



RV-M7 GX
UHF GPS Transceiver
Quick-Start Guide

Version A6 January 2008

RV-M7-UC-GX



RV-M7-UC-GX-WX



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1. Safety / Warning Information

1.1. Blasting Caps and Blasting Areas

To avoid possible interference with blasting operations, turn off this radio or remove the DC power when you are near electrical blasting caps, in a blasting area, or in areas posted: “**Turn off two-way radio.**” Obey all signs and instructions.

1.2. Potentially Explosive Atmospheres

Turn off your radio prior to entering any area with a potentially explosive atmosphere. Do not install this product for use in areas with potentially explosive atmospheres. Do not remove, install, or charge batteries in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

Note: The areas with potentially explosive atmospheres referred to above include fueling areas such as below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles, such as grain, dust or metal powders, and any other area where you would normally be advised to turn off your vehicle engine. Areas with potentially explosive atmospheres are often but not always posted.

Use this manual in conjunction with the *M7 GX Technical Manual*, which contains important safety, licensing, and FCC information.

2. Overview

Raveon’s RV-M7 GX series of GPS transponders are a rugged high-speed UHF data modems with a built-in 12-channel GPS receivers. The *M7 GX* has ½ to 5 watts of RF power output, and operates as both a GPS transponder for tracking, and a radio modem for sending and receiving data.

The *M7 GX* may be configured for a number of different GPS applications, including:

Transponder: Periodically transmit position and status. TX only.

RavTrack PC: Connect the *M7 GX* to a personal computer running *RavTrack PC* (or other PC software) to view a map showing location, status, log movement, set alerts, and make reports from the data.

Radar Display: Connect *M7 GX* to a marine plotter or radar display, and icons will appear on the display showing the location of all other *M7 GX* radios in the system.

GPS display: Connect *M7 GX* to a hand-held or mobile GPS, and icons will appear on the display showing the location of all other *M7 GX* radios in the system.

-LX receive only: This configuration is for the *M7 LX* model. Is a *M7 GX* without the internal GPS. It cannot transmit location, status, or trigger alerts, but it will receive and output the location and status of other *M7 GX*s in the system.

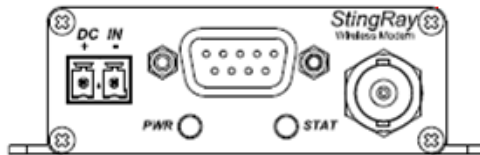
For privacy and security, over-the air encryption is standard on every *M7 GX* radio. For network versatility, the *M7 GX* incorporates a 16-bit identification code, allowing up to 65,000 objects to be identified in one system. For wide-area coverage, all *M7 GX* transponders may be set to store-and-forward messages from other *M7 GX* transponders.

3. Operation

The *M7 GX* operates in a number of different “GPS Modes”, each mode specific to the application it is being used in. The mode of operation is set with one simple command, the **GPS x** command. The different modes change the operation of the *M7 GX* in a number of ways. The serial-port data rate is set, the types of NMEA formatted messages it will send out or accept is set, as will as how the internal UHF radio is used. The table below summarizes this.

GPS Mode	Common Usage	Default Serial Port Baudrate	Output Message	Description
GPS 1	Transponder <i>Simple tracking, AVL, security.</i>	4800	GSV, GLL	Transmit only in this mode. The receiver is off and GPS is turned off between transmissions. This is the lowest-power consuming mode. No RX.
GPS 2	PC / Base Station <i>Proprietary interface for PC applications that monitor M7 Transponders.</i>	38400	PRAVE	Connect the M7 GX to a PC computer running RavTrack PC (or a custom application), The PRAVE message is in NMEA format, and provides location and status information for every transponder it receives.
GPS 3	Marine Radar <i>Displaying the location of M7 transponders on a ship RADAR screen.</i>	38400	TLL	Connect the M7 GX to a marine RADAR display or plotter with a serial port, and waypoints will appear on the GPS screen at the location of all M7 GX transponders within radio range. The display must support the NMEA 0183 TLL message.
GPS 4	GPS Display <i>Lowrance and Garmin GPS displays. Mobile displays.</i>	4800	WPL	Connect the M7 GX to a mobile or hand-held GPS with a serial port, and waypoints will appear on the GPS screen at the location of all M7 GX transponders within radio range.
GPS 5	-LX No GPS module <i>Lowrance and Garmin GPS displays. Radar displays. Mobile displays.</i>	38400	PRAVE	Connect the M7 GX to a PC running RavTrack PC, or change the message to WPL and use with a GPS display. No internal GPS, so no positions/status transmissions.

4. Electrical Inputs and Outputs



The front panel of the M7 GX modem has these features:

1. **RF connector**
2. **Power LED**
3. **Status LED (Receive data = green, TX = red)**
4. **9-Pin Serial I/O connector**
5. **DC Power Jack**

4.1. LEDs

The status LED visually show the current status of the radio.

Status LED (TX) This LED blinks red when the transmitter keys and is putting out RF power. It blinks green upon the reception of data or RF carrier.

Power LED (PWR) This LED does a short blink, once every two seconds, indicating to the user that the power to the modem is ON and the modem is working. When the modem is in the command mode, this LED will blink on and off, once per second.

When the GPS is trying to acquire satellite lock, the Status and Power LEDs will alternately blink back and forth. This usually takes 10-20 seconds upon power-up or loss of satellite signal.

4.2. DC Power

DC power for the modem is connected to the 2-pin DC power input jack labeled DC IN. Use the supplied cable to connect the DC power. The **red wire is positive (+)** and the **black wire is negative (-)**. Its connection is optional, as the user may alternately apply power to Pin 9 and ground to pin 5 of the 9-pin

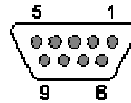
I/O connector. If the power cable run is over 3 feet long, Raveon recommends at least 18 AWG wire be used.

The M7 modem is supplied with a 6-foot DC power cable, Raveon part number 1C738-1.

Note: The M7 has in internal 3-amp mini-fuse (automotive type) to protect it and its power source against reverse voltage and serious hardware failures.

5. RS232 Serial I/O Connector

The RS232 9-pin serial I/O connector is a female 9-pin D- having the following pins configuration. It is pinned out so into a computer or PC's 9-pin COM port.



subminiature connector that it may be plugged directly

Front-view of DB-9 connector on modem (female)

Pin	Name	Dir	Function	Level / Specification
1	CD	out	Carrier detect	Indicates presence of carrier. Logical 0 means carrier is present. If disabled, it is asserted (0). It will be a 1 when the modem is in the configuration mode.
2	RxD	out	Receive data	Data out of the modem.
3	TxD	in	Transmit data or IN2	Data into the modem. Also used as digital input IN2 for exception reporting. GND or floating for a 0, >3V for digital 1. If enabled for digital inputs, the serial data entering this pin is ignored (except in the command mode). Use the TRIGBITS command to set which bits are used as inputs.
4	DTR	in	Data terminal ready or IN0	Used as digital input IN0 for exception reporting. GND or floating for a 0, >3V for digital 1. Use the TRIGBITS command to set which bits are used as inputs.
5	GND		Ground connection	Signal and power ground
6	DSR	out	Data Set Ready	Normally is set to 0 when modem is powered on and running. Modem sets to a 1 when in low-power mode.
7	RTS	in	Request to send or IN1	Used to stop/start the flow of data out TxD pin. 0 = OK, 1 = don't send. Also used as digital input IN1 for exception reporting. GND or floating for a 0, >3V for digital 1. Use the TRIGBITS command to set which bits are used as inputs.
8	CTS	out	Clear to send	Used to stop the flow of data going into the RxD pin from the device connected to the M7. 0 = OK to send, 1 = don't send. If the M7 cannot accept more data, it will negate this signal (set to a 1).
9	Power	In/out	DC power (not ring signal)	User may supply the DC power to the modem on this pin.

Note: RS-232 signals use positive and negative voltages to represent digital 1s and 0s. A positive voltage is a 0, and a negative voltage is a digital 1.

This pin-out allows it to be directly plugged into a computer's 9-pin serial port using a conventional 9-pin RS-232 serial cable. To connect it to a modem, or peripheral that has a serial port, you will need a "null-modem" cable.

IN 2 (TXD)	IN 1 (RTS)	IN 0 (DTR)	Hexadecimal Representation
0	0	0	0
0	0	1	1
0	1	0	2

0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

6. Configuring the M7 GX

6.1. Overview

There is a “Command Mode” used to program and configure the *M7 GX*. In the Command Mode, the *M7 GX* modem accepts commands via the serial port and the user may configure the internal parameters of the unit, such as frequency and ID codes.

6.2. Command Mode

The *M7 GX* modem may be put into a “Command Mode”, by entering a sequence of three plus characters (+++). Using serial communications software such as *HyperTerminal*, send the 3-character command sequence “+++”.

When the *M7 GX* modem first enters the Command Mode, it sends the phrase “RV-M7” out its serial port, and then an “OK”.

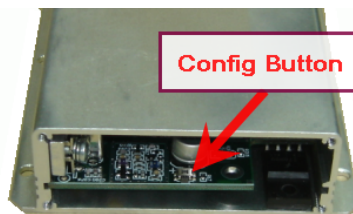
6.3. Setting a Parameter

To set a parameter in the *M7 GX* modem, enter the Command Mode as described above, then enter the proper command, a space, the parameter, and then a carriage return. For Example, to set the destination address of the *M7 GX* modem to 25, enter the following command:

ATDT 25 <CR>.

6.4. CONFIG Button

If certain parameters within the *M7 GX* transponder are modified in a manner that causes the modem to cease functioning or if the user cannot enter the command mode via the “+++” method, there is a small push-button inside the *M7* to assist. This “CONFIG” button may be pressed at any time, and forces the *M7 GX* into a known state. The CONFIG button is located inside the *M7 GX*. Remove the rear cover, exposing the circuit board and the button as shown below.



The default settings that the *M7 GX* will revert to when the CONFIG button is pressed are:

1. Serial port 9600 baud, 8 data bits 1 stop, no parity
2. Serial port flow control is off.
3. ATCT setting set to 60000 (60 second time-out)

Even though the serial baud rate reverts to 9600 baud when the CONFIG button is pressed and the IO port is RS232, it will revert back to the settings programmed into the *M7 GX* once the Command Mode is exited.

6.5. Restoring Factory Defaults

The **AT&F** command may be used to restore the modem back to the factory-default condition. The table in Section 6.6 lists all of the radio modem related commands. Use this command with caution, as it will erase all previously configured parameters. The **GPS&F** command resets only the GPS related settings back to factory defaults. The modem itself keeps its settings. The GPS commands that are reset are shown in Section 6.7.

6.6. MODEM Commands

Command	Command Description	Parameters	Factory Default
ATBD	Baud Rate – Sets serial com port baud rate (bps). Over-the-air (throughput) baud rate is set with ATR2 command. If a PC's serial baud rate is set higher than the fixed over-the-air baud rate of the module, hardware handshaking may be required.	Range: 0 – 7 0 = 1200 5= 38400 1 = 2400 6=57600 2 = 4800 7=115200 3 = 9600 4 = 19200	3
ATBC	Busy Channel Lock Out – Enable/disable the BCL. If enabled, the modem will not transmit on a radio channel that is busy (has RF on if). 0-OFF, 1=ON.	Range: 0-1	0
ATCH	Configure Hardware Flow Control – Enable (1) or disable (0) flow control. When enabled, the modem will monitor the RTS line, and if it is negated, stop sending data out the serial port. If disabled, the modem will ignore the state of RTS, and always send out characters.	1 = Enable 0 = Disable	0
ATDT	Destination Address to call – Sets address of the modem to send data to. Note, this parameter is entered in HEX format. Each digit may be a 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E, or an F.	Range: 0-FFFF	1234
ATF	Display frequencies – Display all of the frequencies programmed into all of the channel memories.		N/A
ATFT	Transmit Frequency – Program the transmit frequency for this channel. Enter in Hz or in MHz. The frequency will automatically be saved in non-volatile memory (flash) for this current channel number.	Range: See product data sheet. For MURS products, frequency cannot be changed.	See product data sheet.
ATFR	Receive Frequency – Program the receive frequency for this channel. Enter in Hz or MHz. The frequency will automatically be saved in non-volatile memory (flash) for this current channel number.	Range: See product data sheet. For MURS products, frequency cannot be changed.	See product data sheet.
ATFX	TX and RX Frequency – Program the receive and transmit frequency for this channel. Enter in Hz or MHz. Same as issuing an ATFR and an ATFT command. The frequency will automatically be saved in non-volatile memory (flash) for this current channel number.	Range: See product data sheet.	N/A
ATHP	Channel Number – Select separate channels to minimize interference between multiple sets of modules operating in the same vicinity.	Range: 1 - 6	1
ATIC	Read Current Draw Read the current draw in mA. Accuracy is within 20% of actual current draw.	Range: 0-9999	N/A
ATL	Enable/Disable the LEDs – 1 = LEDs always off. This reduces some power consumption. 0 = LED operate normally.	0 or 1	0
ATMK	Address Mask – Configures local and global address space. Each digit may be a 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E, or F. In most applications, this is kept at FFFF.	Range: 0000 - FFFF	FFFF
ATMY	Unit Address – Configures the individual; address for this unit. Each digit may be a 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E, or F. Note: FF is interpreted as a group. See addressing section.	Range: 0000 - FFFF	1234
ATNB	Parity – Selects parity format. Settings 0-4 transfer 8-bits over antenna port and generate the parity bit on the RF receiving side.	Range: 0 – 5 0 = none 1 = Odd 2 = Even 3 = Mark (1) 4 = Space (0)	0
ATNS	Stop Bits – Selects the number of stop bits.	Range: 1-2	1

ATPE	Packet Error Display – Shows statistics to compute packet-error rate. Displays Packets Per Minute (PPM) and a running total.	None (display PER) 1 = reset counters 2 = Stop PER display	None
ATPO	RF Power Output. Set or show the RF power output setting. Value is in percent, from 0% to 100%. Use and RF wattmeter to confirm the power setting, and adjust the % accordingly to obtain the desired RF power level.	0-100	100
ATR2	Over-The-Air bit rate - This is the data rate the radio uses to send data over the air. All RF modems in the network must use the same over-the-air baud rate. Refer to section Error! Reference source not found. for information on how to set the OTA baud rate.	Range: 0 = 800 5 = 9600 2L 1 = 1200 6 = 19200 4L 2 = 2400 7 = 5142 2L 3 = 4800 8 = 9600 4L 4 = 8000 4L 9 = 2000 2L	3
ATR3	Serial Port time out – Number of mS of no activity on the serial port before transmitting the data in its buffer.	Range: 1 - 5000	20 (mS)
ATRQ	Receiver Signal Level – Reads the Receiver Signal strength this instant, and returns the level in dBm.	Range: -40 to -130 (dBm)	-
ATRS	RSSI (Receive Signal Strength Indicator) – Returns the signal level of last received packet. The reading is in dBm. Usable for relative comparison of signals, but absolute value is within 10dB at -90dBm.	No parameters. Returns a number : -50 to -140 (dBm) varies by model.	none
ATRV	Disable Remote Access – When enabled (set to a 0), the modem will respond to over-the-air RPR requests, Pings, and over-the-air commands. Default is OFF (1).	0= Remote Access on 1=Remote Access off	1
ATSL	Serial Number – Reads and returns a unique serial number for thjs unit.	Read Only 1 - 999999999	unique
ATSH or SHOW	Show – Display the configuration of the modem. This will return a page of ASCII characters, showing the main configuration parameters.	none	None
ATST	Statistics – Show the unit's operational statistics. See Statistics section of user manual.	0, 1, 2, 3, 4, or 5	None
ATTD	Transmit Test Data – When issued, the modem will begin transmitting data. The type of data sent is set in the parameter. Entering a <CR> will terminate the transmission.	0 = Go back to normal 1 = Random 2 = Hop up/dn one channel 3 = 1010... at ¼ baud rate 4 = TX all 0s 5 = TX all 1s 6 = Test Points ON 7 = Transmit CW 8 = Transmit 1010101...	
ATTE	Read product temperature – Read the internal temperature of the unit's circuit board in degrees Celsius.	-40 to +99	-
ATVB	Read DC input Voltage – Returns the DC input voltage reading, in mV (12500 = 12.5VDC input).	None	none
ATVR	Firmware Version – Returns firmware version currently loaded on the module.	Read Only, 3 characters	none
ATXn	Show or Configure the Repeat Table – Set the addresses that this unit will store-and-forward data to/from. n = 1, 2, 3, or 4 designating the entry in the table to show or edit..	<i>Four parameters</i> aaaa bbbb cccc dddd where aaaa=Source Address bbbb = S.A. Mask cccc = Destination Address dddd = D.A. Mask	
ATXR	Enable/Disable Store and Forward Repeating – 0=disabled, 1 – enabled.	0 or 1	0 (Off)
ATHX	Enable/Disable single-hop repeating – 0=any number of repeats, 1 – unit will not repeat a packet that was already repeated.	0 or 1	0 (multi-hop OK)

PING	Ping another modem. Format is PING xxxx, where xxxx is the ID of the modem to ping. If remote access is enabled on xxxx, it will respond.	XXXX	-
RPR	Remote Procedure Request. Used to request execution of a command on a remote mode (over the air). See <i>M7 System Protocol</i> manual for information on using this feature.		
SHOW	Show/display an overview of the radio's configuration.	None	-

** indicates values that are calibrated in the factory and are unit-specific. If the "Radio Type" is changed, these will need to be re-calibrated.

6.7. GPS Additional Commands

The following commands are unique to the –GX version of the M7. When you execute any of these commands, the new parameter is automatically stored in EEPROM.

Command	Command Description	Parameters	Default
ATTX	Transmit Channel Access Method. Enables TDMA operation. 0=standard carrier-sense. 1=TDMA.	0,1	1
ATHX	Singe-hop repeat. Only applicable if repeater function is enabled. (ATXR = 1) 0 = repeater will repeat as programmed . 1 = will not repeat any packet that has already been repeated.	0 or 1	0
GX	Display GPS settings. Show an overview of the current GPS features and configurations in the M7 GX.	-	-
GPS	GPS Operation Mode. Read/Set the GX version's Operating mode.	0 - 6	1
GPS&F	Reset all GPS (-GX version) parameters. Set the GX version's Operating mode to GPS mode 4, and sets all GPS parameters to factory defaults. It does not erase frequency or other radio-related parameters.	-	-
IDLERATE	IDLE TX Interval. Set the number of seconds between position transmissions when the unit is idle (has not moved more than TRIGDX meters).	0-9999 seconds	10
KEYPHRASE	Privacy Security Key Code. Set the privacy key for this device. It must be the same key as used on all other Raveon products in your system. It secures radio transmissions from unauthorized reception. Set it to 0 to disable security encryption of data.	2-16 ASCII characters.	"RAVEON"
PREFIX	ID Prefix. Set an ID prefix. The prefix is 1-8 characters that will be put in front of the ID when reporting an ID as a waypoint name. A dash means no prefix. Default is a capitol letter V.	1-8 ASCII characters Set it to "0" for no prefix.	V
PROX	Proximity Alert. Set a minimum proximity distance. When any M7 GX with properly configured ID codes and KEYPHRASE comes within this many meters of this unit, a proximity warning is triggered. The report interval will be at the TXRATE setting, and report the proximity warning at least 8 times or until the distance between the two M7 GXs increases beyond the PROX distance.	0-9999 0=feature disabled	Disabled (0)
REPEAT	Enable -GX Repeating. This simple command enables the repeater feature of the M7 GX, and configures it for standard operation. The user may alternately use the ATX and ATRX commands, but they are more complicated to use. This command enables the unit to repeat all messages it receives, as long as the first digit of the 4-digit ID matches its first digit. (It repeats IDs 0001 thru 0999).	0 Off 1 On	0
SLTIME	TDMA Slot duration. Configure the width of a TDMA slot. 50mS increments.	50 - 1000	200
TRIGBITS	I/O Change Reporting. Which bits are used as transmission triggers. This is a HEX number. Bit 0 is IN0, bit 1 is IN1....	0-FF	0
TDMATIME	Set/read TDMA Frame time. The length of one TDMA time frame, in seconds. M7's may transmit once per frame, and only in their preset time-slot.	1-3599	10
TRIGPOL	Polarity of the input bits. 0 = normal active high operation(causes unit to transmit when it goes high), 1 = Inverted, active low. This is a HEX number. Bit 0 is IN0, bit 1 is IN1....	0-FF	0 Active high
TRIGEX	Report on change. Sets which input bits cause a report on change. If a particular bit is a 1, then it will trigger a report when it changes. The input bit must also be enable with the TRIGBITS. This is a HEX number. Bit 0 is IN0, bit 1 is IN1...	0-FF	0
TRIGDX	Distance trigger. Set a distance (in meters) threshold beyond-which the unit will transmit its position and status.	0-999	0

	If set to 0, the unit always reports at the TXRATE. If set to an distance greater than zero, then the unit reports at the TXRATE intervals if it has moved this distance since the last report. If it has not moved, it will still report its position, but at the rate set by IDLERATE. If IDLERATE is set t 0, then the unit will not report its position when not moving.		
TRIGSPEED	Speeding Report. Set a speed (in kilometers/hour) threshold above-which the unit will begin reporting its position and status. Set to 0 to disable this feature.	0-999	0
TXRATE	GPS Report Rate. Set number of seconds between GPS reports. This is also the rate at which the internal GPS will measure position, speed, etc. Even if the unit is not moving, the GPS periodically measures position and speed to determine if it has triggered a speed or position transmission.	1 - 9999	10
TLLPARM	\$GPTLL Message parameters. This command sets flags that tell the M7 GX which internal parameters to append to the target "Name" when it outputs the TLL message. Bit 0 = temperature, Bit 1= velocity, Bit 2=RSSI, Bit 3 = voltage. Enter the number in decimal (a 10 sets bits 1 and 4)	0-16	0

6.8. Factory Default Settings

For the UHF M7 GX model RV-M7-UC-GX, the factory defaults GPS settings are:

Radio channel 1464.500 MHz
GPS Mode4 (Use with GPS display)
Over-the-air baud rate:4800 baud, 2-level
Serial portRS-232, 4800baud, N/8/1
Hardware flow controlOff
RF Power Output5 watts
Channel number selected1
Position/Status report interval10 seconds
Security KEYRAVEON
Proximity Alert0, off.
I/O Change reporting0, off
ID PrefixV

7. Setup and Initial Configuration

1. Connect a DC power source to the DC IN connection on the front of the modem.
2. Connect a good quality antenna, cut to the operating frequency, to the BNC connector on the front of the modem.
3. Connect a computer terminal, or PC computer running HyperTerminal, to the 9-pin I/O connector. The factory default serial ports settings are 4800 bps, 8 data bits, 1 stop, no parity.
4. Put the M7 GX into the command mode. (enter +++ per Section 0)
5. Program the GPS mode. See the table on page 4 to identify the mode to use, and set it with the **GPS x** command. Type **GX** and press enter to see an overview of the current GPS related features and configuration.
6. Program the modem's operating frequency to your desired operating frequency. This is done with the **ATFX xxx.xxxxx** command.
7. Program the ID in the unit. Sequentially number the M7 GX units in your system, starting with 1. Use the **ATMY** command to set the ID.
8. With the unit in the command mode, change any of the default operating parameters that must be modified. From the factory, the modems are configured and shipped ready-to-use. Out of the box,

they will communicate on the default radio channel using the factory defaults. In general, the parameters you may want to modify will be:

ATFX	Frequency for this channel. Set to your frequency.
GPS x	Set the operating mode of this unit. See table on page 23 for details of this setting.
ATMY	The individual ID of this unit. Default is 0001. Number all of your <i>M7 GX</i> transponders with a different MYID. Raveon recommends sequentially numbering them, starting at number 1.
ATDT	The address of the unit this modem will talk to. Default is 0001.
ATMK	The network address mask. Default is F000. This means this unit will receive all transmissions from any other unit with an ID beginning with 0 (0001 thru 0999).
KEYPHRASE	Enter a security key code. Use any word or phrase 1-16 characters long. It is case-sensitive. DO NOT FORGET WHAT YOU SET IT TO! The KEYPHRASE is the only parameter that cannot be read out of the <i>M7 GX</i> . It must be the same as the KEYPHRASE programmed into all the other <i>M7 GX</i> transponders in your system. The factory default KEYPHRASE is RAVEON , call capitals.

9. To see an overview of how the modem is configured, use the **SHOW** command. To see an overview of how the GPS features are configured, use the **GX** command.
10. Type the **ATSV** command to permanently save the new modem parameters into FLASH memory.
11. Connect your serial data device (GPS, Plotter, PC...) to the 9-pin connector on the front of the modem.

The *M7 GX* is now ready to use. Any serial data going into the modem will be transmitted over the air, and any data received over the air will be sent out the serial port.

Remember, that from the factory, all *M7 GX* modems are configured to simply work. Plug in power and connect to the serial port at 4800 baud, and the modems will communicate on the default channel. Change the channel frequency to your specific frequency, and they will be ready to work on your channel.

7.1. GPS Operation Mode Configuration

The **GPS x** command is provided to make configuring the *M7* simple to setup for common configurations. The table on page 4 summarizes the various standard configurations. Choose the configuration that is most similar to your usage, and execute the appropriate **GPS x** command.

7.2. Enabling Repeater Features

Refer to the technical manual for advanced repeater configuration instructions. To quickly enable repeating of all data sent from/to units 1-999, use the **REPEAT 1** command. This will enable the repeater function, and configure it to repeat messages, position, and status transmissions.

Set the Transmission Report rate

Use the **TXRATE xx** command to set the report rate, in seconds, for the *M7 GX* transponder. For example, if you wish the *M7* to report every 5 minutes, set the report rate to 300 seconds (**TXRATE 300**).

If the *M7 GX* should report position and status when it is moving, set the **TXRATE xx** to the desired time between position transmissions. Then, program the **IDLERATE xx** to the desired number of seconds between reports when the unit is not moving (idle).

Important!: Set the minimum distance the unit must move for a transmission occur with the **TRIGDX xx** command. If **TRIGDX** is set to zero, then the unit will always report at the interval set with the **TXRATE xx** command. This is the factory default setting.

For example, to transmit every 2 minutes when idle, and every 10 seconds when moving more than 500 meters, use these commands:

IDLERATE 120 (to set the idling update interval to 2 minutes.)

TRIGDX 500 (tells it to report at the IDLERATE if it does not move this many meters)

TXRATE 10 (configures it to report every 10 seconds whenever it is moves more than TRIGDX meters)

7.3. Device Addressing

Security Key

The security KEY programmed into every *M7 GX* transponder ensures that only *M7 GX* transponders with the exact same security code can receive position and status information. The security key is case sensitive, so "**Raveon**" and "**RAVEON**" are two different keys.

When you program your own security code into your *M7 GX* transponders, write it down in a secure place. This parameter cannot be read out of the *M7 GX*. Use the **KEYPHRASE** command to set the key phrase. For example, to set the key phrase to `Jkl53hhp` type:

KEYPHRASE Jkl53hhp <enter>

Addressing Basics

Addressing is used to differentiate one *M7 Transponder* from another. Each must have a unique number programmed into them, so that when a position report is received, the *M7 GX* that sent the message is known. This is called the MYID.

Each *M7 GX* has an MYID programmed into it, and is represented as a 4 digit number. *M7 GX* IDs may be any number between 0001 and 9999. The MYID is programmed with the **ATMY xxxx** command, and the ID of the destination modem it sends its messages to (the Destination Address) is configured with the **ATDT xxxx** command.

The factory default MYID (ATMY) in all *M7 GX* modem is 0001, and 0001 is also the default for the Destination ID also. The ID of your particular *M7 GX* may have been configured by your dealer or distributor. If so, it is labeled on the rear of the unit. If it is not labeled with an ID, the factory default ID is in it.

The default Address Mask is F000, which means the *M7 GX* will receive a transmission from any other *M7* as long as the first digit matches, in this case, is a 0.

Make sure you set the MYID of each *M7 GX* in your system to a different number.

For example, to set the MYID of your *M7* to 17, enter:

MYID 17 <enter>

To set your *M7* to send its position and status data to *M7* number 1, enter:

ATDT 1 <enter>

To set your address mask to receive all messages from units with IDs 1-999, and exclude 1000-9999, enter

ATMK F000 <enter>

Time Slots

For optimum efficiency in a *M7 GX* system, begin sequentially numbering the MYID of the *M7 GX* transponders at ID 0001. The second *M7* should be ID 0002, and so on.

The *M7 GX* transponders have internal clocks with 20 ticks-per-second. They can measure time and initiate transmissions 20 times every second (every 50mS). The TDMA time slot is configured to be some number of these ticks. The factory default allocation is 4-ticks for one time-slot. So each TDMA time slot is 200mS long, and thus in 10 seconds, up to 50 *M7 GX* transponders may report position. These parameters are programmable, and may be re-configured based upon the type of system they are used in. Program the slot time with the **SLTIME xxx** command, where xxx is in milliseconds.

For over-the-air rates of 4800 baud, Raveon Suggests using a **SLTIME** of 200mS when using a repeater, or 100mS if there is no repeater in the system.

A TDMA "Frame" time is the time it takes all units to transmit. This is configured with the **TDMATIME xx** command. The factory default is 10 seconds, so every 10 seconds, each *M7 GX* is allocated a time-slot that it may use to transmit position in. The TDMA frame must be set long enough for all units to transmit. For example, if you have 50 *M7s*, and use 200mS TDMA slots, then the **TDMATIME** should be set to 10 seconds.

The duration of a TDMA time slot is programmed into the *M7 GX* with the **SLOTTIME** command. If **SLOTTIME** is set to 200 milliseconds (factory default), then every 10 seconds, the *M7* will have a 200mS window to report its position in.

All TDMA frames are synchronized automatically in all *M7 GX Transponders* to the top of the minute. Slot 0, frame 0 is at the top of each minute.

8. Operation

Once power is applied to the M7 GX, the internal GPS will begin to try to lock onto the GPS satellites.

The two LEDs on the front of the M7 will begin to alternately blink red back-and-forth.

After 10 to 60 seconds, depending upon the satellite strength, the red alternating blinking will stop. This indicates the internal GPS receiver is locked onto GPS satellite signals, and has a position fix.

The M7 GX will only transmit if it has GPS lock. If the GPS antenna is broke or obscured, the unit will not report position or status.

When it is locked to GPS, it will transmit its position and status at the interval programmed into the **TXRATE** parameter.

Refer to the *M7 GX Technical Manual* for details on all of the events that will trigger a transmission.

Installation

1. Secure the M7 modem using the mounting holes on the side flanges of the unit.
2. Connect a DC power source to the DC IN connection on the front of the modem. Use the supplied cable, or 18AWG wire, and connect the RED wire to +, and the black wire to – (ground). The black wire and the case of the M7 should be connected to earth ground.
3. Connect a good quality antenna, tuned to the operating frequency, to the RF connector on the front of the modem. Use a good antenna, and place it as high-above obstructions as possible.
4. A separation distance of at least 20 centimeters must be maintained between the transmitter's radiating structures and the body of the user or nearby persons.
5. Connect a GPS antenna to the SMA connector of the M7 GX. Although a passive antenna may work if the cable length is very short, it is recommended that an amplified antenna be used, rated for 3.3V operation.
6. Connect the computer, terminal, controller, or other hardware device that will be using the M7 modem to its DB-9 serial I/O connector using a shielded cable. Secure it to the M7 with the two mounting screws on the sides of the DB-9 connector.
7. If the antenna is mounted out doors, use a lightning arrestor in-line with the antenna, and properly ground the antenna and the M7 chassis to an earth ground.
8. Connect Digital Inputs. The stock M7 GX has up to 3 digital inputs, using the input pins of the RS-232 serial port. An open circuit or ground is a 0, and if they are connected to a positive voltage greater than 3V, they are a digital 1.

RS-232 Pin	Function
4 - DTR	Input 0
7 - RTS	Input 1
3 - TXD	Input 2
5 - Ground	GND

RV-M7 GX GPS Modes of Operation

The **GPX x** command is used to configure the RV-M7 GX for various common configurations. The following table lists the parameters internal to the RV-M7 GX that are configured and saved when the GPS x command is executed. After the command is executed, individual parameters may be modified to customize the operation of the unit.

Parameter	GPS mode	Output Message Format	NMEA Position GGA, GSV, RMC	Position/status report rate	Data communication via RS232 also	Capable of Speed triggered position reports	Speed Trigger default	Minimum Distance Trigger	Digital Input Triggers	Serial Port Baud Rate	Can be a repeater
Command used to modify this parameter	GPS x	OUTPUT x	NMEAOUT x	TXRATE xx	DATAMUTE x		TRIGSPEED xx	TRIGDX xx	TRIGBITS xx	ATBD X	Repeat X Default = 0(off)
<i>Transponder</i>	1	Nothing	No (0)	10	TX only (1)	Yes	0 (off)	0 (off)	0 (off)	4800	NO
<i>RavTrack PC</i>	2	\$PRAVE (x=1)	Yes (1)	10	TX & RX (0)	Yes	0 (off)	0 (off)	0 (off)	38400	Yes
<i>Radar</i>	3	\$GPTLL (x=2)	Yes (1)	10	TX & RX (0)	Yes	0 (off)	0 (off)	0 (off)	38400	Yes
<i>GPS Display</i>	4	\$GPWPL (x=3)	No (0)	10	RX only (1)	Yes	0 (off)	0 (off)	0 (off)	4800	Yes
<i>-LX receive only</i>	5	\$PRAVE (x=1)	No(0)	10	RX (1)	No	N/A [*] ₁	N/A	N/A	38400	Yes

Notes:

*1. -LX units typically do not have a GPS receiver in them. They receive position reports over the air from other units, but do not transmit position or status.

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