Mars700Mini-TMC

GNS TC5000 TMC Module

Smart Design Technology Co., Ltd.
20F-8, No.107, Sec 1,Jhongshan Rd. Sinjhuang City, Taipei County 242, Taiwan
Phone: +886-2-8522-7628
Fax: +886-2-8522-7784
Contact: sales@smartdesign.com.tw

Documentation History

Revision	Description	Date	Remark
V0.1	Preliminary release	July 2010	
V1.0	Technical spec and application note updated	Jan. 2011	Harry Lee

Mars700Mini-TMC is a GPS Mouse receiver build-in well-known SiRF StarIII GPS chipset and TMC module . **Mars700Mini-TMC** provides customer high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities. Customers benefit from the strength of both companies.

Thanks to the low power consumption technology, the GPS-Mouse receiver is ideal for many portable applications such as PDA, Tablet PC, smart phone etc.

Features

- Built-in high performance SiRF Star III low power chipset.
- GNS TMC solution
- Support GNS protocol 3.0.
- Current consumption 40mA
- 20 channels parallel.
- Average Cold Start in 42 seconds.
- -159 dBm sensitivity in tracking mode
- NMEA0183 compliant protocol
- Extreme fast TTFF at low signal level

Applications

- Automotive
- Personal/Portable Navigation (PDA)
- Geographic Surveying
- Sports and Recreation
- Marine Navigation
- Fleet Management
- AVL and Location-Based Services

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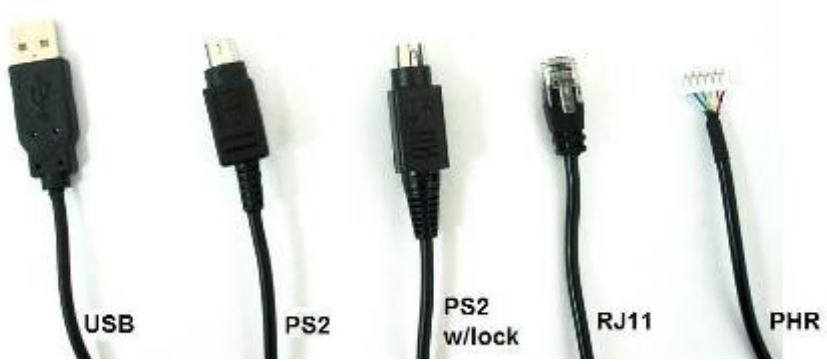
Specifications

General		Accuracy	
GPS Chip	SiRF Star III LP chipset	Position	
Frequency	L1, 1575.42MHz	10 meters, 2D RMS 7 meters 2D RMS, WAAS corrected 1-5 meters, DGPS corrected	
C/A Code	1.023MHz chip rate		0.1 m/sec
Channels	20 CH	Time	1ms synchronized to GPS time
		Datum	
Sensitivity		WGS-84	
To – 159Bm Tracking, Superior Urban Canyon Performance		**Dynamic Conditions**	
		Altitude	<18,000 m (60,000 feet)
Acquisition Rate		Velocity	<515 m/sec (1,000 knots)
Cold Start	35 sec, average	Acceleration	<4g
Warm Start	35 sec, average	Motional Jerk	<20 m/sec
Hot Start	1 sec, average	**GPS Protocol**	
Reacquisition	0.1sec, average	Default: NMEA-0183, GGA(1), GSA(1), GSV(5), RMC(1), Band rate 38400 bps, Data bit : 8, stop bit : 1	
Accuracy	Snap start 2 sec, average		
Power			
Operation Power	5.0 VDC+10%		
Current Consumption	40mA	**Device Size**	
		41.0x36.0x15.0 mm	
Environmental			
Operating Temperature	- 40 ℃ to + 85 ℃	**Water Proof**	
Relative Humidity	5% to 95% non-condensing	IPX6	

Hardware Interface

The Mars700Mini-TMC includes an antenna in a unique style waterproof gadget. We can manufacture four kinds of connector cable to suit your demands.

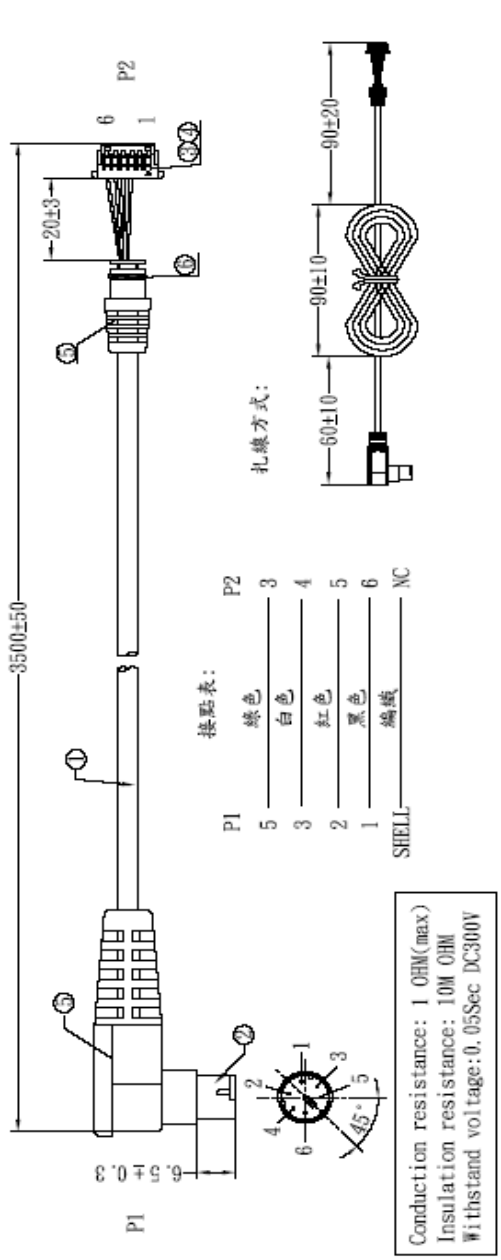


Data Cable

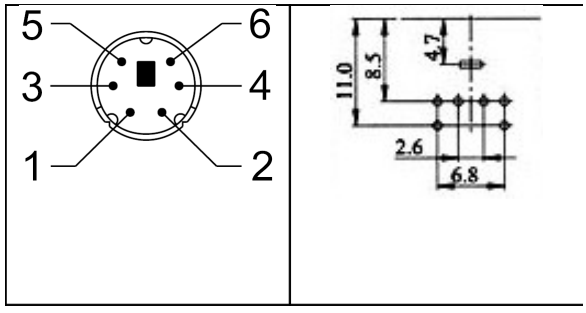
TMC Antenna

Mars700Mini-TMC Standard PIN OUT

- Pin Assignment of standard PS2 male Din Jack (figure 1)



Item	料號	Name & Description	Q'ty	UNIT
1	CABLE	UL 2725 28#*4C(ID:0.65mm)+AE(7/0.12BC)B(80/0.12铝镁丝) OD:3.5mm 黑色外被有印字 线线长:3515mm	1	PC
2	035-06 0-1	MINIDIN 公頭 : 6PIN 公頭 焊線式 鎳殼鍍鎳,端子鍍金 高插拔力	1	PC
3	051HX-1*6PX-1.0	HOUSING: A1001H-6P PH:1.0mm 白色	1	PC
4	050TX-PB-NI-1.0	TERMINAL:A1001-TPE PH:1.0mm	6	PC
5	PVC-M-65-BK001	成型外模料:黑色 55P PVC	8	g
6	套管	暗红色 环形 胶圈 密封圈 内径*外径:5.1*7.1mm	1	PC



Pin	Signal
1	GND
2	+5V
3	NC
4	TMC+GPS_TTL_RX
5	NC
6	TMC+GPS_TTL_TX

TMC baud rate 38400, GPS Baud rate 4800

Appendix A: NMEA output message

NMEA-0183 Output Messages

NMEA Sentence	***Description***
GGA **(default)**	Global Positioning System Fixed Data
GLL	Geographic Position - Latitude/Longitude
GSA **(default)**	GNSS DOP and Active Satellites
GSV **(default)**	GNSS Satellites in View
RMC **(default)**	Recommended Minimum Specific GNSS data
VTG	Course Over Ground and Ground Speed
ZDA	Time and Date

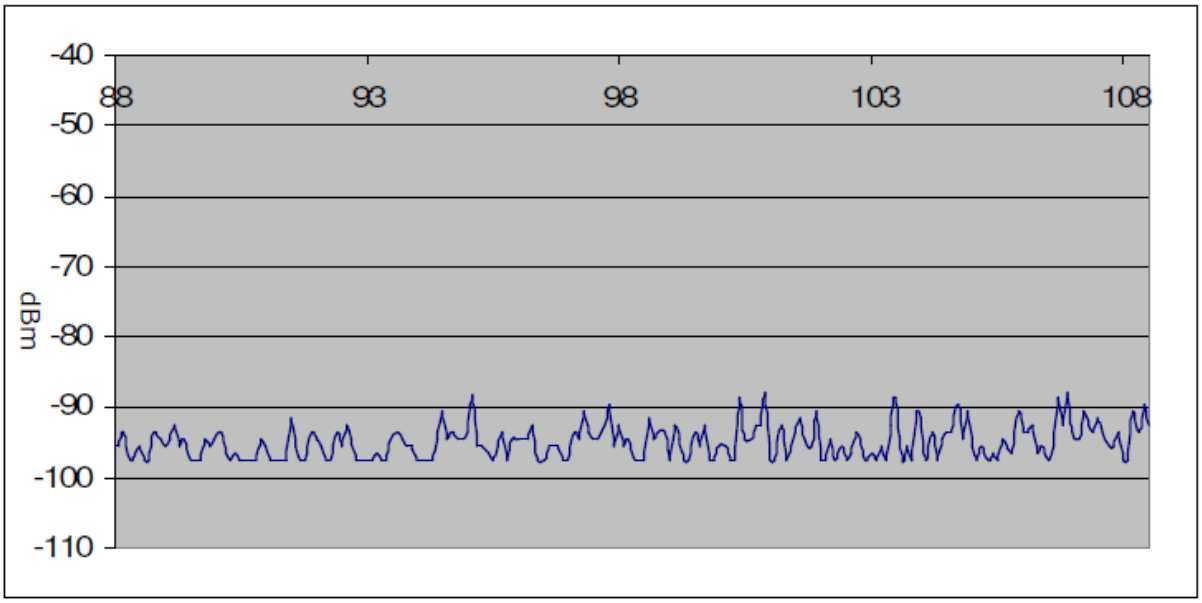
The detail information please refers to SSFXXXX series GPS module NMEA protocol reference manual.

The baud rate only supports 38400 bps. The NMEA message combines with TMC message output.

RDS Performance Diagram

Diagram shows RDS sensitivity vs frequency. specification under following conditions:

1. RF fed via coupled wire
2. RDS modulation is 3.3kHz
3. Criterion for RDS sensitivity is : 50% correct (no error) RDS groups



Application Note

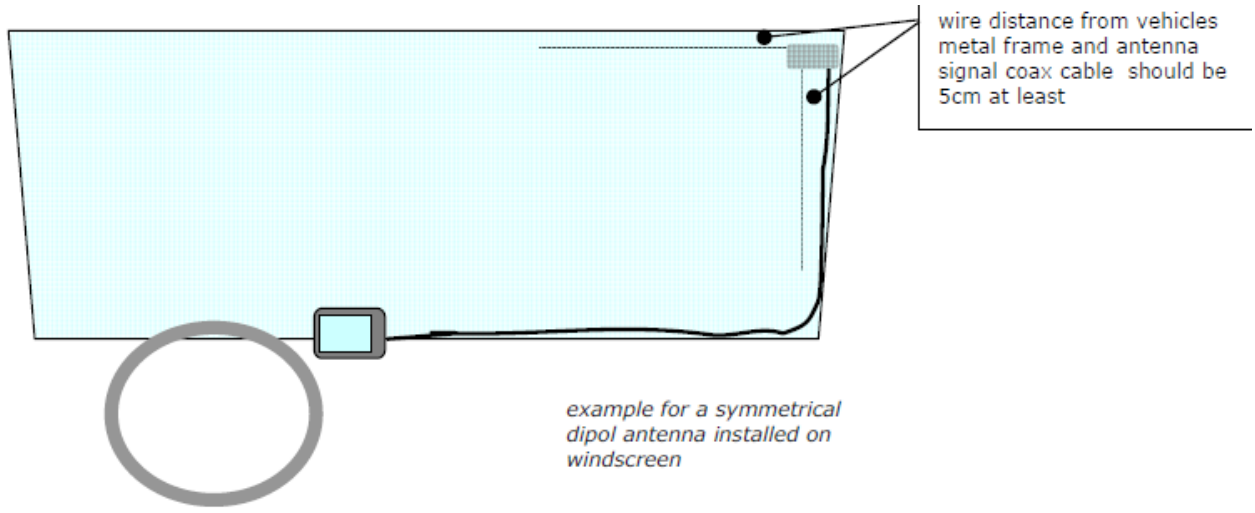
STARTUP TIMING

Due to internal circuitry self test and firmware initialization, setup delay time after power up as specified under electrical data has to be respected by driving software. Delay time has to be kept after power has stabilized before issueing the first command.

Especially in case of software controlled power supply for TC5000 , you should take care to implement a delay in software.

IMPROVED ANTENNA DESIGNS

Instead of using the Y-adaptor, improved antenna designs can be used to enhance the signal to noise conditions and to have an improved RDS performance. Symmetrical dipol antennas are a good approach and will be available soon. Due to their construction, mounting on the windscreen will be a little bit more complicated than for the wire antenna.



NON-PROMISING CONCEPTS

length of the two receiving wires is 50cm

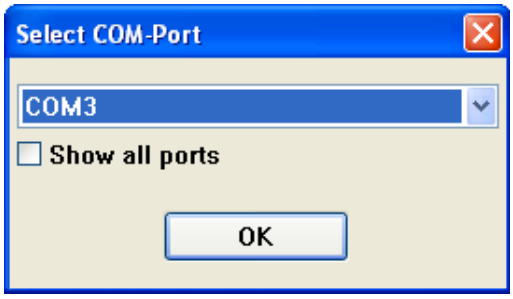
Customers often do not like a long wire antenna which is attached to the windscreen. Therefore, everyone wants to have a very small or wound antenna, that should be integrated inside the PNA housing best.
This approach will only work in strong signal environments and should not be promoted as the only antenna solution for a product.
The idea of just adding a LNA/MMIC (low noise amplifier) to have a better signal is not helpful in that situation. The small antenna will not be able to produce sufficient S/N ratio.
The result of amplification will be a higher level with higher noise…
Indeed, there is no reason for additional amplifiers, because input sensitivity of GNS TMC receivers is already very high. Under clean condition a level of below 5uV is sufficient to decode RDS data.

Another known but not satisfying idea is integration of antenna into the data/charging cable of a device. this concept will have the following shortcomings:

1. The capacitive coupling between antenna and other wires will cause a low impedance and energy loss for the FM signal
2. Normally, on charger wires there are strong noises from switching mode DC/DC converters. This noise will be caught by the antenna wire which is very near to that source of noise
3. possible harmonics of the serial data lines will also have an noise impact.
4. In most cases, the charger cable will be installed in a low position inside the vehicle. FM fields are not strong and very dependent of driving direction.
5. The charger cable cannot be kept straight and vertically, because it will be always too long. Straight and nearly vertically mounting is an important issue for FM antenna performance. A curled cable that is placed in curves has an undefinable behaviour regarding the Rf.

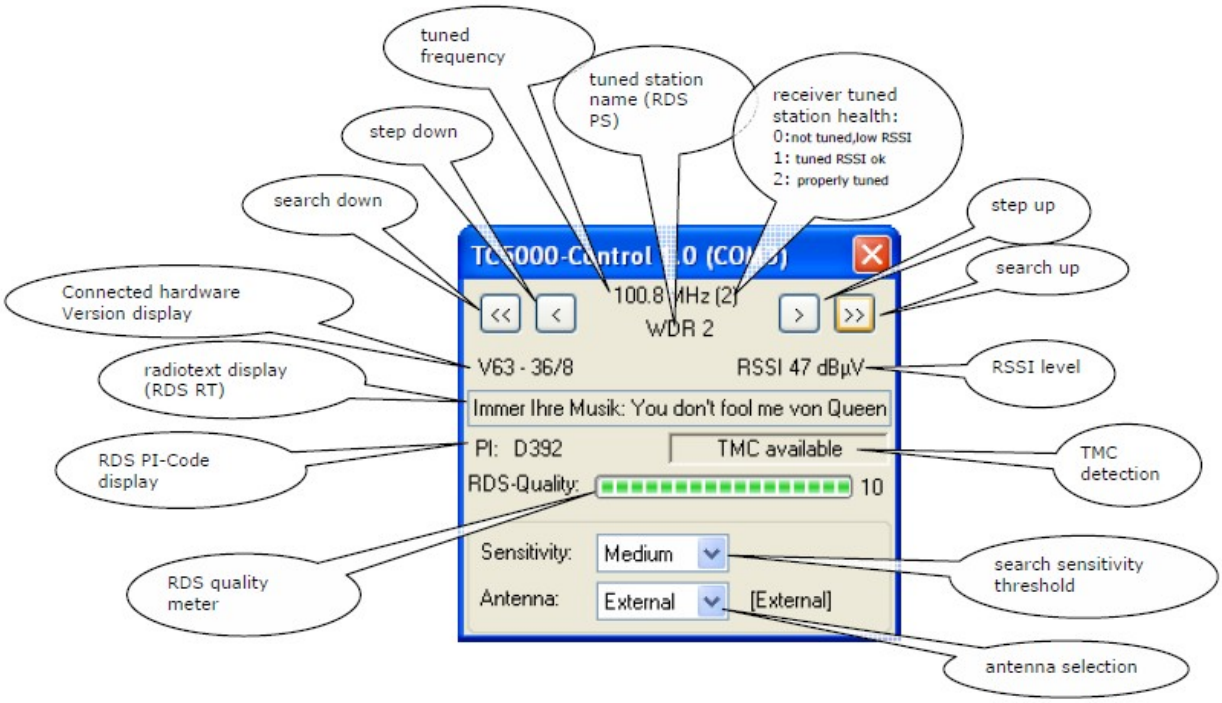
Test Software

1. Double Click on the test file symbol or link to start the application.
2. A window will open to define the correct COM port .



3. Please select the correct COM port where the Mars700Mini-TMC is connected.
4. Click OK Button to confirm selection
5. The application window will come up

During power up, the serial communication is tested. If serial connection fails (fe. if a cable is missing or the COM port selection is not correct), you will not see the Version information.



Now you are ready to test all functionality of Mars700Mini-TMC

1. By default, Mars700Mini-TMC is configured to internal (on board) oscillator option and analog

audio output with full level.

2. Select or search to the desired receiver frequency by the upper tune buttons.

3. After having stopped on a valid FM RDS station , you will be able to readout RSSI, RDS quality, TMC availability, PICode.

4. Now you are ready to do your own testing steps.

Table of output fields.

item	explanation
tuned frequency	the tuned frequency will be shown
receiver tuned station health	This number represent the "health" of the currently tuned station. This value represents the result of tuning process and will not be modified when already tuned. 0 indicates no station found on this frequency 1 indicates station found , RSSI is valid 2 indicates properly tuned
tuned station name	This is the RDS Group 0 PS data which represents the name of an RDS staion. For some commercial programmes, the text will be dynamically modified to display information or advertisements
Connected hardware version display	This information displays the connected TMC firmware version. (Version and release date code)
RSSI level	Displays the currently received fieldstrength in dBuV. Please note, that a high RSSI is not a guarantee for a good signal quality !
radiotext display	Radiotext is derived from RDS Group2. It will take some time (15..30 secs) until the Radiotext is completely received and displayed. Note : Many radio stations do NOT broadcast any radiotext, so the field will stay empty.
RDS PI-Code display	The PI Code is an unique identifier of a RDS radio station. The first digit (the "D" in above figure) is the Country Code which indicated the location of the broadcast
TMC detection	This field will change to "TMC available" if the received radio programme broadcasts TMC data. Note: It is not an indicator for the attached hardware ability!
RDS quality meter	The RDS quality value is determined by the ratio between the decoded count of groups per second and the possible count of groups per second. The possible count of groups is fixed ba RDS system to 11.3 Groups per second.
search sensitivity threshold	The search sensitivity can be selected to adopt the tuning behaviour to the current situation. The search sensitivity does NOT modify the receiver sensitivity, it just modifies the threshold for stopping a search tune !

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