# M7 Over-The-Air Protocol

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## *Overview*

The M7 GX series of GPS transponders may be directly connected to a **Garmin GPS 152H** navigation display. When connected, the Garmin display map will show the location of the vehicle it is in PLUS the location of all other M7 transponders within radio range.  This unique feature allows one to quickly, easily, and inexpensively, make a mobile AVL system for tracking cars, trucks, racecars, construction equipment, or any thing Raveon's M7 GX transponder may be installed on.
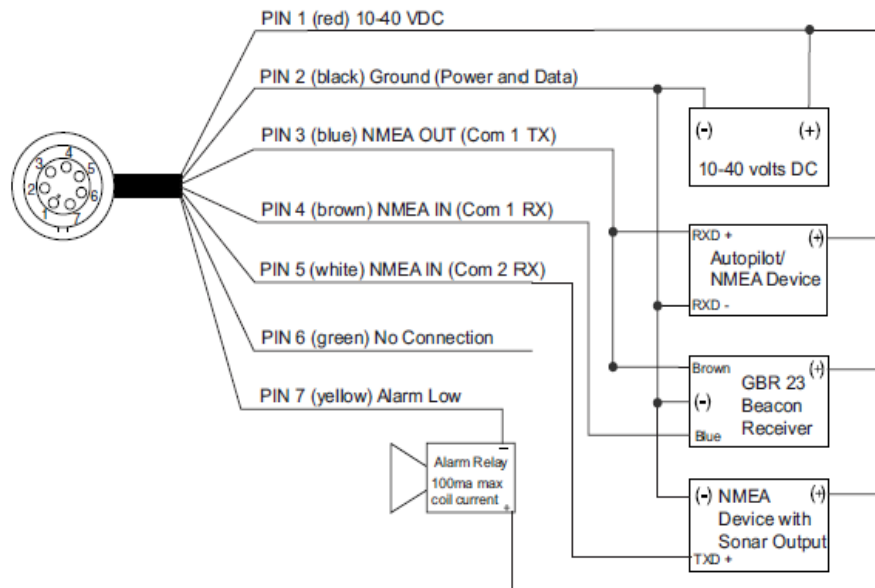
The GPS 152H has a built-in interface for "NMEA 0183″ devices, which is another way of saying that they can connect to other devices using a serial cable.   The NMEA 0183 is an RS232 serial connection that typically operates at 4800 baud.  It is used to exchange waypoint and other information between displays, GPS devices, and transponders.

When Raveon's M7 GX transponder is connected to the Garmin display using the NMEA 0183 connection, the M7 transponder can put icons on the screen of the Garmin display. As the transponder received updated positions from other vehicles, it updates the position of the icons on the Garmin display.

## *Garmin GPS 152H Wiring*

## Connecting the Power/Data

The power/data cable connects the GPS 152 to a 10-40 volt DC system and provides interface capabilities for connecting external devices. The color code in the diagram below indicates the appropriate harness connections. The replacement fuse is an AGC/3AG - 1.5 Amp fuse.

PIN 1 (red) 10-40 VDC

PIN 2 (black) Ground (Power and Data)

PIN 3 (blue) NMEA OUT (Com 1 TX)

(-)          (+)
10-40 volts DC

PIN 4 (brown) NMEA IN (Com 1 RX)

RXD +          (-)
Autopilot/
NMEA Device
RXD -

PIN 5 (white) NMEA IN (Com 2 RX)

PIN 6 (green) No Connection

Brown          (-)
GBR 23
(-)          Beacon
Blue          Receiver

PIN 7 (yellow) Alarm Low

Alarm Relay
100ma max
coil current

(-) NMEA          (+)
Device with
Sonar Output
TXD +

## Interfacing

The following formats are supported for connection of external devices: GARMIN proprietary Differential GPS (DGPS), NMEA 0183 (version 2.3), RTCM SC-104 input (version 2.0).

The following are the sentences for NMEA 0183, version 2.3 output: Approved sentences — GPBOD, GPBWC, GPGGA, GPGLL, GPGSA, GPGSV, GPRMB, GPRMC, GPRTE, GPVTG, GPWPL, and GPXTE; Proprietary sentences — PGRME, PGRMM, PGRMZ, and PSLIB. The GPS 152 also includes NMEA input with support for the WPL sentence and sonar NMEA input with support for the DBT (Depth Below Transducer), DPT (Depth), MTW (Water Temp) and VHW (Water Speed & Heading) sentences. If connecting to COM2 for sonar NMEA input, the unit interface must be set to GARMIN DGPS, Other DGPS (4800 only), or NMEA In/NMEA Out (see page 60). If connecting to COM1, the unit must be set to NMEA In/NMEA Out.

## NMEA Interface

If you are going to interface the GPS 152 with another piece of equipment (such as a radar or autopilot), the unit needs to be set to output NMEA data. The NMEA data can be customized to shorten the update time from the unit. If too many NMEA sentences are activated, the unit may take longer than two seconds to update.

### To activate the NMEA data:

1. With the GPS 152 turned on, press **MENU** twice to display the Main Menu. Use the **ARROW KEYPAD** to select the Com tab.

2. Highlight the 'Serial Data Format' field and press **ENTER/MARK**.

3. Select 'NMEA In/NMEA Out' and press **ENTER/MARK**.

## Advanced NMEA Output Setup

The GPS 152 NMEA data transmission can be customized to keep the output rate at two seconds. If the unit is set up to output all of the available NMEA sentences, the output rate may exceed two seconds. The 'Advanced NMEA Output Setup' page will allow you to turn on/off the GPS Status (GSA, GSV), Waypoint/Route (WPL, RTE) and the GARMIN Proprietary sentences. You can also change the precision of the Lat/Lon minutes.

### To set up the Advanced NMEA Output:

1. With 'NMEA In/NMEA Out' selected, press **MENU**. Select 'NMEA Setup' and press **ENTER/MARK**.

2. To turn a field On/Off, place the highlight over the desired field and press **ENTER**. Make a selection and press **ENTER** again to accept the selection.

## GPS 152 NMEA Sentence Output (NMEA Version 2.3 compliant)

**Always transmitted:** GPRMC, GPGGA, GPGLL, GPBWC, GPVTG, GPXTE, GPRMB

**Switchable sentences:** GPGSA, GPGSV, GPWPL, GPRTE

**GARMIN proprietary:** PGRME, PGRMZ, PGRMM

## NMEA 0183 Cable Connections

*NMEA 0183 is a standard communications format for marine electronic equipment. For example, an autopilot can connect to the NMEA interface on the GPS 152H and receive positioning information. The GPS 152H can exchange information with any device that transmits or receives NMEA 0183 data. See the following diagram for general wiring connections. Read your other product's owner's manual for more wiring information.*

*NMEA 0183 Wiring (Data cable)*

*To exchange NMEA 0183 data, the Garmin GPS 152H has two NMEA 0183 version 2.3 communication ports. Com port one (Com-1) can be used to receive NMEA format GPS data. The com port can also transmit NMEA format GPS data to another device. The four wires for the com port are combined with the Power Supply cable to form the power/data cable. (see "connecting the power/data" shown above). Com-1 uses the blue wire to transmit, the brown wire to receive and the black wire for signal ground.*

## The M7 DB9 Serial Connector

The 9-pin serial I/O connector to the M7 is a female 9-p D-subminiature connector having the following pins configuration.
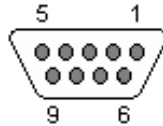


**Front-view of DB-9 connector on modem (female)**

| Pin # | Name | Dir | Function | Level / Specification |
|-------|------|-----|----------|------------------------|
| 1 | CD | out | Carrier detect | |
| 2 | RxD | out | Receive data | Data out of the modem. |
| 3 | TxD | in | Transmit data | Data into the modem. |
| 4 | DTR | in | Data terminal ready | Normally ignored by the *FireLine* modem. |
| 5 | GND | | Ground connection | Signal and power ground |
| 6 | DSR | out | Data Set Ready | |
| 7 | RTS | in | Request to send | |
| 8 | CTS | out | Clear to send | |
| 9 | Power | In/out | DC power (not Ring signal) | User may supply the DC power to the modem on this pin. |

## Wiring the DB9

The Garmin's "Data Cable" must be connected to the M7 transponder. This connection will allow the M7 to put icons on the screen of the Garmin display, showing the location of other tracked vehicles. The Raveon M7 GPS transponder uses a 9-pin "DB9″ connector to connect to the Garmin. Solder the Garmin data cable wires onto a DB9 connector and plug the DB9 into the M7 transponder as shown below:

The **brown wire** goes to pin two of the DB9, the **blue wire** to pin 3, and the **black wire** connects to pin 5 of the DB9.

The white, yellow and green wires on the Garmin GPS 152H display not used in this example, and may be wrapped up with electrical tape and tucked away.

## *Configuring the Garmin*

Set the NMEA communication of the Garmin to 4800 baud.

## *Configuring the M7 GX Transponder*

Raveon has a designed the M7 GX transponder to work with the Garmin display or any other NMEA 0183 display that can accept the "$GPWPL" NMEA message. The $GPWPL is an industry standard message that the Garmin displays and many other GPS displays interpret as a waypoint command. The M7 GX outputs this $GPWPL message to put icons on the screen of the Garmin, and to move the icons around on its screen.

To configure the M7 transponder to output the $GPWPL message, set the M7 GX to GPS mode 4. To do this, put it into the configuration mode by send the +++ into the serial port. The M7 will respond with an OK. Type GPS 4 and press enter to put it into GPS 4 mode. GPS 4 is the mode that causes the M7 GX to output $GPWPL messages whenever it receives a status/position message over the air.

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