Honeywell

OneWireless

XYR 6000 SmartCET Corrosion Transmitter

User's Manual

34-XY-25-18

Revision 7

September 2009

Notices and Trademarks

Honeywell International

Process Solutions

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About This Document

This document describes preparation, operation and maintenance of the XYR 6000 Wireless Corrosion Transmitters. Mounting, installation and wiring are covered in other documents.

Honeywell does not recommend using devices for critical control where there is a single point of failure or where single points of failure result in unsafe conditions. OneWireless is targeted at open loop control, supervisory control, and controls that do not have environmental or safety consequences. As with any process control solution, the end-user must weigh the risks and benefits to determine if the products used are the right match for the application based on security, safety, and performance. Additionally, it is up to the end-user to ensure that the control strategy sheds to a safe operating condition if any crucial segment of the control solution fails.

Revision Information

Document Name	Document ID	Revision Number	Publication Date
XYR 6000 SmartCET Corrosion Transmitter User's Manual	34-XY-25-18	1	6/7/07
		2	8/10/07
		3	6/24/08
		4	11/21/08
		5	April 2009
		6	June 09
		7	Sept 09

References

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

Document Title
XYR 6000 Transmitters Quick Start Guide
Getting Started with Honeywell OneWireless Solutions
OneWireless Wireless Builder User's Guide
OneWireless Builder Parameter Reference

Support and contact info

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World Wide Web

Honeywell Solution Support Online:

http://www.honeywell.com/ps

Elsewhere

Call your nearest Honeywell office.

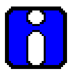
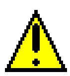
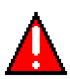
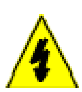
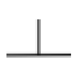
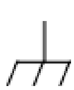
Training Classes

Honeywell Automation College:

http://www.automationcollege.com

Symbol Definitions

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

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.

continued

Symbol	Description
FM APPROVED	The Factory Mutual® Approval mark means the equipment has been rigorously tested and certified to be reliable.
	The Canadian Standards mark means the equipment has been tested and meets applicable standards for safety and/or performance.
	The Ex mark means the equipment complies with the requirements of the European standards that are harmonised with the 94/9/EC Directive (ATEX Directive, named after the French "ATmosphere EXplosible").
0981	For radio equipment used in the European Union in accordance with the R&TTE Directive the CE Mark and the notified body (NB) identification number is used when the NB is involved in the conformity assessment procedure. The alert sign must be used when a restriction on use (output power limit by a country at certain frequencies) applies to the equipment and must follow the CE marking.
N314	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. N314 directly under the logo is Honeywell's unique supplier identification number.

Contents

Tables

Figures

1. Introduction

1.1 Purpose

This manual describes the Honeywell OneWireless XYR 6000 SmartCET Corrosion Transmitter function, operation and maintenance.

1.2 Scope

The manual includes:

- Details of topics that relate uniquely to the Honeywell XYR 6000 Corrosion Transmitter,
- This manual does not cover installation, mounting, or wiring. See XYR 6000 Transmitter Quick Start Guide (document 34-XY-25-21).

1.3 OneWireless network overview

OneWireless is an all digital, serial, two-way communication mesh network that interconnects industrial field sensors to a central system.

OneWireless has defined standards to which field devices and operator stations communicate with one another. The communications protocol is built as an "open system" to allow all field devices and equipment that are built to OneWireless standard to be integrated into a system, regardless of the device manufacturer. This interoperability of devices using OneWireless technology is to become an industry standard for automation systems.

1.4 About the transmitter

The XYR 6000 SmartCET Corrosion Transmitter is furnished with OneWireless interface to operate in a compatible distributed OneWireless system. The transmitter will interoperate with any OneWireless-registered device.

The transmitter includes OneWireless electronics for operating in a 2.4GHz network. It features function block architecture.

The transmitter measures the process corrosion and transmits a digital output signal proportional to the measured variable. Its major component is an electronics housing as shown in Figure 1.

The XYR 6000 transmits its output in a digital OneWireless protocol format for direct digital communications with systems.

The Process Variable (PV) is available for monitoring and alarm purposes.

The sample time can be configured to calculate the corrosion variables every 30 seconds, or every 1, 2, 3, 4, 5 minutes. This parameter is independent of the publish rate, which has a configuration time of 30 seconds. If the sample time and publish rate are both set to 30 seconds, the corrosion transmitter will continuously calculate corrosion measurements and publish a new measurement (all four variables) at each publish rate interval (every 30 seconds). This configuration will result in minimal battery life but provides almost real time corrosion information. If the sample time is set for five minutes, all four corrosion variables will be calculated and published within the next 30 second publish rate interval, however the transmitter corrosion measurement will then go to sleep for 4.5 minutes, until it is time to start the next sample. This configuration will result in maximum battery life and is the default configuration.

Figure 1 shows a block diagram of the XYR 6000 SmartCET Corrosion transmitter’s operating functions.

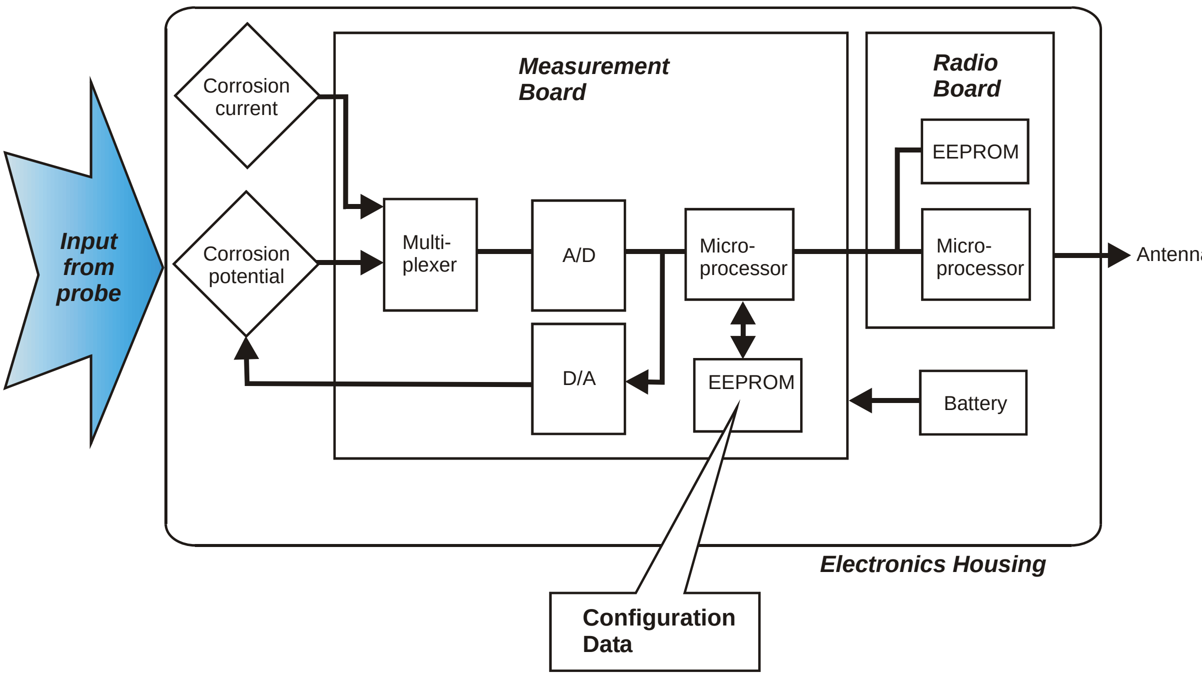


Figure 1 XYR 6000 SmartCET Functional Diagram

2. Specifications

2.1 European Union Usage

This product may be used in any of the following European Union nations.

Country	ISO 3166 2 letter code	Country	ISO 3166 2 letter code
Austria	AT	Latvia	LV
Belgium	BE	Liechtenstein	LI
Bulgaria	BG	Lithuania	LT
Cyprus	CY	Malta	MT
Czech Republic	CZ	Netherlands	NL
Denmark	DK	Norway	NO
Estonia	EE	Poland	PL
Finland	FI	Portugal	PT
France	FR	Romania	RO
Germany	DE	Slovakia	SK
Greece	GR	Slovenia	SI
Hungary	HU	Spain	ES
Iceland	IS	Sweden	SE
Ireland	IE	Switzerland	CH
Italy	IT	United Kingdom	BG

2.2 Certifications and approvals

Transmitter

See the product label for applicable approvals and ratings.

Approval / Item	Ratings / Description
CSAcus Intrinsically Safe	CL I, Div 1, Groups A, B, C, & D; CL II, Div 1, Groups E, F & G; CL III, T4 CL I, Zone 0: Ex ia IIC, T4; CL I, Zone 0: AEx ia IIC, T4
CSAcus Explosionproof	CL I, Div 1, Groups A, B, C, & D; CL II, Div 1, Groups E, F & G; CL III, T4 CL I, Zone 1: Ex d IIC, T4; CL I, Zone 1: AEx d IIC, T4
CSAcus Nonincendive	CL I, Div 2, Groups A, B, C & D; CL II, Div 2, Groups F & G; CL III, Div 2, T4 CL I, Zone 2: Ex nA IIC, T4; CL I, Zone 2: AEx nA IIC, T4

FM Approvals Intrinsically Safe	CL I, Div 1, Groups A, B, C, & D; CL II, Div 1, Groups E, F & G; CL III, T4 CL I, Zone 0: AEx ia IIC, T4
FM Approvals Explosionproof	CL I, Div 1, Groups A, B, C, & D; CL II, Div 1, Groups E, F & G; CL III, T4 CL I, Zone 1: AEx d IIC, T4
FM Approvals Nonincendive	CL I, Div 2, Groups A, B, C & D; CL II, Div 2, Groups F & G; CL III, Div 2, T4 CL I, Zone 2: AEx nA IIC, T4
HON – ATEX Non-Sparking	Ex II 3 GD, Ex nA IIC, T4; Ta = 85°C, Zone 2
KEMA 08 ATEX0062X Intrinsically Safe Non-Sparking	Ex II 1 GD Ex ia IIB; T4 Ta = 70ºC; Ex tD A20 IP66 T90ºC Ex II 3 GD Ex nA [nL] IIC; T4 Ta = 84ºC; Ex tD A22 IP66 T90ºC
IECEx CSA 09.0001X Intrinsically Safe Non-Sparking	Ex ia IIB; T4 Ta = 70ºC; DIP A20 IP66 T90ºC Ex nA [nL] IIC; T4 Ta = 84ºC; DIP A22 IP66 T90ºC
Process Connections in Division 2 / Zone 2	Division 2 / Zone 2 apparatus may only be connected to processes classified as non-hazardous or Division 2 / Zone 2. Connection to hazardous (flammable or ignition capable) Division 1 / Zone 0, or 1 process is not permitted.
Enclosure Type	Type 4X, IP 66
CRN	Canadian Registration Number
Class II and III installations and Type 4X/IP66 applications require that all cable and unused entries be sealed with a NRTL (National Recognized Testing Laboratory) listed cable gland or conduit plug. Cable glands and conduit plugs are not supplied with the product.	

For detailed transmitter specifications see the following Specification and Model Selection Guide.

- XYR 6000 SmartCET Wireless Monitoring Transmitter Corrosion (document 34-XY-03-31)

Authentication Device

Install the Authentication Device application on any PDA having

- Windows Mobile version 4.2+
- Infrared port.

2.3 Agency compliance information

This section contains the Federal Communications Commission (FCC), Industry Canada (IC) and Radio Frequency compliance statements for the XYR 6000 Wireless Transmitters device.

ATTENTION

XYR 6000 units must be professionally installed in accordance with the requirements specified in the *OneWireless XYR 6000 Agency Compliance Professional Installation Guide.*

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 in a residential installation. This equipment generates, uses, and can radiate radiofrequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- Intentional or unintentional changes or modifications must not be made to the XYR 6000 Wireless Transmitters 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.

IC compliance statements

- To reduce potential radio interference to other users, the antenna type and its gain should be so chosen 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 Canadian ICES-003.
- French: Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Radio Frequency (RF) statement

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-Multi-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 20cm and a separation distance of at least 20cm from all persons.
- Remote Fixed 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 20cm and a separation distance of at least 100cm from all persons.
- Furthermore, when using integral antenna(s) the XYR 6000 Wireless Transmitters unit must not be co-located with any other antenna or transmitter device and have a separation distance of at least 20cm from all persons.

European Union restriction

France restricts outdoor use to 10mW (10dBm) EIRP in the frequency range of 2,454-2,483.5 MHz. Installations in France must limit EIRP to 10dBm, for operating modes utilizing frequencies in the range of 2,454 – 2,483.5MHz.

2.4 Honeywell European (CE) Declaration of Conformity (DoC)

This section contains the European Declaration of Conformity (DoC) statement for the XYR 6000 OneWireless products.

R&TTE Directive	199/5/EC	**LVD Directive**	73/23/EC	**EMC Directive**	2004/108/EC	**ATEX Directive**	94/9/EC
Harmonized Standards							
EN 300 328 V1.7.1	Emissions Specification and Methods						
EN 301 893 V1.4.1	Emissions Spec and Methods						
EN 301 489-17 V1.2.1	Immunity Specifications						
EN 301 489-1 V1.6.1	Immunity Methods						
IEC 61326-1 : 2006	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements						
EN 60079-0 : 2006	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements						
EN 60079-11 : 2007	Electrical apparatus for explosive gas atmospheres - Part 11: Intrinsic safety 'i'						
EN 60079-15 : 2005	Electrical apparatus for explosive gas atmospheres - Part 15: Type of protection 'n'						
EN 61241-0 : 2007	Electrical apparatus for use in the presence of combustible dust - Part 0: General Requirements						
EN 61241-1 : 2004	Electrical apparatus for use in the presence of combustible dust - Part 1-1: Electrical apparatus for use in the presence of combustible dust – Part 1: Protection by enclosures "tD"						
Manufacturer's Name and Address	Honeywell Process Solutions 525 East Market Street, York, PA 17403 USA						
Compliance Statement	The products listed herein comply with the harmonized standards listed above. Typical products and systems and configurations have been tested, for compliance.						

European Declaration of Conformity statements

Language	Statement
Česky (Czech):	***Honeywell*** tímto prohlašuje, že tento ***XYR 6000 Wireless Transmitters*** je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk (Danish):	Undertegnede ***Honeywell*** erklærer herved, at følgende udstyr ***XYR 6000 Wireless Transmitters*** overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch (German):	Hiermit erklärt ***Honeywell***, dass sich das Gerät ***XYR 6000 Wireless Transmitters*** in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti (Estonian):	Käesolevaga kinnitab ***Honeywell*** seadme ***XYR 6000 Wireless Transmitters*** vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, ***Honeywell***, declares that this ***XYR 6000 Wireless Transmitters*** is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español (Spanish):	Por medio de la presente ***Honeywell*** declara que el ***XYR 6000 Wireless Transmitters*** cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική (Greek):	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ ***Honeywell*** ΔΗΛΩΝΕΙ ΟΤΙ ***XYR 6000 Wireless Transmitters*** ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français (French):	Par la présente ***Honeywell*** déclare que l'appareil ***XYR 6000 Wireless Transmitters*** est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano (Italian):	Con la presente ***Honeywell*** dichiara che questo ***XYR 6000 Wireless Transmitters*** è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski (Latvian):	Ar šo ***Honeywell*** deklarē, ka ***XYR 6000 Wireless Transmitters*** atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių (Lithuanian):	Šiuo ***Honeywell*** deklaruoja, kad šis ***XYR 6000 Wireless Transmitters*** atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands (Dutch):	Hierbij verklaart ***Honeywell*** dat het toestel ***XYR 6000 Wireless Transmitters*** in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti (Maltese):	Hawnhekk, ***Honeywell***, jiddikjara li dan ***XYR 6000 Wireless Transmitters*** jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar (Hungarian):	Alulírott, ***Honeywell*** nyilatkozom, hogy a ***XYR 6000 Wireless Transmitters*** megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski (Polish):	Niniejszym ***Honeywell*** oświadcza, że ***XYR 6000 Wireless Transmitters*** jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português (Portuguese):	***Honeywell*** declara que este ***XYR 6000 Wireless Transmitters*** está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.

Language	Statement
Slovensko (Slovenian):	***Honeywell*** izjavlja, da je ta ***XYR 6000 Wireless Transmitters*** v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky (Slovak):	***Honeywell*** týmto vyhlasuje, že ***XYR 6000 Wireless Transmitters*** spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi (Finnish):	***Honeywell*** vakuuttaa täten että ***XYR 6000 Wireless Transmitters*** tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska (Swedish):	Härmed intygar ***Honeywell*** att denna ***XYR 6000 Wireless Transmitters*** står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Íslenska (Icelandic):	Hér með lýsir ***Honeywell*** yfir því að ***XYR 6000 Wireless Transmitters*** er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
Norsk (Norwegian):	***Honeywell*** erklærer herved at utstyret ***XYR 6000 Wireless Transmitters*** er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

For more information about the R&TTE Directive

The following website contains additional information about the Radio and Telecommunications Terminal Equipment (R&TTE) directive:

http://ec.europa.eu/enterprise/rtte/faq.htm

2.5 IECEx Conditions of Certification

Parts of the antenna are non-conducting and the area of the non-conducting part exceeds the maximum permissible areas for Category ll 1 G (Zone 0) according to IEC 60079-0. Therefore when the antenna is used within a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

Impact and friction hazards need to be considered according to IEC 60079-0 when the transmitter that is exposed to the exterior atmosphere is made of light metal alloys, and used in Category ll 1 G (Zone).

ATEX Conditions for Safe Use

Because the enclosure of the XYR 6000 Wireless Transmitter is made of aluminum, if it is mounted in an area where the use of Category 1G apparatus is required, it must be installed such that even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

Special precautions shall be taken to prevent the surface of the antenna of the XYR 6000 Wireless Transmitter from being electrostatically charged.

2.6 Probes

The SmartCET probe configuration parameters are found in this section. Proper configuration of the transmitter with the specific probe information is required for accurate corrosion measurements.

Electrode area

Three finger electrodes = 4.75 cm^2

Three flush disk electrodes = 0.18 cm^2

Constants for common probe materials

UNS Number	Material	Atomic Mass (grams)	Density ($grams/cm^3$)	Number of electrons lost on oxidation (typical)
A91100	Aluminum 1100	27.20	2.71	3
A92024	Aluminum 2024	28.97	2.77	3
A95083	5083 Al	27.38	2.66	3
C11000	CDA 110ETP 99.9 Cu	63.54	8.89	2
C12200	DHP Cu	63.53	8.89	2
C27000	Yellow Brass	64.32	8.47	2
C44300	CDA443 (ARS AD. Brass)	64.22	8.52	2
C68700	CDA687 (Al Brass)	63.23	8.33	2
C70600	90-10 Cu-Ni [CDA 706 (Cu/Ni 90/10)]	62.95	8.94	2
C71500	CDA 715 (Cu/Ni 70/30)	61.99	8.94	2
G10100	1010 Carbon Steel	55.77	7.87	2
G10180	1018 Carbon Steel	55.75	7.86	2
G10200	1020 Carbon Steel	55.74	7.86	2
G10800	1080 Carbon Steel	55.46	7.84	2
G41400	4140	55.62	7.85	2
K01200	A179	55.77	7.87	2
K01201	A192	55.70	7.86	2
K02598	ASTM A36	55.71	7.86	2
K02700	A516-70 (A516 Gr70)	55.62	7.86	2
K03005	ASTM A53 [Grade B Carbon Steel]	55.68	7.86	2
K03006	A106, Grade B	55.66	7.86	2
K03006	API 5L-X52	55.71	7.86	2
K03006	API 5L-X70	55.71	7.86	2
L13601	60 Sn / 40 Pb	153.97	8.42	3

UNS Number	Material	Atomic Mass (grams)	Density (grams/cm^3)	Number of electrons lost on oxidation (typical)
N04400	Monel 400	59.62	8.80	2
N08020	Carpenter 20 Cb3	57.30	8.08	2
N10276	C-276 [Hastelloy]	63.43	8.89	2
R50400	Titanium GR2	47.79	4.52	4
R60702	Zr 702	95.08	6.10	4
S30400	AISI 304	55.04	7.94	2
S30403	AISI 304L	55.08	7.94	2
S31600	AISI 316	56.19	7.98	2
S31603	AISI 316L	56.22	7.98	2
S41003	Duracorr	55.12	7.70	2
S41425	Mod. 13Cr	56.13	7.70	2
K03005	A53 Grade B Carbon Steel Pipe	55.68142	7.87	2
K02598	ASTM A36	55.71	7.86	2
K03006	A106, Grade B	55.66	7.86	2

3. Preparation

3.1 Installation

Refer to the XYR 6000 Transmitter Quick Start Guide (document 34-XY-25-21) for installation, mounting and wiring of your XYR 6000 SmartCET transmitter.

3.2 Configuration

The XYR 6000 SmartCET Transmitter contains the electronics interface compatible for connecting to the OneWireless network. An operator uses the Wireless Builder application to configure blocks, to change operating parameters, and to create linkages between blocks that make up the transmitter's configuration. These changes are written to the transmitter when it is authenticated by a security key.

3.3 Connecting to network

Use Authentication Device to connect your transmitter to the OneWireless network. See page 27.

3.4 Calibrating the transmitter

Overview

The transmitter is calibrated at the factory. User calibration is unlikely to improve calibration and is not recommended.

However, calibration is available if desired. For all calibration methods, Wireless Builder must first be used to prepare the channel for calibration. For access to all calibration methods, refer to Wireless Builder.

Calibration choices:

- User calibration
- Restore to factory calibration
- Linear Polarization Resistance check

User calibration

This function calibrates the channel to the default low and high range values for the channel's input type.

Table 1 User calibration

Step	Action
1	In Wireless Builder, set the transmitter's Write Lock to UNLOCKED.
2	In Wireless Builder, set the transmitter's channel to OOS (Out of Service).
3	Loosen the M3 locking set screw on the transmitter's battery end-cap (opposite end from display). Unscrew and remove the end cap.
4	Disconnect the probe wiring from terminals 1-3. Connect a jumper between TB1-1 and TB1-2.
5	At the transmitter display, verify it is OUT SVC (out of service). Use Authentication Device's Device Local Configuration buttons to navigate to the transmitter's CAL menu. If the transmitter is locked a LOCKED message will be displayed. Go to step 1. If CAL menu is passcode protected, enter the passcode. If the channel is not out of service a WRONG MODE message will be displayed. Go to step 2.
6	Select USER CAL. Follow displayed instructions. • When display says APLY L R apply a low resistance between TB1-2 and TB1-3, such as 10 ohms. • Use the arrow keys to enter the resistance value on the display. • Press Enter to accept the value. Display will say WAIT 60 S (wait 60 seconds). • When display says APLY H R apply a high resistance between TB1-2 and TB1-3, such as 10k ohms. • Use the arrow keys to enter the resistance value on the display. • Apply the high calibration input value indicated on display. • Press Enter to accept the value. Display will say WAIT 60 S, then SUCCESS. Otherwise, the display will show one of the calibration error messages listed in Table 2. • Press Enter to return to PV display.
7	Reverse steps 3 and 4.
8	When ready, in Wireless Builder return the transmitter's channel to service and set Write Lock to LOCKED.

Table 2 Calibration error messages

Message	Meaning
CALIBRATION_FAIL	1. Calibration gain is greater than 5%. 2. Calibration offset is greater than 5% of sensor span.
BAD_USER_CALIBRATION	CAL_SOURCE is user and user calibration constants contain invalid values.
BAD_FACTORY_CALIBRATION	1. CAL_SOURCE is factory and factory calibration constants do not contain valid values. 2. CAL_RESTORE command was issued but factory calibration constants do not contain valid values.
BAD_SENSOR	Sensor is bad or faulty input thermocouple.
BAD_UNITS	Units in CAL UNITS parameter are invalid or not supported by the sensor type.

Linear polarization resistance check

Use this mode to check if a known applied resistance is correctly detected. The displayed value should agree with the applied resistance, this indicates the transmitter (and probe wiring if included) are working correctly. If the general corrosion value still differs from what was expected, check the probe (and probe wiring if not in line with the test resistor) and corrosion parameter configuration.

Table 3 Linear polarization resistance check

Step	Action
1	In Wireless Builder, set the transmitter's Write Lock to Unlocked.
2	In Wireless Builder, set the transmitter's channel to OOS (Out of Service).
3	Loosen the M3 locking set screw on the transmitter's battery end-cap (opposite end from display). Unscrew and remove the end cap.
4	Disconnect the probe wiring from terminals 1-3. Connect a known resistance value (10 – 10k ohms) between TB1-2 and TB1-3. Connect a jumper between TB1-1 and TB1-2.
5	At the transmitter display, verify it is OUT SVC (out of service). Use Authentication Device's Device Local Configuration buttons to navigate to the transmitter's CAL menu. If the transmitter is locked a LOCKED message will be displayed. Go to step 1. If CAL menu is passcode protected, enter the passcode. If the channel is not out of service a WRONG MODE message will be displayed. Go to step 2.
6	• Select LPR CHK. Press Enter to accept the applied resistance. Display will say WAIT 60 S (wait 60 seconds). • After waiting 60 seconds the display should show the applied resistance value. This confirms proper operation. If the displayed resistance value is correct, check Wireless Builder for correct probe values. See page 9. • Press Enter to return to PV display.
7	Reverse steps 3 and 4.
8	When ready, in Wireless Builder return the transmitter's channel to service and set Write Lock to Locked.

Restore calibration to factory default

Table 4 Restore calibration

Step	Action
1	In Wireless Builder, set transmitter's Write Lock to Unlocked.
2	In Wireless Builder, set the transmitter's channel to OOS (Out of Service).
3	Use Authentication Device's Device Local Configuration buttons to navigate to the transmitter's CAL menu. If the transmitter is locked a LOCKED message will be displayed. Go to step 1. If CAL menu is passcode protected, enter the passcode. If the channel is not out of service a WRONG MODE message will be displayed. Go to step 2.
4	• Select CAL RSTR by scrolling through menu. • Press Enter to continue. • Display will say SUCCESS. • If calibration is unsuccessful an error message is displayed. See Table 2. • Press Enter to return to PV display.
5	Exit the menu.
6	When ready, in Wireless Builder return the transmitter's channel to service and set Write Lock to Locked.

4. Function blocks

4.1 Introduction

This section explains the construction and contents of the XYR 6000 SmartCET Corrosion Transmitter Function Blocks.

4.2 Block description

Block types

Blocks are the key elements that make up the transmitter's configuration. The blocks contain data (block objects and parameters) which define the application, such as the inputs and outputs, signal processing and connections to other applications. The XYR 6000 SmartCET Transmitter contains the following block types.

Block Type	Function
Device	Contains parameters related to the overall field device rather than a specific input or output channel within it. A field device has exactly one device block.
AITB	Contains parameters related to a specific process input or output channel in a measurement or actuation device. An AITB defines a measurement sensor channel for an analog process variable represented by a floating-point value. There is one AITB per sensor.
Radio	Contains parameters related to radio communication between the transmitter and the multimode(s).

Block diagram

Figure 2 shows the blocks of the XYR 6000 SmartCET Transmitter.

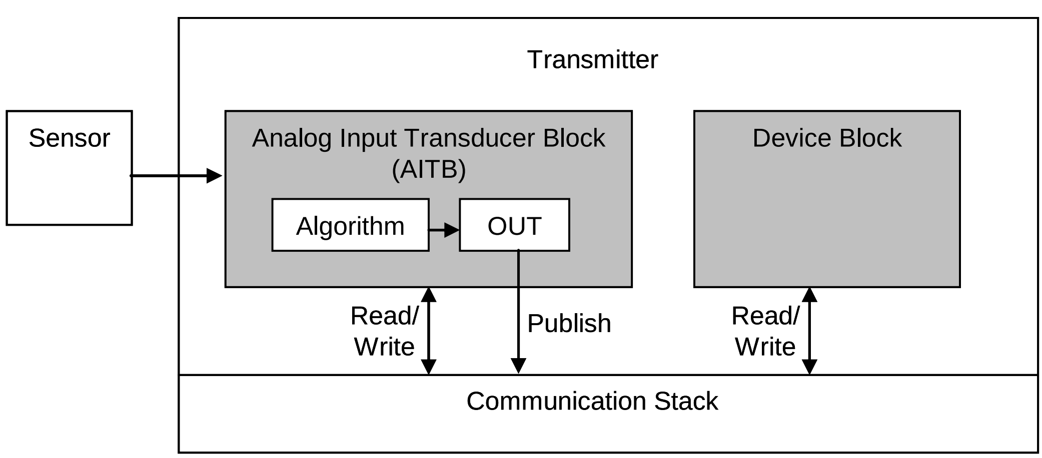


Figure 2 Block Diagram

Each of these blocks contains parameters that are standard OneWireless-transmitter defined parameters. The AITB and device blocks contain standard parameters common to all XYR 6000 transmitter models (that is, pressure, temperature, DI, HLAI) as well as corrosion-specific parameters. The radio block contains parameters for communication with the wireless network.

4.3 Parameter details

The transmitter displays a few basic parameters, such as tag, serial number, device revision, build, device address and WFN ID by accessing the quick view mode using the Authentication Device navigation keys.

For more information on parameters, refer to the following documents.

- OneWireless Wireless Builder User's Guide
- OneWireless Parameter Reference

5. Operation

5.1 Overview

Display modes

The transmitter has the following display modes.

- Test. Appears briefly after power-up to self-test the display.
- Connection status. Appears when transmitter is not fully connected to the OneWireless network. See section 5.2.
- PV display. Default mode of the transmitter displays the PV values and any status messages. See below.
- Quick view of transmitter identification parameters. Displays read-only parameters then returns to PV display. See page 24.
- Menu. See page 25.

Authentication Device

To navigate the transmitter displays and menus, hold the Authentication Device no more than 6” from the transmitter and aim the infrared beam at the transmitter display while tapping the Device Local Configuration buttons (Table 9). You can also use the PDA’s buttons.

Authentication Device menus are described in section 5.6 starting on page 26.

5.2 Transmitter connection status

Table 5 Transmitter connection status

Displayed status	**Definition**	**What to do**
NO KEY	Transmitter needs a key from the Authentication Device and is not transmitting.	Transmit a key to the transmitter. See page 27.
NOT CONN	Transmitter is in between discovery attempts.	If Transmitter does not make a connection within five minutes, do the following: • Check that Key is correct for the network you are trying to join. • Check that Multinode(s) in the local area are turned on and are already a secure part of the network. • Check if KeyServer is active. • Check the KeyServer Event Log to see if the Transmitter is actively trying to join. Errors in the Event Log show that the Transmitter is trying to join but that there are problems. Consult the OneWireless Wireless Builder documentation for troubleshooting errors.
DISCOVER	Transmitter has not made a connection to a Multinode and is in discovery (searching for a connection to a Multinode). Transmitter will automatically enter a power saving mode if it cannot make a connection and will retry later.	Wait for connection. If Transmitter does not make a connection within five minutes, see NOT CONN in this table.
SECURING	Transmitter has connected with the network and is validating its key.	Wait for connection. If Transmitter does not make a connection within five minutes, see NOT CONN in this table.
CONNECTD	For units with radio firmware build* 53 or higher: Transmitter has validated the key and has made a secure connection with at least two Multinodes. Transmitter should appear in Wireless Builder as an uncommissioned device. For units with radio firmware build* 52: Transmitter has validated the key and has made a secure connection with at least one Multinode. Transmitter should appear in Wireless Builder as an uncommissioned device.	For units with radio firmware build* 53 or higher: No action required. For units with radio firmware build* 52: Transmitter will periodically look for a second Multinode in order to form a redundant connection to the network. If connected with only one Multinode Wireless Builder will display a Secondary Multinode Address of 0.
NO REDUN	Appears only on units with radio firmware build* 53 or higher. No redundancy, that is, Transmitter has connected with only one Multinode.	No action required. The Transmitter will periodically look for a second Multinode in order to form a redundant connection to the network
*Use the PDA to determine your radio firmware build number (page 21).		

5.3 Transmitter PV display

In the PV display, the following information is displayed sequentially. For detailed descriptions of the PV's, see page 37.

Item displayed	Example	Details
PV1 value	1 +80.0	The General Corrosion Rate is the average or general corrosion rate. Range: 0 – 250 mil/year (0 - 6.35 mm/yr.)
PV1 engineering units	mPY	Mils per year (mPY) or millimeters per year (mmPY).
PV1 status	BAD	See Table 6. If no PV status is displayed (blank) then the PV value is good.
Device status	LOW BAT	See Table 7. If no device status is displayed (blank) then the device status is normal. If two or more device status messages are in effect they are displayed alternating with the PV values.
PV2 value	2 +0.50	Pitting Factor (also referred to as localized corrosion indicator). Range: 0 – 1. Unitless.
PV2 status	UNC	See Table 6. If PV status is not displayed then the PV value is good.
PV3 value	3 +26.50	B value, also known as the Stern-Geary constant. Range: 0 to 200 typical.
PV3 units	mV	Millivolts
PV3 status	OUT SVC	See Table 6. If PV status is not displayed then the PV value is good.
PV4 value	4 +404.0	Corrosion monitoring index. Unitless. Normal range is 0 – 2000.
PV4 status		See Table 6. If PV status is not displayed then the PV value is good.

Table 6 PV status

PV status	Cause - Action
(blank)	• PV is normal – no action required
BAD	• Possible calibration error – Clear calibration • AITB can not execute due to internal firmware state – Attempt cold restart of device. • AITB can not execute due to hardware fault – Replace sensor board • Sensor failure – Check input connections • Sensor failure – Check bad probe
UNC	• Warning: Input inaccurate due to uncertain input data integrity. • Warning: Input inaccurate due to input conversion limitations or resolution. • Warning: Input outside of characterized range. Value is estimated.

Table 7 Device status

Transmitter display	Wireless Builder display	Definition	What to do
OUT SVC	OOS	All channels are out of service.	Restore mode to Auto in Wireless Builder.
CAL ERR	Calibration Error	Calibration Data Invalid or could not be read.	Use Cal Clear, Restore, or User Calibrate.
LOW PWR	Low Power	External Power Critically Low	Check external 24V power supply
LOW BAT	Low Battery	Battery Voltage Critically Low	Replace batteries as soon as possible. See page 46.
NO RADIO	Radio Interprocessor Comm Error	Radio Board is not accessible.	Restart both the radio and sensor. If condition persists, replace sensor module. See page 44.
BAD RADIO SPI	Sensor Radio SPI Communication Failure	Radio detected loss of communication with sensor board over the inter-processor communication link.	Restart both the radio and sensor. If condition persists, replace sensor module. See page 44.
BAD RADIO EEPROM	EEPROM SPI Communication Failure	Radio EEPROM SPI Communication failure	The radio will not be able to perform firmware upgrades but will operate normally using installed code. Replace sensor module. See page 44.
RADIO WDT RESET	WDT Reset Occurred	Radio Watch Dog Timeout detected	Restart both the radio and sensor. If condition persists, replace sensor module. See page 44.

Transmitter display	Wireless Builder display	Definition	What to do
BAD RADIO	Radio Circuitry Failure	Radio circuitry has failed	The radio processor detected error on internal radio circuitry. Replace sensor module. See page 44.
The following status messages have multiple meanings. Refer to Wireless Builder Device Status for exact cause.			
E FAIL	A/D Failure	Diagnostics detected defect with Analog to Digital Converter.	Replace sensor module. See page 44.
E FAIL	Electronics Failure	Electronic Failure detected on Sensor Board. **Could be caused by one of the status items marked by *.**	Restart both the radio and sensor. If condition persists, replace sensor module. See page 44.
E FAIL*	NVM Fault*	Startup diagnostics detected defect in Sensor Non-Volatile Memory	Replace sensor module. See page 44.
E FAIL*	Program Memory Fault*	Startup diagnostics detected defect in Sensor Read Only Memory	Replace sensor module. See page 44.
E FAIL*	RAM Fault*	Startup diagnostics detected defect in Processor Random Access Memory	Replace sensor module. See page 44.
INP FAIL	Input Failure	Input Error	Check input connection. If condition persists, replace the probe.
INP FAIL	A/D Failure	Diagnostics detected defect with Analog to Digital Converter.	Replace sensor module. See page 44.
The following statuses are displayed only in Wireless Builder Device Status.			
Blank	Electrode Short Circuit	An input is shorted	Check probe electrodes for conductive films or defective (shorted) cable. Check transmitter probe cable connections for a possible short at the transmitter input terminals.
Blank	Electrode Open Circuit or LPR Mode Error	Input open or probe not in solution	Check probe cable for a loose or defective (open) connection to the electrodes or transmitter terminals.
Blank	Harmonic Distortion Mode Not Possible	No valid 3rd harmonic component to calculate B value PV	Corrosion rate may be very low or system may be under diffusion control.

Transmitter display	**Wireless Builder display**	**Definition**	**What to do**
Blank	Asymmetric Response From Probe	Electrochemical response of probe is not symmetrical	Check electrodes for differential attack on electrodes, for example, crevice on one electrode.
Blank	DAC Voltage Deviation	Electrode driver voltage deviation > 3% of measured voltage	Check electrodes for conductive films. Check transmitter probe cable connections for a possible short at the transmitter input terminals. Check transmitter operation offline with a different probe to determine if the fault is caused by the probe or transmitter.
Blank	Calibration Cleared	User calibration cleared to factory constants	User calibration has been cleared and reset to the factory values. Proceed with user calibration if utilizing probe cables >12 ft and if the anticipated corrosion rate is >200 mpy.
blank*	Device/Firmware Mismatch*	Sensor Board Firmware Error. The software did not pass verification tests.	Replace sensor module. See page 44.
blank*	Heap Memory Not Available*	Heap Allocation Failure. Software detected heap shortage and some communication packets may have been dropped.	Clear by warm restart of device. If condition persists contact Honeywell service.
blank*	Watchdog Timer Error*	Sensor Watchdog Timeout. The processor was restarted due to unexpected operation.	Clear by warm restart of device. If condition persists contact Honeywell service.

5.4 Transmitter quick view of parameters

If the Up or Down key is pressed using the Authentication Device while in PV display mode, the display will enter parameter quick view mode. Successive presses of the Up key will increment to the next parameter in the following table, or exit to PV display mode if at last parameter. The Down key will decrement to the previous parameter or exit if at the first parameter. The Enter key will exit to PV display mode at any time.

Position	Parameter	Description
1	Vendor Name	HONEYWELL
2	HONEYWELL	XYR 6000 MULTI AI DI DO
3	Tag Name	HON_XYR6000_MAIDIDO_1234567890
4	SDREV	Sensor device revision
5	SBLD	Sensor build number
6	Radio Type	DSSS
7	RBLD	Radio build number
8	WFN	Wireless field network identifier
9	NET	Network device address
10	MODE/CHANNEL	Frequency hopping mode & channel

5.5 Transmitter menu

Menu tree

At the PV display, press Enter to access the menus. To interact with the menus use the Device Local Configuration onscreen buttons (page 29) or the buttons on your PDA.

Table 8 Menu tree

Menu item	Description
CAL	Calibration menu. May be password-protected. See Table 9 on page 29 for password number entry.
USER CAL	Lets you set calibrate to custom low and high range values. See page 11.
CAL RSTR	Restores calibration to factory setting. The factory setting is very accurate and should be adequate for most applications. See page 11.
LPR CHK	Linear Polarization Resistance check. Use this to check a known applied resistance. The displayed value should agree with the applied resistance; if not then a problem exists in the probe or in the corrosion parameters. See page 11.
RADIO	Radio menu
PRI RSSI	Primary receive signal strength. Read only. Signal strength 00 is too weak to connect to the network. Displayed Value / Value dBm / Rx Margin dB 00 / < -86 / < 10 01 / -86 to -81 / 10 to 15 02 / -80 to -75 / 16 to 21 03 / -74 to -69 / 22 to 27 04 / -68 to -63 / 28 to 33 05 / -62 to -57 / 34 to 39 06 / -56 to -51 / 40 to 45 07 / -50 to -45 / 46 to 51 08 / -44 to -11 / 52 to 85 09 / ≥ -10 / Saturation
SEC RSSI	Secondary receive signal strength. Same as PRI RSSI. Read only.
WFN ID	Wireless Field Network ID. Read only.
DEV ADD	Device address. Read only.
TX POWER	Radio transmit power. Read only.

5.6 Authentication device menus

Overview

Hold the Authentication Device no more than 6” from the transmitter and aim the infrared beam at the transmitter display while tapping on the screen command or button.

Main menu

The main menu is shown below. Details start on the next page.

Figure 3 Main menu

Security and Node Deployment

Use this to receive and transmit security keys for connecting the transmitter to the OneWireless network.

Use this to:

- receive new security keys,
- transmit security keys for connecting the transmitter (or other nodes) to the OneWireless network,
- clear all security keys from the PDA,
- clear the transmitter's key and reset its configuration to factory default (such as for decommissioning).

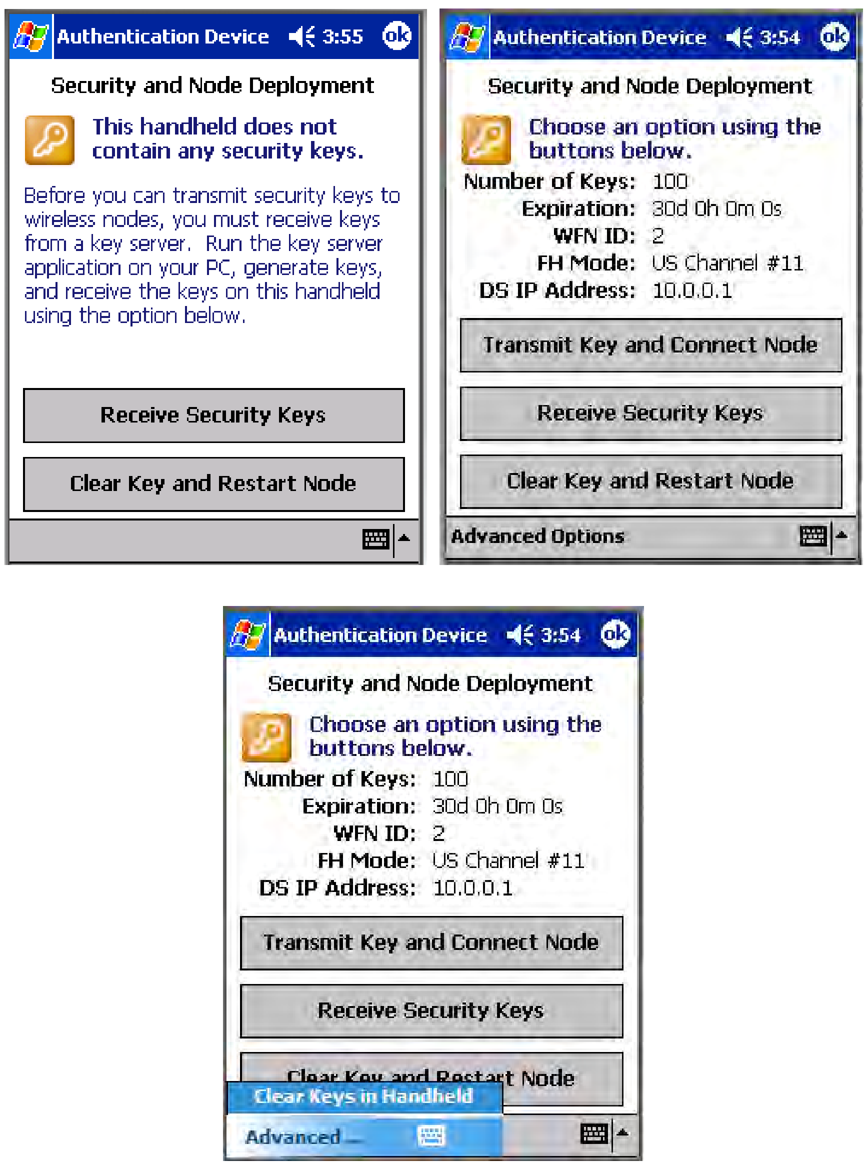


Figure 4 Security and Node Deployment

To connect your transmitter to the OneWireless network perform the following steps.

Step	Action
1	If the PDA contains no keys, obtain new security keys from the PC application Key Server Manager. To do this, select **Receive Security Keys**. Keys can be received either through Infrared (by aiming PDA at the infrared dongle) or through an ActiveSync/USB connection. See **Key Server Communication Method** under Advanced options on page 32 for details. **Important**: The Comm Method settings must match in the PC's Key Server Manager and in the Authentication Device (both must be set to Infrared or both to ActiveSync) in order for your PDA to receive security keys. See **Key Server Communication Method** under Advanced options on page 32 for details.
2	When the Authentication Device has valid unexpired keys, aim it at the transmitter and transmit a key to the transmitter. The transmitter will validate the key and then use it to make a connection to the OneWireless Network. The Transmitter may continue to show the diagnostic message "NO KEY" for a brief time while it validates the key before showing the "DISCOVER" message. To verify your transmitter has been authenticated, see the Connection prompt on the Read Node Info screen (page 30).

To decommission your transmitter from the OneWireless network, select **Clear Key and Restart Node**. This clears the transmitter's key, network and security configurations, and resets the transmitter to its factory default settings. perform the following steps.

Select **Clear Keys from Handheld** (under Advanced Options) when:

- The PDA has keys from one system, but you have moved your Authentication Device to another system, or
- you want to clear all keys so that you cannot deploy any more keys without going to the key server manager and getting more.

For more details on keys, refer to Getting Started with Honeywell OneWireless Solutions.

Device Local Configuration

Use Device Local Configuration buttons (Table 9) to navigate the transmitter menus (Table 8) and to make selections and changes. You can also use the PDA buttons.

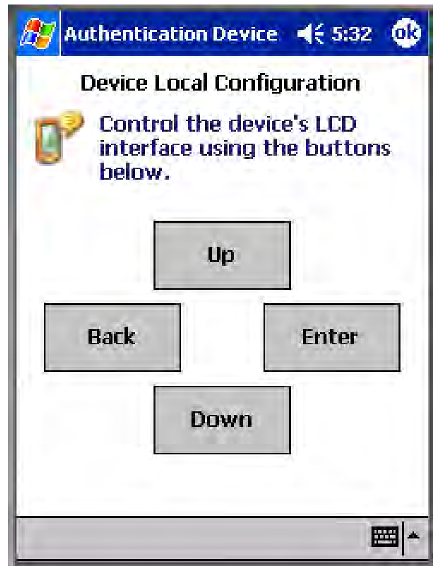


Figure 5 Device Local Configuration screen

Table 9 Buttons for Device Local Configuration

Button	Function
Enter	• Enter the Menu Tree. • Enter submenu of the menu that is appearing on the screen. • Execute action. • Submit the entered number while doing number entry. • Read value of certain displayed parameters.
Up	• Go to the next menu in the same level. • View quick view parameters in Normal Display Sequence (PV Display). • During number entry, increment the digit or change +/- sign.
Down	• Go to the previous menu in the same level. • View quick view parameters in Normal Display Sequence (PV Display). • During number entry, decrement the digit or change +/- sign.
Back	• Go to the upper menu level. • When changing a number value, move cursor to the left/more significant digit, then wrap around to the least significant digit.

Read Node Information

Use this to read the transmitter's information shown in Figure 6. Similar to quick view parameters on the transmitter display. (See page 24.)

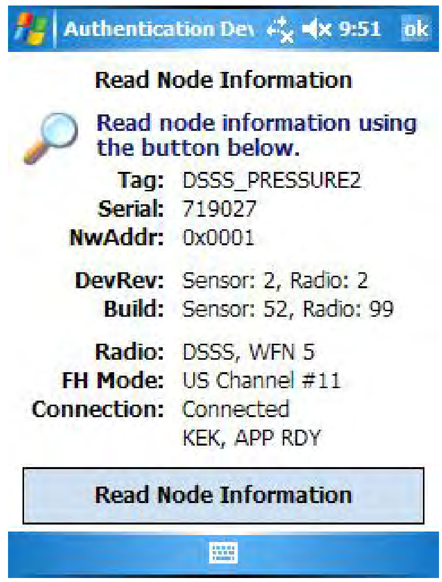


Figure 6 Read Node Information

Table 10 Read Node Information

Item	Description
Tag	The name given to this transmitter
Serial	Transmitter serial number. This is the WBSN on the transmitter's nameplate. Do not confuse this with the other nameplate item marked "Serial."
NwAddr	Network Address of the device in hexadecimal.
DevRev	Device Revision. This parameter changes whenever objects and parameters are added, deleted, or their data type or range changes. It does not change if the application firmware changes without affecting the device description. Range: 0 to 65535.
Build	Sensor firmware and radio firmware build numbers.
Radio	Hardware radio type, FHSS or DSSS WFN ID: Wireless Field Network ID. Range: 0 to 255.

Item	Description
FH Mode	Frequency group or frequency channel selection used by the wireless network of the device. The value must match the value set in the gateway and interface nodes to allow communication between the device and the wireless network. Modes: US Channel #1 US Channel #6 US Channel #11 US Guard Bands EU Channel #1 EU Channel #7 EU Channel #13 EU Guard Bands US/EU Spec Div A US/EU Spec Div B US/EU Channel #3 US/EU Channel #10 Complete Spectrum
Connection	The first line displays one of the following connection states. No Security Key – No security key has been deployed to the device or multinode. The user must give a security key to the device or multinode before it will join the wireless sensor network. No Connection – A security key exists in the device or multinode, but no connection has been formed. The device or multinode is waiting to form a connection and will automatically retry shortly. Users may transmit a new security key in order to force the device or multinode to immediately retry to form a connection. Discovering – The device is attempting to form a connection to the wireless sensor network. The device is discovering multinodes and, if a multinode is found, will transition to the securing state. Securing – The device is attempting to form a connection to the wireless sensor network. The device has discovered one or two multinodes and is attempting to form a secure session. If successful, the device will transition to the connected state. Connected – A secure connection is formed with one or two multinodes. The second line contains detailed state information useful for problem reporting.

Advanced Options

Advanced options are non-typical configuration commands.

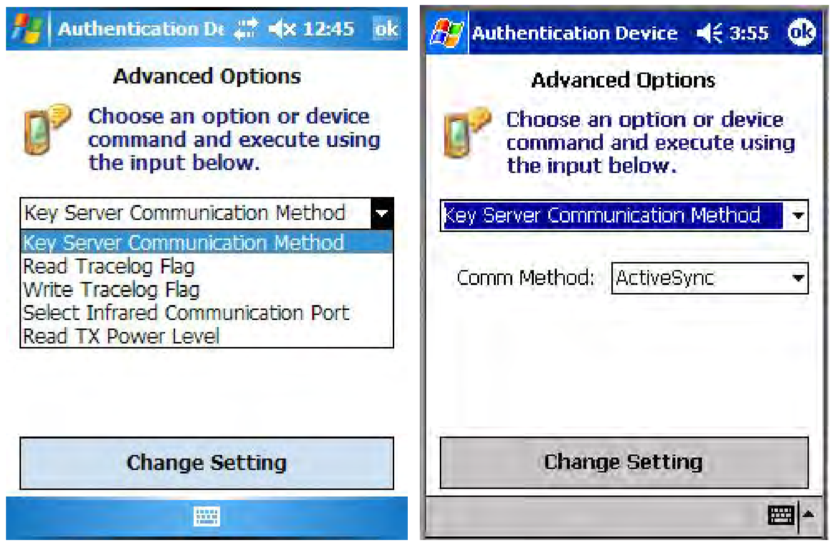


Figure 7 Advanced Options

Table 11 Advanced Options

Item	Description
Key Server Communication Method	Determines how the PDA will receive security keys from the PC's Key Server Manager application. From the Comm Method menu select one of the following methods. **ActiveSync** – Select this to receive keys over a USB connection, such as while the PDA battery is being charged in its base. **Infrared** – Select this to receive keys over the infrared port. **Important**: The Comm Method settings match in the PC's Key Server Manager and in the Authentication Device (both must be set to Infrared or both to ActiveSync) in order for your PDA to receive security keys.
Restart	Commands the transmitter to restart with the current configuration.
Write Tracelog Flag	Reads the transmission power level of the transmitter radio.
Select Infrared Communication Port	Overrides the detected infrared communication port detected on your PDA. If infrared communication is not functioning, you can override the detected settings using this option.
Read TX Power Level	Reads the transmission power level of the transmitter radio.

6. Troubleshooting

6.1 Diagnosis of Transmitter Health from Measurement Data

The output from the corrosion transmitter can provide insight into the health of the transmitter operation. Table 12 shows the output expected for each variable when the transmitter is operating properly and the table also shows an indication when a probe short condition exists and when no probe is connected.

"Example on how to read Table 12. If the corrosion is suspected to be general corrosion, read the column beneath the "General Corrosion" heading. The PV, corrosion rate, will exhibit some value within the range of valid values (less than the URV), the SV, Pitting Factor, will be less than 0.1, the TV, B value, will be a relatively stable value, and the QV, Corrosion Mechanism Indicator, will exhibit a valid value within its range."

Table 12 Diagnosis of Transmitter Health

Description	Transmitter output variable	General Corrosion	Pitting / Localized Corrosion	Probe short	No probe connected
Corrosion rate	PV	Across range	Across range	Maximum value Note 1.	~ 0 Note 3.
Pitting Factor	SV	<0.1	>0.1	<0.001	~ 1
B value	TV	(Stable) Note 2.	(Unstable) Note 2.	(Unstable) Note 2.	(Unstable) Note 2.
Corrosion Mechanism Indicator	QV	Across the range	Across the range	(~ 0) Note 2.	~ 0

Note 1: Corrosion rate maximum will depend on the material constants and surface area entered. From a measurement perspective, it relates to the absolute value of the polarization resistance of the working electrode. If the polarization resistance is very low (<10 ohms), the instrument will be close to current saturation. For optimal operation it is preferable to maintain the polarization resistance of the working electrode at values of >100 ohms. This may be achieved to some extent by changes to the surface area of the working electrode, thereby optimizing the span of the corrosion measurement.

Note 2: Items shown in brackets are general statements. No specific value can be provided.

Note 3: An exact zero value will not be achieved. It will be almost zero or very small, for example, 0.001 mpy.

Under conditions when general corrosion is prevalent on the material being monitored, the measured corrosion rate observed as the primary variable (PV) may be expected to show evidence of being stationary for a short term. In these cases the corrosion rate will tend to exhibit only slight variation in the short term, perhaps over periods of hours or longer. Any slight process change, such as temperature variability is often reflected in the corrosion rate behavior. Larger excursions in the corrosion rate may be experienced if there are more pronounced changes to the environment, for example due to flow rates or changes in composition.

The secondary variable, Pitting Factor, will typically exhibit a low value under these conditions (for example, <0.01), although it may exhibit some short term response to abrupt changes in the environment, for example sudden changes in temperature, flow rate or fluid composition.

The tertiary variable (the B value) will usually fall in a range of 0.010 to 0.030 volts, and will be stable.

The quaternary variable (Corrosion Mechanism Indicator) is largely dependant on the type of material being studied, but generally, if active corrosion is being observed (>5mpy), it will tend to be significantly larger than the case for very low corrosion rates.

If low general corrosion rates are being observed, which are close to instrument baseline (< 0.05 mpy), the Pitting Factor may appear artificially high (for example, > 0.01).

When localized corrosion is occurring, the observed general corrosion rate values may be in the range 0.1 to 10 mpy or higher, depending on the material and the environment. The Pitting Factor will tend to exhibit higher magnitude peaks of activity during pit initiation events, whereas propagating pits may be associated with a general increase in the observed corrosion rate and lower levels of Pitting Factor (<0.1). The general corrosion rate in the case of propagating pits often exhibits short term variation and is noticeably less stable than the case for general corrosion. Pitting is often accompanied by increased variability in the B value. With increasing degrees of pit propagation, the CMI values will also tend to increase.

6.2 General troubleshooting procedures

The XYR 6000 SmartCET transmitter is designed to operate over a broad range of corrosion rates. However, most problems associated with the corrosion rate calculation arise when the actual corrosion rate is extremely high, and there is likelihood that the instrument is approaching or exceeding its stated operating limits. In some circumstances, this can be remedied by using sensors with a smaller surface area.

Another factor to be considered is severe diffusion limiting or mass transport control of the corrosion processes. In this case the B value determination may become difficult, and erratic behavior with very high values may be observed. Troubleshooting procedures that deal with this condition and general situations are shown in Table 13.

Table 13 Troubleshooting procedures

Symptom	Possible cause	Action
Corrosion rate values are very low and do not change	1. Probe or probe cable fault – bad connection to probe electrodes 2. Transmitter fault	1. Check continuity with test cell connected at probe end of cable. May be necessary to remove probe and carry out continuity checks between connecting pins and probe sensing elements. 2. Check with test cell connected directly to transmitter terminals. Consult with the factory for additional information.

Symptom	Possible cause	Action
Corrosion rates are very high, Pitting Factor very low, and B values are very low.	This problem could be due to a shorting condition between probe sensing elements	1a. Disconnect probe and the corrosion rate should fall. 1b. Remove probe and physically check for electrode to electrode contact. 1c. May be caused by the presence of conductive corrosion deposits for example, iron sulfide (B value very low). 2. Use probe with smaller surface area.
Corrosion rate switches abruptly from high to very low levels, Pitting Factor is very high, and the B value goes to the current default value.	This situation is symptomatic of when the (internal) polarization resistance calculation has apparently gone to a negative value, with the result that the corrosion rate is indeterminate and a default low value is returned. Apparent negative polarization resistances may occur in situations where the corrosion rates are very high and the electrode area is incorrect for the process situation.	The electrodes could be too large. Investigate using electrodes with a smaller area. Another possible cause may be due to an asymmetrical response of the electrodes, for example due to crevice corrosion occurring on one of the electrodes. The electrodes should be inspected in this case. All the variables (corrosion rate, Pitting Factor, B value and CMI) are suspect and could be in error. Consult with the factory for additional information.
All corrosion variables are very unstable exhibiting one or more of the following: Corrosion rate unstable, may drop to very low values Pitting Factor low when corrosion rate high and vice versa. B values unstable switching between -20 and 100. CMI unstable switching from very low value 0, to large value for example, > 5000.	These symptoms are typically caused by high and variable corrosion rates in the process environment, hard diffusion limiting processes, and/or electrode surface areas being too large for the application.	Disconnect probe. Corrosion values should return to baseline levels. Check with test cell, transmitter should give a standard response. Electrode surface area could be incorrect for the application. Contact a Honeywell corrosion specialist to review the application. Corroding systems with real diffusion / mass transport limiting scenarios are problematic monitoring situations.
Inaccurate readings.	Possible wrong parameter values for the probe's electrode area.	Check the following parameter values in Wireless Builder. • Electrode area • Atomic mass • Density • Electrons See page 9 for probe parameters.

6.3 Recommended operating conditions

The XYR 6000 SmartCET transmitter utilizes electrochemical techniques that are applicable to a wide range of corrosive conditions. The following table provides the applicable operating envelope for XYR 6000 SmartCET with additional comments when the operating range is outside envelope.

Table 14 Recommended operating conditions

Measurement	Range	Comments
Corrosion rate	0-250 mpy dependent upon the electrode surface area, typically in range of 1 to 10 cm^2. (Default URV setting is 100 mpy and the electrode area is 4.75 cm^2.)	Higher sensitivity at low corrosion rates may be achieved by using larger electrodes - consult factory for additional information. The higher corrosion rate range is achieved with appropriately sized electrodes (for example, small areas). If symptoms listed in Table 13 occur, the B value should be fully reviewed and analyzed before providing a corrosion rate estimate. It is recommended to qualify the rate estimate against mass loss from electrodes – consult factory for additional information.
Pitting Factor	0.001 to 1.	With low corrosion rates, the Pitting Factor may appear artificially high due to very low observed general corrosion rates – consult factory for additional information.
B value	Expected range: 5 to 60mV (0.005 to 0.06V).	Low values may be due to formation of surface films having redox behavior (for example, Iron sulfide). The electrode essentially starts to become non-polarizable. High values predominantly may be due to diffusion limiting processes. As the electrochemical processes become more diffusion limiting, the B value may not achieve a stable value. Applying the B value from this type of situation (for example, updating the default value) is not recommended. Consult with the factory for additional information.
Corrosion Mechanism Indicator	Expected range: 0 to 2000.	Values are dependent on

Measurement	Range	Comments
		material and environment.

7. Corrosion measurements

7.1 Overview

XYR 6000 SmartCET corrosion transmitter uses a number of different electrochemical techniques in order to characterize more completely the corrosion behavior. Electrochemical methods provide a sensitive and rapid means of assessing corrosion behavior of metallic materials. The corrosion rate is obtained from electrochemical measurements designed to evaluate the corrosion current originating from the oxidation of the metal. The nature of the measurements requires ionically conducting media (e.g. water, molten salts) between the electrodes.

SmartCET outputs four corrosion measurements, which are:

- General Corrosion Rate - average or general corrosion rate, and is generally expressed in mils per year (mpy) or millimeters per year (mmpy).
- Pitting Factor - dimensionless number that indicates the presence of a pitting (localization) corrosion environment.
- B value - expressed in millivolts per decade, and is commonly also known as the Stern Geary constant.
- Corrosion Mechanism Indicator – indicator representing health of the probe in regard to fouling or wear.

The values are all updated every 30 seconds, which is the total measurement cycle time of the instrument. The values for the General Corrosion Rate, the Pitting Factor and the Corrosion Mechanism Indicator are set to output the most recent values.

7.2 General corrosion rate

SmartCET essentially uses a variant of the Linear Polarization Resistance (LPR) technique to calculate the general corrosion rate. The measurement is more accurately described as a Low Frequency Impedance measurement. A low frequency, low amplitude, sinusoidal voltage excitation is used to stimulate current flow. The Linear Polarization Resistance (LPR) technique is used to calculate the General Corrosion Rate. This calculation is usually the prime variable of interest since it reflects the overall rate of metallic corrosion. Corrosion may be directly related to operational parameters such as temperatures, flow, chemical composition, etc.

The XYR 6000 SmartCET uses three electrodes that are referred to as the working, counter and reference electrodes. A low frequency sinusoidal voltage excitation is applied to the working electrode with respect to the reference electrode, and the current is measured and analyzed (on the counter electrode) synchronously with the applied signal.

Given a sinusoidal pattern, the working electrode becomes alternately positively then negatively charged (in other words, polarized positively and negatively). The peak-to-peak value of the sinusoidal wave is 50mV. The current flowing between the counter and working electrodes is measured synchronously with the applied voltage sine wave, and the in-phase and out-of-phase components are detected and their amplitudes computed. The real (Faradaic or “resistive”) and imaginary (capacitive) impedance components may then be determined.

This particular method of analysis has been selected due to its superior noise rejection, which is particularly useful when studying corroding systems since they exhibit varying degrees of intrinsic noise.

The result is equivalent to measuring the *linear polarization resistance* of the working electrode. With this measurement, the corrosion current (hence, the corrosion rate) is inversely proportional to the polarization resistance. This measurement also employs the Stern-Geary approximation where the Stern-Geary constant (or B value) is the proportionality constant.

In practice, with no prior knowledge of the system, the "default" value of B for this type of measurement is typically chosen to be in the range 25 to 30 mV; in reality, the value of B is system-dependent.

Use of the default B value may result in the absolute corrosion rate being somewhat in error, but in some instances, it is the general trend of the corrosion rate that could be of interest instead of the absolute value.

Working method summary

1. There are three electrodes in use, which are designated working electrode (WE), counter electrode (CE) and reference electrode (RE). A sinusoidal DC voltage is applied on the WE (voltage is varied).
2. In turn, the current response is measured between the CE and WE. The ratio of voltage to current provides the polarization resistance. The polarization resistance is not a true resistance in the traditional sense, but can be treated as such in describing the LPR technology.
3. The corrosion current is inversely proportional to the polarization resistance.

How does LPR distinguish polarization resistance due to corrosion versus general resistance of the solution? How does an electrical model represent a corrosion process? What makes corrosion look like an electrical system?

a. First, SmartCET includes a Harmonic Distortion measurement cycle where the solution resistance is automatically compensated. The effects of the solution resistance are essentially incorporated in the Stern Geary constant (the B value) obtained from this measurement.
b. Corrosion comprises an anodic process and a cathodic process, i.e. electrochemical processes that occur at anodic and cathodic sites on the metal surface. When corrosion is occurring, there is an increase of ionic current flow between the anodic and cathodic sites (i.e. Faradaic process). A non-corrosive system would not exhibit any ionic flow. SmartCET applies a sinusoidal wave to facilitate an increase in flow. The sinusoidal wave enhances the anodic dissolution sites during one part of the wave and then enhances the cathodic sites in the other half of the wave. SmartCET measures the polarization resistance during these cycles. A heavily corroding system would be characterized by greater ionic current flow.
c. The low levels of applied voltage do not affect the naturally occurring corrosion processes unduly, and the ratio of the applied voltage to the measured real current at the fundamental frequency provides a polarization resistance. Thus the electrochemical interface behaves in a similar manner to a resistance. Stated another way, the corrosion processes can be modeled as a simple resistance – the polarization resistance.

The anodic and cathodic sites exist on all of the three electrodes. Polarization of an electrode away from its free corrosion potential will result in an increase in the anodic reaction and decrease in the cathodic current when polarized more positive, and vice versa. shows the relationship between corrosion rate, environment characterization and the recommendation for electrode area to use.

Table 15 Corrosion Rate and Environment Characterization

Corrosion Rate	Environment	Comments
>200 mpy	Highly conductive, highly corrosive	This could be at upper level of XYR 6000 accuracy range. If used in this environment, electrodes with small area should be used (for example, 1cm2).
1-200mpy	Average corrosion rate	Use correct probe type according to process application.

0.01-1mpy	Low conductivity or passive system	Electrodes with large area should be used (for example, 10cm2).
<0.01mpy	Extreme passivity or low conductivity (for example, organic medium)	This could be at lower level of XYR 6000 accuracy range. If used in this environment, electrodes with large area should be used (for example, 10cm2).

7.3 B value

The B value represents a system 'constant' that is determined by the mechanism and kinetics of the corrosion process. In a dynamic process, research has shown that the B value is not constant. For example, the B value for a sour system with a microbiological influence on corrosion activity could be 4mV, a very low value. The average "industry-accepted" default B value is typically between 25 and 30mV. Houston tap water is approximately 15mV. A severely scaled system (i.e. inorganic scale deposits on the metal surface) would show a B value of around 100 mV.

By evaluation of the non-linearities in the current response from the LPR measurement, it is possible to determine a B value for the system being studied. This involves the analysis of the higher order harmonic content of the current response, and computation of a value of B for the system being studied.

With knowledge of the B value it is possible to *refine* the LPR-generated corrosion rate estimate, since the uncertainty regarding the standard (default) B value is removed. The B value is directly related to the mechanistic properties of the component anodic and cathodic corrosion processes.

The anodic process is essentially the metal oxidation and the cathodic process is, for example, the oxygen reduction or hydrogen evolution process. These are essentially non-linear processes, and the current will typically (but not always) have a logarithmic dependence on the applied voltage.

The B value is a composite of the individual anodic and cathodic Tafel slopes.

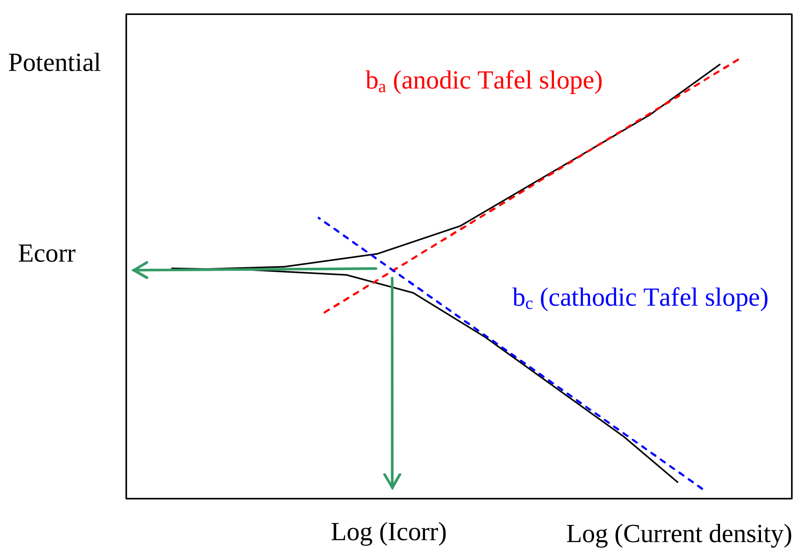


Figure 8 Individual Anodic and Cathodic Tafel Slopes

The B value is calculated using the following equation: B = ba*bc/2.303*(ba+bc)

So these individual slopes are representative of non-linear processes. In the calculation of the general corrosion rate, the Stern Geary approximation assumes that the processes are essentially linear for a small applied potential, e.g. 10 – 20 mV away from the corrosion potential, and only takes into account the first order (linear) processes. Harmonic distortion analysis takes into account the second and third order processes, i.e. it is similar to fitting a polynomial to x^3, but we use the higher frequency harmonic components to analyze rather than trying to fit a polynomial – it's a much better analysis route.

SmartCET uses Harmonic Distortion Analysis (HDA) to calculate the 'true' B value. With an accurately computed B value, the default B value used in the general corrosion rate calculation can be changed thus enabling a more accurate corrosion rate calculation to be made.

Table 16 Corrosion Rate based on B value, anodic and cathodic values

ba	bc	B	Comments
60mV	60mV	13mV	Both processes activation controlled (for example, sulfide film)
60mV	∞	26mV	Anodic process activation, cathodic diffusion, controlled (for example, aerated system)
120mV	∞	52mV	Anodic process activation, cathodic diffusion, controlled (anodic slope different), for example, multiphase system
∞	∞	∞	Severe anodic and cathodic diffusion limiting, for example, vapor phase. B value indeterminate.

7.4 Pitting factor

The Pitting Factor is a measure of the overall stability of the corrosion process, and is obtained from a measurement of the intrinsic current noise of the working electrode, and comparing this measurement to the general corrosion current obtained from the LPR measurement (e.g. general corrosion rate calculation).

General corrosion processes typically have low levels of intrinsic noise, with the ratio of noise to the general corrosion current typically being ≤1% (Pitting Factor ≤0.01). With the onset of instability (pit initiation), localized corrosion occurrence leads to increasingly higher levels of current noise with respect to the general corrosion current such that the Pitting Factor may reach (or even exceed) a value of 1. The Pitting Factor can be viewed as the probability that the corrosion mechanism is localized.

Spontaneous changes in the environment may also cause the instantaneous value of the Pitting Factor to approach a value of 1 in the short term; however, for truly localized corrosion, the Pitting Factor will remain unstable and secondary evidence may be observed in terms of the overall stabilities of both the general corrosion rate estimate and the B value.

SmartCET uses electrochemical noise (ECN) to calculate the Pitting Factor.

Table 17 Pitting Factor Values

PF Value	Comments
0.1 or higher	Pitting/localized corrosion – initiation (Note: check corrosion rate value; if very low, PF could be misleading).
0.01 to 0.1	Intermediate level; general corrosion but check PF does not increase above 0.1.
0.01 or lower	General corrosion.

7.5 Corrosion mechanism indicator

The metallic corroding interface is complex and dynamic. The general corrosion rate, the B value, and the Pitting Factor all help to characterize the Faradaic corrosion processes (current flow that is the result of electrochemical process) quite thoroughly. However, in order to be more complete in the analysis of the electrochemical response there is at least one more factor which needs to be taken into account.

During the measurement of the low frequency impedance, a reactive, phase shifted component of the current response may be detected. This is a consequence of the physical nature of the metal/environment (electrolyte) interface, and may reflect mechanistic properties such as the presence of films, film formation and surface adsorption processes.

The values obtained are likely to be characteristic of a particular system being studied. For example sulfide filming may cause the capacitive reactance to become more positive, whereas adsorption processes may cause the values to go negative. The absolute values obtained may provide the corrosion expert with extra knowledge regarding the corrosion behavior of any particular system.

Understanding CMI values

The CMI is a qualitative indicator of whether a surface film is present or not. If there is no film and only corrosion is present, the CMI will have an intermediate value. Inorganic scale, or thick passive oxide films with little or no conductivity, will show a low CMI value.

Analysis of the Corrosion Mechanism Indicator is shown in Table 18.

Table 18 CMI values

CMI Value	Comments
> 1000	Possible redox film, for example, sulfide
10 - 1000	Freely corroding system
<10	Passive material, for example, Al, Zr, Ti
Negative	Adsorption processes, for example, some corrosion inhibitors

CMI does not provide information on film thickness; however, it can be used to measure a change, up to a point, since a decrease in value will indicate that more filming or scaling is occurring.

The CMI provides the most useful analysis when coupled with other corrosion information and/or process data. It is the combination of process data that provides a more complete view into the corrosion mechanism being measured.

8. Maintenance/Repair

8.1 Parts

The following replacement parts may be ordered from Honeywell. For other replacement parts such as probes, refer to XYR 6000 Wireless Transmitter Corrosion Specification (document 34-XY-03-31)

Part number	Qty.	Description
50015866-504	1	ELECTRONICS MODULE ASSEMBLY aka SENSOR MODULE for Corrosion
50015866-508	1	ELECTRONICS MODULE ASSEMBLY aka SENSOR MODULE for Corrosion-Instrinsically Safe
50015866-512	1	ELECTRONICS MODULE ASSEMBLY aka SENSOR MODULE for Corrosion-DSSS Intrinsically Safe
50015843-501	1	TERMINAL BOARD
50015623-501	1	CAP ASSEMBLY, BATTERY, ALUMINUM, DARK BEIGE
50016190-501	1	CAP ASSEMBLY, LCD, ALUMINUM, DARK BEIGE
50026009-501	1	CAP ASSEMBLY, BATTERY, STAINLESS STEEL
50026127-501	1	CAP ASSEMBLY, LCD, STAINLESS STEEL
50016229-501	1	ANTENNA ASSEMBLY, 2 dBi INTEGRAL RIGHT-ANGLE, ALUMINUM
50016229-502	1	ANTENNA ASSEMBLY, 2 dBi INTEGRAL RIGHT-ANGLE, STAINLESS STEEL
50020767-501	1	ANTENNA ASSEMBLY, 2 dBi INTEGRAL STRAIGHT, STAINLESS STEEL
50020767-502	1	ANTENNA ASSEMBLY, 2 dBi INTEGRAL STRAIGHT, ALUMINUM
50031715-501	1	ANTENNA ASSEMBLY, 4 dBi INTEGRAL RIGHT-ANGLE, ALUMINUM
50031715-502	1	ANTENNA ASSEMBLY, 4 dBi INTEGRAL RIGHT-ANGLE, STAINLESS STEEL
50018414-001	1	REMOTE OMNI-DIRECTIONAL ANTENNA, 8 dBi
50018415-001	1	REMOTE DIRECTIONAL ANTENNA, 14 dBi
50016577-502	1	ANTENNA ADAPTER ASSEMBLY, REMOTE, TYPE TNC, ALUMINUM
50028364-501	1	ANTENNA ADAPTER ASSEMBLY, REMOTE, TYPE N, ALUMINUM
50028364-502	1	ANTENNA ADAPTER ASSEMBLY, REMOTE, TYPE N, STAINLESS STEEL
50018110-001	1	COAX CABLE ASSY, 1.0M (3.3 Ft) LONG, RP-TNC - N-MALE
50018110-002	1	COAX CABLE ASSY, 3.0M (10.0 Ft) LONG, RP-TNC - N-MALE
50018110-003	1	COAX CABLE ASSY, 10.0M (33.0 Ft) LONG, RP-TNC - N-MALE
50018278-001	1	COAX CABLE ASSY, 1.0M (3.3 Ft) LONG, N-MALE - N-MALE
50018278-002	1	COAX CABLE ASSY, 3.0M (10.0 Ft) LONG, N-MALE - N-MALE
50018278-003	1	COAX CABLE ASSY, 10.0M (33.0 Ft) LONG, N-MALE - N-MALE
50018279-090	1	LIGHTNING SURGE ARRESTOR
50031425-501	1	24V EXTERNAL POWER MODULE

continued		
50025288-502	1	BATTERY PWA, INTRINSICALLY SAFE
50026010-001	2	3.6V LITHIUM THIONYL CHLORIDE (Li-SOCI2) BATTERY
50026010-002	4	3.6V LITHIUM THIONYL CHLORIDE (Li-SOCI2) BATTERY
50026010-003	10	3.6V LITHIUM THIONYL CHLORIDE (Li-SOCI2) BATTERY

8.2 Replacing sensor module

Tools required

- #1 Phillips Screwdriver or 1/8” Slotted Screwdriver
- Torque Screwdriver
- 1.5 mm hex key

Procedure

WARNING

Risk of death or serious injury by explosion. Do not open transmitter enclosure when an explosive gas atmosphere is present.

CAUTION

Take precautions against electrostatic discharge to prevent damaging the sensor module.

Table 19 Sensor module replacement

Step	Action
1	Honeywell recommends that the transmitter be removed from service and moved to a clean area before servicing.
2	Loosen the M3 locking set screw on the display end-cap. See item 1 in Figure 9. Unscrew and remove the end cap.
3	Loosen the two screws on the sensor module. See items 2 in Figure 9.
4	Disconnect each connector on the sensor module. See items 3 in Figure 9.
5	Install new sensor module. Be sure to orient sensor module in the proper viewing orientation before tightening two sensor compartment screws. Reverse steps 1-4. Torque screws to 0,4 – 0,6 N-M (3.5 – 5.3 Lb-in). Honeywell recommends lubricating the end cap O-ring with a Silcone Grease such as Dow Corning #55 or equivalent before replacing the end cap. Return transmitter to service.

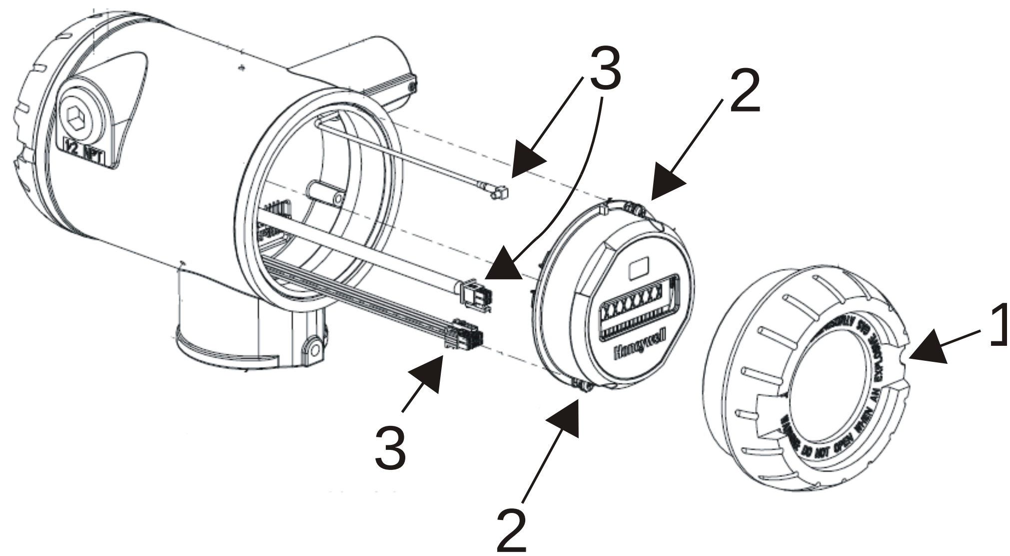


Figure 9 Sensor module removal and replacement

8.3 Replacing batteries

When to replace

When the transmitter displays a LOW BAT message you have 2-4 weeks to replace both batteries before they expire. When batteries are removed or expired, all transmitter data is retained in the transmitter's non-volatile memory.

Tools required

- #1 Phillips Screwdriver or 1/8" Slotted Screwdriver
- Torque Screwdriver
- 1.5 mm hex key

Procedure

ATTENTION

Batteries must be replaced only by a trained service technician.

WARNINGS

- Risk of death or serious injury by explosion. Do not open transmitter enclosure when an explosive gas atmosphere is present.
- Do not change batteries in an explosive gas atmosphere.
- 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.
- When installing batteries, do not snag the battery terminal on the clip or the battery may be damaged. Do not apply excessive force.
- Do not drop. Dropping the battery may cause damage. If a battery is dropped, do not install the dropped battery into the transmitter. Dispose of dropped battery promptly per local regulations or per the battery manufacturer's recommendations.

Table 20 Battery replacement procedure

Step	Action
	ATTENTION You must replace both batteries. 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 3.6V lithium thionyl chloride (Li-SOCl2) batteries (non-rechargeable), size D. No other batteries are approved for use in XYR 6000 Wireless Transmitters. • Xeno Energy XL-205F • Eagle Picher PT-2300H • Tadiran TL-5930/s • Honeywell p/n 50026010-001 (Two 3.6V lithium thionyl chloride batteries) (1 transmitter) • Honeywell p/n 50026010-002 (Four 3.6V lithium thionyl chloride batteries) (2 transmitters) • Honeywell p/n 50026010-003 (Ten 3.6V lithium thionyl chloride batteries) (5 transmitters)
1	Loosen the M3 locking set screw on the battery end-cap (opposite end from display). See item 1 in Figure 10. Unscrew and remove the end cap.
2	Using thumb and forefinger, squeeze the battery connector at top and bottom to disengage the locking mechanism, then pull to disconnect. See item 2 in Figure 10.
3	Loosen the two battery holder retaining screws (closest to the batteries). See item 3 in Figure 10. The screws are captive.
4	Pull the battery holder out of the transmitter.
5	Remove the old batteries from the battery holder. If needed, pry out the batteries by using a slotted screwdriver as a lever in the holder's side slots. See item 4 in Figure 10.
6	Install batteries as follows to avoid snagging the battery terminal on the clip and damaging the battery. Align the new battery with the clips and angle the positive end of the battery into the positive battery terminal clip. Using a thumb and forefinger pull the negative terminal clip outward and push down on the battery until fully seated in the clips. Do not apply excessive force when pushing battery down. Repeat this process for the second battery.
7	Insert the battery holder into the transmitter. Reattach the screws and tighten to 0,4 – 0,6 N-M (3.5 – 5.3 Lb-in). Re-connect battery connector. Honeywell recommends lubricating the end cap O-ring with a Silcone Grease such as Dow Corning #55 or equivalent before replacing the end cap.
8	Screw the end cap back on and tighten the M3 locking screw.
9	Dispose of used battery promptly per local regulations or the battery manufacturer's recommendations. Keep away from children. Do not disassemble and do not dispose of in fire.

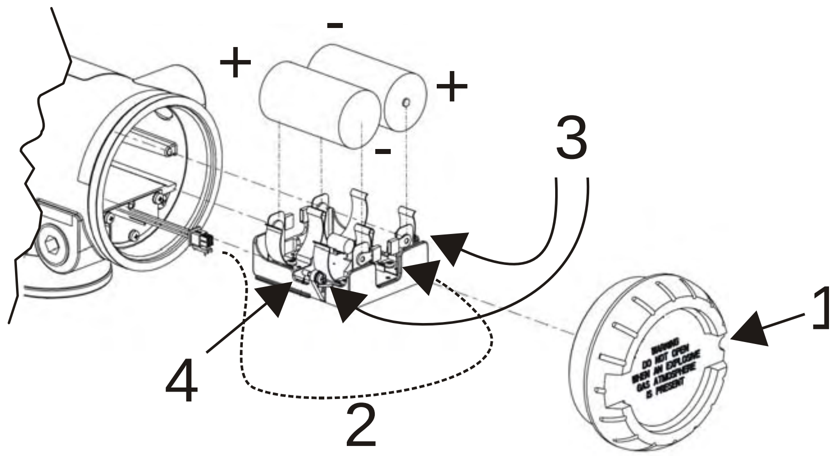


Figure 10 Battery replacement

8.4 Replacing 24V external power module

When to replace

When the transmitter displays LOW PWR and external power is present and sufficient. When the external power is removed to allow replacement of the module, all transmitter data is retained in the transmitter's nonvolatile memory.

Tools required

- • #1 Phillips Screwdriver or 1/8" Slotted Screwdriver
- • Torque Screwdriver
- • 1.5 mm hex key

Procedure

ATTENTION

24V power module must be replaced only by a trained service technician.

WARNINGS

- Risk of death or serious injury by explosion. Do not open transmitter enclosure when an explosive gas atmosphere is present.

SHOCK HAZARD

- Depending on your installation, transmitter input wiring sources may containhigh voltage. Disconnect all power from transmitter input sources beforeaccessing the 24V power module. Failure to do so could result in death or serious injuryif the input terminals or wires are accidentally touched.

Figure 11 24V Power Supply Module Assembly

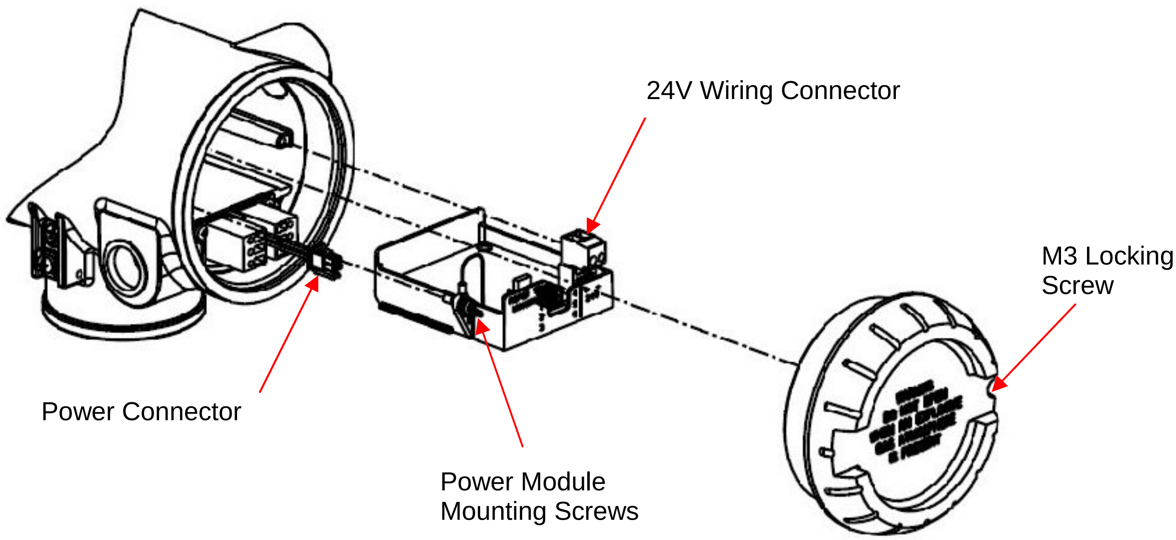


Table 2124V External power module

Step	Action
1	Loosen the M3 locking set screw on the end-cap (opposite end from display). See item 1 in Figure 10. Unscrew and remove the end cap.
2	Using thumb and forefinger squeeze the power connector at top and bottom to disengage the locking mechanism then pull to disconnect. See item 2 in Figure 10.
3	Unplug the 24V wiring from the module
4	Loosen the two 24V power module retaining screws. The screws are captive.
5	Pull the 24V power module out of the transmitter.
6	The replacement 24V Power Modules are supplied with the “J2” Jumper in the NON-RTD position. For 24V Transmitters utilizing RTD sensors, move the “J2” jumper to the “RTD” position on the power module shown in Table 21.
7	Insert the replacement 24V power module into the transmitter. Reattach the screws and tighten to 0,4 – 0,6 N-M (3.5 – 5.3 Lb-in). Re-connect battery connector. Honeywell recommends lubricating the end cap O-ring with a Silicone Grease such as Dow Corning #55 or equivalent before replacing the end cap.
8	Screw the end cap back on and tighten the M3 locking screw.
9	Dispose of the Power Module according to local regulations

8.5 Replacing antenna

Tools required

- #1 Phillips Screwdriver or 1/8” Slotted Screwdriver
- Torque Screwdriver
- 1.5 mm hex key

Procedure

ATTENTION

You must replace your antenna with the same type, that is, elbow, 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 integrally mounted antenna shroud is made of Teflon® and has a surface resistance greater than 1Gohm per square. When the XYR 6000 transmitter 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.

Table 22 Antenna replacement procedure

Step	Action
1	Honeywell recommends that the transmitter be removed from service and moved to a clean area before servicing.
2	Loosen the M3 locking set screw on the display end-cap. See item 1 in Figure 12. Unscrew and remove the front end cap.
3	Loosen the two screws on the sensor module. See items 2 in Figure 12.
4	Remove the sensor module from the transmitter body and disconnect the antenna connector from CN2 connector on the sensor module. See item 3 in Figure 12.
5	Loosen the locking set screw at the antenna base. Unscrew the antenna from the transmitter. Remove the antenna and its connector from the transmitter. See Figure 12.
6	Feed the new antenna’s connector through the antenna hole to the front of the transmitter. Do not connect to sensor module yet. Lubricate o-ring with Silcone Grease such as Dow Corning #55. Screw new antenna into transmitter body until finger-tight, then back off 180 degrees to permit adjustment later.
7	Attach antenna connector to CN2 connector on sensor module. See item 3 in Figure 12.
8	Insert sensor module. Orient in the proper viewing orientation before tightening two sensor compartment screws. See items 2 in Figure 12. Torque screws to 0,4 – 0,6 N-M (3.5 – 5.3 Lb-in).
9	Replace the front end cap. Honeywell recommends lubricating the front end cap O-ring with a Silcone Grease such as Dow Corning #55 or equivalent before replacing the end cap.
10	Adjust antenna for best reception. Don’t rotate antenna more than 180 degrees either direction or you could twist and break the antenna wiring inside. Tighten the antenna locking set screw.

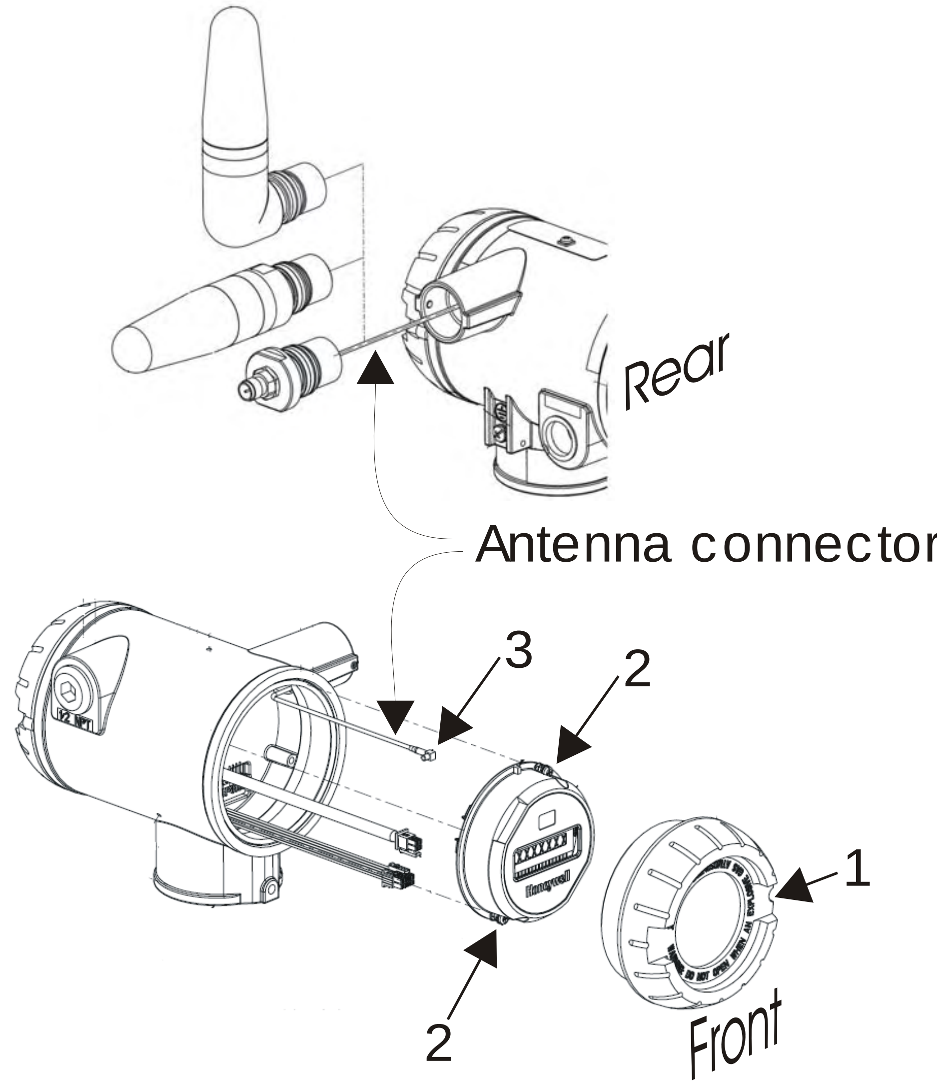


Figure 12 Antenna replacement

8.6 Replacing terminal board

When to replace

Various error messages can help you diagnose a faulty terminal board. These are described elsewhere in this manual.

Tools required

- #1 Phillips Screwdriver or 1/8” Slotted Screwdriver
- Torque Screwdriver
- 1.5 mm hex key

Procedure

WARNING

Risk of death or serious injury by explosion. Do not open transmitter enclosure when an explosive gas atmosphere is present.

Table 23 Terminal board replacement procedure

Step	Action
1	Honeywell recommends that the transmitter be removed from service and moved to a clean area before servicing. **SHOCK HAZARD** Depending on your installation, transmitter input wiring sources may contain high voltage. Disconnect all power from transmitter input sources before accessing the terminal board. Failure to do so could result in death or serious injury.
2	Loosen the M3 locking set screw on the battery end-cap (opposite end from display). See item 1 in Figure 13. Unscrew and remove the end cap.
3	Using thumb and forefinger, squeeze the battery connector at top and bottom to disengage the locking mechanism, then pull to disconnect. See item 2 in Figure 13.
4	Loosen the two battery holder retaining screws (closest to the batteries). See item 3 in Figure 13. The screws are captive.
5	Pull the battery holder out of the transmitter.

Step	Action
6	Disconnect field wiring from terminal board and label it to ease reconnection.
7	Remove and save the 3 screws that attach the terminal board to the housing. Take care because these screws are not captive. See item 4 in Figure 13.
8	Remove terminal board by disconnecting cable from back of the terminal board. Do not pull on the wires or you could damage them. Instead, depress the latch while pulling on the connector.
9	Attach connector to new terminal board. Observe correct polarity of the connector. Verify that the cable is latched to the terminal board.
10	Fasten terminal board with screws from step 7.
11	Re-connect field wiring.
12	Insert the battery holder into the transmitter. Reattach the screws and tighten to 0,4 – 0,6 N-M (3.5 – 5.3 Lb-in). Re-connect battery connector. Honeywell recommends lubricating the end cap O-ring with a Silicone Grease such as Dow Corning #55 or equivalent before replacing the end cap.
13	Screw the end cap back on and tighten the M3 locking screw.

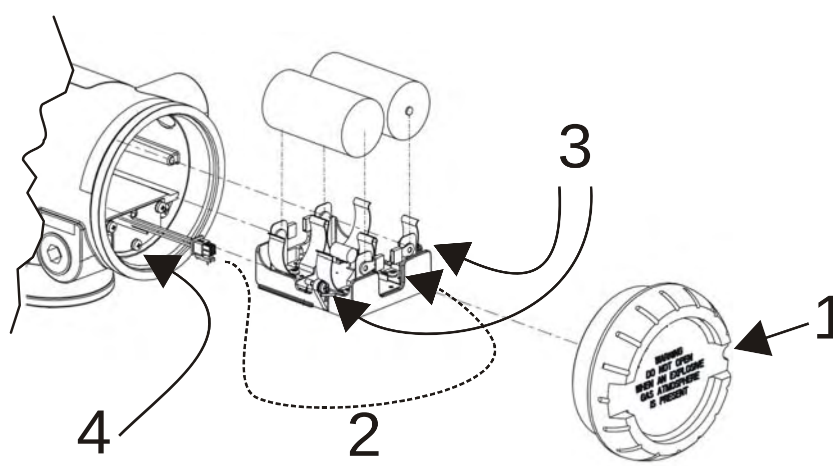


Figure 13 Terminal board replacement

Sales and Service
For application assistance, current specifications, pricing, or name of the nearest Authorized Distributor, contact one of the offices below.

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