ATLAS PL
UHF Personal Locator
Technical Manual

Version C1

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RV-M7-UC-PL

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Table of Contents

1. General Information about the RV-M7

1.1. Congratulations!

Congratulations on your purchase of a *RV-M7-PL GPS* transponder – the most advance UHF GPS radio available today.

Please take a few minutes to read this manual carefully. The information presented here will allow you to derive maximum performance from your radio modem. After reading it, keep the manual handy for quick reference, in case questions arise later on.

1.2. NOTICE

There are no user-serviceable points inside this transceiver. All service work must be referred to your Authorized Service Center or Raveon Technologies Service Department.

1.3. Safety / Warning Information

Blasting Caps and Blasting Areas

To avoid possible interference with blasting operations, turn off this radio or remove the battery pack 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.

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.

1.4. Lithium-Ion Battery Notice:

This product contains two Lithium Ion battery cells.

US Postal regulations, Federal Regulations, and other common carriers restrict the shipment of products containing Lithium-Ion batteries. Consult your carrier before shipping this product.

When sending the product by US mail, it should be mailed using surface carriers, and the outside of the shipping container should have a notice:

Package Contains
Primary Lithium Batteries

Never mail or ship damaged batteries.

When shipping this product, properly label the shipping container per current regulations. Regulations regarding shipment of products containing LiIon batteries changes frequently, so consult your carrier and regulatory bodies. USPS requires a "*Surface Mail Only*" label in addition to DOT's "*Primary Lithium Batteries--Forbidden for Transportation Aboard Passenger Aircraft*" label.

1.5. Safety Training information:

Always use this radio with the antenna supplied with it. This radio is restricted to occupational use, work related operations only where the radio operator must have the knowledge to control the exposure conditions of its passengers and bystanders by maintaining the minimum separation distance of following range. Failure to observe these restrictions may result in exceeding the FCC RF exposure limits.

1.6. FCC Compliance Information

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

This product also complies with FCC Part 22, 90 and Part 95 Subpart J of the FCC rules and regulations.

The Federal Communications Commission (FCC), with its action in ET Docket 93-62, has adopted a safety standard for human exposure to Radio Frequency (RF) electromagnetic energy emitted by FCC-certified equipment. This product meets the uncontrolled environmental limits as stated in OET-65C (01-01) when operated in accordance with the operation guidelines described in this manual. Proper operation of this radio device according to the instructions in this publication will result in user exposure substantially below the FCC recommended limits.

2. Overview

The *ATLAS PL* GPS transponder is a rugged high-speed UHF data modem with a built-in 12-channel GPS receiver. It 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 *ATLAS PL* is configured for operation as a Personal Locator. All Raveon GPS tracking products are configured using the GPS x command, and the ATLAS PL is GPS mode 8 (GPS 8). It comes configured from the factory this way.

Personal Locator: (GPS 8) The factory default configuration for this product. Receiver is always off, serial baud rate is 38400, and battery-saving features are enabled.

As well as sending position and status, the *ATLAS PL* also has a radio modem with integrated RS232/422/485 interface.

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

2.1. Features

- *Transmissions include ID, position, speed, heading, voltage, temperature, input/output status, UTC time, and proximity.*
- *Built-in Li-Ion battery and battery chager.*
- *Ultra-fast 3mS TX-RX switching and 4-level GFSK modem allows truly "Real Time" tracking and status.*
- *Outputs and accepts NMEA 0183 GLL, TLL, WPT, GSV, and PRAVE messages.*

- *High-speed over the air data rates. 19200bps in 25kHz channel, 9600bps in 12.5kHz.*
- *Built-in TDMA channel access allowing truly real-time tracking (200 transmission in 10 seconds)*
- *Very low current draw. As low as 25mA average.*
- *16 bit addressing for up to 65,525 different unique IDs per channel.*
- *Programmable proximity alert (1-9999 meters) and programmable position report rate (1-9999 seconds).*

3. Specifications

3.1. General

All measurements made per TIA-603-B

Frequency: Model RV-PL-UC ..... 450 – 480MHz
Model RV-PL-UB (export Only) ..... 419 – 440MHz
Model RV-PL-UA (export only) ..... 403 – 434MHz

Size ..... 148mm X 68mm X 32mm

Weight ..... 6 ounces (0.17kg)

Radio current draw, receiving, over-the-air rates < 4800bps ..... <115mA

Current draw when transmitting data ..... <2.3A typical, 1.2A typical at 2watts
..... <2.8A max at 5watts

Low Power Mode standby current (Transponder in-between timed transmissions) ..... <25mA

Sleep/Chirp Mode standby current ..... <1mA

Frequency stability ..... ±1.5ppm

Narrow-band Over-the-air baud rates (programmable) 4800, 8000, 9600

Wide-Band Over-the-air baud rates (programmable) 9600, 14400, 19200
Note: Contact the factory for enhanced-sensitivity applications (1200 & 2400 baud)

Internal data buffers (transmit and receive) ..... >2000 bytes

Operating temperature range ..... -10ºC to +60ºC

Storage temperature range ..... -20ºC to +35ºC

Power on time to operational ..... <500mS

Internal fuse ..... 3A Mini

FCC ID Model RV-M7-UC SRS-RV-M7-UC
All other models for export or OEM use

3.2. Transmitter

RF power output (programmable) ..... ½ - 5 watts
Note: RF power output will vary from 3-5 watts at full power, depending upon battery voltage

Maximum duty cycle 25%

Maximum transmit frequency deviation ..... ± 2.25kHz (12.5kHz channels)
..... ± 3.0kHz (25Hz channels)

RF Bandwidth ..... 20MHz, no-tune

Occupied bandwidth ..... 11 kHz (12.5kHz channels)
..... 15.3kHz (25kHz channels)

TX spurious outputs ..... < -70dBc

Emissions designator ..... 11K0F1D (12.5kHz channels)
..... 15K3F1D (25kHz channels)

3.3. Receiver

Typical RX sensitivity (1% BER)
19200bps, 4-level, 25kHz channel ..... -107dBm
9600bps, 4-level, 12.5kHz channel ..... -108dBm
4800bps, 2-level ..... -116dBm

No-tune bandwidth 20MHz

RX selectivity ..... -50dB (12.5kHz channel spacing)
..... -65dB (25kHz channel spacing)

Spurious and image rejection ..... -75dB

RX intermodulation rejection ..... -70dB

Conducted spurious emissions ..... <-53dBm

3.4. Battery and Charger

DC input voltage ..... 11.5 - 15V DC

Current draw when charging battery ..... <1.5A

Battery Capacity 2700mAh

Capacity at 0C 80%

Capacity at -10C 50%

Charge/discharge cycles for >70% capacity 500

Charge time ..... <4 hours

Self-discharge rate 1mA

Maximum time between charges ..... 2 months

3.5. User Input and Output Signals

Serial port baud rates 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Voltage levels ..... RS-232 complaint levels

Modem handshake signals ..... none

Transceiver RF ..... 50 ohm SMA

GPS Antenna ..... Amplified Geo-Helix

GPS Antenna connector option ..... SMA 50 ohm, 3.3V for amplified antenna

Power Connector ..... Hirose HR30 series

3.6. GPS and Transponder Specifications

Number of channels 12

Horizontal accuracy (24 hour static) ..... <2.5m 50%, <5m 90%

Acquisition (-130dBm, 50%) ..... <40sec cold start, <15sec hot start

Sensitivity ..... Tracking -150dBm, Acquisition -142dBm

NMEA Output sentences ..... WPL, TLL, GLL, GSV, PRAVE

Position report rate, programmable ..... 1 to 9999 seconds

Position report resolution ..... 0.0001 degrees

Voltage report resolution/accuracy 0.1V/10%

Temperature resolution and accuracy (enclosure temperature) ..... 2 degrees C/4 degrees C

Velocity resolution and accuracy ..... 1km / 1km per hour

3.7. Model Numbers

The model number of the *RV-M7* modem identifies its operating frequency band, rf power level, and bandwidth. The models are:

RV-PL-*ab-c* where:

a = The band (V=136-174MHz, U=406-512MHz)

b = Sub band (A,B,C,…)

c = Channel Spacing (blank=12.5kHz, W=25kHz)

Other frequency bands, power levels, and channel spacing are available. Contact the factory for your specific needs.

Sub-Bands

Sub-Band Letter	*VHF (RV-M7-V…)*	*UHF (RV-M7-U…)*
A	*132-150MHz*	*403-434MHz*
B	*150-174MHz*	*419-440MHz*
C		*450-480MHz*

4. Electrical Inputs and Outputs

The top of the ATLAS *PL* modem has these features:

1. **RF connector for UHF antenna**
2. **Power LED**
3. **Status LED (Receive data = green, TX = red)**
4. **Alert LED**
5. **Alert Button**

4.1. Buttons

Power Press this button to turn the power on. Press and hold it for two seconds to turn the power off.

Alert Press this button to generate an alert. Press and hold it for two seconds to generate a Critical Alert. Press and hold it for more than 5 seconds to clear all alert conditions.

4.2. LEDs

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

Status LED This LED blinks green upon the reception of data or RF carrier. If the GPS is not locked, its will fast-blink orange twice-per-second.

Power LED 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. If the TXRATE (the rate at which the unit reports its position), is > 60 seconds, the internal power-management may turn the radio circuit completely off. In this case, the Power Led will blink once every 4 seconds. When the unit transmits its position, it will also blink green.

The following table summarizes the power LED indications.

	Charger plugged in	Battery Charged	Battery below 30%	Battery below 10%	Over/Under temperature
Unit is OFF	**No**	Not lit	Not lit	Not lit	Not lit
Unit is OFF	**YES**	Steady green	Steady orange	Steady orange	Not lit
Unit is **ON**	**No**	Green blink- 2 sec rate	Orange blink - 2 sec rate	Orange blink- 0.5 sec rate	Steady red
Unit is **ON**	**YES**	Green blink- 2 sec rate	Green blink- 2 sec rate	Steady orange	Steady red

Alert LED This LED turns yellow when a normal Alert condition is being transmitted. It fast-blinks (twice-per-second) when a Critical Alert is being transmitted. It changes to slow-green blink twice-per-second when the alert has been acknowledged over-the-air. Press and hold the Alert button for 5 seconds to clear the alert which will turn the Alert LED off.

4.3. DC Power

DC power for the PL is connected to the 6-pin I/O jack on the bottom-side of the unit. Use the supplied cable to connect the DC power. The **red wire is positive (+)** and the **black wire is negative (-).**

4.4. Serial I/O Connector

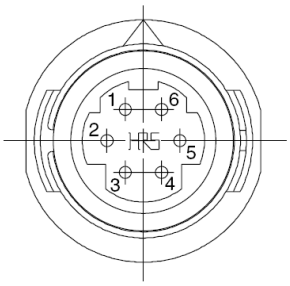
The 6-pin I/O connector has the following pin-out:

Number	Function	Notes
1	DSR	
3	TXD	Data into the PL. 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.
2	RXD	Serial data out of the PL.
4	Switched B+	5-8.5V output, 200mA max current draw.
5	Ground	System ground
6	Charger Input	10-15VDC input for charging battery.

4.5. I/O Connector Type

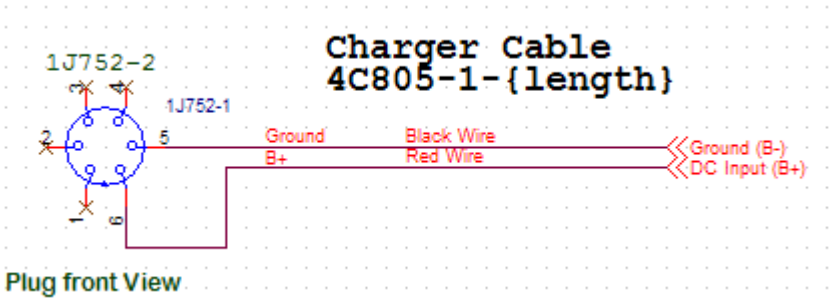
The I/O connector is a Hirose HR30 series. Circular waterproof. Used for RS232 connection and for the DC input for the charger.

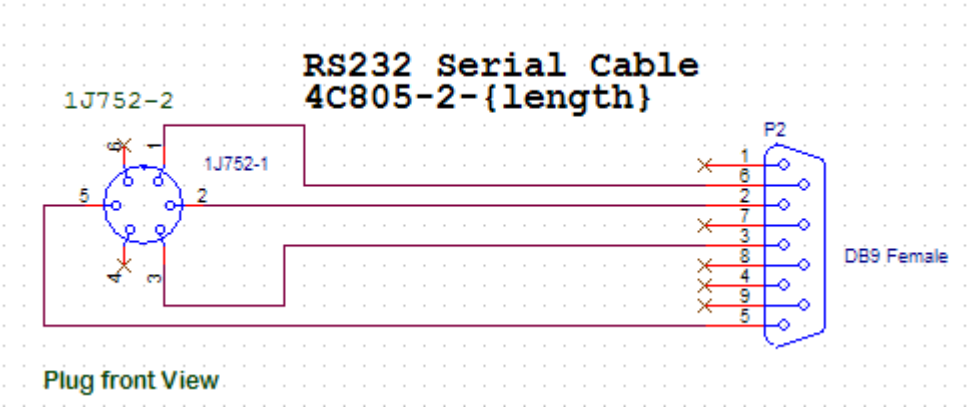
Front view of male pins on ATLAS PL

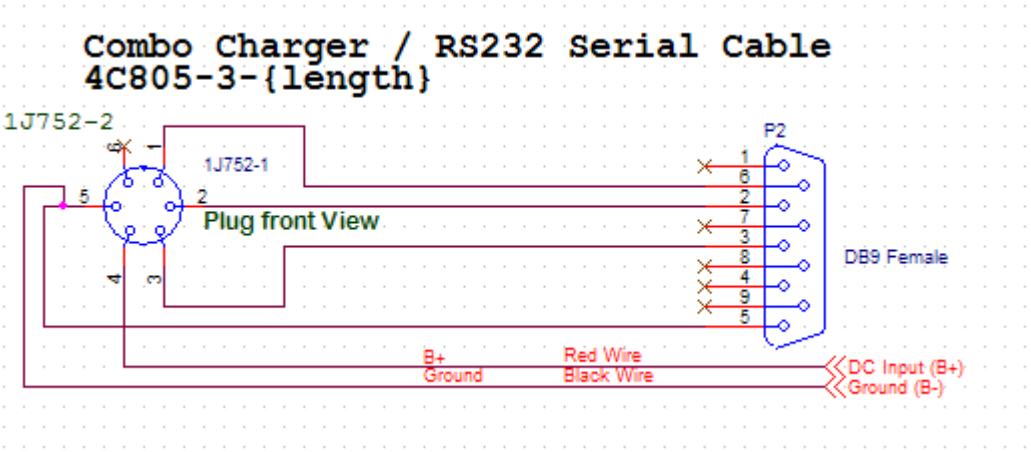


4.6. I/O Cable Options

There are 3 basic type of interface cables available for the ATLAS PL. The are shown below.






Combo Charger / RS232 Serial Cable
4C805-3-{length}
1J752-2
1J752-1
Plug front View
P2
DB9 Female
B+
Ground
Red Wire
Black Wire
DC Input (B+)
Ground (B-)

5. Configuring the ATLAS PL

5.1. Overview

The RS232 serial port on the unit is used to send and receive data over the air, as well as to configure the RF modem. In normal operation, the user sends serial data into the TxD pin of the user port, and this data is transmitted over the air. Received data from another RF modem is output to the user via the RxD pin of the user port. This is the default operating condition of the RF modem. No special characters, hardware control lines, or timing is required to operate the *RV-M7* modem.

If the *ATLAS PL* is configured as a Personal Locator (**GPS 8** mode), the serial port need not be connected to anything. The internal GPS will initiate the transmissions of position and status.

There is also a "Command Mode" used to program and configure the *ATLAS PL*. In the Command Mode, the *ATLAS PL* modem accepts commands via the serial port TxD pin. The commands can be used to change certain internal parameters of the *ATLAS PL* modem as well as to read-out the current configuration and diagnostic statistics.

5.2. Command Mode

The *ATLAS PL* modem may be put into a "Command Mode", by entering a sequence of three plus characters (+++). To keep the *RV-M7* modem from unintentionally entering the Command Mode because of the +++ pattern occurring in a stream of data entering the modem, there must be a pause in the data stream before the +++ as well as a pause after the +++ is sent. If either pause is missing, the modem will not enter the command mode.

Using serial communications software such as *HypterTerminal*, send the 3-character command sequence "+++".

When the *ATLAS PL* modem first enters the Command Mode, it sends the phrase "*RV-M7*" out it serial port, and then an "OK" sequence. The "OK" sequence is a sequence of 4 characters:

"**O**", "**K**", <**CR**>, and <**LF**> characters (<CR> = ASCII 0D, <LF> = ASCII 0A)

Note that the internal power-management function may turn the product off to save power. The LEDs on the unit will continue to blink, but all internal circuits are off. This only happens if the TXRATE is greater than 60 seconds. The Power LED will blink a a 4-second rate if the radio is off. When the radio powers on, it will send an "OK".

To ensure the internal radio is on, and able to be put into the Command Mode, you may turn the unit off, and then back on.

5.3. Setting a Parameter

To set a parameter in the *ATLAS PL* 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 *ATLAS PL* modem to 1234, enter the following command:

ATDT 1234 <CR>.

Once a Parameter is changed, the modem will begin using the new parameter. If the new parameter was saved to non-volatile memory using the **ATSV** command, then the new parameter will be used as well the next time the RV-M7 modem is powered on. If a parameter is changed, but the **ATSV** command is not issued, the new parameter is used to operate the modem, but when power is turned off and back on, upon powering up, the RV-M7 will revert back to the previously saved parameter value. If parametric changes are to be permanent, always issue the **ATSV** command after all parameter changes have been made.

Note: Radios with firmware version B10 or higher do not require the ATSV command. B10 and higher radios automatically save the parameter to EEPROM whenever the parameter is changed.

5.4. Reading a Parameter

To read the value of a particular setting, issue the command with no parameter. The modem will return the value followed by an "OK".

For example, if the user enters the command to read the *RV-M7's* destination address and its address was 1234, the user would issue the following command:

ATDT<cr>

and the modem will respond with:

1234 <CR> <LF>
OK <CR> <LF>

To get on-line help with a command, enter the command and put a question mark in for the parameter. For example, to see what the ATDT command is used for, type **ATDT ?**. The modem will respond by listing a brief description of the command. To see a list of all commands, type **HELP**.

5.5. Configuration 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	5
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, in the ATLAS PL this parameter is entered in decimal format. Each digit may be a 0,1,2,3,4,5,6,7,8, or 9. Do not use A,B,C,D,E,or an F.	Range: 0-9999	0001
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
ATGP	**Group Number** – Set or read the unit's Group Number. 0 means this feature is not used. If GP is set to any number other than 0, then all radios communicating with this unit must have the same group number programmed into them.	Range 0-255	0
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
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

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.	0-110	100
ATPC	**Read TX Current**. Read the device's current draw during the last transmission, in mA.	0-9999	-
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 9 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 10=14.4k 4L	3
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 within10dB 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	**Show –** Display the configuration of the modem. This will return a page of ASCII characters, showing the main configuration parameters.	none	None
ATSM	**Power Savings Options** – When set to 0, the internal radio receiver will be ON. When set to 4 (default for the ATLAS PL), the internal radio receiver will always be OFF and the radio will not receive over-the-air messages.	Range: 0, 1, 2	4 (RX OFF)
ATST	**Statistics –** Show the unit's operational statistics. See Statistics section of user manual.	0, 1,2, 3, 4, or 5	None
ATTE	**Read product temperature –** Read the internal temperature of the unit's circuit board in degrees Celsius.	-40 to +99	-
ATTT	**Max Packet Size –** Set the maximum number of bytes in an over-the-air packet.	1 - 512	80
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..	*Four parameters* 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)*
AT&F	**Restore Factory** – Restore the factory default values. This command will not erase the calibration values.		none
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 *RV-M7 System Protocol* manual for information on using this feature.		
SHOW	**Show/display *an overview of the radio's configuration.***	None	-
BAND	**Show/display *the radio band.*** Displays the frequency band that the radio is configured for, along with the upper and lower frequency, in MHz.. BB is the band code, lll is the lower frequency in MHz, and uuu is the upper frequency in MHz.	None	BB, lll, uuu
CONFIG	**Show Configuration.** Display the settings of every parameter in the unit. If the parameter is 1, then the help text is not displayed, If the parameter is 2, the configuration is output in strictly the format used to program another unit.	None, 1, 2	-

** 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.

5.6. Additional Personal-Locator Related Commands

The following commands are unique to the *–PL* version of the *RV-M7*. When you execute any of these commands, the new parameter is automatically stored in EEPROM. Unlike the Modem Commands in the table above, you do not need to issue the "ATSV" command to save –PL related parameters listed in the table below. The parameters in all GPS commands listed below are automatically saved to EEPROM when they are executed.

Command	Command Description	Parameters	Factory Default
ALERT	The **ALERT x** command may be used to read the alert condition and control it alert feature via the serial port, or controlled over-the air using RPR commands. 0=none, 1= normal, 2=critical alert, 3=acknowledged.	1-3	0
ATTX	**Transmit Channel Access Method.** Enables TDMA operation. 0=standard carrier-sense. 1=TDMA.	1 - 6	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
ATMC	**Set/Read Channel Access Method.** 0=Standard carrier-sense CSMA. 1=Time-Dievision Multiplex, where user-data is transmitted in the unit's TDMA slot.	0 or 1	0
GPS	**GPS Operation Mode.** Set the PL version's Operating mode.	1 – 9	1
GPS&F	**Reset all GPS (-PL version) paramters.** Set the PL 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"
MAXBYTES	**Read Max num of Bytes.** This command asks the modem for the maximum number of bytes it can transmit in one TDMA slot. It is read-only.	-	N/A
MANDOWN	**Set/Read Mandown feature.** Configure the number of seconds that the unit may be horizontal befor triggering a man-down alert. 0=disable.	0-9999 seconds	15
NMEAOUT	**Enable/Disable NMEA messages.** Configures the M7 GX to output standard NMEA messages (GGA, GLL, RMC) out its serial port. **NMEAOUT 0** disables the messages. **NMEAOUT 1** enables them.	0, 1	1
NMEAMASK	**Set/Read NMEA message bit mask.** The NMEAMASK register contains configuration bits to enable various NMEA standard messages from the internal GPS receiver that will be sent out the serial port. The parameter is the decimal integer value of the mask.	0-9999	258 (RMC, GLL, GAA)
NMEARATE	**Set/Read NMEA message rate.** Set/read the number f seconds between NMEA messages from the internal local GPS.	1-99	5
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	1-8 ASCII characters	V

	a waypoint name. A dash means no prefix. Default is a capitol letter V.	Set it to "0" for no prefix.	
PROX	**Proximity Alert.** Set a minimum proximity distance. When any *ATLAS PL* 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 *ATLAS PLs* increases beyond the PROX distance.	0-9999 0=feature disabled	Disabled (0)
REPEAT	**Enable -PL Repeating.** This simple command enables the repeater feature of the *ATLAS PL*, 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 configure repeater.	0
SLOTQTY	**Quantity of TDMA Slots.** Normally this parameter is set to 1. Each unit gets one slot. To facilitate data transmission, it is possible to set this to a number other than 1. For example, if set to 3, and the ID of the unit is 0008, the unit will be allowed to transmit in slots 8, 9, and 10.	1-9999	1
SLOTTIME	**TDMA Slot duration.** Configure the width of a TDMA slot. 50mS increments.	50 - 1000	200
TDMATIME	**Set/read TDMA Frame time.** The length of one TDMA time frame, in seconds.	0-3599	10
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…. IN2 is the serial data input, so if the unit is used to send data, do not set TRIGBITS to a number greater than 3.	0-7	0
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. 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.	0-999	0
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 *ATLAS PL* 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: 10 sets bits 3 and 1, 8 sets bit 3, 9 sets bits 3 and 0	0-15	0

5.7. Factory –PL Default Settings

For the UHF *ATLAS PL* model RV-M7-UC-PL, the factory defaults GPS settings are:

Radio channel 1 .....464.500 MHz
GPS Mode 8
Serial port output message: .....none
Over-the-air baud rate:.....4800 baud, 2-level
Serial port.....RS-232, 38400baud, N/8/1
Hardware flow control .....Off
RF Power Output .....100% (Full power)
Channel number selected 1
Position/Status report interval .....10 seconds
Minimum movement distance to report .....0 (reports even when idle)
Transmission trigger inputs .....0 (digital inputs disabled)
Security KEY (KEYPHRASE).....**RAVEON**
Proximity Alert .....0, off.
I/O Change reporting.....0, off
ID Prefix V
Slot Quantity 1
Mandown .....15 seconds

6. 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 RF connector on the front of the modem. Use a good quality antenna, and place it as high-above obstructions as possible.
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. Note, the serial port may be 38400bps if the ATLAS PL is in GPS modes 2 or 3.
4. Put the *ATLAS PL* into the command mode. (enter **+++** per Section 5.2)
5. Program the modem's operating frequency to your desired operating frequency. This is done with the **ATFX xxx.xxxxx** command. See the Section 5 for information describing the various parameters that may be modified in the modem. In most applications, the default settings from the factory will work fine.
6. 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 delivered ready-to-use. Out of the box, they will communicate on the default radio channel using the factory defaults. Raveon highly recommends you test them first with the factory defaults and see how they work before reprogramming them. In general, the parameters you may want to modify will be:

ATFX	Frequency for this channel. Set to your frequency.
ATMY	The individual ID of this unit. Default is 0001. Number all of your *ATLAS PL* transponders with a different MYID. Raveon recommends sequentially numbering them, starting at number 1.
SLOTNUM	Set the TDMA slot number for this radio to use. Typically, this is set to the same as the ID of the radio as set with the MYID command.
ATDT	The ID 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 *ATLAS PL*. It must be the same as the **KEYPHRASE** programmed into all the other *ATLAS PL* transponders in your system. The factory default **KEYPHRASE** is **RAVEON**, call capitols.
ATSM	If you want the unit to recieive also, you must issue the **ATSM 0** command. The default is receiver disabled, **ATSM 4,** and the receiver will be off. **ATSM 0** turns the receiver on and allows the

unit to receive messages from other transponders, both ATLAS PL type and Raveon's M7 series.

Remember, that from the factory, all *ATLAS PL* modems are configured to simply work. Plug in power and connect to the serial port at 38400 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.

6.1. Position Transmission

When the ATLAS PL transmits its position, it also reports other status information such as voltage, input bits, temperature, velocity, and heading. All of these parameters are compressed into a short data packet, and sent over the air in the proper TDMA time slot. Each *ATLAS PL* is assigned a time slot, based upon its ID. ID 1 is slot 1, ID 2 is slot 2…

Position/status reporting happens in one of 2 intervals.
A) At the **TXRATE** setting. This is the transmit frequency interval setting. The user configures **TXRATE** to be shortest acceptable interval between reports. The factory default is 10 seconds.

B) At the **IDLERATE** setting. This is the idle reporting interval, usually the longest acceptable time between position reports.

IDLERATE is used as a slow-reporting rate for parked vehicles, vehicles that have no active trigger inputs, no proximity alerts, and that the user has programmed them to require a minimum movement distance before they will report.

6.2. Set the Transmission Report rate

Using the **TXRATE xx** command to set the report rate, in seconds, for the *ATLAS PL* transponder. For example, if you wish the RV-M7 to report every 5 minutes, set the report rate to 300 seconds (**TXRATE 300**).

If you only want the *ATLAS PL* to 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 before a transmission occurs 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.

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 idle moving update interval to 2 minutes.)

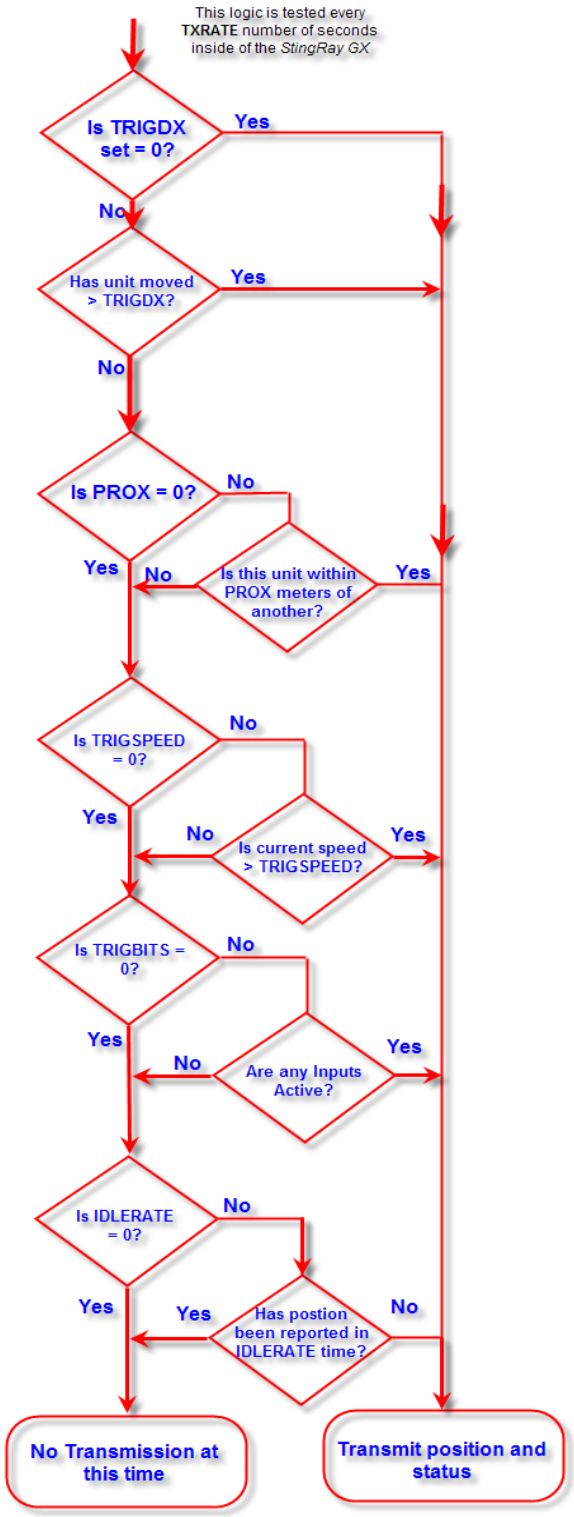
TRIGDX 500 (tells it to report at the IDLERATE if it does not move this far)

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

The following diagram illustrates the logic behind the various programmable parameters that can be used to configure the *ATLAS PL* to trigger position transmission. The logic inside of the *ATLAS PL* shown is tested at a user-programmable rate, called the **TXRATE**. The **TXRATE** is the time interval between *ATLAS PL* position/status radio transmissions.

The diagram clearly shows that if **TRIGDX** is set to 0, the unit will always transmit when it is supposed to, at the interval programmed into the **TXRATE**.

ATLAS PL Transmission Trigger Diagram



6.3. Battery Life

The ATLAS PL uses a smart-battery pack with a built-in microprocessor. The battery has the ability to turn the radio and GPS circuits completely off for a preset amount of time, thus saving battery power.

Whenever the TXRATE is greater than about 60 seconds, the battery in the PL may turn off the radio to conserve power. This condition is referred to as the SLEEP state. During this Sleep state, the unit draws a total of about 1mA, giving a battery life of 1000+ hours.

At the TXRATE interval, the battery will turn the radio back on, allow it to get GPS lock, send its position/status, and then put the radio back into the Sleep state. This features is enabled by setting the TXRATE to a number larger than 60 seconds.

When the unit is in the SLEEP mode, it cannot be put into the configuration mode. Turn the unit off and back on before sending the +++.

6.4. Data Transmission

To transmit data, send one or more bytes of data into the serial port of the modem. When a full packet of data has been collected into the internal buffer of the modem, or when there is a pause in the data, the modem will automatically key its transmitter, and send the data over the air when the unit's TDMA time slot is available.

The *ATLAS PL* will send position/status as well as transmit and receive serial data.

6.5. Data Reception

Serial Port Data

When the *ATLAS PL* receives RS232 data over the radio, it checks it for errors, and if it is error-free, it will send it out the serial port. Again, the serial port may be set to any baud rate the user wishes, and the radio receiver and transmitter will continue to operate independently of the baud rate.

When the modem receives a radio signal, it will assert the CD hardware signal on the RS-232 serial port if it was configured to do so.

GPS Position and Status

When the *ATLAS PL* receives a position report and status from another *ATLAS PL*, it will send this information out its RS232 port, formatted as configured with the **GPS x** command. The ATLAS PL is GPS mode 8 (GPS 8). The default output message format is Raveon's $PRAVE message.

Change the position report output format with the **OUTPUT x** command. Enable/disable the local GPS NMEA data with the **NMEAOUT x** command (0 off, 1 on)

The position/status messages that the *ATLAS PL* is able to send out of its serial port are:

Message	***Description***	***OUTPUT x***

Format		***Parameter/setting***
$GPWPL	***NMEA WayPoint List.*** This message is commonly used to share waypoint locations among GPS units. The *ATLAS PL* can output this message when it receives a position report from other *ATLAS PL* transponders. A GPS connected to it, should put a waypoint on its screen, and in its database, at the location specified by the RV-M7.	***OUTPUT 3***
$PRAVE	***Raveon Position & Satus.*** This message is sent out of the *ATLAS PL* when it is operating in the **GPS 2** mode. This message is used by third-party and PC applications for tracking location and status information.	***OUTPUT 1***
$GPTLL	***NMEA Target Lat Long.*** This message is commonly sent by marine RADAR receivers to notify plotting devices of the location of a RADAR target. The *ATLAS PL* can output this message when it receives a position report from other *ATLAS PL* transponders. A plotter or display connected to it that supports the TLL message, should put an icon on its screen at the location specified by the RV-M7. The icon name is the MYID of the RV-M7 that transmitted its position over the air.	***OUTPUT 2***
$GPGGA	***NMEA GPS Position Fix Data.*** This message is the standard position message from a GPS receiver.	***NMEAOUT 1***
$GPGSV	***NMEA Satellites in view.*** This message is the standard message to indicate the number of satellites in view, and their signal quality.	***NMEAOUT 1***

6.6. Device Addressing

Security Key

The security KEY programmed into every *ATLAS PL* transponder ensures that only *ATLAS PL* 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.

The security code may be from 2 to 16 characters long. The longer the code, the more secure it is and the less likely anyone could guess what it is. It is up to the user to select and set this code. If the *ATLAS PL* is not used in a system where security and privacy are a concern, then it is OK to leave the factory-set code.

If it is important that the *ATLAS PL* transmissions and system be secure, Raveon suggest you program the KEY to be a random sequence of letters and numbers at least 8 digits long.

When you program your own security code into your *ATLAS PL* transponders, write it down in a secure place. This parameter cannot be read out of the *ATLAS PL*. If you forget what it is set to, you will have to reset all the security codes in all of your *ATLAS PL* Transponders.

Use the KEYPHRASE command to set the key phrase. For example, to set the key phrase to Jkl53hhp type:

KEYPHRASE Jkl53hhp <enter>

ID Addressing Basics

ID addressing is used to differentiate one RV-M7 Transponder from another. Each must have a unique number programmed into them, so that when a position report is received, the *ATLAS PL* that sent the message can be identified. This is called the MYID of the unit that sent the message.

Each *ATLAS PL* has a MYID programmed into it, and is represented as a 4 digit decimal number. *ATLAS PL* IDs may be any number between 0001 and 9999. The Unit Address is programmed with the **MYID 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** in all *ATLAS PL* modem is 0001, and 0001 is also the default for the Destination ID also. The ID of your particular *ATLAS PL* 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 *ATLAS PL* will receive a transmission from any other RV-M7 as long as the fist digit matches, in this case, is a 0.

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

For example, to set the ID of your *ATLAS PL* to 17, enter:

MYID 17 <enter>

To set your RV-M7 to send its position and status data to RV-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

The *ATLAS PL* uses a transmission scheme popular in mobile-telephones called TDMA (Time Division Multiple Access). Each *ATLAS PL* is allocated a time-slot to use for sending and receiving radio messages.

Refer to Section **Error! Reference source not found.** for detailed explanation of the TDMA scheme. The important point to understand is that for optimum efficiency in a *ATLAS PL* system, begin sequentially numbering the MYID of the *ATLAS PL* transponders at ID 0001. The second RV-M7 should be ID 0002, and so on.

The *ATLAS PL* 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 *ATLAS PL* transponders may report position. These parameters are programmable, and may be re-configured based upon the type of system they are used in.

Normally, the time slot is the same as the radio's ID. But, the user may modify the time slot without affecting the ID of the unit by using the SLOTNUM command. **SLOTNUM xx** will set the slot number to xx without affecting the ID. Once the SLOTNUM command is used, the slot number will not change when the ID is changed.

6.7. Local NMEA data from the internal GPS

The Atlas PL personal locator may be configured to output standard NMEA 0183 GPS messages from its internal GPS receiver. For GPS tracking, these GPS transponders can receive GPS position reports from other radios, and they may also be configured to output their own GPS location via their serial port.

Following is a list of the NMEA messages that are available (as of revision C2 of the Firmware).

NMEA Message	***Bit Number*** ***(zero based)***	***Bit Mask*** ***(hex format / decimal)***
GGA	0	0×001 / 1
GLL	1	0×002 / 2
RMC	9	0×100 / 256

Once you set the "GPS Mode" of the radio using the GPS X command, you can change the NMEAMASK parameter to modify with of the NMEA sentences will come out the serial port.

For example, to have only the RMC sentence come out the serial port, use the following command"

NMEAMASK 256

To have the GGA and GLL come out the serial port use this command:

NMEAMASK 3

The NMEAMASK parameter is the sum of all of the decimal values of the individual bits corresponding to the NMEA messages.

7. Operation

Once the PL is turned on by pressing the power button, the internal GPS will begin to try to lock onto the GPS satellites.

The Status LEDs on the front of the RV-M7 will begin to blink orange.

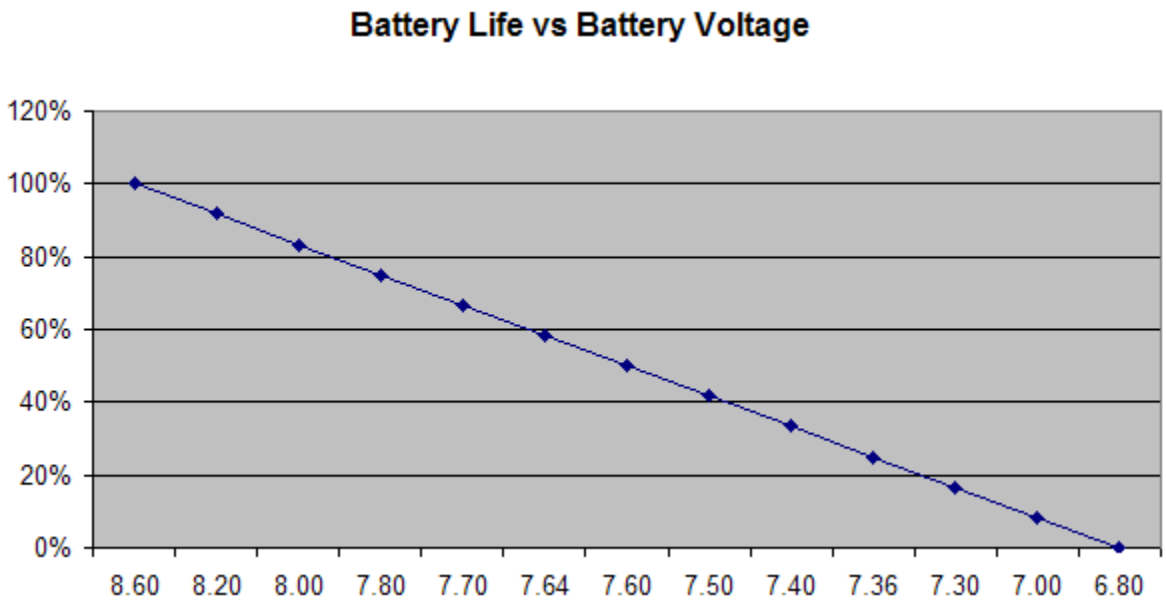
After 10 to 60 seconds, depending upon the satellite strength, orange blinking will stop. This indicates the internal GPS receiver is locked onto GPS satellite signals, and has a position fix.

The ATLAS PL 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.

7.1. Battery Life

The following chart is a guideline to determine approximately how much life is left in the battery, based upon the voltage of the battery pack.



8. FCC Licensing Information

RV-M7 radio modems operate on radio frequencies that are regulated by the Federal Communications Commission (FCC). In order to transmit on these frequencies, you are required to have a license issued by the FCC.

Almost everyone engaged in public safety activities - as well as private organizations, are required, to obtain a radio station license from the Federal Communications Commission if they wish to use a radio transmitter.

The FCC will help you through the licensing process. Raveon will also be glad to assist in this process, and help you obtain your license. It is quite easy.

You can find the basic information you need to begin the process at the FCC website. If you are engaged in public safety activities, you can go directly to:

http://wireless.fcc.gov/publicsafety

If you are a business, commercial, or institutional organization, you can go directly to:

http://wireless.fcc.gov/services/ind&bus

In either case, you will be shown the regulations and the information you will need to gather before you get started - your desired operating frequencies, wideband/narrowband, antenna type and size, power/wattage, etc. You'll also get information on how to obtain the necessary application forms - either in hard-copy or electronic format - and how to proceed.

The FCC website also offers a list of Frequency Coordinators. These are private organizations officially certified by the FCC to help you through the process, and who in most cases will handle the actual filing of your application. With few exceptions, you must apply for an FCC license through a Frequency Coordinator. They are located throughout the country, making it easy for you to find one that is familiar with radio operations in your area.

There are companies who specialize in assisting with licensing radio modems. You may consider contacting one of the following:

Atlas License Company and Data Services
1-800-252-0529
http://www.alcds.com

Airwaves Licensing
1-717-334-0910
http://www.airwaveslicensing.com

9. Technical Information

10. RV-M7 Diagnostic Provisions

10.1. Status and Statistics Command

RV-M7 diagnostic information is read using AT commands, while the unit is in the Command Mode. Refer to the section "User Serial Port Commands" to learn how to put the *RV-M7* modem into the Command Mode.

AT Command	Command Description	Response
ST	**General Communication Statistics** – This command will cause the *RV-M7* to output a table of various operational statistics.	Statistics overview screen
ST1	**GPS Statistics** – Statistics related to the GPS operation, if installed.	GPS Statistics overview screen
ST2	**Low-level internal statistics** – Returns various low-level statistics. These are subject to change in various firmware revisions.	Low-level statistics screen
ST3	**Compile date and time** – Returns the data and the time that the firmware was compiled.	Date and time
ST4	**Run Time** – Returns the amount of time that the modem has been powered up and running.	Run time display screen
ST9	**Reset all statistics counters**	OK
ST10	**Statistic Read** – Returns numeric values, comma separated, of all statistics as described in the ST command.	Run time display screen

10.2. ATST Command

The ATST command, will return the following information:

```
STATISTICS
Good RX Packets  :  nnn   (packets received over the air with no bit-errors and correct address)
With Bad CRCs    :  nnn   (over-the-air packets with bit errors that were discarded)
With Bad Noise   :  nnn   (receptions that were aborted due to noise, CW jamming, lost signal…)
Bytes received   :  nnn   (number of bytes this modem received, and sent out its serial port)
Bytes transmitted:  nnn   (number of bytes this modem received via the serial port, and transmitted
                           over the air)
Packets send     :  nnn   (number of packets this modem has transmitted over the air.
                           Retransmissions in the ARQ mode are not counted)
ACKs received    :  nnn   (Number of ACK packets this modem received, when ARQ was enabled)
ACKs transmitted :  nnn   (Number of ACK packets sent over-the-air in the ARQ mode)
Pkts last minute :  nnn   (Number of packets received during the last minute)
UART errors      :  nnn   (serial port framing and overrun errors. Usually these are caused by
                           incorrect serial port settings)
OK
```

If there is a hardware problem, there may be one ore more hardware error messages listing the error types (`CPU Exceptions, OS Rebooted, or Fatal OS failures`). Consult the factory if any of these messages ever appear.)

10.3. ATST1 Command (GPS Statistics)

The ATST 1 command, will return various information regarding the operation of the GPS features in the *ATLAS PL*.

10.4. ATST3 Command

The ATST3 command, will return the time and date the firmware in the *RV-M7* was compiled.

10.5. ATST4 Command

The ATST4 command will return internal timers that tell how long the modem has been powered up and running. All of these timers restart a 0 upon power up.

```
Run time:
Years: nnn   (number of years running)
Days : nnn   (number of days running, resets to 0 after one year)
Hours: nnn   (number of hours running, resets to 0 after 23 hours, 59 minutes, 59 seconds)
Min:   nnn   (number of minutes running, resets to 0 after 59 minutes, 59 seconds)
Sec:   nnn   (number of seconds running, resets to 0 after 59 seconds)
Uptime:nnn   (number of seconds running. Does not reset.
OK
```

11. Troubleshooting

Symptom: Unit will not receive

Solution #1. Verify that the unit is on the correct RF channel. If it is, the Status LED should blink green every time another modem tries to transmit to it. If the Status LED does not blink when it should be receiving, it is on the wrong RF frequency.

Solution #2. If the Status LED blinks green, verify that the Unit Address of the sending modem matches the unit address of the receiving modem. If this is OK, verify that the over-the-air baud rate of all modems is the same (ATR2 command).

Solution #3. Verify the KEYPHRASE is correct. If encryption is used, the KEYPHRASE is set to a unique word, and must be the same in all radios in the system. If it is not used in the radio system, then the KEYPHRASE in all units must be disabled or left at the factory default. To disable encryption, use the KEYPHRASE 0 command. The factory default KEYPHRASE is RAVEON, in all capitol letters.

Solution #3. Verify the Receiver circuits are powered. The receiver circuitry by default is disabled (**ATSM 4**). If you wish to receive data with the ATALS PL, you must enable the receiver circuits, increasing the current draw a little bit. **ATSM 0** enables the receiver circuits.

Symptom: Unit will not transmit

Solution #1. Verify that the GPS is locked. If the Status LED is blinking twice per second, the internal GPS is not receiving a signal from the GPS satellites, and thus, the unit will not transmits. Locate the ATLAS PL in a lace where it can receive a GPS signal.

Solution #2. Verify that the radio channel is clear or BCL is off. The **ATBC 1** command enables Busy Channel Lockout. If BCL is on, the modem will not transmit on a busy channel. The **ATBC 0** command turns it off, and thus the modem will transmit when it needs to, regardless if the channel is busy. The Status led on the front of the modem is illuminated green whenever the radio channel is busy (RF present).

Symptom: Receive light blinks, but no data is received

Solution #1. Verify the serial port baud rate. This is difficult if it is set wrong, because you cannot enter the command mode to check it. Try all possible baud rates, and see if one of them works with the modem. Alternately, remove the rear cover of the modem, and press the CONFIG button. This will force the modem into the Command Mode, as well as set the serial port to 9600 baud, 8 data bits, one stop, and no parity. If the baud-rate was OK, verify the AT, BT and CT times, that they are long enough for you to enter the +++ string.

Solution #2 Verify the KEYPHRASE is correct. If encryption is used, the KEYPHRASE is set to a unique word, and must be the same in all radios in the system. If it is not used in the radio system, then the KEYPHRASE in all units must be disabled or left at the factory default. To disable encryption, use the KEYPHRASE 0 command. The factory default KEYPHRASE is RAVEON, in all capitol letters.

Symptom: Long delay before transmitting

Solution #1. Verify that serial port timeout is OK. The ATR3 command sets the number of milliseconds that the *RV-M7* will look for in the serial input data stream. If a pause greater than this value happens, the modem will transmit. If the ATG0 parameter is set very large, say 2000, this

means 2 seconds, and the modem may simply be waiting a long time. Typical settings for this parameter are 20 (20mS).

Solution #1. This is normal. A TDMA radio will wait until its assigned TDMA slot is ready before it will send data. A delay in transmission of the TDMATIME is normal.

Symptom: Cannot enter Command Mode

Solution #1. Verify the serial port baud rate. This is difficult if it is set wrong, because you cannot enter the command mode to check it. Try all possible baud rates, and see if one of them works with the modem. Alternately, remove the rear cover of the modem, and press the CONFIG button. This will force the modem into the Command Mode, as well as set the serial port to 9600 baud, 8 data bits, one stop, and no parity. If the baud-rate was OK, verify the AT, BT and CT times, that they are long enough for you to enter the +++ string.

Solution #2. Handshaking. You may have hardware handshaking enabled on your terminal program, but the hardware or cable may not support it. Disable hardware handshaking on your terminal program to verify this is the issue.

Solution #3. Deep Sleep. If the TXRATE is greater than 60 seconds, the unit may be put into a very deep sleep mode, and will not enter the command mode. You must firt turn the unit off, and back on to put it into the command mode.

Symptom: Repeater will not repeat.

Solution #1. Verify the repeater's Unit ID is unique. An RV-M7 configured to be a repeater will not repeat messages it originated. If other units in the system have the same ID as the repeater, the repeater will not repeat them because it thinks that it originated the transmission. Set the MYID of the repeater to a unique ID number.

Solution #2 Verify the KEYPHRASE is correct. If encryption is used, the KEYPHRASE is set to a unique word, and must be the same in all radios in the system. If it is not used in the radio system, then the KEYPHRASE in all units must be disabled or left at the factory default. To disable encryption, use the KEYPHRASE 0 command. The factory default KEYPHRASE is RAVEON, in all capitol letters.

Symptom: Transmits position, but no data.

Solution #1. Verify DATAMUTE is not enabled. DATAMUTE disables data transmission. It must be set to 0 for serial port data transmission or WMX transmit data.

Solution #2. Verify SLOTTIME is long enough. The TDMA slot time must be long enough for data to be transmitted in. Adjust the system slot time (SLOTTIME), or give the particular unit an extra slot using the SLOTQTY command.

12. Mechanical

Note: The GPS connector is SMA.

13. ATLAS PL Messages

The *ATLAS PL* sends and receives messages in the NMEA 0183 format. NMEA is a standard protocol, use by GPS receivers to transmit data. NMEA output is EIA-422A but for most purposes it is RS-232 compatible. Use 4800 bps, 8 data bits, no parity and one stop bit (8N1) for standard NMEA data.

NMEA 0183 sentences are all ASCII characters. Each sentence begins with a dollar sign ($) and ends with a carriage return linefeed (<CR><LF>). Data is comma delimited. All commas must be included as they act as markers. Some GPS do not send some of the fields. A checksum is added to the end of the message. Following the $ is the address field aaccc. aa is the device id. “GP” is used to identify GPS data. Transmission of the device ID is usually optional. ccc is the sentence formatter, otherwise known as the sentence name.

The *ATLAS PL* supports the NMEA standard WPL, TLL, GGA, and GSV sentences. The Raveon proprietary PRAVE sentence is sent out of the *ATLAS PL*

in GPS mode 2. It is used by PC software programs to track *ATLAS PL* transponders, and process their status information.

13.1. $GPTLL Target Lat-Lon

This sentence is typically used by marine radar plotters. When the *ATLAS PL* is set to **GPS 3** mode of operation, it will output this message every time it receives a position report from another *ATLAS PL* transponder. Within the TLL message, is the latitude, longitude, and Target ID". In the Target ID field, the *ATLAS PL* puts the ID of the RV-M7 that transmitted its position.

$GPTLL,1,2,3,4,5,6,7,8,9 * cks

Field	Usage	Comments
	$ GPTLL	TLL header
1	Target number	01-99. Note the 99 target limit of most systems. If the ID is greater than 99, the *ATLAS PL* will only output 2 digits.
2	Lat	Latitude of the point.
3	N/S	North or South. One character.
4	Lon	Longitude of the position
5	E/W	East or west. One character.
6	UTC time	The UTC time at the time the transmission was made. Hhmmss format.
7	Target Name	The ID of the unit that transmitted its postion. If a Prefix" is programmed into the RV-M7, the name will have the prefix charactors in front of the ID. If additional parameters were selected to be appended, these will be put at the end of the name. See the "TLLPARM" command for a list of possible parameters. All parameters are enclosed in one set of parenthesis after the ID number.
8	Status	The character T, for tracking.
9	Reference	Null field. No data
cks		NMEA checksum

Example:

The following sentence is from unit 0006, prefix set to "BUOY", temperature and voltage parameters appended.

$GPTLL,06,3308.9098,N,11713.1306,W,BUOY6(27C 12.9V),41840,T,*06

13.2. $GPGSV Satellites In View

When this message comes out of the *ATLAS PL*, it identifies the number of satellites its internal GPS has in view. Up to 3 satellites may be reported in one message. The *ATLAS PL* typically does not report any satellite information other than the Number of Satellites in view.

$GPGSV,1,2,3,4,5,6,7 * cks

Field	Usage	Comments
	$ GPGSV	Number of SVs in view, PRN numbers, elevation, azimuth & SNR values.
1	Count	Total number of messages of this type in this cycle

2	Message number	This message's number
3	Number of sats	The total number of satellites in view.
4	PRN	Satellite number.
5	Elevation	Elevation in degrees, 90 maximum
6	Azmuth	Azimuth, degrees from true north, 000 to 359
7	SNR	Signal-to-noise ratio for this sat.
cks		NMEA checksum

13.3. $GPWPL Waypoint Location

The waypoint location sentence is used by GPS receivers and plotters in different ways, often to share waypoint data or to show waypoints on-screen.

```
$GPWPL,1,2,3,4,5,6 * cks
```

Field	Usage	Comments
	$ GPWPL	Waypoint Location Message Header
1	Lat	Latitude of the point.
2	N/S	North or South. One character.
3	Lon	Longitude of the position
4	E/W	East or west. One character.
5	WP Name	The ID of the unit that transmitted its position plus any user-set prefix.
cks		NMEA checksum

When the *ATLAS PL* is set to **GPS 4** mode of operation, it will output this message every time it receives a position report from another *ATLAS PL* transponder. Within the WPL message, is the latitude, longitude, and "waypoint ID". In the waypoint ID field, the *ATLAS PL* puts the ID of the RV-M7 that transmitted its position.

For example, if a *ATLAS PL* receives a position report from ID 0003 located at 4917.16N , 12310.64W it sends out the following message.

```
$GPWPL,4917.16,N,12310.64,W,3*65
```

The lat/lon is sent using the dddmm.mm format, where ddd is the degrees, and mm.mmmm is the decimal minutes. There is no sign to these numbers.

GPS 4 mode with the $GPWPL message is the most common way of using the *ATLAS PL* with a hand-held or mobile GPS. Most any GPS with a serial-data input will accept the $GPWPL message, and put an icon on its screen, with a label showing the ID of the RV-M7 at that position.

Some GPS display have an issue when a new position report is received. Most will move the waypoint to the new location, but some re-draw a new waypoint at the new position, and leave the old waypoint in place.

To help make the waypoints easier to read, the *ATLAS PL* may be programmed with an ID prefix, using the **PREFIX vvvv** command. The default is a capitol letter

V. Set it to a dash "-" to disable the prefix string. If a prefix is programmed into the RV-M7, it will add the prefix characters whenever it outputs the ID in a $GPWPL message. For example, if the prefix is set to the phrase "Car", the *ATLAS PL* will output the following message when it receives a position report from RV-M7 Transponder with ID 0003.

```
$GPWPL,4917.16,N,12310.64,W,Car3*65
```

And on a GPS display connected to the RV-M7, the waypoint will show up at the correct lat/lon with the waypoint name "Car3". In most all GPS receivers, this waypoint will also be added to its internal database of waypoints.

13.4. $PRAVE Raveon Proprietary Message, Location-Status

The $PRAVE message is sent out the *ATLAS PL* when it is configured for **GPS 2** mode of operation. This mode is typically used with the RavTrack PC program, or other computer programs that can process position and status information. It is sent at 38.4K bytes/second out the serial port.

Along with ID and position information, it contains a host of other status information. The length of this message may exceed he standard NMEA limit of 79 characters. Any product or software that uses this message must take this into account.

Following is a list of the fields sent in this message

Field	Usage	Comments
1	$PRAVE	Raveon Proprietary Header
2	From ID	The ID of the transponder that transmitted its position over the air. It is a decimal number, 0 – 9999.
3	To ID	The ID that this position report was sent to. It is a decimal number, 0 – 9999.
4	Latitude	dddmm.mmmm format. It is signed. + is north, - is south. No sign means north. Note: typically there are 4 decimal places, but as few as 0 decimal places are possible. Null field if no GPS lock. Leading zeros may be suppressed in the ddd field.
5	Longitude	dddmm.mmmm format. It is signed. + is east, - is west. No sign means east. Note: typically there are 4 decimal places, but as few as 0 decimal places are possible. Null field if no GPS lock. Leading zeros may be suppressed in the ddd field.
6	UTC time	The UTC time at the time the transmission was made. Hhmmss format. Null field if no GPS lock.
7	GPS Status	0=not valid position. 1=GPS locked and valid position. 2=WAAS operation.
8	Num Satellites	The number of satellites in view
9	Altitude	The altitude in meters. Null field if no GPS lock.
10	Temperature	The internal temperature of the RV-M7 in degrees C. Typically this is 5-20 degrees above ambient.
11	Voltage	Input voltage to the device that sent this position.
12	IO status	A decimal number representing the binary inputs.

13	RSSI	The signal-strength of this message as measured by the receiver, in dBm. Note, if the message went through a repeater, it is the signal lever of the repeated message.
14	Speed	The speed of the device in km/hour, 0-255
15	Heading	The heading of the device 0-360 degrees
16	Status	Status flags received from the device. Not all products support generating all status flag codes. NULL means no alerts. "P" means a proximity alert. "M" means man-down alert "A" General alert, usually due to pressing an alert button "C" Critical alert, usually due to pressing and holding alert button "I" Impact alert "V" Vibration "S" Service required on product
17	Spare	A spare field. May be used for UTC date in the future. Typically NULL.
18	*	The "*" NMEA end-of-message identifier.
19	Checksum	The NMEA 0183 checksum.

Example Sentence:

$PRAVE,0001,0001,3308.9051,-11713.1164,195348,1,10,168,31,13.3,3,-83,0,0,,*66

This example shows a unit at 33° 8.9051 north latitude and 117° 13.1164 east longitude. It is not moving (0 speed). Its signal strength was -83dBm. Its altitude is 168 meters.

Limited One Year Warranty

If within one year from date of purchase, this product fails due to a defect in material or workmanship, Raveon Technologies, Incorporated will repair or replace it, at Raveon's sole discretion. This warranty is extended to the original consumer purchaser only and is not transferable.

This warranty does not apply to: (a) product damage caused by accident, dropping or abuse in handling, acts of God or any negligent use; (b) units which have been subject to unauthorized repair, opened, taken apart or otherwise modified; (c) units not used in accordance with instructions; (d) damages exceeding the cost of the product; (e) batteries; (f) the finish on any portion of the product, such as surface and/or weathering, as this is considered normal wear and tear; (g) transit damage, initial installation costs, removal costs, or reinstallation costs; (h) damage due to lighting, floods, fire, or earthquakes, (i) connectors, (j) antennas, or (k) belt clips.

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This warranty gives you specific legal rights and you may also have other rights which vary from state to state.
Warranty service is available by mailing postage prepaid to:

Raveon Technologies Corporation
990 Park Denter Drive, Suite C
Vista, CA 92081

To obtain warranty service, include a copy of the original sales receipt or invoice showing the date, location, and price of purchase. Include a written description of the problem with the product, a phone number and name of person who may be contacted regarding the problem, and the address to where the product should be returned.

Products repaired under warranty will typically have their program memories erased and reset to factory default settings.