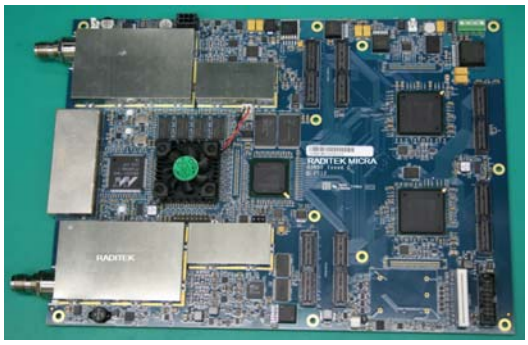
RADITEK MICRA

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

SATCOM
Micra Modem

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**	

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1. Main Specifications

Frequency	950 to 2050MHz (resolution 100Hz) (TNC connector)
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)
Symbol Rate	DVB-S2: 100ksps to 37.5Msps SCPC: 9.6ksps to 40Msps
Operating Modes	DVB-S2 (EN 302 307) option Closed Network (+ESC) (IESS-315)
Scrambling	DVB-S2: as per EN 302 307 Closed + ESC: Synchronized to ESC overhead
Impedance	50Ω
Return Loss	14dB typical
Frequency Reference	Ageing <4E-8/yr
External Reference	Clocking only: 1 to 10MHz, 1kHz steps Clocking and RF frequency: 10MHz, 0dBm±1dB
Redundancy	Can be operated in standalone, 1:1 or 1:N redundancy configuration (redundancy requires Auxiliary Card option)

2. Traffic Interfaces

Standard:
4-port Gigabit Ethernet switch (100,000 packets per second processing capability). See optional IP features under 'Ethernet Traffic'
Traffic options:
EIA-530 (RS422, X.21, V.35 and RS232 on 25-pin
D-type female)

3. Modulator

Output Power	0 to –30dBm (0.1dB steps)
Output Power Stability	±0.5dB, 0ºC to 50ºC
Transmit Filter Roll-off	5%, 10%, 15%, 20%, 25%, 35%
Phase Accuracy	±2º 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

4. Demodulator

Input Range	Minimum: -130 + 10 log (symbol rate) Maximum: -80 + 10 log (symbol rate)
Maximum Composite Signal	+10dBm
Wanted-to-composite Level	-102+10 log (symbol rate)
Frequency Sweep Width	±1kHz to ±32kHz up to 10Msps (1kHz steps) ±10kHz to ±250kHz above 10Msps (10kHz steps)
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)
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. (requires Auxiliary Card option)
LNB 10MHz Reference	Via IFL cable; 10MHz ± 0.001 ppm; 0dBm ± 3dB
LNB Voltage	Selectable 15V or 24V DC to LNB via IFL cable; maximum 0.5A

5. Forward Error Correction

Modulation	DVB-S2 (Option): QPSK, 8PSK, 16APSK
	Non-DVB-S2: BPSK, QPSK, OQPSK, 8PSK, 16QAM, LDPC+ 8QAM, LDPC+:16APSK, LDPC+: 32APSK, LDPC+: 64QAM
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

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
	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 inter-face (standard)
IP Diagnostic Graphs	Shows Tx, Rx throughput (bps, pps); dropped, errored packet counts (standard)

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7. Ethernet Traffic: RAD- IP Option

Traffic Shaping	Provides guaranteed throughput levels for IP streams, using Commit-ted 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
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)
Payload Compression	Uses Deflate algorithm (RFC 1951) to compress all TCP/IP packets (TCP and UDP), typically resulting in compression of payloads by 50%
Dynamic Routing	RIP V1, V2; OSPF V2, V3; BGP V4
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
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
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)
AES-256 Encryption	Note: due to export controls, encryption is supported on the MICRA model only. Please see separate datasheet for more details

8. Test Facilities and Alarm Outputs

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
	Supports 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
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)

9. Mechanical/Environmental

Size	Card: 255mm x 184mm (Optional 1U half-rack chassis, 280mm deep, excluding front panel handles and rear panel connectors and fan)
Weight	0.35kg
Power Supply	24 Volt DC input (not provided) Consumes 30 Watts
Compliances	FCC, CE and RoHS compliant
Safety Standards	EN60950-1
Emission and Immunity	Emissions: EN55022:2006 Class B Immunity: EN55024: 1998 (+ A1:2001 + A2:2003)
Standard Operating Temperature	0 to 65ºC
Extended Operating Temperature (Option al)	-20ºC to 80ºC
Humidity	95% relative humidity, non-condensing

10. Simu-carrier

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
Simu-carrier data rate options	256kbps, 512kbps, 1024kbps, 2.5Mbps, 5Mbps, 10Mbps, 15Mbps, 20Mbps, 25Mbps, 30Mbps, 40Mbps, 50Mbps and 60Mbps traffic rate
Supported power asymmetry	-10dB to +10dB
Supported 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 recalculate position relative to satellite, allowing uninterrupted operation in mobile environments (ships, etc.) anywhere in satellite footprint

11. Advanced ESC

ESC/Aux Port (requires Auxil-liary Card option)	Provides high rate async ESC or Intelsat low rate async IBS ESC	
Electrical Interface	IP, RS232, RS422 or RS485 (requires Auxilliary Card option)	
Async ESC	Closed Net Plus ESC	Overhead scales to any ESC baud rate from 0.5% to 70% of the main channel rate

12. DVB-S2 Performance at PER 1e-6

Guaranteed Es/No (dB) for Normal (64k) frames

	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

13. DVB-S2 Performance at PER 1e-6

Guaranteed Es/No (dB) for Normal (16k) frames

	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	

14. Eb/No BER Performance dB Guaranteed (Typical)

		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)	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)

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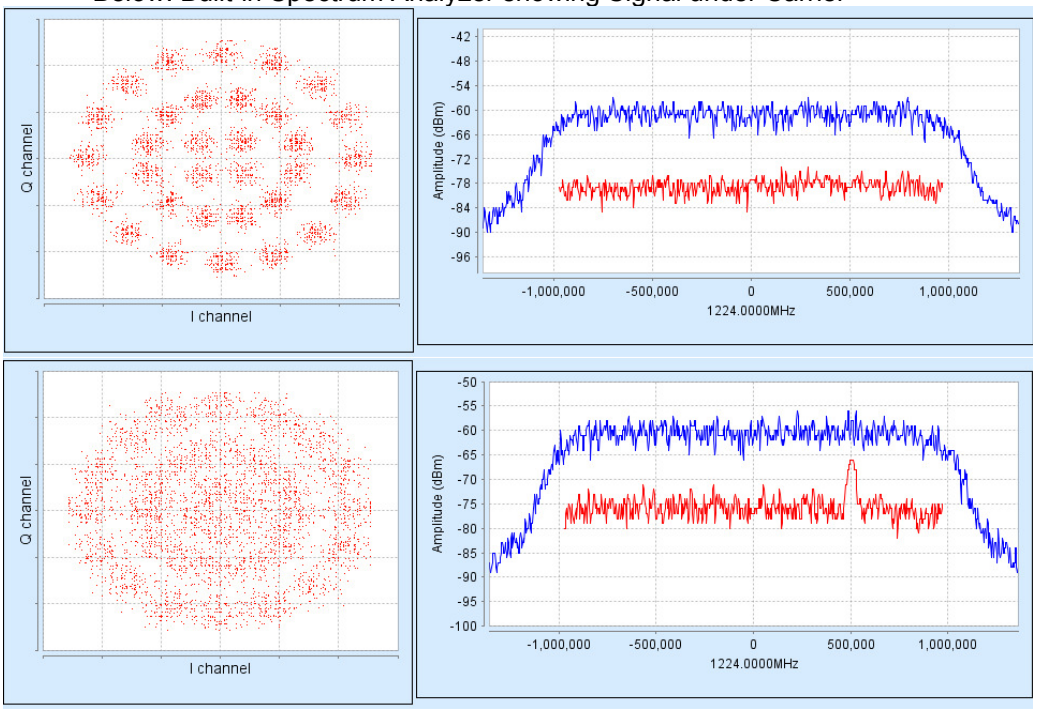
Below: Built-in Spectrum Analyzer showing Signal under Carrier



Above: Interference detection with interferer present.

Micra card mounted inside Aluminum frame option

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	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

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19. Configuration options	Description
Simu-Carrier Subject to prevailing modem data rate limits. Occupied bandwidth: minimum 30kHz; to a maximum of 36MHz	Simu- Carrier hardware option (requires one or more additional Simu-Carrier options below); allows carriers to be overlapped thereby reducing the required satellite bandwidth; The Simu Carrier card mounts above main card
	The Simu-Carrier starts at 256kbps (requires Simu-carrier hardware option)
	It optionally extends in steps: 1.024, 2.5, 5, 10, 15, 20, 25, 30, 40, 50, 60 Mbps
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 65ºC) to -20ºC to 80ºC 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

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