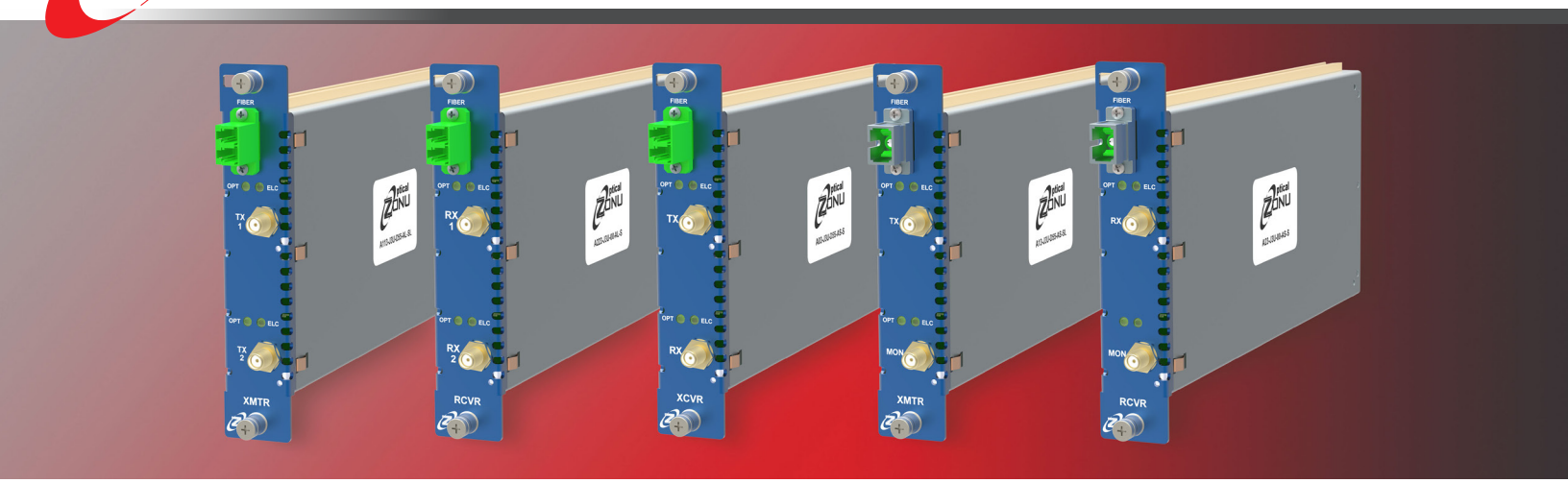

Features

- Single/Dual Transmitter/Receiver or Transceiver
- 30 MHz to 3 GHz (6 GHz option)
- -20°C to +50°C Operating Temperature Range
- Variable/Controlled Transmitter and Receiver RF Gain
- 1310 nm, 1550 nm, CWDM Wavelengths
- High SFDR
- Automatic Optical Power Control
- Hot Swappable
- Multiple Local and Remote Monitoring and Control Options
- Uncooled Isolated DFB Lasers
- Lasers Conform to Class 1 Emission Level Per CDRH and IEC-825 (EN 60825) Standards

Options

- Integrated 20 dB or 40 dB Transmitter LNA
- Extended High Frequency, 6.0 GHz
- Extended Low Frequency, 10 kHz
- Extended Operating Temperature Range, -20°C to +60°C
- Integrated WDM
- +5 VDC or +12 VDC Bias-T or Switchable LNB Bias 13V, 13V (22 kHz), 18V, 18V (22 kHz)
- Detection of Rx Input Bias for Automatic Transmission to the Remote Site
- Low Phase Noise (10-200 MHz)
- Active Antenna Monitoring (Patented)

J3U 3/6 GHz Tx & Rx

Description

The J3U platform (see **J3U** Platform Overview) is a 19" 3RU chassis that accommodates (among other things) 16 pluggable, hot swappable fiber optic RF signal transport modules. Single Slot plug-in modules include the following:

Single Transmitter, Single Receiver, Dual Transmitter, Dual Receiver, Transceiver (Transmitter & Receiver).

J3U transmitters and receivers may be used with J3U RF and Optical Diversity switches to create N+1 and other redundancy architectures.

Digital attenuators (0.5dB steps) enable both transmitter and receiver RF gain control. Transmitters feature linear uncooled isolated DFB laser diodes. Receivers feature high performance InGaAs photodiodes. The standard transport RF frequency band is 30 – 3000 MHz. Options exist for extending the frequency range to 6 GHz on the upper end, and/or 10 kHz on the lower end.

Modules are optimized for linear signal transport with high spur free dynamic range (SFDR). User or programmable adjustable transmitter and receiver RF gain accommodates optimization of noise figure, linearity (P1dB and IIP3), and RF gain over a wide variety of optical loss budgets and RF signal levels. The standard RF interface is 50Ω SMA. Other impedance/connector options may be available, contact Optical Zonu. A variety of APC optical connector options (SC/APC is standard) are available to maintain low optical reflections throughout the fiber plant.

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Applications

- RF Over Fiber Transport
- Teleport RF Signal Distribution
- RF and Optical Redundancy
- Antenna Site Diversity
- Phased Array Antenna Systems
- Radar Systems RF Signal Transport
- TVRO
- VSAT

Single bi-directional links supported by a single fiber are realized by integrating a WDM within the fiber optic transceivers. More complex traffic architectures may be realized by using external rack mount CWDM multiplexers.

Multiple options exist for integrating Bias-Ts into transmitters for the purpose of powering antennas and providing control/biasing to LNBs and BUCs. 13/18V (with or without 22 kHz) biasing is user selectable either on the module or remotely through the J3U management system. Detection of such biasing on the Receiver outputs can be automatically transferred to control a compatible remote Transceiver or eFiberSAT unit. This is a unique feature that only the J3U Transceiver is capable of.

Built-in RF shielding facilitates low EMI/EMC/RF interference. RF links may also be optimized for transporting low phase noise reference clocks in the frequency range 10 – 200 MHz.

RF signal transport modules within the J3U platform may be monitored and controlled via SSH, Web UI, OZC GUI, and SNMP v2 and v3 (see JS14 Managed Switch datasheet).

J3U modules are also available incorporating Optical Zonu's patented GPS fiber transport with antenna monitoring and active DC load at the optical receiver output port. See US 10,257,739 BI

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Temperature	T_{op}	-20	-	50	°C	
Storage Temperature	$T_{storage}$	-40		85	°C	
DC Supply Voltage	V_{CC}	11	12	12.5	V	
Transmitter RF Input (no LNA)	RF_{in}	-	-	+18	dBm	
Transmitter RF Input (LNA)	RF_{in}	-	-	0	dBm	
Transmitter RF Input (2 x LNA)	RF_{in}	-	-	-15	dBm	
Transmitter Optical Output	$P_{Tx,out}$	-	-	+8	dBm	
Receiver Optical Input	$P_{Rx,in}$	-	-	+11	dBm	
Unpackaged Weight	-	-	-	530	g	
Relative Humidity	RH	20	-	90	%	
Altitude	-	-	-	10,000	MASL	

Receiver output MUST be terminated while powered. No Input power allowed at the Rx output

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DC Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
DC Supply Voltage	V_{CC}	11	12	12.5	V	
Transmitter Current (single)	$I_{CC,Tx}$	-	0.35	0.45	A	
Receiver Current (single)	$I_{CC,Rx}$	-	0.3	0.35	A	
Transceiver Current	$I_{CC,TxRx}$	-	0.65	0.75	A	

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Transmitter Output Power	$P_{Tx,out}$	2	3	4	dBmO	
Transmitter Wavelengths	λ_{Tx}	1270 1470	-	1330 1610	nm	
Receiver Wavelengths	λ_{Rx}	1270	-	1610	nm	

RF Characteristics - 3 GHz Link

Parameter	Symbol	Min	Typical	Max	Units	Notes
High Frequency Cutoff	f_{high}	-	3000	-	MHz	
Low Frequency Cutoff	f_{low}	-	30	-	MHz	
Frequency Response Flatness	S21	-	2	3	dB_{p-p}	
RF Gain (unity gain)	G_{unity}	0	-	+4	dB	1, 3
RF Gain (high gain)	G_{high}	+20	-	+22	dB	2, 3
Noise Figure (unity gain)	NF_{unity}	-	40	45	dB	1, 3
Noise Figure (high gain)	NF_{high}	-	20	24	dB	2, 3
Input 1dB Compression (unity gain)	$P1dB_{unity}$	+13	+16	-	dBm	1, 3, 4
Input 1dB Compression (high gain)	$P1dB_{high}$	-6	-3	-	dBm	2, 3, 4
Input 3rd Order Intercept (unity gain)	$IIP3_{unity}$	+28	+32	-	dBm	1, 3, 4
Input 3rd Order Intercept (high gain)	$IIP3_{high}$	+8	+10	-	dBm	2, 3, 4
Spur Free Dynamic Range (unity gain)	$SFDR_{unity}$	-	110	-	$dB/Hz^{2/3}$	1, 3, 5
Spur Free Dynamic range (high gain)	$SFDR_{high}$	-	109	-	$dB/Hz^{2/3}$	2, 3, 5
Group Delay	GD	-	-	2	nsec	
Input/Output Impedance	$Z_{in/out}$	-	50	-	Ω	
Input/Output Return Loss	$RL_{in/out}$	11	13	-	dB	

1. "Unity gain" configuration - transmitter without +20 dB LNA, standard receiver amplifier configuration (00).
2. "High gain" configuration - transmitter with +20 dB LNA, standard receiver amplifier configuration (00).
3. Contact Optical Zonu for additional amplifier configurations.
4. Measured with 1 meter SMF fiber jumper, 2-tone input, each tone at 0 dBm at receiver RF output
5. Measured with 1 meter SMF fiber jumper, single tone input, 0 dBm at receiver RF output

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RF Characteristics - 6 GHz Link

Parameter	Symbol	Min	Typical	Max	Units	Notes
High Frequency Cutoff	f_{high}	-	6000	-	MHz	
Low Frequency Cutoff	f_{low}	-	30	-	MHz	
Frequency Response Flatness	S21	-	2	3	dB_{p-p}	
RF Gain (unity gain)	G_{unity}	0	+2	+4	dB	1, 3
RF Gain (high gain)	G_{high}	+20	+21	+22	dB	2, 3
Noise Figure (unity gain)	NF_{unity}	-	40	45	dB	1, 3
Noise Figure (high gain)	NF_{high}	-	20	24	dB	2, 3
Input 1dB Compression (unity gain)	$P1dB_{unity}$	+13	+16	-	dBm	1, 3, 4
Input 1dB Compression (high gain)	$P1dB_{high}$	-6	-3	-	dBm	2, 3, 4
Input 3rd Order Intercept (unity gain)	$IIP3_{unity}$	+28	+32	-	dBm	1, 3, 4
Input 3rd Order Intercept (high gain)	$IIP3_{high}$	+8	+10	-	dBm	2, 3, 4
Spur Free Dynamic Range (unity gain)	$SFDR_{unity}$	-	110	-	$dB/Hz^{2/3}$	1, 3, 5
Spur Free Dynamic Range (high gain)	$SFDR_{high}$	-	109	-	$dB/Hz^{2/3}$	2, 3, 5
Group Delay	GD	-	-	2	nsec	
Input/Output Impedance	$Z_{in/out}$	-	50	-	Ω	
Input/Output Return Loss	$RL_{in/out}$	11	13	-	dB	

1. "Unity gain" configuration - transmitter without +20 dB LNA, standard receiver amplifier configuration (00)
2. "High gain" configuration - transmitter with +20 dB LNA, standard receiver amplifier configuration (00).
3. Contact Optical Zonu for additional amplifier configurations.
4. Measured with 1 meter SMF fiber jumper, 2-tone input, each tone at 0 dBm at receiver RF output
5. Measured with 1 meter SMF fiber jumper, single tone input, 0 dBm at receiver RF output

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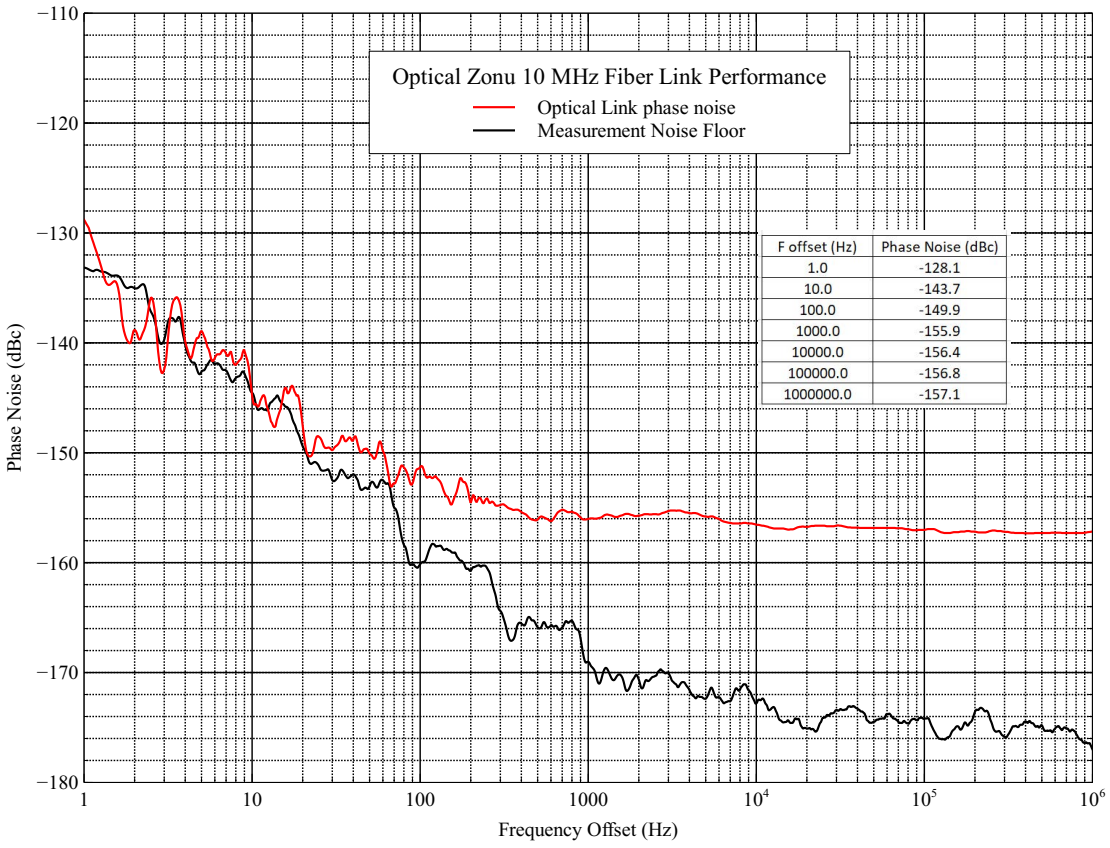
10 MHz Reference Phase Noise Performance

Frequency Offset (MHz)	Phase Noise (dBc)
0.001	-128.1
0.01	-143.7
0.1	-149.9
1	-155.9
10	-156.4
100	-156.8
1000	-157.1



Note: LPN Modules are optimized for low phase noise for references in the range of 10-200 MHz. For other optimizations, contact Optical Zonu.

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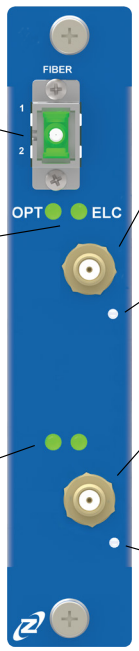
Front Panel Features

Optical Connector
- Transmitter (SC/APC)
- Receiver (SC/APC)
- Dual Transmitter (Dual LC/APC)
- Dual Receiver (Dual LC/APC)
- Transceiver (Dual LC/APC, Transmitter on top)

OPT (left) & ELC (right) LEDs
- Transmitter
- Receiver
- Dual Transmitter (Transmitter #1)
- Dual Receiver (Receiver #1)
- Transceiver (Transmitter)

OPT (left) & ELC (right) LEDs
- Transmitter (dark)
- Receiver (dark)
- Dual Transmitter (Transmitter #2)
- Dual Receiver (Receiver #2)
- Transceiver (Receiver)



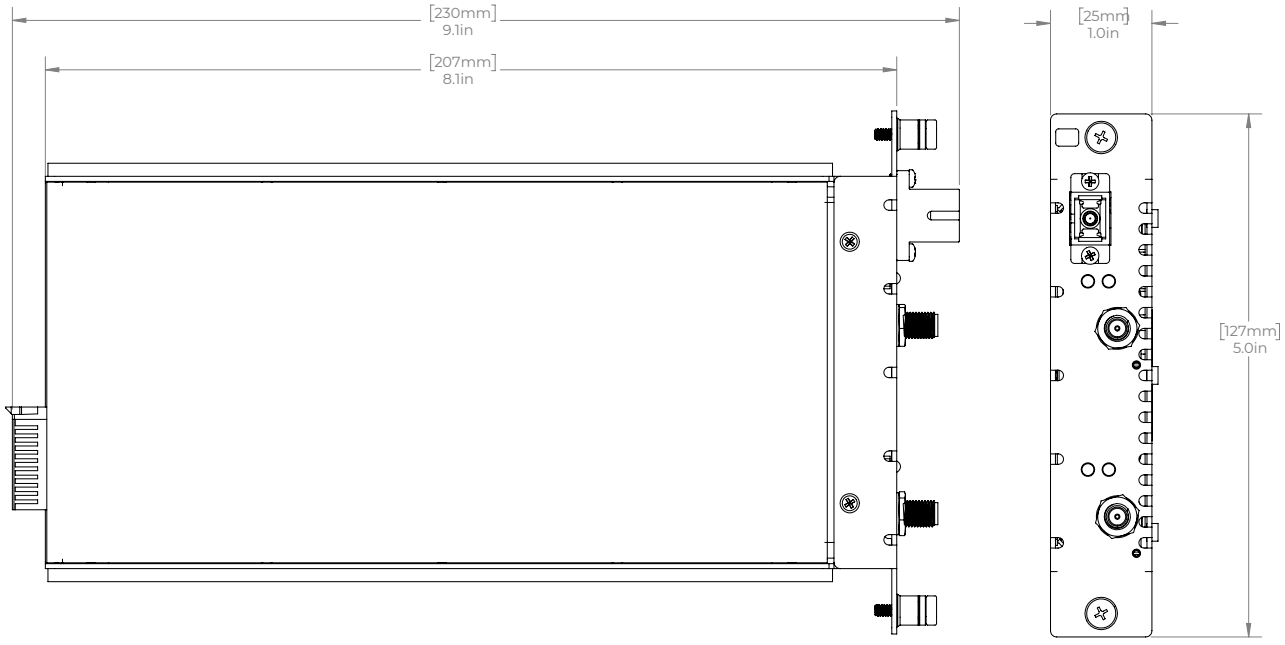
RF Connector
- Transmitter (RF_{in})
- Receiver (RF_{out})
- Dual Transmitter (Transmitter #1 RF_{in})
- Dual Receiver (Receiver #1 RF_{out})
- Transceiver (Transmitter RF_{in})

Manual Gain Adjust

RF Connector
- Transmitter (RF input monitor)
- Receiver (RF output monitor)
- Dual Transmitter (Transmitter #2 RFin)
- Dual Receiver (Receiver #2 RFout)
- Transceiver (Receiver RFout)

Manual Gain Adjust
(not available for single transmitter and single receiver modules)

Mechanical Outline



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LED Definitions - Transmitter

LED State	Condition - OPT LED	Condition - ELC LED
OFF	Module Not Powered	Module Not Powered
GREEN	Normal Operation	Normal Operation
GREEN (blinking)	Transmitter Enable/Disable	RF Input Power Low Warning
YELLOW	Transmitter Power High/Low Warning, and/or Transmitter Bias High/Low Warning	Transmitter Current High/Low Warning, and/or RF Input Power Low Alarm
YELLOW (blinking)	Temperature Control Loop Lock Loss	LNB V_{out} High/Low Warning, and/or LNB Current High/Low Warning, and/or Supply Current High Warning, and/or Supply Voltage Warning, and/or PCB Temperature Warning
RED/GREEN (blinking)	-	LNB Bias-T Current Low Alarm
RED	Transmitter Power High/Low Alarm, and/or Transmitter Bias High/Low Alarm, and/or TX_FAULT	LNB Status Alarm, and/or LNB V_{out} High/Low Alarm, and/or LNB Current High Alarm, and/or Supply Current High Alarm, and/or Supply Voltage Alarm, and/or PCB Temperature Alarm, and/or Transmitter Current High/Low Alarm, and/or RF Input Power High Alarm
RED (blinking)	Core Alarm, and/or Flash Write Error	VRF High/Low Alarm, and/or Core Alarm, and/or Flash Write Error

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LED Definitions - Receiver

LED State	Condition - OPT LED	Condition - ELC LED
OFF	Module Not Powered	Module Not Powered
GREEN	Normal Operation	Normal Operation
GREEN (blinking)	-	RF Output Power Low Warning
YELLOW	Receiver Power High/Low Warning	Receiver Current High/Low Warning, and/or RF Output Power Low Alarm
YELLOW (blinking)	--	Supply Current High Warning, and/or Supply Voltage Warning, and/or PCB Temperature Warning
RED/GREEN (blinking)	Bias-T Signal Alarm	-
RED	Receiver Power High Alarm, and/or RX_LOS (Low Optical Input Alarm)	Supply Current High Alarm, and/or Supply Voltage Alarm, and/or PCB Temperature Alarm, and/or Receiver Current High/Low Alarm, and/or RF Output Power High Alarm
RED (blinking)	Core Alarm Flash Write Error	VRF High/Low Alarm, and/or Core Alarm, and/or Flash Write Error

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Ordering Information

TRANSMITTER PART NO.

AXX3 - X - DXXXX[1] - AX - XX[5]X[5] - X

1 – Single Tx	**(Blank)** - 3 GHz	**31** - 1310 nm	**S** - SC/APC[3]	**S** - Single mode	**(blank)** - no LNA	**(blank)** - No Bias-T	**(blank)** - No LPN
11 – Dual Tx	**4** - 4 GHz	**55** - 1550 nm	**F** - FC/APC[3]	**M** - 62.5µm Multimode	**L** – LNA	**B** - 5V Bias-T	**LPN**[7] - one LPN
	6 - 6 GHz	**yy**[2] - 1yy0 nm	**L**[4] - Dual LC/APC	**M50** - 50µm Multimode	**2L** - 2 LNAs (cascade)	**B12** - 12V Bias-T	**2LPN**[8] - two LPNs
						BA[6] Adj Bias-T	

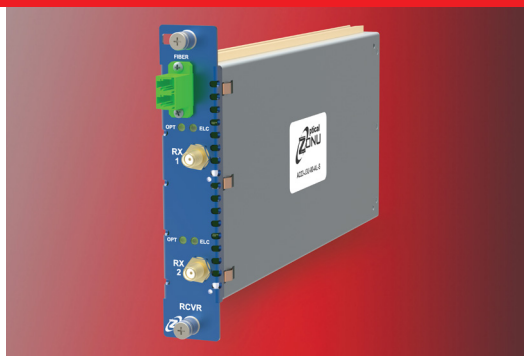
1. For single transmitter or dual transmitter with same wavelength, state once (e.g., D31), for dual transmitter, different wavelengths, state each (e.g., D3155)
2. CWDM wavelengths (e.g., 47 = 1470 nm) Standard wavelengths 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm. For others, contact Optical Zonu
3. Available for single transmitters only
4. Required for dual transmitters
5. Chosen configuration applies to both transmitters if dual transmitter configuration
6. Adjustable Bias-T: 13V, 13V (22 kHz), 18V, 18V (22 kHz)
7. For dual transmitter, LPN (low phase noise) indicates LPN on first sub-slot, regular RF transmitter on second sub-slot
8. Valid for dual transmitters only

RECEIVER PART NO.

AXX3 - J3U - X - XX - AX[1] - X - X

2 - Single Rx	**(blank)** - 3 GHz	**00** - Standard receiver gain	**S**[2] - SC/APC	**S** - Single mode	**(blank)** -no LPN
22 - Dual Rx	**4** - 4 GHz		**F**[2] - FC/APC	**M** - 62.5µm Multi-mode	**LPN**[4] - one LPN
	6 - 6 GHz		**L**[3] - Dual LC/APC	**M50** - 50µm Multi-mode	**2LPN**[5] - two LPNs

1. Multimode fiber receivers have SC/PC optical connectors
2. Available for single receivers only
3. Required for dual receivers
4. For dual receiver, LPN (low phase noise) indicates LPN on first sub-slot, regular RF receiver on second sub-slot
5. Valid for dual receivers only



Related Products

- **J3U** Platform Overview
- **J3U Chassis**, Modular 19" 3RU, 16-Slot (front) + 5-Slot (back), Fan Cooled, AC and/or DC Power Supplies, Remote Access via HTTP, GUI, SNMP v2 and v3
- **J3U RF Diversity Modules**, Splitter/ Combiner, 1:2 Swich, 2:1 Switch, 2:2 Switch, N+1 Redundancy Architectures
- **J3U Optical Diversity Modules**, Splitter/ Combiner, 1:2 Swich, 2:1 Switch, 2:2 Switch, N+1 Redundancy Architectures
- **JS14 Managed Switch** Plug-in Module, 5-Port Layer 2 Ethernet, SFP Optical Port with mOTDR, Hosts Web UI, GUI, SNMP v2 and v3 Agents

Additional Resources

- Standalone RF Over Fiber Modules
- RF Over Fiber Rack Mount Integrated Subsystems
- RF Over Fiber Rack Mount Modular Subsystems
- RF Over Fiber Applications
- 19" 3RU J3U Chassis

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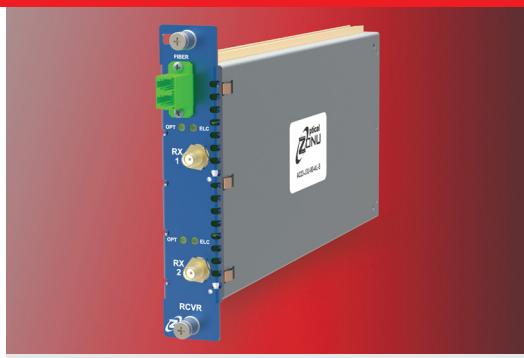
J3U CHASSIS PLATFORM
3/6 GHz RF Signal Transport Plug-in Modules



Ordering Information

TRANSCEIVER PART NO.

A03-J3U-X–DXX–AX[2]–XXXX–X[6]

(blank) - 3GHz	**31** - 1310 nm	**S**[3] - SC/APC	**S** - Single mode	**(blank)** - no LNA	**(blank)** - no WDM	**(blank)** - no Bias-T	**(blank)** - no LPN
4 - 4 GHz	**55** - 1550 nm	**F**[3] - FC/APC	**M** - 62.5µm Multimode	**L** - LNA (in transmitter)	**W** - WDM	**B** - 5V Bias-T	**LPN** - LPN
6 - 6 GHz	**yy**[1] - 1yy0 nm	**L**[4] - Dual LC/APC	**M50** - 50µm Multimode	**2L** - 2 LNAs (cascade)		**B12** - 12V Bias-T	
						BA[5]	

1. CWDM wavelengths (e.g.,47 = 1470 nm) Standard wavelengths 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm. For others, contact Optical Zonu
2. Multimode fiber receivers have SC/PC optical connectors
3. Available when using WDM only
4. Required for non-WDM transceivers
5. Adjustable Bias-T: 13V, 13V (22 kHz), 18V, 18V (22 kHz) on tansmitter input
6. LPN indicates that both transmitter and receiver are LPN (low phase noise)

Related Products

J3U Platform Overview

J3U Chassis, Modular 19" 3RU, 16-Slot (front) + 5-Slot (back), Fan Cooled, AC and/or DC Power Supplies, Remote Access via HTTP, GUI, SNMP v2 and v3

J3U RF Diversity Modules, Splitter/ Combiner, 1:2 Swich, 2:1 Switch, 2:2 Switch, N+1 Redundancy Architectures

J3U Optical Diversity Modules, Splitter/ Combiner, 1:2 Swich, 2:1 Switch, 2:2 Switch, N+1 Redundancy Architectures

JS14 Managed Switch Plug-in Module, 5-Port Layer 2 Ethernet, SFP Optical Port with mOTDR, Hosts Web UI, GUI, SNMP v2 and v3 Agents

Additional Resources

Standalone RF Over Fiber Modules

RF Over Fiber Rack Mount Integrated Subsystems

RF Over Fiber Rack Mount Modular Subsystems

RF Over Fiber Applications

19" 3RU J3U Chassis

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