MobileAccess™ MA-2000 Distributed Antenna System

Product Bulletin

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The MobileAccess™ MA-2000 Distributed Antenna System (DAS) provides state-of-the-art active component technology to improve indoor coverage of a wide range of wireless services. The system can be engineered to support multiple wireless services including cellular/Personal Communications Services (PCS) phones, paging, emergency radio, and wireless Ethernet in a single building, campus, and enterprise environment. Units are approved for in-building wireless phone distribution by Verizon Wireless, Cingular, and Sprint/NETXEL.

The MA-2000 system provides **pay-as-you-grow** functionality via multiple products and modular distribution components. The MA-2000 Lite system handles up to eight wireless services, whereas the MA-2000 Modular Remote Cabinet (MRC) supports up to 20 wireless services.

Figure 1: MA-2000 Distributed Antenna System Remote Distribution Units

Table 1: Features and Benefits

Features	Benefits
Integrated Antenna System	Prevents Radio Frequency (RF) interferences such as those induced where multiple antenna systems are used to serve multiple services, using a single coaxial antenna infrastructure
Multi-service Platform	Accommodates virtually any mix of wireless voice and data services, emergency radio, and Wireless Fidelity (WiFi), eliminating the need for multiple antenna systems
Major Wireless Telecommunications Carrier Approval	Ensures integration with in-building wireless phone distribution by Verizon Wireless, Cingular, and Sprint/NEXTEL
Scalable System Size	Provides flexibility in wireless service levels. Entry level MA-2000 Lite remote units are useful for a limited set of wireless services, whereas expandable MA-2000 MRC units offer complete wireless service flexibility.
Scalable Wireless Services	Allow addition and removal of wireless services without affecting existing services or end users
Scalable Coverage Area	Accomodates additional Remote Units to expand coverage area
Scalable Geographical Area	Allows addition of remote facilities up to 12 miles (19.3 km) away
Active Component Technology	Ensures optimal performance for all wireless services through system tuning
Multiple Mounting Options	Provide flexibility in mounting method. The Base Unit mounts in a telecommunications rack and Remote Units can be wall or rack mounted.
System Monitoring	Provides local or remote real-time monitoring, diagnostics, and control of the wireless indoor network

MA-2000 System Architecture

An MA-2000 System architecture diagram is shown in Figure 2. The main components of the MA-2000 system are:

- **Radio Interface Unit (RIU-xxxx):** receives, filters, and combines RF signals from one or more cellular networks via off-the-air repeaters or Base Transceiver Stations (BTSs).
- **Base Unit (WB-xxx):** converts the cellular RF signals for fiber optic distribution to one or more Remote Units (RUs).
- **Remote Enclosure (2000-RC-xx, 2000-MINI):** holds the Remote Host Units (RHUs). It distributes power and holds add-on components in a cabinet.
- **Remote Unit (2000-xxxx, 1200-xxx):** converts the optical signals back into RF and distributes them to antennas in the coverage area. Each RU can support two cellular services.
- **Broadband Point-To-Point Transport (330):** provides point-to-point transport of wireless signals over single-mode fiber-optics between buildings separated by up to 12 miles (19.3 km).
- **WiFi Distribution (850):** serves as a WiFi Access Point (AP) Switching Hub to enable convergence of 802.11a/b/g services with cellular services.
- **System Management (410/430):** provides system diagnostics and enables remote management of all MA-2000 products from a single location.

Distributed throughout each area are directional and omnidirectional wideband antennas to carry the wireless signals.

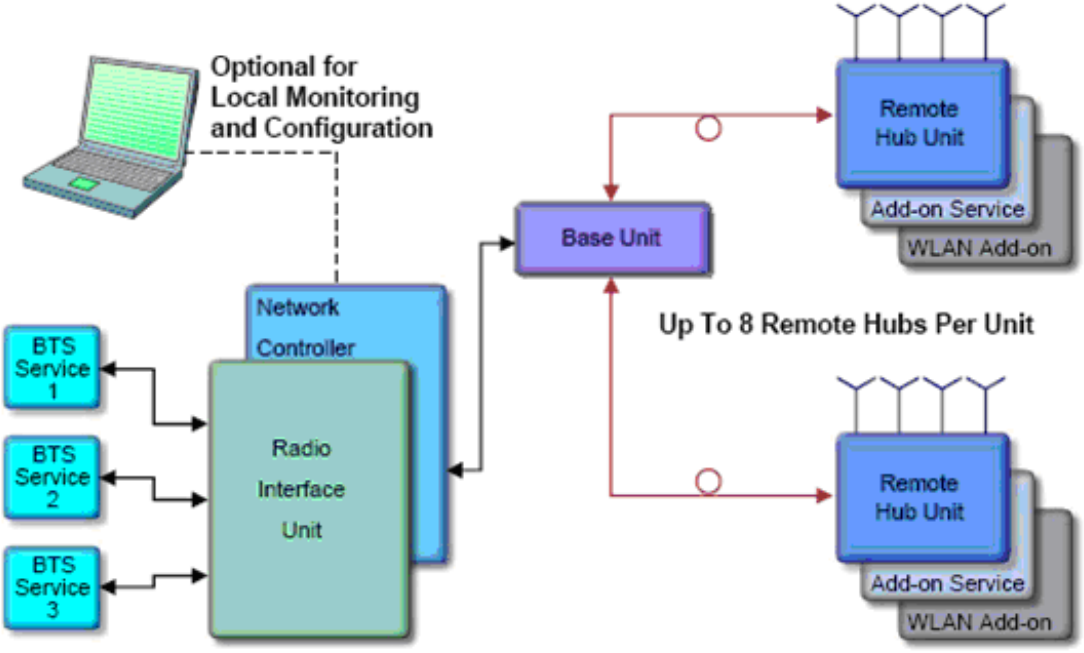

Figure 2: MA-2000 Distributed Antenna System Architecture

Radio Interface Units

Radio Interface Units (RIUs) provide a remotely manageable interface between Base Units and BTS/BDA/Repeaters RF signal sources. The signal can be monitored and controlled, providing a constant conditioned RF signal to indoor coverage systems. Remote management functions, which include Automatic Gain Control (AGC) configuration, enable service operators to control the RF signals and quickly determine the source of faults, minimizing downtime. The type and number of supported services and Base Unit connections depend on the RIU model.

Figure 3: Radio Interface Unit (RIU)

Base Units

Base Units (BUs) perform RF-to-optical conversion of the signal on the BTS/BDA side. Each BU can support up to two services provided by the same wireless operator. Two models of MA Base Units are available:

- four-port unit – supports up to four Remote Units
- eight-port unit – supports up to eight Remote Units

The RU models correspond to the services supplied through the BUs.

Figure 4: 8-Port Base Unit (BU)

Remote Enclosures

2000-MINI

The 2000-MINI handles up to eight wireless services with external connections to two Remote Units. (1200 add-ons and 850 models can also be added to each unit.) This remote unit provides a low-cost option to provide coverage for a limited number of wireless services.

Figure 5: 2000-MINI Remote Enclosure

2000-RC-LP/RP Remote Cabinet

The 2000-RC remote cabinet is designed to support up to 20 services and is suitable for larger sites requiring future-safe support for a number of wireless carriers. The remote units supporting the services are compactly housed inside a cabinet that provides the required interfaces and filtering and combining functionalities.

Figure 6: 2000-RC-LP/RP Remote Cabinet (RC)

Remote Units

The optical-to-RF conversion of each wireless service at the individual building floors is performed by Remote Unit (RU) 2000 modules corresponding to the service type. These consist of 2000 RUs and also may include 1200 and 850 modules. If a Remote Cabinet is installed, the 2000 and 1200 modules are housed inside the cabinet, whereas the 850 module is installed externally and integrated into the system. In a 2000-MINI installation, the modules are installed outside of the enclosure.

2000 Series Remote Units

Each RU supports two different services: one high-band and one low-band. All RUs are add-on ready, so an additional service can be added by connecting a 1200 add-on module supporting the required service to the RU. Each 2000 Series RU is connected to the corresponding Base Unit through a fiber optic connection.

Figure 7: 2000 Series Remote Unit (RU)

1200 Series Remote Units

The 1200 Series add-on module is a high-power module, supporting a single frequency band (low or high). It is designed to be integrated into a 2000 Series RU module. The RU 1200 add-on is housed in the 2000 cabinet and connected to a 2000 RU that provides the interface to the optical, RF, and control signals for both modules.

Figure 8: 1200 Series Remote Unit (RU)

330 Broadband Fiber Transport Units

The 330 module provides a cost-effective solution for extending RF services and control signals from one main building to other buildings up to 12 miles (20 km) away over fiber optic connections. Used in conjunction with MA-2000 Systems, each 330 System can distribute services from a single BTS and control signals from a 430 controller to two remote locations. The system can support two separate links, where each link is completely independent of the other; each link can support a different (or the same) service.

Figure 9: 330 Broadband Fiber Transport Unit

The 330 system is based on the following elements:

- **330 Main:** A 330 Main Unit is installed at the main site, adjacent to the BTS location. It performs the RF-to-optic signal conversion on the BTS side and transmits the services together with control signals from a 430 Controller to the remote location(s) where 330 Remote Units are installed.
- **330 Remote:** A 330 Remote Unit is installed at each remote location. This unit reconverts the signals received over the optic fiber cable to RF and distributes the services and control signals to the connected Base Units, either directly or through a 410 Controller, depending on the installation configuration.
- **330 Expansion Box:** A 330 Expansion box is an optional passive RF distribution unit that interfaces to the 330 Remote Unit and enables doubling the number of Base Units supported at the remote site.
- **330 Graphic User Interface (GUI) Tool:** The 330 GUI Tool is an intuitive program used for setting up, adjusting, and monitoring the 330 System.

850 WiFi Unit

The 850 WiFi Unit provides a secure and centralized connection for 802.11a/b/g Access Points. It significantly expands 802.11 coverage and enables distributing data and voice services over the same coaxial cable and antenna infrastructure used by the 2000 System. The MA-850 may be assembled on the top panel of the 2000 cabinet or adjacent to the 2000 System (either Remote Cabinet or 2000-MINI configuration). The combined signals of the 2000 System are inputted into the 850 Module and then distributed through the same coaxial broadband antenna infrastructure connected to the 850.

Figure 10: 850 WiFi Unit

410/430 System Management

The controller provides the interface between the system elements and the management and control mechanism. Two controller models are available:

- **410 Module:** enables management of the connected devices through a local or point-to-point dial-up connection. It can be remotely managed through a connection to the 430 Controller.
- **430 Module:** enables management of all connected elements, all connected 410 Controllers, and the corresponding elements. The 430 Module supports Simple Network Management Protocol (SNMP) over a Transmission Control Protocol/Internal Protocol (TCP/IP) connection.

MCT, a Java® technology-based GUI application, is provided with both controllers. The MCT is used after the installation procedure to adjust MA-2000 devices according to the installation site characteristics to optimize coverage for the site. The application is installed and run from a computer connected either locally or via remote dial-up to the controller site that requires adjustment and monitoring.

Figure 11: 410/430 System Management

Repair Information

If the MA-2000 Distributed Antenna System fails to operate within its specifications, replace the unit. For a replacement MA-2000 System, contact the nearest Johnson Controls® representative.

Ordering Information

The MA-2000 Distributed Antenna System products listed in Table 2 are available. To order any MA-2000 System products, please contact your local Johnson Controls representative.

Note: The Johnson Controls representative must issue a purchase order with Johnson Controls Purchasing Services to order these products:

Telephone: 1-800-524-1330, Option 4, then Option 2

Fax: 1-866-491-2967

E-mail: procurement@jci.com

Table 2: Product Code Numbers (Part 1 of 3)

Product Code Number	Description
Radio Interface Units (RIU-xxxx)	
RIU-IM	Radio Interface Unit
RIU-BTSC-CELL	BTS Conditioner for Cellular
RIU-BTSC-IDEN	BTS Conditioner for iDEN
RIU-BTSC-PCS	BTS Conditioner for PCS
RIU-BTSC-SMR	BTS Conditioner for SMR-Paging
RIU-BTSC-GSM	BTS Conditioner for GSM 900 MHz
RIU-BTSC-GSM-O	BTS Conditioner for GSM 900 MHz for Orange

Table 2: Product Code Numbers (Part 2 of 3)

Product Code Number	Description
RIU-BTSC-DCS	BTS Conditioner for DCS 1800 MHz
RIU-BTSC-UMTS	BTS Conditioner for UMTS 2100 MHz
RIU-BDAC-CELL	BDA Conditioner for Cellular
RIU-BDAC-IDEN	BDA Conditioner for iDEN
RIU-BDAC-PCS	BDA Conditioner for PCS
RIU-BDAC-SMR	BDA Conditioner for SMR-Paging
RIU-L-ESMR-SMR-1	RIU Lite for iDEN800, SMR900 Supporting 1 Base Unit (BU8)
RIU-L-CELL-PCS1	RIU Lite for Cell/PCS, Supporting 1 Base Unit (BU8)
RIU-L-ESMR-SMR-P1	RIU Lite for iDEN800, SMR900 and PCS1900, Supporting 1 Base Unit (BU8)
Base Units (WB-xxx)	
WB-B8U	Wide Band Base 8 Unit, Supporting 8 Remote Host Units (RHUs)
WB-B4U	Wide Band Base 4 Unit, Supporting 4 Remote Host Units (RHUs)
Remote Enclosures (2000-MINI, 2000-RC-xx)	
2000-MINI-ENC	2000 Lite Enclosure Supporting 2 Modules
2000-RC-RP	Remote Cabinet - All Services, Remote Powering
2000-RC-LP	Remote Cabinet - All Services
Remote Host Units (2000-xxxx, 1200-xxx)	
2000-IDEN-SMR	Dual Band iDEN/SMR-Page 1 Port for Cabinet
2000-CELL-PCS	Dual Band Cell/PCS, 1 Port for Cabinet
2000-CELL-DCS	Dual Band Cell/DCS, 1 Port for Cabinet
2000-GSM-DCS	Dual Band GSM/DCS, 1 Port for Cabinet
2000-CL-M-DCS	Dual Band Cell M.O./DCS, 1 Port for Cabinet
2000-GSMO-DCS	Dual Band GSM Orange/DCS, 1 Port for Cabinet
2000-IDEN-SMR-L	Dual Band iDEN/SMR-Page, 1 Port for 2000 Lite Enclosure
2000-CELL-PCS-L	Dual Band Cell/PCS, 1 Port for 2000 Lite Enclosure
2000-CELL-DCS-L	Dual Band Cell/DCS, 1 Port for 2000 Lite Enclosure
2000-GSM-DCS-L	Dual Band GSM/DCS, 1 Port for 2000 Lite Enclosure
2000-CL-M-DCS-L	Dual Band Cell M.O/DCS, 1 Port for 2000 Lite Enclosure
1200-PCS-AO-CB	Add-on RHU Supporting a PCS Service for 2000 Cabinet
1200-UMTS-AO-CB	Add-on RHU Supporting a UMTS Service for 2000 Cabinet
1200-PCS-AO-LT	Add-on RHU Supporting a PCS Service for 2000 Lite
1200-UMTS-AO-LT	Add-on RHU Supporting a UMTS Service for 2000 Lite
WiFi Distribution (850)	
850	WLAN Module Supporting 1-4 AP 802.11a/b/g
850-U	WLAN Module Supporting 1-4 AP 802.11a/b/g Including UMTS
System Management (410/430)	
410	Network Controller - Serial Interface (Dial-up)
430	Network Controller - Ethernet/IP Interface
NMS-SW-SERVER	GUI and Server Software Package (One Per Site)
NMS-SW-MFEE	NMS Annual Software Maintenance Fee (Per 430-CTLR)

Table 2: Product Code Numbers (Part 3 of 3)

Product Code Number	Description
Broadband Point-to-Point Transport (330)	
330-MB-1	Main Building Unit, Supporting 1 Link
330-MB-2	Main Building Unit, Supporting 2 Links
330-RB-1	Remote Building Unit, 1 Link, Supporting 2 Base Units
330-EXP-BOX	Expansion Box for Remote Building, Supporting 2 Additional Base Units

Table 3: Accessories

Product Code Number	Description
LPS-48V-66W	Local AC/DC Converter, 66 W
LPS-48V-100W	Local AC/DC Converter, 100 W

Technical Specifications

Radio Interface Units (RIU-xxxx)

Models	Individual models based on wireless service provided
Power Requirements	20 to 48 VDC
Power Consumption	4 W per BTSC/BDAC unit
RF In from BTS to BTSC	10 to 36 dBm
RF In from BDA to BDAC	-16 to 10 dBm
Ambient Operating Conditions	32 to 122°F (0 to 50°C)
Ambient Storage Conditions	-4 to 185°F (-20° to 85°C)
Dimensions	19 x 2U x 11.8 in. (48.4 x 2U x 30 cm)
Shipping Weight	9.152 lb (4.16 kg)
Product Warranty	1-year limited warranty against defects in material and workmanship

Base Units (WB-xxx)

Models	4 and 8 Output Port Models
Power Requirements	20 to 48 VDC
Power Consumption	14 W (8-Port BU)
Ambient Operating Conditions	32 to 122°F (0 to 32°C)
Ambient Storage Conditions	-4 to 185°F (-20 to 85°C)
Dimensions	19 x 1U x 11.8 in. (48.26 x 4.44 x 29.97 cm)
Shipping Weight	6.2 lb (2.82 kg)
Product Warranty	1-year limited warranty against defects in material and workmanship

Remote Enclosures (2000-RC-xx, 2000-MINI) (Part 1 of 2)

Models	2000-RC (Full Cabinet), 2000-MINI (Lite Version)
Power Requirements	20 to 48 VDC, line-powered or remote-powered
Power Consumption	2000-RC: 25 W 2000-MINI: 4 W

Remote Enclosures (2000-RC-xx, 2000-MINI) (Part 2 of 2)

Ambient Operating Conditions	32 to 122°F (0 to 50°C)
Ambient Storage Conditions	-4 to 185°F (-20 to 85°C)
Dimensions	2000-RC: 13.97 x 19 x 15.63 in. (355 x 482.6 x 397 mm) 2000-MINI: 17.4 x 13.23 x 3.4 in. (442 x 336 x 86.41 mm)
Shipping Weight	2000-RC: 77 lb (35 kg) 2000-MINI: 12.1 lb (5.5 kg)
Product Warranty	1-year limited warranty against defects in material and workmanship

Remote Host Units (2000-xxxx, 1200-xxx)

Models	2000 Versions: Two Wireless Services 1200 Versions: Single Service Add-on
Power Requirements	2000 Versions: 20 to 48 VDC, line-powered or remote-powered 1200 Versions: 25 to 48 VDC, line-powered or remote-powered
Power Consumption	2000 Versions: 25 W 1200 Versions: 50 W
Ambient Operating Conditions	32 to 122°F (0 to 50°C)
Ambient Storage Conditions	-4 to 185°F (-20 to 85°C)
Mounting	2000 Versions: Mounted in 2000-RC Enclosure 1200 Versions: Wall-mounted or attached to 2000-RC Enclosure
Product Warranty	1-year limited warranty against defects in material and workmanship

WiFi Distribution (850)

Models	850: WLAN Module Supporting 1-4 AP 802.11a/b/g 850-U: WLAN Module Supporting 1-4 AP 802.11a/b/g Including UMTS
Power Requirements	20 to 48 VDC
Power Consumption	20 W
802.11b/g RF Parameters	Bandwidth: 2400 - 2485 MHz Output Power: 20 dBm/port Gain: -10 to 5 dB Gain Flatness: ±1.5 dB
802.11a RF Parameters	Bandwidth: 5150 - 5850 MHz Insertion Loss: 5 dB/Port Gain Flatness: ±1.5 dB
UMTS Parameters	Bandwidth: 1920 - 2170 MHz Insertion Loss: 3.0 dB/Port Gain Flatness: ±1.5 dB Input Power: 0 to 22 dBm
Ambient Operating Conditions	32 to 122°F (0 to 50°C)
Ambient Storage Conditions	-4 to 185°F (-20 to 85°C)
Dimensions	9.54 x 10.98 x 1.5 in. (242 x 279 x 38 mm)
Shipping Weight	6.2 lb (2.82 kg)
Product Warranty	1-year limited warranty against defects in material and workmanship

Broadband Point-to-Point Transport (330)

Models	Single Optical Link and Dual Optical Links
Power Requirements	20 to 48 VDC, line-powered or remote-powered
Power Consumption	20 W
Optical Specifications	Input wavelength (77°F/25°C): 1310 ±20 nm, 1550 ±20 nm (WDM combined) Output PWR (Main/Remote): 0.5 to 5 mW Optical Loss: 0.5 dB maximum (per mated connector pair) Optical Back Reflection: 60 dB maximum (per mated connector pair Optical Budget: 9 dB maximum (Main to Remote) Fiber Loss at 1550 nm: 0.3 dB/Km maximum Fiber Loss at 1310 nm: 0.38 dB/Km maximum Fiber Type: 9/125 SM Corning SMF-28 (or compatible)
Ambient Operating Conditions	32 to 122°F (0 to 50°C)
Ambient Storage Conditions	-4 to 185°F (-20 to 85°C)
Mounting	Rack Mounted
Dimensions	19 x 1U x 11.8 in. (48.26 x 4.44 x 29.97 cm)
Shipping Weight	330 Main, 2 Links: 6.38 lb (2.9 kg) 330 Main, 1 Link: 5.5 lb (2.5 kg) 330 Remote: 7.39 lb (3.36 kg) 330 Exp Box: 5.5 lb (2.5 kg)
Product Warranty	1-year limited warranty against defects in material and workmanship

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Limited Warranty

Johnson Controls, Inc. (JCI) warrants the MobileAccess MA-2000 Distributed Antenna System to be free from defects in material and workmanship for a period of up to one (1) year from the date of sale. The date of sale must be established by a receipt showing the purchase date, seller, and product sold. If the date of sale cannot be determined, the warranty shall be determined by the date of manufacture. This warranty does not extend to goods subjected to misuse, neglect, accident, or improper installation, or to products which have been altered or repaired by anyone except Seller, Buyer, or any person receiving such a product during the duration of the warranty, shall contact the nearest Johnson Controls Product Provider or Johnson Controls, Inc. Customer Service at 1-800-275-5676 as soon as any defect becomes known, for instructions on returned goods procedures. Credit to be allowed will be based on then current prices. THIS REMEDY IS SOLE AND EXCLUSIVE. No other remedy will be allowed, whether in contract or tort, including strict liability and negligence. Seller shall not be liable for any direct or consequential damages arising from any defective product.

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