enables automatic boiler re-start on power failure less than 60 seconds. This will allow restart of the boiler without operator intervention IF no ALARMS or CAUTION conditions occur during power outage.

4. High Conductivity blow down

DIP 1-4 ON (up) enables microcomputer to operate the automatic surface blow down valve if installed as optional equipment.

5. Enable communication

Dip 2-1 ON (up) enables modem communication features.

6. Baud rate
DIP 2-2 ON (up) set communications baud rate at 4800 baud. Switch OFF (down) sets baud rate at 1200.
7. Transmit failure messages
DIP 2-3 ON (up) enables boiler to call out and report an alarm condition to a central location computer that is running the MIURA Boiler Monitoring software.

2.4 RELAY BOARD OPERATION

2.4.1 Low Fire Hold Toggle Switch

Switch UP (ON) disables boiler operation in High Fire for testing and trouble shooting. Allows burner combustion adjustment on low fire rate.

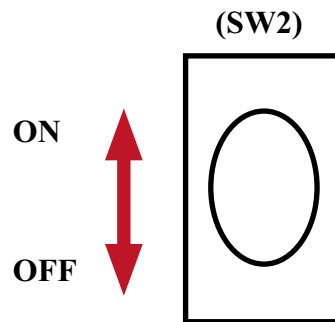


Figure 10 Low Fire Hold Toggle Switch

3 BOILER CONTROL

3.1 FEED WATER CONTROL

The two-way boiler water volume control is achieved by use of electrodes. Depending on the boiler model and options ordered, the Liquid Volume Control, an external water column, has three electrodes. The electrodes, in order of length, are labeled “L” for LONG, “M” for medium, and “S” for short. The “L” electrode is the Primary Low Water Cutout (LWCO), the “M” or Medium electrode is used to control water volume when the boiler is running on High Fire, and the “S” or Short electrode is used to control water level when operating in Low Fire or Stand-by conditions.

1 Operating Description

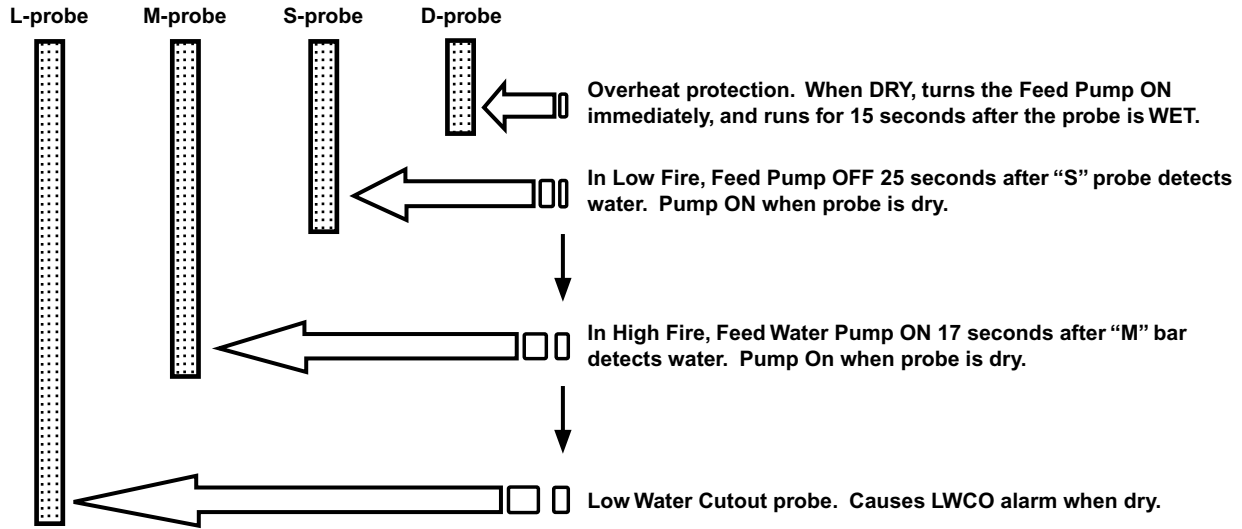


Figure 11 LVC Probe Functions

2 Electrical Operation

MEASURING POINT	RESISTANCE RANGE FOR DETECTING WATER (PROBE WET)
"L" probe to ground	4 ~ 8 KΩ
"M" probe to ground	
"S" probe to ground	
"D" probe to ground	7 ~ 15 KΩ

Table 9 Water Level Probe Functions

Note: The change in resistance to ground must continue for more than one second to change probe status from WET to DRY or DRY to WET.

3 Connection Points

See applicable electrical schematics.

4 Operation

	BOILER CONDITION	FEED PUMP START CONDITION	FEED PUMP STOP CONDITION
A	Combustion SW OFF. Boiler in STANDBY POST PURGE	(1) When switching Operation SW from OFF to ON. (2) 25 seconds after “S” probe becomes DRY (3) “D” probe becomes DRY	(1) “S” probe WET (2) 15 seconds after “D” probe becomes WET
B	Low Fire PRE PURGE	(1) 25 seconds after “S” probe becomes DRY (2) “D” probe becomes DRY	(1) “S” probe WET (2) 15 seconds after “D” probe becomes WET
C	High Fire	(1) 17 seconds after “M” probe becomes DRY (2) “D” probe becomes DRY	(1) “M” probe WET (2) 15 seconds after “D” probe becomes WET

Table 10 Water Level Feed Pump control Descriptions

NOTE: The above timers are always in operation. However, the pump is operated by the “M” probe ONLY when the boiler is running in High Fire.

5 Low Water Level Alarm

The Low Water Level ALARM is active ONLY when the Combustion is ENABLED, AND a Call-For Heat is present AND the “L” probe is DRY. The “L” probe is monitored by Floatless Switch 33WL1. If a low water level condition is present when the OPERATING switch is turned ON, the feed pump will run. The pump will continue to operate until the normal water volumes are reached. Normal water volume is determined by electrode “S” becoming WET. ONLY in the initial start of the boiler, after placing the OPERATING switch in the ON position, will the Low Water Cutout Alarm be ignored and reset automatically. All other occurrences of the condition will be detected and a LOCK OUT will result.

3.2 AUTOMATIC BLOW DOWN CONTROL

There are two types of automatic blow down available:

- Automatic Bottom Blow Down is conducted based on combustion time. Combustion time is directly related to evaporation, therefore, the number of concentration cycles. This allows performing bottom blow downs only when the limiting number of concentration cycles has been reached. The conductivity sensor also controls the bottom blow down valve. If the conductivity is above the HIGH setting for conductivity, the motor driven bottom blow valve is opened (if installed).
- Automatic Surface Blow Down is operated by measured conductivity. The surface blow down is designed to limit suspended solids.

3.2.1 Blow Control for Combustion Time (Automatic Bottom Blow OPTION)

When the timer for combustion time, plus 60 minutes (clock time, not combustion time) has elapsed, AND the “S” electrode is WET (indicating normal water volume), AND the Feed Water Pump is OFF. The Motor valve is opened. The motor operated bottom blow down valve remains open for 30 seconds, OR until the “M” electrode becomes DRY. Then the motor valve is operated to shut.

Combustion time is a calculated value. Time is calculated as ONE hour in continuous High Fire as one hour of combustion. Two hours in continuous low fire is calculated as one hour of combustion time.

When DIP 1-4 is UP (ON) and the blow valve is ON, the blow lamp in the display window is lighted. The blow valve is controlled independent of DIP 1-4.

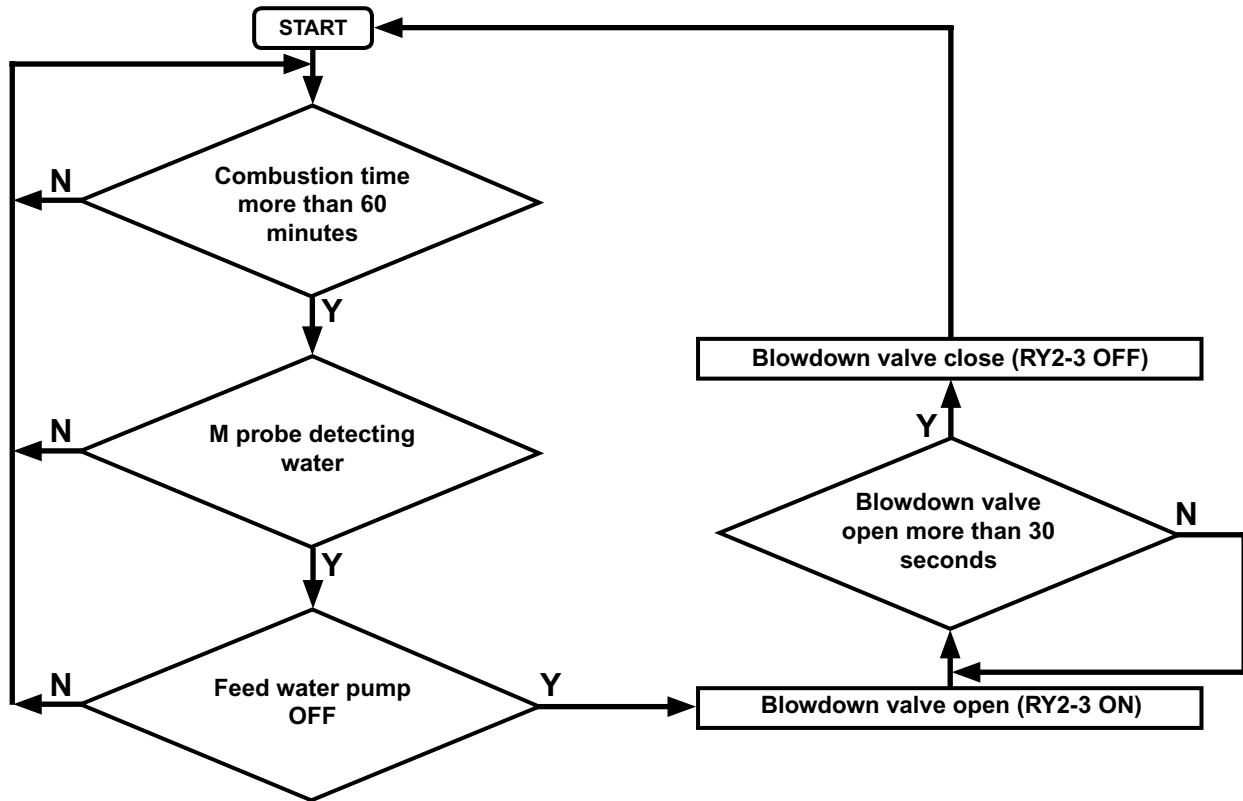


Figure 12 Flow Chart for Blow Control Based on Combustion Time

3.2.2 Surface Blow Control

If conductivity above the High Conductivity set value (item 3 of clock set menu) for 5 seconds, the Surface Blow Solenoid Valve is opened until conductivity falls below set value. This operation is not performed if a fault is detected in the Conductivity Sensor. In the event of a fault in the conductivity sensor, the computer will wait until conductivity reaches the limit and will operate the Automatic Bottom Blow Down Valve to limit conductivity.

NOTES:

1. The Automatic Bottom Blow down valve is optional equipment
2. The Surface blow down valve is shut automatically when the water level is below the LWCO electrode.
3. The Surface Blow Down Valve is shut automatically when the optional Automatic Blow Down Valve is open.
4. Blow down rate through the surface blow down solenoid valve is 20% with the valve open.

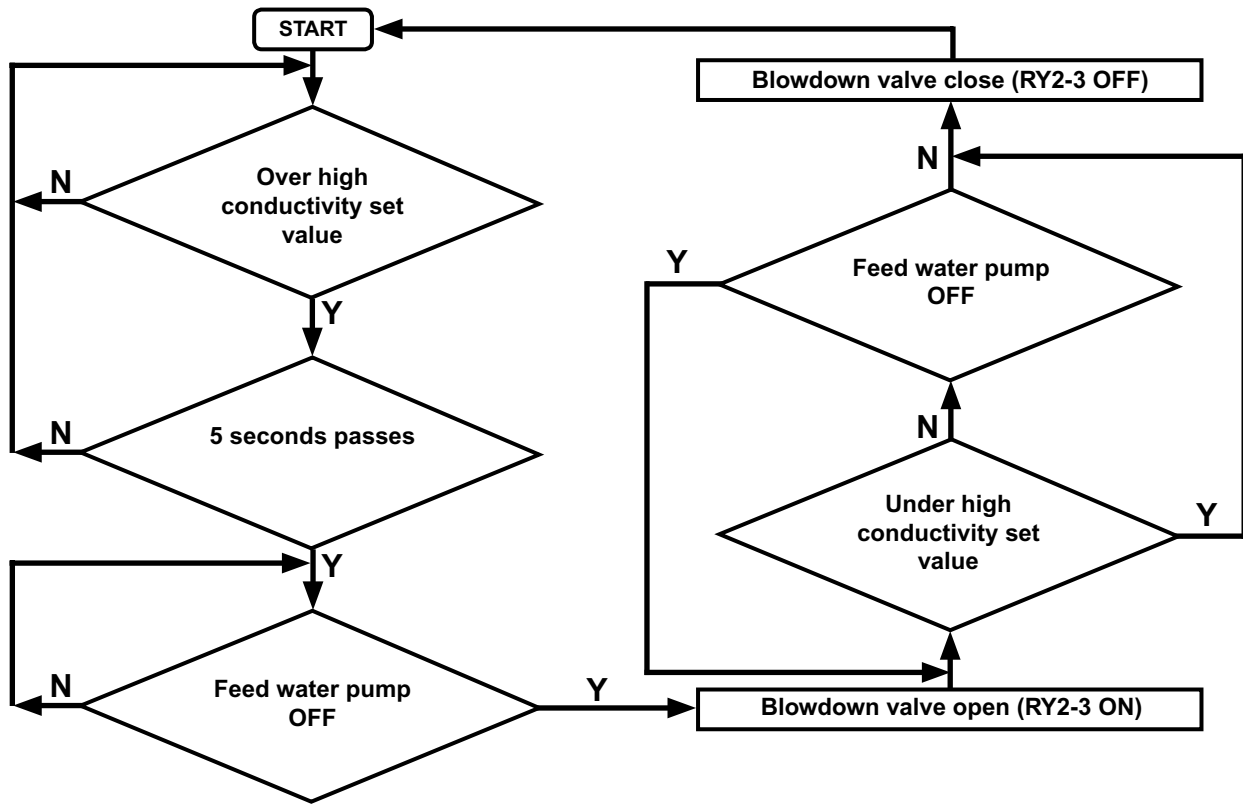


Figure 13 Surface Blow Down Control for Conductivity setting (Flow Chart)

3.3 SURFACE BLOW DOWN CONTROL

There are two types of Surface Blow Down available:

1. Surface Blow Down Valve is controlled by conductivity set value that is set in the computer and is field adjustable.
2. Surface Blow Down valve is also based on combustion times corrected to high fire time. The valve is controlled by the blow rate set value that is set in the computer and is field adjustable.

3.3.1 Surface Blow Down Control for Conductivity Setting

Surface blow down control is also based on combustion time corrected to high fire time. Combustion time for surface blow down is set in the computer and is field adjustable. Default value is 10 hours. The timer is re-set by performing a full bottom blow down on the boiler. If the automatic Bottom Blow Down option valve is installed, this feature is still present, however, the Bottom Blow down feature overrides the surface blow down.

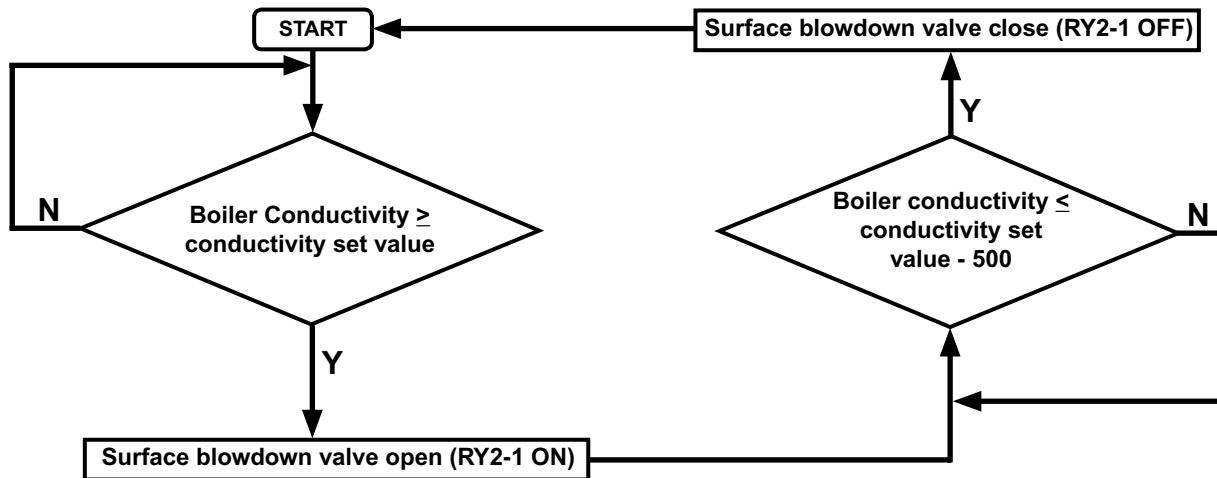


Figure 14 Surface Blow Down Control for Conductivity setting (Flow Chart)

3.3.2 Surface Blow Down Control for Blow Rate Setting

The maximum blow rate is 20% of evaporation rate, with the solenoid valve always open.

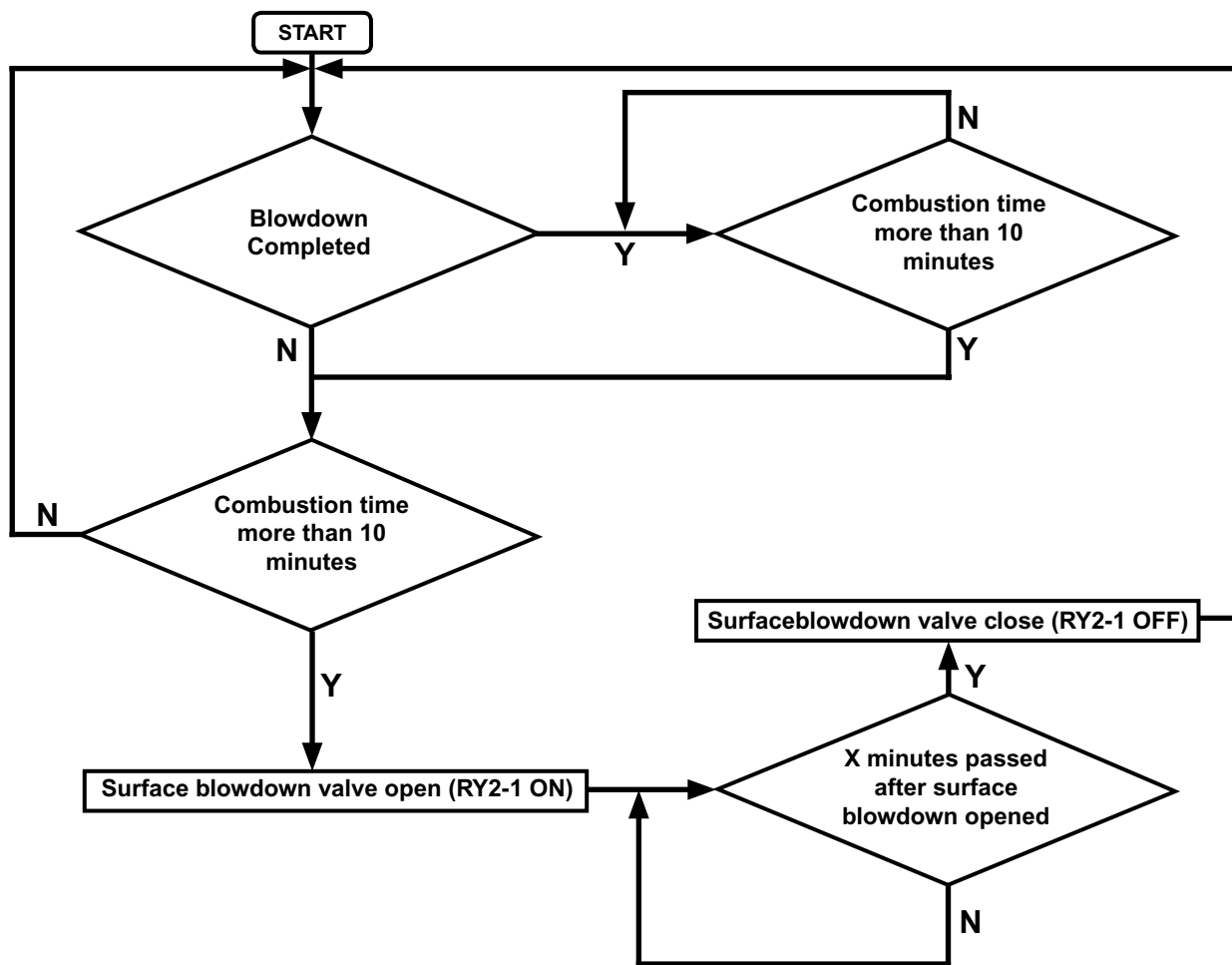


Figure 15 Surface Blow Down Control for Blow rate setting (Flow Chart)

Note:

1. **The combustion time is corrected to equivalent High Fire time.**
2. **Blow rate is a percentage of evaporation rate of the boiler. Default is 10%. The opening time X of the surface blow valve can be calculated using the following formula:**
$$X = 10 \times \text{conductivity rate} / 0.2$$
3. **When the following conditions occur, the blow down rate is automatically changed to 20%, regardless of the set value, until the condition is corrected and the CAUTION condition is re-set:**
 - A. **Water Softener Fault**
 - B. **Overheat thermocouple set point is exceeded**
4. **Surface blow due to high conductivity is stopped when the optional Automatic Bottom Blow Down is activated.**
5. **Surface Blow solenoid is OFF if the water level falls below the "L" electrode. Specifically, if a Low Water Cutout Condition occurs, the Surface Blow down is stopped.**

3.4 FLUE GAS RECIRCULATION (FGR) DAMPER CONTROL (OPTION)

FGR system is active ONLY when DIP 1-2 is up (ON).

For boilers equipped with the low NO_x Flue Gas Recirculation option, the boiler will operate as follows:

**PREPURGE
PILOT
LOW FIRE**

The boiler will remain in low fire until the Flue Gas thermocouple indicates over 120°C (248°F). Then the computer will order the FGR damper to the open position. When the FGR damper micro-switch indicates the FGR damper is open, the computer waits 20 seconds for the flame to stabilize. After the 20 second delay normal operation is resumed, and the boiler switches between High and Low fire automatically based on steam pressure.

NOTES:

1. If the FGR damper micro switch does not indicate damper in the open position in 30 seconds, the boiler will lock out and display “FGR DAMPER FAULT.”
2. If the flue gas thermocouple is faulty, the boiler is held in Low Fire until the condition is corrected. The boiler will display a CAUTION message, “FLUE GAS FLT,” and the action message will read, “CHECK FLUE GAS THERMOCOUPLE.”
3. The FGR damper is shut for post purge.
4. If the flue gas does not go over 120° C (248° F), the boiler is placed in low fire hold until the problem is corrected.

3.5 HIGH WATER LEVEL (optional)

If the High Water Level option is installed on the boiler, a high water level alarm will result in a lockout. During the High Water Level condition, the message “HIGH WATER LEVEL” is displayed and the optional Automatic Bottom Blow Down Valve is opened until the alarm is cleared. The boiler will require manually clearing the High Water Level alarm in order to re-start.

3.6 AUTOMATIC RE-START AFTER POWER FAILURE

The boiler will restart automatically if all of the below listed conditions are satisfied:

1. DIP 1-3 is up (ON) enabling this feature.
2. The power failure occurred with the COMBUSTION switch ON.
3. Elapsed time of power failure is less than 60 seconds.
4. The boiler OPERATING switch remains in the ON position.

3.7 FEED WATER CONTROL VALVE (optional)

An external, motor operated feed water control valve option is available. Normal Feed Water control is by standard motor controller installed to operate pump ON/OFF as necessary to maintain volume in the boiler.

3.8 CHIMNEY FLUE DAMPER

A flue damper can be installed in the chimney. The damper is externally controlled to open prior to the boiler starting the combustion sequence. The microcomputer verifies the damper is open, before the boiler fan starts, by checking the status of the stack damper micro switch.

3.9 XJ1 MICROCOMPUTER RELAY FUNCTIONS

1. RY-1 Alarm Bell. Relay ON when an ALARM condition exists and COMBUSTION switch is ON.

PILOT VALVE (TERMINAL 38)	MAIN FUEL VALVE (TERMINAL 5)	CONDITION OF RY1-3
OFF	OFF	ON
ON	OFF	OFF
ON	ON	OFF
OFF	ON	ON (After 10 second Low Fire Hold on Main Burner Ignition) ON (For High Fire) OFF (For Low Fire)

Table 11 3.9 XJ1 Microcomputer Relay Functions

2. RY2-1 Surface Blow Solenoid. Relay ON when Surface Blow is operating. See Section 3.3.
3. RY2-2 Feed water pump. Relay ON during call for water. See Section 3.1.
4. RY2-3 Bottom Blow. Relay ON for automatic bottom blow down. See section 3.2.
5. RY2-4 FGR Damper. Relay ON to open FGR damper. See section 3.4.
6. RY1-3 Low Fire/High Fire Damper control

NOTE: For steam pressure control operation, see Section 3.10.

7. RY1-4 Reset relay. Relay ON when RESET button is pushed only when the COMBUSTION switch is OFF.
8. RY1-2 Call-For-Heat. Relay ON, if the following conditions are satisfied:
 - a) Terminal 52 input is ON.
 - i. Floatless switch 33WL2 is ON (contact shut)
 - ii. MT1-200 (MI System boiler terminal control) is ON. If MT1-200 is not installed, the jumper is installed between terminal strip terminals 1 and 2.
 - iii. The external steam pressure switch, 63SH, located above the electrical control box, is ON (switch shut).
 - b) The COMBUSTION switch is ON.
 - c) No Interlock condition exists.
 - d) The protect relay alarm (terminal 32) is OFF.
 - e) The steam pressure is below the STEAM PRESSURE HIGH setting minus the HIGH PRESS DIFFERENTIAL setting.

3.10 Operation of the Steam Pressure Control System

The boiler is equipped with a solid state pressure transmitter. The pressure transmitter measures steam pressure in the boiler. The steam pressure transmitter is connected directly to the XJ1 microcomputer. The microcomputer has four field adjustable settings to control the combustion of the boiler. In addition, the boiler is equipped with a simple pressure switch. This switch, 63 SH, is installed to allow operation of the boiler if the pressure transmitter fails. The setting of the switch is field adjustable. The boiler also has a high pressure limit switch, 63 SHA, that requires manual reset if it reaches the high pressure limit setting. This switch is also field adjustable and normally set at the MAWP of the boiler. Optional equipment available for the boiler is the MIURA MT1-200 Multiple installation control unit for each boiler. This unit accepts boiler operation inputs from the MIURA MP1-200 master Control Panel and overrides the local boiler control system. For details on this optional equipment, please see the Multiple Installation manual or contact your local MIURA representative.

NOTE: The following pressures are for discussion only.

CONTROL	SETTING	FUNCTIONS/ACTIONS
External High pressure Limit setting (63SHA)	150psi	Lockout requiring manual reset of the pressure switch
External operating control (63SH)	120psi	If the microcomputer pressure transmitter fails, this switch operates the boiler ON/OFF in High Fire only (except that the boiler will perform a Low Fire Hold on Main burner Ignition). In this case the boiler is turned OFF (combustion stop) when pressure reaches 120psi.
External operating control differential	10psi	Controls the drop in steam pressure, below the switch set pressure, before the switch will shut. In this case, the boiler will start in Low Fire combustion when pressure drops to 140psi.
Internal STEAM SET HIGH setting	100psi	Boiler turns OFF (combustion stop) when steam pressure reaches this setting.
Internal STEAM DIFFER HIGH setting	10psi	Boiler starts combustion cycle when steam pressure drops to 90psi.
Internal STEAM SET LOW setting	80psi	Boiler changes to low fire when steam pressure is above this setting.
Internal STEAM DIFFER LOW setting	10psi	Boiler changes from Low Fire to High Fire when pressure drops to 70psi.

Table 12 Steam Pressure Boiler Control Example

Boiler operation sequence given settings listed in above table.
Sequence assumes that boiler is cold at time of start and that steam outlet valve is shut.

1. Operator starts the boiler by placing OPERATION switch in ON position.
2. Operator pushes COMBUSTION switch to start boiler.
3. Boiler microcomputer starts combustion sequence:
 - a. PREPURGE
 - b. PILOT valves open and ignition transformer ON.
 - c. 5 seconds later IGNITION transformer OFF.
 - d. 5 second PILOT flame verification
 - e. Main fuel valves open
 - f. 5 second hold period
 - g. 10 second Low Fire Hold period to verify Main Flame Established
 - h. Boiler shifts to High Fire.
4. Boiler operates in High Fire until STEAM pressure reaches 80 PSI. Then the boiler shifts to Low Fire.
5. Boiler operates in Low Fire until pressure reaches 100 PSI.
6. The boiler shuts Main Fuel Valves and starts POSTPURGE.
7. Operator opens the steam outlet valve.
8. Boiler pressure drops below 90 PSI and the boiler starts in Low Fire.
9. Boiler steam pressure continues to drop. When pressure reaches 70 PSI, the boiler shifts to High Fire.
10. The boiler will then shift automatically between High and Low Fire to maintain steam pressure between 70 and 100PSI depending on the steam demand.

The following chart illustrates the operation of the boiler pressure control system.

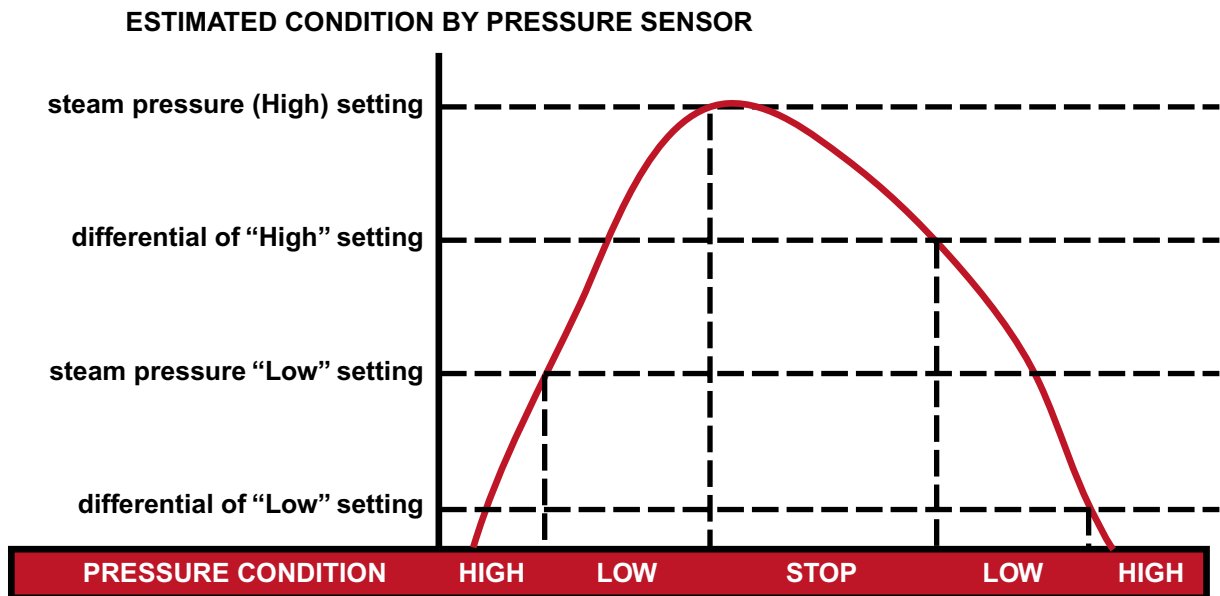


Figure 16 Boiler Response to Pressure Change Graphic

4 ALARMS AND CAUTIONS

4.1 List of Possible ALARMS and CAUTIONS

4.1.1 ALARM Conditions

INTERNAL FLAG NUMBER	ALARM ITEM
A07	EMERGENCY STOP
A10	FLAME FAILURE
A13	AIR PRESSURE FAULT
A20	LOW WATER LEVEL
A30	OVERHEAT THERMOCOUPLE
A31	OVERHEAT THERMOCOUPLE FAULT
A152	SCALE MONITOR
A252	SCALE MONITOR FAULT
A40	POWER FAILURE
A502	LOW OIL PRESSURE
A171	ECONOMIZER DIFFERENTIAL PRESSURE FAULT
A214	LOW GAS PRESSURE
A114	HIGH GAS PRESSURE
A029	HIGH WATER LEVEL
A449	FLUE DAMPER FAULT
A49	FGR DAMPER FAULT

Table 13 List of Boiler Alarms

4.1.2 CAUTION Conditions

INTERNAL FLAG NUMBER	CAUTION ITEM
F05	AIR FILTER CLOGGED
F33	HIGH(CIRCUIT) BOARD TEMPERATURE
F39	WATER SOFTENER FAULT
F44	STEAM PRESSURE SENSOR FAULT
F50	BLOW TIMING
F54	LOW BATTERY
F55	SURFACE BLOW LINE TROUBLE
F56	CONDUCTIVITY SENSOR FAULT
F90	COMMUNICATION ERROR
F32	EXHAUST GAS TEMPERTAURE SENSOR FAULT

Table 14 List of Boiler Caution Messages

4.2 DISPLAY AND STORAGE OF ALARMS/CAUTIONS

4.2.1 Alarm

1. Maximum ALARM dealt with simultaneously is two. For each ALARM, the corresponding function is performed, but only the first ALARM is indicated. When the first ALARM is reset, the second ALARM is indicated. The RESET switch is valid for the current ALARM only. If there are two different ALARMS, the RESET button must be pushed twice to clear the ALARMS.
2. The ALARMS are dealt with prior to the CAUTIONS. If the ALARM occurs when a CAUTION is indicated on the display, the ALARM interrupts the CAUTION and the ALARM is indicated.
3. The ALARMS are stored in order of occurrence unless the same ALARM occurs again before the first occurrence is cleared. This is what happens if a LOW GAS PRESSURE ALARM occurs and the operator attempts to clear it while the Low Gas Pressure condition continues.
4. The microcomputer stores the five most recent ALARMS and CAUTIONS that can be recalled for display.

4.2.2 Caution

1. The maximum number of CAUTION warnings dealt with simultaneously is five. For each CAUTION, the corresponding action is performed, and each CAUTION message is displayed by turns and rotated every 2 seconds.
2. All CAUTION conditions are cleared by pushing the RESET switch once. However, the microcomputer will not return to normal operation until the condition is cleared and verified by the microcomputer.
3. In the event of the same CAUTION condition occurring twice before the RESET button is pushed, the older CAUTION is thrown away.

4.3 ALARM CONDITIONS

1. EMERGENCY STOP

Alarm occurs when there is an error in communication between CPU board and Relay Board. OR, if the relay RY1-2 is ON indicating a call for heat and the High Limit pressure switch. 63SHA is open.

2. FLAME FAILURE

Alarm occurs when the Burner Product Relay indicates a flame failure alarm. ALSO, the ALARM occurs when the Main Gas Valve Proof-of-Closure switch is OPEN (OFF) during PREPURGE/PILOT period.

3. AIR PRESSURE FAULT

Occurs in the condition where the combust air fan is ON and the Air Pressure Switch, 63A, is OFF for greater than 1 second. This occurs at all times EXCEPT for the first 5 seconds after turning the fan ON.

4. LOW WATER LEVEL

See section 3.1. The ALARM occurs any time the COMBUSTION switch is ON and the LVC "L" electrode is dry. Caused by 33WL1.

5. OVERHEAT THERMOCOUPLE

Occurs when the OPERATION switch is “ON” and the Overheat thermocouple measures a temperature above the set value for greater than 2 seconds. The actual alarm setting is always 660°F. The computer will adjust the alarm set point based on actual steam pressure.

6. OVERHEAT THERMOCOUPLE FAULT

Occurs when the thermocouple measures less than -122°F for more than 2 seconds. This indicates an open circuit on the thermocouple.

7. SCALE MONITOR

Occurs when the temperature of the Scale Monitor thermocouple is above the associated High Fire/Low Fire setting for more than 10 seconds. The scale monitor setting is determined at the factory during the shop test. Actual measured temperature at 70 PSI is recorded and the alarm setting is actual temperature plus 90°F. This setting must not be changed. The computer will automatically adjust the alarm set point based on steam pressure and firing rate.

NOTES:

- a) **If a pressure sensor fault has occurred, the temperature is compensated using a pressure of 284 PSI.**
- b) **Under Low Fire Hold, the setting for Low Fire is used as the ALARM set point.**
- c) **When shifting from Low Fire to High Fire, or High Fire to Low Fire, the temperature comparison function is on hold for 40 seconds to allow temperature to stabilize.**
- d) **The microcomputer will perform the temperature evaluation only when pressure is above 71.1 PSI, and the measured temperature will be compared to set temperature adjusted for measured pressure.**

8. SCALE MONITOR THERMOCOUPLE FAULT

Occurs when the OPERATION switch is ON and the temperature of the SCALE Monitor, OR the FEED Water, OR the Exhaust Gas thermocouples are less than -122°F for 2 seconds.

9. POWER FAILURE

Occurs when the COMBUSTION switch is ON and less of Voltage occurs for longer than 0.2 seconds.

NOTES:

- a) **When this ALARM occurs, the POSTPURGE function has not been performed.**
- b) **If power failure is less than 10 milli-seconds, the boiler will continue to operate.**
- c) **If the power failure is greater than 10 milli-seconds, but less than 0.2 seconds, the boiler will restart after the PREPURGE is complete**
- d) **If the power failure is less than 60 seconds, but greater than 0.2 seconds, and DIP1-3 is UP (ON), the boiler will automatically restart.**
- e) **If the power failure is greater than 60 seconds, OR DIP1-3 is DOWN (OFF) and the failure was greater than 1 second, then the power failure ALARM will occur.**

10. LOW OIL PRESSURE

Occurs if oil pressure falls below the Oil Pressure Switch, 63QL, for more than one second IF the boiler is selected to Oil burning, AND the Blower is running. This evaluation is not made for the first 5 seconds after the combustion fan starts.

11. ECONOMIZER DIFFERENTIAL PRESSURE FAULT

Occurs when the Air Pressure Switch, 63A, is ON and the Economizer Differential Pressure switch, 63DA, is OFF for 1 second.

12. LOW GAS PRESSURE

Occurs when the Low Gas Pressure switch, 63GL, is OFF (OPEN) for over 1 second if the boiler is selected for Gas Fuel.

13. HIGH GAS PRESSURE

Occurs when the High Gas Pressure switch, 63GH, is OFF (OPEN) for over 1 second if the boiler is selected for Gas Fuel.

14. HIGH WATER LEVEL

Occurs when the OPTIONAL High Water Level Alarm switch, 33WH, is OFF for over 1 second. This ALARM also opens the OPTIONAL Automatic Bottom Blow Down valve until the condition clears. The ALARM must still be RESET manually and the boiler restarted.

15. FLUE DAMPER FAULT

Occurs when the micro-switch for the Flue Damper Proof-of-Damper-Open is not ON (SHUT) within 90 seconds of starting the blower for PREPURGE. The PREPURGE timer does NOT start until the FLUE DAMPER is verified open.

16. FGR DAMPER FAULT

Occurs when the FGR Damper open micro-switch is not ON (switch SHUT) within 30 seconds of the damper open signal.

4.4 CAUTION CONDITIONS

1. AIR FILTER CLOGGED

Occurs when the Air Filter Differential Pressure Switch, 63AF, remains ON (SHUT) for more than 1 second.

2. HIGH BOARD TEMPERATURE

Occurs when the microcomputer circuit board temperature continues to be above 158°F (70°C) for over 5 minutes when the OPERATION switch is ON.

3. WATER SOFTENER FAULT

Occurs when the Water Softener Alarm/Chemical Low Level alarm input switch is OFF (OPEN) for more than 10 seconds when the OPERATION switch is ON.

4. STEAM PRESSURE SENSOR FAULT

Occurs when the output of the Steam Pressure Sensor is less than 0.3v for more than 2 seconds when the OPERATING switch is ON. If the output returns to normal, 1.0 to 5.0v, the CAUTION is cleared automatically.

5. BLOW TIMING

Occurs when the equivalent High Fire time reaches the time set for BLOW TIME. The water conductivity is above the High Conductivity setting for more than 5 minutes in High Fire, or 10 minutes in Low Fire.

NOTE: The Blow Timing will be reset under one of the following conditions:

- a) The conductivity sensor electrode AND the LWCO electrode detect no water.
- b) The OPERATION switch is changed from OFF to ON, and the Feed Water pump operates for 10 seconds before the LWCO electrode detects water.
- c) If the Conductivity Sensor has a fault, this condition will not clear the CAUTION.

6. LOW BATTERY

Occurs when the voltage of the data falls below 2.4v when power is available to the microcomputer.

7. SURFACE BLOW LINE TROUBLE

Occurs when the measured conductivity is above the set point for Automatic Surface Blow for more than 60 minutes when the OPERATION switch is ON.

This CAUTION is not available in the event of Conductivity Sensor Fault.

8. CONDUCTIVITY SENSOR FAULT

Occurs when the temperature measured by the OVERHEAT thermocouple is less than 212°F and after starting Combustion, the output of the sensor does NOT change by more than $\pm 0.02v$ for more than one hour equivalent High Fire time.

9. COMMUNICATION ERROR

Occurs when the number of modem communication attempts, to report ALARMS or CAUTIONS, reaches 255.

10. EXHAUST GAS TEMPERATURE SENSOR FAULT

Occurs when the temperature of the Exhaust Gas thermocouple remains less than -122°F for more than 2 seconds when the OPERATION switch is ON.

5 DATA PROCESSING

5.1 FUEL COMSUMPTION

5.1.1 Without Flow Meter

A. Fuel consumption in High Fire [Liter]
= Set Data for Flow Rate in High Fire [L/Hr] X $\frac{\text{High Fire Time [seconds]}}{3600}$

B. Fuel consumption in Low Fire [Liter]
= Set Data for Flow Rate in Low Fire [L/Hr] X $\frac{\text{Low Fire Time [seconds]}}{3600}$

$$\text{Total Fuel Consumption [K Liter]} = \frac{A+B}{1000}$$

5.1.2 With Flow Meter

Total Fuel Consumption [K liter]
= $\frac{\text{Unit Flow of Flow Meter [L/pulse]} \times \text{Pulse Counts during Combustion}}{1000}$

5.2 EVAPORATION QUANTITY

Quantity of Evaporation in Tons

$$= \frac{\text{Set Data of Equivalent Evaporation [Kg/Hr]} * 539 \text{ [Kcal/Kg]} \times \text{Equivalent High Fire Time (sec)}}{656 \text{ [Kcal/Kg]} - \text{Set Data of Feed Water [Kcal/Kg]} \times 3600 \times 1000}$$

NOTE: If the feed water temperature thermocouple is not installed, or if it is faulty, this calculation will not be performed.

5.3 Quantity of Blow

$$\text{Quantity of Blow [Liter]} = \frac{\text{Set Data of Surface Blow Rate [l/hr]} * \text{Blow ON Time [sec]}}{3600}$$

Surface Blow On time under Blow Control Filled Water is not included in the above blow ON time.

5.4 PRESSURE SENSOR

When using a sensor having a rating of 20 KG/cm²

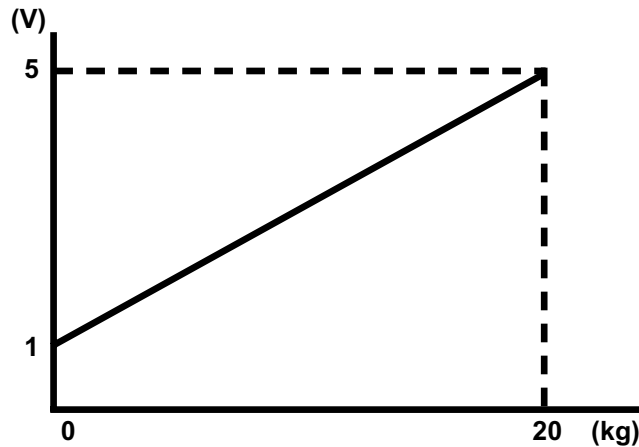


Figure 17 Pressure Sensor Voltage to Pressure Change

5.5 ANALOG DATA PROCESSING

Microcomputer sample sequence:

1. Board Temperature
2. Feed Water Temperature
3. Flame Voltage
4. Exhaust Gas Temperature
5. Steam Pressure
6. Scale Monitor Temperature
7. Air Pressure
8. Overheat Thermocouple Temperature
9. Conductivity Sensor
10. Standard Voltage of Thermocouple

The data on each channel is sampled at 10 msec intervals. The computed value for each channel is a moving average of the last eight data points.

5.6 BOILER WATER TEMPERATURE CORRECTION

The microcomputer automatically temperature compensates the Boiler water conductivity based on boiler pressure. The result is a non-neutralized conductivity.

If the voltage at the electrode is more than 4.8V, the computer will consider the boiler dry.

If the pressure sensor is disconnected, the temperature correction will be zero.

5.7 Pressure Sensor adjustment to alarm settings for different Pressures

PRESSURE RANGE (PSI)	CALIBRATION TEMPERATURE (F)
71.1 to 74.6	-27.4
74.7 to 81.7	-22.0
81.8 to 88.8	-16.6
96.0 to 103	-11.2
104 to 110	-5.8
111 to 117	1.4
118 to 124	6.8
125 to 131	10.4
132 to 138	14.0
139 to 145	17.6
146 to 152	21.2
153 to 159	24.8
160 to 167	28.4
168 to 174	32.0
175 to 181	33.8
182 to 187	37.4
188 to 195	41.0
196 to 202	42.8
203 to 209	46.4
210 to 216	48.2
217 to 223	51.8
224 to 231	53.6
232 to 238	57.2
239 to 245	59.0
246 to 252	60.8
253 to 259	64.4
260 to 266	66.2
267 to 273	68.0
274 to 280	69.8
281 to 287	73.4

Table 15 Amount of Temperature Correction Due to Pressure

NOTE: If the pressure sensor is disconnected, the pressure will be assumed to be 287 psi and 73.4 degrees will be added to the temperature settings.



MIURA BOILER WEST, INC. (Chicago)
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The descriptions and specifications are approximate.

Specifications subject to change to incorporate engineering advances. Manufacturer reserves the right to change specifications and dimensions at any time without liability for equipment previously or subsequently sold.

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