

TWO CHANNEL HOT SWAPPABLE BLOCK CONVERTERS

“HOT SWAPPABLE” BLOCK CONVERTERS, CONVERTER TRAYS WITH INDEPENDENT OPERATION

These block converter systems provide frequency translation between the transponder band and L-band frequencies.

The two independent converter assemblies are “hot swappable” through the rear of the chassis. Each converter tray has independent control of the front panel. The front panel can be replaced without loss of signal.



DUAL CHANNEL STANDARD FEATURES

- Hot swappable independent converter trays with power supplies and reference oscillators.
- 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
- CE Mark

BLOCK UPCONVERTERS

Input (GHz)	Output (GHz)	LO (GHz)	Model Number
0.95 - 1.35	2 - 2.4	4.9/3.85	U2.2
0.95 - 1.525	5.85 - 6.425	7.375	U6.1INV
0.95 - 1.75	5.85 - 6.65	4.9	U6.25
0.95 - 1.825	5.85 - 6.725	4.9	U6.28
0.95 - 1.35	6.7 - 7.1	5.75	U-6.9
0.95 - 1.45	7.9 - 8.4	6.95	U-8.15
0.95 - 1.45	12.75 - 13.25	11.8	U-13
0.95 - 1.7	13.75 - 14.5	12.8	U-14.125
0.95 - 1.45	14 - 14.5	13.05	U-14.25
0.95 - 1.75	17.3 - 18.1	16.35	U-17.7
0.95 - 2.05	17.3 - 18.4	16.35	U-17.85
0.95 - 1.25	18.1 - 18.4	17.15	U-18.25

Note: 1. The D7.5 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.

DUAL CHANNEL OPTIONS

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

BLOCK DOWNCONVERTERS

Input (GHz)	Output (GHz)	LO (GHz)	Conv Tray Model
2 - 2.4	0.95 - 1.35	3.85/4.9	D-2.2
3.4 - 4.2	0.95 - 1.75	5.15	D3.8INV
3.4 - 4.2	0.95 - 1.75	9/6.55	D3.8
3.7 - 4.2	0.95 - 1.45	9/6.25	D3.95
4.5 - 4.8	0.95 - 1.25	3.55	D4.65
7.25 - 7.75	0.95 - 1.45	6.3	D7.5*(Note 1)
10.7 - 11.7	0.95 - 1.95	9.75	D11.2
10.7 - 11.75	0.95 - 2	9.75	D11.225
10.95 - 11.7	0.95 - 1.7	10	D11.35
11.2 - 12	0.95 - 1.75	10.25	D11.6
11.4 - 12.2	0.95 - 1.75	10.45	D11.8
11.45 - 12.25	0.95 - 1.75	10.5	D11.85
11.7 - 12.5	0.95 - 1.75	10.75	D12.1
11.7 - 12.75	0.95 - 2	10.75	D12.225
12.2 - 12.75	0.95 - 1.5	11.25	D12.475
12.2 - 13.25	0.95 - 2	11.25	D12.725
18.3 - 19.3	0.95 - 1.95	17.35	D18.8
20.2 - 21.2	0.95 - 1.95	19.25	D20.7

TWO CHANNEL HOT SWAPPABLE BLOCK CONVERTERS

MULTI-BAND BLOCK DOWNCONVERTERS

Band	Input (GHz)	Output (GHz)	LO (GHz)	Conv Tray Model
1	10.7 – 11.45	0.95 – 1.7	9.75	D3KuL
2	11.45 – 12.2	0.95 – 1.7	10.5	
3	12.2 – 12.75	0.95 – 1.5	11.25	
1	10.95 – 11.7	0.95 – 1.7	10	D3KuL1
2	11.7 – 12.2	0.95 – 1.45	10.75	
3	12.2 – 12.75	0.95 – 1.5	11.25	
1	10.7 – 11.5	0.95 – 1.75	9.75	D3KuL2
2	11.4 – 12.2	0.95 – 1.75	10.45	
3	12.2 – 13.0	0.95 – 1.75	11.25	
1	10.7 – 11.75	0.95 – 2	9.75	D2KuL
2	11.7 – 12.75	0.95 – 2	10.75	
1	17.0 – 17.8	0.95 – 1.75	16.05	D7KaL
2	17.7 – 18.5	0.95 – 1.75	16.75	
3	18.4 – 19.2	0.95 – 1.75	17.45	
4	19.1 – 19.9	0.95 – 1.75	18.15	
5	19.8 – 20.6	0.95 – 1.75	18.85	
6	20.5 – 21.3	0.95 – 1.75	19.55	
7	21.2 – 22.0	0.95 – 1.75	20.25	

Model Numbers consist of the frame prefix RD- followed by any combination of two module bands;

Example: Two channel unit: RD-D12.1/D12.1

Two Downconverter with two identical RF trays: 11.7-12.75 GHz to L-band

Example: Two channel unit: RD- D3.8/D11.2

One channel is 3.4-4.2 GHz to L-band (non-inverting) and the other channel is 10.7-11.7 GHz to L-band

Example: Two channel unit: RD-D11.8/D12.225

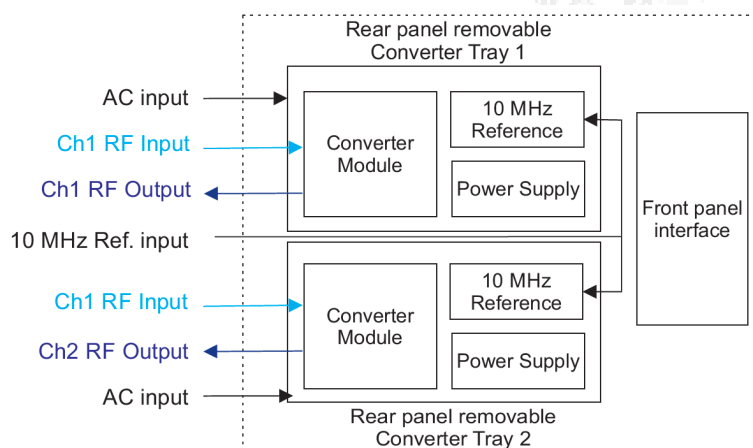
One channel is 11.4-12.2 GHz to L-band and the other channel is 12.2-12.75 GHz to L-band.

Example: Two channel unit: RD-U6.25/D3.8
One channel is L-band to 5.85-6.65 and the other channel is 3.4-4.2 GHz to L-band.

MULTI-BAND BLOCK UPCONVERTERS

Band	Output (GHz)	Input (GHz)	LO (GHz)	Conv Tray Model
1	0.95 – 1.45	12.75 – 13.25	11.8	U2KuL
2	0.95 – 2	13.75 – 14.8	12.8	

DUAL CHANNEL CONFIGURATION



TWO CHANNEL HOT SWAPPABLE BLOCK CONVERTERS

CONVERTER SPECIFICATIONS

	UPCONVERTER	DOWNCONVERTER																																																												
INPUT CHARACTERISTICS																																																														
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 (1 dB Compression)	+13 dBm minimum	+18 dBm minimum																																																												
TRANSFER CHARACTERISTICS																																																														
Gain	30 dB, ±3 dB at 23°C	35 dB, ±3 dB at 23°C																																																												
RF-band 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 maximum 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	50 dBc minimum	60 dBc minimum																																																												
With two inband signals each at	(+25 dBm IP3)	(+30 dBm IP3)																																																												
0 dBm, measured at the output																																																														
Spurious Outputs (Inband)																																																														
Signal Related	65 dBc minimum up to 0 dBm output (including 2 x1 spurious on 1 GHz IF bandwidth units)																																																													
Signal Independent	75 dBm maximum																																																													
Maximum Phase Noise (dBc/Hz) -																																																														
With Maximum Reference Phase Noise:																																																														
10 Hz: -120 dBc/Hz																																																														
100 Hz: -145 dBc/Hz																																																														
1 kHz: -160 dBc/Hz																																																														
	<table><tr><th>LO Frequency</th><th colspan="6">Offset (Hz)</th></tr><tr><td></td><td>10</td><td>100</td><td>1K</td><td>10K</td><td>100K</td><td>1M</td></tr><tr><td>≤ 6.7 GHz</td><td>-52</td><td>-80</td><td>-90</td><td>-100</td><td>-110</td><td>-125</td></tr><tr><td>≤ 12 GHz</td><td>-49</td><td>-73</td><td>-84</td><td>-94</td><td>-104</td><td>-119</td></tr><tr><td>≤ 16</td><td>-48</td><td>-68</td><td>-80</td><td>-90</td><td>-100</td><td>-115</td></tr><tr><td>≤ 20 GHz</td><td>-45</td><td>-65</td><td>-78</td><td>-95</td><td>-95</td><td>-112</td></tr><tr><td>Ku band Multi-band units</td><td>-50</td><td>-70</td><td>-90</td><td>-93</td><td>-95</td><td>-115</td></tr><tr><td>Ka band Multi-band units</td><td>-47</td><td>-67</td><td>-87</td><td>-95</td><td>-92</td><td>-112</td></tr></table>						LO Frequency	Offset (Hz)							10	100	1K	10K	100K	1M	≤ 6.7 GHz	-52	-80	-90	-100	-110	-125	≤ 12 GHz	-49	-73	-84	-94	-104	-119	≤ 16	-48	-68	-80	-90	-100	-115	≤ 20 GHz	-45	-65	-78	-95	-95	-112	Ku band Multi-band units	-50	-70	-90	-93	-95	-115	Ka band Multi-band units	-47	-67	-87	-95	-92	-112
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Frequency Stability	±2 x 10 ⁻⁸ , 0° to 50°																																																													
Frequency Aging	5 x 10 ⁻⁹ /Day after 24 hours on time																																																													
Automatic Reference Configuration	External 5 or 10 MHz at +7 ±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.																																																													



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REMOTE CONTROLS

Serial Interface	RS485/RS422
Ethernet Interface	10/100 Base-T Ethernet interface providing: - HTTP-based web server - SNMP 1.0 configuration, Alarm reporting via SNMP Trap - Telnet Access - 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

OPTIONS (1/2)

35-1. 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 (Inband)	
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 inter-modulation 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) -

	Offset (Hz)					
LO Frequency	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

35-1A. High Dynamic Range -

Power output (1 dB compression)	20 dBm minimum
Group delay	1 ns peak-to-peak maximum



TWO CHANNEL HOT SWAPPABLE BLOCK CONVERTERS

OPTIONS (2/2)

35-2. Lower Gain

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

35-3. Lower Gain

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

35-4. Reference Clean-up Loop and Improved Frequency Stability

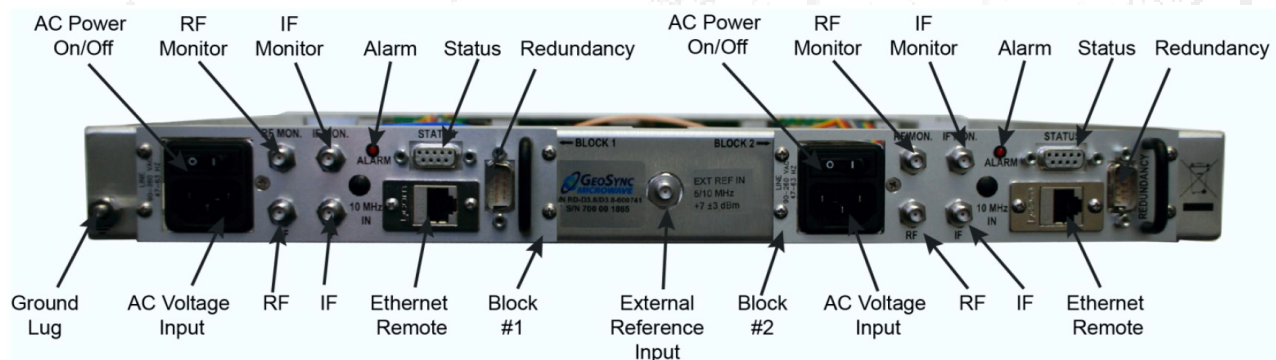
Reference oscillator acts as an analog phase lock with a 0.1 Hz nominal loop bandwidth.
Typical loop suppression of the external reference is as follows:
28 dB at 1 Hz offset; 65 dB at 10 Hz offset and 100 dB at 100 Hz offset
Frequency Stability: $\pm 2 \times 10^{-9}$, 0 to 50°C
Frequency Aging: 1×10^{-9}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

35-4A. Reference Clean-up Loop and Improved Frequency Stability

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: $\pm 2 \times 10^{-8}$, 0 to 50°C
Frequency Aging: 1×10^{-9} per day after 24 hours operation preceded by 10 days operation.

35-5. RF Signal Power Divider/Combiner

Divides (downconverter RF input) or combines (upconverter RF output) the two RF tray signals. Insertion loss: 4 dB typical.



Typical rear panel view - Shown with no options



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TWO CHANNEL HOT SWAPPABLE BLOCK CONVERTERS

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	12 pounds (5.4 kg), nominal without rack slides 16 pounds (7.3 kg), nominal with rack slides
Chassis Dimensions	19" x 1.75" panel height x 20" maximum

Connectors

RF	SMA female (2.92 mm above 17.3 GHz)
Status Interface	DE-9S
Redundancy Interface	DE-9P for RS422, RS485
Ethernet Interface	RJ-45 female for Ethernet
Primary Power	IEC-320

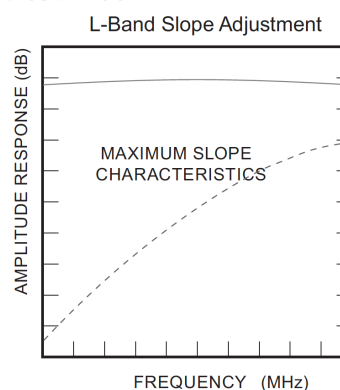
ENVIRONMENTAL

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



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