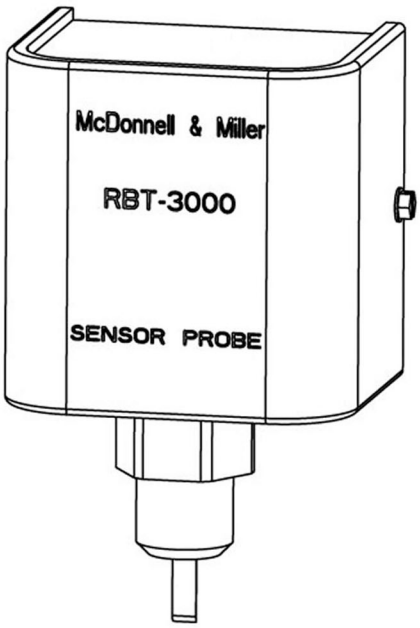
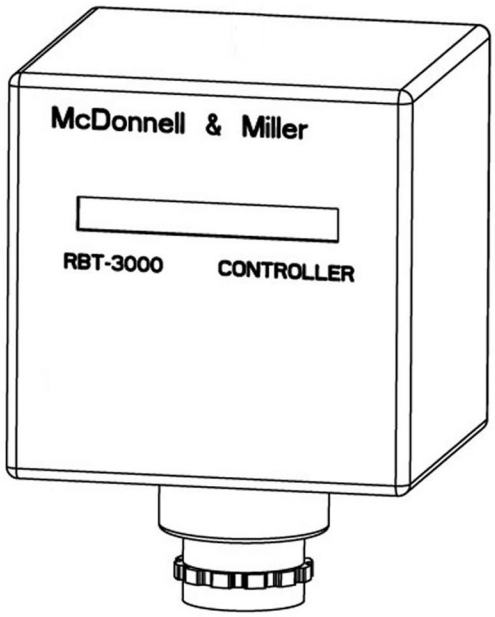
Installation,
Operation, and
Maintenance Manual





RBT-3000

McDonnell & Miller
a xylem brand

Table of Contents

Introduction and Safety

Introduction

Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance

CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

NOTICE:

Save this manual for future reference, and keep it readily available at the location of the unit.

Safety

WARNING:

- The operator must be aware of safety precautions to prevent physical injury.
- Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
- Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.
- This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
- Do not change the service application without the approval of an authorized Xylem representative.

CAUTION:

You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	• A potential situation which, if not avoided, could result in undesirable conditions • A practice not related to personal injury

Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol:

Electrical Hazard:

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

User safety

General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Hard hat
- Safety goggles, preferably with side shields

- Protective shoes
- Protective gloves
- Gas mask
- Hearing protection
- First-aid kit
- Safety devices

NOTICE:

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

Product warranty

Coverage

Xylem undertakes to remedy defects in products from Xylem under these conditions:

- The faults are due to defects in design, materials, or workmanship.
- The faults are reported to an local sales and service representative within the warranty period.
- The product is used only under the conditions described in this manual.
- The monitoring equipment incorporated in the product is correctly connected and in use.
- All service and repair work is done by Xylem authorized personnel.
- Genuine Xylem parts are used.
- Only Ex-approved spare parts and accessories authorized by an EX-approved Xylem representative are used in Ex-approved products.

Limitations

The warranty does not cover defects caused by these situations:

- Deficient maintenance
- Improper installation
- Modifications or changes to the product and installation made without consulting an Xylem authorized representative
- Incorrectly executed repair work
- Normal wear and tear

Xylem assumes no liability for these situations:

- Bodily injuries
- Material damages
- Economic losses

Warranty claim

Xylem products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, then contact your local sales and service representative.

Product Description

General description

Description

This control is a combination Low-water safety cut-off and fuel saving device for residential heating systems.

- The low water cut-off turns off the burner due to unsafe water loss from a broken or leaky radiator or pipe, or a cracked section in the boiler.
- The energy saving feature reduces fuel consumption, wear on boiler parts and burner emissions. The control actively manages the burner cycling along with the boiler operating control, to match boiler output to the required load. This control also indicates actual savings on a burner cycle by cycle basis and also indicates the averages of these cycles. All parameters are stored in non-volatile memory.

Control positioning

The unit can be mounted on the equipment vertically or horizontally. The vertical position is preferred for better readability.

- Mount the unit directly to an existing electric enclosure on the boiler via the unit's standard 1/2" electrical fitting.
- If no electrical enclosure is available to mount the control unit, one can be purchased at a local electrical supply distributor or as RBT-EC from a distributor where the RBT-3000 was purchased.

Operational specifications

Low-water cut-off ratings

For indoor use only

Maximum water pressure	160 psi (11 kg/cm^2)
Maximum water temperature	250ºF (121ºC)
Ambient temperature	32–120ºF (0–49ºC)
Humidity	85% non-condensing

Agency listings

Electrical specifications

Ratings

Power input	24, 115 VAC +10%/-15%, 3 watts maximum
Control circuit input	24, 115 VAC ± 10%, 0.1A maximum burden
Relay contact	7.4A @ 120 VAC
Low-water cut-off probe	Low voltage (24 VAC) conductance type

Installation

General guidelines

- The control is electrically installed in series, never in parallel, with the boiler operating control. Review wiring diagrams for proper application.
- The control must be wired before interlocks but after the operating control to ensure proper operation of the burner. This wiring eliminates alarms and faults that are caused by the control holding the burner off.
- Do not circumvent safety controls or circuits at any time.
- Check and determine the voltages of the burner control circuit before installation.

Recommended settings

Default settings

All of the default values have been carefully selected to result in the greatest savings for the broadest scope of heating system applications. Individual system requirements may require changes. Refer to the Programming Instructions MM-TM11-01 before programming.

- The default heating Low-Limit (HLOLIM) is set to 120˚F (49˚C), and is proper for Heating only Cold-Start boiler applications.
- If the boiler is also used to generate domestic hot-water, and the domestic water sensor is used; the default HLOLIM will automatically change to 145˚F (63˚C). The default Domestic Low-Limit (DLOLIM) value is 115˚F (46˚C).

Other recommendations

Other recommendations are as follows, and would require the programming of the control. Reference and understand the Programming Instructions in MM-TM11-01 which are found on the McDonnell & Miller website, before any reprogramming of the control.

- For Single Aquastats – HLOLIM should be set 15˚F (9˚C) below the aquastat setpoint minus the differential setting. (e.g. for an aquastat with a setpoint of 170˚F, with a 10˚F differential the HLOLIM setting should be: 170˚-10˚-15˚=145˚). The DLOLIM should be set to the minimum desired temperature of the Domestic Hot-Water (if Domestic sensor is used).
- For Dual or Triple Aquastats: The HLOLIM parameter should be set 5˚F (3˚C) below the setting of the “B” stat. The DLOLIM parameter should be set 20˚F (12˚C) below the setting of the “B” stat.
- For COLD-START boilers the HLOLIM should be set at 120˚F (49˚C).

Determine location for the probe control installation

DANGER:

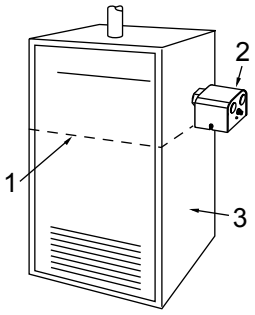
Electrical hazard sufficient to kill. Always disconnect and lock out the power before you service the unit.

NOTICE:

- Low water cut-off must be installed in series with all other limit and operating controls on the boiler. Check for proper operation of all of the limit and operating controls before leaving the site.
- All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of plumbing, steam and electrical equipment or systems in accordance with all applicable codes and regulations.

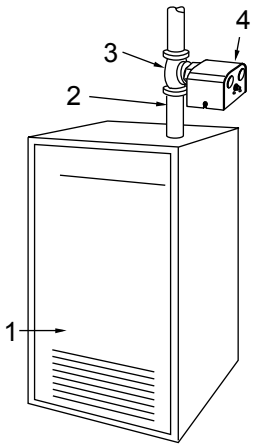
Use the following criteria to locate a suitable position to install the probe control.

- Install probe in a tapping on the boiler that is designated by the boiler manufacturer. Review boiler IOMs or contact manufacturer for location of tapping.
- If no tapping is provided on the boiler, install the probe control in a header or riser pipe above the boiler's safe water level. Review the following figures to determine a location for the probe control.



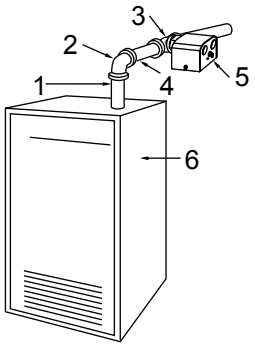
1. Minimum safe water level, may vary by boiler manufacturer.
2. Probe control
3. Hot water boiler

Figure 1: Horizontal in boiler side



1. Hot water boiler
2. Riser pipe
3. Tee fitting
4. Probe control

Figure 2: Horizontal in riser pipe



1. Riser pipe
2. Pipe elbow
3. Tee fitting
4. Header pipe
5. Probe control
6. Hot water boiler

Figure 3: Horizontal in header pipe

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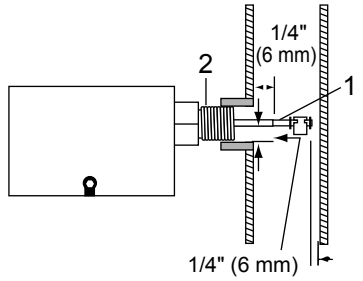
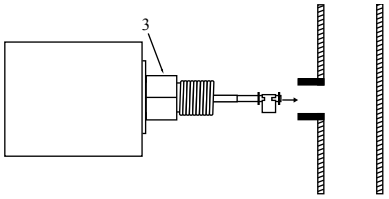
- Install probe control in a location above the minimum safe water level as designated by the boiler manufacturer.
- Installing the probe control in a location other than a tapping designated by the boiler manufacturer could result in nuisance shutdowns of the burner.
- There must be at least 1/4 in of clearance between the end of the probe and the wall of any piping or fitting.

Install the probe

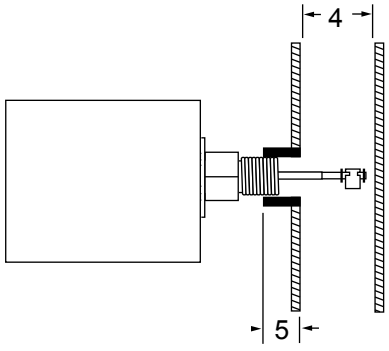
1. Apply pipe sealing compound on the probe threads (2).
   IMPORTANT: Do not use PTFE. Only use a pipe sealant.
2. Insert the probe (1) into the 3/4" NPT boiler tapping or tee fitting.



3. Tighten the brass hex adapter (3) with a 1 3/8" (35 mm) open end wrench to 47 ft·lb (64 N·m).
   IMPORTANT: Do not turn the housing cover to tighten the probe.



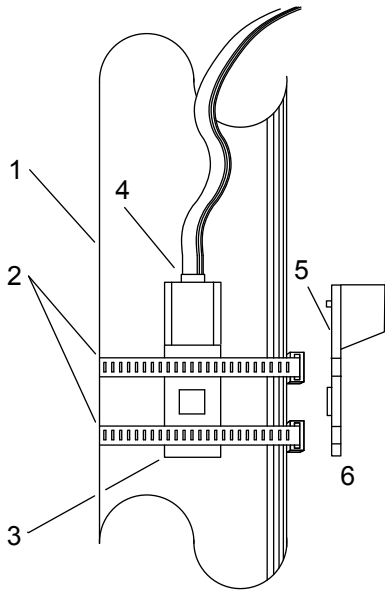
To prevent fire, there must be a 2" (51 mm) minimum width in the boiler section (4) and the 3/4" (20 mm) NPT coupling must be 1/2" (12.7 mm) in length (5).



Properly route and affix the wire from the LWCO probe back to the control. Plug the sensor probe wire into the jack marked LWCO probe, that is on the side of the control.

Install the temperature sensor

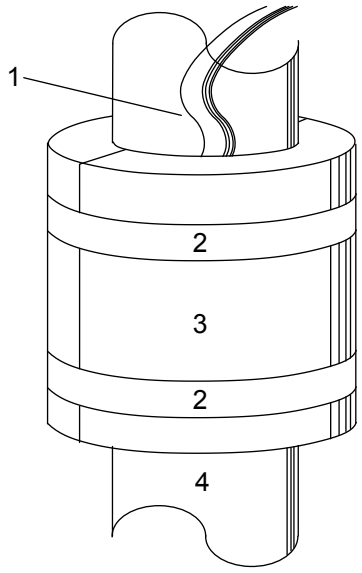
1. Mount the sensor on the boiler outflow pipe using tie-wraps or other secure method as close to the boiler as possible.
2. Route and affix the sensor wiring back to the control. Plug wire into the "heating water sensor" jack that is on the side of the control.



1. Temperature sensor
2. Tie-wraps
3. Outflow pipe
4. Cable plugs into the jack on the sensor
5. This side towards pipe
6. Side view

3. Make sure that the sensor makes good thermal contact with the pipe.
4. Cover the temperature sensor with a small piece of pipe insulation and secure in place.

   The shipping material that is used on the LWCO sensor is a good insulator and can be used for this purpose.



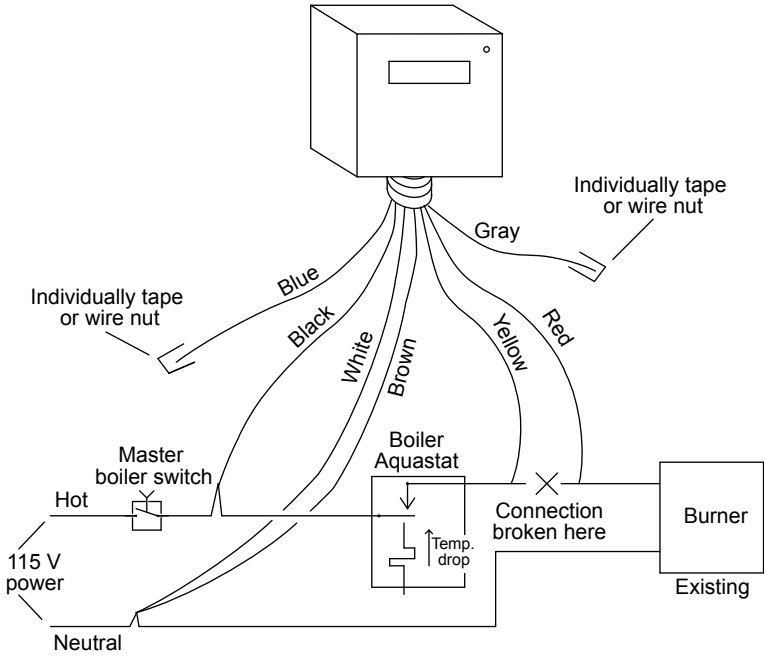
1. Temperature sensor wire
2. Tape
3. Insulation
4. Outflow pipe

If a sensor fails, the controller automatically goes into bypass mode and returns full control of the burner to the boiler operating-control. The power indicator blinks and the following message is displayed to identify the faulty sensor: “H SENSOR FAULT” and/or “D SENSOR FAULT”, “SYSTEM BYPASSED”

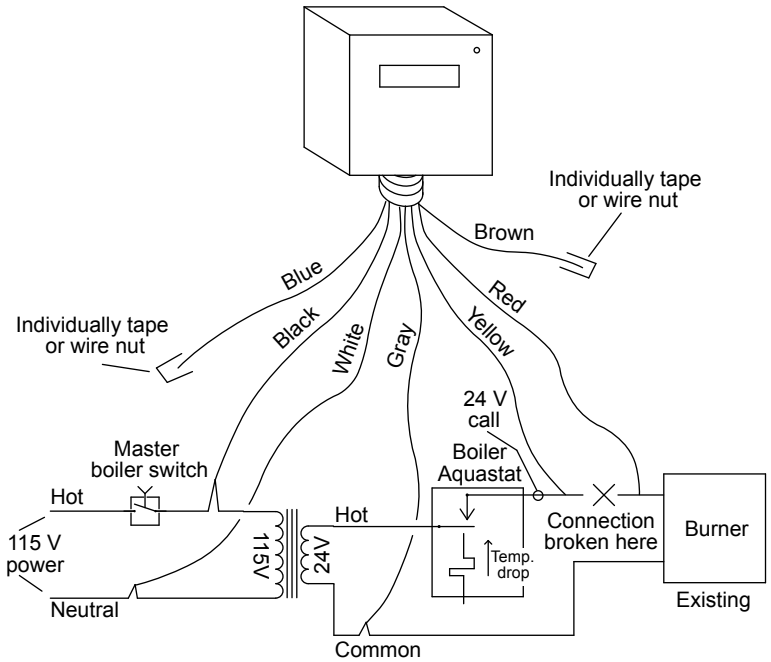
If this message appears, check and replace the faulty sensor.

Wiring diagrams

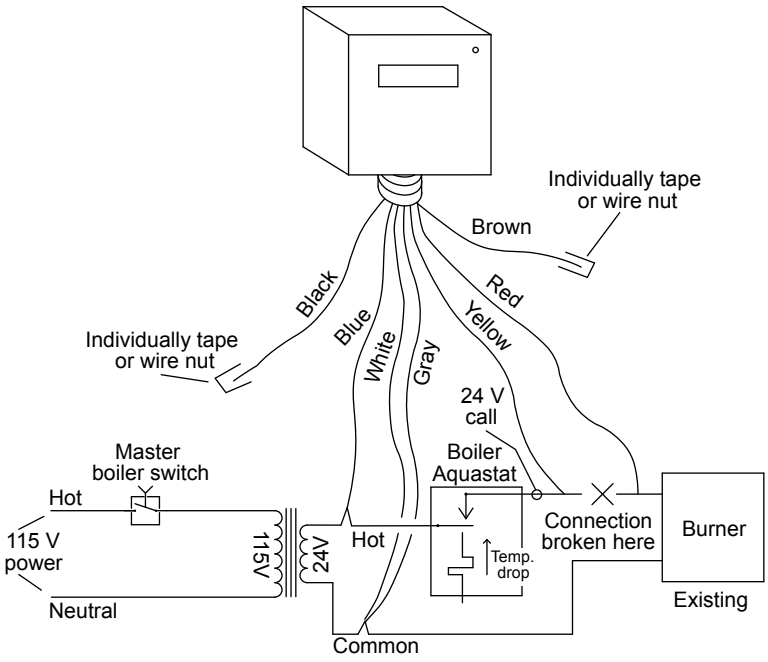
Typical 115 V power and control – boiler burner circuit



Typical 115 V power with 24 V control – boiler burner circuit



Typical 24 V power and control – boiler burner circuit



Wiring precautions

- The control has a multi-voltage capability and has separate common wires for the power and control circuits. It is necessary that these wires be connected to the appropriate commons for the circuit or the unit will not function properly.
- Unused wires must be separately taped.
- Improper voltage selection will damage the unit and void the warranty.

Final wiring check

1. Check wiring to make sure that the LWCO sensor and the temperature sensor are plugged into the correct connectors.
   a) The LWCO is always detected when it is plugged in.
   b) The temperature sensor is only detected when the Bypass-Reset / Normal switch is in normal position.
2. Set the controller switch to 'Bypass-Reset' and restore power to the system. After a brief electronics check, the control indicates a LWCO condition.
   a) 'Normal' is indicated and the power indicator is on steady when there is sufficient water in the system.
   b) A 'Low Water' indication is present and the power indicator is blinking when there is not sufficient water.
   c) When LWCO is anything but 'Normal', correct condition before proceeding.
   d) If all is well, place the controller switch in the 'Normal' position.
3. After a brief check of the electronics and display of the various parameters of the control, the sensor(s) will be detected and the 'Power' indicator light is on continuously.

   If the installed sensors are not detected, the energy saving part of the control will not function properly.

a) If the power indicator is blinking or the display does not verify that the sensors are installed properly and are plugged into the correct jacks, switch to 'Bypass-Reset' and after 5 seconds, switch back to normal.
b) Recheck that the installed sensors are indicating properly.
c) After sensor check, depending upon the temperature of the boiler water at power up, the controller will go into one of its various modes.

4. If the controller goes into 'Standby Mode', note the operating-control setting and force a burner call by temporarily adjusting the operator-control higher and verify the change of mode of the controller to the “Economizer Mode', 'Heating Mode' or 'Heating-LOLIM' Mode.
   a) If the controller went into the 'Economizer Mode', either wait for the water temperature to drop and for the controller to go into 'Heating Mode' or 'Heating/LOLIM', or by removing a temperature sensor plug, the controller will go into bypass mode, and the burner should fire shortly thereafter.
   b) If, after adjusting the operating-control, the controller went directly into 'Heating Mode' or 'Heating/LOLIM' the burner should fire shortly thereafter.
   c) The burner should run continuously until the call from the operating-control is satisfied. Once satisfied, the burner should stop firing and the controller should go into 'Standby Mode'.

The controller and burner, following the above sequence, indicates a properly wired and functioning control. Make sure that if the operating-control was previously adjusted that it is returned to its' previous setting.

- If the burner fires for a brief second then stops even though the operating-control is calling for the burner to run, it is likely caused by the Yellow and Red wires being reversed.
- If the controller does not come out of 'Standby Mode' when the boiler's operating-control is calling for the burner to run, the unit is wired incorrectly. The likely cause of this situation is either a reversed Yellow and Red wire or an improperly connected 'common' connection for the control circuit.

Commissioning, Startup, Operation, and Shutdown

Modes of operation

LCD display

Setting the switch on the control to the 'NORMAL' position activates the control. The LCD display indicates the various modes of operation, sensed temperatures, savings, and faults. The following table shows possible messages and their explanations.

Message	Explanation
STANDBY MODE	The boiler is operating under its own internal operating-control, which has turned off the burner. This mode occurs for a time after the burner has shut down.
ECONOMIZER MODE	The boiler operating-control has requested the burner to come on but the controller has sensed that there is available heat which can be used without burning fuel. The burner remains off and useful heat is delivered from the existing supply of residual heat in the boiler.
HEATING MODE	The controller has released the burner to fire.
HEATING / LO LIM	The controller has released the burner to fire due to a load condition that has caused the water temperature to go below the programmed low limits. This condition occurs occasionally. If this message appears frequently, the boiler operating-control should either be increased in 5°F (3°C) increments until the condition stops or the low limits need to be adjusted.

During normal operation, the above messages will be alternated with the following messages.

Message	Explanation
HEAT TEMP = xxx°F	The measure value of the boiler outflow water temperature is displayed in °F (may be programmed for °C).
DOM TEMP =xxx°F	This message only appears if the boiler supplies domestic hot water and the optional second sensor is installed. See sensor section of these instructions.
I SAVE = xx.x%	The calculated savings of the last complete burner cycle. The option to display this screen is programmable (Default = OFF). Note: If the value cannot be calculated, this item will not be displayed.
A SAVE = xx.x%	The calculated average savings of all valid burner cycles since commissioning of the controller. The option to display this screen is programmable (Default = ON). Note: The numeric value will not be displayed until a value that is greater than zero is calculated.
ET HRS = xxxxx.x	Total hours of economizer time (maximum 999,999.9 hours). The option to display this screen is programmable (Default = ON).
RT HOURS = xxxxx.x	Total hours of burner run-time (maximum = 999,999.9 hours). The option to display this screen is programmable (Default = ON).
LWCO: NORMAL	The low water cut-off safety circuit is sensing water in the system. The safety circuit will allow the burner to fire.
LWCO: LOW WATER	The low water cut-off safety circuit is not detecting sufficient water in the boiler and will not allow the burner to fire. Note: This message will supersede all other messages.

Maintenance

Periodic maintenance

Activate the test switch to verify proper operation of the low water cut-off circuit

1. Place the Bypass-Reset / Normal switch in the Bypass position.
2. Adjust the operating control on the boiler to cause the burner to fire.
3. Press and hold the test switch while the burner fires.
4. The LCD on the control changes from the Bypass message to an LWCO fault condition message and the burner stops firing.
5. If the burner fails to stop firing, a malfunction has occurred. Service must be called.
6. Release the test switch to allow the burner to refire. The indicator on the control changes back to the Bypass message.
7. Return the slide switch on the control back to the Normal position.

Boiler service or maintenance

- Override the energy saving function by placing the switch to the Bypass-Reset position. The Bypass-Reset position allows work on the system without interference from the energy saving function.
- The LWCO function is always operational and cannot be bypassed.

Troubleshooting

Fault codes

Fault	Solution
Power indicator on front panel blinks continuously	Fault has occurred. LCD indicator displays a message indicating the type of fault and, with the exception of a low water condition, that the controller has automatically placed itself into Bypass mode. With the exception of a low water condition, the boiler will be allowed to fire.
TIMER FAULT	Place in Bypass/Reset position and call for service.
STANDBY MODE and burner is running	Call for service.

Xylem |ˈzīləm|

1) The tissue in plants that brings water upward from the roots
2) A leading global water technology company

We're 12,500 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com

xylem
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Visit our Web site for the latest version of this document and more information

The original instruction is in English. All non-English instructions are translations of the original instruction.

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