

Installation and Technical Manual for the Limitless™ Series WBX Limit Switch

Issue 1

Used in conjunction with the Limitless™ WPMM or WDRR Series

50096377

⚠ WARNING **PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

Honeywell does not recommend using devices for critical control applications where there is, or may be, a single point of failure or where single points of failure may result in an unsafe condition. It is up to the end-user to weigh the risks and benefits to determine if the products are appropriate for the application based on security, safety and performance. Additionally, it is up to the end-user to ensure that the control strategy results in a safe operating condition if any crucial segment of the control solution fails. Honeywell customers assume full responsibility for learning and meeting the required Declaration of Conformity, Regulations, Guidelines, etc. for each country in their distribution market.

⚠ WARNING **POTENTIAL ELECTROSTATIC CHARGING HAZARD**

When the WBX Series is installed in potentially hazardous locations, care should be taken not to electrostatically charge the surface of the antenna shroud by rubbing the surface with a cloth, or cleaning the surface with a solvent. If electrostatically charged, discharge of the antenna shroud to a person or a tool could possibly ignite a surrounding hazardous atmosphere.

⚠ WARNING **POTENTIAL IMPACT HAZARD**

Care should be taken during installation of the WBX switch to not apply an impact force to the device. (i.e. dropping the WBX on a hard surface, impact with a hammer/wrench, etc.).

⚠ WARNING

Enclosure contains aluminum. Care must be taken to avoid ignition hazard due to impact.

⚠ WARNING **RF EXPOSURE**

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna used for this transmission must not be co-located in conjunction with any other antenna or transmitter.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

The WBX must be installed in accordance with the requirements specified in this document in order to comply with the specific Country Communication Agency requirements (i.e., FCC, IC, ETSI, ACMA, etc.). See Section 3 as this requires choosing the correct Country Use Code and thus allowable antenna and/or cable usage.

⚠ WARNING **RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE**

Connection and disconnection of the antennas should only be performed in a non-hazardous area and with **no battery power** applied to the WBX. This is due to the risk of possibly damaging the internal WBX electronics and/or igniting the surrounding hazardous atmosphere.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING **RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE**

Connection and disconnection of the batteries should only be performed in a non-hazardous area. The batteries used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 100 °C [212 °F], or incinerate.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

Device cannot be used without metal "S" shaped clamp and screw securely fastened to switch.

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1 DESCRIPTION

1.1 General

The Limitless™ product line combines the best of MICRO SWITCH™ Heavy Duty limit switches with the latest commercial off-the-shelf wireless technology. Wireless-enabled limit switches can now be used for position sensing and presence/absence detection for a wide variety of applications. The Limitless™ Series is especially beneficial for remote monitoring applications where wiring or wire maintenance is not physically possible or economically feasible. Combining this greater flexibility with proven harsh duty packaging can result in increased efficiencies and improved safety for machine and equipment OEMs and operators. This document will provide installation instructions to properly install a Limitless™ Hazardous Area limit switch, WBX switch, or simply the WBX .

1.2 Principle of Operation

The WBX will transmit the position of its actuator to a Limitless™ Wireless Panel Mount Monitor (WPMM Series) or Limitless™ Wireless DIN Rail Receiver (WDRR Series). The WPMM or WDRR will then indicate the actuator position of the WBX via a visual indicator, audible indicator and/or electronic output. The WBX supports no electrical signal inputs and is powered by a replaceable battery.

1.3 Model Reference for Hazardous Area Limit Switch options

WBX Nomenclature

WBX	1	A	00	B	0	A	1	3
Switch type	Gen Code	RF Code	Antenna type code	Country use code	Zone use code	Operating head code	Actuator code	Modification code
WBX Series Wireless	1 Version 1	A 2.4 GHz; IEEE 802.15.4 B 2.4 GHz; ISA 100.11a	00 No antenna; RP-SMA connector jack 12 2.0 dBi omni w/switch mount; straight design with radome	A US, Canada, Australia B All approved countries	A Zone 0 B Zone 1	A Side rotary, momentary C Top plunger, plain J Wobble stick	1 Rollerless 1A Fixed 0.75 in x 0.25 in nylon roller, front mount 1C Fixed 0.75 in x 0.25 in nylon roller, back mount 2 Adjustable, rollerless 2A Adjust. 0.75 in x 0.25 in nylon roller, front mount 2C Adjust. 0.75 in x 0.25 in nylon roller, back mount 2J Adjust. 1 in x 0.5 in nylon roller, front mount 2K Adjust. 1.5 in x 0.25 in nylon roller, front mount 3E Yoke, 0.75 in x 0.25 in nylon roller, back/front 3M Yoke, 0.75 in x 1.25 in nylon roller, back/front 3S Yoke, 0.75 in x 0.25 in nylon roller, back/back 4 Hub only 4M Hub rod, 5.5 in, aluminum 5 Offset, rollerless 5A Offset, 0.75 in x 0.25 in nylon roller, back mount 5C Offset, 0.75 in x 0.25 in nylon roller, front mount 7A Delrin™ rod, 5.5 inches* 9A Short fixed, 0.75 x 0.25 in nylon roller, front mount 9C Short fixed, 0.75 x 0.25 in nylon roller, back mount	3 Head assembled with actuator to right side 4 Head assembled with actuator to left side 5 Head assembled with actuator to mounting surface

Zone 0:
An area in which an explosive gas atmosphere is present continuously or for long periods.

Zone 1
An area in which an explosive gas atmosphere is likely to occur in normal operation.

* 7A to be assembled to operating head code J only.

Table 1 – Actuator Code Table

Code	Catalog Listing	Material	Roller Dia. (in)	Roller Width (in)	Roller Mounting
Fixed 1.5 inch radius					
1		Rollerless	n/a	n/a	n/a
1A	LSZ51A	Nylon	0.75	0.25	Front
1C	LSZ51C	Nylon	0.75	0.25	Back
Adjustable 1.5 in to 3.5 in radius					
2		Rollerless	n/a	n/a	n/a
2A	LSZ52A	Nylon	0.75	0.25	Back
2C	LSZ52C	Nylon	0.75	0.25	Front
2J	LSZ52J	Nylon	1.0	0.50	Front
2K	LSZ52K	Nylon	1.5	0.25	Front
Yoke – 1.5 in radius					
3E	LSZ53E	Nylon	0.75	0.25	Back/Front
3M	LSZ53M	Nylon	0.75	1.25	Back/Front
3S	LSZ53S	Nylon	0.75	0.25	Front/Front

Code	Catalog Listing	Material	Roller Dia. (in)	Roller Width (in)	Roller Mounting
Rod					
4		Hub only	n/a	n/a	n/a
4M	LSZ54M	Alum, 5.5 in	n/a	n/a	n/a
Offset – 1.5 in radius					
5		Rollerless	n/a	n/a	n/a
5A	LSZ55A	Nylon	0.75	0.25	Back
5C	LSZ55C	Nylon	0.75	0.25	Front
Wobble stick					
7A	LSZ1JGA	Delrin™ rod, 5.5	n/a	n/a	n/a
Short fixed - 1.3 in radius					
9A	LSZ59A	Nylon	0.75	0.25	Front
9C	LSZ59C	Nylon	0.75	0.25	Back

1.4 Abbreviations and Definitions















Table 2 – Table of Abbreviations and Definitions

ACMA	Australian Communications and Media Authority
dB	Decibel
dB_i	Decibel Isotropic
dB_m	Decibel above or below 1 milliwatt
DSSS	Direct Sequence Spread Spectrum
EIRP	Equivalent isotropic radiated power
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Standards Institute
EU	European Union
FCC	Federal Communications Committee
ft-lbs	Foot-pounds
GHz	GigaHertz
IC	Industry Canada
ICES	Industry Canada Electrical Specification
IEEE	Institute of Electrical and Electronics Engineers
I.S.	Intrinsically Safe
kbps	KiloBits Per Second
LED	Light Emitting Diode
Mhz	MegaHertz
MPE	Maximum Permissible Exposure
NA	North America – United States of America and Canada
NEMA	National Electrical Manufacturers Association
R&TTE	Radio and Telecommunications Terminal Equipment
RP-SMA	Reverse Polarity SMA connector
RF	Radio Frequency
TX	Transmit
WBX	Wireless Hazardous Area Limit Switch Series
WDRR	Wireless DIN Rail Receiver
WOI	Wireless Operator Interface
WPMM	Wireless Panel Mount Monitor Series

1.5 Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Table 3 – Table Symbol Definitions

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user, often in terms of performing a task.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
	CAUTION symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death.
	WARNING symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING, Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc may be accessible.
	ESD HAZARD: Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	Protective Earth (PE) terminal: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground: Functional earth connection. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	C-Tick Mark. The C-Tick Mark is a certification trade mark registered to ACMA (Australian Communications and Media Authority) in Australia under the Trade Marks Act 1995 and to RSM in New Zealand under section 47 of the NZ Trade Marks Act. The mark is only to be used in accordance with conditions laid down by ACMA and RSM. This mark is equal to the CE Mark used in the European Union.
	Notified Body. For radio equipment used in the European Union in accordance with the R&TTE Directive, the CE Mark and the notified body (NB) identification number is used when the NB is involved in the conformity assessment procedure. The alert sign must be used when a restriction on use (output power limit by a country at certain frequencies) applies to the equipment and must follow the CE marking.

2 SPECIFICATIONS

2.1 Intended Country Usage

Table 4 – North America

Country	ISO 3166 2 letter code
UNITED STATES	US
CANADA	CA

Table 5 – Australia

Country	ISO 3166 2 letter code
AUSTRALIA	AU

Table 6 – European Union

Country	ISO 3166 2 letter code	Country	ISO 3166 2 letter code
Austria	AT	Latvia	LV
Belgium	BE	Lithuania	LT
Bulgaria	BG	Luxembourg	LU
Cyprus	CY	Malta	MT
Czech Republic	CZ	Netherlands	NL
Denmark	DK	Poland	PL
Estonia	EE	Portugal	PT
Finland	FI	Romania	RO
France	FR	Slovak Republic	SK
Germany	DE	Slovenia	SI
Greece	GR	Spain	ES
Hungary	HU	Sweden	SE
Ireland	IE	United Kingdom	GB
Italy	IT		

Table 7 – Other European Countries

Country	ISO 3166 2 letter code	Country	ISO 3166 2 letter code
Bosnia and Herzegovina	BA	Norway	NO
Croatia	HR	Russian Federation	RU
Iceland	IS	Serbia	RS
Liechtenstein	LI	Switzerland	CH
Macedonia	MK	Turkey	TR

2.2 Certification and Approvals

See the product label for applicable approvals and ratings.

Table 8 – Approvals and Ratings

Approval/Item	Ratings/Description
Enclosure Type	Type 1, 3, 4, 13
Federal Communications Commission (FCC)	FCC Part 15.247
Industry Canada (IC)	Canadian ICES-003
European Telecommunications Standards Institute (ETSI)	CE mark
Hazardous Location APPROVALS	cULus, ATEX, IECEx, ACMA

Table 9 – Hazardous Location Standards and Certifications

cULus Listing	ATEX Certification	IECEx Certification
Standards: UL913 8 th edition; CAN/CSA-C22.2 NO. 157-92 (R2012)	Standards: EN60079-0:2012 + A11:2013; EN60079-11:2012; EN60079- 26-2007	Standards: IEC60079-0 ed6.0; IEC60079-11 ed6.0; IEC60079-26 ed 2.0
Class I, Div 1, Groups A, B, C, D T4 Class I, Zone 1 AEx ia IIC T4 Ga Class I, Zone 1 Ex ia IIC T4 Ga Class I, Zone 0 AEx ia IIC T4 Ga Class I, Zone 0 Ex ia IIC T4 Ga Tambient -40C to 70C	Zone 1 AEx ia IIC T4 Ga Zone 1 Ex ia IIC T4 Ga Zone 0 AEx ia IIC T4 Ga Zone 0 Ex ia IIC T4 Ga	Zone 1 AEx ia IIC T4 Ga Zone 1 Ex ia IIC T4 Ga Zone 0 AEx ia IIC T4 Ga Zone 0 Ex ia IIC T4 Ga

The above certifications are applicable only for the WBX limit switch product and the listed antenna options.

2.3 Radio Module Specifications

Table 10 – Radio Module Specifications

Item	Specification
Radio module	Honeywell RF-PCBa
Wireless standard IEEE	Standard: 802.15.4, 2.4 GHz global, license-free bands Protocol: Limitless point-to-point
Data rate	250 kbps
Operating frequency	ISM 2.4 GHz
Module transmit power (max.)	Country code A: 14 dBm max; Country code B: 8 dBm max.
Receive sensitivity (typ.)	-98 dBm

WARNING

The WBX must be installed in accordance with the requirements specified in this document in order to comply with the specific Country Communication Agency requirements (i.e., FCC, IC, ETSI, ACMA).

Specific Conditions of Safe Use:

- Aluminium enclosure – Care should be taken to minimize the risk of ignition due to impact or friction.
- Potential electrostatic discharge – Clean product only with a damp cloth.
- The metal “S-shaped” clamp which provides securement of the lid to the enclosure housing shall always be secured in place, when product is in use.
- Do not open when an explosive atmosphere may be present.
- Do not replace the battery when an explosive atmosphere is present.
- Use only Xeno Energy – XL-060F, Tadiran – TL-5903, or Bi-Power ER14505H batteries

ATTENTION

The following additional previous editions of Standards noted under the “Standards” section of this Certificate where applied to integral Components as itemized below. There are no significant safety related changes between these previous editions and the editions noted under the “Standards” section.

Fuse, Part No. 0259.125TX913 manufactured by Littelfuse

IEC 60079-0:2007-10, IEC 60079-11:2006

2.4 Electrical Specifications

Table 11 – Electrical Specifications

Item	Specification
Battery	3.6 Vdc Lithium Thionyl Chloride; AA size, Qty: 2; Manufacturer: Xeno Energy, P/N XL-060F; Tadiran, P/N TL-5903/S; Bi-power, P/N: ER14505H

2.5 EMC Specifications

The latest applicable EMC Standards are as follows:

- EN 300 328, V1.7.1
- EN 61326-1 (2006)
- EN 301 489-1, V1.8.1
- EN 301 489-17, V2.1.1

2.6 Functional Specifications

Table 12 – WBX Mechanical Actuator Cycle Testing with WDRR Monitoring (99.9 % count detection)

Item	Specification
High temperature endurance	70 °C, 10,000 cycles, 15 cpm
Low temperature endurance	-40 °C, 10,000 cycles, 15 cpm
Electrical operation (normal speed)	25 °C, 100K cycles, 15 cpm
Electrical operation (low speed)	25 °C, 1.1 million cycles, 100 cpm

2.7 Environmental Specifications

Table 13 – Environmental Specifications

Item	Specification
Operating temperature	-40 °C to 70 °C [-40 °F to 158 °F]
Storage temperature	-40 °C to 70 °C [-40 °F to 158 °F]
Operating humidity	0 %RH to 100 %RH
Vibration	IEC 60068-2-6: 10 Hz to 58 Hz w/0,35 mm peak-to-peak, 58 Hz to 500 Hz, 10g 58 Hz to 500 Hz – 10g amplitude
Shock	IEC60068-2-27; half sine, 50 g, 6 mS, 3 AXIS
Sealing	Type 1, 3, 4, 13

2.8 Agency Compliance Information

2.8.1 FCC Compliance Statements

- This device complies with Part 15 of FCC Rules and Regulations. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.
- 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 these instructions, 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/her own expense.
- Intentional or unintentional changes or modifications must not be made to the WBX unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and will void the manufacturer's warranty.

2.8.2 IC Compliance Statements

- To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropic radiated power (EIRP) is not more than that permitted for successful communication.
- Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
- This Class B digital apparatus has been tested and found to comply with Canadian ICES-003.
- ~~French: Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.~~

2.8.3 Radio Frequency (RF) Safety Statement (FCC & IC)

To comply with FCC's and Industry Canada's RF exposure requirements, the following antenna installation and device operating configurations must be satisfied.

- Remote antenna for this unit must be fixed and mounted on outdoor permanent structures with a separation distance between any other antenna(s) of greater than 20 cm and a separation distance of at least 20 cm [7.87 in] from all persons.
- Furthermore, when using an integral antenna with the WBX, it must not be co-located with any other antenna or transmitter device and have a separation distance of at least 20 cm [7.87 in] from all persons.

2.8.4 European Restrictions

- Information regarding national restrictions can be found in document: ERC/REC 70-03 (Relating to the use of short-range devices including appendixes and annexes). Documentation may be found in the document database in the European Communication's office.
- <http://www.erodocdb.dk/doks/dochistory.aspx?docintid=1622>

- Pour réduire les interférences radio potentielles aux autres utilisateurs, le type d'antenne et son gain doivent être choisis de telle sorte que l'équivalent isotrope puissance rayonnée (PIRE) ne est pas supérieure à celle permise pour une communication réussie.
- Son fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne doit pas causer d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.
- Cet appareil numérique de classe B a été testé et déclaré conforme à la norme ICES-003 du Canada .

2.9 European (CE) Declaration of Conformity (DoC)

2.9.1 European Declaration of Conformity Statements

This section contains the European Declaration of Conformity (DoC) statement for the radio used in the Limitless™ WBX switch.

Figure 1. European Declaration of Conformity (DoC)

Honeywell

<p>Honeywell Control Systems Ltd., Newhouse Industrial Estate, Motherwell, Lanarkshire, ML1 5SB, Scotland, United Kingdom.</p> <p>Tel.: +44 (0)1698 481000 Fax: +44 (0)1698 481011</p>	<p>A subsidiary of Honeywell Control Systems Ltd.,</p> <p>Registered Office: Honeywell House, Arlington Business Park, Bracknell, Berkshire, R12 1EB.</p> <p>Registered No 217808 (England)</p>
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EC Declaration of Conformity

Honeywell Control Systems Ltd. hereby declare that the products identified below conform to the essential requirements of the EC Directive(s) listed below and that the products supplied are in conformity with the type described in any EC Type Examination Certificate (EC TEC) identified below.

Manufacturer:	Honeywell International, MICRO SWITCH Division 11309 West Chetlain Lane, Galena, Illinois, IL 61036-0327, USA	
Product:	Limit Switch Wireless Intrinsically Safe Limit Switches	

<u>Directive (Amendments)</u>	<u>Conformity Details</u>	
1999/5/EC and 2004/108/EC	Standards applied:	BS EN 61326-1 2006 ETSI EN 300 328 V1.8.1 ETSI EN 301 489-1 V1.9.2 and -17 V2.2.1
94/9/EC	Standards applied:	EN 60079-0:2012 EN 60079-11:2012 EN 60079-26: 2007
	EC TEC No:	DEMKO 14ATEX1224X
	Notified Body:	Notified Body ID 0518 Sira Certification Service, Rake Lane, Eccleston, Chester, CH4 9JN, England
	Provisions fulfilled:	1.0, 1.1, 1.2.1, 1.2.5, 1.2.7, 1.2.9, 1.3.1, 1.3.2, 1.3.4, 1.4, 2.2

Signed on behalf of Honeywell Control Systems Ltd. :	<p>Colin O'Neil, quality Eng. Manager, Newhouse</p>
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DoC No: A491	DoC Issue: 1	DoC Date: 31/10/2014
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2.9.2 For more information about the R&TTE Directive

The following website contains additional information about the Radio and Telecommunications Terminal Equipment (R&TTE) directive:
<http://ec.europa.eu/enterprise/sectors/rtte/faq/>

3 ANTENNA OPTIONS ALLOWED

This section defines the antenna options that can be used in either North America or other approved countries. The integral antenna mounts directly to the WBX RP-SMA jack while the remote antenna mounts to the WBX RP-SMA jack via a cable assembly (see Section 5.2.3.1). Further technical information on the WAN Series antennas, WAMM Series magnetic mounts and WCA Series cable assemblies can be found in Section 5.1.

⚠ WARNING

The WBX must be installed in accordance with the requirements specified in this document in order to comply with the specific Country Communication Agency requirements. (i.e. FCC, IC, ETSI)

⚠ WARNING

POTENTIAL ELECTROSTATIC CHARGING HAZARD

When the WBX Series is installed in potentially hazardous locations care should be taken not to electrostatically charge the surface of the antenna shroud by rubbing the surface with a cloth, or cleaning the surface with a solvent. If electrostatically charged, discharge of the antenna shroud to a person or a tool could possibly ignite a surrounding hazardous atmosphere.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Connection and disconnection of the antennas should only be performed in a non-hazardous area and with **no battery power** applied to the WBX. This is due to the risk of possibly damaging the internal WBX electronics and/or igniting the surrounding hazardous atmosphere.

Failure to comply with these instructions could result in death or serious injury.

3.1 ANTENNA OPTIONS

Table 14 - Antenna Options for United States, Canada, and Australia

ANTENNAS FOR USE IN UNITED STATES, CANADA, AND AUSTRALIA (Note: all columns are independent of each other)				
Antenna Type Code (antenna provided with product)	Antenna Accessory: Must be ordered separately			
	Remote Mount Antennas (allowed for use)	Magnetic Remote Mount Assemblies/ Antennas WAMM100RSP-005 WAMM100RSP-010 (allowed for use)	Extension Cable Assemblies/Antennas for Remote Mount WCA200RSJRSP-002 WCA200RSJRSP-005 WCA200RSJRSP-010 WCA200RSJRSP-015 WCA200RSJRSP-020 (allowed for use)	Extension Cable Assemblies/Antennas for Remote Mount WCA200RNPRSP-002 WCA200RNPRSP-010 (allowed for use)
00	WAN03RSP	WAN04RSP	WAN03RSP	WAN06RNJ
12	WAN09RSP	WAN05RSP	WAN04RSP	
	WAN10RSP	WAN08RSP	WAN05RSP	
			WAN08RSP	
			WAN09RSP	
			WAN10RSP	
			WAN11RSP	

Table 15 - Antenna Options for All Other Approved Countries

ANTENNAS FOR USE IN ALL OTHER APPROVED COUNTRIES (Note: all columns are independent of each other)				
Antenna Type Code (antenna provided with product)	Antenna Accessory: Must be ordered separately			
	Remote Mount Antennas (allowed for use)	Magnetic Remote Mount Assemblies/ Antennas WAMM100RSP-005 (allowed for use)	Magnetic Remote Mount Assemblies/ Antennas WAMM100RSP-010 (allowed for use)	Extension Cable Assemblies/Antennas for Remote Mount WCA200RSJRSP-002 WCA200RSJRSP-005 WCA200RSJRSP-010 WCA200RSJRSP-015 WCA200RSJRSP-020 (allowed for use)
00	WAN03RSP	WAN08RSP	WAN04RSP	WAN03RSP
12	WAN09RSP		WAN08RSP	WAN08RSP
	WAN10RSP			WAN09RSP
				WAN10RSP
				WAN11RSP

Remote mount: Remote mount antenna uses a cable with a RP-SMA plug that connects directly to the WBX RP-SMA jack (exception, WAN06RNJ)

 **ATTENTION**

The WBX cannot be used in a portable application. It must be used in a fixed location.

 **ATTENTION**

The antenna cables should not be modified (i.e. cut short and/or re-terminated) as it may affect Communication Agency approval.

Notes for Section 3.1 • Tables 13-14:

1. Antennas listed in this chart are approved and are the only antennas allowed for use with the WBX.
2. Industry Canada Compliance Statement: This device has been designed to operate with the antenna types listed in this document, and having a maximum gain of 9 dBi. Antenna types not included in this list or having a gain greater than 9 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 Ohm.

4 WBX BASIC START UP AND FUNCTIONAL MODES

This section provides basic installation instructions for the WBX used in conjunction with a Limitless™ Wireless Panel Mount Monitor (WPMM) or a Limitless™ Wireless DIN Rail Receiver (WDRR). If necessary, refer to the WDRR or WPMM Installation and Technical Manual for further detailed information regarding installation.

4.1 Antenna Connection (if required)

⚠ WARNING

RF EXPOSURE

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm [7.87 in] or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna used for this transmission must not be co-located in conjunction with any other antenna or transmitter.

Failure to comply with these instructions could result in death or serious injury.

CAUTION

Power to the WBX should not be applied (ensure battery is removed) during installation of antenna as damage could occur to the WBX electronics and/or ignite the surrounding hazardous atmosphere.

The WBX is normally shipped with a direct mount 2.0 dBi antenna and radome. To use one another style of direct mount antenna or remote mount antenna per Section 3.1, the radome must be removed by using a 30 mm open-end or adjustable wrench; unscrew the radome by turning it CCW (see Figures 2 and 3). If the WBX you purchased was not provided with an antenna and radome, you can proceed to using another style of antenna recommended and approved for use with this product by Honeywell (see Tables 14 & 15).

Figure 2. Removal of Radome



Figure 3. Unscrew Antenna



A **remote mount antenna** requires the use of an extension cable to allow the antenna to be mounted in a different location than the WBX location. The extension cable will need to have one end with a RP-SMA plug connector which will mate with the WBX connector jack under the same mounting procedure as the direct mount antenna. The other end of the extension cable will need to mate with antenna connector directly or it may be integral to the particular remote mount antenna chosen. See Figure 4.

Figure 4. Limitless™ WBX RP-SMA Connection, Remote



4.2 Battery Connection Procedure

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Connection and disconnection of the batteries should only be performed in a non-hazardous area. The batteries used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 100 °C [212 °F], or incinerate.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

If WBX is to be returned to Honeywell for any reason, the battery **MUST** be removed prior to shipping. Dispose of used batteries promptly per local regulations or the battery manufacturer's recommendations. Keep away from children. Do not disassemble and do not dispose of in fire.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Both batteries must be the same model from the same manufacturer. Mixing old and new batteries or different manufacturers is not permitted.

Use only the following 3.6 V lithium thionyl chloride (Li-SOCl₂) battery (non-rechargeable), size AA. No other batteries are approved for use in the WBX Series. Always replace both batteries.

- XENO Energy, part number: XL-060F
- Tadiran, part number: TL-5903/S
- Bi-Power, part number: ER14505H

STOP ATTENTION

When the WBX switch is being installed or operating in a hazardous environment, the end customer/user should issue a work permit to a trained professional installer prior to any work performed on the Limitless™ WBX switch. This includes the following actions:

- Installation and/or operation of the Limitless™ WBX switch
- Installation and/or adjustment of a remote antenna for the Limitless™ WBX switch
- Maintenance on the Limitless™ WBX switch, including battery replacement, pairing, purging, etc.

WBX battery activation (see Figures 5 and 6):

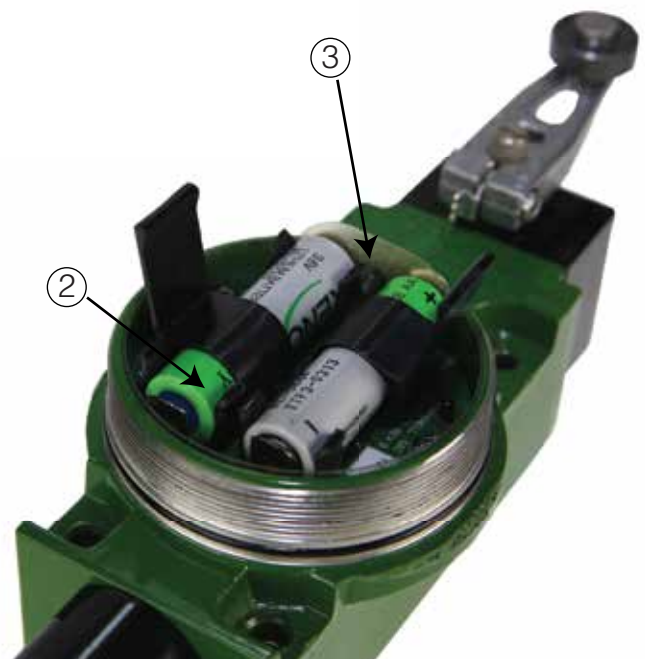
Tools required: Slotted or Phillips screwdriver

Step	Action
1	Loosen the screw and remove the S-shaped clamp holding down the housing cover.
2	Remove the WBX housing cover by turning CCW as shown in Figure 6.
3	Using a finger, press down slightly on the batteries ② and remove the battery insulator ③ (see Figure 6). Ensure that the batteries are properly seated and making good contact. After removing the battery insulator observe the AMBER LED blinks one time. This visual indication confirms device functionality is normal.
4	Replace cover and ensure it is turned fully CW until tight or immediately proceed to Section 4.4 Pairing Mode.
5	Place the S-shaped clamp in place and tighten the screw using 1,5 Nm[13.3 in-lb] torque to firmly hold down the housing cover.

Figure 5. Limitless™ WBX housing

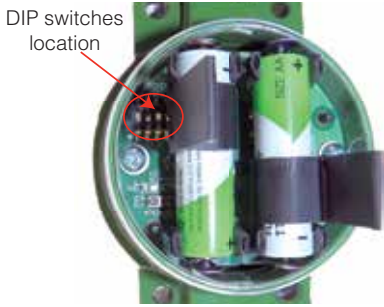

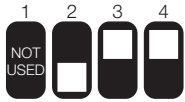
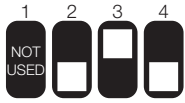
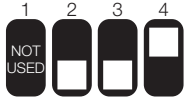
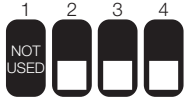


Figure 6. Limitless™ WBX battery and Insulator



4.3 Update Rate/DIP Switches

The WBX update rate is the frequency at which the WBX will automatically communicate with the receiver when the switch is not being actuated or de-actuated. It is adjustable from 2 seconds to 300 seconds. If the operator is cycling the switch faster than what the update rate is set, the auto communication will not occur. The update rate “clock” will also be reset upon an actuation or de-actuation of the switch so communication will happen at the next switch activation or update rate time; whichever occurs first. An advantage of increasing the update rate frequency is allowing a faster indication of a lost RF signal between the switch and receiver which is important in some applications. A disadvantage of increasing the update rate is that it can decrease the battery life as increasing the frequency of communication consumes more battery power. The WBX has the capability to change the update rate via DIP switch settings located inside the housing; see the table below. The allowable DIP switch settings are seen in the table below along with the Lost RF receiver indication time. The Lost RF receiver indication time is the amount of time it takes the receiver to indicate a lost RF condition via LED indication and/or Lost RF electrical output change.

	DIP Switch Setting	Switch Position				Update Rate (seconds)	Lost RF Signal*
		1	2	3	4		
		n/a	ON	OFF	OFF	1.5	5
		n/a	OFF	ON	ON	4.5	18
		n/a	OFF	ON	OFF	11	45
		n/a	OFF	OFF	ON	30	120
		n/a	OFF	OFF	OFF	90	360

*Time that elapses from the last successful communication signal that was received, either automatic or from a switch actuation/de-actuation

NOTICE: Firmware (FW) operation differences with Limitless™ monitor/receiver due to update rate chosen; FW# of monitor/receiver is noted on product label.

WPMM Series monitor

- FW7271: Any update rate chosen does not change operation as they are all defaulted to 30 seconds
- FW7273: Any update rate chosen will allow normal operation with only one WBX switch connected to WPMM

WDRR Series receiver

- FW7404: Any update rate chosen will allow normal operation
- FW7406: Any update rate chosen will allow normal operation

4.4 Pairing Mode

Pairing is required to initiate and establish an RF communication link between each single WBX and a single WPMM or WDRR. As there are up to 16 WBX devices that can be paired to a single WPMM or WDRR, it is advised that you identify each WBX switch by physically marking them (permanent marker) from #1 to #16. The initial WBX paired to the WPMM or WDRR will be Sequence #1; the second WBX paired will be Sequence #2 and so on. If replacing a WBX that has been purged, as applicable(see section 6.5 of the WPMM Installation and Technical Manual or Section 7.3 of the WDRR Installation & Technical Manual), identify the correct replacement Sequence # on the WBX.

Pairing steps when using a WPMM: The battery will need to be activated in the WBX and proper power applied to the WPMM (green LED illuminated) before proceeding with this pairing procedure. Once the pairing is completed, the WBX selected will only communicate with the WPMM it was paired to and no other device.

Step	Action
1	Completely read this procedure before starting in order to understand the timing of events that need to be performed.
2	WBX: Remove (if required) the housing cover (See Figure 7) of the WBX and locate the function button ⑦ (See Figure 9) to be used in Step 4.
3	WPMM: Press the Function button ④ on WPMM (See Figure 8) for more than four seconds and less than eight seconds at which time the green ② and yellow ③ LEDs will be flashing which indicates to release the function button immediately as it has entered the pairing mode.
4	WBX: Within a 30 second interval of Step 3, depress the WBX switch function button ⑦ (See Figure 9) and hold depressed for more than one second and less than 12 seconds at which time the orange ⑧ LED turns on. While in pairing mode, the orange led will flash on for 100 ms every second. The orange ⑧ LED flashes three times 100 ms on, 100 ms off when pairing succeeds. If pairing does not succeed, the orange ⑧ LED will turn off and user needs to repeat steps starting with #3.
5	WPMM: Successful pairing will be indicated by the green ② and yellow ③ LEDs (See Figure 9) ceasing to flash and remaining on for a few seconds before turning off. A short buzzer beep will also occur.
6	To confirm proper pairing between the WBX and WPMM: actuate the WBX actuator and the red LED ⑤ should illuminate along with a buzzer sound.
7	Record the WBX Sequence # on the WBX housing.
8	Repeat Steps 2-7 to add additional WBX switches. Up to 16 WBX can be paired to a single WPMM.

Figure 7. Limitless™ WBX Housing



Figure 9. Limitless™ WBX with Function Button Depressed

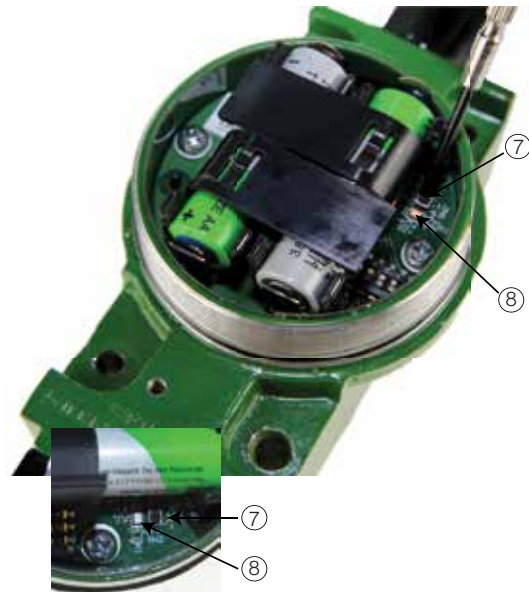


Figure 8. Limitless™ WPMM Housing



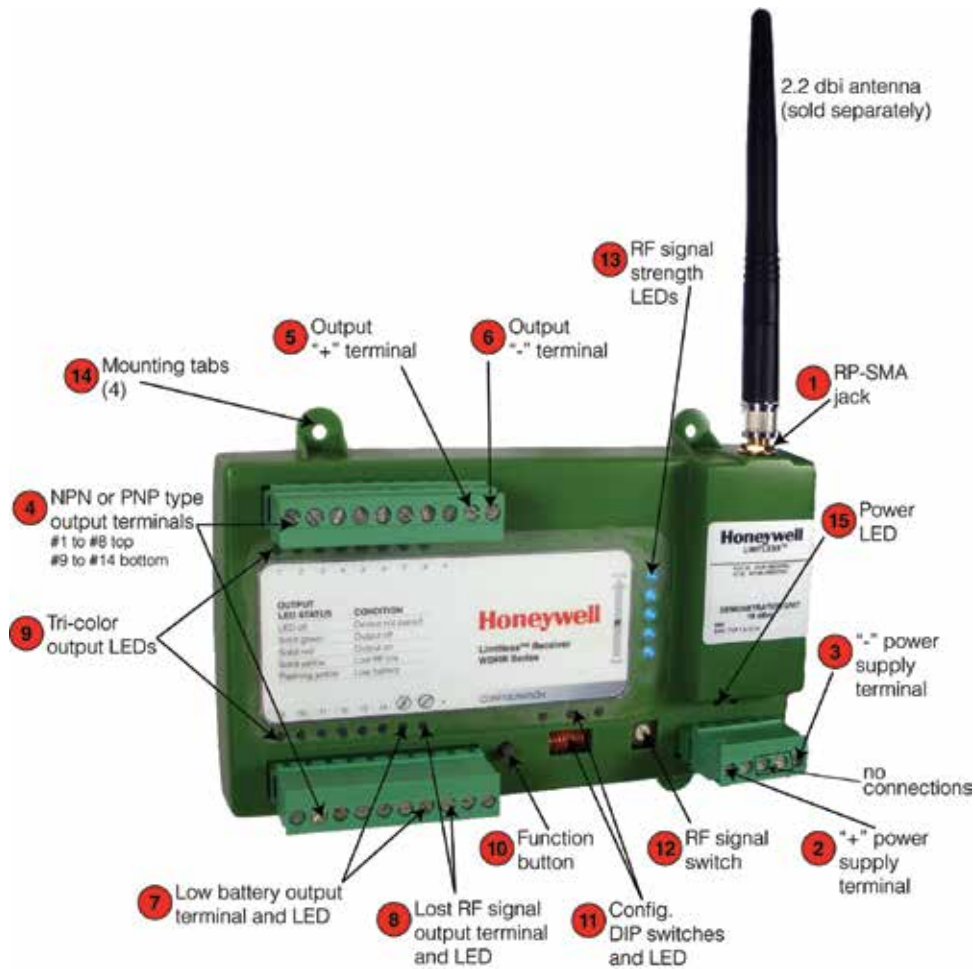
NOTE: Use a blunt object, such as a paper clip to actuate the function switch ⑦.

Pairing Steps when using a WDRR (see Figure 10): The battery will need to be activated in the WBX and proper power applied to the WDRR (green ② LED illuminated) before proceeding with this pairing procedure. Once the pairing is completed, the WBX selected will only communicate with the WDRR it was paired to and no other device.

Step	Action
1	Completely read this procedure before starting in order to understand the timing of events that need to be performed.
2	WBX: Remove (if required) the housing cover (See Figure 7) of the WBX and locate the function button ⑦ (see Figure 9) to be used in Step 4.
3	WDRR: Press the Function button ⑩ on WDRR (See Figure 10) for more than four seconds and less than eight seconds at which time the green and yellow LEDs ⑪ (see Figure 10) will be flashing which indicates to release the function button immediately as it has entered the pairing mode.
4	WBX: Within a 30 second interval of Step 3, depress the WBX function button ⑦ (See Figure 9) and hold depressed for more than one second and less than 12 seconds at which time the orange ⑧ LED turns on (see Figure 9). While in pairing mode, the orange ⑧ LED will flash on for 100 ms every second. The orange ⑧ LED flashes three times 100 ms on, 100 ms off when pairing succeeds. If pairing does not succeed, the orange ⑧ LED will turn off and user will need to repeat steps starting with Step 3.
5	WDRR Receiver: Successful pairing will be indicated by the green and yellow LEDs ⑪ (see Figure 10) ceasing to flash and remaining on for a few seconds before turning off. The specific Tricolor Output LED will also turn on.
6	To confirm proper pairing between the WBX and WDRR: actuate the WBX actuator and the Tricolor Output LED ⑨ (see Figure 10) should turn on to indicate the proper output status.
7	Record the WBX Sequence # on the WBX housing.
8	Repeat Steps 2-7 to add additional Limitless™ switch. Up to 14 WBX can be paired to a single WDRR.

NOTICE: Lost RF or no change in switch state may occur with already paired switches when the WDRR is in pairing mode.

Figure 10. Limitless™ WDRR Housing



4.5 WBX Mounting

Mounting: The WBX housing has two slotted mounting holes that will accept a M5 or #10 size screw and it also has two 10-32 UNF tapped holes for mounting from the back. Refer to Section 5.6 in this manual for more detail

4.6 Antenna Adjustment

The antenna of the WBX and WPMM or WDRR should be oriented with respect to each other such that they are parallel. This will in most cases allow the longest range and highest RF communication link/signal. The least RF signal is normally in a direction in-line with the top of the antenna, so it is best to avoid having the antennas pointed directly toward each other, or directly away from each other. An acceptable RF signal is also indicated by the RF signal strength LEDs on the WDRR; see the WDRR Installation and Technical Manual for further information.

Figure 11. Limitless™ WBX and WPMM in Parallel



⚠ WARNING

RF EXPOSURE

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm [7.87 in] or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

Failure to comply with these instructions could result in death or serious injury.

4.7 Purge Mode

The purging of a WBX is required when a previously paired WBX is desired to be paired again per Section 4.4. Follow the procedure below which will then allow a new pairing to be conducted after successful purging:

Step	Action
1	Remove (if required) the housing cover of the WBX (See Figure 8) and locate the WBX function button ⑦ & orange LED ⑧ (See Figure 9).
2	Press and hold the WBX function button for greater than 12 seconds. Initially the orange LED ⑧ turns on and after the 12 seconds will turn off indicating the WBX has been purged.
3	Repeat above steps if necessary to purge more Limitless™ switch(es).

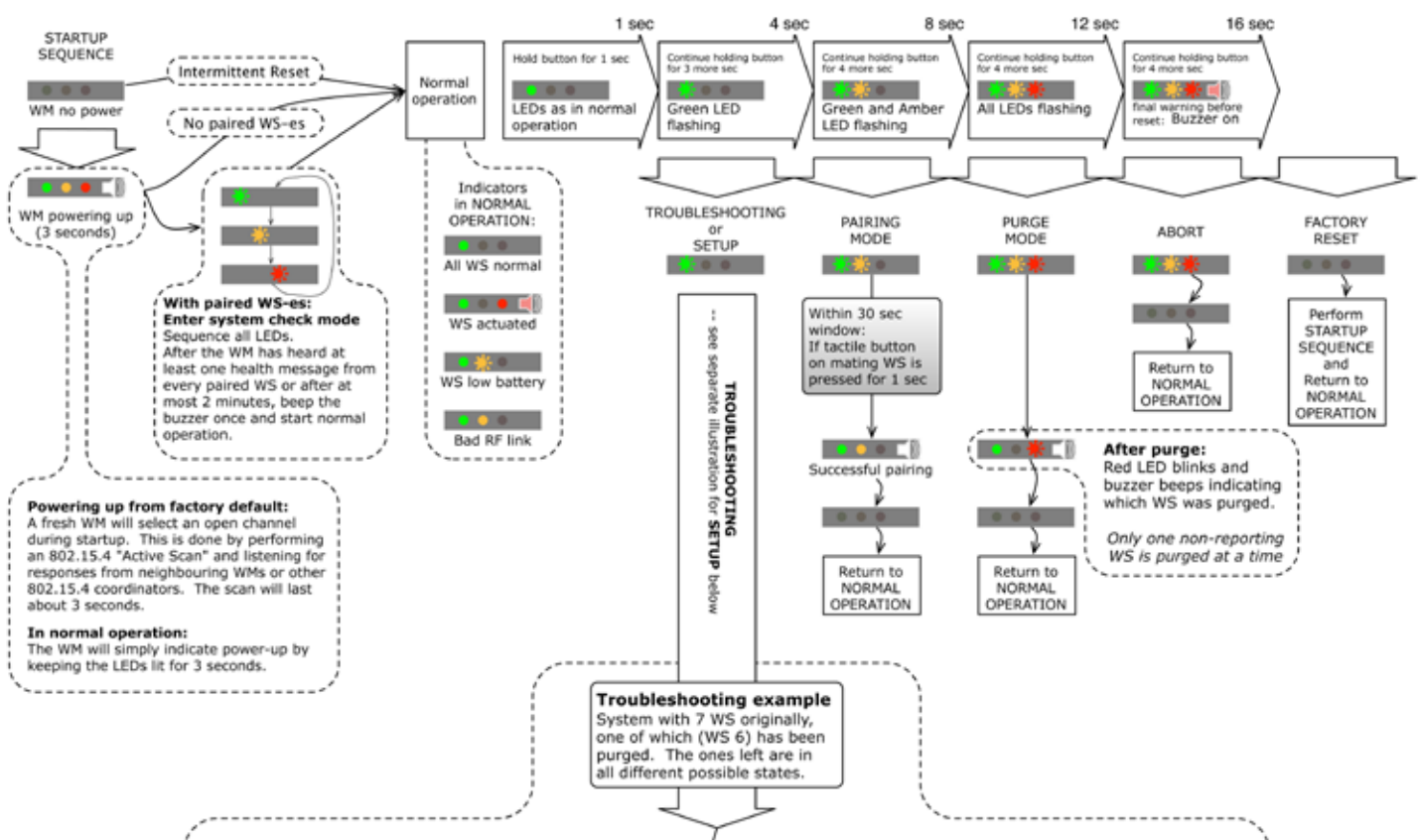
4.8 WPMM Operation and LED functions

4.8.1 Principle of Operation of the WPMM and Limitless™ Switch:

A Limitless™ WBX will send an RF signal to the WPMM when the actuator of the WBX switch changes position. There are up to 16 Limitless™ WBX switches that will communicate and indicate their actuation position with a single WPMM. The mechanical actuation (free position to full overtravel) of any one of the WBX switches will cause a single red output LED to illuminate, a buzzer to sound, and/or a change in the electrical output.* However, there will be no differentiation of outputs (visual, audible or electrical state change) between any of the WBX switches being actuated. Further, if a WBX switch causes the single red output LED to illuminate, a buzzer to sound, and a change in the electrical output, actuation of any other Limitless™ WBX will not cause another output change (visual, audible or electrical state change).

The operation and LED functions for the WPMM are visually depicted and described in the attached file. This file is also located as a separate file at sensing.honeywell.com.

Figure 12. WPMM Operation and LED Functions Chart – part 1



* Refer to the WPMM Installation and Technical Manual for further set-up instructions(buzzer mute and/or reversed output).

Figure 13. WPMO Operation and LED Functions Chart – part 2

Legend

- Long buzz up to 30 seconds, then 2 sec every 30 sec (to indicate switch actuated)
- Very short buzz; for sequence of beeps .125 s on, .125 s off
- Blinks are on for .125s, off for .125 s (4 blinks per second.)
- After each mode is complete: device pauses for 1 second with all LEDs off before returning to normal operation.

Scenarios when WM indicates status of multiple WSES

- one WS has bad RF link and another WS gets actuated:
amber LED indicates bad RF link and red LED + buzzer indicate WS actuated.
- one WS has low battery and another WS gets actuated:
amber LED indicates low battery and red LED + buzzer indicate WS actuated.
- one WS has low battery and another WS has bad RF link:
amber LED indicates bad RF link.
Once the bad RF link issue is resolved (by either repairing that WS/link or by purging that WS), the amber LED must indicate the current status of the remaining WSES. If there is a WS with low battery at that time, the amber LED should start blinking.

WM timeout

In pairing mode:
Will go back to normal operation after 35 seconds if no pairing happens.

In troubleshooting mode:
Will go back to normal operation after 30 seconds if no user input.

WS button operation
(button located inside housing)

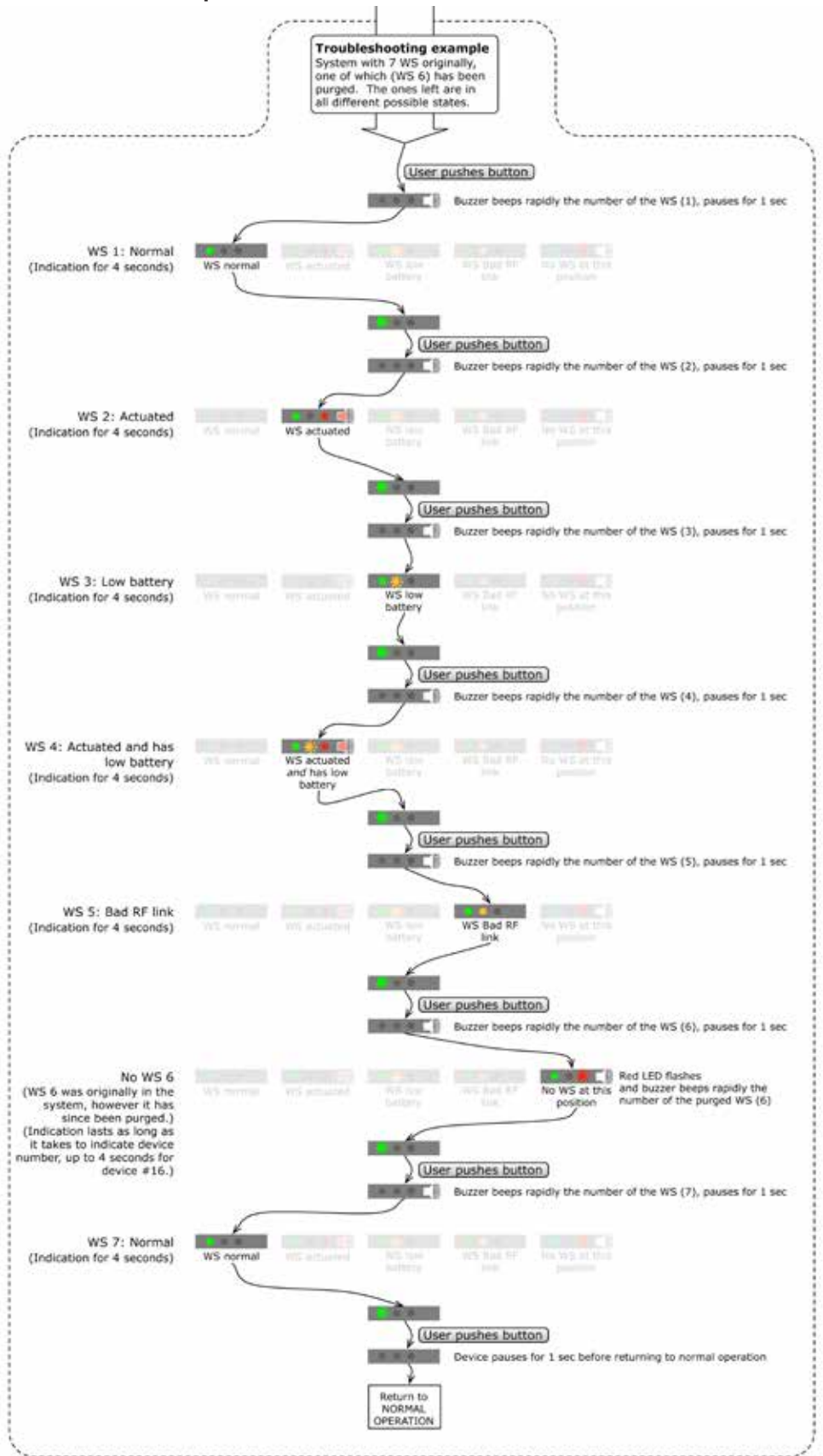
HOLD FOR 1 sec: Enter pairing mode

HOLD FOR 12 sec: Reset to factory default

Bad RF link

When the WM stops hearing from a WS (either because the RF link with the WS is broken or because the WS is not communicating for reasons such as dead battery), it has no way of knowing what status this WS is in (actuated, battery status, etc.)

Thus, the WM should only display "Bad RF" for this WS and clear up any other indications for this WS.



4.8.2 WDRR Operation and LED functions


A Limitless™ WBX will send an RF signal to the WDRR when the actuator of the WBX switch changes position. There are up to 14 WBX switches will communicate and indicate their actuation position with a single WDRR. The actuation of any one of the WBX switches will cause a single red output LED to illuminate and change in the electrical output for the associated output (#1 thru 14) that it is paired to.


The operation and LED functions for the WPMM are visually depicted and described in the WDRR Installation and Technical Manual located at sensing.honeywell.com/limitless.

5 ANTENNA CONSIDERATIONS/OPTIONS & SWITCH/ANTENNA INSTALLATION

5.1 Overview of Antenna Options

The following chart lists the antenna options along with the various characteristics that will be referenced throughout this section. This section is intended to assist an end user in determining which antenna(s) are worth investigating and subjecting to application requirements for proof of suitability.

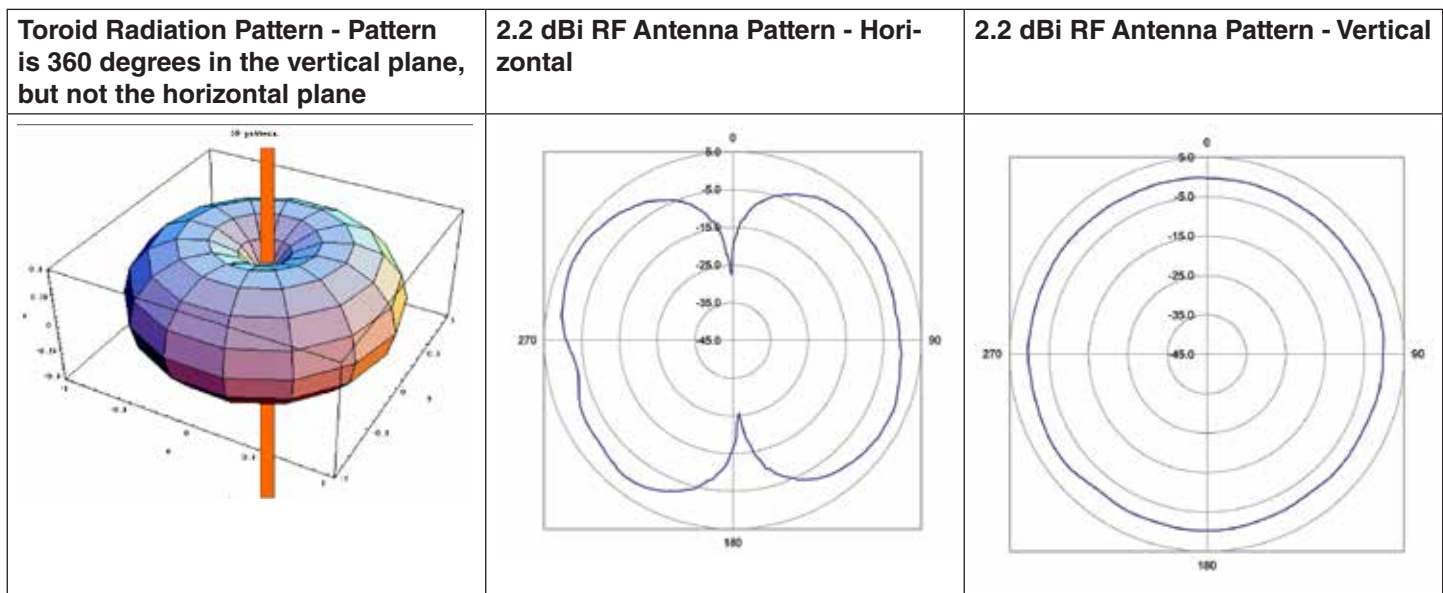
 ATTENTION The antenna cables should not be modified (i.e. cut short and/or re-terminated) as it may affect Communication Agency approval.

 WARNING The WBX must be installed in accordance with the requirements specified in this document in order to comply with the specific Country Communication Agency requirements (i.e., FCC, IC, ETSI).
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5.1.1 Omni-directional Antenna Design

The omni-directional antennas offered in the Limitless™ Series were chosen for their ability to be used in applications where transmit-and-receiver antennas may be moving with respect to each other or could also be stationary. They are dipole antennas that radiate power (power from the internal radio of the WBX) in a 360° outward pattern in a plane perpendicular to the length of the antenna element. “Omni” may suggest the antenna radiates power in all directions, but that is not the case. The actual antenna radiation pattern looks more like a toroid (doughnut-shape) as shown in Figure 14.

Figure 14. Radiation Pattern of an Omni-directional Antenna



The antenna radiates virtually zero power in the Z axis and most of the power in the X and Y axis. Increasing the antenna’s gain will increase the power only in the X and Y axis. As a result, the radiation pattern becomes narrower. For instance, this is analogous to the reflector in an automobile’s headlight. The reflector does not add light or increase the luminous intensity of the light bulb, rather it simply directs all the light energy in the forward direction where the light is needed most.

5.2 Antenna Mounting and Considerations

5.2.1 Antenna Mounting Location with Respect to RF Signal

⚠ WARNING

RF EXPOSURE

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm [7.87 in] or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna used for this transmission must not be co-located in conjunction with any other antenna or transmitter.

Failure to comply with these instructions could result in death or serious injury.

There are several environmental factors to consider with respect to antenna location during installation. These factors can affect the radio frequency (RF) signal strength being both transmitted and received by the WBX and corresponding WPMM monitor or WDRR receiver. It is desirable for the antenna to be mounted to limit exposure of adjacent materials/objects between the Limitless™ WBX and WPMM or WDRR receiver, as they will have an effect on RF signal strength. If the mounting location for an omni-directional antenna is on the side of a building or tower, the antenna pattern will be degraded on the building or tower side.

Obstacles that affect antenna patterns and RF signal strength:

- Indoor: Concrete, wood, drywall, and metal walls, etc.
- Outdoor: Vehicles, buildings, trees, structures, topology, weather conditions, chain link fence, major power cables, etc.

Best performance is achieved when antennas for both the WBX and WPMM monitor are mounted at the same height and in a direct line of sight (LOS) with no obstructions. Generally, the higher the antenna is above ground, the better it performs. Another concern is RF interference, discussed in Section 5.5.3.

Figure 15. WBX to WPMM or WDRR Antennas with RF Signal Line of Sight (LOS) Free From Obstacles

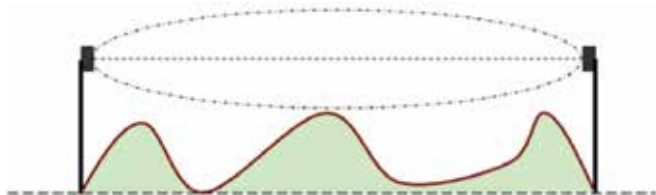
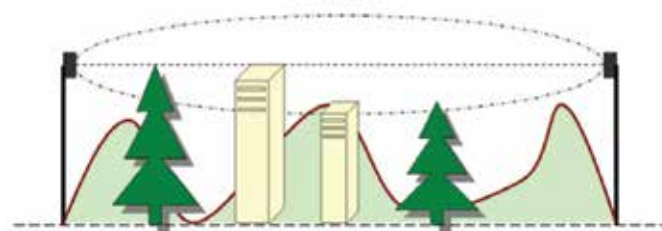


Figure 16. WBX to WPMM or WDRR Antennas with RF Signal Line of Sight (LOS) Affected by Obstacles



5.2.2 Outdoor Installation Warnings

WARNING

LIVES MAY BE AT RISK!

Carefully observe these instructions and any special instructions included with the equipment being installed.

WARNING

CONTACTING POWER LINES COULD BE FATAL

Look over the site before beginning any installation and anticipate possible hazards, especially these:

- Make sure no power lines are near where possible contact can be made. Antennas, masts, towers, guy wires, or cables may lean or fall and contact these lines. People may be injured or killed if they are touching or holding any part of equipment when it contacts electric lines. Make sure there is NO possibility that equipment or personnel can come in contact directly or indirectly with power lines.
- Assume all overhead lines are power lines.
- The horizontal distance from a tower, mast, or antenna to the nearest power line should be at least twice the total length of the mast/antenna combination. This will ensure that the mast will not contact power if it falls during either installation or later.

WARNING

TO AVOID FALLING, USE SAFE PROCEDURES WHEN WORKING AT HEIGHTS ABOVE GROUND

- Select equipment locations that will allow safe, simple equipment installation
- Don't work alone. A friend or co-worker can save a life if an accident happens.
- Use approved, non-conducting ladders and other safety equipment. Make sure all equipment is in good repair.
- If a tower or mast begins falling, don't attempt to catch it. Stand back and let it fall.
- If anything such as a wire or mast does come in contact with a power line, DON'T TOUCH IT OR ATTEMPT TO MOVE IT. Instead, save a life by calling the power company.
- Don't attempt to erect antennas or towers on windy days.

WARNING

MAKE SURE ALL TOWERS AND MASTS ARE SECURELY GROUNDED, AND ELECTRICAL CABLES CONNECTED TO ANTENNAS HAVE LIGHTNING ARRESTORS.

This will help prevent fire damage or human injury in case of lightning, static build up, or short circuit within equipment connected to antenna.

- The base of the antenna mast or tower must be connected directly to the building protective ground or to one-or-more approved grounding rods, using 1 AWG ground wire and corrosion-resistant connectors.
- Refer to the National Electrical Code for grounding details.
- Lightning arrestors for antenna feed coaxial cables are available from HyperLink Technologies, Inc.

WARNING

If a person comes in contact with electrical power, and cannot move

DO NOT TOUCH THAT PERSON OR RISK ELECTROCUTION.

- Use a non-conductive dry board, stick, or rope to push, pull, or drag them so they no longer are in contact with electrical power.
- Once they are no longer contacting electrical power, administer CPR if certified, and make sure emergency medical aid has been requested.

ATTENTION

When the WBX switch is being installed or operating in a hazardous environment, the end customer/user should issue a work permit to a trained professional installer prior to any work performed on the Limitless™ WBX switch. This includes the following actions:

- Installation and/or operation of the Limitless™ WBX switch
- Installation and/or adjustment of a remote antenna for the Limitless™ WBX switch
- Maintenance on the Limitless™ WBX switch, including battery replacement, pairing, purging, etc.

5.2.3 Antenna Styles and Mounting Options

⚠ WARNING

RF EXPOSURE

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm [7.87 in] or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna used for this transmission must not be co-located in conjunction with any other antenna or transmitter.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

POTENTIAL ELECTROSTATIC CHARGING HAZARD

When the WBX Series is installed in potentially hazardous locations care should be taken not to electrostatically charge the surface of the antenna shroud by rubbing the surface with a cloth, or cleaning the surface with a solvent. If electrostatically charged, discharge of the antenna shroud to a person or a tool could possibly ignite a surrounding hazardous atmosphere.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Connection and disconnection of the antennas should only be performed in a non-hazardous area and with **no battery power** applied to the WBX. This is due to the risk of possibly damaging the internal WBX electronics and/or igniting the surrounding hazardous atmosphere.

Failure to comply with these instructions could result in death or serious injury.

5.2.3.1 Antenna Connection, Styles, and Mounting Options

Choosing an antenna mounting style depends on application conditions, along with antenna benefits and/or features and user preference. The antenna's gain (discussed further in Section 5.4) to some extent determines physical size; also a consideration is the amount of room available in the application.

Figure 17. Straight Antennas (Radome included with 2.0 dBi straight antenna)



Adhesive mount: The benefit of the remote adhesive mount antenna is mounting flexibility to a number of surfaces and in various orientations. Remember, the surface that the antenna is being mounted to will affect the radiation pattern so it is suggested that masking tape be used to temporarily attach the antenna. Perform fade-margin testing, as described in Section 5.4 before permanently mounting.

Permanent mounting: Pre-clean the surface where the antenna is to be mounted with an alcohol wipe. Peel paper protection from adhesive strip and mount to the cleaned surface (see Figures 19, 20, and 21).

**Figure 18. Adhesive Mount Antenna
– Step 1. Pre-clean the surface**



**Figure 19. Adhesive Mount Antenna
– Step 2. Peel Protection from Adhesive Strip**



**Figure 20. Adhesive Mount Antenna
– Step 3. Mount the Antenna**



Mast mount: The benefit of the mast-mount antenna is its rigid design and resistance to displacement when subjected to shock, vibration, wind, etc. It can be easily mounted high above the ground to obtain greater RF signal performance and it withstands winds up to 100 mph.

- Mast-mount bracket (Included with the 8 dBi antenna): Attach antenna to its mounting bracket and tighten nut. Assemble two U-clamps around mast and tighten nuts to ensure lock washers provided are compressed to a flat condition (See Figures 21 and 22).

Figure 21. Mast Mount Antenna – Tighten nut on mounting bracket

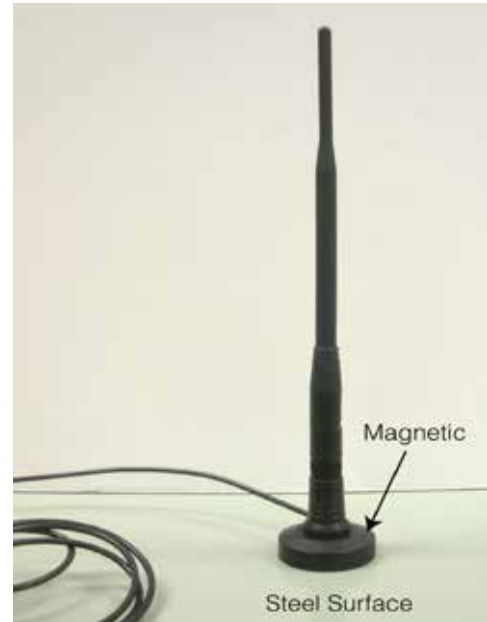


Figure 22. Mast Mount Antenna – Side View with Attachment to Pipe



Magnetic mount: The benefit of the magnetic-mount antenna is its ability to mount on any ferrous-metal surface and in various orientations. A smooth metal surface is preferred to allow the best attraction of the magnet to the surface. First, the user will need to determine if the magnetic attraction is sufficient to hold the antenna in the desired position (i.e., shock, vibration, etc. in the application). Placing the antenna in a location where it cannot be inadvertently displaced may help. Magnetic-mount antennas are not designed for mobile applications (see Figure 23).

Figure 23. Magnetic Mount Bracket with Antenna – Mounted on Steel Surface



5.2.4 Antenna Adjustment Considerations

The antenna of the WBX and WPMM monitor or WDRR receiver should be oriented in parallel. This will, in most cases, allow the longest range and highest RF signal. The least RF signal is normally in a direction in-line with the top of the antenna, so avoid having antennas pointed directly toward or directly away from each other.

Figure 24. Highest RF Signal When Antennas are as Parallel to Each Other as Possible



5.3 Signal Range of an Antenna

The signal range is defined as the physical distance between the WBX and WPMM monitor or WDRR receiver. It's a function of the antenna's gain, radio output of the WBX switch and WPMM monitor or and cable loss (if used) in conjunction with the environment (i.e. outdoor urban, indoors, etc.) that the Limitless™ product is operating in.

Signal range specification:

305 m [1000 ft] (nominal)

Line of sight with a 2.0 dBi antenna installed on the WBX and WPMM monitor or WDRR receiver

5.4 Choosing an Antenna Gain (dBi) With Acceptable Fade-Margin

There are several different antenna gain options in the Limitless™ Series to choose from. This section helps determine the antenna version(s) that will provide suitable RF signal performance for specific applications.

⚠ WARNING

The attenuator shall be used for testing purposes only. The connection and disconnection of the antennas/attenuator should only be performed in a non-hazardous area and with **no battery power** applied to the WBX. This is due to the risk of possibly damaging the internal WBX electronics and/or igniting the surrounding hazardous atmosphere.

Failure to comply with these instructions could result in death or serious injury.

The Limitless™ Series antenna's actual gain is measured by how much of the input power from the internal radio of the WBX is concentrated in a particular direction. The WBX's antenna transmits RF signals, and also receives RF signals from a Limitless™ WPMM monitor or WDRR receiver. In a particular application, transmit signal strength may be better than the receive signal strength or vice versa. The intent is to choose an antenna with the optimum gain relative to application conditions for both transmitting and receiving.

Fade-margin is the amount of excess power available above and beyond what is necessary to maintain a reliable RF signal between the transmitter and receiver. Normally, an acceptable threshold of excess power to ensure effective operation in a variety of environmental conditions is 10 dB. A simple way to determine if the signal strength is sufficient is to temporarily install a 10 dB attenuator* between the RP-SMA plug of the antenna or remote cable and RP-SMA jack of the WBX. This should be completed in an operating application environment with good nominal environmental conditions. When using a WPMM monitor and starting with the antenna chosen in Section 3.1, install the attenuator and operate the system until exposure of all normal application conditions is completed while monitoring the amber yellow LED (RF link/signal indicator of the WPMM monitor). If the fade-margin is unacceptable, the LED turns on solid indicating that the antenna position on the WBX and/or WPMM monitor will need to be changed or another antenna type should be chosen. If using a WDRR receiver; the RF signal strength can be monitored via the RF Signal Strength LEDs. Please refer to the FUNCTIONAL INDICATOR section in the WDRR Installation and Technical Manual for further details of operation.

Try several mounting locations and/or antennas while retesting each with the attenuator to determine the optimal set-up that provides an acceptable fade-margin. Remember to remove the attenuator after testing is completed.

*Suggested sources/part numbers

- 10 dB attenuator (i.e. Crystek – Part number: CATTEN-0100)
- RP-SMA female to SMA male connector Adapter (i.e. Connector City – Part number : ADP-SMAM-RPSF)
- RP-SMA male to SMA female connector Adapter (i.e. Connector City – Part number : ADP-RPSM-SMAF)

5.5 Environment Usage/Concerns

5.5.1 Choosing an Antenna/Cable to Meet Application Exposure Conditions

There is no antenna or cable design impervious to every environmental condition that it could be exposed to. So it is suggested that the application environment be reviewed as follows:

Step	Action
1	Determine where the antenna will be installed and the application conditions: indoor, outdoor, or limited outdoor exposure. Even if the antenna is going to be used indoors, an outdoor antenna may be more suitable (i.e., resistant to fluids, rigid construction, etc.)
2	Determine what the antenna may be subjected to (i.e., fluids, chemicals, oils, wind, shock, vibration, etc.).
3	<p>A. Review antenna and/or cable materials (listed in Section 5.1) against resistance to chemicals and fluids. If choosing an adhesive mount, adhesive resistance testing may be necessary.</p> <p>B. If shock, vibration, wind, rain, sleet/snow, etc. are in the application, choose an antenna rated for outdoors and has a rigid design as defined in Sections 5.1 and 5.2.3.2.</p>
4	<p>The WBX's enclosure is designed to meet Type seal requirements; however, this step may be required to provide an extra level of protection, especially if the application may be subjecting antennas and cables to liquids. The RP-SMA connections, tilt/swivel joints, and cable entrances are potential leak paths that could lead to corrosion. The following procedure is one way to provide extra protection to these connections and joints.</p> <p>Ensure that the area you are applying tape to is clean from contaminants by first cleaning with mild detergent/water and completely dry. Follow with an isopropyl alcohol wipe of the area.</p> <p>Layer 1: Wrap a layer of polyvinyl chloride insulating tape Layer 2: Wrap a layer of Rubber splicing tape i.e. Scotch™ 23 Layer 3: Wrap a layer of UV stable polyvinyl chloride insulating tape</p> <p>Layer 1 allows the user to remove Layer 2 for connector inspection, antenna replacement, repositioning of the tilt/swivel antenna, etc.</p> <p>See Figure 25 as an example of the tapes applied to a RP-SMA jack antenna connection. The lime/black antenna guard is not required to be installed.</p>

If the antenna and connectors are not protected by the radome, the connector and threads should be protected from the elements through an application of protective tape.

- A recommended protective tape is COAX-SEAL #104 Hand Moldable Plastic Weatherproofing Tape, available from LCOM, Inc.
- Also acceptable is Scotch® Premium Vinyl Electrical Tape 88-Super tape, available from 3M.

Figure 25 – Application of Protective Tape

Step 1 - Remove radome.



Step 2 - First apply 1/2 inch wide Coax Seal (flexible and moldable material)



Step 3 - Secondly, apply 3M Scotch® Premium Vinyl Electrical Tape 88-Super



In the end, the antenna/cable choice may need to be tested in the actual application conditions to prove suitability.

5.5.2 RF Interference

The WBX and WPMM or WDRR radio operate in the 2.4 GHz range. Upon initial pairing with the WBX, the WPMM's or WDRR's radio will automatically scan each of the 9 or 12 channels in the 2.4 GHz range and choose a channel with the least amount of usage. This provides a level of protection from RF interference as the chosen channel where RF communication is low will have a lower chance of signal collision.

However, if multiple RF sources exist in the chosen channel or the external source has an extremely high power intensity or it is in close proximity to the Limitless™ Series antenna, RF interference can cause an RF signal to not reach the WBX or WPMM monitor, or WDRR receiver. RF interference can be caused by many sources (i.e., other radios in the same operating range, solar activity, high frequency digital products, conventional microwave ovens, etc.). If the Limitless™ Series is in an environment with a high usage of products in the 2.4 GHz range, or the RF environment is unknown, an on-site RF survey may prove to be valuable in identifying possible RF interference sources along with other existing wireless devices.

Once the RF sources are identified and located, it may allow the Limitless™ Series antennas to be moved away from the identified RF sources to achieve acceptable performance. The other option is removing the external source, if feasible.

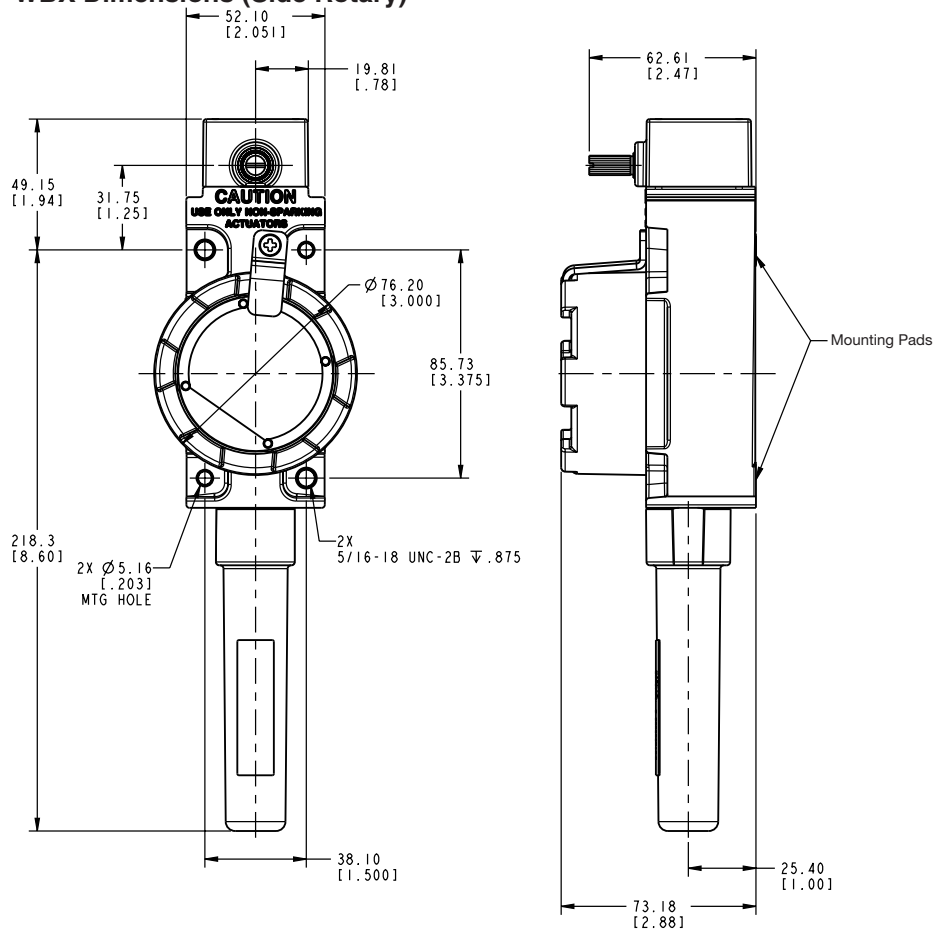
5.6 WBX Mounting

5.6.1 WBX Heavy-Duty Inherently Safe Limit Switch with Mechanical Actuators

The housing has two slotted mounting holes that will accept a M5 or #10 size screw and allow adjustment of the switch actuator to the customer actuator during installation. The switch also has two 10-32 UNF tapped holes for mounting from the back.

Note: The adjustment process should not allow preload of the switch actuator and the full travel of the switch actuator should not exceed the switch over travel maximum specification. (See installation drawing at sensing.honeywell.com)

Figure 26. Limitless™ WBX Dimensions (Side Rotary)



**OPERATING HEAD CODE "A"
STRAIGHT ANTENNA**

Operating point given in relation to lever mounting shaft.

CHARACTERISTICS	OPERATING HEAD CODE "A" MOMENTARY
PRETRAVEL (MAX)	17.5°
OVERTRAVEL (MIN)	60°
DIFFERENTIAL TRAVEL (MAX)	7°
TOTAL TRAVEL (REF)	80°
OPERATING TORQUE (MAX)	4 IN. LBS
FULL TRAVEL TORQUE (MAX)	4 IN. LBS

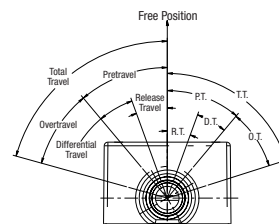
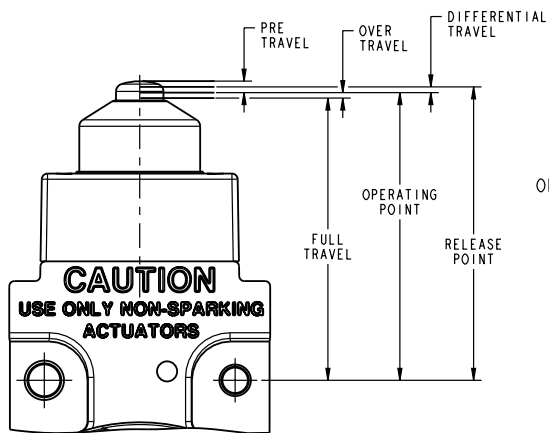
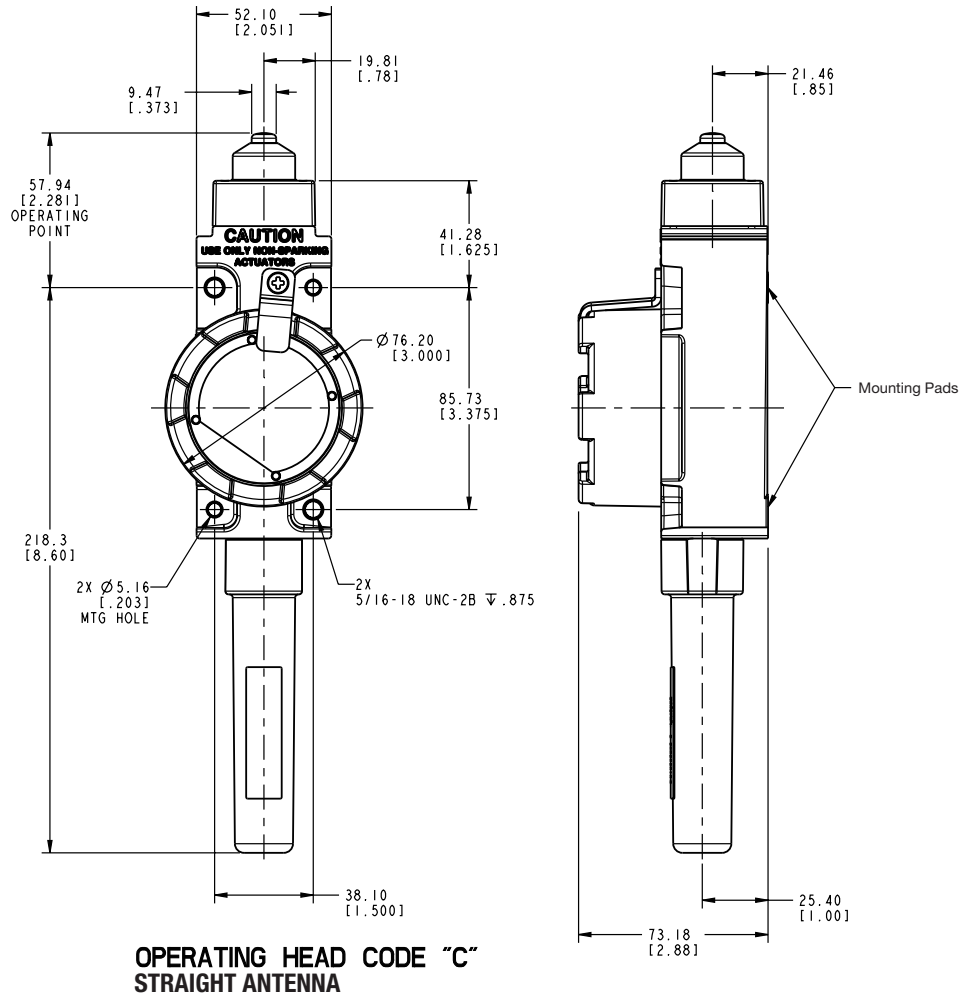


Figure 27. Limitless™ WBX Dimensions

Pin Plunger

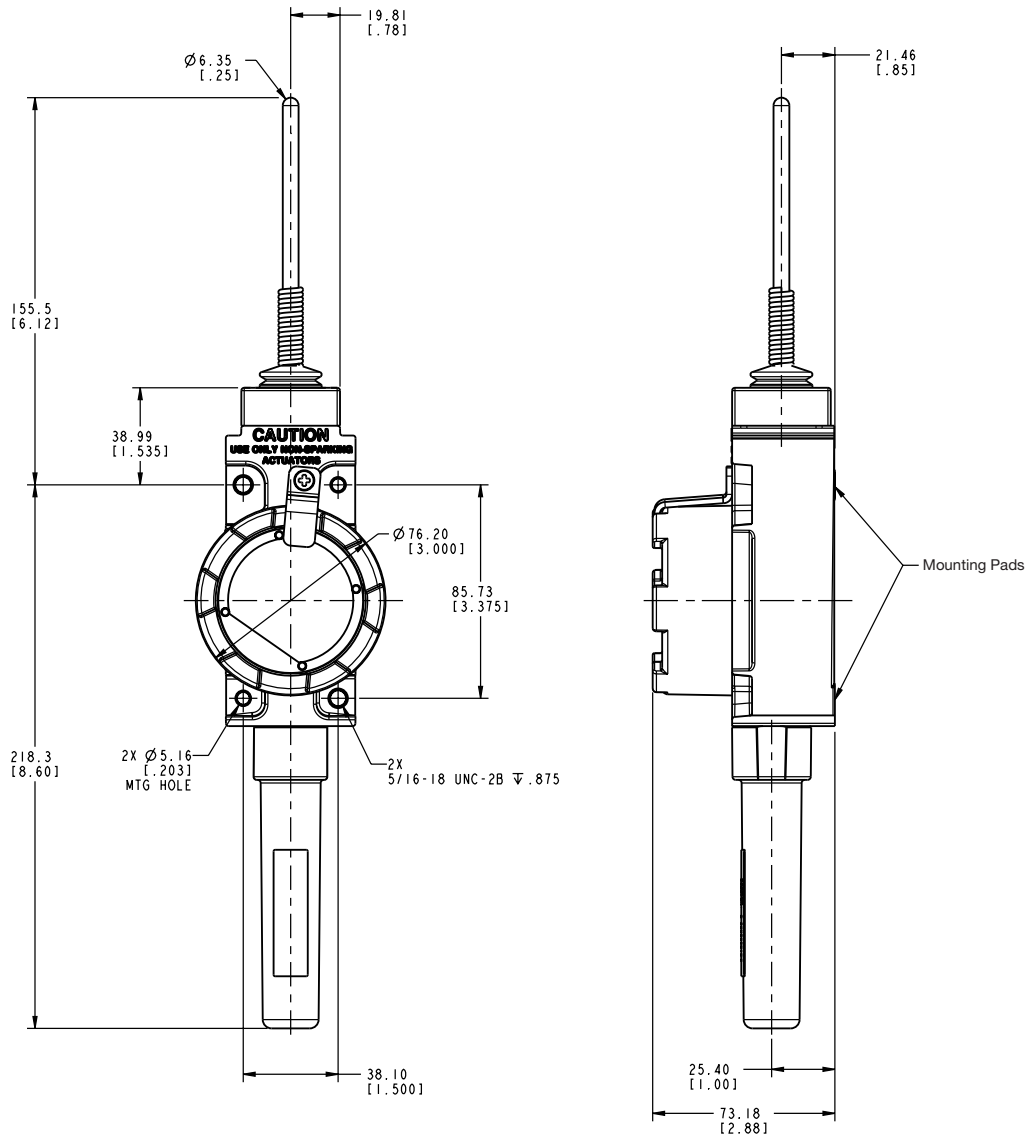


OPERATING DATA - PIN PLUNGER

OPERATING POINT GIVEN IN RELATION TO TOP MOUNTING HOLE

CHARACTERISTICS	OPERATING HEAD CODE "C" TOP PLUNGER PLAIN
PRETRAVEL (MAX)	.070 INCH
DIFFERENTIAL TRAVEL (MAX)	.020 INCH
OVERTRAVEL (MIN)	.190 INCH
OPERATING FORCE (MAX)	4 LBS
OPERATING POINT	2.281±.020 INCH
FULL OVERTRAVEL FORCE (MAX)	9 LBS

Figure 28. Limitless™ WBX Dimensions
Wobble



**OPERATING HEAD CODE "J"
STRAIGHT ANTENNA**

OPERATING POINT GIVEN IN RELATION TO TOP MOUNTING HOLE

CHARACTERISTICS	OPERATING HEAD CODE "J" WOBBLE STICK
PRETRAVEL (APPROX) IN. RADIUS	1.0
OPERATING FORCE - OZ (MAX)	10.0

Figure 29. Limitless™ WBX Available Levers



6 INSPECTION AND MAINTENANCE

6.1 WBX Inspection and Replacement

Periodic inspection

- Check the WBX housing and the actuator, cable grip, and/or connectors, etc. for signs of damage. Replace if necessary

ATTENTION

When the WBX switch is being installed or operating in a hazardous environment, the end customer/user should issue a work permit to a trained professional installer prior to any work performed on the Limitless™ WBX switch. This includes the following actions:

- Installation and/or operation of the Limitless™ WBX switch
- Installation and/or adjustment of a remote antenna for the Limitless™ WBX switch
- Maintenance on the Limitless™ WBX switch, including battery replacement, pairing, purging, etc.

6.2 Antenna Inspection and Replacement

Periodic inspection

- Check radome or cable connection to WBX connector to ensure it is tight and no signs of damage or corrosion. Replace if necessary per Section 5.2.3.1.

ATTENTION

When the WBX switch is being installed or operating in a hazardous environment, the end customer/user should issue a work permit to a trained professional installer prior to any work performed on the Limitless™ WBX switch. This includes the following actions:

- Installation and/or operation of the Limitless™ WBX switch
- Installation and/or adjustment of a remote antenna for the Limitless™ WBX switch
- Maintenance on the Limitless™ WBX switch, including battery replacement, pairing, purging, etc.

6.3 Battery Replacement

When to replace

- Battery is dead or low. The WPMM and WDRR will indicate a dead or low battery condition when a yellow LED is flashing. Upon this indication, proceed with replacing the battery in the WBX as per below.

Tools required

- Slotted or Phillips screwdriver

WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Connection and disconnection of the batteries should only be performed in a non-hazardous area. The batteries used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 100°C [212°F], or incinerate.

Failure to comply with these instructions could result in death or serious injury.

WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

If the WBX is to be returned to Honeywell for any reason, the battery MUST be removed prior to shipping. Dispose of used batteries promptly per local regulations or the battery manufacturer's recommendations. Keep away from children. Do not disassemble and do not dispose of in fire.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

When installing the battery, do not snag the battery terminal on the clip or the battery may be damaged. Do not apply excessive force. Do not drop. Dropping the battery may cause damage. If a battery is dropped, do not install the dropped battery into the WBX. Dispose of dropped battery promptly per local regulations or per the battery manufacturer's recommendations

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Both batteries must be the same model from the same manufacturer. Mixing old and new batteries or different manufacturers is not permitted.

Use only the following 3.6 V lithium thionyl chloride (Li-SOCl₂) battery (non-rechargeable), size AA. No other batteries are approved for use in the WBX Series. Always replace both batteries.

- XENO Energy, part number: XL-060F
- Tadiran, part number: TL-5903/S
- Bi-Power, part number: ER14505H

STOP ATTENTION

When the WBX switch is being installed or operating in a hazardous environment, the end customer/user should issue a work permit to a trained professional installer prior to any work performed on the Limitless™ WBX switch. This includes the following actions:

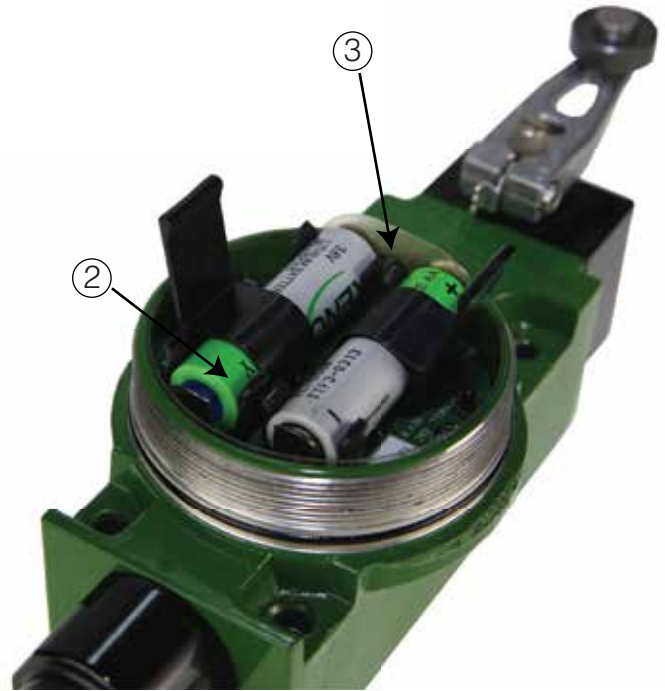
- Installation and/or operation of the Limitless™ WBX switch
- Installation and/or adjustment of a remote antenna for the Limitless™ WBX switch
- Maintenance on the Limitless™ WBX switch, including battery replacement, pairing, purging, etc.

Reference Figure 30.

Step	Action
1	Remove the housing cover by turning CCW as shown in Figure 30.
2	Remove old battery from the battery holder ② by using pulling on the battery extractors as shown. Remove the battery extractors and install on the new battery housings.
3	Install battery as follows to avoid damage to the battery and holder: <ul style="list-style-type: none"> • See label in battery holder defining the "+" and "-" terminals ③ to ensure battery is placed in holder with correct polarity. • Do not attempt to bend the battery's hold-down tabs forward. • Insert the battery negative end under the hold-down tab, at an angle, and against the end of the spring tab ④. Simultaneously move the negative end of the battery into position, compressing the spring tab, and angle the positive end into the holder ⑤.
4	Replace cover and ensure it is turn fully CW until tight; see Figure 30.
5	Dispose of used battery promptly per local regulations or the battery manufacturer's recommendations. Keep away from children. Do not disassemble and do not expose of in fire.

Note: Re-pairing via pairing mode is not required after installing a new battery

Figure 30. Limitless™ WBX Battery Replacement



7 ACCESSORIES

7.1 Antenna Options



7.2 Antenna Cable Options

WCA200RNPRSP-002 Cable Assembly: 2 ft¹
WCA200RNPRSP-010 Cable Assembly: 10 ft¹



¹ use only with WAN06RNJ antenna and when extra cable is desired

WCA200RNJRSP-002 Cable Assembly: 2 feet length²
WCA200RNJRSP-005 Cable Assembly: 5 feet length²
WCA200RNJRSP-010 Cable Assembly: 10 feet length²
WCA200RNJRSP-015 Cable Assembly: 15 feet length²
WCA200RNJRSP-020 Cable Assembly: 20 feet length²

² Use when extra cable length is desired and allows connection from RP-SMA jack to RP-SMA plug

7.3 Antenna Mounting Options

WAMM100RSP-005 Magnetic Antenna Mount: w/ 5 ft of cable³
WAMM100RSP-010 Magnetic Antenna Mount: w/ 10 ft of cable³



³ Use only with WAN01RSP, WAN02RSP, WAN04RSP, WAN05RSP, or WAN08RSP antennas

8 INSTALLATION DRAWINGS

8.1 Drawing Availability

Complete installation drawings for each listing of the Limitless™ WBX Series switch and accessories are available at sensing.honeywell.com

9 TROUBLESHOOTING GUIDES

9.1 WBX used in conjunction with a WPMM

The troubleshooting guide includes WPMM indications and symptoms as it is being used in conjunction with the WBX. Refer to Figure 31 for layout of LEDs, terminals, connections, etc.

SYMPTOM	CAUSE	RESOLUTION
Green LED ④ is not ON	10 Vdc to 30 Vdc is not applied to "+" & "-" terminals ②③	Check for proper connection and 10 Vdc to 30 Vdc to "+" and "-" terminals ②③
	Power leads connected in reverse	Check for proper connection of power: "+" and "-" terminals ②③
Green ④, yellow ⑤ and/or red ⑦ LEDs do not blink ON at start-up	WPMM internal electronics damaged	Replace WPMM
	LED(s) burnt out ④⑤⑦	Replace WPMM
Green ④, yellow ⑤, and red ⑦ LEDs are momentarily OFF then ON with possible output change during normal operation. Resulting in only green ④ LED on and possibly incorrect yellow ⑤ and red ⑦ LED indication/output for up to 30 seconds.	ESD/EMI exposure beyond published specifications or device performing self check	Determine source for ESD/EMI emissions in application and take action to remove
Yellow LED ⑤ is flashing	Low battery in WBX	<ul style="list-style-type: none"> Determine which WBX has a low battery using the procedure in the TROUBLESHOOTING MODE section of the WPMM Installation and Technical manual. Replace WBX battery per Section 6.3
	Incorrect battery installed in WBX switch	<ul style="list-style-type: none"> Determine which WBX has a low battery using the procedure in the TROUBLESHOOTING MODE section of the WPMM Installation and Technical manual. Replace WBX battery per Section 6.3

Figure 31. Limitless™ WPMM With Call-outs



SYMPTOM	CAUSE	RESOLUTION
Yellow ⑤ LED is constantly ON	Dead or low battery in WBX	<ul style="list-style-type: none"> • Determine which WBX has a low battery using the procedure in the TROUBLESHOOTING MODE section of the WPMM Installation and Technical manual • WBX status will in this case be reported as insufficient RF • Replace WBX battery per Section 6.3
	Incorrect battery installed in WBX	<ul style="list-style-type: none"> • Determine which WBX has a low battery using the procedure in the TROUBLESHOOTING MODE section of the WPMM Installation and Technical manual. • WBX status will in this case be reported as insufficient RF • Replace WBX battery per Section 6.3
	RF range/distance between WPMM and WBX is beyond capability	Reposition WBX closer to the WPMM until yellow LED ⑤ is no longer ON
	Exposure to adjacent materials/objects and/or materials/objects	Reposition WBX away from objects until yellow LED ⑤ is no longer ON
	Damage or missing antenna from WPMM and/or WBX	Replace antenna; reference Section 5.2.3.1
	Antenna alignment is not acceptable	Reposition antenna; reference Section 5.2.4
	Damage to antenna cable	Replace antenna cable; reference Section 5.2.3.1
Loose antenna or cable connections	Check connections and tighten as necessary; reference Section 5.2.3.1	

SYMPTOM	CAUSE	RESOLUTION
Red LED ⑦ is not ON and buzzer does not sound when WBX is actuated (green LED ④ ON, yellow LED ⑤ OFF) *	WBX is not paired to WPMM	Pair WBX to WPMM per Section 4.4
	WPMM buzzer was set to “mute” during initial set-up	Refer to WPMM Installation and Technical Manual as the WPMM will need to be factory reset, and paired to the WBX(es)
	Actuator is nonfunctional or defective	Replace actuator
	WBX internal electronics damaged	Replace WBX
	Yellow LED ⑤ burnt out or damaged electronics of WPMM	Replace WPMM
	Red LED ⑦ burnt out	Replace WPMM
Buzzer not sounding when WBX actuated (green LED ④ ON, yellow LED ⑤ OFF) *	WBX is not paired to WPMM	Pair WBX to WPMM per Section 4.4
	WPMM buzzer was set to “mute” during initial set-up	Refer to WPMM Installation and Technical Manual as the WPMM will need to be factory reset, and paired to the WBX(es)
	Actuator defective	Replace actuator
	WBX internal electronics damaged	Replace WBX
	Yellow LED ⑤ burnt out or damaged electronics of WPMM	Replace WPMM
	Buzzer burnt out	Replace WPMM
Electrical output is not changing state when WBX is actuated (green LED ④ ON, yellow LED ⑤ OFF)	WBX is not paired to WPMM	Pair WBX to WPMM per Section 4.4
	Incorrect connections	Check for correct connections to output terminal "O" ① with respect to minus "-" terminal ②
	Actuator in WBX IS nonfunctional or defective	Replace actuator
	WBX internal electronics damaged	Replace WBX
	Damaged output	Replace WPMM

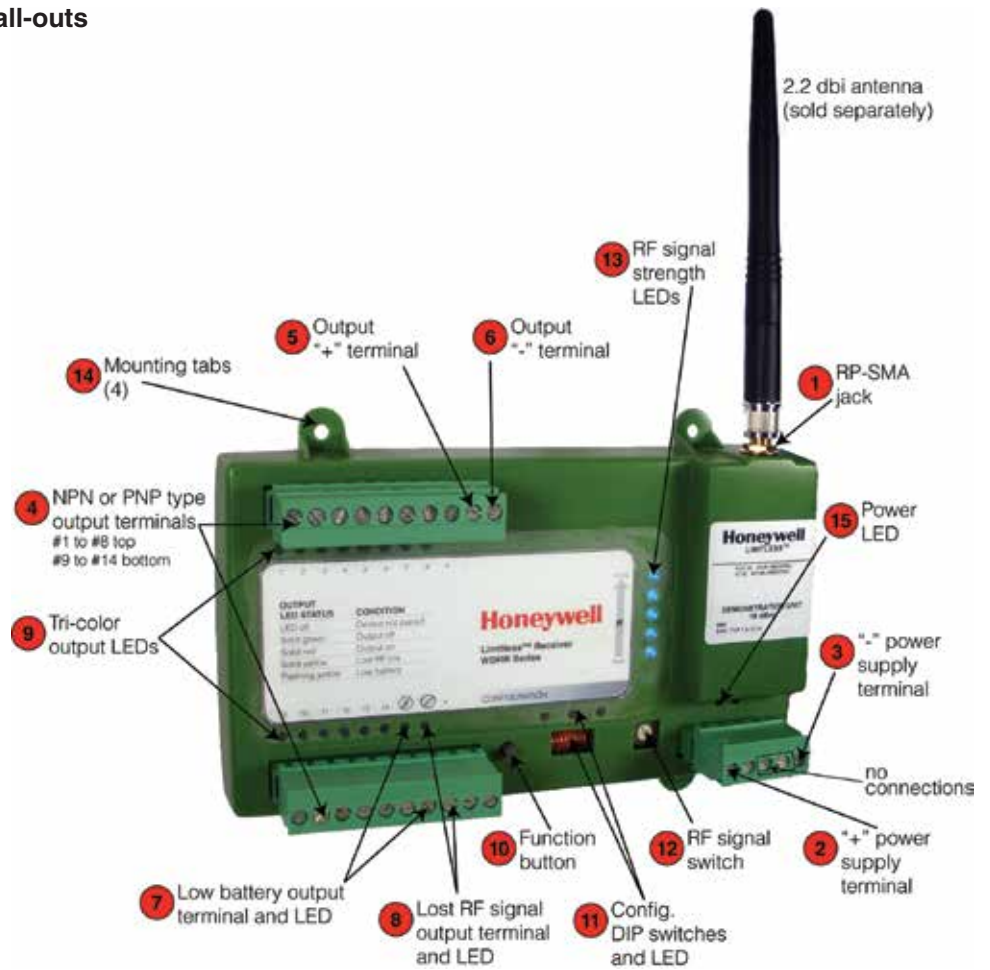
9.2 WBX used in conjunction with a WDRR

The troubleshooting guide includes WDRR indications and symptoms as it is being used in conjunction with the WBX. Refer to Figure 32 for layout of LEDs, terminals, connections, etc.

SYMPTOM	CAUSE	RESOLUTION
Green power LED ⑩ is not ON	10 Vdc to 28 Vdc is not applied to "+" & "-" terminals ② ③	Check for proper connection and 10 Vdc to 28 Vdc to "+" and "-" terminals ② ③
	Power leads connected in reverse	Check for proper connection of power: "+" and "-" terminals ② ③
Green, yellow and/or red configuration LEDs ⑪ do not blink ON at start-up	WDRR internal electronics damaged	Replace WDRR
	LED(s) burnt out ⑪	Check LED ⑪ operation referencing "Tri-color Output LEDs" section (RF Link position "F") described in the WDRR Installation and Technical Manual and replace WDRR if necessary
Tri-color output LEDs ⑨ are momentarily OFF then ON with possible NPN/PNP output change during normal operation. Resulting in only green Power LED on and possibly incorrect yellow and red LED ⑨ indication/output for up to 30 seconds.	ESD/EMI exposure beyond published specifications or device performing self check	Determine source for ESD/EMI emissions in application and take action to remove
Yellow LED ⑨ is flashing	Low battery in WBX	<ul style="list-style-type: none"> Determine which WBX has a low battery by visually inspecting the tri-color output LEDs ⑨ as one or more should be flashing yellow (see WDRR Installation and Technical Manual) Replace WBX battery per Section 6.3
	Incorrect battery installed in WBX	<ul style="list-style-type: none"> Determine which WBX has a low battery by visually inspecting the tri-color output LEDs ⑨ as one or more should be flashing yellow (see WDRR Installation and Technical Manual) Replace WBX battery per Section 6.3

SYMPTOM	CAUSE	RESOLUTION
Yellow tri-color output LED ⑨ is constantly ON	Dead or low battery in WBX	<ul style="list-style-type: none"> Determine which WBX has a low battery by visually inspecting the tri-color output LEDs ⑨ as one or more should be flashing yellow (see WDRR Installation and Technical Manual) WBX status will in this case be reported as lost RF Replace WBX battery per Section 6.3
	Incorrect battery installed in WBX	<ul style="list-style-type: none"> Determine which WBX has a low battery by visually inspecting the tri-color output LEDs ⑨ as one or more should be flashing yellow (see WDRR Installation and Technical Manual) WBX status will in this case be reported as lost RF Replace WBX battery per Section 6.3
	RF range/distance between WDRR and in WBX is beyond capability	Reposition WBX closer to the WDRR until yellow LED ⑨ is no longer ON
	Exposure to adjacent materials/objects and/or materials/objects	Reposition WBX away from objects until yellow LED ⑨ is no longer ON
	Damage or missing antenna from WDRR and/or in WBX	Replace antenna; reference Section 5.2.3.1
	Antenna alignment is not acceptable	Reposition antenna; reference Section 5.2.4
	Damage to antenna cable	Replace antenna cable; reference Section 5.2.3.1
	Loose antenna or cable connections	Check connections and tighten as necessary; reference Section 5.2.3.1
Red tri-color output LED ⑨ is not ON when WBX is actuated (green power LED ⑮ ON, yellow LED ⑨ OFF) <i>*Dependant on if the WPMM Set-up mode was used during initial set-up, this operation may be expected</i>	WBX is not paired to WDRR	Pair in WBX to WDRR
	Actuator is nonfunctional or defective	Replace actuator
	WBX internal electronics damaged	Replace in WBX
	Tri-color LED ⑨ burnt out or damaged electronics of WDRR	Replace WDRR
	Tri-color red LED ⑨ burnt out	Check LED ⑩ operation referencing “Tri-color Output LEDs” section (RF Link position “F”) described in the WDRR Installation and Technical Manual and replace WDRR if necessary
NPN/PNP output(s) ④ is not changing state when WBX is actuated (green power LED ⑮ ON, yellow LEDs ⑨ OFF) <i>*Dependant on if the WPMM Set-up mode was used during initial set-up, this operation may be expected</i>	WBX(es) not paired to WDRR	Pair WBX to WDRR per Section 4.4
	Incorrect connections	Check for correct connections to output terminal(s) ④
	Replace actuator	Actuator defective
	WBX internal electronics damaged	Replace WBX
	Damaged output(s)	Replace WDRR receiver

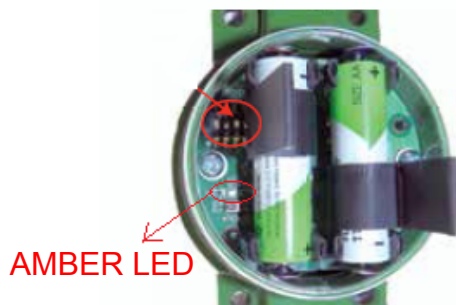
Figure 32. Limitless™ WDRR with call-outs



9.3 WBX BATTERY INSTALLATION OR REPLACEMENT

This troubleshooting guide captures a rare symptom of WBX device during battery installation or replacement.

SYMPTOM	CAUSE	RESOLUTION
AMBER LED does not blink upon battery insertion	Device is not operational upon battery installation	Power cycle the device by removing the Battery (one of them) and reinserting.



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