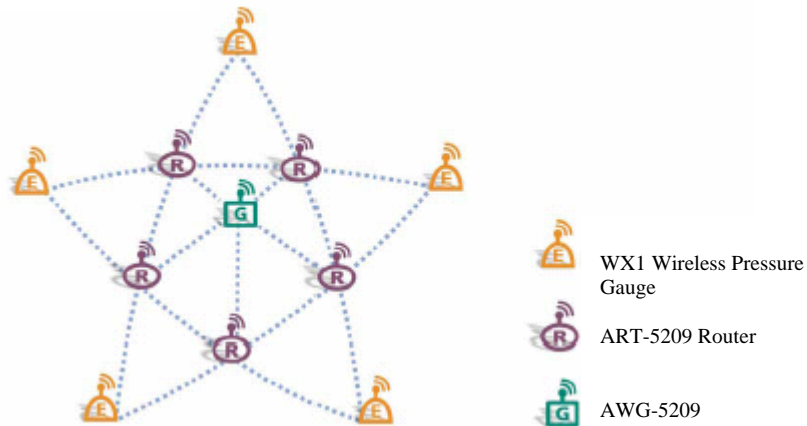


XW-1 916 MHz Wireless Pressure Gauge Network User's Guide

Preliminary



Document Number: 008-10140-9/05

Revision: 0.0

Released: October 2005

XW-1 916 MHz Wireless Pressure Gauge Network User's Guide

PRELIMINARY Rev 0.0

XW-1 916 MHz Wireless Pressure Gauge Network User's Guide

Copyright

This manual is produced and copyrighted by Ashcroft, Inc. any use or reproduction of the contents of this manual without the prior written consent of Ashcroft, Inc. is strictly prohibited

Notice

All title and Ashcroft, Inc owns copyrights to this document. No part of the contents of this document may be reproduced or transmitted in any form or by any means without the written permission of Ashcroft, Inc. Ashcroft, Inc. shall not be liable for errors contained herein. Ashcroft, Inc. shall not be liable for any damages whatsoever, including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss arising out of the use of this documentation even if Ashcroft, Inc. has been made aware of the possibility of such damages. Information contained in this document is subject to change without notice. While every effort is made to ensure that the information is accurate as of the publication date, users are reminded to update their use of this document with documents published by Ashcroft, Inc. subsequent to this date. Third-party product information is for informational purposes only, and constitutes neither an endorsement nor a recommendation. Ashcroft, Inc. expressly disclaims any responsibility with respect to the performance of the third-party products.

Copyright 2005 by Ashcroft, Inc.

ALL RIGHTS RESERVED

Printed in U.S.A.

Ashcroft, Inc.

250 East Main Street

Stratford, CT 06614

Copyright Acknowledgements

Millennial Net TM is a trademark and i-Bean® is a registered trademark of Millennial Net

Microsoft is a trademark of Microsoft Corporation

Ashcroft is a trademark of Ashcroft Holdings Inc

Plus is a registered trademark of Ashcroft Holdings Inc

Panasonic is a trademark of Panasonic Corporation

Duracell is a trademark of Gillette Corporation

Important Agency Approval Information

FCC Compliance Statement

FCC compliance for Ashcroft's XW-1 Wireless Pressure Gauge System (916MHz, 5-3-1) consisting of the following models/components:

- WX-1 Wireless Pressure Gauge
- AGW-5209 Gateway
- ART-5209 Router

Compliance Statement (Part 15.19)

The Ashcroft XW-1 Wireless Pressure Gauge System complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

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.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Compliance Statement

This device has been designed to operate with an antenna having a maximum gain of 2.65 dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 Ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Underwriter's Laboratories

Telemetric Equipment for use in Hazardous Locations
Class 1 Div 2 Groups A B C D



CE Heavy Industrial

Pressure Gauge Safety Precautions

Users should become familiar with ASME B40.1 (Gauges – Pressure Indicating Dial Type Elastic Element) before specifying pressure measuring instruments. That document may be ordered from:

ASME International
Three Park Avenue
New York, N.Y. 10016-5990
800-843-2763 (US/Canada)
95-800-843-2763 (Mexico)
973-882-1167 outside North America
Email: infocentral@asme.org

To prevent misapplication, pressure gauges should be selected considering media and ambient operating conditions. Improper application can be detrimental to the gauge, causing failure and possible personal injury, property damage or death. The following information is offered as a guide in making the proper selection of a pressure gauge. Additional information is available from Ashcroft. The following highlights some of the more important considerations:

1.1 Range – The range of the instrument should be approximately twice the maximum operating pressure. Too low a range may result in (a) low fatigue life of the elastic element due to high operating stress and (b) susceptibility to overpressure set due to pressure transients that exceed the normal operating pressure. Too high a range may yield insufficient resolution for the application.

1.2 Temperature – Ideally, pressure gauges are used at an ambient temperature between –20 and +150F (30 to +65C). At very low temperatures, standard gauges may exhibit slow pointer response. Above 150F, the accuracy will be affected by approximately 1.5% per 100F. Duralife gauges types 1008 and 1009, can withstand continuous operating temperatures up to 250F.

1.2.1 Accuracy – Heat and cold affect accuracy of indication. A general rule of thumb for dry gauges is 0.5% of full scale change for every 40°F change from 75°F. Double that allowance for gauges with hermetically sealed or liquid filled cases, except for Duragauge® gauges where no extra allowance is required due to the elastomeric, compensating back. Above 250°F there may exist very significant errors in indication.

1.2.2 Steam service – In order to prevent live steam from entering the Bourdon tube, a siphon filled with water should be installed between the gauge and the process line. Siphons can be supplied with ratings up to 4,000 psi. If freezing of the condensate in the loop of the siphon is a possibility, a diaphragm seal should be used to isolate the gauge from the process steam. Siphons should also be used whenever condensing, hot vapors (not just steam) are present. Super heated steam should have enough piping or capillary line ahead of the siphon to maintain liquid water in the siphon loop.

1.2.3 Hot or very cold media – A five foot capillary line assembly will bring most hot or cold process media within the recommended gauge ambient temperature range. For media above 750F (400C) the customer should use his own small diameter piping to avoid possible corrosion of the stainless steel. The five-foot capillary will protect the gauges used on the common cryogenic (less than –300F (200C) gases, liquid argon, nitrogen, and oxygen. The capillary and gauge must be cleaned for oxygen service. The media must not be corrosive to stainless steel, and must not plug the small bore of the capillary.

1.3 Media – The material of the process-sensing element must be compatible with the process media. Consult the Corrosion Guide available on the website: www.ashcroft.com. Use of a diaphragm seal with the gauge is recommended for process media that (a) are corrosive to the process sensing element; (b) contain heavy particulate (slurries) or (c) are very viscous including those that harden at room temperature.

1.4 Oxidizing media – Gauges for direct use on oxidizing media should be specially cleaned. Gauges for oxygen service should be ordered to variation X6B and will carry the ASME required dial marking “USE NO OIL” in red letters.

1.5 Pulsation/Vibration – Pressure pulsation can be dampened by several mechanisms; the patented *PLUS!* Performance gauge will handle the vast majority of applications. One exception to this is high frequency pulsation that is difficult to detect. The only indication may be an upscale zero shift due to movement wear. These applications should be addressed with a liquid filled gauge, or in extreme cases, a remotely mounted liquid filled gauge connected with a length of capillary line.

1.6 Gauge fills – Once it has been determined that a liquid filled gauge is in order, the next step is selecting the type of fill. **Glycerin** is suitable for temperature ranges of 20/250°F. **Silicone** filled gauges have a broader service range: – 40/250°F. Oxidizing media require the use of **Halocarbon**, with a service range of –50/250°F.

Table of Contents

Contacting Ashcroft Inc. xx	
World Wide Web xx	
Customer Support xx	
Technical Publications xx	
Important Agency Approval Information	v
Pressure Gauge Safety Precautions	vii
Symbols and Conventions	xi
Introduction	13
Unpacking and Inspection	14
1.0 Product Overview	15
1.1 XW-1 Wireless Pressure Gauge	
1.2 ART-5209 Router	
1.3 AGW-5209 Gateway	
2.0 Network Overview	16
3.0 Hardware Installation	17
3.1 WX1 Wireless Pressure Gauge: Power up and Battery Replacement	
3.2 AGW-5209 Gateway Setup	
3.3 ART 5209 Router Setup	
3.4 AM-5209 Network Monitor Installation	
Host PC Requirements	
3.4.1 Installing Contents of the CD-ROM	
3.4.2 Launching AM-5209 Network Monitor using Windows	
3.4.2 Launching AM-5209 Network Monitor using Windows	
4.0 A-5209 Network Monitor Overview	22
4.1 Configuring a Node's Operation	25
4.2 Configuring Sample Interval of Single Node	26
Appendix A. Product Specification	28
Index	
List of Figures	
List of Tables	

Symbols and Conventions

This guide uses the following symbols and conventions to emphasize certain information.

Note: A note is used to highlight important information relating to the topic being discussed.

Caution

A caution means that a specific action could cause harm to the equipment or to the data.



Warning

A warning describes an action that could result in physical injury, or destruction of property.



Hazard

A hazard is a particular form of warning related expressly to electric shock.

Italics - Indicate the first occurrence of a new term, book title, and emphasized text.

1. Numbered list - Where the order of the items is important.

• Bulleted list - Where the items are of equal importance and their order is unimportant.

Introduction

The WX-1 provides pressure measurement data from numerous clustered measurement points, via radio, in a star, mesh and/or star mesh network topology to a gateway that may interface with an on-line customer's computer system. The system is suitable for laboratory and industrial environments. The wireless gauge may be located inside a building or outside in an open environment, including Class I Div 2 areas. The product is based on the Ashcroft Industrial Pressure gauge with Xmitr technology. The WX1 is used in conjunction with ART-5209 router(s) and an AWG-5209 Gateway to form a wireless pressure measurement network.

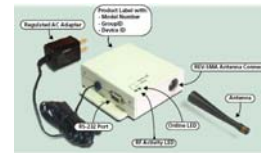
Unpacking and Inspection

Compare the contents of your packages to your order and check visually for damage that may have occurred in shipment. It will consist of one or more of the following items, depending on the order.



Warning: The electronic products are sensitive to electrostatic discharge (ESD). Permanent damage to these devices can result if subjected to high-energy electrostatic discharges. Proper precautions are recommended to avoid performance degradation or loss of functionality.

- WX-1 Wireless Pressure Gauge(s) of specified range(s)
- ART-5209 Router(s) with Model No: ULW305-3315 power supply - Input AC 100-240V 50/60 Hz 0.3A – Output: DC 3.3V 1.5A



- AGW-5209 Gateway(s) with Model No: UL305-3315 power supply – Input: AC 100-240V 0.12A – Output: DC 3.3V 1.5A



- 9 Pin Serial Port Connector Cable(s)
- UL listed, “AA” 3 Volt Lithium Battery(s) or Duracell DL123A or Panasonic CR123A
- Part Number 8xx-xxx-01 Optional Transmitter Extension Cable



1.0 Product Overview

1.1 XW-1 Wireless Pressure Gauge

The WX-1 provides pressure measurement data from numerous clustered measurement points, via radio, in a star, mesh and/or star mesh network topology to a gateway that may interface with an on-line customer's computer system. The system is suitable for laboratory and industrial environments. The wireless gauge may be located inside a building or outside in an open environment, including Class I Div 2 areas. The product is based on the Ashcroft Industrial Pressure gauge with Xmitr technology. The WX1 is used in conjunction with ART-5209 router(s) and an AGW-5209 Gateway to form a wireless pressure measurement network.

1.2 ART-5209 Router

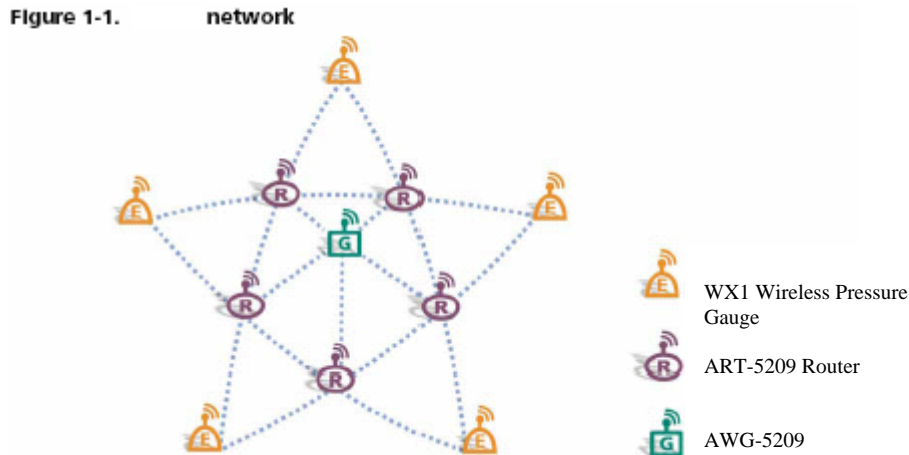
A router is used to extend the coverage area of the wireless gauge network by passing the communication through one or more routers in a wireless network. In order to achieve this capability the router must always be powered. This requires that the router be mains powered. The router can communicate up to 30 meters or more to a gateway or another router and 20 meters to a wireless gauge transmitter. Routers can be used to increase the distance between a wireless gauge transmitter and gateway, extending the span of the network to thousands of meters. Routers are also used to improve the integrity of communication networks that show significant problems with channel coherence or interference by providing alternate (mesh) communication paths from measurement to gateway. Wireless communication networks consisting of only XW-1 wireless pressure gauges can only form a star topology, as the XW-1 wireless pressure gauges cannot communicate between each other but only to the gateway.

1.3 AGW-5209 Gateway

The gateway allows network monitoring and control. It serves as the focal point of the network. It aggregates data traffic from endpoint transmitters and routers within radio range, and communicates to a host computer. The gateway also relays commands from the host computer to routers and endpoint transmitters and supervises the operation of the network.

2.0 Network Overview

Ashcroft's innovative, self-organizing network technology combines battery-powered WX1 wireless pressure gauges and ART-5209 routers and an AWG-5209 Gateways to form a reliable, scalable star-mesh wireless network (see [Figure 1-1](#)). This is a unique solution for low data-rate networks that provides both long battery life at the pressure sensor interfaces and fault-tolerant networking. The network protocol creates robust, fully redundant wireless links from the AWG-5209 Gateway to the WX1 wireless pressure gauge through a self-configuring mesh network.



Each network device is configured at the factory with a unique *device ID* and a *group ID*. The device ID identifies the device within a network, while the group ID identifies the WX1 network that the device is associated with. The group ID allows the system to establish multiple networks within the same location without interfering with each other. Devices (WX1 wireless gauges and ART-5209 routers) can join a specific network only if they have the same group ID that is assigned to the AWG-5209 Gateway. Both group and device IDs are statically assigned and cannot be changed by a system user. The network elements self-organize at power-up and re-configure in response to changes in the environment network traffic, device status, and location. This enables mobility and minimizes installation and operating costs.

XW-1 Wireless pressure Gauges contain a Bourdon tube pressure sensor, movement, Xmitr™ inductance sensor, microcomputer, and a wireless transceiver

ART-5209 Routers extend network coverage area, routes around obstacles, and provides back-up routes in case of network congestion or device failure.

AGW-5209 Gateways interface the XW-1 network to your host PC. They aggregate data from the network and act as a portal to monitor performance and configure network parameters. AGW-5209 Gateways connect via an RS-232 connection to the host PC, which in turn could be connected to a LAN or the Internet through one or more physical-layer interfaces, including RS-232, Ethernet, 802.11, landline or cellular modem. XW-1 wireless pressure gauges, ART-5209 Routers, and AGW-5209 Gateways self-organize at power-up and quickly re-configure as devices join, leave, or move around the network. They also adapt to changes in network traffic and propagation conditions. These capabilities enable mobility of individual devices or the entire network, and minimize installation and operating costs.

3.0 Hardware Installation


The following procedures describe in order, how to install the hardware components of the WX1 Wireless pressure measurement system. When initially setting up the hardware, it is recommended that AGW-5209 Gateway, ART-5209 Routers, and WX-1 wireless pressure gauge be placed close to the host PC. This will make verifying proper network installation and operation easier when first establishing a session with A-5209 Network Monitor. The devices can then be moved away from the host PC to their ultimate locations.

3.1 WX-1 Wireless Pressure Gauge: Power up and Battery Replacement

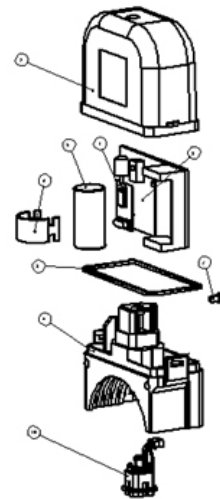
The WX-1 Wireless pressure gauge is comprised of a Bourdon tube gauge and movement assembly, Ashcroft's patented Xmitr™ inductance sensor, power management board, microcomputer, and a wireless transceiver. It is powered by a UL listed, 3 Volt, 2/3 "AA" cell and can run for years, depending on user configured transmission interval.

Note: The WX-1 Wireless pressure Gauge is UL approved for Telemetric Equipment for use in Hazardous Locations Class 1 Div 2 Groups A B C D.

The unit is shipped with the battery installed but must be opened to turn the power switch located on the interface board "on".

 **Warning. Opening the housing must be performed in a non-hazardous area. Take precautions to avoid ESD, which can cause damage to the circuitry.**

1. Remove transmitter-housing cover.
 - A. Remove the M3 Philips head screw from the top of the plastic housing.
 - B. Gently pry the retainer tabs away from the sides of the plastic housing to clear the locking tabs.
 - C. Lift the housing cover off and place to the side.



2. The switch is located in the upper left quadrant of the interface board as view from the component side
 - A. To power up move the switch to the "on" position. **Note:** If the battery is being replaced make sure the power switch is in the "off" position.
3. Battery Replacement
 - A. Remove the battery retaining clip (item XX)
 - B. Note the orientation of the battery with regard to polarity (positive up)

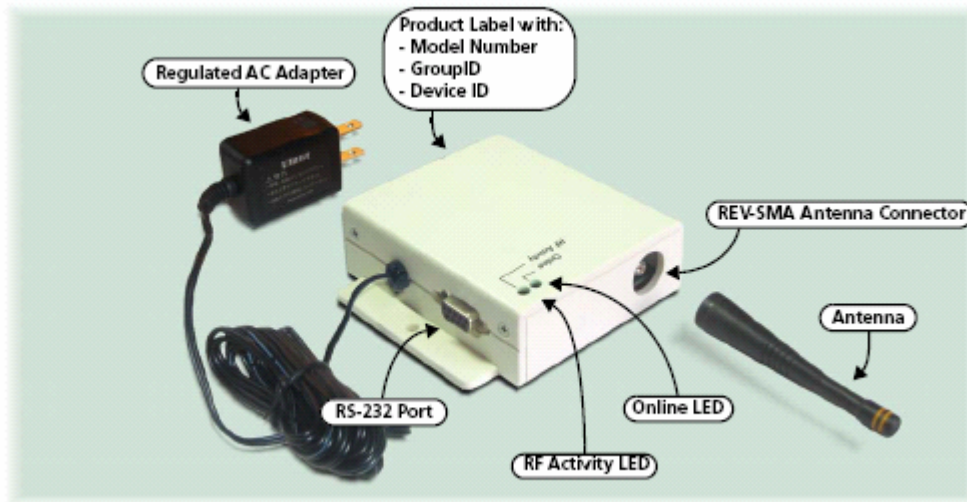
- C. Install a new battery (UL listed, “AA” 3 Volt Lithium Battery(s) or Duracell DL123A or Panasonic CR123A)
4. Replace the transmitter housing cover insuring that the gasket (item XX) is in good condition and properly oriented.

3.2 AGW-5209 Gateway Setup

Warning. The AGW-5209 Gateway is not approved for use in hazardous locations.

The Gateway, model number AGW-5209 (label with model number on bottom), is shipped enclosed in a case that has openings for access to the antenna and RS-232 connectors as shown in Figure 2-1.

Figure 2-1



2. Connect the RS-232 cable between the gateway and the host PC.
3. Plug the factory-installed AC adapter into a 110 VAC power source. The gateway is ready to interface with the host device and surrounding network nodes (XW-1 pressure gauges and ART5209 Routers). For information on the behavior of the status LEDs, see [Table 2-1](#).

Table 2-1. Gateway Status LEDs

LED	Led State	Status
Online	On	Connection with host device detected.
	Blinking	No host device detected or iB-5209 Network Monitor not running.
	Off	Power has been removed.
RF Activity	On	Gateway detects RF activity*.
	Off	No RF activity detected.

* The RF Activity LED will flash when detecting valid packets (packets destined for device) and may also flash when detecting invalid packets (packets destined for other devices) or environmental noise. The device processes only valid packets.

3.3 ART 5209 Router Setup



Warning: The ART-5209 Router is not approved for use in hazardous locations.

The router(s), model number RT-5209 (label with model number on bottom), are shipped enclosed in cases that have openings for access to the antenna and RS-232 connectors, similar to the Gateway shown in [Figure 2-1](#) above.

Installing antenna and applying power

To install a router:

1. Attach one of the included antennas to the REV-SMA antenna connector. The antenna screws onto the connector.
 2. Connect one of the following power sources supplied with the kit:
 - **Regulated AC Adapter** Plug the regulated AC adapter into a 110 VAC power source.
 - **Batteries:** For applications where a 110 VAC power source is not available, the Router can be converted to a battery-powered device. For instructions on installing a battery pack, see '[Converting to battery power](#)' on page PP.
- The router is ready to operate as a router device (see note below). For information on the behavior of the status LEDs, see [Table 2-2](#).
3. Repeat Steps 1 and 2 for each router, if applicable.

Router status LED operation

Table 2-2 describes how the behavior of the status LEDs on the router.

Caution. When attaching the antenna, only hand-tighten the antenna to the connector. Using excessive force may damage the connector.

Table 2-2. Router Status LEDs

LED	Led State	Status
Online	On	Online and in network.
	Blinking	Offline and searching.
	Off	No power.
RF Activity	On	i-Bean Router detects RF activity*.
	Off	No RF activity detected.

3.4 AM-5209 Network Monitor Installation

The procedures in this section describe how to do the following:

1. Use the CD-ROM shipped with the evaluation kit to install the following items onto the host PC:
 - AM-5209 Network Monitor
 - API software
 - AM-5209 i-Bean Endpoint Data Sheet
 - AGW-5209 Gateway and ART-5209 Router Data Sheet
 - AM- 5209 Evaluation Kit User's guide
 - Release Note
2. Open an AM-5209 Network Monitor session.

The software installation procedure utilizes an InstallShield Wizard that will guide you through the installation process. When the process is complete, an AM-5209 Network Monitor shortcut icon is also added to the host PC's desktop.

3.4.1 Installing Contents of the CD-ROM

To install the software contained on the CD-ROM:

Host PC Requirements

The host PC must have the following minimal configuration:

- MS Windows XP or 2000
- Processor: 1.0 GHz or greater
- 512 MB RAM
- RS-232 serial port
- CD-ROM drive for loading software
- Display with SVGA (800 x 600) resolution or greater
- 10 MB free disk space
- Microsoft Visual C/C++ for development purposes

Insert the AM-5209 CD into the host PC's CD-ROM drive. The Auto-run feature launches the InstallShield Wizard. Follow the prompts to install the contents of the CD onto the host PC.

Note: If Auto-run is not enabled, drill down to the contents of the kit CD and double-click on **setup.exe**. The InstallShield Wizard is launched. Follow the prompts to install the contents of the CD onto the host PC. Proceed to ['Launching AM-5209 Network Monitor using Windows' on page PP](#).

Note: If a version of AM-5209 Network Monitor already exists on the host PC, it will be detected during the installation process. A special prompt screen is then displayed, allowing you to modify, repair, or remove the existing files. You must select **Remove** to uninstall the exiting version before installing the version contained on the CD.

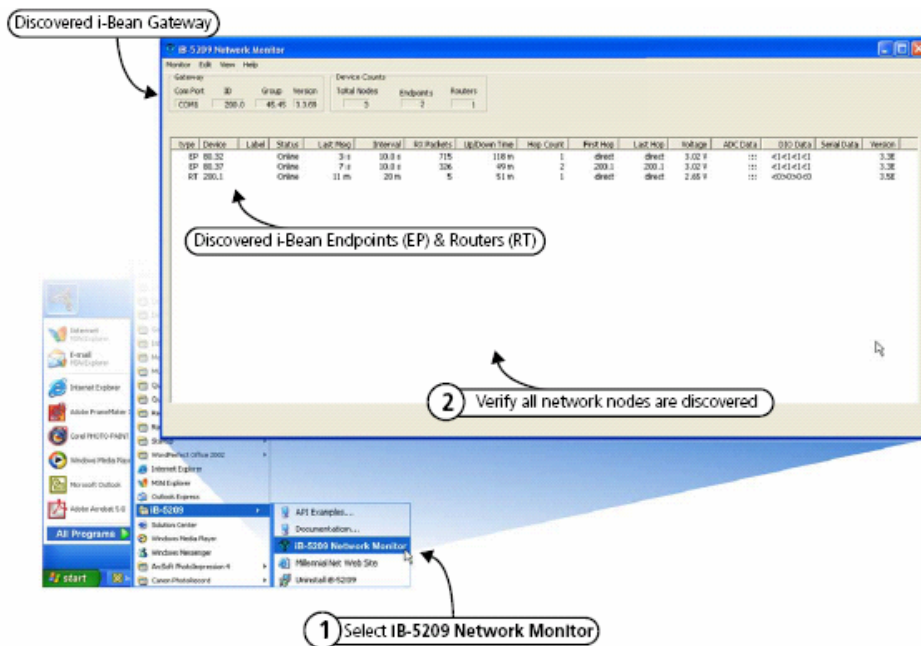
3.4.2 Launching AM-5209 Network Monitor using Windows

Using the standard application launching methods of Windows, the following procedure describes how to launch AM -5209 Network Monitor and verify proper communication with the XW-1 network nodes (see [Figure 2-5](#)):

1. To launch AM-5209 Network Monitor, do one of the following:
 - Double-click on the desktop's AM-5209 Network Monitor icon.
 - From the Windows taskbar, select:

Start>All Programs>AM-5209>AM-5209 Network Monitor.

2. Verify that all network nodes are discovered and displayed by AM-5209 Network Monitor.



Once proper operation of the XW-1 network has been verified, proceed to [Chapter C, "Network Monitor Operations"](#) for an overview of the GUI and details on how to use it to configure the operation of your network.

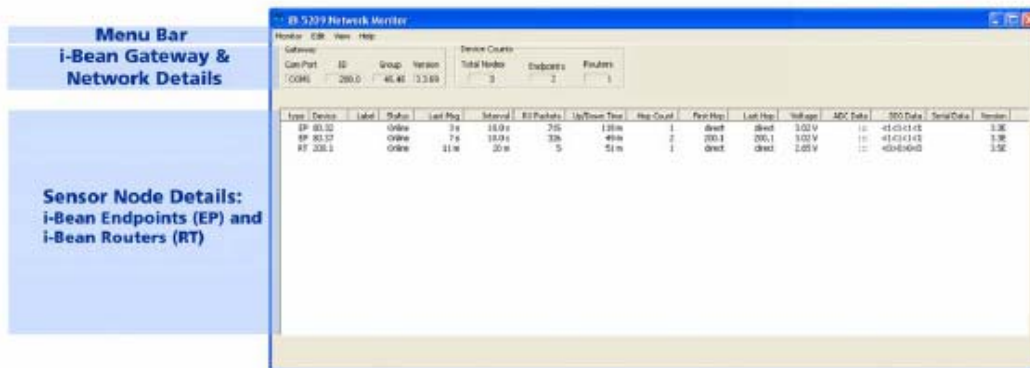
4.0 A-5209 Network Monitor Overview

The AB-5209 Network Monitor is a monitoring and management system for AB-5209 networks. This management tool will discover and display active Routers in the vicinity of the Gateway, and XW-1 Endpoints in the range of the Gateway and Routers as shown in [Figure 3-1](#). AB-5209 Network Monitor displays the *Group ID* and *Device ID* of the Gateway and will display only XW-1 gauges and Routers that have the same Group ID as the Gateway. (For information on opening a AB-5209 Network Monitor session, see '[Launching AB-5209 Network Monitor using Windows](#)' on page PP.)

Using AB-5209 Network Monitor, a number of the monitoring features may be observed:

- **Any of the XW-1s can be moved, and as long as they are within the range of a Router or the Gateway, connectivity will be maintained seamlessly.** Any of the Routers and even the Gateway can be moved while operating, and all routes will automatically adapt to their new locations.
- **The network routing protocol always seeks to route data using the most reliable RF links with the fewest hops.** The network protocol will change the route when an RF link in the route is deemed unreliable. This can be seen in the AB-5209 Network Monitor. For example, the Router IDs used for the first and last hops may change from time to time even when the XW-1 is stationary, due to environmental interference.
- **If any of the Routers runs out of battery power or is turned off, all routes that went through that Router will be reconfigured—all XW-1s communicating with that Router will still be connected to other Routers without any disruption or loss of packets.** However, if a XW-1 exceeds the range of the network due to the loss of a Router, then the XW-1 will be displayed as Offline or removed from the display (depending on how the Persistence function is configured).

Figure 3-1. Sample AB-5209 Network Monitor window



As shown in [Figure 3-1](#), the main window is divided into the following sections:

Menu Bar

From the menu bar, system users access the following:

• Monitor

This menu option provides access to the following functions:

- **Thread Priority:** This setting refers to the priority level of the iB-5209 Network Monitor program in a MS Windows operating system environment. For details, see '[Setting Thread Priority](#)' on page 3-6.

- **Exit:** Ends the session and closes iB-5209 Network Monitor.

- **Edit**

- **Devices:** Displays the Edit Device window used to configure a node's sampling interval time, I/O interfaces, and start/stop recording I/O information to a log file. For details, see '[Configuring a Node's Operation](#)' on page PP.
- **Labels:** Assign user-defined names to i-Bean Endpoints and i-Bean Routers on the network. For details, see '[Labeling XW-1s or Routers](#)' on page PP.
- **Logging:** Create a log file of reported network events, such as reported up/down events and changes to voltages or routes. For details, see '[Creating an Event Log File](#)' on page PP.
- **Persistence:** Stop monitoring/displaying offline i-Bean Endpoints and i-Bean Routers. For details, see '[Configure Persistence Attributes](#)' on page PP.
- **Data Format:** Configure the following I/O data formats:

- **Serial Data Format:** Define format of displayed serial data (ASCII/Hex/Decimal)

- **ADC Data Format:** Define format of displayed ADC data (Voltage/Raw Data) For details, see '[Configure Serial and ADC Data Formats](#)' on page PP.

- **Com Port:** Select serial port on Host PC to use for i-Bean Gateway connection. For details, see '[Select Com Port on Host PC](#)' on page PP.
- **All Sampling Intervals:** Configure all network nodes with the same sampling interval time. For details, see '[Configuring Sample Interval of all Network Nodes](#)' on page PP.

- **View**

- **Monitor Statistics:** Open Monitor Statistics window, displaying RX/TX packet and byte information.
- **Log:** Display contents of log file.

- **Help**

- **About:** Displays AB-5209 Network Monitor revision level information. **3-4**

Gateway: This section displays the following information on the Gateway connected to the host PC's RS-232 port:

- **Com Port:** Host PC's RS-232 port connected to the Gateway.
- **ID:** Device identifier assigned to the i-Bean Gateway. The ID consists of two octets (A.B), where each octet's value = 000 to 255.
- **Group:** Group identifier assigned to the i-Bean Gateway. All Routers and XW-1s with the same Group identifier will communicate with the displayed Gateway.
- **Version:** Version of firmware loaded on the Gateway.

Device Counts This section displays the following information on the discovered network nodes:

- **Total Nodes:** Total combined number of discovered XW-1s and Router nodes.
- **Endpoints:** Total number of XW-1 nodes.
- **Routers:** Total number of discovered Router nodes.

Sensor Node Details This section displays the following information related to the XW-1 and I Bean Router nodes on the network:

- **Type:** This column lists all nodes discovered on the network that are assigned the same Group ID as the displayed Gateway. Nodes displayed here include XW-1s and Routers

- **Device:** Unique identifier assigned each node. The identifier consists of two octets (A.B), where each octet contains a value between 000 and 255.
 - **Label:** User-defined name assigned to node.
 - **Status:** Current status of the device:
 - **Online:** The node is communicating with the Gateway.
 - **Offline:** The Gateway can no longer communicate with the node.
 - **Queued:** The node, when it first comes into the network, is waiting to be acknowledged by the Gateway.
 - **Late:** Packet from node is delayed (possible route interference).
 - **Refresh:** The node is being updated with a new operating state.
 - **Last Msg:** Time elapsed since last packet was received from the node. Time is displayed in seconds (s).
- Interval:** Time of the last message generated by a node. This value is synchronized with the sampling interval of the node. Time is displayed in either seconds (s) or minutes (m).
- **RX Packets:** Number of packets successfully delivered to iB-5209 Network Monitor from a node since the node was detected by the Gateway. The counter is reset if one of the following actions occur:
 - The node is powered down.
 - The Gateway is powered down.
 - A Router used as a network hop is powered down.
 - AB-5209 Network Monitor program is restarted.
 - **Up/Down Time:** Time since the node was first detected by the i-Bean Gateway.
 - **Hop Count:** Number of network node hops taken by a packet delivered from a node to the Gateway. For example: XW-1—Gateway = 1 hop, XW-1— Router— Gateway = 2 hops (each additional Router will add another hop).
 - **First Hop:** Device ID of the first Router on the path used by a packet to get to the Gateway. If no Router was used, then *Direct* will display, indicating the device is communicating directly with the Gateway.
 - **Last Hop:** Device ID of the last i-Bean Router on the path used by a packet to get to the Gateway. If no Router was used, then *Direct* will display, indicating the device is communicating directly with the Gateway.
 - **Voltage:** DC voltage level of the node's power source in volts.
 - **ADC Data:** Input voltages on pins used for analog-to-digital conversion operation.
 - **DIO Data:** Digital information on pins used for digital I/O operation.
 - **Serial Data:** Input serial data information when configured for serial operation.
 - **Version:** Version of firmware loaded on the node.

4.1 Configuring a Node's Operation

From AB-5209 Network Monitor, use one of the following methods to open the the Edit Device window used to configure the operation of an XW-1 or Router:

- Double-click on the desired device from the list of discovered sensor nodes in the main display. The Edit Device window is displayed, showing the current configuration of the selected device (see [Figure 3-2](#)).
- From the menu bar, select **Edit>Devices**. The Edit Device window is displayed, showing the configuration of the last device displayed.

Figure 3-2. AB-5209 Network Monitor's Edit Device window

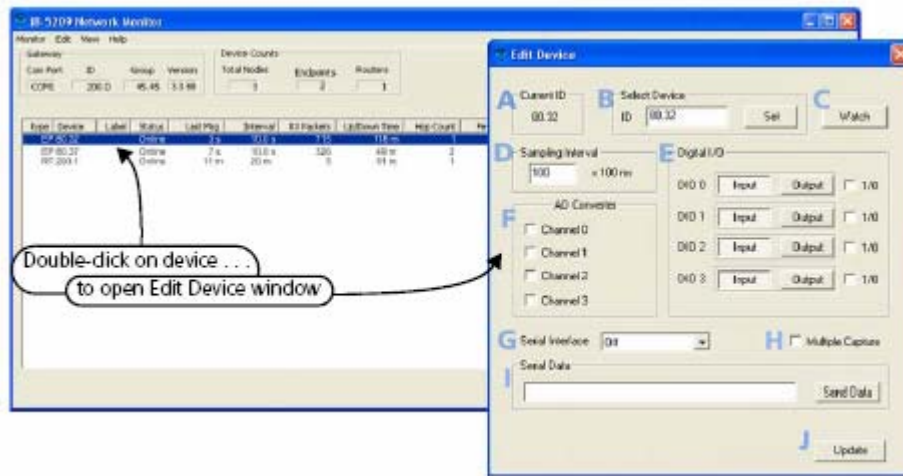


Table 3-1 describes the functions of the various sections of the window as shown in Figure 3-2.

Table 3-1. Edit Device window functions

Item	Description	Function
A	Current ID	This is the Device ID of the node currently selected for configuring.
B	Select Device	Use this panel to select another node to configure by entering the device ID of the desired node, then selecting Set .
C	Watch	This option opens a new widow that displays information relating to the the node's various interfaces, including analog and digital I/O configuration states and packets received/sent. For details, see ' Using Watch Function to Display Current I/O Information ' on page 3-9 .
D	Sampling Interval	This functions configures how often the node transmits a 'heart beat' data packet. For details, see ' Configuring Sample Interval of Single Node ' on page 3-11 .

Table 3-1. Edit Device window functions (continued)

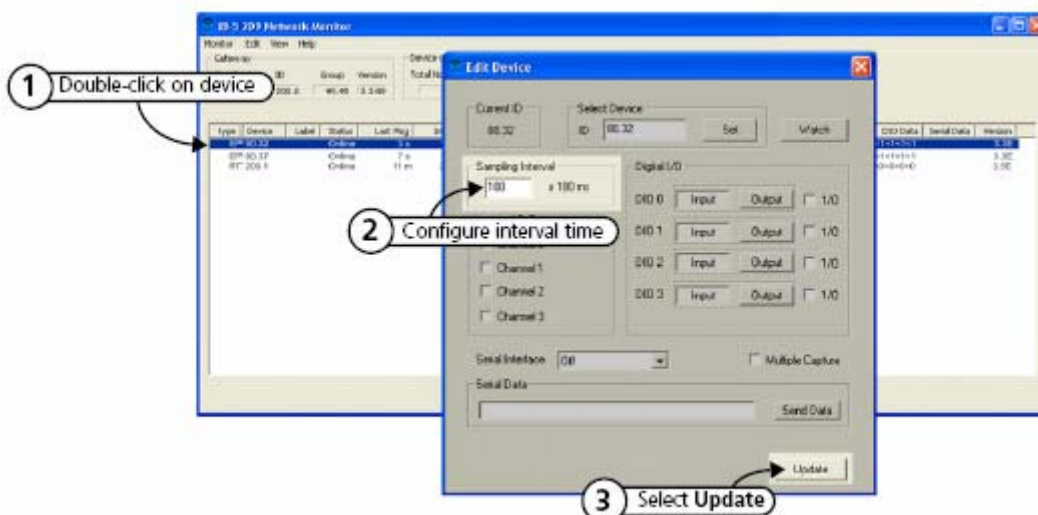
Item	Description	Function
E	Digital I/O	This panel is used to control the states of the I/O pins associated with digital I/O channels D0–D3. For details, see ‘Configuring Digital I/O Operation’ on page 3-12
F	AD Converter	This panel is used to control the states of the AD (Analog-to-Digital) Converter channels. For details, see ‘Configuring AD (analog-to-digital) Converter Operation’ on page 3-17 .
G	Serial Interfaces	This panel is used to select a serial I/O operation for a device: Digital UART, RS-232 (RT-5209 only), or RS-485 (RT-5209 only). Selecting serial operation disables digital I/O functionality. For details, see the following: <ul style="list-style-type: none"> • ‘Configuring UART Operation’ on page 3-15 • ‘Configuring RS-232 Operation (RT-5209 only)’ on page 3-18 • ‘Configuring RS-485 Operation (RT-5209 only)’ on page 3-19
H	Multiple Capture	Multiple capture is a special feature that enables iB-5209 Network Monitor to report the surrounding router information of a given device (an i-Bean Endpoint or an i-Bean Router that has endpoint functionality). For details, see ‘Enable Multiple Capture’ on page 3-28 .
I	Serial Data	This panel, which is only used if the node is configured for serial operation, is used to send serial data to the node and configure the length of the string sent. For details, see the following: <ul style="list-style-type: none"> • ‘Configuring UART Operation’ on page 3-15 • ‘Configuring RS-232 Operation (RT-5209 only)’ on page 3-18 • ‘Configuring RS-485 Operation (RT-5209 only)’ on page 3-19
J	Update	Updates the selected device with any changes made to its configuration.

4.2 Configuring Sample Interval of Single Node

To configure the time interval between data packets transmitted by a node (see [Figure 3-4](#)):

1. Double-click on the desired device from the list of discovered sensor nodes. The Edit Device window is opened, displaying the device’s current configuration.
2. Using the *Sampling Interval* panel, enter the interval sampling rate as a multiple of 100 milliseconds. For example, to configure a sampling interval rate of 10 seconds, enter a value of 100. *minimum value*: 1 (0.1 sec) *maximum value*: 65535 (109 minutes)
3. Select **Update**. The device’s configuration is updated.

Figure 3-4. Configuring sample interval of single node

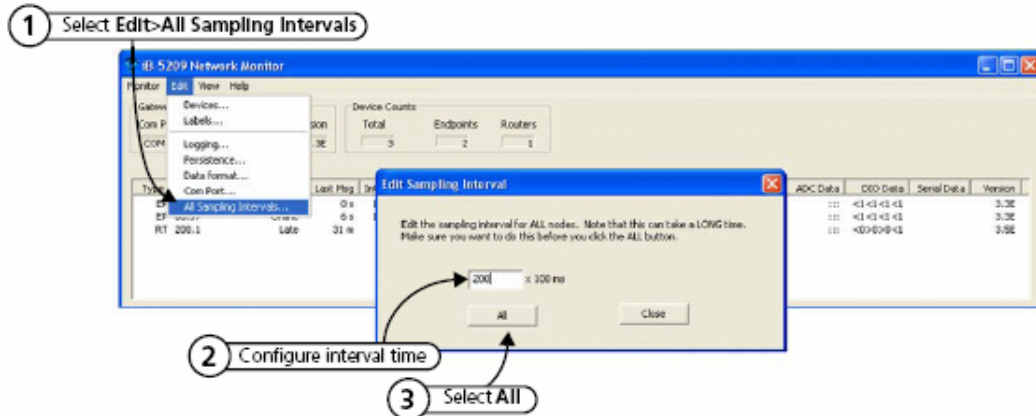


4.2 Configuring Sample Interval of all Network Nodes

To configure all the network nodes with the same sampling interval rate (see [Figure 3-5](#)):

1. Select **Edit>All Sampling Intervals**. The Edit Sampling Interval window is opened.
2. Enter the interval rate as a multiple of 100 milliseconds. For example, to configure a sampling interval rate of 20 seconds, enter a value of 200.
3. Select **All**. All nodes on the network are configured with the sampling interval rate entered.

Figure 3-5. Configuring sample interval of all nodes



Appendix A. Product Specification

• Xmitr Wireless Gauge

- 1) Pressure Ranges: 0/400, 0/600, 0/3000, 4000 PSI
- 2) Size: 2.5" Diameter
- 3) Lower Connect Pressure Inlet – ¼" MNPT
- 4) Housing characteristics
 - Material: 300 S.S. and Lexan 500 10% glass filled UL 94V0 rated
 - Environmental Rating: NEMA 4X, IP41
- 5) Temperature Spec:
 - Operating range: TBD but typical for North America –40 to 85 °C
 - Compensated Range: -20 to 85 °C
 - Thermal Errors Over Compensated Range: $\pm 3\%$ FS Zero and Span Combined
- 6) Wetted Materials:
 - Application 2 Industrial Gauge 316 Stainless Steel/welded wetted components
- 7) Agency Compliance/Approvals:
 - ANSI/ASME B40.1
 - UL 404
 - CE Heavy Industrial
 - UL 1604 Class 1, Div 2
 - FCC
- 8) Xmitr Configuration- Regulated output version based upon a 3.8 volt nominal input voltage. Zero Pressure output will be .3 V dc, Full scale Pressure output will be 2.7 V dc.

• Radio Characteristics

- 1) Frequency: 916 MHz
- 2) Star, Mesh, Star Mesh Network Topology 802.15.4 Compliant
- 3) Programmable features:
 - Transmission interval (message rate) - User programmable through API
- 4) - API Functions Include: See Appendix B. – Millennial API Documentation Transmission Distance
 - Gauge/transceiver: 20 Meters Typical
- 5) Internal Power Requirement: 3.3 VDC
- 6) Battery Type: 3 Volt Lithium
- 7) Battery life: Min. 1 Year - Determined by Transmission Frequency
 - Note: Transmission interval effects battery life and or size required. If interval is once per day battery life of a sensor transmitter (not router) approaches the rated shelf life of the battery.
- 8) Transmitted Data Accuracy: $\pm 2.0\%$ BFSL (Best-Fit Straight Line same as commercial Xmitr specs.)
- 9) Resolution: $\pm 0.5\%$ of FS (1 part in 204 counts based upon an 8 bit ADC)
- 10) Over range/Under range 10% or 25.5 Counts

ART-5209 Router and AGW-5209 Gateway Specifications

Note: Specifications are valid over specified temperature and supply voltage ranges.
Packaging will require upgrading based on final environmental requirements.

Endpoint Power Characteristics

Power Supply: Operating current 8 mA Typical at 3 VDC; radio is active
Standby current 1 mA Maximum in sleep mode; radio is not active
Power supply voltage from AC adapter 1.5 to 3.3 VDC Typical; regulated
Power supply ripple from AC adapter 50 mV Maximum, peak-to-peak

Radio Characteristics

PRELIMINARY Rev 0.0
XW-1 916 MHz Wireless Pressure Gauge Network User's Guide

Direct Sequence Spread-Spectrum
Center frequency 916 MHz ISM band
Transmit power 0 dBm Maximum EIRP
Receive sensitivity -85 dBm Typical
Range to router or gateway 30 m (typical indoor environment, line of sight)
Range to endpoint 20 m (typical indoor environment, line of sight)
Data rate 115 kbps Maximum
RS-232 Interface
Router Data rate 9.6 kbps
Gateway Data rate 115 kbps

Environmental and Mechanical

Operating temperature -40 to +85 °C
Size without antenna (L x W x H) 2.7 x 2.0 x 0.7 inch Height measured from top of highest component on top
69 x 51 x 18 mm of board to top of highest on bottom side. DB-9 hangs off
0.41 inches (10.4 mm).

- Accuracy**, vii
- Agency Approval**, v
- ART 5209 Router Setup**, 7
- Auto-run, 8
- Battery Replacement, 5
- Bourdon tube, 4
- Conventions**, xi
- Copyright**, iii
- Current status, 12
- device ID*, 4
- Device ID*, 10
- Edit Device, 11
- elastic element, vii
- electrostatic discharge. *See*
- ESD, 2
- Extension Cable, 2
- FCC Compliance**, v
- gateway**, 3
- Gateway Setup**, 6
- group ID*, 4
- Group ID*, 10
- Hardware Installation, 5
- Hazard**, xi
- Hazardous Locations, v
- host PC, 8
- Installing antenna**, 7
- Interval**, 12
- launching methods, 8
- Lithium Battery, 2
- mesh, 3
- Monitor Statistics, 11
- network coverage area, 4
- Network Monitor**, 8
- network topology, 3

- Oxidizing media**, vii
- power supply, 2
- power switch, 5
- Power up, 5
- Precautions, vii
- Pressure Gauge, vii
- Pressure pulsation, vii
- Product Specification, 16
- Radio Characteristics**, 16
- regulated AC adapter, 7
- router, 3
- Router status LED**, 7
- RS-232 cable, 6
- RS-232 port, 11
- Safety, vii
- Sample Interval**, 14
- sampling interval rate, 15
- serial data, 11
- star, 3
- status LEDs, 6
- Symbols**, xi
- taskbar, 8
- temperature, vii
- Thread Priority**, 11
- time interval, 14
- transmitter-housing cover, 5
- Underwriter's Laboratories**, v
- Version, 11
- Warning**, xi
- wireless gauge, 1
- Wireless pressure Gauges, 4
- Xmitr technology, 1, 3
- XW-1 network, 4