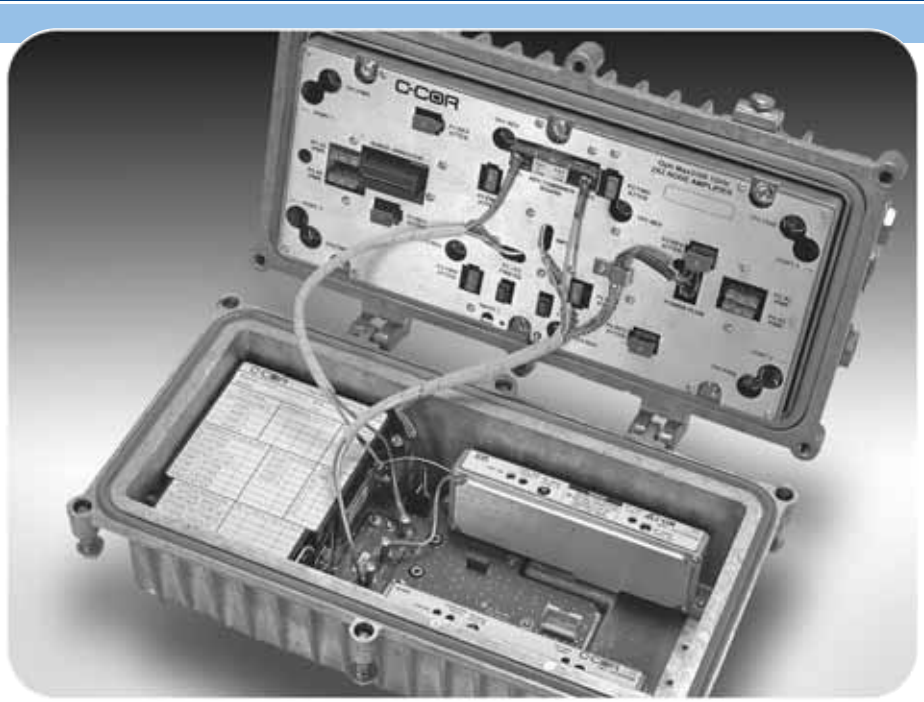
Opti Max3100

1 GHz 2 x 2 Segmentable Node



- **1 GHz technology**
- **Full 2 x 2 forward and return segmentation capability**
- **Future 85/105 MHz architecture support**
- **Investment preservation through scalability**
- **Analog 1310 nm, 1550 nm, and CWDM DFB return transmitters**
- **Accepts legacy 9-A and 9-A-WC series PADs**
- **Accepts GEQL-1 GHz series equalizers**
- **HMS/AM protocol support**

The Opti Max3100 1 GHz 2 x 2 Segmentable Node is the next generation of C-COR's proven and reliable Opti Max3000 node. Extended bandwidth from 870 MHz to 1 GHz will enable broadband service providers to increase forward capacity for HDTV over previous program offerings, thereby allowing a typically 40% increase over current HDTV channels in a lineup. This multi-functional node is available for new system builds or is an economical upgrade that reuses the existing optical modules of Opti Max3000 nodes.

The Opti Max3100 1 GHz node's modular design enables broadband service providers to deploy minimal configurations today and expand as subscriber demands increase. Future expansion options include forward and return 2 x 2 segmentation or forward and return redundancy, analog CWDM return transmitters, and the Value Max transponder, which supports either AM or open-standard HMS protocols.

In addition, the Opti Max3100 1GHz node supports fiber-poor systems with a variety of return transmitter options and the future availability of an 85/105MHz option, which will double return bandwidth without capital expenditures for additional return transmitters.

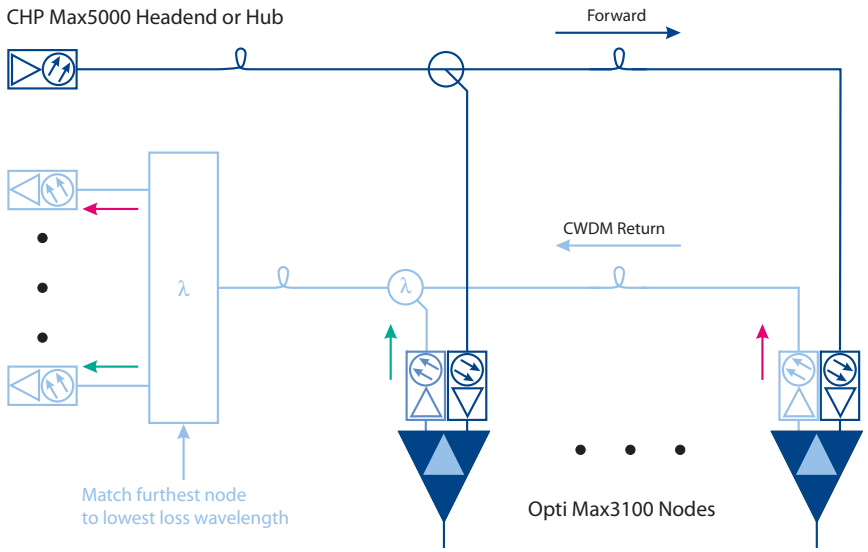
Features

- 1 GHz bandwidth
- Based on the Opti Max3000 form factor and supports Opti Max3000 optics modules
- Capable of 2 x 2 forward and return segmentation
- Supports C-COR's HMS/AM protocol Value Max transponder
- Supports optical redundancy
- Bench upgradable plug-in diplex filters
- Direct AC powering for pedestal/cabinet applications

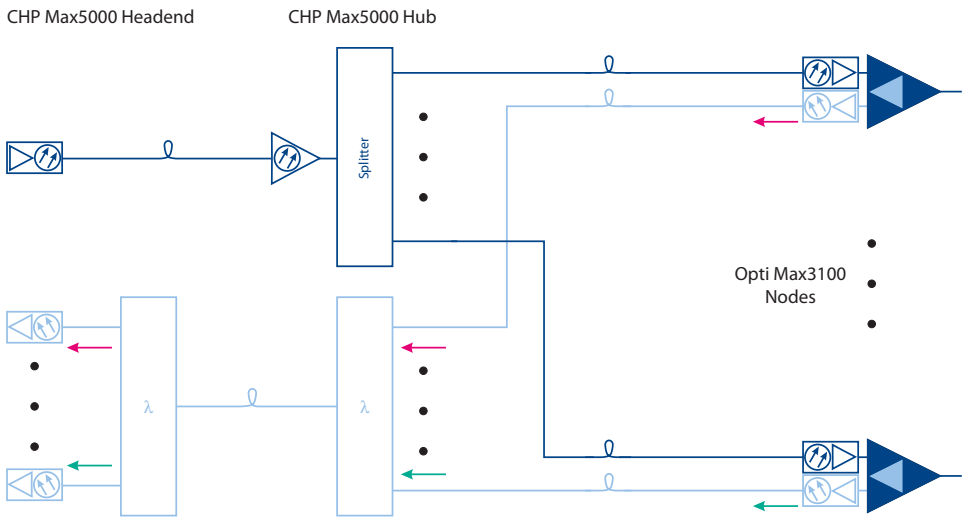
Applications

For broadband service providers requiring increased network reliability, the Opti Max3100 can be deployed in 1 x 4, 1 x 4 redundant, and 2 x 2 forward and return segmentation configurations. In addition, the Opti Max3100 supports analog CWDM return applications.

In fiber poor systems, CWDM technology increases analog return path capability using a single fiber. In the following example, multiple return paths can be combined onto a single fiber from nodes to a headend or hub.

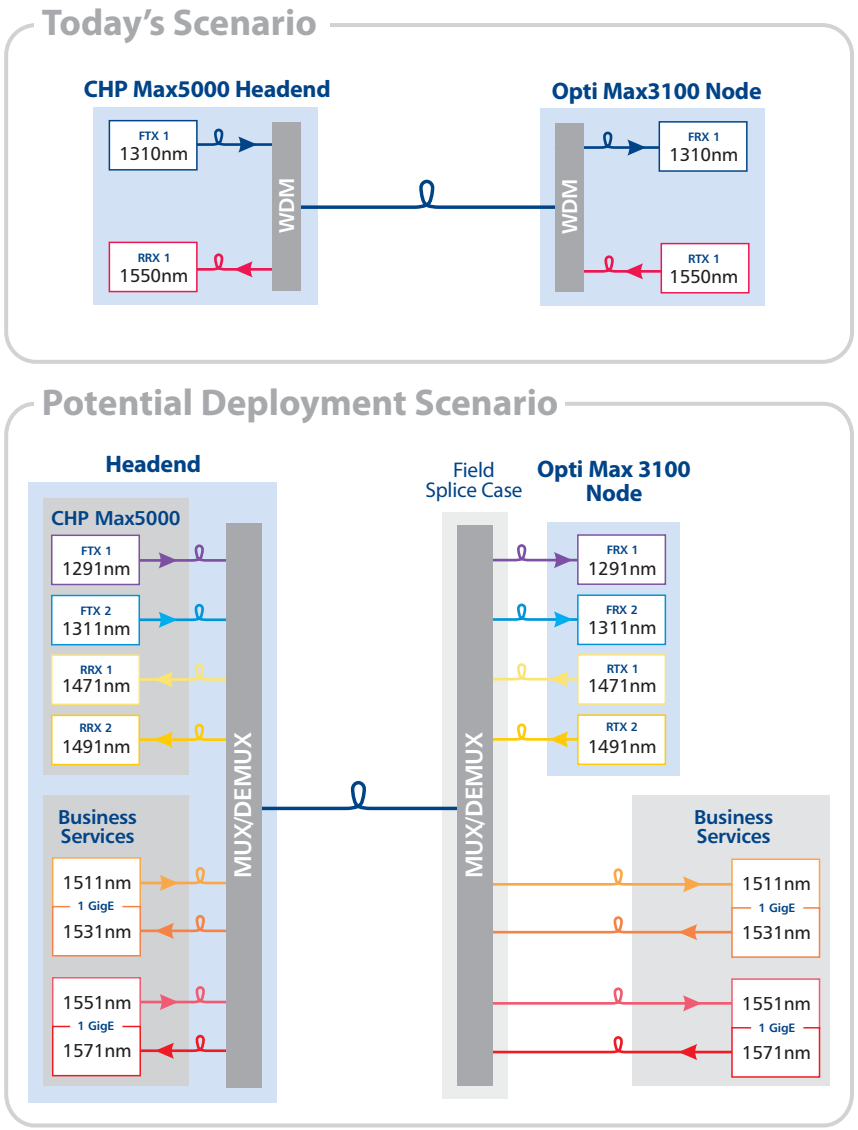


In the following star architecture, point-to-point links between each node and a hub are possible with short fiber lengths, while maintaining a single, long fiber between the hub and headend. The advantage with this architecture is that an existing fiber can be used between hub and headend, or only one fiber has to be installed between hub and headend, reducing the cost of such implementation.



C-COR offers an even more targeted solution that enables MSOs to offer the full range of next-generation residential and business services by leveraging their existing network. Rigorously tested and field-proven, C-COR's CWDM Multi-Wavelength Access Network delivers up to 10 multiplexed 20 nm spaced CWDM wavelengths of analog forward, return, and GigE services on a single fiber. CWDM technology is economical not only because it is now widely deployed but also because it does not require the special laser temperature controls and expensive wavelength circuitry needed with DWDM applications. These same features give CWDM technology the robust capabilities required in outdoor environments.

In this example, the Opti Max3100 can be segmented in both the forward and return paths with one fiber. This same fiber can also be used for wavelengths dedicated to business services.



Note: Updating from Today's Scenario to the Potential Deployment Scenario results in one spare fiber.

General Node Specifications

General Node Specifications		
Number of Active RF/AC Ports	4	
AC Current Passing, A (All Ports)	15	
Physical Dimensions, (W x H x D), in (cm)	15.5 x 9.1 x 7.9 (39.4 x 23.1 x 20.1)	
Weight, 2 x2 configuration, lbs (kg)	25 (11.3)	
Operating Temperature Range, °C	–40 to 60	
Forward Path Specifications		
Optical Specifications		
Optical Input Wavelength, nm	1290 to 1600	
Optical Input Range, dBm	–3 to 3; circuit resiliency to 5 dBm	
RF Specifications		
Operating Passband, MHz	54/85 to 1002	
Output Level @ 1002 MHz, –3dBm input, 3.5% OMI, dBmV, min.	53.5	
Level Stability, dB, max.	±1.5	
Gain Slope, dB (Note 1)	9.5, 11.5, 12.5, 14.5, 16.5 ± 1.0	
Flatness @ Gain Slope, dB	±1.5	
Return Loss, dB, min. (all RF ports)	16.0	
Port to Port Isolation @ 1002 MHz, dB, typ.	60	
NTSC Channel Performance (Notes 2, 3, and 6)	**79 Channels (42/54 MHz split)**	
Reference Frequency, MHz	1002/870/550/54	
Output Level, dBmV	53.5/51.2/45.7/37	
Carrier to Noise Ratio, 4 MHz, 75 Ohm, dB	57, 0 dBm input	
Composite Triple Beat, –dBc	73	
Composite 2IM, –dBc	67	
Cross Modulation (per NTCTA std.), –dB	70	
Composite Intermodulation Noise, dB (Note 4)	62.5	
PAL/CENELEC Channel Performance	**60 PAL Channels (65/85 MHz split) (Notes 2, 5, and 6)**	**42 CENELEC Channels (65/85 split) (Note 7)**
Reference Frequency, MHz	1002/600/85	870/85
Output Level, dBmV	53.5/46.3/37	53/45
Carrier to Noise Ratio, 5 MHz, 75 Ohm, dB	57, 0 dBm input	49
Composite Triple Beat, –dBc	73	62
Composite 2IM, –dBc	69	62
Cross Modulation (per NTCTA std.), –dB	70	—
Composite Intermodulation Noise, dB (Note 4)	63	—
Return Path Specifications		
RF Specifications		
Operating Passband, MHz	5 to 42/65	
Optimum RF Input Level, dBmV/6 MHz	12	
Gain Slope, dB	±1.0	
Flatness @ Gain Slope, dB	±1.0	
Level Stability, dB	±2.5	
Return Loss, dB (all RF ports)	16.0	
Port to Port Isolation, dB, typ.	50	

General Node Specifications (cont'd)

Powering Requirements (Note 8)	DC Current (A, max.) @ 24V	DC Power (W)	AC I/P Current @ 60/90V (A)	AC I/P Power (W)
1 x 4/4 x 1 w/ 1310/1550 new DFB NRT	2.71	65.04	1.28/0.85	76.52
1 x 4/4 x 1 w/ 1310 legacy DFB NRT	2.93	70.32	1.38/0.92	82.73
1 x 4/4 x 1 w/ 1310/1550 CWDM DFB NRT	3.08	73.92	1.45/0.97	86.96
1 x 4/4 x 1 Redundant w/ 1310/1550 new DFB NRT	3.21	77.04	1.51/1.01	90.64
1 x 4/4 x 1 Redundant w/ 1310 legacy DFB NRT	3.66	87.84	1.72/1.15	103.34
1 x 4/4 x 1 Redundant w/ 1310/1550 CWDM NRT	3.96	95.04	1.86/1.24	111.81
2 x 2 w/ 1310/1550 new DFB NRT	3.41	81.84	1.60/1.07	96.28
2 x 2 w/ 1310 legacy DFB NRT	3.86	92.64	1.82/1.21	108.99
2 x 2 w/ 1310/1550 CWDM NRT	4.16	99.84	1.96/1.31	117.46

Notes:
1. Typical slope is 6.5dB with no EQ installed. Slope is defined as the difference between the highest and lowest specified frequency on a straight line determined by applying a best fit/least squared formula to the measured response.Slope can be reconfigured via plug-in equalizers.
2. The distortion values listed are for the node only. To obtain a particular link performance, combine the listed node performance values with the applicable transmitter performance values.
3. Analog channels occupying the 54 to 550MHz frequency range with digitally compressed channels or equivalent broadband noise to 1002MHz at levels 6dB below equivalent video channels.
4. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002MHz at levels 6dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550MHz frequency spectrum.
5. Analog channels occupying the 85 to 600MHz frequency range with digitally compressed channels or equivalent broadband noise to 1002MHz at levels 6dB below equivalent video channels.
6. At the specified operational tilt of 16.5dB, the maximum output level for 870MHz or 1002MHz loading is 56.5dBmV at the highest frequency.
7. According to EN50083-3, 42 Cenelec channel loading, and with diplex filter and 8dB slope. Measured with 5% OMI, –6dBm optical input, 113dBµV (53dBmV) RF output level, no optical AGC.
8. Value Max transponder and daughter card add 55mA @ 24VDC current draw. All values assume the use of a 1GHz NOR receiver; the use of a legacy NOR will increase the DC current draw by 140mA each.

Specifications subject to change without notice

1310nm and 1550nm DFB Return Transmitter Specifications

Optical Specifications		
Laser Type	Isolated Uncooled DFB	
Transmission Wavelength, nm	NRT-1310DFB: 1310 ± 20 NRT-1550DFB: 1550 ± 25	
Output Power, dBm	3.0 ± 1.0	
Connector Types	SC/APC, FC/APC, SC/UPC, FC/UPC	
RF Specifications		
Bandwidth, MHz	5 to 200	
Impedance, Ohm	75	
Return Loss, from max. gain to 8dB of attenuation, dB	17	
Flatness, with respect to gain slope, max., dB	±0.75	
Gain Slope, max., dB	±0.5	
Level Stability, over temp., dB	±2.5	
Manual Gain Control Range	> 8dB	
Reverse Spurious, –dBc	< 50	
RF Testpoint Insertion Loss, dB (Note 1)	–9 ± 0.5	
Performance Specifications (Note 2)	**42/54MHz split**	**65/85MHz split**
Optimum Transmitter Input, dBmV/6MHz (dBmV/Hz)	6 (–62)	6 (–62)
Optimum Testpoint Level, dBmV/6MHz (dBmV/Hz)	–3 (–71)	–3 (–71)
NPR/Dynamic Range, dB (Note 3)	41/12	39/12
NPR Peak, dB (Notes 3 and 4)	48	47

1310nm and 1550nm DFB Return Transmitter Specifications (cont'd)

BER Dynamic Range (Note 3)		
QPSK @ 10^{-6}, dB	45	43
16-QAM @ 10^{-6}, dB	35	33
Powering Specifications		
Input Voltage, VDC	24 ± 0.5	
Current Draw, max., mA	225	
Environmental Specification		
Operating Temperature, within Opti Max3100 node	–40 to 60°C (–40 to 140°F)	

1. RF testpoint is –9dB referenced to transmitter input with transmitter set fully clockwise to maximum gain (minimum attenuation).
2. Performance specs measured while installed in an Opti Max3100 node with a receiver causing low degradation to performance (≤0.5dB).
3. Measured over 6dB fiber link using 40MHz NPR loading.
4. Typical NPR performance measurements taken at room temperature.
5. These return transmitters are also compatible with the OM3000 node.

Specifications subject to change without notice

CWDM Return Transmitter Specifications

Optical Specifications		
Laser Type	Isolated Uncooled DFB	
Transmission Wavelengths, nm ±6.5nm	1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611	
Output Power, dBm	3.0 ± 1.0	
Connector Types	SC/APC, FC/APC, SC/UPC, FC/UPC	
RF Specifications		
Bandwidth, MHz	5 to 200	
Impedance, Ohm	75	
Return Loss, from max. gain to 8dB of attenuation, dB	17	
Flatness, with respect to gain slope, max., dB	±0.75	
Gain Slope, max., dB	±0.5	
Level Stability, over temp., dB	±2.5	
Manual Gain Control Range	> 8dB	
Reverse Spurious, –dBc	< 50	
RF Testpoint Insertion Loss, dB (Note 1)	–9 ± 0.5	
Performance Specifications (Note 2)	**42/54MHz split**	**65/85MHz split**
Optimum Transmitter Input, dBmV/6MHz (dBmV/Hz)	6 (–62)	6 (–62)
Optimum Testpoint Level, dBmV/6MHz (dBmV/Hz)	–3 (–71)	–3 (–71)
NPR/Dynamic Range, dB (Note 3)	35/15	33/15
NPR Peak, dB (Notes 3 and 4)	45	44
BER Dynamic Range (Note 3)		
QPSK @ 10^{-6}, dB	45	43
16-QAM @ 10^{-6}, dB	33	33
Powering Specifications		
Input Voltage, VDC	24 ± 0.5	
Current Draw, max., mA	600	
Environmental Specification		
Operating Temperature, within Opti Max3100 node	–40 to 60°C (–40 to 140°F)	

1. RF testpoint is –9dB referenced to transmitter input with transmitter set to maximum gain (minimum attenuation).
2. All performance specifications measured while installed in an Opti Max3000 node with an optical receiver causing low degradation to performance (≤0.5dB).
3. Measured over 6dB fiber link using 40MHz NPR loading.
4. Typical NPR performance measurements taken at room temperature.
5. These return transmitters are also compatible with the OM3000 node.

Specifications subject to0 change without notice

Ordering Information

			1	2	3		4	5	6	7	8		9	10	11	12	13	14	15		16	
O	M	3	1	G	x	–	x	x	x	x	x	–	x	x	x	x	x	x	x	–	x	0

1	Series
1	Opti Max3100 series

2	Bandwidth
G	1 GHz with 53.5 dBmV output level

3	Frequency Split
J	42/54 MHz
H	65/85 MHz

4	Return Switch	
6	None	
7	Return switches	a

a) Operation of return switches requires a transponder.

5	Output Tilt (54–1002 MHz)
C	9.5 dB (8 dB @ 54–870 MHz)
D	11.5 dB (10 dB @ 54–870 MHz)
E	12.5 dB (11 dB @ 54–870 MHz)
F	14.5 dB (12.5 dB @ 54–870 MHz)
G	16.5 dB (14.5 dB @ 54–870 MHz)

6	Forward Segmentation Option	
1	1 x 4 forward using 1 x 4 RF module	a, c
2	2 x 2 forward using 2 x 2 RF module	b, c
3	1 x 4 forward using 2 x 2 RF module	a, c

*a) Must select "**A**", "**B**", or "**D**" in #9 block,* **Network Optical Receiver (NOR)**.

*b) Must select "**C**" in #9 block,* **Network Optical Receiver (NOR)**.

c) –20 dB internal testpoints.

7	Housing	
B	Strand-mount with fiber tray	a
C	Strand-mount with bracket	a
D	Pedestal-mount with bracket	b
E	Pedestal-mount with fiber tray	b
F	Pedestal-mount with bracket	a
G	Pedestal-mount with fiber tray	a

a) No direct power kit installed.

b) Direct power kit installed.

8	Return Segmentation Option	
0	None	
1	4 x 1 return (no segmentation)	a
2	2 x 2 top/bottom return segmentation	b
3	2 x 2 left/right return segmentation	c

*a) Must select "**A**" or "**B**" in #12 block,* **Network Return Transmitter (NRT)**.

*b) Must select "**C**" in #12 block,* **Network Return Transmitter (NRT)**. *Ports 1 & 2 combined, ports 3 & 4 combined.*

*c) Must select "**C**" in #12 block,* **Network Return Transmitter (NRT)**. *Ports 1 & 3 combined, ports 2 & 4 combined.*

9	Network Optical Receiver (NOR)	
A	Single NOR	
B	Dual NORs with optical redundancy	a
C	Dual NORs with 2 x 2 forward segmentation	
D	Dual NORs with 330 MHz network forward combiner	

a) A/B switch module included.

10	NOR Connector	
1	FC/APC	a
2	SC/APC	b
3	FC/UPC	a
4	SC/UPC	b

*a) Must select "**1**" or "**3**" in #15 block,* **NRT Connector**.

*b) Must select "**2**" or "**4**" in #15 block,* **NRT Connector**.

11	Fiber Type	
A	Jacketed fiber (bracket)	a
B	Buffered fiber (tray)	

*a) Must select "**C**", "**D**", or "**F**" in #7 block,* **Housing**.

12	Network Return Transmitter (NRT)
0	None
A	Single NRT
B	Dual NRTs for optical redundancy
C	Dual NRTs for 2 x 2 segmentation

13–14	NRT Wavelength	
00	None	a
0y	Single NRT	b
xy	Dual NRTs	c
Available NRT Wavelengths (please specify)		
A	1611 nm CWDM	
B	1591 nm CWDM	
C	1571 nm CWDM	
D	1551 nm CWDM	
E	1531 nm CWDM	
F	1511 nm CWDM	
G	1491 nm CWDM	
H	1471 nm CWDM	
J	1310 nm DFB	
K	1550 nm DFB	

*a) Must select "**0**" in #12 block,* **Network Return Transmitter (NRT)**.

b) Where y represents one of the above wavelengths and is located in the NRT1 location.

c) Where x and y each represents one of the above wavelengths. NRT x is located in the NRT2 location and NRT y is located in the NRT1 location.

15	NRT Connector	
1	FC/APC	a
2	SC/APC	b
3	FC/UPC	a
4	SC/UPC	b

*a) Must select "**1**" or "**3**" in #10 block,* **NOR Connector**.

*b) Must select "**2**" or "**4**" in #10 block,* **NOR Connector**.

16	Element Management Transponder	
0	No transponder	
B	Value Max, AM protocol	a, b
C	Value Max, HMS protocol	a, b
Z	No transponder but daughter card ready	

a) Daughter card and cable included.

b) Transponder is frequency agile. Forward path: 48 to 162 MHz in 0.1 MHz steps. Return path: 5 to 21 MHz in 0.1 MHz steps.

Replacement Modules and Accessories

Part Number	Description	Part Number	Description
1501837-xxx (Note 1)	1 GHz Network Optical Receiver (NOR)	1502066-xxx (Note 12)	Splitter/Daughterboard/AB switch
720065x (Note 2)	1310 nm DFB Network Return TX (NRT)	1502037-xxx (Note 13)	Return segmentation combiners
72006xx (Note 3)	1550 nm DFB NRT	1502036-001	Return switch
720066x (Note 4)	1471 nm CWDM NRT	(Note 14)	9-A series PADs (0.5–19.5 dB, 0.5 dB steps)
720066x (Note 5)	1491 nm CWDM NRT	(Note 14)	Amini short style PADs (12.5–23.0 dB, 0.5 dB steps)
720066x (Note 6)	1511 nm CWDM NRT	2500848 (KP012394)	Port PAD location terminator
720067x (Note 7)	1531 nm CWDM NRT	GEQL-1GHz-xxx-1	1 GHz linear equalizers (2–13 dB, 1 dB steps)
720067x (Note 8)	1551 nm CWDM NRT	1500390-002	90 V surge terminator
720067x (Note 9)	1571 nm CWDM NRT	810-0354-01H	Value Max Transponder (HMS protocol)
72006xx (Note 10)	1591 nm CWDM NRT	810-0354-01A	Value Max Transponder (AM protocol)
720068x (Note 11)	1611 nm CWDM NRT	—	—

1. xxx = connector and fiber type (-001 = SC/APC w/jacketed, -002 = SC/APC w/buffered, -003 = FC/APC w/buffered, -004 = SC/UPC w/buffered).
2. x = connector and fiber type (5 = SC/APC w/jacketed, 6 = SC/APC w/buffered, 7 = FC/APC w/buffered).
3. xx = connector and fiber type (58 = SC/APC w/jacketed, 59 = SC/APC w/buffered, 60 = FC/APC w/buffered).
4. x = connector and fiber type (1 = SC/APC w/jacketed, 2 = SC/APC w/buffered, 3 = FC/APC w/buffered).
5. x = connector and fiber type (4 = SC/APC w/jacketed, 5 = SC/APC w/buffered, 6 = FC/APC w/buffered).
6. x = connector and fiber type (7 = SC/APC w/jacketed, 8 = SC/APC w/buffered, 9 = FC/APC w/buffered).
7. x = connector and fiber type (0 = SC/APC w/jacketed, 1 = SC/APC w/buffered, 2 = FC/APC w/buffered).
8. x = connector and fiber type (3 = SC/APC w/jacketed, 4 = SC/APC w/buffered, 5 = FC/APC w/buffered).
9. x = connector and fiber type (6 = SC/APC w/jacketed, 7 = SC/APC w/buffered, 8 = FC/APC w/buffered).
10. xx = connector and fiber type (79 = SC/APC w/jacketed, 80 = SC/APC w/buffered, 81 = FC/APC w/buffered).
11. x = connector and fiber type (2 = SC/APC w/jacketed, 3 = SC/APC w/buffered, 4 = FC/APC w/buffered).
12. xxx = (-001 = module splitter, -002 = module splitter/daughter card, -003 = module splitter/daughter card/AB switch, -004 = daughter card/AB switch, -005 = daughter card.
13. xxx = combiner type (-001 = 4 x 1, -002 = 2 x 2 right & left, -003 = 2 x 2 top & bottom.
14. Refer to the HFC Product Accessories data sheet on the C-COR website for specific part numbers.

C-COR also offers a comprehensive suite of optical passive solutions to help you take full advantage of our new CWDM transmitters. Contact your C-COR sales professional for more details and to discuss how our exciting new 1 GHz products can add value to your network.

Refer to the C-COR HFC Product Accessories data sheet on our website for detailed ordering information and specifications on the complete set of plug-in accessories used in the Opti Max3100.

Americas Headquarters
60 Decibel Road • State College • Pennsylvania • 16801 • USA
T: 1-814-238-2461 T: 1-800-233-2267 F: 1-814-238-4065

EuroPacific Headquarters
Transistorstraat 44-V • 1322 CG Almere • The Netherlands
T: 31-36-546 1111 F: 31-36-536 4255

www.c-cor.com

The C-COR logo is a registered trademark of C-COR Incorporated.
Copyright © 2006 C-COR Incorporated. All rights reserved.