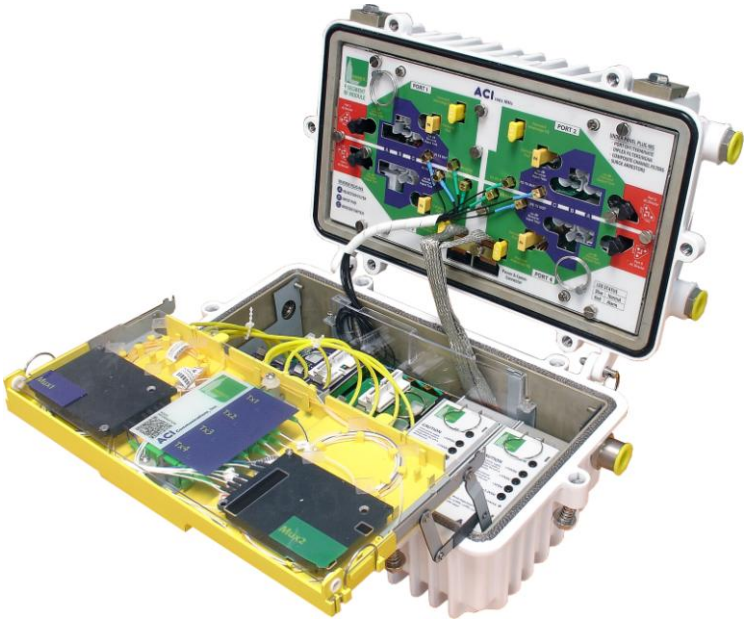


Emerald® Optical Node

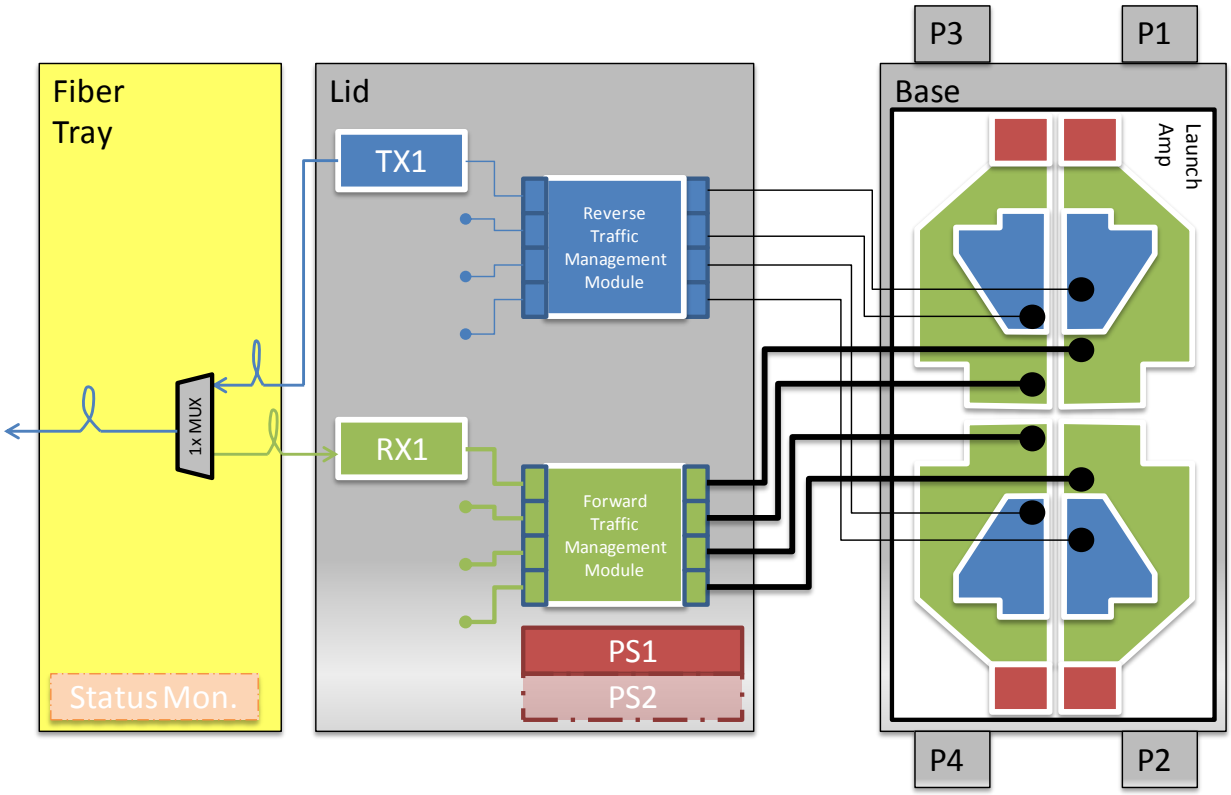
4x4 Fully Segmentable Redundant Optics and Power Supplies

ACI Communications' Emerald is a very small form factor, fully featured, low power consumption 4x4 optical node that is capable of providing up to 57 dBmV output at 1002 MHz. The forward optical input level ranges from -3 dBm to +2 dBm. The node can have up to four segmented optical receivers and four segmented analog optical transmitters or 2 digitally multiplexed digital return modules. Plug-and-play forward/reverse frequency splits make for headache free extension of return path bandwidth when necessary.

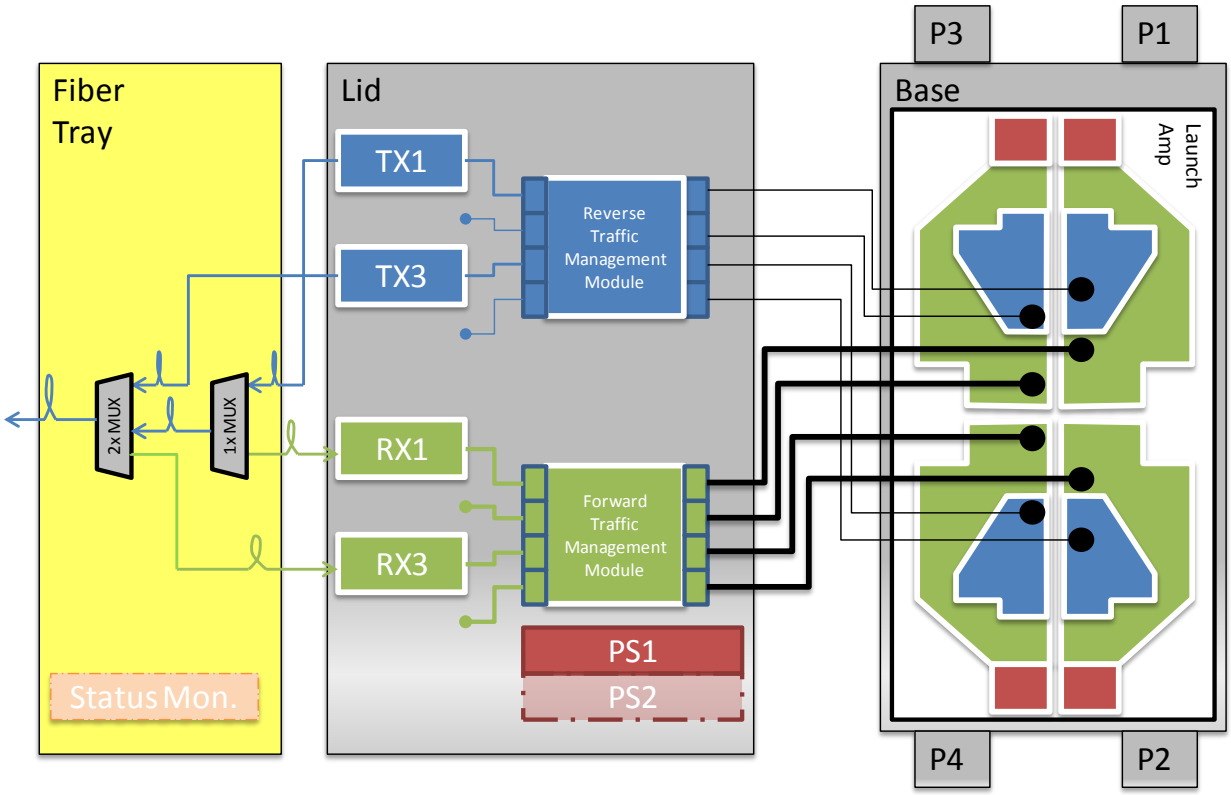
The Emerald is part of ACI's common housing platform, which encompasses everything in ACI's main distribution product set, whether it be a single output line extender, a trunk amplifier, a bridger amplifier, a distribution amplifier node conversion, a 1x4 optical node or a 2x2 optical node.

Features

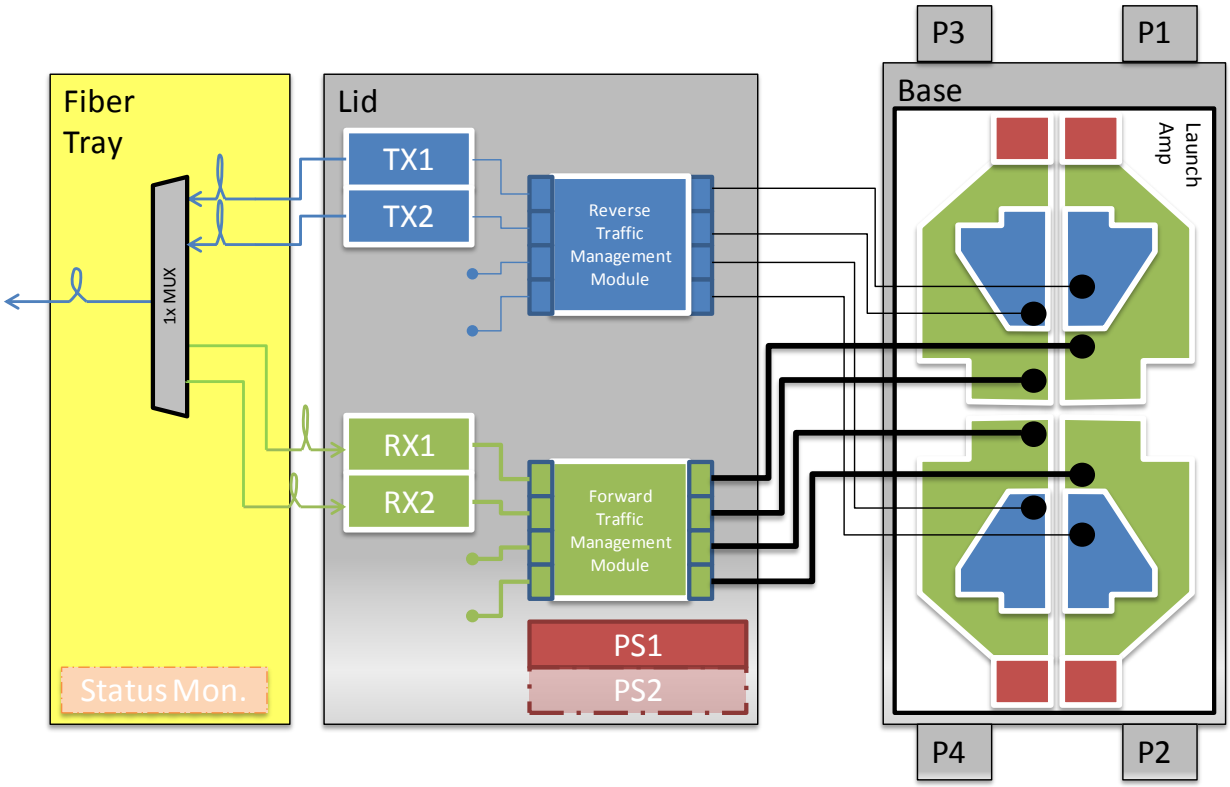
- Super compact, super light. Occupies less than 1/3 the volume of a typical 4x4 optical node
- Lowest power consumption node available- only 73.5 watts in the maximum configuration.
- 4 driven ports - four outputs allow 4 different coaxial paths out of the node just like its bigger, bulkier competitors
- CWDM ready and configurable - internal outdoor rated Mux/Demux allows 4 forward and 4 reverse wavelengths to traverse a single fiber into and out of the node
- Plug-in bridger switching for managing the reverse path @ 0, -3.0, -6.0, -12.0 dB and open with active status monitoring (optional)
- Traffic Management Solutions include 2+2, 3+1, and “any direction” configurations
- FP, DFB and DFB CWDM transmitters available
- Redundant receivers, transmitters, and power supply (optional)
- 85% efficient 40/90 VAC switch-mode power supplies with built-in Triac surge protection



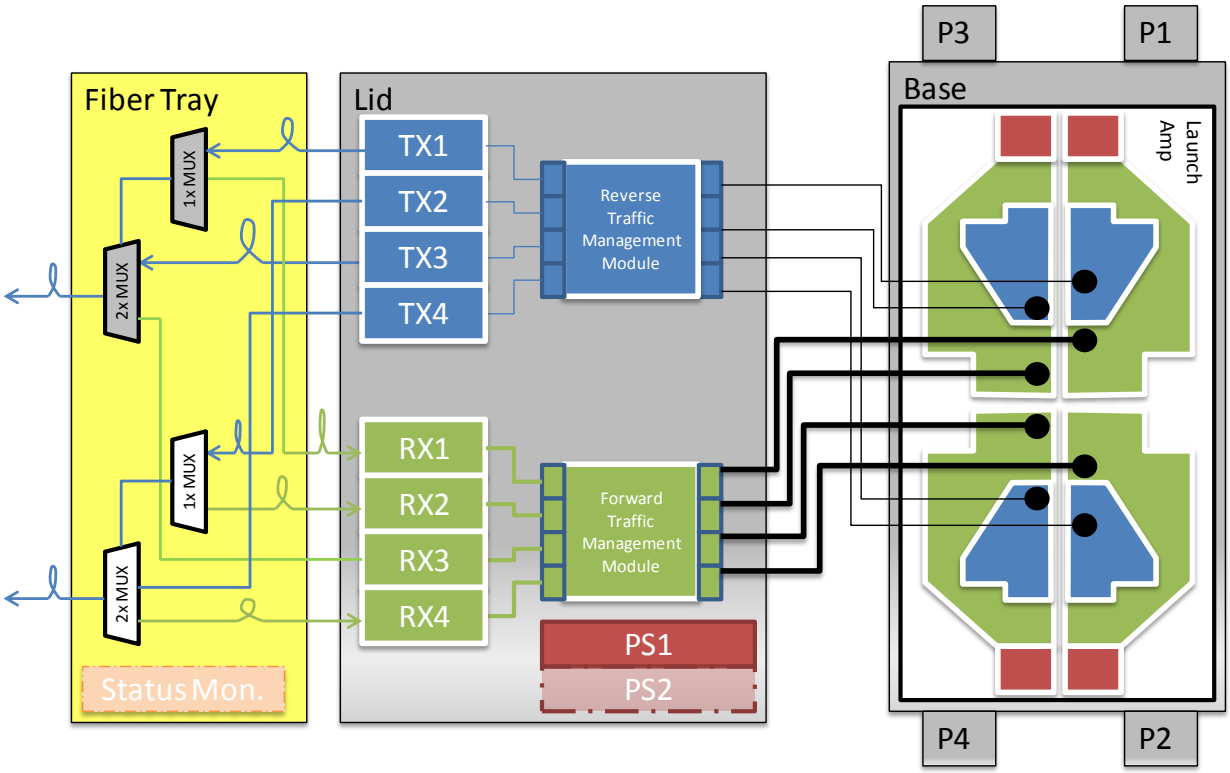
High Level 1x4 Block Diagram



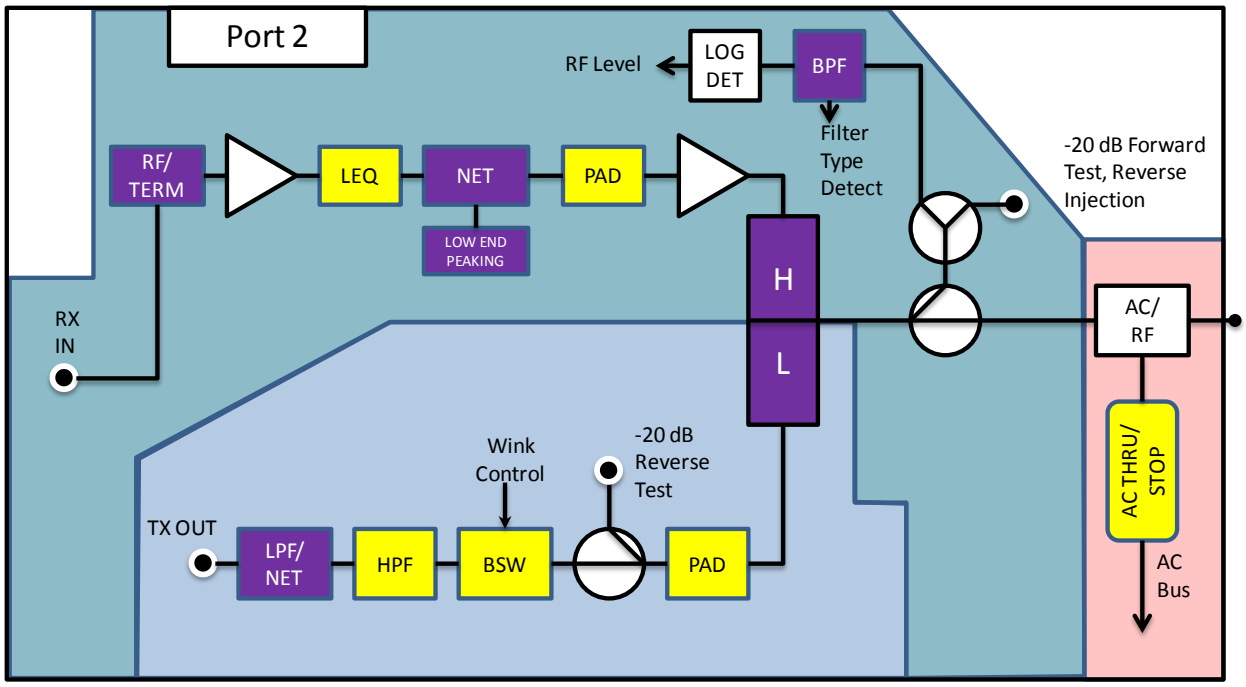
High Level 2x2 Block Diagram



High Level 1x4 Redundant Block Diagram



High Level 2x2 Redundant or 4x4 Block Diagram



Key:

Fixed Component | Thru-Panel Plug-In | Under-Panel Plug-In

RF Module Port Block Diagram

Emerald ON 4-Output (Forward and Reverse Segmentable Optical Node 1002 MHz)									
STATION PARAMETERS									
	CONDITIONS	UNITS	SPECIFICATION					NOTES	
Housing passband		MHz	5 to 1002						
Input current capacity	Any port, worst case	Amperes	15						
Frequency range		MHz	5 - 10	11-750		751 - 1002	751 - 1002		
Hum modulation	Time domain @ rated current above	-dBc	55	70		65	65		
Station passband		MHz	54 to 1002						
Return loss- Ports 1 to 4	Worst case	-dB	17					Typical 18.0	
Frequency range		MHz	54-870		871-1002				
Port to Port Isolation	Typical	-dB	70		60				
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 40						
Test point accuracy	Reverse TP	±dB	0.5						
Frequency Range									
Station passband		MHz	54 to 1002						
Station flatness - feeder out		±dB	0.75						
Station Gain									
Configuration			1:4	1:2 (X2)	1:1 (x4)	2+2	3+1		
Gain- Segmentation module			Unity	Unity	Unity	Unity	Unity		
Gain - Launch Amplifier	@ 1002 MHz	dB	37.5	37.5	37.5	37.5	37.5		
Gain control type		N / A	JXP Pads						
Gain control range		dB	15.0						
Gain control steps	Pad value steps	dB	0.5						
Station Slope									
Slope control type	Linear equalizers	dB	JXP						
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	@ 1002 MHz	dBmV	52.2						
Operational slope	@ 54 / 550 / 750 / 870 / 1002 MHz	dB	0 / 9.0 / 12.6 / 14.8 / 17.2						
Operational optical input range		dBm	-3 to +2					Recommended optical input level 0 dBm	
Station Output Levels with a -3 dBm optical input									
Distribution out	@ 54 / 550 / 750 / 870 / 1002 MHz	dBmV	35.0 / 44.0 / 47.6 / 49.8 / 52.2						
Station Noise Figure - values for RF portion of node only. Complete values dependent on optical link.									
			* No slope		17.2 dB slope			* LEQ1= 0 dB	
Noise figure (NF)	@ 54 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				
Station Distortions - values for RF Portion of node only. Complete values dependent on optical link.									
550 MHz analog channel loading, 79 channels + 450 MHz digital channel loading, 256 QAM at -6 dBc relative to its associated visual carrier									
Reference levels	@ 54 / 550 / 650 / 870 / 1002 MHz	dBmV	35.0 / 44.0 / 47.6 / 49.8 / 52.2						
		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						

Emerald ON 4-Output (Forward and Reverse Segmentable Optical Node 1002 MHz)								
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)	2+2	3+1	
Gain- Segmentation Module			Unity	Unity	Unity	Unity	Unity	
Gain Launch Amplifier	Minimum	dB	-2	-2	-2	-2	-2	*for one TX Configuration
Gain control type		N / A	JXP 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					
Reverse - Noise Figure								
Configuration			4:1	2:1 (X2)	1:1 (X4)	2+2	3+1	
Station Noise Figure (w/EQ)		dB	16.5	12.0	10.0	12/10/10	16.5/10/10	
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	8					
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 & 4 TX)	2+2	3+1	
Power requirements	Worst case	W	66.7	70.5	68.0	73.5	70.5	
AC Voltage								
Input ranges		VAC	40 - 90					
Current Draw								
@ 40 VAC	Maximum	A	1.09	1.15	1.11	1.20	1.15	
@ 50 VAC	Maximum	A	1.23	1.30	1.25	1.35	1.30	
@ 60 VAC	Maximum	A	1.40	1.48	1.43	1.54	1.48	
@ 70 VAC	Maximum	A	1.63	1.73	1.67	1.80	1.73	
@ 80 VAC	Maximum	A	1.96	2.07	2.00	2.16	2.07	
@ 90 VAC	Maximum	A	2.45	2.59	2.50	2.70	2.59	
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)	6.75 X 14.25 X 9 (17.15 X 36.20 X 22.86)					
Weight		lbs. (kg)	20 lbs					

Emerald Node Configuration Sheet

Customer: _____

Created By: _____ Order Date: _____

ORDERING MATRIX

November 5, 2014

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PART NUMBER	**E**															

2 ☐ **BASIC CONFIGURATION**

A = FWD 1:4 REV 4:1 Nonsegmented
- 1 Transmitter installed
- 1 Receiver installed
- TX and RX redundancy capable

B =FWD 1:4 REV 4:1 Nonsegmented with optics redundancy
- 2 Transmitters installed (TX1 & 2 Need to be the same type)
- 2 Receiver installed

C = FWD 1:2 (2X) REV 2:1 (X2) Forward & Return segmented
- 2 Transmitters installed
- 2 Receivers installed
- TX or RX redundancy capable

D = FWD 1:2 (2X) REV 2:1 (X2) Forward & Return segmented with optics redundancy
- 4 Transmitters installed (TX1 & 2 and TX 3 & 4 Need to be the same type)
- 4 Receivers installed

E = FWD 3+1 REV 1+3 Nonsegmented
- 2 Transmitters installed
- 2 Receivers installed
- TX or RX redundancy capable

F = FWD 3+1 REV 1+3 Nonsegmented with optics redundancy
- 4 Transmitters installed
- 4 Receivers installed

G = FWD 2+2 REV 2+2 Forward & Return segmented
- 3 Transmitters installed
- 3 Receivers installed
- TX1 & RX1 redundancy capable with TX2 & RX2

H = FWD 2+2 REV 2+2 Forward & Return segmented with optics redundancy
- 4 Transmitters installed (TX1 & 2 Need to be the same type)
- 4 Receivers installed

J = FWD 4:4 REV 4:4 Forward & Return segmented
- 4 Transmitters installed
- 4 Receivers installed
- Not TX or RX redundancy capable

12 ☐ 13 ☐ **Mux/DeMux or WDM**
(For a 1X2 Mux or WDM use position 12)
MUX A -Use for 2:2, or ports 1 & 3 for 4:4
MUX B Ports 2 & 4 for 4:4 or 2:2, 2+2, & 3+1 With Optics Redundancy
- 0 = None
- A = FWD Path 1310, 1431; REV path 1451, 1551 nm & common
- B = FWD path 1290, 1295; REV path 1591, 1611 nm & common
- C = FWD path 1291, 1293; REV path 1471, 1491 nm & common
- W = WDM 1310/1550 nm

Future = ____λ1 ____λ2 ____λ3 ____λ4

14 ☐ **SLOPE**

	550	750	870	1002
E=	9.0	12.6	14.8	17.2
T=	7.3	10.3	12.0	14.0
H=	9.4	13.2	15.5	18.0

15 ☐ **HOUSING OPTIONS & POWER SUPPLY QUANTITY (See Notes 1 & 2)**
- P = Complete Node - 1 Power Supply
- K = Upgrade kit - 1 Power Supply
- E =Complete Node - 2 Power Supplies
- F = Upgrade kit - 2 Power Supplies
- G =Complete Node / With Local Injection Port - 1 Power Supply
- H = Upgrade kit / With Local Injection Port - 1 Power Supply
- M =Complete Node / With Local Injection Port - 2 Power Supplies
- N = Upgrade kit / With Local Injection Port - 2 Power Supplies

16 ☐ **CUSTOM (See note 3 for option H)**
- 0 = None
- H = High output 42.0/60.0 dBmV (54/1002 MHz) with 18.0 dB of Slope
- X = Determined by Product Management

3 ☐ **DIPLEX FREQUENCY SPLIT & CONNECTOR TYPE**

Connector / Split	SC/APC	SC/UPC	FC/APC	FC/UPC
	4 = 42/53	A = 42/53	E = 42/53	J = 42/53
	5 = 55/70	B = 55/70	F = 55/70	K = 55/70
	6 = 65/85	C = 65/85	G = 65/85	L = 65/85
	8 = 85/105	D = 85/105	H = 85/105	M = 85/105

4 & 5 ☐ **TRANSMITTER 1 - Primary 4:1, Ports 1 & 3 for 2:1 (X2), Port 1 for 4:1**
6 & 7 ☐ **TRANSMITTER 2 - Secondary 4:1 or Ports 2 & 4 for 2:1 (X2) or Port 2 for 4:1**
8 & 9 ☐ **TRANSMITTER 3 - Secondary Ports 1 & 3 for 2:1 (X2) or Port 3 for 4:1**
10 & 11 ☐ **TRANSMITTER 4 - Secondary Ports 2 & 4 for 2:1 (X2) or Port 4 for 4:1**

TYPE FP & DFB
- 00 = None
- D0 = Uncooled 1310 nm 1.0 mW FP
- H0 = Uncooled 1310 nm 2.0 mW FP W/ISOLATOR
- J0 = Uncooled 1310 nm 1.0 mW DFB
- R0= Uncooled 1310 nm 2.0 mW DFB
- B0= Uncooled 1310 nm 3.0 mW DFB
- C0 = Uncooled 1550 nm 2.0 mW DFB

TYPE DFB CWDM
- A0 = Uncooled 1471 nm DFB CWDM (2.0 mW)
- G0 = Uncooled 1491 nm DFB CWDM (2.0 mW)
- V0 = Uncooled 1511 nm DFB CWDM (2.0 mW)
- L0 = Uncooled 1531 nm DFB CWDM (2.0 mW)
- W0 = Uncooled 1551 nm DFB CWDM (2.0 mW)
- M0 = Uncooled 1571 nm DFB CWDM (2.0 mW)
- N0 = Uncooled 1591 nm DFB CWDM (2.0 mW)
- T0 = Uncooled 1611 nm DFB CWDM (2.0 mW)
- U0 = Uncooled 1431 nm DFB CWDM (2.0 mW) E-Band
- Y0 = Uncooled 1451 nm DFB CWDM (2.0 mW) E-Band

DWDM: ITU Grid: C-Band, 100 GHz Spacing

19 = Channel 19 - 1562.23nm	38 = Channel 38 - 1546.92nm	57 = Channel 57 - 1531.90nm
20 = Channel 20 - 1561.42nm	39 = Channel 39 - 1546.12nm	58 = Channel 58 - 1531.12nm
21 = Channel 21 - 1560.61nm	40 = Channel 40 - 1545.32nm	59 = Channel 59 - 1530.33nm
22 = Channel 22 - 1559.79nm	41 = Channel 41 - 1544.53nm	60 = Channel 60 - 1529.55nm
23 = Channel 23 - 1558.98nm	42 = Channel 42 - 1543.73nm	61 = Channel 61 - 1528.77nm
24 = Channel 24 - 1558.17nm	43 = Channel 42 - 1542.94nm	62 = Channel 62 - 1527.99nm
25 = Channel 25 - 1557.36nm	44 = Channel 44 - 1542.14nm	63 = Channel 63 - 1527.22nm
26 = Channel 26 - 1556.56nm	45 = Channel 45 - 1541.35nm	64 = Channel 64 - 1526.44nm
27 = Channel 27 - 1555.75nm	46 = Channel 46 - 1540.56nm	
28 = Channel 28 - 1554.94nm	47 = Channel 47 - 1539.77nm	
29 = Channel 29 - 1554.13nm	48 = Channel 48 - 1538.98nm	
30 = Channel 30 - 1553.33nm	49 = Channel 49 - 1538.19nm	
31 = Channel 31 - 1552.52nm	50 = Channel 50 - 1537.40nm	
32 = Channel 32 - 1551.72nm	51 = Channel 51 - 1536.61nm	
33 = Channel 33 - 1550.92nm	52 = Channel 52 - 1535.82nm	
34 = Channel 34 - 1550.12nm	53 = Channel 53 - 1535.04nm	
35 = Channel 35 - 1549.32nm	54 = Channel 54 - 1534.25nm	
36 = Channel 36 - 1548.52nm	55 = Channel 55 - 1533.47nm	
37 = Channel 37 - 1547.72nm	56 = Channel 56 - 1532.68nm	

Sub-octave SR
Reverse 4X Module (See Note 1)
(Enter same letter and number for positions 4-11)

TX1	TX2	TX3	TX4	
R1	R1	R1	R1	4:4 Module @ 1550 nm X4

NOTES:

1 The secondary power supply option is not offered with Sub-octave SR reverse module.

2 The Emerald upgrade kit (option # 15 selection K, F, H or N) will include a fully configured optical top housing assembly and the RF module tray. The upgrade Kit will allow field upgrades of legacy ACION 3000, ACION 3410 & ACION 3422 nodes or it can be used as a conversion kit to convert an existing SDA RF amplifier into a fully 2X2 or 4X4 segmentable optical node.

3 The custom option H to have the high output of 42.0/60.0 dBmV (54/1002 MHz) is only available in a 1x4 configuration with 18.0 dB of Slope at 1002 MHz.

ACI Communications, Inc.
23307 66th Avenue South
Kent, WA 98032

Rev F 9-29-2015 Printed in U.S.A.