1:1 Redundant Rack Mounted Hot Swappable Block Converters

"HOT SWAPPABLE" BLOCK CONVERTERS, CONVERTER TRAYS WITH INDEPENDENT OPERATION

1:1 REDUNDANT STANDARD FEATURES

- Hot swappable converter trays with power supplies.
- RS422, RS485 and 10/100 Base-T Ethernet
- Amplitude slope adjust
- Low phase noise, better than IESS-308/309
- Low intermodulation distortion
- 30 dB level control
- Summary Alarm
- Auto/manual mode
- Input power divider, with output switching

1:1 REDUNDANT OPTIONS

- Reference clean-up loop and improved stability
- Lower gain
- High Performance Package
- Lower phase noise (included in high performance package)
- Dual reference oscillators
- Input signal switching

These block converter systems provide frequency translation between the transponder band and L-band frequencies. The 1:1 Redundant System provides automatic and manual switch-over modes of operation.

The two independent converter assemblies are "hot swappable" through the rear of the chassis.

BLOCK UPCONVERTERS

Input (GHz)	Output (GHz)	LO (GHz)	1:1 Model Number
0.95 – 1.35	2 – 2.4	4.9/3.85	R1U-2.2
0.95 – 1.525	5.85 – 6.425	7.375	R1U-6.1-INV
0.95 – 1.75	5.85 – 6.65	4.9	R1U-6.25
0.95 – 1.825	5.85 – 6.725	4.9	R1U-6.28
0.95 – 1.35	6.7 – 7.1	5.75	R1U-6.9
0.95 – 1.45	7.9 – 8.4	6.95	R1U-8.15
0.95 – 1.45	12.75 – 13.25	11.8	R1U-13
0.95 – 1.7	13.75– 14.5	12.8	R1U-14.125
0.95 – 1.45	14 – 14.5	13.05	R1U-14.25
0.95 – 1.75	17.3 – 18.1	16.35	R1U-17.7
0.95 – 2.05	17.3 – 18.4	16.35	R1U-17.85
0.95 – 1.25	18.1 – 18.4	17.15	R1U-18.25
0.95 – 1.95	30 – 31	28.05	R1U-30.5

BLOCK DOWNCONVERTERS

Input (GHz)	Output (GHz)	LO (GHz)	1:1 Model Number
2 – 2.4	0.95 – 1.35	3.85/4.9	R1D-2.2
3.4 – 4.2	0.95 – 1.75	6.55/9	R1D-3.8
3.7 – 4.2	0.95 – 1.45	6.4/9	R1D-3.95
4.5 – 4.8	0.95 – 1.7	3.55	R1D-4.65
7.25 – 7.75	0.95 – 1.45	6.3	R1D-7.5*(Note1)
10.7 – 11.7	0.95 – 1.95	9.75	R1D-11.2
10.95 – 11.7	0.95 – 1.7	10	R1D-11.35
11.2 – 12	0.95 – 1.75	10.25	R1D-11.6
11.4 – 12.2	0.95 – 1.75	10.45	R1D-11.8
11.45 – 12.25	0.95 – 1.75	10.5	R1D-11.85
11.7 – 12.5	0.95 – 1.75	10.75	R1D-12.1
11.7 – 12.75	0.95 – 2	10.75	R1D-12.225
12.2 – 12.75	0.95 – 1.5	11.25	R1D-12.475
12.2 – 13.25	0.95 – 2	11.25	R1D-12.725
20.2-21.2	0.95 – 1.95	19.25	R1D-20.7

Note: 1. The R*D-7.5 Block Downconverter Incorporates an inter-stage filter to attenuate the transmit frequency. Published performance will be maintained with a presence of a 7.9 GHz signal at a level of -5 dBm.

CONVERTER SPECIFICATIONS

INPUT CHARACTERISTICS –

	UPCONVERTER	DOWNCONVERTER
Return Loss (50 Ohms)	18 dB minimum	18 dB minimum
Signal Monitor	-20 dBc nominal	
LO Leakage	N/A	-80 dB maximum

OUTPUT CHARACTERISTICS –

Return Loss (50 Ohms)	18 dB minimum	18 dB minimum
Signal Monitor	-20 dBc nominal	
Power Output (1dB Compression) –	+13 dBm minimum	+18 dBm minimum

TRANSFER CHARACTERISTICS -

Gain (at center frequency)	33 dB, ±3 dB	36 dB, ±3 dB
RF Level Control	15 dB in 0.2 dB steps	
L-band Level Control	30 dB in 0.2 dB steps	
Level Stability	±0.25 dB/day maximum at constant temperature	
Amplitude Response	±0.25 dB/40 MHz maximum, ±1 dB maximum over RF frequency band	
Slope Adjust	0 to 6 dB	
Noise Figure at Minimum Attenuation	N/A	15 dB maximum
Noise Power Density	-125 dBm/Hz maximum	N/A
Image Rejection	60 dB minimum	
Third Order Intermodulation Distortion With two inband signals each at 0 dBm, measured at the output	50 dBc minimum (+25 dBm IP3)	60 dBc minimum (+30 dBm IP3)
Spurious Outputs (Inband) –		
Signal Related	65 dBc minimum up to 0 dBm output (including 2x1 spurious on 1 GHz IF bandwidth units)	
Signal Independent	-75 dBm maximum	

Maximum Phase Noise (dBc/Hz) – With Maximum Reference Phase Noise: 10Hz: -120dBc/Hz, 100Hz: -145dBc/Hz, 1kHz: -160dBc/Hz

LO Frequency	Offset (Hz)					
	10	100	1K	10K	100K	1M
≤ 6.7 GHz	-52	-80	-90	-100	-110	-125
≤ 12 GHz	-46	-73	-84	-94	-104	-119
≤ 17.15 GHz	-45	-68	-80	-90	-100	-115
≤ 20 GHz	-63	-83	-87	-95	-97	-118
≤ 30 GHz	-60	-80	-90	-93	-95	-115
Multiband units	-50	-70	-90	-95	-95	-115

Frequency Stability	±2 x 10^{-8}, 0° to 50°C
Frequency Aging	5 x 10^{-9}/day after 24 hours on time
Automatic Reference Configuration	External 5 or 10 MHz at +4 ±3 dBm. If external reference is below +1 dBm nominal, the converter will automatically lock to the internal reference.
Converter Mute	60 dB minimum on summary alarm or mute command.

REMOTE CONTROLS

Serial Interface	RS485/RS422	
Ethernet Interface	10/100Base-T Ethernet interface providing:	
	• HTTP-based web server	• Telnet access
	• SNMP 1.0 configuration	• Password protection

INDICATOR and ALARMS

Remote Mode	Green LED (front panel)
Alarm	Red LED (front panel)
Summary Alarm	Contact closure status for DC voltage and local oscillator

Note: Performance specifications do not include redundancy configuration. Specifications apply to converter tray at 23C. Please refer to switch specifications.

OPTIONS

30-1. High Performance Package -

Power Output (1 dB compression)	20 dBm minimum
Gain Slope	0.03 dB/MHz maximum
Level Stability	±0.25 dB/day maximum at constant temperature, 1.0 dB peak-to-peak maximum, 0 to 50°C
Group Delay	1 ns peak-to-peak maximum
Spurious outputs (in-band) -	
Signal related	65 dBc minimum at 0 dBm output
Signal Independent	-80 dBm maximum
Image Rejection	80 dB minimum
Intermodulation Distortion (Third Order)	With two inband signals at 0 dBm output each, third order intermodulation products are less than 60 dBc minimum.
Noise Spectral Density	-85 dBm/4 KHz maximum
AM/PM Conversion (at 0 dBm output)	0.1°/dB maximum
Upconverter Mute	80 dB minimum on summary alarm, external mute input control or remote control.

High Performance Phase Noise (dBc/Hz maximum, not available with Multi-band units) -

LO Frequency	Offset (Hz)					
	10	100	1K	10K	100K	1M
≤ 6.7 GHz	-54	-78	-108	-116	-119	-136
≤ 12 GHz	-48	-73	-103	-112	-115	-132
≤ 17.15 GHz	-47	-70	-100	-108	-111	-128
≤ 20 GHz	-52	-67	-98	-106	-109	-126
≤ 30 GHz	-47	-64	-94	-102	-107	-124

30-1A. High Dynamic Range -

Power Output (1 dB compression)	20 dBm minimum
Group Delay	1 ns peak-to-peak maximum

30-2. Lower Gain . . . . . 20 ±3 dB at 23°C, 18 dB noise figure
(20 dB noise figure for upconverters with 1 GHz bandwidth)
(2x1 signal related, 65 dBc at -10 dBm output)

30-3. Lower Gain . . . . . 10 ±3 dB at 23°C, 20 dB noise figure
(22 dB noise figure for upconverters with 1 GHz bandwidth)
(2x1 signal related, 65 dBc at -10 dBm output)

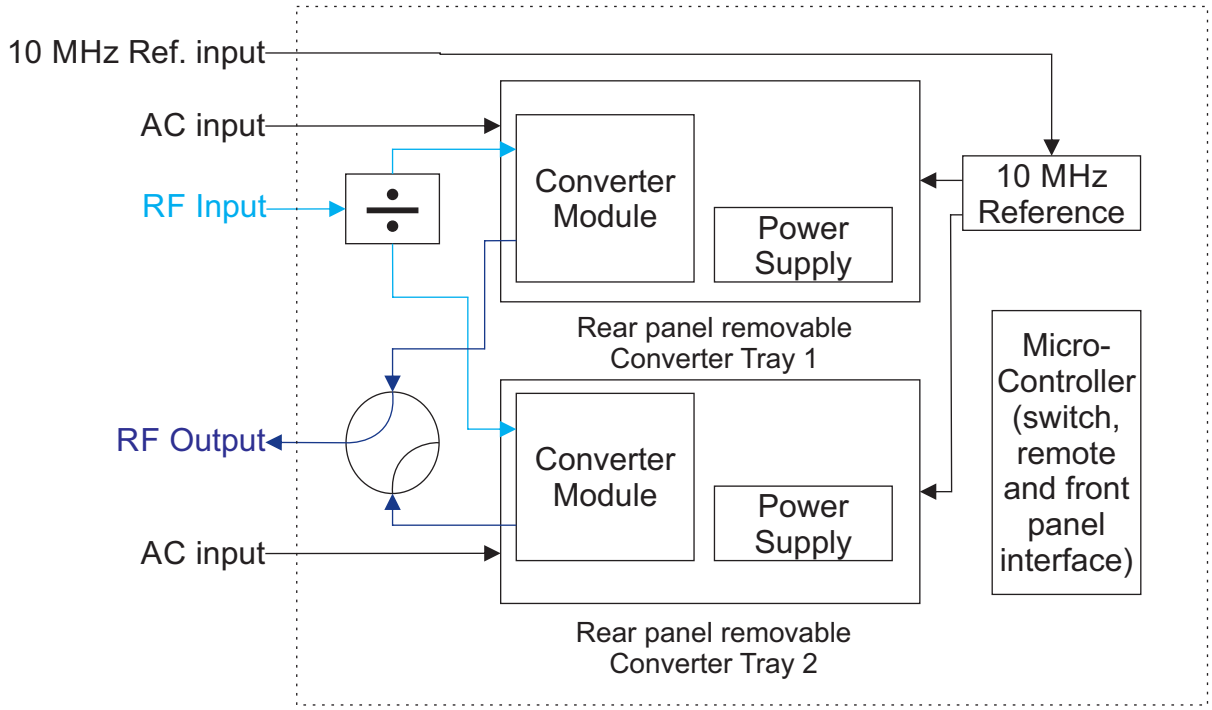
30-4. Reference Clean-up Loop and
Improved Frequency Stability . . . . . Reference oscillator acts as an analog phase lock with a 0.1 Hz nominal loop bandwidth.
Typical loop suppression of the external reference is as follows: 28 dB at 1 Hz offset, 65 dB at 10 Hz, and 100 dB at 100 Hz offset
Frequency Stability: ±2 x 10^{-9}, 0 to 50°C
Frequency Aging: 1 x 10^{-9} per day after 24 hours operation preceded by 10 days operation.

30-4A. Reference Clean-up Loop . . . . . Reference oscillator acts as an analog phase lock with a 40 Hz nominal loop bandwidth. Typical loop suppression of the external reference is as follows: 24 dB at 100 Hz offset.
Frequency Stability: ±2 x 10^{-8}, 0 to 50°C
Frequency Aging: 1 x 10^{-9} per day after 24 hours operation preceded by 10 days operation

30-5. Dual reference . . . . . Each RF tray includes one reference oscillator.

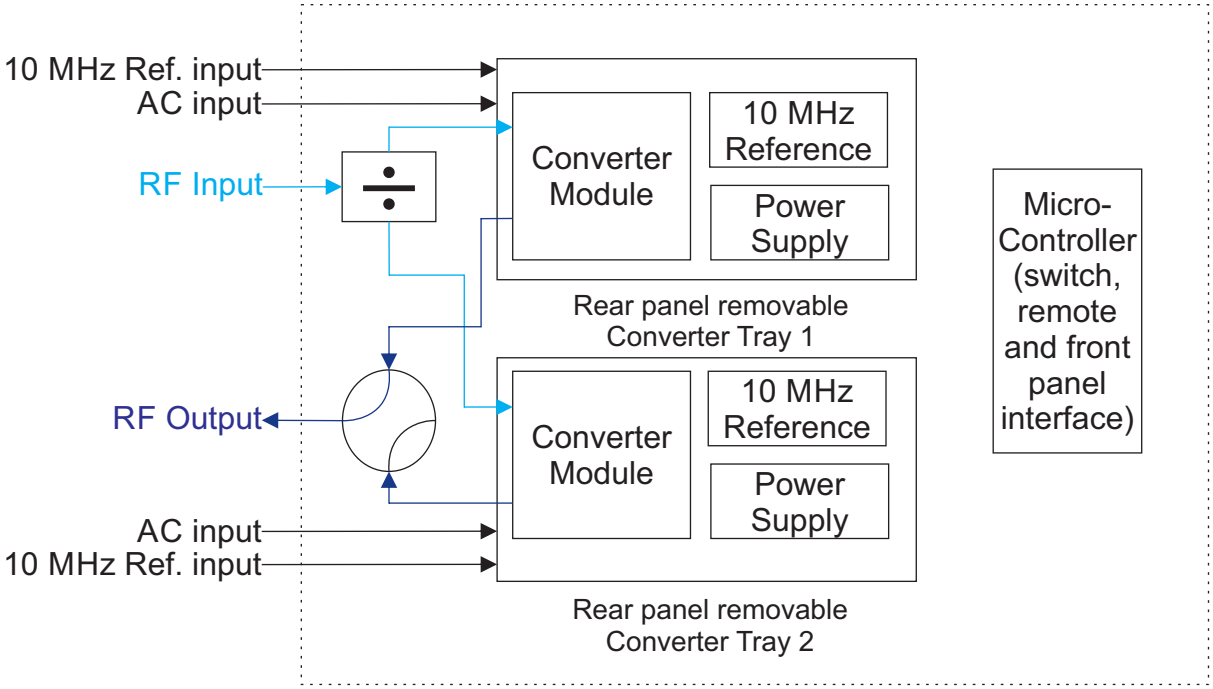
30-6. Off Line Access. . . . . Adds second switch to 1:1 redundant configurations to provide off-line converter access.

OPTIONS (Redundancy configurations)



Standard redundant configuration

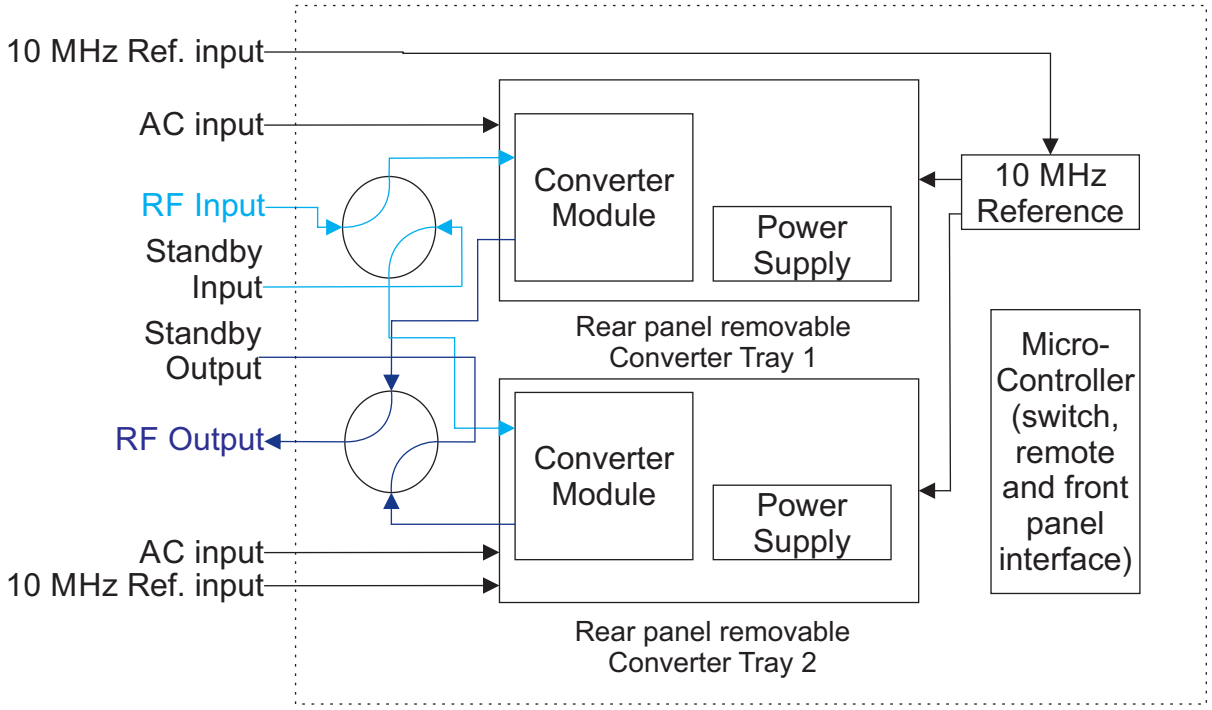
- Lowest cost, Lowest reliability - Both converters at risk from reference failure, No standby unit access



Option 30-5 redundant configuration

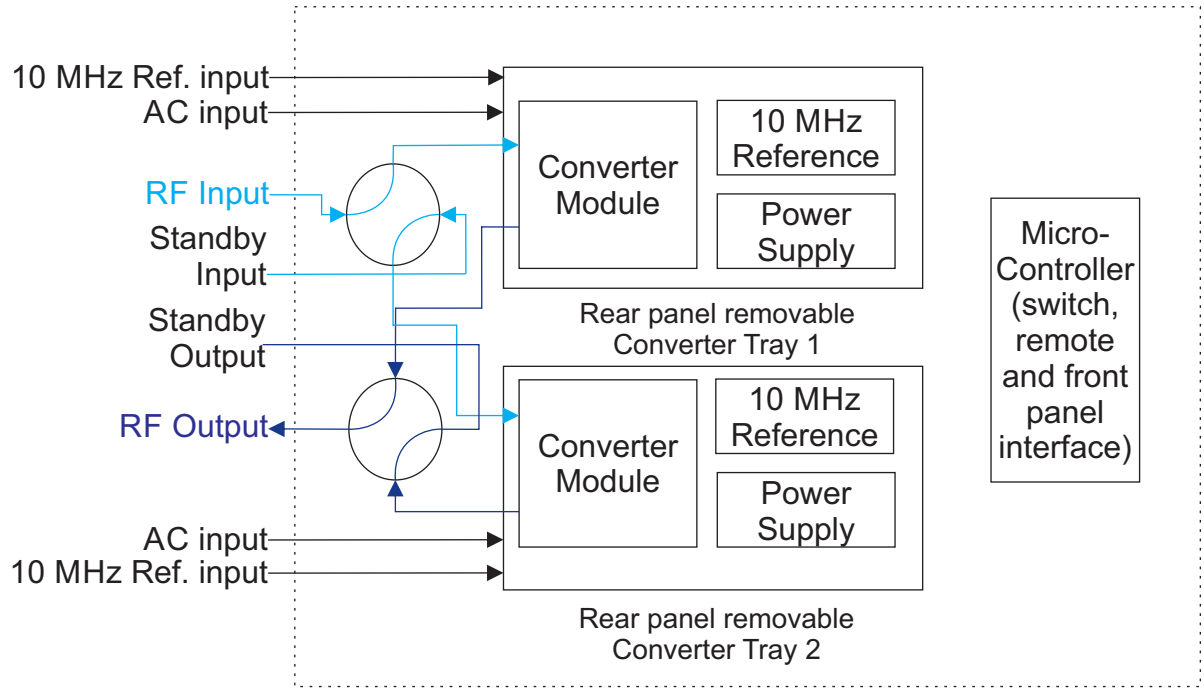
- Higher cost, Best reliability, No standby unit access

OPTIONS (Redundancy configurations)



Option 30-5 redundant configuration

- Low cost, Lowest reliability - Both converters at risk from reference failure, Standby unit access



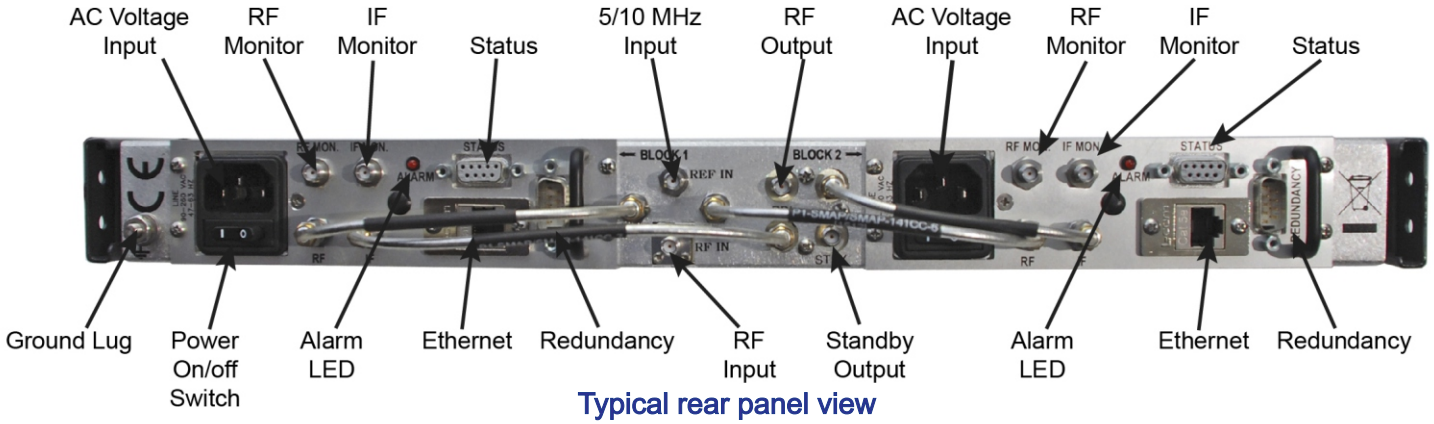
Options 30-4 and 30-5 redundant configuration

- Highest cost, Best reliability, Standby unit access

SWITCH SPECIFICATIONS

Frequency (GHZ)	Insertion Loss (Maximum, dB)	Amplitude Flatness/40 MHz (Maximum, dB)	Return Loss (Minimum, dB)	Isolation (Minimum, dB)	Switch Connector
0.05-0.180	0.1	0.2	26	80	SMA
0.95-3.0	0.2	0.2	20	80	SMA
3.0-8.0	0.3	0.3	17	70	SMA
8.0-12.4	0.4	0.3	15	60	SMA
12.4-18.4	0.5	0.4	13	60	SMA
18.4-26.5	0.7	0.5	11	55	2.9 mm
26.5-31	1.0	0.6	9.5	50	2.9 mm

Note: RF specifications apply to a single switch. IF switches (BNC female) are 50-180 MHZ. Consult factory for divider and cables performance.



Typical rear panel view

PRIMARY POWER REQUIREMENTS

Voltage..... 90-250 VAC
Frequency.....47-63 Hz
Power Consumption .....40W typical
Fuses T1.5A

SUMMARY ALARM

Contact closure/open for DC voltage and/or amplifier alarm. Status alarm readout on remote control bus.

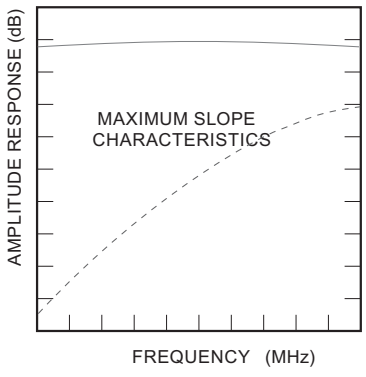
PHYSICAL

Weight .....10 pounds (4.5 kg), nominal without rack slides
14 pounds (6.4 kg), nominal with rack slides
Chassis Dimensions .....19” x 1.75” panel height x 20” maximum
Connectors -
RF .....SMA female
Summary Alarm DE-9P
Remote Interface .....DE-9S for RS422, RS485
RJ-45 female for Ethernet
Primary Power IEC-320

ENVIRONMENTAL

Operating -
Ambient Temperature ..... 0 to 50°C
Relative Humidity ..... Up to 95% at 30°C
Altitude .....Up to 10,000 feet
Non-operating –
Ambient Temperature ..... -50 to +70°C
Relative Humidity ..... Up to 95% at 40°C
Altitude .....Up to 40,000 feet
Shock and Vibration ..... Normal handling by commercial carriers

L-Band Slope Adjustment



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