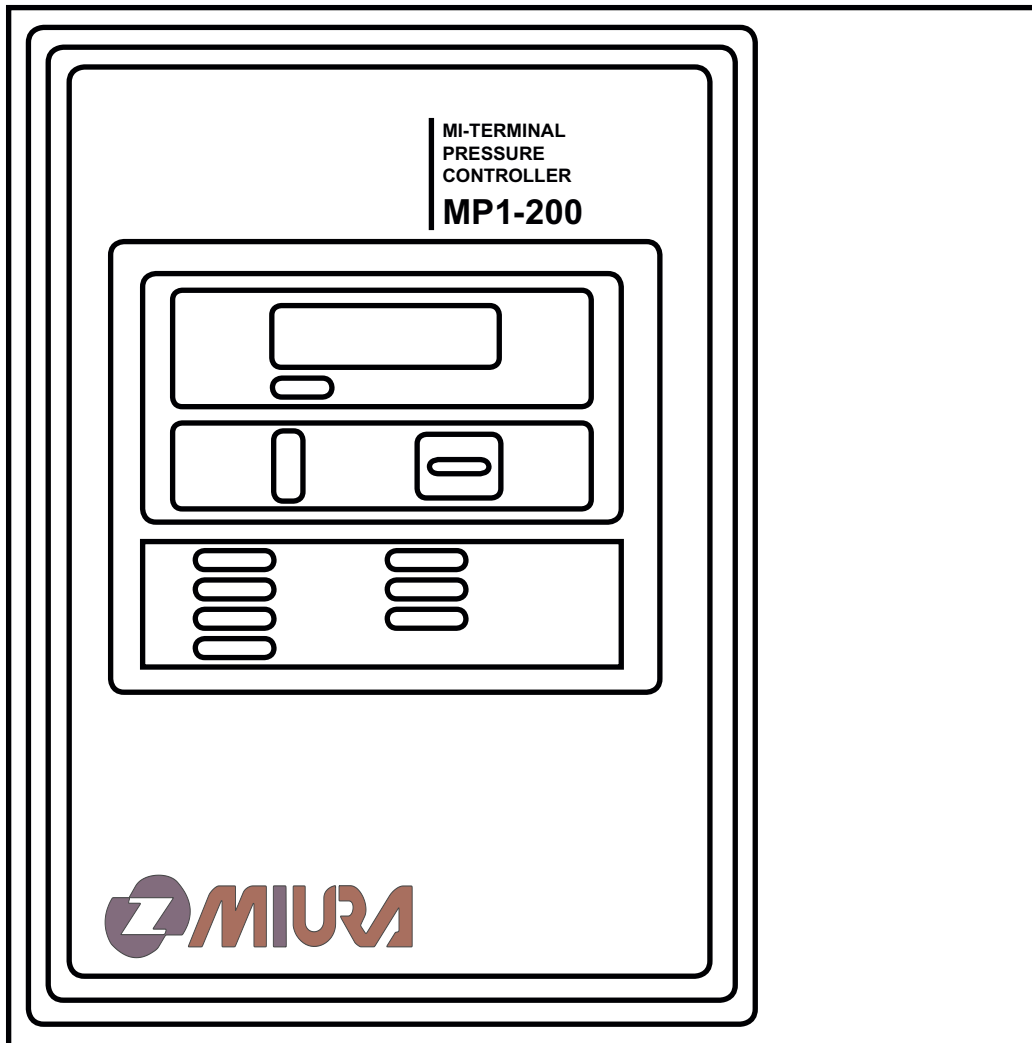


***MIURA* Multiple Installation Specifications MP1-200 & MTI-200**



*** IN OUR CONTINUING EFFORT TO IMPROVE OUR PRODUCT,
INFORMATION IN THIS MANUAL MAY BE CHANGED WITHOUT NOTICE**

OWNER SHALL MAINTAIN THIS MANUAL IN LEGIBLE CONDITION FOR FUTURE REFERENCE

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1 GENERAL

The Multiple Installation Controller is designed for modular, step fired, boiler systems. The master control panel, model MP1-200, is a single wall mounted unit. The master panel communicates with each individual boiler's multiple installation control terminal, model MT1-200m, which is installed at the factory in each boiler. Communication and control is by a simple twisted pair network. Each master panel is capable of operating up to 15 boilers. More small boilers are more fuel efficient than a single large one. In addition, this allows the flexibility to start with a few boilers and add more boilers if necessary.

NOTE: The MIURA Multiple Installation Controller is a very flexible instrument and has many optional features. This manual attempts to describe the capabilities of the MI system operation in specific situations. It is not possible to describe the response of the MI system to all customer configurations and boiler control options. This manual will discuss the MI system in as much detail as possible. The owner/operator can then adjust the system to operate in the best manner consistent with production operations. READ THE MANUAL CAREFULLY BEFORE STARTING ANY CONTROL SETTINGS OR ADJUSTMENTS!

The Miura Multiple Installation System is fully Y2K compliant. There are no date functions in the system.

MIURA MULTIPLE INSTALLATION OPERATION

Miura Boilers are actually steam generators that save fuel. The two major reason MIURA results in large fuel savings to the customer are because of the small size and the advantages of the design that allows a different operation pattern than a conventional fire tube type boiler.

The first factor in fuel savings is a smaller size boiler. The MIURA Boiler averages 1/3 the surface radiation area of a conventional fire tube boiler. This means 2/3 less heat from fuel is wasted by heating the boiler room.

The second reason is a result of the differences in design and construction between a MIURA Boiler and a standard fire tube type boiler. MIURA can give full steam output from a cold start within five minutes without fear of thermal shock. This means there is no concern about feed water temperature, and no fear of bringing the boiler on or off line too quickly. The "leaky tube" problem common to the fire tube design is eliminated - no more re-rolling of the tubes to the tube sheet and no more cracked tube sheets. The MIURA pressure vessel is 100% welded and heat-treated.

Another factor of the design advantage is low water content. A normal fire tube boiler may contain 2,000 gallons of water. Our equivalent capacity boiler has only 48 gallons of water. A regular fire tube boiler may take up to an hour or more to come up to full steam pressure. MIURA can achieve the same pressure in less than five minutes. Therefore, the owner does not have to make a choice between loss of production for an hour while heating up an extra boiler, or wasting the expense of the fuel just to keep the standby boiler hot.

The customer has the biggest impact on how MIURA can reduce a fuel bill. MIURA has found that the average customer will use only about 35% of the total installed boiler capacity in any given year. Therefore, the customer can run only the boilers that are required instead of the boilers that are installed. Also, the boilers do not have to be kept hot, or "bank fired" over a weekend or an extended production halt.

The system senses steam header pressure and operates the boilers in various patterns in order to maximize fuel to steam efficiency. The system is not designed to maintain a specified steam pressure under all load conditions. However, during a change in steam demand, the system header pressure will change. In some situations this change may be relatively large. However, the system is designed to minimize this change under most control settings. After a change in steam demand has occurred, the system will return steam pressure to the specified range in a short period of time. Remember, the conventional boiler must recover pressure by heating 2,000 gallons of water with the same size flame that we use to heat 48 gallons.

2 BASIC CONFIGURATION

The MIURA Multiple Installation boiler control system basically consists of:

- a) A pressure sensor connected to the main steam header
- b) The master control panel, which reads the pressure and sends control signals to the boilers
- c) A boiler control terminal in each boiler that receives the operation commands and controls the individual boilers
- d) A simple twisted pair network connects the system components

NOTE: The system cannot be directly interfaced to other building automation systems except for the items discussed in 4.6.

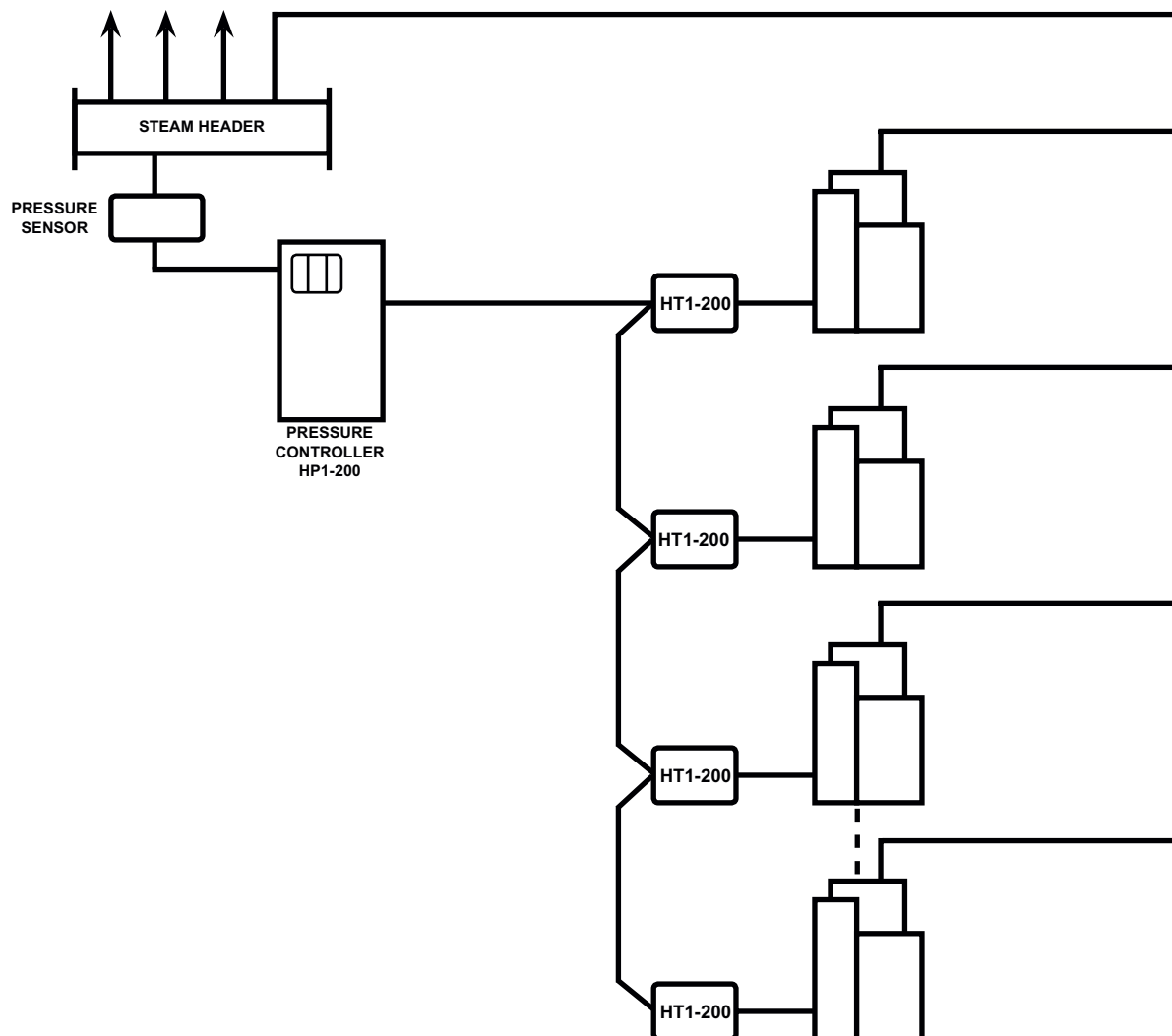


Figure 1 Typical Multiple Installation

3 SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS

Allowable Control Pressure

- a) 30-270psi (2.0-19.0 Kg/cm²)
- b) 15-135psi (1.0-9.5 Kg/cm²) (Optional)
- c) 3.0-27.0psi (0.2-1.9 Kg/cm²) (Optional)

Standard pressure range is 30-270 PSI. If the customer operating pressure is below 135psi, the pressure sensor should be changed to the lower-pressure range. For low-pressure systems, using the LXL or WXL series boilers option (c) should be specified.

Pressure Differential:

- a) 15 PSI minimum to 70 PSI maximum for standard sensor
 - b) 7 PSI minimum to 57 PSI maximum for the optional lower range pressure sensor
 - c) 1.5 PSI minimum to 7.0 PSI maximum for optional lower range pressure sensor.
- Maximum number of controlled boilers is 15. Maximum total network wire length: 300 Ft.

Control Operation:

- a) The number of boilers in combustion is controlled by the steam pressure in the steam header.
- b) Automatic rotation of the lead boiler is to equalize boiler combustion time for individual boilers. This ensures that no single boiler remains idle for extended periods. The system is capable of rotating a boiler after a manual bottom blow down, or in order to keep one boiler operating as a preferred unit.
- c) Capabilities include automatic start of a backup boiler if one or more of the running boilers has an alarm condition.

Network:

- a) Mutual correspondence by a twisted pair cable
- b) Network protocol is not a computer industry standard and cannot be connected to any type of building automation system.

Accessory Inputs:

- a) Emergency Stop
- b) Group (Lump) Combustion Stop
- c) Group (Lump) Combustion Start
- d) Alarm (Bell) Stop

Available Output Connections:

- a) High Steam Pressure Alarm
- b) Low Steam Pressure Alarm
- c) Boiler Trouble
- d) Emergency Stop Warning
- e) Alarm Bell
- f) Normal Running
- g) Network Trouble
- h) Pressure Sensor Trouble

NOTE: The outputs available are “DRY” relay contacts. These relays are actuated when the corresponding condition occurs.

3.2 MP1-200 SPECIFICATIONS

Master Pressure Controller, Model MP1-200. One unit required for up to 15 boilers. Manufactured by MIURA Boiler Co., LTD.

Electrical Ratings: AC120V (+10, -15%)

Frequency: 50/60 Hz

Power Consumption: 11VA maximum

Operating Temperature Limits:

- +4°F minimum, 158° maximum
- 20% R.H. minimum, 90% R.H. maximum (non-condensing)

Accessory Inputs: The contacts should be rated for 250VAC, 0.5A rating as a minimum. The contacts will be supplied with 120VAC from the MP1.

Available Outputs:

- Contact rating 250VAC, 1A
- Contacts are dry, with normally open and normally shut for each output. Do not directly connect an induction load, such as a solenoid valve or transformer. If an induction load is to be connected, use an external relay operated by the contact to avoid inductive kick on the MP1 circuit board.

Display:

4 character, numerical LED display indicating the following:

- Steam Pressure
- Steam Pressure Control Setting
- High Pressure Alarm Setting
- Diagnostic Troubleshooting Codes

Settings are changed by selecting the setting and adjusting the potentiometer

LED Lights:

Indicating lights are for the following conditions:

- High Pressure Alarm
- Low Pressure Alarm
- Emergency Stop
- Lump Operation
- Boiler Trouble
- Sensor Failure
- CPU Failure

Adjustable Settings and Range:

- Number of Controlled Boilers: 1-15
- Number of Preferential Low Fire Boilers: 0-15
- Control Pressure
- Steam Pressure Differential
- High Pressure Alarm
- Low Pressure Alarm
- Operation Mode

3.3 MT1-200 SPECIFICATIONS

Model: MT1-200
Maker: MIURA Co. LTD.
Boiler Control: High/Low/Off step fired boilers manufactured by MIURA Boiler Co., Ltd.
Installation: One unit per boiler under control of the MP1-200
Electrical Ratings: AC120V (+10,-15%)
Frequency: 50/60 Hz
Power Consumption: 11VA maximum
Operating Temperature Limits:
+4°F minimum, +158°F maximum 20% R.H. minimum, 90% R.H. maximum (non-condensing)

NOTE: Power for the MT1-200 is supplied by the Boiler Control Power circuit. No separate power source is required.

Control Method:

The boiler is operated in High/Low/Off modes under control of the Master Control Panel, MP1-200. MP1-200 commands are in SERIES with the boiler local pressure switches. Both the MP1 and the local switch must be satisfied before the boiler will operate.

Additional Functions:

Full Blow Down Timer: The boiler will indicate when a bottom blow down is required based on combustion time. The amount of time can be calculated by the chemical treatment company and set in the MT1-200.

The preferential combustion timer will be reset after full blow down. The boiler will be designated as the lead boiler for an adjustable period of time; 0 seconds up to a maximum of 2 hrs and 46 min. after the “B-BLOW” button is pushed. The boilers will return to the previous combustion order after the timer expires. This feature is designed to allow the boiler chemistry to return to normal as soon as possible.

Outputs to the Boiler:

- Combustion Signal
- High Fire Signal
- Stand-by Signal

Inputs:

- Operation Switch Signal
- Combustion Signal
- High Fire Signal
- Boiler Fail (ALARM) Signal
- Optional Boiler Pressure Sensor

120 VAC is supplied from the boiler control power circuit

NOTE: All of the above inputs are already wired into the boiler control system when the boiler is ordered with the MI option. The pressure sensor may be factory installed.

Display: Four Digit LED Display

Information Available: Steam pressure, time, day of the week, accumulated combustion time corrected to high fire, current sequence number for combustion order, main steam header pressure (as read at the MP1), boiler communication ID number.

Individual LED's give status information on the following:

- Network communication status (traffic) standby
- automatic/local operation
- full blow down

User Settings at the MT1-200 Terminal:

- Boiler communications network ID number (Shipping default is ID# = 0. User MUST set the number at the job site to a value of 1-15. Each boiler must have a unique number.)
- Boiler ON/OFF time of day (if allowed by local regulations)
- Automatic rotation time of day and interval in days between rotations
- Time and day of week
- Combustion time before Bottom Blow Down is due and time in preferential combustion after blow down is performed
- If optional Boiler Pressure Sensor is installed, the boiler may be set to maintain a minimum steam pressure and other features become available

Operating Switches:

- Display Change
- Automatic/Local
- UP/DOWN
- Blow down timer reset

3.4 PRESSURE SENSOR

Model: YSK-AC20M-334 (standard high-pressure sensor)
YSK-AC10M-334 or YSK-AC2.0M-334 (optional)

Manufacturer: Saginomiya Seisakusyo Inc.

Type: Semiconductor Pressure Sensor

Input: Pressure Range 0-284psi (0-20Kg/cm²)
0-142psi (0-10Kg/cm²) or 0-28.4psi (0-2.0Kg/cm²) (optional)
Maximum pressure: 1250 PSI
Pipe Connection: ¼" NPT
Insulation Resistance: 100MW@ 500VDC

Output: Output Signal 1-5 VDC linear
Straight Error ± 0.5% of full span
Hysteresis Error ± 0.5% of full span
Load 10K
Response Time: approximately 1.5msec

Power Supply: 10-28VDC (supplied from MP1-200 panel)

4 CONTROL OPERATION

TERMINOLOGY

Component ID Number: Refers to the selected network ID# of the specific boiler. This ID# is selected by SW1 inside the MT1-200 for each boiler. This ID# normally corresponds to the physical machine number assigned by the customer. The component ID# has no other significance except that it must not be zero and must not be duplicated between the boilers.

Low Fire Preferential Number: Refers to the number of boilers that the MI controller would PREFER to keep running on Low Fire (in most situations).

Preferential Control Number: Refers to the operating sequence number that the boiler is currently assigned. The control number changes automatically. The number is assigned by the Master Control Panel, MP1-200. This number can also be set manually. Depending on the settings of the MT1-200 rotation flag, this number can also be permanently assigned to one boiler, or it can rotate only when a bottom blow down is performed on one of the boilers.

Pressure Differential: The differential is the “Dead Band” allowed by the MP1-200 before a control action is applied.

4.1 COMBUSTION PATTERN

Combustion is determined by the pressure of the steam header, the pressure differential setting, and the control number of the boiler.

When the load is increasing, (steam pressure decreasing), the MP1 adds to the number of boilers under combustion, while attempting to maintain only the preferential number of boilers operating in Low Fire.

For example:

Given: Six boilers installed and in automatic operation. The MP1 is set for two boilers in Low Fire preference. As steam pressure drops, the MP1 will start operational boiler #1 in Low Fire. preference. As steam pressure drops, the MP1 operational boiler #1 in low fire. If pressure falls still more, then operational boiler #2 will start in Low Fire. If pressure continues to fall, boiler #3 will start in Low Fire. If pressure falls more, boiler #1 will shift to High Fire, and #2 and #3 will remain in Low Fire. As pressure continues to fall, then the MP1 will start one additional boiler in Low Fire before shifting any running boiler to High Fire. When no additional boilers are available, the MP1 will shift the boilers to High Fire until all are running in High Fire.

When the load is decreasing, (steam pressure is increasing), the MP1 will reduce the number of boilers in combustion. This is done by attempting to bring all boilers running in High Fire down to Low Fire while attempting to keep the preferential number of boilers operating in Low Fire. Using the example above, when six boilers are running in High Fire and load drops, the boilers will be switched to Low Fire combustion until pressure is constant. Given that this point is reached and conditions stabilized with all six boilers running on Low Fire, the MP1 will revert to the specified Low Fire Preferential order after 15 minutes. In this case, boiler #1 will shift to high fire and boiler #6 will stop. If steam pressure remains constant, the MP1 will force boiler #2 to High Fire and stop #5. At this point, we have boilers #1 and #2 running in High Fire, and boiler #3 and #4 running in Low Fire. This condition will continue until steam demand changes.

In situations where additional boilers are required, the MP1 will order the next boiler to start. While the boiler is going through the pre-purge and start sequence, the boiler already running in Low Fire will be forced to High Fire. When the boiler that was just started reaches Low Fire Combustion, the previous boiler will shift back to Low Fire. This temporary, High Fire condition will occur only when Preferential Low Fire Combustion is set for greater than zero boilers. Under some situations, depending on the rate of change of steam pressure, this feature may be temporarily “masked” by the need for more boilers. For example, if the steam demand goes from 10% of installed boiler capacity to 90% in a short period of time, less than 5 minutes, for example, the MP1 Will order all boilers to start and try to return pressure to the set value. When this happens, each boiler will start in sequence, go to High Fire, and stay at High Fire until pressure starts going up.

A different way of describing the system operation is that as long as steam pressure is below the set point and going up, the MP1 will continue to call for more heat. In other words, the system will continue to shift boilers to High Fire or start more boilers in Low Fire. If pressure is constant, the system will attempt to stop boilers that are not required and shift running boilers to High Fire. If the steam pressure is going up, the MP1 will attempt to keep the boilers running as long as possible by shifting High Fire boilers to Low Fire. This is done to keep as many boilers available as possible to respond quickly to a sudden demand for steam. The system will run the boilers in the combination desired based on the number of installed boilers and the number of preferential Low Fire boilers set and the total steam demand. At the same time, the system will attempt to keep as many boilers as possible turned off to conserve fuel.

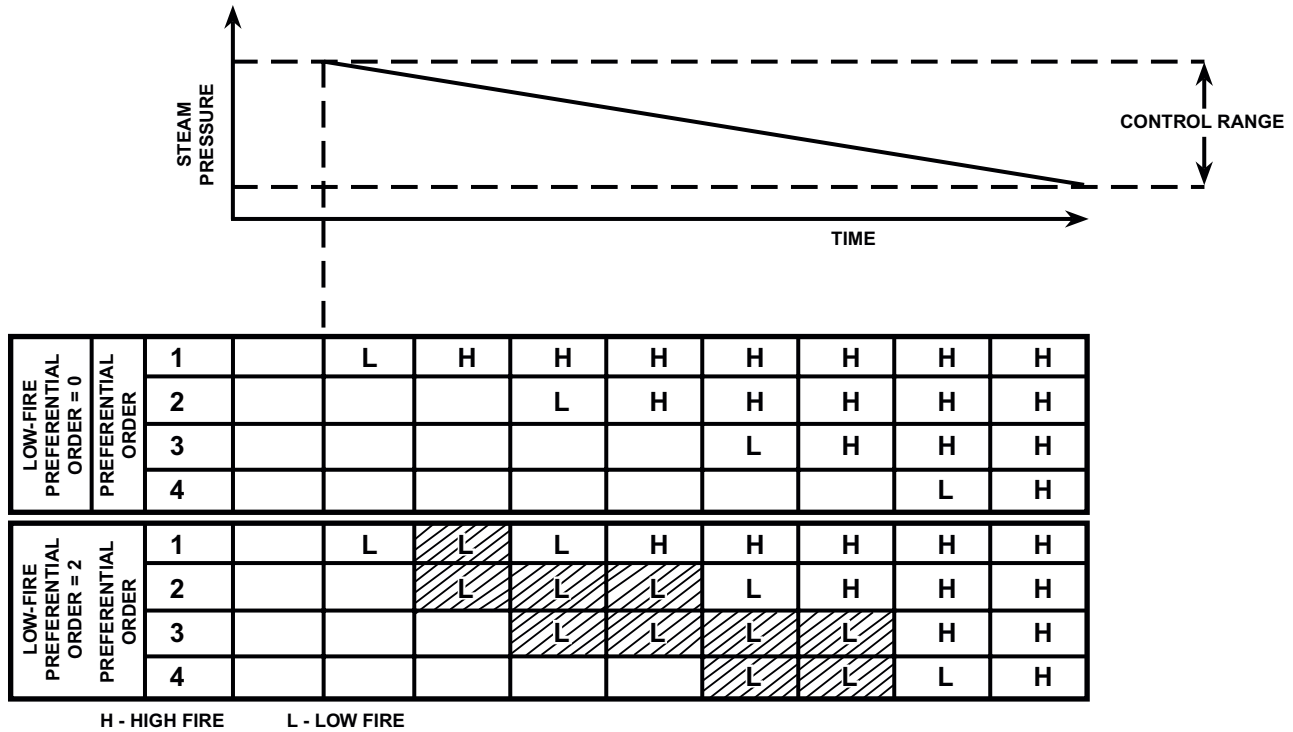


Figure 2 Combustion Pattern Example, Increasing Load

NOTE: The shaded boxes indicate the Low Fire Preferential boilers. As load increases, the system starts additional boilers to maintain this number of boilers in Low Fire Combustion. In the top box, the Low Fire Preferential order is set to “0” and a new boiler is started only when all boilers are running in High Fire. This is the maximum fuel savings situation. However, the steam pressure can change by relatively large amounts and may not be practical for some customers.

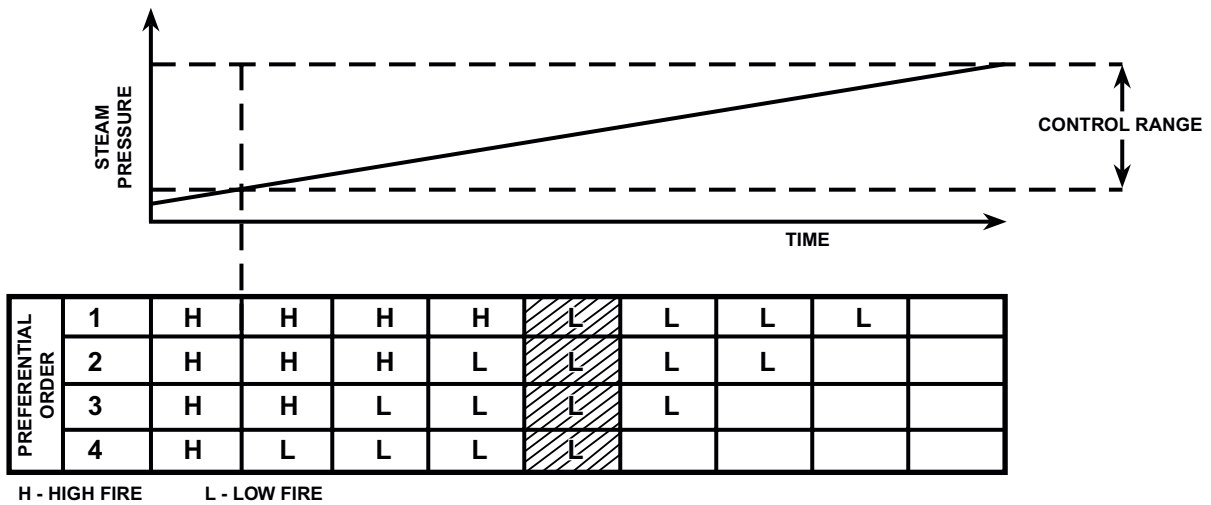


Figure 3 Combustion Pattern Example, Decreasing Load

NOTE: In the example given above, the load decreases very slowly and gradually allows the system to respond. In cases of rapid load changes, the system may turn off boilers in a different pattern or sequence. If the four boilers, shown in the shaded boxes, are running for more than 15 minutes, the system will switch #1 boiler to High Fire and stop #4 boiler.

4.2 LEAD CONTROL ORDER

The Lead Control number is set initially during boiler commissioning. After commissioning, the Lead Control number can be set to rotate automatically. Automatic rotation of Lead Control numbers can be selected for a specific time of day. The number of days between rotation can be selected from daily to once every seven days. This feature is intended to equalize operating time for the boilers. In addition, the system may be set to rotate the boilers only when a bottom blow down is performed. If desired, the system may be set so that a specific boiler will be permanently assigned a control number for 02 through 15.

4.3 ROTATION

In order to equalize the work of each boiler, the boiler with the lowest combustion time (equivalent High Fire Time) is rotated automatically to control number 01. This occurs unless another sequence is specified.

4.3.1 Rotation at a Specific Time

If desired, the system may be set for rotating the boilers at intervals of 1 - 7 days. The specific time of day the rotation occurs may also be set separately.

4.3.2 Rotation after Full Blow Down

The system may be set to rotate the boilers only when a complete blow down is performed on a boiler. This is done by setting the rotation flag to "8". This will allow the boiler that just completed a blow down to become the lead boiler (control number 01) for a period of time after the blow down to allow water chemistry to return to normal. Minimum time between blow downs is 12 hours for automatic rotation.

4.3.3 No Automatic Rotation

If desired, the specific boiler may be selected not to rotate at any time. This is done by setting the rotation flag for that boiler to "9". This feature may be used in the situation where one smaller boiler is designated to run as much as possible to maintain minimum steam loads.

NOTE: If the boiler with Component ID#1 is set for rotation flag “9”, then the automatic rotation features described are disabled for all boilers.

4.4 BOTTOM BLOW DOWN TIMING

If the blow down timer function is set, the MT1-200 blow down LED will start blinking when combustion time, corrected to High Fire, reaches the set time. After the operator has conducted a full bottom blow down, the blow down button must be pushed to reset the blow down timer. Determination of the time must be based on the water quality and treatment. Consult with the chemical treatment company and determine the maximum concentration cycles based on limiting chemistry. Determine the number of full output combustion hours before the limit is reached. Set the timer accordingly.

4.5 MP1-200 OUTSIDE CONTROL OUTPUT

The pressure controller MP1-200 has the following control input terminals, the customer may elect to use these features by installing external switches.

4.5.1 Emergency Cut-Off

An external switch may be installed for Emergency Stop on all boilers. The switch should be a normally open type. Install the switch on terminals 2 and 3 of the MP1-200. When an emergency stop condition exists, the switch will provide continuity between terminals 2 and 3. All boilers operating under MP1-200 control will have combustion stopped including boilers not in automatic operation. Use of this feature will close relays on the MP1 and provide continuity between terminals 13-14 and terminals 15-16. These dry contacts may be used to turn on alarm bells or warning lights.

If the Emergency Stop switch has a lamp to indicate the switch has been activated, power for the lamp is supplied by the MP1-200 through terminals 1 and 3.

This function does not turn off electrical power to the boilers. The only function is to stop combustion. Depending on the nature of the emergency, the operator should turn off the boilers locally using the normal procedures.

Opening the circuit between terminals 2 and 3 will allow all boilers operating in automatic mode to restart and return to normal automatic operation. This may be changed to a normally open switch by changing DIP SW 1-2 to off.

NOTE: If the 120VAC power to the MP1-200 is off, or the network cable is cut, the Emergency Stop function may not be carried out on all boilers.

4.5.2 Lump or Group Operation

The MP1-200 is provided with the ability to start and stop the boilers from a remote location. This may be useful in a situation where the boilers are controlled by the MP1-200 are at the far end of a building and the steam is supplied to only one production line. This feature will allow the production line foreman to start boilers when the line is ready. After the production run is finished, the foreman may stop the boilers if an extended period of time will pass before the steam is again required. If this feature is used, the switch should be a single pole, double throw type. The common wire should be connected to terminal 7. The Lump Start position is connected to terminal 6 and the Lump Stop is connected to terminal 8.

4.5.2.1 Lump Stop

An external, retaining shut type switch may be installed between terminals 7 and 8. By short-circuiting between terminals 7 and 8 of the MP1-200 pressure controller, all boilers connected and operating in Automatic, will be stopped in sequence. Any boilers not operating in Automatic will continue to run under local pressure switch control.. Use of this feature will not activate any alarm outputs.

When the switch is opened, the boilers in Automatic will not restart. To restart the boilers, the operator must use the Lump Start option.

4.5.2.2 Lump Start

An external, retaining shut type switch may be installed between terminals 6 and 7 of the MP1-200. By short-circuiting between terminals 6 and 7 of the MP1-200 pressure controller, all boilers connected and operating in Automatic will be started in sequence. Any boilers not operating in Automatic will continue to run under local pressure switch control. If the Emergency Stop switch is on, the boilers will not start.

When the switch is shut, the boilers will continue to operate under control of the MP1-200.

4.5.3 Warning Bell Stop

An external, momentary shut type switch may be installed between terminals 4 and 5 of the MP1-200. The function of this switch is to silence the alarm bell that may be installed between terminals 13 and 14 on the MP1-200. This switch will not reset the alarm condition. It will only silence the alarm bell if a bell is installed.

4.5.4 Input List for MP1-200

TERMINALS				FUNCTION	COMMENT
2-3	4-5	6-7	7-8		
On				Emergency Stop	Earthquake sensor, Fire Alarm, etc.
Off		Off	On	Lump Stop	Select Switch or other Single Pole, Double Throw Switch
Off		On	Off	Lump Start	
	Momentary On		Bell Stop		Momentary Push Button

NOTE: The switches are supplied power from the MP1-200. Switch contacts should be rated for greater than AC250V, 0.5A.

4.6 AVAILABLE OUTPUTS MP1-200

The MP1-200 pressure controller has several “dry” contacts available. On site wiring of these outputs must be done by the customer or electrical contractor to fully utilize the available features. All of the outputs require power from an outside source. The contacts are operated by a relay mounted on the MP1-200. The relay contacts are rated for 250VAC, 1A. Output loads are requested to be non-inductive. MIURA does not recommend installing an induction load such as a solenoid valve or transformer. If an induction load is to be connected, use an external relay operated by the contact to avoid inductive kick on the MP1 circuit board.

4.6.1 High Pressure Alarm

When the steam pressure reaches the preset pressure (H), the contact turns ON, making continuity between terminals 19 and 20. When the steam pressure drops below the alarm setting, the contact turns OFF with no operator action. The alarm set point is adjusted by VR2 on the circuit board.

4.6.2 Low Pressure Alarm

When the steam pressure reaches the preset pressure (L), the contact turns ON making continuity between terminals 18 and 19. When steam pressure rises above the alarm setting, the contact turns OFF with no operator action. The alarm set point is adjusted by VR3 on the circuit board.

4.6.3 Boiler Trouble

When any one boiler has an alarm condition, the contact turns ON and provides continuity between terminals 16 and 17. The contact turns OFF when all boilers on the MP1-200 network are cleared. No information is available from the MP1-200 as to which boiler is alarming. This information is not critical to the system because the MP1-200 will automatically start an additional boiler to maintain steam pressure. If the customer wants to know which boiler is alarming, extra wiring must be done. This wiring consists of installing a 120VAC relay inside the boiler panel. When the extra relay is installed, it will allow output to the customer's system.

4.6.4 Emergency Stop

When the Emergency Stop switch is used (if installed) the contact turns ON and provides continuity between terminals 15 and 16. When the Emergency Stop switch contacts are OPEN, the contact turns OFF automatically. This allows the control room or guard shack to know that an emergency stop switch was used to stop the boilers.

4.6.5 Warning Bell

When any alarm condition occurs, the contact turns ON and provides continuity between terminals 13 and 14. When the alarm condition clears, the contact turns OFF automatically. If desired, a warning light may be operated by this contact.

4.6.6 Operation

When any boiler has the start button pushed, and is in the STANDBY or COMBUSTION condition, the contact turns ON. This provides continuity between terminals 12 and 13. When all of the boilers are OFF, the contact opens after about 5 seconds. This feature allows remote verification that the boilers are ready to make steam. In addition, the alarm outputs from the MP1-200 such as Low Steam Pressure and boiler trouble, may be disabled by this output if all boilers are OFF.

4.6.7 Network

This output is used to indicate correct communication on the MI network. This information may be necessary in the situation where the customer is required to have an Emergency Stop switch in the plant. If there is network fault, the Emergency Stop switch MAY NOT stop combustion on all boilers in an emergency. This contact is between terminals 10 and 11. The contact is shut when the network is operating correctly. The contact is open when there is a network fault. No information concerning the actual boiler status is available from this output.

4.6.8 Pressure Sensor Trouble

If an error is detected in the pressure sensor output, the contact turns ON providing continuity between terminals 9 and 10. This information is provided in the event that the pressure sensor fails high. If the sensor fails in the high-pressure condition, the MI boilers operating in Automatic will not run. If the sensor fails low, the boilers will run as if ALL of the boilers were in Local Operation. Steam pressure would be maintained by the boiler local pressure switch. This contact turns OFF when the sensor problem is corrected.

4.7 BOILER STANDBY PRESSURE

Installation of an optional pressure sensor on the individual boiler will allow the boiler to maintain a minimum pressure. This feature may be useful if the boiler must be maintained available for steam production in less than five minutes. This option will allow maintaining the boiler at lower steam pressure, such as 30 PSI, which will reduce the heat loss to the boiler room and reduce the response time to less than half of that required if the boiler were cold.

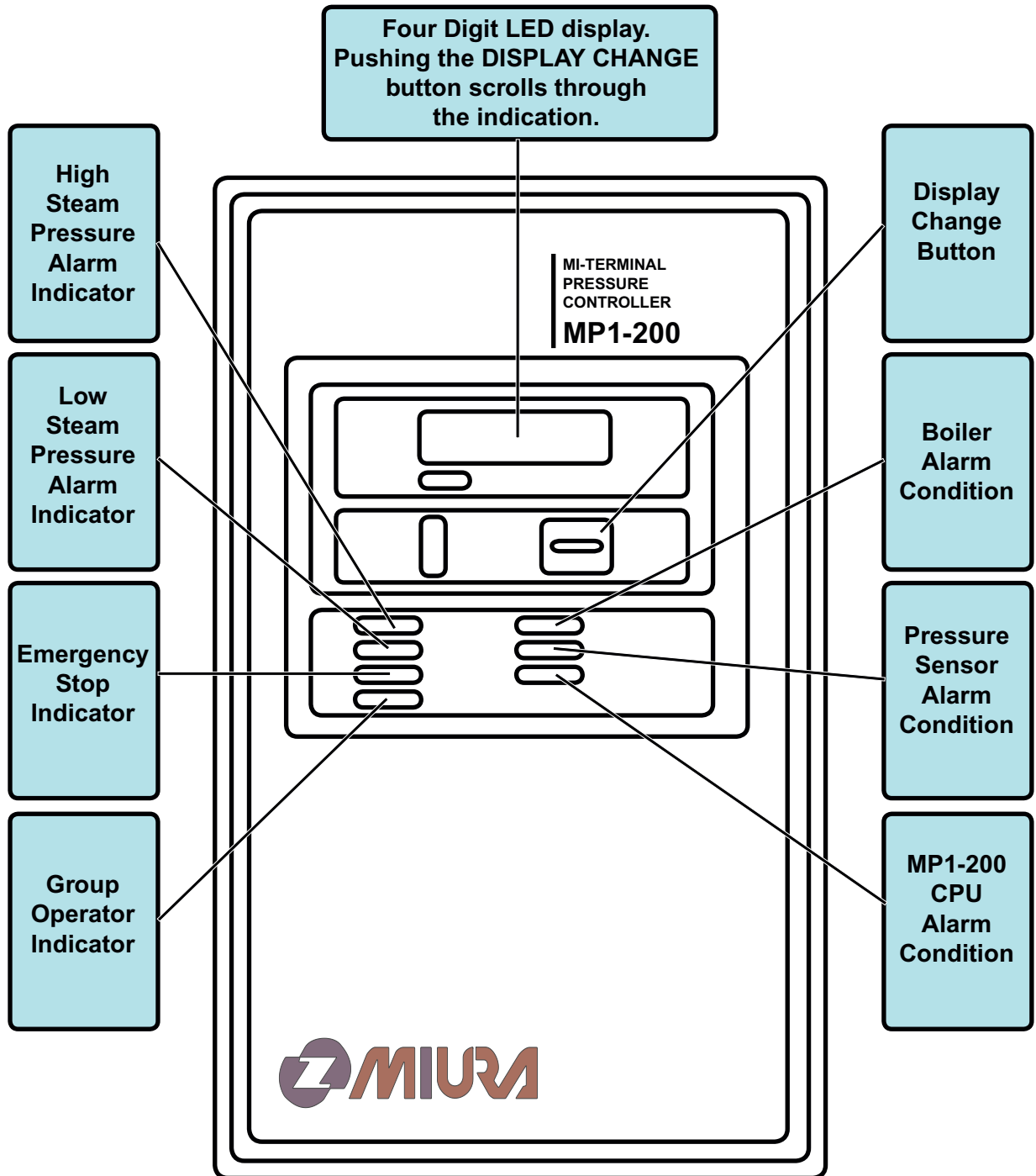
4.8 FUNCTION SUMMARY LIST

	MP1-200 Pressure Controller	MI Terminal MT1-200
Setting	Control Pressure (VR4)	ON/OFF Timer
	Differential Pressure Range (Span)	Full Blowdown Timer
	Number of Connected Boilers (SW2)	Soot Blowdown Timer
	Number of Low Fire Preferential Boilers (SW3)	Component (boiler) ID number
	High Steam Pressure Warning	Control Number
	Low Steam Pressure Warning	Rotation Flag Time Automatic/Manual operation
Input Signal	Emergency Stop*	Operation Switch
	Lump (Group) Start*	Combustion Switch
	Lump (Group) Stop*	High Fire
	Bell Silence*	Alarm Boiler Pressure (Optional)
Output Signal	Alarm*	Combustion
	Emergency Stop*	High Fire
	Steam Pressure High*	Standby
	Steam Pressure Low*	
	Start*	
	Boiler Trouble (Alarm)*	
	Network Operation*	
Steam Sensor Trouble*		
Other Functions	Backup	Automatic Rotation
	Rotation	Full Blowdown Timing
	Main Pressure Display	Soot Blowdown Timing
		Timer ON/OFF Preferential Combustion after Full Blowdown

* Notes: inputs or outputs that are available. On site wiring required. See section 4.6 for details.

2 BASIC CONFIGURATION

5.1 MP1-200 Operation Display and Controls



5.1.1 MP1-200 Display Function Explanation

The number displayed is in Kilograms/square centimeter. See Table 5 for pressure conversion to pounds per square inch. The conversion factor is the indicated number by 14.5 equals pressure in PSI.

5.1.1.1 LED Display

Pushing the Display Change button scrolls through the data indication. There are five separate indications: steam pressure, control pressure setting, control pressure differential, low steam pressure alarm setting, and high steam pressure alarm setting.

Position 1	Position 2	Position 3	Position 4
	8	8	8
C	8	8	8
d	8	8	8
L	8	8	8
H	8	8	8

Table 1 MP1-200 LED Display

Display reads __ 6.9	Means system is operating and current steam pressure is 6.9 Kg/cm ² (or 98.1 PSI)
Display reads C _ 7.2	Means system control set point is 7.2 Kg/cm ² (or 102.4 PSI)
Display reads d _ 0.5	Means system control differential (dead band) is set for 0.5 KG/cm ² (or 7.1 PSI)
Display reads L _ 5.1	Means that system Low Steam pressure Alarm is set for 5.1 KG/cm ² (or 72.5 PSI)
Display reads H _ 8.1	Means that system High Steam pressure Alarm is set for 8.1 KG/cm ² (or 115.2 PSI)

Table 2 MP1-200 LED Display Indications Examples

5.1.1.2 Indicating Lights

High Steam Pressure Alarm

The light is on if the steam pressure is above the setting of VR2 as shown on the display, If this alarm is on, investigate the steam process line to ensure that valves are open to the load equipment and that all boilers are in Automatic operation. This alarm may occur if a boiler is running in manual with the boiler steam pressure switches set above the high steam pressure alarm point.

Low Steam Pressure Alarm

The light is on if the steam pressure is below the setting VR3 as shown on the display. If this alarm occurs, investigate for boilers that are alarming or not turned on. Ensure that all boiler are on line with steam outlet valves open.

Emergency Stop

The light is on if the emergency stop switch is used. (Option installed by customer)

Group Operation Indicator

The light indicates that the boilers are in Lump or Group operation and all boilers will turn on and off at the same time. Requires Option switch installed by customer.

Boiler Alarm Condition

The light indicates that one of the boilers connected to the MP1-200 network has a lock out alarm condition. The light is turned off when the alarm on the affected boiler is reset. There is no indication of which boiler is alarming. If this alarm occurs, determine which boiler is alarming, silence the alarm and correct the faulty condition. Automatic operation of the boilers will continue during this alarm condition.

Pressure Sensor Alarm

The light indicates when a fault is detected on the steam pressure sensor. This fault will affect automatic operation of the boilers depending on the actual failure. If this alarm occurs, place all boilers in manual operation until the sensor is replaced.

CPU Alarm

If this light is on, check the MP1-200 control fuses inside the panel. If fuses are good, place all boilers in manual operation and contact the nearest authorized MIURA representative.

5.2.1 MP1-200 Adjustment Switches

5.2.1.1 SW1 DIP Switch

Used to select different options (* factory default setting) See table below. For low Pressure systems, <15 psi, set dip switch 5 on and divide indicated pressure by 10.

SW1-1	ON *	Not used
	OFF	
SW1-2	ON *	For N.O. type Emergency Stop switch
	OFF	For N.C. type Emergency Stop switch
SW1-3	ON	Not used
	OFF *	
SW1-4	ON	Open contact for all boilers faulty communication (N.C. contact)
	OFF *	Close contact for any boiler faulty communication (N.O. contact)
SW1-5	ON *	For standard pressure sensor (20Kg/cm ²) (And 2.0Kg/cm ²)
	OFF	For optional pressure sensor (10Kg/cm ²)
SW1-6	ON	Not used
	OFF *	
SW1-7	ON	Not used
	OFF *	
SW1-8	ON	Factory test mode only.
	OFF *	Factory test mode off.

Table 3 MP1-200 Switch SW1 Positions

5.2.1.2 SW2 Number of Controlled Boilers

For the set number of boilers that are connected to this MP1-200

SET	BOILER	SET	BOILER	SET	BOILER	SET	BOILER
0	15	4	4	8	8	C	12
1	1	5	5	9	9	D	13
2	2	6	6	A	10	E	14
3	4	7	7	B	11	F	15

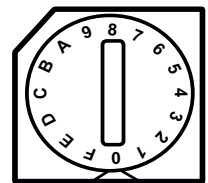


Table 4 SW1 Rotary Switch

5.2.1.3 SW3 Number of Preferential Low Fire Boilers

Used to select the number of boilers that the MP1 will attempt to maintain running in Low Fire. This switch selects the firing pattern of the boilers. For a customer with four boilers, select number two as a starting point. Detailed guidance on selecting the best number is not possible. A discussion with several examples is given later in this book in Section 7. A good start is to divide the number of installed boilers by 2, round down the nearest whole number, and set the switch as a result.

5.2.1.4 SW4 Time Delay Setting

Controls the time-delay before the MP1 stops the boiler with Preferential Control number “01.” This is the amount of time the system will try to keep the lead boiler running in Low Fire, after steam pressure has reached the control pressure. It is normally set at zero. In some situations, this setting may be used to prevent the boiler from excessive cycling between Off and Low Fire conditions. This situation will be very rare. This feature may be necessary if the customer has a situation where the steam demand stops for a short time, such as 15 to 30 seconds and then starts again. The boiler local pressure switches will over-ride this function and stop the boiler if necessary.

SET	TIME	SET	TIME	SET	TIME	SET	TIME
0*	0 sec.	4	6 sec.	8	18 sec.	C	35 sec.
1	1 sec.	5	8 sec.	9	22 sec.	D	40 sec.
2	2 sec.	6	10 sec.	A	26 sec.	E	45 sec.
3	4 sec.	7	14 sec.	B	30 sec.	F	55 sec.

Table 4 SW-4 Time Delay Settings

5.2.1.5 VR6 Pressure Zero Adjustment

When installing a pressure sensor, cycle the display change button on the MP1-200 until no letters are shown on the left most panel. With the sensor removed from the pipe, adjust VR7 using a standard screw driver until the display reads 0.0 (zero point zero). This sets the zero pressure reference point for the pressure sensor.

5.2.1.6 Pressure Sensor Gain Adjustment

When the steam pressure in the steam header is constant at approximately the normal pressure desired, adjust this potentiometer until the normal pressure display on the MP1-200 reads the same as the ACTUAL STEAM HEADER PRESSURE. Use the pressure conversion chart, Table 5, to convert from actual measured steam header pressure to Kg/cm². For example, if the actual measured steam pressure is 100 PSI, adjust VR5 to a reading of 7.0 on the MP1-200 display.

5.2.1.7 VR4 Control Pressure Differential

This adjustment is used to set the “Dead Band” of the MP1-200 controller. Normally this is set to the minimum value. The minimum for the standard pressure sensor is 1.0 Kg/cm². The minimum setting for the optional low range pressure sensor is 0.5 Kg/cm². This minimum differential is determined by DIP SW1-5 setting. If DIP1-5 is “OFF,” then the minimum differential is 0.5 and the sensor model number should be “YSK-AC10M.” If the DIP SW1-5 is “ON,” then the minimum differential is 1.0 and the sensor model number should be “YSK-AC20M.” In most conditions, the control pressure differential should start at the minimum setting. A discussion on when to set the differential for other than minimum is beyond the scope of this manual. In actual operation, the differential pressure setting is divided by the number of boilers installed and connected to the MP1-200. For example, if ten boilers are installed with the standard high range pressure sensor, the minimum control differential setting is 1.0 Kg/cm² or 14.2 PSI. With 10 boilers connected, the effective pressure differential is actually 0.1 Kg/cm² or 1.4 PSL. In other words, the more boilers installed in the plant, the less the steam pressure fluctuates.

5.2.1.8 VR3 Low Steam Pressure Alarm

The setting of the low steam alarm is a customer option. If this feature is used, additional equipment must be wired to the MP1-200 dry contacts 18 and 19. This equipment can be a flashing light or alarm horn or both. Otherwise, the Low Pressure Alarm will only light the LED on the MP1-200 panel. If this feature is used, the customer should select the steam pressure that is the lowest possible. Generally this is about 60 PSI or 4.2 Kg/cm². Steam pressure this low would tend to indicate that there is a problem with the boilers that is not correctable by automatic operation of the MP1-200.

If a minimum sustained steam pressure of 80 PSI is required, the alarm can be set for 5.6 Kg/cm². However, if a sudden steam demand occurs and all boilers were in STANDBY and not running, steam pressure may drop below 80psi for a short period of time before returning to normal. This would cause a false Low Steam Pressure Alarm and possible loss of product for no valid reason. The amount of time that steam pressure is below 80 PSI is very easily measured in seconds and is too short to affect product temperature. Therefore, the customer may elect to experiment with this setting to match actual plant operations.

5.2.1.9 VR2 High Steam Pressure Alarm

The setting of the high steam pressure alarm is a customer option. Note that the High Pressure Alarm **MUST** be set above Control Pressure or erratic operation of the MI system may result. If this feature is used, additional equipment must be wired to the MP1-200 dry contacts 19 and 20. The equipment can be a flashing light or alarm horn or both. Otherwise the High Pressure Alarm will only light the LED on the MP1-200 panel. If this feature is used, the customer should select the steam pressure that is the highest permissible. Generally this is about 140 PSI or 9.8 Kg/cm². Steam pressure this high would tend to indicate that there is a problem with the boilers that is not correctable by automatic operation of the MP1-200.

An example of this condition would be a single boiler running in manual that has the steam pressure switches set too high or stuck shut.

5.2.1.10 VR1 Control Pressure Setting

The pressure set by this potentiometer is normally the top of the desired operating pressure for the customer. In most cases the customer desires to operate at about 100psi. Therefore, the correct setting of VR1 would be 100psi + VR4 or about 115 SPI for the standard sensor or 107 PSI for the optional low range sensor. For purposes of discussion in this manual, we will assume that VR1 is set for 110psi or 7.7 Kg/cm². A good estimate for this setting is about 10 PSI above the desired operating pressure.

5.3 MT1-200 MI BOILER CONTROL TERMINAL

5.3.1 MT1-200 Operation Display and Controls

5.3.1.1 NET Communication Indicator Light

This red light will blink during communication on the MI network bus. This is the normal condition. If the light is OFF, it indicates that the MP1-200 master panel power is off or there is a problem with the network such as a broken wire or reversed polarity. To locate the problem, check this indicator on all installed boilers. The boiler with this light off that is farthest from the MP1-200 controller is the one downstream of the problem. Check the network wire between this boiler and the one next closest to the MP1-200 for the wiring problem.

5.3.1.2 MI Network Status

Light should be ON continuously. Red light ON indicates that this specific MT1-200 terminal and the boiler are under the control of the MP1-200.

If the light is off, it indicates a wiring failure as indicated above or that two or more of the boilers have the same hardware number, or that there is a wrong number of boilers selected on SW2 of the MP1-200.

5.3.1.3 Data Display Window

Indicates all data and MT1-200 control information. This is a five-digit LED display. Under normal indication conditions, this window displays the PREFERENTIAL CONTROL NUMBER and the current steam pressure in the Kg/cm² units as measured by the MP1-200 pressure sensor. This display is also used to set many of the extra functions of the MI system. These features and display information will be discussed later in the manual.

5.3.1.4 UP Arrow Button

Used to scroll UP in the display of various menu items and to change the value of a menu item.

5.3.1.5 DOWN Arrow Button

Used to scroll DOWN in the display of various menu items and to change the value of a menu item.

5.3.1.6 SELECT Button

Used to select various menu items. Also used to accept the current value of a menu item after a change by the use of the UP/DOWN buttons.

5.3.1.7 B. Blow Indicator Light

Used to indicate when a bottom blow down of the boiler is due. The light will blink until the timer is reset by pushing the B.Blow push button. This is normally done after performing a bottom blow down on the boiler. This feature is not normally operational unless the timers are set as discussed in section 7.2.4.

5.3.1.8 B. Blow Button

This button is used to indicate the completion of a manual bottom blow down. In addition, the button is used with others to set different menu options.

5.3.1.9 Automatic Operation Indicator Light

This indicates that the MT1-200 and the boiler are in Automatic or Manual operation. If the light is ON, the boiler is under control of the MP1-200. If the light is OFF, the boiler is operating in Manual or Local control. If the light is blinking, the boiler is operating under local control and there is a problem with the MI system, Refer to section 9 for trouble shooting.

5.3.1.10 AUTO/Manual Push Button

This button toggles between Automatic control, where the boiler operates under control of the MP1-200, or Manual, where the boiler is operating with only the boiler pressure switches.

Figure 7 MT1-200 Circuit Board

5.4.1 MT1-200 Adjustment Switches

There are only two switches inside the MT1-200.

5.4.2 Boiler ID# Setting

This is SW1 of the MT1-200 boiler control terminal. This switch is used to select the boiler's control terminal network ID#. This must be set at installation and start up of the boiler system. The MT1-200 is shipped from the factory with all component switches set to "0." Remove the MT1-200 from the boiler electrical control cabinet by removing the four white thumb screws in the bottom of the control box. Remove the rubber plug from the top of the control box. The plug is located in the center near the front of the unit. Using a standard small flat blade screwdriver, set the component ID#. MIURA recommends setting the numbers in order of location on the network. The boiler closest to the MP1-200 would have ID#1, and the next boiler in line would have ID#2, etc. The actual ID numbers do not matter, except that the boiler with ID#1 should be remembered since most features, such as setting the clock of the MI system, must be done on the boiler with Component ID# =1. The switch is numbered 0 to 9 and "A" through "F". "A" = 10,"B" =11, "C"= 12, "D" = 13, "E" = 14, "F" = 15.

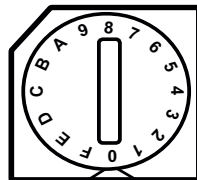


Figure 8 SW1 Rotary Switch

5.4.3 SW2 Slide Switch

The unit is shipped from the factory with this switch off. This switch must remain in the OFF position. If this switch is turned ON, the MI system will not function. Factory use only.

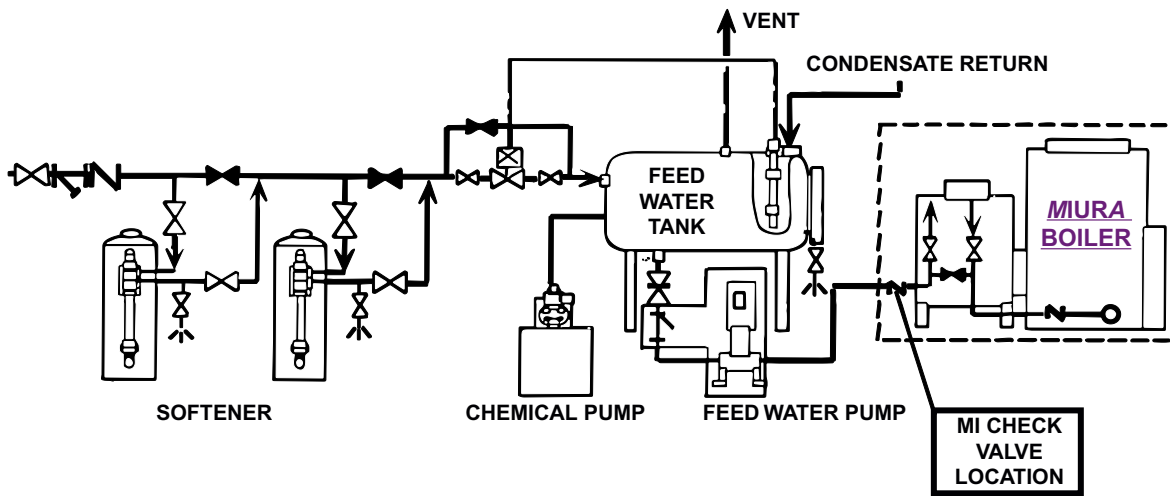
6 INSTALLATION AND INITIAL SETTINGS

6.1 MULTIPLE INSTALLATION CHECK VALVE

Some boiler installations require a special check valve. The function of this valve is to prevent a boiler from filling with water as it cools down to room temperature. If the boiler is stopped by the MP1-200, the boiler will start to cool down. Boiler steam pressure will drop into a vacuum. This will draw water out of the Hotwell or De-Aerator tank and fill the boiler. If this occurs, the boiler will over-pressurize if it is started and result in an “Emergency Stop” alarm message.

For Multiple Installation systems where boilers are expected to be in “Standby” for a long period of time, a special check valve should be installed on the boiler feed water piping. The check valve is called a restrictor check valve and is listed as a MI check valve in the options section of the MIURA Price List. The check valve should require at least 18 psi differential pressure to open.

For installations where the MI check valve is installed, remove the first check valve on the inlet to the Economizer or boiler, and replace it with the MI check valve.



6.2 MP1-200 WIRING

6.2.1 MI Communication Network Cable Installation

The communication cable or twisted pair network wires are two conductor, shielded cable, 18-22 gage wire. The cable shield must be connected to earth ground through the “F” or Frame ground terminals.

Cable polarity is important and must be the same for all units. The MP1-200 and each boiler have two pairs of terminals labeled S1, S2. On the MP1, select the pair of terminals without the resistor connected. Connect the positive or number one wire or the twisted pair to terminal S1 and the negative or number two wire to terminal S2. Connect the wire shield to terminal “F.” Run this wire through conduit as required by local electrical codes to the nearest boiler to be placed on the MI network. Repeat the above connections inside the boiler electrical cabinet. Note that the boilers may or may not have a resistor between one pair of S1, S2 terminals. Connect a different length of twisted pair cable between the remaining pair of S1, S2 terminals and run the wire to the next boiler in line. Repeat until all boilers are connected. The last boiler in the chain will have a pair of S1, S2 terminals without a cable connected. Install a 100 ohm, ¼ watt resistor between the empty S1, S2 terminals.

NOTE: This is a computer network. The installation should be done carefully to ensure there are no breaks in the wires of the shield. Care should be taken to properly connect the shield to earth ground at the same point the boilers and MP1-200 control box are earth grounded. This network can be affected by radio interference under some conditions. Proper installation will minimize this possibility. There are no special requirements necessary, just use care in installation. A separate metal conduit with no other AC power wires inside is recommended if practical.

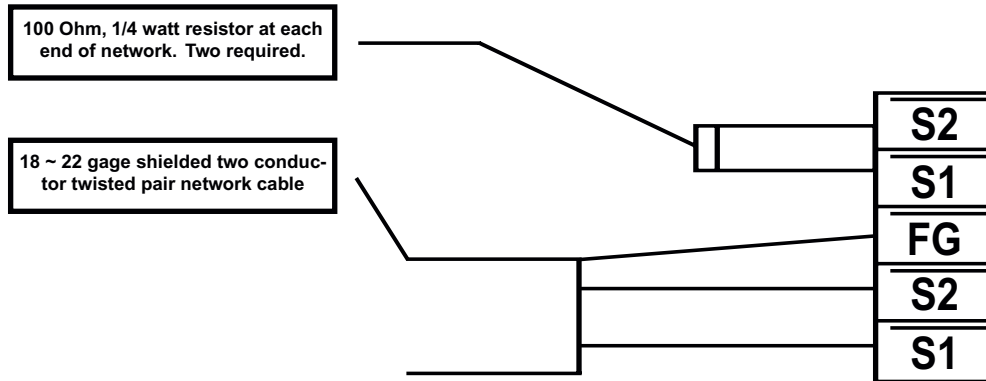


Figure 10 Detail of Twisted Pair Cable Connection at each end

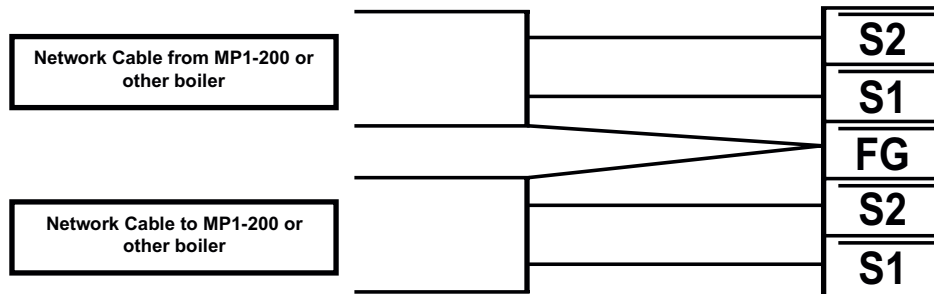


Figure 11 Detail of Twisted Pair Connection at each Boiler

6.2.2 XJ1 Remote Monitoring System

The boilers are equipped with a remote monitoring system. This system consists of a communications terminal in each boiler and a master box with modem. The communications system is also a twisted pair series network and should be wired at the same time as the MI network.

6.2.3 Remote Monitoring Communication Network Cable Installation

The communication cable or twisted pair network wires are three conductor shielded cables, 18-22 gage wire. The cable shield must be connected to earth ground through the “F” or Frame ground terminals.

Cable polarity is important and must be the same for all units. The MTU-100, or Master Communications and modem box, and each boiler have two sets of terminals labeled N0, N1, and N2. On the MTU, select the set of terminals without the resistor connected. Connect the number one wire of the cable to terminal N2. Connect the wire shield to terminal “F”. Run this wire through conduit as required by local electrical codes to the nearest boiler to be placed on the communications network. If possible, both the MI network cables and the Communications network cables should be run through the same electrical conduit. Do NOT run power wires, 120VAC etc., through

the same conduit as the network cables. Repeat the above connections inside the boiler electrical cabinet. Note that the boilers may or may not have a resistor between one pair of N1 and N2 terminals. Connect a different length of cable between the remaining set of N0, N1, and N2 terminals and run the wire to the next boiler in line. Repeat until all boilers are connected. The last boiler in the chain will have a set of N0, N1, and N2 terminals without a cable connected. Install a 100 ohm, ¼ watt resistor between the N1 and N2 terminals.

NOTE: This is a computer network. The installation should be done carefully to ensure there are no breaks in the wires of the shield. Care should be taken to properly connect the shield to earth ground at the same point the boilers and MTU-100 control box are earth grounded. This network can be affected by radio interference under some conditions. Proper installation will minimize this possibility. There are no special requirements necessary, just use care in installation. A separate metal conduit with no other AC power wires inside is recommended if practical.

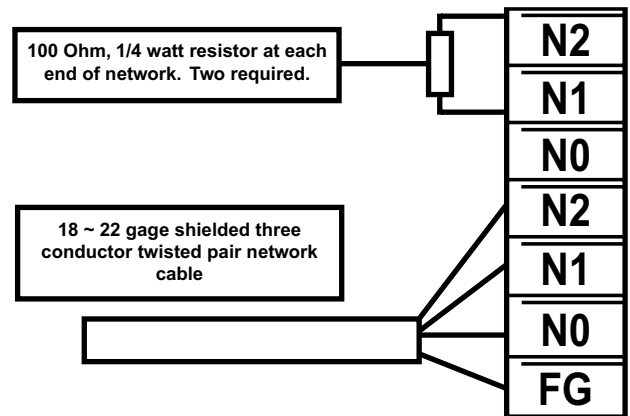


Figure 12 Detail of Twisted Pair Cable Connection at each end

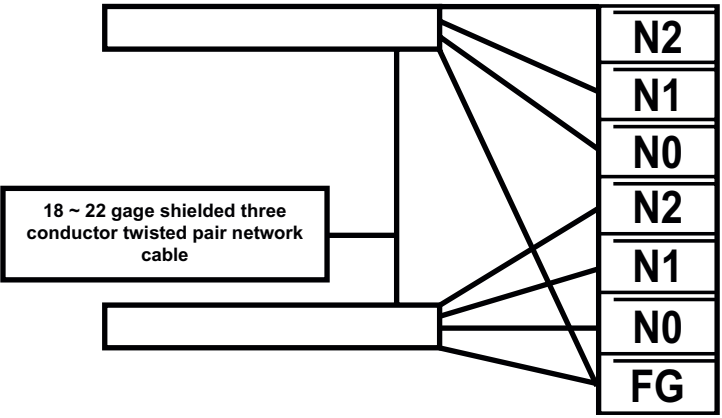


Figure 13 Detail of Twisted Pair Connection at each Boiler

6.2.4 Pressure Sensor Installation

The solid state pressure sensor is supplied with one meter of cable. If possible, connect a ½ or ¼ inch pipe from the steam header to the MP1-200 panel and install the pressure sensor and a large pressure gage at the end of this pipe. An extra valve to allow isolation of the pressure sensor and blow down of the line is also recommended. This allows a water seal between the steam and the pressure sensor and avoids the necessity of splicing the pressure sensor wires. If this is not practical, a suitable cable may be connected to the pressure sensor wires inside a connection

box and run to the MP1-200 control box. The length of this extra cable should be kept as short as possible and must not exceed 100 ft.

- Connect the BLACK pressure sensor wire to terminal P1.
- Connect the WHITE pressure sensor wire to terminal P2.
- Connect the RED pressure sensor wire to terminal P3.

6.2.5 MP1-200 Master Panel 120V Power Connection

The MP1-200 requires a separate source of single phase 120VAC power. This power source should be the most reliable available and should remain energized if any of the boilers have power. The power required is 11VA and must have the same Earth Ground as the boilers. Connect to terminals R and S with ground on terminal G.

6.2.6 Optional Switch Installation

If desired by the customer, or required by local codes. Emergency Stop switches or earthquake sensors may be connected to the MP1-200 master control panel. The details of which terminals to connect are given in Section 4.5. Note that if the Emergency Stop switch is used, several switches may be connected in series. If the Emergency Stop switch is a normally open type, leave DIP 1-2 in the ON position. If the Switch is normally closed, move DIP-2 to the OFF position. The power for any external switches is supplied by the MP1-200.

6.2.7 Optional Output Connections

If desired by the customer, or required by local code, several outputs or status information connections are available for the MP1-200. The details of which terminals to connect are given in Section 4.6. Note that these connections require an outside power source, and should not be transformers or other inductive loads.

6.2.8 MT1-200 Wiring

The MT1-200 individual boiler control units do not require any electrical connections other than the network as discussed in section 6.2.1. All other connections, including 120VAC power are made at the factory prior to shipment. If the MI system is to be added to an existing boiler installation, contact the nearest MIURA representative for assistance.

6.2.9 Other Connections

The MIURA Multiple Installation system is not compatible with other types of computerized building automation or monitoring systems. The only information available for other systems is the information listed in section 4.6. Information such as which boiler has an alarm or which of the boilers is running in High or Low Fire is not available. Contact MIURA for assistance in collecting this type of individual boiler information. MIURA Boiler does not, cannot, and will not accept any responsibility or liability for changes made to the boiler electrical system. Many of the common status information items, such as boiler alarm or feedwater pump operation, are available as factory installed options. If this type of information is desired, contact your local MIURA representative for assistance.

7 MI OPERATION SETTINGS

7.1 DISCUSSION

Selecting the initial settings for the MIURA Multiple Installation Control system, model MP1-200 and MT1-200, is only approximate on the first try. The correct initial settings depend on the number and size of the boilers installed, the number and size of the loads on the steam system, and what the various combinations of operation for these loads are.

For the purposes of discussion, for this first example, we will walk through the settings for the following customer configuration:

- Four MIURA 200 BHP boilers installed
- Eight production lines that are all the same size load (heat-input requirement).
- Each product line equals $\frac{1}{2}$ of a boiler capacity.
- The load operates ON/OFF only. In other words, the load requires full heat input or none. (Note that this is not typical operation of production line equipment).
- There are not other uses for steam except the product lines. We will discuss the affects of other steam loads further on in the manual.
- The equipment requires 100 PSI for operation. Maximum steam pressure allowed is 150 PSI.

SET UP PROCEDURE:

1. Test and adjust combustion of all four boilers individually. This testing should be done with all boilers selected to Manual operation using the Automatic/Manual push button.
2. Verify the electrical jumpers on the boiler terminal strip are removed for terminals 1-2 and 17-18, or terminals as listed on wiring diagram.
3. Set the boiler pressure switches as follows:
 - A. 63SHA, High Steam Pressure Limit Switch (with manual reset) for 150psi
 - B. 63SH, Low Fire Pressure Switch, for 130 PSI - Differential setting at minimum
 - C. 63SL, High Fire Pressure Switch, for 115 PSI - Differential setting at minimum
4. Remove the MT1-200 from the boiler control panel and set the component ID's. For this discussion, we will call the physical boilers "A" through "D." Set boiler "A" as ID#1, boiler "B" as ID#2, etc.
5. At the MP1-200 master control panel:
 - A. Check DIP Switches 1 and 2 up or ON, and 3,4,6,7,8 down or OFF.
 - B. Check DIP Switch 5 up or ON for standard sensor, or down and OFF for low range sensor.
 - C. Set SW2 to position 4 which is 4 boilers on the network.
 - D. Set SW3 to position 1 for this example situation.
 - E. Set SW4 to position "0" (zero).
 - F. Remove the pressure sensor from the steam header. Adjust VR6 until the display indicates 0.0 (Zero . Zero). If the display has a letter in the left panel, push the Display Change button until the left panel is blank.
 - G. Install the pressure sensor. Open the valve between the sensor and the steam header. With steam in the steam header, compare the display reading with the steam header pressure gage. If necessary, adjust VR5 until indicated pressure, in Kg/cm² equals steam pressure. The pressure conversion may be done using Table 5.

- H. Push the Display Change button until the letter “d” appears in the left hand panel. Adjust VR4 until this number is as low as possible. For a standard range pressure sensor, such as this example, the minimum differential is 1.0.
 - I. Push the Display Change button again until the letter “C” is displayed in the left hand panel. Adjust VR1 until the display indicates 7.2. This is equivalent to 102.4 PSI. This is the MI system control pressure setting. Note that all three pressure switches on the boilers MUST be set above this pressure or the system will not respond as designed.
 - J. Push the Display Change button until the display indicates a letter H in the left panel. Adjust the VR2 until the display reads 9.9. This sets the High Pressure alarm at 9.9 Kg/cm² or 141 PSI.
 - K. Push the display change button until the display indicates a letter “L” in the left hand panel. Adjust VR3 until the display reads 4.1. This sets the low pressure alarm at 4.1 Kg/cm² or 58 PSI.
 - L. Push the Display Change button until there are no letters in the left hand panel. This concludes the initial settings of the MP1-200.
6. Turn on all four boilers.
 7. Go to boiler “A”. This is the boiler with the MT1-200 switch set to position “1”.
 8. Verify the Network LED is blinking and the MI LED is on continuously. If these conditions are not met, trouble-shoot the network wiring connections.
 9. Look at the MT1-200 display in boiler “A.”
 10. The display should read 01._7.2. This indicates boiler “A” is Preferential Control boiler #1 or the lead boiler. If necessary, push the “UP & DOWN” push buttons at the same time. The left digits, “01.”, in this case, will start blinking. Push the “UP” or “DOWN” button until the number changes to “01.”. Then push the select button. Repeat this procedure on the other three boilers. Set boiler “B” to #”02,” boiler “C” to #”03,” and boiler “D” to #”04.” Return to boiler “A.”
 11. Push the select button until the display read “_13. 23”. This is the time in 24 hour format. This setting can only be done on boiler ID# = 1. Push the “UP” and “DOWN” buttons at the same time until the display is blinking. Use the “UP” & “DOWN” buttons to set the time in 24 hour format. In this case, the display reads 13.23 or 23 minutes after 1 PM. Push the select button to accept the time.
 12. Push the “SELECT” button until a lower case “y” is shown in the leftmost position. Push the “UP” & “DOWN” buttons at the same time until the right hand digit starts to blink. ‘Then use the “UP & DOWN” buttons to set the day of the week as follows:

SUN 0 MON 1 TUE 2 WED 3 THU 4 FRI 5 SAT 6

Push the “SELECT” button to accept the day of the week setting.

13. At this point, all required settings of the MI system are completed. The system default settings may be changed if necessary. See section 7.2 for details of the MT1-200 settings.
14. Place all the boilers in automatic operation by pushing the “AUTO” button on the MT1 until the RED AUTO(matic) operation light comes on. And then push the green START or Red Combustion switch.

The system is now ready for operation.

Remember the initial conditions:

Four MIURA 200 BHP boilers installed

Has eight production lines that are all the same size load (heat-input requirement)

Each product line equals $\frac{1}{2}$ of a boiler capacity.

The load operates ON/OFF only. In other words, the load requires full heat input or none.

Note that this is not typical operation of production line equipment.

There are not other uses for steam except the product lines. We will discuss the effects of other steam loads further on in manual.

The equipment requires 100 PSI for operation. Maximum steam pressure allowed is 150 PSI.

The system will try to maintain one boiler, the lead or control number #01 in this case, boiler "A" in Low Fire. When steam pressure reaches 7.2 Kg/cm², or about 103 PSI, the boiler will stop. At this time, the customer starts production line #1. When steam pressure falls to about 95 PSI, or 6.7 Kg/cm², boiler #01 or "A" in this case will start. If the steam pressure continues to fall, the MI system may start boiler #02 or "B". When boiler #01 is running in Low Fire, the system will evaluate steam pressure. If pressure is below 6.6 KG/cm², the MI system will switch boiler #01 to High Fire until pressure returns to the normal band of 6.7 to 7.2. When pressure returns to the normal range, the MI system will return boiler #01 to Low Fire and stop boiler #02. As long as steam pressure does not go above 7.2 Kg/cm², or 102 PSI, the number 01 or "A" boiler will continue to run in Low Fire.

Now the customer starts production line #2. This will cause steam pressure to fall. When pressure reaches 6.7, the MI will start boiler #02 and shift boiler #01 to High Fire. When boiler #02 starts running in Low Fire, the steam pressure will come up. When pressure reaches 6.7 Kg/cm², the MI system will switch boiler #01 to Low Fire. Now we have boilers "A" and "B" running in Low Fire.

Production line #3 is started. Again, steam pressure falls below 6.7 Kg/cm². This time the only action is to switch boiler#01 to High Fire and leave boiler #02 running in Low Fire.

Production Line #4 is started. The MI system will start boiler #03 in Low Fire and shift boiler #02 to High Fire until #03 is running in Low Fire, and steam pressure is returned to the normal band. When steam pressure returns to normal, boiler #02 is shifted to Low Fire. Now we have boiler #01 running in High Fire and boilers #02 and #03 running in Low Fire. At this time, boiler #2, or boiler "B," will switch between High and Low as necessary to maintain steam pressure in the band.

This pattern continues until all production lines are running. This condition will result in all four boilers running in high fire.

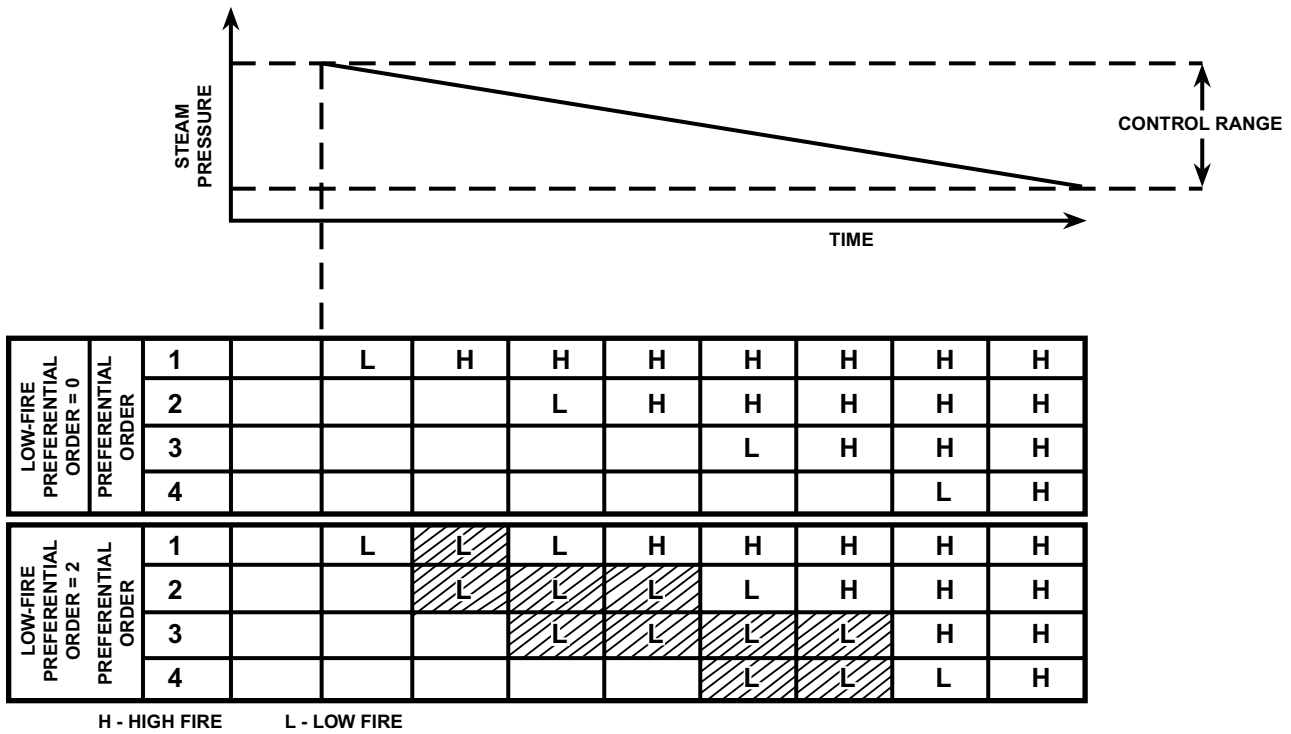


Figure 14 Increase Load Boiler Operation Pattern, Two Boiler Low Fire Preferential

Note that in this discussion, each production line was started in sequence and only after boiler operation was stable at each new load level. Since we started this example with all four boilers up to steam pressure and the steam header full of steam, each change in combustion pattern will take between 35 and 55 seconds depending on the boiler model. If one or more boilers were “cold” or at zero pressure, then the time delay would be about 5 minutes from call for heat to full capacity on the boiler.

Now for a discussion of the system response to a decrease in load.

The production run for line #1 is over and line #1 is stopped. When steam pressure goes up (due to steam production greater than demand), the MI system will switch boiler #04, or unit “D”, to Low Fire.

Now production line #2 is stopped. This time the MI system switches boiler #03, or unit “C” to Low Fire. Now we have boiler #01 & #02 running in High Fire and units #03 and #04 running in Low Fire. Production line #3 is stopped. Now the MI system will switch boiler #02 to Low Fire. Now we have boiler #01 running in High Fire and boilers #02, #03, and #04 running in Low Fire.

When production line #4 is stopped, boiler #01 will also switch to Low Fire. Now we have 50% of the total boiler system load running and all four boilers running in Low Fire. This situation will continue for about 15 minutes. After the 15 minutes are up, the MI system will switch boiler #01 to High Fire and stop boiler #04. If there is no change in steam load, this condition will continue.

If production line #5 is stopped, then boiler #01 will go to Low Fire. If this condition continues for 15 minutes, then boiler #01 will go back to High Fire and boiler #03 will stop.

This pattern continues until all lines are stopped and all boilers stop.

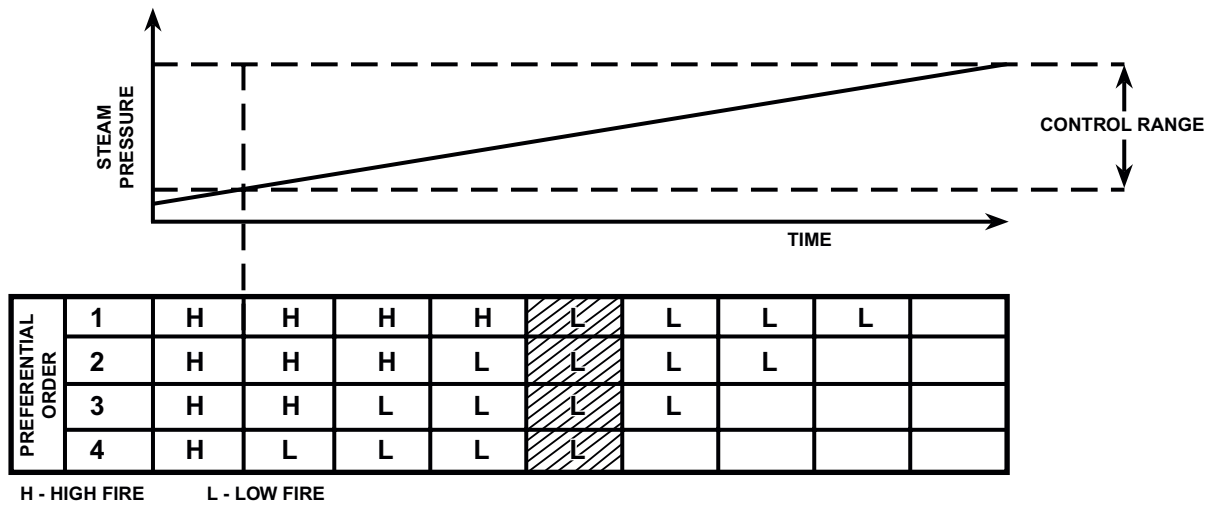


Figure 15 Decrease Load Boiler Operation Pattern, One Boiler Low Fire Preferential

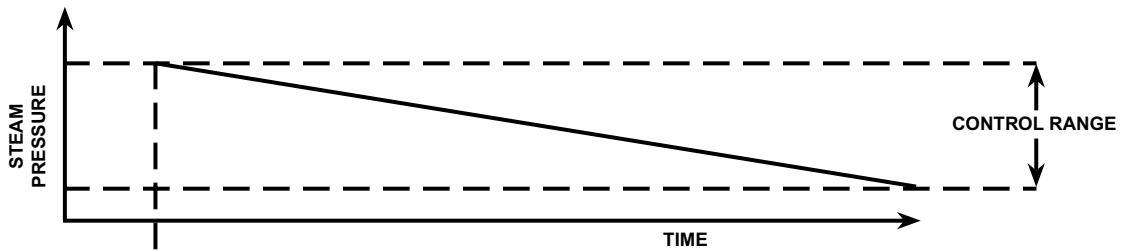
Now we continue the discussion with different conditions. Only this time we add into the equation where some production lines are turned on and off.

We start with all production lines running and all boilers running in High Fire. Now two lines are stopped. This results in #01 and #02 running in High Fire, and boilers #03 and #04 in Low Fire. If line #7 is started, boiler#3 switches to High Fire. If lines #4, 5, and 6 are stopped, then we have four production lines running and four boilers running in Low Fire, unless the 15 minute timer has expired. Now if a line is started again, boiler #01 shifts to High Fire. If an additional production line is started before the timer expires, boiler #02 switches to High Fire. If all but three lines are turned off, and then boilers #01, #02, and #03 will stay running in Low Fire and boiler #04 will stop.

The above discussion started with eight production lines, each of which required 1/2 of the boiler capacity. There was on other use for steam. In real world situations, some steam is required to run the de-aerator tank and some steam condenses in the steam piping. There is some loss of steam due to leaks.

In the real world, the customer would have some boiler capacity used for “parasite” loads. For this discussion, we will assume that the total parasitic loads are about 25% of one boiler capacity. If this large of a parasite load existed, the customer would not be able to run all eight production lines. In addition, depending on the production runs and the other steam uses, some boiler short cycling may occur. A boiler Short Cycle is when a boiler goes through the pre-purge and pilot sequence, and may even get to Low Fire, and is then turned off by the MI system. This has no effect on the life of the boiler. However, it is very distracting for the boiler operator. If this happens often to this customer, he should change SW3 on the MP1-200 to setting “2”. This will force the MI controller to attempt to keep two boilers running in Low Fire. Now, when the loads are halfway between starting a boiler or just switching one that is already running to High Fire, the MI can avoid short cycling the boiler.

The chart below show this difference between Low Fire Preferential order of “0” and “2”. In the discussion above, we gave an example of Low Fire Preferential of 1. The chart below shows the effect of Low Fire Preferential of “0”. With a zero setting, the MI system will start a boiler in Low Fire and then shift it to High Fire before starting a second unit. This setting results in larger steam pressure and changes while waiting for the next boiler to start. There is no “temporary High Fire” feature where a boiler running in Low Fire will switch to High Fire where a new boiler is started and purged. This setting is mostly for the customer whose individual production line requires between 50% and 100% of each boiler’s capacity. The system will continue to rotate the units automatically and the other optional features are still functional. For two boiler MI installations, this is the preferred starting setting.



LOW-FIRE PREFERENTIAL ORDER = 0	PREFERENTIAL ORDER	1		L	H	H	H	H	H	H	H		
		2				L	H	H	H	H	H		
		3						L	H	H	H		
		4								L	H		
LOW-FIRE PREFERENTIAL ORDER = 2	PREFERENTIAL ORDER	1		L	L	L	H	H	H	H	H		
		2			L	L	L	L	L	L	H	H	
		3					L	L	L	L	L	H	H
		4							L	L	L	L	L

H - HIGH FIRE L - LOW FIRE

Figure 16 Difference Between Low Fire Preferential of Zero and Two

In addition to other loads than just the production line, there is the matter of how fast the steam usage changes. If, for example, four production lines start at the same time, the system responds differently. The actual control functions of the MI system remain the same as what was discussed above, but what the operator sees is different. Depending on how many boilers are running and at what firing rate, steam pressure may either be changed by a small amount or a large dip may occur. If all four boilers were running in Low Fire, then there would be a small change in steam pressure. This is because the boilers are very quick to go from Low Fire to High Fire. If all boilers were off, then steam pressure may drop to 80 PSI or less. This occurs because the boilers have to go through pre-purge, trial for pilot, etc. What the boiler room operator would probably see is all four boilers start up and go to High Fire and then switch to Low Fire. If this happens a lot, then the customer may change the position of SW3 to “3” or even “4”. This will keep as many boilers running in Low Fire for as long as possible in order to minimize the chance of low steam pressures. This transient is of very short duration. Moreover, this has proven to be of no significance to production operations.

When the different variables such as production schedules, steam loads for other than production, and operational schedules such as equipment cleaning and sterilizing are all added up, the number of possible control and response sequences is almost infinitely variable. The facts that the boiler preferential control number is set by default to automatically rotate at 23:59 (or 11:59 pm) and that it is almost impossible for two boilers to make equal steam production capacity, much less four, mean that the MI response will usually change a little bit from one day to the next.

7.2 MI ADDITIONAL FEATURES SETTINGS

7.2.1 MT1-200 Display Menus

The MT1-200 Multiple Installation boiler control terminal has three display or data menus. The menus are:

1. Normal Indications
2. Dip Switch Indications
3. Basic Data Indications

Pressing the "SELECT" button will scroll through the data display items in each menu. To change or set the data, use the "SELECT" button to scroll down to the item. Push the "UP" & "DOWN" buttons at the same time. The data value will start blinking. The number may be changed by pushing the "UP" or "DOWN" button. After the desired value is reached, set the new value by pushing the "SELECT" button.

Note: All of the display indications and adjustments listed in following sections can be made on any boiler unless specified that the change must be made on the boiler with Component ID# = 1.

7.2.2 MT1-200 Normal Indication Contents and Options

Normal indications are displayed by default. The MT1-200 will return to normal data indications automatically after 5-10 minutes. To return to the normal indication menu from any other menu, push "SELECT" & "S-BLOW" together. Note that the position of the period or decimal point is very important as to which data point is displayed. Pushing the "SELECT" button scrolls down the list of menu items.

DISPLAY

DISCUSSION

0	1.		7.	5
---	----	--	----	---

			7.	5
--	--	--	----	---

	1	3.	2	3
--	---	----	---	---

Set on Boiler ID # = 1

y				0
---	--	--	--	---

Set on Boiler ID # = 1

F	1	5.	0	0
---	---	----	---	---

o	1	5.	0	0
---	---	----	---	---

		5	4	1
--	--	---	---	---

E	r	r	1	0
---	---	---	---	---

Error 10 indicates a problem with the wiring between the MT1-200 and the boiler control circuit.

First two digits indicate Preference order. Last two digits indicate steam pressure in Kg/cm². The preference number is set during initial start up. Subsequently the number changes automatically based on running conditions.

Indicates Steam pressure in the boiler when optional pressure sensor is installed on the MT1. (Note that this option is not normally used.)

Indicates the time in 24 hour military format. This example is 1:23 P.M. The time can be set. The time is not automatically adjusted for daylight savings time.

Indicates the day of the week. The letter “y” has no significance other than to identify the data. The day of the week is set as follows:

SUN	MON	TUE	WED	THU	FRI	SAT
0	1	2	3	4	5	6

Indicates the time in 24 hour format that has been set for the boiler to turn “ON” or turn “OFF”. “F” indicates turn “ON”, “o” indicates turn “OFF”. This example is to turn on the boiler at 3:00 P.M. The time can be set only in menu 3 or BASIC DATA INDICATIONS, section 7.2.4.

Indicates the boiler combustion time in equivalent High Fire Hours. Two hours of Low Fire combustion equals One Hour of High Fire combustion. This number is specific to the boiler. The number may be reset. If the data is reset, then the Preferential Low Fire order is also reset. This data may be used with the total time in combustion (COMBUSTION HOURS) displayed by the Honeywell protect relay to determine average boiler firing rate for a given period of time.

First three characters indicate the presence of error in the MI Network. The last two digits indicate the nature of the error. If this error message appears, then check the shielding and electrical ground of the MI Network cable. Error codes are listed in section 9.

7.2.3 MT1-200 Dip Switch Indication Contents

To see the contents of the DIP Switch settings, push “SELECT & TIMER” buttons together. The characters displayed in the first two digits have no significance and cannot be set. They do identify which data point is displayed. Note that the position of the period or decimal point is very important to which data point is displayed. Pushing the “SELECT” button scrolls down the list of menu items.

DISPLAY					DISCUSSION
1.	3			0	Information on presence or absence of the local MT1-200 optional pressure sensor. Default setting is “0” or zero, indicating there is no pressure sensor installed. Set this value to “1” if a pressure sensor is installed.
1.	1		9.	8	This indication appears only when the data flag for local pressure sensor described above is set at “1”. This is the Mt1-200 high limit setting. Set the limit within 5 to 10% of boiler or equipment safety valve setting, whichever is lower.
1.	4			0	Indication for future options. Must be set at the default value of “0”.
1.	5			0	Indication for future options. Must be set at the default value of “0”.
3			0	2	Indicates the boiler component ID# that is set by SW1 inside the MT1. This number can only be changed by adjusting the switch inside the MT1-200 box on each boiler. Must not remain set at the default value of “0”. This number must be unique to each boiler.

4.4.4 MT1-200 Basic Data Indications and Options

To see the contents of the Basic Data Indication settings, push “SELECT” & “B-BLOW” buttons together. Note that the position of the period or decimal point is very important to which data point is displayed. Pushing the “SELECT” button scrolls down the list of menu items.

DISPLAY	DISCUSSION					
<table border="1"> <tr> <td>H</td> <td></td> <td></td> <td>7.</td> <td>5</td> </tr> </table>	H			7.	5	<p>This indication appears only when the optional MT1-200 local pressure sensor is installed and the sensor flag is set to “1”. (See section 7.2.3) This number is the boiler High Steam pressure setting. This is the steam pressure at which the boiler will stop when the boiler is NOT running in AUTOMATIC.</p>
H			7.	5		
<table border="1"> <tr> <td>H</td> <td>d</td> <td></td> <td>1.</td> <td>5</td> </tr> </table>	H	d		1.	5	<p>This indication appears only when the optional MT1-200 local pressure sensor is installed and the sensor flag is set to “1”. (See section 7.2.3) This number is the boiler differential pressure setting for the High Steam pressure setting described above. This is the amount that steam pressure must drop before the boiler will start again in Low Fire. This setting is only in effect when the boiler is NOT running in AUTOMATIC.</p>
H	d		1.	5		
<table border="1"> <tr> <td>L</td> <td></td> <td></td> <td>6.</td> <td>5</td> </tr> </table>	L			6.	5	<p>This indication appears only when the optional MT1-200 local pressure sensor is installed and the sensor flag is set to “1”. (See section 7.2.3) This number is the boiler Low Steam pressure setting. This is the pressure where the boiler will change to High Fire. This setting is only in effect when the boiler is NOT running AUTOMATIC.</p>
L			6.	5		
<table border="1"> <tr> <td>L</td> <td>d</td> <td></td> <td>1.</td> <td>5</td> </tr> </table>	L	d		1.	5	<p>This indication appears only when the optional MT1-200 local pressure sensor is installed and the sensor flag is set to “1.” (See section 7.2.3) This number is the boiler differential pressure for the Low Steam pressure setting described above. This is the amount of steam pressure that must rise before the boiler will go into Low Fire combustion. This setting is only in effect when the boiler is NOT running in AUTOMATIC.</p>
L	d		1.	5		

DISPLAY

DISCUSSION

S			4.	0
---	--	--	----	---

This indication appears only when the optional MT1-200 local pressure sensor is installed and the sensor flag is set to "1". (See section 7.2.3). This number is the boiler standby pressure setting. This is the steam pressure at which the boiler will stop when the boiler IS running in AUTOMATIC AND is placed in standby by the MP1-200. This is designed to shorten the response time of the boiler in the event of a sudden demand for steam, while letting the boiler cool off (and lower heat radiation losses.)

S	d		1.	0
---	---	--	----	---

This indication appears only when the optional MT1-200 local pressure sensor is installed and the sensor flag is set to "1". (See section 7.2.3). This number is the boiler standby pressure differential setting. This is the amount of steam pressure which must fall (below the setting made above) at which the boiler will start when the boiler IS running AUTOMATIC AND is placed in standby by the MP1-200.

0	2	4.	0	0
---	---	----	---	---

Boiler Start at midnight Sunday

This is the Automatic START/STOP program timer. This timer allows setting the START/STOP times of the individual boilers for each specific day of the week. This time may be different for each boiler. The first character indicates the day for the week in the same format as explained in Section 7.2.3. In this example "0" indicates Sunday. The second and third characters indicate the hour. Minutes are set by the fourth and fifth characters. The START and STOP times can be differentiated by the period sign "." after the last digit. A period after the last digit indicates a stop time.

0	2	4.	0	0
---	---	----	---	---

Boiler Stop at midnight Sunday

1	0	6.	3	0
---	---	----	---	---

Boiler Start at 6:30 A.M. Monday

The start and stop times are set at the same number by default. This option is intended for a situation where the customer wants the specific boiler started and stopped at specific times so it can be ready for production.

1	2	0.	0	0
---	---	----	---	---

Boiler Start at 8:00 P.M. Monday

Each day of the week Start/Stop times may be set separately with this feature. Default value is 24.00 for Start and Stop times for all seven days of the week.

USE OF THIS OPTION CAN ALLOW THE BOILERS TO OPERATE WITH NO OPERATORS IN THE BUILDING. THIS MAY NOT BE ALLOWED BY LOCAL CODES.

DISPLAY

DISCUSSION

P.				0
----	--	--	--	---

This indication has no significance, future option use only

C	0	9.	3	0
---	---	----	---	---

This indication is for rotation time. The first character has no significance. "09.30" indicates 9:30 A.M. This is the time of day that automatic boiler rotation will occur. Default value is midnight.

C				0
---	--	--	--	---

This indication is for rotation flag 0 to 9. The first character has no significance. The last digit is the flag value. A ZERO indicates boilers do not rotate automatically. 1-7 indicates that the boiler rotates on intervals of 1-7 days. Default value is "1." 8 indicates that the boilers rotate only when the "B-Blow" button is pushed. This flag must be set on all boilers.

9 disables the automatic rotation for this boiler. If the Low Fire Preferential order is "02," when this value is set for "9," then this boiler will always be the second boiler to start. If this flag is set to "9," on the boiler with the Component ID# = 1, then automatic rotation of all boilers will be affected.

DISCUSSION:

The above options of the MT1-200 will not normally be used by a customer. However, let us examine a situation where it may be useful. A customer installs four MIURA 100 BHP boilers in the plant. The process equipment is within the capacity of three boilers, and the fourth is a full backup unit. The customer may elect to keep boiler #4 designated as a backup or for use only during maintenance on one of the other three boilers. In this case the customer can set the Low Fire Preferential order to "04" and the rotation flag to "9" and the boiler will only run when one of the other three is off for maintenance or alarm condition. If the same customer adds more production equipment, all four boilers would be required to provide enough steam. If business is good, the customer may purchase and install a new process line that might require 300 BHP to run. At this point the customer runs out of steam. If the new line is used, some of the other production lines must be shut down. Now the options are to install more boilers, or to suffer a loss of production when the new machine is used. If the new process line is used frequently, the best choice is to install three additional 100 BHP boilers. However, if the new line is used only once a day, the best choice (cheapest in this case) is to install a 300 BHP boiler. Set the rotation flag for "9," and the start-stop time to the scheduled time of equipment operation. This allows the new 300 BHP MIURA to start before the new equipment is used and will carry the load of the regular production equipment with the existing boilers.

If the time of day cannot be scheduled for the new equipment, then the option is to set the rotation flag for "9," and Low Fire Preferential order to "05" and allow the new boiler to start only when the other boilers are running at full capacity. This may cause problems if the time between production runs is long enough for the new boiler to cool off. In this situation, the optional pressure sensor can be added to the boiler and set to maintain about 25 PSI. The time from call for heat to full output would now be much shorter, resulting in a smaller drop in steam pressure. The amount of fuel used to keep the new boiler "warm" will be much smaller.

DISPLAY

DISCUSSION

b	9	8	0	0
----------	----------	----------	----------	----------

NOTE: Boiler rotation flag must be set at “8” for all boilers for this feature to function.

This indication is for setting the combustion time in seconds after a bottom blow down is performed that the boiler will run as the lead boiler. This feature is intended to restore conductivity and alkalinity to a normal value as soon as possible after a bottom blow down has been performed. The default is “0000” and then subsequent displays have no significance. Maximum interval is 9800 seconds.

NOTE: The time between bottom blow downs, and the time the boiler should run to restore chemical inventory after a blow down must be determined by the boiler water treatment company responsible for the boilers. The time is equivalent 100% combustion rate time. Time spent in Low Fire is counted as 50% of High Fire time.

When the blow down timer has expired, the light above the “B-BLOW” button will start blinking and the operator should then blow down the boiler and reset the timer by pushing the “B-BLOW” button. After this button is pushed, the Low Fire Preference number will change to “01,” and the boiler will run as the lead boiler for the number of seconds set in this menu item.

In the example given, the chemical treatment company has determined that 2 concentration cycles will restore chemistry to satisfactory levels at maximum evaporation rate. Two concentration cycles will require 2 hours. Therefore, the timer should be set for: (2 hrs X 60 min X 60 sec = 7200 seconds). By setting this timer to “7200,” the boiler will change its Low Fire Preferential number from the current value, say “03” for discussion, to “01” for 2 hours or 7200 seconds after the “B-BLOW” button was pushed. At the end of this interval, the boiler will return to Low Fire Preferential order “03.”

DISPLAY

DISCUSSION

b.			1	2
-----------	--	--	----------	----------

This indication is for setting the combustion time interval in hours before a bottom blow down is required. The default is “000,” and then subsequent displays have no significance. Maximum interval is 999 hours.

NOTE: The time in hours between bottom blow downs must be determined by the boiler water treatment company responsible for the boilers. The time is equivalent 100% evaporation rate time. Time spent in Low Fire is counted as 50% of high fire time.

When this time has expired, the light above the “B-BLOW” button will start blinking. At this point the operator should stop the boiler and conduct a full bottom blow down on the boiler. When the boiler is filled and restarted, the operator will push the “B-BLOW” button and the light will stop blinking. At this point, the Low Fire Preference number will change to “01,” and the boiler will run as the lead boiler for the time set in the following menu.

In the example given, the chemical treatment company has determined that 10 concentration cycles will occur in 12 hours of running at maximum evaporation rate. After 12 hours of running at maximum evaporation rate. After ten cycles the boiler requires a bottom blow down. By setting this timer to “12,” the “B-BLOW” button will start blinking after 12 hours of High Fire equivalent run time AFTER the last bottom blow down was performed, as indicated by pushing the “B-BLOW” button.

S	b			0
----------	----------	--	--	----------

This indication is for the Soot Blow timer that is necessary when burning heavy oil fuel. This function is not used.

DISCUSSION:

MIURA defines a “Bottom Blow Down” as a complete drain and fill of the boiler. This is primarily because the lower water content makes a partial blow down potentially unsafe to perform manually. However, due to the shape and arrangement of the boiler “mud drum,” the only way to insure all “mud” or boiler sludge is removed is to completely drain the boiler. If the boiler is equipped with an Automatic Bottom Blow Down option, the boiler must still be completely drained at some interval. MIURA recommends a complete drain and fill at two-week intervals in this case. Instead of doing the blow down every two weeks, the customer/water treatment company may elect to perform the blow down every two weeks of operation. If this is the option selected, then instead of setting the blow down interval timer described above for ten concentration cycles, set the timer for 14 days of operation or 336 hours.

8 SUMMARY

The MIURA Boiler Multiple Installation Controller is the key to using the advanced design features of the MIURA boilers for maximum fuel savings and steam production reliability and flexibility. However, the system has many features that are not useful to all customer situations. Some of the features, such as an Automatic Soot Blow Timer similar to the Bottom Blow Timer discussed earlier, are not used on North American made models. The Soot Blow Down, for example, is for boilers burning #6 heavy fuel oil or Bunker “C,” which the North American boilers do not burn.

Some features, such as the automatic Start/Stop features, may not be allowed by local boiler codes or some other regulation.

Some features, such as the optional pressure sensor, may not be installed or useful to the customer.

Some customers may object to the boilers cycling on and off often, or the boilers may short cycle at random intervals. This is not going to damage the boilers in any way and is the reason the Multiple Installation controller exists. The entire reason for the system is to maximize the production of steam from the same amount of fuel.

Occasionally, there are times when adding a time delay before switching a boiler from Low Fire to High Fire will prevent a boiler from short cycling. Or it can be used to “force” the MI system to start an additional boiler. This may be useful because some production equipment may call for some small amount of steam to warm up and then suddenly call for a larger amount.

MIURA technicians can set the equipment to perform in the optimum manner based on the boiler size and customer description of actual operations. However, production schedules change and what the system was set for may not work out the best. The system can be adjusted by the customer. The settings of the MP1-200 SW 3 and SW 4, as well as the control and differential settings of VR1 and VR4 may be changed as desired to change the system response. Changing the Low Fire Preferential order on the boilers may be changed at will. Changing the rotation time or rotation day can also be changed if desired. Only experience in the production schedule/use of steam will enable an operator to adjust the equipment. **MIURA STRONGLY RECOMMENDS THAT BEFORE ANY CHANGES ARE MADE, A RECORD OF THE BEFORE AND AFTER SETTINGS ARE KEPT.** This will ensure that if any change is made with the wrong results, the change can be reversed.

DISPLAY	PSI	DISPLAY	PSI	DISPLAY	PSI	DISPLAY	PSI	DISPLAY	PSI
0.1	1.4	4.1	58.3	8.1	115.2	12.1	172.1	16.1	228.9
0.2	2.8	4.2	59.7	8.2	116.6	12.2	173.5	16.2	230.4
0.3	4.3	4.3	61.1	8.3	118.0	12.3	174.9	16.3	231.8
0.4	5.7	4.4	62.6	8.4	119.4	12.4	176.3	16.4	233.2
0.5	7.1	4.5	64.0	8.5	120.9	12.5	177.8	16.5	234.6
0.6	8.5	4.6	65.4	8.6	122.3	12.6	179.2	16.6	236.1
0.7	10.0	4.7	66.8	8.7	123.7	12.7	180.6	16.7	237.5
0.8	11.4	4.8	68.3	8.8	125.1	12.8	182.0	16.8	238.9
0.9	12.8	4.9	69.7	8.9	126.6	12.9	183.4	16.9	240.3
1.0	14.2	5.0	71.1	9.0	128.0	13.0	184.9	17.0	241.7
1.1	15.6	5.1	72.5	9.1	129.4	13.1	186.3	17.1	243.2
1.2	17.1	5.2	73.9	9.2	130.8	13.2	187.7	17.2	244.6
1.3	18.5	5.3	75.4	9.3	132.2	13.3	189.1	17.3	246.0
1.4	19.9	5.4	76.8	9.4	133.7	13.4	190.5	17.4	247.4
1.5	21.3	5.5	78.2	9.5	135.1	13.5	192.0	17.5	248.9
1.6	22.8	5.6	79.6	9.6	136.5	13.6	193.4	17.6	250.3
1.7	24.2	5.7	81.1	9.7	137.9	13.7	194.8	17.7	251.7
1.8	25.6	5.8	82.5	9.8	139.4	13.8	196.2	17.8	253.1
1.9	27.0	5.9	83.9	9.9	140.8	13.9	197.7	17.9	254.5
2.0	28.4	6.0	85.3	10.0	142.2	14.0	199.1	18.0	256.0
2.1	29.9	6.1	86.7	10.1	143.6	14.1	200.5	18.1	257.4
2.2	31.3	6.2	88.2	10.2	145.0	14.2	201.9	18.2	258.8
2.3	32.7	6.3	89.6	10.3	146.5	14.3	203.3	18.3	260.2
2.4	34.1	6.4	91.0	10.4	147.9	14.4	204.8	18.4	261.6
2.5	35.6	6.5	92.4	10.5	149.3	14.5	206.2	18.5	263.1
2.6	37.0	6.6	93.9	10.6	150.7	14.6	207.6	18.6	264.5
2.7	38.4	6.7	95.3	10.7	152.2	14.7	209.0	18.7	265.9
2.8	39.8	6.8	96.7	10.8	153.6	14.8	210.5	18.8	267.3
2.9	41.2	6.9	98.1	10.9	155.0	14.9	211.9	18.9	268.8
3.0	42.7	7.0	99.5	11.0	156.4	15.0	213.3	19.0	270.2
3.1	44.1	7.1	101.0	11.1	157.8	15.1	214.7	19.1	271.6
3.2	45.5	7.2	102.4	11.2	159.3	15.2	216.1	19.2	273.0
3.3	46.9	7.3	103.8	11.3	160.7	15.3	217.6	19.3	274.4
3.4	48.3	7.4	105.2	11.4	162.1	15.4	219.0	19.4	275.9
3.5	49.8	7.5	106.7	11.5	163.5	15.5	220.4	19.5	277.3
3.6	51.2	7.6	108.1	11.6	165.0	15.6	221.8	19.6	278.7
3.7	52.6	7.7	109.5	11.7	166.4	15.7	223.3	19.7	280.1
3.8	54.0	7.8	110.9	11.8	167.8	15.8	224.7	19.8	281.6
3.9	55.5	7.9	112.3	11.9	169.2	15.9	226.1	19.9	283.0
4.0	56.9	8.0	113.8	12.0	170.6	16.0	227.5	20.0	284.4

Table 5 Pressure Conversion Chart

9 TROUBLE SHOOTING

9.1 SELF-CHECK FEATURE

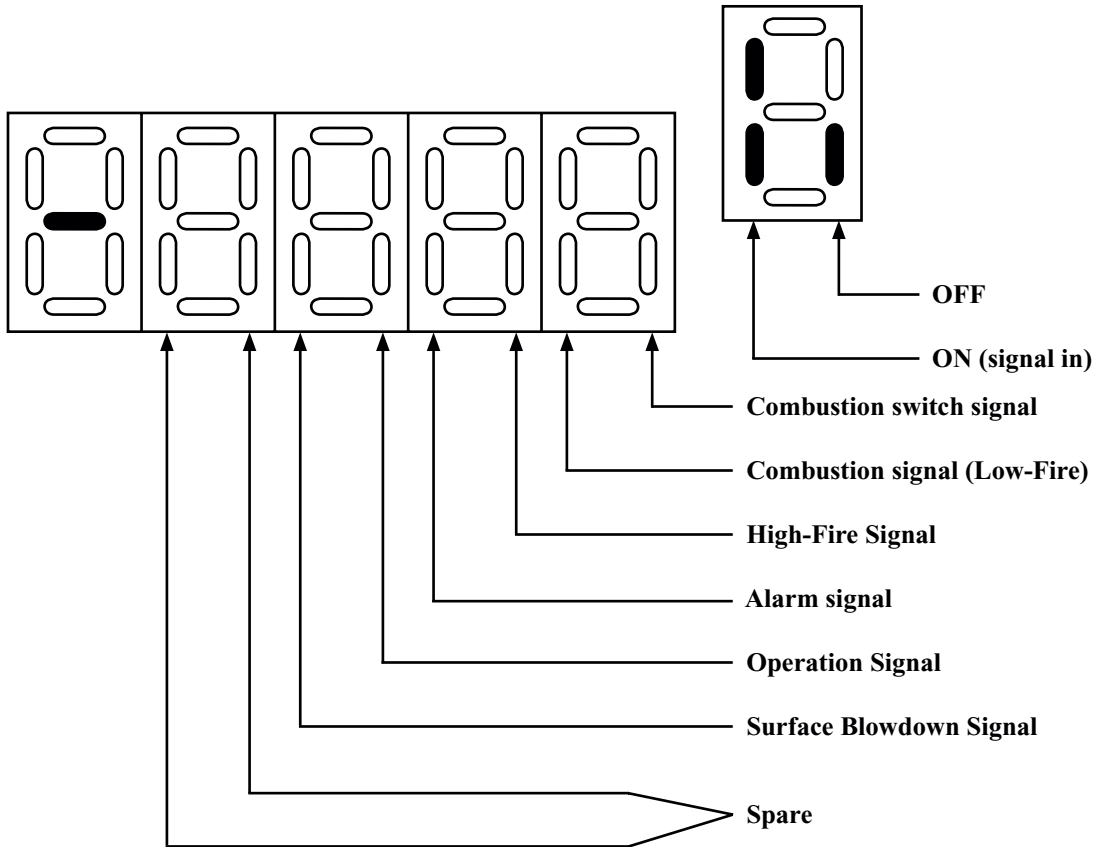
Each MT1-200 Boiler Control Terminal has a self-check feature. Depending on signal inputs to MT1-200. This self-check feature logic determines the ERROR CODE. The details of “ERROR CODE” (see 7.2.2 MT1-200 Normal Indication Contents and Options) are shown in the following list:

ERROR CODE	INPUT SIGNAL					BOILER OPERATING CONDITION	CAUSED BY (SIGNAL TO MT1-200)
	OPERATION SWITCH	COMBUSTION SWITCH	COMBUSTION (LOW-FIRE)	COMBUSTION (HIGH-FIRE)	SURFACE BLOWDOWN		
ERR 01	OFF	ON	OFF	OFF	OFF	Operation switch is OFF	Faulty operation switch
						Operation switch is ON	No operation switch signal
ERR 02	OFF	OFF	ON	OFF	OFF	Operation switch is OFF	Faulty combustion signal
						Low-Fire	No operation switch & combustion switch signal
ERR 03	OFF	ON	ON	OFF	OFF	Operation switch if OFF	Faulty operation switch signal & combustion signal
						Low-Fire	No operation switch signal
ERR 04	OFF	OFF	OFF	ON	OFF	Operation switch is OFF	Faulty High-Fire signal
ERR 05	OFF	ON	OFF	ON	OFF	Operation switch is OFF	Faulty operation switch signal & High-Fire signal-
						High-Fire	No operation switch & combustion switch signal
ERR 06	OFF	OFF	ON	ON	OFF	Operation switch if OFF	Faulty combustion & High-Fire signal
						High-Fire	No operation switch & no combustion switch signal
ERR 07	OFF	ON	ON	ON	OFF	High-Fire	No operation switch signal
ERR 06 ERR 20	ON	OFF	ON	OFF	OFF	Combustion switch OFF	Faulty combustion switch signal
						Low-Fire	No combustion signal
ERR 09 ERR 21	ON	OFF	OFF	ON		Combustion switch OFF	Faulty High-Fire signal
						High-Fire	No combustion switch & combustion signal
ERR 10 ERR 22	ON	ON	OFF	ON	OFF	Not in combustion	Faulty High-Fire signal
						High-fire	No combustion signal
ERR 11 ERR 23	ON	OFF	ON	ON	OFF	High-Fire	No combustion switch signal
						ON	
ERR 12	OFF	OFF	OFF	OFF	ON	Operation switch is OFF	Faulty surface blowdown signal
						Operation switch is ON	No operation switch signal
ERR 13	OFF	ON	OFF	OFF	ON	Combustion switch ON	No operation switch signal
ERR 14	OFF	OFF	ON	OFF	ON	Operation switch is OFF	Faulty combustion & surface blowdown signal
						Low-Fire	No operation switch & combustion switch signal
ERR 15	OFF	ON	ON	OFF	ON	Low-Fire	No operation switch signal
ERR 16	OFF	OFF	OFF	ON	ON	Operation switch is OFF	Faulty High-Fire & surface blowdown signal
ERR 17	OFF	ON	OFF	ON	ON	Operation switch is OFF	Faulty combustion switch, High-Fire & surface blowdown signal
						High-Fire	No operation switch & combustion switch signal
ERR 18	OFF	OFF	ON	ON	ON	Operation switch is OFF	Faulty operation, High-Fire & surface blowdown signal
						High-Fire	No operation switch & combustion switch signal
ERR 19	OFF	ON	ON	ON	ON	High-Fire	No operation switch signal

9.2 TROUBLE SHOOTING TIPS

9.2.1 Direct Input Monitor on MT1-200 Boiler Control Terminal

Press and hold "SELECT" switch on MT1-200 for 7 seconds, MT1-200 Boiler Control Terminal will show the following Direct input signals on the LED indicators.



Note: Input ON indicates 120VAC present at MT1-200 terminal connection

