FTTMax®
RF Over Glass (RFoG)

FTTM2000
Optical Network Unit (ONU)

FEATURES

- All passive network and ONUs at the customer premises simplifies fault isolation
- Conserves space and powering with a small form factor and less than 4 watts power consumption
- Provides flexibility in network design with 1310/1550 nm or 1610/1550 nm optical channel plans available
- Allows PON based data services to be added using optional built in EPON upgrade port
- Built in optical filtering prevents interference from 1G and 10 EPON wavelengths
- Conforms to SCTE RFoG standard and aligns with IEEE 802.ah Gigabit EPON
- Optical automatic gain control (AGC) maintains RF output levels over a range of optical inputs
- Burst mode upstream transmission suppresses noise from the subscriber location

PRODUCT OVERVIEW

Cable operators must have investment-protecting, cost-effective, scalable solutions that leverage existing infrastructure. With ARRIS Fiber to the Premises RFoG solutions, operators can now supply greenfield communities and small to medium businesses with video, voice, and data at DOCSIS® speeds, and quickly "light up" MDUs and rural communities in an economical fashion. 'All fiber' connectivity enables cable operators to claim parity with other Fiber to the Home (FTTH) architectures and provides a future migration path to PON without changing the outside plant infrastructure. Triple play services delivered over RFoG work the same as those delivered over coax and make use of existing headend, back office, and customer premise equipment.

RFoG Solutions for Parity with FTTH Networks

The FTTMax® RFoG Optical Network Unit (FTTM2000) is part of the ARRIS fiber to the premises solutions portfolio. The FTTM2000 is a 1 GHz optical network unit that converts optical signals carrying voice, video, and data to RF signals at the customer premises. The 1G and 10G EPON upgrade port options allow the FTTM2000 to pass Gigabit and 10 Gigabit EPON wavelengths to support separate EPON services on the same fiber network without the need for additional optical passives. Combined with the CHP CORWave® II or CORWave® 3 multiwavelength transmitters, a wide selection of optical passives, Trans Max® RFoG repeaters, and CHP low noise return receivers, the FTTM2000 can leverage existing HFC infrastructure and back office systems to provide cable operators with the ability to extend their fiber networks easily, incrementally, and economically.

Cable Friendly Options

- Local powering convenience - optional AC adapter* with USA or European plugs
- DFB laser technology
- Available in a NID enclosure for simplified installation

* Coax power jumpers not included. Customized jumpers available–please contact your authorized ARRIS professional.

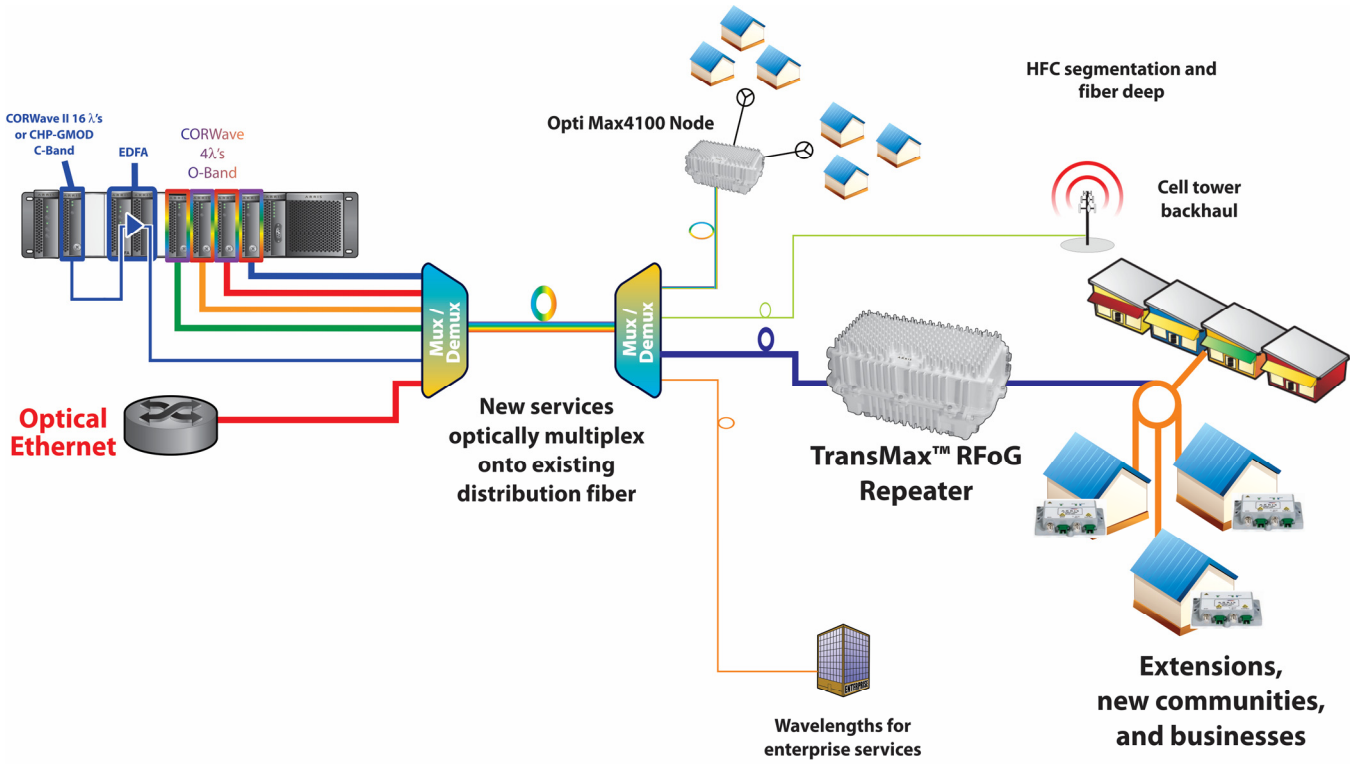


Diagram shows how RFoG can share existing distribution fiber with other services using multi-wavelength technology.

FTTMax® 2000 RFoG Optical Network Unit (ONU)

The FTTMax 2000 supports a number of options, including a power supply, 42/54 MHz, 65/85 MHz, and 85/102 MHz frequency splits, 1550 nm downstream transmission, and upstream transmission wavelengths of 1610 nm or 1310 nm.

Specifications FTTMax 2000 RFoG (42/54 MHz Split) Standards Compliant ONU

Characteristic	Specification
Downstream (Forward)	
Optical Specifications	
Optical Input Wavelength, nm[13]	1525 – 1565
Optical Rejection of PON Wavelengths	
1260-1360 nm	-22 dB
1480-1500 nm	-30 dB
1575-1581 nm	-30 dB
Optional 1G PON Pass Thru Port Wavelength, nm	1260 – 1500
Optional 10G PON Pass Thru Port Wavelengths, nm	1260-1360, 1480-1500, 1575-1581
Optional PON Pass Thru Port Loss, dB, max.	1.0
Optical AGC Input Range, dBm	–6 to 0
RF Specifications	
Operating Passband, MHz	54 to 1002
Output Level @ 860 MHz, dBmV[1]	17 ± 3
Tilt, dB[2]	5 ± 1
Flatness, dB[3]	± 1.0
Optical AGC accuracy, dB typ./max.	0.7/1.5
Port Impedance, Ω	75
Return Loss, dB	14
Forward Distortion Specifications	
Channel Loading[4]	79 NTSC + 75 QAM 256 Channels 154 QAM 256 Channels
Reference Frequency, MHz	1002/860/550/54
Reference Output Level, dBmV	17.7/17/15.3/12.7
Carrier to Noise, dB[5]	48.5
Composite Triple Beat, –dBc	65
Composite Second Order, –dBc	61
Composite Intermodulation Noise (CIN), dB[6]	58
MER	38
BER(Pre-FEC)	1E-8
1310 nm DFB Transmitter Upstream	
Optical Specifications	
Transmitted Wavelength, nm	1310 ± 50
Laser Turn On Level, dBmV, typ.[7]	10
Laser Turn Off Level, dBmV, typ.[7]	–4
Output Power, RF > Input Threshold, dBm	3 ± 1.5
Output Power, RF < Input Threshold, dBm	Off
Laser Rise time, µs typ.	1.0
Laser Fall time, µs typ.	1.0
Tx OMI, %[8]	35
OMI per channel @ recommended input level,% typ.[9]	17.5
RF Specifications	
Operating Passband, MHz	5 to 42
Input level, dBmV/Channel, (4) 6.4 MHz channels[14]	33
Tilt, dB[2]	± 1.0
Flatness, dB[3]	± 1.0
Port Impedance, Ω	75
Return Loss, dB	14
NPR Dynamic Range @ 30 dB NPR, dB[10]	13
64–QAM BER Dynamic Range, dB[(10,11)]	14

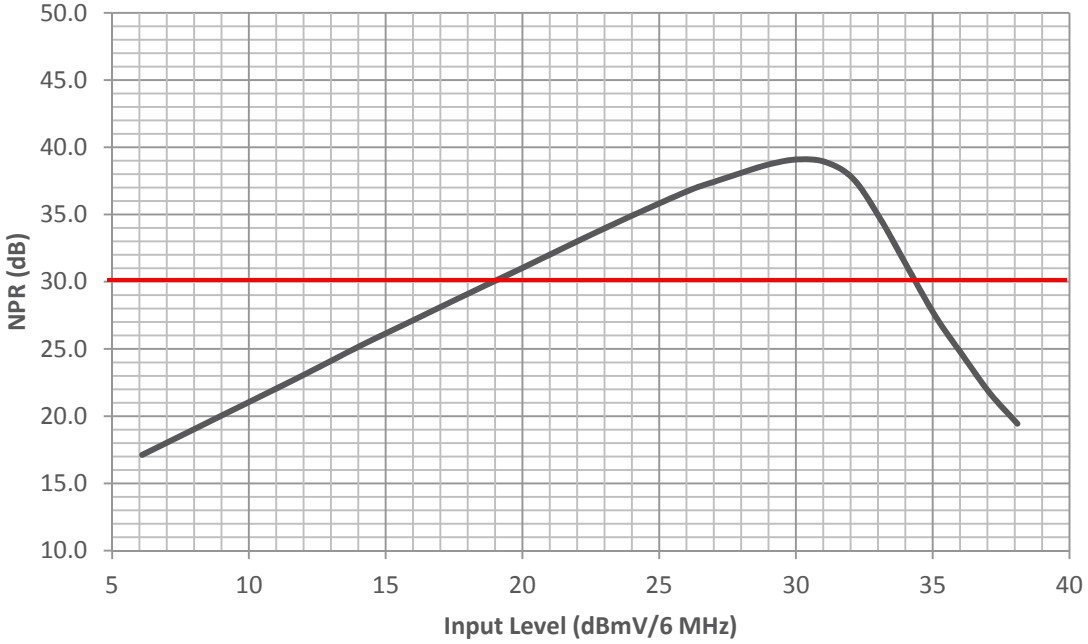
Specifications FTTMax 2000 RFoG (42/54 MHz Split) Standards Compliant ONU (Continued)

Characteristic	Specification
1610 nm DFB Transmitter Upstream Specifications	
Optical Specifications	
Transmitted Wavelength, nm	1610 ± 10
Laser Turn On Level, dBmV, typ.[7]	10
Laser Turn Off Level, dBmV, typ.[7]	–4
Output Power, RF > Input Threshold, dBm	3 ± 1.5
Output Power, RF < Input Threshold, dBm	Off
Laser Rise time, µs typ.	1.0
Laser Fall time, µs typ.	1.0
Tx OMI, %[8]	35
OMI per channel @ recommended input level,% typ.[9]	17.5
RF Specifications	
Operating Passband, MHz	5 to 42
Input level, dBmV/Channel, (4) 6.4 MHz channels[14]	33
Tilt, dB[2]	± 1.0
Flatness, dB[3]	± 1.0
Port Impedance, Ω	75
Return Loss, dB	14
NPR Dynamic Range @ 30 dB NPR, dB[12]	16
64–QAM BER Dynamic Range, dB[(11,12)]	17
LED Indicators	
Rx Input	ON: –12 dBm < optical input < 0 dBm OFF: 2 dBm < optical input < –14 dBm
Tx Burst	ON: Laser is on OFF: Laser is off
DC Power	ON: DC Power present OFF: DC Power not present
Mechanical Specifications	**Standard Housing**
Number of RF/Powering Ports	1, F-Female
Number of Power Ports	1, F-Female
Optical Connector types	SC/APC
Dimensions (W x H x L)	78 x 31 x 128 mm (3.1 x 1.2 x 5.0 inches)
Environmental Specifications Temperature Range, °C	–40 to 60 (–40 to 140°F)
Powering Specifications	
Input Voltage Range, VDC	10.5 to 18 VDC
Input Frequency, Hz	NA
Power Consumption, W max.	3.8

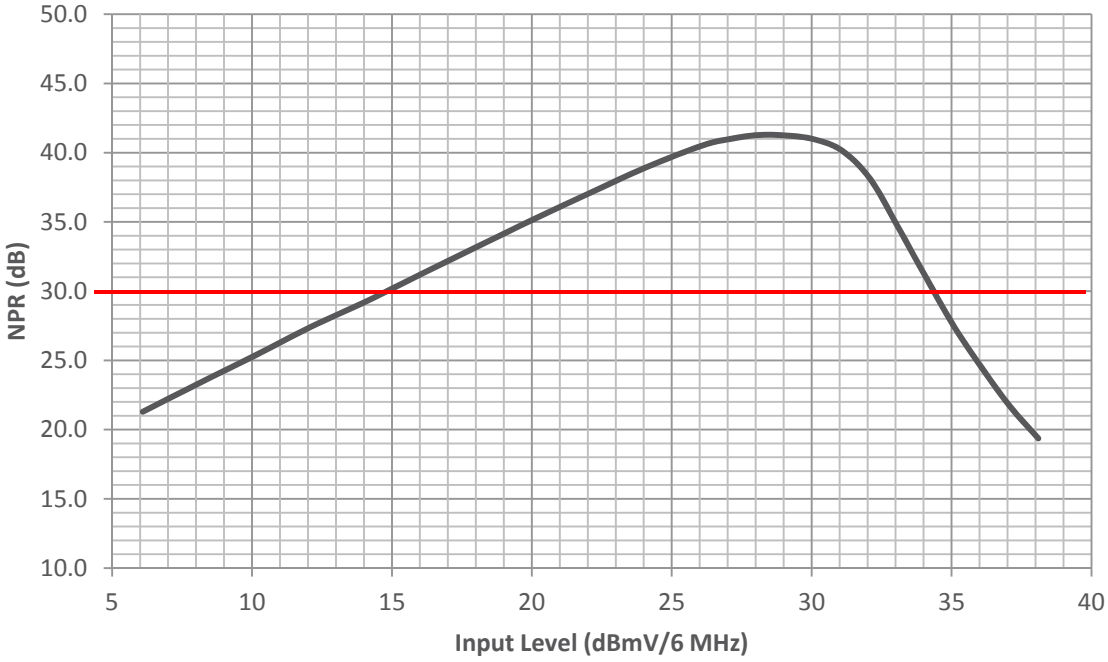
Notes:

1. Optical Input from –6 to 0 dBm and 3.5% OMI. For other OMI values, use the following equation to determine the typical output level: 17 dBmV + 20 Log (New OMI%/3.5).
2. Measured from Low Frequency to High Frequency using a best fit slope approximation.
3. Measured with respect to the gain slope.
4. Analog channels occupying the 54 to 550 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1002 MHz at levels 6 dB below equivalent video channels.
5. Measured with an optical input of –4.5 dBm, 3.0% OMI.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz will experience a composite distortion (CIN) appearing as noise in the 54—550 MHz frequency spectrum.
7. Measured with a single tone. Once the laser is "On", the input RF level must fall below the Laser Turn off level for the laser to turn off. Tested in accordance with SCTE 174 2010.
8. Tested in accordance with SCTE 174 2010 with a single 39 dBmV tone. Tolerance is ± 3 dB.
9. Recommended input level is based on (4) 6.4 MHz channels. For higher channel loading, reduce the input level accordingly based on composite power basis.
10. Measured using a receiver with an equivalent input noise of <1.0 $pA/Hz^{0.5}$ with a link budget of 26 dB (20 km fiber + passive loss). NPR test performed with 37 MHz noise loading.
11. BER $<10^{-6}$. DFB transmitter loading is (4) 64–QAM (6.4 MHz) channels.
12. Measured using a receiver with an equivalent input noise of <1.0 $pA/Hz^{0.5}$ with a link budget of 23 dB (20 km fiber + passive loss). NPR test performed with 37 MHz noise loading.
13. 1525-1562 nm and 1525-1565 nm versions available.
14. Recommended RF input level can vary based on application.

FTTM20J-B2-xBAS-0S NPR
CHP-L2RR Reference Rx, -23 dBm Input , 1310 nm
37 MHz Noise Loading, 20 km fiber + Passive Loss



FTTM20J-A(1/2)-xBAS-0S NPR
CHP-L2RR Reference Rx, -20 dBm Input , 1610 nm
37 MHz Noise Loading, 20 km fiber + Passive Loss



Specifications FTTMax 2000 RFoG (65/85 MHz Split) Standards Compliant ONU

Characteristic	Specification	
Downstream (Forward)		
Optical Specifications		
Optical Input Wavelength, nm[13]	1525 – 1565	
Optical Rejection of PON Wavelengths		
1260-1360 nm	-22 dB	
1480-1500 nm	-30 dB	
1575-1581 nm	-30 dB	
Optional 1G PON Pass Thru Port Wavelength, nm	1260 – 1500	
Optional 10G PON Pass Thru Port Wavelengths, nm	1260-1360, 1480-1500, 1575-1581	
Optional PON Pass Thru Port Loss, dB, max.	1.0	
Optical AGC Input Range, dBm	–6 to 0	
RF Specifications		
Operating Passband, MHz	85 to 1006	
Output Level @ 860 MHz, dBmV[1]	17 ± 3	
Tilt, dB[2]	5 ± 1	
Flatness, dB[3]	± 1.0	
Optical AGC accuracy, dB typ./max.	0.7/1.5	
Port Impedance, Ω	75	
Return Loss, dB	14	
Distortion Specifications		
Channel Loading[4]	**60 PAL**	**42 CENELEC**
Reference Frequency, MHz	1006/600/85	855/119
Reference Output Level, dBmV	17.7/15.5/12.7	16.9/12.9
Carrier to Noise, dB[5]	47.5	47.5
Composite Triple Beat, –dBc	65	62
Composite Second Order, –dBc	62	60
Composite Intermodulation Noise (CIN), dB[6]	58	—
1310 nm DFB Transmitter Upstream		
Optical Specifications		
Transmitted Wavelength, nm	1310 ± 50	
Laser Turn On Level, dBmV, typ.[7]	10	
Laser Turn Off Level, dBmV, typ.[7]	–4	
Output Power, RF > Input Threshold, dBm	3 ± 1.5	
Output Power, RF < Input Threshold, dBm	Off	
Laser Rise time, µs typ.	1.0	
Laser Fall time, µs typ.	1.0	
Tx OMI, %[8]	35	
OMI per channel @ recommended input level,% typ.[9]	17.5	
RF Specifications		
Operating Passband, MHz	5 to 65	
Input level, dBmV/Channel, (4) 6.4 MHz channels[14]	33	
Tilt, dB[2]	± 1.0	
Flatness, dB[3]	± 1.0	
Port Impedance, Ω	75	
Return Loss, dB	14	
NPR Dynamic Range @ 30 dB NPR, dB[10]	11	
64–QAM BER Dynamic Range, dB[(10,11)]	14	
1610 nm DFB Transmitter Upstream		
Optical Specifications		
Transmitted Wavelength, nm	1610 ± 10	
Laser Turn On Level, dBmV, typ.[7]	10	
Laser Turn Off Level, dBmV, typ.[7]	–4	
Output Power, RF > Input Threshold, dBm	3 ± 1.5	
Output Power, RF < Input Threshold, dBm	Off	
Laser Rise time, µs typ.	1.0	
Laser Fall time, µs typ.	1.0	
Tx OMI, %[8]	35	
OMI per channel @ recommended input level,% typ.[9]	17.5	
RF Specifications		
Operating Passband, MHz	5 to 65	
Input level, dBmV/Channel, (4) 6.4 MHz channels[14]	33	
Tilt, dB[2]	± 1.0	
Flatness, dB[3]	± 1.0	
Port Impedance, Ω	75	
Return Loss, dB	14	
NPR Dynamic Range @ 30 dB NPR, dB[12]	14	
64–QAM BER Dynamic Range, dB[(11,12)]	17	

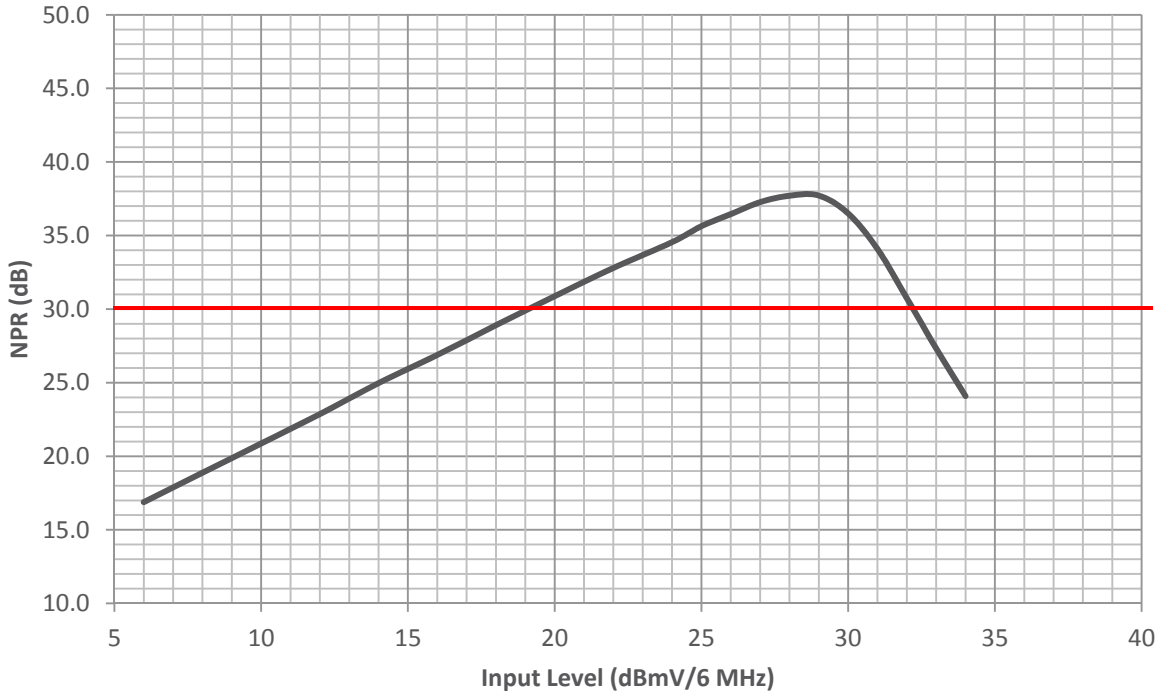
Specifications FTTMax 2000 RFoG (65/85 MHz Split) Standards Compliant ONU (Continued)

Characteristic	Specification
General Specifications	
LED Indicators	
Rx Input	ON: –12 dBm < optical input < 0 dBm OFF: 2 dBm < optical input < –14 dBm
Tx Burst	ON: Laser is on OFF: Laser is off
DC Power	ON: DC Power present OFF: DC Power not present
Mechanical Specifications	**Standard Housing**
Number of RF/Powering Ports	1, F-Female
Number of Power Ports	1, F-Female
Optical Connector types	SC/APC, FC/APC
Dimensions (W x H x L)	78 x 31 x 128 mm (3.1 x 1.2 x 5.0 inches)
Environmental Specifications	
Temperature Range, °C	–40 to 60 (–40 to 140°F)
Powering Specifications	
Input Voltage Range, VDC	10.5 to 18 VDC
Input Frequency, Hz	NA
Power Consumption, W max.	3.8

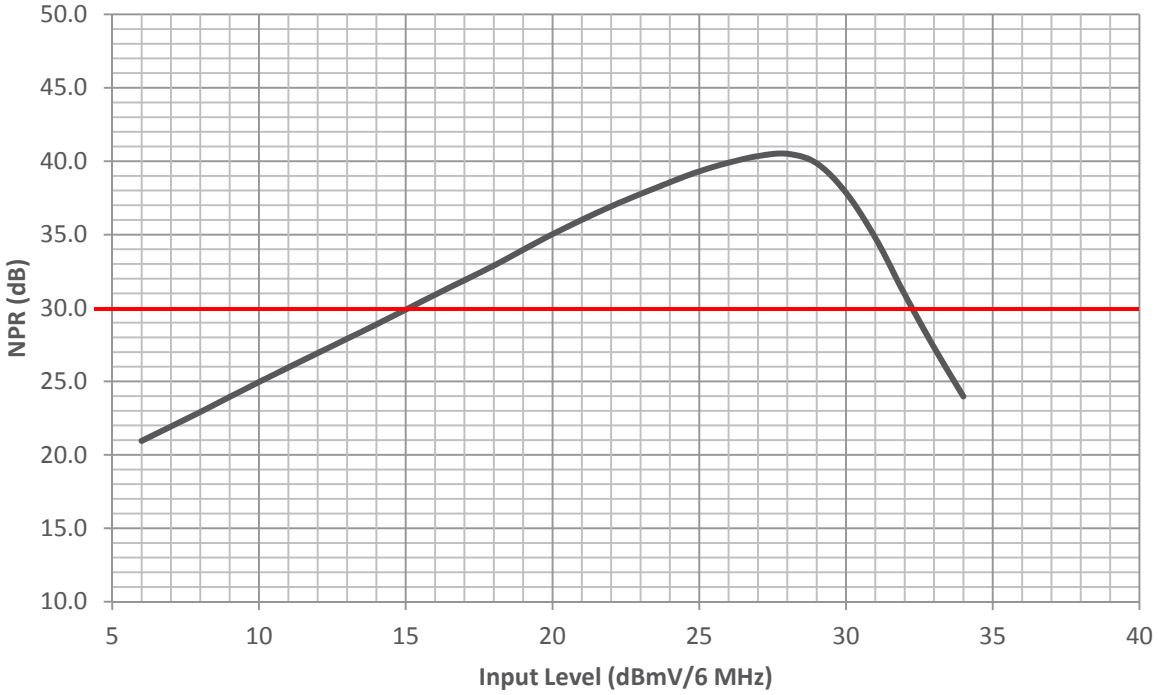
Notes:

1. Optical Input from –6 to 0 dBm and 3.5% OMI. For other OMI values, use the following equation to determine the typical output level: 17 dBmV + 20 Log (New OMI%/3.5).
2. Measured from Low Frequency to High Frequency using a best fit slope approximation.
3. Measured with respect to the gain slope.
4. Analog channels occupying the 85 to 600 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1006 MHz at levels 6 dB below equivalent video channels.
5. Measured with an optical input of –4.5 dBm, 3.0% OMI.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 600 to 1006 MHz will experience a composite distortion (CIN) appearing as noise in the 85—599 MHz frequency spectrum.
7. Measured with a single tone. Once the laser is “On”, the input RF level must fall below the Laser Turn off level for the laser to turn off. Tested in accordance with SCTE 174 2010.
8. Tested in accordance with SCTE 174 2010 with a single 39 dBmV tone. Tolerance is ± 3 dB.
9. Recommended input level is based on (4) 6.4 MHz channels. For higher channel loading, reduce the input level accordingly based on composite power basis.
10. Measured using a receiver with an equivalent input noise of <1.0 $pA/Hz^{0.5}$ with a link budget of 26 dB (20 km fiber + passive loss). NPR test performed with 60 MHz noise loading.
11. BER $<10^{-6}$. DFB transmitter loading is 4 64–QAM (6.4 MHz) channels.
12. Measured using a receiver with an equivalent input noise of <1.0 $pA/Hz^{0.5}$ with a link budget of 23 dB (20 km fiber + passive loss). NPR test performed with 60 MHz noise loading.
13. 1525-1562 nm and 1525-1565 nm versions available.
14. Recommended RF input level can vary based on application.

FTTM20H-B2-xBAS-0S NPR
CHP-L2RR Reference Rx, -23 dBm Input , 1310 nm
60 MHz Noise Loading, 20 km fiber + Passive Loss



FTTM20H-A(1/2)-xBAS-0S NPR
CHP-L2RR Reference Rx, -20 dBm Input, 1610 nm
60 MHz Noise Loading, 20 km fiber + Passive Loss



Specifications FTTMax 2000 RFoG (85/102 MHz Split) Standards Compliant ONU

Characteristic	Specification
Downstream (Forward)	
Optical Specifications	
Optical Input Wavelength, nm[12]	1525 – 1565
Optical Rejection of PON Wavelengths	
1260-1360 nm	-22 dB
1480-1500 nm	-30 dB
1575-1581 nm	-30 dB
Optional 1G PON Pass Thru Port Wavelength, nm	1260 – 1500
Optional 10G PON Pass Thru Port Wavelengths, nm	1260-1360, 1480-1500, 1575-1581
Optional PON Pass Thru Port Loss, dB, max.	1.0
Optical AGC Input Range, dBm	–6 to 0
RF Specifications	
Operating Passband, MHz	102 to 1002
Output Level @ 860 MHz, dBmV[1]	17 ± 3
Tilt, dB[2]	5 ± 1
Flatness, dB[3]	± 1.0
Optical AGC accuracy, dB typ./max.	0.7/1.5
Port Impedance, Ω	75
Return Loss, dB	14
Forward Distortion Specifications	
Channel Loading[4]	74 NTSC + 75 QAM 256 Channels 149 QAM 256 Channels
Reference Frequency, MHz	1002/860/550/102
Reference Output Level, dBmV	17.7/17/15.3/12.9
Carrier to Noise, dB[5]	48.5
Composite Triple Beat, –dBc	65
Composite Second Order, –dBc	61
Composite Intermodulation Noise (CIN), dB[6]	58
MER	38
BER(Pre-FEC)	1E-8

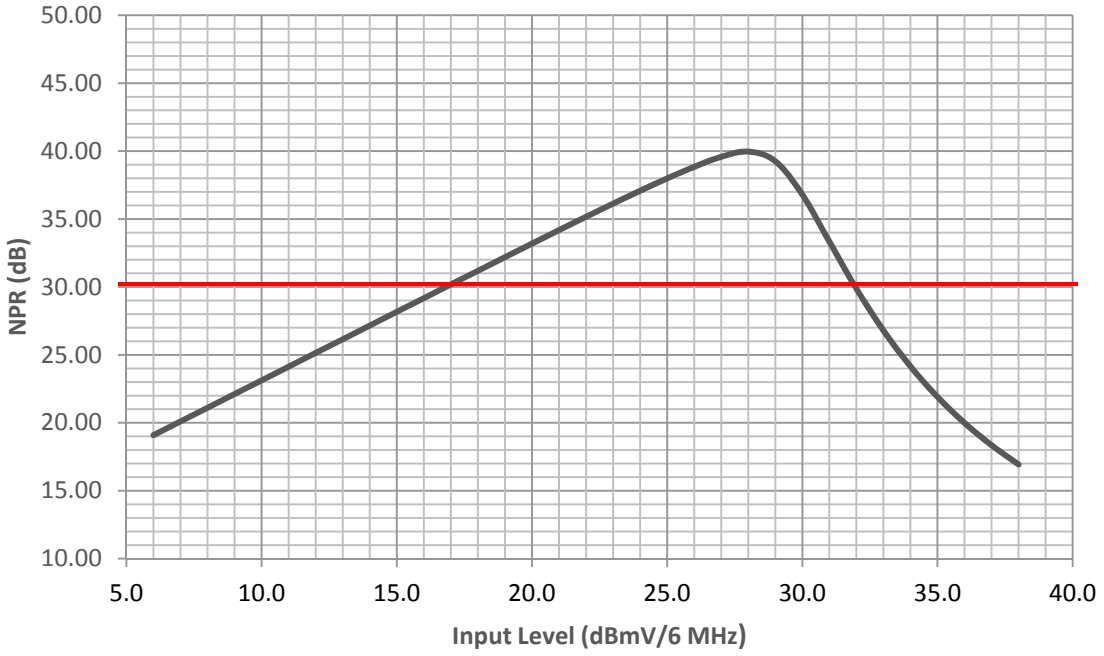
Specifications FTTMax 2000 RFoG (85/102 MHz Split) Standards Compliant ONU (Continued)

Characteristic	Specification
1610 nm DFB Transmitter Upstream Specifications	
Optical Specifications	
Transmitted Wavelength, nm	1610 ± 10
Laser Turn On Level, dBmV, typ.[7]	10
Laser Turn Off Level, dBmV, typ.[7]	–4
Output Power, RF > Input Threshold, dBm	3 ± 1.5
Output Power, RF < Input Threshold, dBm	Off
Laser Rise time, µs typ.	1.0
Laser Fall time, µs typ.	1.0
Tx OMI, %[8]	35
OMI per channel @ recommended input level,% typ.[9]	17.5
RF Specifications	
Operating Passband, MHz	5 to 85
Input level, dBmV/Channel, (4) 6.4 MHz channels[13]	33
Tilt, dB[2]	± 1.0
Flatness, dB[3]	± 1.0
Port Impedance, Ω	75
Return Loss, dB	14
NPR Dynamic Range @ 30 dB NPR, dB[11]	13
64–QAM BER Dynamic Range, dB[(10,11)]	16
LED Indicators	
Rx Input	ON: –12 dBm < optical input < 0 dBm OFF: 2 dBm < optical input < –14 dBm
Tx Burst	ON: Laser is on OFF: Laser is off
DC Power	ON: DC Power present OFF: DC Power not present
Mechanical Specifications	**Standard Housing**
Number of RF/Powering Ports	1, F-Female
Number of Power Ports	1, F-Female
Optical Connector types	SC/APC
Dimensions (W x H x L)	78 x 31 x 128 mm (3.1 x 1.2 x 5.0 inches)
Environmental Specifications Temperature Range, °C	–40 to 60 (–40 to 140°F)
Powering Specifications	
Input Voltage Range, VDC	10.5 to 18 VDC
Input Frequency, Hz	NA
Power Consumption, W max.	3.8

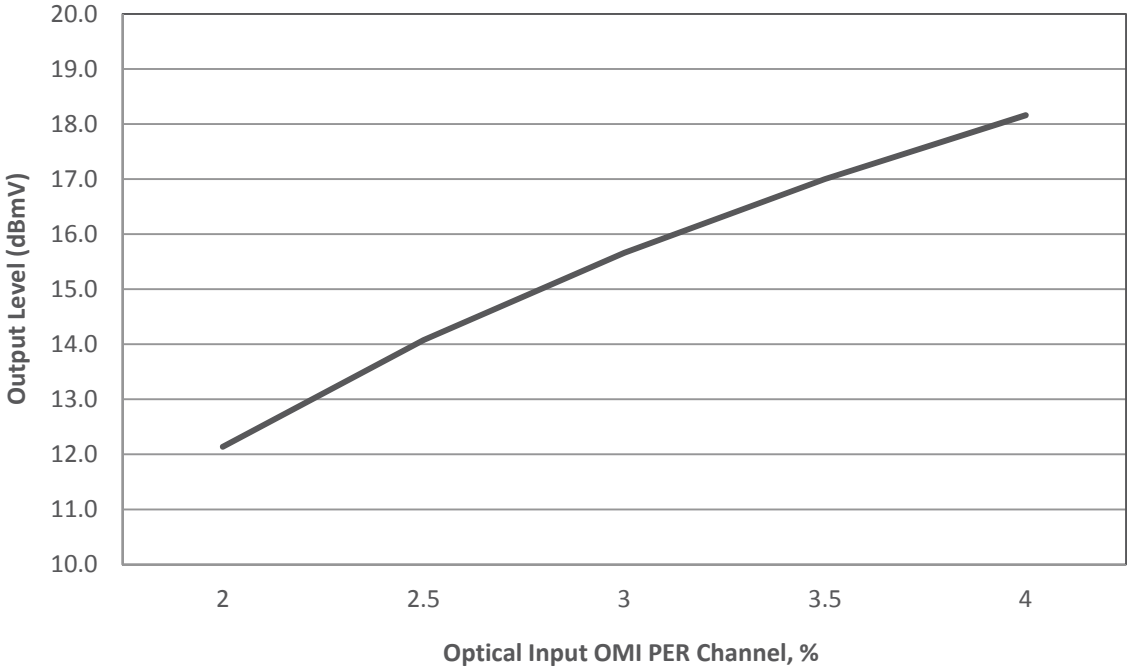
Notes:

1. Optical Input from –6 to 0 dBm and 3.5% OMI. For other OMI values, use the following equation to determine the typical output level: 17 dBmV + 20 Log (New OMI%/3.5).
2. Measured from Low Frequency to High Frequency using a best fit slope approximation.
3. Measured with respect to the gain slope.
4. Analog channels occupying the 104 to 550 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1002 MHz at levels 6 dB below equivalent video channels.
5. Measured with an optical input of –4.5 dBm, 3.0% OMI.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz will experience a composite distortion (CIN) appearing as noise in the 54—550 MHz frequency spectrum.
7. Measured with a single tone. Once the laser is "On", the input RF level must fall below the Laser Turn off level for the laser to turn off. Tested in accordance with SCTE 174 2010.
8. Tested in accordance with SCTE 174 2010 with a single 39 dBmV tone. Tolerance is ± 3 dB.
9. Recommended input level is based on (4) 6.4 MHz channels. For higher channel loading, reduce the input level accordingly based on composite power basis.
10. BER $<10^{-6}$. DFB transmitter loading is (4) 64–QAM (6.4 MHz) channels.
11. Measured using a receiver with an equivalent input noise of $<1.0\ pA/Hz^{0.5}$ with a link budget of 23 dB (20 km fiber + passive loss). NPR test performed with 80 MHz noise loading.
12. 1525-1562 nm and 1525-1565 nm versions available.
13. Recommended RF input level can vary based on application.

FTTM20R-A2-JBAS-0S NPR
L2RR Reference Rx, -20 dBm Input
80 MHz Noise Loading, 20 km fiber + Passive Loss



FTTMax Output Level vs Optical Input OMI



FTTMax RFoG ONU Dimensions and Weight

Characteristics	Specifications
	Standard ONU
Uncrated (W x H x D)	3.07 x 1.22 x 5.04 inches (78 x 31 x 128 mm.)
Uncrated weight, approx.	0.64 lbs. (0.29 kg)
Crated (W x H x D)	6 x 5.25 x 2.5 inches (153 x 134 x 63.5 mm)
Crated weight, approx.	1.0 lbs (0.45 kg)

RELATED PRODUCTS

Optical Passives	CORWave® II Multiwavelength Transmitters
CHP Return Receivers	Trans Max® RFoG Repeaters
CHP EDFA	CORWave® 3 Multiwavelength Transmitters
	Installation Services

Customer Care

Contact Customer Care for product information and sales:

- United States: 866-36-ARRIS
- International: +1-678-473-5656

Note: Specifications are subject to change without notice.

FTTMAX-RFOG-ONU_DS_24SEP15 (rev 09-2015)