

Installation and Technical Manual for the Intrinsically Safe Limitless™ Point-to-Point Wireless Pressure Sensor, IS-WPS Series

Issue 1

32317839

Used in conjunction with Limitless™ WMPR Series Receiver

⚠️ 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 IS-WPS 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 IS-WPS Pressure Sensor to not apply an impact force to the device. (i.e. dropping the IS-WPS Pressure Sensor on a hard surface, impact with a hammer/wrench, etc.).

Failure to comply with these instructions could cause damage to the internal components, housing, and/or antenna.

⚠️ WARNING **RF EXPOSURE**

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

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

⚠️ WARNING

The IS-WPS 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 2.2 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 IS-WPS. This is due to the risk of possibly damaging the internal IS-WPS 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 only the Intrinsically Safe battery pack can be performed in a hazardous environment. Connection and disconnection of the non-IS 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

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

Impact could potentially cause ignition in the surrounding hazardous atmosphere that could result in death or serious injury.

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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™ WMPR Receiver.

About this Document

This document outlines professional installation requirements for the Limitless™ Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series. Professional installation is required to comply with certification agency and legal requirements. This document must be adhered to for all installations of the Limitless™ Intrinsically Safe Wireless Pressure Sensor, IS-WPS 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
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New	32317839, Issue 1	xxxx

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document title	Document No.
Installation and Technical Manual for the Limitless™ WMPR Receiver	32309669, Issue 1
Limitless™ WMPR Receiver Product Sheet	002391-1-EN, July 2015

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







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Symbol Definitions

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

Table 1. Table Symbol Definitions

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user, often in terms of performing a task.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
	CAUTION symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death.
	WARNING symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING, Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc may be accessible.
	ESD HAZARD: Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	Protective Earth (PE) terminal: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground: Functional earth connection. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	C-Tick Mark. The C-Tick Mark is a certification trade mark registered to ACMA (Australian Communications and Media Authority) in Australia under the Trade Marks Act 1995 and to RSM in New Zealand under section 47 of the NZ Trade Marks Act. The mark is only to be used in accordance with conditions laid down by ACMA and RSM. This mark is equal to the CE Mark used in the European Union.
	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.
	The Ex mark means the equipment complies with the requirements of the European standards that are harmonised with the 2014/34/EU Directive, (ATEX Directive named after the French "ATmosphere EXplosible.")
	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.
	Notified Body. For radio equipment used in the European Union in accordance with the R&TTE Directive, the CE Mark and the notified body (NB) identification number is used when the NB is involved in the conformity assessment procedure.

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1 | PRODUCT DESCRIPTION

1.1 | General

Limitless™ Intrinsically Safe Wireless Pressure Sensors (IS-WPS Series) are WPAN Compliant wireless point-to-point (P2P) devices, and offers a variety of remote or built-in antenna options.

It features a rugged aluminum enclosure, corrosion-resistant construction, and is suitable for outdoor applications in harsh environments due to its IP67 sealed enclosure. Its pressure port and pressure diaphragm are made with corrosion-resistant material making it resilient to harsh process media. The direct- or remote-mount antenna options add flexibility for adaptation to different applications.

The IS-WPS is especially beneficial for remote pressure 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 ease in establishing remote, cost-effective process sensing.

This document describes the Limitless™ P2P Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series' function, operation, and maintenance.

The document includes:

- Details of topics that relate uniquely to the Limitless™ P2P Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series
- Installation and mounting
- Antenna and cable options and mounting

1.2 | Principle of Operation

The Limitless™ P2P Wireless Network is an all-digital, serial, two-way communication Point-to-Point wireless network that connects industrial field sensors to a Limitless™ WMPR (Wireless Multi-Protocol Receiver). This system uses a standard WPAN 802.15.4 protocol for Point-to-Point (P2P) communication.

The sensor supports one input channel. This channel is available as gage pressure or absolute pressure.

The sensor measures this analog pressure and transmits a digital output signal proportional to the measured value.

The IS-WPS Pressure Sensor supports no electrical signal inputs and is powered by an intrinsically safe battery pack that uses standard replaceable, non-rechargeable batteries.

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1.3 | Product Nomenclature

This document is valid for the Limitless™ Wireless Pressure Sensor, IS-WPS Series in the following variations:

Figure 1. Limitless™ Wireless Pressure Sensor, IS-WPS Series Nomenclature

Type	Gen Code	RF Code	Antenna Type Code	Country Use Code	Pressure Type	Connection Type	Pressure Range (refer to Table 3: Pressure range chart)	Enclosure Type	Display	Protection Code
WPS Series Intrinsically Safe Wireless Pressure Sensor	1 Version 1	A 2.4 GHz, IEEE 802.15.4 <small>For "B" coded versions, refer to WPS ISA100 datasheet, 32317842.</small>	00 No antenna; RP-SMA jack 12 2.0 dBi omni antenna	A US, Canada, Australia B All other approved countries	AP Absolute pressure GP Gage pressure	1 1/2 in NPT male & 1/4 in NPT female 2 3/4 in NPT male & 1/4 in NPT female 3 1/4 in NPT female 4 9/16-18 UNF female	P F B J K K L M	M Metal	0 No LCD 1 with LCD	X Intrinsically safe, Zone I Y Intrinsically safe, Zone 0

Table 2. Pressure Range Conversion Chart

		Pressure Range				
Port Material		316L SST	316L SST	15-5 PH SST	15-5 PH SST	Crucible A-286
Diaphragm Material		Hastelloy®	Hastelloy®	15-5 PH SST	15-5 PH SST	Crucible A-286
Unit Code	Description	F	J	K	L	M
P	psi	0 to 500	0 to 5000	0 to 10000	0 to 15000	0 to 15000
B	bar	0 to 34.5	0 to 344.7	0 to 689.5	0 to 1034.2	0 to 1034.2
K	kPa	0 to 3447.4	0 to 34473	0 to 68947	0 to 103421 ^A	0 to 103421 ^A

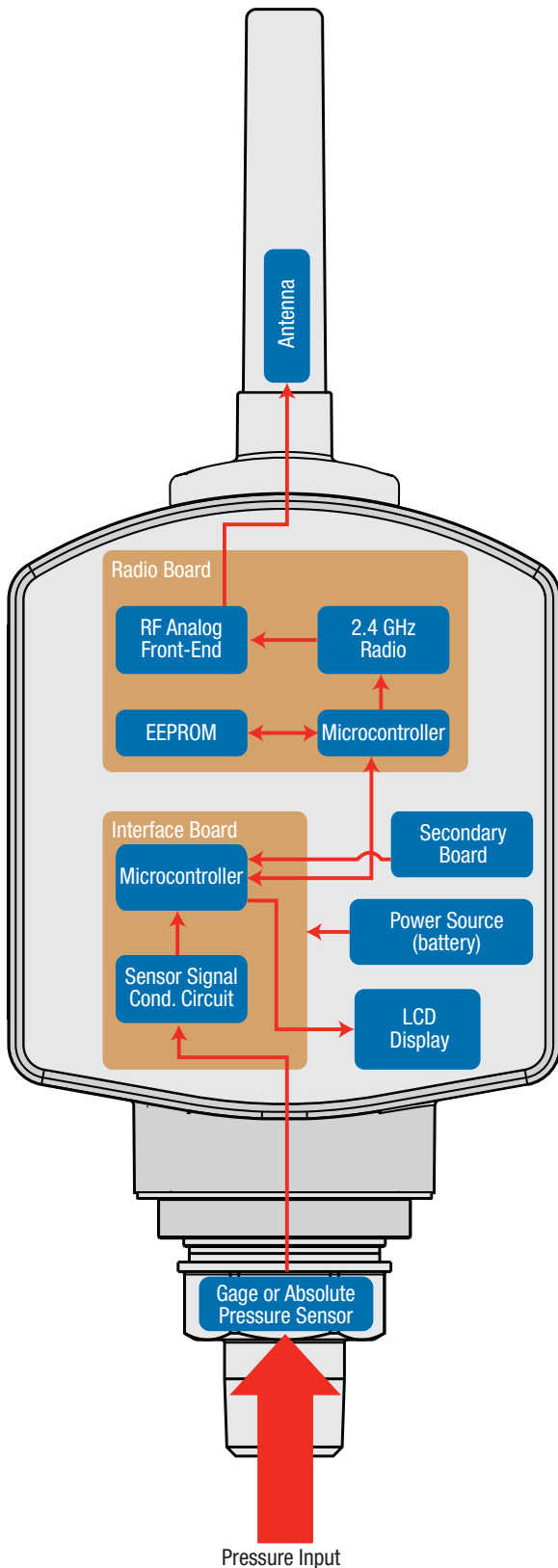
^A Values >99999 kPa will be displayed in MPa on LCD screen

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1.3 | Functional Diagram

Figure 2. IS-WPS Functional Diagram



1.4 | Abbreviations and Definitions

Table 3. Abbreviations and Definitions

ACMA	Australian Communications and Media Authority
ANATEL	National Agency of Telecommunication (Agência Nacional de Telecomunicação)
AWG	American Wire Gauge
dB	Decibel
dB_i	Decibel Isotropic
dB_m	Decibel above or below 1 milliwatt
DSSS	Direct Sequence Spread Spectrum
EIRP	Equivalent Isotropic Radiated power
EMC	Electromagnetic Compatibility
Ethernet	a family of computer networking technologies for wired local area networks such as IEEE 802.3
ETSI	European Telecommunications Standards Institute
EU	European Union
FCC	Federal Communications Committee
GHz	GigaHertz
IC	Industry Canada
ICES	Industry Canada Electrical Specification
IEEE	Institute of Electrical and Electronics Engineers
IS	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
N-m	Newton meter
NEMA	National Electrical Manufacturers Association
PCBa	Printed Circuit Board Assembly
psi	Pounds per square inch (unit of pressure)
R&TTE	Radio and Telecommunications Terminal Equipment
RJ-45	Registered Jack - 45, a standard connector used for Ethernet connections
RP-SMA	Reverse Polarity SMA connector
RF	Radio Frequency
TX	Transmit
Wi-Fi	Wireless Local Area Network based on IEEE 802.11 Specifications
WLAN	Wireless Local Area Network (aka WIFI)
WMPR	Wireless Multi-Protocol Receiver

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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	GB
Italy	IT		

Table 7. Other European Countries

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

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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	16 dBm	FCC 15.247 and 15.209
		Industry Canada RSS 210 Issue 8
	8 dBm	ETSI, CE mark


FCC ID: XJLWPS001
IC ID: 9832A-WPS001IC

2.3 | Radio Module Specifications

Table 9. Radio Module Specifications

Item	Specification
Radio module	Honeywell RF-PCBa
Wireless standard	IEEE Standard: 802.15.4; 2.4 GHz global, license-free bands Protocol: Limitless™ point-to-point
Data rate	250 kbps
Operating frequency	ISM 2.4 GHz
Module transmit power (max.)	Country code A: 16 dBm max; Country code B: 8 dBm max
Receive sensitivity (typ.)	-98 dBm

Table 10. Radio Certifications

Agency	Certification	Description
Federal Communications Commission (FCC)	FCC ID: XJLWPS001	The Intrinsically Safe Wireless Pressure Sensors, IS-WPS Series 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)	IC: 9832A-WPS001IC	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/ewh-semt/pubs/radiation/radio_guide-lignes_direct/index-eng.php . L'installateur de cette radio doit s'assurer que l'antenne est située ou orientée de manière à ne pas émettre de radiofréquences excédant les limites permises par Santé Canada pour la population générale. Veuillez consulter le Code de sécurité 6 de Santé Canada au http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct/index-eng.php .
		For radio equipment used in the European Union in accordance with the R&TTE Directive the CE Mark and the notified body (NB) identification number is used when the NB is involved in the conformity assessment procedure.

WARNING

The IS-WPS Pressure Sensor 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)

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2.4 | Battery Specifications

Table 11. Battery Pack Specifications

Item	Specification
Battery pack	Honeywell Intrinsically Safe Battery Pack P/N: WBT8
Battery	3.6 Vdc Lithium Thionyl Chloride; D size, Qty: 2 Approved battery manufacturer: Xeno Energy: XL-205F batteries; Battery P/N: WBT5

2.5 | EMC Specifications

The latest applicable EMC Standards are as follows:

- EN 300 328, V1.8.1
- EN 61326-1 (2013)
- 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 antenna (refer to Section 5.1) are the only antennas allowed for use with the IS-WPS.

2.6 | Functional Specifications

Table 12. Sensor Specifications

Item	Specification
Total error band	±2.0 %FSS max.
Resolution	0.04 %FS
Pressure ranges	0 psi to 500 psi; 0 psi to 5000 psi; 0 psi to 10k psi; 0 psi to 15k psi
Pressure type	gage or absolute
Overload safe pressure	4X FS for 500 psi; 15,000 psi for 5K psi 1.5X for > 10,000 psi
Burst pressure	3000 psi for 500 psi, 15000 psi for 5,000 psi 26000 psi for 10,000 psi; 40000 psi for 15,000 psi
Diaphragm material	Hastelloy® C276: 500 psi and 5,000 psi 15-5PH or A-286: 10,000 psi and 15,000 psi

2.7 | Environmental Specifications

Table 13. Environmental Specifications

Item	Specification
Operating temperature	-40 °C to 70 °C [-40 °F to 158 °F]
Storage temperature	-40 °C to 70 °C [-40 °F to 158 °F]
Operating humidity	0 %RH to 100 %RH
Vibration	5 Hz to 200 Hz, 4 g, Sinusoidal as per IEC 60068-2-6
Shock	40 g as per IEC 60068-2-27
Sealing	IP65, IP67 As tested by Honeywell to sealing standards

ATTENTION

The IS-WPS cannot be used in a portable application. It must be used in a fixed location.

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2.8 | Certifications and Safety Approvals

Table 14. Hazardous Location Standards and Certifications

cULus Listing	ATEX Certification	IECEX 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; EN60079-11: 2012	Standards: IEC60079-0 edition 6.0; IEC60079-11 edition 6.0
Class I, Div 1, Groups A, B, C, D T4 Class I, Zone 1 AEx ia IIC T4 Ga Class I, Zone 1 Ex ia IIC T4 Ga Class I, Zone 0 AEx ia IIC T4 Ga Class I, Zone 0 Ex ia IIC T4 Ga T _{ambient} -40°C to 70°C	Zone 1 Ex ia IIC T4 Ga Zone 0 Ex ia IIC T4 Ga	Zone 1 Ex ia IIC T4 Ga Zone 0 Ex ia IIC T4 Ga



2.9 | Limitless™ Intrinsically Safe, Wireless Pressure Sensor, IS-WPS Series Power Specifications

The IS-WPS Series sensors operate from an Intrinsically Safe Battery Pack which constitutes two (2) D-size 3.6 V Lithium Thionyl Chloride (Li/SOCl₂) batteries connected in series with additional protection circuit to meet Intrinsic Safety standards. The battery pack produces a nominal voltage of 7.2 Vdc. There is no provision for external power.

2.10 | Weight

All versions of the IS-WPS Series sensor have a maximum weight of 1,75 kg [3 lb, 14 oz] (weight tolerance of ±100 g) These weights do not include remote cables, antennas, or external pipe thread adapters.

2.11 | Antenna Connection

Antennas connect to an RP-SMA male connector on the upper surface of the IS-WPS. For straight antenna variants, a radome is fastened to the IS-WPS housing, protecting the antenna and connectors from the environment. Alternatively, when ordered without any antenna fitted to the IS-WPS product, a remote antenna and/or a lightning arrestor may be connected to the RP-SMA connector.

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2.12 | Certifications and Approvals

2.12.1 | 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 A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- Intentional or unintentional changes or modifications must not be made to the IS-WPS Series 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

2.12.2 | 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 A digital apparatus complies with Industry Canada RSS 210 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.

2.12.3 | RF Safety Statements

- To comply with FCC's and Industry Canada's RF exposure requirements, the following antenna installation and device operating configurations must be satisfied.
- Remote point-to-point antenna(s) for this unit must be fixed and mounted on outdoor permanent structures with a separation distance between the 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 the IS-WPS Series unit must not be co-located with any other antenna or sensor device and have a separation distance of at least 20 cm [7.87 in] from all persons.

⚠ 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.

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2.13 | Declaration of Conformity Figure 3. Declaration of Conformity

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,
R12 1EB.

Registered No 217808 (England)

EU Declaration of Conformity

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

Manufacturer: Honeywell Sensing & Productivity Solutions (S&PS)
2080 Arlingate Lane
Columbus, OH 43228-4112 USA

Product: Pressure Sensor
WPS Metal Wireless Pressure Sensor

<u>Directive (Amendments)</u>	<u>Conformity Details</u>	
RoHS 2011/65/EU	Complies	
LV 2014/35/EU	Standards applied:	EN 61010-1:2010
2014/53/EU and 2014/30/EU	Standards applied:	EN 61326-1:2013 ETSI EN 300 328 V1.8.1 ETSI EN 301 489-1 V1.9.2 and -17 V2.2.1

ATEX 2014/34/EU	Standards applied:	EN 60079-0: 2012 + A11: 2013 EN 60079-11:2012
	EU TEC No:	DEMKO 16ATEX1558 X
	Notified Body:	Notified Body ID 0539 UL International Demko A/S Borupvang 5A, 2750 Ballerup, Denmark
	ATEX Markings	II 1 G Ex ia IIC T4 Ga, Tamb -40C to +70C

Signed on behalf of Honeywell Control Systems Ltd. :


.....
Colin O'Neil, quality Eng. Manager, Newhouse

DoC No: A510

DoC Issue: 1

DoC Date: 20/05/2016

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3 | GENERAL DESCRIPTION

3.1 | Intended Use

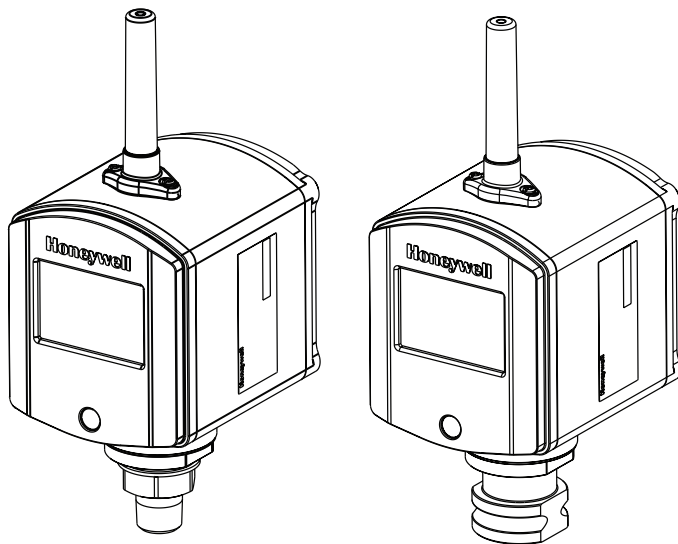
The Limitless™ P2P Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series complies with the IEEE 802.15.4 standard, and uses a low-powered 2.4 GHz radio to communicate with a Wireless Multi-Protocol Receiver (WMPPR).

This receiver includes an RJ-45 Ethernet connector that allows connection to an EtherNet™-compliant Master device.

Initial provisioning and setting of user parameters is accomplished over-the-air through the WMPPR receiver.

3.2 | IS-WPS Series Sensor Diagrams

Figure 4. IS-WPS Series Sensor with Radome



3.3 | Process Connection

Wireless Pressure Sensors have the following standard connection fitting for mounting on the process pipe:

- For ≤5,000 psi: 1/2 in NPT male, 3/4 in NPT male. Either of these connections will also provide a 1/4 in NPT female connection.
- For 10,000 psi: Supports a 1/4 in NPT Female connection with provision to mount the product on a bracket assembly using U-bolts (see Figure 4).
- For 15,000 psi: Supports 9/16-18 UNF Female connection with provision to mount the product on a bracket assembly using U-bolts (see Figure 4).

3.4 | IS-WPS Series Sensor Location

3.4.1 | Recommended Locations

Table 15. IS-WPS Series, GP or AP

Process	Suggested location	Explanation
Gases	Above the gas line	The condensate drains away from the sensor.
Liquids	Below but close to the elevation of the process connection.	This minimizes the static head effect of the condensate.
	Level with or above the process connection	This requires a siphon to protect the sensor from process steam. The siphon retains water as a “fill fluid.”

NOTE: it is the sole responsibility of the customer to determine and identify the correct location for their particular application.

3.5 | Conduit / Cable Entries

There are no conduit/cable entries for the IS-WPS Series sensor.

3.6 | Bracket Mounting

The IS-WPS Series Pressure Sensor is mounted directly on the pipe fitting for pressure ranges <10,000 psi.

For ≥10,000 psi the device is anchored to a bracket by means of a U-bolt arrangement. Recommended bracket assembly for mounting is P/N: WPB2-004, which can be ordered separately. There are additional bracket assemblies that can be ordered based on the specific installation need as below – P/N: WPB2-104/-204/-304/-404 or WPB3-002/-006/-009

3.7 | Pressure Port

Wireless Pressure Sensor provides the following pressure port options to choose from:

Port material	316L SS	15-5 PH SST	Crucible A-286
Diaphragm material	Hastelloy®	15-5 PH SST	Crucible A-286
Process connection	1/2 in NPT male	1/4 in NPT female	–
	3/4 in NPT male	9/16-18 UNF female	

Note: Both 1/2 in NPT male and 3/4 in NPT male also provide 1/4-in NPT female connection

Swivel: The IS-WPS Series sensor body will swivel 350° with respect to the pressure port body, to optimize readability of the LCD. Refer to section 4.1.4 for more information about the swiveling feature.

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4 | PROCESS INSERTION

4.1 | Pressure Sensing

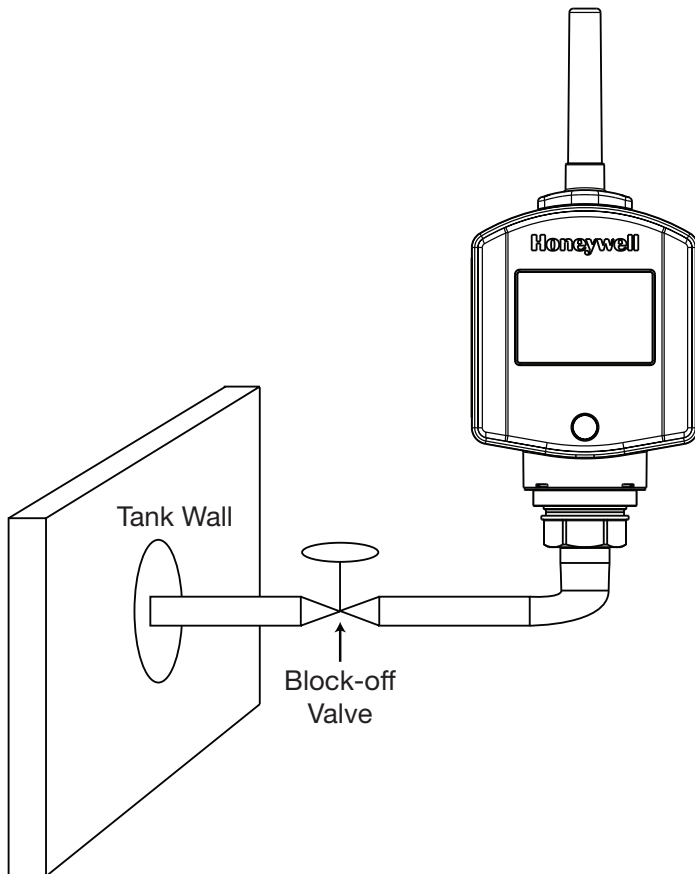
4.1.1 | Piping

The actual piping arrangement will vary depending upon the process measurement requirements and the sensor model. Process connections are made to 1/2 in NPT male, 3/4 in NPT male, 1/4 in NPT female, or 9/16-18 UNF female connections in the head of the sensor's body. Elbow fittings may be utilized as required.

The most common type of pipe used is 1/2 inch Schedule 80 steel pipe. Many piping arrangements use a three-valve manifold to connect the process piping to the sensor. A manifold makes it easy to install and remove a sensor without interrupting the process. It also accommodates the installation of blow-down valves to clear debris from pressure lines to the sensor.

Another piping arrangement uses a block-off valve and a tee connector in the process piping to the sensor as shown in Figure 5.

Figure 5. Typical Arrangement for 1/2 NPT Process Connection Piping



STOP ATTENTION

For liquid or steam, the piping should slope a minimum of 25,4 mm [1 in] per 305 mm [1 ft]. Slope the piping down towards the sensor, if the sensor is below the process connection so the bubbles may rise back into the piping through the liquid. If the sensor is located above the process connection, the piping should rise vertically above the sensor; then slope down towards the flowline with a vent valve at the high point. For gas measurement, use a condensate leg and drain at the low point (freeze protection may be required here).

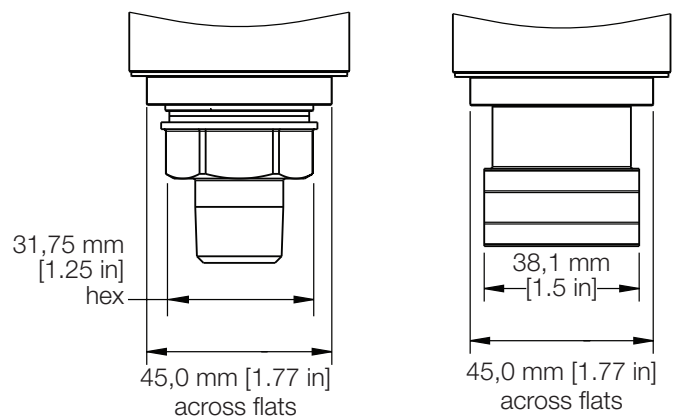
CAUTION

Property damage may result if operating temperature limits of sensor are exceeded. Sensor housing must not exceed 70 °C [158 °F]. To reduce the temperature of the process that comes into contact with the sensor body, install impulse piping. As a general rule, there is a 56 °C drop [100 °F] in the temperature of the process for every foot (305 mm) of 1/2 inch uninsulated piping.

4.1.2 | Process Connections

In addition to connection of IS-WPS device to the piping arrangement (as explained in section 4.1.1), which is recommended mounting arrangement for pressure range up to and including 5,000 psi, there is another mounting arrangement strongly recommended for higher pressures ranges ($\geq 10,000$ psi) using bracket assembly and U-bolts. See the connection diagrams below depicting a typical bracket assembly mounting.

Figure 6. Process Connection - Pipe Fitting



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4.1.3 | General piping guidelines

When measuring fluids containing suspended solids, install permanent valves at regular intervals to blow-down piping.

Blow-down all lines on new installations with compressed air or steam and flush them with process fluids (where possible) before connecting these lines to the sensor's port.

Be sure all the valves in the blow-down lines are closed tight after the initial blow-down procedure and each maintenance procedure after that.

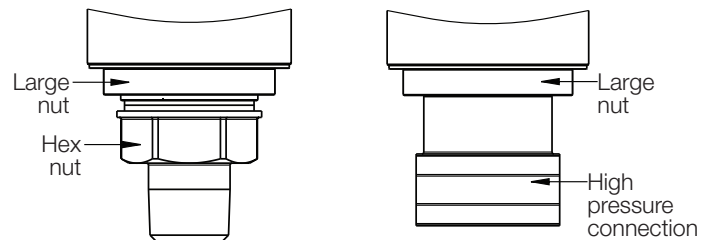
Mount sensor vertically to assure best accuracy, and to obtain optimum R.F. link performance.

4.1.4 | Sensor Housing Swiveling

The IS-WPS Series sensor housing will swivel through a 350° range to facilitate easy reading of the LCD display. To adjust the swivel mounting:

1. Ensure that the process connector (threaded fitting) is in its final position and is fully tightened, using a wrench on the hex-nut area above the threads (do NOT tighten using the sensor body).
2. Loosen the large nut just below the housing using a 45 mm [1.77 in] crescent wrench.

Figure 7. Process Connection - Large and Hex Nuts



3. Swivel sensor housing as needed.
4. While holding the sensor body in place, gently tighten the large nut with a 45 mm [1.77 in] crescent wrench to 14 Nm ± 1 Nm [10.32 ft-lb ± 0.74 ft-lb].

⚠ 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.

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5 | ANTENNA, CABLE, & MOUNTING OPTIONS

5.1 | Approved Antenna Options

This section defines the antenna options that can be used in a particular country of interest; reference Section 2.1 for a list of Countries per Country Use Code. It is important to determine the country the IS-WPS will be used in. Thereby, noting the correct Country Use Code in the IS-WPS nomenclature will help ensure proper selection of antenna and/or cable options. The direct antenna mounts directly to the IS-WPS RP-SMA jack while the remote antenna mounts to the IS-WPS RP-SMA jack via a cable assembly (see Section 6.5.1). Further technical information on the WAN Series antennas, WAMM Series magnetic mounts and WCA Series cable assemblies can be found in Section 6.4.

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 IS-WPS 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 2 as it requires choosing the correct Country Use Code and thus allowable antenna and/or cable usage.

CAUTION

Power to the IS-WPS should not be applied during installation of an antenna as damage could occur to the IS-WPS electronics.

Table 16. Antenna and Accessories Allowed for Use (United States, Canada, Australia)

United States, Canada, Australia (Note: all columns are independent of each other)				
Antenna Type Code (antenna provided with product)	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	WAN04RSP	WAN05RSP	WAN04RSP	
	WAN05RSP	WAN08RSP	WAN05RSP	
	WAN08RSP		WAN08RSP	
	WAN09RSP		WAN09RSP	
	WAN10RSP		WAN10RSP	
	WAN11RSP			
	WAN12RSP			

Note:

Direct mount: Antennas have an RP-SMA plug that connects directly to the IS-WPS RP-SMA jack

Remote mount: Remote mount antenna uses a cable with a RP-SMA plug that connects directly to the IS-WPS RP-SMA jack

Note for Section 5.1, Tables 16 and 17:

1. 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.

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Table 17. Antenna and Accessories Allowed for Use In All Other Approved Countries

All Other Approved Countries (Note: all columns are independent of each other)				
Antenna Type Code (antenna provided with product)	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 WAN10RSP WAN12RSP		WAN08RSP	WAN08RSP WAN09RSP WAN10RSP WAN11RSP

Note:

Direct mount: Antennas have an RP-SMA plug that connects directly to the IS-WPS RP-SMA jack

Remote mount: Remote mount antenna uses a cable with a RP-SMA plug that connects directly to the IS-WPS RP-SMA jack

ATTENTION

If using the IS-WPS in a portable application (for example, the IS-WPS is used as a handheld device and the antenna is less than 20 cm [7.87 in] from the human body when the device is in operation): The integrator is responsible for passing additional SAR (Specific Absorption Rate) testing based on FCC rules 2.1091 and FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, OET Bulletin and Supplement C. The testing results will be submitted to the FCC for approval prior to selling the integrated unit. The required SAR testing measures emissions from the module and how they affect the person.

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.

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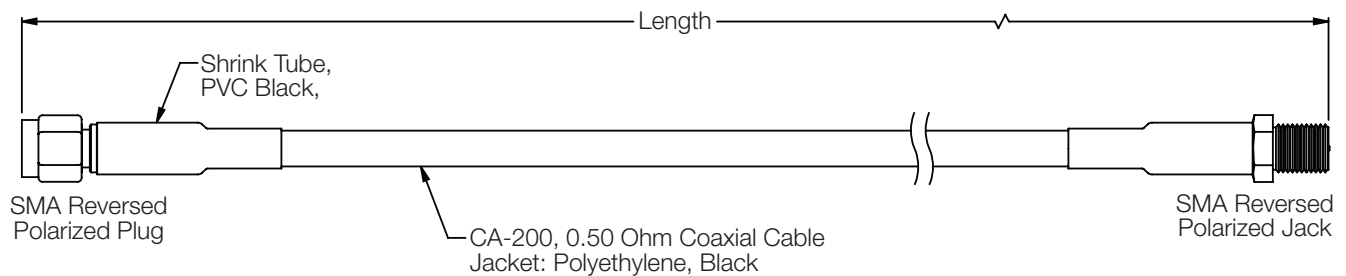
5.2 | IS-WPS Series Sensor Cables

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

Table 18. Sensor to Antenna Cable Specifications for IS-WPS Series

Honeywell Part Number	Cable Type	Connector Type	Frequency (GHz)	Length	Loss (dB)	Total Capacitance	Total Inductance
WAMM100RSP-005	100 Series	RP-SMA Jack to RP-SMA Plug	2.4	1,52 m [5 ft]	1.99	154 pF	0.4 μH
WAMM100RSP-010	100 Series	RP-SMA Jack to RP-SMA Plug	2.4	3,05 m [10 ft]	3.98	309 pF	0.8 μH
RF Cable A							
WCA200RNPRSP-002	200 Series	RP-N Plug to RP-SMA Plug	2.4	0,61 m [2 ft]	0.34	50 pF	0.2 μH
WCA200RNPRSP-010	200 Series	RP-N Plug to RP-SMA Plug	2.4	3,05 m [10 ft]	1.69	246 pF	0.7 μH
RF Cable B							
WCA200RNJRSP-002	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	0,61 m [2 ft]	0.34	50 pF	0.2 μH
WCA200RNJRSP-005	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	1,52 m [5 ft]	0.85	123 pF	0.4 μH
WCA200RNJRSP-010	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	3,05 m [10 ft]	1.69	246 pF	0.7 μH
WCA200RNJRSP-015	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	4,57 m [15 ft]	2.54	368 pF	1.0 μH
WCA200RNJRSP-020	200 Series	RP-SMA Jack to RP-SMA Plug	2.4	6,10 m [20 ft]	3.38	491 pF	1.3 μH

Figure 8. IS-WPS Antenna Extender Cables

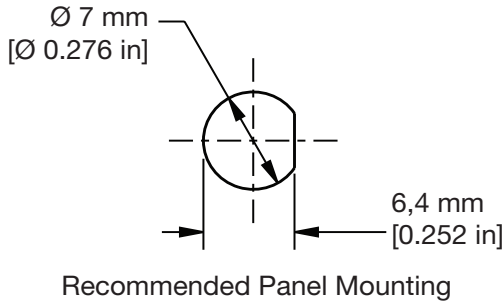


Note: This cable may optionally be mounted in a hole (see Figure 8), and fastened with the included nut and lockwasher. This would allow the RP-SMA jack to support the antenna. If this is done, ensure that the surface around the hole is clean and free of paint or oil, so as to allow a low resistance ground connection for optimum R.F. performance.

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Figure 9. IS-WPS Antenna Extender Cable Mounting Hole



ATTENTION

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

5.2.1 | Connection Diagrams for Remote Antenna Configuration

Figure 10a. IS-WPS Connected to Remote Antenna Directly

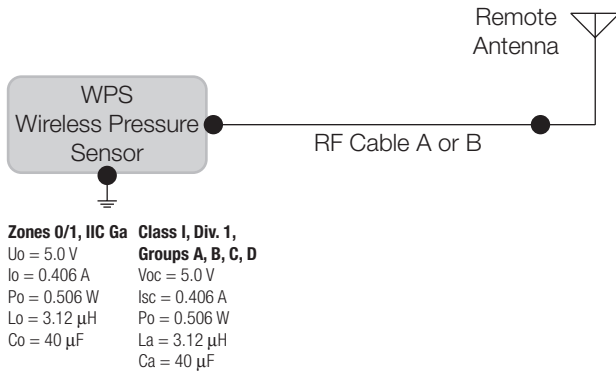
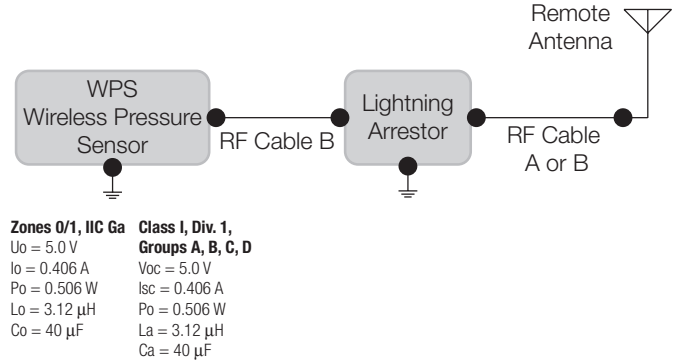


Figure 10b. IS-WPS Connected to Remote Antenna Via Lightning Arrestor



Note 1: Only lightning surge arrestors determined to be simple apparatus with no discrete inductors or capacitors may be installed as defined in the National Electrical Code or other local codes, as applicable.

Note 2: Refer to the chart in Section 5.1 that captures the approved antenna to be used with the IS-WPS product as remote connection.

Note 3: Only where all externally connected inductance and capacitance is contained in cabling, i.e. no discrete inductors or capacitors in any externally connected device. No reduction of L_0 or C_0 are necessary.

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6 | ANTENNA SELECTION, ADJUSTMENT, AND MOUNTING

6.1 | Warnings

6.1.1 | General Installation Warnings

ATTENTION

- Professional Installation is required to ensure 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™ IS-WPS Series as configured for the particular installation site.
- The antenna used for this sensor must be installed to provide a separation distance of at least 20 cm [7.87 in] from all persons and must not be co-located or operating in conjunction with any other antenna or sensor.
- For remote antenna, see antenna installation requirements to satisfy FCC RF exposure requirements.

ATTENTION

Federal Communications Commission (FCC):

- The Limitless™ IS-WPS Series complies 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):

- L'installateur de cette radio doit s'assurer que l'antenne est située ou orientée de manière à ne pas émettre de radio-fréquences excédant les limites permises par Santé Canada pour la population générale. Veuillez consulter le Code de sécurité 6 de Santé Canada au www.hc-sc.gc.ca/rpb.

6.1.2 | Outdoor Installation Warnings

WARNING

LIVES MAY BE AT RISK!

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

WARNING

CONTACTING POWER LINES COULD BE FATAL

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

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

WARNING

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

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

WARNING

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

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

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

⚠ WARNING

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

DO NOT TOUCH THAT PERSON OR RISK ELECTROCUTION.

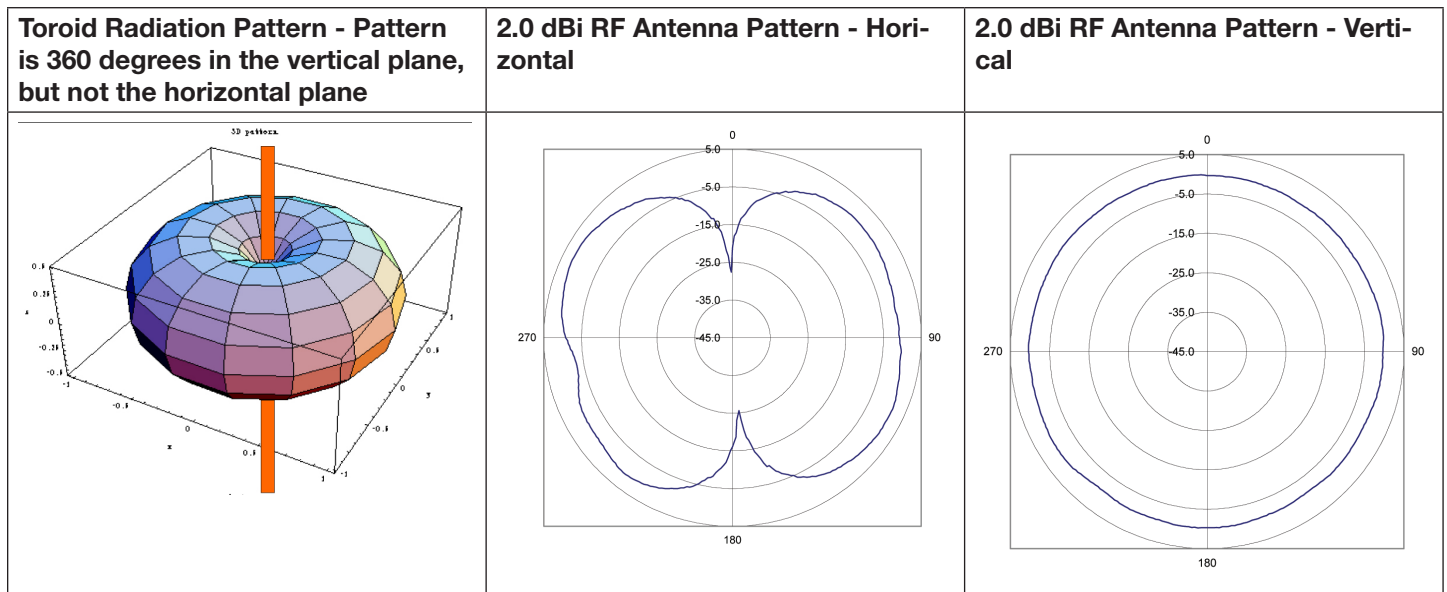
- Use a non-conductive dry board, stick, or rope to push, pull, or drag them so they no longer are in contact with electrical power.
- Once they are no longer contacting electrical power, administer CPR if certified, and make sure emergency medical aid has been requested.

6.2 | Antenna Designs and Considerations

6.2.1 | Omni-directional Antenna Design

The Limitless™ Series omni-directional antennas were chosen for their ability to be used in applications where transmitter-and-receiver antennas may be moving with respect to each other or could be stationary. These monopole and dipole antennas radiate power (power from the internal radio of the IS-WPS) in a 360° outward pattern in a plane perpendicular to the length of the antenna element. The term “omni” may suggest that 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 11.

Figure 11. Radiation Pattern of an Omni-directional Antenna



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

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6.3 | Antenna Mounting and Considerations

6.3.1 | Antenna Mounting Location with Respect to RF Signal

⚠ WARNING

RF EXPOSURE

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

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

There are several environmental factors to consider when determining antenna location during installation. These factors can affect the radio frequency (RF) signal strength being both transmitted and received by the Limitless™ IS-WPS and corresponding WMPR. It is desirable for the antenna to be mounted in a place that will limit exposure of adjacent materials/objects between the IS-WPS and WMPR, as they 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, metal walls, etc.
- Outdoor: Vehicles, buildings, trees, structures, topology, weather conditions, chain link fence, major power cables, etc.

The best performance is achieved when both the Limitless™ IS-WPS and WMPR antennas are mounted at the same height and in a direct line of sight (LOS) with no obstructions. Generally, the higher the antenna is above ground, the better it performs. Another concern is RF interference, discussed in Section 6.7.

Figure 12. Limitless™ IS-WPS to WMPR with RF Signal Line of Sight (LOS) Free From Obstacles

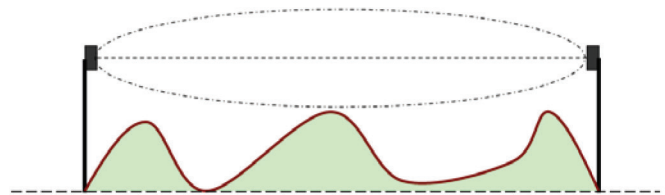
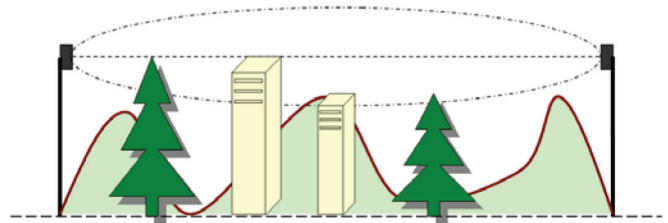


Figure 13. Limitless™ IS-WPS to WMPR with RF Signal Line of Sight (LOS) Affected by Obstacles



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6.4 | Antenna Options

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

Table 19. Antenna Options

Part number	Replacement antenna mount or cable	Antenna design	Ant. gain (max.)	Connector/mounting	Dimensions	Antenna material	Cable material/type	Mount material
WAN03RSP	–	flat	3.0 dBi	RP-SMA plug/adhesive mount	Ø 7,87 mm x 22,1 mm W x 4,57 mm D [Ø 0.31 in x 0.87 in W x 0.18 in D] 3 m [9 ft] cable	UV stable ABS	UV stable PVC/ RG-174 coax	–
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
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
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
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
WAN06RNJ	WCA200RNPRSP-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
WAN06RNJ	WCA200RNPRSP-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
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
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
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
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	–	–

*Reference Limitless™ nomenclature (i.e. WMPR Series, WDPR Series, WPMM Series, WGLA Series, etc.)

**Reference Limitless™ Environment Usage section 6.6 for further details

*** Reference Section 5.1 for antennas and accessories for use in the United States, Canada, Australia, and other approved countries.

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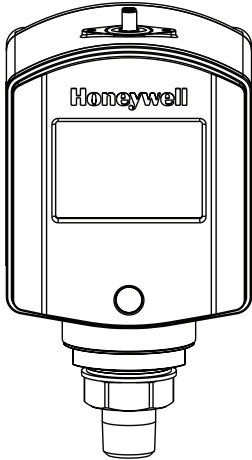
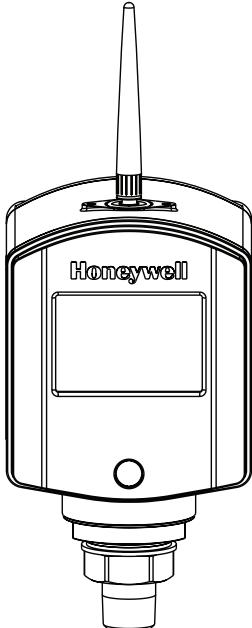
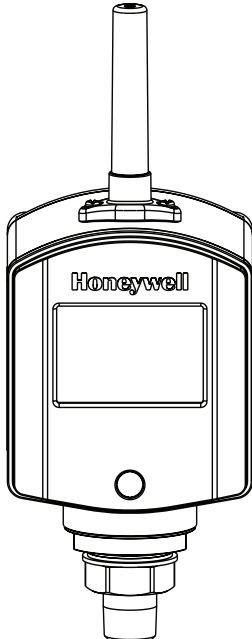
STOP ATTENTION

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

WARNING

The IS-WPS Series sensor must be professionally 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™ Point-to-Point Wireless Pressure Sensor, IS-WPS Series installations.

Figure 14. IS-WPS Standard Antenna Options

Antenna Type Code 00	Antenna Type Code 12	Antenna Type Code 12: Radome Installed
No antenna. RP-SMA antenna jack on top is used	2.0 dBi gain omni-directional antenna (radome not shown)	(note: only one size radome available)
		

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6.5 | Antenna Connection, Styles, and Mounting Options

⚠ WARNING

RF EXPOSURE

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

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

⊘ CAUTION

Power to the IS-WPS should not be applied during installation of an antenna as damage could occur to the IS-WPS electronics.

6.5.1 | Antenna Connection

Physical connection of the antenna to the IS-WPS is accomplished by using mating RP-SMA connectors: plug and jack. Direct-mount antennas have an RP-SMA plug that connects directly to the IS-WPS RP-SMA jack. The remote mount antenna uses a cable with a RP-SMA plug that connects directly to the IS-WPS RP-SMA jack allowing the antenna to be remotely mounted away from the IS-WPS. Mounting options are based on user preference, communication agency approvals, IS-WPS mounting location, and obstacles as discussed in Section 6.6.6.

A direct- or remote-mount antenna can be easily mounted by threading the mating RP-SMA plug of the antenna to the IS-WPS's RP-SMA jack. Reference section 6.6.2 for further details on extra environmental protection of RP-SMA connections. Tighten the RP-SMA connection until finger tight. See Figures 15 and 16.

Figure 15. Limitless™ IS-WPS RP-SMA Connection, Direct-Mount

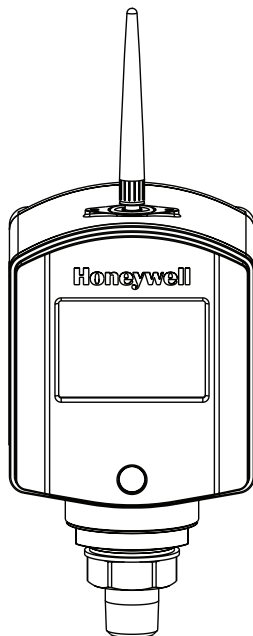
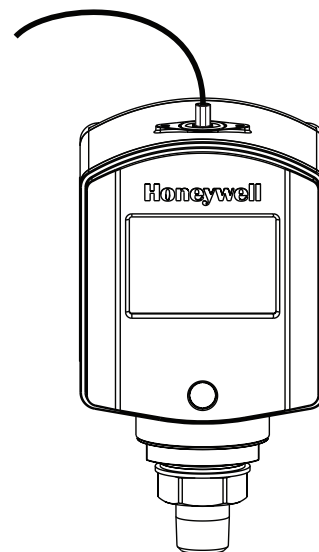


Figure 16. Limitless™ IS-WPS RP-SMA Connection, Remote-Mount



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6.5.2 | Cable Requirement

Some remote mount antennas have an antenna cable permanently attached, with an RP-SMA plug, that is simply connected to the jack on the IS-WPS. 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 sensor, and one end with an RP-SMA jack (outside threads). The jack of the extension cable will mate with the antenna or the lightning arrester. If a lightning arrester is connected this way, the antenna may be directly connected to the arrester.

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 5.1 for approved antenna and cable options.

6.5.3 | Antenna Styles and Mounting Options

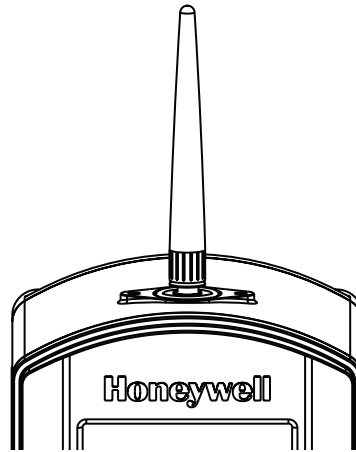
Choosing an antenna mounting style depends on application conditions, antenna benefits and/or features, and user preference. The antenna's gain (discussed further in Section 6.4, Table 19) to some extent determines physical size. Another consideration is the amount of room available in the application.

Straight with Radome: A benefit of the straight antenna radome is rigid design and resistance to being repositioned (shock, vibration, wind, etc.).

Catalog listing: WAN12RSP

WAN12RSP

Straight wireless antenna with 2.2 dBi gain, reverse polarity SMA plug, connector mount (RP-SMA)



Adhesive mount: The benefit of a remote adhesive mount antenna is mounting flexibility to a number of surfaces and in various orientations. Remember, the surface an antenna is being mounted to will affect the radiation pattern. Use masking tape to temporarily attach the antenna. Perform fade-margin testing, as described in Section 6.8 before permanently mounting.

Catalog listing: WAN03RSP

Permanent mounting: Pre-clean the antenna's mounting surface with an alcohol wipe. Peel paper protection from adhesive strip and mount to the cleaned surface.

Figure 17. Adhesive Mounting Steps

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



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



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



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

Catalog listing: WAN06RNJ

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

Figure 18. Mast Mount Antenna – Tighten nut on mounting bracket



Figure 19. Mast Mount Antenna – Side View with Attachment to Pipe



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

Catalog listings: WAMM100RSP-005 & WAMM100RSP-010:

These magnetic-mount bases are not designed for mobile applications.

Catalog listings: WAN09RSP & WAN10RSP: These magnetic-mount antennas are designed for mobile applications and can withstand winds at >150 mph.

Use Magnetic Mounts with the following antenna catalog listings: WAN04RSP and WAN05RSP

Figure 20. Magnetic Mount Base with Antenna – Mounted on Steel Surface



Figure 21. WAN09RSP Magnetic Mount Antenna



Figure 22. WAN10RSP Magnetic Mount Antenna



Thru-hole mount: The benefit of the thru-hole mount antenna is it allows the cable to run “thru” the mounting surface. There is also an adhesive material between the antenna housing and the mounting surface for seal protection. This is a very low profile, rugged design [approximately 30 mm (1.18 in) height] when mounted and also can be used in mobile applications.

Catalog listing: WAN11RSP

Figure 23. Thru-hole mount antenna

WAN11RSP



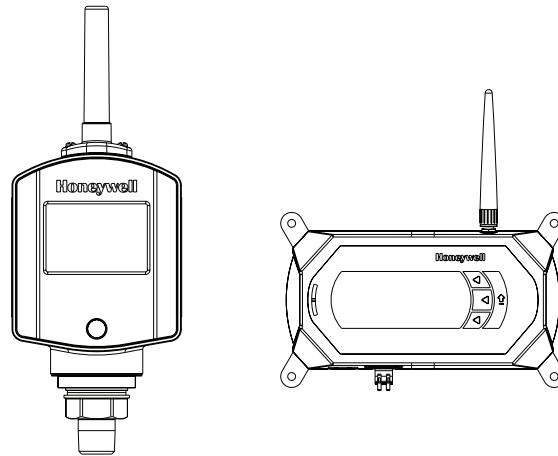
6.5.4 | Antenna Adjustment Considerations

The antennas of the IS-WPS and WMPR receiver should be oriented in parallel as best as possible. This will, in most cases, allow the longest range and highest RF signal. The least RF signal is normally in-line with the top of the antenna, so avoid having the antennas pointed directly toward or directly away from each other.

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Figure 24. Highest RF signal when antennas are as parallel to each other as possible (parallel arrangement shown with the Limitless™ WMPR monitor and IS-WPS sensor)



6.5.5 | Grounding the Remote Antenna

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

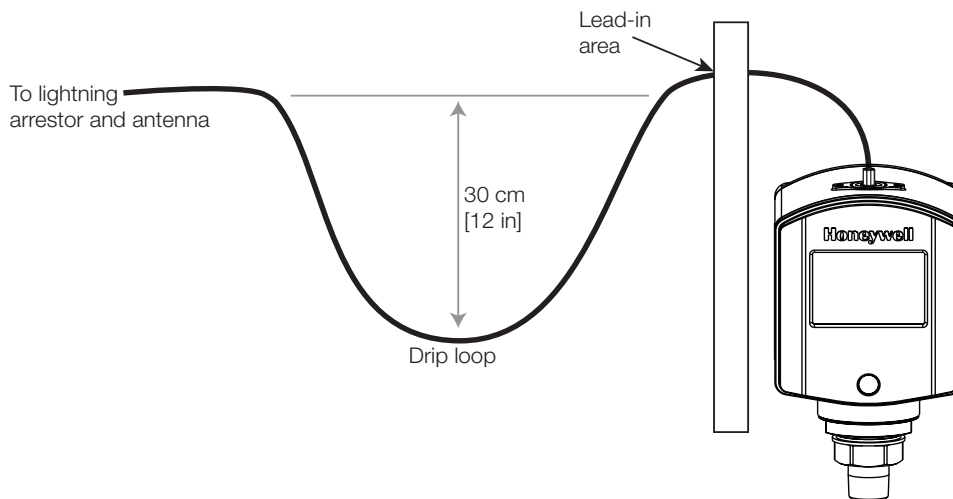
Table 20. Grounding the Antenna

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 arrester 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 arrester 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 arrester must be grounded independent of the antennas, using number 10 solid wire. This wire must be connected directly to 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 feedthru 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 [11.81 in].



- 6 Thoroughly waterproof the lead-in area.
- 7 Connect the lead-in cable to the IS-WPS Series sensor. Tighten cables by hand only; do not use tools or you could overtighten and damage the RF cable on the sensor.

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6.6 | Antenna Environmental Usage/Concerns

6.6.1 | Choosing an Antenna/Cable to Meet Application Exposure Conditions

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

Table 21. Environmental Protection Steps

Step	Action
1	Determine where the antenna will be installed and the application conditions: indoor, outdoor, or limited outdoor exposure. Even if the antenna is going to be used indoors, an outdoor antenna may be more suitable (i.e., resistant to fluids, rigid construction, etc.)
2	Determine what the antenna may be subjected to (i.e., fluids, chemicals, oils, wind, shock, vibration, etc.)

3	<p>A. Review antenna and/or cable materials (listed in Section 6.4) with respect to resistance of chemicals and fluids in the application. If choosing an adhesive mount, adhesive resistance testing may be necessary.</p> <p>B. If shock, vibration, wind, rain, sleet/snow, etc. are in the application, choose an antenna rated for outdoors and has a rigid design as defined in Section 6.5.3.</p>
4	<p>This step may be required to provide an extra level of protection, especially if the application may be subjecting antennas and cables to liquids. The RP-SMA connections, tilt/swivel joints, and cable entrances are potential leak paths that could lead to corrosion. The following procedure is one way to provide extra protection to these connections and joints.</p> <p>See Section 6.6.2 for further detail.</p>

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

6.6.2 | 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.

- For Step 2 (see Figure 25), the recommended protective tape is COAX-SEAL® #104 Hand Moldable Plastic Weatherproofing Tape, available from electrical supply houses.
- For Step 3 (see Figure 25), the recommended tape is Scotch® Premium Vinyl Electrical Tape 88-Super tape, available from 3M.

Figure 25. Application of Protective Tape

Step 1 - Remove radome.

Step 2 - First apply 1/2 inch wide COAX-SEAL® (flexible and moldable material)

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



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

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6.6.3 | Outdoor Antenna Installations - Lightning Concerns

Outdoor antenna installations can lead to the possible damage caused by nearby lightning strikes that induce charges or surges on the antenna and/or antenna extension cables.

A lightning arrestor similar to AL6-RSPRSJBW-9 from L-COM Global Connectivity that is classified as 'Simple Apparatus' can be reviewed against application requirements.

ATTENTION

National, local, and/or regulatory agencies may require the use of a lightning arrestor and possibly other requirements for an antenna system installation. It is recommended that the customer review and adhere to these requirements.

6.6.4 | Lightning Arrestor

The lightning arrestor may be mounted directly on the sensor, 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 sensor, use caution when attaching a grounding wire to the arrestor to avoid putting undue stress on the sensor'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 IS-WPS Series Pressure Sensors.

6.6.5 | 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.

6.6.6 | 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 Limitless™ IS-WPS sensor and the Wireless Multi-Protocol Receiver (WMPR). It is desirable for the antenna to be mounted to limit exposure of adjacent materials/objects between the Limitless™ IS-WPS sensor and the WMPR, as they will have an effect on RF signal strength. If the mounting location for an omnidirectional 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: Intrinsically safe wireless sensors 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).

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6.7 | R.F. Interference Considerations

6.7.1 | General

The 802.15.4 specification provides increased 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 reported by the WMPR, as well as shorter battery life.

6.7.2 | 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 R.F. 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.
- 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

6.7.3 | 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 IS-WPS.

6.7.4 | 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.

6.7.5 | 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 sensor from the wireless sensor would be very desirable. Alternatively, utilizing directional antennas on the wireless sensor, and /or on the wireless video link would help greatly.

6.7.6 | 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 msec 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.

6.7.7 | Cordless Phones/Baby Monitors/ Intercoms

A 2.4 GHz cordless phone in very close proximity to a wireless sensor 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.

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6.8 | Choosing an Antenna Gain (dBi) with Acceptable Fade-Margin

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

The Limitless™ Series antenna's actual gain is measured by how much of the input power from the IS-WPS's internal radio is concentrated in a particular direction. The IS-WPS antenna transmits RF signals, and also receives RF signals from a Limitless™ WMPR 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 IS-WPS's RP-SMA jack. This should be completed in an operating application environment with good nominal environmental conditions. Starting with the antenna chosen in Sections 5 & 6, install the attenuator and operate the system until exposure of all normal application conditions is completed while monitoring the lost RF

signal output. If the fade-margin is unacceptable, the lost RF signal output changes state indicating the antenna position on the Limitless™ IS-WPS and/or WMPR receiver will need to be changed and/or another antenna type should be chosen. The RF Signal indication within the Node Status Menu or Node Information Menu is useful in indicating the RF Link Strength; refer to Section 6.9 for more information.

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

*Suggested sources/part numbers

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

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6.9 | Wireless Link Quality Measurements

6.9.1 | Link Measurements

There are two methods of observing the R.F. link performance

- **The LCD on the IS-WPS sensor** will display the R.F. link quality as one of five values; BEST, GOOD, BAD, POOR and NO RF, based upon the link analysis.
- The applicable data block on the WMPR receiver will show RSSI. (Refer to Section 7.4 or the WMPR Installation and Technical Manual.)
- The Node Detail or Node Status screen on the WMPR will show the RSSI value for each active node (see Figure 26)

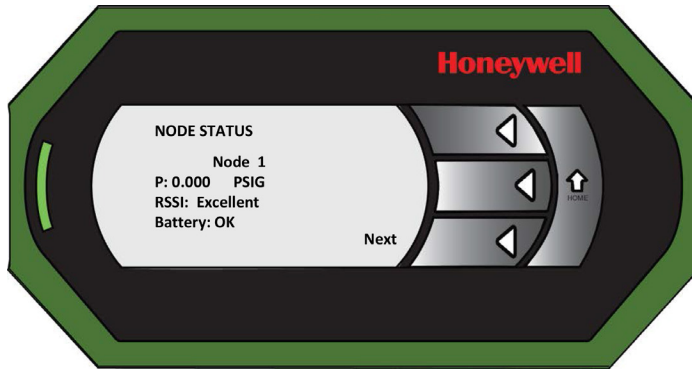
6.9.2 | Connection Quality Labels

Link quality details can be categorized as poor, fair, good, etc. The default numerical criteria for these labels as per the WMPR I&T manual are:

Table 22. IS-WPS Connection Quality Labels

Quality Detail	Numerical Value	Label
RSSI range	> -50	Excellent/Best
	-60 to -50	Good
	-85 to -60	Fair
	< -85	Poor

Figure 26. R.F. Link Quality shown on WMPR



RSSI is the Received Signal Strength Indicator value, lowest value/highest value. The less negative the values, the stronger the signal (-60 dBm is stronger than -70 dBm).

The required antenna impedance is 50 ohms.

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7 | OPERATING THE IS-WPS P2P INTERFACE WITH THE WMPR

7.1 | Overview of the P2P User Interface

The IS-WPS Sensor is paired with a WMPR receiver, which provides

- A means of pairing/purging the IS-WPS on the P2P network
- A readout of the measured process variable from IS-WPS
- Status of the IS-WPS (received signal, battery status)
- A means to set parameters used by the IS-WPS (measurement update rate, display update rate)
- An interface to an existing EtherNet/IP™ compliant Master device

7.2 | Starting the IS-WPS with the WMPR

Note: Before proceeding with the pairing process it is suggested that a “system map” be created listing which wireless devices (IS-WPS or others) are to be paired with the WMPR, and at which “Node”. Each of these devices will be paired with one of the 14 available “Nodes” in the WMPR.

7.2.1 | Powering up the system

1. Insure that the IS-WPS has fresh batteries installed in the battery pack and the power cable is connected to battery pack (see Figure 49).
2. Upon power-up, the IS-WPS device performs a battery status check to determine if the batteries installed are good for use or not. This activity is expected to last for 10 to 15 seconds. The green LED on secondary board will blink at 1 second intervals for approximately 10 seconds; subsequently if battery is GOOD, green LED will stay ON for 4 seconds and then turns OFF. Otherwise, if battery is BAD, green LED will continuously blink at 1 second interval; operator should replace the battery pack containing fresh batteries before continuing.
3. If the IS-WPS has been paired with any other WMPR, perform a Restore to Factory Defaults (see Factory Reset, Section 7.8).
4. Insure that the WMPR is connected to a EtherNet/IP™ compliant Master device through the RJ-45 Ethernet connection.

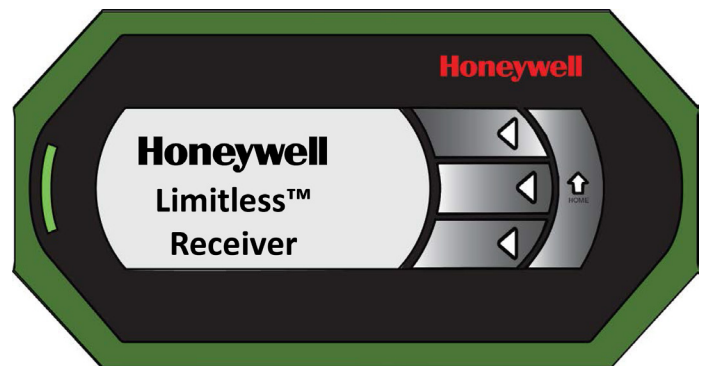
(If this is not done, the WMPR will remain on the initial splash screen).
5. Apply a source of +10 Vdc to +30 Vdc to the power terminals of the WMPR (refer to WMPR I&T Manual).

7.3 | Start-up or Re-start Sequence Mode (EtherNet/IP™ Active Connection and Power Supplied to WMPR)

7.3.1 | Zero Switches or Sensors Paired to WMPR

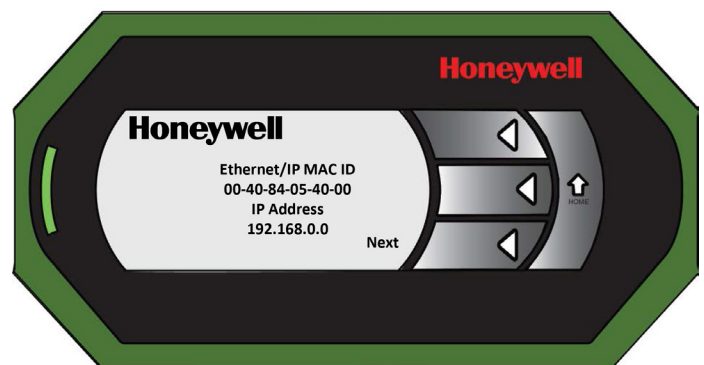
Zero switches/sensors paired to the WMPR: EtherNet/IP™ active connection is made and then applying power to the WMPR will result in the LCD Menu sequencing through the following displays before entering the Main Menu.

Figure 27. Honeywell Splash Screen (momentarily shown)



EtherNet/MAC ID screen appears (see Figure 28). (Record the MAC ID, IP Address, and then touch the “Next” function button to move to the Main Menu) (see Figure 29).

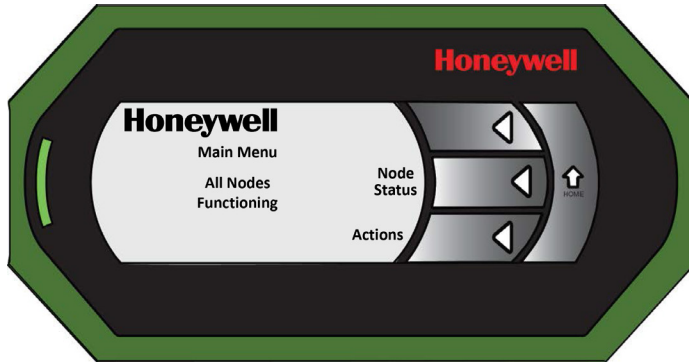
Figure 28. Ethernet/IP MAC ID & IP Address



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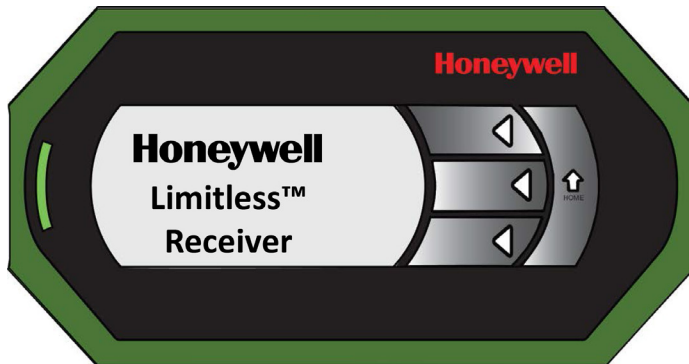
Figure 29. Main Menu



7.3.2 | One or More Switches or Sensors Paired to WMPR

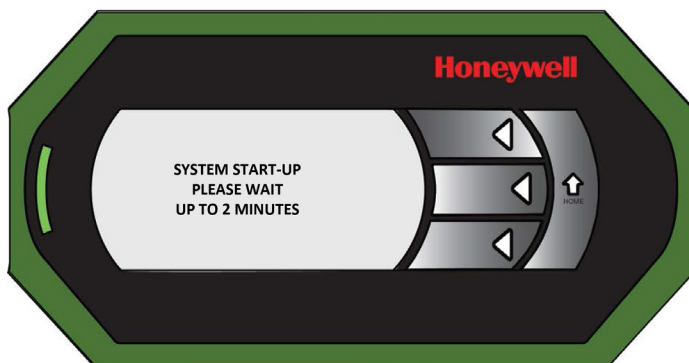
One or more switches/sensors paired to the WMPR: EtherNet/IP™ active connection is made and then applying power to the WMPR will result in the LCD Menu scrolling through the following displays before entering the Main Menu:

Figure 30. Honeywell Splash Screen (momentarily shown)



System start-up screen (see Figure 31) will take up to two (2) minutes before displaying EtherNet/IP MAC ID & IP address (see Figure 32) screen.

Figure 31. System Start Up



EtherNet/MAC ID screen appears (see Figure 32). (Record the MAC ID, IP Address, and then touch the “Next” function button to move to the Main Menu) (see Figure 33).

Figure 32. Ethernet/IP MAC ID & IP Address

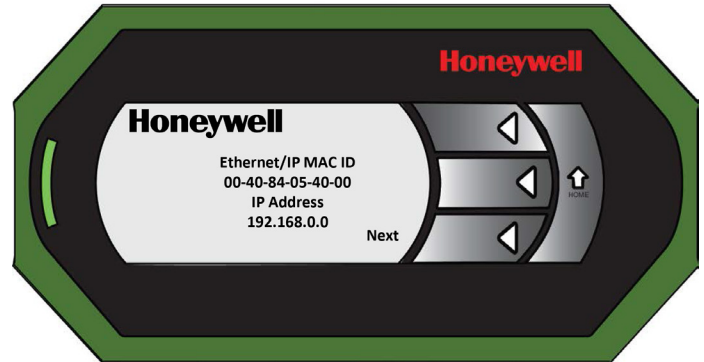
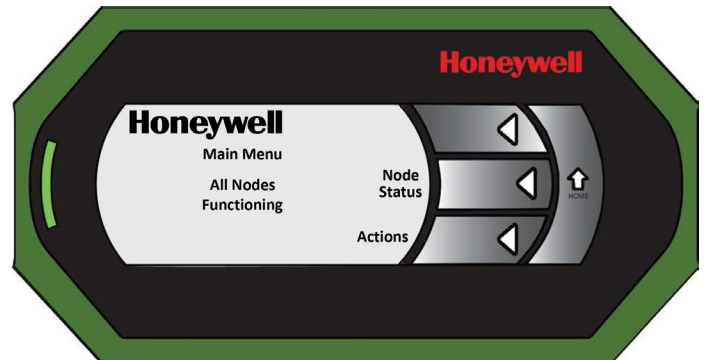
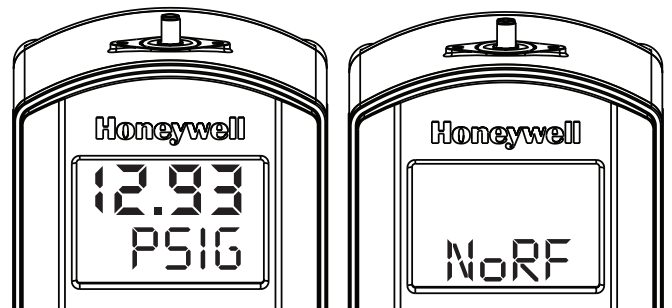


Figure 33. Main Menu



The display on the IS-WPS toggles between pressure value and “No RF” when not paired to WMPR. Note, this is only applicable for the LCD variant of the IS-WPS.

Figure 34. Limitless™ IS-WPS Pressure Value and no RF Messages



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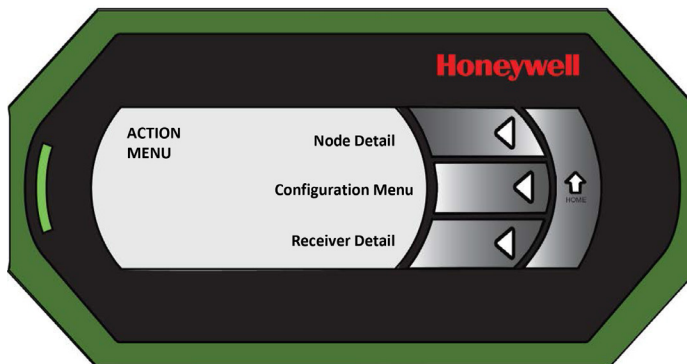
STOP ATTENTION

If there are multiple WMPRs being used in the application, apply power to previously paired WMPRs first (if any) and then to one WMPR at a time. **Allow time for each WMPR to complete its start-up sequence before applying power to the next WMPR. There is a maximum of five WMPRs that can be used in the same localized area. Contact Honeywell Application Engineering at 800-537-6945 if more than five WMPRs are desired to be used in the same localized area.**

7.3.3 | Pairing the IS-WPS with the WMPR

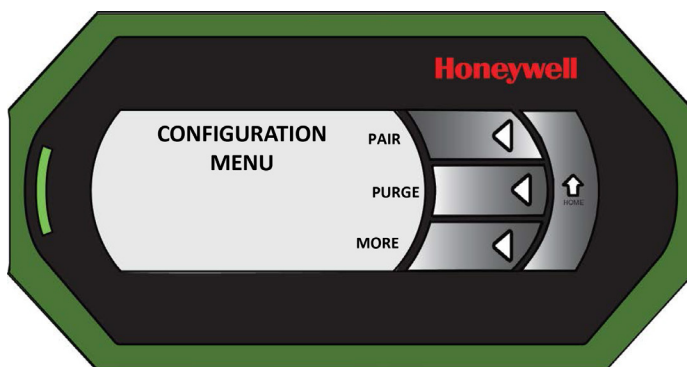
1. With the **Main Menu** Page displayed, touch the lower button next to **Actions** (see Figure 35).

Figure 35. Action Menu



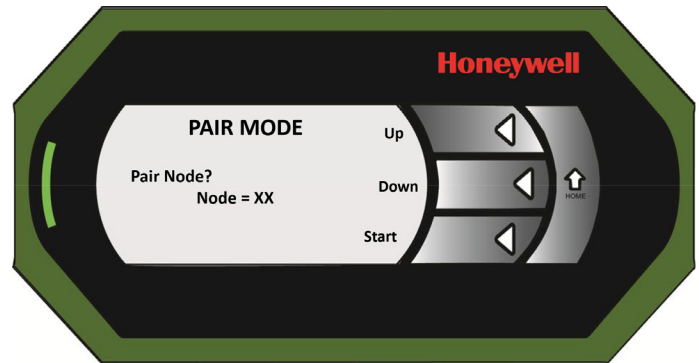
2. Touch the center button next to **Configuration Menu** (see Figure 36)

Figure 36. Configuration Menu



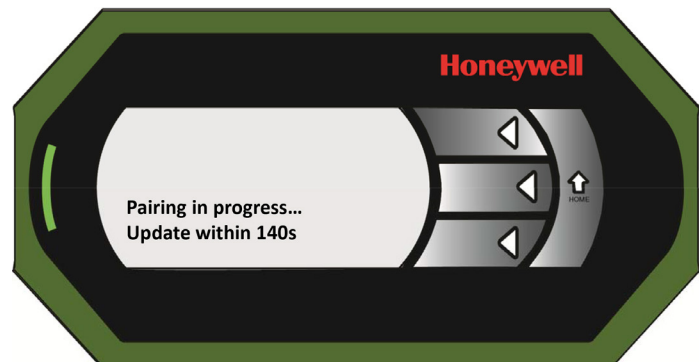
3. If the WMPR has been previously paired with the desired node, touch **Purge** (see Figure 37) and perform the required steps. (Refer to Purge Mode in WMPR Installation & Technical Manual.)
4. Touch the upper button next to **Pair** (see Figure 37)

Figure 37. Pair Mode Screen



5. Referring to the system “Map” for this installation, determine which node the current IS-WPS is to be paired into. Scroll “UP” or “DOWN” to the desired node # (see Figure 37).
6. If not already done, remove the rear cover of the IS-WPS, and remove the battery pack, allowing access to the reset button and green LED (see Figure 48).
7. On the WMPR, touch the **Start** button on the Pair Mode screen (see Figure 37) which will start the Pairing process (see Figure 38).

Figure 38. Pairing In-Progress Screen



8. Within 140 seconds, press the reset button inside the IS-WPS (see Figure 48), for more than five seconds and less than 12 seconds. Observe that the green LED is lit when first pressed, and then goes out as the button is released. The green LED continues to flash ON/OFF (1 second interval) during the pairing operation for 30 seconds maximum. Upon successful pairing, the green LED flashes faster for four seconds (0.25 seconds interval) and then turns OFF. On IS-WPS LCD variant, the signal strength changes from “NoRF” to either “GOOD” or “BEST” after successful pairing.

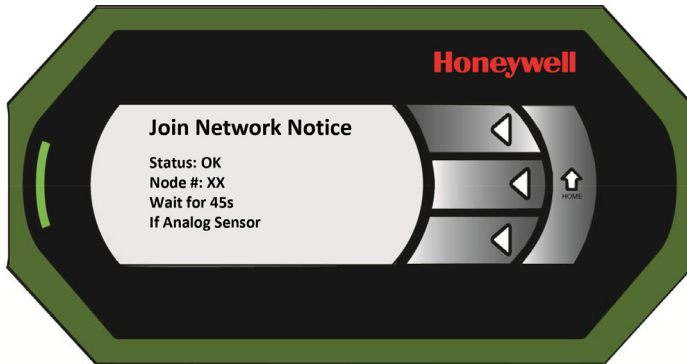
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Note: If pairing is unsuccessful, the LED will stop flashing ON/OFF (1 second interval) after 30 seconds from commencement. On IS-WPS LCD variant, the signal strength continues to appear as “NoRF” if the pairing operation is unsuccessful.

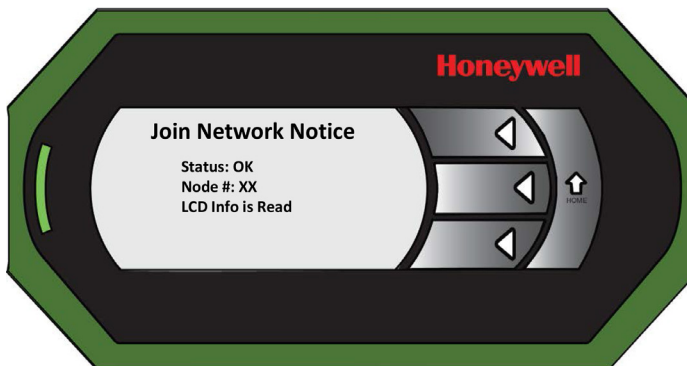
9. Upon successful pairing, observe the Join Network Notice on WMPR LCD screen (See Figure 39). Verify that Status is OK, and the Device Address is the Node number desired. On IS-WPS LCD variant (the signal connection should indicate either GOOD or BEST based on signal strength).

Figure 39. Join Network Notice in WMPR



10. Wait at the above screen (Figure 39) for 45 seconds maximum. Verify the IS-WPS device type is read successfully and WMPR should display **LCD info is read** (see Figure 40). If IS-WPS device type read is unsuccessful, the WMPR screen displays Node Pairing Failed or Not Paired, it is possible that either the IS-WPS or WMPR were not purged correctly. Perform Reset to Factory Defaults on the IS-WPS (Section 7.8), purge the particular node of interest on WMPR, and repeat steps 1 through 10.

Figure 40. Successful Pairing Screen



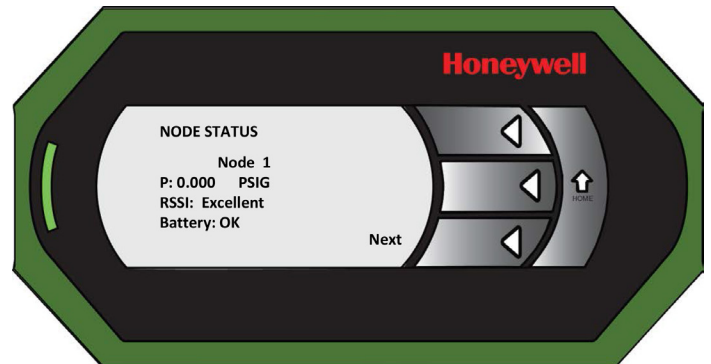
11. Replace interior rubber cover inside IS-WPS, and replace rear cover of IS-WPS and tighten the rear cover screws to 0,6 Nm max. torque.

7.4 | Reading IS-WPS Pressure Value on the WMPR

1. From WMPR Main Menu screen, select **Node Status** (See Figure 29).
2. Scroll through the different pages, by touching button next to “UP” or “DOWN”, to view the appropriate Node. Next to the “P” will be the pressure value and measurement unit (see Figure 41).

Note: Depending on the update interval of the node, the WMPR may display Loading Data... on the screen while the data is being retrieved from the node.

Figure 41. Node Status Screen

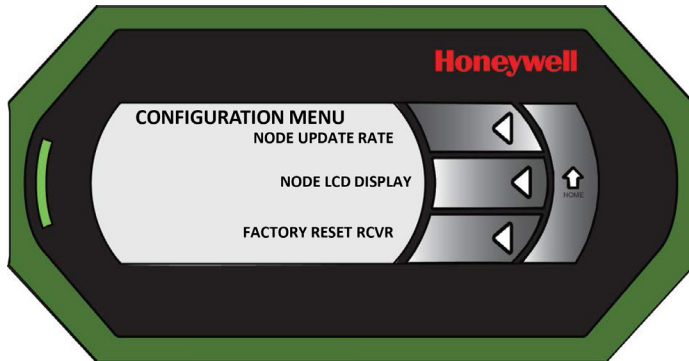


7.5 | Setting Update Rate and Display Timing of IS-WPS

7.5.1 | Setting the Update Rate

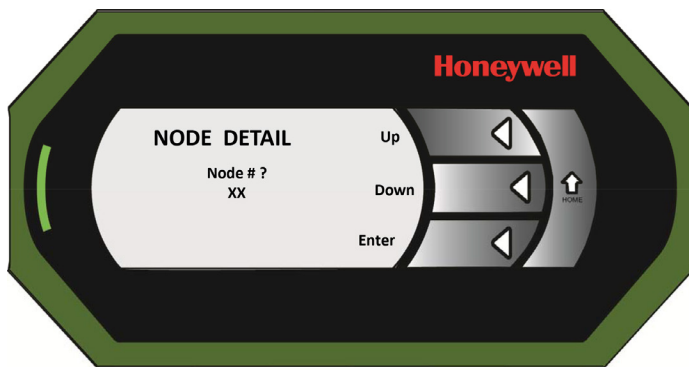
1. From the WMPR Main Menu, touch the lower button next to **Actions** (see Figure 29).
2. From the Action menu, touch the center button next to **Configuration** (see Figure 36).
3. From the Configuration page, press the lower button next to **More**. (see Figure 36).

Figure 42. WMPR Configuration Menu Screen, Cont.



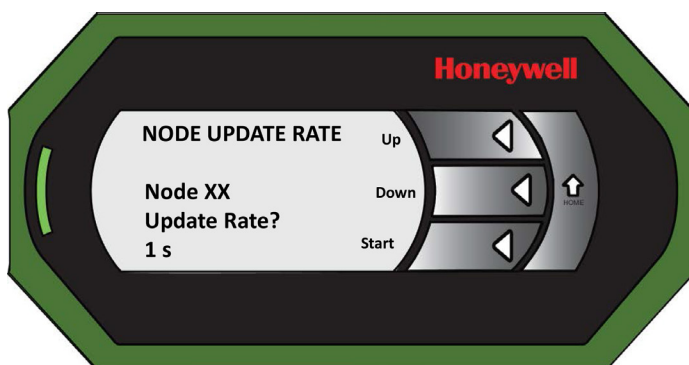
- To set the Update Rate for a node, press the upper button next to **Node Update Rate** (see Figure 42).

Figure 43. WMPR Node Update Rate Screen



- As needed, scroll "Up" or "Down" to desired Node # (see Figure 43).
- Touch Enter, after 45 seconds maximum, the page refreshes to then allow the installer to set the update rate (see Figure 44).

Figure 44. WMPR Node Update Rate Screen 2

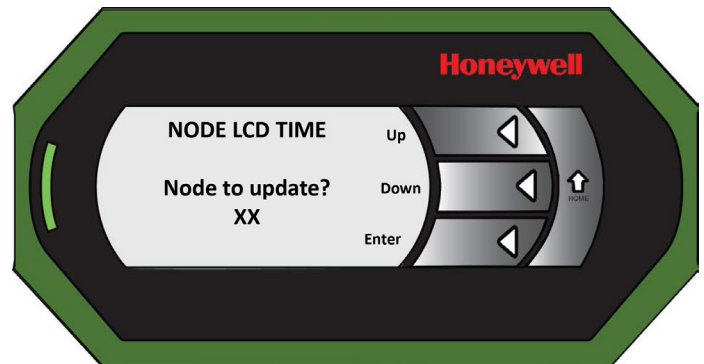


- Choose the desired Update Rate by touching the **Up or Down** buttons. When the desired Update Rate is displayed, press **Start** (see Figure 44).
- Observe that the message "Update is Sent!" appears on the display.

7.5.2 | Setting the LCD Time Display

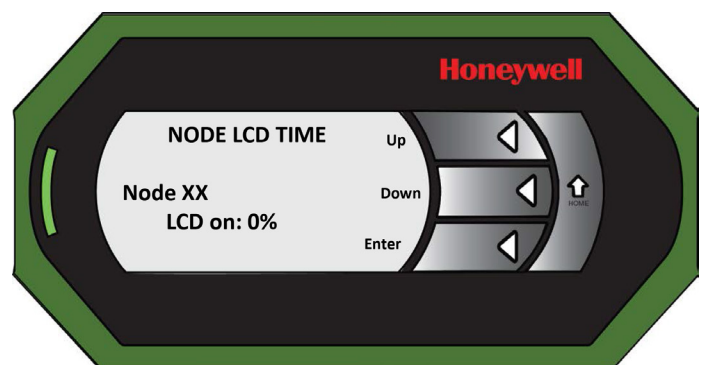
- From the WMPR Main Menu, touch the lower button next to **Actions** (see Figure 29).
- From the Action menu, touch the center button next to **Configuration** (see Figure 36).
- From the Configuration page, press the lower button next to **More**. (see Figure 36).
- Touch **Node LCD Display** to select the Node LCD Time screen (see Figure 45).

Figure 45. WMPR Node LCD Display



- As needed, select which node to update by using the **Up or Down** buttons (See Figure 45).
- Touch **Enter** to view current Node LCD Time setting (see Figure 46).

Figure 46. WMPR Node LCD Time Screen



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7. Change the LCD “On” Time by touching the **Up** or **Down** buttons. When the desired LCD “On” Time is displayed, touch **Enter** (see Figure 46).
8. Observe that the message “Update is Sent!” appears on the display.

ATTENTION

The P2P Wireless Pressure Sensor, IS-WPS Series, when configured to operate at 0.1 s update rate would exhibit a data success probability of 99.99 % at a minimum.

7.6 | Setting TX Power

7.6.1 | TX Power Setting Policy

WARNING

The P2P Wireless Pressure Sensor, IS-WPS Series must be professionally installed in accordance with the requirements specified in this document. Only the specified IS-WPS part numbers, antenna types and gains and cable lengths (attenuation) as outlined in this document are valid for Limitless™ P2P Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series installations.

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

The IS-WPS Series as shipped from the factory will have its TX power value set according to its model part number and this value is consistent with those values allowed for the applicable countries.

Therefore, it is not permissible to operate a IS-WPS Sensor in a country not specifically listed in the applicable table.

The TX power setting for the IS-WPS Sensor is set at factory and not adjustable through any field procedure, dip switch, or software commands.

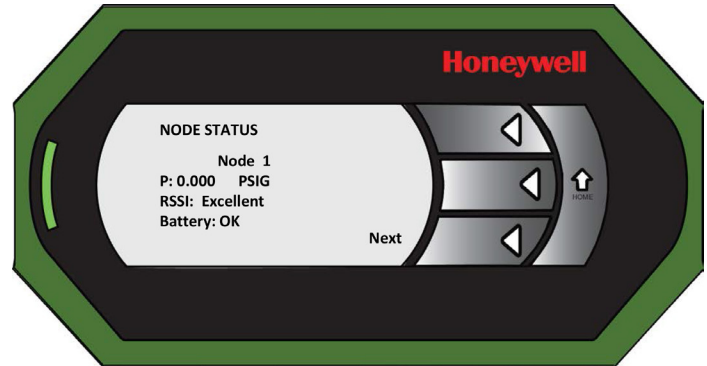
7.7 | Reading Battery Status

Battery status of the IS-WPS sensor may be read on the WMPR on the Node Status Screen. The options are OK or LOW, based on a measurement of the actual battery voltage.

If the battery status is LOW, the batteries must be changed immediately to avoid loss of service (see Section 10.2).

1. From the Main Menu screen, touch the middle button next to Node Status (see Figure 29)
2. Scroll through the different pages, by touching button next to “**UP**” or “**DOWN**”, to the appropriate Node and view the **Battery:** status (see Figure 47)

Figure 47. Battery Status



7.8 | Restore to Factory Defaults

The IS-WPS device can be restored to factory default settings by pressing and holding the reset button for >12 seconds. The reset button must be held pressed until the reset (green) LED turns off, indicating successful restoration to factory defaults. Figure 48 shows the location of the reset button and LED. Also, on IS-WPS LCD variant, upon successful restoration to Factory Default, the link status is shown as “NoRF”.

CAUTION

Use care to avoid moving or applying pressure to the small coaxial cable passing above the reset button. This cable connects the antenna jack to the receiver board. Pressing on this cable could cause the cable to disconnect from the receiver board and cause permanent damage to the 2.4 GHz transmitter.

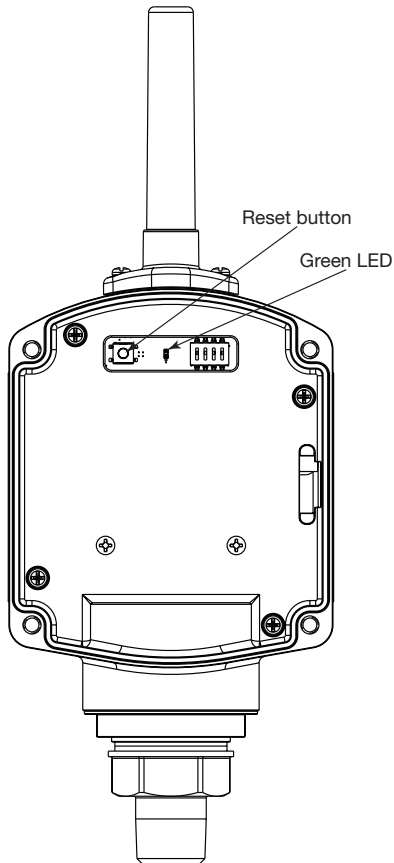
Restoring the IS-WPS to factory default also includes removing any existing pairing. It is necessary to remove the pairing any time a IS-WPS has been paired with a WMPR, and later, needs to be paired with a different WMPR. The Restore to Factory Default must be done prior to pairing the IS-WPS with the new WMPR.

Note that there is an equivalent process in the WMPR which removes the pairing for a paired node. This is called “Purge” in the WMPR menu. See WMPR Installation and Technical Manual for details.

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Figure 48. Location of Reset Button



7.9 | Calibrating the Sensor

The Limitless™ P2P Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series is factory calibrated at time of manufacture. The calibration parameters are permanently stored in flash memory of microcontroller in the interface board. There is no user calibration routine available.

8 | FUNCTION BLOCKS

8.1 | Introduction

This section explains the construction and contents of the IS-WPS Series sensor function blocks.

8.1.1 | Configuration

The IS-WPS Series sensor contains an electronics interface compatible for connecting to the WMPR. An operator uses the WMPR User Interface to configure the sensor (pair it to the WMPR), and to change operating parameters such as update rate and display timing.

8.2 | Hardware Description

8.2.1 | Detailed Block Diagram

The Limitless™ P2P Intrinsically Safe Wireless Pressure Sensor, IS-WPS Series contains the following functional components:

1. Sensor module
2. Interface board
3. Secondary board
4. Radio board
5. LCD display
6. Battery

Figure 2 shows the detailed block diagram of the IS-WPS Series sensor.

8.2.2 | Sensor Module

Two versions are available, GP (gauge pressure), or AP (absolute pressure). For the gauge pressure models, a vent feature is provided on the front cover. Electrical signals from the sensor connect to signal conditioning circuit on the interface board.

Note: for pressure ranges <1000 psi, there exists only gauge (sealed gage) pressure option.

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8.2.3 | Interface Board

The microprocessor internally consists of a flash, non-volatile memory containing:

- Characterization data, loaded at time of manufacture, that identifies the specific measurement hardware installed, pressure range, burst pressure, GP or AP type, etc. Also stored are the default user settings. After a hard reset (cold restart), any user settings are replaced with the default user settings (i.e., update rate is read from DIP switch, LCD display timing is based on DIP setting, upon cold re-start). None of the characterization data is user changeable.
- Calibration data, from the factory calibration procedure. This data is not erasable or changeable.
- User settings, selected through the WMPP Receiver User Interface, such as update rate, LCD display timing, etc.

8.2.4 | Secondary Board

The secondary board hosts a small Reset button, green LED and DIP switch. This enables the user to perform operations such as Pairing, Restore to Factory Defaults, and Update Rate setting.

8.2.5 | Radio Board

The radio board contains a microprocessor with EEPROM to store its program code and operating parameters. A small R.F. connector on the radio board is connected to a short cable assembly containing the sensor external antenna connector.

CAUTION

Applying power to the device/product with no antenna connected to the radio board could cause permanent damage to the device or the radio board.

8.2.6 | LCD Display

The optional LCD display is connected through a cable assembly to the interface board. It is activated as required, by the interface board, in accordance with the LCD timing user options.

8.2.7 | Battery Pack

The IS-WPS uses an intrinsically safe battery pack that consists of a specially designed pack and two, D-sized Lithium Thionyl Chloride cells. Each cell provides 3.6 Vdc and the two cells are connected in series to provide 7.2 Vdc to operate all circuits in the sensor. There is no on/off switching, so when the Battery Pack is connected, the sensor becomes active. See Section 9.3 for battery considerations and see Table 29 for battery replacement procedures.

8.2.8 | Battery Life

The battery life depends on three factors:

- Update rate - Setting a higher periodic update interval increases battery consumption.
- LCD display timing - Setting the LCD to display continuously or for longer periods will increase battery consumption.
- R.F. link data re-transmissions - When the Limitless™ P2P Wireless Pressure Sensor, IS-WPS Series needs to send a packet of data to the WMPP, it transmits the packet and waits for an acknowledgement. Normally, it receives the acknowledgement immediately, stops, and waits for the next scheduled transmission time. A long R.F. path, interfering materials (metal structures, etc.), or R.F. interference from other nearby transmitters, may cause the transmitted packet to be “dropped”. If this occurs, the sensor will re-try to send the packet. It will re-try two more times, waiting for an acknowledgement. These extra re-transmissions will greatly increase the battery usage and reduce battery life.

Typical battery life is estimated to be as much as 6.5 years for 30 second periodic update intervals, 5 years for 5 second periodic update intervals, and as low as 2.5 years for 1 second periodic update intervals, contingent upon the other factors listed above.

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9 | OPERATION

9.1 | Overview

9.1.1 | Display Modes

The sensor has the following display modes.

- PV display: Displays the process value and units
- Connection (Link) status: Displays a label calculated from the link signal amplitude
- Battery status: Displays a warning label in the event of a low battery condition

9.2 | Sensor PV Display

On the LCD display, the following information is displayed in sequence. First, the PV will be displayed for three seconds, then the link status will be displayed for two seconds. This sequence will repeat at a rate determined by the periodic update interval and the LCD display rate.

Table 23. PV Display

Item Displayed	Example	Details
PV value	50.0	Latest PV value
PV engineering units	psig	See Table 24
Link status	GOOD	Received signal strength - See Table 22 Sensor Link Status Display

Table 24. PV Engineering Units

Item Displayed	Details
Pa	Pascals ¹
kPa	KiloPascals
MPa	MegaPascals ³
bar	bar ²
mbar	Millibar
psia	Pounds per square inch absolute
psig	Pounds per square inch gage

¹ Values greater than 10,000 Pa will be automatically converted to kPa and displayed on the LCD.

² Values lesser than 1 bar will be automatically converted to mbar (millibar) and displayed on the LCD.

³ Values greater than 99,999 kPa will be automatically converted to MPa and displayed on the LCD.

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Table 25. Sensor Link Status Display

Display	Meaning	Suggested Action
BEST	Best strength – approx. -50 dBm to -25 dBm	<ul style="list-style-type: none"> No action required
GOOD	Good strength – approx. -60 dBm to -50 dBm	<ul style="list-style-type: none"> No action required
BAD	Weak signal – approx. -85 dBm to -60 dBm	<ul style="list-style-type: none"> Troubleshoot antenna, antenna cables Evaluate signal path and distance to the WMPR Substitute other paired sensor into same location
POOR	Very weak signal – approx. -95 dBm to -85 dBm	
NoRF	Unusable signal level - no link possible	<ul style="list-style-type: none"> Troubleshoot antenna, antenna cables Evaluate signal path and distance to WMPR Verify sensor is properly paired with appropriate WMPR, in case there are more than one WMPR at the location Substitute other paired sensor into same location

Table 26. Sensor Error Codes

Sensor Display	WMPR LCD Display	Definition	What to do
E-1	Electrical failure	Diagnostics detected defect with analog-to-digital converter.	Restart the device (remove and re-insert one of the batteries). If condition persists, interface board has failed, sensor must be replaced.
E-2	Low battery	Batteries are drained for >90% of capacity and should be replaced.	Replace batteries as soon as possible. See Section 10.2.
E-3	Characterization error	Startup diagnostics detected invalid sensor nonvolatile memory characterization data.	Restart the device. If condition persists, interface board has failed, sensor must be replaced.
E-5	Sensor overpressure	The input pressure has crossed the sensor maximum limit as stored in the characterization data. Note that this error will clear when the input pressure is measured as 1 % or more below the maximum limit.	Cross-check input pressure with other means, if actual pressure is less than the sensor maximum limit, the pressure sensor within the unit has failed, IS-WPS sensor must be replaced.

9.3 | Battery Considerations

As shipped from the factory, the sensor will have the battery pack and two battery cells inside of the pack installed. The power cable, required to mate with the battery pack, is left unconnected to ensure the product is not powered until it is ready for installation. The following are suggested policies:

- Do not connect the power cable until the unit is ready for use, as battery life will be considerably shortened. The unit will transmit frequently, trying to establish communication with a node. This node establishment will not succeed, if the network has not yet been provisioned for that sensor.
- Do not connect the power cable and provision the unit until the unit is in its intended location, as it will try to establish links with whatever WMPRs are nearby. This will cause unnecessary transmissions through the network to occur, wasting battery power and using bandwidth.

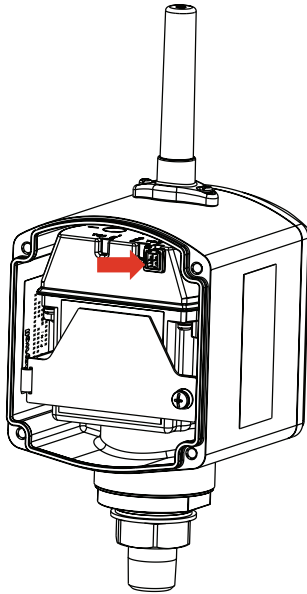
- When a sensor is removed from service, and is to be stored, it is recommended that the power cable is disconnected so as to preserve battery life and avoid unnecessary data transmissions.

Refer to Section 10.2 for battery replacement procedures.

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Figure 49. Connection of Power Cable to Battery Pack



9.4 | Other User Settings

The following user settings may be set over the air, using the WMPR LCD User Interface (refer to WMPR Installation and Technical Manual).

- Update rate - frequency of transmitting data packets, 0.1, 0.25, 0.5, 1, 5, 10, 30, or 90 seconds
- LCD Display Options - LCD always ON, LCD always OFF, LCD default time

Table 27. DIP Switch Settings

DIP Switch Setting	Switch Position				Update Rate (seconds)	Lost RF Signal Delay (seconds)*
	4	3	2	1		
	n/a	OFF	OFF	OFF	0.1	0.5
	n/a	OFF	OFF	ON	0.25	1
	n/a	OFF	ON	OFF	0.5	2
	n/a	OFF	ON	ON	1	5
	n/a	ON	OFF	OFF	5	18
	n/a	ON	OFF	ON	10	45
	n/a	ON	ON	OFF	30	120
	n/a	ON	ON	ON	90	360

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10 | MAINTENANCE/REPAIR

10.1 | Parts

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

Table 28. IS-WPS Replacement Parts

Part number	Qty.	Description
WBT5	1	3.6 V Lithium Thionyl Chloride (Li-SOCl ₂) battery, D size (2nos)
WBT8	1	Battery pack
WAN12RSP	1	2.4 GHz 2.0 dBi RP-SMA WLAN Antenna
WAN22RAD	1	IS-WPS Radome replacement kit

The above batteries are also available from the Xeno Energy, part number XL-205F. Refer to battery specifications, Table 11.

10.2 | Replacing Batteries

10.2.1 | When to Replace

When the IS-WPS Wireless Pressure Sensor displays an E-2 message either on the LCD display on the WMPR displays a low battery warning message, there are two- to four-weeks of operation remaining before the batteries expire, unless the update rate is operating at one update per second or faster (< one second), then there is a maximum of one week of operation remaining.

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

Batteries may be replaced while the sensor remains connected to the pressure being measured.

10.2.2 | Battery Storage

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

10.2.3 | 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 "D" sized Lithium Thionyl Chloride cells weigh approximately 194 grams and contain approximately 10 grams of lithium.

10.2.4 | Tools Required

- M5 Hexagon Socket Head Screwdriver
- Torx Drive T-10 Screwdriver

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Connection and disconnection of only the Intrinsically Safe Battery Pack, WBT8, can be performed in a hazardous environment. 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 IS-WPS is to be returned to Honeywell for any reason, the battery MUST be removed prior to shipping. Dispose of used batteries promptly per local regulations or the battery manufacturer's recommendations. Keep away from children. Do not disassemble and do not dispose of in fire.

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

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

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 IS-WPS Battery Pack. 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.

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⚠ 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 D. Always replace both batteries at the same time. WBT5 is Honeywell-supplied batteries for use in the IS-WPS Series. Recommended batteries for use are:

- XENO Energy, part number: XL-205F

⚠ 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.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

If the IS-WPS 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.

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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 IS-WPS Battery Pack. 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.

10.2.5 | Battery Pack Replacement

When to replace:

- The IS-WPS Series Pressure Sensor, displays "E2" error on LCD variant and/or "Low Battery" is registered for that particular Wireless node on the Wireless Receiver. Upon this indication, proceed with replacing the battery pack in the IS-WPS as per below.
- Battery pack may be replaced while the sensor remains connected to the pressure being measured.

Tools required

- Torx Drive T-10 screwdriver

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

Connection and disconnection of only the Intrinsically Safe Battery Pack, WBT8, can be performed in a hazardous environment. 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.

Table 29. Battery Pack Replacement Procedure

Step	Action
1	Remove the rear cover of the IS-WPS product by unthreading the four screws shown in Figure 51a, using a M5 hexagon socket head screwdriver, to expose the battery pack compartment of the product.
2	Disconnect the power cable, at #1 shown in Figure 51b, before unthreading the screw, #2 shown in Figure 51b. Swivel the latch open to access the battery pack.
3	Support the battery pack on the left side with one or two fingers and thumb on the right side, swivel the battery pack outwards, #1 shown in Figure 51c. Pull it outwards in direction, #2 shown in Figure 51c.
4	Install the new battery pack (containing fresh or good batteries) at an angle to seat inside the bracket, #1 shown in Figure 2d. Then, push it inwards till it is located fully inside the bracket, #2 shown in Figure 51d.
5	Close the bracket lid and tighten the screw, #2 in Figure 51b, using M4 Phillips screwdriver to 0,8 Nm [7.1 in-lb]. The battery pack is now secured in position within the product.
6	Connect the power cable at #1 shown in Figure 51b.
7	Replace the rear cover and tighten the 4 screws, #1 in Figure 51a, using M5 hexagon socket head screwdriver to 4,5 N-m [40 in-lb]

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10.2.6 | Battery Replacement

When to replace:

- The IS-WPS Series Pressure Sensor, displays “E2” error on LCD variant and/or “Low Battery” is registered for that particular Wireless node on the Wireless Receiver. Upon this indication, proceed with replacing the battery pack in the IS-WPS as per below.
- Battery pack may be replaced while the sensor remains connected to the pressure being measured.

Tools required

- M5 Hexagon Socket Head Screwdriver
- M4 Phillips Screwdriver

⚠ WARNING

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Connection and disconnection of only the Intrinsically Safe Battery Pack, WBT8, can be performed in a hazardous environment. 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 IS-WPS is to be returned to Honeywell for any reason, the battery **MUST** be removed prior to shipping. Dispose of used batteries promptly per local regulations or the battery manufacturer’s recommendations. Keep away from children. Do not disassemble and do not dispose of in fire.
Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

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 IS-WPS Battery Pack. 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

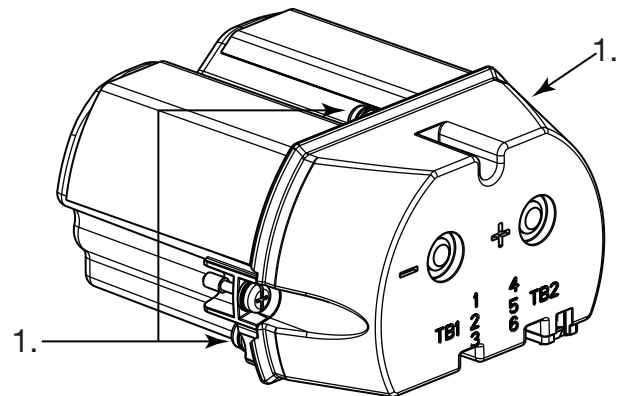
RISK OF DEATH OR SERIOUS INJURY FROM EXPLOSION OR FIRE

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 D. Always replace both batteries at the same time. WBT5 is Honeywell-supplied batteries for use in the IS-WPS Series. Recommended batteries for use are:
• XENO Energy, part number: XL-205F

Table 30. Battery Replacement Procedure

Step	Action
1	Follow instructions in Table 29 for battery pack removal. Please note, batteries must be replaced in a non-hazardous location.
2	Remove the drained batteries and dispose of them promptly according to local regulations of the battery manufacturer’s recommendations.
3	Install the batteries following the polarity as noted on the lid.
4	Follow instructions in Table 29 for re-inserting the battery pack.

Figure 50. IS-WPS Intrinsically Safe Battery Pack Housing



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Figure 51. IS-WPS Intrinsically Safe Battery Pack Replacement

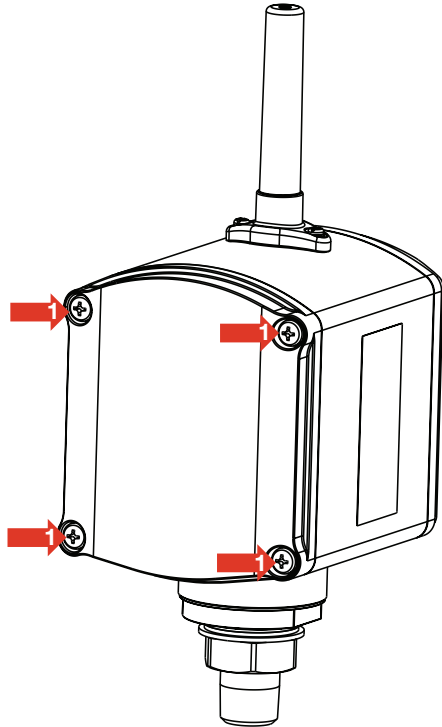


Figure A. Battery Pack Compartment

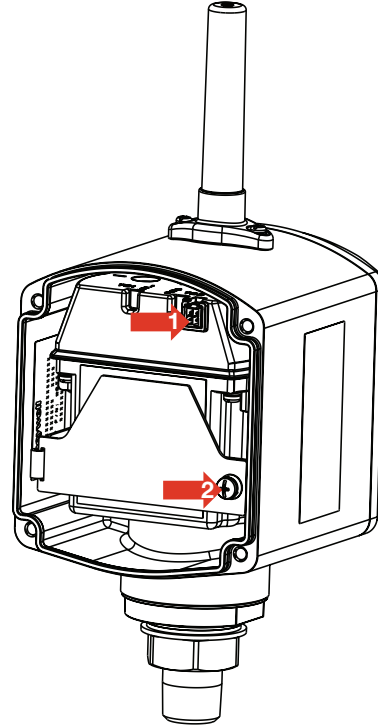


Figure B. Battery Pack Access

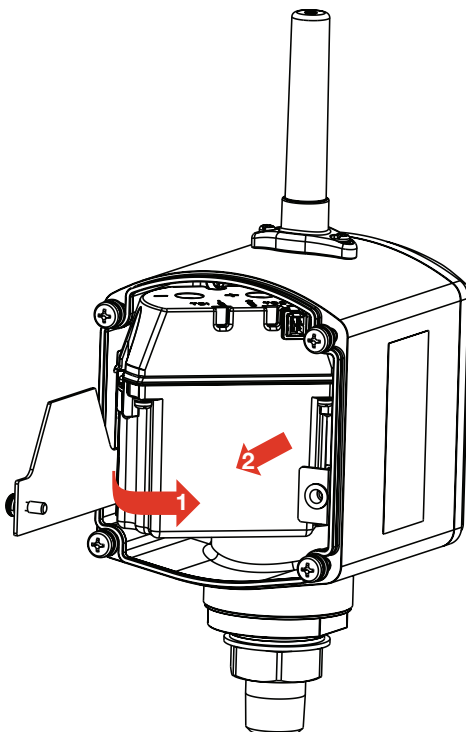


Figure C. Battery Pack Removal

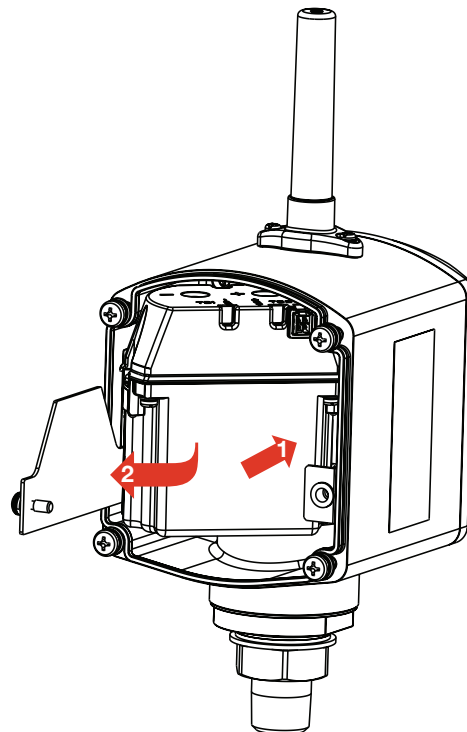


Figure D. Battery Pack Installation

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10.3 | Replacing Antenna and Radome

10.3.1 | Tools Required

- #1 Phillips screwdriver
- Torque screwdriver with #1 bit

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 sensor module.

WARNING

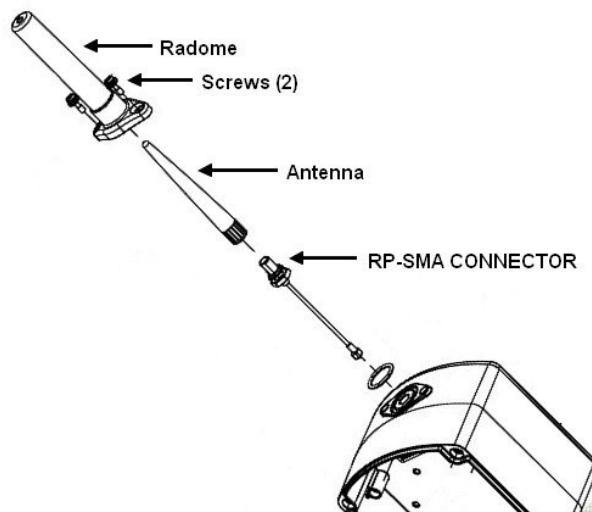
POTENTIAL ELECTROSTATIC CHARGING HAZARD

The antenna radome is made of plastic and has a surface resistivity of $>1 \text{ Gohm per square}$. 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.

Table 31. Antenna Replacement Procedure

Step	Action
1	Honeywell recommends that the sensor be removed from service and moved to a clean area before servicing. Unplug the power cable to battery pack to disconnect power to the device. Refer to Figure 52 before initiating antenna replacement.
2	Loosen the two captive screws holding the antenna radome to the sensor housing.
3	Unthread the antenna from the RP-SMA connector.
4	Inspect both antenna and sensor RP-SMA connectors for damage or debris, clean as needed.
5	Thread the new antenna's connector on to the antenna jack on the sensor housing.
6	Hand tighten antenna connector snugly by holding the antenna above the straight knurl portion. Caution! Do not overtighten antenna as it could twist in the housing and damage the antenna cable, or separate it from the R.F. board.
7	Re-install antenna radome, fastening it with two screws, and tighten screws to $0,5 \text{ Nm} \pm 0,1 \text{ Nm}$. Ensure o-ring is back in place before re-installing the radome and tightening the screws.
8	Reinstate the power to the IS-WPS device by connecting the power cable to the battery pack.

Figure 52. Antenna Replacement



10.4 Software Updates

The IS-WPS device can be loaded with software only in the factory. There is no option to upgrade to a newer software version in the field.

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11 | FAULT CODES AND LINK STATUS INFO

The following fault codes may be detected by the measurement board microprocessor, and transmitted to the WMPR Receiver.

- E-1:** Electronics failure
- E-2:** Low battery warning
- E-3:** Characterization error
- E-5:** Sensor overpressure warning

Link status will be displayed on the LCD as:

“BEST”, “GOOD”, “BAD”, “POOR”, “NoRF”

A complete description of all fault codes and link status labels, along with recommended action, may be found in Section 9.2, PV Display, in this document.

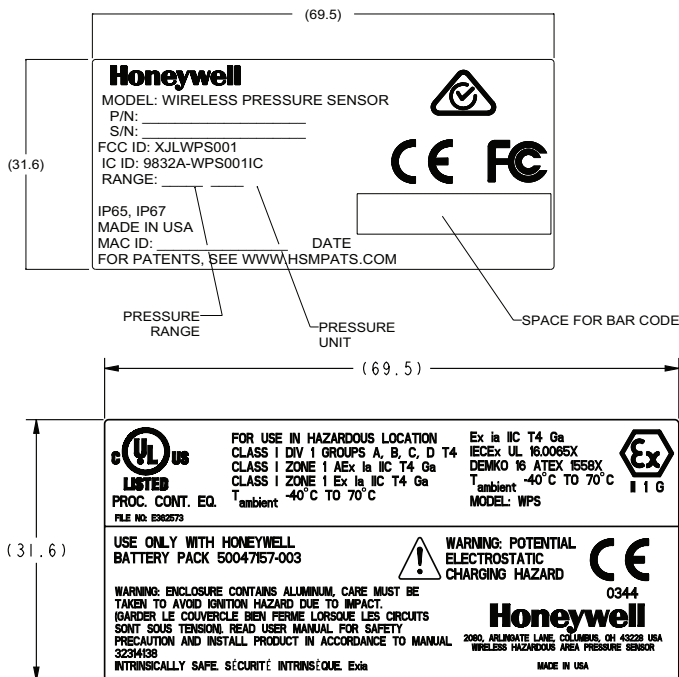
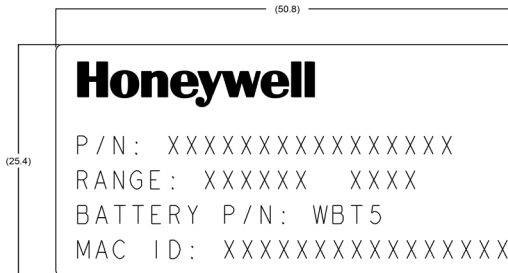
12 | AGENCY LABEL INFORMATION

The following information shall be clearly and permanently labeled on the IS-WPS Series sensor

12.1 External FCC/IC Labels

12.2 Internal Labels

This label is applied in the battery compartment of the product.











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
13 | ACCESSORIES

Table 32. Limitless™ Antennas

	Part Number	Antenna Type Code (if ordered with a wireless switch)		Antenna Design	Antenna Gain (dBi)	Connector/ Mounting	Dimensions
	WAN03RSP	03		flat	3.0	RP-SMA plug/adhesive mount	Ø 7,87 mm x 22,1 mm W x 4,57 mm D [Ø 0.31 in x 0.87 in W x 0.18 in D] 3 m [9 ft] cable
	WAN04RSP*	04** with a WAMM100RSP-005 base with 1,52 m [5 ft] of cable	05** with a WAMM100RSP-010 base with 3,05 m [10 ft] of cable	tilt/swivel	5.5	RP-SMA plug/direct mount	Ø 12,7 mm x 208,28 mm L [Ø 0.50 in x 8.20 in L]
	WAN05RSP*	06** with a WAMM100RSP-005 base with 1,52 m [5 ft] of cable	07** with a WAMM100RSP-010 base with 3,05 m [10 ft] of cable	tilt/swivel	9.0	RP-SMA plug/direct mount	Ø 12,7 mm x 384,05 mm L [Ø 0.50 in x 15.12 in L]
	WAN06RNJ*	08** with a WCA200RNPRSP-002 coax cable assembly 0,682 m [2 ft]	09** with a WCA200RNPRSP-010 coax cable assembly 3,05 m [10 ft]	straight	8.0	RP-N jack/ bracket	Ø 33,5 mm x 427,9 mm L [Ø 1.32 in x 16.85 in L]
	WAN09RSP	-		low profile mobile	3.0	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
	WAN10RSP	-		straight	5.0	RP-SMA plug/magnetic	Ø 76,2 mm x 230,1 mm L [Ø 3.0 in x 9.06 in L] 1,52 m [5 ft] cable
	WAN11RSP*	-		low profile mobile dome	4.0	RP-SMA plug/thru- hole screw	Ø 39 mm x 42,4 mm L [Ø 1.54 in x 1.67 in L]
	WAN12RSP	-		straight	2.0	RP-SMA plug/direct mount	Ø 10 mm x 79,5 mm L [Ø 0.39 in x 3.13 in L]

* Not allowed for use with Country Use Code "B" Limitless™ products

Table 33. IS-WPS Brackets

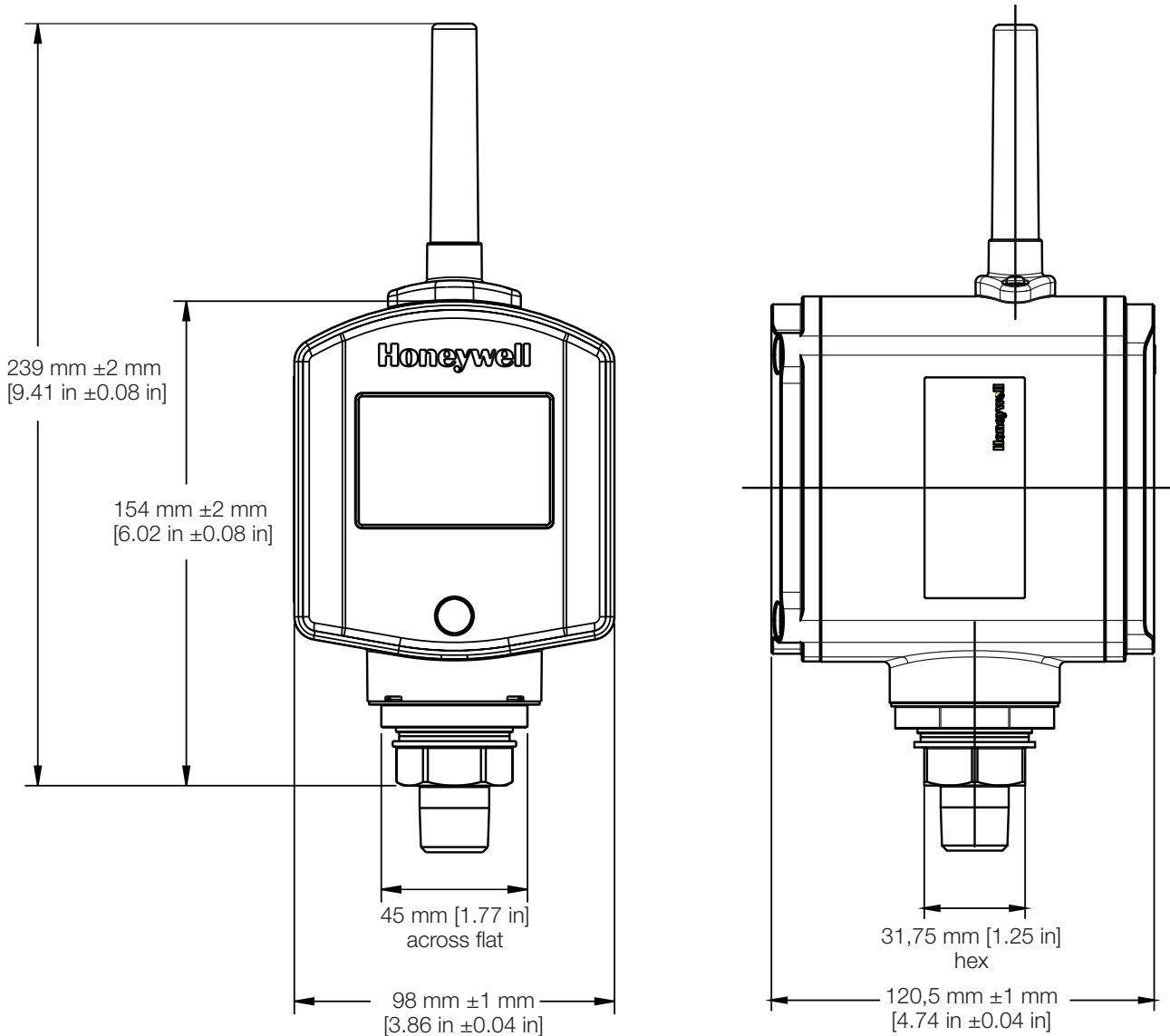
Photo	Catalog Listing	Description
	WPB2	Angle mounting bracket for IS-WPS Series wireless pressure sensor. May be mounted vertically or horizontally.
	WPB3	Straight mounting bracket for IS-WPS Series wireless pressure sensor.

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14 | INSTALLATION DRAWING

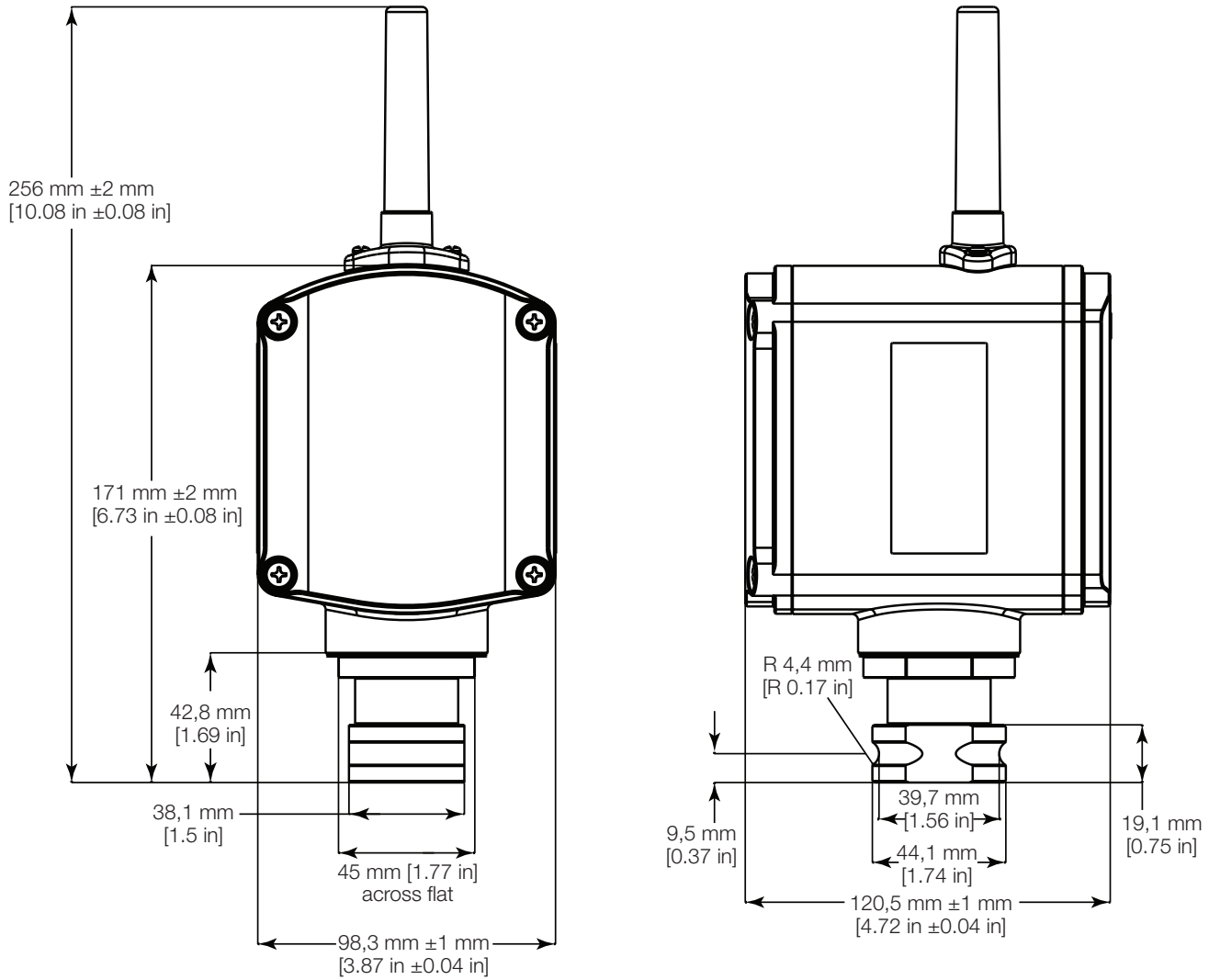
Figure 53. Dimensions of Limitless™ Wireless Pressure Sensor, IS-WPS Series, Connection Type 1 & 2



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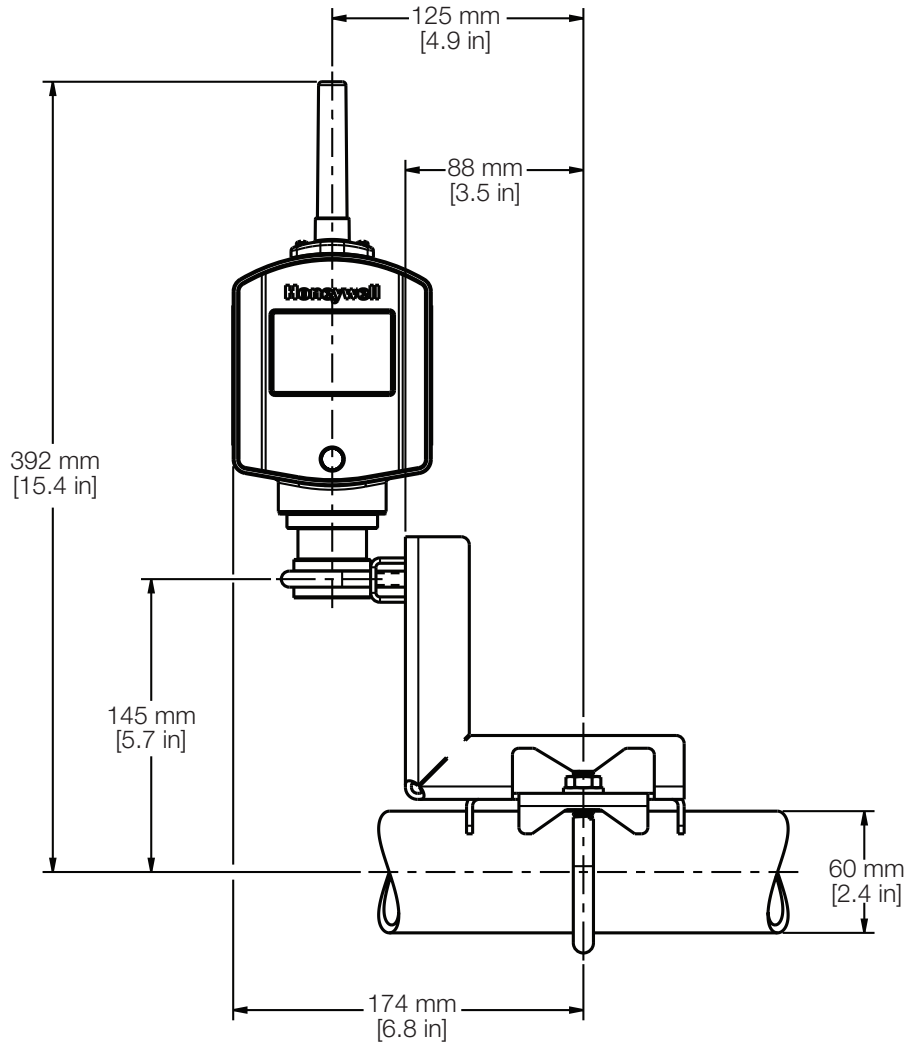
Figure 54. Dimensions of Limitless™ Wireless Pressure Sensor, IS-WPS Series, Connection Type 3 & 4



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Figure 55. Dimensions of Limitless™ Wireless Pressure Sensor, IS-WPS Series, with WPB2 (Horizontal)

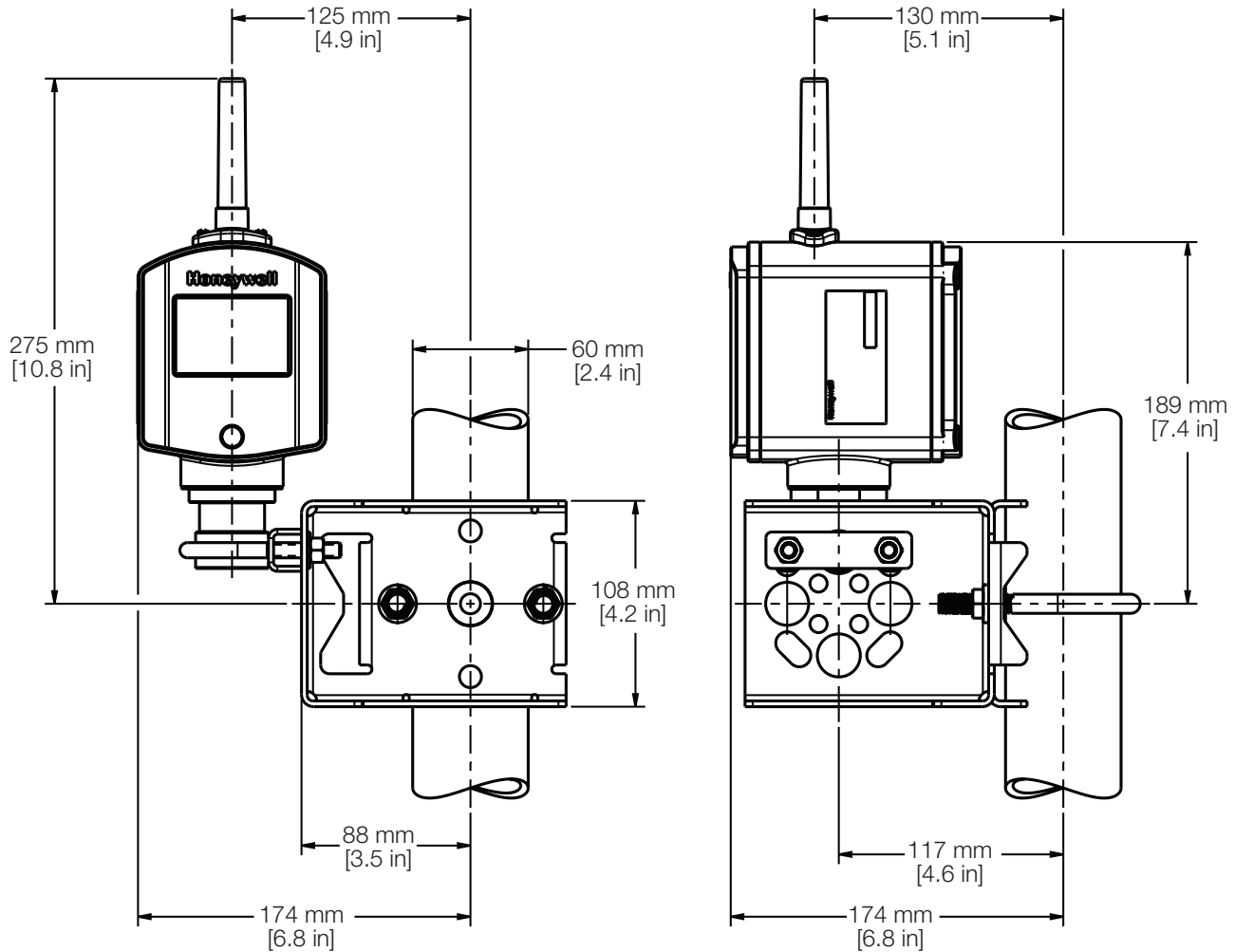


Angle mounting bracket, horizontal pipe mounting layout
(Representation of WPB2-004, WPB2-104, WPB2-404)

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Figure 56. Dimensions of Limitless™ Wireless Pressure Sensor, IS-WPS Series, with WPB2 (Vertical)

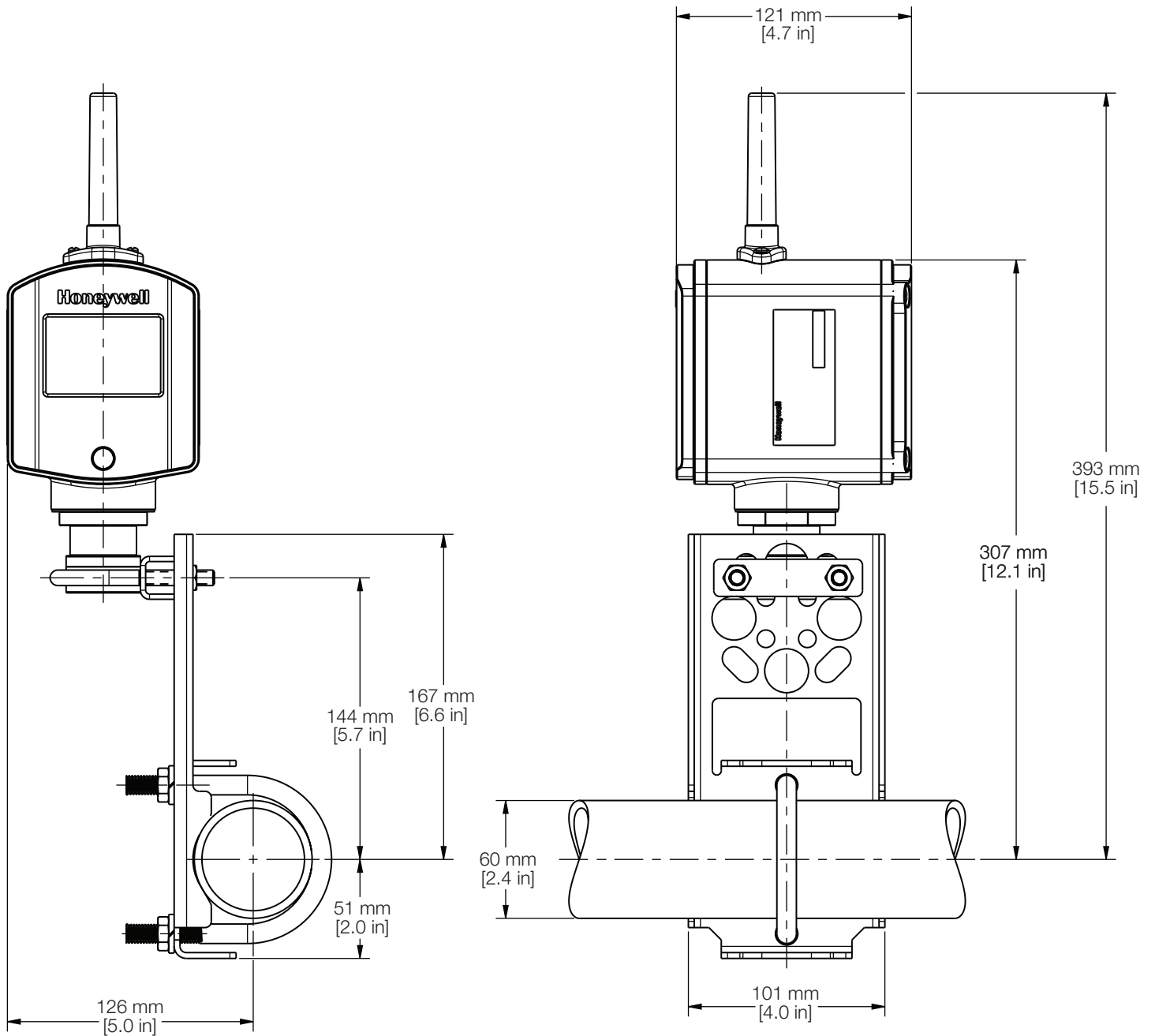


Angle mounting bracket, vertical pipe mounting layout
(Representation of WPB2-004, WPB2-104, WPB2-404)

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Figure 57. Dimensions of Limitless™ Wireless Pressure Sensor, IS-WPS Series, with WPB3



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Installation and Technical Manual for the **Intrinsically Safe Limitless™ Wireless Pressure Sensor, IS-WPS Series**

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