

***RADITEK*** *INC.*



*SATCOM / TELECOM  
BROCHURE*



2013



Block Up Converter-L to C Band  
N or F Type Female Connector,  
10MHz Ext Reference, 1mW-  
500Watts, Outdoor Unit



Small and Compact 4.9/  
5.15-5.85GHz  
OFDM outdoor Subscriber  
5/10/20/40MHz Fractional  
Bandwidths, 100Mbps



SSPA Amplifier, Ku-Band  
(16/25/40/80, 100,150,200)W-  
ODU/(Rack), Redundant Ready



Point to Point Radio  
Family 7-38GHz  
Over 300/600 Mbps,  
Ethernet, Point to Point  
Radio

1000BaseT  
Traffic Port  
+ 100BaseT  
NMS Port

Indoor or  
Outdoor  
mounted PoE  
-48VDC  
(watertight  
cover/seals  
removed)

Total Outdoor  
Radio with  
Common  
Antenna /  
Waveguide port



5GHz OFDM Outdoor Radio  
54Mbps Variable Bandwidth



Point to Point  
Radio Family  
6-38GHz

Point to Point Radio Family  
2.4 or 5.85GHz  
PDH / Ethernet Convergent System  
1xE1/T1 and 2xE1/T1



Block Up Converter-L to C Band  
N or F Type Female Connector,  
10MHz Ext Reference, 1-  
200Watts, Indoor / Outdoor Unit





This 2013 year of Snake is meant for steady progress and attention to detail. Hoping you achieve all that you set out to create. Good luck to everyone. Raditek is pleased to announce several new Telecommunications products. We can provide the complete solution, to include: Satcom, Point to Point and DAMA products. Plus the last mile solution using Point to Multipoint, IP based solutions, eg WiMax and WiFi. Please come to us with your requirements, we will help you find the best solution.

Our new **Satcom Modems** increases our Technical lead even more over competitors:

1. **RADITEK Micra™**, Small form factor (255mm x 184mm) single board modem; With L-band operation IF(950MHz to 2050MHz); Data rates 4.8Kbps to 60Mbps; TCP, IP acceleration, compression, IP routing, bridging, traffic shaping, ACM and throughput diagnostic graphs; DVB-S2, low-latency LDPC and other FEC options up to 64QAM modulation. Now with 5% spectral roll-off factor; 24 Volt (30W) input power supply. An Ideal solution for Man pack and transportable applications.
2. **RMOD-DREAM™** has been introduced to support 16Kbps to 12Mbps (TPC) and to 20Mbps (Advanced LDPC) data rates as standard. Ideal tracking modem to work with our IOTM (Internet on the move) antennas. BPSK , QPSK, 8PSK and 16QAM standard
3. **RADITEK Extreme™** Multi IF band support: (70M/140MHz and L-band); Data rates 18Kbps to 155Mbps; DVB-S2-/ACM, to 16APSK. LDPC/BCH, TPC FEC options; Terrestrial interface options including Ethernet: EIA-530, G.703 (balanced & unbalanced), OC-3, STM-1, Serial LVDS, ASI, HSSI, Quad E1, Modulation up to 64QAM Simu-Carrier™ option (reusing uplink frequencies); Uplink Power control (AUPC); Signal-under-carrier™ real time interferer detection tool.



**Plus we have a full range of low to high power BUCs and SSPAs, with LNAs and LNBs.**

4. **Plus TWTAs (Traveling wave Tube Amplifier) EG: RTWTA-5.850-6.425G-1KW-RL-n6** (right). A C-band, high efficiency, 2.25KW multi-stage depressed collector TWT. Limited to 1KW maximum LINEAR power with even more efficient power supplies- to give lower cost, better efficiency. The unit includes RF gain control and a solid state pre-amplifier, RF filters, cooling, and monitoring and control (M&C) systems.
5. **Plus our NEW, LOW COST, 5.8, 7, 10.5/11, 13 and 23GHz, licensed band, LOW COST, Carrier class, point to point Radios.** To 120Mbps, IP and/or up to 60 x E1. EG.: **RTR-P2P-13G-60E1+IP120M-LC-g16™**



6. We have expanded our last mile radio product range too, in unlicensed bands: 2.4GHz and 5.8GHz, for example.



# DAMA / SCPC / Router /Satellite Modem RMOD-DREAM-2IP4-j8



## FEATURES

- Ideal tracking modem to work with our IOTM (Internet on the move) antennas
- BPSK , QPSK, 8PSK and 16QAM standard
- 16Kbps to 12Mbps (TPC) and to 20Mbps (Advanced LDPC) data rates as standard
- The modem also has a DVB-S2 receive card option.
- Has both static and dynamic internet routing to make it an ideal modem for any internet network applications
- Ideal for SCADA, Bank ATM, any IP based network, in STAR and/or MESH configurations. It has the most efficient return channel for DVB-S2/broadband networks.
- WEB GUI with traffic statistics

The RADITEK RMOD-DREAM-2IP4 DAMA / SCPC / Router / Satellite Modem is capable of normal, standalone SCPC operation and DAMA/ABOD (Demand Assigned Multiple Access./Adaptive Bandwidth On Demand), router operation. It can realize up to over 95% Satellite efficiency.

The RADITEK RMOD-DREAM-2IP4 High Performance, IP Modem is designed for IP networks to 20Mbps/16QAM/LDPC OR to 12Mbps/16QAM/TPC. It is capable for multiple 2-way services and is ideal for all general purpose SCPC operation OR MESH and multi-STAR/MESH DAMA based small to large networks, with carrier rate adaptability to match real time IP traffic.

The DAMA system uses an on-Demand, in-bound, Composite TDM Carrier, using Contention Access, Shared Slotted Aloha (CSC-IB) using only 24/48 Kbps for nitial network entry and to initiate DAMA activation for SCPC / MCPC Inbound Carrier for IP traffic services. The network uses, “Packet Switched Multiple Access”, (PSMA) with Adaptive Bandwidth-On-Demand (ABOD). Applications in MCPC mesh connectivity are particularly suitable for real time traffic such as voice and multicasting videoconference.

When used in the Networking Mode, there are efficient simultaneous links to multiple sites including network hub, remotes, and remote center sites located at end user sites. The ability to connect to two or more central sites allows traffic routing between corporate branches and headquarters directly and traffic bypasses the hub.

## DAMA / SCPC / Router /Satellite Modem RMOD-DREAM-2IP4-j8

Specifications for RADITEK DREAM-2IP4 DAMA/SCPC/Router/Satellite modem:	
IP Features and Routing Function	Outbound Carrier
Intranet/Internet, Multicast, TCP Acceleration, VLAN, DNS Caching	Proprietary TDM with PSMA, or SCPC/MCPC
Supports standard & Customized QoS traffic Prioritization Protocols: TCP, UDP, RIP, ARP, DHCP, ICMP, IGMP, Telnet, PPP, FTP, HTTP, SMTP, and SNMP	BPSK; QPSK, 8PSK, 16QAM Modulations
Interface	Turbo Product Code (TPC) rates: ~1/2, ~3/4, ~7/8
RJ-45, 10/100 Base T Ethernet Interface RS-232 Asynchronous Serial Interface to ACU	LDPC Code rates: 1/2, 2/3, 3/4, 4/5, 8/9
AC Power, IEC-320 Interface 85-264 VAC 47-63Hz, 150W	Carrier Data Rate 16 Kbps to 12 Mbps (TPC) Carrier Data Rate 16 Kbps to 20 Mbps (LDPC)
48VDC @ 2.8A optional	1.20 or 1.30 Symbol Rate Carrier Spacing Options
Mechanical	Inbound Carrier
Dimensions: 43 x 286 x 432 mm Rack Mount Unit	SCPC / MCPC with ABOD for IP traffic
Weight: 4.0 Kg	BPSK, QPSK, 8PSK, 16QAM Modulation
Environmental	Turbo Product Code: 1/2, 3/4, 7/8 Rates
Operating temp.: 0 to +45°Centigrade	LDPC Code: 1/2, 2/3, 3/4, 4/5, 8/9
Storage temp.: -30 to +70°Centigrade	Inbound Carrier rate adaptable to match actual site traffic
Humidity: Up to 95 % non-condensing	Spacing Options: 1.20 or 1.30 Symbol Rate Carrier
RECEIVE IF interface	TRANSMIT IF Interface
Receive: 950-1850 MHz L-band with 2.5 KHz steps; +24 VDC @ 0.3A and 10 MHz	Transmit: 950-1850 MHz L-band with 2.5 KHz steps +24 VDC @ 2.7A and 10 MHz
Reference @ 5 dBm/5 x 10E-8	Reference @ 5dBm/5 x 10E-8
Connector: Type N (f) 75Ω.	Connector: Type N (f) 75Ω.
Level: -75 to - 35 dBm	Level: -45 to -0 dBm in 0.5 dB steps
Option : ESA Embedded Network Spectrum Analyzer	
Option : HSR High Stability Reference Clock	

Contact Raditek for your entire C, X, Ku, Ka band BUCs, TRANSCEIVERS, Antennas (tracking/flyaway (Carbon fiber reflector), Manpack and large steerable/trackable antennas, to >16m AND our Internet on the move tracking antennas (Ku band IOTM, as shown on page 1).



# DVB-S2 Modulator Satellite Modem

## 80Mbps, RMOD-DVB-S2-80Mbps-p3



### Overview

The RMOD-DVB-S2-80Mbps-p3- is an 80Mbps DVB-S2 (Digital Video Broadcast) satellite modulator (also available as a modem). ASI and Gigabit Ethernet interfaces are supported.

### Features

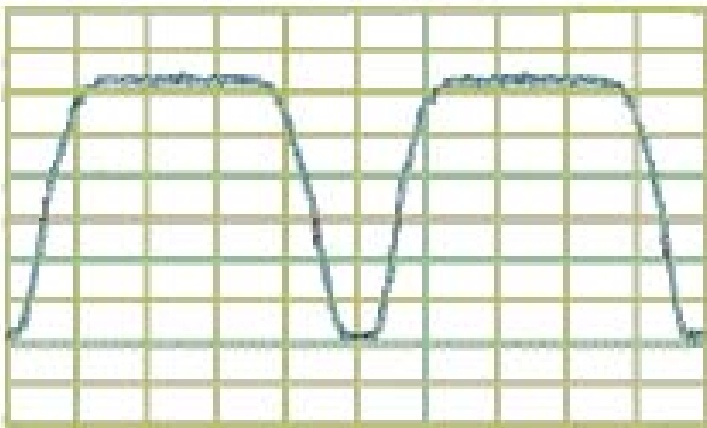
- DVB-S2 (EN 302 307) Tx to 45Msps, Rx to 37.5Msps
- DVB-S2 Constant Coding and Modulation (CCM)
- DVB-S2 Variable Coding and Modulation (VCM) supporting up to 2 ASI streams optionally multiplexed with IP traffic and IP M&C
- DVB-S2 Adaptive Coding and Modulation (ACM) for point-to-point operation
- DVB-S (EN 300 421), DVB-SNG (EN 301 210) operation to 40Msps
- IF Frequency range of 50 to 90MHz and 100 to 180MHz

### Simu carrier bandwidth re-use

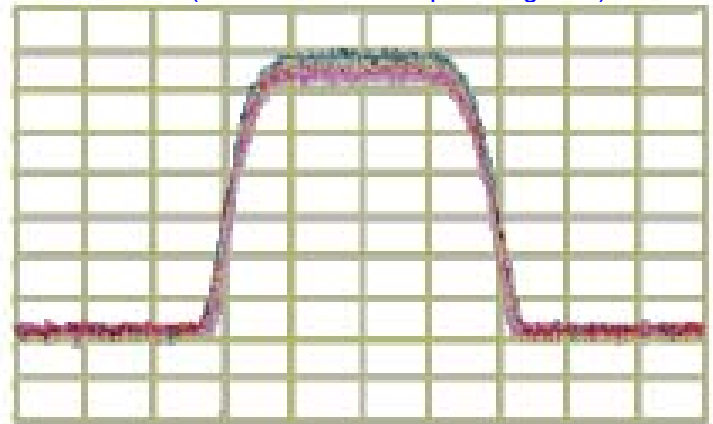
- **Inner** (Forward Error Correction) **FEC**: Viterbi1, (Trellis Code Modulation) TCM and (Low Density Parity Code) **LDPC**
- **Outer FEC** options of concatenated (Reed-Solomon) **RS** and (Bose-Chaudhuri-Hocquenghem) **BCH** coding.
- ASI and Gigabit Ethernet traffic options
- Rich IP feature set including routing, bridging, HTTP and TCP Acceleration, Header/Payload Compression, DHCP, IEEE 802.1p QoS, IEEE 802.1q VLAN, traffic shaping and diagnostic graphs. IP over DVB encapsulation supports MPE, ULE and most efficient RADITEK RXE (<2% efficient) standards.
- IPv6 compliant
- Compact 1U chassis

### Simu carrier Operation

Simu carrier Disabled



Simu carrier Enabled  
(Can save 50% on space segment)



## Digital Video Broadcast satellite RMOD-DVB-S2MOD-80Mbps-p3

<b>Main Specifications</b>	
Frequency (IF)	50 to 90MHz & 100 to 180MHz (resolution 100Hz) (BNC connector)
Data Rate	DVB-S2: 50kbps to 100Mbps DVB-S/DSNG: 4.8kbps to 100Mbps 1bps resolution
Symbol Rate	DVB-S2 Tx: 100ksps to 45Msps; DVB-S2 Rx: 100ksps to 37.5Msps; DVB-S/DSNG: 9.6ksps to 40Msps
IF port Impedance	50Ω/75Ω
IF port Return Loss	~18dB typical
Frequency Reference Stability	<1ppm/yr
External Reference	Clocking only: 1 to 10MHz; 1kHz steps Clocking and RF frequency: 10MHz, 0dBm±1dB
<b>Traffic Interfaces</b>	Traffic options: Ethernet (10/100/1000 BaseT) IP traffic on RJ45 with processing capability of 50,000 packets per second Quad ASI on 75Ω BNC female
<b>Modulator</b>	
Output Power	0 to -25dBm (0.1dB steps)
Output Power Stability	±0.5dB, 0°C to 50°C
Transmit Filter Roll-off	20%, 25%, 35%
Phase Accuracy	<±2°
Amplitude Accuracy	<±0.2dB
Carrier Suppression	>-30dBc
Output Phase Noise	As IESS-316, to 3dB better
Harmonics	> -55dBc/ 4kHz in band
Spurious	> -55dBc/ 4kHz in band
Transmit On/Off Ratio	>55dB
<b>Demodulator</b>	
Input Range	Minimum: -115+10 log (symbol rate) Maximum: -80+10 log (symbol rate)
Maximum Composite Signal	< 20dB above the level of the desired input signal up to a maximum of 0dBm
Frequency Sweep Width	±1kHz to ±32kHz up to 10 Msps (1kHz steps) ±10kHz to ±250kHz above 10 Msps (10kHz steps)
Acquisition Threshold	<5dB Es/No QPSK
Acquisition Time	Dependent on FEC, data rate and sweep width, eg: At 9.6kbps, < 1s at 6dB Es/No QPSK; at 10Mbps, < 100ms at 6dB Es/No QPSK.
Clock Tracking Range	>±100ppm minimum
Receive Filter Roll-off	20%, 25%, 35%
Performance Monitoring	Eb/No (range 0-15dB, ±0.2dB) Frequency offset (100Hz resolution) Receive signal level Buffer fill status
AGC Output	Buffered direct AGC output for antenna tracking, etc.
<b>Forward Error Correction</b>	
Modulation	DVB-S2: QPSK, 8PSK, 16APSK, 32APSK
	DVB-S: QPSK DVB-DSNG: 8PSK, 16QAM
FEC	<b>DVB-S2</b> (LDPC/BCH): QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 (note 32APSK is supported for Tx only)
	<b>DVB-S</b> : QPSK 1/2, 2/3, 3/4, 5/6
	<b>DVB-DSNG</b> : 8PSK 2/3, 5/6, 8/9; 16QAM 3/4, 7/8

<b>DVB-S2 Performance at PER 1e-6 Guaranteed Es/No (dB) for Short (16k) frames</b>											
Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate
1/4	1/3	2/5	1/2	3/5	2/3	3/4	4/5	5/6	8/9	9/10	
QPSK	-1.3	-0.4	0.5	1.9	3.0	3.5	4.4	5.2	5.6	6.7	
8PSK					6.5	7.3	8.6		9.9	11.2	11.3
16APSK						9.8	11.1	11.7	12.3	13.5	

## Digital Video Broadcast satellite RMOD-DVB-S2MOD-80Mbps-p3

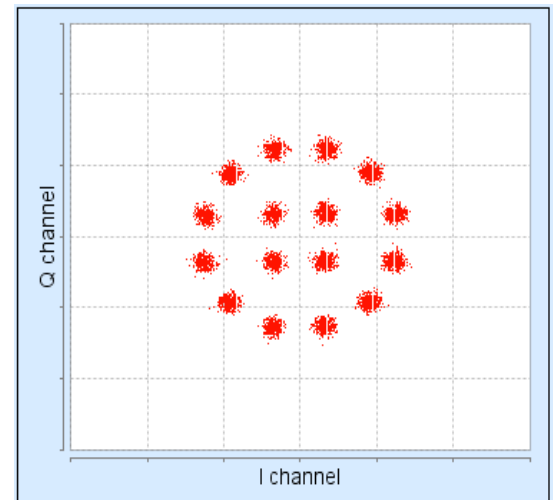
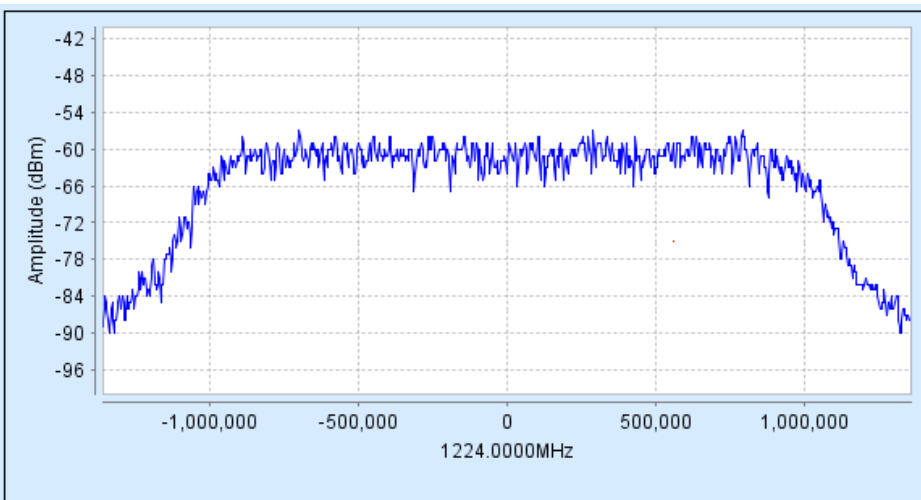
DVB-S2 Performance at PER 1e-6 Guaranteed Es/No (dB) for Normal (64k) frames										
Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate
1/4	1/3	2/5	1/2	3/5	2/3	3/4	4/5	5/6	8/9	9/10
QPSK	-1.6	-0.7	0.3	1.5	2.8	3.4	4.3	5.0	5.5	6.5
8PSK					6.4	7.2	8.6		9.8	11.0
16APSK						9.7	10.8	11.6	12.2	13.4

Simu carrier	
<b>Simu carrier</b>	Transmit and receive carriers use the same frequency/bandwidth. Digital cancellation techniques are used in the demodulator to recover the required receive carrier signal
<b>Simu carrier</b> data rate options:	512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps and 25Mbps traffic rate
Allowable power asymmetry:	-10dB to +10dB
Allowable symbol rate asymmetry:	Up to 12:1
Eb/No degradation	Typically < 0.5dB (0.7dB for 16QAM/16APSK with up to 10dB power difference)
Mobile Operation:	Uses GPS data to continually recalculate position relative to satellite, allowing uninterrupted operation in mobile environments (ships, etc.)
Ruggedization	
Ruggedization Option	For modems operating in hostile/harsh environments, the external fan is replaced with two heavy duty fans with greater airflow. Heatsinks are added to critical components to improve dissipation of heat. Improved internal cable assemblies to reduce any problems due to vibration. Internal operating temperature of the modem is lowered by several degrees, so less stress to the electronic components and increased mean time between failure (MTBF).
Ethernet Traffic	
Throughput Performance	The maximum modem through-put depends on IP traffic format and the features enabled. Bridged IP/UDP data can be processed up to the modem maximum data rate. Please seek assistance from Raditek to help evaluate your specific requirements.
Routing and Bridging	Bridging (standard). Static routing (standard). Dynamic routing option: RIP V1, V2; OSPF V2, V3; BGP V4
TCP Acceleration Option	Typical throughput level of 90% of link capacity. IP Traffic card option: Supports 5,000 concurrent accelerated TCP connection limit (plus at least 35,000 unaccelerated TCP connections) up to the modem maximum data rate. IP Traffic card includes HTTP Acceleration (reduces web page download times)
Header Compression Option	IP Traffic card option. Robust Header Compression to RFC 3095. Reduces Ethernet/IP/UDP/RTP header sizes typically by 90%. 1-way packet processing limit: 60,000 pps; 2-way limit: 45,000 pps. Includes Ethernet header compression (compresses a 14-byte Ethernet frame to typically one byte)
Payload Compression Option	Deflate algorithm (RFC 1951) compresses all TCP/IP packets (TCP and UDP), typically giving a compression of 50%
Traffic Shaping Option	Guaranteed throughput levels for IP streams, using Committed Information Rate and Burst Information Rate settings. Stream differentiation is by IP address, IEEE 802.1p priority class, Diff serv DSCP class or MPLS EXP field
Encryption Option	Encrypts all IP traffic using AES with 256 -bit keys
IPV6	Provided as standard. Dual IPV4/IPV6 TCP/IP stack allowing use of both IPV4 and IPV6 addresses for bridging and routing of traffic
VLAN Support	
	IEEE 802.1q VLAN support (standard)
	IEEE 802.1p Quality of Service (packet prioritization) using strict priority or fair weighting queuing
DHCP, SNMP	DHCP (standard) for automatic allocation of M&C IP address. SNMP (standard) v1, v2c and v3
Web Server	Embedded web server M&C interface (standard)
IP Diagnostic Graphs	Shows Tx, Rx throughput (bps, pps); dropped, packet error counts (standard)
Operating mode	Can be operated in standalone, 1:1 or 1:N redundancy configuration.
IP over DVB	<b>Encapsulation Option</b> : Supports encapsulation/decapsulation of MPE, ULE and Raditek (2% overhead) RXE
DVB-S2 IP Multi-streaming	Point-to-multipoint CCM and VCM multi-streaming. VCM allows the FEC error correction to vary for each remote
DVB-S2 ACM Option	Dynamically varies mod-cod with varying link conditions, maximizing throughput at all times by converting excess link margin capacity into additional throughput



## Digital Video Broadcast satellite RMOD-DVB-S2MOD-80Mbps-p3

Mechanical/Environmental	
Size	1U chassis – 410mm deep, excluding front panel handles and rear panel connectors and fans
Weight	3.5kg
Power Supply	100-240VAC, +6%, -10%, 1A @100V, 0.5A @ 240V, 47-63Hz Fused IEC connector (live and neutral fused) -48Volts DC option
Safety Standards	EN60950-1
Emission and Immunity	EN55022 Class B (Emissions) EN55024 (Immunity)
Operating Temperature	0 to 50°C
Humidity	95% relative humidity, non-condensing
Compliance	FCC, CE and RoHS compliant
Alarm Relays	4 Independent Form C relays for unit, Tx, Rx and backward alarms



Built in receive spectrum analyzer and receive constellation display for channel diagnostics.

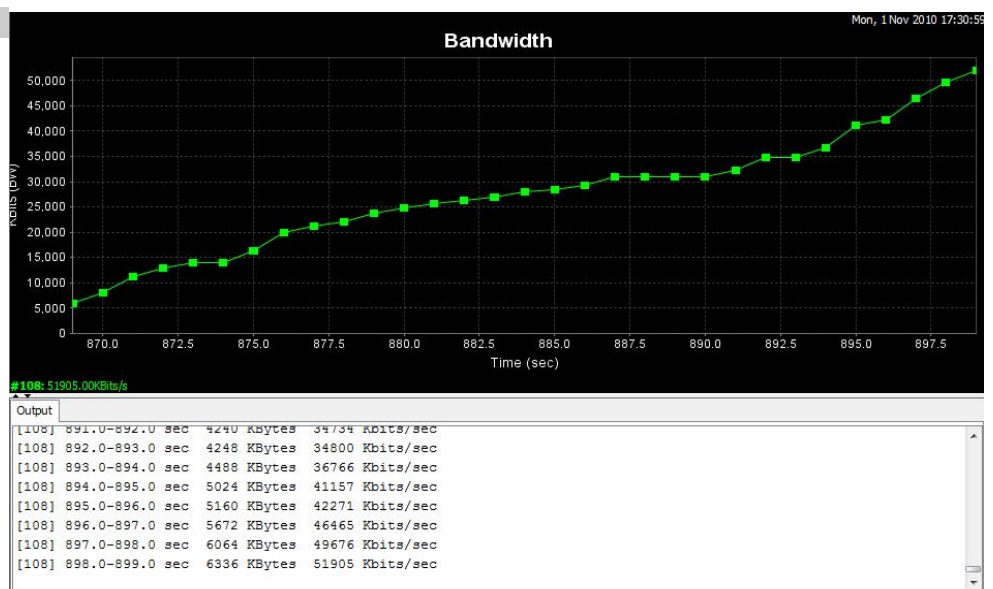
### Adaptive Coding and Modulation (ACM)

Modulation and coding can automatically and progressively be reduced to recover  $E_b/N_0$  when the link becomes compromised to rain fade etc.

Or by changing the error correction to match worsening atmospheric conditions, link margin is converted into useful bandwidth. Modulation and FEC rate (mod-cod) are dynamically matched to the current  $E_s/N_0$ .

The symbol rate is kept constant, changing the terrestrial data rate up or down with  $E_s/N_0$ .

Changes in mod-cod are transparent at the receiver, and throughput increases of up to 100% have been reported.



## Digital Video Broadcast satellite RMOD-DVB-S2MOD-80Mbps-p3

	Description
IF Base Modem description.	With Filter roll-off factors: 20%, 25%, 35% Wideband IF: 50-90 MHz & 100-180MHz in 100Hz steps PID filtering and monitoring Remote web browser based monitoring tools (Spectrum Display, Constellation Monitor and link performance versus time). SMTP email client for status notification SNMP v1, v2c & v3 for modem M&C DHCP allowing IP address to be allocated dynamically via external DHCP network server - <b>DVB options must be selected below</b> :
DVB-S TX	Transmit DVB-S compliant (to EN300421) to 40Msymbol/s. QPSK modulation, provides Viterbi FEC Rates 1/2, 2/3, 3/4, 5/6, 7/8 and Reed-Solomon Outer FEC
DVB-S RX	Receive DVB-S compliant (to EN300421) to 40Msymbol/s. QPSK modulation, provides Viterbi FEC Rates 1/2, 2/3, 3/4, 5/6, 7/8 and Reed-Solomon Outer FEC
DVB-DSNG TX	Transmit DVB-DSNG compliant to EN301210 to 40Msymbol/s. 8PSK and 16QAM modulation Includes DVB-S TX
DVB-DSNG RX	Receive DVB-DSNG compliant to EN301210 to 40Msymbol/s. 8PSK and 16QAM modulation Includes DVB-S RX
DVB-S2 CCM TX	Transmit DVB-S2 compliant to EN302307 (excluding 32APSK) to 37.5Msymbol/s with Constant Coding and Modulation (CCM) mode Includes DVB-S TX and DVB-DSNG TX
DVB-S2 CCM RX	Receive DVB-S2 compliant to EN302307 (excluding 32APSK) to 37.5Msymbol/s with Constant Coding and Modulation (CCM) mode Includes DVB-S RX and DVB-DSNG RX
DVB-S2 VCM Multi-streaming	Variable Coding and Modulation (VCM) allows multiplexing of up to 2 ASI streams with IP traffic and IP M&C onto a single carrier, with per stream selection of modulation, FEC rate, DVB-S2 frame size and pilots
DVB-S2 ACM TX	Requires DVB-S2 CCM TX. (Note that ACM RX operation is free of charge subject to the modem having the DVB-S2 CCM RX feature enabled.)
DVB-S2 32APSK Tx	To add support for DVB-S2 32APSK to TX (DVB-S2 32APSK for RX is not currently supported)
Traffic Interface Hardware Options	IP Traffic card with Ethernet Bridge and static routing as standard. Includes HTTP Acceleration (by pre-fetching web page inline objects to reduce web page download time). Includes TCP Acceleration up to 16,896kbps
	Quad ASI card. Supports both 188 and 204 byte MPEG2 TS packets. Use of multiple ports is subject to other features purchased
IP Traffic Card Options	To Add TCP acceleration up to 25Mbps on IP Traffic card - requires IP Traffic card
	To add TCP acceleration up to 55Mbps on IP Traffic card, subject to prevailing data rate limits - requires IP high capacity card and requires 25Mbps acceleration option .
	To add Robust Header Compression to RFC 3095 and RFC 4815 (IP/UDP/RTP), plus RFC 4995 and RFC 4996 (IP/TCP) at throughput rates to 29kppts/s (1-way), 22kppts/s (2-way); includes Ethernet header compression - requires IP Traffic card
	To add Encapsulation of IP packets and Ethernet frames over DVB uses RADITEK Protocol (RXE), Multi Protocol Encapsulation (MPE) or Ultra Lightweight Encapsulation (ULE) protocols, includes Static Routing - up to 64 static routes
	To add Dynamic Routing, supports RIP, OSPF and BGP plus 64 static routes
	To add IP Traffic Shaping: Supports allocation of CIR and BIR plus priority for IP Streams identified by IP Address, Diff serv Class, IEEE 802.1p priority tag or MPLS EXP field
Quad ASI Card Option	To add Multi-stream ASI support, requires DVB-S2 and Quad ASI card
AUPC	To add end-to-end AUPC operation only when IP Traffic used - requires TX and RX operation and IP Traffic card Adds self maintain AUPC operation for IP or ASI Traffic - requires TX and RX operation
48V DC Input	-48V DC Primary power input in place of 100-240V AC input
FSK Control Option on IF (hardware option)	Allows monitor & control of a compatible Transceiver from the Modem, via the Tx IFL.
<b>Simu carrier</b> Minimum occupied BW limit of 25kHz, and maximum occupied band-width limit of 36MHz .	<b>Simu carrier</b> Ready, allows Tx and Rx carriers to occupy the same satellite bandwidth. (hardware and S/W option) - requires additional cumulative software options.
Ruggedization	Adds extra ruggedization for hostile environments

NOTE: Raditek reserves the right to change/improve specifications of features described in this document at any time, without notice and without obligation to notify any person of such changes. Refer to the website or contact Sales or Customer Service for the latest product information.

# Advanced SCPC Satellite Modem

70/140MHz or L-band, 220V AC, IP, E1, T1, Data

RMOD-SCPC-(2-20Mb)\*-70/140MHz/L-p3

\* 2Mb (optionally expandable to 20Mbps) data rate,

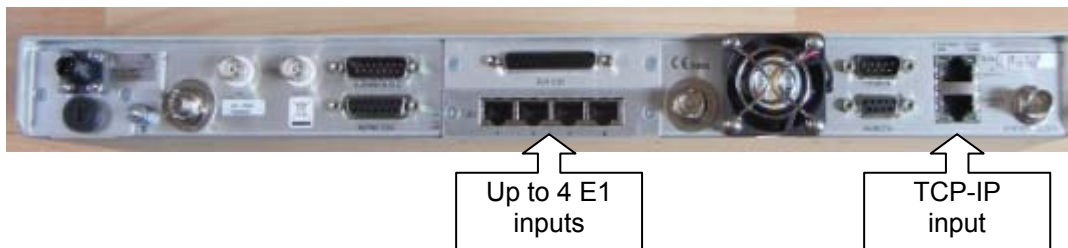


**OPTIONS Available:**

- Data rate is from 2Mbps to a maximum of 20Mbps,
- 10Msymbol/s maximum for 8PSK (and above) and DVB-S2.
- IBS, IDR, E1/E0 Drop & Insert...
- DVB-S2 FEC and modulation support...
- Ethernet.
- Various traffic/terrestrial interfaces
- AUPC (Automatic Uplink Power control)
- Quad(4) E1 cards allowing up to 4 x E1s to be multiplexed onto a single carrier
- IF interfaces include: 70MHz or 140MHz or L-band, and special IF combinations
- SCPC (Single Channel per carrier)
- DVB-S2 outbound with SCPC return, or SCPC outbound with DVB-S2 return.
- Or SCPC outbound and return.
- Hybrid mode where Tx/Rx SCPC features are combined with DVB-S2 space segment savings.
- All traditional SCPC features are supported including IBS, IDR, ESC, Drop & Insert, AUPC, etc.
- 48 V DC Power Supply

**Raditek can also offer other state of the art modems to support SCPC with DAMA, ABOD (automatic bandwidth on demand) with MESH and/or STAR networks-all with sophisticated NMC software support.**

The **Multi-E1/IP** option is a very useful way to combine up to 4x E1 (balanced/G.703) inputs or 3XE1 and an IP input, simultaneously, for transmission on one satellite channel. There is no other way to send IP and E1 at the same time on this modem.



**Part Number:** RMOD-SCPC-(2-20Mb)\*-70/140MHz/L-p3

**Description:** High Performance Satellite Modem: SCPC 70/140MHz or L-band, 220V AC, IP, E1, T1, Data

\* 2Mb (optionally expandable to 20Mbps) data rate,

**Options**   Data Rate   DVBS2   Simu Carrier   Modulation   SCPC   LDPC+

*If IP is used, an IP accelerator is recommended, either as an option within the modem or a third party external one. The data rate is limited, otherwise, due to the satellite propagation delay.*

*The maximum data rate when using the MUX option is limited, at any port to 2Mbps. Without any IP accelerator you may not see data rates above 200Kbps on the IP channel.*

*All E1 MUX options include: Drop and Insert and full E1 setup. Supports Extended Drop and Insert with 1-31 timeslots Requires IBS/SMS option in 4. the host modem. Modem can easily be 1+1 redundancy protected*

## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

Main Specifications	
<b>Modulation Scheme</b>	SCPC: BPSK, QPSK, OQPSK, 8PSK (Optionally: 8APSK, 16QAM) Or DVB-S2 (Option): QPSK, 8PSK, 16APSK
<b>IF Frequency Range</b>	50 - 90MHz (70MHz) & 100 - 180MHz (140MHz)
<b>L-band Frequency Range</b>	950 to 2,050MHz
<b>IF Frequency Resolution</b>	100Hz
<b>Traffic Interface - Electrical</b>	Ethernet (10/100 BaseT) IP Traffic on RJ45 with link and traffic indicators. Electronically selectable with other interfaces fitted.
<b>Traffic Interface - Options</b>	RS422 including X.21 DCE and DTE emulation, V.35 and RS232 on EIA530 connector 25 pin female D-type (Option), EIA530 maximum 10Mbps, RS232 max 100kbps Serial LVDS 25 pin female D-type (Option) HSSI 50 pin HD SCSI-2 connector (Option) G.703 balanced on EIA530 <b>G.703 unbalanced on BNC female 75Ω</b> <b>Quad E1 G.703 balanced on RJ45</b> IP Traffic card 10/100/1000 BaseT on RJ45 <b>Mux option allows a mix of multiple G.703 interfaces plus IP and/or EIA530 traffic with a limit of 2,048kbps per MUX traffic to 4 ports max.</b>
<b>User Traffic Data Rate</b>	SCPC: 4.8kbps – 2,048kbps in base Modem DVB-S2 50kbps – 2,048kbps in base Modem, subject to minimum symbol rate of 100ksymbol/s Extension of base operation to 5Mbps (Optionally to 10 and 20Mps)
<b>User Traffic Data Rate Resolution</b>	1bps <b>Note:</b> The combination of FEC Rate, Modulation scheme and Satellite Overhead limits the Traffic Data Rate Range in all modes.
<b>User Data Rate Range – Closed Network</b>	4.8kbps to 20Mbps no Satellite Overhead (with high Data Rate options)
<b>User Data Rate Range – Minimum Overhead (Closed Network plus ESC)</b>	As Closed Network above except limits inclusive of overhead of approximately 1.4 times the ESC baud rate. Resolution of 1bps. Supports ESC rate from 110 baud to >38.4kbaud.
<b>Outer Forward Error Correction</b>	Concatenated Intelsat Reed-Solomon Outer Codec to IESS308/310 with Custom Option offering variable code rate. Maximum traffic rate 10Mbps.
<b>Scrambling – SCPC Closed Network Plus ESC</b>	32kbps or above: synchronized to ESC overhead. Less than 32kbps: as per closed network. V.35 Scrambler has CCITT, Intelsat, “FDC” and “Linkabit” modes up to 20Mbps (with high Data Rate options)
<b>IF Connector type</b>	BNC female
<b>IF Impedance</b>	50Ω & 75Ω, electronically selectable
<b>Return Loss</b>	18dB typical
<b>Internal Frequency Reference - Ageing</b>	<1ppm/yr
<b>External Reference</b>	Clocking Only: 1-10MHz in 1kHz steps. Clocking and RF Frequency: 10MHz, 0dBm±1dB

## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

BER Performance -Guaranteed dB (Typical)						
SCPC mode		Rate 1/2	Rate 3/4	Rate 7/8	Rate 2/3	Rate 0.93
Viterbi QPSK	1E-4	4.7 (4.4)	6.1 (5.8)	7.1 (6.8)		
	1E-8	7.2 (6.9)	8.8 (8.5)	9.5 (9.2)		
Sequential (64kbps)	1E-4	4.3 (4.0)	5.4 (5.1)	6.4 (6.1)		
	1E-8	6.4 (6.1)	7.3 (7.0)	8.6 (8.3)		
Sequential (2048kbps)	1E-4	5.6 (5.3)	6.1 (5.8)	6.9 (6.6)		
	1E-8	7.5 (7.2)	8.1 (7.8)	8.4 (8.1)		
Turbo (TPC) QPSK	1E-4	2.7 (2.4)	3.5 (3.2)	4.1 (3.8)		
	1E-6					6.3 (6.0)
	1E-8	3.3 (3.0)	4.5 (4.2)	4.5 (4.2)		6.8 (6.5)
Turbo (TPC) 8PSK	1E-4		5.6 (5.3)	6.8 (6.5)		
	1E-6					9.2 (8.9)
	1E-8		6.8 (6.3)	7.2 (6.8)		9.9 (9.6)
Turbo (TPC) 16QAM	1E-3		6.5 (6.2)	7.7 (7.4)		
	1E-6					10.0 (9.7)
	1E-7		7.8 (7.5)	8.2 (7.8)		
	1E-8					10.7 (10.4)
8PSK/TCM	1E-3				6.3 (6.0)	
	1E-8				10.4 (10.1)	
8PSK/TCM + Reed-Solomon (all rates)	1E-4				6.1 (5.8)	
	1E-10				7.3 (7.0)	

Modulator Specifications	
Output Power Level	0 to -25dBm Continuously Variable in 0.1dB steps
Output Level Stability	±0.5dB, 0°C to 40°C
Transmit Filtering Selectable	Intelsat IESS and DVB-S2
Occupied Bandwidth	compliant $\alpha = 0.35$ <span style="margin-left: 150px;"><math>\alpha = 0.25</math></span> <span style="margin-left: 50px;"><math>\alpha = 0.20</math></span>
Recommended Channel Spacing	1.2 x Symbol Rate <span style="margin-left: 150px;">1.13 x SR</span> <span style="margin-left: 50px;">1.1 x SR</span>
Phase Accuracy	1.4 x Symbol Rate <span style="margin-left: 150px;">1.27 x SR</span> <span style="margin-left: 50px;">1.2 x SR</span>
Amplitude Accuracy	±2° maximum
Carrier Suppression	±0.2dB maximum
Output Phase Noise	-30dBc minimum
Output Frequency Stability	As IESS-308, nominally 3dB better.
Harmonics	<1ppm/yr
Spurious	Better than -55dBc/ 4kHz in band
Transmit On/Off Ratio	Better than -55dBc/ 4kHz in band
External Transmit Inhibit	55dB minimum
Adaptive Signal Predistorter	By external contact closure or by TTL signal applied to rear panel Alarms & AGC connector
	Option: Use with 16QAM to reduce HPA backoff to 1.6dB.

Demodulator Specifications	
Input Range	-30 to -60dBm
Maximum Composite Signal	30dB above level to a maximum of 0dBm

## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

### Demodulator Specifications

Frequency Acquisition Range	Selectable from $\pm 1\text{kHz}$ to $\pm 32\text{kHz}$ up to 10 MSPS (in 1kHz steps) $\pm 10\text{kHz}$ to $\pm 250\text{kHz}$ above 10 MSPS (in 10kHz steps)
Acquisition Threshold	<5dB Es/No QPSK
Acquisition Time	At 9.6kbps, less than 1s at 6dB Es/No QPSK At 10 Mbps, less than 100ms at 6dB Es/No QPSK
Clock Tracking Range	$\pm 100\text{ppm}$ minimum
Receive Filtering Selectable	Intelsat IESS compliant $\alpha = 0.35$ , $\alpha = 0.25$ , $\alpha = 0.20$
Performance Monitoring	Measured Eb/No (range 0-15dB, $\pm 0.2\text{dB}$ ). Measured Frequency Offset (100Hz resolution). Wanted signal level strength indicator centered on the middle of the Rx Input range.
AGC Output	Buffered direct AGC output for antenna tracking, etc.

### Data Rate Specifications

Modulation/FEC	FEC Rate de facto	Min Data Rate (kbps)	Max Data Rate (Mbps)
BPSK VIT / SEQ	1/2	4.8	5 / 2
BPSK VIT / SEQ	3/4	7.2	7.5 / 2
BPSK VIT / SEQ	7/8	8.4	8.7 / 2
BPSK VIT RS	1/2	4.3	4.4
BPSK VIT RS	3/4	6.4	6.6
BPSK VIT RS	7/8	7.5	7.7
O/QPSK VIT / SEQ	1/2	9.6	10 / 2
O/QPSK VIT / SEQ	3/4	14.4	15 / 2
O/QPSK VIT / SEQ	7/8	16.8	17.5 / 2
O/QPSK VIT RS	1/2	8.6	8.8
O/QPSK VIT RS	3/4	12.8	13.3
O/QPSK VIT RS	7/8	15	15.5
O/QPSK TPC	1/2	9.6	10
O/QPSK TPC	3/4	14.4	15
O/QPSK TPC	7/8	16.8	17.5
O/QPSK TPC	0.93	17.9	18.6
8PSK TCM	2/3	19.2	20
8PSK TCM RS	2/3	17.7	18.3
8PSK TPC	3/4	21.6	20
8PSK TPC	7/8	25.2	20
8PSK TPC	0.93	26.8	20
16QAM TPC	3/4	28.8	20
16QAM TPC	7/8	33.6	20
16QAM TPC	0.93	35.8	20

### Clocking and Buffering Specifications

Clock Integrity	Frequency Locked Loops give phase-hit immune operation even with poor clock sources such as routers etc.	
Tx Clocking <b>SCPC mode</b>	Internal	Standard ( $\pm 1\text{ppm}$ )
	External	Tracking range $\pm 100\text{ppm}/\text{min}$
	Rx Clock	Slaves Tx timing from Rx clock. (Includes full asymmetric operation)

RMOD-SCPC-(2-20Mb)-70-140M-L-p3

Specifications may be subject to change

07/09/13

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## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

Clocking and Buffering Specifications	
Rx Clocking <b>SCPC mode</b>	Buffer Disable Tx Input clock Internal Clock from Satellite Plesiochronous. (Includes full asymmetric operation) Standard $\pm 1$ ppm
Station Reference Inputs	External timing clock (DTE interface only) Station Reference (see below) 75 $\Omega$ BNC female Station Clock Connector, transformer isolated. 1MHz to 10MHz in 1kHz steps (accepts sinusoidal >0dBm or square-wave e.g. G.703 para 10) 120 $\Omega$ RS422 compatible input, 1MHz to 10MHz in 1kHz steps via Async ESC connector NB: When set to 10MHz, the station reference may replace internal reference to all internal circuitry. Unit automatically switches back to internal reference if station reference fails.
Buffer Size	Selectable in 1ms increments from 0ms to 99ms. Automatically adjusted to slip an integer number of terrestrial multi-frame lengths for framed rates. Buffer storage: Maximum buffer size – 256kbytes.

Drop & Insert Option Specifications	
Bearer Types	T1-D4, T1-ESF and E1-G.732
Timeslot Selection	Independent selection of arbitrary timeslots for both Drop and Insert.
Bearer Generation	The terrestrial bearer may be looped through the Drop Mux then Insert Mux, or terminated after the drop Mux and a new blank bearer generated by the insert Mux. The bearer generated within Insert Mux provides full multi-frame and CRC support and may be generated from the Tx clock, station reference, satellite clock or internal reference.
Bearer Backup	In the event that Insert Mux bearer clock is lost, or AIS is supplied, then Insert Mux will switch temporarily to bearer generation mode in order to preserve receive traffic. The backup bearer may be generated from the station reference, satellite clock or internal reference.
Terrestrial CRC	Fully supported, with front panel display of terrestrial error rate based on CRC (T1-ESF and G.732) or Frame Alignment Word errors (all bearer types).
Timeslot ID	The IBS/SMS or Closed Net Plus ESC overhead maintains the identity of individual Drop/Insert timeslots for N=1,2,3,4,5,6,8,10,12,15,16, 20, 24 and 30. (See extended option below).

Extended Drop & Insert Option Specifications	
Timeslot Re-Ordering	Selected timeslots may be independently re-ordered on both Tx and Rx paths.
Multi-Destination	All or only a subset of the received data may be inserted into the terrestrial bearer on the receive path for multi-destination working.
Timeslot ID Maintenance	The IBS/SMS or Closed Net Plus ESC is extended to maintain the identity of individual timeslots for all values of N from 1 to 31.
Signaling	Both Channel Associated Signaling (CAS) and Robbed Bit Signaling (RBS) are fully supported. For G.732 Drop/Insert, CAS signaling is extracted from terrestrial TS16 and carried over the satellite in IBS/SMS TS16 and TS48 before re-inserting into the distant terrestrial TS16. For RBS, the IBS or Closed Net Plus ESC overheads maintain the identity of the in-band signaling and it is re-inserted into the terrestrial multi-frame in the correct positions to maintain the RBS.

Ethernet Traffic Parameter	
Standard (unaccelerated)	Base modem will pass UDP to at least 5Mbps (subject to prevailing data rate limits enabled in the modem) and unaccelerated TCP to typically 128kbps per connection, subject to an overall packet

## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

<b>Ethernet Traffic Parameter</b>	
PEP (TCP/IP acceleration) Option Traffic mode	handling limit of 10,000 packets per second. Performance Enhancing Protocol (acceleration) for TCP/IP traffic - overcomes performance problems associated with TCP over satellite. Maximum throughput on the base Modem 10Mbps. Bridging (standard) for point-to-point operation Brouting (Option) for point-to-multipoint and satellite outbound plus non--satellite return. Mesh network support. User selectable bridge between Ethernet traffic and Ethernet M&C port.
DHCP	Dynamic Host Control Protocol allows modem IP address to be allocated dynamically from an external DHCP network server.
Ethernet Header Compression	Compression of Ethernet frame headers at data rates up to 2Mbps. Typically reduces 14 byte Ethernet header to 1 byte.
IEEE 802.1p/q	IEEE 802.1p Quality of Service supporting the choice of strict priority queuing or fair weighting queuing. IEEE 802.1q VLAN support

Aux Port	IDR	Synchronous access to 8kbps IDR ESC. With the Async ESC option, async ESC access to the 8kbps IDR ESC is provided giving up to a 9600 baud async channel
	Others	IBS and Closed Net Plus ESC facilities as before installation of IDR option, but now on ESC port on IDR card not shared ESC/Aux port of base unit.
	RS232 or RS422	(user selectable). Provides clock and data lines.
	IDR	Provides 32 or 64kbps access in place of one or both audio ESC channels.

<b>AUPC Specifications Parameter</b>	
Modes of Operation	Monitor of distant Eb/No and BER only, full distant Eb/No maintenance. Unidirectional or Bi-directional operation.
Communication Link	Utilizes asynchronous ESC channel on IBS/SMS, IDR and Closed Network plus ESC carriers (ESC from 300 baud, i.e., overheads down to less than 1%). Maximum data rate 10 Mbps
User Parameters	Target Eb/No, positive power offset, negative power offset



## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

<b>BERT Tester Option Specifications</b>	
BER Channel	The BERT may operate through main traffic, ESC or Aux data channels, or outputted via the terrestrial interface. Use of ESC & Aux data channels allows continuous real traffic BER performance monitoring whilst the modem carries traffic.
Test Patterns	PRBS 2 <sup>N</sup> -1: N=6, 7, 9, 11, 15, 19, 20, 23. All 1s, All 0s, Alternate Patterns, Sparce Patterns, QRSS, User. Compatible with common stand-alone BER testers.
Results	Display of error count and average BER.
Autolog	Automatic logging of average BER and other parameters at regular intervals.

<b>General Specifications</b>	
Loop-backs	Interface Loop (Local and Remote) Framer Loop (Local) RS Loop (Local) FEC Loop (Local) Deframer/Framer Loop (Remote) Internal IF loopback (local, automatically matching Rx IF frequency to Tx)
Test Modes	Transmit CW (Pure Carrier) Transmit Alternate 1-0 Pattern Wideband spectrum analyzer display EZ Audio: 1kHz test tone on audio channels in IDR and P1348 emulation modes
Alarm Relays	4 Independent Change-Over Contacts: Unit Fault, Rx Traffic Fault, Tx Traffic Fault, Deferred Alarm (backward alarm, BER or Eb/No below user set threshold)
Controller	Motorola PowerPC
Embedded Software	Revised embedded software may be downloaded into FLASH memory via Ethernet port with modem remaining in equipment rack.
Configuration Memories	>20 configurations can be stored and recalled from the front panel or remote M&C. Memories can be labeled with text string to aid identification.
User Interface	Clear and intuitive operator interface with plain English dialogue (other languages supported). Graphic display, backlit, high contrast, wide angle LCD. 17 key tactile full keyboard.
Remote Monitor And Control	For multi-drop applications, RS485 interface. For direct to PC applications, RS232 interface (front panel selectable). M&C port may be directly internally linked to ESC port for "over-the-satellite" M&C without cabling. Ethernet (10/100 Base T) via RJ45, embedded Web server, SNMP agent V1, V2c and V3
Redundancy Features	1:1 redundancy controller built in. "Y" cables passively split data maintaining impedances. IF inputs/outputs are passively split/ combined outside the units. Off-line unit tri-states data outputs and mutes Tx carrier.
Monitor	0-10V analogue output (Signal level, Eb/No, or Rx offset frequency) on Alarms & AGC connector.
Mechanical	1U chassis – 410mm deep, excluding front panel handles and rear panel connectors and fans.
Weight	3.5 kg
Power Supply	100-240VAC, +6%, -10%, 1A @100V, 0.5A @ 240V, 47-63Hz.
Safety	Fused IEC connector (live and neutral fused). 48 Volts DC option
EMC	EN60950-1
Environmental	EN55022 Class B (Emissions) EN55082 Part 1 (Immunity) Operating Temperature Range 0-50°C

## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

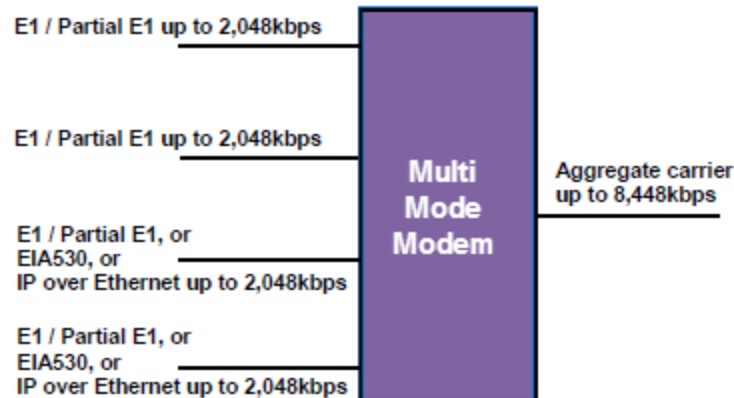
### ODU facilities via IF interface

#### Parameter

FSK Control Option      Allows monitor & control of a compatible Transceiver from the Modem, via the Tx IFL.

A single composite datastream carrying diverse traffic and traffic formats requires just one modem at each site for a point-to-point link — reducing modem count with no reduction in flexibility.

- An RF power amplifier carrying a single carrier may be operated closer to saturation than an amplifier carrying multiple carriers — e.g. an SSPA with 2 x carriers must be backed off by 2.5dB more than a single carrier SSPA system (TWTAs require even more back-off!). An SSPA with 3 x carriers requires 3.5dB back-off. The single carrier benefit results in more useable power from a given RF amplifier, therefore requires a smaller RF amplifier than multi-carrier solutions.
- As a result of the above, both hub and remote costs are reduced — results in more cost effective solutions for complex systems.
- 1:1 Redundancy protection is available on the combined Modem offers improved reliability for both the modem and multiplexer functions and the 1:1 redundancy controller is included free of charge in the modems.
- More services can be carried simultaneously with no increase in system complexity expandable through software activated feature codes.
- Less hardware means smaller equipment size and less weight — makes the Modem ideal for transportable and mobile systems.
- Suitable for both Military and Commercial applications - has uses in GSM over Satellite (particularly during migration to IP traffic), Distance Learning, Outside Broadcast Co-ordination, Disaster Recovery and more.
- Offers more services to the user at minimal extra cost - multiple traffic links are concentrated into a single carrier.



## Advanced SCPC Satellite Modem

2Mbps (expandable to 20Mbps) data rate, 70 or 140MHz IF, 220V AC.

RMOD-SCPC-2-20Mb-70/140MHz/L-band-p3

### E1 DATA-MUX option for RMOD-SCPC-5-20Mbps-70MHz-p3 Example

The E1 MUX DATA option is a feature, which is available with 70/140MHz IF or L-band interfaces, and the entire Modem family includes free monitoring tools such as a Spectrum Analyzer, Constellation Monitor, performance graphing versus time up to 1 month in duration, plus full Monitor & Control via Internet Explorer and offers unique features which are both cost effective and easy to use.

#### Application Examples - GSM, Hybrid Services, Cost/Carrier-Reduction

- GSM over satellite migration from G.703 telephony to IP traffic
- GSM over satellite mixed G.703 plus IP data services
- Mixed G.703 and VoIP telephony streams



### E1MUX Data Option

# SCPC-EXTREME Satellite Modem

to 64QAM, with data rate:  
18K-155 Mbps & dual IF: 70/140M and L band



RADITEK's new *software-defined modem*, the SCPC Extreme modem has a multiband IF: 70MHz, 140MHz and L band. The *hardware platform* has a powerful processor that makes it ideal for handling high speed IP traffic. The modem can be fitted with *virtually any standard type of terrestrial interface* and *software activated options* will allow it to operate at data rates up to 155Mbps.

*Low cost software activated options* allow you to enable only the features you need at the time, and you can upgrading as needed. Upgrades requiring hardware additions include: the Quad RAD Mux and LDPC+.

### Advanced Bandwidth-Efficient Features

This RMOD-EXTREME has the most powerful SCPC, bandwidth-saving features, such as:

**Simu-Carrier**, which shares the same transmit and receive frequency reducing satellite bandwidth by up to (in some cases) a full 50% at the expense of some Transmit power. NOTE: Using our LDPC+ will save around 2 dB excess Eb/No. Using our **AUPC** (Uplink Power Control), several more dBs can be saved too. This can allow perfect transponder loading and significant cost savings, especially in the case where there is no excess satellite Tx power penalty/cost (such as operating own satellite).

- **Low-latency LDPC+** has been designed for Eb/No extending applications (1 to 2 dB better than TPC)
- **DVB-S2** option is also available.
- Advanced bandwidth-saving IP features include acceleration and header and payload compression.

### Optional features:

- Multi IF band support: (70M/140MHz and L-band)
- Data rates 18Kbps to 155Mbps
- DVB-S2-/ACM, to 16APSK. LDPC/BCH, TPC FEC options
- Terrestrial interface options including Ethernet: EIA-530, G.703 (balanced & unbalanced), OC-3, STM-1, Serial LVDS, ASI, HSSI, Quad E1,
- Modulation up to 64QAM
- Simu-Carrier option (reusing uplink frequencies)
- Uplink Power control (AUPC)
- Signal-under-carrier real time interferer detection tool
- Built-in spectrum and constellation monitors tool
- IPv6 compliant
- Drop and insert: T1-D4, T1-ESF, E1-G.732
- Interoperable with other Raditek SCPC modems
- Feature-based pricing and corresponding Software upgradeable features, for many options.
- Advanced ESC: High rate Async and low rate IBS.

### Applications include:

- IP trunking/backhaul
- Mobile backhaul
- SNG
- Maritime communications
- Corporate networking
- Disaster recovery
- Satellite news gathering
- G.703 backhaul
- Advanced IP feature set options, including:
  - TCP acceleration
  - HTTP acceleration,
  - Routing, bridging, encryption
  - ACM (DVB-S2)
  - Header and payload compression
  - Traffic shaping
  - AES 256 encryption (limited availability)

### Part Number: RMOD-Extreme-p3

Description: (High Performance Satellite Modem: EXTREME)

Options	Data Rate	DVBS2	Simu Carrier	Modulation	SCPC	LDPC+
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## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

Specifications	
Frequency	IF: 50 to 90MHz & 100 to 180MHz (resolution 100Hz) (BNC f/m connector) L-band: 950 to 2050MHz (resolution 100Hz) (N-type f/m connector)
Data Rate	DVB-S2: 50kbps to 155Mbps LDPC+: 4.8kbps to 100Mbps TPC: 4.8kbps to 60Mbps 1bps resolution Operation to 2,048kbps-standard. Options to 5Mbps, 10Mbps, 25Mbps, 60Mbps, 100Mbps and 155Mbps
Symbol Rate	DVB-S2: 100ksps to 45Msps Non-DVB-S2: 9.6ksps to 40Msps
Operating Modes	DVB-S2 (EN 302 307) option Closed Network (+ ESC) (IESS-315) IBS/IDR (IESS-308/309/310/314) options
Scrambling	DVB-S2: as per EN 302 307 IBS: Synchronized to framing per IESS-309 Closed Network + ESC: Synchronized to ESC overhead
Impedance	IF: 50Ω/75Ω L-band: 50Ω
Return Loss	IF: 18dB typical L-band: 14dB typical
Frequency Reference Stability	Ageing <4E-8/yr
External Reference	Clocking only: 1 to 10MHz, 1kHz steps Clocking and RF frequency: 10MHz, 0dBm±1dB
Redundancy	Standalone, 1:1 or 1:N redundancy configuration
Traffic Interfaces	
<b>Base modem (standard):</b> Ethernet (10/100/1000 BaseT) IP traffic on RJ45. Processing capability: 100,000 packets per second <b>Traffic options:</b> EIA-530 (RS422, X.21, V.35 and RS232 on 25-pin D-type female) G.703 (balanced on RJ-45; unbalanced 75Ω BNC female) Quad E1 G.703 (balanced RJ45) Quad ASI (75Ω BNC) STM-1/OC-3/Optical Gigabit Ethernet (small form-factor pluggable module) Serial LVDS (25-pin D-type female), HSSI 50pin HD SCSI-2 connector (50-pin f/m D connector)	
<b>RadMux (4 port Mux) option:</b> Combines from: G.703, IP and EIA-530 traffic (requires Quad E1 option)	

Modulator	
Output Power	IF: 0 to -25dBm (0.1dB steps) L-band: 0 to -30dBm (0.1dB steps)
Output Power Stability	±0.5dB, 0°C to 50°C
Transmit Filter Roll-off	5, 10, 15, 20%, 25%, 35%
Phase Accuracy	±2° maximum
Amplitude Accuracy	±0.2dB maximum
Carrier Suppression	-30dBc minimum
Output Phase Noise	To IESS-316, typ. 3dB better
Harmonics	Better than -55dBc/ 4kHz in band
Spurious	Better than -55dBc/ 4kHz in band
Transmit On/Off Ratio	55dB minimum
Demodulator	
Input Range	IF minimum: -115+10 log (symbol rate) L-band minimum: -130+10 log (symbol rate) IF/L-band maximum: -80+10 log (symbol rate)
Maximum Composite Signal	+10dBm
Wanted-to-composite Level	IF: -94+10 log (symbol rate) L-band: -102+10 log (symbol rate)
Frequency Sweep Width	±1kHz to ±32kHz up to 10 Msps (1kHz steps) ±10kHz to ±250kHz above 10 Msps (10kHz steps)
Acquisition Threshold	<5dB Es/No QPSK
Acquisition Time	Dependent on FEC, data rate and sweep width (at 9.6kbps, less than 1s at 6dB Es/No QPSK; at 10Mbps, less than 100ms at 6dB Es/No QPSK)
Clock Tracking Range	±100ppm minimum
Receive Filter Roll-off	5, 10, 15, 20%, 25%, 35%
Performance Monitoring	Eb/No (range 0-15dB, ±0.2dB) Frequency offset (100Hz resolution) Receive signal level Buffer fill status
AGC Output	Buffered direct AGC output for antenna tracking, etc.

## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

Forward Error Correction	
Modulation	<b>1. DVB-S2 (Option):</b> QPSK, 8PSK, 16APSK <b>2a. Non-DVB-S2:</b> BPSK, QPSK, OQPSK <b>2b. Plus options for:</b> 8PSK, 16QAM, <b>2c. Low Latency LDPC+:</b> 8QAM, 16APSK, 32APSK, 64QAM
FEC	<b>1. DVB-S2 (LDPC/BCH) option:</b> QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10  <b>2. Non-DVB-S2:</b> Note <u>BPSK and (O)QPSK provided as standard</u> ; other modulations are optional:  <b>3. Low-Latency LDPC+ option:</b> BPSK: 0.499 (O)QPSK: 0.532, 0.639, 0.710, 0.798 8PSK/8QAM: 0.639, 0.710, 0.778 16APSK/16QAM: 0.726, 0.778, 0.828, 0.851 32APSK: 0.778, 0.828, 0.886, 0.938 64QAM: 0.828, 0.886, 0.938, 0.960  <b>4. TPC option:</b> BPSK: 5/16, 21/44, 2/3, 3/4, 0.493, 7/8, Rate 7/8 de facto, 0.789, (O)QPSK: 5/16, 21/44, 2/3, 3/4, 0.493 7/8, 7/8 de facto, 0.789, 0.93 8PSK: 3/4 de facto, 7/8 de facto, 0.93 16QAM: 3/4 de facto, 7/8 de facto, 0.93  <b>5. Viterbi:</b> BPSK/(O)QPSK 1/2, 3/4, 7/8  <b>6. TCM option:</b> 8PSK rate:2/3  <b>7. Sequential option:</b> BPSK/(O)QPSK 1/2, 3/4, 7/8  <b>8. Reed-Solomon:</b> Outer codec available with Viterbi and TCM
Ethernet Traffic	
Throughput Performance	The maximum modem throughput depends on IP traffic format and the features enabled. Bridged IP/ UDP data can be processed up to the modem maximum data rate. Please seek assistance in evaluating your particular requirements.
Routing and Bridging	Bridging (standard). Static routing (standard). Dynamic routing option: RIP V1, V2; OSPF V2, V3; BGP V4
TCP Acceleration	Typical throughput level of 90% of link

Option	capacity. Supports 5,000 concurrent accelerated TCP connections (plus at least 35,000 unaccelerated TCP connections) up to the modem maximum data rate.
Header Compression Option	Header Compression to RFC 3095. Reduces Ethernet/IP/UDP/ TCP/RTP header sizes typically by 90%. 1-way packet processing limit: 60,000 pps; 2-way limit: 45,000 pps. Includes Ethernet header compression (compresses 14-byte Ethernet frame to typically one byte)
Payload Compression Option	Uses Deflate algorithm (RFC 1951) to compress all TCP/IP packets (TCP and UDP), typically resulting in compression of payloads by 50%
Traffic Shaping Option	Reliable throughput levels for IP streams, using committed info. rate and Burst Info. Rate settings. Stream differentiation is by IP address, IEEE 802.1p priority class, Diff serv DSCP class or MPLS EXP field
Encryption Option	Encrypts all IP traffic using AES with 256-bit keys
IPv6	Provided as standard. Dual IPV4/ IPV6 TCP/IP stack allowing use of both IPV4 and IPV6 addresses for bridging and routing of traffic
VLAN Support	IEEE 802.1q VLAN support (standard) IEEE 802.1p Quality of Service (packet prioritization) using strict priority or fair weighting queuing
DHCP, SNMP	DHCP (standard) for automatic allocation of M&C IP address. SNMP (standard) v1, v2c and v3
Web Server	Embedded web server M&C interface (standard)
IP Diagnostic Graphs	Shows Tx, Rx throughput (bps, pps); dropped, errored packet counts (standard)
IP over DVB-S2 Encapsulation Option	Supports encapsulation/ decapsulation of MPE (EN301192), ULE (RFC4326) Or RADITEK's advanced RXE
DVB-S2 ACM (option)	Dynamically varies mod/cod with varying link conditions, maximizing throughput at all times by converting unused link margin into additional throughput

## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

<b>ODU facilities via IF interface</b>	
FSK Control	Allows monitor & control of a compatible L-band BUC or IF Transceiver from the modem via the Tx IFL cable
<b>Simu-Carrier</b>	
Simu-Carrier	Transmit and receive carriers share/reuse the same bandwidths. Special digital techniques are used in the demodulator to cancel the transmit carrier leaving the receive carrier signal.
Simu-Carrier data rate options	256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps, 60Mbps, 80Mbps, 100Mbps and 155Mbps traffic rate (30kHz to 54MHz occupied bandwidth)
Power asymmetry	-10dB to +10dB
Symbol rate asymmetry	Up to 12:1
Eb/No degradation	Typically < 0.5dB (0.7dB for 16QAM/16APSK with 10dB power asymmetry)
Mobile Operation	Uses GPS data to continually update the position allowing uninterrupted operation in mobile environments (ships, etc.) anywhere in the satellite footprints.

<b>Drop &amp; Insert Option</b>	
Bearer Types	T1-D4, T1-ESF, E1-G.732
Timeslot Selection	Independent selection of arbitrary timeslots for both drop and insert.
Bearer Generation	Terrestrial bearer may be looped through modem, or terminated after Drop Mux and a new bearer generated by the insert Mux
Timeslot ID	Maintains the identity of individual Drop/Insert timeslots for N=1,2,3,4,5,6,8,10,12,15,16, 20, 24 and 30. (See extended option-next)

<b>Extended Drop &amp; Insert Option</b>	
Multi-Destination Working	All or only a subset of the received data may be inserted into the terrestrial bearer on the receive path for multi-destination working
Timeslot ID Maintenance	Maintains the identity of individual timeslots for all values of N from 1 to 31
Signaling	CAS and RBS are fully supported

<b>Advanced ESC</b>		
ESC/Aux Port	Provides high-rate async ESC or Intelsat low-rate async IBS ESC	
Electrical Interface	IP, RS232, RS422 or RS485	
Async ESC	Closed Net Plus ESC	Overhead scales to any ESC baud rate from 0.5% to 70% of the main channel rate
Async ESC	IBS Option	High-rate async channel (1/32nd to 2/32nd of the IBS overhead) providing async baud rates from 0.2% to 5.1% of the terrestrial rate
Advanced Aux	Intelsat low-rate async ESC carried in bit 1 of TS32 providing a synchronous channel at 1/480th of the data rate, allowing up to one quarter of this rate for over-sampled async data	

## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

<b>DVB-S2 Performance at BER 1E-6 Guaranteed Es/No (dB) for Normal (64k) Frames</b>											
	Rate 1/4	Rate 1/3	Rate 2/5	Rate 1/2	Rate 3/5	Rate 2/3	Rate 3/4	Rate 4/5	Rate 5/6	Rate 8/9	Rate 9/10
QPSK	-1.6	-0.7	0.3	1.5	2.8	3.4	4.3	5.0	5.5	6.5	6.7
8PSK					6.4	7.2	8.5		9.8	11.0	11.3
16APSK						9.7	10.8	11.6	12.2	13.4	13.7

<b>DVB-S2 Performance at BER 1E-6 Guaranteed Es/No (dB) for Short (16k) Frames</b>											
	Rate 1/4	Rate 1/3	Rate 2/5	Rate 1/2	Rate 3/5	Rate 2/3	Rate 3/4	Rate 4/5	Rate 5/6	Rate 8/9	Rate 9/10
QPSK	-1.3	-0.4	0.5	1.9	3.0	3.5	4.4	5.2	5.6	6.7	
8PSK					6.5	7.3	8.6		9.9	11.2	11.3
16APSK						9.8	11.1	11.7	12.3	13.5	

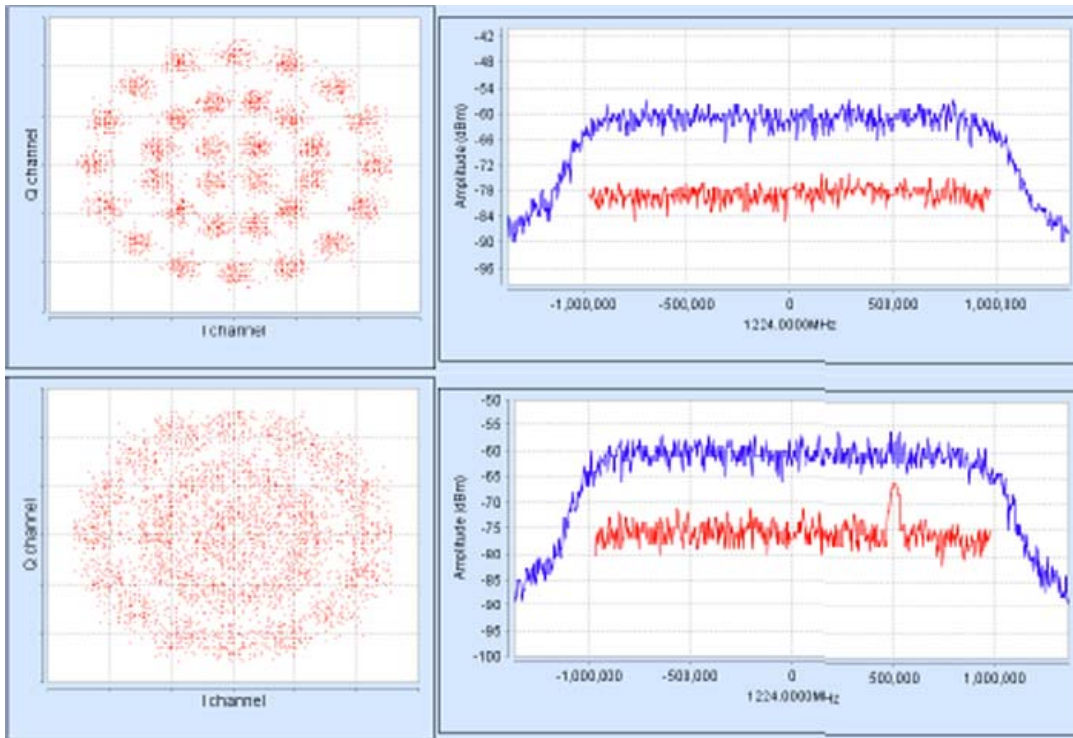
<b>Guaranteed Eb/No BER Performance (dB) (Typical in parentheses)</b>						
		Rate 1/2	Rate 3/4	Rate 7/8	Rate 2/3	Rate 0.93
Viterbi QPSK	1E-4	4.7 (4.4)	6.1 (5.8)	7.1 (6.8)		
	1E-8	7.2 (6.9)	8.8 (8.5)	9.5 (9.2)		
Sequential (64kbps)	1E-4	4.3 (4.0)	5.4 (5.1)	6.4 (6.1)		
	1E-8	6.4 (6.1)	7.3 (7.0)	8.6 (8.3)		
Sequential (2048kbps)	1E-4	5.6 (5.3)	6.1 (5.8)	6.9 (6.6)		
	1E-8	7.5 (7.2)	8.1 (7.8)	8.4 (8.1)		
Turbo (TPC) QPSK	1E-4	2.7 (2.4)	3.5 (3.2)	4.1 (3.8)		
	1E-6					6.3 (6.0)
	1E-8	3.3 (3.0)	4.5 (4.2)	4.5 (4.2)		6.8 (6.5)
2Turbo (TPC) 8PSK	1E-4		5.6 (5.3)	6.8 (6.5)		
	1E-6					9.2 (8.9)
	1E-8		6.8 (6.3)	7.2 (6.8)		9.9 (9.6)
Turbo (TPC) 16QAM	1E-3		6.5 (6.2)	7.7 (7.4)		
	1E-6					10.0 (9.7)
	1E-7		7.8 (7.5)	8.2 (7.8)		
	1E-8					10.7 (10.4)
8PSK/TCM	1E-3				6.3 (6.0)	
	1E-6				10.4 (10.1)	
8PSK/TCM + Reed-Solomon (all rates)	1E-4				6.1 (5.8)	
	1E-10				7.3 (7.0)	



## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

Mechanical Environmental	
Size	1U chassis, 410mm deep excluding front panel handles and rear panel connectors and fans
Weight	3.5kg
Power Supply	90-250VAC, 1A @100V, 0.5A @ 240V, 47-63Hz Fused IEC connector (live and neutral fused); 48V DC optional
Safety Standards	EN60950-1 2006
Emission and Immunity	EN55022 2006 Class B (Emissions) EN55024 1998 A1 + A2 (Immunity)
Operating Temperature	0 to 50°C
Compliance	FCC, CE and RoHS compliant
Humidity	95% relative humidity, non-condensing
Alarm Relays	4 Independent Form C relays for unit, Tx, Rx and backward alarms

BER Testing Option	
BER Channel	Bit error rate tester operates over main traffic, ESC or Aux channels, allowing BER monitoring while on traffic. Not available in DVB-S2 mode
Test Patterns	Various test patterns compatible with common BER testers
Other test modes	Transmit CW (pure carrier) Transmit alternate 1-0 pattern Simulated satellite delay for TCP/IP packets
<b>IF cable power (and reference) summary</b>	
LNB reference	10M ±0.001ppm, 0dBm ±3 dB
LNB power	15V or 24V 0.5A
BUC power	24 or 48V, 200W



**Carrier Under Carrier, interference monitoring plots, showing an interferer, in real time, that is invisible to a regular Spectrum analyzer, when the data traffic is running. Eb/No degradation is optionally programmable, to alarm at a preset level.**

### How does the RMOD-EXTREME-p3 compare to others?

RMOD-EXTREME-p3

Specifications may be subject to change

07/08/13

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## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

Regarding the Comtech CDM625, for example, EDMAC is a COMTECH ESC channel proprietary command protocol. RADITEK modems do not support EDMAC, per se, but we do have equivalent ESC command protocols.

Some highlights for the RMOD-EXTREME-p3 include:

- Data rates from 18kbps to 10Mbps ( up to 155Mbps).
- Modulations from BPSK to 16QAM (but also 16APSK, 32APSK and 64QAM).
- The equivalent ESC channel control to EDMAC/EDMAC 2.
- Drop & Insert for Single port E1/T1 and Quad E1 D and I (Ports 2, 3, 4).
- The modem hardware itself supports IEEE 1588v2 Precision Time Protocol (PTP) and we are in the process of updating/adding software support for this feature.
  
- Support for jumbo Ethernet frames (2048 byte).
- We have no direct equivalent of Comtech's CnC-APC, but do support AUPC(Adaptive Uplink Power Control) with SIMU-Carrier.
- Note: We do not support asynchronous E1 streams because, as stated, G.703 actually requires that clocks are synchronous to within +/-50ppm at 2048kbps so there is no actual market, or significant market, that we are aware of for asynchronous timing support??
  
- SNMP can be used to reboot the modem, if necessary, and can be used for 1:N control.
- The modem supports Robbed-bit Signaling.
- Quality of Service (QoS) supports Layer 2 and Layer 3.

The RADITEK modem that matches (and exceeds) the CDM625 is the new 155Mbps Raditek Extreme. . Essentially the CDM625 doesn't even support standard 20% roll-off (managing only 25% minimum) compared to the 5% roll-off for the Extreme.

	Comtech	Comtech	Paradise	RADITEK	RADITEK Comments
Model:	CDM625	CDM750	PD60	Extreme	
Carrier overlap	√	√	√	√	
Carrier overlap + power control	√	x	x	x	Have SIMU-Carrier and AUPC instead
5% spectral roll-off factor	x	x	√	√	
Low-latency LDPC	√	x	√	√	
Low-latency ACM	√	x	x	x	Under development
Header compression	√	x	√	√	
Payload compression	√	√	√	√	
Encryption	√	x	x	√	
Acceleration	x	x	√	√	
Traffic shaping	√	x	√	√	
Dual IF/L-band	√	√	x	√	
Maximum data rate	25Mbps	169Mbps	100Mbps	155Mbps	
Maximum symbol rate	12.5Msps	63Msps	40Msps	45Msps	
					<b>RADITEK Comments:</b>

Model: Comtech Comtech Paradise RADITEK Specifications may be subject to change 07/08/13

## SCPC Satcom Modem (18K-155 Mbps), (IFs: 70, 140MHz & L band), BPSK to 64QAM, RMOD-EXTREME-p3

	CDM625	CDM750	PD60	Extreme	
Highest order modulation	16QAM	32APSK	64QAM	64QAM	
DVB-S2	x	√	√	√	
DVB-S2 ACM	x	√	√	√	
ASI	√	x	x	√	<b>Note: Will be available soon (high speed serial Video)</b>
SNMP	√	√	√	√	
AUPC	√	x	√	√	
L-band services	√	√	√	√	
IPv6	x	x	√	√	
Web diagnostic tools	x	x	√	√	
Redundancy switch	√	x	√	√	
VLAN	√	x	√	√	
TPC	√	x	√	√	
4-port ethernet switch	√	x	x	x	<b>Easier to use external switch</b>
4 port MUX	√	x	√	√	
Legacy features (see Note 1)	√	x	√	√	
MPE encapsulation	x	x	√	√	~10% overhead
ULE encapsulation	x	x	√	√	~7% overhead
GSE encapsulation	x	√	x	x	~2% over head
RXE encapsulation (proprietary)	x	x	√	√	~2% over head (Raditek's own encapsulation)
Tx predistorter	x	x	√	x	
Rx adaptive equalizer	x	?	√	√	
Optical Ethernet/STM-1/OC-3	x	√	x	√	<b>Coming soon, can use external adapter for now.</b>
Number of features	19	11	27	30	

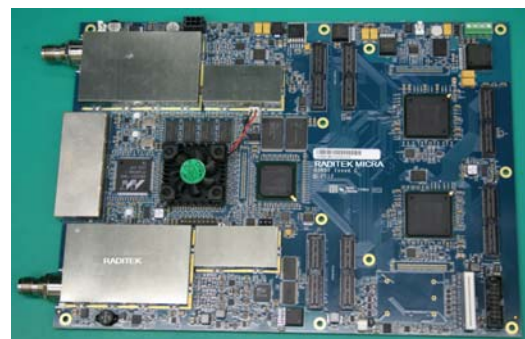
Note 1: Legacy features cover G.703, Quad E1, HSSI, LVDS, EIA-530, IBS, IDR, TCM, Sequential, Viterbi, Reed-Solomon

# RADITEK MICRA

High Performance Satellite Modem Card  
to 64 QAM Modulation Data rate:  
4.8K-60MBps

**Applications:**

- Communications-on-the-move
- Portable communications systems
- Man-pack radios
- Disaster relief
- High-speed train internet connectivity
- Satellite news gathering (SNG)
- Compact, low-power satellite terminals



**Overview**

The Raditek MICRA is a compact, single-board satellite modem, suitable for integration into custom enclosures for portable communications and communications-on-the-move. The MICRA has been designed for simple mechanical integration into OEM products, being small in physical size and with very low power consumption but huge with functionality. Monitoring and control of the modem is via Ethernet, with an option to fit a keypad and LCD display for localized GUI based control. There are also options to fit one or two cooling fans.

**Features:**

- Small form factor (255mm x 184mm)
- L-band operation (950MHz to 2050MHz)
- Data rates 4.8Kbps to 60Mbps
- IP interface with advanced IP feature set including encryption,
- TCP acceleration, compression, routing, bridging, traffic shaping, ACM and throughput diagnostic graphs
- DVB-S2, low-latency LDPC and other FEC options
- Now with 5% spectral roll-off factor
- 24 Volt input power supply
- 30 Watt power consumption
- Modulations up to 64QAM
- Optional keypad, LCD display and up to 2 cooling fans
- Optional L-band services (10MHz output, BUC/LNB PSU)
- Optional 1U half-rack enclosure (half the width of a standard 19" rack)
- Signal-under-carrier interference detection
- Built-in spectrum and constellation monitors
- Interoperable with other Raditek SCPC modems
- Many Remote Software upgradeable features

**Advanced Bandwidth-Efficient Features**

SIMU Carrier overlays transmit and receive carriers halving the number of carriers-thereby increasing capacity by up to 100%  
DVB-S2 is well known for its bandwidth efficiency.  
LDPC+ low-latency coding has been designed for latency-sensitive applications.  
Raditek offers 5% spectral roll-off (option) with LDPC+ and TPC, saving up to 15% bandwidth when compared to standard 20% roll-off.

**Part Number: RMOD-Micra-p3**

**Description:** (High Performance Satellite Modem Card: MICRA)

**Options:** Data Rate: DVBS2 Simu Carrier IP  
Modulation: SCPC LDPC

## RADITEK MICRA Satellite modem card

### High performance to 64 QAM, L Band IF, 4.8K-60Mbps

1. Main Specifications		4. Demodulator		
Frequency	950 to 2050MHz (resolution 100Hz) (TNC connector)	Input Range	Minimum: -130 + 10 log (symbol rate) Maximum: -80 + 10 log (symbol rate)	
Data Rate	DVB-S2 50kbps to 60Mbps SCPC: 4.8kbps to 60Mbps 1bps resolution (Note: Operation to 2,048kbps provided as standard; extension options to 5Mbps, 10Mbps, 25Mbps and 60Mbps)	Maximum Composite Signal	+10dBm	
Symbol Rate	DVB-S2: 100ksps to 37.5Msps SCPC: 9.6ksps to 40Msps	Wanted-to-composite Level	-102+10 log (symbol rate)	
Operating Modes	DVB-S2 (EN 302 307) option Closed Network (+ESC) (IESS-315)	Frequency Sweep Width	±1kHz to ±32kHz up to 10Msps (1kHz steps) ±10kHz to ±250kHz above 10Msps (10kHz steps)	
Scrambling	DVB-S2: as per EN 302 307 Closed + ESC: Synchronized to ESC overhead	Acquisition Time	Dependent on FEC, data rate and sweep width (e.g. at 9.6kbps, less than 1s at 6dB Es/No QPSK; at 10Mbps, less than 100ms at 6dB Es/No QPSK)	
Impedance	50Ω	Clock Tracking Range	±100ppm minimum	
Return Loss	14dB typical	Receive Filter Roll-off	5%, 10%, 15% 20%, 25%, 35%	
Frequency Reference	Ageing <4E-8/yr	Performance Monitoring	Eb/No (range 0-15dB, ±0.2dB) Frequency offset (100Hz resolution) Receive signal level Buffer fill status	
External Reference	Clocking only: 1 to 10MHz, 1kHz steps Clocking and RF frequency: 10MHz, 0dBm±1dB	AGC Output	Buffered direct AGC output for antenna tracking, etc. (requires Auxiliary Card option)	
Redundancy	Can be operated in standalone, 1:1 or 1:N redundancy configuration (redundancy requires Auxiliary Card option)	LNB 10MHz Reference	Via IFL cable; 10MHz ± 0.001 ppm; 0dBm ± 3dB	
2. Traffic Interfaces		LNB Voltage	Selectable 15V or 24V DC to LNB via IFL cable; maximum 0.5A	
Standard:		5. Forward Error Correction		
4-port Gigabit Ethernet switch (100,000 packets per second processing capability). See optional IP features under 'Ethernet Traffic'		Modulation	DVB-S2 (Option): QPSK, 8PSK, 16APSK	
Traffic options:			Non-DVB-S2: BPSK, QPSK, OQPSK, 8PSK, 16QAM, LDPC+ 8QAM, LDPC+:16APSK, LDPC+: 32APSK, LDPC+: 64QAM	
EIA-530 (RS422, X.21, V.35 and RS232 on 25-pin D-type female)		FEC	DVB-S2 (LDPC/BCH) option: (EN 302 307): QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 Non-DVB-S2: LDPC+ Low-Latency LDPC+ option: BPSK 0.499 (O)QPSK 0.532, 0.639, 0.710, 0.798 8PSK/8QAM: 0.639, 0.710, 0.778 16APSK/16QAM: 0.726, 0.778, 0.828, 0.851 32APSK: 0.778, 0.828, 0.886, 0.938 64QAM: 0.828, 0.886, 0.938, 0.960 TPC option: BPSK 5/16, 21/44, 3/4, 7/8 (O)QPSK: 5/16, 21/44, 3/4, 7/8, 0.93 8PSK: 3/4, 7/8, 0.93 16QAM: 3/4, 7/8, 0.93	
3. Modulator				
Output Power	0 to -30dBm (0.1dB steps)			
Output Power Stability	±0.5dB, 0°C to 50°C			
Transmit Filter Roll-off	5%, 10%, 15%, 20%, 25%, 35%			
Phase Accuracy	±2° maximum			
Amplitude Accuracy	±0.2dB maximum			
Carrier Suppression	-30dBc minimum			
Output Phase Noise	As IESS-316, nominally 3dB better			
Harmonics	Better than -55dBc/ 4kHz in band			
Spurious	Better than -55dBc/ 4kHz in band			
Transmit On/Off Ratio	55dB minimum			
BUC 10MHz Reference	Via IFL cable; 10MHz ± 0.001 ppm; 3dBm ± 3dB			
BUC PSU Option	24V or 48V DC via IFL cable, 200W			
6. Ethernet Traffic: Standard Features				
Note that the maximum modem IP throughput depends on traffic format and the features enabled. Bridged IP data can be processed up to the modem maximum data rate. Please seek assistance from Raditek in evaluating your particular requirements.				
Bridging and Static Routing	Bridging Static routing			
IPv4/IPv6	Dual IPv4/IPv6 TCP/IP stack allow both IPv4 and IPv6 addresses bridging and routing of traffic			
VLAN Support	IEEE 802.1q VLAN support			
DHCP, SNMP	IEEE 802.1p Quality of Service (packet prioritization) using strict priority or fair weighting queuing			
Web Server	DHCP (standard) for automatic allocation of M&C IP address. SNMP (standard) v1, v2c and v3			
IP Diagnostic Graphs	Embedded web server M&C inter-face (standard)			
	Shows Tx, Rx throughput (bps, pps); dropped, errored packet counts (standard)			

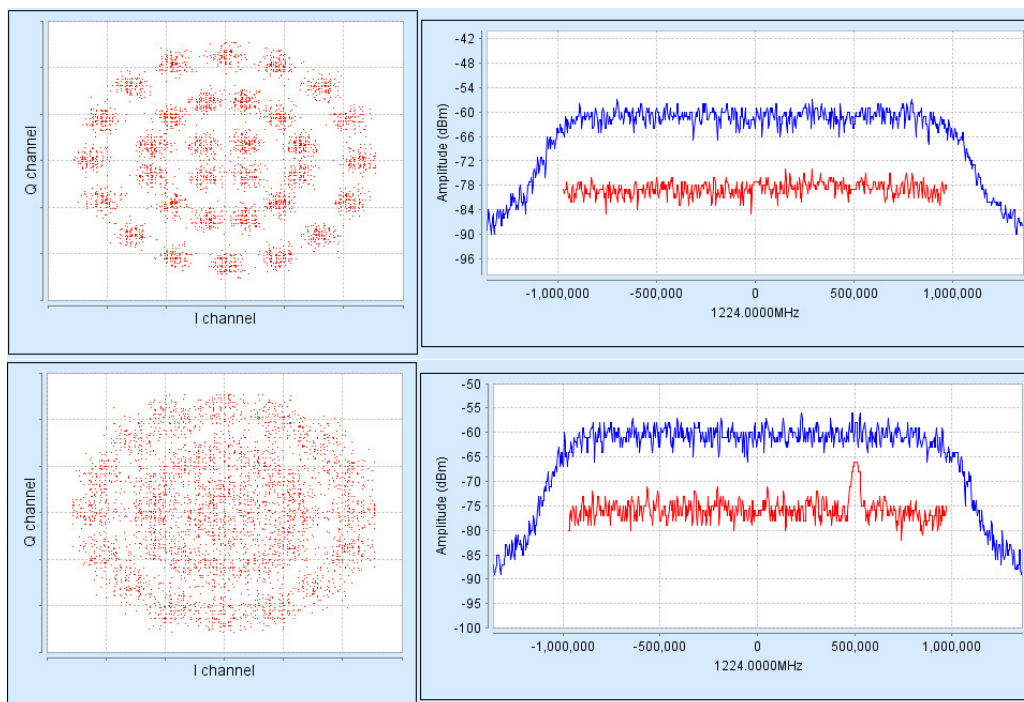
## RADITEK MICRA Satellite modem card

### High performance to 64 QAM, L Band IF, 4.8K-60Mbps

<b>7. Ethernet Traffic: RAD-IP Option</b>		<b>10. Simu-carrier</b>																																																		
Traffic Shaping	Provides guaranteed throughput levels for IP streams, using Commit-terd Information Rate and Burst Information Rate settings. Stream differentiation is by IP address, IEEE 802.1p priority class, Diff serv DSCP class or MPLS EXP field	Simu-carrier	Transmit and receive carriers are overlaid on top of each other in the same space segment. Techniques are used in the demodulator to cancel the transmit carrier and extract the wanted receive carrier signal																																																	
Header Compression	Robust Header Compression to RFC 3095. Reduces Ethernet/IP/UDP/ TCP/RTP header sizes typically by 90%. 1-way packet processing limit: 60,000 pps; 2-way limit: 45,000 pps. Includes Ethernet header Compression (compresses 14-byte Ethernet frame to typically one byte)	Simu-carrier data rate options	256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps and 60Mbps traffic rate																																																	
Payload Compression	Uses Deflate algorithm (RFC 1951) to compress all TCP/IP packets (TCP and UDP), typically resulting in compression of payloads by 50%	Supported power asymmetry	-10dB to +10dB																																																	
Dynamic Routing	RIP V1, V2; OSPF V2, V3; BGP V4	Supported symbol rate asymmetry	Up to 12:1																																																	
TCP Acceleration	Typical throughput level of 90% of link capacity. Supports 10,000 concurrent accelerated TCP connections (plus at least 40,000 non accelerated TCP connections) up to the modem maximum data rate	Eb/No degradation	Typically < 0.5dB (0.7dB for 16QAM/16APSK with 10dB power asymmetry)																																																	
DVB-S2 ACM (Requires DVB-S2 hardware option)	Dynamically varies modcod with varying link conditions, maximizing throughput at all times by converting unused link margin into additional throughput	Mobile Operation	Uses GPS data to continually recalculate position relative to satellite, allowing uninterrupted operation in mobile environments (ships, etc.) anywhere in satellite footprint																																																	
IP-over-DVB-S2 Encapsulation (Requires DVB-S2 hardware option)	Supports the transmission of IP packets (or optionally, full Ethernet frames) over DVB-S2; encapsulates & de-encapsulates using MPE (EN 301 192), ULE (RFC 4326) or Raditek RXE (with only 2% overhead)	<b>11. Advanced ESC</b>																																																		
AES-256 Encryption	Note: due to export controls, encryption is supported on the MICRA model only. Please see separate datasheet for more details	ESC/Aux Port (requires Auxil-liary Card option)	Provides high rate async ESC or Intelsat low rate async IBS ESC																																																	
<b>8. Test Facilities and Alarm Outputs</b>		Electrical Interface	IP, RS232, RS422 or RS485 (requires Auxilliary Card option)																																																	
BER Tester	Bit error rate tester operates over main traffic, ESC or Aux channels, allowing BER monitoring while on traffic. Not available in DVB-S2 mode	Async ESC	Closed Net Plus ESC    Overhead scales to any ESC baud rate from 0.5% to 70% of the main channel rate																																																	
	Supports various test patterns compatible with common BER testers	<b>12. DVB-S2 Performance at PER 1e-6</b>																																																		
Other test modes	Transmit CW (pure carrier) Transmit alternate 1-0 pattern Simulated satellite delay for TCP/IP packets	Guaranteed Es/No (dB) for Normal (64k) frames																																																		
Alarm Outputs	Single open-collector output summary alarm, as standard (Additional 4 Independent Form C relays for unit, Tx, Rx and backward alarms: requires Utilities card)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>Rate 1/4</th> <th>Rate 1/3</th> <th>Rate 2/5</th> <th>Rate 1/2</th> <th>Rate 3/5</th> <th>Rate 2/3</th> <th>Rate 3/4</th> <th>Rate 4/5</th> <th>Rate 5/6</th> <th>Rate 8/9</th> <th>Rate 9/10</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>-1.6</td> <td>-0.7</td> <td>0.3</td> <td>1.5</td> <td>2.8</td> <td>3.4</td> <td>4.3</td> <td>5.0</td> <td>5.5</td> <td>6.5</td> <td>6.7</td> </tr> <tr> <td>8PSK</td> <td></td> <td></td> <td></td> <td></td> <td>6.4</td> <td>7.2</td> <td>8.5</td> <td></td> <td>9.8</td> <td>11.0</td> <td>11.3</td> </tr> <tr> <td>16APSK</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>9.7</td> <td>10.8</td> <td>11.6</td> <td>12.2</td> <td>13.4</td> <td>13.7</td> </tr> </tbody> </table>			Rate 1/4	Rate 1/3	Rate 2/5	Rate 1/2	Rate 3/5	Rate 2/3	Rate 3/4	Rate 4/5	Rate 5/6	Rate 8/9	Rate 9/10	QPSK	-1.6	-0.7	0.3	1.5	2.8	3.4	4.3	5.0	5.5	6.5	6.7	8PSK					6.4	7.2	8.5		9.8	11.0	11.3	16APSK						9.7	10.8	11.6	12.2	13.4	13.7	
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16APSK						9.7	10.8	11.6	12.2	13.4	13.7																																									
<b>9. Mechanical/Environmental</b>		<b>13. DVB-S2 Performance at PER 1e-6</b>																																																		
Size	Card: 255mm x 184mm (Optional 1U half-rack chassis, 280mm deep, excluding front panel handles and rear panel connectors and fan)	Guaranteed Es/No (dB) for Normal (16k) frames																																																		
Weight	0.35kg	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>Rate 1/4</th> <th>Rate 1/3</th> <th>Rate 2/5</th> <th>Rate 1/2</th> <th>Rate 3/5</th> <th>Rate 2/3</th> <th>Rate 3/4</th> <th>Rate 4/5</th> <th>Rate 5/6</th> <th>Rate 8/9</th> <th>Rate 9/10</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>-1.3</td> <td>-0.4</td> <td>0.5</td> <td>1.9</td> <td>3.0</td> <td>3.5</td> <td>4.4</td> <td>5.2</td> <td>5.6</td> <td>6.7</td> <td></td> </tr> <tr> <td>8PSK</td> <td></td> <td></td> <td></td> <td></td> <td>6.5</td> <td>7.3</td> <td>8.6</td> <td></td> <td>9.9</td> <td>11.2</td> <td>11.3</td> </tr> <tr> <td>16APSK</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>9.8</td> <td>11.1</td> <td>11.7</td> <td>12.3</td> <td>13.5</td> <td></td> </tr> </tbody> </table>			Rate 1/4	Rate 1/3	Rate 2/5	Rate 1/2	Rate 3/5	Rate 2/3	Rate 3/4	Rate 4/5	Rate 5/6	Rate 8/9	Rate 9/10	QPSK	-1.3	-0.4	0.5	1.9	3.0	3.5	4.4	5.2	5.6	6.7		8PSK					6.5	7.3	8.6		9.9	11.2	11.3	16APSK						9.8	11.1	11.7	12.3	13.5		
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Power Supply	24 Volt DC input (not provided) Consumes 30 Watts	<b>14. Eb/No BER Performance dB Guaranteed (Typical)</b>																																																		
Compliances	FCC, CE and RoHS compliant	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>Rate 1/2</th> <th>Rate 3/4</th> <th>Rate 7/8</th> <th>Rate 0.93</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Turbo (TPC) QPSK</td> <td>1E-4</td> <td>2.7 (2.4)</td> <td>3.5 (3.2)</td> <td>4.1 (3.8)</td> </tr> <tr> <td>1E-6</td> <td></td> <td></td> <td>6.3 (6.0)</td> </tr> <tr> <td>1E-8</td> <td>3.3 (3.0)</td> <td>4.5 (4.2)</td> <td>4.5 (4.2)</td> </tr> <tr> <td rowspan="3">Turbo (TPC) 8PSK</td> <td>1E-4</td> <td></td> <td>5.6 (5.3)</td> <td>6.8 (6.5)</td> </tr> <tr> <td>1E-6</td> <td></td> <td></td> <td>9.2 (8.9)</td> </tr> <tr> <td>1E-8</td> <td></td> <td>6.8 (6.3)</td> <td>7.2 (6.8)</td> </tr> <tr> <td rowspan="3">Turbo (TPC) 16QAM</td> <td>1E-3</td> <td></td> <td>6.5 (6.2)</td> <td>7.7 (7.4)</td> </tr> <tr> <td>1E-6</td> <td></td> <td></td> <td>10.0 (9.7)</td> </tr> <tr> <td>1E-7</td> <td></td> <td>7.8 (7.5)</td> <td>8.2 (7.8)</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>10.7 (10.4)</td> </tr> </tbody> </table>			Rate 1/2	Rate 3/4	Rate 7/8	Rate 0.93	Turbo (TPC) QPSK	1E-4	2.7 (2.4)	3.5 (3.2)	4.1 (3.8)	1E-6			6.3 (6.0)	1E-8	3.3 (3.0)	4.5 (4.2)	4.5 (4.2)	Turbo (TPC) 8PSK	1E-4		5.6 (5.3)	6.8 (6.5)	1E-6			9.2 (8.9)	1E-8		6.8 (6.3)	7.2 (6.8)	Turbo (TPC) 16QAM	1E-3		6.5 (6.2)	7.7 (7.4)	1E-6			10.0 (9.7)	1E-7		7.8 (7.5)	8.2 (7.8)					10.7 (10.4)
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Safety Standards	EN60950-1																																																			
Emission and Immunity	Emissions: EN55022:2006 Class B Immunity: EN55024:1998 (+ A1:2001 + A2:2003)																																																			
Standard Operating Temperature	0 to 65°C																																																			
Extended Operating Temperature (Option al)	-20°C to 80°C																																																			
Humidity	95% relative humidity, non-condensing																																																			

Below: Built-in Spectrum Analyzer showing Signal under Carrier

## RADITEK MICRA Satellite modem card High performance to 64 QAM, L Band IF, 4.8K-60Mbps



Above: Interference detection with interferer present.



Micra card mounted inside Aluminum frame option

## RADITEK MICRA Satellite modem card

### High performance to 64 QAM, L Band IF, 4.8K-60Mbps

	Description
15. Base Modem	4.8kbps to 2.048Mbps Closed & Closed Network + ESC modem with four-port Ethernet 10/100/1000 BaseT switch (for M&C and traffic); Ethernet bridge, static routing; IPv4/IPv6 support; IEEE 802.1p QoS; IEEE 802.1q VLAN support L-band operation for 950-2050MHz; high-stability 10MHz reference AUPC: Automatic Uplink Power Control Web browser monitoring tools: Spectrum Display, Constellation Monitor, TCP/IP throughput Internal Bit Error Rate Tester (BERT) for non-DVB-S2 modes (Note: no FEC is provided with the base modem)
Tx-only Option	Transmit functions only
Rx-only Option	Receive functions only
Data Rate Options	5Mbps data rate: extends base operation to 5Mbps
	10Mbps data rate: extends 5Mbps operation to 10Mbps
	25Mbps data rate: extends 10Mbps operation to 25Mbps
	60Mbps data rate: extends 25Mbps operation to 60Mbps
16. RAD IP	Traffic Shaping: supports CIR/BIR/priority settings for IP streams classified by IP address, Diff serv class, IEEE 802.1p priority tag or MPLS EXP field
	Header Compression: IP/UDP/TCP/RTP packet header compression (RFC 3095) plus Ethernet header compression
	Payload Compression: TCP/UDP packet payload compression using the Deflate algorithm (RFC 1951)
	Encryption: TCP/IP packet payload encryption using AES with 256-bit keys
	Dynamic Routing: RIP, OSPF and BGP
	Web Acceleration: acceleration of HTTP requests through pre-fetching of web page contents
	TCP Acceleration
	DVB-S2 ACM. Requires DVB-S2 hardware option
	Please note that if Encryption (TCP/IP packet payload encryption using AES with 256-bit keys) is required then you should order the MICRA encryption option.
DVB-S2 encapsulation: Encapsulation of IP packets and Ethernet frames over DVB-S2 using Raditek's own Protocol (RXE with only 2 dB overhead), MPE or ULE (requires DVB-S2 hardware option)	
17. DVB-S2 (Add-on card mounts above main card)	DVB-S2 CCM Tx: DVB-S2 QPSK, 8PSK & 16APSK Tx operation per EN 302 307; subject to prevailing data rate limits. Includes DVB-S2 encapsulation: encapsulation of IP packets and Ethernet frames over DVB-S2 using RADITEK's Protocol (RXE), MPE or ULE
	DVB-S2 CCM Rx: DVB-S2 QPSK, 8PSK & 16APSK Rx operation per EN 302 307; subject to prevailing data rate limits. Includes DVB-S2 encapsulation: Encapsulation of IP packets and Ethernet frames over DVB-S2 using RADITEK's Protocol (RXE), MPE or ULE
18. Low-latency LDPC+ (Add-on card mounts above main card)	LDPC+ LDPC includes BPSK, QPSK, OQPSK, 8PSK, 8QAM, 16APSK, 16QAM, 32APSK & 64QAM; subject to prevailing modem data rate limits



## RADITEK MICRA Satellite modem card

### High performance to 64 QAM, L Band IF, 4.8K-60Mbps

19. Configuration options	Description
Simu-Carrier Subject to prevailing modem data rate limits. Occupied bandwidth: minimum 30kHz; to a maximum of 36MHz	<p>Simu- Carrier hardware option (requires one or more additional Simu-Carrier options below); allows carriers to be overlapped thereby reducing the required satellite bandwidth;</p> <p>The Simu Carrier card mounts above main card</p> <p>The Simu-Carrier starts at 256kbps (requires Simu-carrier hardware option)</p> <p>It optionally extends in steps: 1.024, 2.5, 5, 10, 15, 20, 25, 30, 40, 50, 60 Mbps</p>
Utilities Card Option (Add-on card mounts above main card)	Size: 168mm x 104mm 9-way D type for 1:1 and 1:N, compatible with PDQS Standalone Redundancy Switch 15-way D type for alarms and AGC USB connector for software upgrades, etc. BNC connector for Station Clock Also alarm relays, transmit inhibit function, additional fan, Async ESC channel, AGC output for antenna pointing, FSK signaling
TPC	TPC includes BPSK, QPSK, OQPSK, 8PSK and 16QAM Rates 5/16, 21/44, 3/4 in BPSK, QPSK, OQPSK; Rate 7/8 in QPSK, OQPSK; Rate 0.93 Paradise in QPSK, OQPSK; Rates 3/4, 7/8, 0.93 RADITEK in 8PSK; Rates 3/4, 7/8, 0.93 Raditek in 16QAM
Optimized Spectral Roll-off	Extends the standard 35%, 25% and 20% roll-off factors by allowing 5%, 10% and 15% roll-off selections (non-DVB-S2 only)
Signal under carrier	Signal-under-carrier interference detection web spectrum graph showing received spectrum and any interference underneath the received carrier while on traffic; automatic alarm when interference rises above user-set threshold; supported for all non-DVB-S2 FECs and modulations
BUC PSU	When connected to the output of an external BUC PSU (not provided), the Micra can provide up to 200W to the BUC at 24V or 48V, as determined by the BUC PSU
L-bracket Option	An aluminum L-bracket can be used to mount the Micra; includes: mechanical support for the Utilities card; may be useful as part of custom enclosure or for test purposes
Keypad/LCD Display Option	RADITEK's standard front-panel membrane (local user interface) consisting of LEDs that provide basic modem status; 3-line LCD display; keypad. The Micra software will automatically detect and support the membrane when it is fitted
Fan Option	Standard modem fan: 20mm; 12V; 2.5W; 12.0 CFM; 65000 hour lifetime; connects to Micra card; a second fan can be fitted on the Utilities card
Half-rack Enclosure Option	1U half-rack (half width of 19" rack) enclosure (depth 280mm). Supports RJ45 for IP, RF I/O via TNC connectors, 24V input connector. Due to size limitations, this enclosure does not support the fitting of any option cards or BUC PSU
Extended Temperature Range Option	Extends the standard operating temperature range (0 to 65°C) to -20°C to 80°C with respect to the board's ambient temperature
EIA-530 Terrestrial Interface Card Option	EIA-530 (D25 DCE providing RS422/X.21/V.35/RS232); add-on card mounts above main card



# Internet on the Move Solution



## Ku-Band, (20W or 40W SSPA)

Comprised with the following

- RIOTM-Ku-Band-M1, 2, 3 (20W or 40W)-Antenna
- RMOD-DREAM-2IP4 Modem- SCPC (DAMA optional)



**RMOD-DREAM-2IP4 DAMA or SCPC IP Router Modem (below) Mounts inside vehicle- 19 inch rack mount**  
 High-speed satellite tracking technology supports IP communication at speed and can be configured for use with virtually any Ku band satellite to enable IP connectivity on any moving vehicle for real-time (receive only) video, 2 way: Voice and Data applications.



### Applications include:

- SNG (Satellite News Gathering), Voice-Video-Data
- First responders: in-pursuit, en-route, and on-scene
- ANY mobile Internet "On The Move" application.
- Disaster Recovery, ICE, FEMA, DHS mobile field ops etc

### Each Outdoor unit includes:

- Transmit and receive antenna Positioner
- GPS based controller
- Gyro-assisted mechanical tracking system used for a fast and fully automatic satellite acquisition
- Integral LNB
- Power supply
- All in a compact, robust sealed unit

The Raditek RIOTM-KU-system is the leading edge, best and unique solution (triple play: voice, video, data) "Internet On The Move": solution. Continuous access at highway speeds.  
 The sleek, super low profile, Antenna pod easily mounts on the roof of any vehicle, boat or plane.

### RMOD-DREAM-2IP4 Modem

- Minimum set up, just connect to our low profile BUC and (L band) modem unit, which uses the world's most efficient, 2-way SCPC OR Optional DAMA (Single Channel Per Carrier/Demand Assigned Multiple Access) system.
- The system can be used for either:
  1. SCPC for simple point to point applications.
  2. DAMA with the associated 95% satellite efficiency potential for uses Raditek's advanced satellite modem using SCPC/DAMA with uplink power control and Automatic Bandwidth On Demand (ABOD).
- The modem supports data rates from 16Kbps up to 20Mbps, data rate with LDPC coding and to 12 Mbps with TPC coding.
- The MODEM has its own IP address, same as if it was connected to a permanent land line.
- Actual IOTM data rate is based on link budget, and will typically be below 1 Mbps Transmit, typically around 128-512Kbps. Using our modem, no special frequency spreading is usually required (as needed with others).

## Internet on the Move, Ku-Band, (20 or 40)W RIOTM-Ku-Band-(20 or 40)W-v13

We offer 3 Antenna model options :

Specifications	Units	Model 1 20W (38.5dBW)	Model 2 40W (42.3dBW)	Model 3 40W (45dBW)
<b>Frequency Band:</b>				
Receive: High band	GHz	11.7 - 12.75	11.7 - 12.75	11.7 - 12.75
Receive: Low band	GHz	10.95 - 11.7	10.95 - 11.7	10.95 - 11.7
Other specials bands possible.		(Custom option)	(Custom option)	(Custom option)
Transmit:	GHz	14.0 - 14.5	14.0 - 14.5	14.0 - 14.5
Polarization: (auto polarization control)		Linear	Linear	Linear
<b>Gain:</b>				
Receive:	dBi	29.5	30	29.5
Transmit:	dBi	27	26	29
<b>Antenna G/T:</b>				
at 30° elevation	db/°K	8	7.3	6.6
at 45° elevation	db/°K	9	8.1	7.6
Uplink EIRP:	dBW	38.5	42.3	45
Cross Polarization:	dB	> 30	> 25	> 25
IF Input (Tx):	MHz	950-2150	950 - 1450	950 - 1450
IF Output (Rx):	MHz	950-2150	950 - 2150	950 - 2150
<b>Power Supply:</b>				
Antenna	VDC	10-30	10-30	10-30
BUC	VDC	48	48	48
<b>Continuous Power Consumption:</b>				
Antenna	W	55	55	55
BUC	W	180	300	300
IDU	W		8	8
<b>Antenna Performance</b>				
Elevation Look Angle Range (Automatically adjusted)		20 - 80 °	20 - 70 °	25 - 70 °
Azimuth Angle Range: (Automatically adjusted)		360 ° continuous	360 ° continuous	360 ° continuous
Tracking Rate:	°/sec	60	60	60 (w/o notice)
Polarization Angle Range: (Automatically adjusted)		-180 ° to +180 °	-180 ° to +180 °	180 ° to +180 °
Initial Satellite Acquisition & Lock: (fully automated with integrated GPS)	s.	< 60	< 60	< 60
Satellite Re-Acquisition:	s.	<1 modem dependent	< 10 (when LoS blockage is <2 minutes)	< 10 (when LoS blockage is <2 minutes)
Azimuth tracking accuracy (@ 60°/s, 360°/s <sup>2</sup> )			0.5 °	0.5 °
Elevation tracking accuracy (@ 45°/s, 180°/s <sup>2</sup> )			1.0 °	1.0 °

## Internet on the Move, Ku-Band, (20 or 40)W RIOTM-Ku-Band-(20 or 40)W-v13

Specifications	Units	Model 1 20W (38.5dBW)	Model 2 40W (42.3dBW)	Model 3 40W (45dBW)
<b>Electrical Interfaces</b>				
Tx, BUC Input (L-band)		TNC, 50Ω	N (50Ω)	N 50Ω
Rx Output			TNC, 50Ω	TNC, 50Ω
<b>Physical</b>				
Outdoor Unit Size: (L x W x H)	in. (cm)	45 x 35 x 7 (115 x 90 x 18)	45 x 35 x 7.5 (115 x 90 x 19.1)	45 x 35 x 9.3 (115 x 90 x 23.6)
Outdoor Unit Weight:	lb (kg)	77 (35)	93.6 (42.5)	103 (46.7)
Indoor Unit Size: (L x W x H)	in. (cm)	7 x 9 x 3 (18 x 23 x 7)	7 x 9 x 3 (18 x 23 x 7)	7 x 9 x 3 (18 x 23 x 7)
Indoor Unit Weight:	lb (kg)	2.8 (1.3)	2.8 (1.3)	2.8 (1.3)
<b>Environmental</b>				
Temperature Range	°F (°C)	-13 to + 130 (-25 to + 55)	-40 to + 131 (-40 to +55)	-13 to + 158 (-25 to 70)
Relative Humidity	%	10 to 100% condensing	up to 95	up to 95
Ground Speed	mph (Km/h)	Up to 220 (350)	Up to 220 (350)	Up to 220 (350)
Flammability		UL 94, V0		

The RADITEK RMOD-DREAM-2IP4 modem operates as a complete switching Internet router, and so *any SCPC, Point to Point Internet application can be supported*. In addition: MESH and STAR network configurations are ALSO possible, when used in DAMA (Demand Assigned Multiple Access) mode with our unique, advanced NMS system.

Connection is possible with our satellite network solution using our LOW PROFILE, IOTM (Internet On The Move) antenna mounted on vehicles, boats or planes.

Our solution uses SCPC *only* or a unique combination of: SCPC in MESH or STAR configuration, with DAMA with AUPC (Automatic Uplink Power Control), and ABOD (Automatic Bandwidth On Demand), and combined with the most advanced Turbo Product Code, which can give BER (Bit Error Rates) as low as 10E-8 to 10E-10 with only a few tenths of a dB more Eb/No, than the already very low level needed for 10E-6! or even better performance to 20Mbps with LDPC coding.

### ***DVB-S/S2 Satellite TV on the Move***

*The most advanced DVB-S2 with DAMA based (95% efficient typically) return channel is ideal for running 2 way internet and broadcast video. Because conventional return channels like RCS are typically 50% efficient!*

If DVB video is needed, for Receive Video on the go, we offer our DVB-S/S2 Demod, combined with our SCPC/DAMA remote modulator.

RADITEK can supply the BUCs, Example, the smallest, lightest and most efficient 40W Ku Band GaN based BUC. and HUB solution too. We have advanced Antenna Control Units (ACS) model RACU-1000 (below), which can be used to steer large antennas to track even Inclined Orbit satellites, thereby extending their useful life.



## Internet on the Move, Ku-Band, (20 or 40)W RIOTM-Ku-Band-(20 or 40)W-v13

### Antenna Tracking Details:

- Tracking is autonomous, after it has locked onto a carrier. GPS gives current Antenna/Vehicle coordinates. ACU (Antenna Control Unit) has satellite information to adjust to appropriate elevation and polarity.
- With TX muted, antenna will sweep in Azimuth looking for the satellite signal. Once it has found it, it tracks the satellite with it's 3 axis gyro and inclinometers.
- The filtered received satellite signal can track **any carrier** on the satellite, not necessarily the actual one you need,(ideally a video carrier) 50KHz - 50MHz or a Beacon tracked RSI (non coherent Received Signal Strength).
- Interrogates the modem (via RS232), to detect lock. It can use AGC output either (Analog or Digital), according to a preprogrammed objective.
- Then the antenna tracks, with beam steering in elevation, easily preset using a PC/GUI based app. usually with BPSK.

### Antenna Tracking Interface Details:

#### A.1 Connector

The interface connection is a 9-pin D-Sub male located at the rear panel of the terminal.  
The signals are EIA-232.

**Table A-1 Antenna Tracking Interface Pin Assignments**

Pin #	Description	Direction
2	EIA-232 RX data	In
3	EIA-232 TX data	Out
5	Ground	
1,4,6-9	Not used	

#### A.2 Serial Protocol

The RS-232 data is sent and received as asynchronous serial characters with a format that is programmable via the terminal's GUI.

**Table B-2 Antenna Tracking Serial Protocol Parameters**

Parameter	Description
Baud Rate	4800 to 38400 kbps
Parity	None, even, or odd
Data	7 or 8 bits
Stop	1 or 2 bits



# TWT Amplifier C Band 5.850-6.425GHz,



1KW linearized TWTA

RTWTA-5.850-6.425G-1KW-RL-n6



- **2250W of peak power, limited to give up to**
  - **1KW of linear power.**
- **Touch Screen Interface**
- **Build-in Redundancy Controller**
- **High Efficiency with integrated linearizer**
- **Ethernet interface with Remote Diagnostics**
- **Parameter Trend Analysis**
- **19 inch rack space of 11 rack units.**
- **1:1 or 1:2 redundant system mounted in a single rack.**

- **Incorporates a high efficiency, 2.25KW multi-stage depressed collector TWTA. Limited to 1KW maximum linear power powered by simplified, more efficient power supplies-to give lower cost better efficiency.**
- **The unit includes RF gain control, a solid state pre-amplifier, RF filters, cooling, and monitoring and control (M&C) systems.**
- **The touch screen front panel for easy customer interface. The display shows HPA status, parameter trend analysis and event logs, and remote diagnostics can be easily performed via the Ethernet interface. Also, because the display can show and control waveguide switches or a combiner, the need for separate external controllers is eliminated for common architectures**

Specifications		Units
<b>R F Specifications</b>		
Frequency (Extended frequency coverage available option)		5.850-6.425 5.850-6.650 GHz
<b>Output Power</b>	Traveling Wave Tube	2250(sat)
	Rated Power @ Amplifier Flange	1000 (linear)
<b>GAIN</b>	Large Signal	70 (min)
	Small Signal	75 (min)
	Attenuator Range	25 (continuous)
	Maximum SSG Variation Over:	
	Any Narrow Band	1.0 dB per 40 MHz
	Full Band	2.5 dB/575 MHz
	Slope (maximum)	± 0.02
	Stability, 24 hr. (maximum)	± 0.25
Stability, Temperature (maximum)		± 1.0 dB over temperature range at any frequency
INTERMODULATION (maximum) with two equal carriers (with linearizer)		-24 @ 4 dB total power back off from rated power dBc
HARMONIC OUTPUT (maximum)		-60 dBc
AM/PM CONVERSION (maximum)		2.5 deg/dB at 6 dB below rated power deg/dB
<b>NOISE POWER (maximum)</b>	Transmit Band	-70 dBW/4kHz
	Receive Band	-150 dBW/4kHz (3.7 to 4.2 GHz)
<b>GROUP DELAY (maximum)</b>	Bandwidth	Any 40 MHz
	Linear	± 0.01 nS/MHz
	Parabolic	± 0.001 nS/MHz
	Ripple	0.5 nS/Pk-Pk

## TWT Amplifier C Band 5.850-6.425GHz, 1KW linearized TWTA

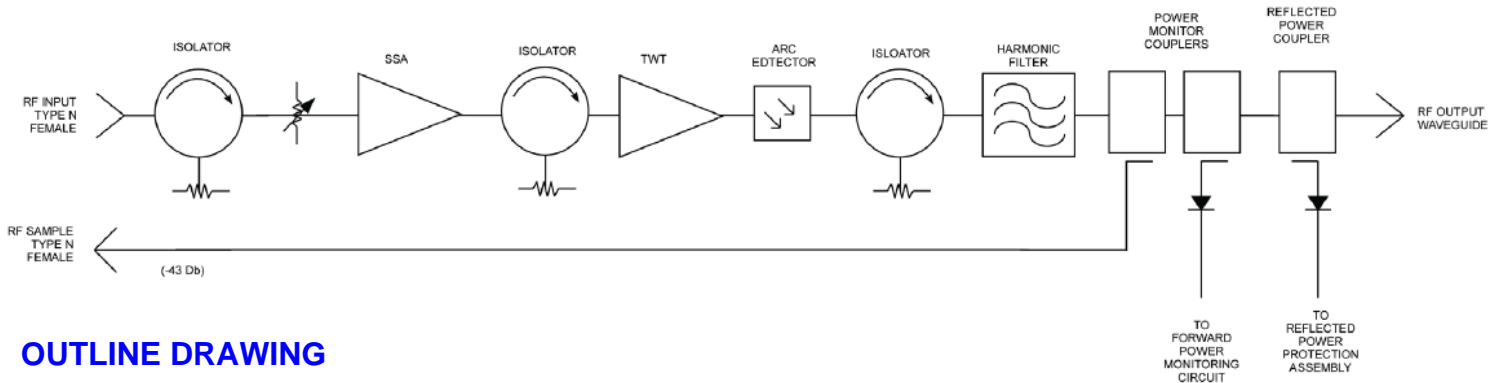
<b>RESIDUAL AM NOISE (maximum)</b>		-50 dBc to 10 kHz	
		-20 (1.5 + logf ) dBc to 500 kHz	
		-85 dBc above 500 kHz	
<b>PHASE NOISE (maximum)</b>		12 dB below IESS 308/309 phase noise profile	
		AC fundamental -50 dBc	
		Sum of all spurs -47 dBc	
<b>VSWR</b>		Output and input	1.30:1
<b>Prime Power</b>	208V ±10% THREE PHASE; 47 to 63Hz, Single phase, 5000VA typical, 0.95 minimum prime power factor		
<b>Environment</b>	Non operating temperature	-50°C to +70°C	
	Operating temperature	-10°C to +50°C (2°C/1000 Feet Derating)	
	HUMIDITY	Up to 95% Non condensing	
	ALTITUDE	10,000 Feet MSL (maximum)	
	SHOCK AND VIBRATION	Normal Transportation	
	COOLING	Forced Air: 275 CFM (typical)	

**Interface**

Type		Function		
<b>Controls</b>	<b>Local</b>	Local / Remote	AC Power on / off	
	<b>Local and Remote</b>	Gain	High Voltage ON/OFF	
		Min/Max Power Alarm/Fault	Audio Alarm ON/OFF	
		Reflected Power Alarm/Fault	Units (Watts, dBm, dBW)	
		Fault Reset	Lamp test	
		Heater Standby ON/OFF	System	
<b>Status</b>	<b>Front Panel LCD</b>	Standby	Power	
		Local	Remote	
		Summary Fault	High Voltage ON/OFF	
		Heater Time Out (FTD)	Heater Standby	
		Power Out	Beam Hours	
		Reflected Power	Helix Current	
		TWT Temperature	Helix Voltage	
		Heater Hours	Faults	
		Uplink Power (option)		High VSWR
		Event Log		High Voltage
		Trend Log	Helix Current	
		TWT Temperature		
	System Status			
	Dry Form-C Relay Contacts (2)	Summary Fault		
<b>Computer serial port</b>	<b>Hardware Interface</b>	Two Ports: RS-232 & RS-422/RS-485		
		Ethernet T10/100		
	<b>Command Set</b>	ASCII Commands		
	RF Sample port Coupling	-37dB nominal		
<b>Options</b>	220/380 VAC±10% 3 Phase, 5 wire, 47-63Hz : 240/415 VAC±10% 3 Phase, 5 wire, 47-63Hz			
	1:1, 1:2, 1:N Redundancy : Extended frequency 5.85-6.65 GHz			
	Variable Phase Combined			

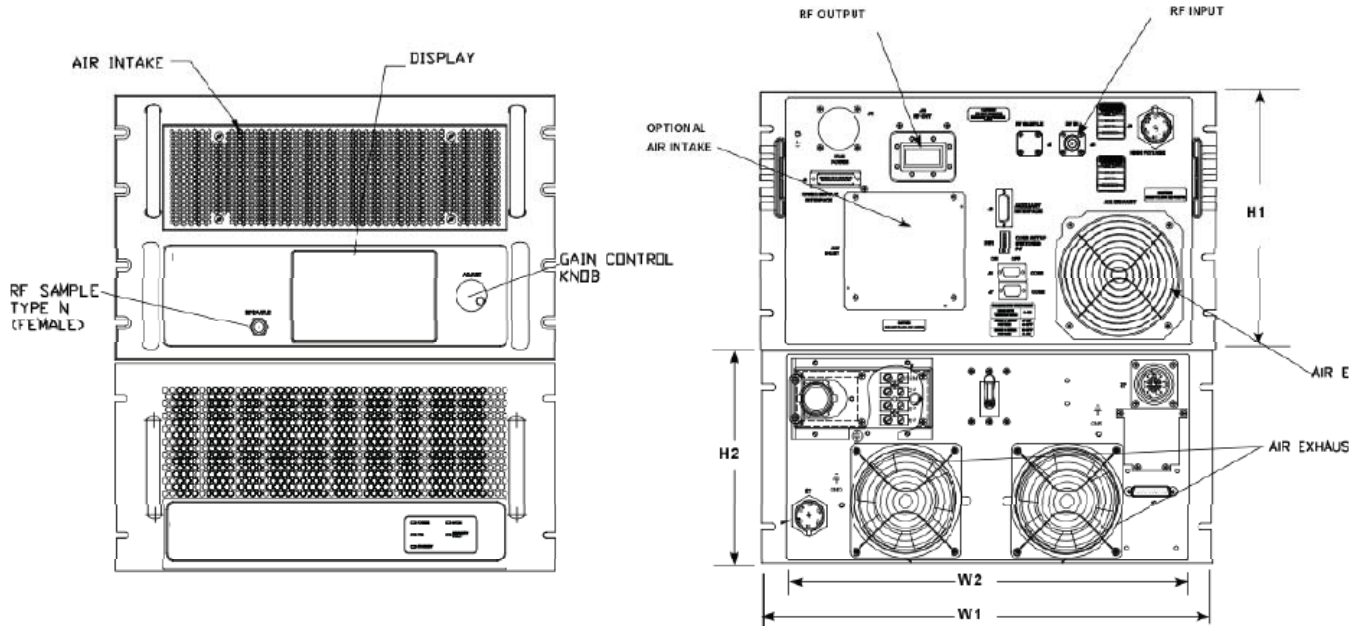
## TWT Amplifier C Band 5.850-6.425GHz, 1KW Linearized TWTA

### BLOCK DIAGRAM



### OUTLINE DRAWING

Units: Inch (Centimeter)  
Not to scale



Dimensions					
W1	19.00"	48.27cm	H1	10.09"	25.63cm
W2	17.00"	43.18cm	H2	8.72"	22.15cm
RFoutput	CPR137G		Nominal weight: 180Lbs; 81.65kg		





# HF Power Amplifier, 1.6-30MHz, 5KW CW/Pulsed Power

## Special Features include:

- Hot Swappable SSPAs (8 units with 625W per module)
- Modular Power Supplies (8 Units with 200W capacity)
- Remote monitoring with BITE (Built-in Test Equipment)
- Redundancy: Full rated power even if one SSPA/PSU fails.



The *RAMP-1.6-30M-5KW-85-265VAC-d16* is a high power, 1.6 to 30MHz, Amplifier, that is one of a family of highly efficient, linear Class A/B amplifier, that uses the latest, state of the art LDMOS and latest GaN (Gallium Nitride) technology. This amplifier is capable of delivering pulsed or continuous (CW) operation, at 5KW. It has 8 hot-swappable, 625W SSPAs (Solid State Power Amplifiers). Each SSPA has a built-in switchable, low pass filter to ensure a clean output signal. The outputs of the 8 modules are then combined for to deliver the rated output power

The PSUs (Power Supply Units) are also hot swappable, consisting of 8 PSUs, each delivering 2KW of DC Power. All of the PSUs are constantly monitored, and all critical data is available via internet (read only) or by interactive RS232//USB link locally.

The SSPA/PSUs are controlled by a microcontroller that monitors all the critical functions. This microcontroller has the ability to receive requests and data from the driving exciter to pre-tune the amplifier (at any specific frequency) for greatest efficiency and signal purity. The microcontroller also enables *BITE* (Built In Test Equipment) functions, providing continuous SSPA monitoring of all critical operating parameters that can be read with an Ethernet connection. Monitoring of the *RAMP-1.6-30M-5KW-85-265VAC-D16* may be done by the customer over the Internet. In addition, the *RAMP-1.6-30M-5KW-85-265VAC-D16* incorporates front panel metering for the SSPA voltages and current for each of the 8 x SSPA modules.

The amplifier may be driven to full power with 100mW from the host exciter. The *RAMP-1.6-30M-5KW-85-265VAC-D16* has a built in Automatic Level Control (ALC) for producing a level output as well as a controlled rollback of power due to rising VSWR, it can withstand VSWR's up to 60:1, with full protection from excessive VSWR. The *RAMP-1.6-30M-5KW-85-265VAC-D16* can also be supplied with an optional Raditek exciter (high speed synthesizer). The SSPA array will be automatically optimized for optimal performance for any given (in range) frequency, with dynamic frequency info supplied by the exciter.

Power amplifier redundancy: Full rated output power is available, even if *one* SSPA or PSU should fail for any reason.

### Order Examples: RAMP-1.6-30M-5KW-85-265VAC-d16

Description: (Amplifier, (1.6-30MHz) 5KW CW/pulse power, 85-265V AC Single Phase

### Options:

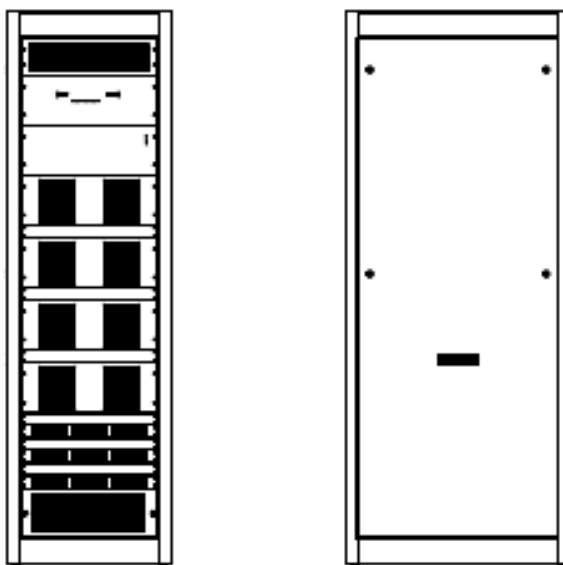
Opt 1	Opt 2	Opt 3	Opt 4	Opt 5
AC Line input	Acoustic Noise	Freq Change time	BITE to Ethernet	Certified to MIL-Std-188-141
342-418 VAC at 28A or 375-456 VAC	55dBa fans	20ms switching	Read only	

## HF Power Amplifier 1.6-30MHz 5KW CW/Pulsed Power, K1 model

<b>Specifications</b>	
Frequency Range	1.6-30 MHz
Frequency change time:	<40ms (standard), <20ms optional
Power Output	5KW PEP(Peak Envelope Power) and Average Power with VSWR up to 60:1 (fully protected)
Key Control	RF Power is within $\pm 1$ dB of time steady state level in less than 10 ms after key ON
	RF power is reduced by more than 50 dB within 5 ms after key OFF
Power Input	100 mW for Full Output Power , 1mW average for rated power output
ALC Range:	Can control output power to within +/- 0.5 dB, <i>even if one amplifier or its PSU fails!</i>
Gain Variation	1.5dB maximum over frequency range
Input Impedance	50 $\Omega$ (1.5:1 VSWR)
VSWR Rollback (Turndown)	Adjustable eg at 3:1, amplifier can set to operate into up to 60:1 VSWR.
VSWR Withstand:	VSWR >60:1
Spurious Emissions:	<-60dBc within $\pm 5\%$ of operating frequency and <-80 dBc at beyond $\pm 5\%$ of operating frequency
Harmonic Levels:	<-65 dBc at rated power (into a 50 $\Omega$ load)
3rd order IMD:	<32 dBc below PEP
RF Noise	<- 75 dBc/Hz below the rated 5KW output signal
<b>Power</b>	
Power Supply	Modular (8 x 2KW DC) hot swappable
AC Line Input (Single phase)	1 phase or 3 (shared) phase standard 85-265 VAC Single (~40A) (or 185-379 VDC)
AC Line Input: (3 phase) (Optional)	or 342 -418 VAC at 28A nominal: or 375-456 VAC at 27A nominal
Power Supply Efficiency	92% efficient
<b>Monitors</b>	
Monitoring/control:	Dual Analog Monitors providing Forward/Reflected Power and Power Amplifier Voltage and Current
Indicator LEDs	Front Panel Monitoring and remote monitoring via Built in Test Equipment
Control	RS232/ RS422/RS485 (standard) Ethernet Read only, USB to exciter
	ALC to the external exciter BIT parameters via serial bus
Monitor Interface	Transmitter RS232/485 USB interface Optional And Ethernet (read only)
Metering	Dual Analog Meters providing Forward/Reflected Power and Power Amplifier Voltage/Current
<b>Size and Weight</b>	
Dimensions:	70.31" (H) x 31.5" (D) x 23.0" (W) , Standard 19" rack
Weight	< 800 Lb
Designed to meet MIL-STD-188-141	Full Certification (Optional)

## HF Power Amplifier 1.6-30MHz 5KW CW/Pulsed Power, K1 model

Interfaces	
TX Interface	Transmitter RS232/485/USB Note: USB with an adapter.
Monitoring Interface	Ethernet (local)
Connection	RF In RF Out AC In
Monitor & Control	RS232/ RS485 (standard) USB(with an adapter), Ethernet (Option)
Environmental	
Altitude:	Operating: 0-10,000 ft. ASL (not airborne) Non-operating: 0-50,000 ft
Temperature	Operating over 0-50°C at sea level Operating: maximum temp. derated linearly to + 20 °C at 10,000 ft Non operating: -40 to + 60°C
Humidity	0-95% relative humidity, non-condensing
Cooling	Internal Forced Air Cooling (from bottom to top of rack. Requires ~4inches headroom above the rack to exhaust hot air.)
Acoustic Noise:	65dBa normal, Optional: 55dBa fans can be installed



# Flyaway Antenna, Ku-Band, Carbon Fiber, 1.2meter, Auto Tracking

# RADITEK

## SATCOM Ku-Band Antenna

### Components:

- Dual Offset Antenna
- Azimuth & elevation turntable
- Built in Controller

### Applications:

- Disaster recovery
- Public security government, oil, water conservancy, electricity, finance and other important sectors of the country
- Coverage for remote areas
- Field operations



### Features

- **Carbon fiber antenna reflector:** with light weight, high precision and high efficiency,
- **Corrosion resistant** to ensure normal operation under harsh environment.
- **Compact structure:** Lightweight, portable, rapid deployment, high performance.
- **Easy to install:** a person can install within 5 minutes.
- **Shippable:** in airline baggage.
- **Operation: controller:** Works with GPS and inclined angle mete to achieve full auto controlling, ease of operation.
- **Designed:** compact and robust,
- **Cost-effective:** Fast and reliable satellite communications.
- **Designed specifically for field use:** It quickly transfers high-quality broadband content.

### Order Examples: RANT-Kue-CF-Flyaway-1.2m-Auto-x15

**Description:** (Flyaway Antenna, Ku Extended-Band (Tx 13.75-14.5GHz, Rx 10.95-12.75GHz), Carbon Fiber, Flyaway, 1.2meter, Auto Tracking)

RF Performance		
Antenna Aperture	1.2m×1.1m Gregorian offset antenna	
Operation Frequency	Tx	13.75-14.5GHz
	Rx	10.95-12.75GHz
Gain ( dBi )	Tx	≥41.5
	Rx	≥40.5
Polarization	Linear	
Satellite positioning	Motorized positioning through GPS and inclinometer; Beacon receiver assures positioning accuracy;	
VSWR	≤1.25:1	
Cross-pol	>35 dB(On-Axis) >30dB (Off-Axis within 1dB contour)	
Interface	WR75	
Pointing Accuracy	≤ 1/10 beam-width	
Tx/Rx Isolation	≥85 dB (including rejection filter )	
First sidelobe	≤ -14 dB	
Sidelobe ( 1° ≤ Ø < 20° )	29-25 log Ø dBi	

## Flyaway Antenna Ku-Band, Carbon Fiber, 1.2m, Auto Tracking

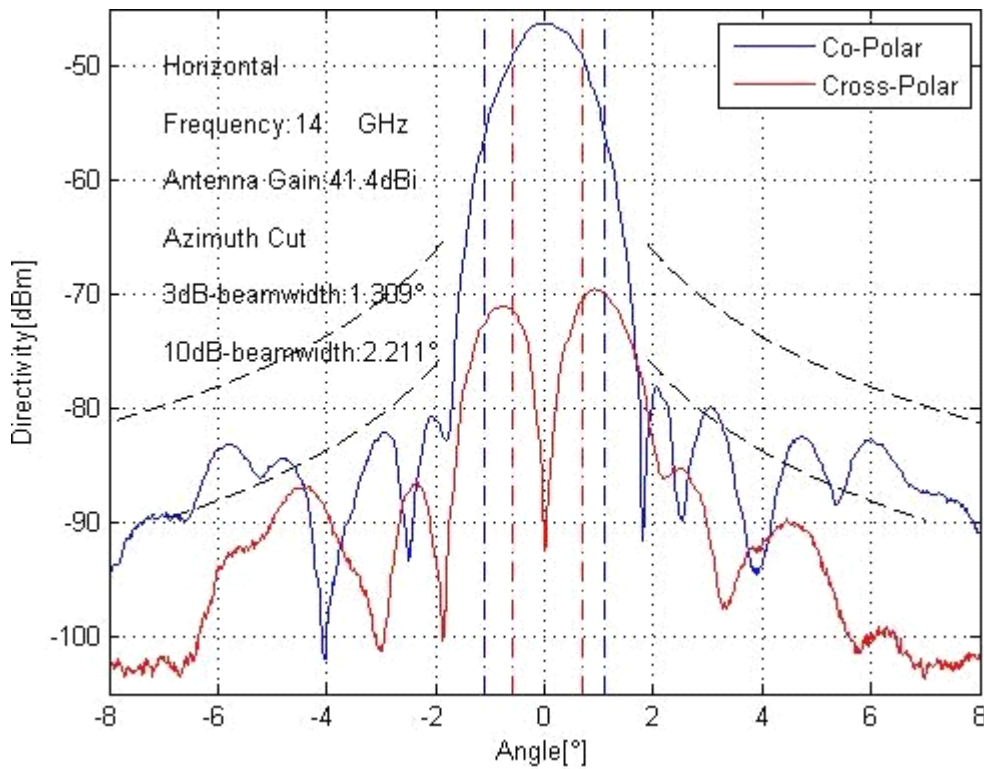
RF Performance	
Power supply	85 ~ 265VAC (350 W)@ 50 ~ 60 Hz
Power capacity	1000W
Mechanical Specification	
Antenna Type	Dual Offset antenna
Main reflector material	Carbon Fiber
Reflector	6 pcs
Net Weight	Antenna: 25Kg
Package	Case (ABS travel case) 1: 802×520×316mm (37kg) Case 2(backpack): 732×510×185mm(10kg)
Elevation	15~90°
Azimuth	±90°
Polarization	±90°
Environmental Specification	
Wind load operational	12m/s , survival 18m/s
Operational Temperature	-30 ~ + 55°C
Storage temperature	-55 ~ +80°C
Operational humidity	100%



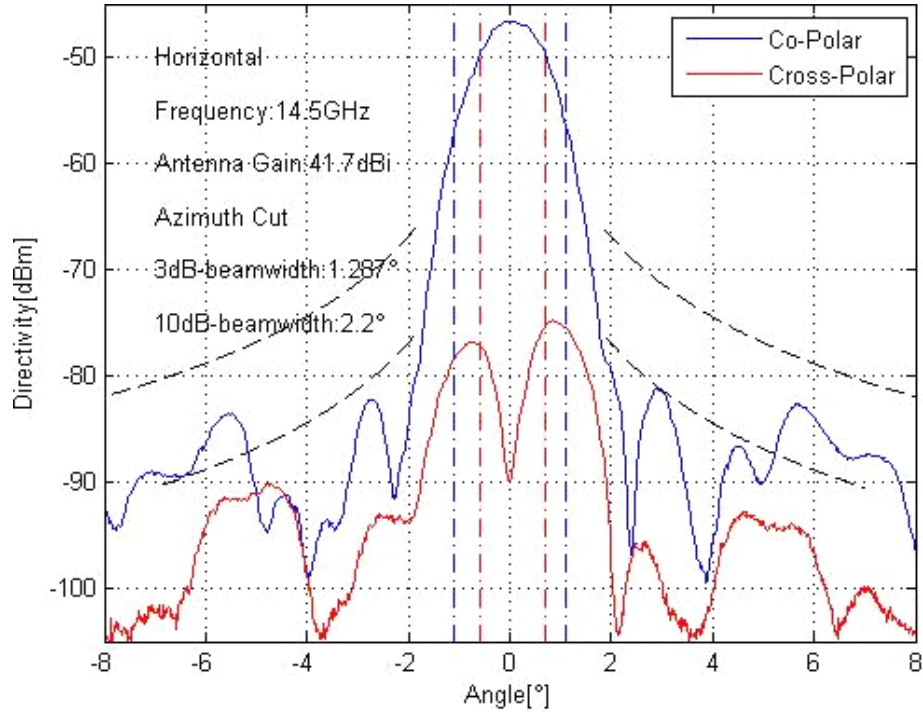
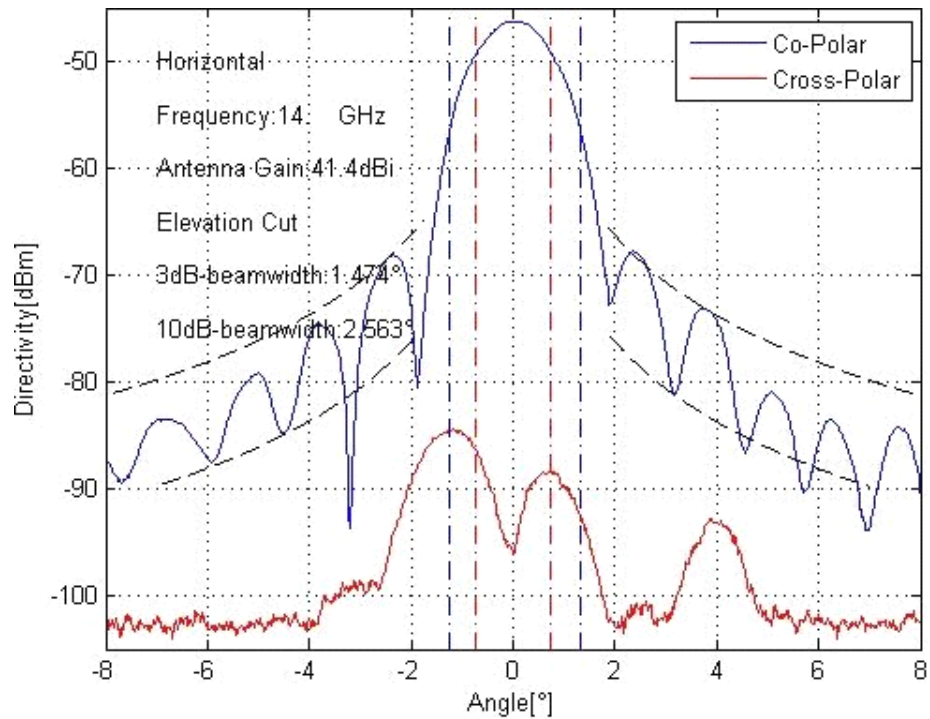
## Flyaway Antenna Ku-Band, Carbon Fiber, 1.2m, Auto Tracking

### 0.96 x 1.20 Metre Kue-band Antenna - Horizontal Patterns

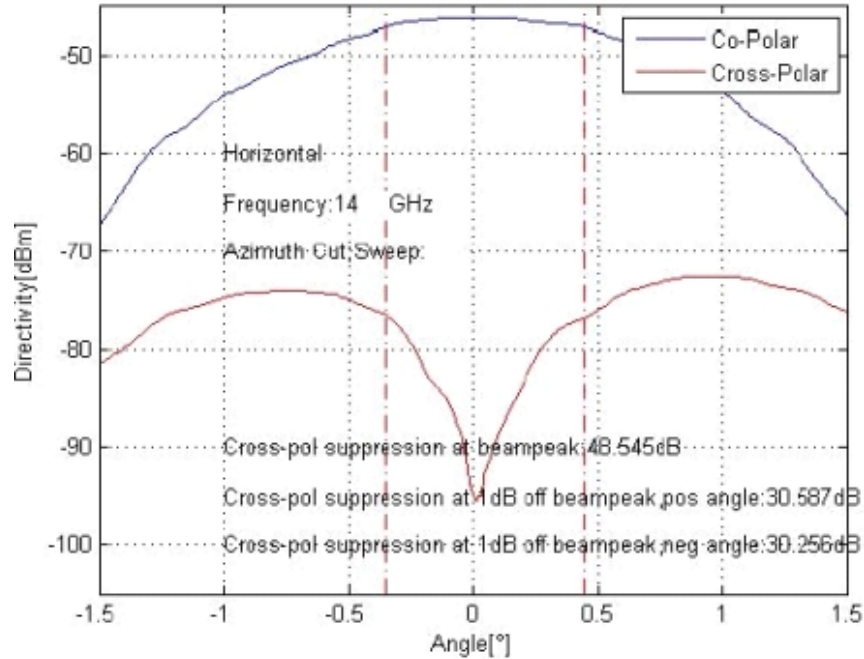
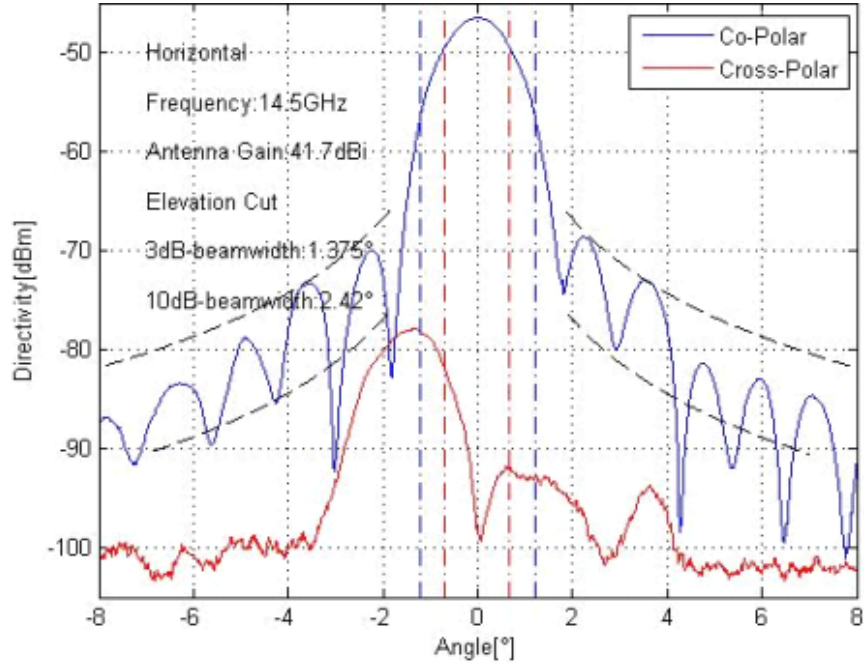
**Antenna Aperture:** Diameter: 960mmx1200mm  
**Co-pol (Co-Polarization) Sidelobe Envelope:**  
 $29 - 25 \log_{10} - (\text{off axis angle})$  from  $100\lambda / D$  to 8 Deg  
**X-pol (Cross Polarization) Sidelobe Envelope:**  
 $19 - 25 \log_{10} - (\text{off axis angle})$  from  $100\lambda / D$  to 8 Deg  
 Where  $\lambda$  is wavelength and D is antenna aperture diameter (0.96 or 1.2m)



## Flyaway Antenna Ku-Band, Carbon Fiber, 1.2m, Auto Tracking

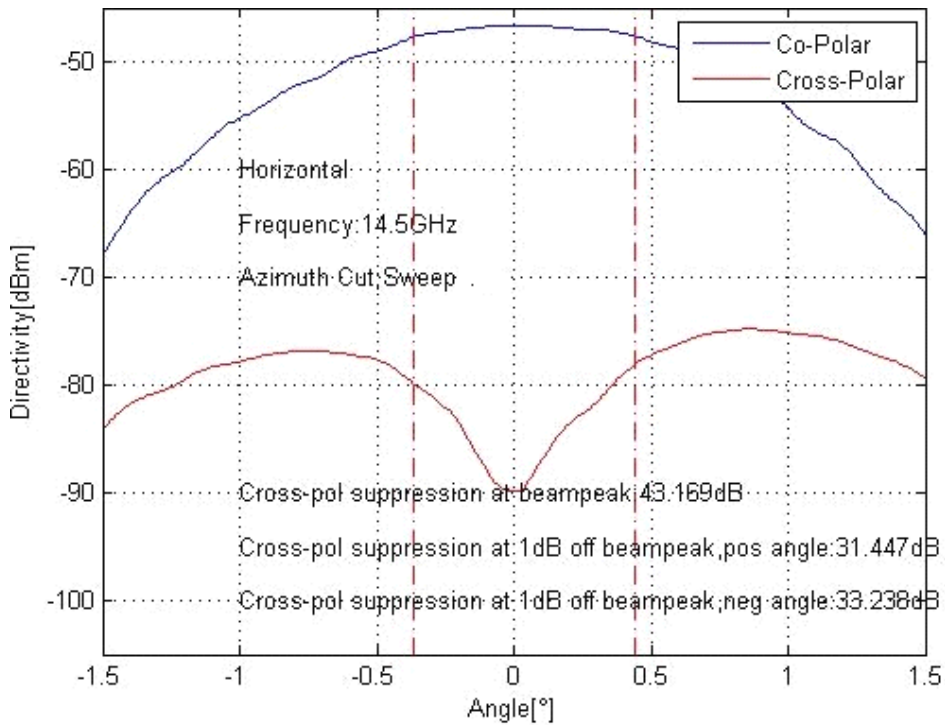
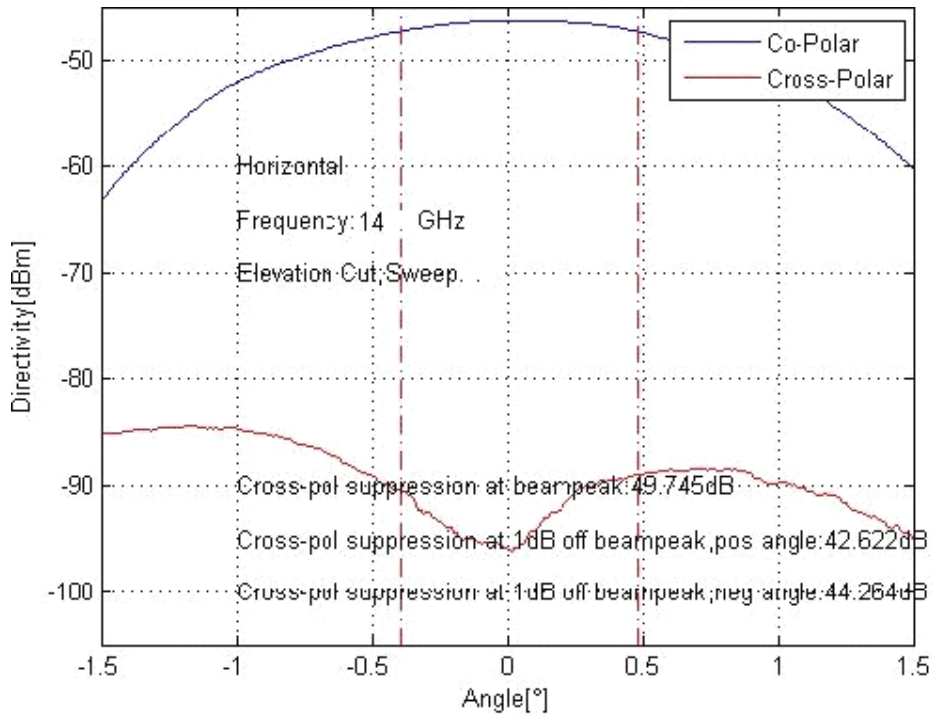


## Flyaway Antenna Ku-Band, Carbon Fiber, 1.2m, Auto Tracking

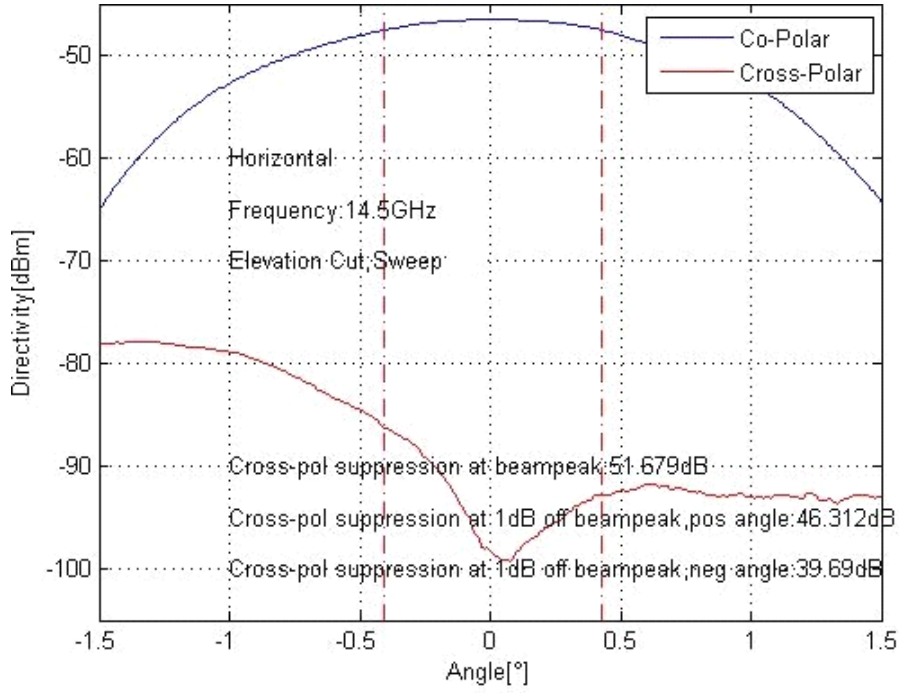




## Flyaway Antenna Ku-Band, Carbon Fiber, 1.2m, Auto Tracking



## Flyaway Antenna Ku-Band, Carbon Fiber, 1.2m, Auto Tracking



# Antenna Control Unit

RACU-1000-q16

## Features

- Single key antenna positioned
- Simultaneously displays on front panel LCD:
  - Az, El, Pol angles
  - Received signal strength
  - Satellite name and longitude
- Non Volatile Memory
  - Stores up to 38 preset position and polarization combination
- Continuous Antenna Status Monitoring
  - Motion limits
  - Drive error monitoring
  - Maintenance info.
  - Emergency stop and runaway conditions
- Dual Speed: Fast slewing, fine positioning
- **Inclined Orbit tracking:** Step track, memory & search modes
- PC control: Optional RS-422 interface
- Opto-isolators: Up to 5KV rated, opto-isolation.

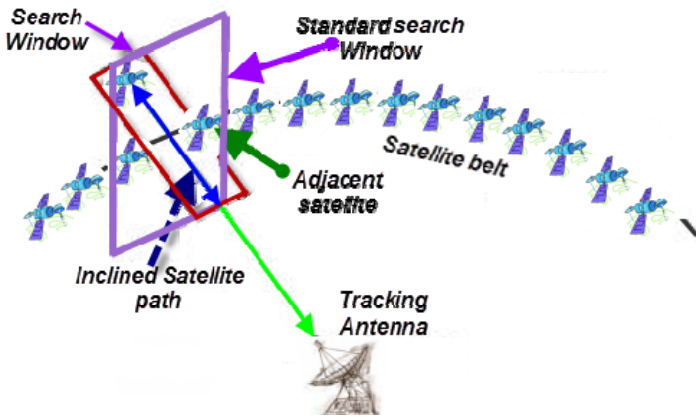


The **RADITEK, RACU-1000-q16** controller is all you need for any satellite, including inclined satellite, tracking system. The ACU works with any L, C and Ku band antenna from 0.4 to 10m. It offers the best tracking solution for new installations, as well as **upgrading, older existing antenna systems**. Even if the satellite (up to 5 inclined satellites) **has declined into an inclined orbit**, for example and it has PC remote control ability, and optically coupled drive outputs, limit inputs that provide isolation between the outdoor unit and the rack mounted **RACU-1000-q16**. Antenna position sensing is performed by a high resolver system. Up to 38 preset satellites can be stored and fast slewing as well as fine positioning speeds are possible.

**This controller is designed for future expansion as well, It has extra ports for potentiometer based feed control, RF power measurement circuits, TTL compatible Digital inputs, and form C relay outputs.**

**The ACU continuously monitors: Motion limits, maintenance Drive error, emergency stops and runaway conditions.**

## Antenna Control Unit RACU-1000-q16



The **RACU-1000-Q16** has a special intelligent algorithmic search feature that reduces errors associated with traditional “box” search methods.

The **RACU** search algorithm calculates the satellite trajectory, and stores it for future reference. Even an inclined satellite can be tracked as easily as a normal one. To do this, select **AUTO** mode, select the satellite from the list there, select the proper polarization, and the **RACU-1000-q16** does the rest.

This tracking algorithm can be operated in 3 modes:

### STEP\_TRACK/PROGRAM\_TRACK/SEARCH

The user jogs the antenna to the satellite, and verifies its' identity. The system enters...

**STEP\_TRACK MODE:** the controller periodically peaks the receiver's AGC signal strength, by jogging the antenna. The controller records the time and position in its non volatile memory.

The inter-peak interval is determined by antenna beam width, satellite inclination, and a user specified error in dB.

**STEP\_TRACK** mode changes to:

**PROGRAM\_TRACK**, once the satellite's motion corresponds to a previously stored normal trajectory. In this mode, the controller smoothly moves the antenna in Azimuth and Elevation, to positions defined in its (pre-stored) **tracking tables**. Antenna actuator wear can be minimized by a user specified “maximum allowable error” entry, that can result in a fewer antenna movements. The track table accuracy is maintained by peaking the receiver's AGC periodically. **Once the error is out of the operator's requested range, the all entries in the track table are tagged for update. The user can specify once a day to once a week.**

If the satellite signal is lost, the **SEARCH** mode is activated, which uses the intelligent search algorithm to rapidly reacquire satellite lock.

### Specifications:

<b>Track mode:</b>		
Antenna size	0.4 to 10	meters
Tracking modes	Intelligent, Step and program track	
Inclined satellites	Can track up to 5	
AGC inputs	2 x ±15	Volts
Input impedance	4	MΩ
<b>ANTENNA interface:</b>		
Control Output	Protected, open collector relay drivers	
Control Output	I max=700	mA
Control Output	Vmax=60	V
Positioning	Low voltage resolver interface	
Alarm output	3A @30Vdc or 3A @ 125V (NO and NC)	
<b>Physical:</b>		
Size	19 x 3.5 x 9 (rack)	inch
Weight	19	Lbs
Operating temp.	0 to 50	°C
Power (AC)	115/230 (48W)	VAC 50/60Hz



Ku-Band Micra-BUC  
Block-Up-Converter  
16, 20, 25, 40Watts,  
10MHz Ext. Reference,  
Outdoor Unit.



Not all BUCs are equal: Raditek's Ku-Band Block-Up-Converter Family is so compact, its small size and weight facilitate direct antenna feed mounting. It weighs only 5½ lbs, with up to 40W (Rated power), and has a built-in AC (90-265VAC 50-60Hz auto-ranging) power supply, with -48V (DC) optionally available too. These BUCs have the best in class RF performance, including: Internal output isolator and Internet based monitor and control, with both serial and analog interfaces. **Ideal for any VSAT application, especially RADITEK's Internet on the Move (IOTM) for the smallest, lightest weight applications. Also ideal with the Raditek Micra™ single board modem to RADITEK's highest performance Extreme Modem.**

**KEY FEATURES:**

- Up to 40W Linear / 50W Psat (Rated Power)
- **6.25"x6.45"x3.5" (extremely small!), 5.5lbs**
- Ideal for feed horn mounting
- Only 250W Power consumption at 40W output
- 180W power consumption at 3dB back off.
- Excellent RF performance:
  - ❖ Phase noise 6dB better than IESS308/309
  - ❖ Saturated power of 44dBm minimum
  - ❖ Spurious below -60dBc
  - ❖ Wide dynamic range of Gain Control
- Integrated L-Band to Ku-Band up converter
- Overdrive protection on 40W model
- High Linearity
- Switchable LO option – Standard (S) and Extended Ku-Band (E) in one unit
- Built In isolator provides full output VSWR Protection
- Output power measurement - True RMS detector installed at factory (optional)
- Configuration via RS-232 serial, packet protocol RS-485 - User friendly HTTP based GUI and SNMP (optional),
- Built in auto-ranging AC power supply
- -48VDC isolated power supply (optional)
- Field upgradable software
- Status LED

(Compare to our competitor, Wavestream, for example:-

Wavestream's Ku-Band Matchbox BUC	16W/25W/40W	10.3"L x 5.4"W x 4.5"H	10 lbs
-----------------------------------	-------------	------------------------	--------

**Order Examples: RBUC-L-Kue-WR75-Nf-40W-ER10M AC-ODU-i13**

Description: (Block Up Converter, L Band (950-1450MHz) to Kue(13.75-14.5GHz), N-Type Female IF Input Connector, WR75 Grooved RF Output Connector, 10MHz External Reference, 40 Watts, AC (90-265V)

Additional Options: **Kue (13.75-14.5GHz) / Ku (14.0-14.5GHz)**

**RF Power: 16, 20, 25 and 40 Watts**

**AC (90-265V), (DC: -48V(32-72V))**

\*Contact us for the part number per frequency sub-band options.

## Block Up Converter L to Ku-Band

### 16, 20, 25, 40Watts, 10MHz Ext Reference, ODU

#### 16,20,25W Rated Power Micra-BUCs

Specifications	16W	20W	25W
<b>RF Performance</b>			
RF Frequency Range - <b>(switchable via RS485)</b>	14-14.5GHz (Ku)		13.75-14.5GHz (KuE)
IF Frequency Range	950-1450MHz		950-1700MHz
LO Frequency	13.05GHz		12.8GHz
Conversion	Single Conversion; non-inverting		
Output Power at Psat	42dBm minimum -16W	43dBm minimum-20W	44dBm minimum -25W
Saturated Power	43dBm typical.	44dBm typical.	45dBm typical.
Conversion Gain	72dB min, 75dB typical		
Gain Flatness	±1dB typical ±1.5dB max over full band; ±0.5dB maximum over any 40MHz		
Gain Stability	±1.5dB over full temperature range		
Gain Control	20dB minimum dynamic range		
External Reference Frequency	10MHz multiplexed with IF In		
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz		
Up-Converter Phase Noise	-70dBc/Hz @ 100Hz; -80dBc/Hz @ 1kHz; -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz		
Linearity: 2 tone IMD	-25dBc at 3dB total power back off from Psat. -30dBc for QPSK at 1.5xsymbol rate at 2dB back off from Psat.		
Output Spurious: Non-signal related	-60dBc		
Signal related	-55dBc		
<b>Power</b>			
AC Voltage Range	90-265VAC 50-60Hz auto-ranging		
48V DC Voltage Range (optional)	(-48V) 32-72VDC Isolated (with reverse voltage protection)		
Power Consumption	180W(16W RF)	220W (20W RF)	250W (25W RF)
<b>Mechanical</b>			
Size	6.25"x6.45"x3.9"		
Weight	5.5lbs		
Cooling	Forced Air		
Operating temperature	-40°C to +60°C		
Relative Humidity	Up to 100% condensing		
<b>Interfaces</b>			
IF Input Connector	N-type female		
RF Output Connector	WR75 grooved		
AC Power In Connector	MS3112E10-8P		
RS485-RS232-Ethernet-SNMP	MS3112E14-19S		

## Block Up Converter L to Ku-Band 16, 20, 25, 40Watts, 10MHz Ext Reference, ODU

### 40W Rated Power Micra-BUC.

Parameter	40W	
<b>RF Performance</b>		
RF Frequency Range	14-14.5GHz (Ku)	13.75-14.5GHz (KuE)
IF Frequency Range	950-1450MHz	950-1700MHz
LO Frequency	13.05GHz	12.8GHz
Conversion	Single Conversion; non-inverting	
Rated Power (P <sub>sat</sub> )	46dBm	
Conversion Gain	72dB min, 75dB typ	
Gain Flatness	±1dB typ ±1.5dB max over full band; ±0.5dB max over any 40MHz	
Gain Stability	±1.5dB over full temperature range	
Gain Control	20dB min dynamic range	
External Reference Frequency	10MHz multiplexed with IF In	
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz	
Up-Converter Phase Noise	70dBc/Hz @ 100Hz; -80dBc/Hz @ 1kHz; -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz	
Linearity: 2 tone IMD	-24dBc at 43 dBm (20W) -30dBc at 40dBm (10W) -30dBc for QPSK at 1.5xsymbol rate at 44dBm	
Output Spurious: Non-signal related	-60dBc	
Signal related	-55dBc	
<b>Power</b>		
AC Voltage Range	90-265VAC 50-60Hz auto-ranging	
48V DC Voltage Range (optional)	-48 (36-75VDC)	
Power Consumption	250W at rated power (P <sub>1dB</sub> ) 180W at 3dB back off/linear	
<b>Mechanical</b>		
Size	6.25"x6.45"x3.5"	
Weight	5.5lbs	
Cooling	Forced Air	
Operating temperature	-40°C to +60°C	
Relative Humidity	Up to 100% condensing	
<b>Interfaces</b>		
IF Input Connector	N-type female	
RF Output Connector	WR75 grooved	
AC Power In Connector	MS3112E10-8P	
RS485-RS232-Ethernet-SNMP	MS3112E14-19S	



L- to C-Band Block-Up-Converter  
20, 40, 80Watts,  
10MHz External Reference. ODU



Not all BUCs are equal: Raditek C-Band Block-Up-Converter Family is so compact, its small size and weight facilitate direct feed horn/antenna mounting. It weighs only 5½ lbs, with up to 80W Psat, and has a built-in AC (90-265VAC 50-60Hz auto-ranging) power supply, with -48V (DC) optionally available too. These BUCs have the best in class RF performance, including: Internal output isolator and Internet based monitor and control, with both serial and analog interfaces.

Key Features

- Up to 80W Psat in this super-compact and light weight package 6.25"x6.45"x3.9" only!
  - Suitable for feed horn mounting
  - Best RF performance:
    - Phase noise 10dB better than IESS308/309
    - Psat of 49dBm Spurious below -60dBc
    - Wide dynamic range of Gain Control
  - Integrated L-Band to C-Band conversion
- Available also in Standard, Extended, Palapa and Insat frequency **options**.
- Built In Output Isolator
  - Output power measurement has RMS detector
  - Configuration via RS-232 serial console, packet protocol RS-485 - User friendly HTTP based GUI and SNMP optional
  - Built in auto-ranging AC power supply
  - -48VDC isolated power supply (**optional**)
  - Field upgradable software
  - Status LED
  - Overdrive Protection on 80W model

**Order Examples: RBUCLCsNfCPR137ER10M20WACODUi13**

**Description:** (Block Up Converter, L Band(950-1525MHz) to C(5.85-6.425GHz), N-Type Female IF Input Connector, CPR137 Grooved RF Output Connector, 10MHz External Reference, 20 Watts, AC A90-265V), Outdoor Unit

**Additional Options:** **Opt: Cs Standard, Ce Extended, Ci Insat, Cp Palapa**

**40, 80Watts -48V DC (32-72V) Isolated**

\*Contact us for the part number per frequency sub-band options.



## Block Up Converter L to C-Band

### 20, 40, 80Watts, 10MHz External Reference, ODU

#### 20,40W PSAT

Parameter	20W	40W
<b>RF Performance</b>		
RF Frequency Range-Available in/switched:	5.85-6.425GHz (other frequency options available)	
IF Frequency Range	950-1525MHz	
LO Frequency	4.9 GHz (other options available)	
Conversion	Single Conversion; non-inverting	
Output Power at 1dB compression point	43dBm min	46dBm min
Saturated Power	44dBm typ	47dBm typ
Conversion Gain	72dB min, 75dB typ	
Gain Flatness	+/-1dB typ +/-1.5dB max over full band; +/-0.5dB max over any 40MHz	
Gain Stability	+/-1.5dB over full temperature range	
Gain Control	20dB min dynamic range	
External Reference Frequency	10MHz multiplexed with IF In	
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz	-140dBc/Hz @ 1kHz -155dBc/Hz @ 100 kHz
Up-Converter Phase Noise	-70dBc/Hz @ 100Hz; -95dBc/Hz @ 100kHz	-80dBc/Hz @ 1kHz; -115dBc/Hz @ 1MHz
Linearity: 2 tone IMD Spectral Regrowth	-26dBc at 3dB total power back off from P1dB -30dBc for QPSK at 1.5xsymbol rate at 2dB back off from P1dB	
Output Spurious: Non-signal related	-60dBc	
Signal related	-55dBc	
<b>Power</b>		
AC Voltage Range	90-265VAC 50-60Hz auto-ranging	
48V DC Voltage Range (optional)	32-72VDC Isolated	
Power Consumption	180W	220W
<b>Mechanical</b>		
Size	6.25"x6.45"x3.9"	
Weight	5.5lbs	
Cooling	Forced Air	
Operating temperature	-40°C to +60°C	
Relative Humidity	Up to 100% condensing	
<b>Interfaces</b>		
IF Input Connector	N-type female	
RF Output Connector	CPR137 Grooved	
AC Power In	MS3112E10-8P	
RS485-RS232-Ethernet-SNMP	MS3112E14-19S	

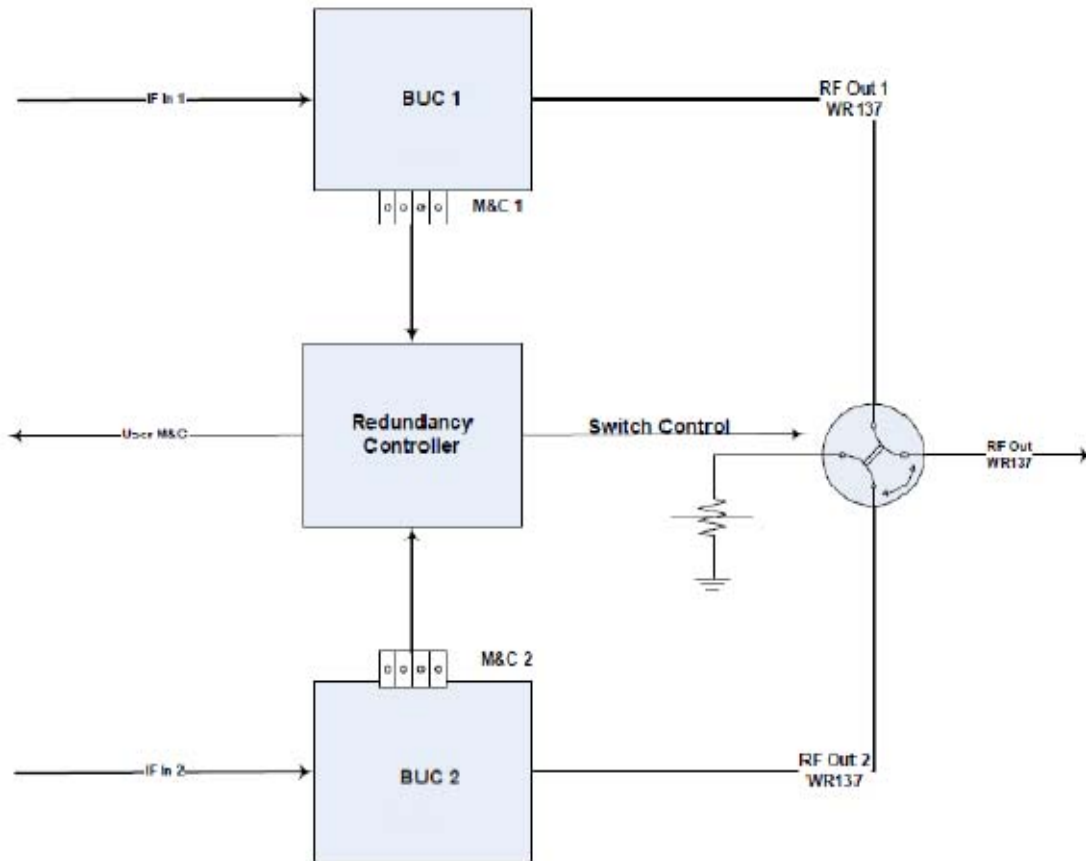
## Block Up Converter L to C-Band 20, 40, 80Watts, 10MHz External Reference, ODU

### 80W PSAT

Parameter	80W
<b>RF Performance</b>	
RF Frequency Range-Available in/switched:	5.85-6.425GHz (other frequency options available)
IF Frequency Range	950-1525MHz
LO Frequency	4.9 GHz
Conversion	Single Conversion; non-inverting
Rated Power	49dBm
Conversion Gain	75dB min, 77dB typ
Gain Flatness	+/-1dB typ +/-1.5dB max over full band; +/-0.5dB max over any 40MHz
Gain Stability	+/-1.5dB over full temperature range
Gain Control	20dB min dynamic range
External Reference Frequency	10MHz multiplexed with IF In
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz    -140dBc/Hz @ 1kHz    -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz
Up-Converter Phase Noise	-70dBc/Hz @ 100Hz;    -80dBc/Hz @ 1kHz;    -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz    -115dBc/Hz @ 1MHz
Linearity: 2 tone IMD Spectral Regrowth	-25dBc at 3dB total power back off from rated power -30dBc at 6dB total power back off from rated power -30dBc for QPSK at 1.5xsymbol rate at 2dB back off from rated power
Output Spurious: Non-signal related	-60dBc
Signal related	-55dBc
<b>Power</b>	
AC Voltage Range	90-265VAC 50-60Hz auto-ranging
48V DC Voltage Range (optional)	32-72VDC Isolated
Power Consumption	350W at rated power 270W at 3dB back off from rated power
<b>Mechanical</b>	
Size	6.25"x6.45"x3.9"
Weight	5.5lbs
Cooling	Forced Air
Operating temperature	-40°C to +60°C
Relative Humidity	Up to 100% condensing
<b>Interfaces</b>	
IF Input Connector	N-type female
RF Output Connector	CPR137 grooved
AC Power In	MS3112E10-8P
RS485-RS232-Ethernet-SNMP	MS3112E14-19S

## Block Up Converter L to C-Band 20, 40, 80Watts, 10MHz External Reference, ODU

### 1:1 C-Band BUC Redundant System



**Note 1.** System IF input can be routed to an input splitter or coaxial switch (as a part of ganged WG switch) depending on system configuration.

**Note 2.** Stand by unit can be running in hold over mode using internal low stability reference clock signal to provide "hot standby" operation in case of external reference being switched to the active unit only.

**Note 3.** Indoor RU Remoter control Panel can be added to the system as an option for customer convenience.



Ku-Band Micra-BUC  
Block-Up-Converter  
16, 20, 25, 40Watts,  
10MHz Ext. Reference,  
Outdoor Unit.



Not all BUCs are equal: Raditek's Ku-Band Block-Up-Converter Family is so compact, its small size and weight facilitate direct antenna feed mounting. It weighs only 5½ lbs, with up to 40W (Rated power), and has a built-in AC (90-265VAC 50-60Hz auto-ranging) power supply, with -48V (DC) optionally available too. These BUCs have the best in class RF performance, including: Internal output isolator and Internet based monitor and control, with both serial and analog interfaces. **Ideal for any VSAT application, especially RADITEK's Internet on the Move (IOTM) for the smallest, lightest weight applications. Also ideal with the Raditek Micra™ single board modem to RADITEK's highest performance Extreme Modem.**

**KEY FEATURES:**

- Up to 40W Linear / 50W Psat (Rated Power)
- **6.25"x6.45"x3.5" (extremely small!), 5.5lbs**
- Ideal for feed horn mounting
- Only 250W Power consumption at 40W output
- 180W power consumption at 3dB back off.
- Excellent RF performance:
  - ❖ Phase noise 6dB better than IESS308/309
  - ❖ Saturated power of 44dBm minimum
  - ❖ Spurious below -60dBc
  - ❖ Wide dynamic range of Gain Control
- Integrated L-Band to Ku-Band up converter
- Overdrive protection on 40W model
- High Linearity
- Switchable LO option – Standard (S) and Extended Ku-Band (E) in one unit
- Built In isolator provides full output VSWR Protection
- Output power measurement - True RMS detector installed at factory (optional)
- Configuration via RS-232 serial, packet protocol RS-485 - User friendly HTTP based GUI and SNMP (optional),
- Built in auto-ranging AC power supply
- -48VDC isolated power supply (optional)
- Field upgradable software
- Status LED

(Compare to our competitor, Wavestream, for example:-

Wavestream's Ku-Band Matchbox BUC	16W/25W/40W	10.3"L x 5.4"W x 4.5"H	10 lbs
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**Order Examples: RBUC-L-Kue-WR75-Nf-40W-ER10M AC-ODU-i13**

Description: (Block Up Converter, L Band (950-1450MHz) to Kue(13.75-14.5GHz), N-Type Female IF Input Connector, WR75 Grooved RF Output Connector, 10MHz External Reference, 40 Watts, AC (90-265V)

Additional Options: **Kue (13.75-14.5GHz) / Ku (14.0-14.5GHz)**

**RF Power: 16, 20, 25 and 40 Watts**

**AC (90-265V), (DC: -48V(32-72V))**

\*Contact us for the part number per frequency sub-band options.

## Block Up Converter L to Ku-Band 16, 20, 25, 40Watts, 10MHz Ext Reference, ODU

### 16,20,25W Rated Power Micra-BUCs

Specifications	16W	20W	25W
<b>RF Performance</b>			
RF Frequency Range - <b>(switchable via RS485)</b>	14-14.5GHz (Ku)		13.75-14.5GHz (KuE)
IF Frequency Range	950-1450MHz		950-1700MHz
LO Frequency	13.05GHz		12.8GHz
Conversion	Single Conversion; non-inverting		
Output Power at Psat	42dBm minimum -16W	43dBm minimum-20W	44dBm minimum -25W
Saturated Power	43dBm typical.	44dBm typical.	45dBm typical.
Conversion Gain	72dB min, 75dB typical		
Gain Flatness	±1dB typical ±1.5dB max over full band; ±0.5dB maximum over any 40MHz		
Gain Stability	±1.5dB over full temperature range		
Gain Control	20dB minimum dynamic range		
External Reference Frequency	10MHz multiplexed with IF In		
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz		
Up-Converter Phase Noise	-70dBc/Hz @ 100Hz; -80dBc/Hz @ 1kHz; -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz		
Linearity: 2 tone IMD	-25dBc at 3dB total power back off from Psat. -30dBc for QPSK at 1.5xsymbol rate at 2dB back off from Psat.		
Output Spurious: Non-signal related	-60dBc		
Signal related	-55dBc		
<b>Power</b>			
AC Voltage Range	90-265VAC 50-60Hz auto-ranging		
48V DC Voltage Range (optional)	(-48V) 32-72VDC Isolated (with reverse voltage protection)		
Power Consumption	180W(16W RF)	220W (20W RF)	250W (25W RF)
<b>Mechanical</b>			
Size	6.25"x6.45"x3.9"		
Weight	5.5lbs		
Cooling	Forced Air		
Operating temperature	-40°C to +60°C		
Relative Humidity	Up to 100% condensing		
<b>Interfaces</b>			
IF Input Connector	N-type female		
RF Output Connector	WR75 grooved		
AC Power In Connector	MS3112E10-8P		
RS485-RS232-Ethernet-SNMP	MS3112E14-19S		

## Block Up Converter L to Ku-Band 16, 20, 25, 40Watts, 10MHz Ext Reference, ODU

### 40W Rated Power Micra-BUC.

Parameter	40W	
<b>RF Performance</b>		
RF Frequency Range	14-14.5GHz (Ku)	13.75-14.5GHz (KuE)
IF Frequency Range	950-1450MHz	
LO Frequency	13.05GHz	12.8GHz
Conversion	Single Conversion; non-inverting	
Rated Power (P <sub>sat</sub> )	46dBm	
Conversion Gain	72dB min, 75dB typ	
Gain Flatness	±1dB typ ±1.5dB max over full band; ±0.5dB max over any 40MHz	
Gain Stability	±1.5dB over full temperature range	
Gain Control	20dB min dynamic range	
External Reference Frequency	10MHz multiplexed with IF In	
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz	
Up-Converter Phase Noise	70dBc/Hz @ 100Hz; -80dBc/Hz @ 1kHz; -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz	
Linearity:           2 tone IMD	-24dBc at 43 dBm (20W) -30dBc at 40dBm (10W) -30dBc for QPSK at 1.5xsymbol rate at 44dBm	
Output Spurious: Non-signal related	-60dBc	
Signal related	-55dBc	
<b>Power</b>		
AC Voltage Range	90-265VAC 50-60Hz auto-ranging	
48V DC Voltage Range (optional)	-48 (36-75VDC)	
Power Consumption	250W at rated power (P <sub>1dB</sub> ) 180W at 3dB back off/linear	
<b>Mechanical</b>		
Size	6.25"x6.45"x3.5"	
Weight	5.5lbs	
Cooling	Forced Air	
Operating temperature	-40°C to +60°C	
Relative Humidity	Up to 100% condensing	
<b>Interfaces</b>		
IF Input Connector	N-type female	
RF Output Connector	WR75 grooved	
AC Power In Connector	MS3112E10-8P	
RS485-RS232-Ethernet-SNMP	MS3112E14-19S	



# L- to Ku-Band Block-Up-Converter

150, 200Watts,  
10MHz Ext Reference, ODU



Not all BUCs are equal: Raditek Ku-Band Block-Up-Converter Family is so compact, its small size and weight facilitate simplified antenna mounting. It weighs only 92 lbs, in either 150W (P1dB)/ or 200W (P1dB)/250W (Psat), and has a built-in AC (190-265VAC 50-60Hz auto-ranging) power supply.

These BUCs have the best in class RF performance, including: Internal output isolator and Internet based monitor and control, with both serial and analog interfaces.

### Key Features:

- Patent pending Combiner, allowing extremely high power density -to 250W Psat
- 16"x13"x10.7" Extremely small housing!
- Superior RF performance:
  - Phase noise 10dB better than IESS308/309
  - P1dB of 53dBm (200W)
  - Spurious below -60dBc
  - Wide dynamic range of Gain Control
- RF Overdrive Protection
- Available in both standard (Ku) and Extended Ku-Band (Kue)
- Switchable LO option - standard (Ku) and Extended Ku-Band (Kue) in one unit
- Input and Output True RMS Power Detection
- Output power measurement - True RMS detector
- Configuration via RS-232 serial, packet protocol RS-485 – IP based HTTP based GUI and SNMP optional
- Automated Level Control (ALC) Option
- Redundant ready - No external controller required for 1:N redundant configuration
- Field replaceable plug-In Power Supply
- Field upgradable software
- Status LED

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### Order Examples: RBUC-L-Kue-Nf-WR75-ER10M-200W-AC-ODU -i13

Description: (Block Up Converter, L Band (950-1700MHz) to Ku (13.75-14.5MHz) N-Type Female IF Input Connector, WR75 Grooved RF Output Waveguide, 10MHz External Reference, (200 Watts P1db, AC (190-260V), ODU)

Additional Options: **Ku (14.0-14.5GHz) switchable (150W option)**

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## Block Up Converter L to Ku-Band 150-200Watts, 10MHz Ext Reference, ODU

<b>Specifications</b>		
RF Performance		
RF Frequency Range-	14-14.5GHz (Ku)	13.75-14.5GHz (Kue)
IF Frequency Range	950-1450MHz	950-1700MHz
LO Frequency	13.05GHz	12.8GHz
Conversion	Single Conversion; non-inverting	
	<b>150W</b>	<b>200W</b>
Output Power at 1dB compression point	52dBm min (150W)	53dBm min (200W)
Saturated Power	53dBm typ	54dBm typ
Conversion Gain	75dB min, 77dB typ	
Gain Flatness	±1dB typ +/-1.5dB max over full band; ±0.5dB max over any 40MHz	
Gain Stability	±1.5dB over full temperature range	
Gain Control	20dB min dynamic range	
External Reference Frequency	10MHz multiplexed with IF In	
External Reference Required Phase Noise	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz	
Up-Converter Phase Noise	-70dBc/Hz @ 100Hz; -80dBc/Hz @ 1kHz; -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz	
Linearity: 2 tone IMD	-25dBc at 3dB total power back off from P1dB -30dBc for QPSK at 1.5xsymbol rate at 2dB back off from P1dB	
Output Spurious: Non-signal related	-60dBc	
Signal related	-55dBc	
Power		
AC Voltage Range	190-265VAC 50-60Hz auto-ranging PFC	
Power Consumption	1600W (for 150W RF)	1800W (for 200W RF)
Mechanical		
Size	16"x13"x10.7"	
Weight	92lbs	
Cooling	Forced Air	
Operating temperature	-40°C to +55°C	
Relative Humidity	Up to 100% condensing	
Interfaces		
IF Input Connector	N-type female	
RF Output waveguide	WR75 grooved	
AC Power In Connector	TE 788188	
M&C Interfaces	Serial In MS3112E12-10S; Alarm In MS3112E12-14S; Ethernet RJ45	
Redundant Interfaces	Redundancy Protection Int MS3112E14-19S; Switch In MS3112E14-15S	





Up and Down Converter family  
Rack Mount: 70M to L Band, L band to 70MHz



**Our Frequency Converters offer a new best in class for the industry. Not only for ease of operation, but lowest cost too.** They embody embedded redundancy options and extensive monitor and control via: front panel, serial ports (EIA232/EIA485) and Ethernet. **RUC-Up Converter; RDC-Down Converter**  
There may be up to 4 converter modules in a single 1RU shelf, and they can be configured for various applications and bands. The reference with autosensing can lock to an external 5/10 MHz reference or utilize the built-in high stab, reference oscillator. Hot-swappable shelf redundancy option and extensive monitor and control via front panel, serial ports EIA232/EIA485 and Ethernet.

**Order Examples: RUC-70M-L-ER10M-AC-IDU i13 UpConverter**

**RDC-L-70M-ER-AC-IDU.i13 Down Converter**

Description : (Up Converter, 70MHz (IF) to L-Band, REF eg 10M ER, 10 MHz Voltage-AC or DC

(Down Converter, to L-Band to 70MHz (IF), REF eg 10M ER, 10 MHz Voltage-AC or DC

**Key Features:**

- Superior RF performance:
- Phase noise >8dB better than IESS308/309
- In-band Spurious < -60dBc
- Superior Gain flatness
- Very wide IF frequency band: 950 to 2150 MHz
- 5 or 10MHz external reference with Autosense.
- -48VDC power supply optional
- Synthesizer frequency step of 1kHz with optional 1 Hz step size
- Full featured M&C Interface via serial EIA485, EIA232 and Ethernet:
- 25dB Gain Control (30dB optional) dynamic range
- Input and output power detectors
- Automated level control (ALC) mode available
- Hitless redundancy switching
- 1:1 and 1:N Redundant ready
- Redundancy is supported with hot swappable converters and power supply
- 10MHz and DC injected into L-Band

Power Supply:		Mechanical		IF/RF Connectors:	
Input Voltage AC option	90 to 265VAC 50/60Hz PFC	Width	19" Rack	L band mon. (option)	BNC (other options available)
DC option	-48VDC	Height	1RU	IF mon. (option)	BNC (other options available)
<b>Environmental:</b>		Depth	20"	RF	N-type
Operating temp,	0 to 60 °C	Color	Light tan	10MHz Ref.	BNC (other options available)
Storage Temp.	-40 to +85 °C	Cooling	Forced air	IF	BNC (other options available)
Humidity 0 to 95% (non-condensing)					

## Up and Down Converter Family

### 70M to L Band, L band to 70MHz (Rack mount)

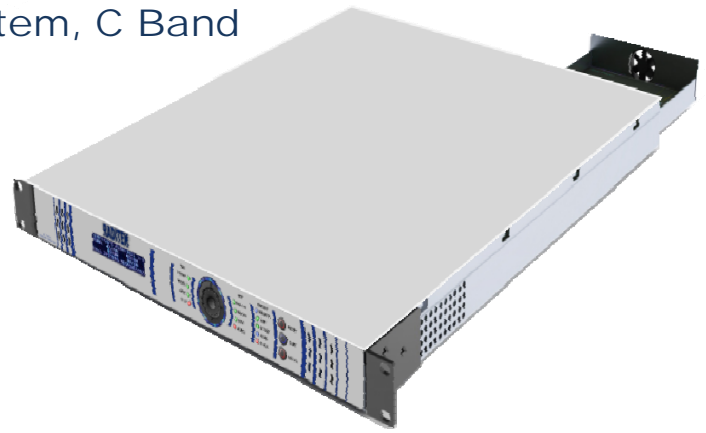
#### 70/140MHz TO L-Band Up/Down Converter

Specification:	Upconverter	Down converter	Monitor & Control Features	
Frequency Range:	IF Input	IF Output	Interfaces:	
70MHz IF	70MHz +/-18MHz		Serial - EIA485	DB9 Connector (rear panel)
140MHz IF	140MHz +/-36MHz		Serial - EIA232	RJ45 or DB9 (rear panel)
O/P Power @ P1dB	N/A	5dBm min	10/100 base-T Ethernet	RJ45 (rear panel)
			Alarm and Control	DB9 Connector rear panel
Max. Input Level	10dBm	N/A	Redund. prot. interface	DB15 Connector rear panel
Impedance	50 $\Omega$ / 75 $\Omega$ optional		Controls:	
Return Loss	-18dB max		Gain Control	Serial, Ethernet, Front panel
RF Characteristics	RF Output	RF Input	Uplink Freq Control	Serial, Ethernet, Front panel
Frequency Range:	950-2150MHz	950-2150MHz	Downlink Freq Control	Serial, Ethernet, Front panel
Frequency Step	1kHz/1Hz		Mute Control	Serial, Ethernet, Front panel, Red LED.
Output Power @P1dB	15dBm min	N/A	Local/Remote toggle	Serial (Ethernet) / Front panel toggle
2 tone IMD at 0dBm Pout	-40dBc max	N/A	Clear Alarm	Serial, Ethernet, Front panel
Gain Control	25dB range 0.1dB step		Indicators:	
10MHz Reference Out	Multiplexed at RF out port optional		Uplink Frequency	Serial, Ethernet, Front panel
DC Mux'd on L-Band	24VDC 2A	24VDC 0.5A	Downlink Frequency	Serial, Ethernet, Front panel
Impedance	50 $\Omega$ / 75 $\Omega$ optional		Gain Status	Serial, Ethernet, Front panel
Return Loss	1.5			
Max Input Level	N/A	Operational up to 0dBm		
	No Damage up to 10dBm		IF Power Detect	Serial, Ethernet, Front panel
Transfer Characteristics:			RF Power Detect	Serial, Ethernet, Front panel
Conversion Gain	30 dB (Optional 35 dB)		Temperature	Serial, Ethernet, Front panel
Gain Adjustment	25dB with 0.1dB step (Optional 30 dB)		Summary Alarm Status	Serial, Ethernet, Front panel, Red Int
Gain Flatness with 70MHz IF:	Over full L- band: $\pm 1.0$ max. Over 36MHz: $\pm 0.5$ max.		Mute Status	Serial, Ethernet, Front panel, Red Int
			Reference Frequency Stability	
LO Phase Noise			Aging (0.01PPB )	+/-100ppb per year
@ 100Hz	-70dBc		Reference Phase Noise, 10MHz, (5MHz option)	
@ 1kHz	-90dBc		@ 10Hz	-125dBc/Hz
@ 10kHz	-95dBc		@ 100Hz	-140dBc/Hz
@ 100kHz	-95dBc		@ 1kHz	-150dBc/Hz
@ 1MHz	-115dBc		@ 10kHz	-155dBc/Hz
In Band Spurious	<-60dBc		Power Level at L-Band Port	+5dBm +/-2dB Optional
Reference	10MHz	(5MHz Optional)	Int./Ext. Autosense	Int. clock locks on ext. ref.



# Up and Down Block Converter Family

## Rack Mount System, C Band



**Our Frequency Converters offer a new best in class for the Industry. Not only for ease of operation, but lowest cost too.** They embody embedded redundancy options and extensive monitor and control via: front panel, serial ports (EIA232/EIA485) and Ethernet.

There may be [up to 4 converter modules in a single 1RU shelf](#), and they can be configured for various applications and bands. The reference with autosensing can lock to an external 5/10 MHz reference or utilize the built-in high stab, reference oscillator.

### Order Examples: RBU DC-L-Cs-ER10M-AC-IDU-i13

**Description :** (Up and Down Converter, L band to C-Band std,(REF option, eg ER10M), 10 MHz Voltage-AC or DC)  
**Opt:** Cs Standard, Ce Extended, Ci Insat, Cp Palapa  
**DC -48V**

### Key Features:

- **Superior RF performance:**
  - Phase noise >8dB better than IESS308/309
  - In-band Spurious < -60dBc
  - Superior Gain flatness
- Available in all C-Band options:
  - Standard, Extended, incl. Palapa and Insat;
- User Friendly front panel with menu driven graphical display
- 5 or 10MHz external reference with Autosense.
- -48VDC power supply optional
- **Full featured M&C Interface via serial EIA485, EIA232 and Ethernet:**
  - 20dB Gain Control dynamic range
  - Input and output power detectors
  - Automated level control (ALC) mode available
- Hitless redundancy switching
- 1:1 and 1:N Redundant ready
- Redundancy is supported with hot swappable converters and power supply

Power Supply:		Mechanical		IF/RF Connectors:	
Input Voltage AC option	90 to 265VAC 50/60Hz PFC	Width	19" Rack		
DC option	-48VDC	Height	1RU	IF	N-type (other options available)
Environmental:		Depth	20"	RF	N-type
Operating temp,	0 to 60 °C	Color	Light tan	10MHz Ref.	BNC (other options available)
Storage Temp.	-40 to +85 °C	Cooling	Forced air		
Humidity 0 to 95% (non-condensing)					

## Up and Down Converter Family

### L-Band to C Band Block Up Converter (IDU-Rack mount)

<b>Specifications:</b>				
RF Performance	Cs Standard C	Ce Extended C	Cp Palapa	Ci Insat
RF Frequency Range-GHz Available in/switched:	5.85-6.425	5.85-6.725	6.425-6.725	6.725-7.025
IF Frequency Range MHz	950-1525	950-1825	950-1250	1250-1550
LO Frequency GHz	4.9		5.475	
Conversion	Single Conversion; non-inverting			
Output Power at P1dB	10 dBm min			
Conversion Gain	35 dB typical 30dB min.			
Gain Flatness	$\pm 1$ dB typ, $\pm 1.5$ dB max over full band; $\pm 0.5$ dB max over any 40MHz			
Gain Stability	$\pm 1.5$ dB over full temperature range			
Gain Control	20dB min dynamic range			
External Reference Freq.	10MHz			
External Reference Phase Noise (typ. required)	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 Hz			
Up-Converter Phase Noise (Depends on reference)	-70dBc/Hz @ 100Hz -80dBc/Hz @ 1kHz -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz			
<b>Spurious</b>				
Signal related	-55dBc For Extended Band Flatness $\pm 1.5$ dB typical For Extended Band signal, related Spurious -45dBc			
Non signal related	-60dBc			
<b>Interfaces:</b>				
Serial - EIA485	DSUB Connector (Rear panel)			
Serial - EIA232	USB (Front Panel)			
Ethernet	RJ45 (Rear Panel)			
Redundant protection port	DSUB Connector (Rear panel)			
<b>Controls:</b>				
Gain Control	Serial, Ethernet, Front panel			
Mute Control	Serial, Ethernet, Front panel, Red LED			
Local/Remote toggle	Serial(Ethernet)/Front panel toggle			
Clear Alarm	Serial, Ethernet, Front panel			
<b>Indicators:</b>				
Lock Status	Serial, Ethernet, Front panel			
Gain Status	Serial, Ethernet, Front panel			
IF Power Detect	Serial, Ethernet, Front panel			
RF Power Detect	Serial, Ethernet, Front panel			
Temperature	Serial, Ethernet, Front panel			
Summary Alarm Status	Serial, Ethernet, Front panel Red LED			
Mute Status	via Serial, Ethernet, Front panel, Red LED			



# Up and Down Block Converter Family

## Rack Mount System: Ku Band



Our Frequency Converters offer a new best in class for the industry. Not only for ease of operation, but lowest cost too. They embody embedded redundancy options and extensive monitor and control via: front panel, serial ports (EIA232/EIA485) and Ethernet.

There may be [up to 4 converter modules in a single 1RU shelf](#), and they can be configured for various applications and bands. The reference with autosensing can lock to an external 5/10 MHz reference or utilize the built-in high stab, reference oscillator.

### Order Examples: RBU DC-L-KuS-ER10M-AC-IDU-i13

Description : (Block Up and Down Converter, L band (IF) to Ku-Band, (REF option, eg ER10M 10 MHz), Voltage-AC or DC)

Additional Options: **KuE 13.75-14.5GHz DC -48V**

### Key Features:

- Superior RF performance:
  - Phase noise >8dB better than IESS308/309
  - In-band Spurious < -60dBc
  - Superior Gain flatness
- User Friendly front panel with menu driven graphical display
- 5 or 10MHz external reference with Autosense.
- -48VDC power supply optional
- Full featured M&C Interface via serial EIA485, EIA232 and Ethernet:
  - 20dB Gain Control dynamic range
  - Input and output power detectors
  - Automated level control (ALC) mode available
- Hitless redundancy switching
- 1:1 and 1:N Redundant ready
- Redundancy is supported with hot swappable converters and power supply

Power Supply:		Mechanical		IF/RF Connectors:	
Input Voltage AC option	90 to 265VAC 50/60Hz PFC	Width	19" Rack		
DC option	-48VDC	Height	1RU	IF	N-type (other options available)
Environmental:		Depth	20"	RF	N-type
Operating temp,	0 to 60 °C	Color	Light tan	10MHz Ref. in/out	BNC (other options available)
Storage Temp.	-40 to +85 °C	Cooling	Forced air		
Humidity 0 to 95% (non-condensing)					

## Up and Down Converter Family L-Band to Ku Band Upconverter (Rack mount)

### L- to Ku-Band Up- Converter Rack Mount System

<b>Specifications:</b>		
RF Performance:	Standard Ku (KuS)	Extended Ku (KuE)
RF Frequency Range- in/switched: (GHz)	14-14.5	13.75-14.5
IF Frequency Range (MHz)	950-1450	950-1700
LO Frequency (GHz)	13.05	12.8
Conversion	Single Conversion; non-inverting	
Output Power at 1dB compression point	10dBm min	
Conversion Gain	35dB typical, (30dB minimum)	
Gain Flatness	$\pm 1$ dB max over full band; $\pm 0.5$ dB max over any 40MHz	
Gain Stability	$\pm 1.5$ dB over full temperature range	
Gain Control	20dB min dynamic range	
External Reference Frequency	10MHz	
External TCXO/OCXO Reference's Required Phase Noise:	-130dBc/Hz @ 100Hz -140dBc/Hz @ 1kHz -150dBc/Hz @ 10kHz -155dBc/Hz @ 100 kHz	
Up-Converter Phase Noise (Typical)	-70dBc/Hz @ 100Hz -80dBc/Hz @ 1kHz -90dBc/Hz @ 10kHz -95dBc/Hz @ 100kHz -115dBc/Hz @ 1MHz	
<b>Spurious</b>		
Signal related *	-55dBc (For Extended Band Flatness +/-1.5dB typ)	
Non signal related	-60dBc (For Extended Band signal related Spurious -45dBc)	
<b>Monitor &amp; Control Interfaces</b>		
Serial - EIA485	DSUB Connector rear panel	
Serial - EIA232	USB (Front Panel)	
Ethernet	RJ45 (Rear panel)	
Redundant protection interface	DSUB Connector (Rear panel)	
<b>Controls:</b>		
Gain Control	Serial, Ethernet, Front panel	
Mute Control	Serial, Ethernet, Front panel, Red LED	
Local/Remote toggle	Serial Ethernet, Front panel toggle	
Clear Alarm	Serial, Ethernet, Front panel	
<b>Indicators:</b>		
Lock Status	Serial, Ethernet, Front panel	
Gain Status	Serial, Ethernet, Front panel	
IF Power Detect	Serial, Ethernet, Front panel	
RF Power Detect	Serial, Ethernet, Front panel	
Temperature	Serial, Ethernet, Front panel	
Summary Alarm Status	Serial, Ethernet, Front panel, Red LED	
Mute Status	Serial, Ethernet, Front panel, Red LED	

# RADITEK

## Telecom 13G Point to Point Radio

Point to Point Radio  
LC Family, 13 GHz  
RTR-P2P-13G- 64E1 or IP120M-LC-g16



**< 120 Mbps Ethernet or 64E1, Low Cost, Point 2 Point**

Features & Benefits																	
<ul style="list-style-type: none"> <li>• Licensed Frequency Bands</li> <li>• Point to Point IP Link Supports up to 64 x E1</li> <li>• Very Low Latency Ethernet</li> <li>• Adaptive Modulation for increased availability</li> <li>• Internet Ethernet 10/100Base-T</li> <li>• Low Power Consumption</li> <li>• Wide Operating Temperature Range</li> <li>• SNMP (V1,2,3) Management</li> <li>• Up to 300 Meter separation between IDU and ODU</li> <li>• Small profile</li> <li>• Low installed cost</li> <li>• Carrier class performance</li> </ul>	<p><b>Overview</b></p> <p>This is a Full Duplex (FD), 13GHz Point to Point, <b>Low Cost (LC)</b> microwave, radio link. An IP based Ethernet Radio system, offering Full Duplex (FD) data rates up to 100 Mbps). The radio supports software configurable capacity selection to <b>120 Mbps, using 14, 28 and 40 MHz channel bandwidths.</b> With <b>QPSK to 32APSK</b> and Advanced, integrated forward Error correction (FEC) provides superior link performance and reliability.</p> <p>This RADIO is ideally suited for: Backhaul networks; including: WiMAX backhaul, ISPs, next generation mobile, and enterprise/campus networks requiring the best solution that exceeds Carrier-Grade Class standards for highest reliability, quality, and environmental compliance at a relatively low price. It can support to 64 x E1 carriers.</p> <p><b>The simplified all-outdoor solution:</b></p> <ul style="list-style-type: none"> <li>• Incorporates digital Channel filtering for the various data bandwidths.</li> <li>• Offers volume capacity and proven performance for applications, worldwide</li> <li>• Represents a new low cost solution of roof/tower installation</li> <li>• Designed to minimize product logistics and overall product life cycle costs.</li> <li>• Connects directly to antennas from many (other) manufacturers.</li> <li>• Optional: Protected (1+1), 2 x (2+0) Capacity, Full Duplex and other configurations possible with compatible router</li> </ul> <p><b>Standards Compliance</b></p> <table border="1"> <tr> <td><b>EMC</b></td> <td>EN 301 489</td> </tr> <tr> <td><b>Operation, ODU</b></td> <td>ETS 300 019 Class 4.1</td> </tr> <tr> <td><b>Operation , IDU</b></td> <td>ETS 300 019 Class 3.2</td> </tr> <tr> <td><b>Storage</b></td> <td>ETS 300 019 Class 1.2</td> </tr> <tr> <td><b>Transportation</b></td> <td>ETS 300 019 Class 2.3</td> </tr> <tr> <td><b>Safety</b></td> <td>EN 60950</td> </tr> <tr> <td><b>RF</b></td> <td>EN 302 217</td> </tr> <tr> <td><b>Water resistance, ODU</b></td> <td>IEC 60529 (IPX6)</td> </tr> </table>	<b>EMC</b>	EN 301 489	<b>Operation, ODU</b>	ETS 300 019 Class 4.1	<b>Operation , IDU</b>	ETS 300 019 Class 3.2	<b>Storage</b>	ETS 300 019 Class 1.2	<b>Transportation</b>	ETS 300 019 Class 2.3	<b>Safety</b>	EN 60950	<b>RF</b>	EN 302 217	<b>Water resistance, ODU</b>	IEC 60529 (IPX6)
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## Point to Point Radio LC Family, 13GHZ RTR-P2P-13G- 64E1 or IP120M-LC-g16

Key Feature			
<ul style="list-style-type: none"> <li>• Browser based GUI for easy setup and management</li> <li>• Standard IP and Serial Interfaces</li> <li>• Supports NMS &amp; SNMP</li> </ul> <p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>• More cost effective</li> <li>• Quick Deployment</li> <li>• Lowest cost, Licensed bands</li> <li>• Easily Setup and Activated</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Ethernet IP</li> <li>• IP Radio Networks</li> <li>• G3/G4 Backhaul</li> <li>• WiMAX /LTE Backhaul</li> </ul> <p><b>Services available</b></p> <ul style="list-style-type: none"> <li>• Technical Support</li> <li>• Installation and Setup</li> <li>• Maintenance</li> <li>• Applications Support</li> <li>• Hardware Support</li> <li>• Extended Warranty</li> </ul>	<b>GENERAL Technical Information</b>		
	RTR-P2P-13G-IP100-LC-g16		
	Operating frequency	13	GHz
	Range	To 40Km	Depends on antenna
	Digital line rate	100	Mbps (Fast Ethernet)
	Capacity	120	Mbps
	Modulation Options	QPSK, 8PSK, 16APSK, 32APSK	
	Error Correction/coding	RS, LDPC	
	<b>PRODUCT CONFIGURATION:</b>		
	1+1, HSB, FD, SD		
	<b>ENVIRONMENTAL:</b>		
	Operating temperature		
	IDU	-5 to 50 °C	
	ODU, standard		
	ODU, extended		
IDU, Humidity	0 to 100%		
Altitude	4500m	15000 feet	
<b>Fault and configuration management</b>			
Protocol	SNMP v1/v2/v3		
Interface, electrical	Ethernet 10/100 base-T		
Interface, electrical	RJ-45		
Local/remote configuration, support Tools	WEB LCT		
Performance monitoring	ITU-T REC. G.826		
Network management	EMS 1000		
EOW (Engineering OrderWire)	EOW and AUX RS-232		
<b>Channel Bandwidth</b>			
<b>Capacity and modulation</b>			
<b>Capacity</b>	<b>Modulation</b>	<b>Bandwidth</b>	
20-60 Mbps	QPSK-32APSK	14MHz (ODU 60)	
40-120 Mbps	OPSK-32APSK	28, 40MHz (ODU 60)	

### General. IDU Options

RTR-P2P-13G-64E1 or IP120M-LC-g16

Specifications may be subject to change

03/05/13

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## Point to Point Radio LC Family, 13GHZ RTR-P2P-13G- 64E1 or IP120M-LC-g16

<b>LED indicators</b>	PWR, IDU, ODU, RAI, LNK	
<b>Line interface</b>	Fast Ethernet, n x E1	To 64 x E1 (2.048Mbps)
<b>IF interface</b>	Transmit	350MHz -12 to -8 dBm
	Receive	140MHz, -8to -37 dBm
<b>IF Cable Connector</b>	N Type (f/m)	
<b>Auxiliary Data</b>	Channel interface #	1
	Interface	RS232
	Line rate, configurable	1.2 to 19.2 Kbps Async
	Connector type	RS232, 9 PIN D-SUB
<b>Alarm I/O</b>	External Alarm input	2 x TTL
	External Alarm output	2 x TTL, 2 x Form C relay
	Connector	9 pin D-SUB
<b>NMS LNA</b>		
<b>Interface</b>	<b>Type</b>	<b>10/100 BaseT Ethernet, RJ45</b>
<b>Electrical</b>	Input voltage range	-38 to -72 VDC
	Power consumption	<20W, typ.
	Protective Circuit	6A fuse
<b>Mechanical</b>	Dimensions	44 x 482mm x 240mm
	Weight	~2.8Kg (typ.)
<b>Internet</b>	<b>E1</b>	
Capacity options	Configurable to 120Mbps	Capacity options: 8 x 2.048Mbps (E1)
Traffic	4 x Fast Ethernet	Traffic connectors: SCS168
Connectors	4 x RJ45	Coding type: HDB3; 75Ω unbalanced or 120Ω balanced.
Specifications	L2 Switching, VLAN (802.3ac), Flow control (802.3X), QoS (802.1p)	
<b>Threshold (BER 10E-6)</b>		
QPSK (28MHz BW)	-85	dBm
8PSK (28MHz BW)	-82	dBm
16APSK (28MHz BW)	-79	dBm
32APSK (28MHz BW)	-76	dBm
<b>ODU Specifications</b>		
Frequency	13	GHz
Capacity/coding (QPSK to 32APSK)	20-60Mbps, 14MHz Bandwidths	(ODU 60)
Capacity/coding (QPSK to 32APSK)	40-120Mbps. 28/40MHz Bandwidths	(ODU 60)
Modulation	QPSK to 32APSK	
<b>IF Specification</b>		
IF frequency, Tx	350	MHz
IF frequency, Rx	140	MHz
Cable impedance	50	Ω
Maximum IF cable length (IDU-ODU)	300	m
<b>ODU Interfaces</b>		
IF cable connectors	N type f/m	
AGC monitor	BNC f/m	
Antenna port	EIA rectangular (standard)	Refer to ODU system spec.
Polarization (field selectable)	Vertical(standard), horizontal	
Antenna mount	Direct mount	
Power	20 (QPSK)	dBm
	17.5 (32APSK)	dBm

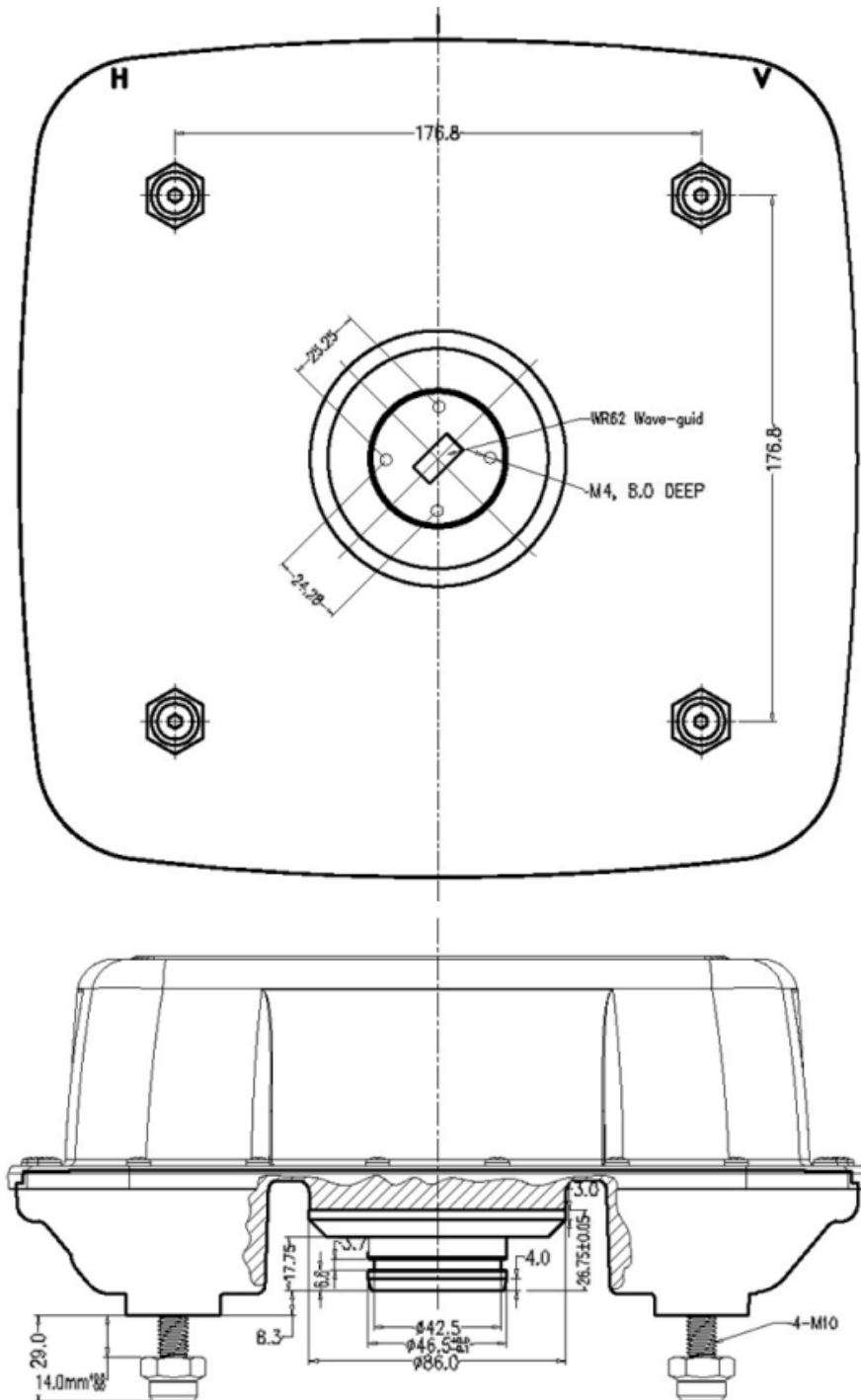
## Point to Point Radio LC Family, 13GHz RTR-P2P-13G- 64E1 or IP120M-LC-g16

Power control range	Resolution: 0.1 steps (6dB/sec.)	dB
	Accuracy: $\pm 1$	dB
Transmit mute	<-50	dBm/MHz
Tolerance		
Transmitter source	Synthesizer	
Stability	$\pm 5$	ppm
Receiver overload (BER 10E-6)	-20	dBm
Residual BER	10E-13	
RSSI accuracy	$\pm 2$	dB
<b>@1KHz Phase Noise</b>	-53 (-65 typ.)	dBc/Hz
<b>@10KHz</b>	-73 (-65 typ.)	dBc/Hz
<b>@100KHz</b>	-93 (-95 typ.)	dBc/Hz
<b>@1MHz</b>	-110 (-118 typ.)	dBc/Hz
25 dBm (Pout) QPSK EVM	15 spec. (12.1 typ.)	%
24 dBm (Pout) 8PSK EVM	10 spec. (7.1 typ.)	%
23 dBm (Pout) 16APSK EVM	8 spec. (5.8 typ.)	%
22dBm (Pout) 32 APSK EVM	6 spec (3.6 typ.)	%
<b>Electrical</b>		
Power consumption	30	W
<b>Mechanical</b>		
<b>H x W x D</b>	287 x 287 x 120	mm
Weight	6.5	Kg
Thermal cycle (32APSK, 28MHz BW)	8	hrs



## Point to Point Radio LC Family, 13GHZ RTR-P2P-13G- 64E1 or IP120M-LC-g16

### Antenna Mount



# RADITEK

## Telecom 23G Point to Point Radio

Point to Point Radio LC Family,  
23 GHz 160E1 / IP 366Mb



**Up to 366 Mbps, Ethernet, 160E1, Low Cost, Point to Point**

Features & Benefits																		
<ul style="list-style-type: none"> <li>• Licensed Frequency Bands</li> <li>• Point to Point IP Link</li> <li>• Very Low Latency Ethernet</li> <li>• Adaptive Modulation for increased availability</li> <li>• Internet Ethernet 10/100Base-T</li> <li>• Low Power Consumption</li> <li>• Wide Operating Temperature Range</li> <li>• SNMP (V1,2,3) Management</li> <li>• Up to 300 Meter separation between IDU and ODU</li> <li>• Small profile</li> <li>• Low installed cost</li> <li>• Carrier class performance</li> </ul>	<p><b>Overview</b></p> <p>This is a Full Duplex (FD), 23GHz Point to Point, <b>Low Cost (LC)</b> microwave, radio link. An IP based Ethernet Radio system, offering Full Duplex (FD) (data rates up to 366 Mbps). The radio supports software configurable capacity selection to <b>366 Mbps capacity, up to 160 x E1, using 14, 28/30, 40 and 56 MHz channel bandwidths</b>. With <b>QPSK to 256QAM</b> modulation and Advanced, integrated forward Error correction (FEC) provides superior link performance and reliability.</p> <p>This RADIO is ideally suited for: Backhaul networks; including: WiMAX backhaul, ISPs, next generation mobile, and enterprise/campus networks requiring the best solution that exceeds Carrier-Grade Class standards for highest reliability, quality, and environmental compliance at a relatively low price.</p> <ul style="list-style-type: none"> <li>• Incorporates digital Channel filtering for the various data bandwidths.</li> <li>• Offers volume capacity and proven performance for applications, worldwide</li> <li>• Represents a new low cost solution of roof/tower installation</li> <li>• Designed to minimize product logistics and overall product life cycle costs.</li> <li>• Connects directly to antennas from many (other) manufacturers.</li> <li>• Optional: Protected (1+1), 2 x (2+0) Capacity, Full Duplex and other configurations possible with compatible router</li> </ul> <p><b>Standards Compliance</b></p> <table border="1" data-bbox="477 1398 1406 1654"> <tr><td>EMC</td><td>EN 301 489</td></tr> <tr><td>Operation, ODU</td><td>ETS 300 019 Class 4.1</td></tr> <tr><td>Operation , IDU</td><td>ETS 300 019 Class 3.2</td></tr> <tr><td>Storage</td><td>ETS 300 019 Class 1.2</td></tr> <tr><td>Transportation</td><td>ETS 300 019 Class 2.3</td></tr> <tr><td>Safety</td><td>EN 60950</td></tr> <tr><td>RF</td><td>EN 302 217</td></tr> <tr><td>Water resistance, ODU</td><td>IEC 60529 (IPX6)</td></tr> </table>	EMC	EN 301 489	Operation, ODU	ETS 300 019 Class 4.1	Operation , IDU	ETS 300 019 Class 3.2	Storage	ETS 300 019 Class 1.2	Transportation	ETS 300 019 Class 2.3	Safety	EN 60950	RF	EN 302 217	Water resistance, ODU	IEC 60529 (IPX6)	
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Safety	EN 60950																	
RF	EN 302 217																	
Water resistance, ODU	IEC 60529 (IPX6)																	

## Point to Point Radio Family 23GHZ RTR-P2P-23G-HYBRID-LC-g16

Key Feature																																																																										
<ul style="list-style-type: none"> <li>Browser based GUI for easy setup and management</li> <li>Standard IP and Serial Interfaces</li> <li>Supports NMS &amp; SNMP</li> </ul> <p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>More cost effective</li> <li>Quick Deployment</li> <li>Lowest cost, Licensed bands</li> <li>Easily Setup and Activated</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>Ethernet IP/ to 160E1</li> <li>IP Radio Networks</li> <li>G3/G4 Backhaul</li> <li>WiMAX /LTE Backhaul</li> </ul> <p><b>Services available</b></p> <ul style="list-style-type: none"> <li>Technical Support</li> <li>Installation and Setup</li> <li>Maintenance</li> <li>Applications Support</li> <li>Hardware Support</li> <li>Extended Warranty</li> </ul>	<p><b><u>GENERAL Technical Information</u></b></p> <p><b>RTR-P2P-23G-HYBRID-LC-g16</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Operating frequency</td> <td>23</td> <td>GHz</td> </tr> <tr> <td>Range</td> <td>To 20Km</td> <td>Depends on antenna</td> </tr> <tr> <td>Digital line rate</td> <td>1000</td> <td>Mbps (Fast Ethernet)</td> </tr> <tr> <td>Capacity</td> <td>3660</td> <td>Mbps</td> </tr> <tr> <td>Modulation Options</td> <td colspan="2">QPSK, 8PSK, 16QAM/16APSK, 32QAM/32APSK to 256 QAM</td> </tr> <tr> <td>Error Correction/coding</td> <td colspan="2">RS, LDPC</td> </tr> </table> <p style="text-align: center;"><b>PRODUCT CONFIGURATION:</b></p> <p>1+1, HSB, FD, SD</p> <p><b>ENVIRONMENTAL:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3">Operating temperature</td> </tr> <tr> <td>IDU</td> <td>-5 to 50 °C</td> <td></td> </tr> <tr> <td>ODU, standard</td> <td></td> <td></td> </tr> <tr> <td>ODU, extended</td> <td></td> <td></td> </tr> <tr> <td>IDU, Humidity, (ODU)</td> <td>0 to 95% (100%)</td> <td>Non condensing ( )</td> </tr> <tr> <td>Altitude</td> <td>4500m</td> <td>15000 feet</td> </tr> </table> <p style="text-align: center;"><b>Fault and configuration management</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Protocol</td> <td colspan="2">SNMP v1/v2/v3</td> </tr> <tr> <td>Interface, electrical</td> <td colspan="2">Ethernet 10/100 base-T</td> </tr> <tr> <td>Interface, electrical</td> <td colspan="2">RJ-45</td> </tr> <tr> <td>Local/remote configuration, support Tools</td> <td colspan="2">WEB LCT</td> </tr> <tr> <td>Performance monitoring</td> <td colspan="2">ITU-T REC. G.826</td> </tr> <tr> <td>Network management</td> <td colspan="2">EMS 1000</td> </tr> <tr> <td>EOW (Engineering Order Wire)</td> <td colspan="2">EOW and AUX RS-232</td> </tr> </table> <p style="text-align: center;"><b>Capacity/Channel Bandwidth</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Capacity</th> <th>Modulation</th> <th>Bandwidth (ODU 300)</th> </tr> </thead> <tbody> <tr> <td>20-90 Mbps</td> <td>QPSK-256QAM</td> <td>14MHz</td> </tr> <tr> <td>40-180 Mbps</td> <td>QPSK-256QAM</td> <td>28/30MHz,</td> </tr> <tr> <td>60-260 Mbps</td> <td>QPSK-256QAM</td> <td>40MHz</td> </tr> <tr> <td>88-366Mbps</td> <td>QPSK-256QAM</td> <td>56MHz</td> </tr> </tbody> </table>		Operating frequency	23	GHz	Range	To 20Km	Depends on antenna	Digital line rate	1000	Mbps (Fast Ethernet)	Capacity	3660	Mbps	Modulation Options	QPSK, 8PSK, 16QAM/16APSK, 32QAM/32APSK to 256 QAM		Error Correction/coding	RS, LDPC		Operating temperature			IDU	-5 to 50 °C		ODU, standard			ODU, extended			IDU, Humidity, (ODU)	0 to 95% (100%)	Non condensing ( )	Altitude	4500m	15000 feet	Protocol	SNMP v1/v2/v3		Interface, electrical	Ethernet 10/100 base-T		Interface, electrical	RJ-45		Local/remote configuration, support Tools	WEB LCT		Performance monitoring	ITU-T REC. G.826		Network management	EMS 1000		EOW (Engineering Order Wire)	EOW and AUX RS-232		Capacity	Modulation	Bandwidth (ODU 300)	20-90 Mbps	QPSK-256QAM	14MHz	40-180 Mbps	QPSK-256QAM	28/30MHz,	60-260 Mbps	QPSK-256QAM	40MHz	88-366Mbps	QPSK-256QAM	56MHz
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## Point to Point Radio Family 23GHZ RTR-P2P-23G-HYBRID-LC-g16

### General. IDU Options

<b>LED indicators</b>	PWR, IDU, ODU, RAI, LNK	
<b>Line interface</b>	GE	
<b>IF interface</b>	Transmit	350MHz -12 to -8 dBm
	Receive	140MHz, -8 to -37 dBm
<b>IF Cable Connector</b>	N Type (f/m)	
<b>Auxiliary Data</b>	Channel interface #	1
	Interface	RS-232
	Line rate, configurable	1.2 to 19.2 Kbps Async
	Connector type	RS-232, 9 PIN D-SUB
<b>Alarm I/O</b>	External Alarm input	2 x TTL
	External Alarm output	2 x TTL, 2 x Form C relay
	Connector	9 pin D-SUB
<b>NMS LNA</b>		
<b>Interface</b>	<b>Type</b>	<b>10/100 BaseT Ethernet, RJ45</b>
<b>Electrical</b>	Input voltage range	-38 to -72 VDC
	Power consumption	<40W, typ.
	Protective Circuit	6A fuse
<b>Mechanical</b>	Dimensions	44 x 482 x 300 (1U); 87 x 482 x300 (2U)
	Weight	~2.8Kg (1U typ.), 5.6Kg/2U typ.
<b>Internet</b>		<b>E1</b>
Capacity options	Configurable to 366Mbps, 10/100/1000baseT	Configurable to 160 x E1 (2.048 Mbps)
Traffic	4 x GE electrical, 1xGE Optical, 4 RJ45 and 1xSFP	SCS168
Connectors	4 x RJ45	Coding type: HDB3; 75Ω unbalanced or 120Ω balanced.
Specifications	L2 Switching, VLAN (802.3ac), Flow control (802.3X), QoS (802.1p)	
<b>Threshold (BER 10E-6)</b>		
QPSK (28MHz BW)	-85	dBm
<b>ODU Specifications</b>		
Frequency	23	GHz
Modulation	QPSK to 256QAM	
<b>IF Specification</b>		
IF frequency, Tx	140	MHz
IF frequency, Rx	350	MHz
Cable impedance	50	Ω
Maximum IF cable length (IDU-ODU)	300	m
<b>ODU Interfaces</b>		
IF cable connectors	N type f/m	
AGC monitor	BNC f/m	
Antenna port	EIA rectangular (standard)	Refer to ODU system spec.
Polarization (field selectable)	Vertical (standard), horizontal	
Antenna mount	Direct mount	
Power	20 (QPSK)	dBm
	16 (128QAM)	dBm
Power control range	Resolution: 0.1 steps (6dB/sec.)	dB
	Accuracy: ± 1	dB
Transmit mute	<-50	dBm/MHz
Transmitter source	Synthesizer	

RTR-P2P-23G-160E1 or IP366Mb-LC-g16

Specifications may be subject to change

03/08/13

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## Point to Point Radio Family 23GHZ RTR-P2P-23G-HYBRID-LC-g16

Stability	±5	ppm
Receiver overload (BER 10E-6)	-20	dBm
Residual BER	10E-13	
RSSI accuracy	±2	dB
<b>@1KHz Phase Noise</b>	-70	dBc/Hz
<b>@10KHz</b>	-80	dBc/Hz
<b>@100KHz</b>	-98	dBc/Hz
<b>@1MHz</b>	-110	dBc/Hz
25 dBm (Pout) QPSK EVM	15 spec.	%
24 dBm (Pout) 8PSK EVM	10 spec.	%
23 dBm (Pout) 16APSK EVM	8 spec.	%
15dBm (Pout) 256 QAM EVM	4 spec.	%
<b>Electrical</b>		
Power consumption	35	W
<b>Mechanical</b>		
<b>H x W x D</b>	287 x 287 x 120	mm
Weight	6.5	Kg
Thermal cycle (32APSK, 28MHz BW)	8	hrs



## Point to Point Radio Family 23GHZ RTR-P2P-23G-HYBRID-LC-g16

### Mounting Detail

