

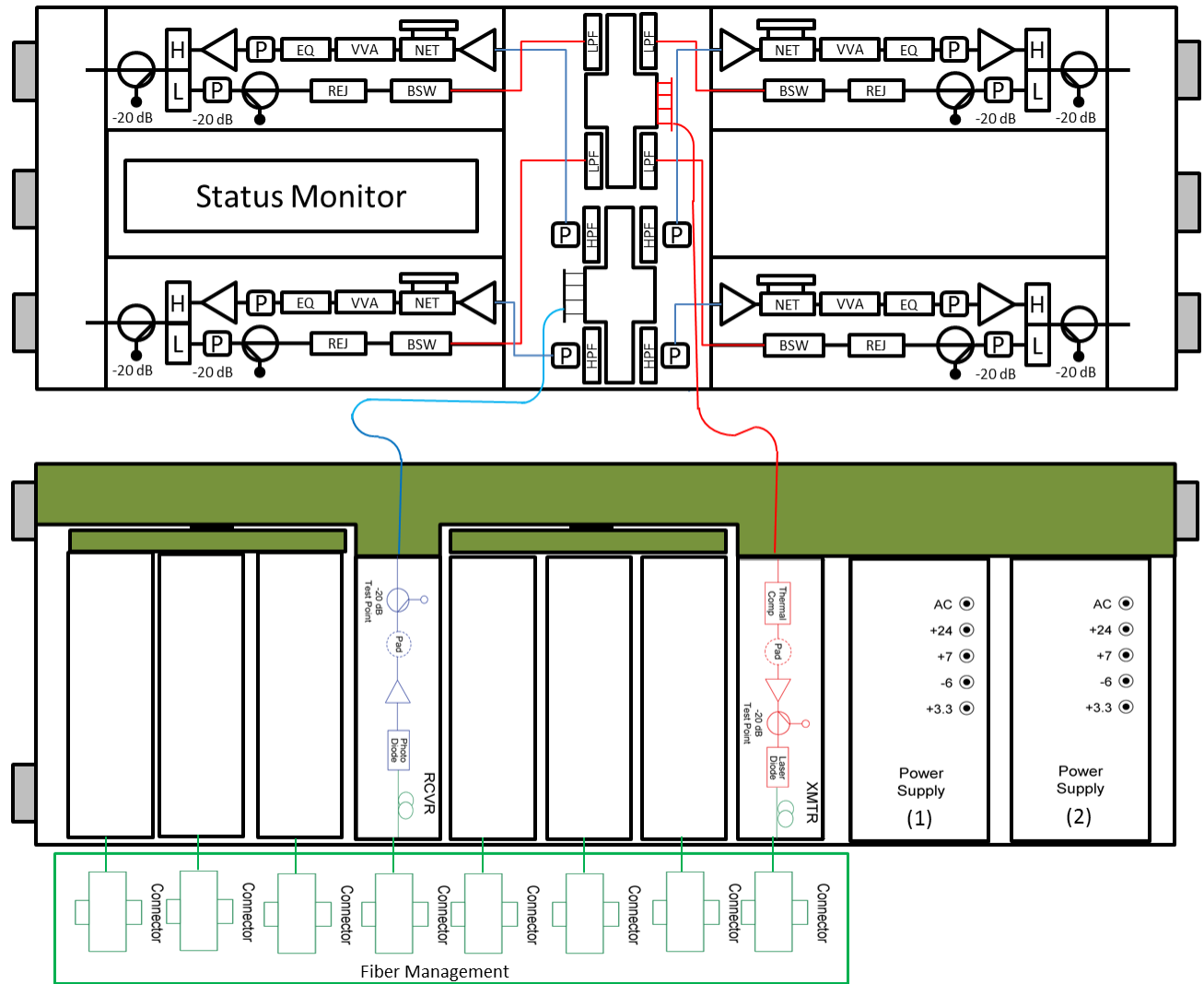
N5022 Optical Node 4x4 Fully Segmentable

The N5022 1.2 GHz is a 4-output 4x4 fully segmentable optical node that is capable of providing up to 59.1 dBmV output at 1218 MHz with an optical input range from -8 dBm to +2 dBm. The node can have up to four optical receivers and four optical transmitters. Replacing conventional analog optical modules, two Remote PHY modules can be integrated into the node to provide high speed full digital optical link for better RF signal quality to meet high-order QAM modulation and data transmission rate as required by DOCSIS 3.1 standard.

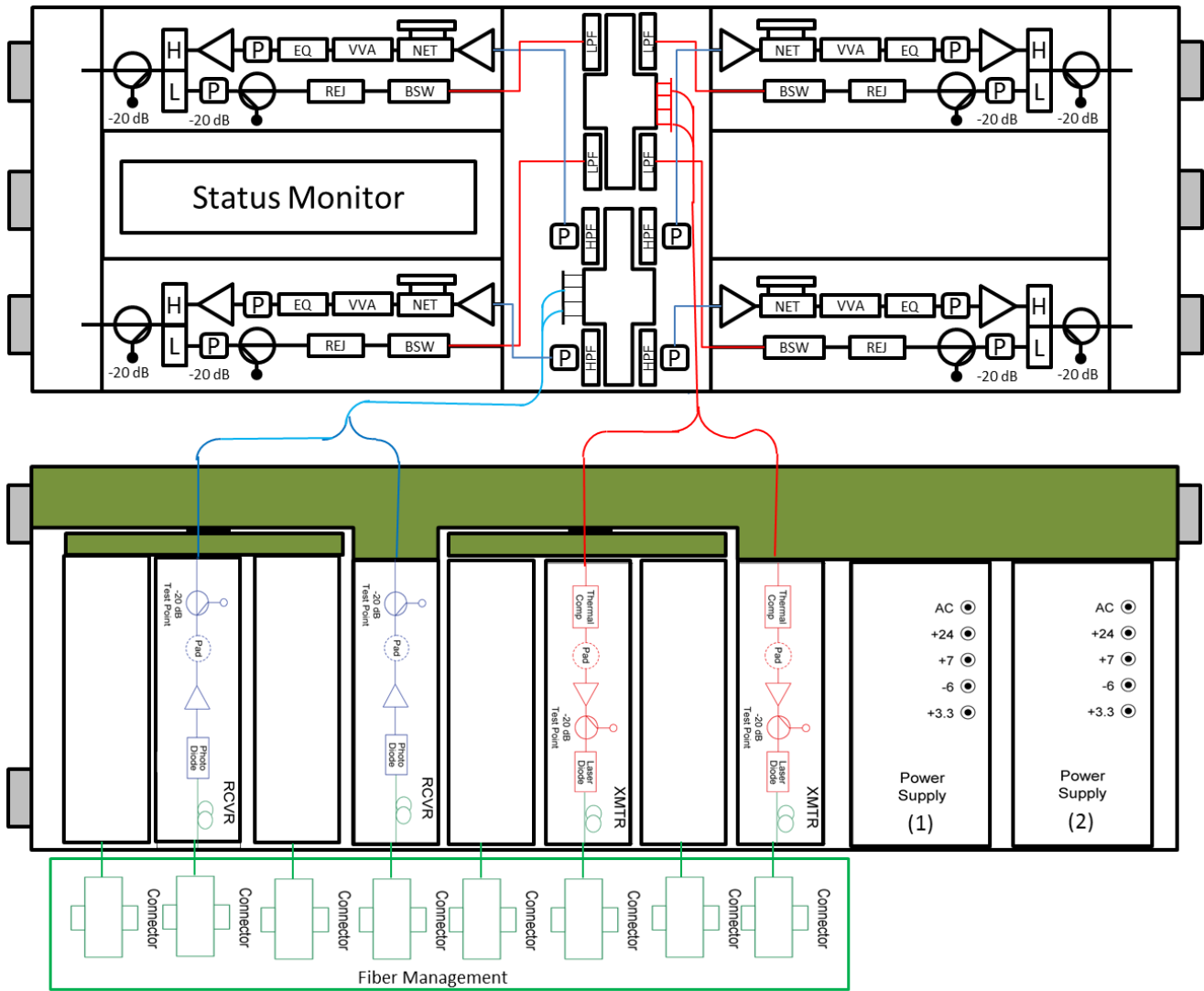
Features

- ◆ Four driven output ports
- ◆ Compact size for a 4x4 segmentable node
- ◆ -20.0 dB directional coupler test points
- ◆ 15 amp power passing
- ◆ Plug-in bridger switching for managing the reverse path @ 0, -3.0, -6.0, -12.0 dB and open with active status monitoring (optional)
- ◆ Standard push on “F” connectors can be used on all test points
- ◆ FP, DFB, CWDM, DWDM & Digital return transmitters available
- ◆ Remote PHY module is available for digital fiber link (option)
- ◆ Redundant receiver & Transmitter (optional for 1:4 or 2:2 configurations)
- ◆ Plug-in forward and reverse configuration modules allows for easy field reconfiguration to add or remove segmentation as needed
- ◆ 85% efficient 40/90 VAC switch-mode power supply with built-in Triac surge protection

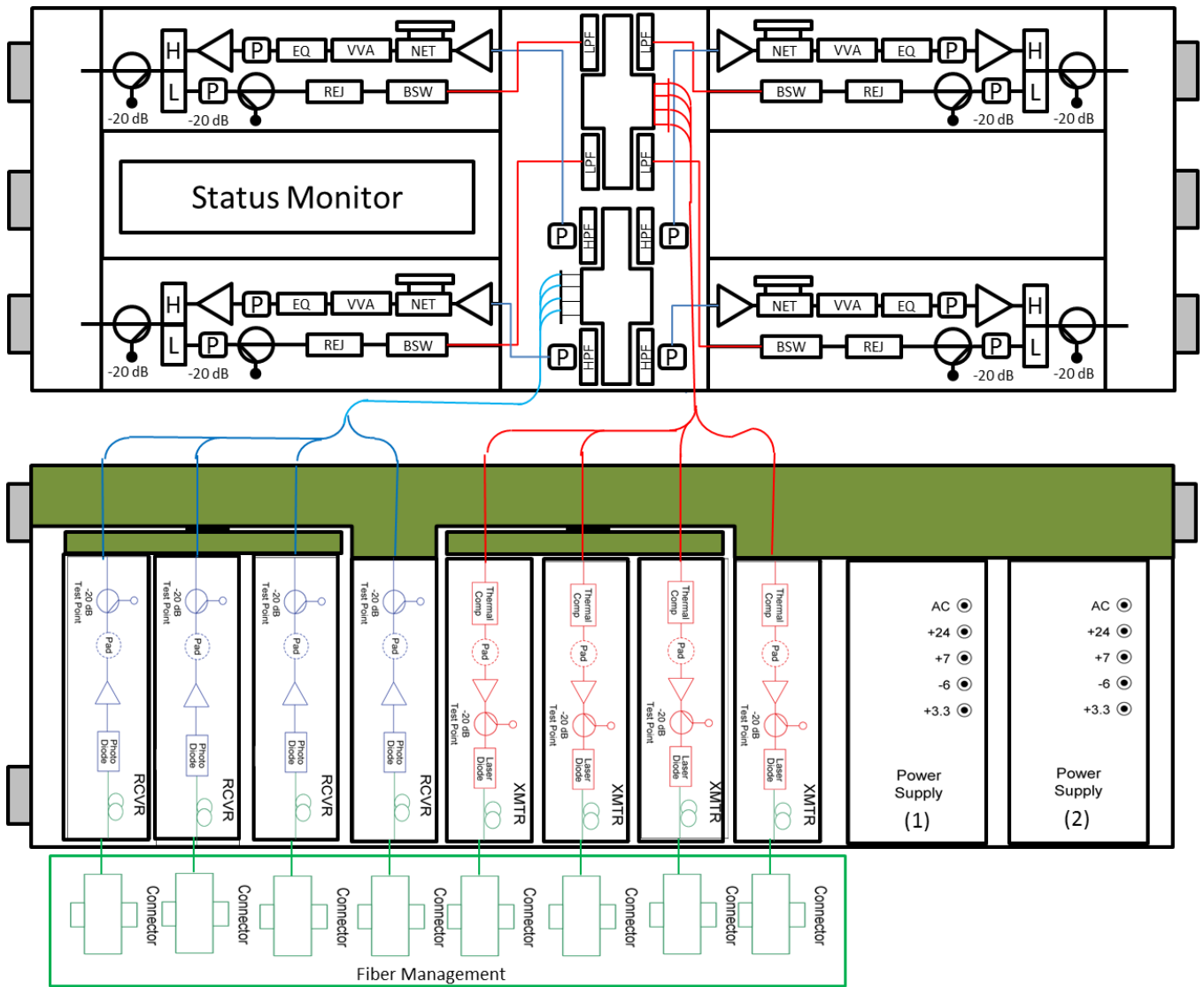
Block Diagrams



N5022 Block Diagram (1x4 Non-Segmented Optical Node 1218Hz)



N5022 Block Diagram (2x2 Forward and Reverse Segmented Optical Node 1218 MHz)



N5022 Block Diagram (4x4 Forward and Reverse Segmented Optical Node 1218 MHz)

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ACI		N5022 4-Output 1218 MHz Forward and Reverse 4x4 Segmentable Optical Node				
STATION PARAMETERS						
	CONDITIONS	UNITS	SPECIFICATION			NOTES
Housing passband		MHz	5 to 1218			
Input current capacity	Any port, worst case	Amperes	15			
Frequency range		MHz	5 - 10	11-750	751-1002	1003-1218
Hum modulation	Time domain @ rated current above	-dBc	55	70	65	60
Station passband		MHz	53 to 1218			
Return loss- Ports 1 to 4	Worst case	-dB	16.5			Typical 18.0
Frequency range		MHz	53-870	871-1002	1003-1218	
Port to Port Isolation	Typical	-dB	70	60	50	
Test Points						
Test point type	Directional coupler	N / A	DC			
Test point level(s)		-dB	20.0			
Test point accuracy	Forward TP	±dB	0.5			
Frequency range	Reverse TP	MHz	5 to 42			
Test point accuracy	Reverse TP	±dB	0.5			
Frequency Range						
Station passband		MHz	53 to 1218			
Station flatness - feeder out		±dB	0.75			
Station Gain						
			Minimum	Minimum	Minimum	
Configuration			1:4	1:2 (X2)	1:1(x4)	
Gain - feeder	@ 1218 MHz	dB	40	40	40	
Gain control type		N / A	Plug-in pads			
Gain control range		dB	15.0			
Gain control steps	Pad value steps	dB	0.5			
Station Slope						
Slope control type	Linear equalizers	N / A	Plug-in Equalizers			
Slope control range		dB	-12.0 to 13.0			
Slope control steps	Equalizer value steps	dB	1.0 linear steps			
Operational Specifications						
Operational level - feeders	@ 1218 MHz	dBmV	59.1			
Operational slope	@53 / 550 / 750 / 870 / 1002 / 1218 MHz	dB	0 / 8.4 / 12.2 / 14.5 / 17 / 21			
Operational optical input range		dBm	-8 to +2			Recommended input level 0 dBm
Station Output Levels with a -8 dBm optical input						
Distribution out	@53 / 550 / 750 / 870 / 1002 / 1218 MHz	dBmV	38 / 47 / 50 / 53 / 55 / 59			
Station Noise Figure - values for RF portion of node only. Complete values dependent on optical link.						
			* No slope	21.0 dB slope	* LEQ1= 0 dB	
Noise figure (NF)	@ 53 MHz	dB	9.5	16.0		
Noise figure (NF)	@ 550 MHz	dB	9.5	11.0		
Noise figure (NF)	@ 1002 MHz	dB	9.5	11.0		
Noise figure (NF)	@ 1218 MHz	dB	9.5	11.0		
Station Distortions - values for RF Portion of node only. Complete values dependent on optical link.						
550 MHz analog channel loading, 79 channels + 660 MHz digital channel loading 256 QAM at -6 dBc relative to its associated visual carrier						
Reference levels	@53 / 550 / 750 / 870 / 1002 / 1218 MHz	dBmV	38 / 47 / 50 / 53 / 55 / 59			
		N / A	Worst Case	Typical		
Composite Triple Beat (CTB)		-dBc	70	72		
Cross Modulation (XMOD)		-dBc	64	66		
Composite Second Order (CSO -)	(Vc +0.75 & -1.25 MHz only)	-dBc	69	71		
Composite Second Order (CSO +)	(Vc +1.25 MHz only)	-dBc	69	71		
CIN		-dBc	65	67		
Station Group Delay						
Group delay	Channel 2 (std)	nSec / 3.58 MHz	30			Typical 25
Group delay	Channel 3	nSec / 3.58 MHz	16			
Group delay	Channel 4	nSec / 3.58 MHz	10			
Group delay	Channel 5 & >	nSec / 3.58 MHz	3			

REVERSE SPECTRUM:

		CONDITIONS	UNITS	SPECIFICATIONS			NOTES
Reverse - General							
Station passband			MHz	5 to 42			
Station flatness			±dB	1.0			
Bridger switch control (optional)			-dB	0, 3.0, 6.0, 12.0 & open			
Port to Port Isolation	Typical		-dB	65			
Reverse - Station Gain (RF section only)							
Configuration				4:1	2:1 (X2)	1:1 (X4)	
Gain	Minimum		dB	6.0	6.0	6.0	
Gain control type			N / A	Plug-in pads			
Gain control steps	Pad value steps		dB	0.5			
Reverse - Station Input Levels							
RF station input to node for 40 dBmV @ Laser TP	Minimum		dBmV	17.0			
Reverse - Noise Figure							
Configuration				4:1	2:1 (X2)	1:1 (X4)	
Station Noise Figure (w/ EQ)			dB	16.5	12.0	9.0	
Reverse - Station Distortions @ 23 dBmV							
Composite Second Order (CSO)	6 NTSC channel loading		-dBc	75			
Composite Triple Beat (CTB)	6 NTSC channel loading		-dBc	80			
Cross Modulation (XMOD)	6 NTSC channel loading		-dBc	80			
Noise-to-Power Ratio (NPR)	Noise loading		dB	Typical >40.0 / 13.0			@ 10.0 dB optical loss (6.0 dB fiber +4.0 dB flat loss) @ -51 dBmV/Hz
Reverse - Station Group Delay							
Group delay	5 MHz		nSec / 1.5 MHz	36			
Group delay	7 MHz		nSec / 1.5 MHz	16			
Group delay	10 MHz		nSec / 1.5 MHz	4			
Group delay	35 MHz		nSec / 1.5 MHz	10			
Group delay	38.5 MHz		nSec / 1.5 MHz	25			
Power Requirements:							
Station configuration (Over temperature range of -40°F to +140°F (-40°C to +60°C) @ 90 VAC)				1X4 (1RX & 1TX)	2X2 (2RX & 2TX)	4x4 (4RX & 4TX)	
Power requirements	Worst case		W	67.8	87.5	96.8	
AC Voltage							
Input ranges			VAC	40 - 90			
Current Draw							
@ 40 VAC	Maximum		A	1.9	2.1	2.3	
@ 50 VAC	Maximum		A	1.6	1.9	2.1	
@ 60 VAC	Maximum		A	1.4	1.6	1.8	
@ 70 VAC	Maximum		A	1.3	1.5	1.7	
@ 80 VAC	Maximum		A	1.1	1.4	1.6	
@ 90 VAC	Maximum		A	1.0	1.2	1.4	
Environmental							
Operating temperature			°F (°C)	-40 to +140 (-40 to +60)			
RF output stability over temperature			±dB	0.5			
Physical							
Dimensions (H X W X D)			In. (cm)	8.44 x 20.22 x 10.73 (21.45 x 51.35 x 27.25)			
Weight			lbs. (kg)	22.0 (10.00)			

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ACI		N5022 4-Output 1218 MHz Forward and Reverse 4x4 Segmentable Optical Node					
STATION PARAMETERS							
		CONDITIONS	UNITS	SPECIFICATION			NOTES
Housing passband			MHz	5 to 1218			
Input current capacity	Any port, worst case		Amperes	15			
Frequency range			MHz	5 - 10	11-750	751-1002	1003-1218
Hum modulation	Time domain @ rated current above		-dBc	55	70	65	60
Station passband			MHz	105 to 1218			
Return loss- Ports 1 to 4	Worst case		-dB	16.5			Typical 18.0
Frequency range			MHz	105-870	871-1002	1003-1218	
Port to Port Isolation	Typical		-dB	70	60	50	
Test Points							
Test point type	Directional coupler		N / A	DC			
Test point level(s)			-dB	20.0			
Test point accuracy	Forward TP		±dB	0.5			
Frequency range	Reverse TP		MHz	5 to 83			
Test point accuracy	Reverse TP		±dB	0.5			
Frequency Range							
Station passband			MHz	105 to 1218			
Station flatness - feeder out			±dB	0.75			
Station Gain							
				Minimum	Minimum	Minimum	
Configuration				1:4	1:2 (X2)	1:1(x4)	
Gain - feeder	@ 1218 MHz		dB	40	40	40	
Gain control type			N / A	Plug-in pads			
Gain control range			dB	15.0			
Gain control steps	Pad value steps		dB	0.5			
Station Slope							
Slope control type	Linear equalizers		N / A	Plug-in Equalizers			
Slope control range			dB	-12.0 to 13.0			
Slope control steps	Equalizer value steps		dB	1.0 linear steps			
Operational Specifications							
Operational level - feeders	@ 1218 MHz		dBmV	59.1			
Operational slope	@105 / 550 / 750 / 870 / 1002 / 1218 MHz		dB	0 / 7.4 / 11.2 / 13.5 / 16 / 20			
Operational optical input range			dBm	-8 to +2			Recommended input level 0 dBm
Station Output Levels with a -8 dBm optical input							
Distribution out	@105 / 550 / 750 / 870 / 1002 / 1218 MHz		dBmV	39 / 47 / 50 / 53 / 55 / 59			
Station Noise Figure - values for RF portion of node only. Complete values dependent on optical link.							
				* No slope	20.0 dB slope	* LEQ1= 0 dB	
Noise figure (NF)	@ 105 MHz		dB	9.5	16.0		
Noise figure (NF)	@ 550 MHz		dB	9.5	11.0		
Noise figure (NF)	@ 1002 MHz		dB	9.5	11.0		
Noise figure (NF)	@ 1218 MHz		dB	9.5	11.0		
Station Distortions - values for RF Portion of node only. Complete values dependent on optical link.							
550 MHz analog channel loading, 74 channels + 660 MHz digital channel loading, 256 QAM at -6 dBc relative to its associated visual carrier							
Reference levels	@105 / 550 / 750 / 870 / 1002 / 1218 MHz		dBmV	39 / 47 / 50 / 53 / 55 / 59			
			N / A	Worst Case	Typical		
Composite Triple Beat (CTB)			-dBc	70	72		
Cross Modulation (XMOD)			-dBc	64	66		
Composite Second Order (CSO -)	(Vc +0.75 & -1.25 MHz only)		-dBc	69	71		
Composite Second Order (CSO +)	(Vc +1.25 MHz only)		-dBc	69	71		
CIN			-dBc	65	67		
Station Group Delay							
Group delay	Channel 2 (std)		nSec / 3.58 MHz	30			Typical 25
Group delay	Channel 3		nSec / 3.58 MHz	16			
Group delay	Channel 4		nSec / 3.58 MHz	10			
Group delay	Channel 5 & >		nSec / 3.58 MHz	3			

REVERSE SPECTRUM:

		CONDITIONS	UNITS	SPECIFICATIONS			NOTES
Reverse - General							
Station passband			MHz	5 to 85			
Station flatness			±dB	1.0			
Bridger switch control (optional)			-dB	0, 3.0, 6.0, 12.0 & open			
Port to Port Isolation	Typical		-dB	65			
Reverse - Station Gain (RF section only)							
Configuration				4:1	2:1(X2)	1:1(x4)	
Gain	Minimum		dB	6.0	6.0	6.0	
Gain control type			N / A	Plug-in pads			
Gain control steps	Pad value steps		dB	0.5			
Reverse - Station Input Levels							
RF station input to node for 40 dBmV @ Laser TP	Minimum		dBmV	17.0			
Reverse - Noise Figure							
Configuration				4:1	2:1 (X2)	1:1(x4)	
Station Noise Figure (w/ EQ)			dB	16.5	12.0	9	
Reverse - Station Distortions @ 23 dBmV							
Composite Second Order (CSO)	12 NTSC channel loading		-dBc	75			
Composite Triple Beat (CTB)	12 NTSC channel loading		-dBc	80			
Cross Modulation (XMOD)	12 NTSC channel loading		-dBc	80			
Noise-to-Power Ratio (NPR)	Noise loading		dB	Typical >40.0 / 13.0			@ 10.0 dB optical loss (6.0 dB fiber +4.0 dB flat loss) @ -51 dBmV/Hz
Reverse - Station Group Delay							
Group delay	5 MHz		nSec / 1.5 MHz	36			
Group delay	7 MHz		nSec / 1.5 MHz	16			
Group delay	10 MHz		nSec / 1.5 MHz	4			
Group delay	80.5 MHz		nSec / 1.5 MHz	10			
Group delay	83.5 MHz		nSec / 1.5 MHz	25			
Power Requirements:							
Station configuration (Over temperature range of -40°F to +140°F (-40°C to +60°C) @ 90 VAC)				1X4 (1RX & 1TX)	2X2 (2RX & 2TX)	4x4 (4RX&4TX)	
Power requirements	Worst case		W	67.8	87.5	96.8	
AC Voltage							
Input ranges			VAC	40 - 90			
Current Draw							
@ 40 VAC	Maximum		A	1.9	2.1	2.3	
@ 50 VAC	Maximum		A	1.6	1.9	2.1	
@ 60 VAC	Maximum		A	1.4	1.6	1.8	
@ 70 VAC	Maximum		A	1.3	1.5	1.7	
@ 80 VAC	Maximum		A	1.1	1.4	1.6	
@ 90 VAC	Maximum		A	1.0	1.2	1.4	
Environmental							
Operating temperature			°F (°C)	-40 to +140 (-40 to +60)			
RF output stability over temperature			±dB	0.5			
Physical							
Dimensions (H X W X D)			In. (cm)	8.44 x 20.22 x 10.73 (21.45 x 51.35 x 27.25)			
Weight			lbs. (kg)	22.0 (10.00)			

Specifications Remote PHY

ACI		N5022 4-Output 1218 MHz Forward and Reverse 4x4 Segmentable Optical Node				
REMOTE PHY MODULE (OPTIONAL)						
	CONDITIONS	UNITS	SPECIFICATIONS			NOTES
General Requirements			Min.	Typical	Max.	
Specification Support			PHY3.1, DRFI Annex D, MHA v2			
Number of RF ports			1xDS, 2x US			
DS:US SG ratio			1:1 or 1:2			
RF ports impedance		Ohm	75			
Number of RF channels						
DOCSIS 3.0 DS channels						
Annex A (8MHz channel)		Channel			120	
Annex B/C (6MHz channel)		Channel			158	
DOCSIS 3.0 US channels/port		Channel			12	
ATDMA		Channel			12	
SCDMA		Channel			4	
ATDMA+SCDMA		Channel			8+4	
DOCSIS 3.1 DS channels (OFDM)	Bandwidth of 24MHz to 192MHz bandwidth per channel	Channel			6	
DOCSIS 3.1 US channels (OFDMA)/port	Bandwidth of 6.4MHz to 96MHz per channel	Channel			2	
DS RF Performances						
DS Spectrum Range for SC-QAM		MHz	54		1006	
DS Spectrum Range for OFDM		MHz	108		1218	
Carrier Frequency Resolution		Hz			312.5	
DS RF Port Return Loss		dB	16			
DS RF Power Level	For 158 SC-QAMs loaded, +22dB for composite power level	dBmV/ 6MHz	20	22	24	
For less than 158 SC-QAM		dBmV/ 6MHz	PLa158+ceil(3*LOG2(158/N'))			PL ^a 158 – power level per channel for 158 loaded D3.0 SC-QAM channels for active RF chain
Flatness over entire DS spectrum range		dB			1 dB	From min to max power
US RF Performances / per port						
US Spectrum Range for SC-QAM		MHz	5		85	
US Spectrum Range for OFDMA		MHz	5		204	
US Input RF Power Level	For 6.4MHz channel	dBmV/ch	-2		23	
US Attenuation Control	Programmable	dB	0		31.5	
Average US Composite Signal Power		dB			15	
Instantaneous US Composite Power		dB			20	
US Flatness 5-204MHz		dB			2	
US RF port Return Loss (15MHz - 204MHz)		dB	16			Min 12dB from 5 to 15MHz
DS to US Isolation		dB	60			
Physical / Powering						
Power Consumption	2 US ports, no SFP modules	W			26	
Dimensions (D x W x H)		mm	184 x 115 x 45			



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