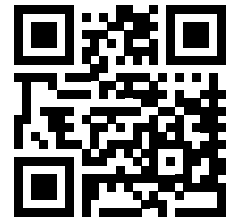




FPCe-1000 LWCO with Bluetooth Interface Module



1 FPC-1000 LWCO Base Unit

1.1 Introduction and Safety

1.1.1 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.

1.1.2 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 and its surroundings
- 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:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, as shown in the following table.

Electrical hazard	Magnetic fields hazard
 Electrical Hazard:	 CAUTION:

1.1.3 Safety



WARNING:

- The operator must be aware of safety precautions to prevent physical injury.
- 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.
- 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.



WARNING:

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 opening 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 cutoffs should be dismantled, inspected, cleaned, and checked for proper calibrations and performance.

1.1.4 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.

1.2 Product Description

1.2.1 General description

Description
 The product is a Field Configurable Control. The control unit has a Red LED light to alert personnel to a low water condition and a Green/Yellow (Auto/Manual) LED to indicate control mode. At power up, all LEDs will be blinking 4 times to indicate Hot-Water boiler type or blinking 6 times to indicate Steam boiler type.



WARNING:

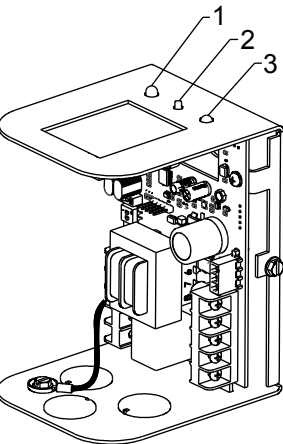
This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.

Lockout delay
 For manual reset units, when a low water condition occurs, the burner turns off and the Red LED begins to blink. When the water level is not restored to a level above the probe within 30 seconds, the control locks out. To reset control, press the Test/Reset button when the water level is restored to a level above the probe.

Power interruption Auto Mode
 The control will automatically reset after a loss of power as long as there is water on the probe before and after the power loss occurred.

CSD-1 code compliance
 For manual reset units, when the control is in a low water condition and there is an interruption of power the control remains in that condition when power is restored. Press the Test/Reset button when the water level is restored to a level above the probe.

NOTICE:
 Flood hazard. Do not use manual reset models with automatic water feeders.



1. Power on LED, Green (Auto)/Yellow (Manual)
2. Test/Reset/Configuration button
3. Low water LED, Red

Figure 1: Control unit

1.2.2 Operational specifications

Control unit ratings

Storage temperature	-40°F to 135°F (-40°C to 57°C) -40°F to 120°F (-40°C to 49°C)
Ambient temperature	32°F to 120°F (0°C to 49°C)
Humidity	85% non-condensing

Operation Specifications

Boiler type	Hot Water		Steam	
Control mode	Manual	Auto	Manual	Auto
Product configuration mode	Manual-Hot Water	Auto-Hot Water	Manual-Steam	Auto-Steam
Probe sensitivity	~20 K Ohm	~20 K Ohm	~7.5 K Ohm	~7.5 K Ohm
DOM	~3 sec	~3 sec	~3 sec	~30 sec (see Note)
DOB	~5 sec	~5 sec	~5 sec	~5 sec
Foam detection	NA	NA	NA	YES

Note: For Bluetooth model, DOM (15/30/45/60 seconds) time for Steam-Auto mode can be configured through Mobile App.

Probe specifications
 Maximum water pressure: 160 psi (11.2 kg/cm²)
 Maximum steam pressure: 15 psi (1.0 kg/cm²)

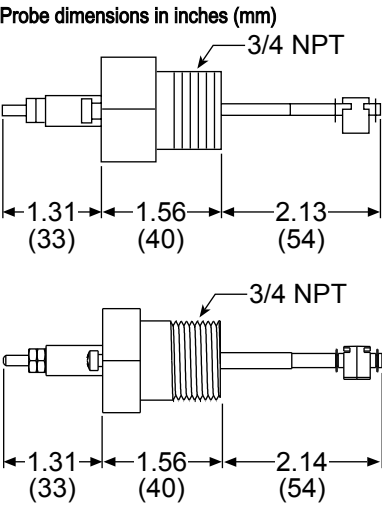


Figure 2: Standard probe (PA-800)

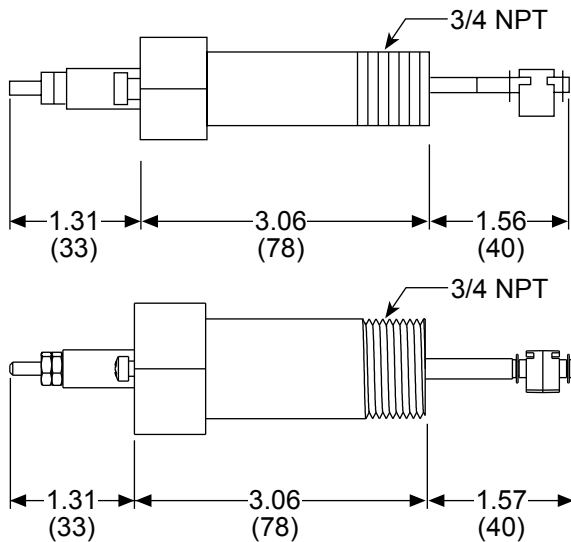


Figure 3: "U" probe (PA-800-U)

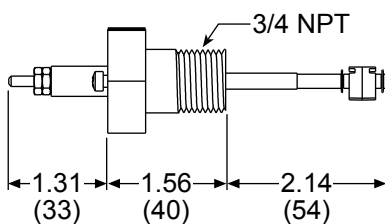


Figure 4: RX2 probe (PA-800-RX2)

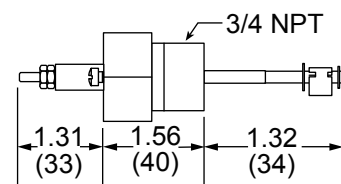


Figure 5: Short probe (PA-RB-122)

1.2.3 Electrical specifications

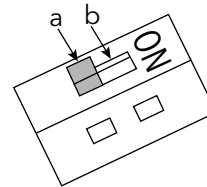
Table 1: Electrical ratings

Model	Control voltage	Motor switch rating		Pilot duty
		Full load	Locked rotor	
FPC-1000	24 VAC	N/A	N/A	50 VA
FPC-1000-P	120 VAC	7.5 FLA	43.2 LRA	125 VA at 120 VAC or 240 VAC, 50 Hz or 60 Hz
FPC-1000-U				
FPC-1000-RX2	240 VAC	3.75 FLA	21.6 LRA	
FPC-1000-SP				

Hz	Control power consumption	Electrical enclosure rating
50/60	3 VA maximum	NEMA 1 general purpose

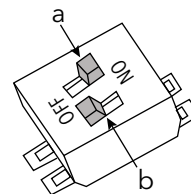
1.2.4 Device configuration

1. Turn on the FPC-1000.
2. The device must be in the Default mode indicated by the Green, Yellow and Red LEDs blinking alternately.
3. Set the SW3 DIP switch which is an SPST DIP switch for Hot Water/Steam selection. Slide the switch to the desired position (Water/Steam) per the labels marked on the PCB. See the picture below of the SW3 switch to configure device in Hot-Water mode.



- a. Water
- b. Steam

4. Set the SW4 DIP switch which is a dual DPDT DIP switch for Auto and Manual selection. Slide the switch to the ON position for selection of desired boiler type control mode (Auto/Manual) and other switch to OFF position per the labels marked on the PCB. See the picture below of the SW4 to configure device in Auto control mode.



- a. Auto
- b. Manual

5. After setting SW3 and SW4 DIP switches, Green or Yellow LED will be blink as per Auto or Manual control selection respectively. If switch position of any DIP switches is not set appropriately, both Green and Yellow LEDs will blink alternate (@1 Second rate).
6. After configuring the DIP switches, press and hold the Test/Reset button for 30 seconds. LED will blink for 20 seconds (@500ms rate) and will blink for 10 seconds (@250ms rate).
7. Once the Red LED and Green/Yellow (Auto/Manual) LEDs are solid on, release the Test/Reset button.
8. The device will reset and restart after releasing the Test/Reset button.
9. On device reset or power on, the LEDs will blink as in the following table for each device configuration mode:

Table 2: Configuration and operation control

Boiler Type	Hot Water		Steam	
	Manual	Auto	Manual	Auto
Status LED (Power-On Condition)	Yellow LED (4 times blinking)	Green LED (4 times blinking)	Yellow LED (6 times blinking)	Green LED (6 times blinking)
LWCO Condition	Red LED	Red LED	Red LED	Red LED

NOTE: The above configuration is only for one time setup and cannot be re-configured to different boiler type and/or control mode after the first setup.

NOTE: Product configuration can be indicated by the status LEDs and should be inspected by an operator:

- GREEN/YELLOW (AUTO/MANUAL) LED blinks 4 times @500 ms rate during power-on condition for HOT-WATER boiler application.
- GREEN/YELLOW (AUTO/MANUAL) LED blinks 6 times @500 ms rate during power-on condition for STEAM boiler application.

After the product is configured, the product label should be updated/marked up by the operator.

NOTE: If the control is in low water condition when the power to the unit is interrupted in manual control mode, the operator must press the Test/Reset button to reset the unit when the power is restored and the water level is again above the level of the probe.

1.3 Installation

1.3.1 Determine location for the probe installation



DANGER:

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

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.

1.3.2 Where to install

Based on the following criteria locate a suitable position for the probe (A):

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" (6.4 mm) from all internal metal surfaces. See "A" in Figure 7 on page 4
3. Make sure the probe is positioned to shut off the boiler before the water level falls below the lowest visible part of the gauge glass.

For Steam Boilers:

1. Refer to boiler manufactures instructions to determine suitable tapping for the probe.

For Hot Water Boilers:

1. Refer to boiler manufacturers instructions to determine suitable tapping for the probe.
2. Locate probe in supply piping using a tee fitting.

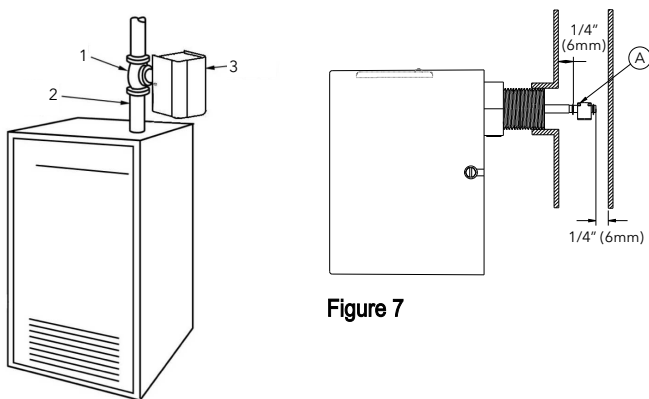
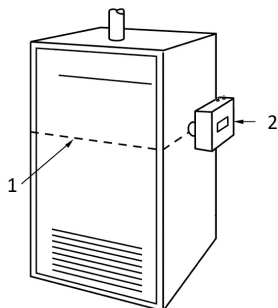


Figure 7

1. Tee Fitting
2. Riser Pipe
3. Probe Control

Figure 6: Hot water boilers



1. Minimum Safe Water Level (May vary by boiler manufacturer)
2. Probe Control

Figure 8: Hot or steam boilers

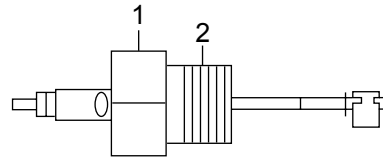
1.3.3 Install the probe

1. Apply a small amount of pipe sealant to the external threads (2) of the probe (1).



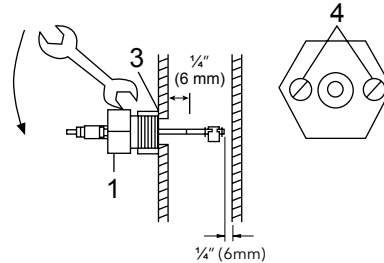
WARNING:

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.



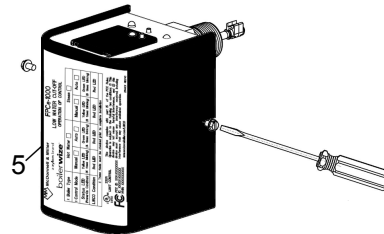
2. Tighten the probe (1) into the tapped connection (3).

Be sure to align the probe so that the mounting screws (4) are in a horizontal position.

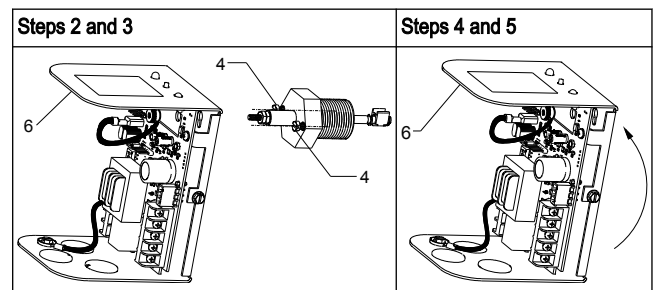


1.3.4 Install the control housing

1. Loosen the screws that secure the cover (5) to the control housing about 1-1/2 turns. Remove cover.

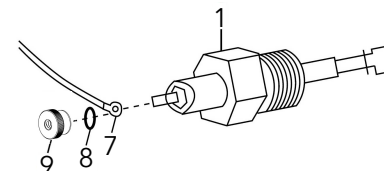


2. Loosen the probe mounting screws.
3. Slip the control housing (6) over the two screws at a 20° angle.
4. Rotate the control housing (6) 20° counter-clockwise so that the slots in the control base are under the screws heads.
5. Tighten the mounting screws.

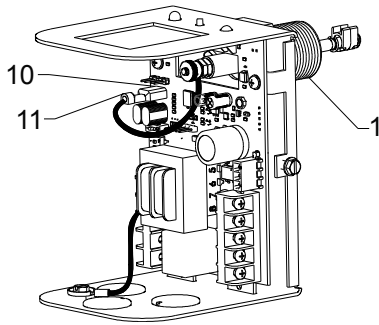


1.3.5 Wire the probe to the control housing

1. Slip the ring terminal (7) followed by the lock washer (8) over the threaded end of the probe (1).
2. Tighten the wingnut (9) onto the probe (5 inch-lbs minimum).



3. Connect the probe (1) to the wiring circuit by sliding the female quick-connect terminal of the probe wire (10) onto the male spade terminal (11). The male spade terminal is marked PROBE.



1.3.6 Electrical conduit connections



WARNING:

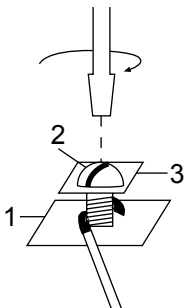
- Fire hazard. Electrical wiring must have a rating of 167°F (75°C) if the liquid exceeds 180°F (82°C).
- When installing factory jumper bar make sure you are not introducing a second voltage source into the burner circuit and thereby bypassing other safety, limit, and operating controls.

- Connect electric conduit using knockouts provided.
- Follow accepted electrical practices for installation of fittings and connections.
- Refer to and follow local codes and standards when selecting the types of electrical fittings and conduit.

1.3.7 Wire connections to the terminal block

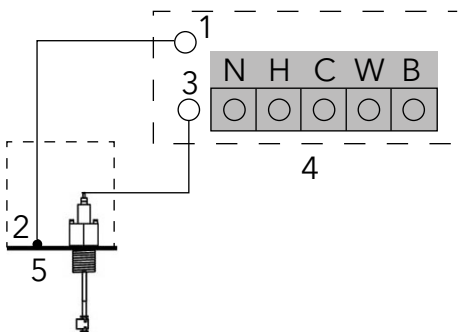
Use the following instructions for all wire connections to the terminal block.

1. Strip about 1/3" (8.5 mm) of insulation from the wire.
2. Loosen the terminal screw (2) but do not remove it.
3. Move the wire clamping plate (3) back until the plate touches the back side of the screw head.
4. Insert the stripped end of the wire between the terminal block (1) and the wire clamping plate (3).
5. Tighten the terminal screw (2).



1.3.8 Remote sensor wiring

1. Connect ground wire from remote sensor green ground screw to GROUND terminal on FPC-1000 PCB.
2. Connect probe wire from probe end to PROBE terminal on FPC-1000 PCB.



1. GROUND terminal on PCB
2. Chassis ground screw
3. PROBE terminal on PCB
4. FPC-1000
5. Remote sensor

Wiring Diagram Legend

- Solid black lines indicate action to be taken in step shown.
- Dotted black lines indicate internal wiring.

NOTE: Probe wires should be minimum 18 AWG stranded with glass braided Silicone jacket (UL 3071) suit able for high temperature 392°F (200°C) service.

1.3.9 Control wiring



WARNING:

Electrical connections are to be made by a qualified electrician in accordance with all applicable codes, ordinance and good practices.



WARNING:

The probe wire must be connected to the terminal connection marked with "PROBE" from PCB and ground wire must be connected to the terminal connection marked with "GND" from PCB.

NOTICE:

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

Table 3: Power supply schemes

Terminal designation and abbreviation		Terminal of TB2	Terminal of TB1
Hot	H	24 VAC - H	120 VAC - H
Neutral	N	24 VAC - N	120 VAC - N
Common	C	C	C
Water	W	W	W
Burner	B	B	B

NOTE: Never supply two different voltages to TB1 and TB2 at the same time. Only one supplied voltage, either 120 VAC or 24 VAC to be applied to TB1 or TB2, respectively.

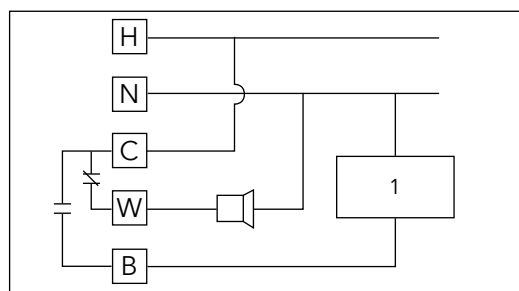
NOTE: A loose factory jumper bar is included in the product box.

NOTE: For 120 VAC, Connect terminal H and terminal C using jumper bar for TB1 OR For 24 VAC, Connect terminal H and terminal C using jumper bar for TB2.

WARNING: Never connect terminal H and terminal C of both TB1 & TB2 at the same time using the jumper bar to avoid damaging the control.

Control Wiring Schemes: Same voltage for control and burner circuit

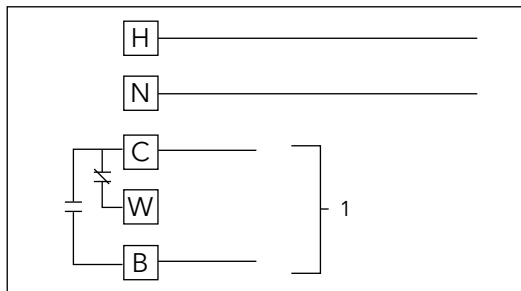
- Connect hot wire to Terminal H.
- Connect neutral wire to Terminal N.
- Connect factory jumper bar from terminal H to Terminal C.
- Connect a wire from Terminal B to the next safety device of the Burner's safety circuit, such as thermostat, gas valve, limits, etc.
- Connect wire from end of Burner circuit to Terminal N.



1. Burner limit control

Control Wiring Schemes: Different voltage for control and Burner circuit

- Connect hot wire to Terminal H.
- Connect neutral wire to Terminal N.
- Connect hot wire from the separate power supply to Terminal C.
- Connect a wire from Terminal B to the next safety device in the circuit.
- Connect black wire from probe end to Terminal.

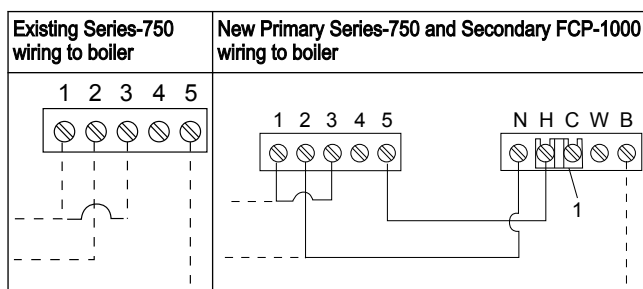


1. Wired in series as a part of burner control

Control wiring: FPC-1000 can be used as primary and secondary with the same supply voltage

Series 750 as primary and FPC-1000 as secondary

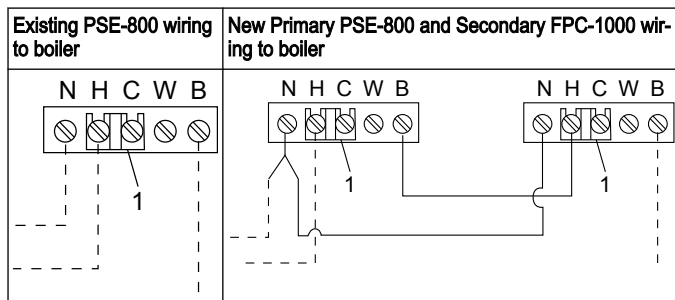
- Remove existing wire from terminal 5 of existing Auto Reset LWCO and connect to terminal B of new Manual Reset LWCO.
- Connect new wire from terminal 5 of existing Auto Reset LWCO to terminal H of new Manual Reset LWCO.
- Connect new wire from terminal 2 of existing Auto Reset LWCO to terminal N of new Manual Reset LWCO.



Series PSE-800 as primary and FPC-1000 as secondary

- Remove existing wire from terminal B of existing Auto Reset LWCO and connect to terminal B of new Manual Reset LWCO.
- Connect new wire from terminal B of existing Auto Reset LWCO to terminal H of new Manual Reset LWCO.
- Connect new wire from terminal N of existing Auto Reset LWCO to terminal N of new Manual Reset LWCO.

NOTE: Terminals 1 and 2 and Terminals N and H must be at the same voltage. Either 24 VAC supplied for TB2 or 120 VAC supplied for TB1 of the FPC-1000.



1. Factory jumper bar

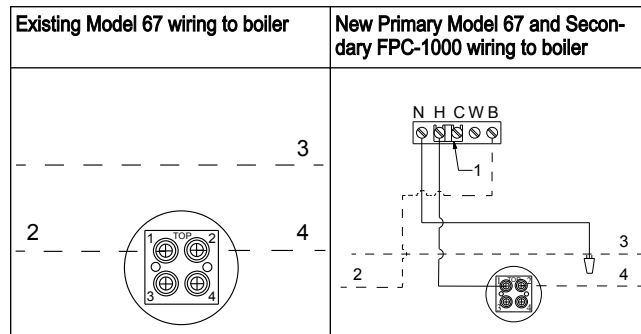
---- Dashed lines indicate existing wires.

— Solid lines indicate new wires.

NOTE: All N and H terminals must be at the same voltage. Either 24 VAC supplied for TB2 or 120 VAC supplied for TB1 of the FPC-1000.

Control wiring with secondary: Wiring a new manual reset LWCO to a boiler with a Model 67 LWCO. Voltage of the new manual reset LWCO must be the same voltage as the burner circuit

- Remove existing wire from terminal 1 of the Model 67 LWCO and connect it to Terminal B of the new manual reset LWCO.
- Connect a new wire from terminal 1 of Model 67 LWCO to terminal H of the new manual reset LWCO.
- Connect a new wire to terminal N of new manual reset LWCO and splice it to the existing neutral wire.



1. Factory jumper bar

2. To burner

3. Neutral

4. Hot

---- Dashed lines indicate existing wires.

— Solid lines indicate new wires.

NOTE: Terminal 3 and 4 and Terminal N and H must be at the same voltage. Either 24 VAC supplied for TB2 or 120 VAC supplied for TB1 of the FPC-1000.

NOTE: Only an electronic water feeder can be used with the FPC-1000 controller for correct functioning.

1.4 Testing

1.4.1 Start-Up

Refer the preceding Operation of Control table

- Before filling the system,** turn on the electric power to the boiler.
 - Upon initial power up, the Green/Yellow (Auto/Manual) and Red lights will flash simultaneously 4 times (Hot Water) or 6 times (Steam).
 - The Green/Yellow (Auto/Manual) light will turn "ON".
 - Red LED will be flashing for 5 sec. in Auto mode or 30 sec. in Manual mode and turn solid on afterward.
 - The burner will never turn "ON" during power up, if water is off the probe.
- Now fill the boiler with water.**

(For manual reset units, when water returns to the probe, nothing will happen until the manual Test/Reset button is depressed.)

- The Green/Yellow (Auto/Manual) and Red lights will flash simultaneously 4 times (Hot Water) or 6 times (Steam) if the controller power was recycled.
 - Then the Green/Yellow (Auto/Manual) light will turn "ON" and the Red light will be blinking for 30 sec. in Auto Steam mode or blinking for 3 sec. in all other modes and turn off after that.
 - The burner will be "ON" as long as there is water on the probe
- Slowly drain the boiler of water.**
 - When the water drops off the probe, the Green/Yellow (Auto/Manual) light remains "ON".
 - The Red light starts flashing and the burner will turn "OFF", if water is off the probe.

Red LED will turn "OFF" and burner turns "ON" if water returns to probe during 30 sec. lock-out period in Manual mode or whenever water returns to probe after DOM time in Auto mode.

Red LED will turn "ON" and burner turns "OFF" if water below probe.

- Testing Control Using "ON" and "Test/Reset Button". Depressing the Test/Reset button with "water on probe":**

(Must depress and hold Test/Reset button for 5 sec. to simulate out of water condition. On Manual Reset Units, depress and hold Test/Reset button for 30 sec. for testing lock-out/CSD-1 condition). Red LED will flash and Green/Yellow (Auto/Manual) is "ON".)

- Both Red and Green/Yellow (Auto/Manual) LEDs stay "ON" after reset cycle is activated.
- The burner will turn "OFF".

(Release Test/Reset button. You must depress the manual Test/Reset button to unlock the low water cut-off for Manual mode.)

- Then the Green/Yellow (Auto/Manual) light will turn "ON" and the Red light will blink for DOM times and after that turn "OFF".
- The burner will turn "ON" as long as there is water on the probe. The LEDs will be blinking 4 times (Hot Water) or 6 times (Steam) for Manual mode only when the controller is reset to take out from lock-out condition.

CSD.1 Compliance

On Manual Reset Units, if the control is in low water condition (water is off the probe) and there is a sudden power interruption, the control will remain in low water condition (Burner Off) even if the power is restored. The Test/Reset Button must be depressed to make the control back to function, after the water level is re-established to the probe.

1.5 Maintenance

1.5.1 Maintenance schedule



WARNING:

- Maintenance and service must be performed by skilled and qualified personnel only.
- Replace probe when PFA insulator is cracked or worn or probe is loose.

- Test the low water cut-off annually.
- Remove and inspect the self-cleaning probe every five years.
 - Use a non-abrasive cloth and rinse with clean water when the probe requires cleaning. Do not use sharp instruments to remove accumulations of rust or scale.
- Replace probe every ten years.
- Replace the low water cut-off control box every 15 years.

1.6 Troubleshooting

1.6.1 Probe fails to operate

Perform the following diagnostic checks if the probe fails to operate as required:

1. Check that the water level in the boiler is at or above the level of the probe.
2. Recheck all wiring to ensure proper connections as specified in the wiring diagrams of the boiler manufacturer or in this instruction manual.
3. Check to ensure that PTFE tape has not been used on the threaded connection of the electrode to the boiler.
4. Some foaming is common in certain boilers. Refer to recommendations from the boiler manufacturer for cleaning the boiler and piping when excessive foaming occurs.
5. Boiler does not turn ON and FPC-1000 Green/Yellow (Auto/Manual) LED continues blinking 13 times: The probe is shorting at power on.
 - Turn off boiler and check probe wiring connection.
 - Turn off boiler, drain boiler and remove control to check if the tip of the probe is touching a metal surface.
6. Boiler does not turn ON and FPC-1000 Green/Yellow (Auto/Manual) LED continues blinking from 1 to 10 times: Internal faults.
 - Press the Test/Reset button for more than 1 second until the Red LED turns off or perform a power cycle to reset the device.
 - If the problem continues, replace the control with a new unit.

2 Bluetooth Interface Module

2.1 Product Description

2.1.1 Usage

FPCe-1000 Bluetooth is a conditioning monitoring application that gives data and predictive maintenance advice for the low water cut-off:

- Low water condition DOM
- Low Water Configuration Mode
- Boiler feed water count

The cloud stores the data of asset low water cut-off as a backup and shares the information with multiple users.

2.1.2 Features

- Periodic measurement of low water cut-off condition
- Uses the Bluetooth[®] wireless technology¹ to communicate the low water cut-off operating data to a smart device
- Shares data automatically with other local users through cloud
- Shows the asset low water cut-off by using a traffic light warning system
- Graphical trending and waveform analysis
- Generates reports
- Shows maintenance logs
- Library of product documentation (IOM, data sheet, and parts)
- Schedules the routine preventive maintenance of assets

2.1.3 Compatibility

- iOS
- Android

2.2 User Interface

2.2.1 Common icon

The following icons are shown on the home page:

Icon	Color	Description
	-	Show the following pages: • Add a sensor • Dashboard • View reports • View reminders • Setting • Contact us • Sign out
	-	Allows the user to email information
	-	Displays the notifications and warnings
	-	Allows the user to add new asset or sensor
	Green	Shows that the data is up to date
	Red	Shows that the data is out of date
	-	Shows that the new data has been uploaded from the sensor today
	-	Shows that the new data has not been uploaded from the sensor today
	-	Shows the following parameters in the asset details menu: • Reminders • Asset Setting
	-	Allows the user to edit the information
	-	Allows the user to delete the information or item
	-	Allows the user to customize date range
	-	Shows the drop-down list
	-	Allows the user to capture or upload photo

2.2.2 Main menu

The icon contains the following tabs:

Icon	Tab	Function
	Dashboard	Shows all assets and status, pending updates for assets and access to all notifications/ warnings: • Low water cut-off of the assets • Status of the data synchronization
	View reports	Allows the user to view and share the reports
	View reminders	Allows the user to view the maintenance reminders
	Setting	Allows the user to edit the user profile information and application settings
	Contact us	Shows the email ID and phone number of the local sales and service representative Allows the user to send the log history to the local sales and service representative

2.2.3 Asset low water cut-off menu

The menu shows the following parameters of sensors and assets:

Parameter	Description
-----------	-------------

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Low Water condition - From last reset - Last 7 days - Last 3 days - Last manual reset	Shows the count of low water conditions in the last 3 days, 7 days and total since the last reset. Allows users to reset the counter.
DOM (delay on make timer)	Allows user to access the latest DOM value if device is configured in Auto, Steam mode.
Boiler feedwater	

Each asset shows the following parameters:

- Asset picture
- Name
- Location
- Sensor icon

The sensor icon changes color according to the low water cut-off of the asset. For more information, see [Common icon](#) on page 7

2.2.4 Asset details menu

The  icon contains the following tabs:

Tab	Function	Description
Reminders	Allows the user to create and view the maintenance reminders for a specific asset	Notifications must be turned on in the settings to create and receive reminders
Asset Setting	Asset setting shows the following parameters: - Image of the asset - Asset name - Location - Boiler type - Automatic water feeder - Automatic water feeder brand - Orifice size - Water feeder DIP switch setting - Warning and critical thresholds - Boiler size range - BTU range - Sensors The sensor setting page shows the following parameters: - Device model - Device type - DOM - Installation date - Manufacturing date - Installation company - Warranty start date - Warranty end date	-
Documents	Shows the product-specific information, literature, and data	-

2.3 Operation

2.3.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 1 of the 211320 FPC-1000 Low Water Cut-off Instruction Manual (current version) have been read and understood.

2.3.2 Download the optimyze application

Download the **optimyze** application by using one of the following methods:

- Search for the Xylem **optimyze** application in the application store.
- Scan the QR code by using the mobile camera to go to the application store.



2.3.3 Register the user

- On the landing page, tap the **Register** button.
- If the user already has a Xylem cloud account, register by using the existing details.
- On the **Register** page, follow these steps.
 - Type the following information:
 - Email ID**
 - Phone number**
 - Select the **Country code**.
 - Tap **Register**.
An email with the verification link is sent to the user.
- Click the verification link to validate the email address.
A set password window appears.
- Type the password.
- Click **Set Password**.

2.3.4 Start the application

- Go to the **optimyze** application.
- Type the following information:
 - Email address
 - Password
- Tap **Login**.

2.3.5 Set up the configuration mode

Press the Bluetooth reset switch for at least 2 seconds.

The device enters the configuration mode indicated by fast blue blinking LED light (@100 mSec rate)

Note: LWCO stays in this mode for approximately 90 seconds.

2.3.6 Connect a mobile phone to the sensor

- Before connecting the mobile phone to sensor, check that the following procedures are completed:
 - Bluetooth wireless technology is enabled.
 - Camera permission is allowed for the **optimyze** application.
- On the Asset data page, tap the .
- On the **Add a sensor** page, select one of the following options:

Entry	Action
QR code	Use the mobile phone camera to scan the QR code on the sensor.
Manual entry	Type the nine-digit serial number The serial number is located below the QR code .

- Tap **Enter**.
A blue LED blinking twice in 1 second (blink twice in 20ms and remain off for 800ms) shows that the mobile phone is connected to the sensor.
- On the **Bluetooth Pairing Request** screen, tap the **Pair** button.

2.3.7 Configure the sensor

On the **Sensor configuration** page, follow these steps to configure the sensor:

- Select the **Installation date**
- Select Installation Company and Name
- Warranty Date
- Location of Asset
- Upload an image

- Boiler size
- Automatic Water feeder
- Automatic Water feeder brand
- Orifice size
- Water feeder DIP switch setting

2.3.8 Configure the asset

On the asset configuration page, follow these steps to configure the asset.

- Type the asset name.
- Select the **Manufacturing date**.
- Select the asset location from the drop-down list.
- Tap the  icon to add an image of the asset.
- Select the asset model from the drop-down list.
- Tap **Save** button.

2.4 Troubleshooting

2.4.1 Symptoms and remedies

Symptom	Cause	Remedy
The LED is off.	The device is not powered on.	1. Make sure the device is powered on. 2. Disconnect and re-connect the device.
No information is displayed on the Scan QR code screen.	The camera of mobile device is turned off in privacy.	Turn on the camera in privacy for mobile device.
	The Bluetooth wireless technology is turned off in settings and privacy for mobile device.	Turn on the Bluetooth wireless technology.
Incorrect serial number is entered.	The Valid serial number is 9 digits long and starts with 5 message is shown.	Check that the serial number is correct.
The Enter button is not seen on the bottom of the screen, after the serial number is entered.	The soft keyboard on the phone screen hides the Enter button at the bottom of the screen.	Tap Done button or the background to close the soft keyboard.
Cannot find the device, try again. message is shown.	The device is not powered on. The configuration mode is off. The incorrect serial number is entered.	1. Check the power for the device. 2. Disconnect and re-connect the device . 3. Put the device in configuration mode. For more information, refer to Configure the sensor on page 8
Device found, turn on configuration mode and try again message is shown.	The configuration mode is off. The configuration mode is on and does not connect with mobile device.	1. Put the device in configuration mode. For more information, refer to Configure the sensor on page 8 2. Check the Bluetooth wireless technology compatibility. The Bluetooth wireless technology software version must be 5.0. 1. Connect the mobile device to sensor. For more information, see • Connect a mobile phone to the sensor on page 8

Symptom	Cause	Remedy
The device does not enter configuration mode.		Disconnect and reconnect the device from power source.

2.5 Technical Specification

2.5.1 Approvals

- CE
- FCC and IC
- UL and cUL

2.5.2 Environmental requirements

Feature	Value
Operating location	Indoor use only
Operating environment	Non-hazardous, non-corrosive
Operating temperature	-4°F to +122°F (-20°C to +50°C)
Storage temperature	-13°F to +149°F (-25°C to +65°C)
Operating humidity	5% to 95% relative humidity, non-condensing
Protection rating	NEMA4 / IP56

2.5.3 Wireless communication

Feature	Description
Network type	Bluetooth® Low Energy 5.01 2.4 GHz ISM band RF 3.29 mW (5.17 dBm)
Connection range (without interference)	30 meters (100 feet)

3 Product Warranty

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 twelve (12) months from the date of installation or eighteen (18) months from the date of shipment (which date of shipment shall not be greater than thirty (30) days sixty (60) days after receipt of notice that the goods are ready to ship), 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.

4 Cybersecurity

Xylem values system security and resilience. Defending against cybersecurity threats is a shared responsibility. Xylem builds products that are secure by design. Our customers have a responsibility to understand the risks inherent in their processes and take steps to operate and maintain their solutions securely. This section reviews security features and provides guidance to help securely operate this product. For details and updates on Xylem product cybersecurity visit xylem.com/security.

Xylem Product Cybersecurity

Xylem performs appropriate due care in building security and resilience into products. Xylem performs the following security activities for defense-in-depth:

- security engineers perform **threat modeling** to identify **testable controls**
- code is scanned for flaws with **static analysis** tools and hardened
- **product components are analyzed** and hardened
- security controls are verified through **automated and manual tests**
- Xylem maintains relationships with customers, integrators, and the cybersecurity research community and the **Product Security Incident Response Team (PSIRT)** coordinates the collection, analysis, remediation, and responsible disclosure of vulnerability and remediation information to keep products secure
- cloud connections, data flows, and cloud infrastructure are continuously monitored by the **Product Security Operations Center (PSOC)**
- Product security is **governed through a three lines of defense** model that includes: product developers, product security engineers, and audit staff

Security Recommendations for End-User

The Next Generation Low Water Cut-Off device has been tailored for boiler safety application, as such most security hardening is already in place. The following guidance provides recommendation for customers for hardening the operating environment, secure operations, account management and disposal. In the table below: *Safeguard* describes the security guidance, *Security Context & Rationale* provides overview of security features and value of the security safeguard, and *References* provide additional resources for further investigation for implementing the recommended safeguards.

Safeguard	Security Context & Rationale	References
Restrict physical access - Ensure physical access to assets is limited. Include physical isolation to protect the environment and equipment therein. - Ensure strict control over physical access in and out of the customer's facility.	The communication channel is hardened to restrict access and ensure integrity of device operations. BLE pairing requires proximity and pressing physical button on device. This safeguard supports the ability to further limit exposure associated with physical threats to the device itself.	ATT&CK for ICS: M0801 NIST SP 800-53 Rev. 5: AC-3 ISA/IEC 62443-3-3: SR 2.1
Each account should be tied to an individual. Organizations should control individual accounts through policy.	Mobile application requires registration and authentication, and security events are logged. This safeguard ensures all activities are traceable and non-repudiable.	ATT&CK for ICS: M0801 NIST SP 800-53 Rev. 5: AC-3 (7) ISA/IEC 62443-3-3: SR 1.1
Ensure physical button is not pressed continuously / again and again, after putting device in Configuration Mode so that the device does not re-enter Configuration Mode unexpectedly and enable alternative access to your data.	Protections, such as the physical button, are put in place to make pairing deliberate and to require physical proximity to the device. This safeguard provides additional checks and ensures no fingerprinting of BLE devices takes place.	NIST SP 800-53 Rev. 5: AC-18 ISA/IEC 62443-4-2: CR.4.1, NDR.1.6
Ensure Bluetooth signal cannot be received outside the organization-controlled boundaries by employing emission security and purposefully positioning the device.	Multiple BLE pairing mechanisms are available to ensure availability of data. This safeguard reduces the likelihood of capturing or intercepting signals.	ATT&CK for ICS: M0806 NIST SP 800-53 Rev. 5: AC-18, SC-40 ISA/IEC 62443-3: SR 5.2
Implement specific inventory, logging and monitoring for hardware and report security-related incidents associated with devices to Xylem. These might include unexpected operations, confirmed tampering, or theft of the device.	Devices are hardened and Xylem provides PSIRT to help customers investigate potential security incidents. This safeguard supports the ability to track assets and recognize potential security events.	ATT&CK for ICS: M0947 NIST SP 800-53 Rev. 5: SM-8 ISA/IEC 62443-3-3:2013: SR 1.11, SR 2.8, SR 3.4
Ensure cybersecurity policies, awareness, and training to the operators, administrators and other personnel.	While the system has been hardened in many ways, this safeguard prevents Social Engineering attacks and promotes awareness related to cybersecurity.	NIST SP 800-53 Rev. 5: AT-2 ISA/IEC 62443-2-4: SP.01
Before device disposal clear all paired connections.	No data is persistent on the device, but BLE bonding is enabled for gathering of data. This safeguard ensures that no one can connect to your device using already-paired devices.	ATT&CK for ICS ID: M0942 NIST SP 800-53 Rev5: SR-12 ISA/IEC 62443-3-3: SR 4.2

For additional information see references:

1. ATT&CK for ICS available online: <https://collaborate.mitre.org/attackics/index.php/Mitigations>
2. NIST SP 800-53 Rev 5 available online: <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-53r5.pdf>
3. ISA/IEC 62443 standards available for purchase from ISA, IEC, or ANSI.

5 FCC Compliance Statement

FCC ID: 2AAFYFPC1000

Compliance Statements: This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including, an interference that may cause undesired operation.

Caution Statements:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

IC: 11516A-FPCE1000

Compliance Statements: This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: 1) This device may not cause interference., 2) This device must accept any interference, including interference that may cause undesired operation of the device.

Déclarations de conformité: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution Statements:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

Déclarations de mise en garde:

- Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par Industrie Canada pour un environnement non contrôlé.
- Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance dispositif et l'utilisateur ou des tiers.

1 INFORMATION TO THE USER

For Class A and Class B digital devices, information to the user is required to include the following statements (Section 15.105):

For a Class A digital device or peripheral, the instructions furnished to the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For a Class B digital device or peripheral, the instructions furnished to the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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