

RV-M6

M6 Narrow Band
2W OEM Radio Modem

The M6 OEM Radio Modem is a low-cost rugged single-board 2W VHF/UHF/900MHz narrow-band OEM data radio modem with digital serial interface. Ideal for Automatic Meter Reading (AMR), SCADA and telemetry applications. It is over-the-air compatible with Raveon's 5-watt M7 and M8 series of data radios.



Product Overview

Long-Range Operation

Operating in the narrow-band frequency bands, the RV-M6 radio modem works over 10 miles point-to-point and many miles with omni-directional antennas. All RV-M6 modems support store-and-forward repeating for wide-area coverage.

GPS Option

The optional internal GPS receiver allows the RV-M6 to be a powerful Automatic Vehicle Location (AVL) system or Time Space Position Information (TSP) reporting device. Raveon's TDMA protocol is built in for track thousands of things in real time.

Tech Series I/O Options

The M6 may be installed in a Raveon M22 Tech Series enclosure with these I/O options. The following interface boards may be attached or changed at any time:

- RS-232 [S]
- USB [U]
- RS-485 [T]
- RS-422 [F]
- GPIO [G]
- Analog [A]



High Speed and High Efficiency

The RV-M6 operates with user-selectable over-the-air data rates of 1200 to 19200bps. This fast-switching radio can send up to 50 transmissions per second.

Wireless SCADA RTU

When used with the GPIO interface in the Tech Series enclosures, or just using the M6's TTL IO pins,

it implements many SCADA remote terminal unit features.

Flexible Input Voltage

The RV-M6 is designed to run off of voltage sources such as 7V-30V. For other voltage ranges, contact the factory.

Automatic Meter Reading

Being small, power efficient, and fast makes the M6 ideal for automatic meter reading. With a communication range of many miles, a network of M6 radios can cover a nation reading and managing a smart grid.

Spectrally Efficient

In the USA, FCC compliant data radios must be capable of 9600baud in 12.5kHz channel or 19200baud in 25kHz channel. The M6's 4FSK modes meet all FCC spectral efficiency requirements. *Streaming Mode* can send out data in 10-20mS.

Network Management

The CPU in the M6 has many features and commands implemented in it simplifying the setup and management of large radio networks. 16 bit IDs, ID masks, packet filtering, and repeating by ID are some powerful included features. Ping by ID capability and remote command execution simplify network monitoring and diagnostics.

Very Low Power Consumption

It has very low power consumption, and sleep modes allow it to be active and consume almost no power at all.

Universal 20-Pin Header

The M6 is plug-in compatible with Raveon's M8, M50, and Z50 radio modules giving your design the ability to use cellular, 915MHz ISM LoRa, industrial VHF, UHF, 220MHz, and/or the M6.

General Specifications

Model: **RV-M6c-xx-oo** (x=band)(oo=options)
 Size and Weight:
 61mm X 37mm 3oz
 Channel Bandwidths (kHz):
 6.5, 12.5, 25 set with: ATBW cmd.
 Input Voltage:
 Clean Regulated 8-30V DC.
 (Max ripple 50mV AC)
 Current Draw, (12.5V DC):
 Receiving data: <58mA
 2W transmitting: < 620mA
 Sleep ATSM2 (<45mA) (RX disabled)
 GPS Option: adds 8mA average, 20mA Acqui.
 Frequency Bands:
 VA 135-155MHz
 VM MURS channels
 VB 150-174MHz
 UC 450-470MHz
 Contact factory for use in other 130MHz - 990MHz
 Options: (c) Standard transceiver: S
 Internal GPS G
 Receive Only R
 Serial Port Baud Rates (programmable)
 1.2k, 2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 57.6k, 115.2k
 Over-the-air baud rates (programmable)
 -N 1200, 2000, 2400, 4.8k, 5142, 8K,9.6k
 -W 1200, 2000, 2400, 4.8k, 8k, 9.6k, 19.2k
 Full Spec Operating Temperature range
 -30°C to +60°C
 TX-RX and RX-TX time <3mS
 RF I/O Connector MMCX (Female)
 LED Indications: TX, RX
 Max OTA Packet Size: 105 bytes

Transmitter Specifications

RF Power Output 2W
 (Lower power options available from factory)
 Frequency Deviation $\pm 2.2\text{kHz}$ (-N) $\pm 3.5\text{kHz}$ (-W)
 TX Spurious outputs < -70dBc
 Occupied Bandwidth per FCC
 FCC Emissions Designator 11K0F1D (-N)
 Frequency Stability Better than $\pm 1.5\text{ppm}$
 RF Power Stability across band: 0dB to -1dB
 If PA is grounded to conductive metal.
 Max Duty Cycle..... 100% to 40C, 25% to 60C
 If PA not grounded, module laying open:
 Max Duty Cycle 50% to 30C, 20% 50C, 10% to 60C

Receiver Specifications

RX sensitivity (.1% BER) 9600bps < -108dBm
 4800bps < -114dBm
 1200 & 2400baud < -118dBm
 RF No-tune bandwidth 20MHz
 Adjacent Channel Selectivity 12.5kHz..... -50dB
 Adjacent Channel Selectivity 25kHz..... -60dB
 Alternate Channel Selectivity -65dB
 Blocking and spurious rejection 10MHz . -85dB
 RX intermodulation rejection..... -70dB

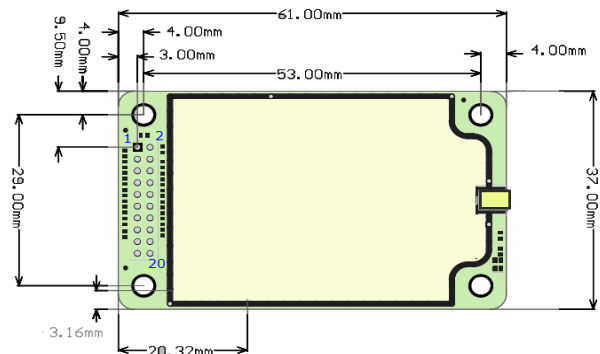
Input / Output Connection Functions

20-Pin UWORC Interface Port

1	GND	Ground
2	VCC	DC Input
3	CD	Carrier Detect Out.
4	TX On	Pin is High when module is transmitting. Low when off, receiving, or sleeping.
5	Data In (TXD)	Transmit serial data input.
6	Data Out (RXD)	Receive serial data output.
7	Enable	Low to shut-down the module. High to enable it.
8	DTR	CPU Sleep input. Put in low-power fast-startup mode.
9	CTS	Clear to send output. Indicates state of internal buffers.
10	RTS	RTS input for serial flow control.
11		
12	VDIG	3.3V output
13	IOA	IO port A, Analog Input Capability.
14	IOB	IO port B,
15	IOC	IO port C
16	STAT1	Status IO 1
17		Do not connect.
18	STAT2	Status LED out
19	GND	Ground
20		Do not Connect

*See App Note AN224 for UWORC details

Mechanical Specifications



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SCADA and Remote Control Features

Built into the M6 are many features and commands for SCADA, telemetry, and remote control monitoring without having to attach an external sensor. Contact the factory if you wish to use MODBUS commands to control this radio's GPIO.

For SCADA systems, the GPIO interface is the ideal interface to monitor or control remote devices. Serial interfaces such as RS-232, USB, and RS485 can be connected to a SCADA controller or HMI to communicate with a remote Tech Series radio modem that has the GPIO interface.

The following commands in the M6 are powerful SCADA and telemetry features.

Command	Command Description	Parameters
FAILSAFE	FAILSAFE A B command sets the minimum message interval, and the default digital output state if an over-the-air MIMIC message is not received within the failsafe period. A is the minimum period in seconds, Set A to 0 to disable FAILSAFE feature. B is the power-on ASCII hex value of the digital outputs, and B default values are used if the failsafe interval passes and no MIMIC messages are received. The B values are outputted if MIMIC was enabled without receiving messages during the MIMIC interval.	A: Required Message Interval or interface to transmit MIMIC data (Seconds) 0 - 99999 B: Default Ascii hex value to set outputs to. 00-FF
MIMIC	MIMIC mode. MIMIC X Y X number of seconds to TX if input 0 is low. X=0 to disable MIMIC mode. Y is number of seconds between transmissions when the input 0 is high.	X: 0-255 Y:0-255
GOUT	GOUT Get the output bit register in hexadecimal format. Example: GOUT will return hex value C3 if bits 0, 1, 14, 15 are set (1) and all other clear (0).	Returns Hex value, 16 bits max.
GINP	GINP Get the input bit register in hexadecimal format. Example: GINP will return hex value C3 if bits 0, 1, 14, 15 are set (1) and all other clear (0).	Returns Hex value, 16 bits max.
CBIT	CBIT X Clears output bits. X is hexadecimal format. Any bit in x set to 1 will cause the same output bit in the modem's output register to be cleared to 0. No bits get set. X=C3 to set bits 0, 1, 14, 15. To read the output bit register, enter CLRBIT with no parameter, or better, use GOUT command.	0-FF
SBIT	SBIT X Sets output bits. X is hexadecimal format. Any bit in x set to 1 will cause the same output bit in the modem's output register to be set. No bits get cleared. X=C3 to set bits 0, 1, 14, 15. To read the output bit register, enter SETBIT with no parameter, or better, use GOUT command.	0-FF
TBIT	TBIT XX MMM Sets output bits for a specific time. XX is hexadecimal format. Any bit in x set to 1 will cause the same output bit in the modem's output register to be set. MMM is in mS. 1000=one second, 60000=one minute. To set bit #3 to 1 for 250mS: TBIT 4 250 After the time expires, the bit that was set in XX is cleared to 0.	0-FF 2 - 4000000000 (2mS - 1100hours)
TRIGBITS	TRIGBITS This command enables or disables individual bits for use as input triggers.	0-FF
CNTTM	CNTTM B SS Configure a timer to reset the bit's binary counter. B is the bit number (0-15) that is being configured. SS is the interval number of seconds that the transition counter will be reset to 0. Set SS to 0 to never automatically reset the counter.	B: 0 - 15 SS: 0 - 65536
IOPIN	IOPIN XX M Set the GPIO bits on the Tech Series GPIO front panel to inputs or outputs. XX parameter are the hexadecimal representation of the pins being configured. M is the mode for the XX pins. Mode M values: A :Digital TTL Input, B :Digital TTL Output. C :Open Drain MOSFET output, D :DC Power switch output. E :Analog Input	XX=Hex 00-FF M=(A,B,C,D)

Most of these SCADA commands will work with just the M6 modem module. Some require that the M6 be inside a RV-M22 Tech series enclosure with an appropriate interface panel to operate. For example, if there is a desire to have a switched DC output voltage, the RV-M22 Tech Series enclosure with GPIO interface must be utilized.

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Tech Series Flexibility

The Tech Series radio enclosure from Raveon is the most flexible radio platform in the industry. 6 I/O options, 6 RF band options, GPS option, wide/narrow channels, Arduino option, and wide DC input voltage range.

I/O Connector Type	Connector Code
	S RS-232[S]
	U USB[U],
	G, T, F RS-485[T], RS-422[F], GPIO[G]

Raveon's Tech Series enclosures are the radio modem enclosures referred to as RV-M21 and RV-M22 part numbers. The Series enclosures have many different I/O options:

RS-232[S], USB[U], RS-485[T], RS-422[F], GPIO[G],

MIMIC Mode

The MIMIC mode in the M6 radio module enables two M6's to monitor or remotely control external devices without any additional software or devices. MIMIC mode operation takes the digital inputs from one M6 and automatically transmits them over the air to another M6 that will automatically output them.

Receiving MIMIC messages over the air and outputting them to the M6 I/O pins is done by setting the ATIO command to 1. If the radio modem used is incorporated into a Tech Series enclosure (M21 or M21), then keep the I/O mode set to 8 (ATIO 8). The MIMIC mode will be enabled automatically when the GPIO front panel of the Tech Series Enclosure is installed on the unit.

Transmitting MIMIC messages: MIMIC transmissions are enabled with the MIMIC X Y command. MIMIC 0 disables MIMIC mode and puts the unit in standard radio modem operation mode. MIMIC X Y with X and Y being any positive number will enable the MIMIC feature. The MIMIC X Y command sets the unit to transmit a MIMIC over-the-air message every X seconds when INPUT0 is low, and to every Y seconds when INPUT0 is high.

If the radio modem is receiving inbound data over the air when it comes time to transmit the MIMIC data, it will wait until the reception is over, and then send the MIMIC data.

GPS Tracking Option

The M6 radio module has a GPS option (G) that incorporates a UBLOX GPS module into the module.



The M6 uses Raveon's TDMA (Time Division Multiple Access) protocol to transmit and receive GPS location and status information over the air. Data may also be transmitted in TDMA slots. Using the TDMA protocol, thousands of devices can be tracked with no interference supporting fast and reliable update times. AES128 encryption is used to secure the location transmissions.

This GPS Transponder lets you quickly locate: your co-workers, your vehicles that break-down, your rented watercraft, your stolen vehicle, a drowsy driver, nearest help, lost people, or slow-moving golfers.

It is the fastest real-time GPS tracking transponder available. It uses commercial radio channels without service fees or monthly charges, and it works virtually anywhere.

- Public Safety:** Know where your first-responders and officers are, and who is closest to the scene. See the tactical situation in real-time, so you can respond intelligently.
- Vehicle Monitor:** Track vehicles in real-time, monitor speed, door sensors, voltage, and operator behavior. Use the M6 GX for tracking, emergency location, and potential theft recovery.
- Mining:** Watch your machinery at work, monitoring for improper speed, location, and usage.
- Off-road Racing:** Quickly know where your race-car and chase truck are. Find it fast if it breaks or is stolen.
- Parks and Golf:** Easily locate all other vehicles in the park or golf-course. The location display may be in any vehicle, at the ranger-station, or even use a hand-held GPS display.
- Marine:** Track all the vessels in your rental fleet, and ensure they are not abused, stolen, or misplaced. RADAR display can be used to display M6 position AND status.
- Construction:** Know where all your equipment is, and how it is being used. Quickly locate anyone, as soon as you drive onto the site.

GPS location transmission report rates can be setup within the M6 to any update rate from 1 second to 1 day. Transmissions include: Latitude, longitude, speed, heading, altitude, time, temperature, IO status, and motion sensor status.

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