



## **GPS Mobile Locator SMART SKYMASTER**



## **Installation Guide**

# Smart SkyMaster Installation Guide

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## Manual Contents

1.0 Important Notes.....	1
1.1.1 Introduction.....	1
1.1.2 System Requirements.....	1
2. Installing the Smart Skymaster Mobile Locator .....	2
2.1 Hardware lay-out/ Wiring .....	2
2.2 Cable harness wiring layout .....	2
3. Installation & Operating Procedure .....	3
3.1 Software information: .....	3
3.2 Communication Specification.....	3
4. Application.....	3
5. System Specifications:.....	4
6. Troubleshooting Tips:.....	5
7. Product Limited Warranty .....	5
8. NMEA-0183 APPROVED SENTENCES .....	5
9. QUICK START: .....	9

## Package Contents

- *One Smart SkyMaster GPS Receiver with serial & PS2 connector*
- One PS2 automotive cigarette-lighter power adapter.
- User Manual
- Free Evaluation GPS Map Software

Please check if all of the contents listed are included and not damaged from shipping. If any of the items are missing or damaged, please notify Tri-M Systems, Inc.

<http://www.tri-m.com>  
[info@tri-m.com](mailto:info@tri-m.com)

## 1.0 Important Notes

Using extensions power and data cable in addition to the cabling provided with the Smart SkyMaster may cause degrade operational performance or interference with other electronics. Should you require longer cabling in your particular application, please consult with a qualified technician or contact Tri-M System Inc.

On installation take extra care to secure the Power/Data cable of the Smart SkyMaster GPS receiver to protect it against mechanical stress or vibrations.

Unless you are a qualified electronic technician, **DO NOT** attempt to supply DC power to the SkyMaster other than with the automotive cigarette-lighter power adapter supplied or by plugging directly into the PS2 port of your desktop or laptop computer.

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**NOTE: DAMAGE WILL OCCUR IF IMPROPER INPUT POWER IS APPLIED.**

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### 1.1.1 Introduction

#### Smart SkyMaster GPS Receiver

Congratulations on your purchase of the Smart SkyMaster GPS receiver. Tri-M's Smart SkyMaster will provide you years of trouble free and reliable position and navigation information using the newest GPS technology. The Smart SkyMaster combines the latest 12 parallel channel GPS receiver technology together with our high gain, low noise active patch antenna technology into a single innovative harsh environment enclosure. Tri-M brings you a simple concept where just attaching the Smart SkyMaster to your notebook or desktop computer, completes a "Plug-Location-Navigate" capability to use very accurate, reliable and free, three-dimensional positioning information in your day-to-day life.

The Smart SkyMaster uses the free broadcast signal from the US Military's Low Orbit Global Positioning System (GPS). This is a system of satellite-base transmitter emits ranging/satellite information and high precision time signals. The Smart SkyMaster receiver uses signals to determine its exact position, altitude, date, time, speed and course over ground anywhere on earth.

### 1.1.2 System Requirements

System requirements for operating your new Smart SkyMaster GPS receiver are as follows.

- PC running DOS, Windows OS or any OS that accept GPS NMEA data format. PDA, Palm-PC, Chart Plotter, Notebook or Micro-controller using UART as serial bus.
- Power source using our PS2 for Notebook PC, automotive cigarette-lighter power adapter.

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**NOTE: Regulated DC must be supplied to this unit either through our PS2 connector to your Notebook/PC or via the automotive cigarette-lighter power adapter that has built-in power regulation.**

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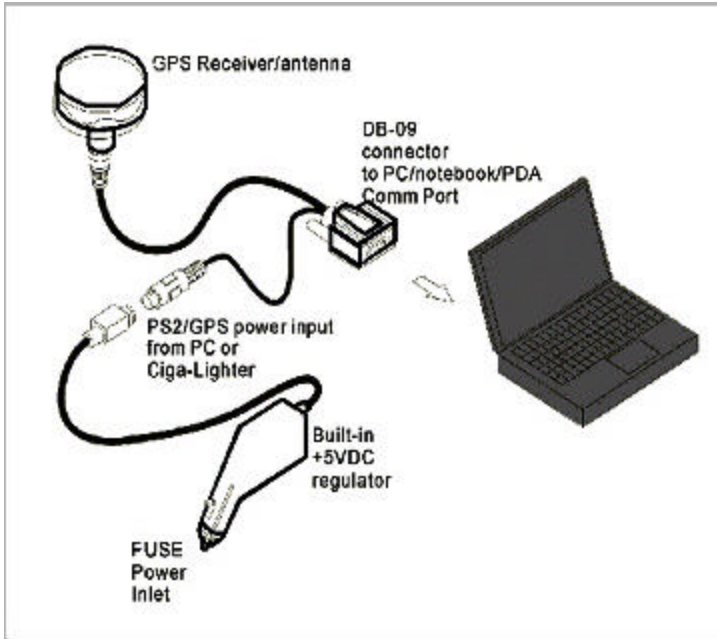
- For best performance, position the Smart SkyMaster with as much of an un-obstructed view of the sky as possible. The GPS satellite signals used by all GPS receivers are very weak, and best performance is achieved when the signals passed in a directly line of site.

## 2. Installing the Smart Skymaster

### 2.1 Hardware lay-out/ Wiring

The Smart SkyMaster GPS receiver is designed as a center mount unit with a hex fastener for permanent installation.

**Figure 1: Smart SkyMaster System Illustration**



### 2.2 Cable harness wiring layout

Please note that the connector wire destination DOES not coincide with wire the signal name.

**Figure 2: Connector Wire pin-out:**

DB09 Female	DIN - 8PIN	DIN-6PIN
pin1=n/c pin2=TXA pin3=RXA pin4=n/c pin5=GND pin6=n/c pin7=n/c pin8=n/c pin9=n/c	pin1=TXA pin2=RXA pin3=+5VDC pin4=1pps/TTL pin5=n/c pin6=GND pin7=n/c pin8=n/c	pin1=n/c pin2=GND pin3=n/c pin4=n/c pin5=+5VDC pin6=n/c

## 3. Installation & Operating Procedure

After a complete familiarity of your new Mobile Locator using Figure 1 & Figure 2 , you are ready to interface the unit to your computing device. *PLEASE MAKE SURE THAT POWER IS OFF BEFORE PROCEEDING.*

**Step 1:** Install your new Smart SkyMaster in an open sky view to a secure location.

**Step 2:** Locate the data DIN 8PIN connector and plug it to your Smart SkyMaster and secure the cable harness from vibration.

**Step 3:** Locate the data DB09 connector and plug it to your computing device serial COM -PORT.

**Step 4:** Locate the power DIN 6 PIN connector and connect it to a power source (PS2 port of a notebook Computer or the automotive cigarette-lighter power adapter provided)

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**NOTE: The Smart SkyMaster DOES NOT has a power on/off switch. When power is properly applied, the Smart SkyMaster initializes and starts sending/reporting NMEA data messages at 1Hz (1 per second) intervals via its serial port.**

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A full 30-day working evaluation copy, with an interactive tutorial of the FUGAWI GPS software program is included for your WINDOWS computer. Please load the program to your computer and follow the instructions in running and loading your own maps. Please see <http://www.gpss.co.uk> web pages for more information.

### 3.1 Software information:

The Smart SkyMaster GPS receiver is NMEA 0183 compatible data format, it outputs sentences, which ALL mapping software or GIS software will support. The following are examples of commercial Map Software:

- Street Atlas
- Fugawi
- Route66

### 3.2 Communication Specification

System: Asynchronous

Speed: 4800bps

Start Bit: 1 bit

Data Length: 8bits(MSB=0)

Stop Bit: 1 bit

Parity Bit: None

## 4. Application

Tri-M's Smart SkyMaster GPS receiver can be use in any application, which utilizes GPS information for Navigation, as a Precise Timing source or to capture and create Geographic Information Systems (GIS). A very few examples are:

- Mobile train, plane, truck, bus, tank navigation
- Marine GPS chart plotting and navigation
- Fleet Management GPS System
- Land Survey GPS/GIS data collection
- Automotive Vehicle Locations (AVL) GPS data
- Very accurate Timing for networks or wireless applications.

## 5. System Specifications:

### *Performance:*

Receiver ..... 12 CH/Parallel  
Frequency ..... 1575.42MHz  
Tracking Code ..... C/A codes  
Max. Number of Satellites Tracked..... 12 satellites  
Acquisition Time ..... 18seconds typical.(warm start)  
Position Accuracy ..... 15m or 50ft RMS\*(DOP<3)  
Velocity Accuracy ..... 0.1knots RMS steady state  
Update Rate..... 1Hz (1 second continuous)

### *Interface:*

Serial Communication.....RS232(standard), USB(option)  
Output Format ..... NMEA 0183, SGP GGA, SGPRMC, SGPGSV, SGPVTG, SGPGLL, SGP GSA

### *Power:*

Input ..... 8~+35VDC reverse protected  
Power Consumption ..... 0.9 watt max.

### *Environmental*

Operating Temperature..... -30~+75degree C  
Storage Temperature ..... -40~+80degree C  
Humidity..... 95%non-condensing

### *Construction:*

Radome .....Polycarbonate  
Body Frame.....Hard-steel with coarse tread  
Mounting .....Center mount  
Size..... 52mm x 22mm

## 6. Troubleshooting Tips:

### 1. No output:

- ✓ If you are using your PS2 Notebook supply, check if the PS2 connector is connected to your notebook properly.
- ✓ Check to see if the COM PORT is enabled.
- ✓ If you are using the PS2 Cigarette-Lighter adapter, check to see if the RED LED is lit, if not check the built-in FUSE 1A inside the Adapter.

### 2. GPS Data is not in correct positions:

- ✓ During the FIRST COLD start situation, when the unit is turn-on at your location. The unit will AUTOMATICALLY search for the satellites and accumulate new data for your receiver and this may take from 4~5min. NOTE: One can use any comm-program or WINDOWS TERMINAL to see the raw data at 1Hz, 4800bps.

### 3. No activity or the Map Software is not receiving any GPS data.

- ✓ In the free program the software will auto search for COM1 & COM2 data as soon as the program is execute, be sure that the Smart SkyMaster is connected to COM1 or COM2.

## 7. Product Limited Warranty

Skymaster has a standard one-year depot warranty from Tri-M Systems.

### **PURCHASER'S DUTIES**

Please call our technical department for RMA number prior to returning the defective products. Products send back to us without RMA number will not be process.

## 8. NMEA-0183 APPROVED SENTENCES

Approved sentences are those of which formats are defined format NOT user-definable. An approved sentences generally takes the following form: See Tables examples: ZDA,RMC, GSA, VTG,GSV, GLL, GGA. \$<address field>, <data field>.....[\*<checksum field>] <CR><LF>

**TABLE 1:**

Name	Example	Description
Message ID	\$GPZDA	ZDA protocol header
UTC: Time	12-34-56	hh-mm-ss
UTC: Day of Mont h	01	DD
UTC: Mont h	02	MM
UTC: Year	2001	YYYY
Local Zone Time	+09	hh
Local Zone Time	00	mm
Checksum	*6B	
<CR> <LF>		End of message

Interpreting Example:

February, 1, 2001

12:34:56

Local Zone Time: +09:00

**TABLE 2**

RMC- Recommended Minimum Specific GNSS Data

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=Not
Latitude	3723. 2475		ddmm.mmmm
N/ S Indicator	N		N=north or S=south
Longitude	12158. 3416		dddmm.mmmm
E/ W Indicator	W		E=east or W=west
Speed Over ground	0. 13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
MSL Altitude	9.0	meters	
Magnetic Variation		degrees	E=east or W=west
Checksum	*10		
<CR> <LF>			End of message

**TABLE 3**

Name	Example	Description
Message ID	\$GPGSA	GSA protocol header
Mode 1	A	Automatic-switch 2D/3D
Mode 2	3	1=No Fix, 2=2D, 3=3D
Satellite Used	07	Sv on Channel 1
Satellite Used	02	Sv on Channel 2
.....	.	.....
Satellite Used		Sv on Channel 12
PDOP	1.8	Position Dilution of Precision
HDOP	1.0	Horizontal Dilution of Precision
VDOP	1.5	Vertical Dilution of Precision
Checksum	*33	
<CR> <LF>		End of message



**TABLE 4**

VTG- Course Over Ground and Ground Speed

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course	309.62		Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	*6E		
<CR> <LF>			End of message

**TABLE 5**

GLL - Geographic Position-Latitude/Longitude

Name	Example	Description
Message ID	\$GPGLL	GLL protocol header
Latitude	3723.2475	ddmm.mmmm
N/S Indicator	N	N=north or S=south
Longitude	12158.3416	ddd.mm.mmmm
E/W Indicator	W	E=east or W= west
UTC Position	161229.487	hhmmss.sss
Status	A	A=valid or V=not valid
Checksum	*2C	
<CR> <LF>		End of message

**TABLE 6**

GSV - GNSS Satellites in View

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Messages	2		Range 1 to 3
Message Number	1		
Satellites in View	07		
Satellite ID	07		Channel 1 (1~32)
Elevation	79	degrees	Channel 1(max. 90)
Azimuth	048	degrees	
SNR (C/No)	42	dBHz	0~99,null when not tracking
....			....
Satellite ID	27		Channel 4(1~32)
Elevation	27	degrees	Channel 4(max. 90)
Azimuth	138	degrees	Channel 4(True,0~359)
SNR(C/No.)	42	dBHz	range 0~99, null not track
Ages of Diff. Corr.		second	
Checksum	*71		
<CR> <LF>			End of message

**TABLE 7**

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		0=invalid      1=Fix valid GPS 2=DGPS Fix    3=GPS PPS Fix
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoid Separation		meters	
Units	M	meters	
Ages of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message

## 9. QUICK START:

1. Please review the System Layout wiring and be sure PC power is OFF before proceeding.
2. Connect the DB09 data cable to your PC comport, locate the PS2 power DIN6 connector and insert it into your Laptop PS2 jack (same jack as an external mouse uses).
3. Make certain that your new Smart SkyMaster is secured properly.
4. Turn your Laptop power on and run your Map program, be sure that your Map program uses the standard NMEA sentences mentioned in this manual, Some programs' proprietary software requires their GPS hardware to run.
5. Select your proper COMPORT number of your Laptop: Note: Most Laptops share comport #1 (PCMCIA & SERIAL DB09) and the BIOS will detect which serial is being used. If your BIOS cannot detect serial port, then it must be manually selected during your Laptop PC start-up.