McDonnell & Miller
a xylem brand

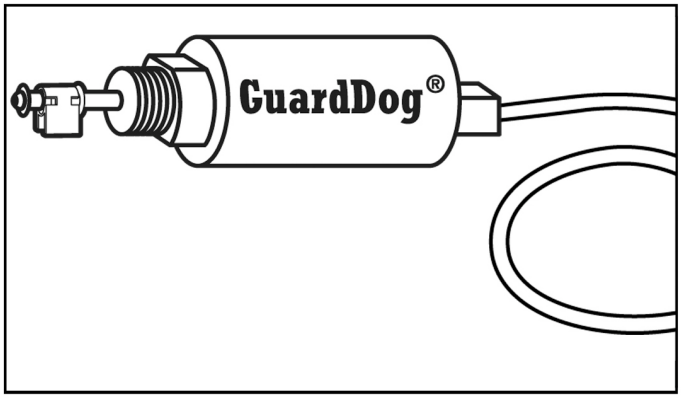
INSTRUCTION MANUAL
MM-228REVO

210318

Model RB-24E

Conductance Type Low Water Cut-Off

For Residential 24 VAC Hot Water Boilers



GUARDDOG®

c UL us LISTED

⚠ WARNING

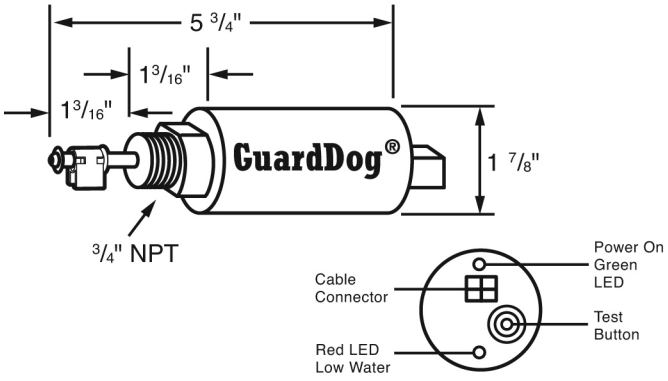
- **Before using this product read and understand instructions.**
- **Save these instructions for future reference.**
- **All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of plumbing, steam, hot water, and electrical equipment and/or systems in accordance with all applicable codes and ordinances.**
- **To prevent electrical shock, turn off the electrical power before making electrical connections.**
- **This low water cut-off must be installed in series with all other limit and operating controls installed on the boiler. After installation, check for proper operation of all of the limit and operating controls, before leaving the site.**
- **We recommend that secondary (redundant) Low Water Cut-Off controls be installed on all steam boilers with heat input greater than 400,000 BTU/hour or operating above 15 psi of steam pressure. At least two controls should be connected in series with the burner control circuit to provide safety redundancy protection should the boiler experience a low water condition. Moreover, at each annual outage, the low water cut-offs should be dismantled, inspected, cleaned, and checked for proper calibration and performance.**

Failure to follow this warning could cause property damage, personal injury or death.

OPERATION

The Model RB-24E Low Water Cut-Off is specifically designed to provide burner cut-off if there is an unsafe water loss, which can result from a broken or leaking radiator or pipe, or a cracked section in the boiler.

Water/glycol mixtures up to 50% concentration may be used.



SPECIFICATIONS

Temperature:
Storage: -40˚F to 120˚F (-40˚C to 49˚C)
Ambient: 32˚F to 120˚F (0˚C to 49˚C)
Humidity: 85% (non-condensing)
Maximum Water Pressure: 160 psi (11.2 kg/cm^2)
Maximum Water Temperature: 250˚F (121˚C)

Electrical Ratings

Voltage	Power Consumption	Switching Capacity
24 VAC	2.5 VA	2A at 24 VAC

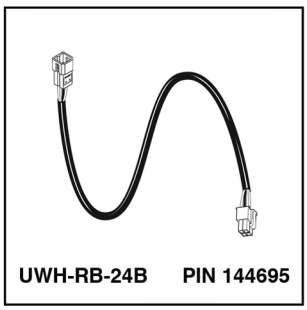
Enclosure Rating: NEMA 1 General Purpose

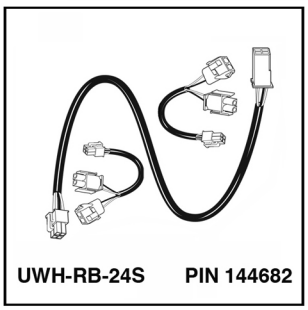
IMPORTANT: **Do not use Model RB-24 on steam boilers.**

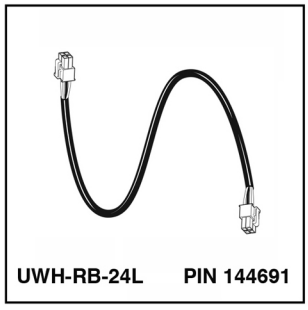
IMPORTANT: **Do not use on millivolt systems.**

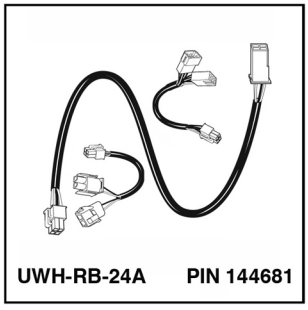
IMPORTANT: Before making any wiring connections to the boiler with the connector or 'Y' harnesses, You **MUST** wire the boiler per boiler manufacturer's recommendations and verify operation.

IMPORTANT: Universal wiring harness adaptors are now available for use with systems having modular plug-on burner controllers and vent dampers (sold separately).


UWH-RB-24B PIN 144695


UWH-RB-24S PIN 144682


UWH-RB-24L PIN 144691


UWH-RB-24A PIN 144681

The **UWH-RB-24B** is for use on hot water boilers that have a harness plug connection.

The **UWH-RB-24A** is for use on hot water boilers that have a vent damper.

The **UWH-RB-24S** is for use on hot water boilers that have a transformer plug connection on the aquastat.

The **UWH-RB-24L** is for use on hot water boilers that have a control panel connection.

INSTALLATION –

TOOLS NEEDED:
Pipe wrench or channel lock pliers.

STEP 1 - Determine Where to Install the Low Water Cut-Off

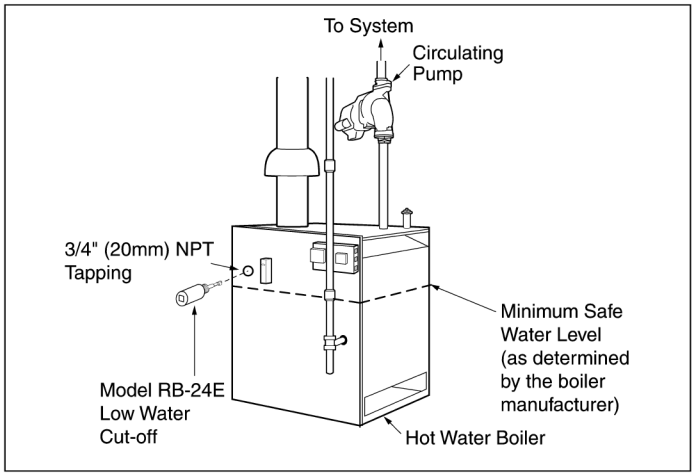
Determine where to install the probe control based on the following requirements:

a. If tappings are provided on the boiler, install the probe control in one that is above the minimum safe water level, as specified by the boiler manufacturer. If no specified minimum safe water level is designated, contact the boiler manufacturer.

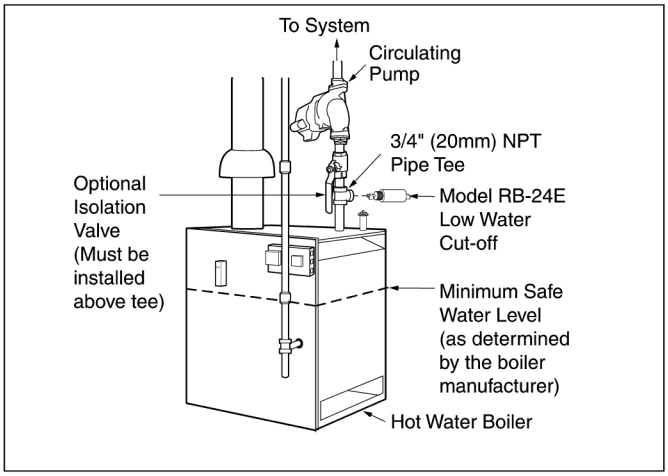
b. **If no tapping is provided** on the boiler, install the probe control in a header or riser pipe above the boiler. Refer to the Typical Installation Diagrams below.

TYPICAL INSTALLATIONS

On the Boiler (RECOMMENDED)



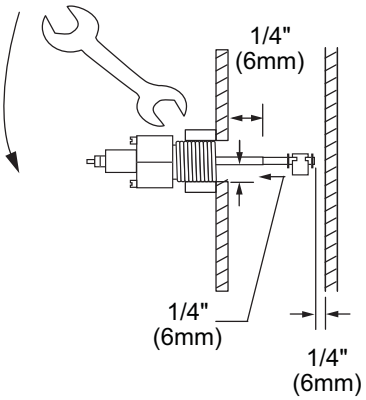
In a Pipe Tee Above the Boiler



For all Applications:

1. Make sure probe is installed above minimum safe water line as determined by the boiler manufacturer.

2. Make sure that ends and sides of the probe are at least 1/4" (6.4mm) from all internal metal surfaces.



STEP 2 - Electrical Wiring Options

⚠ WARNING

- **To prevent electrical shock, turn off the electrical power before making electrical connections.**
- **This low water cut-off must be installed in series with all other limit and operating controls installed on the boiler. After installation, check for proper operation of all of the limit and operating controls, before leaving the site.**

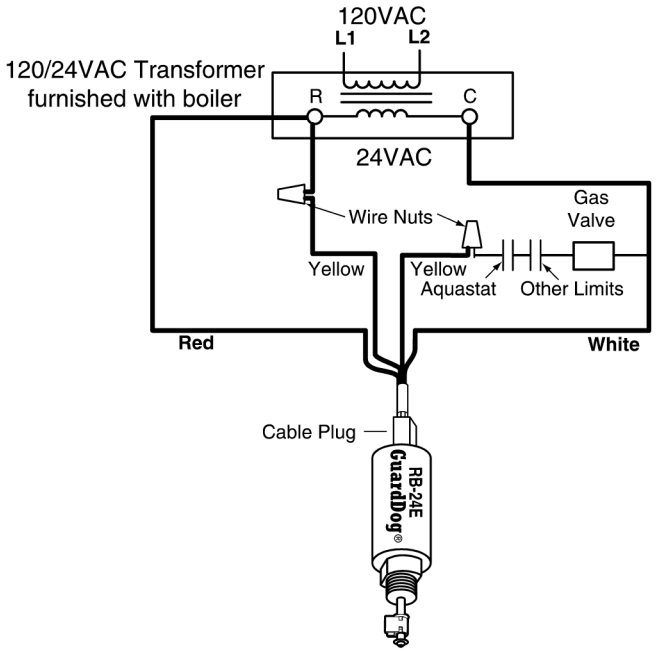
Failure to follow this warning could cause property damage, personal injury or death.

IMPORTANT: Boiler manufacturer schematics should always be followed. In the event the boiler manufacturer's schematic does not exist or is not available from the boiler manufacturer, refer to the schematics provided in this document.

Option 1

For hot water boilers which utilize a simple series circuit to operate the boiler, the RB-24E can be wired as shown.

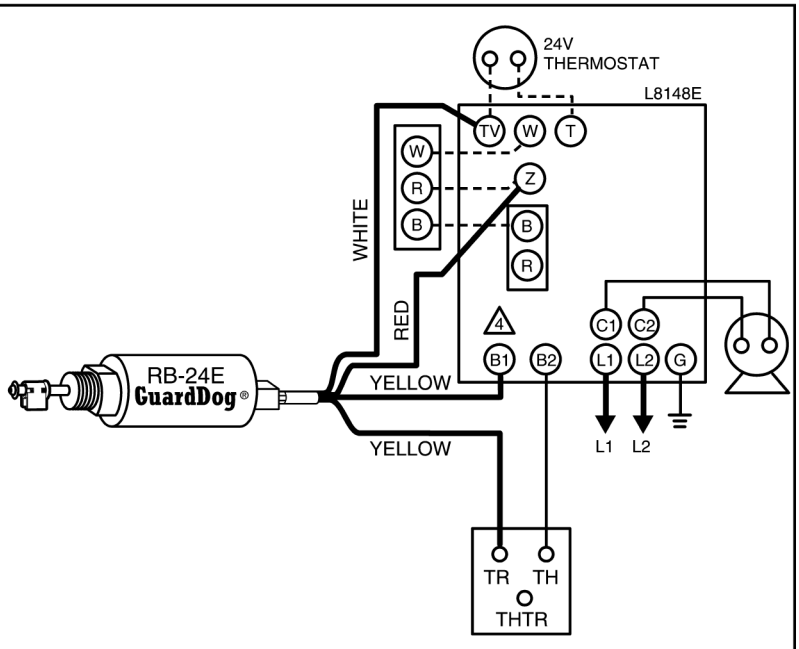
- Connect the **red** wire to the hot side (Terminal “R”) of the (24V) transformer on the boiler.
- Connect the **white** wire to the neutral side (Terminal “C”) of the (24V) transformer on the boiler.
- Connect one yellow wire to Terminal “R”.
- Connect the other yellow wire in series with all other limit and operating controls.



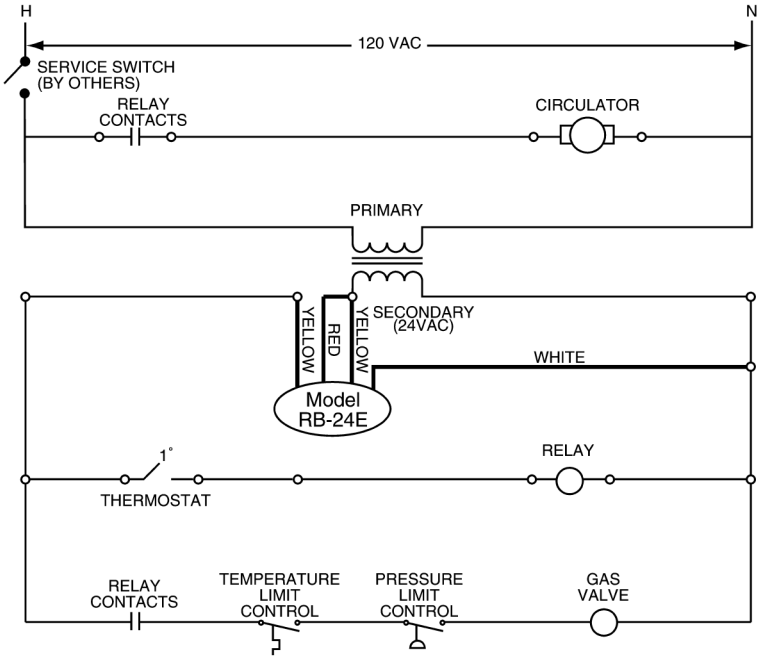
Option 2

For hot water boilers that utilize an aquastat relay to control the burner and circulator circuits. To wire a boiler of this type, the Model RB-24E should be wired in series with the gas valve as shown.

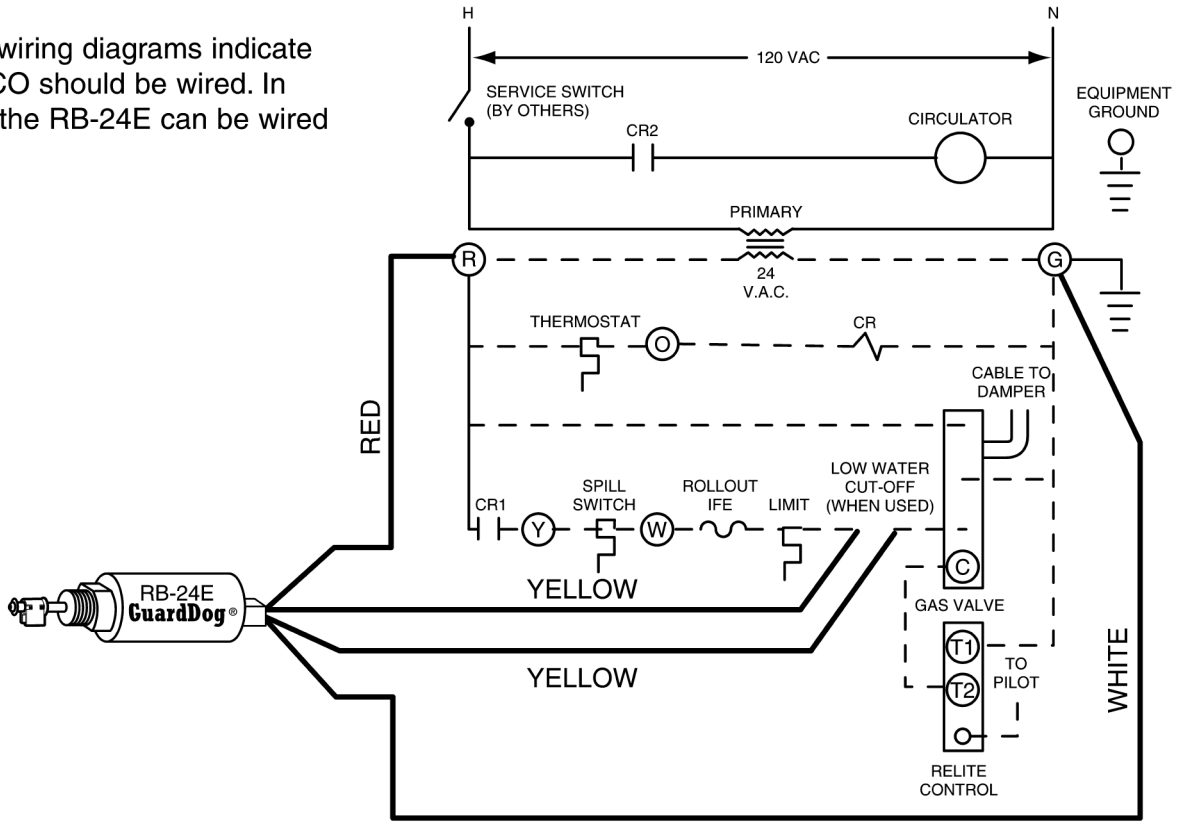
NOTE: The example shows wiring an RB-24E to a Honeywell Model L8148E aquastat. For other manufacturers, refer to the electrical schematic to confirm appropriate connections for obtaining 24 VAC power and wiring in limit circuit.
Diagram at right assumes "Z" is the hot side and "TV" is the neutral or grounded side of the transformer.



Option 3
Certain types of boilers may utilize a relay or series of relays to control the burner and circulator circuits. To wire into a boiler of this type, the Model RB-24E can be wired as shown.



Option 4
Some boiler wiring diagrams indicate where a LWCO should be wired. In this diagram the RB-24E can be wired as shown.

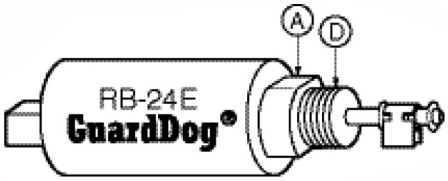


STEP 3 - Installing the Low Water Cut-Off

a. **Sparingly,** apply pipe sealant to the external threads (D) of the probe(A).

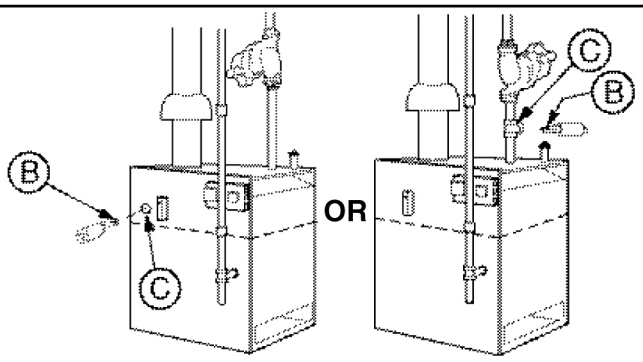
⚠ WARNING

Do not use PTFE tape. Only use pipe sealant. Failure to follow these instructions will cause the probe not to function as intended and could cause property damage, personal injury or death.

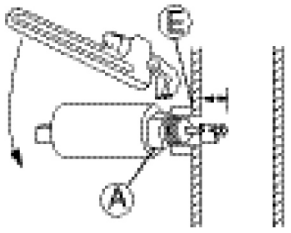


b. Insert the probe portion (B) of the low water cut-off into the ¾" (20mm) NPT tapping (C) on the boiler **OR** into a ¾" (20mm) NPT pipe or reducing tee (D) above the boiler. Do not cross thread the low water cut-off.

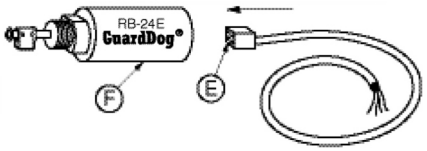
Fully **hand tighten** the low water cut-off (approximately 4 revolutions) to approximately 6 ft•lb (8 N•m).



c. Using a wrench, tighten the unit (A) into the tapped connection (E) that was determined in Step 1 of these instructions. Tighten to 47 ft•lb (64 N•m).

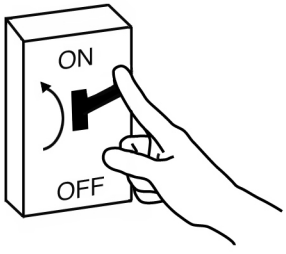


d. Install the plug end of the cable (E) into the low water cut-off (F).



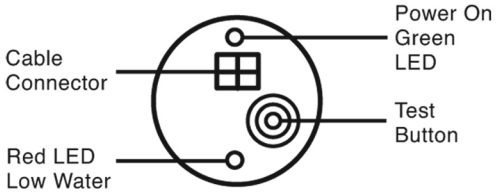
STEP 4 - Testing

a. **Before filling the system,** turn on the electric power to the boiler. The low water cut-off's green "Power On" LED should be illuminated. With the room thermostat set on "heat," confirm that the burner **will not** operate without water in the system. The low water cut-off's red LED should be illuminated.
NOTE: The burner will come on briefly (1 second or less) and then shut off to verify proper operation.



b. Fill the system with water. When water is just above the probe, the low water cut-off's red LED should turn off.

c. Check and confirm that the boiler's thermostat, burner and safety limits are operating properly after filling system and before leaving the site.



d. Check the threaded connection of the low water cut-off for leakage. Tighten, if necessary.

Testing Control Using “Test Button”

Pressing the “Test Button” interrupts the probe circuit which simulates water off the probe.

a. Press and hold “test button” while burner is running.

b. The burner should turn OFF and red light turn ON if burner is wired correctly.

c. Release the test button and the red light should turn off and the boiler should turn on provided that the boiler water in contact with the probe.

INSTALLATION COMPLETE

TROUBLESHOOTING:

If control fails to operate, perform the following diagnostic checks.

1. Check to be sure that the water level in the boiler is at or above the level of the probe.
2. Re-check all wiring to ensure proper connections as specified in boiler manufacturers wiring diagrams.
3. Check to ensure that PTFE tape has not been used on the threaded connection of the probe to the boiler.
4. Check the quality of the boiler water to ensure adequate conductance.

Boiler Does Not Turn Off (when water is below probe)

- Turn off boiler and check boiler wiring connections.
- Turn off boiler, drain boiler and remove control to check if the tip of the probe is touching a metal surface.

Boiler Does Not Turn ON

- Make sure water is above the level of the probe.
- Make sure probe is installed in a location where an air pocket cannot develop.
- Check boiler wiring connections.

Boiler Does Not Turn ON and RB-24E Red LED blinking

- Problem is wrong transformer ‘Y’ harness.
- Turn off boiler and install correct transformer ‘Y’ harness.

MAINTENANCE

SCHEDULE:

• Test the low water cut-off annually or more frequently.
• Remove and inspect the self-cleaning probe every 5 years.
• Replace the low water cut-off every 15 years.

NOTE
Clean probe by wiping with non-abrasive cloth and rinsing with clean water. DO NOT use sharp instruments to remove any accumulations of rust or scale.

⚠ CAUTION
Replace Probe if: **• PTFE insulator is cracked or worn.** **• Probe is loose.** **Failure to follow this caution could cause property damage, personal injury or death.**

COMMERCIAL WARRANTY

Warranty. For goods sold to commercial buyers, Seller warrants the goods sold to Buyer hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be (i) be built in accordance with the specifications referred to in the quotation or sales form, if such specifications are expressly made a part of this Agreement, and (ii) free from defects in material and workmanship for a period of one (1) year from the date of installation or two (2) years from the date of manufacture, whichever shall occur first, unless a longer period is specified in the product documentation (the "Warranty").

Except as otherwise required by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty provided Buyer gives written notice to Seller of any defects in material or workmanship within ten (10) days of the date when any defects or non-conformance are first manifest. Under either repair or replacement option, Seller shall not be obligated to remove or pay for the removal of the defective product or install or pay for the installation of the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have sole discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall terminate Seller's obligations under this Warranty and render the Warranty void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that have been: (a) repaired by third parties other than Seller or without Seller's written approval; (b) subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) damaged from ordinary wear and tear, corrosion, or chemical attack; (e) damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) damaged due to a defective power supply or improper electrical protection; or (g) damaged resulting from the use of accessory equipment not sold or approved by Seller. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO THE GOODS PROVIDED HEREUNDER, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. EXCEPT AS OTHERWISE REQUIRED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER FOR THE DEFECTIVE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

LIMITED CONSUMER WARRANTY

Warranty. For goods sold for personal, family or household purposes, Seller warrants the goods purchased hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be free from defects in material and workmanship for a period of one (1) year from the date of installation or two (2) years from the product date code, whichever shall occur first, unless a longer period is provided by law or is specified in the product documentation (the "Warranty").

Except as otherwise required by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty provided Buyer gives written notice to Seller of any defects in material or workmanship within ten (10) days of the date when any defects or non-conformance are first manifest. Under either repair or replacement option, Seller shall not be obligated to remove or pay for the removal of the defective product or install or pay for the installation of the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have sole discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall terminate Seller's obligations under this Warranty and render this Warranty void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. The Warranty is conditioned on Buyer giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest.

Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that have been: (a) repaired by third parties other than Seller or without Seller's written approval; (b) subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) damaged from ordinary wear and tear, corrosion, or chemical attack; (e) damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) damaged due to a defective power supply or improper electrical protection; or (g) damaged resulting from the use of accessory equipment not sold or approved by Seller. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS PROVIDED IN PLACE OF ALL OTHER EXPRESS WARRANTIES. ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO ONE (1) YEAR FROM THE DATE OF INSTALLATION OR TWO (2) YEARS FROM THE PRODUCT DATE CODE, WHICHEVER SHALL OCCUR FIRST. EXCEPT AS OTHERWISE REQUIRED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER FOR THE DEFECTIVE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

To make a warranty claim, check first with the dealer from whom you purchased the product or call +1-847-966-3700 for the name and location of the nearest dealer providing warranty service.

xylem
Let's Solve Water

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, Illinois 60053
Phone: (847) 966-3700
Fax: (847) 965-8379
www.mcdonnellmiller.com