SYNERGY SYSTEMS, LLC
Time proven products and support

M12M LOW COST EVALUATION KIT QUICKSTART INSTRUCTIONS

The Synergy Systems Low Cost Evaluation Kits for the i-Lotus M12M GPS navigation receiver (P/N 10001870), and i-Lotus M12M GPS Timing receiver (P/N 10001871) consist of five main items:

P/N	Description	Qty
IL-GPS-0020-A (Nav)	i-Lotus M12M GPS Receiver	1 ea.
-or-		
IL-GPS-0010-A (Timing)		
10001668	M12M Evaluation Board	1 ea.
-Varies-	Synergy Systems' AR-10 GPS Antenna	1 ea.
10001107G	Serial Cable	1 ea.
10001108G	USB to 1.3mm Power Cable	1 ea.

DOWNLOADABLE COMPONENTS

In order to keep the cost of the kit low, hard copies of the documentation and software have been kept to a minimum. The complete documentation and software package can be downloaded from the Synergy Systems website: www.synergy-gps.com

Once you are on the Home Page, browse to "Tech Support", "User Guides", and then "Synergy". Once there download the M12M Evaluation Kit package.

These instructions for the Low Cost Evaluation Kit are based on use of the WinOncore12 program.

GETTING STARTED

As supplied, the M12M receiver is pre-installed on the Evaluation Board and has been fully tested before shipment. All that is necessary to start operation are these four simple steps:

1. Install WinOncore12 on your computer.
2. Carefully plug the antenna into the mating connector on the M12M GPS receiver.
3. Install the serial cable between a serial port on your host computer and J1 on the Evaluation Board.
4. Plug the USB power supply cable into a free USB port on your computer and then plug the 1.3mm DC power connector into J3 on the Evaluation Board.
5. If desired, connect a coax cable (not supplied) to the SMA jack on the Evaluation Board to monitor the fast rise time 1PPS pulse.

SIGNS OF LIFE

As soon as power is supplied, Light Emitting Diode (LED) D3 will illuminate, indicating the presence of power on the Eval Board. This will be followed closely by D4, the One Pulse Per Second (1PPS) monitor. Once the M12M has finished initialization, the 1PPS monitor should continue flashing at 1 Hz. This is a good indication that the receiver is “happy” and running it’s normal housekeeping routines.

RECEIVING SATELLITE DATA

Note that for the previous steps to be completed successfully, the receiver does not need to be receiving data from the GPS satellites. In fact, the antenna doesn’t even have to be **connected** in order to have the receiver initialize. Naturally, this isn’t a very useful state of operation, but it is helpful to note that the receiver does not need to be actively receiving data from the satellites in order to initialize or communicate with the host.

This is a good time to talk about antenna placement. In order to work reliably, the antenna must be placed so that it has a reasonably unobstructed view of the sky. The power levels of the signals being received from the satellites are very low, and are easily blocked by such things as buildings, trees, etc. Can you set the system up on your desk and track satellites? Maybe, but probably not. If you are in a single story, wood framed building, you can probably track SOME satellites, but most likely only ones that are high above the horizon. If your building is several stories tall or covered with foil-backed insulation, you will be lucky to track anything at all. Placing the antenna in a window helps a little, but bear in mind that you are only “seeing” part of the sky, so this can be spotty at best. If there are a lot of satellites currently in the part of the sky that your window is facing, you might do pretty well for a while. Then again, if you try placing the antenna in the window when there are no satellites in that direction, you could wait for hours waiting for a satellite to move into view. You can certainly verify that the system is operational in this way, but performance will be severely compromised.

NOTE:
If you try placing the antenna next to a window, make sure it is not coated with an aluminum based UV reflecting film. This material makes a GREAT shield.

1PPS OUTPUT

There are two 1PPS signals available on the Evaluation Board. The first is on Pin 1 (DCD line) of the DB-9 connector. This is an RS-232 level signal (+/-6V nominal) and is normally used as an interrupt for systems such as NTP time servers. Being an RS-232 signal it is not extremely accurate, but is sufficient for this type of system.

The second 1PPS is present on the SMA jack next to the DB-9 connector. This is a high speed 3V pulse (10ns rise/fall time) and is used for applications that need a precise time pulse.
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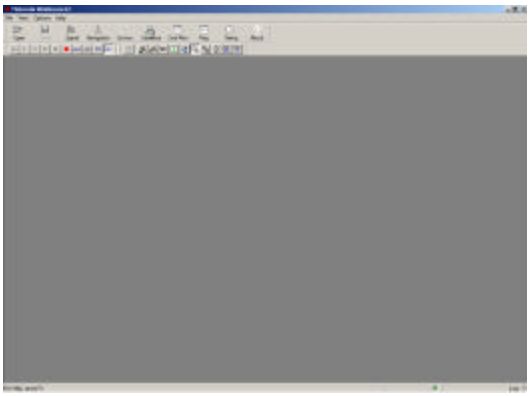
SOFTWARE

OK, the receiver is happily turning the 1PPS LED ON and OFF, but what is it DOING? The program we use most often to monitor and control the M12+ GPS receiver is Motorola’s WinOncore12. At this point I suggest you install ***WinOncore12*** which is included in the download package. If you accept all of the defaults during the install, WinOncore12 will be installed in a ***Motorola*** directory in the *Program Files* directory of your hard drive.

RUNNING WINONCORE12

Step 1 - Assuming your computer is already booted, start WinOncore12.

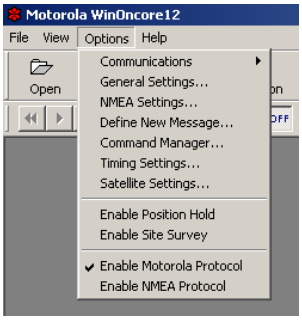
Step 2 - On your computer screen, WinOncore12 should be displaying a screen that looks something like this:



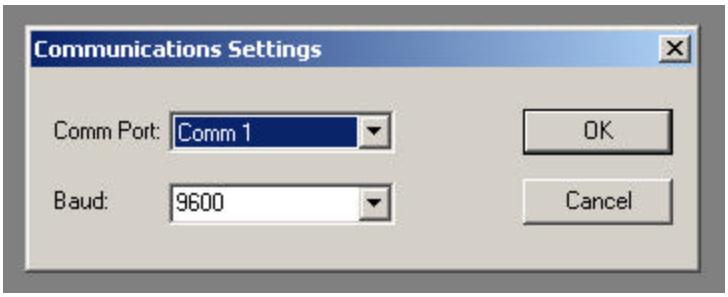
Not very interesting, but we will soon change that.

Step 3 - The first thing to do is to check for communications between the M12M and WinOncore12. Upon initial power-up, the M12M is set up for communications in binary protocol at 9600 baud. The quickest way to verify communications is to query the receiver for its identification string. To do this:

- Click on <Options> on the main toolbar and make sure that "Enable Motorola Protocol" is checkmarked:



- Click on <Options> again, then <Communications>, then <PC Communications...>. Check to make sure that the proper Comm port is selected, and that the baud rate is 9600 as shown on the next page:



- Next, look on the Action Bar for an icon that looks like: **ID=**. Clicking on this icon will cause WinOncore12 to request the ID string from the receiver. If this command is successful you will get a new window that looks something like this:

Note that in early M12M units the ID still references Motorola. If you get the window to open but it remains blank, there is a communications problem that still needs to be resolved.

Note:

*When you click on the <**ID=>** icon you should see the **RxD** LED on the evaluation board flash briefly, indicating that the request has been received by the board. Shortly after that you should see the **TxD** LED flash, indicating that the ID information is being sent back to WinOncore12.*

Step 4 - To request data from the receiver we are going to make use of the WinOncore12 setup "Wizard". This is the icon that looks like a magic wand with a wizard's hat, two icons to the left of the <**ID=**> icon. The wizard will guide you through serial port selection, initial position, time, and update rate settings. At this point, the easiest thing is to just accept the defaults and click "OK" whenever asked. Don't worry about putting in values for position, time, UTC offset, etc. The receiver can start up quite nicely without any of this information. Later, when you are more comfortable with the receiver and its capabilities, you can experiment with these.

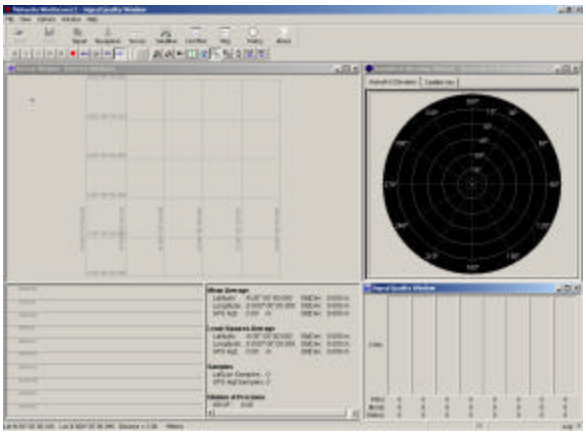
Windows XP Note:

It has been observed that occasionally the wizard does not work properly on XP machines. It will start properly, but then unceremoniously dump you before you are finished. This is due to a known "compatibility" problem with WindowsXP. Instructions for fixing this problem can be found in the download package: "Disabling_Detection_of_Microsoft_Ballpoint_Mouse.pdf".

All things being equal, the M12M should get an initial 3D fix under these conditions in less than 60 seconds. If you find yourself standing around through several coffee breaks waiting for the receiver to develop a fix, SOMETHING is wrong. Normally it turns out to be bad antenna placement.

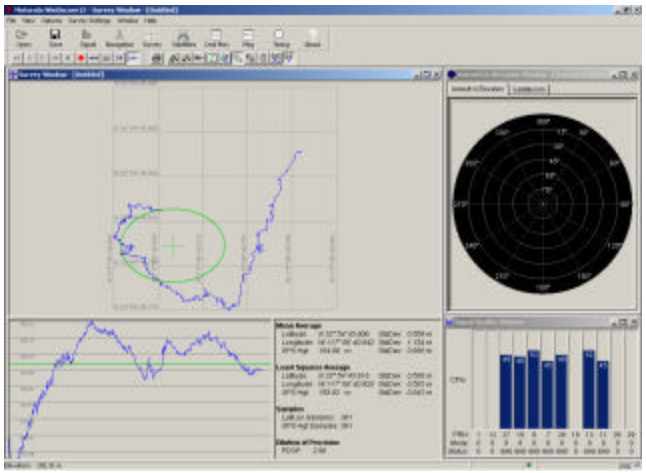
As soon as you finish with the setup wizard and click on “OK”, you should see the RxD and TxD LEDs on the Eval Board start flashing furiously. WinOncore12 is setting up the receiver and ordering it to start transmitting the 12 Channel Position/Status/Data message (@@Ha). Once the receiver is initialized, the RxD LED will extinguish, and the TxD LED will continue flashing once per second as data is sent to your PC.

Step 5 - OK, we are now getting data, but where is it? WinOncore12 has half a dozen screens that can be called up individually or in combination, depending on what you want displayed. My personal favorites are the Survey, Satellites, and Signal windows. Simply click on the icons on the toolbar to bring up these screens. After moving the windows around a little you should see something like this:

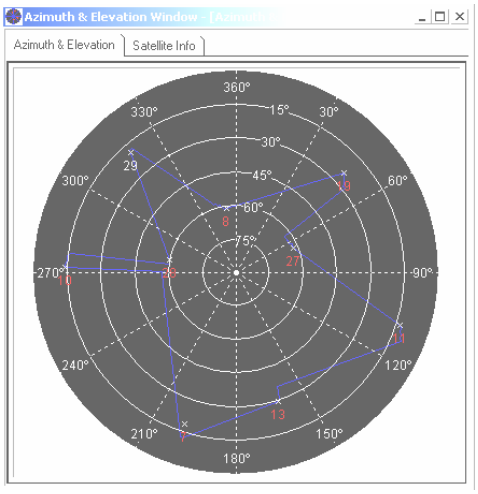


This shows just about everything I usually want to know: X/Y/Z position track, number of satellites tracked, signal strengths, and satellite positions.

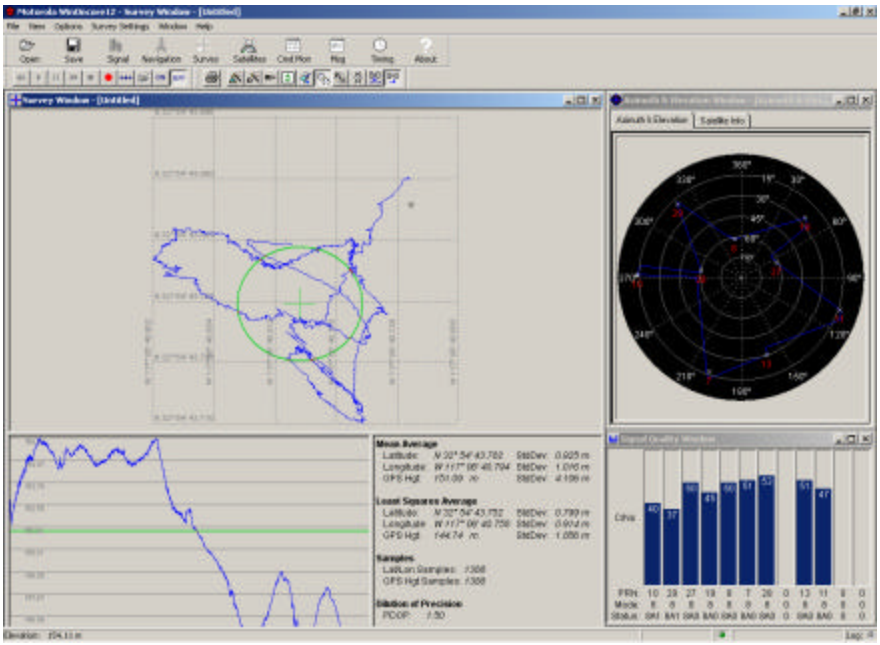
If you have successfully initialized the receiver using the Wizard the screen should look something like this:



This all looks well and good, but notice that the Satellite Azimuth and Elevation window is pretty featureless. The reason for this is that it takes 12.5 minutes to download the almanac from the satellites necessary to get some data in this window. To get satellite info, click on the icon on the far end of the action bar (it looks like a little satellite with a blue arrow underneath it), and wait for the info to be downloaded. Once this happens the Azimuth-Elevation window should look like this:



Note how the satellites that are being tracked are highlighted in red, while ones that are not (in this case satellite 29 at about 320° azimuth. After things have run for a while your WinOncore screen should look like the screen-shot below. Note that we now have almost 1400 position fixes with 9 satellites being tracked. A pretty typical looking screen.



That's about it. There is simply not time nor room for me to take you through all of the workings of WinOncore12. The best advice I can give is to just play with it. The help files are extensive and well written. The important thing is that you have an operational GPS receiver and can start exploring its characteristics and developing applications around it

EVALUATION BOARD DESCRIPTION

User interface to the M12M GPS receiver is made through two connectors. In addition, there are three test points and four status LEDs that can be used for testing and troubleshooting. Details are as follows:

CONNECTORS

J1 DB9-F - Main serial port. Normally hooked to a host computer using the standard 9 pin (M-F) serial extension cable included in the kit *(ref: Digikey P/N AE1020)*. This cable should be wired one-to-one (i.e., not a null modem.) Pin assignments:

Pin 1 1PPS to host, RS-232 levels
Pin 2 TxD, serial data from M12M to host, RS-232 levels
Pin 3 RxD, serial commands from host to M12M, RS-232 levels
Pin 5 Signal common

J2 10 pin header - Main interface to M12+. Pin assignments per M12M documentation.
J3 1.3mm coaxial DC power - Power normally supplied by USB port on user's computer.
J4 SMA jack - Precision 1PPS monitor. 3V active high logic. Approx. 200ms pulse width.

1PPS JUMPER

SJ1 1PPS Enable - User selectable 1PPS signal on serial port DCD line. Normally used to synchronize host computer to UTC. This solder jumper is bridged when the kit leaves our factory. If this pulse interferes with your particular system, unsoldering the jumper can disable the pulse.

TEST POINTS

+3V Regulated +3VDC.
TXD TxD, Serial Data from M12M. 3V active low logic.
RXD RxD, Serial Commands to M12M. 3V active low logic.

STATUS LEDs

POWER (D3) Green whenever +5V regulator is active
TxD (D4) Flashes RED whenever M12M is sending data to host
RxD (D5) Normally OFF. Flashes RED whenever commands are sent from host to M12M. Solid RED on the LED indicates that Eval Board is not hooked to host properly
1PPS (D6) Flashes RED to indicate 1PPS output from M12M

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