Honeywell

OneWireless Multinode

User's Guide

OW-CDX050
R110
6/08

.

Notices and Trademarks

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About This Document

This document describes how to configure, install and operate the Honeywell Multinode/Wireless System Gateway. The Multinode/Wireless System Gateway is one component of Honeywell's OneWireless network solution for industrial control.

Release Information

Document Name	Document ID	Release Number	Publication Date
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References

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

Document Title
See 'About This Guide' section for Related Documents.

Technical Assistance and Contacts

Honeywell has technical assistance centers worldwide. Contact the office at your location.

Location and Contact	Location and Contact
United States and Canada Contact: Honeywell Solution Support Center Phone: 1-800 822-7673. In Arizona: 602-313-5558 Calls are answered by dispatcher between 6:00 am and 4:00 pm Mountain Standard Time. Emergency calls outside normal working hours are received by an answering service and returned within one hour. Facsimile: (602) 313-3293 Mail: Honeywell TAC, MS P13 2500 West Union Hills Drive Phoenix, AZ, 85027	**Singapore** Contact: Honeywell Global TAC - South East Asia Phone: +65-6580-3500 Facsimile: +65-6580-3501 +65-6445-3033 Mail: Honeywell Private Limited Honeywell Building 17, Changi Business Park Central 1 Singapore 486073 Email: GTAC-SEA@honeywell.com
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Declaration

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. This release of OneWireless (R110) is targeted at open loop control, supervisory control, and controls that do not have environmental or safety consequence. 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.

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.

Contents

Tables

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About this Guide

Purpose

This guide describes the configuration, installation and integration of the Multinode/Wireless System Gateway (WSG) and associated equipment as part of the Honeywell's OneWireless network solution for industrial applications.

Intended Audience

This guide is intended for people who are responsible for configuring and installing the Honeywell wireless components, monitoring and maintaining these components operating in a wireless network, or those that need to add a new device to an existing system. Some experience and understanding of wireless networks is helpful when using this document.

ATTENTION

Multinodes must be professionally installed in accordance with the requirements specified in the *OneWireless Multinode Agency Compliance Professional Installation Guide*.

How to use this guide

Information in this guide is arranged according to the task that you want perform and is listed in the following table:

If you want to…	See...
Learn more about the multinode/wireless system gateway (WSG)	The Multinode/Wireless System Gateway on page 13.
Understand the installation tasks for multinode/WSG installation	Installation Overview on page 23.
Set the operating mode on the multinode/WSG	System Configuration - Operating Mode on page 45.
Select the security option for the multinode/WSG	Security screen on page 52.
Update the multinode's firmware	System Administration - System Upgrade on page 65.

If you want to…	See...
Set up a wireless mesh and between multinodes and wireless networks	Setting up wireless networks on page 82.
Monitor multinode/WSG operation	Multinode operation and Monitoring on page 97.
Replace a multinode or WSG	Multinode Maintenance on page 111.
Troubleshoot a multinode/ WSG fault	Troubleshooting on page 113.

Related documents

The following documents provide supporting information for setting up and commissioning a wireless network.

- *Getting Started with Honeywell OneWireless Solution*, Document OW-CDX010 - provides a brief description of what to do when setting up a wireless network.
- *OneWireless Planning Guide*, Document OW-CDX030 - provides site planning information.
- *OneWireless System Administration Guide*, Document OW-CDX040 - Provides guidance for the commissioning and administration of a OneWireless system.
- *OneWireless Builder User's Guide*, Document OW-CDX060 - Describes the use of the Wireless Builder application for device node identification and configuration.
- *OneWireless Builder Parameter Reference*, Document OW-CDX070 - A reference containing definitions of the user-visible parameters for defining wireless devices in the system.
- OneWireless Field Device manuals, various documents - describes the function and use of the various wireless field devices (sensors) that can be employed in the system.
- *OneWireless Field Network Dictionary*, Document OW-CDX020 - A glossary of terms and abbreviations used in the wireless system.

On-line help support is available when using Wireless Builder.

OneWireless System

Overview

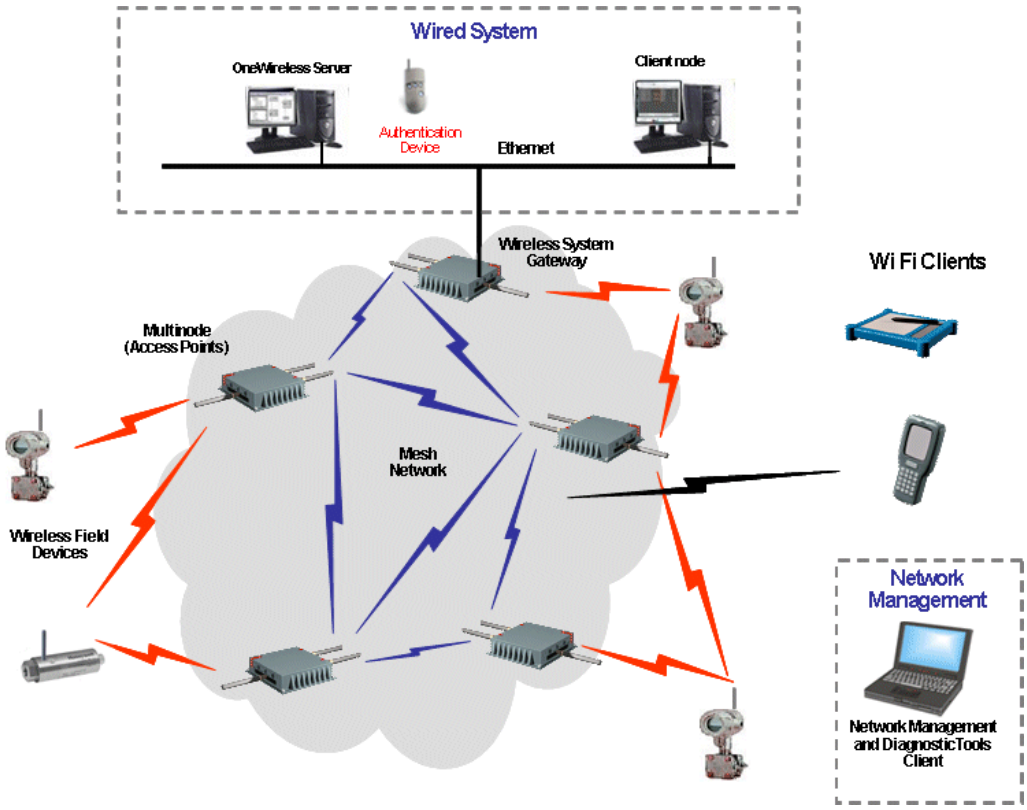
OneWireless is Honeywell's network solution which connects process sensors and transmitters to the control system wirelessly in an industrial control environment. OneWireless uses Radio Frequency (RF) communications to transfer process data between the sensors and the control system, rather than the traditional wired connections.

WNSIA solution

There are four major components that make up Honeywell's OneWireless network:

1. Wireless sensors (field I/O devices, such as temperature or pressure transmitters) that provide replacement for non-electronic or legacy wired sensors.
2. Wireless network infrastructure nodes (Multinodes) that serve as the network backbone to route wireless traffic towards the gateway and the control system.
3. Wireless System Gateways (WSGs) which act as bridges between the wireless network and the wired plant network.
4. Wireless device configuration tools (Wireless Builder, Key Server, Network Management and Diagnostics) allow users to configure, operate and monitor wireless devices.

A typical OneWireless network using these components is shown in Figure 1.



NOTE: The Key Server and Wireless Builder are installed on the OneWireless Server.

Figure 1 Honeywell's OneWireless solution for Wireless Network for Secure Industrial Applications (WNSIA)

OneWireless Network topology

Honeywell uses a wireless mesh network to achieve the OneWireless solution. A mesh network provides multiple RF communication paths between multinodes and Wireless System Gateways to transfer data to and from the wireless field devices. For example, in Figure 1 the WSG is connected to the wired network of the control system. Four multinodes are operating as Access Points (APs), communicating with the field devices and the WSG. Each multinode also is communicating with the other multinodes to form a mesh network. Multiple communications paths are also made between any field device and the WSG via any multinode in the network. Wi Fi clients can connect to the network via the multinode access points.

Agency compliance information

This section contains agency compliance information for Honeywell's OneWireless Multinode. For additional details on compliance information, see also the *OneWireless Multinode Agency Compliance Professional Installation Guide*.

Compliance statements and restrictions

This section contains the Federal Communications Commission (FCC), Industry Canada (IC) and Radio Frequency compliance statements for the OneWireless Multinode device.

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 their own expense.
- Intentional or unintentional changes or modifications must not be made to the Multinode 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 Multinode 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.

Agency approval marks

The following table describes the agency approval for the Honeywell OneWireless Multinode.

Symbol	Description
	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 harmonized with the 94/9/EC Directive (ATEX Directive, named after the French "ATmosphere EXplosible").
	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.
	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.

Honeywell Declaration of Conformity information

This section contains the Declaration of Conformity (DoC) statement for the Multinode device and the countries it is intended to be used in. For a complete list of compliant models, contact Honeywell.

Multinode device DoC statement

Following is Honeywell's Declaration of Conformity (DOC) for the OneWireless Multinode Device.

R&TTE Directive	1999/5/EC	**LVD Directive**	73/23/EEC	**EMC Directive**	2004/108/EC	**ATEX Directive**	94/9/EC
Harmonized Standards							
Emissions Specification and Method: EN 300 328 V1.7.1 Emissions Spec and Method: EN 301 893 V1.4.1 Immunity Specification: EN 301 489-17 V1.2.1 Immunity Method: EN 301 489-1 V1.6.1 Product Standard: IEC61326-1 (1st Edition, 2002-02, Industrial Locations) EN 50014:1992, "Electrical Apparatus for Potentially Explosive Atmospheres – General Requirements" EN 50021:1999, "Electrical Apparatus for Potentially Explosive Atmospheres – Type of Protection "n"							
Manufacturer's Name and Address	Honeywell Process Solutions 2500 West Union Hills Drive, Phoenix, AZ 85027, USA						
Compliance Statement	The product herewith complies with the harmonized standards listed above. Typical product line systems and configurations have been tested, for compliance.						

Intended country usage

The following table lists the countries in which the Honeywell Multinode device is intended to be used.

Country	ISO 3166 2 letter code	Country	ISO 3166 2 letter code
North America			
United States	US	Canada	CA
Australia and New Zealand			
Australia	AU	New Zealand	NZ
European Union			
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

Declaration of conformity statements

Language	Statement
Česky (Czech):	***Honeywell*** tímto prohlašuje, že tento ***Multinode*** je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk (Danish):	Undertegnede ***Honeywell*** erklærer herved, at følgende udstyr ***Multinode*** overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch (German):	Hiermit erklärt ***Honeywell***, dass sich das Gerät ***Multinode*** in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti (Estonian):	Käesolevaga kinnitab ***Honeywell*** seadme ***Multinode*** vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, ***Honeywell***, declares that this ***Multinode*** 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 ***Multinode*** 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 ***Multinode*** 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 ***Multinode*** 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 ***Multinode*** è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski (Latvian):	Ar šo ***Honeywell*** deklarē, ka ***Multinode*** atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių (Lithuanian):	Šiuo ***Honeywell*** deklaruoja, kad šis ***Multinode*** atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Language	Statement
Nederlands (Dutch):	Hierbij verklaart ***Honeywell*** dat het toestel ***Multinode*** in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti (Maltese):	Hawnhekk, ***Honeywell***, jiddikjara li dan ***Multinode*** jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar (Hungarian):	Alulírott, ***Honeywell*** nyilatkozom, hogy a ***Multinode*** megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
Polski (Polish):	Niniejszym ***Honeywell*** oświadcza, że ***Multinode*** jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português (Portuguese):	***Honeywell*** declara que este ***Multinode*** está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko (Slovenian):	***Honeywell*** izjavlja, da je ta ***Multinode*** v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky (Slovak):	***Honeywell*** týmto vyhlasuje, že ***Multinode*** spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi (Finnish):	***Honeywell*** vakuuttaa täten että ***Multinode*** tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska (Swedish):	Härmed intygar ***Honeywell*** att denna ***Multinode*** 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 ***Multinode*** er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
Norsk (Norwegian):	***Honeywell*** erklærer herved at utstyret ***Multinode*** 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

The Multinode/Wireless System Gateway

Multinode description

The Multinode is a wireless RF transmitter-receiver and router that is used to create the wireless communications network. Communication occurs by establishing radio links between the multinode and other wireless devices that are configured to operate as part of the Wireless Local Area Network (WLAN). It routes network traffic between devices, such as wireless field devices, other multinodes and wireless system gateways.

The multinode is enclosed in a weatherproof enclosure and is mounted on a pole, a wall or near rooftop locations where it can transmit, receive and route control messages between field devices and the WSG. Figure 2 shows the physical features of the multinode. The multinode and the WSG are physically the same, and contain the same internal components. The operating mode selection during configuration enables the multinode to operate as a WSG or a multinode.

Operating modes

Multinodes can be configured to operate as either a Wireless System Gateway- in which the multinode acts as a device connecting the wireless network with the wired control system; or as a Multinode- which is an access point that communicates with the wireless field devices and the WSGs in the wireless network. Note that a WSG may also be configured to act as an access point within the wireless network. Multinodes also can be configured to provide mesh communications where multinodes communicate with other multinodes and WSGs to form a mesh network. The WSGs and multinodes use IEEE 802.11a/b/g communications protocol to communicate and complete the wireless network. Multinodes may also be connected to WSGs through a wired Ethernet link.

System security

OneWireless system uses both encryption keys and secure key deployment to secure the wireless network. Security of the multinodes operating in a mesh network use key encryption. During multinode configuration an encryption key is created which is then copied to the configuration of other multinodes that will operate in the same network. Every wireless communication is encrypted using a strong security key, (see Data Encryption for more information).

Security between multinodes and field I/O devices is achieved through secure key deployment. Security keys are generated by the key server and then are deployed to individual field I/O devices via an authentication device. Security keys are dynamic and change automatically by the system following initial deployment providing a greater level of security for the wireless network.

The Key Server is an application operating on the wireless server that stores, allocates and manages the security keys. Authentication devices are small handheld devices (PDAs) with an infrared port and buttons which are used to carry the security keys around between key server and the devices to be authenticated. The authentication device deploys the security keys to field devices to establish a trust between the device which is being authenticated (added to the network) and the key server. A couple of button presses is all that is required to authenticate a new device. See *Getting Started for Honeywell OneWireless Solution* for more information on authentication of wireless nodes. Additionally, the authentication device can also read and set parameters on multinodes and field I/O devices.

Service Set ID (SSID)

The Service Set ID (SSID) is used to define a common domain (network) among multiple wireless access points. Access points having the same SSID can communicate with each other. Two wireless networks with different SSIDs on access points can create overlapping wireless networks. The SSID can act as a password so that a client cannot connect to the network without it. However, security using the SSID is easily overridden when an access point is set to broadcast the SSID, which means that any client can associate with the AP. SSID broadcasting can be disabled in the multinode setup menus.

Data Encryption

You can select a data encryption option to be used for multinode wireless communications. Options include: None (no encryption), Static WEP, WPA, or AES-CCMP, depending on the multinode's mode of operation. The AES-CCMP encryption option is available when operating multinodes in a wireless bridge network. Some level of security is recommended for all modes of operation.

Wired Equivalent Privacy (WEP)

Wired Equivalent Privacy (WEP) encryption is a security protocol for Wireless Local Area Networks (WLANs) defined in the IEEE 802.11 standard. WEP relies on the use of identical static keys deployed on client stations and access points. Static WEP gives you a choice of 64-bit or 128-bit encryption. A multinode configured with WEP encryption is compatible with any 802.11b PC Card configured for WEP.

Wi-Fi Protected Access (WPA)/WPA2 with TKIP/ AES-CCMP

WPA combines several technologies which includes the use of the 802.1X standard and the Extensible Authentication Protocol (EAP). For encryption, WPA uses the Temporal Key Integrity Protocol (TKIP) and WEP 128-bit encryption keys. Also, a message integrity check is used to prevent an attacker from capturing and altering or forging data packets. In addition, it can employ a form of AES called AES-CCMP.

WPA includes the option of using a WPA pre-shared key for key management with either TKIP or AES-CCMP encryption

Physical description

Figure 2 shows some of the physical features of the multinode which are described in the following sections.

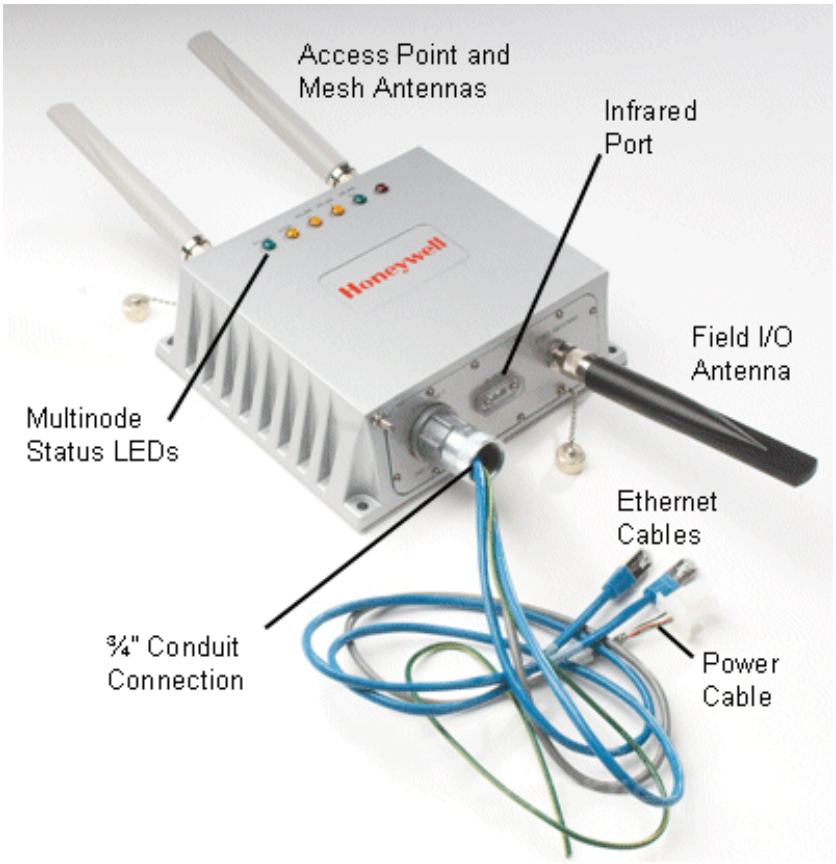


Figure 2 Multinode/Wireless System Gateway

Features

The Honeywell Multinode/Wireless System Gateway is a self-contained unit that is weatherproof and conforms to IP66 waterproof specifications. The multinode contains no user-serviceable parts inside the enclosure. External connections on the multinode include three Type N connections for antennas. A ¾-inch conduit connection provides access to wired connections for DC power, grounding and Ethernet cables.

On the top side of the enclosure are six LEDs that indicate power to the unit and operating status. See Table 2 for a description of the LED indicators. A small window on the side of the enclosure provides an optical infrared connection which is used to issue a security key by the authentication device when commissioning the multinode.

Mounting holes are located at each corner of the multinode enclosure with a grounding stud located on one side. The enclosure is designed to attach to a mounting panel that enables pole mounted or wall mounted installation.

When the multinode is mounted outdoors or when approval certifications require it, installation of lightning protection components, (such as lightning arrestors and enclosure grounding) are necessary. See Outdoor protection kit for more information.

Refer to Table 3 Multinode specifications for more information.

Two multinode versions are available that provide two temperature ranges of operation.

Multinode model	Model numbers
Multinode with Standard temperature range, -20º to +60º C	WNMN, WNMX
Multinode with Extended temperature range, -40º to +75º C	WNMF, WNMS

Note: There are some differences between multinode versions with regards to cabling, connectors and labeling of the unit. These differences are noted where applicable.

External Connections

The multinode contains a number of connections which are described in Table 1. Note that labeling, cabling and connector types of the unit may differ depending upon the multinode version.

Table 1 Multinode connections

Feature or Connector	Description
ETHERNET **24V DC POWER**	¾-inch conduit connection with four cable pigtails. • Two Ethernet cables - (Labelled WLAN1 and WLAN2) Either Ethernet cable can be used to: – Connect to a PC for initial setup. – Connect the WSG to the plant control network – Connect Ethernet-based devices, such as switches, controllers, cameras, etc. to a multinode or WSG. Note: Both Ethernet ports are wired to one switch with a single MAC Address. • A red (or grey) cable - power cable • A green/yellow grounding conductor.
IR PORT	Infrared sensor port used for communication with the authentication device.
FHSS ANTENNA (Type N-female connector) **OR** **FIELD I/O ANTENNA** (Type N-female connector)	Provides connection of an omni-directional antenna or optional remote antennas for communication with various wireless field devices.
ANTENNA (Two reverse polarity Type N-female connectors) **OR** **AP ANTENNA** and **MESH ANTENNA** (Two Type N-female connectors)	Provides connection for two 5dBi omni-directional or optional remote antennas that enable communication between the multinodes, WSGs, other multinodes in the network and other WiFi devices.
Operating/Status indicators LEDs	Six indicators located on the top of the multinode enclosure and indicate operating status. These LEDs are described in Table 2 on page 18.

LED indicators

The front of the enclosure features six LED indicators (Green, Yellow and Red) to indicate the various stages of operation. Table 2 identifies the indicators and describes the operating conditions of the unit when the indicators are lighted.

Table 2 Multinode LED indicators

LED Indicator	When lit it …
Power (Green)	Indicates that power is applied to the unit.
WAN (Yellow)	Indicates that the unit has an active connection to the wired network on the WAN1 port. May be steady on or blinking.
WLAN 1 (Yellow) Activity (AP)	Indicates that information is passing through the AP connection. May be steady on or blinking. If off, indicates that the AP radio is disabled.
WLAN 2 (Yellow) Activity (Mesh)	Indicates that information is passing through the mesh node connection. If off, indicates that the mesh radio is disabled.
WLAN SS (Green) Signal Strength (Mesh)	Indicates the signal strength of the connection with the mesh node as defined by the MAC address of the multinode in the mesh radio configuration page, (WLAN2). See Signal Strength MAC in Table 9 for more information of this indicator. 1. LED Off: No connection on the mesh, or the signal is very weak. 2. LED blinks slowly (once every 1 second): there is a connection, and the signal quality is poor. 3. LED blinks fast: there is a connection, and the signal quality is good. 4. LED steady on: there is a connection, and the signal quality is excellent.
FIPS / MODE (Red)	Indicates status depending on whether multinode is configured as a WSG or a multinode. • WSG - LED blinks: the WSG is not loaded with the gateway application. LED is steady on: the WSG is loaded and running

LED Indicator	When lit it …
	with the gateway application and the WSG has been configured in Wireless Builder. • Multinode - LED behavior is undetermined.

NOTE: A fault in the multinode is indicated when WLAN1 and WLAN2 LEDs blink simultaneously. The multinode software has detected a fault with the encryption algorithm or the device configuration has not passed the integrity check. See Troubleshooting for more information.

Multinode specificiations

Table 3 Multinode specifications

Specification	Description
Enclosure	Certifications: Class 1 DIV2/ZONE2 hazardous area. IP66 waterproof Physical dimensions: 9.25 in. x 8.25 in. x 3.0 in. Weight: 7.0 lbs
Power requirements	Power input: +24 Volts dc, -15% +10% (20.4 to 26.4Vdc) Current requirement: 1.5 Amps, maximum. Power output: 25 Watts, maximum
Hardware Specification:	CPU: XScale IXP425 @ 533 MHz 8 MB flash 64 MB SDRAM
External Ports:	Two 10/100 Mbps WAN Ethernet ports. See Note. 3 external antenna ports. Note: Both Ethernet ports are wired to one switch with a single MAC Address.
WAN Ethernert setting:	Fixed IP Supports: IEEE 802.3u Fast Ethernet

Specification	Description
	10/100 Mbps auto negotiation
Receive Sensitivity:	802.11a: -87dB@6Mbps to -71dB@54Mbps 802.11b: -94dB@1Mbps to -90dB@11Mbps 802.11g: -87dB@6Mbps to -74dB@54Mbps
RF Output Power:	802.11a/b/g: +20dBm, maximum Note: Maximum transmit power will vary by antenna selection, channel selection, data rate and region, (Country Code).
Environmental:	**Standard Temperature Model**: Operating Temperature: -20º to +60º C (-40º to +140º F) **Extended Temperature Model**: Operating Temperature: -40º to +75º C (-40º to +167º F) **Other**: Storage Temperature: -40º to +85º C (-40º to +185º F) Humidity: 0 to 100% noncondensing EMI/Safety: FCC Class A Lightning and surge suppressor kits (optional)

Mulitnode communications radios

The multinode contains three radios that are used for RF communications; two IEEE 802.11 radios (a client radio and a mesh radio), and one radio which is used to communicate with the wireless field devices (field I/O radio).

- One 802.11 radio (client or AP radio) is used for communication when the multinode is configured to operate as an access point or WSG. Radio activity is indicated by the WLAN1 LED on the multinode enclosure.
- One 802.11 radio (mesh radio) is used with multinodes and WSGs when implementing a wireless mesh. Mesh radio activity is indicated by the WLAN2 LED on the multinode enclosure.

- One field I/O radio which communicates with the various wireless field devices. A multinode will contain one of two radio types:
  - A FHSS radio which uses Frequency Hopping Spread Spectrum modulation as the communications protocol.
  - A DSSS radio which uses a Direct Sequence Spread Spectrum modulation as the communication procotol and is based on the IEEE 802.15.4 standard.

Antennas

The multinode is supplied with three 5dBi omni-directional antennas. Two antennas are identical and are installed to the MESH and AP connectors located on the top of the unit. These antennas are used with the 802.11 radios for client and wireless mesh communications. The third antenna is used with the field I/O radio for communication with the field devices and is installed on the FIELD I/O ANTENNA (or FHSS ANTENNA) connector.
Note: The 802.11 antennas and the field I/O radio antenna are not interchangeable.

A number of optional high gain antennas from various manufacturers also have been qualified for use with the multinode. Antenna selection is based on a number of factors such as frequency range, overall antenna output, and country regulations. Antenna options also include installation of the antenna remote from the multinode. When using one of these antennas, you must manually adjust the transmit power of the radios in the multinode.

ATTENTION

Multinodes must be professionally installed in accordance with the requirements specified in the *OneWireless Multinode Agency Compliance Professional Installation Guide*.

If you are not using the wireless access point function then you do not need to connect the client antenna. Make sure during your configuration set up that you go to the Wireless Access Point-General screen and set the Tx Pwr Mode to Off, (See page 47). Also ensure that any unused antenna port is securely covered with the attached protection caps.

NOTE: If any part of the multinode or antenna is located outdoors, a lightning arrestor must be installed between the unit and the antenna. See the Outdoor protection kit.

Outdoor protection kit

If any portion of this system (multinode enclosure, antennas, cables etc.) is to be mounted outdoors, it is recommended that you use the Outdoor Protection Kit with the installation. This kit contains lightning arrestors and ground cables designed for installation with multinodes.

If the system is mounted outdoors where CE Mark certification is required, use of the Outdoor Protection Kit (or equivalent) is mandatory.

Installation Overview

First read through this section so that you have a good understanding of the tasks to properly plan and execute installation of Multinode/WSG nodes in a wireless network.

Preinstallation requirements

The following tasks must be completed before you actually install wireless system gateways and multinodes in a wireless network:

- **Network site planning** must be completed to understand how a wireless network can be built and supported for your application using OneWireless components. These components consist of wireless field devices, multinodes, and wireless system gateways.
- **RF site survey** must be completed by a qualified professional. The RF survey is essential for building the architecture of the wireless network. The site survey should at a minimum include the following tasks:
  - RF spectrum analysis must be conducted on the 2.40-2.49 GHz band and 5.7-5.9 GHz band (if available to be used) to detect any potential RF interference. Strong interference sources should be addressed (removed, avoided or minimized) before an installation. Note that some frequencies may not be available for use in some locations and countries.
  - A point-to-point 2-node mesh should be staged in various locations to measure the RF propagation ability in the site environment. Received Signal Strength Indicator (RSSI) can serve as one indicator of the RF environment. TCP/IP throughput testing and UDP/IP throughput and packet drop rate testing should be conducted in all selected locations to measure the quality of the site environment.
  - Site survey should be conducted once the factory system is operating so that maximum possible interference is measured and addressed.
- **Multinode placement** should be determined through the completion of the network planning and RF survey activities.
- **Power requirements** for network should be identified. Wired cable runs that provide DC power to the WSGs and multinodes should be determined.
- **Ethernet cable runs** should be determined for WSGs and/or any other wired nodes in the network.

Multinode/WSG installation

Honeywell's multinode/ WSG requires physical mounting and installation on site following the execution of the preinstallation requirements. The location of all multinodes should be determined to ensure optimum operation in a wireless network.

Installation tasks

WARNING

Multinodes and wireless system gateways must be professionally installed in accordance with the requirements specified in the '*OneWireless Multinode Agency Compliance Professional Installation Guide*.' Only the specified power settings, antenna types and gains and cable lengths (attenuation) as outlined in the installation guide are valid for multinode installations.

Before the multinode is installed at the site location there are a number tasks which must be completed to properly set up the unit. Table 4 outlines these tasks to be performed for each multinode/WSG installation. For example, the site location of the multinode/WSGs should be identified and prepared before the multinode is installed. Additionally, you should verify that the multinode contains the latest version firmware and ensure that it is configured properly for the network in which it is designed to operate. Follow the tasks listed in Table 4 to complete a multinode installation. The page numbers reference additional information and details on each task.

Table 4 Multinode installation tasks

Task	Action	Done
Preparing the multinode installation site(s)	a. Inspect the multinode hardware. See page 26.	
	b. Identify multinode site locations. See page 26.	
	c. Assemble and install mounting hardware. See page 27.	
	d. Construct conduit and cable runs for multinode power and Ethernet See page 27.	
Initial bench configuration of multinode (See Configuration section for procedures.)	e. Bench setup and connection to multinode. See Initial Configuration on page 35.	
	f. Verify firmware version and update if necessary. See Verify firmware version on page	

Task	Action	Done
	39.	
	g. Configure operating mode and security. See System Configuration - Operating Mode on page 45.	
	h. Configure security options. See Security screen on page 52.	
	i. Additional multinode configuration steps. • Services settings (SNMP Agent) on page 60 • Set up Wireless Mesh starting on page 71.	
Saving system configuration of multinode	j. Save the configuration of the multinode for future reference. See Local Configuration Upgrade on page 66	
Selecting antennas	k. Verify proper antenna selection. See antenna selection on page 27.	
Configuring transmit power and Country Code settings	l. Set transmit power settings accordingly based on RF survey results, antenna selection and Country Code. See Warning under Installation Tasks.	
Authenticating a multinode/WSG	m. See Authenticating a multinode/WSG on page 32.	
Installing the multinode at site location(s)	n. Install the Lightning arrestors (if installation site is outdoors)	
	o. Grounding. See page 29.	
	p. Seal the antenna connections. See page 29.	
	q. Install multinode/Wireless System Gateway at its installation site. See page 29	
	r. Complete conduit installation.	
	s. Connect power and Ethernet cabling See page 29	
Turn up multinodes/WSGs	t. Power up WSGs and multinodes in the network. See page 31	

Task	Action	Done
Field testing and tuning of wireless network	Perform field testing of the multinodes operation and mesh network coverage. See Multinode and Mesh Network Tuning on Page 97.	

Installation guidelines

CAUTION

FCC RF exposure compliance requires that the antennas used with the device (multinode) must be installed with a minimum separation distance of 20 cm (7.9 in.) from all persons, and must not be co-located or operated in conjunction with any other antenna or transmitter.

Multinode/wireless system gateway installation should be accomplished using the approved antennas, cables and connectors provided with the device or available from Honeywell for use with this device. Changes or modifications not expressly approved by Honeywell or the party responsible for this FCC compliance could void the end-user's authority to operate the equipment.

Inspect multinode and associated hardware

Open the box and examine the multinode for any signs of damage. Examine any other hardware shipped with the multinode, such as antennas and mounting brackets. Ensure all hardware that is necessary for completing installation of each multinode is available. Refer to Figure 2 and Figure 3 for two views of the multinode and its associated hardware. The multinode package includes the following items:

- Multinode/Wireless System Gateway
- 1 Client (AP) radio antenna (if required)
- 1 Mesh radio antenna
- 1 Field I/O radio antenna

Identify multinode site locations

Site location of the wireless system gateways and multinodes are identified through the completion of the network site planning and RF survey activities. Locations can be mapped so that site preparation for the multinodes can be started.

Antenna selection

Antennas play critical roles in the setup and operation of wireless mesh systems. Depending upon results of the site survey and the requirements of the installed environment, proper antenna type should be determined, (omni-directional vs. directional, low-gain vs. high gain, etc.).

Assemble and install mounting hardware

The multinode can be wall mounted or pole mounted using the hardware mounting kit supplied with the unit. When pole mounting the multinode you can assemble and install the mounting hardware at the site. The mounting kit includes the following items:

- Mounting bracket
- U-bolts with nuts
- Screws (to attach the multinode to the mounting bracket)

Construct conduit and cable runs for multinode power and Ethernet

Power cabling from the plant must be run through conduit to a junction box installed at the multinode installation site.

If the multinode will be connected to a wired Ethernet you must run Ethernet cabling from the control system through the conduit to the multinode site.

Outdoor Protection Kit

An outdoor protection kit must be used to prevent lightning damage when the multinode is mounted outdoors. The outdoor protection kit contains the following items:

- Three lengths (10, 12 and 18-inches) of 10AWG wire with #8 ring terminal on one end and a #10 ring terminal on the other end.
- Two lightning arrestors, with Type N Male-to-Female, or two Reverse Polarity Type N (RPN) Male-to-Female connectors for the mesh and AP radio antennas.
- One Lightning arrestor, Type N Male-to-Female connectors for Field I/O radio antenna.

Lightning arrestor installation, (when required)

NOTE: A lightning arrestor must be installed between the antenna and the multinode antenna connector when the unit is installed outdoors. Use the following procedure to install lightning arrestors on the multinode.

Step	Action
1	Examine the lightning arrestors and remove and discard the following items (if not needed). Securing nut, washer and ring terminal (but retain the screw).
2	Attach the 10, 12, and 18-inch wires to the appropriate lightning arrestor body ensuring that the smaller (#8) ring terminals and those wires with identifying labels are used.
3	Secure the ring terminal to the lightning arrestor using a screwdriver.
4	Install the two lightning arrestors to the multinode by attaching one end of the lightning arrestor to the multinode's MESH and AP connectors. Make sure that the lightning arrestor with the 12-inch wire is mounted closer to the ground stud and that the lightning arrestor with the 18-inch wire is mounted on the antenna connector farther from the ground stud.
5	Secure the lightning arrestors to the Type N connectors so that they are hand tight. Do not over tighten.
6	Install the Type N lightning arrestor with the 10-inch wire to the multinode by attaching one end of the lightning arrestor to the multinode's Type N FIELD I/O (or FHSS) ANTENNA connector. Hand tighten only.
	Note: Steps 7 and 8 may need to be performed once the multinode is mounted and connected at its site location.
7	Construct a grounding wire to be used for the earth ground connection. See Grounding in the next section for additional information. Attach the ground wire to the ring terminal attached to the multinode's grounding stud. The earth ground ring terminal must be the first connection on the multinode's grounding stud when making additional connections to the grounding stud.
8	Place the ring terminals from the lightning arrestor ground cables on the grounding stud of the multinode enclosure and secure with a screw. Note that the earth ground ring terminal should be attached to the multinode before the lightning arrestor's ring terminal is attached.

It is recommended that the outdoor protection kit be replaced every three years. If the unit is operated in an area subject to intense lightning activity, it is recommended that the outdoor protection kit be replaced every year.

Grounding

NOTE: Users are responsible that the multinode connection to a proper earth ground is made by certified and authorized personnel and must conform to all applicable codes and regulations. The materials required to make a proper earth ground are defined by local regulations and must be obtained locally to ensure that the correct safety environment is achieved. The ground wire must be AWG 10 or heavier. The earth ground wire run should be kept as short as possible.

Attach the earth ground wire (AWG 10 or heavier) to the ring terminal attached to the multinode's grounding stud (see Figure 3). The ring terminal must be secure against the unit's metal enclosure. The earth ground ring terminal must be the first connection on the unit's grounding stud when making additional connections to the grounding stud, (such as lightning arrestor ground wires).

Sealing Antenna Connections

Once all antennas have been installed, the connections should be sealed to protect them from the exterior environment. First use a wrap of electrical tape over the antenna connections. Then use a self-amalgamating polyisobutylene tape which adheres to itself and forms a single amalgamated rubber molding. Once the tape is in place for several hours, it forms a shaped rubber molding that is resistant to water and most solvents. Note that if you need to remove the tape after it has sealed for 30 minutes or more, it must be cut away.

Installing the multinode/WSG at its location

The assembled multinode, complete with antennas and lightning arrestors (if required), is now ready to be mounted in its site location. If the multinode is to be wall mounted, it can be secured to the wall with screws at each corner of the enclosure. When using the mounting bracket for pole installation, secure the multinode to the bracket using the screws supplied with the bracket kit.

Connect power cables and Ethernet cables

Conduit must be installed from the multinode ETHERNET connection to the junction box installed at the multinode site. The power cabling, green/yellow grounding wire and Ethernet cables from the multinode must be run through conduit to the junction box.

Note that when installation is complete, all cabling must be routed through conduit and enclosed within the junction box.

Refer to Figure 3 for multinode cable identification.

ATTENTION

The power cable attached to the multinode may be one of the following:

- Red cable with two wires (Red and Black)
- Grey cable with two wire pairs (Red and Green, Black and White)

The red (or grey) power cable, the Green/yellow grounding cable and Ethernet cables are connected as follows:

Step	Action
1	Ensure that all power is removed from the power cabling run to the multinode site.
2	If the multinode is equipped with a Red power cable: • Connect the Red wire from the multinode power cable to +24 volt dc output of the power supply in the junction box. • Connect the Black wire from the multinode power cable to the 24 volt COMMON of the power supply.
	If the multinode is equipped with a Grey power cable: • Connect both the Red and Green wires from the multinode power cable to +24 volt dc output of the power supply in the junction box. • Connect both the Black and White wires from the multinode power cable to the 24 volt COMMON of the power supply.
3	Cut and tie back the drain wire from the power cable.
4	Connect the Green/Yellow grounding cable from the multinode to a safety ground point.
5	The two WAN cables, labeled WLAN1 and WLAN2 (Ethernet cables), from the multinode are configured with the same IP address and a single MAC address and should be regarded as a two-port Ethernet switch. Therefore, if the control system provides connections to redundant switches, then use both Ethernet cables to connect to the separate switches. If only a single switch available in the control system, then use WLAN1 Ethernet cable to connect to the network switch. The two Ethernet cables should not be connected to the same network switch. Note: Using the WLAN1 cable enables the the WLAN LED indicator.

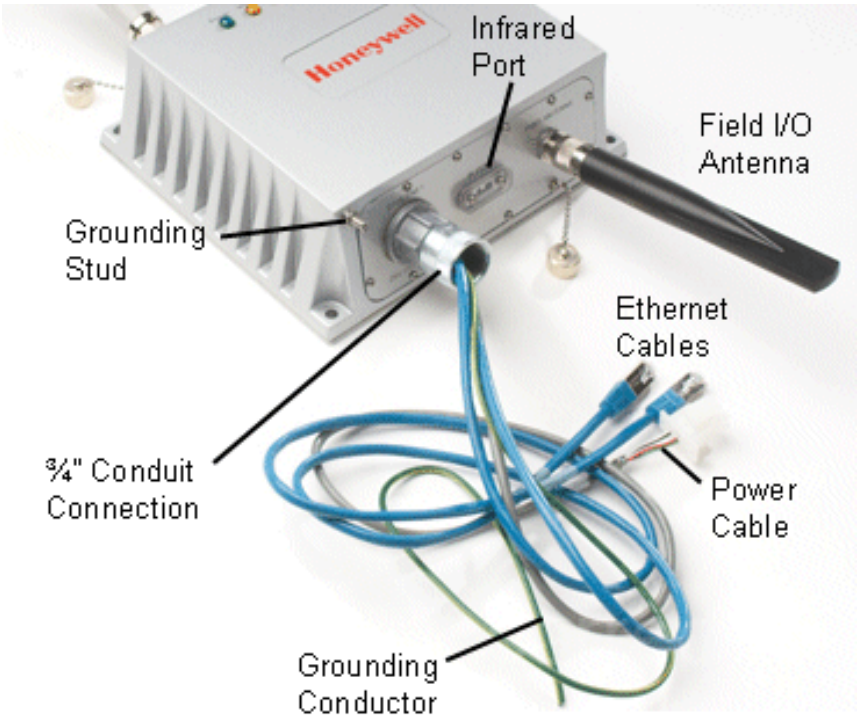


Figure 3 Multinode cable identification

Power up multinodes and WSGs

Once all multinodes/WSGs have been installed and connected at their site locations, turn up the multinodes to verify wireless network communications. See the *Getting Started with Honeywell OneWireless Solution* for more information.

Authenticating a multinode/WSG

Authenticating a multinode or WSG is the action taken to inject a wireless device with a security key so that when the device requests access to the system, it will be recognized and allowed to join the secure wireless network and start publishing packet information. A handheld PDA running the authentication device software is used to inject the security key into the multinode. Use the following procedure to authenticate multinodes and WSGs.

Authentication order

Authentication is performed once the multinode has been configured and is ready for deployment in a wireless network.

Authenticate the WSG first, and then authenticate additional multinodes after you verify the gateway has been authenticated. See the Key Server event log to view authentication status of device.

Prerequisite

- The Key Server must be active on the network that the multinode/WSG is connecting to.
- Keys from the Key Server are loaded onto the authentication device. See *Getting Started with Honeywell OneWireless* for the procedure.

To transmit a security key to multinode/WSG:

Step	Action
1	If you have not already done so, power on the multinode.
2	Align the IR port of the authentication device with the IR Port of the multinode and place the authentication device 6 to 8 inches from the multinode's IR port.
3	From the main menu of the authentication device, select **Security and Node Deployment** and select **Clear Key and Restart Node**. This clears any security keys from the multinode. The multinode LEDs will shut off for several seconds and cycle through a reboot of the multinode.
4	Select **Transmit and Connect Node**. A **Security key deployed successfully** message appears on the authentication device.

Step	Action
5	Verify that you receive a message on the authentication device indicating the multinode received the security key successfully. If you receive a message indicating that key deployment was not successful, repeat the procedure from step 1.
6	Select **Read Device Information** to determine if the multinode acquired a network address from the wireless directory server. A valid address should start with 0xEF or similar. (0x0000 indicates the multinode did not acquire a valid IP address.)
	**TIP** After the multinode has been injected with an authentication key and authenticated by the Key Server, you can look at the event log on the Key Server. • Select **Start** > **Programs** > **Honeywell OneWireless** > **KeyServerManager**, and then click **Event Log**.

Configuration

Initial configuration

Once you have received the multinode and associated hardware and physically inspected it for any damaged components, you then perform an initial setup of the unit. This should be peformed before the multinode is installed in the network at its designated physical location. The setup requires that you select configuration options, such as operating mode, security encryption and IP address, which gives the unit an identity. Also, the multinode must be given a security key to associate it with the wireless network in which it will be installed and operate (authentication). Completing setup and authentication will allow the multinode to join the network and communicate in the network.

TIP

When configuring multiple multinodes using the same option settings, you can create a template (configuration file) which contains the multinode settings, so that the template can be loaded to the multinodes.

- First, configure a multinode using the Multinode Configuration Tool application.
- Download the configuration file in the multinode to a local computer.
- The configuration file then can be downloaded to additional multinodes.

NOTE: The configuration file that you download to a local computer and use to configure additional multinodes contains both configuration parameters and some network parameters such as the IP address and hostname.

- Update the network parameters to give the multinode a valid hostname, Description and IP Address.

See System Administration for more information on downloading configuration files.

Minimum PC system and component requirements

To complete multinode configuration, you should have at least the following components:

- One or more PCs or laptops with one of the following operating systems installed: Windows NT 4.0, Windows 2000, Windows XP or Windows 2003;
- An Ethernet interface on the PC or laptop to perform initial configuration.
- A Web browser program (such as Microsoft Internet Explorer 5.5 or later, or Netscape 6.2 or later) installed on the PC or laptop to access the multinode configuration tool.
- TCP/IP Protocol (usually comes installed on Windows PCs.)
- Additionally, A Wi-Fi compatible 802.11a/b/g interface for each PC or laptop that you want to connect wirelessly to the network.

Prerequisites

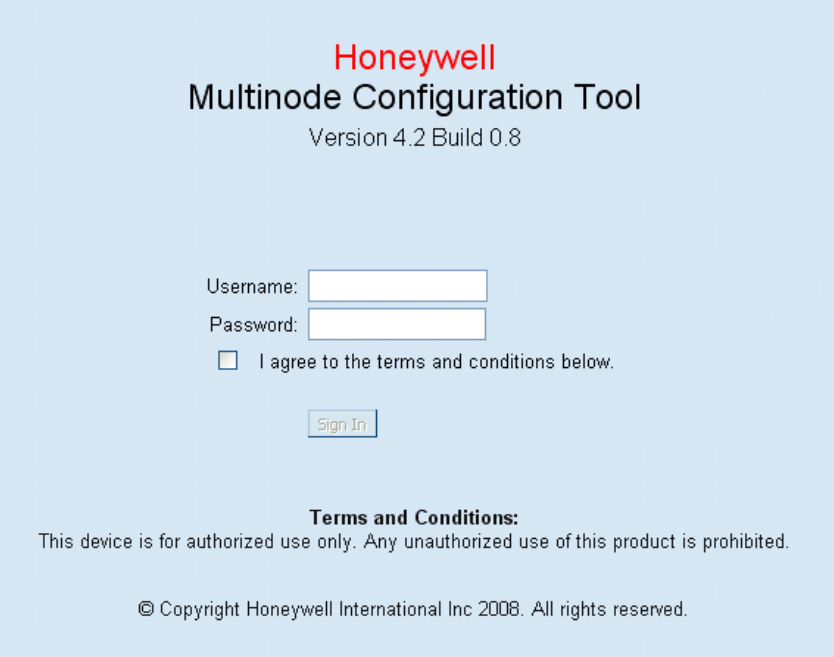
The following information and addresses are required during the initial setup of the multinode. Please have this information available for each multinode to be installed in the network you are setting up before you begin setup.

✓	Information
	IP address - a list of IP addresses available on the organization's LAN that are available to be used for assignment to the multinode(s).
	Subnet Mask for the LAN.
	Default IP address of the multinode, (192.168.254.254).
	DNS IP addresses (if required).
	SSID - an ID number/tag name that you want to use to identify all members of the wireless LAN.
	The MAC addresses of all wireless cards that will be used to access the wireless network of access points, (if MAC address filtering is to be enabled). This information can be recorded during initial configuration of the multinodes and then entered when setting up MAC address filtering.
	The appropriate encryption key for wireless communication. This key can be generated during setup, but it should be recorded for future reference.

Multinode connection for setup

Initial setup is performed best on a test bench. The unit is powered up and connected via the Ethernet cable to a PC. The PC is used to access the Multinode Configuration Tool application, which is loaded on the multinode and contains the forms where you enter the required addresses and configuration information.

Step	Action
1	Place the multinode/WSG on a test bench.
2	Connect the power cable leads to the proper power source (24Vdc).
	If the multinode is equipped with a Red power cable: • Connect the Red wire to +24 volt dc. • Connect the Black wire to 24 volt COMMON.
	If the multinode is equipped with a Grey power cable: • Connect both the Red and Green wires to +24 volt dc. • Connect both the Black and White wires to the 24 volt COMMON.
3	Power on the multinode unit.
4	Connect one end of the RJ-45 Ethernet cable labeled **WAN1** to an Ethernet port on the laptop or PC.
5	Verify these settings on your PC or set as follows: **TCP/IP properties** must be set to "**Using the following IP address**." IP Address: **192.168.254.1** Network Mask: **255.255.255.0**
	To access the screen, which contains these settings on your PC, and view or change your TCP/IP settings: If the operating system on your computer is Windows 2000 or XP, follow the path Start >Settings > Network and Dialup Connections > Local Area Connection and select the Properties button. In the Properties window, highlight the TCP/IP protocol and click Properties. Make sure that the radio button for Using the following IP address is selected, and enter the IP address 192.168.254.1 and the network mask 255.255.255.0.

Step	Action
6	On your PC, open a browser window and paste the default URL for the unit's Local LAN in the address line. (**https://192.168.254.254**) **Note**: For some versions of the multinode, the IP address may be 192.168.15.1
7	Enter the default Username "**CryptoOfficer**" and Password "**CryptoFIPS**" in the opening dialog screen. (The username and password are case-sensitive.) 
8	Read the terms and conditions and check the checkbox to agree to the terms of use. Click **Sign In** to continue. **Note**: Honeywell strongly recommends you change the default username and password on each multinode after you initially configure it. If this username and password does not work, review the SCN for any changes.

Once you sign in, the System Configuration - General screen appears in the browser window. See Figure 4.

Verify software Version and upgrade

The multinode/WSG is shipped from the factory loaded with the latest released software. Verify that the multinode contains the latest version software and then update if necessary. The software version currently loaded on the multinode is labeled 'Version:' on the System Configuration - General screen and is shown circled in Figure 4.

Prerequisite

You must have access to the HPS Solution Support Online (SSOL) website. If you are a new user, you can register for access to the Solution Support Online site at www.honeywell.com/ps.

Step	Action
1	Record the software version which is displayed in the upper right of the Multinode Configuration Tool screen. The version is shown as follows: Version: *Multinode/Sensor Radio - Version x.x Build x.x / RAP110.x-xx.x*
2	Refer to the Software Change Notice (SCN) which is supplied with your OneWireless software to verify the latest released version of the mesh (multinode) software.
3	If required, obtain the latest software version from the Honeywell SSOL web site at: http://www.honeywell.com/ps
4	Click **Login to My Account**, type your user name and password, and then click **Login**.
5	Select **Software Downloads** from the **SUPPORT** menu.
6	Choose **OneWireless**.
7	Download the Mesh software and/or the Sensor radio software files.
8	At the multinode, sign-in to the Multinode Configuration Tool screen.
9	From the left pane, click **System Administration > System Upgrade.**
10	Update the mesh software: • Click the top **Browse** button and navigate to the location of the mesh software you downloaded in step 7. • Click the top **Upload firmware** button. The multinode will reboot after the firmware update is completed.

Step	Action
11	Sign-in to the Multinode Configuration Tool screen.
12	From the left pane, click **System Administration > System Upgrade.**
13	Update the sensor radio software: • Click the bottom **Browse** button and navigate to the location of the Sensor radio software you downloaded in step 7. • Click the bottom **Upload firmware** button.
14	Wait for the message to select "Back." This confirms that the sensor software upload has completed.

Multinode Configuration Tool screens

To the left of the System Configuration screen is a tree view of the available screens that can be accessed for initial configuration of the multinode, to monitor and view system status, and to perform system administration functions such as adding users and updating unit's firmware. The screens are listed in Table 5 below. If viewing this document online, click on the screen name to view the details and the configuration options available on the screen.

Table 5 Multinode Configuration Tool screens

Screen Title	For details go to page
System Configuration	
General	42
Operating Mode	45
WAN	46
Wireless Access Point	
General	47
Security	52
MAC Address Filtering	57
Rogue AP Detection	58
Advanced	59
Wireless Mesh	
General	71
Radio	77
Encryption	80
MAC Address Filtering	81
Services Settings	
SNMP Agent	60

System Configuration - General screen.

The System Configuration - General screen lists the firmware Version number for the unit and allows you to set the Host Name and Domain Name as well as selecting the system time source and other general information. (Note that Host and Domain names are both set to ‘default’ at the factory but can be assigned a unique name for each.)

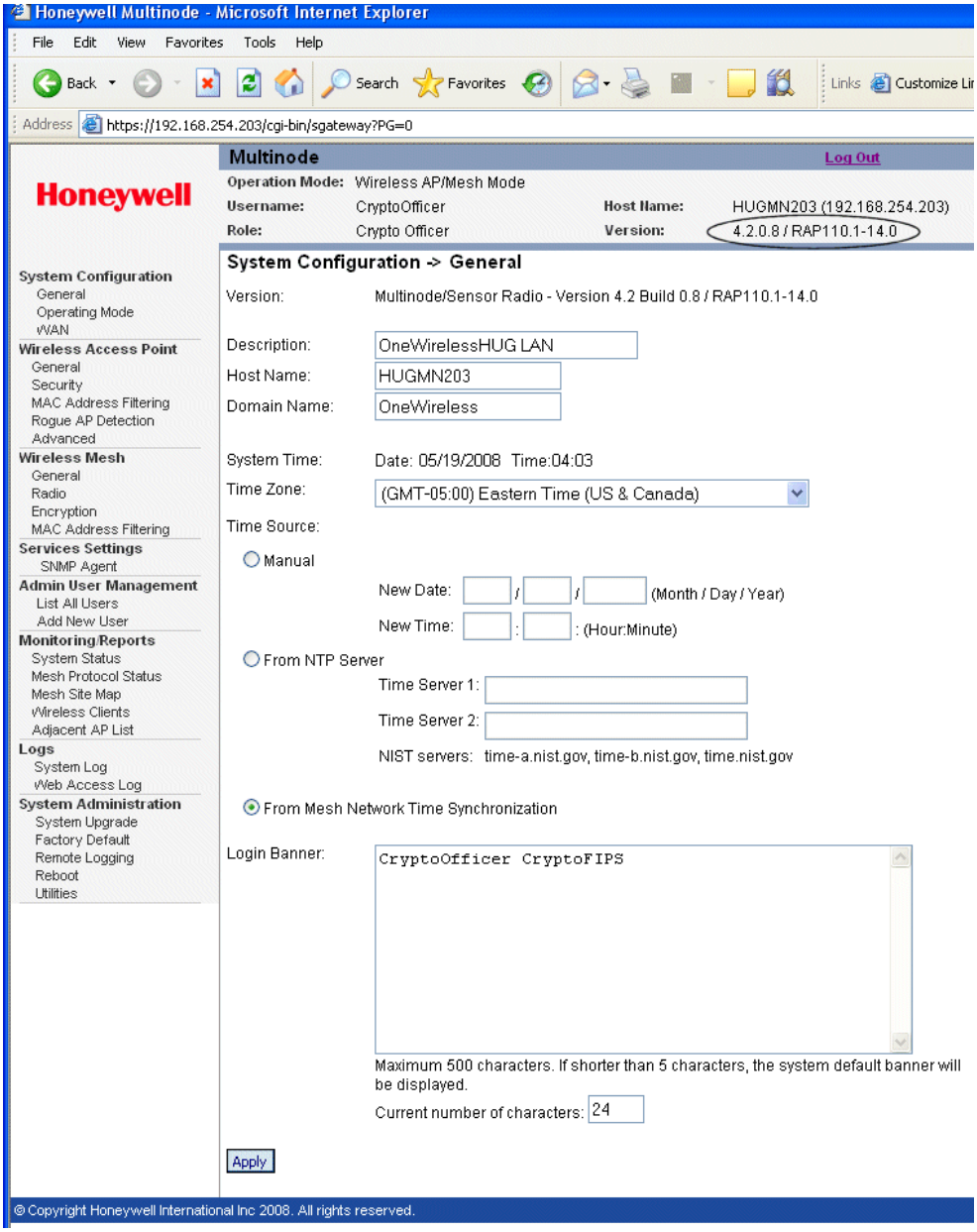


Figure 4 System Configuration - General screen

Follow the steps to enter information for the System Configuration - General screen.

Step	Action
1	Click on the **System Configuration - General** at the left of the screen to call up the General screen.
2	Enter a **Description** that identifies the unit and/or its location.
3	Enter a **Host name** for the unit.
4	Enter the name of the **Domain** in which the unit will reside.
5	If configuring the **Wireless System Gateway** for the network: a) Click the radio button to select **From NTP Server**. b) Choose the correct **Time Zone** for your location from the drop down selections c) Enter the IP address of the **Time Server 1**. For example, 10.0.10.100.
6	If configuring a **multinode**: Click the '**From Mesh Network Time Synchronization**' radio button.
7	If you want to display a message in the log in screen, enter the text for the **Login Banner**. Maximum text content is 500 characters. The default message is "This device is for authorized use only. Any unauthorized use of this product is prohibited."
8	When you have completed entries for the fields on the screen, click **Apply**.

System Configuration - Operating Mode

The System Configuration - Operating Mode screen allows you to set the unit to operate as either a WSG or a multinode. Note that if you change modes from multinode to WSG, your configuration is not lost.

Follow the steps to make selections for the operating mode.

Step	Action
1	Click on the **System Configuration - Operating Mode** at the left of the screen to call up the Operating Mode screen.
2	Choose one of the following **Operation Modes**: • **L1/L2 Gateway** - select when the multinode is to be used as a WSG to connect the wireless network to a Level 1 or Level 2 wired network • **L3/L4 Gateway** - select when the multinode is to be used as a WSG to connect the wireless network to a Level 3 or Level 4 wired network • **Multinode** - select when the multinode is to be used as a multinode to communicate with the wireless field devices.
3	Choose **Time Sync Root**. Note: When using the network time synchronization function (in the General screen) among the mesh nodes, configure only one mesh node as the time sync root/source. The time source of this node should be set to either Manual or From NTP Server in the General screen.
4	When you have completed entries for all fields on the screen, click **Apply**.

System Configuration - WAN screen

The System Configuration - WAN screen allows you to specify static IP Address information that will be used to manage this network if you do not use the DHCP server to obtain an IP address.

Step	Action
1	Click on the **System Configuration - WAN** at the left of the screen to call up the WAN screen.
2	Select WAN Link **Auto** from the drop down selections. Note: When interfacing with Cisco switches, this setting may need to be set to another value other than Auto. Also see NOTE 1 below this procedure.
3	Click on the **Specify a static IP address** radio button.
4	Enter a valid **IP Address** for the WSG such as 192.168.254.254, or other address as specified for the site. Note that if the IP Address is changed and then applied, the PC network card settings must be changed to log back in to the multinode.
5	Enter the **Subnet Mask** such as 255.255.255.0, or other subnet as specified for the site.
6	Enter the **Default Gateway** such as 192.163.254.1, or other address as specified for the site.
7	Leave DNS1 and DNS 2 fields blank unless a value is specified for the site.
8	Record the addresses entered in steps 4 through 7. They will be needed to perform other tasks.
9	When you have completed entries for all fields on the screen, click **Apply**.
10	Log back into the multinode: • Open Internet Explorer and type in https:// and the new IP address from step 4. • Type the username and password.

NOTE 1: There are two WAN ports - WAN 1, which can be set through the WAN Link field, and WAN 2 which is always fixed to Auto. The WAN Link field only sets the link speed and duplex mode for the WAN 1 port.

Wireless Access Point Configuration

Wireless Setup allows your computer's PC card to communicate with the access point (multinode). Once you have completed wireless access point configuration, you can complete the rest of the configuration wirelessly, assuming that you have installed and configured a wireless PC card on your computer. (If you have not done so, you will have to do that to establish communications. Follow the manufacturer's instructions to set up the PC card on each wireless device that will be part of the WLAN.)

General screen

Wireless Access Point - General screen shown in Figure 5 lists the MAC Address of the Gateway card. Note that this is not the MAC Address that will be used for the Bridge SSID for mesh setup, which is found on the Wireless Bridge - General screen.

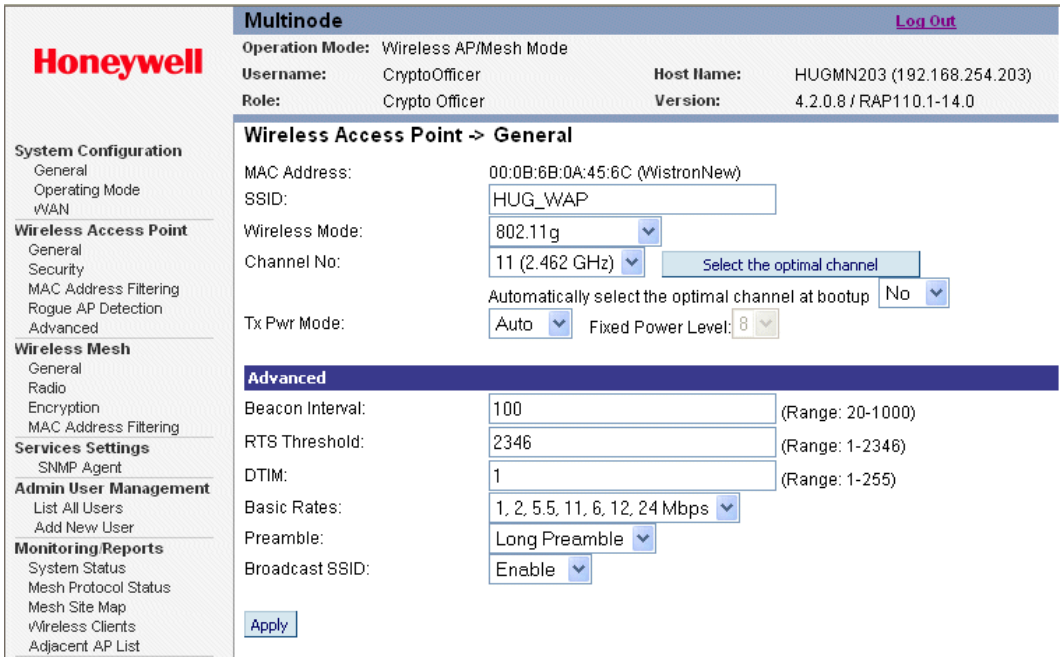


Figure 5 Wireless Access Point - General configuration screen

Follow the steps to enter information for the multinode configuration. See Table 6 and Table 7 below for the details in setting these fields.

Step	Action
1	Click on the **Wireless Access Point - General** at the left of the screen to call up the Wireless Access Point screen.
2	MAC Address is displayed 00:0B:6B:0A:45:6C (WistronNew) as in the example in Figure 5.
3	Enter the **SSID** for this network. Note: If you are using an SSID for a wireless LAN, enter it here and in the setup of each wireless client (multinode) in the network. The SSID must be the same for the WSG and each wireless client in the network for them to communicate.
4	Choose the **Wireless Mode** communications protocol to be used for this network from selections in the drop down menu.
5	Choose the **Channel No** from the list in the drop down selections. See Channel number description below. Click **Apply** after selecting the channel number.
6	The **Select the optimal channel** button may appear. See Optimal channel selection below for an explanation of this function. An option may appear for the AP to **Automatically select the optimal channel at bootup**. You can choose Yes or No.
7	Choose **Auto** for the **TxPower Mode** field. See TxPwr Mode description below.
8	When choosing the Advanced options, you can use the default selections, or choose values appropriate for your wireless network. See Table 7 for description of these Advanced options. The following values are the defaults for these fields: Beacon Interval: 100 RTS Threshold: 2346 DTIM: 1 Basic Rates: 1, 2, 5.5, 11 Mbps (basic rates available depend upon Wireless Mode selection)

Step	Action
	Preamble: Long Preamble Broadcast SSID: Enable
9	When you have completed entries for all fields on the screen, click **Apply**.

Channel number

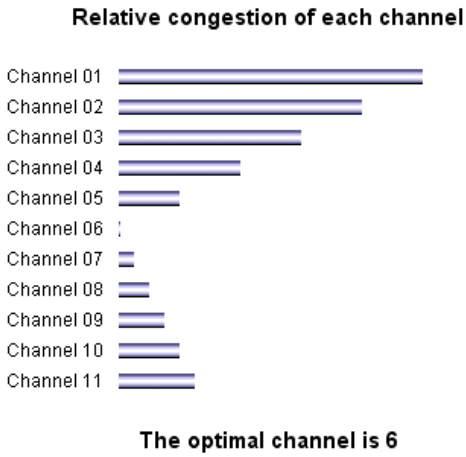
You can assign a channel number for the multinode to use or allow the software to select the optimum channel for multinode communications.

The Channel Number allows you to assign frequencies to a series of access points to minimize noise when many multinodes are used in the same WLAN. For example, there are 11 channel numbers that may be assigned. If you assign channel number 1 to the first wireless AP in a series, then assign channel 6 to the next AP, then channel 11, and then continue assigning APs to channels 1, 6, 11, you will achieve the optimum frequency spread to minimize noise.

Table 6 lists the channel numbers and frequencies used for the available wireless modes. Note that the Country Code selection determines the available frequency bands and channels for use in the wireless network. Therefore, all channel numbers in the table below may not be available for use in the network location.

Optimal channel selection

If you click on the button **Select the optimal channel**, a popup screen will display the available channels and the relative use of each channel in the local area as shown in the figure. The software will select the optimal channel for you. The figure below shows that the channel used the least in the local area is channel 6.



You can also set up the AP to select the optimal channel automatically at boot up.

Table 6 Channel Number options

Wireless Mode	Channel No.
802.11b 802.11g 802.11b/g Mixed	1 (2.412 GHz) 2 (2.417 GHz) 3 (2.422 GHz) 4 (2.427 GHz) 5 (2.432 GHz) 6 (2.437 GHz) 7 (2.442 GHz) 8 (2.447 GHz) 9 (2.452 GHz) 10 (2.457 GHz) 11 (2.462 GHz)
802.11a	52 (5.26 GHz) 56 (5.28 GHz) 60 (5.30 GHz) 64 (5.32 GHz) 149 (5.745 GHz) 153 (5.765 GHz) 157 (5.785 GHz) 161 (5.805 GHz) 165 (5.825 GHz)

Tx Pwr Mode and Fixed Pwr Level

The Tx Power Mode can be set during configuration. The default is Auto, which provides the largest range of radio transmission power levels available under normal conditions. The AP's broadcast range can be limited by setting the Tx Power Mode to Fixed and then choosing a Fixed Pwr Level from 1-8, (1 being the lowest power level). You can set the Tx Pwr Mode to Off to prevent any RF transmission, if desired.

Advanced options

The Advanced options for the Wireless Accesss Point - General screen are described in Table 7.

Table 7 Advanced options

Configuration Option	Range/ Value	Description
Beacon interval	20-1000	The time interval in milliseconds in which the 802.11 beacon is transmitted by the AP.
RTS Threshold	1-2346	The number of bytes used for the RTS/CTS handshake boundary. When a packet size is greater than the RTS threshold, the RTS/CTS handshaking is performed.
DTIM	1-255	The number of beacon intervals that broadcast and multicast traffic is buffered for a client in power save mode.
Basic Rates		The basic rates used and reported by the AP. The highest rate specified is the rate that the AP uses when transmitting broadcast/multicast and management frames. Note: The Tx rate should not exceed 12 Mbps if the system is to operate with wireless sensors. This is to prevent the possibility of overloading the WSG with WiFi traffic and allow the gateway application to operate efficiently.
	Basic Rates for 802.11b and 802.11b/g Mixed - 1, 2 Mbps or 1, 2, 5.5, 11 Mbps	

Configuration Option	Range/ Value	Description
	Basic Rates for 802.11g - 1, 2, 5.5, 11, 6, 12, 24 Mbps or 1, 2, 5.5, 11 Mbps	
	Basic Rates for 802.11a - 6, 12, 24 Mbps	
Preamble	Short/Long Preamble	Specifies whether frames are transmitted using a short or long preamble.
Broadcast SSID	Enabled/ Disabled	Enabled - the SSID is broadcast by the access point. When disabled, the SSID is embedded in outgoing beacon frames so that stations cannot obtain the SSID through passive scanning. Also, the AP doesn't send probe responses to probe requests with unspecified SSIDs.

Security screen

The Wireless Access Point - Security screen displays the default factory setting of no encryption, but encryption must be set by the CryptoOfficer for the multinode to communicate with any client. There are three different encryption options available for access points.

- None
- Static WEP (Wired Equivalent Privacy)
- 802.11i and WPA (Wi-Fi Protected Access)

None - No Encryption (Not Recommended)

You can choose to have no encryption of wireless communications within the network although it is not recommended. Although no encryption is the default setting, you must manually select **None** and click **Apply** to operate the WSG without encryption. You will be prompted if you want to operate the WSG in Bypass mode. If you answer Yes, no encryption is applied.

Static Wired Equivalent Privacy (WEP) Encryption

Wired Equivalent Privacy (WEP) encryption is a security protocol for Wireless Local Area Networks (WLANs) defined in the IEEE 802.11 standard. WEP relies on the use of identical static keys deployed on client stations and access points. WEP encryption does provide some measure of security, although not the highest level of security.

To configure your network for WEP encryption, perform the following steps:

Step	Action
1	Click on the **Wireless Access Point - Security** at the left of the screen to call up the Security screen.
2	Choose **Static WEP Encryption** from the drop down selections in the **Security Method** field. The Static WEP encryption options appear on the screen.
3	Select the **Authentication Type** from the drop down menu. Note: For greater security, set Authentication Type to **Shared Key**
4	Select the level of encryption, (either 64-bit, 128-bit or 152-bit encryption). If using 64-bit encryption, select the Default WEP Key from the drop down selections. Enter the WEP keys in the appropriate fields. The **Key Generator** button can be used to automatically generate a randomized key. Note that this key is initially shown in plain text so that you can copy or record the key. Once the key is applied, the key is no longer displayed in plain text
	**Important** Record the WEP Key used in step 4. When WEP is enabled, the same WEP key must also be applied to each wireless device that is to become part of the wireless network, and if "shared key" is accepted, then each wireless device must also be configured for "shared key".
5	Once you have made the selections in the screen and recorded the WEP key(s), if used, click **Apply**.

NOTE: Utilities exist for scanning for networks and logging all networks the utilities detect, including the real SSIDs, the access point's MAC address, the best signal-to-noise

ratio encountered, and the time the user crossed into the network's space. These utilities can be used to determine whether your network is unsecured.

IEEE 802.11i and WPA (Recommended)

Wi-Fi Protected Access (WPA) is designed to enable use of wireless legacy systems employing WEP while improving security. WPA uses improved data encryption through the Temporal Key Integrity Protocol (TKIP) which scrambles keys using a hashing algorithm and, by adding an integrity-checking feature to ensure that the keys have not been tampered with. Additionally, user authentication is enabled using the Extensible Authentication Protocol (EAP).

Choosing the IEEE 802.11i and WPA Security Method will call up the following screen:

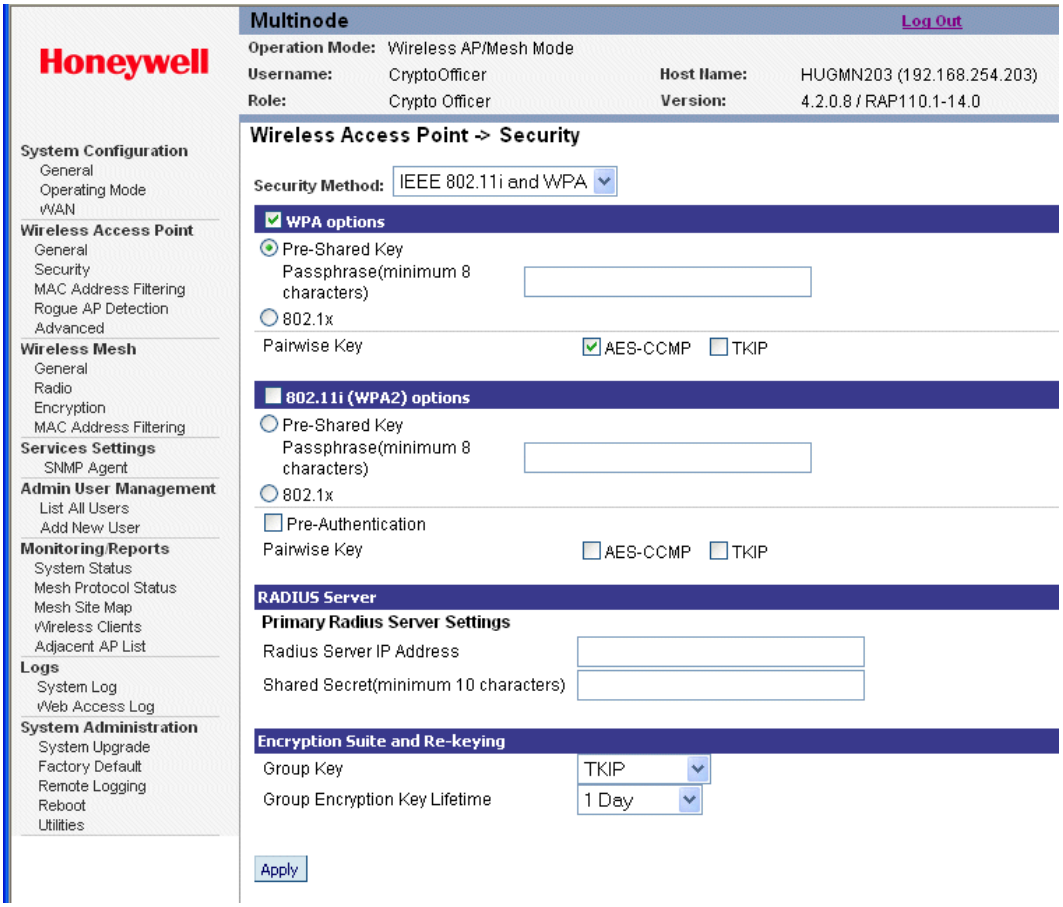


Figure 6 Wireless Access Point - Security with IEEE 802.11i and WPA selected

Perform the following steps to use the IEEE 802.11i and WPA Security method. See Table 8 below for the details in setting these fields.

Step	Action
1	Click on the **Wireless Access Point - Security** at the left of the screen to call up the Security screen.
2	Choose **IEEE 802.11i and WPA** from the drop down selections in the **Security Method** field. The IEEE 802.11i and WPA encryption options appear on the screen.
3	If you wish to use WPA on the wireless system gateway, enable either **WPA options** or **802.1x (WPA2) options** by adding a check to the appropriate check box. Note: Both options can be checked (WPA and 802.11i WPA2), so that clients can connect to the network using either method. Be sure to set the appropriate options for each.
4	Click the **Pre-Shared Key** radio button to enable this feature. See Pre-Shared Key description in Table 8.
5	Enter the passphrase in the **Passphrase** field, (Passphrase minimum is 8 charracters/numeric or hexidecimals). (The passphrase limit is 63 characters.)
6	If you have selected 802.11i (WPA2) options, you may enable **Pre-Authentication** by checking the box. See Pre-Authentication description in Table 8.
7	Choose the **Pairwise Key** to match the encryption type used by the clients. See Pairwise Key description in Table 8.
8	• Choose the appropriate **Group Key** from the selections in the drop down list. • Choose the **Group Encryption Key Lifetime** from the selections in the drop down list. See Encryption suite and Re-keying description in Table 8.
9	Once you have selected the options you will use, click **Apply**.

Table 8 IEEE 802.11i and WPA security options

Option	Description
Pre-Shared Key	When selected, allows input up to 63 characters, numerics or hexadecimals in the Passphrase field.
Pairwise Key	If the clients use WPA-TKIP, select TKIP as encryption type. If the clients use WPA-AES, select AES-CCMP. If the clients use both encryption types, select AUTO.
Pre-Authentication	Enable pre-authentication to allow a client to authenticate in advance with the AP before the client is associated with it. Allowing the AP to pre-authenticate a client decreases the transition time when a client roams between APs.
RADIUS Server	As an alternative for business applications who have installed Radius Servers, select WPA 802.1x and input the Primary Radius Server settings. Use of Radius Server for key management and authentication requires that you have installed a separate certification system and each client must have been issued an authentication certificate.
Encryption suite and Re-keying	Re-keying time is the frequency in which new encryption keys are generated and distributed to the client. The more frequent re-keying (Group Encryption Key Lifetime) - the better the security. For highest security, select the shortest re-keying interval.

MAC Address Filtering screen

The Wireless Access Point -MAC Address Filtering screen is used to set up MAC address filtering for the APs. This feature allows you to further strengthen wireless client access security by allowing only known clients to join the secure network. MAC address filtering is recommended for static configurations with a small number of clients. The default setting for MAC Address filtering is Disabled.

To enable and setup MAC Address filtering for the access points in your network:

Step	Action
1	Click on the **Wireless Access Point - MAC Address Filtering** at the left of the screen to call up the MAC Address Filtering screen.
2	Select **Enable** to enble MAC Address filtering.
3	Select **Filtering Type** from the drop down menu.
	MAC Address filtering and filter type works as follows: • When Filtering is enabled and the Filter Type is **Deny All Except Those Listed Below**, only those devices equipped with the authorized MAC addresses will be able to communicate with this bridge node. In this case, input the MAC addresses of all the PC cards that will be authorized to access this bridge node. The MAC address is engraved or printed on the PC (PCMCIA) card. • When Filtering is enabled and the Filter Type is **Allow All Except Those Listed Below**, any device with a MAC address which has been entered in the MAC Address list will not be able to communicate with this bridge node. In this case, navigate to the report: Wireless Clients and copy the MAC address of any wireless client that you want to exclude from communication with the bridge node and then add those MAC Addresses to the MAC Address list.
4	Enter a MAC Address with a note to the **MAC Address** and **Note** fields and click **Add** to add it to the MAC Address List at the bottom of the screen. Note that communication with the mesh nodes containing these MAC addresses entered in this field depends upon the Filter Type selected above.

Rogue AP Detection screen

The Wireless Access Point - Rogue AP Detection screen allows the network administrator to set up rogue AP detection which provides another level of security to the wireless network. Once all mesh nodes have been deployed, you can enter their MAC addresses as described below to only allow known nodes to join the mesh network. Any other nodes will not be able to join the network even if the nodes contain the correct SSID and security credentials. These nodes will be detected as rogue APs and a notification can be sent to the operator.

To set up Rogue AP detection:

Step	Action
1	Click on the **Wireless Access Point - Rogue AP Detection** at the left of the screen to call up the Rogue AP Detection screen.
2	Select **Enable** to activate Rogue AP detection.
3	Enter an email address in the **To** field where notifications can be sent for any rogue or non-trusted APs that are detected.
4	Select the filtering options for the notification of any rogue APs that are detected. • **SSID Filter** - This option will send only rogue APs that match the APs SSID or wireless bridge's SSID. • **Channel Filter** - This option will send only rogue APs that match the AP's channel of the wireless bridge's channel. Note: When both options are selected, only APs that match both the SSID and channel are sent in the notification.
5	Click **Apply** to enable changes.
6	In the **MAC Address** field, enter the MAC Address of each AP in the network that you want the AP being configured to accept as a trusted AP. (You may add up to 200 APs. The MAC Address for the AP is located on the Wireless Access Point - General screen.)
7	Click **Add** button to add the MAC address to the Known AP MAC Address List.

NOTE: The Adjacent AP list screen, under Monitoring/Reports will detail any rogue APs.

Advanced screen

The Wireless Access Point - Advanced screen allows you to enable or disable load balancing between APs and control packet forwarding between clients in a network.

- The **Load Balancing** feature balances the wireless clients communications between APs. For example, if two APs with similar settings are located in close proximity of each other, all wireless clients near that location could potentially associate with the same AP, leaving the other AP unused. Load balancing attempts to evenly distribute the wireless clients communication on both APs.
  NOTE: Load balanceing is disabled by default. If enabled, all APs in the network should be enabled for load balancing.
- **Publicly Secure Packet Forwarding** (No Inter-client Communicaton) prevents wireless clients that associate with the same AP from communicating with each other. When this feature is enabled, wireless clients can not talk to other wireless clients directly at Layer 2. However, both clients can have access to others that are not associating to the same AP.

Click **Apply** to save changes you have made in the Advanced screen.

Wireless Mesh

Wireless mesh provides a means for multinodes to:

(1) Communicate with each other,

(2) Extend the Basic Service Set (BSS) of a single access point (multinode), and

(3) Connect two or more separate LANs without cabling.

Wireless mesh is a function that requires set up in addition to the basic access point configuration. The screens which are used when configuring the unit for wireless mesh are described in the following sections:

- Wireless Mesh - Describes the screens and the available options you can choose when setting up wireless mesh. Starting on page 71.
- Setting up wireless networks - Provides typical configurations and outlines the procedures for setting up three common types of wireless networks. Page 82.

Services Settings

SNMP Agent screen

The Service Settings - SNMP Agent screen allows you to set up a Simple Network Management Protocol (SNMP) Agent. The agent is a software module that collects and stores management information for use in a network management system (such as the Network Management and Diagnostic tool). The unit's integrated SNMP agent software module translates the device's management information into a common form for interpretation by the SNMP Manager software, which resides on a network administrator's computer.

The SNMP Manager interacts with the SNMP Agent to execute applications that control and manage object variables (interface features and devices) in the WSG. Common forms of managed information include number of packets received on an interface, port status, dropped packets, and so forth. SNMP is a simple request and response protocol, allowing the manager to interact with the agent to either:

• Get - Allows the manager to read information about an object variable

• Set - Allows the manager to write values for object variables within an agent's control

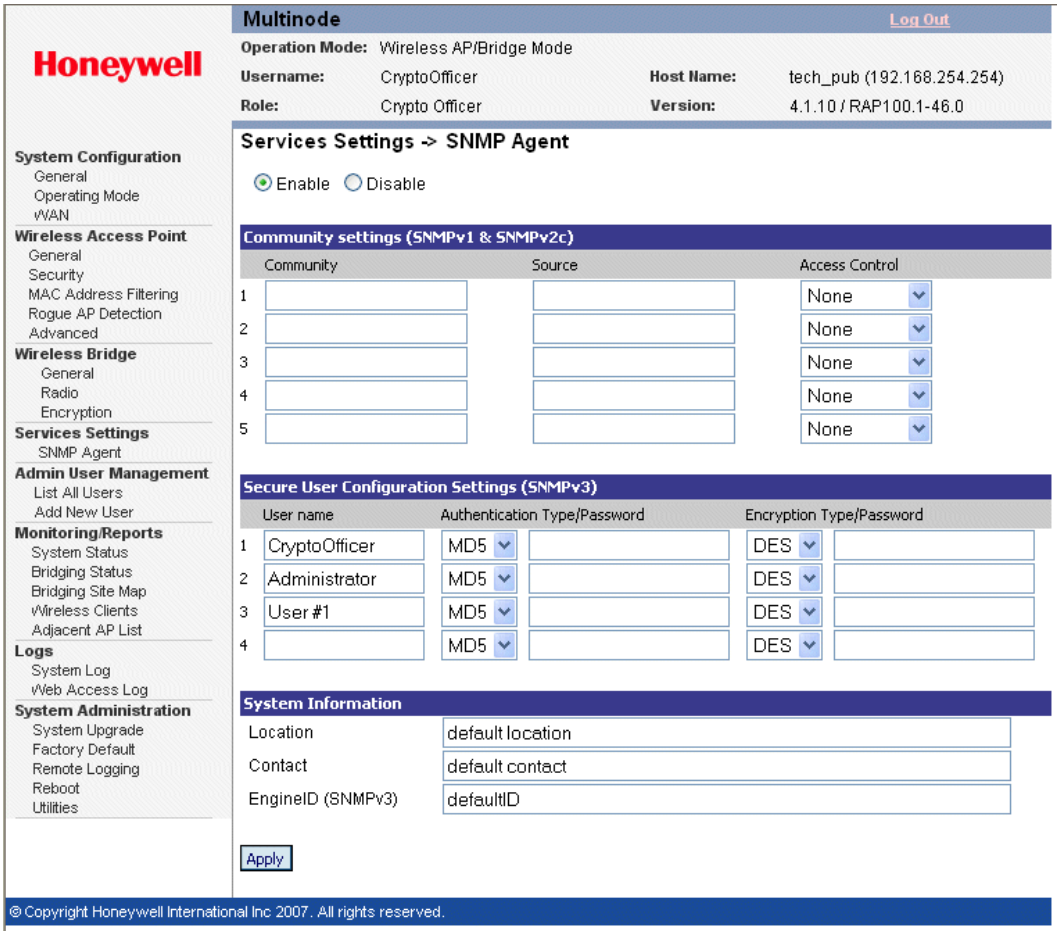


Figure 7 Service Settings - SNMP Agent screen

Step	Action
1	At the left of the screen, click on **SNMP Agent** to display the Service Settings - SNMP Agent screen.
2	Select the **Enable** radio button to enable this function.
3	Enter a name in the **Community** field, which is a password to access the Access Control functions.

Step	Action
4	Enter a valid IP address in the **Source** field as the address where information is accessed.
5	Select the type of **Access Control** from the drop down menu that defines the permitted level of management interaction. (Set, Get and Trap)
6	If using Secure user configuration settings (SNMPv3): • Enter a User name (minimum of 8 characters) • Select from the drop down menu an Authentication type and enter a password • Select from the drop down menu the Encryption type and enter a password. Note: **DES** encryption type is recommended.
	This configuration information also must be entered when setting up the Network Management and Diagnostics application.
7	Enter System Information in the following fields. • Location • Contact • EngineID
8	Once you have selected the options in this screen, click **Apply**.

Admin User Management

User Management - List All Users screen

The User Management - List All Users screen lists the Crypto Officer and all Administrator user accounts defined for the multinode.

To edit or delete users:

Step	Action
1	Click on the **List All Users** at the left of the screen to call up the User Management - List All Users screen.
2	Click the **Edit** button for the User ID listed on the screen. The User Management - Edit User screen appears.
3	You can now edit any of the following fields: • User ID: Edit or change the name of the user ID • Password: Edit or change the password. • Role: Edit the Role of this user. • Note: Add or edit a descriptive note about this user.
4	When finished editing the user, click **Update** to apply the changes made to the user definition. Or Click **Reset** to cancel the changes and revert to the previous user definition.
5	To delete a user, click the **Delete** button for the User ID in the list.

User Management - Add New User screen

The User Management - Add New User screen allows you to add new Administrator user accounts and assign and confirm the password for the user.

To add a new user:

Step	Action
1	Click on the **Add New User** at the left of the screen to call up the User Management - Add New User screen.
2	Enter a descriptive name to identify the user in the **User ID** field.
3	Enter a password that the user will use when accessing the system in the **Password** field.
4	Retype the password to confirm the password entry.
5	Choose the **Role** assigned to this user. • Crypto Officer - The user that performs initial setup for a multinode. The user has full access to all system management screens. • Administrator - The user which is assigned to administer the wireless network node.
6	Add a descriptive note for this user in the **Note** field.
7	When finished entering the user information, click **Add** to create the new user account and add it to the users list. Or Click **Reset** to cancel the changes.

System Administration

The System Administration screens provide access to system functions such as firmware upgrades, configuration backup/restore, remote logging and utilities.

System Administration - System Upgrade

The System Administration - System Upgrade screen allows you to upload updates to the multinode's firmware. Configuration files also can be copied from one multinode to another. There are three tabs on the System Upgrade screen.

The **Firmware Upgrade** tab allows you to browse and select new files to upgrade the mesh (multinode) and sensor (field I/O radio) firmware.

The **Local Configuration Upgrade** tab and the **Remote Configuration Upgrade** tab allow you transfer (copy) the system configuration file from one mulitnode to another multinode.

Firmware Upgrade

To perform a firmware upgrade on a multinode:

Step	Action
	You must be logged in as the Crypto Officer to perform this procedure.
1	On the System Administration - System Upgrade screen, the **Firmware Upgrade** tab is the default view.
	There are two firmware upgrade choices: • Upgrade Mesh software • Upgrade Sensor Radio software
2	Click **Browse…** to navigate to the directory and select the software file to be uploaded.
3	Click on the appropriate **Upload Firmware** button to begin the software upload.
4	Either of the two events will occur to indicate successful upload of the software: • The multinode will reboot after the software upload is completed.

Step	Action
	• A message to select "Back" confirms that the software upload is completed.

Local Configuration Upgrade

On the System Administration - System Upgrade screen, the Local Configuration Upgrade tab allows you to download the system configuration of a multinode to a local computer where it is saved as a configuration file. The file contains the configuration settings for a multinode that can be uploaded to other multinodes on the local network. A passphrase is associated with the file to provide a password level of security to use the file. A tag name can also be associated with the file for identification.

NOTE: The configuration file that you download to a local computer and use to configure additional multinodes contains both configuration parameters and some network parameters such as the IP address and hostname.

To download a configuration file from a multinode to a local computer:

Step	Action
	You must be logged in as the CryptoOfficer to perform this procedure.
1	On the System Administration - System Upgrade screen, click on the **Local Configuration Upgrade** tab
2	Enter a **Passphrase** in the Option 2 field of the screen. Record this passphrase for future use.
3	Enter a File Tag name (up to 12 characters) to be applied to the configuration file so that it can be tracked as the file is loaded to other multinodes.
4	Click **Apply** to apply the tag name to the file.
5	Click the **Download Configuration** button to download the configurartion file to the local computer.

To upload the configuration file to the multinode:

Step	Action
1	Log in to the multinode that you want to upload the configuration file as the Crypto Officer.
2	On the System Administration - System Upgrade screen, click on the **Local Configuration Upgrade** tab
3	Under Option 1: click the **Browse** button to select a configuration file on the local computer to upload.
4	Enter the **Passphrase** (recorded during download procedure) for the selected configuration file.
5	Click the **Upload Configuration** button to begin the file upload.

Remote Configuration Upgrade

On the System Administration - System Upgrade screen, the Remote Configuration Upgrade allows you to upload and download configuration files to multinodes in remote locations which are not configured. You can transfer a configuration file to other selected multinodes.

NOTE: Only configuration parameters that can be shared between multinodes are downloaded in the configuration file. The WAN IP address and hostname are not transferred in the configuration file.

To upload and download configuration files to multinodes in remote locations which are not configured:

Step	Action
1	On the System Administration - System Upgrade screen, click on the **Remote Configuration Upgrade** tab
2	Click the **Local File Tag** radio button and select a configuration file to transfer.
3	Check the nodes in the Site Map field that you want to transfer the file to.
4	Click **Apply**. The nodes will reboot once the file has been transferred.

Step	Action
5	Click on the **Update Site Map** button.
6	Verify the file has been transferred to the selected nodes successfully. The File Tag shows the status of the nodes. If the File Tag matches the Local File Tag the transfer was successful.

To generate and transfer a randomly generated configuration file to a multinode:

Step	Action
1	Click **Generate** button. A random mesh configuration file is created in a temporary file and an Install button appears. This configuration file is used to update the bridging SSID and bridging encryption on other devices using the existing bridging link. If the bridging key or the bridging SSID is changed on the normal configuration screen, then the bridging link to the other devices will be terminated, and the configuration can not be updated.
2	Select the **Disable** radio button in the Automatic IP Address Configuration field.
3	To transfer the random bridging configuration file: • Select the **Generated File** radio button. • Check the nodes in the Site Map field that you want to transfer the file. • Click **Apply**.
4	Verify the file has been transferred to the selected nodes successfully. Indicated in the Upgrade Status field of the Site Map.
5	Click **Install** to apply the randomly generated configuration file to the node. Once applied, the node will reboot and start using the new configuration file.

Factory Default

The System Administration - Factory Default screen is used to reset the multinode to its factory settings. You must be logged in as the CryptoOfficer to access the Restore button.

ATTENTION

The "Restore" button is a fallback troubleshooting function that should be used only to reset the multinode to its factory default settings.

Remote logging

The System Administration -Remote Logging screen allows you to forward the system log data from each multinode to a central remote logging server. If you enable Remote Logging, enter the IP addresss for the System Log Server and the System Log Server Port. Click Apply to accept these values.

Reboot

The System Administration - Reboot screen allows you to reboot the multinode without changing any preset functionality. Both CryptoOfficer and Administrator users have access to this function.

Utilities

The System Administration - Utilities screen gives you access to two useful utilities: Ping and Traceroute. Simply enter the IP Address or hostname you wish to ping or traceroute and click either the Ping or Traceroute button, as appropriate.

Wireless Mesh Configuration

Introduction

Wireless mesh provides a method for multinodes to communicate with each other; to extend the Basic Service Set (BSS) of a single access point (multinode), and to connect two or more separate LANs without cabling. The multinode contains a second WLAN card which is used to set up the independent wireless mesh/network connection. The multinode supports three common network types:

1. Point-to-point network of two Ethernet links
2. Point-to-multipoint network of several Ethernet links
3. Repeater mode

The following sections describe the configuration options that are available to set up your network in the Multinode Configuration Tool screens. Setting up wireless networks provides typical configurations and procedures for setting up the various network types.

Wireless Mesh screens

The screens that you need to modify when setting up a wireless network are in the **Wireless Mesh** section of the navigation bar in the Multinode Configuration Tool. These screens include:

- Wireless Mesh - General
- Wireless Mesh - Radio
- Wireless Mesh - Encryption
- Wireless Mesh - MAC Address Filtering (when Auto Mesh is selected.)

General screen

The Wireless Mesh - General screen shown in Figure 8 contains wireless mesh information. This page is important in setting up the mesh/network configuration. Wireless mesh supports two modes of operation:

Auto-forming wireless mesh (Auto Mesh) - Auto Mesh mode enables the multinode to search for beacons from other wireless meshs/networks and identifies multinodes that match configuration settings such as SSID and channel number. A three-way association handshake between the wireless networks is performed to control network access to the mesh. The maximum number links that a multinode will allow when forming the mesh

link is 40. It does not limit the overall size of the mesh/network or the number of networks.

- **Manual wireless mesh** (Manual Mesh) - A manual mesh/network is defined through the wireless mesh configuration settings. Multinodes do not search for matching wireless networks, (as in the auto mesh mode).

NOTE: This section describes the options that are available when using the Wireless Mesh - General screen. See Setting up wireless networks in this guide for typical multinode configurations when creating a wireless network.

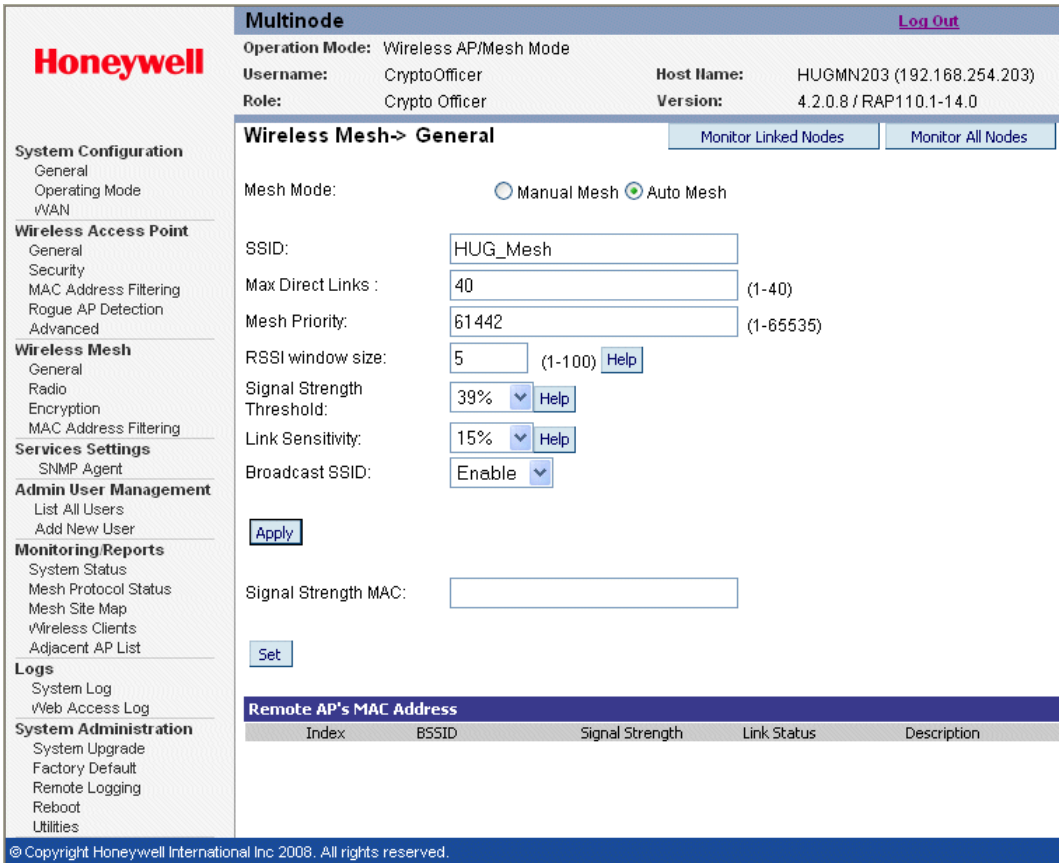


Figure 8 Wireless Mesh - General screen (Auto Mesh mode selected)

Auto mesh options

When Auto Mesh mode is selected on the Wireless Mesh - General screen, the wireless mesh searches for beacons from other wireless meshs/networks and identifies multinodes that match configuration options such as SSID and channel number.

ATTENTION

Several of the parameters that appear in the Wireless Mesh screens are used when tuning the mesh network (Mesh priority, Signal Strength Threshold and MAC Address Filtering). See Multinode and Mesh NetworkTuning on page 97 for additional information on adjusting these parameters.

Instead of simply adding the multinodes with the same SSID/channel to the network, a three-way association handshake between the wireless networks is performed to control network access to the mesh.

Table 9 Auto Mesh screen options

Auto Mesh Parameter	Option	Description
Mesh Mode	Auto Mesh	Auto Mesh is selected.
SSID	numbers and/or letters	An alpha-numeric ID assigned by the network administrator. This SSID must be set on each wireless device in the network so that the devices can communicate with each other.
Max Direct Links	1-40	Sets the maximum number of multinode links allowed in forming a mesh link. It does not limit the overall size of the mesh/network or the number of networks.
Mesh Priority	1-65535	Sets the mesh priority of the node in the network. The number should be set to a multiple of 4096. For example, use these values: 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344, 61440 and 65535 A lower the value indicates a higher mesh priority.

Note: For wired Ethernet switches, WSGs and any wired multinodes, set the mesh

Auto Mesh Parameter	Option	Description
priority to a value lower than all wireless multinodes in the mesh network. The lowest value (highest mesh priority) in the network becomes the STP root. See also Tuning the mesh priority.		
RSSI window size	1 - 100	Sets the number of samples over which the reported RSSI value is calculated. A smaller number means that the RSSI value changes more quickly and is affected more by outliner values. A larger value means that the RSSI value is not affected by transient changes in RSSI value. This parameter serves to smooth RSSI value.
RF signals fluctuate over time and in different operating environments and the rate of fluctuation can vary. The RSSI value in which multinode applications use is an average of the last window size samples. The sample rate is dependent upon the beacon interval of the associated node. His parameter also servers to stabilize the wireless network. For fixed location deployment, higher values are recommended for both window-size and beacon interval. Lower values are recommended when adjusting antennas or distributing mobile mesh devices.		
Signal Strength Threshold	75%, 60%, 51%, 45%, 39%, 27%, 21%, 15%, 9%, None	Sets the threshold of signal strength that prevents the node from associating and joining the network.
When creating a mesh link, if the signal strength is less that the threshold, the link is not be created. Although once a link is created, it will not be broken even if the signal goes below the threshold. This parameter helps to stabilize the network.		
Link Sensitivity	75%, 60%, 51%, 45%, 39%, 27%, 21%, 15%, 9%, None	The amount of change in the RSSI value required before the multinode changes its mesh link. Set this value high for good mesh stability. It is recommended that all nodes in a network are set to the same value.
Once a link is created, signal strength is mapped to rapid spanning tree priority (RSTP) path cost. Since RF signals fluctuate, path cost needs to be adjusted accordingly. However, adjusting path cost too frequently causes network instablility. Path cost is adjusted if the signal strength increases/decreases by link sensitivity value since the last adjustment. If the value is set to none, evey link acts like 100% signal and no path cost adjustment is made.		

Auto Mesh Parameter	Option	Description
Broadcast SSID	Disable/Enable	When enabled, the SSID of the network is broadcast so that any client using the SSID can associate with the multinode. When disabled, the multinode hides the SSID in outgoing beacon frames to prevent stations from obtaining the SSID through passive scanning. Also, the bridge doesn't send probe responses to probe requests with unspecified SSIDs when disabled.
Signal Strength MAC		The MAC address of a multinode. The signal strength of the link between this multinode and the other multinode (indicated in the Signal Strength MAC field) will be represented by the WLANSS LED located on the front of the multinode. The WLANSS LED will blink at a rate proportional to the signal strength of the link. Note that the MAC address may or may not be the addresss of the bridge link used in the mesh network. Normally, this parameter is not configured and is used only as a diagnostic aid.

Manual mesh options

When Manual Mesh mode is selected on the Wireless Mesh - General screen, you can manually select MAC address of a node that represents the signal strength LED and enable or disable spanning tree protocol. You can also add and delete remote AP's (multinode's) MAC addresses.

Table 10 Manual Mesh screen options

Manual Mesh Parameter	Option	Description
Mesh Mode	Manual Mesh	Manual Mesh is selected.
Signal Strength LED MAC	Not Assigned	Selects the number of one of the remote multinodes that will be listed at the bottom of the screen once the system is operational

Manual Mesh Parameter	Option	Description
		(Remote AP's MAC address). This wireless mesh link becomes the guiding port indicated as a signal in the WLANSS LED on the front of the multinode. 'Not Assigned' is the default. No signal indication of any multinode will be indicated when option is set to 'Not Assigned.'
Spanning Tree Protocol (STP) 802.1d	Enable/Disable	Sets the Spanning Tree Protocol for this node. Enable STP if there is any possiblity that a mesh loop could occur. If there is no possibility that a mesh loop will occur, then disable STP. Bridge communications is faster when STP is disabled.

Mesh loop

Mesh loop is a condition that occurs where data is transmitted circularly between multinodes in a mesh network. For example, three multinodes are operating in a mesh network. Device data from a field device is received by one multinode which is then passed to the second multinode and then the third multinode, because all three multinodes are meshed together. It is possible that the device data could be passed on to the first multinode again creating a loop. Enabling Spanning Tree Protocol will prevent mesh loops from occurring.

Monitor Linked Nodes button

The **Monitor Linked Nodes** button in the upper right-hand corner of the **Wireless Mesh - General** screen allows you to view a pop-up window (Wireless Mesh Information). It shows the signal strength of all nodes linked to this multinode. Select Enable refesh, you can set the mesh refresh interval from 5 seconds to 30 minutes. Refreshing the screen allows you to see the effect when aiming the antenna to improve signal strength. The signal can be trended for each node.

Monitor All Nodes button

The **Monitor All Nodes** button in the upper right-hand corner of the **Wireless Mesh - General** screen allows you to view a pop-up window (Wireless Mesh Information). It shows the signal strength of all nodes detected by this multinode. Select Enable refesh, you can set the mesh refresh interval from 5 seconds to 30 minutes. Refreshing the screen

allows you to see the effect when aiming the antenna to improve signal strength. The signal can be trended for each node.

Wireless Mesh - Radio screen

The Wireless Mesh - Radio screen, shown in Figure 9 contains wireless mesh information including the channel number, Tx Rate, Tx Power and remote AP's BSSID. This page is important in setting up your mesh configuration. Table 11 describes the options appearing on the Radio screen.

NOTE: This section describes the options that are available when using this screen. See Setting up wireless networks in this guide for typical multinode configurations when creating a wireless mesh network.

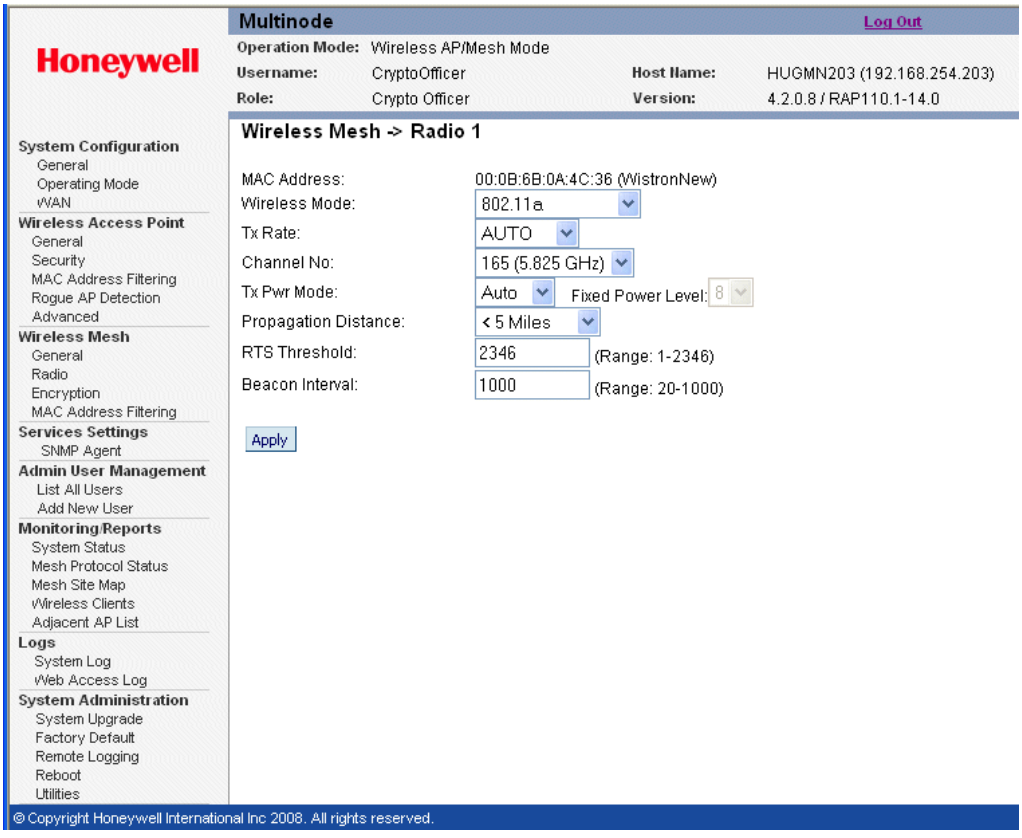


Figure 9 Wireless Mesh - Radio screen

Table 11 lists and describes the options available on the Wireless Mesh - Radio screen.

Table 11 Radio screen options

Screen Field	Option	Description
MAC Address	MAC address is fixed	Displays the MAC address of the multinode.
Wireless Mode	802.11b/g Mixed 802.11a	Sets the wireless mode for the wireless mesh.
Tx Rate	For wireless mode option 802.11b/g Mixed	
	AUTO, 1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54 Mbps	Sets the transmit rate for the selected wireless mode and channel number. When set to AUTO, the WLAN card attempts to select the optimal rate for the channel. If a fixed rate is selected, the WLAN card will transmit only at that rate.
	For wireless mode option 802.11a	
	AUTO, 6, 9, 12, 18, 24, 36, 48, 54 Mbps	Sets the transmit rate for the selected wireless mode and channel number. When set to AUTO, the WLAN card attempts to select the optimal rate for the channel. If a fixed rate is selected, the WLAN card will transmit only at that rate.
Channel No. Note: Available channels are dependent upon Country Code setting.	For wireless mode option 802.11b/g Mixed 1 (2.412 GHz) 2 (2.417 GHz) 3 (2.422 GHz) 4 (2.427 GHz) 5 (2.432 GHz) 6 (2.437 GHz) 7 (2.442 GHz) 8 (2.447 GHz) 9 (2.452 GHz) 10 (2.457 GHz) 11 (2.462 GHz)	Sets the channel frequency for the wireless mesh.

Screen Field	Option	Description
	For wireless mode option 802.11a	
	52 (5.26 GHz) 56 (5.28 GHz) 60 (5.30 GHz) 64 (5.32 GHz) 149 (5.745 GHz) 153 (5.765 GHz) 157 (5.785 GHz) 161 (5.805 GHz) 165 (5.825 GHz)	Sets the channel frequency for the wireless mesh.
Tx Pwr Mode	Off, Fixed, Auto	Sets the RF transmit level of the multinode.
The default mode is Auto which provides the widest range of RF transmission available under ambient conditions. The wireless mesh's broadcast range can be limited by setting the Tx Pwr Mode to Fixed and choosing a Fixed Pwr Level between 1 and 8. To prevent any RF transmission from the wireless mesh, set the Tx Pwr Mode to Off. RF transmissions from any associated wireless devices will not be turned off, but the devices will not be able to communicate with the wireless mesh when Tx Pwr Mode is set to Off.		
Fixed Pwr Level	1, 2, 3, 4, 5,6 7, 8	Sets transmit power level to a fixed value and is active when Tx Pwr Mode is set to Fixed. Level 1 is the lowest power level (Level 1 = 7dBm) and Level 8 is the highest power level, (Level 5=15dBm)
Propagation Distance	< 5 Miles 5-10 Miles 11-15 Miles 16-20 Miles 21-25 Miles 26-30 Miles > 30 Miles	Sets the approximate distance between two mesh nodes. Set Propagation Distance based on the distance between this mesh node and the mesh node that is furthest from it and in the same network.
RTS Threshold	Range 1-2346	The number of bytes used for the RTS/CTS handshake boundary. When a packet size is greater than

Screen Field	Option	Description
		the RTS threshold, the RTS/CTS handshaking is performed.
Beacon Interval	Range 20 - 1000	The time interval in milliseconds in which the 802.11 beacon is transmitted by the AP. See also RSSI window size in Table 9.
Note	You can enter a note that defines the location of the remote mesh node.	

Wireless Mesh - Encryption screen

The Wireless Mesh - Encryption screen, shown in Figure 10 is used to select the encryption type and generate the static encryption keys for the wireless mesh. You must set the Encryption type and enter the encryption Key (if required) to ensure that your mesh is working correctly. The encryption key that you use on this screen must be the same for any mesh node connected to this network. The encryption type and key value for Multinode 1 must be the same as for Multinode 2.

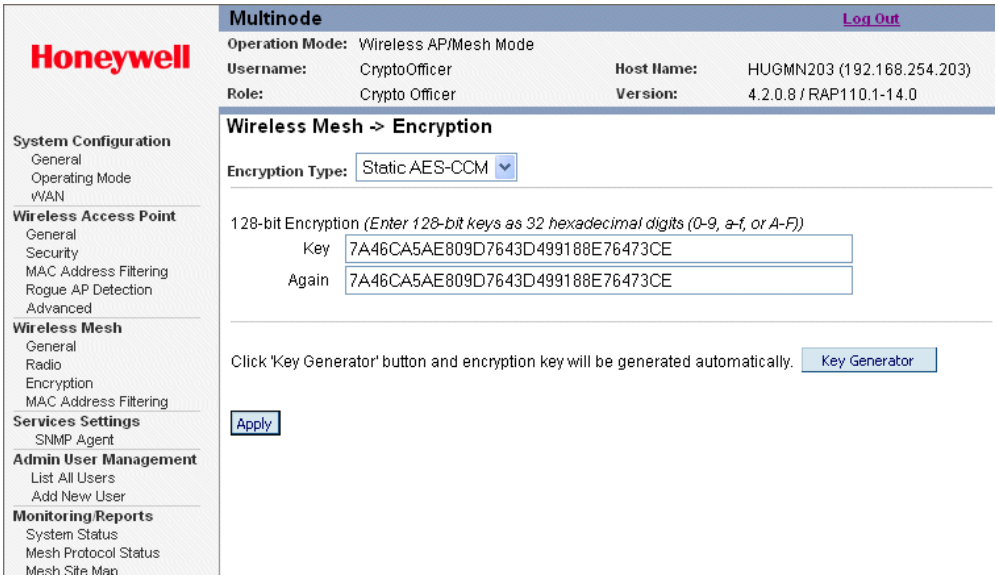


Figure 10 Wireless Mesh - Encryption screen

Table 12 Encryption screen options

Screen Field	Option	Description
Encryption Type	None Static AES-CCM	Sets the encryption type for the wireless mesh.
128-bit encryption	Hexidecimal numbers	Enter a 128-bit key as hexadecimal digits in the Key field, or click on the **Key Generator** button which automatically generates a randomized key. Enter the encryption key a second time in the Again field. Note: Record this key for future reference.
Key Generator	*button*	Generates a random encryption key automatically which is entered in the Key field.

Wireless Mesh - MAC Address Filtering screen

The Wireless Mesh -MAC Address Filtering screen is used to set up MAC address filtering for the wireless mesh. This feature allows you to further strengthen wireless client access security by allowing only known clients to join the mesh/network. MAC address filtering is recommended for static configurations with a small number of clients. The default setting for MAC Address filtering is Disabled.

NOTE: this screen is visible in the navigation tree only when Auto Mesh mode is selected on the multinode. See Wireless Mesh - General screen to select the mesh mode. MAC Address Filtering function for mesh works the same as it does for access point configuration.

To enable and setup MAC Address filtering for the access points in your network:

Step	Action
1	Click on the **Wireless Mesh - MAC Address Filtering** at the left of the screen to call up the MAC Address Filtering screen.
2	Select **Enable** to enable MAC Address filtering.
3	Select **Filtering Type** from the drop down menu.

Step	Action
	MAC Address filtering and filter type works as follows: • When Filtering is enabled and the Filter Type is **Deny All Except Those Listed Below**, only those devices equipped with the authorized MAC addresses will be able to communicate with this mesh node. In this case, input the MAC addresses of all the PC cards that will be authorized to access this mesh node. The MAC address is engraved or printed on the PC (PCMCIA) card. • When Filtering is enabled and the Filter Type is **Allow All Except Those Listed Below**, any device with a MAC address which has been entered in the MAC Address list will not be able to communicate with this mesh node. In this case, navigate to the report: Wireless Clients and copy the MAC address of any wireless client that you want to exclude from communication with the mesh node and then add those MAC Addresses to the MAC Address list.
4	Enter a MAC Address with a note to the **MAC Address** and **Note** fields and click **Add** to add it to the MAC Address List at the bottom of the screen. Note that communication with the mesh nodes containing these MAC addresses entered in this field depends upon the Filter Type selected above.

Setting up wireless networks

Multinodes configured to operate as access points can also be setup to operate in a mesh network. These multinodes require additional configuration. If the multinode is to be used only as a bridge, some settings made during access point setup may not be necessary.

You can set up a multinode to operate in a mesh network during initial configuration. See Setup on page 37 for more information. The **Wireless Mesh** screens allow you to setup the multinode to operate in a wireless mesh network. These screens include the Wireless Mesh General, Radio, Encryption and MAC Address Filtering screens

The following sections describe the setup for three types of network configuration: Point-to-Point, Point-to-Multipoint and Repeater.

NOTE: To set up a mesh network, which is most commonly used in OneWireless networks, use the settings for Auto Mesh for the Point to Multipoint network.

Point-to-Point network

Figure 11 shows an example of a point-to-point network, which is a direct communications link (using 802.11a protocol) between two multinodes: Mesh node 1 and Mesh node 2.

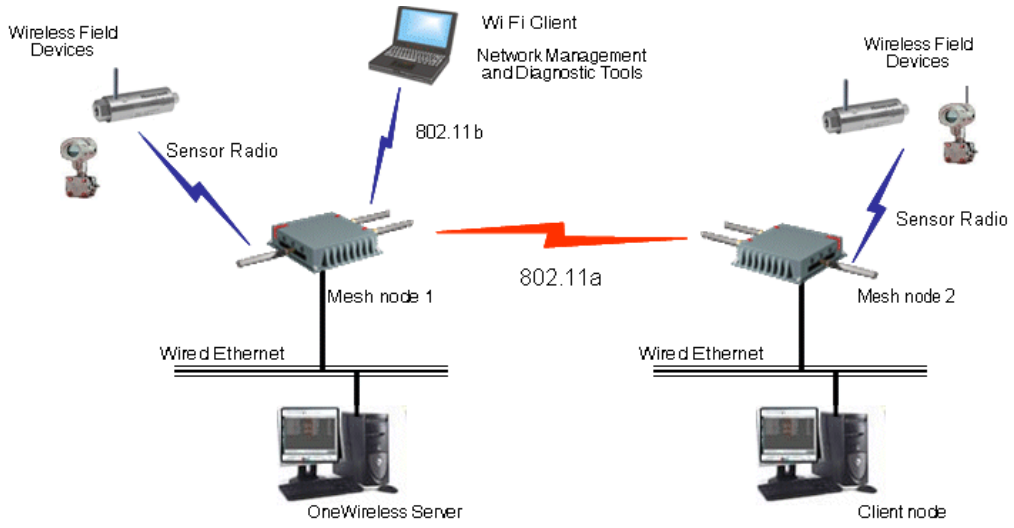


Figure 11 Point-to-point network example

For two networks to be linked and communicating properly, the multinodes must be configured with compatible options in the Wireless Mesh setup screens. Depending upon whether manual or auto mesh is used, Table 13 and Table 14 show typical option settings for setting up a point-to-point network as shown in Figure 11. Make sure that the options are set according to the values in the tables.

Table 13 Point-to-point network settings for Manual Mesh

Screen / Option	Mesh node 1	Mesh node 2
Wireless Mesh - General screen		
Mesh Mode:	Manual Mesh	Manual Mesh
Signal Strength LED MAC:	Not assigned (select from drop-down list)	Not Assigned (select from drop-down list)
Spanning Tree Protocol (STP) 802.1d:	Enable (or Disable if no mesh loop possible)	Enable (or Disable if no mesh loop possible)
Wireless Mesh - Radio screen		
Wireless Mode:	802.11a	802.11a
Tx Rate:	AUTO	AUTO
Channel No.:	Must be the same as Mesh node 2	Must be the same as Mesh node 1
Tx Power Mode:	Auto	Auto
Propagation Distance:	< 5 Miles	< 5 Miles
RTS Threshold:	2346	2346
Beacon Interval:	100	100
Wireless Mesh - Encryption screen		
Mesh encryption options	Must be the same as Mesh node 2	Must be the same as Mesh node 1

Table 14 Point-to-point network settings for Auto Mesh

Screen / Option	Mesh node 1	Mesh node 2
Wireless Mesh - General screen		
Mesh mode:	Auto Mesh selected	Auto Mesh selected
SSID	Must be the same as Mesh node 2	Must be the same as Mesh node 1

Screen / Option	Mesh node 1	Mesh node 2
Max Direct Links:	40 (range 1 - 40)	40 (range 1 - 40)
Mesh Priority:	A multiple of 4096. See Table 9 for details.	A multiple of 4096. See Table 9 for details.
RSSI window size:	5 (range 1 - 100)	5 (range 1 - 100)
Signal Strength Threshold:	9%	9%
Link Sensitivity:	21%	21%
Broadcast SSID:	Disable	Disable
Signal Strength LED MAC:	Enter from list at bottom of screen	Enter from list at bottom of screen
Wireless Mesh - Radio screen		
Wireless Mode:	802.11a	802.11a
Tx Rate:	AUTO	AUTO
Channel No.:	Must be the same as Mesh node 2	Must be the same as Mesh node 1
Tx Power Mode:	Auto	Auto
Propagation Distance:	< 5 Miles	< 5 Miles
RTS Threshold:	2346	2346
Beacon Interval:	100	100
Wireless Mesh - Encryption screen		
Mesh encryption options	Must be the same as Mesh node 2	Must be the same as Mesh node 1
Wireless Mesh - MAC Address Filtering screen		
Filtering:	Enable/Disable	Enable/Disable
Filter Type:	Deny All/Allow All	Deny All/Allow All
MAC Address:	Add MAC address of Mesh node links	Add MAC address of Mesh node links

To set up a wireless mesh (network)

The following procedure outlines the Wireless Mesh setup options for a multinode to operate as a wireless mesh node. The procedure for setting up the three network types is the same, although you should refer to the appropriate tables when selecting the options.

For example, If you want to set up a point-to-multipoint mesh network using auto mesh, refer to Table 15 for the correct option settings and use the procedures below to access the Wireless Mesh screens and select the options. Additional information for all of the options on the Wireless Mesh screens is found in the following places:

Table 9 Auto Mesh screen options on page 73

Table 10 Manual Mesh screen options on page 75

Table 11 Radio screen options on page 78

Table 12 Encryption screen options on page 81.

This procedure assumes that the multinode is connected to a PC and that you are logged into the Multinode Configuration Tool.

Step	Action
1	At the left of the screen, click on **Radio** to display the **Wireless Mesh - Radio screen**.
2	The **MAC Address** field shows the MAC address of the WLAN card for this multinode. Note: Record this address since it must be entered as the BSSID for other multinodes that will be communicating with this multinode.
3	Choose the **Wireless Mode** to be used for wireless mesh, from the drop down menu.
4	Choose the **Tx Rate** from the drop down menu. You can choose AUTO if you want the WLAN card to attempt to select the optimal transmit rate for the channel. Selecting a fixed Tx rate will enable the WLAN card to transmit only at that rate.
5	Choose a **Channel No**. (channel number) from the drop down menu. Note: The channel number must be set to the same frequency for each mesh node to communicate. See Table 11 for a listing of available channels.

Step	Action
6	Choose the **Tx Pwr Mode** from the drop down menu. Note: The Tx Pwr Mode can be set to AUTO unless the power must be regulated. If FIXED is selected, you then must choose the Fixed Power Level from the drop down menu. See Table 11 for more information.
7	Choose the **Propogation Distance** from the drop down menu. Note: This field is set based on the distance between a mesh node and the furthest mesh node that is connected to it.
8	Choose the RTS Threshold. See Table 11 for more information on this option.
9	Choose the value for Beacon Interval. See Table 11 for more information on this option.
10	After you have entered the information in the fields, click **Apply** to accept the values.
11	Enter a descriptive note to identify the remote mesh node or its location.
12	Click **Add** button.

Select mesh mode:

Step	Action
1	Click on the **Wireless Mesh - General** at the left of the screen to call up the General configuration screen.
2	Select either Manual Mesh or Auto Mesh. The screen will refresh according to the Mesh mode that was selected.
3	• If Auto Mesh is selected, go to Complete Auto Mesh on page 88 and follow the procedure. • If Manual Mesh is selected, go to Complete Manual Mesh on page 89 and follow the procedure.

Complete auto mesh:

Step	Action
1	Enter the **SSID.** This SSID must be set on the wireless mesh node and each wireless device in the network so that the devices can communicate with each other.
2	Enter a number from 1 to 40 for the **Max Direct Links.**
3	Next enter the **Mesh Priority** (range from 1-65535). See Table 9 for more information on this option.
4	Select the **RSSI window size**. See Table 9 for more information on this option.
5	Select the **Signal Strength Threshold**. See Table 9 for more information on this option.
6	Select the **Link Sensitivity**. See Table 9 for more information on this option.
7	Either enable or disable the **Broadcast SSID**. See Table 9 for more information on this option.
8	Once you have selected the options you will use, click **Apply**.
9	Enter the **Signal Strength MAC**. The signal strength of the wireless mesh node (indicated in the window) that will be represented by the WLANSS LED located on the front of the multinode.
10	At the left of the screen, click on **Encryption** to display the **Wireless Mesh - Encryption** screen.
11	Choose the Encryption Type from the drop down menu. Choice is either None or **Static AES-CCM**.
12	If you select AES-CCM, you must enter a 128-bit key as hexadecimal digits, or click on the **Key Generator** button which automatically generates a randomized key. Record the key number. You will need to use it later. Note that this key is initially shown in plain text so you have the opportunity to copy the key. Once the key is applied, the key is no longer displayed in plain text.
13	Once you have selected the options you will use, click **Apply**.

Complete manual mesh:

Step	Action
1	Select the **Signal Strength LED MAC** from the drop down menu. The selections are also listed at the bottom of the screen. See Table 10 for more information on this option.
2	Set **Spanning Tree Protocol (STP) 802.1d** to **Enable** unless you are sure that there is no chance of a mesh loop. See Table 10 and Mesh loop for more information on this option.
3	Click **Apply** to accept the changes made on this screen.
4	At the left of the screen, click on **Encryption** to display the **Wireless Mesh - Encryption** screen.
5	Choose the Encryption Type from the drop down menu. Choice is either None or **Static AES-CCM**.
6	If you select AES-CCM, you must enter a 128-bit key as hexadecimal digits in the Key field, or click on the **Key Generator** button which automatically generates a randomized key. Record the key number. You will need to use it later. Note that this key is initially shown in plain text so you have the opportunity to record or copy the key. Once the key is applied, the key is no longer displayed in plain text.
7	Once you have selected the options you will use, click **Apply**.

TIP

Configure other multinodes in the mesh network following the instructions given for Multinode 1 above.

Be sure that you have completed configuration of the multinode by visiting the System Configuration, Wireless Access Point and System Services screens and choosing the configuration options applicable to the wireless network.

You must set the Encryption type and encryption key (if required) to ensure that the mesh is working correctly. The encryption key that you use on this screen must be the same for any mesh node connected to this network in order for communication to occur. The encryption type and key value for Mesh node 1 must be the same as for Mesh node 2 and any other mesh node in the network.

Point-to-Multipoint network

A point-to-multipoint network allows three or more multinode access points to communicate wirelessly between 3 or more locations. Figure 12 shows an example of this network type. Multinode 1 is the single access point for communication with the other mesh nodes (Mesh nodes 2, 3, …*n*) in the network. For the mesh nodes to be linked and communicating properly, they must be configured with compatible options in their Wireless Mesh setup screens. For example, all mesh nodes must be set with the same channel number.

When setting up this type of network, Mesh node 1 must contain the BSSIDs for all other mesh nodes in the network, while Mesh nodes 2, 3, …*n* need to contain only Mesh node 1's BSSID. Table 15 and Table 16 list the option settings for creating the point-to-multipoint network as shown in Figure 12. Use the settings in these tables if you want to set up this type of network. The procedure to set up a wireless mesh begins on page 86.

NOTE: To set up bridging for Mesh network communications, use the settings for Auto Mesh in Table 15.

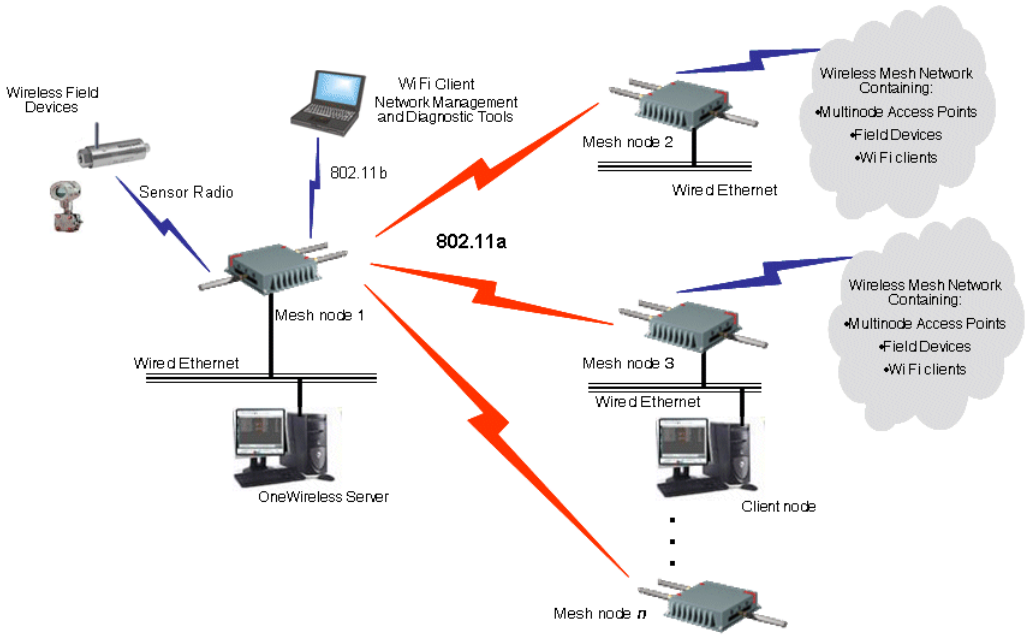


Figure 12 Point-to-multipoint network example

The network shown in Figure 12 requires that only Mesh node 1 be set in Auto Mesh mode. You can set all multinodes to auto mesh mode, in which case each mesh node must contain the BSSID for each of the other mesh nodes and Spanning Tree Protocol must be Enabled.

Table 15 Point-to-Mulitpoint network setting for Auto Mesh

Screen / Option	Mesh node 1	Mesh node 2, 3, …*n*
Wireless Mesh - General screen		
Mesh mode:	Auto Mesh selected	Auto Mesh selected
SSID	Must be the same as Mesh nodes 2, 3, …*n*	Must be the same as Mesh node 1
Max Direct Links:	40 (range 1 - 40)	40 (range 1 - 40)
Mesh Priority:	65535 (range 1 - 65535)	65535 (range 1 - 65535)
RSSI window size	5	5
Signal Strength Threshold:	9%	9%
Link Sensitivity	21%	21%
Broadcast SSID	Disable	Disable
Signal Strength LED MAC:	Enter from list at bottom of screen	Enter from list at bottom of screen
Wireless Mesh - Radio screen		
Wireless Mode:	802.11a	802.11a
Tx Rate:	AUTO	AUTO
Channel No.:	Must be the same as Mesh nodes 2, 3, …*n*	Must be the same as Mesh node 1
Tx Power Mode:	Auto	Auto
Propagation Distance:	< 5 Miles	< 5 Miles
RTS Threshold:	2346	2346
Beacon Interval:	100	100
Wireless Mesh - Encryption screen		
Mesh encryption options	Must be the same as Mesh	Must be the same as Mesh

Screen / Option	Mesh node 1	Mesh node 2, 3, …*n*
	nodes 2, 3, …*n*	node 1
Wireless Mesh - MAC Address Filtering screen		
Filtering:	Enable/Disable	Enable/Disable
Filter Type:	Deny All/Allow All	Deny All/Allow All
MAC Address:	Add MAC address of Mesh nodes	Add MAC address of Mesh nodes

Table 16 Point-to-Multipoint network settings for Manual Mesh

Screen / Option	Mesh node 1	Mesh nodes 2, 3, 4, …*n*
Wireless Mesh - General screen		
Mesh mode:	Manual Mesh selected	Manual Mesh selected
Signal Strength LED MAC:	Not Assigned (select from drop-down list)	Not Assigned (select from drop-down list)
Spanning Tree Protocol (STP) 802.1d:	Enable (or Disable if no mesh loop possible)	Enable (or Disable if no mesh loop possible)
Wireless Mesh - Radio screen		
Wireless Mode:	802.11a	802.11a
Tx Rate:	AUTO	AUTO
Channel No.:	Must be the same as Mesh nodes 2, 3, …*n*	Must be the same as Mesh node 1
Tx Power Mode:	Auto	Auto
Propagation Distance:	< 5 Miles	< 5 Miles
RTS Threshold:	2346	2346
Beacon Interval:	100	100
Wireless Mesh - Encryption screen		
Mesh encryption options	Must be the same as Mesh nodes 2, 3, …*n*	Must be the same as Mesh node 1

Mesh network configuration

A mesh network allows you to connect three or more multinodes in mesh networks mode wirelessly. This network type is most commonly used in OneWireless networks.

NOTE: Use the option settings in Table 15 for point-to-multipoint network in auto mesh mode when setting up a mesh network. STP is enabled automatically in auto mesh mode.

Repeater network configuration

A repeater network can be used to extend the wireless signal from one mesh node connected to an Ethernet LAN wirelessly so that another mesh node can control a wireless LAN at a distance. With this configuration, each mesh node can control a wireless LAN. All wireless clients must have the same SSID as the mesh node on the AP card channel. All clients can roam between the three mesh nodes. The option settings in Table 17 and Table 18 are used when setting up a repeater network configuration as shown in Figure 13. Use the procedure To set up wireless mesh on page 86 to set up the network.

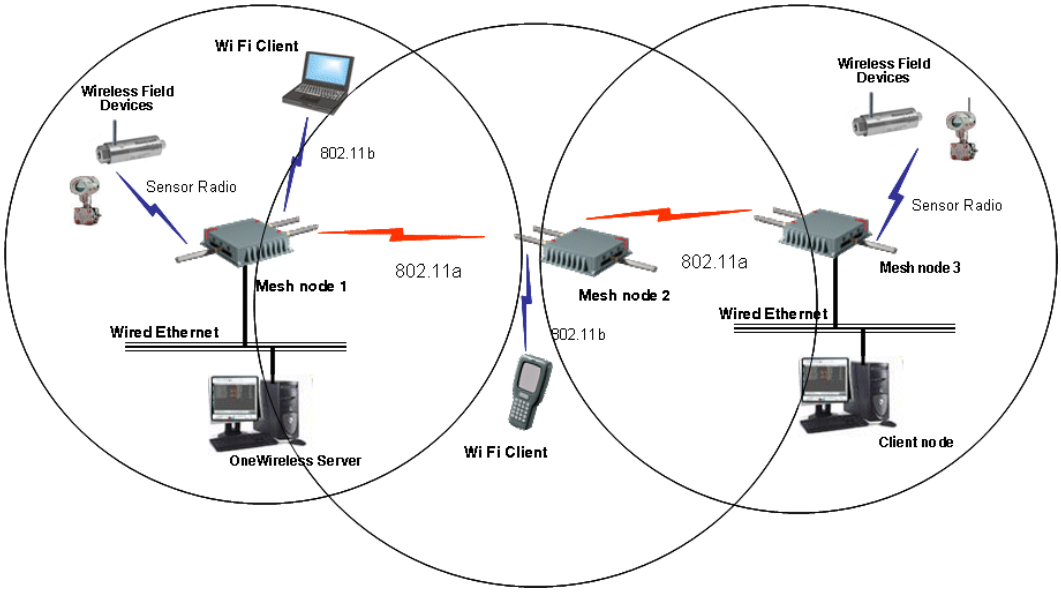


Figure 13 Repeater network example

Table 17 Repeater network settings for Manual Mesh

Screen and Option	Multinode 1	Multinode 2	Multinode 3
Wireless Mesh - General screen			
Mesh mode:	Manual Mesh	Manual Mesh	Manual Mesh
Signal Strength LED MAC:	Not assigned (select from drop-down list)	Not Assigned (select from drop-down list)	Not Assigned (select from drop-down list)
Spanning Tree Protocol (STP) 802.1d:	Enable (or Disable if no mesh loop possible)	Enable (or Disable if no mesh loop possible)	Enable (or Disable if no mesh loop possible)
Wireless Mesh - Radio screen			
Wireless Mode:	802.11a	802.11a	802.11a
Tx Rate:	AUTO	AUTO	AUTO
Channel No.:	Must be the same as Multinode 2	Must be the same as Multinode 1	Must be the same as Multinode 1
Tx Power Mode:	Auto	Auto	Auto
Propagation Distance:	< 5 Miles	< 5 Miles	< 5 Miles
RTS Threshold:	2346	2346	2346
Beacon Interval:	100	100	100
Wireless Mesh - Encryption screen			
Mesh encryption options	Must be the same as other two multinodes	Must be the same as other two multinodes	Must be the same as other two multinodes

Table 18 Repeater network setting for Auto Mesh

Screen and Option	Multinode 1	Multinode 2	Multinode 3
Wireless Mesh - General screen			
Mesh mode:	Auto Mesh selected	Auto Mesh selected	Auto Mesh selected
SSID	Must be the same as Multinode 2	Must be the same as Multinode 1	Must be the same as Multinode 1

Screen and Option	Multinode 1	Multinode 2	Multinode 3
Max Direct Links:	40 (range 1 - 40)	40 (range 1 - 40)	40 (range 1 - 40)
Mesh Priority:	65535 (range 1 - 65535)	65535 (range 1 - 65535)	65535 (range 1 - 65535)
RSSI window size	5	5	5
Signal Strength Threshold:	9%	9%	9%
Link Sensitivity	21%	21%	21%
Broadcast SSID:	Disable	Disable	Disable
Signal Strength LED MAC:	Enter from list at bottom of screen	Enter from list at bottom of screen	Enter from list at bottom of screen
Wireless Mesh - Radio screen			
Wireless Mode:	802.11a	802.11a	802.11a
Tx Rate:	AUTO	AUTO	AUTO
Channel No.:	Must be the same as Multinode 2	Must be the same as Multinode 1	Must be the same as Multinode 1
Tx Power Mode:	Auto	Auto	Auto
Propagation Distance:	< 5 Miles	< 5 Miles	< 5 Miles
RTS Threshold:	2346	2346	2346
Beacon Interval:	100	100	100
Wireless Mesh - Encryption screen			
Mesh encryption options	Must be the same as other two Multinodes	Must be the same as other two Multinodes	Must be the same as other two Multinodes
Wireless Mesh - MAC Address Filtering screen (Deleted? Not used?)			
Filtering:	Enable/Disable	Enable/Disable	Enable/Disable
Filter Type:	Deny All/Allow All	Deny All/Allow All	Deny All/Allow All
MAC Address:	Add MAC address of multinodes	Add MAC address of multinodes	Add MAC address of multinodes

Multinode and Mesh Network Tuning

This section contains information on making adjustments to multinode parameters when conducting a site survey of an installed wireless network. Although a site survey was conducted during the planning phase to determine the optimal location of multinodes and WSGs to create a wireless network, once the multinodes have been installed in their designated locations a site survey should be conducted to measure the performance of the wireless network and make adjustments or tune the mesh network for the best possible and reliable wireless communication.

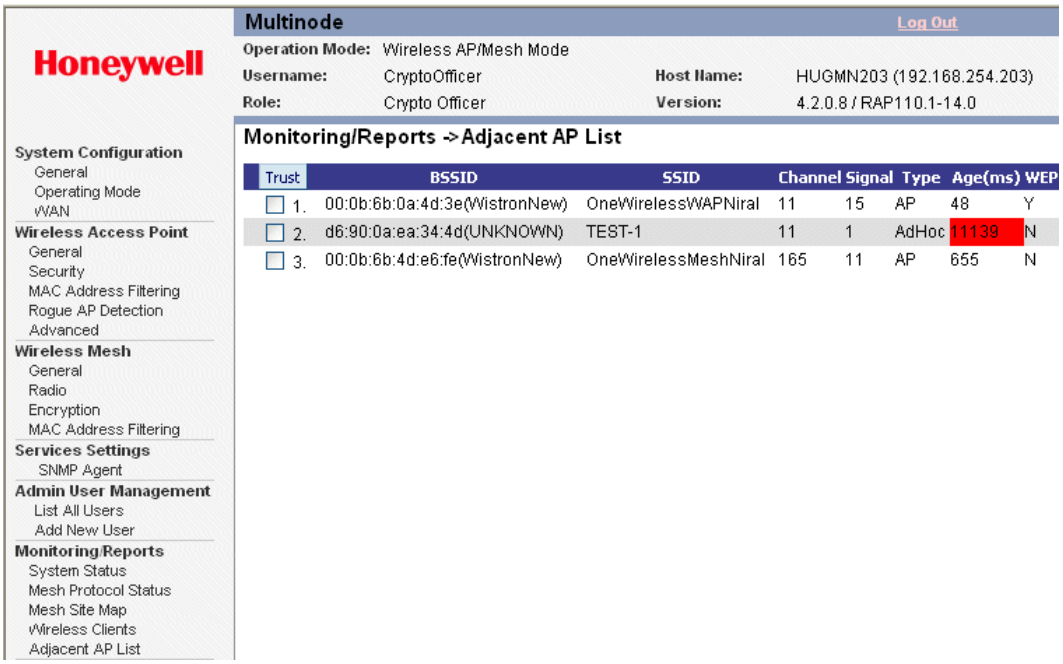
The Network Management and Diagnostics tool also can provide realtime feedback on network performance. See the *OneWireless System Administration Guide* for a description of the NMD tool.

Monitoring signal strength

The multinode configuration tool application contains a tool that can be used to monitor the received signal strength of all wireless devices it can detect. The tool should be used during the site-survey and during multinode deployment for optimal antenna positioning.

To access the monitoring tool:

Step	Action
1	Open Internet Explorer and access the multinode's configuration tool by typing the URL for the multinode in the address line: *https:// <ip address>* Where: ip address is the IP address of the multinode.
2	From the sign-in screen, type your username and password and then click **Sign In**.
3	From the left pane of the Multinode Configuration Tool, click **Monitoring/Reports > Adjacent AP List**.
4	Refresh the page to get the most recent RSSI readings.



Note: In the Adjacent AP List screen, the Signal column lists the signal strength of the received signal (RSSI) from other access Points detected by the multinode. Signal = RSSI value.

RSSI value = dbm - 95 (Subtract 95 from the RSSI value for the dbm value)

For example: An RSSI of 15 equals -80 dbm.
An RSSI of 20 equals -75 dbm.

Mesh tuning for optimal settings

Due to the variety of installation environments, the default configuration/parameter settings of the mesh network may not be the optimal settings for your site. The following are important parameters contained on the Wireless Mesh screen that you can adjust to customize the mesh for optimal performance:

- Mesh link Signal Strength Threshold
- Mesh priority
- MAC address filtering

See Table 9 for more information on these parameters.

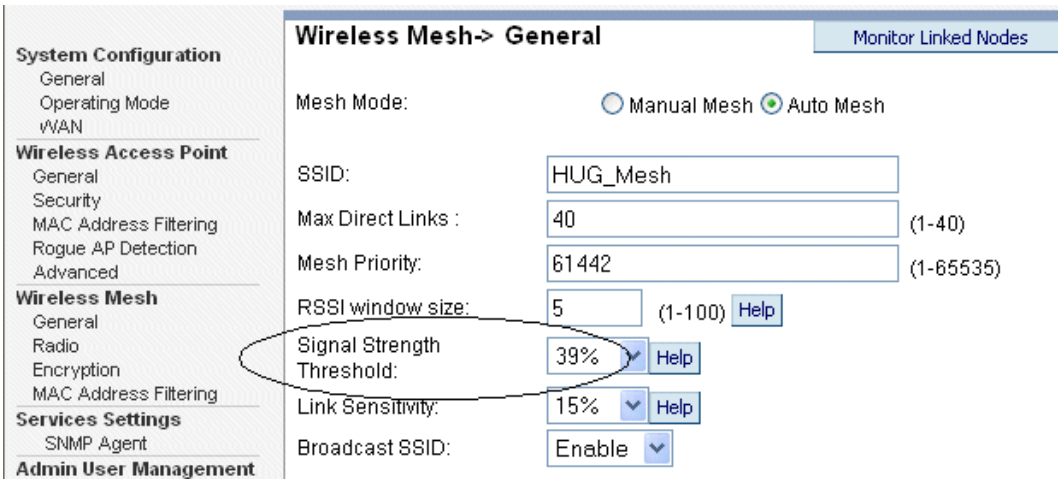
Tuning the mesh link Signal Strength threshold

The Signal Strength threshold value is checked when a node tries to establishes a link with another node. Both nodes will check the RSSI of its partner against its configured threshold value. If the RSSI value is lower than the threshold value in either side, the link between them will not be established.

If the signal strength threshold is too small, the node will establish links with all nodes it can see even though some link quality may be poor. Too many links in the mesh network can result in unnecessary and frequent changes of the network topology.

If the signal strength threshold is too large, the node may not link with any other nodes and be isolated. This is an undesirable condition.

The proper signal strength threshold should include 2-4 links on each node.



Tuning the mesh priority

Mesh priority sets the 802.1D/ RSTP (Rapid Spanning Tree) mesh priority. The latest revision of 802.1D requires the priority to be set to a multiple of 4096. Therefore, the mesh priority value should be one of the following:

4096	8192	12288	16384	20480	24576	28672	32768
36864	40960	45056	49152	53248	57344	61440	

Further considerations should be made in setting mesh priority in a network and is dependent upon the role the multinode (or device) plays in the network. For example, if the mesh network includes a WSG which is then wired to a switch, the following priority should be assigned to the nodes in the network:

Node type in network	Priority	Typical value
Ethernet switch that uses RSTP	Highest	4096
Default gateway, WSG	2nd highest	8192
Any wired multinode directly connecting to the mesh through a wired Ethernet link	3rd highest	12288
Wireless multinodes	4th highest	16384

The device with the lowest bridge priority becomes the ROOT node. This device can be any RSTP compliant device (such as a switch) and not necessarily a multinode. The mesh priority number does not affect the general topology of the mesh networks.

Tuning MAC address filtering

Wireless Mesh - MAC Address Filtering screen can be used to further customize the mesh network (only available in auto-mesh mode)

In some cases, you may want to specifically link to one or a few nodes. You can use MAC Address Filtering to achieve this. For example, if one multinode (A) is used to stream video to another multinode (B) which is not the ROOT node, you can specify A to always connect to B and maybe another node for link backup. This allows video to be delivered using the shortest path to B.

You can also use MAC Address Filtering to specify that a set of nodes NOT to connect to. For more information on using MAC Address filtering, see Wireless Mesh - MAC Address Filtering screen on page 81.

Estimating network performance

The values from the two tables below, (Throughput based on signal strength and Throughput based on "hops") are based on a best-case scenario. That is, there is little to no 5.8GHz RF interference sources present while the data was being passed. The values are also based on the mesh radio only. It does not take into account the stability of the link for the Field I/O radio to the sensors nor the wireless client link to the AP radio of the multinode.

Throughput based on signal strength

The theoretical data rates and throughput values for corresponding signal strengths for wireless bridge connectivity are displayed in the following table. These throughput values are based on a single point-to-point link between two multinodes.

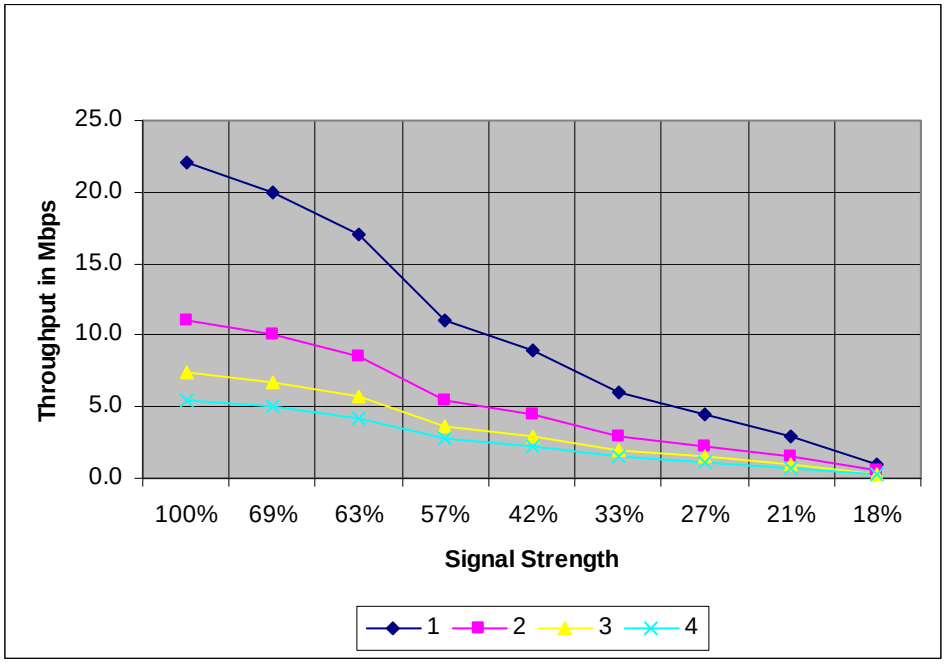
Signal strength	Data rate	Throughput
> or = 72%	54 Mbps	22 Mbps
69%	48 Mbps	20 Mbps
66%	48 Mbps	20 Mbps
63%	36 Mbps	17 Mbps
60%	36 Mbps	17 Mbps
57%	24 Mbps	11 Mbps
45%	24 Mbps	11 Mbps
42%	18 Mbps	9 Mbps
36%	18 Mbps	9 Mbps
33%	12 Mbps	6 Mbps
30%	12 Mbps	6 Mbps
27%	9 Mbps	4.5 Mbps
24%	9 Mbps	4.5 Mbps
< 21%	6 Mbps	3 Mbps
<18%	< 6 Mbps	< 3 Mbps

Throughput based on "hops"

The throughput values through a specified number of "hops" are shown in the following table. Hops are defined as the number of devices or nodes through which the data must pass in order to reach its destination.

Signal strength	1 Hop	2 Hops	3 Hops	4 Hops
100%	22.0 Mbps	11.0 Mbps	7.3 Mbps	5.5 Mbps
69%	20.0 Mbps	10.0 Mbps	6.7 Mbps	5.0 Mbps
63%	17.0 Mbps	8.5 Mbps	5.7 Mbps	4.3 Mbps
57%	11.0 Mbps	5.5 Mbps	3.7 Mbps	2.8 Mbps
42%	9.0 Mbps	4.5 Mbps	3.0 Mbps	2.3 Mbps
33%	6.0 Mbps	3.0 Mbps	2.0 Mbps	1.5 Mbps
27%	4.5 Mbps	2.3 Mbps	1.5 Mbps	1.1 Mbps
21%	3.0 Mbps	1.5 Mbps	1.0 Mbps	0.8 Mbps
18%	1.0 Mbps	0.5 Mbps	0.3 Mbps	0.3 Mbps

Throughput based on "Hops" and signal strength



	Hops	Signal Strength								
		100%	69%	63%	57%	42%	33%	27%	21%	18%
Throughput in Mbps	1	22.0	20.0	17.0	11.0	9.0	6.0	4.5	3.0	1.0
	2	11.0	10.0	8.5	5.5	4.5	3.0	2.3	1.5	0.5
	3	7.3	6.7	5.7	3.7	3.0	2.0	1.5	1.0	0.3
	4	5.5	5.0	4.3	2.8	2.3	1.5	1.1	0.8	0.3

Multinode Operation and Monitoring

Overview

The status and performance of multinodes, WSGs and field devices operating in a wireless network can be monitored a number of ways.

- In **Wireless Builder**, you can manage the database of your wireless nodes (multinodes, WSGs, field devices). The Monitoring tab in the Wireless Builder provides a tree view showing the operating status of the wireless system gateway and field devices that are commissioned in the network. Also you can view the block configuration of the WSGs and field devices in the network. The configuration forms have a number of tabs that show the block configuration and operating statistics for a network node.
- Using **Multinode Configuration Tool screens** (Monitoring/Reports screens) on the WSG provides a view of the multinodes communicating in a network. You can connect a laptop to individual multinodes to view configuration settings of the node and operating statistics of the node within the network.
- **Network Management and Diagnostics** (NMD) tool provides a live graphical interface of the wireless network nodes. You can also access, view and change multinode configuration settings (although not all configuration settings can be changed using this tool).

Monitoring/Reports screens

Monitoring Reports screens are accessed through the Multinode Configuration Tool on the multinode and provide a variety of screens that show operating status and current client lists in the network.

System Status

Click on the System Status at the left of the screen to call up the Monitoring Reports - System Status screen. Statistics listed on the screen are described in Table 19.

Table 19 System Status screen statistics

Statistic	Description
Device Status	
Current Encryption Mode:	Indicates the current encryption mode that is being used by the node.
Mesh Encryption Mode:	Indicates the mesh encryption mode that is currently being used by the node.
System Uptime:	The time that the node has been running since last reset.
Total Useable Memory Size:	The total useable memory size available in the node (in bytes).
Free Memory:	The free memory that is currently available in the node (in bytes).
Current Processes:	The current number of processes that are active in the node.
Country Code:	Indicates the region of the world where this wireless network is located. The country code enables a set of available frequency bands and channels for use in the wireless network which is based on that country's regulations.
Other Information: Buttons to access additional statistics.	Clicking on one of these buttons opens a pop-up window that lists a number statistics for that particular component or function.
	CPU
	PCI
	Interrupts
	Processes
	Interfaces

Statistic	Description
Network Interface Status	
WAN Ethernet MAC Address:	The MAC address of the WAN card
LAN Ethernet MAC Address:	The MAC address of the Local Access Network (LAN) card in the multinode.
Primary WLAN MAC Address:	The MAC address of the primary Wireless LAN card in the multinode.
Secondary WLAN MAC Address:	The MAC address of the secondary Wireless LAN card in the multinode.
Routing Table	
Dest. LAN IP:	
Subnet Mask	
Default Gateway	
Hop Count	
Interface	

Mesh Protocol Status

Click on the Monitoring Reports - Mesh Protocol Status at the left of the screen to call up the Mesh Protocol Status screen and provides the statistics of the wireless mesh network, such as:

- Ethernet Port STP Status
- Wireless Port 0 STP Status
- Wireless Mesh Information

Mesh Site Map

Click on the Mesh Site Map at the left of the screen to call up the Monitoring Reports - Mesh Site Map screen.

The Mesh Site Map shows the spanning tree network topology of both the wired and wireless nodes connected to the network. The root STP node is always shown on top with the other nodes shown in hierarchial tree below it. Wired links are shown with double dotted lines and wireless links are shown with single dotted lines. To refresh the map you must click the Update button since the map does not update dynamically. An example is shown in Figure 14. Table 20 describes the statisitics that are shown for each node defined in the network.

Table 20 Mesh Site Map screen statistics

Statistic or Feature	Description	
Update *button*	Click this button to update the Mesh Site map with current information.	
Last Update:	The time that the mesh site map was last updated.	
Current Time:	The current system time.	
Retrieve *button*	Click this button to retrieve missing network node information.	
Cached Nodes Info *button*		
Information for each node detected in the Mesh	BRG:	Bridge ID
	IP:	The IP address
	Radio:	The MAC address of the radio interface.
	Desc:	The node's Description field text
	Built:	The build date of the firmware currently loaded and operating in the multinode.

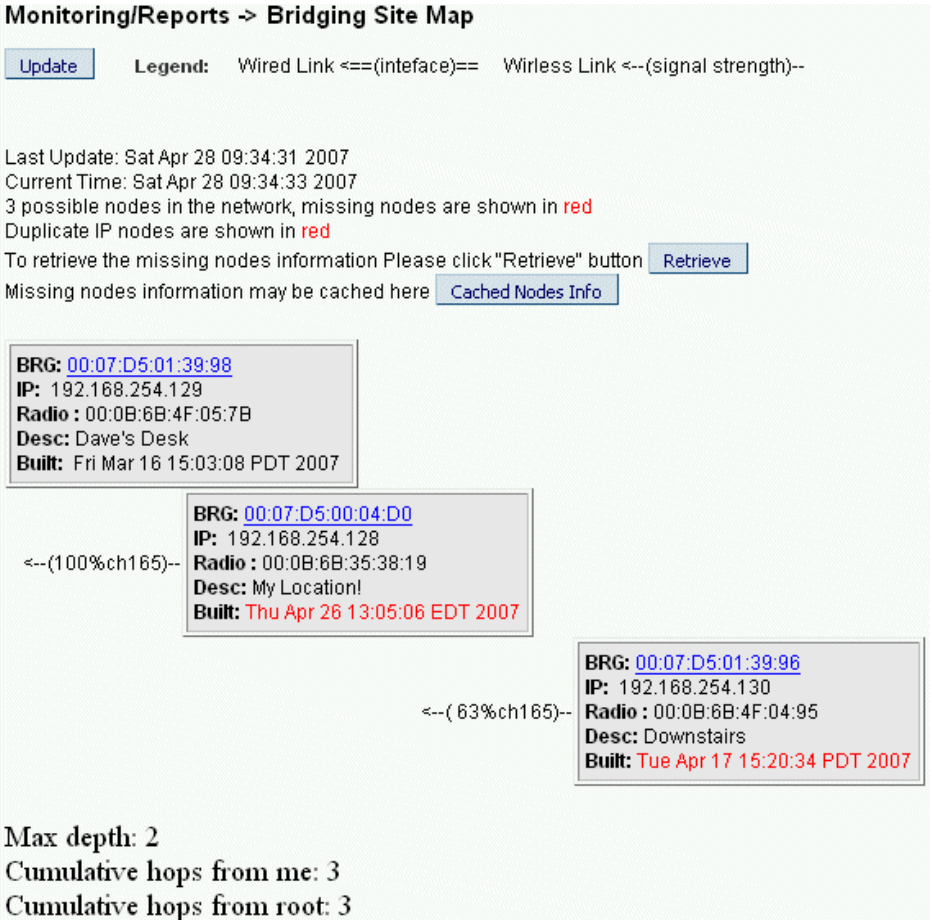


Figure 14 Mesh Site Map example

Wireless Clients

Click on the Wireless Clients at the left of the screen to call up the Monitoring Reports - Wireless Clients screen.

The Wireless Clients screen displays the MAC Address of all wireless clients along with their signal strength and transmit rate. The screen also allows you remove clients from the current MAC Address filter list.

Adjacent AP Lists

Click on the Monitoring Reports - Adjacent AP List at the left of the screen to call up the Adjacent AP List screen.

The Monitoring Reports - Adjacent AP List screen shows all the APs detected by the multinode's wireless card and the wireless bridge's wireless card. This list includes all APs regardless of whether or not they are in the network.

System and Web Access Logs

There are two logs available for viewing and exporting: System Log and Web Access Log.

System Logs

The System Log screen displays system messages with a date and time stamp. These messages document events performed internally by the system. The System log updates when a system event occurs. This information is helpful to System Administrators, Field Engineers and technical support personnel.

To view the current system log, select **System Log** at the left of the Multinode Configuration Tool screen.

To export the log and save it as a file on a PC, Click on **Export** button. Log file is exported as an HTML file. You can then open the file in Word or WordPad to view the log entries.

Web Access log

The Web Access Log displays system messages with date and time stamp for any actions involving web access. For example, this log records when you set encryption mode, change operating mode, etc., using the Multinode Configuration Tool screens. It creates a log of what actions were performed and by what user. The Web access log updates when a web access event occurs.

To view the current Web access log, select **Web Access Log** at the left of the Multinode Configuration Tool screen

To export the log and save it as a file on a PC, Click on **Export** button. Log file is exported as an HTML file. You can then open the file in Word or WordPad to view the log entries

Multinode Maintenance

Overview

The multinode contains no user-serviceable parts inside the multinode enclosure. Any maintenance required is limited only to the external enclosure surface, cable connections, antennas and the firmware. A failed unit should be returned to Honeywell for maintenance, repair or replacement

Replacing a multinode/WSG

If a multinode or WSG fails in an operating network, you can replace it. First it must be configured. The system configuration file of the node that has failed can be used to configure the replacement multinode.

To replace a failed multinode in a network:

Step	Action
1	Obtain a replacement multinode.
2	Verify firmware version of the mesh and sensor radio software currently installed on the replacement multinode is the latest version.
3	If required, Perform a Firmware Upgrade .
4	Perform a System Upgrade of the configuration file of the failed multinode. This requires that a system configuration file of the failed unit has been saved previously. This file can be uploaded to the replacement multinode.
5	Authenticate the replacement multinode.
6	Remove and replace the failed multinode with the new multinode.
7	Verify that the replacement multinode is operating properly in the network.
8	Return the failed unit to Honeywell.

Troubleshooting

Overview

If a fault or a failure is indicated or suspected in a wireless system gateway or multinode in the network, there are a number of tools that you can use to gather information to help diagnose a problem.

- **Network Management Diagnostic** (NMD) tool - This tool provides a live graphic display of the mesh network showing multinodes and wireless field devices, the operating status of the nodes, and the signal strength of the links between nodes. The NMD tool allows you to access, view and change multinode configuration options (although not all configuration options can be changed using the NMD).
- **Data Collection** - This is a method in which you can capture data logs from the wireless network and Key Server activity and save the log files. These files are then forwarded to Honeywell technical assistance for analysis.
- **System and Web Access logs** - These logs are available using the Multinode Configuration Tool in the multinode. The logs can exported and saved to a PC for later analysis. See System and Web Access Logs for more information.
- **Monitoring/Report screens** - A number of status screens are available in the Multinode Confguration Tool. Multinode operating status and statistics can be viewed and collected for analysis. See Monitoring/Reports screens for more information.

Since the multinode contains no user-serviceable parts inside the multinode enclosure, any failure within a multinode will require a hardware replacement.

Multinode failure indications

Failure indication may be signaled via the multinode status LEDs. The WLAN1 and WLAN2 LEDs blink simultaneously when the system is halted. This indicates the software has detected a problem with the encryption algorithm or the system configuration does not pass the integrity check.

Reboot multinode

You may want to reboot the multinode if a failure is suspected. The System Administration - Reboot screen allows you to reboot the multinode without changing any configuration settings. Both CryptoOfficer and Administrator users have access to this function.

If you are using the Network Management and Diagnostics (NMD) tool there is an icon on the interface that allows you to reboot the multinode. When making changes to the configuration settings of a multinode, you must reboot the multinode to enable the changes.

Restore factory default settings

The System Administration - Factory Default screen is used to reset the multinode to its factory settings. You must be logged in as the CryptoOfficer to access the Restore button.

ATTENTION

The "Restore" button is a fallback troubleshooting function that should only be used to reset the multinode to its factory default settings.

Network Management Diagnostics tool

The Network Management and Diagonostics tool can be use to gather event data and operation and configuration information for troubleshooting and diagnosing a problem. If troubleshooting a problem with a multinode, WSG, or field device, you must connect a PC or laptop (with the NMD tool installed) to the network in which the node is operating. Using the NMD, you can open the tool and view the nodes operating in the network and obtain node configuration settings.

See the *OneWireless System Administration Guide* for a description of the NMD tool.

Data Collection

Event data can be captured and saved in files so this data can be forwarded to Honeywell Technical Assistance for analysis. Event data is sometimes cryptic and is best analyzed by trained Honeywell personnel. These event log files are collected from three sources:

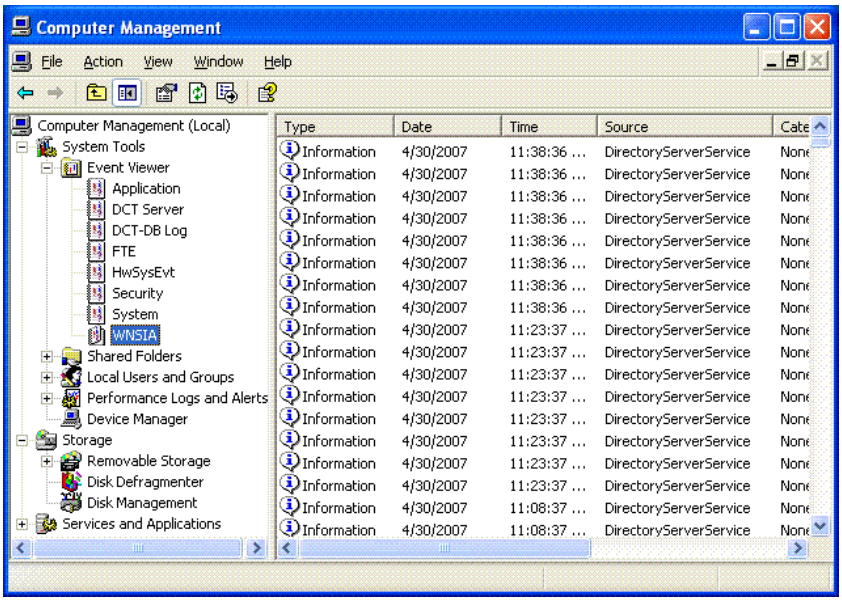
- The WNSIA event log is collected from the server or PC.
- The Key Server Manager (KSM) event log is collected from the Key Server
- The Wirelesss Capture File (WCF) is collected from the multinode.

Event and file capture data is time stamped by the system which allows a view of the events leading up to and immediately after the fault event. So it is important to supply the time of the fault or failure when submitting the data files to Honeywell. Also, the WNSIA event log and portions of the WCF are constructed as circular lists, meaning that as new data is captured in the file, older data is deleted. Therefore, you should collect

these files as soon as possible after the problem occurs in order to capture the events leading up to it. Use the following procedures to capture these log files when a fault occurs.

To capture the WNSIA event log

Step	Action
1	On the Server desktop, go to **My Computer**. Right click and select **Manage** from the menu.
2	Expand the listing under **System Tools**and **Event Viewer** as shown in the figure.



3	Select **WNSIA**. Right click ans select **Save Log File as…** from the menu.
4	Select a destination and save the file.

To capture the Key Server Manager event log:

Step	Action
1	On the Key Server, open **Key Server Manager**.
2	Select **Event Log**.
3	Click Export, select a destination and save the log file.

To capture the WCF capture file:

Step	Action
1	From a command line prompt, type: **wcfcap *<IP Address> <Login Name> <Login Password>***
2	Select **Save as…**, select destination and save the file.

Authentication Device access to multinode

The authentication device can be used to read the IP Address or SSID of a multinode in the case that it has been lost.

Addendum

OneWireless Multinode - Models WNMN and WNMS

This addendum applies to installation of the Model WNMN and Model WNMS OneWireless Multinodes within hazardous locations

Factory Mutual

The Model WNMF and Model WNMS are Approved by Factory Mutual for use in Class I, Division 2, Groups A, B, C and D hazardous locations and Class I, Zone 2, AEx nC IIC hazardous locations. The temperature rating for both Division 2 and Zone 2 hazardous location is T4 based upon an ambient operating temperature range of -40° C to +75° C.

Canadian Standards Association

The Model WNMF and Model WNMS are Approved by Canadian Standards Association for use in Class I, Division 2, Groups A, B, C and D hazardous locations and Class I, Zone 2, Ex nA IIC hazardous locations. The temperature rating for both Division 2 and Zone 2 hazardous location is T4 based upon an ambient operating temperature range of -40° C to +75° C.

ATEX Directive 94/6/EC

The Model WNMF and Model WNMS are ATEX Certified for use in Zone 2, II 3G Ex nA nL IIC hazardous locations. The temperature rating is T4 based upon an ambient operating temperature range of -40° C to +75° C

The ATEX Directive 94/6/EC is a European CE Mark directive concerning products that are designed for use in potentially explosive environments. Only products with the ATEX certification and with ATEX labeling will be approved for free movement in the 19 EU (European Union) and EFTA (European Free Trade Association) countries. As defined in the directive, "free movement" refers to:

- placing a product on the market, and/or
- placing a product into service.

The ATEX Directive 94/6/EC is a living (set of) document(s), subject to further change and refinement, whose details are beyond the scope of this addendum. Further information can be obtained in the Official Journal of the European Communities No L100/1, and in related publications such as Guidelines on the Application of Directive 94/9/EC. Both of these items are available at:

http://europa.eu.int/comm/enterprise/atex/index.htm

The Honeywell WNMF and WNMS OneWireless multinodes are now ATEX certified, and all units manufactured currently and in the future will include labeling that includes all markings required under the ATEX directive.

Purpose and Content

This adendum includes information relative to both the Factory Mutual Approval and Canadian Standards Association Certification and as required under the ATEX Directive regarding:

1. The appearance and meaning of each certification mark (CE Mark) that appears on the label(s) affixed to the product.

2. Instructions for installation and use of the product within potentially explosive atmospheres.

Information required for use of this product, and additional installation information, is included in:

OW-CDX050 - OneWireless Multinode User's Guide

of which this adendum is a part.

Details regarding certification marks that appear in labeling for this product are given in this addendum.

ATTENTION

The publications cited above and the functioning and construction (except for labeling) of the devices described therein are essentially unchanged. The purpose of this addendum is to provide details the purpose and appearance of the labels attached to each device under ATEX Directive 94/6/EC.

ATTENTION

Before installing the equipment in a potentially explosive atmosphere, please read the information provided in this addendum, which supports the ATEX certifications for this product.

CE Conformity

The Multinode is in conformity with the protection requirements of the following European Council Directives: 94/9/EC, the Explosive Atmospheres (ATEX) Directive and 89/336/EEC, the Electromagnetic Compatibility (EMC) Directive and Radio and Telecommunications Terminal Equipment (RTTE) Directive - 1999/5/EC.

In conformity with the ATEX directive, the CE mark on the certification nameplate includes the Notified Body identification number 0981 adjacent to the EC Type Examination Certificate number.

Deviation from the installation conditions in this manual may invalidate this product's conformity with the Explosive Atmospheres and EMC Directives.

Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.

Marking, ATEX Directive

Honeywell's Multinode with the nameplate has been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19-April-1994.

The following information is provided as part of the labeling of the transmitter:

- Name and Address of the manufacturer: Honeywell, Phoenix, AZ 85029 USA.
- Notified Body identification: Northwest EMC Inc.

  CE
  0344
- The serial number of the multinode is located on the label applied to the back plate of the assembly. The first two digits of the serial number identify the year (02) and the second two digits identify the week of the year (23); for example, 0223xxxxxxxx indicates that the product was manufactured in 2002, in the 23 rd week.

Environmental

Ambient operating temperature: -40 to 75º C

Enclosure classification: IP 66

Special conditions for safe use, NonSparking

The multinode is nonsparking apparatus that can be installed in potentially explosive atmospheres.

Temperature classifications: T4 up to Ta ≤ 75º C

Equipment shall be installed in a location providing a degree of protection from dust and water equivalent to IP54

Installations specific to the ATEX Directive shall have the flying leads of the multinode suitably protected against mechanical damage and terminated within a terminal or junction facility suitable for the conditions of use. All other installations shall have the

external wiring routed through metallic conduit (via the ¾" NPT connection) and shall be terminated within a junction rated appropriately for the conditions of the installation.

These units are non-repairable items and if faulty must be replaced. The electrical supply must be switched off before any replacement and during any time that the wiring terminations are being connected or disconnected.

Before commissioning of this equipment, it must be verified that the supply voltage cannot exceed the voltage rating as identified on the product label.

The flying leads of the multinode shall be suitably protected against mechanical damage and terminated within a terminal or junction facility suitable for the conditions of use.

Special conditions for safe use

It is the responsibility of the installer and user to ensure chemical compatibility between the equipment with the gases and vapors to which the equipment may be exposed. The equipment is constructed largely of the following materials:

Enclosure - Aluminum

Conduit entry - Galvanized steel

Printed Circuit Boards - FR4 epoxy-impregnated glass fiber

Wiring insulation - PVC

Honeywell

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