Honeywell

Installation and Technical Manual for the

Limitless™ Point-to-Point Wireless Hazardous Area Limit Switch, WBX Series

Issue 1

32307000

Used in conjunction with the Limitless™ WPMM or WDRR Series

⚠ 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 3.3 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.

TABLE OF CONTENTS

List of Figures

List of Tables

Intended Audience

This guide is intended for people who are responsible for planning, configuring, administering, and operating the Limitless™ wireless point-to-point network.

Prerequisite Skills

It is assumed that you are familiar with the operation of Honeywell Limitless™ WPMM wireless monitors and WDRR wireless receivers.

About this Document

This document outlines professional installation requirements for the Limitless™ Wireless Hazardous Area Limit Switch, WBX Series. Professional installation is required to comply with certification agency and legal requirements. This document must be adhered to for all installations of the Honeywell Limitless™ Wireless Hazardous Area Limit Switch, WBX Series.

These devices are not intended for critical control where there is a single point of failure or where single points of failure result in unsafe conditions. As with any process control solution, it is the end users' responsibility to weigh the risks and benefits to determine if the products used are the right match for the application based on security, safety, regulations, and performance.

Revision Information

Document name	Document ID	Publication Date
Installation and Technical Manual for the Limitless Point-to-Point Wireless Hazardous Area Limit Switch, WBX Series	32307000	May 2015
New	32307000 Issue 1	May 2015

1 | PRODUCT 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. Limitless™ wireless products incorporate point-to-point (P2P) 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™ WBX 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™ WBX Hazardous Area Limit Switch, WBX switch, or simply the WBX .

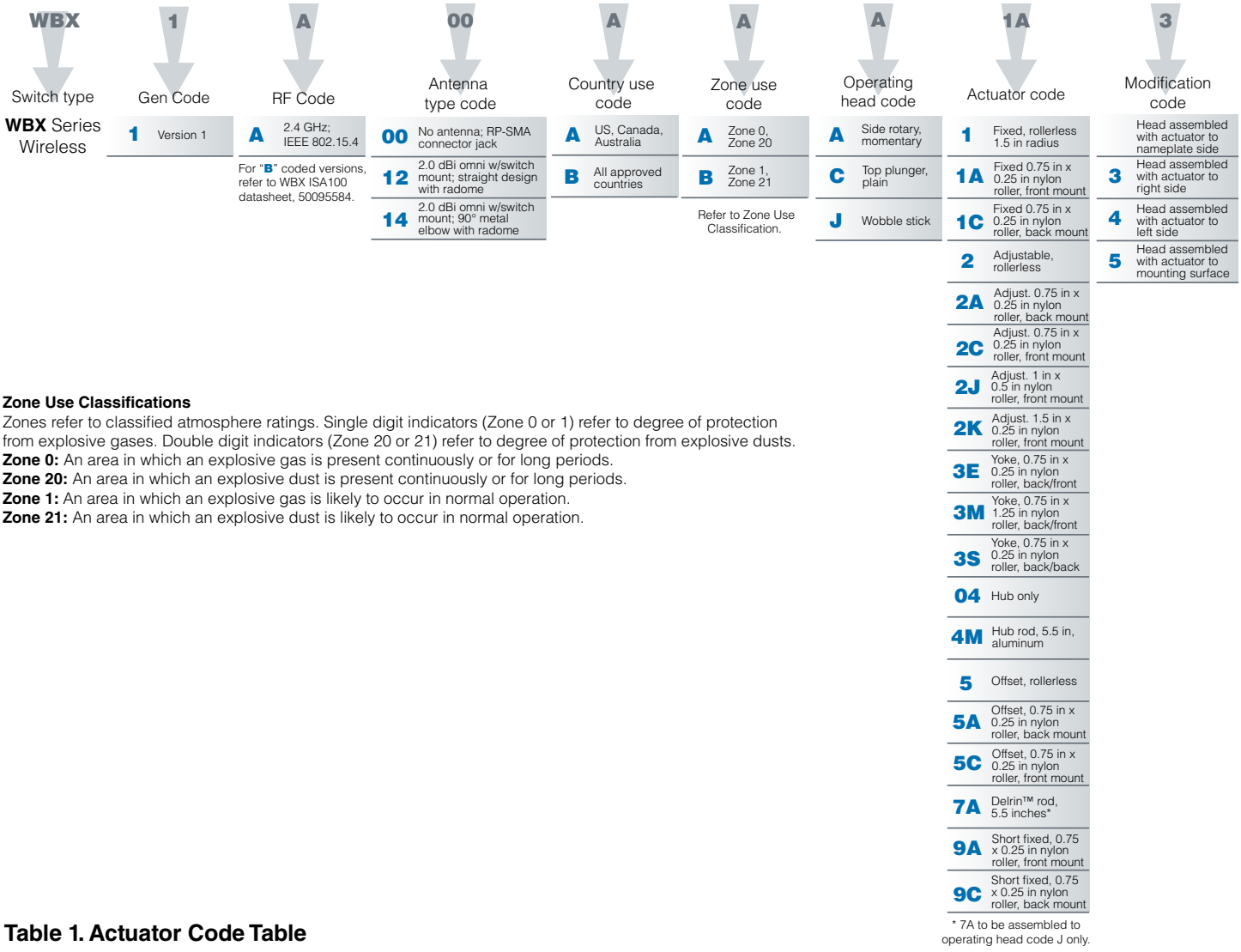
1.2 | Principle of Operation

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

This document is valid for the Limitless™ P2P Wireless Hazardous Area Limit Switch in the following variations.

Figure 1. Limitless™ P2P Wireless Hazardous Area Limit Switch, WBX Series Nomenclature



Zone Use Classifications
Zones refer to classified atmosphere ratings. Single digit indicators (Zone 0 or 1) refer to degree of protection from explosive gases. Double digit indicators (Zone 20 or 21) refer to degree of protection from explosive dusts.
Zone 0: An area in which an explosive gas is present continuously or for long periods.
Zone 20: An area in which an explosive dust is present continuously or for long periods.
Zone 1: An area in which an explosive gas is likely to occur in normal operation.
Zone 21: An area in which an explosive dust is likely to occur in normal operation.

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					
04		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
dBi	Decibel Isotropic
dBm	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-lb	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
PCB	Printed Circuit Board Assembly
R&TTE	Radio and Telecommunications Terminal Equipment
RP-SMA	Reverse Polarity SMA connector
RF	Radio Frequency
TX	Transmit Power
WBX	Wireless Hazardous Area Limit Switch Series
WDRR	Wireless DIN Rail Receiver
WM	Wireless Monitor
WOI	Wireless Operator Interface
WPMM	Wireless Panel Mount Monitor Series
WS	Wireless Switch

1.5 | Symbol Definitions

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

Table 3. 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.
	The **IEC Ex** mark means the equipment complies with the requirements of the International Electrotechnical Commission Explosive. The objective of the IECEx system is to facilitate international trade in equipment and services for use in explosive atmospheres, while maintaining the required level of safety.
	The **Ex mark** means the equipment complies with the requirements of the European standards that are harmonised with the 94/9/EC Directive (ATEX Directive, named after the French “ATmosphere EXplosible”).
	The **cULus mark** means the equipment was tested to Canadian and US standards by Underwriters’ Laboratories. The combination mark indicates compliance with both Canadian and U.S. Requirements. “Listed” means that the product can be operated as sold, in accordance with its inscriptions and operating instructions, without retesting by UL. Products are for use in hazardous locations where explosive atmospheres may be present. Certification covers division and zone area classification systems for the United States and/or Canada.

2 | SPECIFICATIONS, CERTIFICATIONS, AND APPROVALS

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	BG
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 | Certifications and Approvals

See product labels for applicable approvals and ratings.

Table 8. Communication Approvals and Standards

Approval/Item	Ratings/Description	
Communication agency approvals and standards	14 dBm	FCC Part 15.247 and 15.209
		Industry Canada RSS 210 Issue 8
		ACMA, C-Tick mark
	8 dBm	ETSI, CE mark
Enclosure type	Type 1, 3, 4, 13 IP67 (self-declared)	
Hazardous location approvals	cULus, ATEX, IEC Ex	

FCC ID: XJLWBX001
IC ID: 9832A-WBX001IC

⚠ 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:

- Aluminum 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 secures the cover to the enclosure/housing. It must be screwed in place when product is in use.
- Do not open when an explosive atmosphere may be present.
- Do not replace batteries when an explosive atmosphere is present.
- Use only Honeywell battery P/N: WBT7; approved battery manufacturers: Xeno Energy – XL-060F; Tadiran – TL-5903/S; or Bipower ER14505H batteries.

STOP ATTENTION

IEC 60079-0:2007-10 and IEC 60079-11:2006 were applied to the integral component fuse, Part No. 0259.125TX913 manufactured by Littelfuse. There are no significant safety related changes between these editions and the later editions of the standards noted under the “Standards” section of this document.

2.3 | Hazardous Location Standards and Certifications

Table 9. Hazardous Location Standards and Certifications

cULus Listing	ATEX Certification	IEC Ex Certification
Standards: UL913 8th edition; CAN/CSA-C22.2 NO. 157-92 (R2012); UL 60079-0 edition 6.0; UL 60079-11 edition 6.0; CSA C22.2 No. 60079-11: 14 edition 2.0; CSA C22.2 No. 60079-0: 11 edition 2.0	Standards: EN 60079-0: 2012 + A11:2013; EN 60079-11: 2012; EN 60079-26:2007	Standards: IEC 60079-0 edition 6.0; IEC 60079-11 edition 6.0; IEC 60079-26 edition 2.0
Class I, Div 1, Groups A, B, C, D T4 Class II, Div 1, Groups E, F, G Class I, Zone 1 AEx ia IIC T4 Ga Class I, Zone 1 Ex ia IIC T4 Ga Class II, Zone 21 AEx ia IIIC T135°C Da Class I, Zone 0 AEx ia IIC T4 Ga Class I, Zone 0 Ex ia IIC T4 Ga Class II, Zone 20 AEx ia IIIC T135°C Da Tambient -40°C to 70°C	Zone 1 Ex ia IIC T4 Ga Zone 21 Ex ia IIIC T135°C Da Zone 0 Ex ia IIC T4 Ga Zone 20 Ex ia IIIC T135°C Da	Zone 1 Ex ia IIC T4 Ga Zone 21 Ex ia IIIC T135°C Da Zone 0 Ex ia IIC T4 Ga Zone 20 Ex ia IIIC T135°C Da

CE 0518 c UL us LISTED Ex II 1 G II 1 D

2.4 | Radio Module Specifications

Table 10. Radio Module Specifications

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

2.5 | Battery Specifications

Table 11. Battery Specifications

Item	Specification
Battery	3.6 Vdc Lithium Thionyl Chloride; AA size, Qty: 2 Manufacturer: Honeywell, WBT7; Xeno Energy, P/N XL-060F; Tadiran, P/N TL-5903/S; Bipower, P/N: ER14505H

CAUTION

Do not mount or remove the antenna when batteries are present in WBX product as damage could occur to the WBX electronics and/or ignite the surrounding hazardous atmosphere.

2.6 | EMC Specifications

The latest applicable EMC Standards are as follows:

- EN 300 328, V1.8.1
- EN 61326-1 (2012)
- EN 301 489-1, V1.9.2
- EN 301 489-17, V2.2.1

ATTENTION

The antenna cables should not be modified (i.e. cut short and/or re-terminated) as it may affect Communication Agency approval. Approved antennas (refer to Section 3.3) are the only antennas allowed for use with the WBX.

2.7 | Environmental Specifications

Table 12. 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 - 0,35 mm peak-to-peak, 58 Hz to 500 Hz, 10 g
Shock	IEC 60068-2-27; half sine, 50 g, 6 mS
Sealing	Type 1, 3, 4, 13; IP67 (self-declared)

2.8 | Functional Specifications

Table 13. Functional Specifications

Item	Specification
High temperature endurance	70 °C; 10,000 cycles; 15 cpm
Low temperature endurance	-40 °C; 10,000 cycles; 15 cpm
Electrical/mechanical life	25 °C; 1 million operating cycles

ATTENTION

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

2.9 | Weight

All versions of the WBX Series switch have a maximum weight of 0,754 g [1.7 lb]. These weights do not include remote cables, antennas, radome, or actuators.

2.10 | Antenna Connection

Antennas connect to an RP-SMA male connector on the upper surface of the WBX. For straight antenna variants, a radome is fastened to the metal conduit fitting, protecting the antenna and connectors from the environment. Similarly, for 90° elbow variant, the radome is fastened to the conduit fitting at the far end of the metal elbow. Alternatively, a remote antenna and/or a lightning arrestor may be connected to the RP-SMA connector; when ordered without any antenna fitted to the WBX product.

2.11 | Agency Compliance Statements

2.11.1 | 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.

2.11.2 | Industry Canada (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 RSS 210 Gen Issue 8.
- 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 A est conforme avec Industrie Canada RSS 210 Numéro 8.

2.11.3 | Radio Frequency (RF) Safety Statements (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 [7.87 in] 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 it must have a separation distance of at least 20 cm [7.87 in] from all persons.

2.11.4 | 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

2.11.5 | European Declaration of Conformity Statements

Figure 2. European Declaration of Conformity (DoC)

Honeywell

Honeywell Control Systems Ltd.,
Newhouse Industrial Estate,
Motherwell, Lanarkshire, ML1 5SB,
Scotland, United Kingdom.

Tel.: +44 (0)1698 481000
Fax: +44 (0)1698 481011

A subsidiary of Honeywell Control Systems Ltd.,

Registered Office: Honeywell House, Arlington Business Park, Bracknell, Berkshire, RG12 1EB

Registered No 217808 (England)

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	
Directive (Amendments)	**Conformity Details**	
1999/5/EC and 2004/108/EC	Standards applied:	EN 61326-1: 2012 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 + A11: 2013 EN 60079-11:2012 EN 60079-26: 2007
	EC TEC No:	DEMKO I4ATEX1224X
	Notified Body:	
	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. :

Colin O'Neil, quality Eng. Manager, Newhouse

DoC No: A491 **DoC Issue: 3** **DoC Date: 03/03/2015** **Page 1 of 2**

2.11.6 | 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 | ANTENNAS

3.1 | Approved Antenna Types and Gains

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. Further technical information on the WAN Series antennas, WAMM Series magnetic mounts and WCA Series cable assemblies are available in later sections of this document.

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.

⚠ WARNING

The WBX Series switch must be installed in accordance with the requirements specified in this document. Only the specified power settings, antenna types and gains and cable lengths (attenuation) as outlined in this document are valid for Limitless™ Wireless Hazardous Area Limit Switches, WBX Series installations.

⚠ 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).

⚠ 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.

3.2 | Antenna Details

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.

Table 14. Antenna Options - Country Code A

Ant. type code	Part number	Replacement antenna mount or cable	Antenna design	Ant. gain (max.)	Connector/ mounting	Dimensions	Antenna material	Cable material/ type	Mount material
00	WAN03RSP	–	flat	3.0 dBi	RP-SMA plug/adhesive mount	115 mm L x 22,1 mm W x 4,57 mm D [4.53 in L x 0.87 in W x 0.18 in D] 3 m [9.8 ft] cable	UV stable ABS	UV stable PVC/ RG-174 coax	–
00	WAN04RSP	WAMM100RSP-005 base with 1,52 m [5 ft] of cable	tilt/ swivel	5.5 dBi	RP-SMA plug/direct mount	Ø 12,7 mm x 208,28 mm L [Ø 0.50 in x 8.20 in L]	UV stable molded polyurethane	UV stable PVC/ RG-174 coax	UV stable black ABS
00	WAN04RSP	WAMM100RSP-010 base with 3,05 m [10 ft] of cable	tilt/ swivel	5.5 dBi	RP-SMA plug/direct mount	Ø 12,7 mm x 208,28 mm L [Ø 0.50 in x 8.20 in L]	UV stable molded polyurethane	UV stable PVC/ RG-174 coax	UV stable black ABS
00	WAN05RSP	WAMM100RSP-005 base with 1,52 m [5 ft] of cable	tilt/ swivel	9.0 dBi	RP-SMA plug/direct mount	Ø 12,7 mm x 384,05 mm L [Ø 0.50 in x 15.12 in L]	UV stable molded polyurethane	UV stable PVC/ RG-174 coax	UV stable black ABS
00	WAN05RSP	WAMM100RSP-010 base with 3,05 m [10 ft] of cable	tilt/ swivel	9.0 dBi	RP-SMA plug/direct mount	Ø 12,7 mm x 384,05 mm L [Ø 0.50 in x 15.12 in L]	UV stable molded polyurethane	UV stable PVC/ RG-174 coax	UV stable black ABS
00	WAN06RNJ	WCA200RNPR-SP-002 coax cable assembly 0,682 m [2 ft]	straight	8.0 dBi	RP-N jack/ bracket	Ø 33,5 mm x 427,9 mm L [Ø 1.32 in x 16.85 in L]	UV stable fiberglass	UV stable PVC/RG-316 coax, UV stable Polyethylene/200 Series coax	300 series SST aluminum alloy
00	WAN06RNJ	WCA200RNPR-SP-010 coax cable assembly 3,05 m [10 ft]	straight	8.0 dBi	RP-N jack/ bracket	Ø 33,5 mm x 427,9 mm L [Ø 1.32 in x 16.85 in L]	UV stable fiberglass	UV stable PVC/RG-316 coax, UV stable Polyethylene/200 Series coax	300 series SST aluminum alloy
00	WAN08RSP	–	90°	0 dBi	RP-SMA plug/direct mount	Ø 8,0 mm x 29 mm L [Ø 0.34 in x 1.14 in L]	UV stable	–	–
00	WAN09RSP	–	low profile mobile	3.0 dBi	RP-SMA plug/magnetic	Ø 76,2 mm x 115 mm L [Ø 3.0 in x 4.54 in L] 4,57 m [15 ft] cable	UV stable ABS plastic	UV stable black PVC	Nickel-plated steel
00	WAN10RSP	–	straight	5.0 dBi	RP-SMA plug/magnetic	Ø 76,2 mm x 230,1 mm L [Ø 3.0 in x 9.06 in L] 4,57 m [15 ft] cable	Nickel-plated steel	UV stable black PVC	Nickel-plated steel
00	WAN11RSP	–	low profile mobile	4.0 dBi	RP-SMA plug/ thru-hole screw	Ø 39 mm x 42,4 mm L [Ø 1.54 in x 1.67 in L]	UV stable black PVC	UV stable black PVC	Nickel-plated steel
12/14	WAN12RSP	–	straight	2.0 dBi	RP-SMA plug/direct mount	Ø 10 mm x 79,5 mm L [Ø 0.39 in. x 3.13 in. L]	UV stable ABS plastic	–	–

Table 15. Antenna Options - Country Code B

Ant. type code	Part number	Replacement antenna mount or cable	Antenna design	Ant. gain (max.)	Connector/ mounting	Dimensions	Antenna material	Cable material/ type	Mount material
00	WAN03RSP	–	flat	3.0 dBi	RP-SMA plug/adhe-sive mount	115 mm L x 22,1 mm W x 4,57 mm D [4.53 in L x 0.87 in W x 0.18 in D] 3 m [9.8 ft] cable	UV stable ABS	UV stable PVC/ RG-174 coax	–
00	WAN04RSP	WAMM100RSP-010 base with 3,05 m [10 ft] of cable	tilt/ swivel	5.5 dBi	RP-SMA plug/direct mount	Ø 12,7 mm x 208,28 mm L [Ø 0.50 in x 8.20 in L]	UV stable molded polyurethane	UV stable PVC/ RG-174 coax	UV stable black ABS
00	WAN08RSP	–	90°	0 dBi	RP-SMA plug/direct mount	Ø 8,0 mm x 29 mm L [Ø 0.34 in x 1.14 in L]	UV stable	–	–
00	WAN09RSP	–	low profile mobile	3.0 dBi	RP-SMA plug/mag-netic	Ø 76,2 mm x 115 mm L [Ø 3.0 in x 4.54 in L] 4,57 m [15 ft] cable	UV stable ABS plastic	UV stable black PVC	Nick-el-plated steel
00	WAN10RSP	–	straight	5.0 dBi	RP-SMA plug/mag-netic	Ø 76,2 mm x 230,1 mm L [Ø 3.0 in x 9.06 in L] 4,57 m [15 ft] cable	Nickel-plated steel	UV stable black PVC	Nick-el-plated steel
00	WAN11RSP	–	low profile mobile	4.0 dBi	RP-SMA plug/ thru-hole screw	Ø 39 mm x 42,4 mm L [Ø 1.54 in x 1.67 in L]	UV stable black PVC	UV stable black PVC	Nick-el-plated steel
12/14	WAN12RSP	–	straight	2.0 dBi	RP-SMA plug/direct mount	Ø 10 mm x 79,5 mm L [Ø 0.39 in. x 3.13 in. L]	UV stable ABS plastic	–	–

Table 16. WBX Standard Antenna Options

Option 00	Option 12: Straight with Radome	Option 14: 90° Metal Elbow
No antenna. RP-SMA antenna jack is used	2.0 dBi gain omni-directional antenna	Note: The 90° metal elbow can be swivelled through a 330° range to orient away from any obstructions; the set-screw should be loosened using a M3 Allen key to enable the swivelling and is then tightened when desirable position is identified, using the M3 Allen key to a max. torque of 1,0 Nm [8.85 lb-in]
		

3.3 | ANTENNA OPTIONS

Table 17. 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	
14	WAN10RSP	WAN08RSP	WAN05RSP	
			WAN08RSP	
			WAN09RSP	
			WAN10RSP	
			WAN11RSP	

Note:
(1) Cable with a RP-SMA plug that connects directly to the WBX RP-SMA jack is used for Remote Antenna (exception, WAN06RNJ which uses N-type jack)
(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.

Table 18. 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
14	WAN10RSP			WAN09RSP
				WAN10RSP
				WAN11RSP

Remote mount: Remote mount antenna uses a cable with an RP-SMA plug that connects directly to the WBX RP-SMA jack (exception, WAN06RNJ, which uses a cable with an RP-N plug on one end and an RP-SMA plug on the other end.)

4 | CABLES

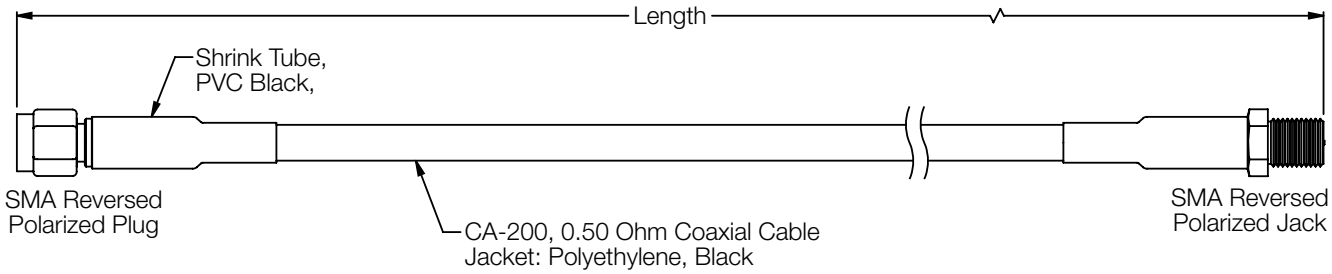
4.1 | WBX Series Antenna Cables

- All cables in these tables have a specified impedance of 50 ohms.
- These cables may also be used between the switch and lightning arrestor, between the lightning arrestor and antenna, or between the switch and antenna.

Table 19. Switch to Antenna Cable Specifications for WBX Series

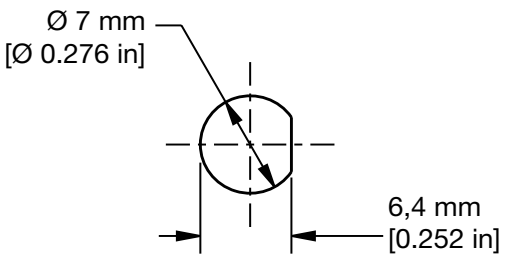
Honeywell Part Number	Cable Type	Connector Type	Frequency (GHz)	Length	Loss (dB)
WAMM100RSP-005	100 Series	RP-SMA Jack to RP-SMA Plug	2.4	1,52 m [5 ft]	1.99
WAMM100RSP-010	100 Series	RP-SMA Jack to RP-SMA Plug	2.4	3,05 m [10 ft]	3.98
RF Cable A					
WCA200RNPRSP-002	200 Series	RP-N Plug to RP-SMA Plug	2.4	0,61 m [2 ft]	0.34
WCA200RNPRSP-010	200 Series	RP-N Plug to RP-SMA Plug	2.4	3,05 m [10 ft]	1.69
RF Cable B					
WCA200RNJRSP-002	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	0,61 m [2 ft]	0.34
WCA200RNJRSP-005	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	1,52 m [5 ft]	0.85
WCA200RNJRSP-010	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	3,05 m [10 ft]	1.69
WCA200RNJRSP-015	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	4,57 m [15 ft]	2.54
WCA200RNJRSP-020	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	6,09 m [20 ft]	3.38

Figure 3. WBX Antenna Extender Cables



Note: This cable may optionally be mounted in a hole (see Figure 4), and fastened with the included nut and lockwasher. This would allow the RP-SMA jack to support the antenna. If this is done, ensure that the surface around the hole is clean and free of paint or oil, so as to allow a low resistance ground connection for optimum R.F. performance.

Figure 4. WBX Antenna Extender Cable Mounting Hole



Recommended Panel Mounting

ATTENTION

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

4.2 | Protection of Antenna Connections

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 electrical supply houses.
- Also acceptable is Scotch® Premium Vinyl Electrical Tape 88-Super tape, available from 3M.

Figure 5. 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

Ultimately, the antenna/cable choice may need to be tested in the actual application conditions to prove suitability for the environment.

5 | WBX BASIC START UP

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.

5.1 | 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.

CAUTION

When re-installing a radome on the WBX, do NOT use a wrench. Thread the radome on and tighten hand-tight. Ensure that the lower surface of the radome is flush with the WBX housing. Using a wrench could crack or damage the radome.

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 3.3, the radome may be removed by hand or using 30 mm open-end or adjustable wrench; unscrew the radome by turning it CCW (see Figures 6 and 7). 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 17 & 18).

Figure 6. Removal of Radome

Figure 7. Unscrew Antenna

Unthread the radome from the conduit fitting. Caution: Using a wrench could crack or damage the radome.

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 an 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 8.

Figure 8. Limitless™ WBX RP-SMA Connection, Remote

5.2 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. For shipping purposes, note that each of the two battery cells contains approx. 0.7 grams of lithium metal. Regulations may limit the maximum weight of lithium in a shipment.

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 at the same time.

- Honeywell Battery, part number: WBT7
- Approved battery manufacturers: Xeno Energy, part number: XL-060F; Tadiran, part number: TL-5903/S; Bipower, part number: ER14505H

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.

Tools required: #2 Phillips screwdriver.

Table 20. Battery Replacement Procedure

Step	Action
⚠	**WARNING** DO NOT DISASSEMBLE OR ASSEMBLE WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
1	Using a #2 Philips screwdriver, unscrew the screw holding the S-shaped clamp. Remove the screw and S-shaped clamp that is holding down the housing cover.
2	**Remove the WBX housing cover by turning in CCW direction as shown in Figure 9.**
3	Using a finger, press down slightly on both the batteries and pull out the battery insulator (see Figure 11). Ensure that the batteries are properly seated and making contact. Also, while removing the battery insulator observe the ORANGE LED flash one time; this confirms the device is powered up and operational. **IMPORTANT: If the ORANGE LED does not blink upon powering up, it is recommended to remove the batteries and re-insert back again.**
4	Replace the cover and thread it on to housing by turning in CW direction until tight.
5	Place the S-shaped clamp and tighten the screw with a 1,5 Nm [13.3 in-lb] torque to firmly hold down the housing cover.
6	Proceed with pairing, if applicable.

Figure 9. Limitless™ WBX housing

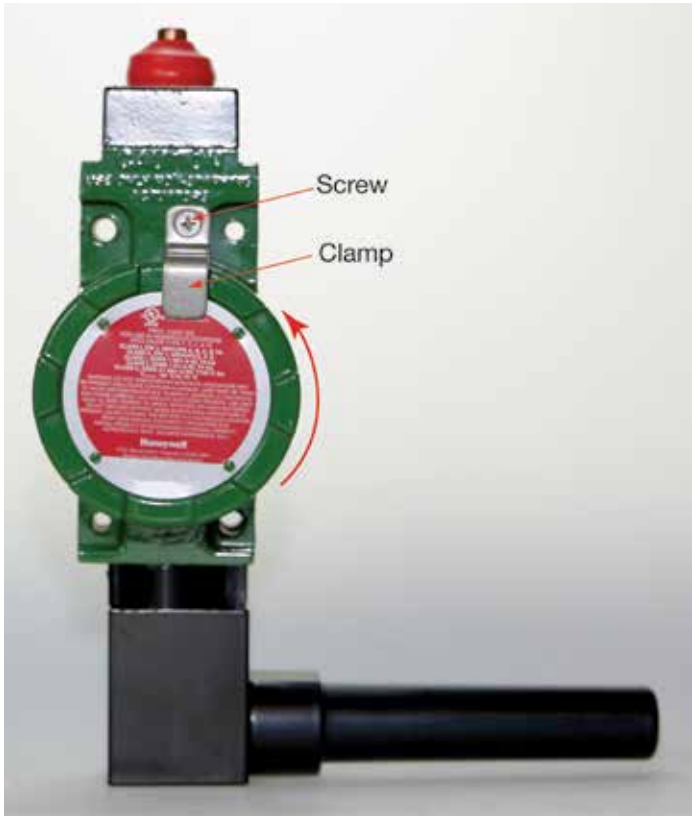
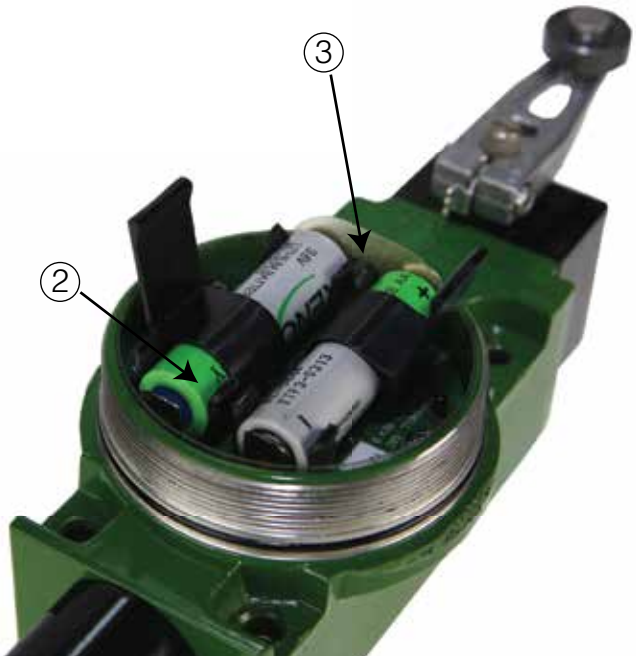


Figure 10. Limitless™ WBX battery and Insulator



② = Battery • ③ = Insulator

5.3 | 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 1 second to 90 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.

**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
- FW7275: 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
- FW7408: Any update rate chosen will allow normal operation

Figure 11. DIP Switches

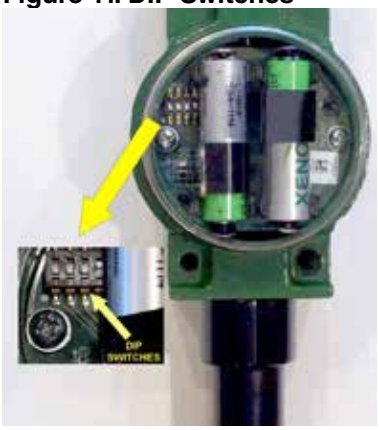
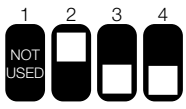
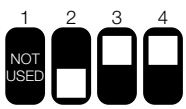
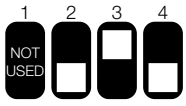
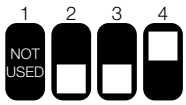
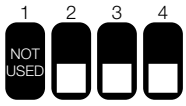


Table 21. DIP Switch Settings

DIP Switch Setting	Switch Position 1	2	3	4	Update Rate (seconds)	Lost RF Signal Delay (seconds)*
	n/a	ON	OFF	OFF	1	5
	n/a	OFF	ON	ON	5	18
	n/a	OFF	ON	OFF	10	45
	n/a	OFF	OFF	ON	30	120
	n/a	OFF	OFF	OFF	90	360

6 | WBX OPERATION

6.1 | 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 14 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 #14. 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. For example, if a single WDRR is paired with 14 WBX devices, and WBX #4 must be replaced, the replacement WBX will automatically become #4. If the WDRR was paired with fewer than 14 devices, the specific pairing number assigned to the newly paired device must be ascertained and then recorded.

Pairing steps when using a WPMM: The battery will need to be activated in the WBX and proper power applied to the WPMM (green ② 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.

Table 22. WPMM Pairing Instructions

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 12) of the WBX and locate the function button ⑦ (See Figure 14) to be used in Step 4.
3	WPMM: Press the Function button ④ on WPMM (See Figure 13) 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 the operator must release the function button immediately as the WPMM has entered the pairing mode.
4	WBX: Within a 30 second interval of Step 3, depress the WBX switch function button ⑦ (See Figure 14) 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. If the WBX does not enter pairing mode, it may be necessary to purge the WBX of it's previous pairing (refer to Section 6.4).
5	WPMM: Successful pairing will be indicated by the green ② and yellow ③ LEDs (See Figure 13) ceasing to flash and remaining on for a few seconds before turning off. The green LED will then come on and stay on. A short buzzer beep will also occur. If the WPMM does not indicate successful pairing, it may be necessary to purge the WPMM of it's previous pairing (see WPMM Installation and Technical Manual).
6	To confirm proper pairing between the WBX and WPMM (green LED will then come on and stay on): 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. Note that the sequence # recorded may be in the same order sequence as one or more WBX units are paired to the WPMM.
8	Repeat Steps 2-7 to add additional WBX switches. Up to 14 WBX can be paired to a single WPMM.

Figure 12. Limitless™ WBX Housing

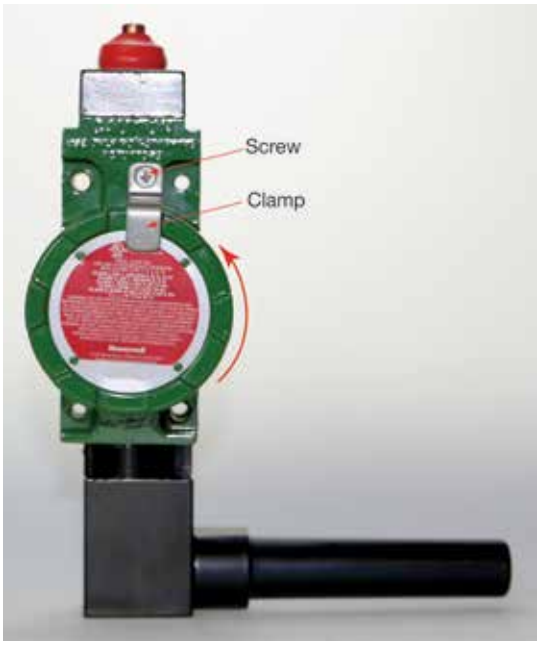
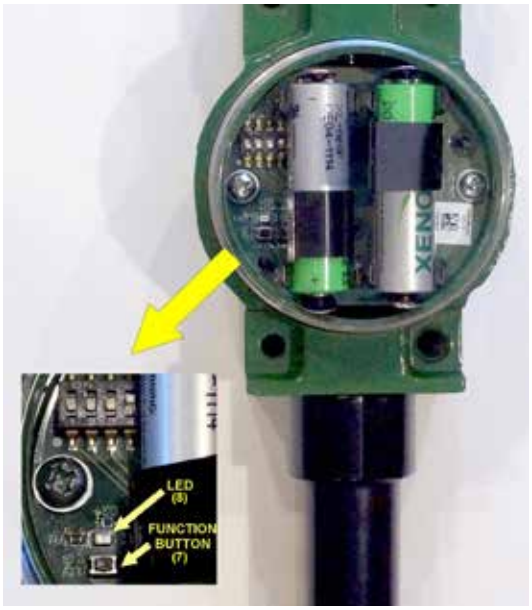


Figure 13. Limitless™ WPMM Housing

NOTE: Use a blunt object, such as a paper clip to actuate the WPMM function switch (4)

Figure 14. Limitless™ WBX with Function Button and LED



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

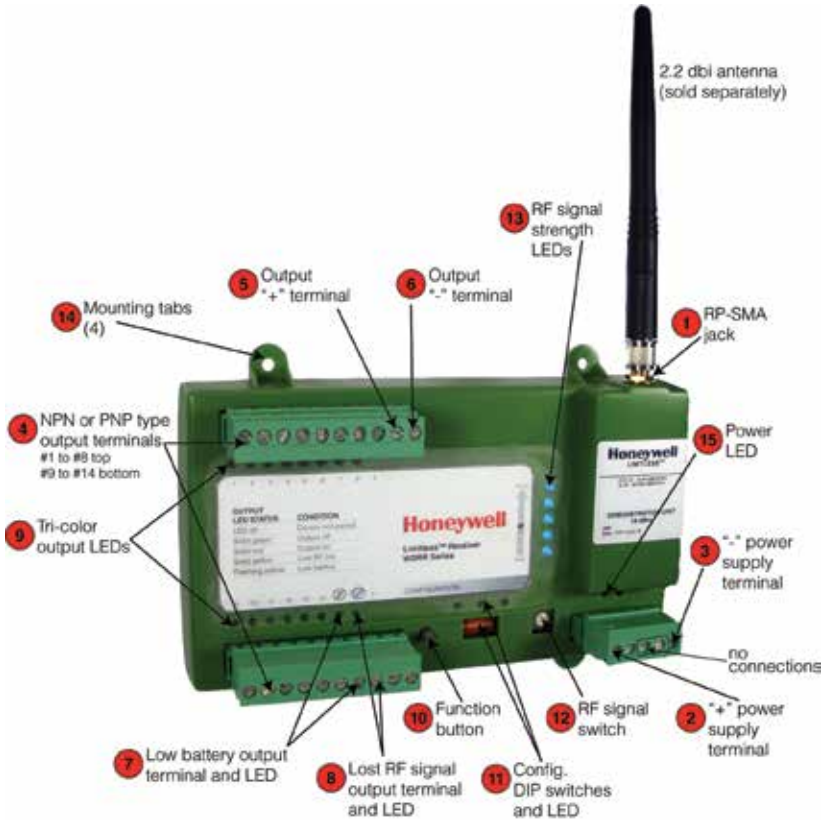
Pairing Steps when using a WDRR (see Figure 15): The battery will need to be activated in the WBX and proper power applied to the WDRR (green ② LED illuminated) before proceeding with this pairing procedure. Once the pairing is completed, the WBX selected will only communicate with the WDRR it was paired to and no other device.

Table 23. WDRR Pairing Instructions

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 12) of the WBX and locate the function button ⑦ (see Figure 14) to be used in Step 4.
3	WDRR: Press the Function button ⑩ on WDRR (See Figure 15) for more than four seconds and less than eight seconds at which time the green and yellow LEDs ⑪ (see Figure 15) 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 14) and hold depressed for more than one second and less than 12 seconds at which time the orange ⑧ LED turns on (see Figure 14). 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 15) 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 15) 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 15. Limitless™ WDRR Housing



6.2 | 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 5/16-18 UNC-2B tapped holes for mounting from the back. Refer to Section 8 in this manual for more detail

6.3 | 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 16. Limitless™ WBX and WPMM

⚠ 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.

6.4 | Purge Mode (Factory Reset)

The purging of a WBX is required when a previously paired WBX is desired to paired again per Section 6.1. Follow the procedure below which will then allow a new pairing to be conducted after successful purging:

Table 24. Purging Instructions

Step	Action
1	Remove (if required) the housing cover of the WBX (See Figure 12) and locate the WBX function button ⑦ & orange LED ⑧ (See Figure 14).
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).

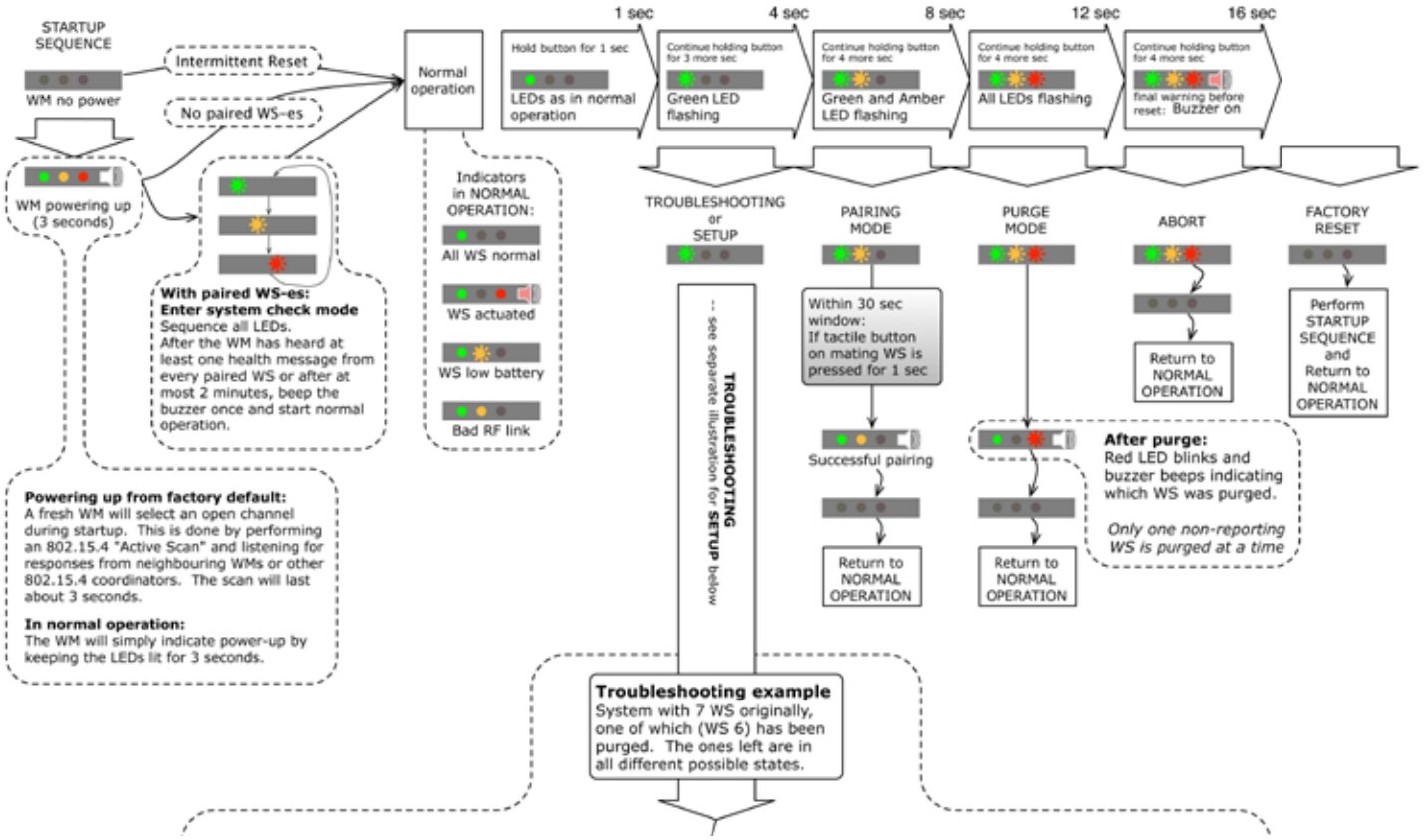
6.5 | WPMM Operation and LED functions

6.5.1 | 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 14 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 switch paired with WPMM will not cause another output change (visual, audible or electrical state change).

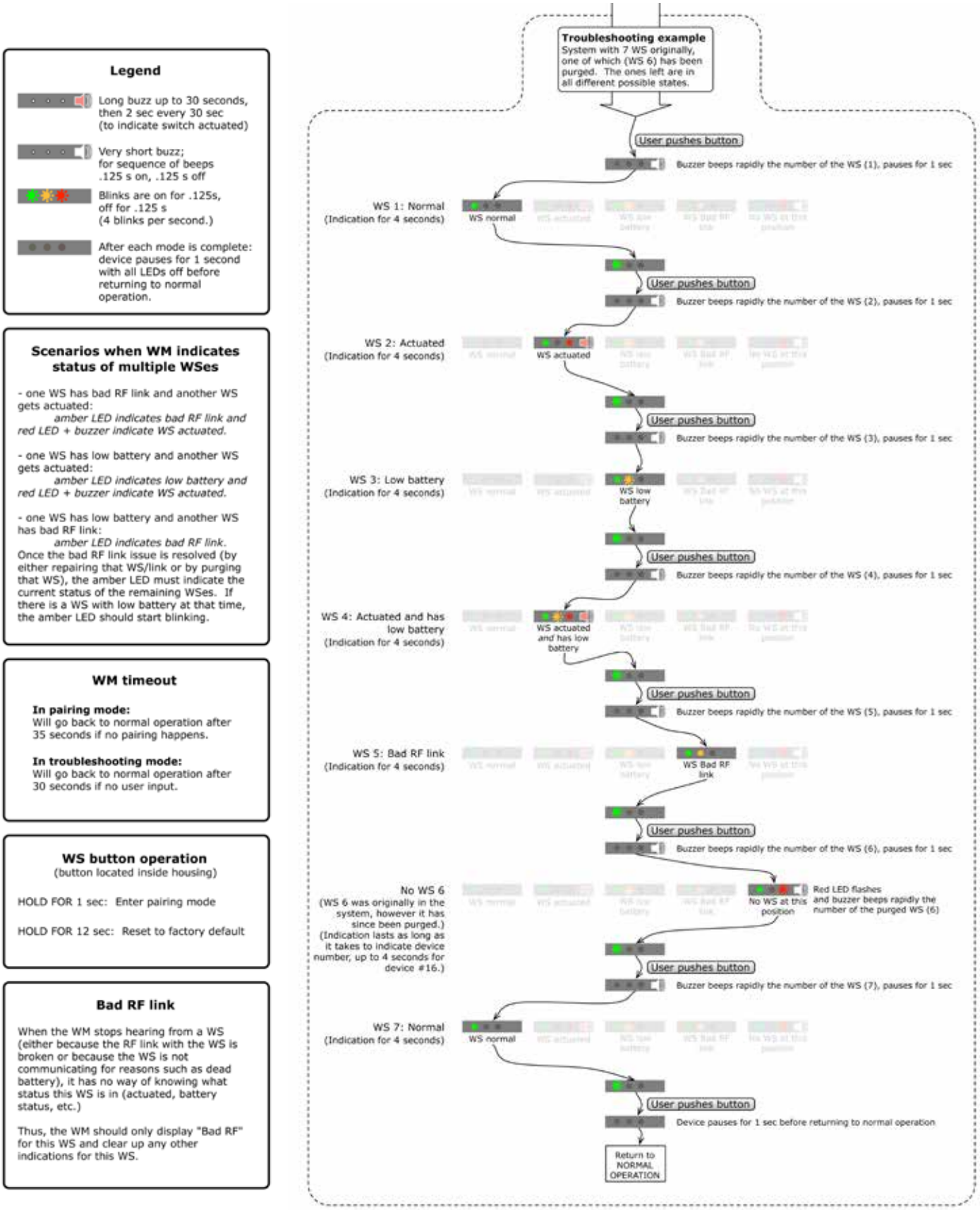
The operation and LED functions for the WPMM are visually depicted and described in the attached file. This file is also located as a separate file at sensing.honeywell.com.

Figure 17. 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 18. WPMM Operation and LED Functions Chart – part 2



6.6 | 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 a corresponding 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.

7 | ANTENNA CONSIDERATIONS AND INSTALLATION

7.1 | Overview of Antenna Options

Tables 14 and 15 list 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

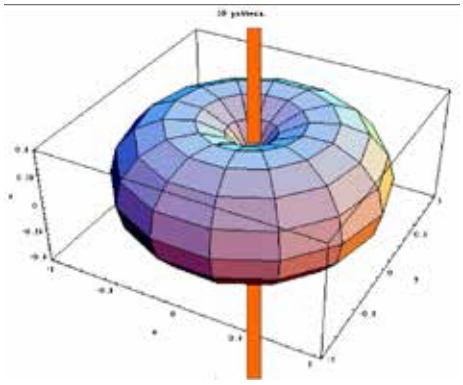
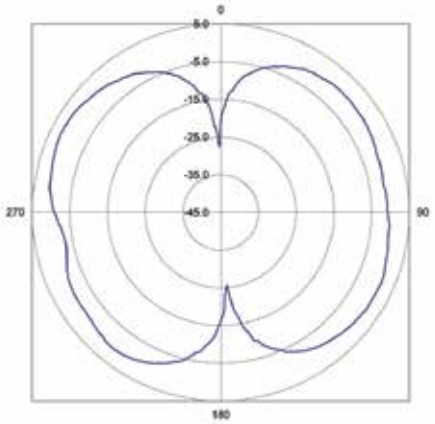
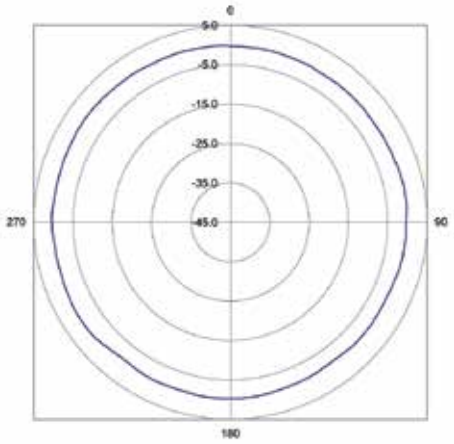
The WBX must be installed in accordance with the requirements specified in this document in order to comply with the specific Country Communication Agency requirements (i.e., FCC, IC, ETSI).

7.1.1 | 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 19.

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.

Figure 19. Radiation Pattern of an Omni-directional Antenna

Toroid Radiation Pattern - Pattern is 360 degrees in the vertical plane, but not the horizontal plane	2.0 dBi RF Antenna Pattern - Horizontal	2.0 dBi RF Antenna Pattern - Vertical
		

7.2 | Antenna Mounting Considerations

7.2.1 | Antenna Mounting Location with Respect to RF Signal

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 WBX Series limit switch. This includes the following actions:

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

⚠ 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 switch.

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

⚠ 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 determined as 'Simple Apparatus' are allowed and approved for use.

⚠ 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.

7.2.2 | Antenna Mounting Location with Respect to Antenna Location

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 Limitless™ WPMM or WDRR. It is desirable for the antenna to be mounted to limit exposure of adjacent materials/objects between the Honeywell WBX and WPMM or WDRR, 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.

Rain and moisture: Wireless switches compliant with IEEE 802.15.4 operate in a 2.4 GHz band. As the peak absorption frequency of water molecules is approximately 22 GHz, the total signal attenuation due to rain, fog or moisture is negligible (less than 0.1 dB/mile for a heavy downpour).

7.2.3 | Line of Sight Considerations

Best performance is achieved when antennas for both the WBX Limit Switch and WPMM or WDRR are mounted at the same height and in a direct line of sight (LoS) with no obstructions, and with both antennas vertical. Generally, the higher the antenna is above ground, the better it performs.

Figure 20. WBX to WDRR or WPMM Antennas with RF Signal Line of Sight (LOS) Free From Obstacles

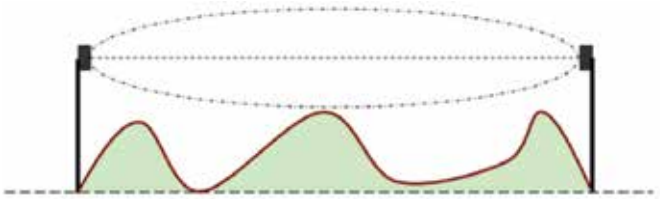
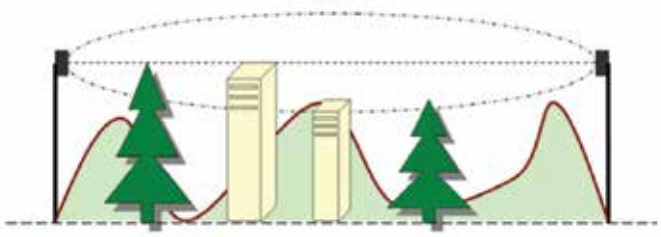


Figure 21. WBX to WDRR or WPMM Antennas with RF Signal Line of Sight (LOS) Affected by Obstacles



7.3 | R.F. Interference Considerations

7.3.1 | General

The 802.15.4 specification provides a high resistance to interference. Within the 2.4 GHz band, there are 16 channels, each using approximately 2 MHz of bandwidth. The channel used may be rapidly changed depending on the presence of other signals sensed in that channel. Thus narrow band interfering signals may have no effect, while broadband noise sources may cause loss. The effect of light to moderate interference is not to make the system fail, but to increase the rate of “lost packets” of data. These “lost packets” are simply retransmitted as needed, so the user may not notice any problem. More serious interference can cause loss of more data updates, and error messages, as well as shorter battery life.

7.3.2 | WiFi Networks

Most WiFi (WLAN) networks operate in the same 2.4 GHz range and use wider bands within that range. Also, the faster protocols (802.11N or AC), may utilize multiple channels. Factors affecting RF interference would be channel separation, distance separation, and duty cycle.

- Channel separation: Studies have shown that a channel separation of 7 MHz will make interference less likely. WiFi routers can be set to use different channels as needed, and auto channel modes can be disabled. If possible, switching to a 5 GHz-only protocol (using 802.11N or AC), would eliminate any possibility of 2.4 GHz interference. The WDM may be set to not use certain 802.15.4 channels.
- Distance separation: A physical separation of 10 meters or more will reduce possibility of interference.
- Duty Cycle: Generally the duty cycle of WiFi routers is very low for simple uses as e-mailing, messaging, most web browsing, and voice protocols. However, a video camera or multiple users streaming video would cause a significant increase in bandwidth usage and increase the possibility of interference, making channel or distance separation more desirable.

Regarding the WiFi client (laptop, smartphone, tablet), they are much less of a problem as they generally operate with a much reduced duty cycle (most data is received by the device), and may operate with much lower transmit power.

7.3.3 | Smart Phone “Apps”

Smart phone “apps” are available to display consumer WIFI signal strengths or download/upload speeds. These apps will not display the 802.15.4 signals as the packet format is different. However, if a suspected interference source causes a large reduction in consumer WiFi download speed, it is likely it could also cause interference to the 802.15.4 data used by the WBX.

7.3.4 | Bluetooth® Devices

Bluetooth® interference is less of an issue, due to the very narrow bandwidth of Bluetooth® signals, the low transmit power, and the rapid "frequency hopping" of the signals. If the 802.15.4 device misses a packet of data due to a Bluetooth® burst of data, the re-transmission of the 802.15.4 data will likely succeed, as the Bluetooth® will have hopped to a different channel by then.

7.3.5 | Wireless Video Camera and Video Links

Wireless video links operating in the 2.4 GHz band can cause serious interference as they are operating continuously, use a wide (6 MHz) bandwidth), and may be more powerful. Interference from wireless video could cause the "NO RF" indication in severe cases. As mentioned, frequency and/or distance separation may be required.

- Frequency Separation: Many video links have four or more channels selectable. Changing channels may help. Additionally, wireless video links are available in the 900 MHz band, and the 1.2 GHz band. Switching to one of those would eliminate interference issues with 802.15.4 (and 802.11x).
- Distance Separation: Separating the video link switch from the wireless switch would be very desirable. Alternatively, utilizing directional antennas on the wireless switch, and /or on the wireless video link would help greatly.

7.3.6 | Microwave Ovens

Microwave ovens operate in the 2.4 GHz range, they are powerful, and a high duty cycle. However, they may not be a problem to a modern 802.15.4 network. The magnetron in a microwave oven is driven by half-wave rectified AC, so the R.F. output is actually off for one half of the 60 Hz or 50 Hz power line cycle (8.33 or 10.0 msec). During that part of the cycle, the packets of 802.15.4 data may succeed. However, close to half of the packets may require retransmission, so data throughput could be greatly reduced.

7.3.7 | Cordless Phones/Baby Monitors/ Intercoms

A 2.4 GHz cordless phone in very close proximity to a wireless switch could cause lost packets, while the phone is in use, but is not a very likely cause. If monitoring the link quality as in "link measurements" above, shows interference, a simple remedy is to switch to a DECT 6.0 cordless phone operating on 1.9 GHz.

7.4 | Requirements

7.4.1 | Radio Installation Requirements

ATTENTION

- Professional Installation is required to insure conformity with Federal Communications Commission (FCC) in the USA, Industry Canada (IC) in Canada and the Radio and Telecommunications Terminal Equipment Directive, 1999/5/EC (R&TTE), in the European Union (EU).
- Professional installation is required for the selection and installation of approved antennas and setup of the maximum allowable radiated power from the Limitless™ WBX Series as configured for the particular installation site.
- The antenna used for this switch must be installed to provide a separation distance of at least 20 cm (8 inches) from all persons and must not be co-located or operating in conjunction with any other antenna or switch.
- For remote antenna, see antenna installation requirements to satisfy FCC RF exposure requirements.

ATTENTION

Federal Communications Commission (FCC):

- The Limitless™ WBX Series Limit Switch comply with part 15 of the FCC rules. 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.

Industry Canada (IC):

- The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF fields in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's web site http://www.hc-sc.gc.ca/index-eng.php

7.5 | Direct Mount Antenna

⚠ WARNING

POTENTIAL ELECTROSTATIC CHARGING HAZARD

The direct mount antenna radome is made of plastic and has a surface resistivity greater than 1 Gohm per square. When the Limitless™ WBX Series Limit Switch is installed, 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.

7.5.1 | Direct Mount, General Guidelines

A direct-mount antenna can be easily mounted by threading the mating RP-SMA plug of the antenna to the RP-SMA jack on the WBX. Tighten the antenna connection until finger tight by holding the antenna above the vertical 'knurl' portion of the antenna. Mildly push the antenna radome on to the conduit fitting and hand-tight the radome by rotating it CW till the radome hits a hard stop, when it comes in contact with the metal housing surface.

7.5.2 | Direct Mount, Straight

Figure 22. Direct Mount Antenna

Option "12" – Straight with Radome. 2.0dBi gain omni-directional antenna	**Option "14" – 90° metal elbow with Radome. 2.0dBi gain omni-directional antenna**
	
	Note: The 90° metal elbow can be swivelled through a 330° range to orient away from any obstructions; the set-screw should be loosened using a M3 Allen key to enable the swiveling and is then tightened when desirable position is identified, using the M3 Allen key to a max. torque of 1,0 Nm [8.85 lb-in].
Direct mount antenna available in 2 dBi configurations.	

7.6 | Remote Antennas

7.6.1 | 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 determined as 'Simple Apparatus' is are allowed and approved for use.

⚠ 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 WBX Series Limit switch. This includes the following actions:

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

7.6.2 | Cable Requirement

Some remote mount SMA connector antennas have an antenna cable permanently attached, with an RP-SMA plug, which is simply connected to the jack on the switch. Other remote mount antennas do not include cable, and require the use of an extension cable. This extension cable will normally need to have one end with an RP-SMA plug (inside threads), which will connect to the switch, and one end with an RP-SMA jack (outside threads). The jack of the extension cable will mate with the antenna or the lightning arrestor. If a lightning arrestor is connected this way, the antenna may be directly connected to the arrestor.

Note that at 2.4 GHz, typical antenna cables types have 0.5 dB of loss per meter (almost 5 dB for a ten meter cable, plus connector losses). Excessively long cable runs should be avoided if possible.

Refer to Section 3.1 & 3.2 for approved antenna options and approved cable options.

7.6.3 | Lightning Arrestor

The lightning arrestor may be mounted directly on the switch, or at the far end of the antenna cable, mounted to a sheet of metal in a through-hole. Generally, the choice should be made based on having the shortest, most direct path to a good, solid ground.

If the lightning arrestor is mounted directly on the switch, use caution when attaching a grounding wire to the arrestor to avoid putting undue stress on the switch's antenna connector. If the coax cable is to enter a building, then the lightning arrestor should be mounted as close as possible to where the lead-in wire enters the building.

Lightning arrestors determined as 'Simple Apparatus' are allowed and approved for use with WBX Series Limit Switch.

7.6.4 | Choosing a Mounting Location

The location of the antenna is important. Objects such as metal columns, walls, etc. will reduce efficiency. Best performance is achieved when antennas for both Multinodes and WBX Series Switches are mounted at the same height and in a direct line of sight with no obstructions. If this is not possible and reception is poor, you try different mounting positions to optimize reception.

Antennas should be mounted clear of any obstructions to the sides of the radiating element. If the mounting location for an omni-directional antenna is on the side of a building or tower, then the antenna pattern will be degraded on the building or tower side.

7.6.5 | Site Selection

Before attempting to install your antenna, consider the best place to install the antenna for safety and performance.

Follow these steps to determine a safe distance from wires, power lines, and trees.

Step	Action
1	Measure the height of the antenna.
2	Add this length to the length of the tower or mast and then double this total for the minimum recommended safe distance.

Generally speaking, the higher the antenna is above the ground, the better it performs. Good practice is to install your antenna about 1,5 m to 3 m [5 ft to 10 ft] above the roof line and away from all power lines and obstructions. If possible, find a mounting place directly above the wireless device so the lead-in cable can be as direct as possible.

7.6.6 | Antenna Styles

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

Figure 23 Straight Antennas (Radome included with 2.0 dBi straight antenna)

7.6.7 | Antenna Mount Types

Antennas are provided with a variety of mounting options, including magnetic mount, tape mounting, or mast mounting. The standard 2.0 dBi antennas, normally mounted on the switch, may also be mounted to an extender cable, if the remote cable end is mounted in a through hole with the nut and lockwasher. These antennas may also be mounted on a lightning arrestor, if the lightning arrestor is properly mounted in a through hole with a nut and lockwasher.

Omni-directional antennas are vertically polarized and produce a "doughnut" shaped pattern. It is very important to mount the antenna in a vertical (not leaning) position for optimal performance, especially with higher gain antennas.

7.6.8 | Magnetic Mounting

If a horizontal steel structural member or sheet metal area is available, and there are no severe environmental conditions (wind, vibration, etc.), a magnetic mount antenna may be an easy solution. This also allows the option of easily making small adjustments to optimize RF path performance.

Using tie-wraps (cable ties), secure the coax cable to the nearby structural members, using a tie-wrap every 25 cm to 30 cm [10 in to 12 in].

Figure 24. Magnetic Mount Antenna

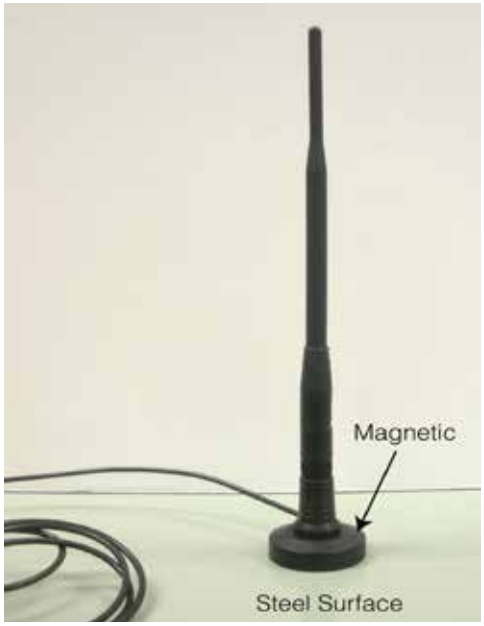


Figure 25. Adhesive Mounting Steps

Step 1. Pre-clean the surface

Step 2. Peel Protection from Adhesive Strip

Step 3. Mount the Antenna

7.6.9 | Adhesive Mounting

The benefit of the remote adhesive mount antenna is mounting flexibility to a number of surfaces and in various orientations. Note that 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. Evaluate performance 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 Figure 25.

7.6.10 | Mast Mounting

Mast mounting kits consist of a mounting bracket and one or two U-bolt clamps. These kits allow the bracket to be mounted to masts with outside diameters (O.D.) from 3,2 cm [1.25 in] to 5,1 cm [2 in]. Honeywell recommends that a 3,8 cm [1.5 in] or larger tubing mast be used. The antenna is then mounted in a hole on the bracket upper surface. Most standard brackets will have a hole too large for an SMA mount antenna, so a new hole will be needed. For hole dimensions, refer to Figure 4, WBX Antenna Extender Cable Mounting Hole.

Follow these steps to mount the antenna on a mast.

Figure 26. Mast Mount Antenna – Tighten nut on mounting bracket

Figure 27. Mast Mount Antenna – Side View with Attachment to Pipe

7.6.11 | 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 28. Highest RF Signal When Antennas are as Parallel to Each Other as Possible

7.7 | 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

7.8 | 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 orange 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.

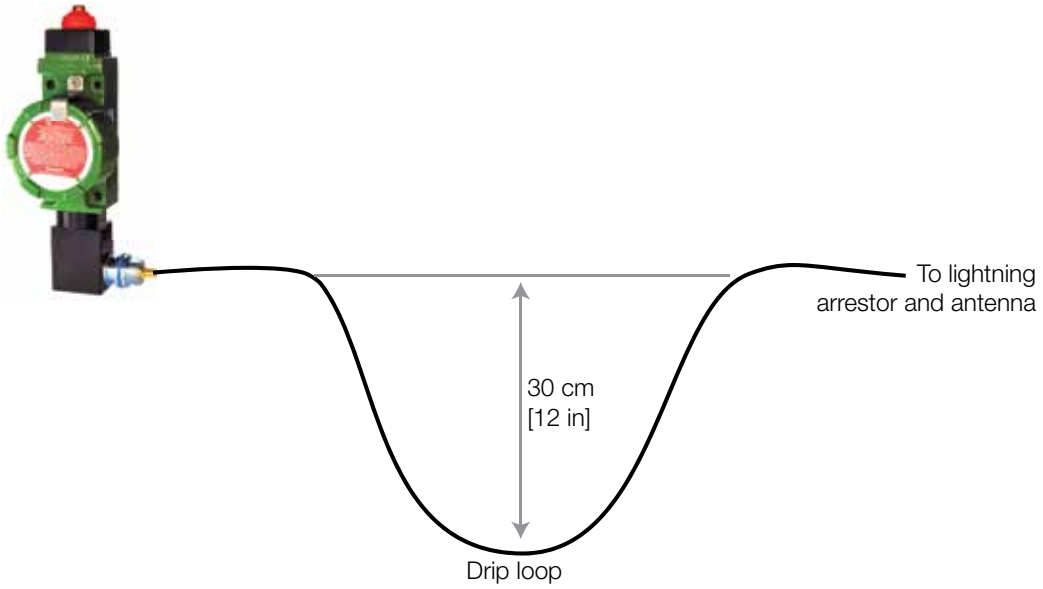
*Suggested sources/part numbers

- 10 dB attenuator (i.e. Crystek – Part number: CAT-TEN-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)

7.9 | Antenna Assembly and Installation

Table 25. Antenna Installation Steps

Step	Action
1	Assemble the new antenna on the ground at the installation site. For SMA mount antennas, mount the RP-SMA jack of the antenna cable to a hole in the bracket, using the nut and lockwasher supplied. For lightning arrestor mounting, mount the lightning arrestor in the mounting bracket hole, and attach the extension cable to the arrestor.
2	Screw the SMA antenna onto the cable or lightning arrestor. Tighten all cables by hand only; do not use tools or you could overtighten. Make sure that the connections are sealed (if outdoors) to prevent moisture and other weathering elements from affecting performance. Honeywell recommends using a weathering tape (such as COAX-SEAL® #104 from electrical supply houses, or Super 88 tape from 3M) for outdoor connections. Silicon sealant or ordinary electrical tape is not recommended for sealing outdoor connections.
3	Attach the antenna bracket to the mast, using the U-Bolts as required.
4	Using tie-wraps (cable ties), secure the coax cable to the mast, using a tie-wrap every 25 cm to 30 cm [10 in to 12 in].
5	Follow standard strain relief practice when installing the antenna cable. Avoid excessive strain, bending, kinks, or crushing (stepping on or placing any weight on cable) before, during, or after the coax cable is secured in its final position.
6	Make sure the mast does not fall the “wrong way” should you lose control as you raise or take down the mast. Use a durable non-conductive rope. Have an assistant tend to the rope; ready to pull the mast clear of any hazards (such as power lines) should it begin to fall.
7	If the installation will use guy wires: • Install guy anchor bolts. • Estimate the length of guy wire and cut it before raising the mast. • Attach guy wires to a mast using guy rings.
8	Carefully connect the antenna and mast assembly to its mounting bracket and tighten the clamp bolts. In the case of a guyed installation, you must have at least one assistant to hold the mast upright while the guy wires are attached and tightened to the anchor bolts.
9	Attach a "DANGER" label at eye level on the mast.
10	Install ground rods to remove any static electricity buildup and connect a ground wire to the mast and ground rod. Use ground rods designed for that purpose; do not use a spare piece of pipe.
11	When attaching the coax cable to the WBX Switch, it is recommended that a drip loop with a radius of at least 30 cm [12 in] be formed close to the WBX Switch. This will minimize ice and water buildup on the switch itself. Tighten cables by hand only; do not use tools or you could overtighten.



7.10 | Grounding the Antenna

Follow these guidelines to ground the antenna in accordance with national electrical code instructions.

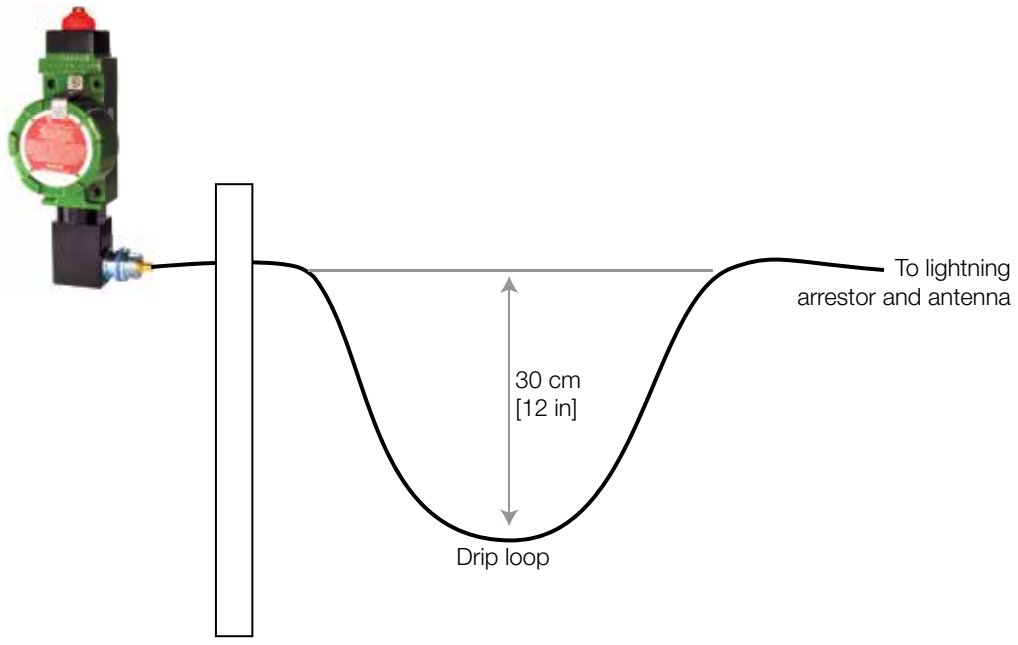
Table 26. Antenna Grounding Steps

Step	Action
1	Use No. 10 AWG copper or No. 8 or larger copper-clad steel or bronze wire as ground wires for both mast and lead-in. Securely clamp the wire to the bottom of the mast.
2	Secure the lead-in wire to a lightning arrestor and mast ground wire to the building with stand-off insulators spaced from 1,2 m [4 ft] to 1,8 m [8 ft] apart.
3	The lightning arrestor must be bonded to earth ground in order to function properly. Due to the small diameter coaxial cables used with the RP-SMA connectors, the lightning arrestor must be grounded independent of the antennas, using number 10 solid wire. This wire must be connected directly to a solid ground. It may be the same ground as is used for the antenna tower.
4	Drill a hole in the building's wall as close as possible to the equipment to which you will connect the lead-in cable. Use a rubber grommet or feed-thru tube to protect the cable from abrasion.

⚠ CAUTION

There may be wires in the wall. Before drilling check that the area is clear of any obstructions or other hazards.

5	Pull the cable through the hole and form a drip loop on the outside close to where the cable enters the building. The drip loop should have a radius of at least 30 cm [12 in].

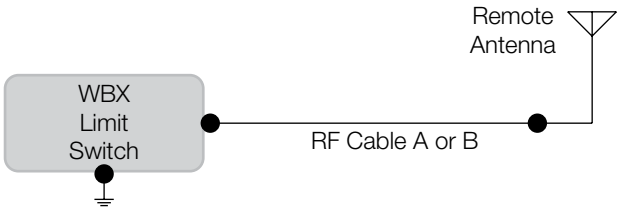


6	Thoroughly waterproof the lead-in area.
7	Connect the lead-in cable to the WBX Switch. Tighten cables by hand only; do not use tools or you could overtighten.

7.11 | Antenna Configurations/Parameters

7.11.1 | Connection Diagrams for Remote Antenna Configuration

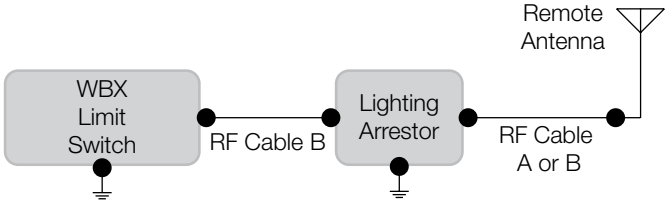
Figure 29. WBX Connected to Remote Antenna² Directly



Zones 0, 20/1, 21, IIC, IIIC, Ga, Da
Uo = 5.0 V
Io = 757 mA
Po = 0.946 W
Co = 23.48 µF
Lo = 4.487 µH

Class I, II, Div. 1, Groups A, B, C, D, E, F, G
Voc = 5.0 V
Isc = 757 mA
Po = 0.946 W
Ca = 23.48 µF
La = 4.487 µH

Figure 30. WBX Connected to Remote Antenna² Via Lightning Arrestor



Zones 0, 20/1, 21, IIC, IIIC, Ga, Da
Uo = 5.0 V
Io = 757 mA
Po = 0.946 W
Co = 23.48 µF
Lo = 4.487 µH

Class I, II, Div. 1, Groups A, B, C, D, E, F, G
Voc = 5.0 V
Isc = 757 mA
Po = 0.946 W
Ca = 23.48 µF
La = 4.487 µH

NOTES:
(1) These values are specific to the WBX.
(2) Only lightning surge arrestors determined to be simple apparatus may be installed.
(3) Refer to Tables 17 and 18 that capture the approved antenna to be used with the WBX product as remote connection.

7.11.2 | Intrinsically Safe Device Entity Parameters for Remote Antenna Cables

Table 27. Intrinsically Safe Device Entity Parameters for Remote Antenna Cables

	Length	Loss (dB)	Total Capacitance	Total Inductance
RF Cable A				
WCA200RNPRSP-002	0,61 m [2 ft]	0.34	49 pF	0.12 µH
WCA200RNPRSP-010	3,05 m [10 ft]	1.69	245 pF	0.61 µH
RF Cable B				
WCA200RNJRSP-002	0,61 m [2 ft]	0.34	49 pF	0.12 µH
WCA200RNJRSP-005	1,52 m [5 ft]	0.85	122 pF	0.3 µH
WCA200RNJRSP-010	3,05 m [10 ft]	1.69	245 pF	0.61 µH
WCA200RNJRSP-015	4,57 m [15 ft]	2.54	367 pF	0.92 µH
WCA200RNJRSP-020	6,1 m [20 ft]	3.38	490 pF	1.2 µH

7.12 | Environment Usage/Concerns

7.12.1 | 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:

Table 28. Preparing Antenna for Environmental Use

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	A. Review antenna and/or cable materials (listed in Section 3.2) against resistance to chemicals and fluids. If choosing an adhesive mount, adhesive resistance testing may be necessary. B. If shock, vibration, wind, rain, sleet/snow, etc. are in the application, choose an antenna rated for outdoors and has a rigid design.
4	The WBX's enclosure is designed to meet NEMA 4 and IP67 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. 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. 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 Layer 1 allows the user to remove Layer 2 for connector inspection, antenna replacement, repositioning of the tilt/swivel antenna, etc. See Figure 5 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.

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. See Figure 5, Application of Protective Tape.

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

8 | MOUNTING AND DIMENSIONS

8.1 | WBX Mounting

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 5/16-18 UNC-2B 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.

8.2 | Conduit / Cable Entries

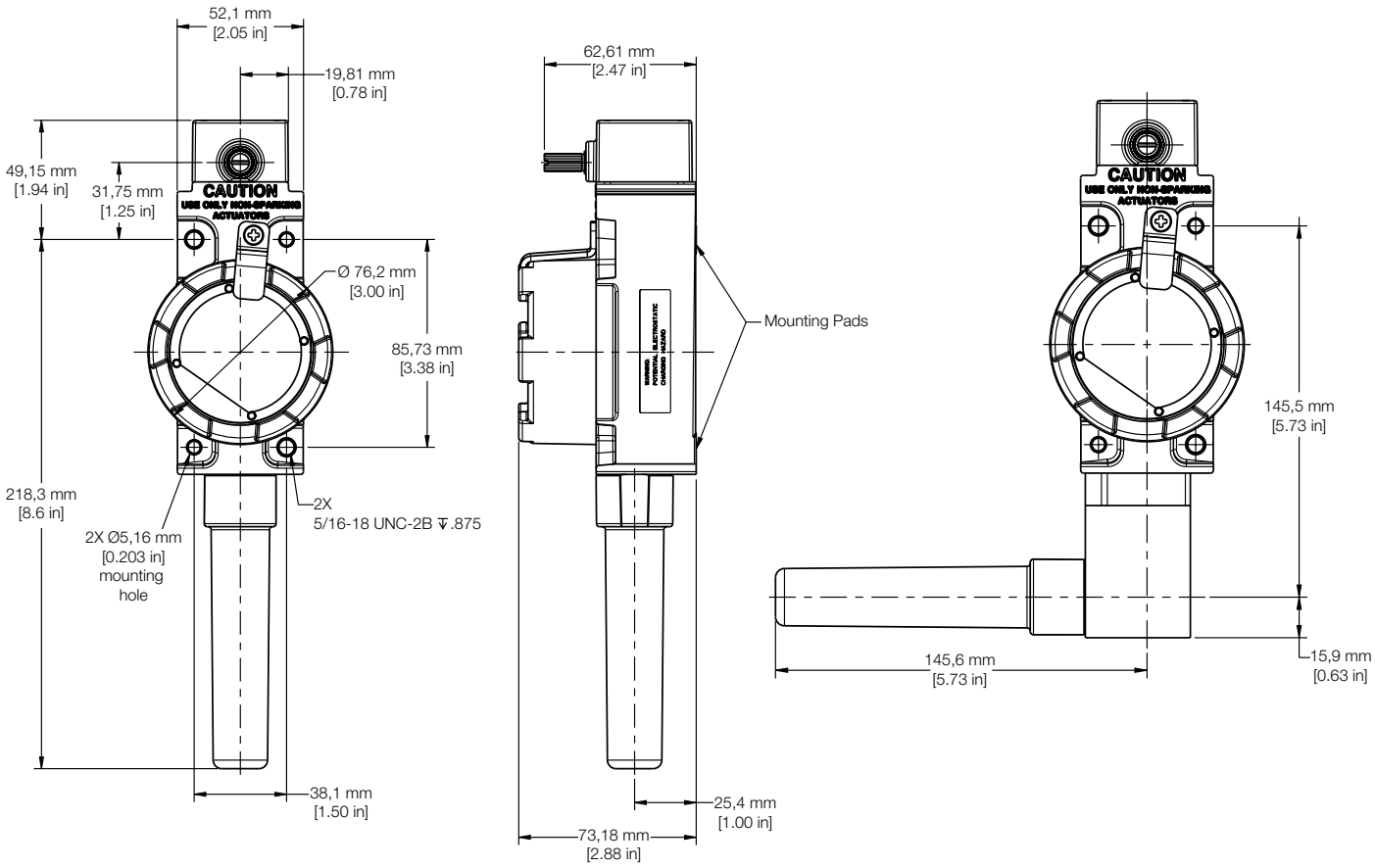
There are no conduit/cable entries for the Limitless™ Wireless Hazardous Area Limit Switch, WBX Series.

8.3 | Bracket Mounting

There is no bracket mounting for the Limitless™ Wireless Hazardous Area Limit Switch, WBX Series. It is mounted by means of the switch body mounting holes.

8.4 | WBX Dimensions

Figure 31. Limitless™ WBX Dimensions (Side Rotary)



Operating Head Code "A"
Straight Antenna

Operating Head Code "A"
90° Antenna

MECHANICAL OPERATING SPECIFICATIONS

for Side Rotary Actuators

Operating Specifications (Mechanical)*

Characteristic	Operating Head Code "A" Momentary
Pretravel	17.5° max.
Overtravel	60° min.
Differential travel	7° max.
Total travel	85° ref
Operating torque	0,45 Nm [4 in-lb] max.
Full travel torque	0,68 Nm [6 in-lb] max.

* Operating point given in relation to actuator center

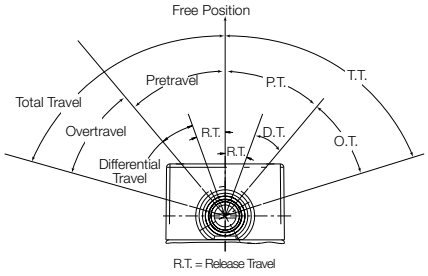
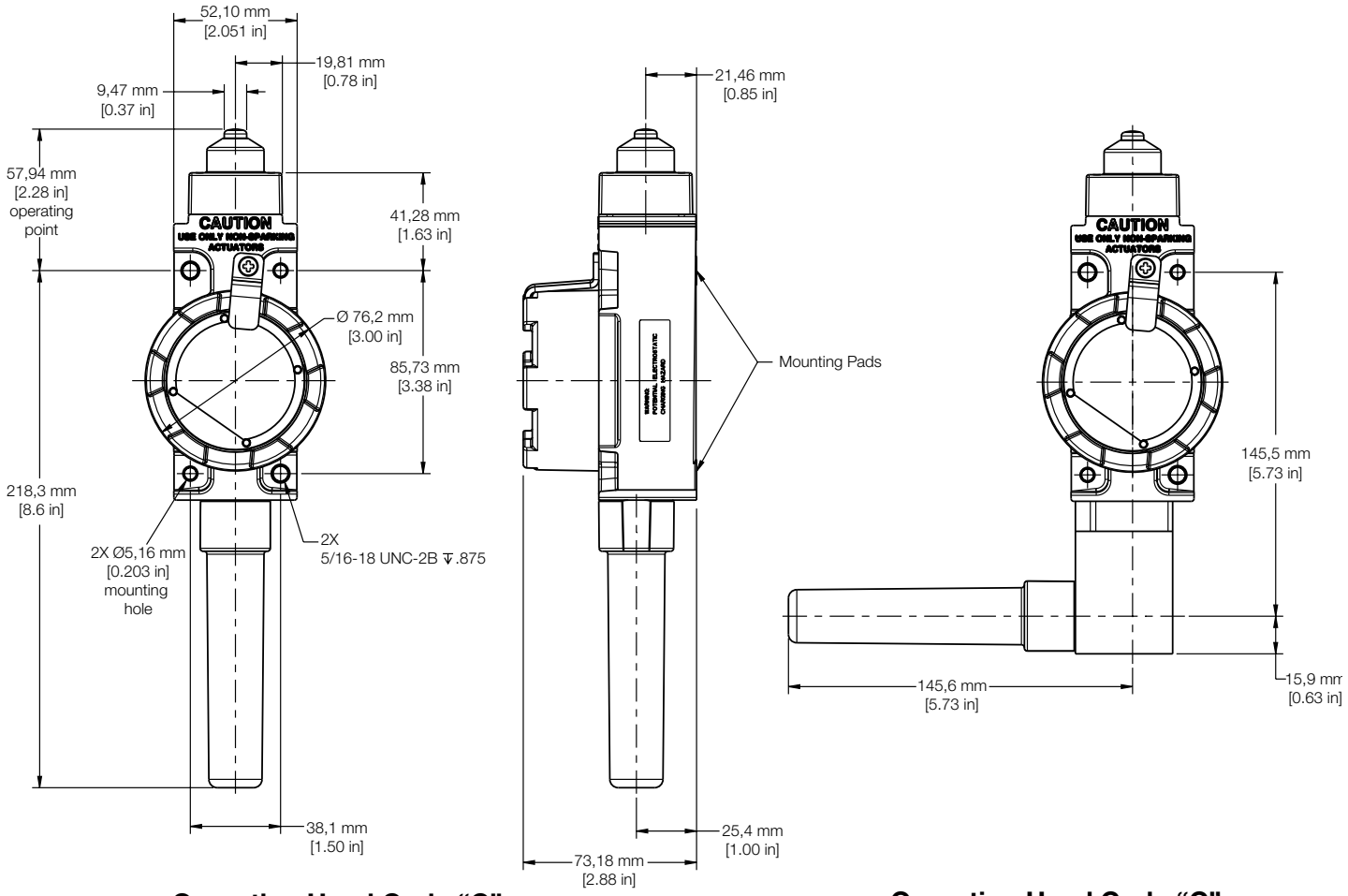
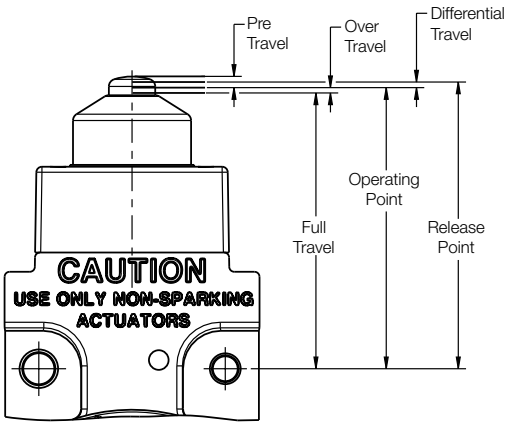


Figure 32. Limitless™ WBX Dimensions, Pin Plunger



Operating Head Code "C"
Straight Antenna

Operating Head Code "C"
90° Antenna



MECHANICAL OPERATING SPECIFICATIONS

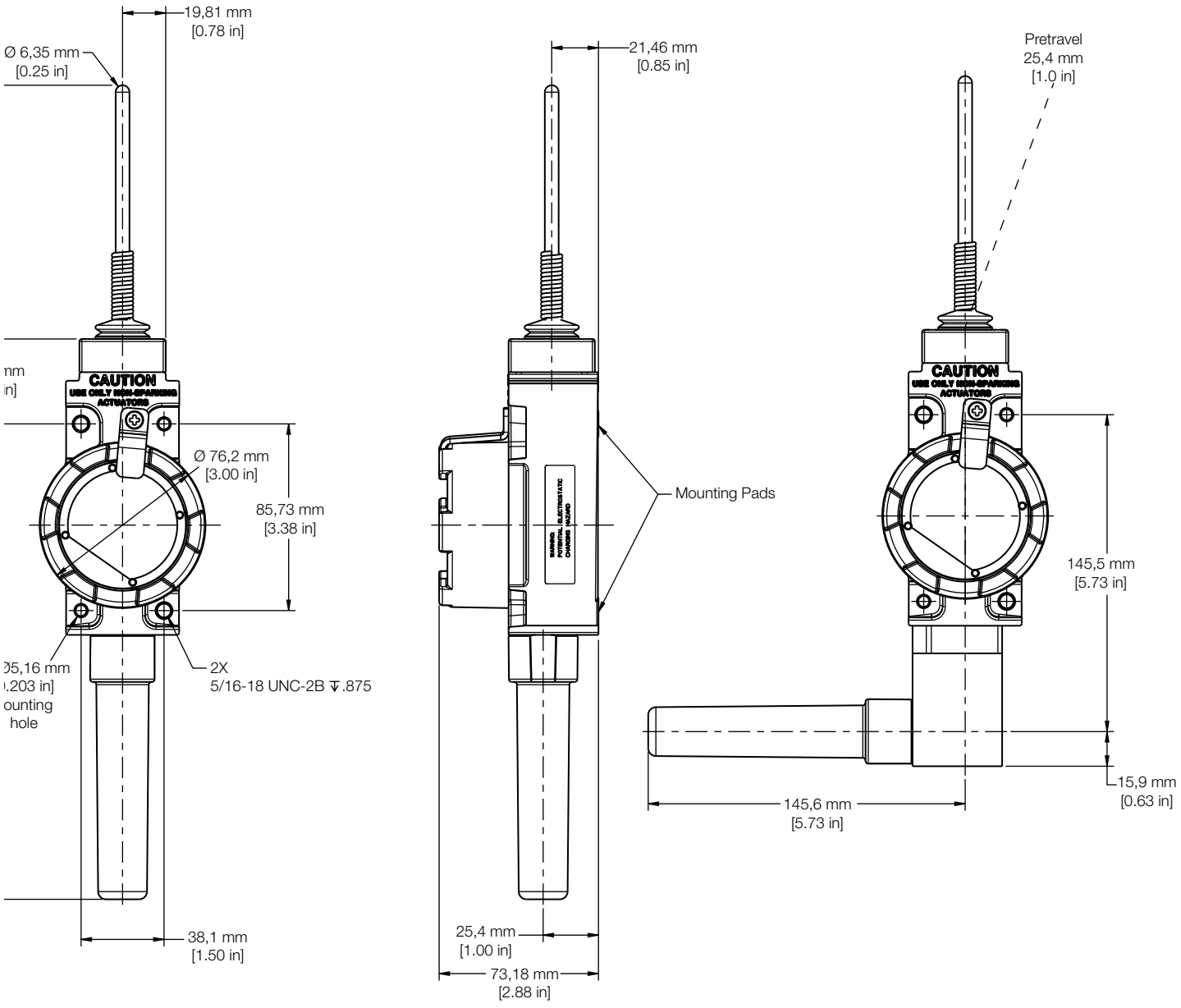
for Pin Plunger Actuators

Operating Specifications (Mechanical)*

Characteristic	Operating Head Code "C" Top Plunger Plain
Pretravel	1,78 mm [0.07 in] max.
Overtravel	4,83 mm [0.19 in] min.
Differential travel	0,51 mm [0.02 in] max.
Operating force	20,02 N [4.5 lb] max.
Operating point	57,94 mm ± 0,50 mm [2.281 in ±0.02 in]
Full overtravel force	40 N [9 lb] max.

* Operating point given in relation to top mounting hole

Figure 33. Limitless™ WBX Dimensions, Wobble



Operating Head Code "J"
Straight Antenna

Operating Head Code "J"
90° Antenna

MECHANICAL OPERATING SPECIFICATIONS

for Wobble Stick Actuators

Operating Specifications (Mechanical)*

Characteristic	Operating Head Code "J" Wobble Stick
Pretravel	25,4 mm [1.0 in] approx. radius
Operating force	2,8 N [10.0 oz] max.

* Operating point given in relation to wobble stick center

9 | INSPECTION, MAINTENANCE AND REPAIR

9.1 | 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.

9.2 | Antenna Inspection and Replacement

Periodic inspection

- Check radome or cable connection to WBX connector to ensure it is tight and there are no signs of damage or corrosion. Replace if necessary per Section 9.6.

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.

9.3 | Replacement Parts

The following replacement parts may be ordered from Honeywell Sensing and Control.

Table 29. WBX Replacement Parts

Part number	Qty.	Description
WAN12RSP	1	2.4 GHz, 2.0 dBi RP-SMA WLAN antenna
WAN20RAD	1	Replacement WBX Radome
WBT7	1	3.6 Vdc Lithium Thionyl Chloride, AA size, Quantity: 2. Battery extractors (2), included

The above batteries are also available from the Xeno Energy, part number XL-060F, Tadiran, part number TL-5930/S, and Bipower, part number ER14505H. Refer to battery specifications, Table 11.

9.4 | Antenna and Radome Connection (if required)

⚠ 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.**

ATTENTION

Don't mount or remove the antenna when batteries are present in WBX product 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 either replace the radome and antenna or use remote mount antenna per Section 3.3, follow the procedure described in the table below. 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 17 & 18).

Table 30. WBX Antenna and Radome Steps

Step	Action
⚠	**WARNING** DO NOT DISASSEMBLE OR ASSEMBLE WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
1	Remove the radome by turning it CCW by hand or by using a 30mm open-end /adjustable wrench.
2	Unscrew the antenna by turning it CCW by hand (if required to replace the antenna)
3	Mount the antenna and tighten by turning CW till hand-tight. **CAUTION: Do not use any tool for tightening to avoid damage to the RF cable.**
4	Mount the radome and thread it on to the conduit fitting by turning CW and tighten till hand-tight. Ensure the lower surface of the radome is flush with the housing surface. **CAUTION: Do not use any tool for tightening to avoid damage to the radome.**
5	To connect remote antenna, the RP-SMA end of the cable (either from antenna or an extension cable) should be threaded on to the RP-SMA connector and tightened by turning CW till hand-tight. Protect the junction of remote cable as explained in section 4.2. **CAUTION: Do not use any tool for tightening to avoid damage to the RF cable**.

Note: 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 (refer to Section 5.1 for details). The other end of the extension cable will need to mate with either antenna connector directly or lightning arrestor or it may be integral to the particular remote mount antenna chosen.

9.5 | Replacing Batteries

⚠ 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 batteries 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 at the same time.

Honeywell battery part number: WBT7.

Approved battery manufacturers: Xeno Energy, part number: XL-060F, Tadiran, part number: TL-5903/S, Bipower, part number: ER14505H

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.

9.5.1 | 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.

When batteries are removed or expired, all switch configuration data, calibration data, and program data is retained in the switch's flash memory.

9.5.2 | Battery Storage

Batteries should be kept in pairs, not mixed together with others from different vendors or of different shipments.

9.5.3 | Transporting Batteries

When transporting or shipping Lithium Thionyl Chloride batteries, be aware that many regulations and restrictions apply. These batteries are not permitted for transport aboard passenger aircraft. For shipping purposes, two "AA" sized Lithium Thionyl Chloride cells weigh approximately 35 grams and contain approximately 1,4 grams of lithium.

9.5.4 | Tools Required

- #2 Phillips screwdriver

ATTENTION

Both batteries to be replaced together.

⚠ WARNINGS

- Risk of death or serious injury by explosion. Do not open switch enclosure when an explosive gas atmosphere is present.
- Batteries must not be changed in an explosive gas atmosphere.
- The switch enclosure must not be opened when an explosive gas atmosphere is present.
- When not in use the batteries must be stored 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. Do not expose batteries to water.
- When installing batteries 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 switch. Dispose of dropped battery promptly per local regulations or per the battery manufacturer's recommendations.

Figure 34. Switch Battery Replacement

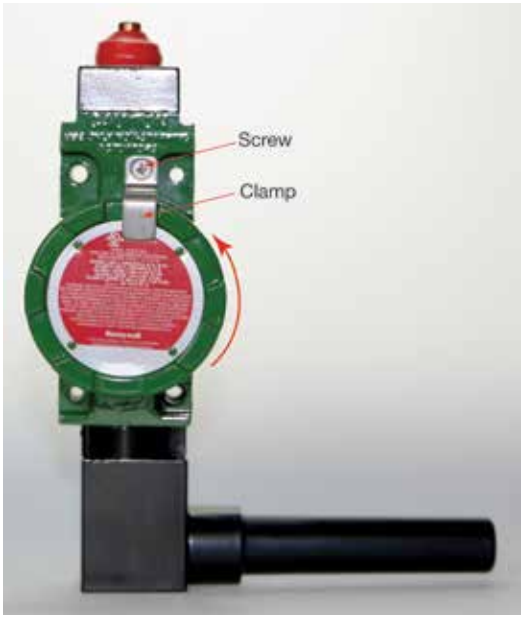


Table 31. Battery Replacement Procedure

Step	Action
⚠	**WARNING** DO NOT DISASSEMBLE OR ASSEMBLE WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
1	Using a #2 Philips screwdriver, unscrew the screw holding the S-shaped clamp. Remove the screw and S-shaped clamp that is holding down the housing cover.
2	**Remove the WBX housing cover by turning in CCW direction as shown in Figure 34.**
3	Remove the old batteries from the battery holder by pulling on the battery extractors as shown.
4	Install each battery as follows to avoid damage to the battery and holder: • See label on battery PCBa defining the "+" and "-" terminals 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 first, at an angle, and against the end of the tab. Push down the battery into position gently. Ensure the batteries are properly seated and making contact. **IMPORTANT: If the ORANGE LED does not blink, it is recommended to remove one of the batteries and re-insert back again.**
5	Repeat steps 3 and 4 for the other battery
6	Replace the cover and thread it on to housing by turning in CW direction until tight.
7	Place the S-shaped clamp and tighten the screw with a 1,5 Nm [13.3 in-lb] torque to firmly hold down the housing cover.
8	Dispose of used battery promptly per local regulations or the battery manufacturer's recommendations. Keep away from children. Do not dispose of in fire.

Note: Each battery contains 0,7 gm of lithium metal. There may be shipping restrictions depending upon the total amount of lithium metal.

9.6 | Replacing Antenna and Radome

9.6.1 | Tools Required

- #1 Phillips screwdriver

ATTENTION

You must replace your antenna with the same type and gain, that is, straight or remote. Changing to a different antenna type is not permitted by approval agencies.

⚠ CAUTION

Take precautions against electrostatic discharge to prevent damaging the switch.

⚠ WARNING

POTENTIAL ELECTROSTATIC CHARGING HAZARD

The antenna radome is made of plastic and has a surface resistivity of >1 Gohm per square. When this device is being installed care should be taken not to electrostatically charge the radome surface by rubbing the surface with a cloth, or cleaning the surface with a solvent

Figure 35. Antenna Replacement

Table 32. Antenna Replacement Procedure

Step	Action
1	Remove the radome by turning it CCW by hand or by using a 30 mm open-end /adjustable wrench.
2	Unscrew the antenna by turning it CCW by hand (if required to replace the antenna).
3	Inspect both antenna and RP-SMA connectors for damage or debris, clean as needed.
4	Mount the antenna and tighten by turning CW till hand-tight. **CAUTION: Do not use any tool for tightening to avoid damage to the RF cable.**
5	Mount the radome and thread it on to the conduit fitting by turning CW and tighten till hand-tight. Ensure the lower surface of the radome is flush with the housing surface. **Do not use any tool for tightening to avoid damage to the radome.**

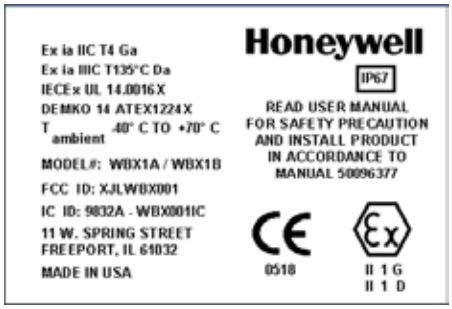
10 | AGENCY LABEL INFORMATION

The following information shall be clearly and permanently labeled on the Limitless™ Wireless Hazardous Area Limit Switch, WBX Series.

10.1 | External Labels

Figure 36. External Cover Metal Label

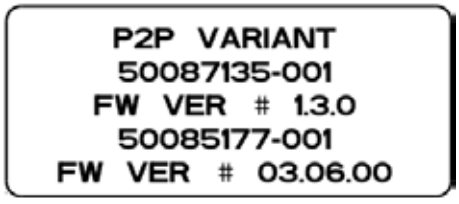
Figure 37. Side Label



10.2 | Internal Label

This label is applied on the battery board of the product.

Figure 38. Battery Board Label



11 | ACCESSORIES

Figure 39. Limitless™ WBX Available Levers
Note in hazardous locations, only non-sparking actuators are allowed for use.

Table 33. Cable and Coax Accessories

Photo	Part Number	Description
	WCA200RNPRSP-002	Wireless cable assembly with 200 Series cable, 2 ft length, reverse polarity N plug to reverse polarity SMA plug, use only with WAN06RNJ antenna
	WCA200RNPRSP-010	Wireless cable assembly with 200 Series cable, 10 ft length, reverse polarity N plug to reverse polarity SMA plug, use only with WAN06RNJ antenna
	WCA200RNJRSP-002	Wireless cable assembly with 200 Series cable, 2 ft length, reverse polarity SMA jack to reverse polarity SMA plug
	WCA200RNJRSP-005	Wireless cable assembly with 200 Series cable, 5 ft length, reverse polarity SMA jack to reverse polarity SMA plug
	WCA200RNJRSP-010	Wireless cable assembly with 200 Series cable, 10 ft length, reverse polarity SMA jack to reverse polarity SMA plug
	WCA200RNJRSP-015	Wireless cable assembly with 200 Series cable, 15 ft length, reverse polarity SMA jack to reverse polarity SMA plug
	WCA200RNJRSP-020	Wireless cable assembly with 200 Series cable, 20 ft length, reverse polarity SMA jack to reverse polarity SMA plug

Table 34. Base Accessories

Photo	Part Number	Description
	WAMM100RSP-005	Magnetic antenna base with 1,52 m [5 ft] of cable
	WAMM100RSP-010	Magnetic antenna base with 3,05 m [10 ft] of cable
	WPB1	WPMM Wireless panel mount receiver mounting bracket
	WPR1	WPMM panel mount retainer

12 | TROUBLESHOOTING GUIDE

12.1 | 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	• 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 9.5
	Incorrect battery installed in WBX switch	• 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 9.5

SYMPTOM	CAUSE	RESOLUTION
Yellow ⑤ LED is constantly ON	Dead or low battery in WBX	• 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 9.5
	Incorrect battery installed in WBX	• 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 9.5
	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 9.4
	Antenna alignment is not acceptable	Reposition antenna; reference Section 9.4
	Damage to antenna cable	Replace antenna cable; reference Section 4.1
	Loose antenna or cable connections	Check connections and tighten as necessary; reference Section 4.1

Figure 40. Limitless™ WPMM With Call-outs

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 6.1
	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) * **Dependant on if the WPMM Set-up mode was used during initial set-up, this operation may be expected*	WBX is not paired to WPMM	Pair WBX to WPMM per Section 6.1
	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) **Dependant on if the WPMM Set-up mode was used during initial set-up, this operation may be expected*	WBX is not paired to WPMM	Pair WBX to WPMM per Section 6.1
	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

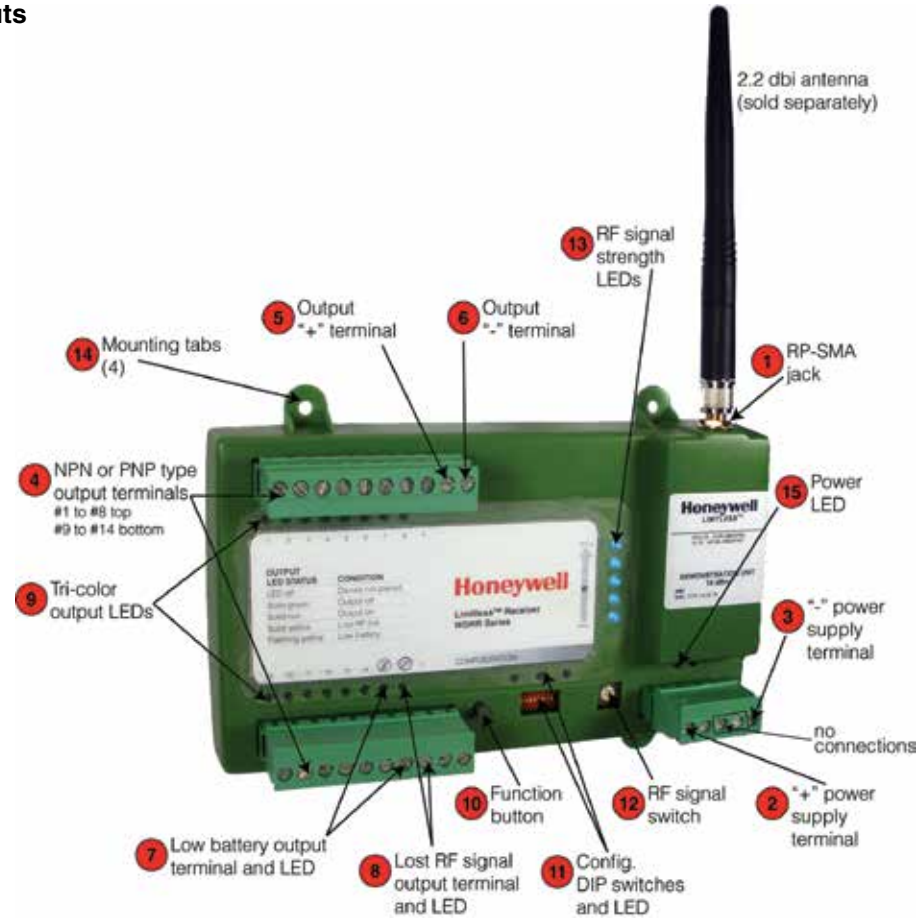
12.2 | WBX used in conjunction with a WDRR

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 ⑮ 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	• 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 9.5
	Incorrect battery installed in WBX	• 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 9.5

SYMPTOM	CAUSE	RESOLUTION
Yellow tri-color output LED ⑨ is constantly ON	Dead or low battery in WBX	• 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 9.5
	Incorrect battery installed in WBX	• 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 6.1
	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 9.4
	Antenna alignment is not acceptable	Reposition antenna; reference Section 9.4
	Damage to antenna cable	Replace antenna cable; reference Section 4.1
	Loose antenna or cable connections	Check connections and tighten as necessary; reference Section 4.1
Red tri-color output LED ⑨ is not ON when WBX is actuated (green power LED ⑮ ON, yellow LED ⑨ OFF) **Dependant on if the WPMM Set-up mode was used during initial set-up, this operation may be expected*	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 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
NPN/PNP output(s) ④ is not changing state when WBX is actuated (green power LED ⑮ ON, yellow LEDs ⑨ OFF) **Dependant on if the WPMM Set-up mode was used during initial set-up, this operation may be expected*	WBX(es) not paired to WDRR	Pair WBX to WDRR per Section 6.1
	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 41. Limitless™ WDRR with call-outs



12.3 | WBX Battery Installation or Replacement

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

SYMPTOM	CAUSE	RESOLUTION
Orange LED does not blink upon battery insertion	Device is not operational upon battery installation	Power cycle the device by removing one battery and reinserting
	WBX internal electronics damaged	Replace WBX
	Damaged output(s)	Replace WDRR receiver

Installation and Technical Manual for the
Limitless™ P2P Wireless Hazardous Area Limit Switch, WBX Series

ISSUE 1
32307000

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: info.sc@honeywell.com
Internet: sensing.honeywell.com

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

Notices and Trademarks

While this information is presented in good faith and believed to be accurate, Honeywell disclaims the implied warranties of merchantability and fitness for a particular purpose and makes no express warranties except as may be stated in its written agreement with and for its customers.

In no event is Honeywell liable to anyone for any indirect, special or consequential damages. The information and specifications in this document are subject to change without notice.

Honeywell is a registered trademarks of Honeywell International Inc.

Other brand or product names are trademarks of their respective owners.

Sensing and Control
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422
honeywell.com

Honeywell

32307000-1-EN IL50 GLO Printed in USA.
July 2015