MA1000
Distributed Antenna System

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features and benefits |

Multiservice platform	Accommodates up to four wireless voice and data services including WLAN, eliminating the need for separate overlay networks. Supported wireless voice and data services and technologies include: TDMA, CDMA, WCDMA, GSM, and LTE, and services such as Cellular, PCS, AWS1/3, and iDEN
Modular design	With its modular packaging, the MA1000 enables new wireless services to be added easily and cost effectively without disruption to work spaces or existing services
Carrier-class operation	Advanced signal handling and management ensures optimal performance for all services involved in a multioperator environment
Robust management	Proactive, centralized end-to-end monitoring and management of MA1000 equipment and RF signals
Reduce operating expenses	Single-operator, multiservice across common infrastructure; supports multimode fiber
Web Management	Local and remote web management via the SC-450 controller

The MA1000 provides enterprise level indoor coverage for a wide range of wireless services over a single broadband infrastructure.

MA1000 is a single operator, multiband system based on combining a number of services, voice and data, and distributing them to each remote location through a common antenna infrastructure.

Wireless RF services are bidirectionally transmitted between the capacity source (BTS/BDA) and remote locations using low-loss fiber and broadband coax.

Deployment Options

- **RHU**: Supports two RF services over a common fiber/coax antenna infrastructure.
- **MA1000 TSX:** Supports three RF services over a common fiber/coax antenna infrastructure
- **MA1000 QSX:** Supports four RF services over a common fiber/coax antenna infrastructure.

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system description |

The MA1000 solution deployment is comprised of the following elements:

Headend Equipment

Radio Interface Unit (RIU): The RIU conditions the RF Downlink signals from base-transceiver stations (BTS) or bidirectional amplifiers (BDA) provided by the wireless service providers (WSPs), ensuring a constant level of RF before passing them on to the base units. RF Uplink signals from subscribers are received from the Base Units and transported back to the BTS or BDA.

Base Unit (BU): The BU converts the RF downlink signals received from the RIU to an optical signal for transport on single-mode or multimode fiber to the remote hub units (RHU), which are located at the remote locations. Uplink optical signals from subscribers are received from the RHU and converted back to RF before passing them on to the RIU.

System Controller: The system controller enables remote management and control of all MA1000 elements from a single location. Refer to the system controller spec sheet for more information.

Remote Location Equipment

Quad-Service Package (QSX): The MA1000 QSX offers a simple and cost-effective method for delivering a dedicated single carrier, four RF service deployment across a common fiber/coax antenna infrastructure. It consists of a single RHU with two Add-on units mounted on a bracket.

Tri-Service Package (TSX): The MA1000 TSX offers a simple and cost-effective method for delivering a dedicated single carrier, three RF service deployment across a common fiber/coax antenna infrastructure. It consists of a single RHU and an Add-on mounted on a bracket.

Typical Headend Equipment: SC-450 (Top), Base Unit (Middle), and RIU (Bottom) | Figure 1

Typical Remote-End Equipment Add-On (Top) and RHU (Bottom) | Figure 2

Remote Hub Unit (RHU): The RHU is a service-specific module that performs optical to RF conversion on signals received from the BU. The signals are then filtered and amplified for transport across broadband coax to the antenna. Similarly uplink signals from the antenna are converted to optical signals before being transmitted back to the BU. Each RHU supports up to two RF services.

Add-On (AO): The add-on is a single service unit that is coupled with an RHU to support an additional RF service. The add-on receives filtered RF signal from the RHU and amplifies it for transport across the broadband coax.

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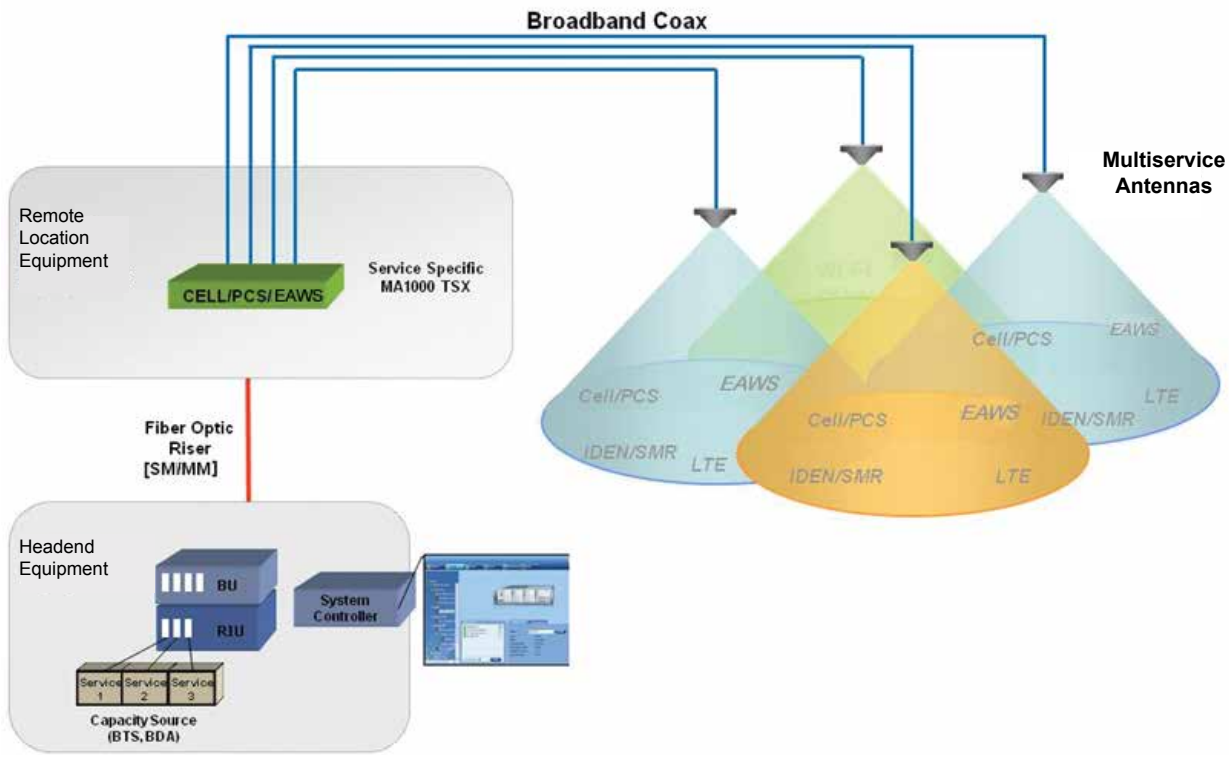
system description | (continued)



Example of MA1000 System Deployment | Figure 3

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specifications |

Supported Low-Band Services

Services/Band	Frequency Range	
	Downlink (DL)	Uplink (UL)
700 LTE	728-757	698-716 777-787
700/800 Public Safety	763-775 851-869	793-805 806-824
CELL	869-894	824-849
iDEN	851-869	806-824
GSM	935-960	890-915
E-GSM	925-960	880-915
Telstra 850M	869-890	824-849
SMR	929-941	896-902

Supported High-Band Services

Services/Band	Frequency Range	
	Downlink (DL)	Uplink (UL)
DCS	1805-1880	1710-1785
PCS	1930-1995	1850-1915
G-PCS	1930-1995	1850-1915
UMTS 2100	2110-2170	1920-1980
AWS1/3	2110-2180	1710-1780
DCS	1805-1880	1710-1785

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specifications | (continued)

RF Parameters per Service
MA1000 RHU Low-Band Service RF Parameters

LTE 700 MHz		
RF Parameter	**DL**	**UL**
Frequency Range	728-757	698-716 777-787
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 21 18 15	
Mean Gain (dB)‡	21	
Pin (dBm)‡	0	
Input IP3 (dBm) AGC OFF Minimum		-10
Input IP3 (dBm) AGC ON Minimum		
SFDR (dB)		55
Maximum Intermod Distortion (dBm)†	†	
Maximum NF (dB)		20
Gain Flatness/Ripple (dB)⁻⁻	+/- 1.0[5]	

CELL TDMA/CDMA/WCDMA/GSM 800		
RF Parameter	**DL**	**UL**
Frequency Range	869-894	824-849
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 20 17 14 11 9	
Mean Gain (dB)‡	20	
Pin (dBm)‡	0	
Input IP3 (dBm) AGC OFF Minimum		-5
Input IP3 (dBm) AGC ON Minimum		5
SFDR§ (dB)		68/69/73
Maximum Intermod Distortion (dBm)⁻	-13⁻	
Maximum NF (dB)		20
Gain Flatness/Ripple (dB)⁻⁻	+/- 1.0[5]	

SMR 800ǂ		
RF Parameter	**DL**	**UL**
Frequency Range	929-941	896-902
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 20 17 14 11	
Mean Gain (dB)‡	9	
Pin (dBm)‡	20	7
Input IP3 (dBm) AGC OFF Minimum	0	
Input IP3 (dBm) AGC ON Minimum		-5
SFDR (dB)		5
Maximum Intermod Distortion (dBm)		72
Maximum NF(dB)		
Gain Flatness/Ripple (dB)⁻⁻		

GSM/ E-GSMǂ		
RF Parameter	**DL**	**UL**
Frequency Range	935-960 925-960	890-915 880-915
Maximum Output Power per Antenna 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 14 11 8 5 3	
Mean Gain (dB)‡	14	7
Pin (dBm)‡	0	
Input IP3 (dBm) AGC OFF Minimum		-5
Input IP3 (dBm) AGC ON Minimum		5
SFDR (dB)		68
Maximum Intermod Distortion (dBm)	-36	
Maximum NF(dB)		16
Gain Flatness/Ripple (dB)⁻⁻		

⁻WCDMA complies with 3GPP TS 25.106 V5.0.0 (2002-03) table 9.4 spectrum emission mask.
†Out-of-band and spurious emissions compliant with FCC standards.
‡Factory-set mean gain BU-RHU without RIU. May be field adjusted using controller system.
§SFDR for CDMA services is calculated in 100KB/sec.
⁻⁻Gain flatness/ripple is specified for the non-duplexed port of the system at any block of the spectrum.
ǂThe SMR 800/900 for Sprint are to be designed, per Sprint guidelines, with composite power levels per antenna port and mean gain values 3dB less than stated.
Note: Specifications include the 900 MHz UL filter. The output power is limited on the downlink.

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specifications | (continued)

RF Parameters per Service
MA1000 RHU Low-Band Service RF Parameters

SMR 900‡		
RF Parameter	**DL**	**UL**
Frequency Range	929-941	896-902
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 20 17 14 11 9	
Mean Gain (dB)*	20	7
Pin (dBm)*	0	
Input IP3 (dBm) AGC OFF Minimum		-5
Input IP3 (dBm) AGC ON Minimum		5
SFDR (dB)		74
Maximum Intermod Distortion (dBm)	-13	
Maximum NF (dB)		16
Gain Flatness/Ripple (dB)†		

*Factory-set mean gain BU-RHU without RIU. May be field adjusted using controller system.
†Gain flatness/ripple is specified for the non-duplexed port of the system.
‡The SMR 800/900 for Sprint are to be designed, per Sprint guidelines, with composite power levels per antenna port and mean gain values 3 dB less than stated.

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specifications | (continued)

RF Parameters per Service
MA1000 RHU High-Band Service RF Parameters

DCS		
RF Parameter	**DL**	**UL**
Frequency Range	1805-1880	1710-1785
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 16 13 10 7 5	
Mean Gain (dB)†	16	3
Pin (dBm)†	0	
Input IP3 (dBm) AGC OFF Minimum		-6
Input IP3 (dBm) AGC ON Minimum		3
SFDR (dB)		65
Maximum Intermod Distortion (dBm)	-30	
Maximum NF (dB)		18
Gain Flatness/Ripple (dB)§	+/- 2.0	

PCS** CDMA/WCDMA		
RF Parameter	**DL**	**UL**
Frequency Range	1930-1995	1850-1915
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 20 17 14 11 9	
Mean Gain (dB)†	20	
Pin (dBm)†	0	
Input IP3 (dBm) AGC OFF Minimum		-6
Input IP3 (dBm) AGC ON Minimum		3
SFDR‡ **(dB)**		67
Maximum Intermod Distortion (dBm)	-13*	
Maximum NF (dB)		
Gain Flatness/Ripple (dB)§	+/- 2.0	

PCS** GSM/TDMA		
RF Parameter	**DL**	**UL**
Frequency Range	1930-1995	1850-1915
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 20 17 14 11 9	
Mean Gain (dB)†	20	3
Pin (dBm) †	0	
Input IP3 (dBm) AGC OFF Minimum		-6
Input IP3 (dBm) AGC ON Minimum		3
SFDR (dB)		70/65
Maximum Intermod Distortion (dBm)		
Maximum NF (dB)		
Gain Flatness/Ripple (dB)§	+/- 2.0	

G-PCS‡ CDMA/WCDMA*		
RF Parameter	**DL**	**UL**
Frequency Range	1930-1995	1850-1915
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 20 17 14 11 9	
Mean Gain (dB)†	20	
Pin (dBm)†	0	
Input IP3 (dBm) AGC OFF Minimum		-7
Input IP3 (dBm) AGC ON Minimum		
SFDR‡ **(dB)**		66
Maximum Intermod Distortion (dBm)	-13*	
Maximum NF (dB)		
Gain Flatness/Ripple (dB)§	+/- 2.0	

*WCDMA complies with 3GPP TS 25.106 V5.0.0 (2002-03) table 9.4 spectrum emission mask.
†Factory-set mean gain BU-RHU without RIU. May be field adjusted using controller system.
‡SFDR for CDMA services is calculated in 100KB/sec.
§Gain flatness/ripple is specified for the non-duplexed port of the system.
**Specifications for the older version of the CELL/PCS RHU (P/N 2000-CELL-PCSE(L) and 2000M-CELL-PCS(L)
‡Specifications for the current CELL/PCS RHU (P/N 2000 (M)-CELL-PCSH and 2000 (M)-CELL-PCSH(L).

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specifications | (continued)

RF Parameters per Service
MA1000 RHU Add-On Service RF Parameters

G-PCS** GSM/TDMA		
RF Parameter	**DL**	**UL**
Frequency Range	1930-1995	1850-1915
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 21 18 15 12 10	
Mean Gain (dB)†	20	3
Pin (dBm)†	1	
Input IP3 (dBm) AGC OFF Minimum		-7
Input IP3 (dBm) AGC ON Minimum		
SFDR (dB)		64
Maximum Intermod Distortion (dBm)	-13	
Maximum NF (dB)		
Gain Flatness/Ripple (dB)§	+/- 2.0	

UMTS and AWS1/3 CDMA/WCDMA*		
RF Parameter	**DL**	**UL**
Frequency Range	1930-1995	1850-1915
Maximum Output Power per Antenna: 1 (Composite) 2 Carriers 4 Carriers 8 Carriers 12 Carriers	 21 18 15 12 10	
Mean Gain (dB)†	21	3
Pin (dBm)†	0	
Input IP3 (dBm) AGC OFF Minimum		-7
Input IP3 (dBm) AGC ON Minimum		
SFDR‡ **(dB)**		66
Maximum Intermod Distortion (dBm)	*	
Maximum NF (dB)		
Gain Flatness/Ripple (dB)§	+/- 2.0	

*WCDMA complies with 3GPP TS 25.106 V5.0.0 (2002-03) table 9.4 spectrum emission mask.
†Factory-set mean gain BU-RHU without RIU. May be field adjusted using controller system.
‡SFDR for CDMA services is calculated in 100KB/sec.
§Gain flatness/ripple is specified for the non-duplexed port of the system.
**The PCS service RF specifications outlined is relevant only for the MA1000 PCS AO and IDEN/SMR/PCS TSX

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specifications | (continued)

Absolute Maximum Rating

Total Input RF Power to BU	10 dBm
Power Supply	60 VDC

Optical Specifications

Optical Output Power	< 3.0 mW
Maximum Optical Budget	2 dB for fiber +1 dB for connectors (assumed) = 3 dB total 300 m multimode
Optical Loss per Mated-Pair Connectors	0.5 dB (max)
Optical Connector	SC APC
Fiber Type	Single-mode: 9/125 µm Multimode: 50/125 µm or 62.5/125 µm (minimum qualifications with ANSI/TIA/EIA-568-B series, EN50173-1, or ISO/IEC 11801)
Wavelength	1310 +/- 10 nm
Maximum Distance Between Base Unit and Remote Cabinet	2 km

Temperature Specifications

Operating	0°C to +50°C (32°F to 122°F)
Storage	-20°C to 85°C (-4°F to 185°F)

specifications | (continued)

standards and approvals

Laser Safety	CDRH 21 CFR 1040.10, 1040.11 (except for deviations per notice No. 50, July 26, 2001) IEC 60825-1, Amendment 2 (January 2001) EN 60825-1
CE	Radio Equiptment and Systems: EN 302 502 - for GSM/ EGSM frequency bands EN 300 609 - for DCS frequency band EN 301 908 - for UMTS frequency band EN 300 328 - for WLAN 802.11 b/g 2.4GHz frequency Band EMC: EN 301 489 Radio Equipment and Systems: FCC 47 CFR Part2, 15, 22, 24, 27, 90
FCC	EMC: FCC 47 CFR Part 15 Subpart B EN 60950UL 60950
Safety	CAN/CSA-C22.2 No 60950 UL 2043

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system component specifications |

Tri-Service Package (TSX)

Supported Modules	Three services per TSX. Refer to the TSX model number for specific service support.
Ports	Optical Port to BU: One SC APC
Power	Power Consumption: 79 W Maximum
Physical Dimensions	Dimensions (H x W x D): 27.9 x 22.00 x 11.4 cm (10.98 x 8.66 x 4.49 in)

MA 1000 Tri-Service Package | Figure 4

Quad-Service Package (QSX)

Supported Modules	Four services per QSX. Refer to the QSX model number for specific service support.
Ports	Optical Port to BU: One SC APC
Power	Power Consumption: 129 W Maximum
Physical Dimensions	Dimensions (H x W xD): 183 x 220 x 349 mm (7.2 x 8.7 x 13.7 in) Weight: 5.6 kg (12.4 lb)

MA1000 Quad-Service Package | Figure 5

Remote Hub Unit

Supported Services	Two services per RHU. Refer to RHU model support.
Ports	Optical Port to BU: One SC APC to Add-on: TWO SMA 50 Ω connectors (one DL and one UL)
Power	Input Power: 20 to 48 V DC Power Consumption: 29 W
Physical Dimensions	Mounting: Wall mountable Dimensions: 27.9 x 22.0 x 4.5 cm (10.98 x 8.66 x 1.77 in) Weight: 2.8 kg (6.2 lb)

RHU | Figure 6

system component specifications | (continued)

Add-On (AO) Module

Supported Services	Single service per Add-on module. Refer to AO model number for specific service support
Ports	To RHU: Two SMA 50Ω connectors (one DL and one UL)
Power	Input power: 25 to 48 V DC Power consumption: 50 W
Physical Dimensions	Dimensions: 27.9 x 22.0 x 6.9 cm (10.98 x 8.66 x 2.71 in) Weight: 2.8 kg (6.2 lb)

Add-On Module | Figure 7w

system specifications |

Multimode Fiber Qualifications

50/125 or 62.5/125 µm complying with ANSI/TIA/EIA-568-B series, EN50173-1 or ISO/IEC 11801, may be used up to 300 meters in length assuming the following qualifications:

- Both the base unit and remote hub unit must be multimode capable.
- All fiber in a given length of fiber must be of the same core diameter.
- All bulkhead adapters must be single-mode SC APC (green) adapters.
- All terminations, cross connections, or patches must be direct fusion splice or Corning specified patch cords listed below.

900 µm Patch Cord for splicing, 2 m, 2 x SC APC

62.5/125/900	Diamond p/n ENC/1045341	FiberNext p/n OEM-629002-MAN
50/125/900	Diamond p/n ENC/1045340	FiberNext p/n OEM-509002-MAN

Zipcord Patch Cord, 4 x SC APC, 50/125/900/2000/4500 µm

1 m Diamond p/n ENC/1045342 FiberNext p/n OEM-50ZIP1-MAN
3 m Diamond p/n ENC/1045343 FiberNext p/n OEM-50ZIP3-MAN

Zipcord Patch Cord, 4 x SC APC, 62.5/125/900/2000/4500 µm

1 m Diamond p/n ENC/1045344 FiberNext p/n OEM-62ZIP1-MAN
3 m Diamond p/n ENC/1045345 FiberNext p/n OEM-62ZIP3-MAN

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ordering information |

Note: For RIU ordering information, refer to relevant RIU (i.e., RIU-IM, RIU-4, and RIU-12) datasheet.

MA1000 QSX

Supported Services	Part Number	Description
CELL/PCS/700 LTE/AWS	1000-C85P19L70A17-A	MA1000 Quad-Band package supporting CELL, PCS, 700 MHz LTE, and AWS.
	1000M-C85P19L70A17-A	MA1000 Quad-Band package supporting CELL, PCS, 700 MHz LTE, and AWS with multimode fiber
CELL/PCS/700 LTE/ EAWS	1000-C85P19L70EA17-A	MA1000 Quad-Band CELL, PCS, 700 MHz LTE, and EAWS
	1000M-C85P19L70EA17-A	MA1000 Quad-Band CELL, PCS, 700 MHz LTE, and EAWS with multimode fiber

MA1000 TSX

Supported Services	Part Number	Description
CELL/PCS/700 LTE	1000-C85P19L70-A	MA1000 TSX Tri-Service CELL/PCS, and 700 MHz LTE
	1000M-C85P19L70-A	MA1000 TSX Tri-Service CELL/PCS, and 700 MHz LTE with multimode fiber.
CELL/PCS/AWS	1000-C85P19A17-A	MA1000 TSX Tri-ServiceCELL/PCS, and AWS.
	1000M-C85P19A17-A	MA1000 TSX Tri-Service CELL/PCS, and AWS with multimode fiber.
CELL/PCS/EAWS	1000-C85P19EA17-A	MA1000 Tri-Service, CELL/PCS, and EAWS
	1000M-C85P19EA17-A	MA1000 Tri-Service CELL, PCS, and EAWS with multimode fiber
IDEN/SMR/PCS	1000-IDEN-SMR-G-PCS	MA1000 TSX Tri-Service iDEN/SMR and PCS with G-block support.
	1000M-IDEN-SMR-G-PCS	MA1000 TSX Tri-Service iDEN/SMR and PCS with G-block support with multimode fiber.
	1000-IDEN-SMR-G-PCSF	MA1000 TSX Tri-Service iDEN/SMR and PCS with G-block support and filter to provide additional guard band between iDEN DL and SMR UL.
	1000M-IDEN-SMR-G-PCSF	MA1000 TSX Tri-Service iDEN/SMR and PCS with G-block support and filter to provide additional guard band between iDEN DL and SMR UL with multimode fiber.

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ordering information | (continued)

Remote Hub Units

Part Number	Description
1000-CELL-4E	Single-Band CELL, 4 ports, PCS add-on support
1000-PCS-4E	Single-Band PCS, 4 ports, AWS add-on support
1000-DCS-4E	Single-Band DCS, 4 ports, UMTS add-on support
1000M-DCS	MMF Single-Band DCS, 4 ports, UMTS add-on support
1000-CELL-PCS4E-HL	Dual-Band CELL/PCS, 4 ports, AWS add-on support
1000M-CELL-PCS4E-HL	MMF Dual-Band CELL/PCS, 4 ports, AWS add-on support
1000-CELL-DCS4E	Dual-Band CELL/DCS, 4 ports, UMTS add-on support
1000M-GSM-DCS	MMF Dual-Band GSM/DCS 4 ports, UMTS add-on support
1000-GSM-DCS4E	Dual-Band GSM/DCS, 4 ports, UMTS add-on support
1000-GSMO-DCS4E	Dual-Band GSM Orange/DCS, 4 ports, UMTS add-on support
1000M-iDEN-SMR	MMF Dual-Band iDEN(SMR800)/SMR900 Paging,4 ports, PCS add-on support
1000-iDEN-SMR4	Dual-Band iDEN(SMR800)/SMR900, 4 ports, PCS add-on support
1000-iDEN-SMR4F	Dual-Band iDEN(SMR800)/SMR900, 4 ports with filter kit, PCS add-on support
1000-SMR-FILTER	Filter Kit for SMR 900

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ordering information | (continued)

Add-on Modules

Part Number	Description
700LTE-AO-A-SCU	Add-On Kit for LTE 700 MHz service for use in upgrade situations with older MA1000 Cell/PCS RHUs (P/N 1000-CELL-PCS4E and 1000M-CELL-PCS). Includes 700 MHz service combiner unit (SCU-700) and applicable accessories for connecting to the CELL/PCS RHU.
700LTE-AO-B-HL	Add-On for LTE 700 MHz Service with MA1000 CELL/PCS RHUs (P/N 1000(M)-CELL-PCS4E-HL)
1200-G-PCS-AO	Add-On RHU supporting a PCS w/G-block
1200-UMTSE-AO	Add-On RHU - UMTS service
1200-AWS-AO	Add-On RHU supporting AWS service
1200-EAWS-AO	Add-On RHU supporting EAWS service for MA1000

Base Units

Part Number	Description
WB-B8U	Wideband Base-8 Unit supporting 8 RHUs
WBM-B8U	Wideband Base-8 Unit supporting 8 RHUs over mulitmode
WB-B4U	Wideband Base-4 Unit supporting 4 RHUs
WBM-B4U	Wideband Base-4 Unit supporting 4 RHUs over mulitmode

Power Supplies

Part Number	Description
LPS-48V-66W	Local AC/DC Converter 66 W
LPS-48V-100W	Local AC/DC Converter 100 W
AK-PWR-CORD-EU	AC Power Cord for 66W and 100 W power supplies, European connector
AK-PWR-CORD-UK	AC Power Cord for 66W and 100 W power supplies, UK connector

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ordering information | (continued)

Mounting Brackets Accessories

Part Number	Description
BRKT-1200-STK	Bracket for stacking RHU/Add-on/860 module on top of an Add-on module
BRKT-1RU-SHELF-2K	Shelf for RHU/Add-on/860 or bracket for stacking on MA2000 MRC
BRKT-RHU-800-STK	Bracket for stacking RHU/Add-on/860 module on top of an RHU/860 module (Note: Not on top of an Add-on)

Corning Optical Communications LLC • PO Box 489 • Hickory, NC 28603-0489 USA
800-743-2675 • FAX: 828-325-5060 • International: +1-828-901-5000 • www.corning.com/opcomm

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