MT3318 GPS Receiver for Fire Bird VI

Figure 1: MT3318 GPS receiver

Introduction

GPS Receiver MT3318 Module is based on the MediaTek MTK MT3318 chipset. It has active patch antenna from Cirocomm. It can track 51 satellites simultaneously. GPS receiver is mounted on the PCB along with the 3.3V low drop voltage regulator, transmit, receive and power indication LEDs, MAX232 RS232 serial interface.

This GPS receiver gives data output in standard NMEA format with update rate of 1 second at 9600 bps. Receiver has onboard battery for memory backup for quicker acquisition of GPS satellites. Module can directly work on 5V supply and can be interfaced at RS232 logic level.

The Documentation CD contains GPS Cockpit GUI software which displays logged GPS data in graphical way and even provides statistical information such latitude, longitude, UTC, No. of Satellites locked etc. on PC. For interfacing this module with the PC you you will need USB to RS232 serial converter.

Specifications

- Supply: 5V, 40mA,
- Built in RTC power battery (3V) for location data retention
- Chipset: MTK MT3318
- Antenna: High gain GPS patch antenna from Cirocomm
- Data output: CMOS UART interface at 3.3V
- Protocol: NMEA-0183@9600bps (Default) at update rate of 1 second.
- Protocol message support: GGA, GSA, GSV,RMC, VTG
- No. of Satellite simultaneously tracked: 51
- Tracking Sensitivity: On-module antenna : -157 dBm
- Position Accuracy : <3 m
- Max. Update Rate：5Hz (Default: 1 Hz)
- Time to First Fix (Open sky and stationary position)
    - Obscuration recovery: 0.1 second average
    - Hot start: <1 seconds average
    - Warm start: <34 seconds average
    - Cold start: <36 seconds average
- GPS Receiver Size: 30mm x 54mm
- Onboard 3.3V low drop voltage regulator

Interfacing GPS receiver with the robot:

GPS receiver has two wires. Wire with 2 pin 2510 relimate connector is used for providing 5V supply. Wire with DB9 serial connector is used for connection with the UART of the main microcontroller.

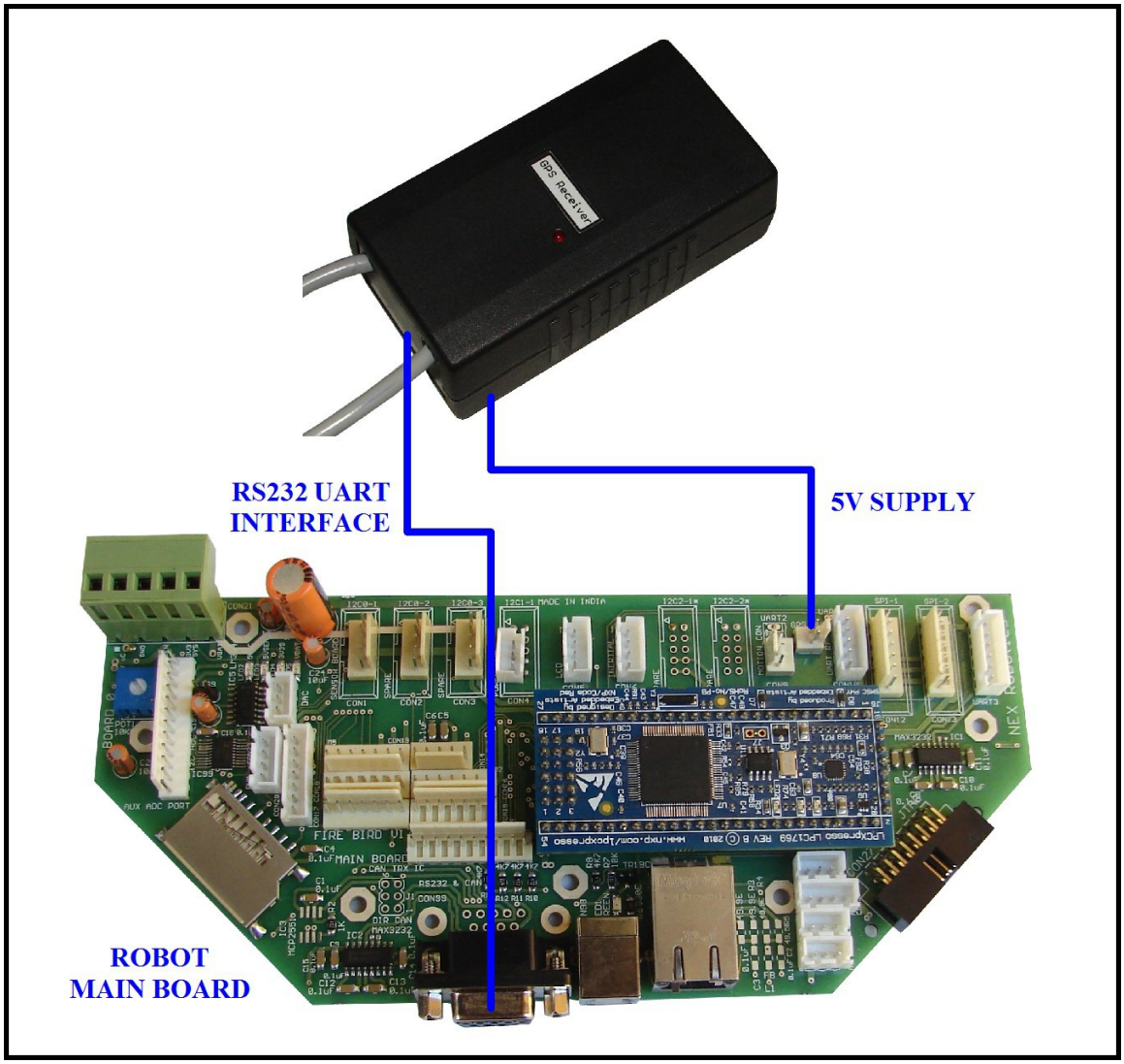

Figure 2: MT3318 GPS receiver interfacing with the robot

Application Example:

Application example for the GPS interfacing is located in the folder "Experiments" in the documentation CD. While running the application example, ensure that serial LCD, GPS power cable and GPS RS232 data cable is connected with the robot.

After turning on the robot keep it in the open area for few minutes. For the 1st time GPS receiver will take some time for getting position fix. After that GPS receiver will acquire position fix relative quicker. When GPS receiver lock the position it displays "FIX = 1" on the LCD display. Figure 3 shows the GPS receiver in correct position fix.

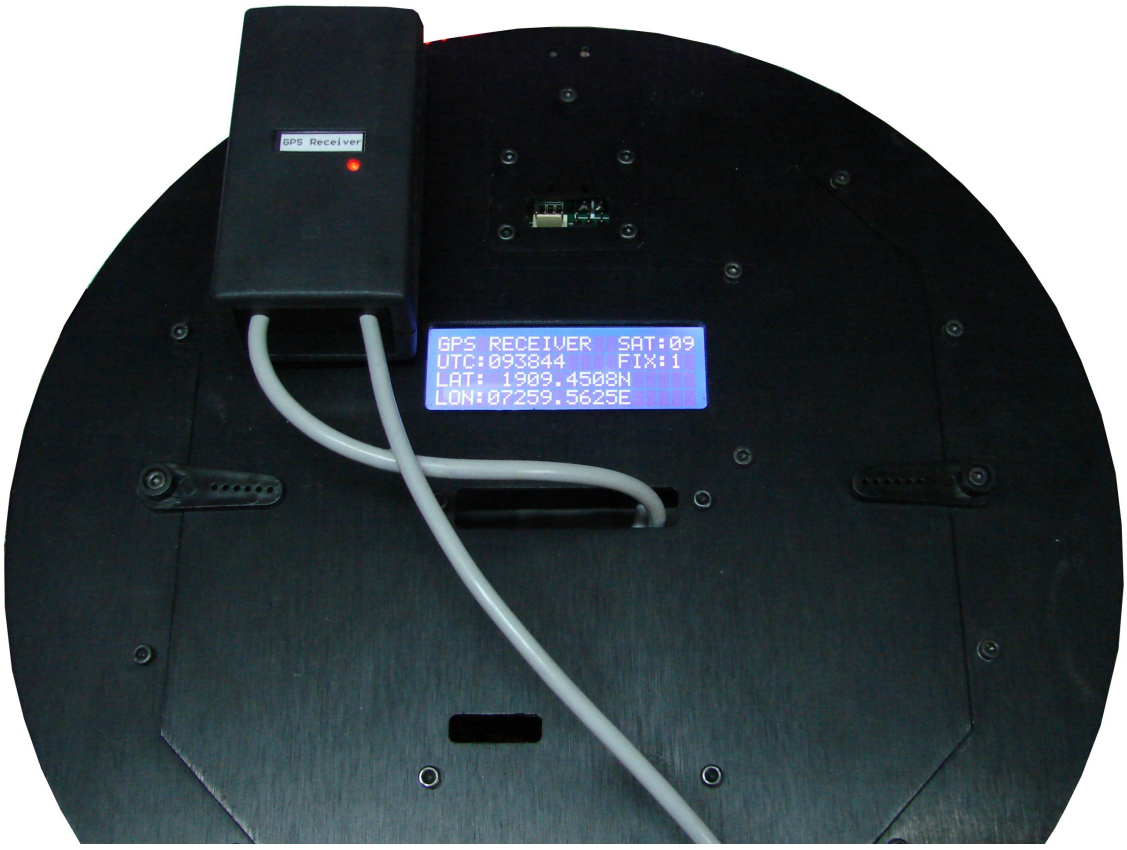

Figure 3: GPS interfacing application example

Acquiring GPS data on the PC:

You can also acquire GPS data on the PC. This is more useful if you have onboard PC and wish to acquire GPS signal on the PC directly. You can connect RS232 serial connector of the GPS receiver directly to the PC's serial port or use USB to RS232 serial converter. Insure that GPS receiver gets 5V supply when its interfaced with the PC.

Following example shows the GPS data acquisition on the PC using terminal software from the NEX Robotics.

If you are using Serial terminal from NEX Robotics then follow bellow steps

Step1: Install the terminal software from NEX Robotic on the PC which is located in the documentation CD.
Step 2: Select COM Port in serial terminal setting column.
Step 3: Set Baud rate to 9600
Step 4: Set parity to none, Data bits to 8 and stop bits to one.
Step 5: click on connect button for connection

Connecting GPS module with the PC:

Connect GPS module with the PC using Serial port or via USB to RS232 serial converter.

Note:
If you are using USB to Serial Converters from NEX Robotics then for installing drivers, refer to the respective product manuals.

GPS data accusation on the PC:

When GPS module inside the room:

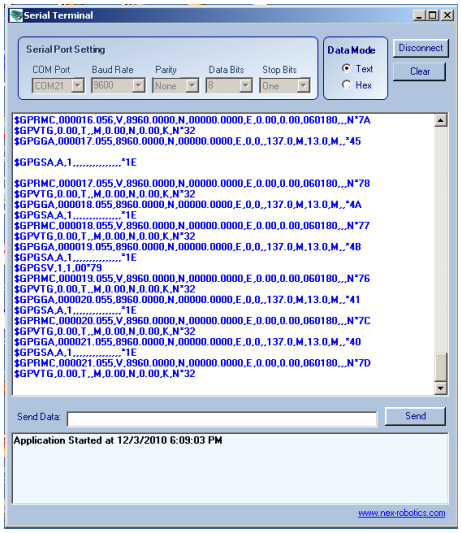

Figure 4: GPS data display on the terminal if GPS receiver is not receiving signal

Figure 4 shows data when GPS module inside the room. You will not get any data also it will not detect any satellite inside the room.

When GPS module outside the room:

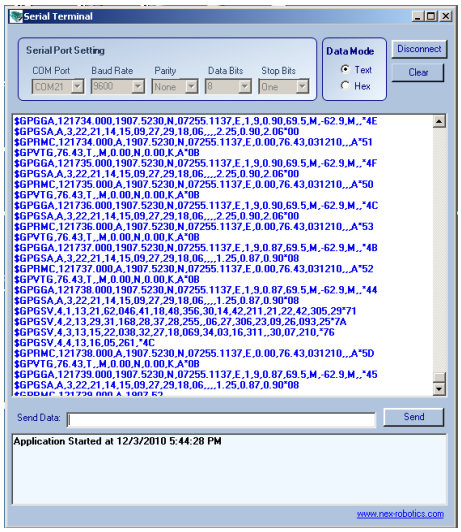

Figure 5

Figure 5 shows data when GPS module outside the room. You will get perfect data in NMEA-0183 format at 9600bps.

You can also use GPS Cockpit software to see GPS Data on PC

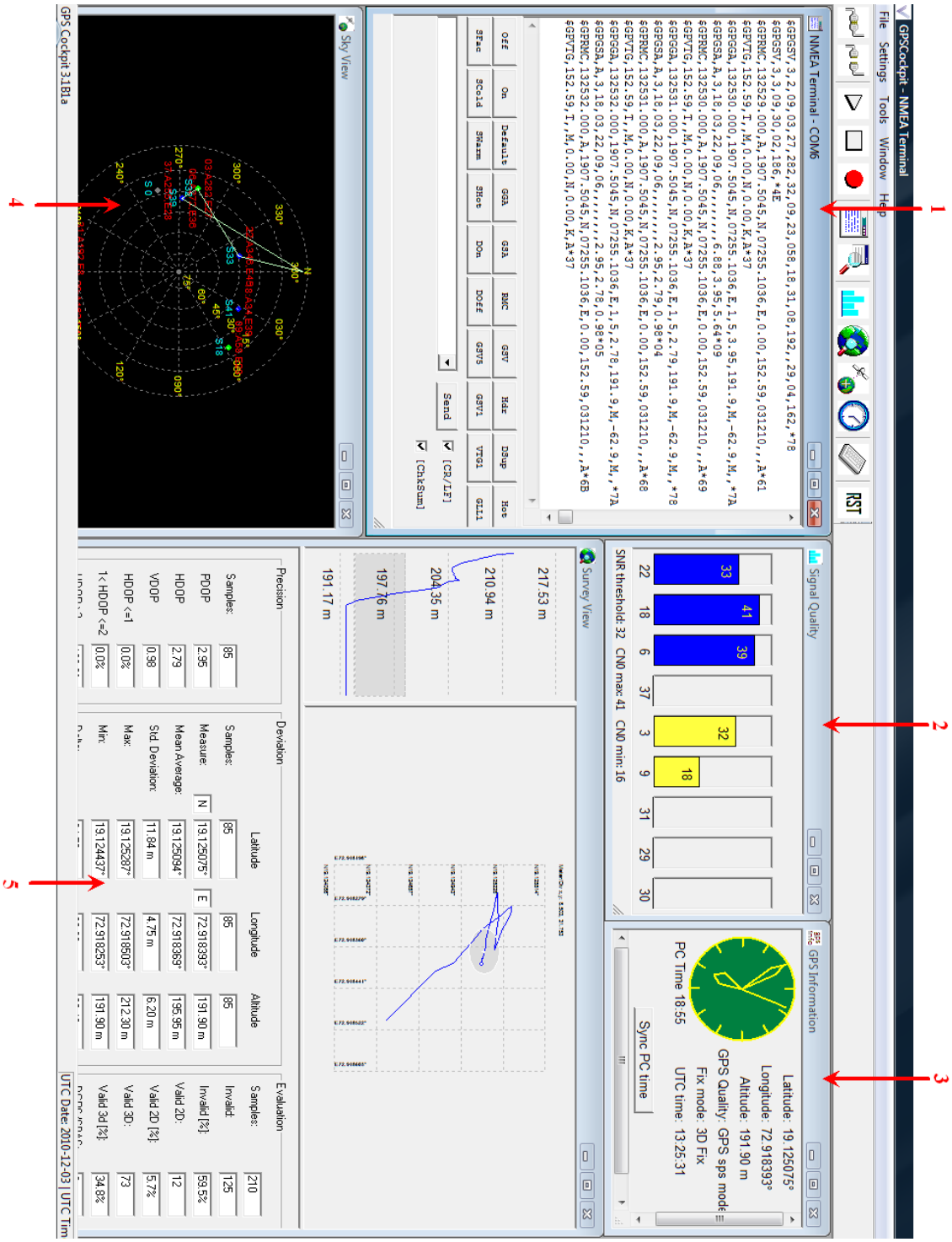

Figure 6

GPS Cockpit software is a good software for GPS data observation. It shows GPS data in different windows. You can directly get latitude and longitude on GPS information window, you can also find out distance between two points in survey window. In signal quality window displays the signal to noise ratio or carrier to noise. You can also see satellite position in sky view window. All other important GPS data you can see it on NMEA terminal window.

Install the GPS Cockpit software on the PC which is located in the documentation CD.
First Set com port and baud rate 9600 in sitting option. Then click *Play NMEA file* option

Figure 8 shows NMEA cock pit terminal window it having
1:- NMEA Terminal window
2:- Signal quality window
3:- GPS information window
4:- Sky view window
5:- Survey view window

For more information about Cockpit software you can Refer GPS Cockpit user manual located in the documentation CD.

NMEA protocol explanation:

1: GPGGA - Global Positioning System Fix Data
2: GPGSA - GPS DOP and active satellites
3: GPGSV - GPS Satellites in view
4: GPRMC: Recommended minimum specific GPS/Transit data
5: GPVTG: Track Made Good and Ground Speed.

GPGGA: Global Positioning System Fix Data

Name	Example Data	Description
Sentence Identifier	$GPGGA	Global Positioning System Fix Data
Time	170834	17:08:34 Z
Latitude	4124.8963, N	41d 24.8963' N or 41d 24' 54" N
Longitude	08151.6838, W	81d 51.6838' W or 81d 51' 41" W
Fix Quality: - 0 = Invalid - 1 = GPS fix - 2 = DGPS fix	1	Data is from a GPS fix
Number of Satellites	05	5 Satellites are in view
Horizontal Dilution of Precision (HDOP)	1.5	Relative accuracy of horizontal position
Altitude	280.2, M	280.2 meters above mean sea level
Height of geoid above WGS84 ellipsoid	-34.0, M	-34.0 meters
Time since last DGPS update	blank	No last update
DGPS reference station id	blank	No station id
Checksum	*75	Used by program to check for transmission errors

Courtesy of Brian McClure, N8PQI.

Global Positioning System Fix Data. Time, position and fix related data for a GPS receiver.

eg2. $--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx

hhmmss.ss = UTC of position
llll.ll = latitude of position
a = N or S

yyyyy.yy = Longitude of position
a = E or W
x = GPS Quality indicator (0=no fix, 1=GPS fix, 2=Dif. GPS fix)
xx = number of satellites in use
x.x = horizontal dilution of precision
x.x = Antenna altitude above mean-sea-level
M = units of antenna altitude, meters
x.x = Geoidal separation
M = units of geoidal separation, meters
x.x = Age of Differential GPS data (seconds)
xxxx = Differential reference station ID

eg3. $GPGGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
1 = UTC of Position
2 = Latitude
3 = N or S
4 = Longitude
5 = E or W
6 = GPS quality indicator (0=invalid; 1=GPS fix; 2=Diff. GPS fix)
7 = Number of satellites in use [not those in view]
8 = Horizontal dilution of position
9 = Antenna altitude above/below mean sea level (geoid)
10 = Meters (Antenna height unit)
11 = Geoidal separation (Diff. between WGS-84 earth ellipsoid and mean sea level. -=geoid is below WGS-84 ellipsoid)
12 = Meters (Units of geoidal separation)
13 = Age in seconds since last update from diff. reference station
14 = Diff. reference station ID#
15 = Checksum

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GPGSA: GPS DOP and active satellites

eg1. $GPGSA,A,3,,,,,,16,18,,22,24,,,3.6,2.1,2.2*3C
eg2. $GPGSA,A,3,19,28,14,18,27,22,31,39,,,,,1.7,1.0,1.3*35

1 = Mode:
M=Manual, forced to operate in 2D or 3D
A=Automatic, 3D/2D
2 = Mode:
1=Fix not available
2=2D
3=3D

3-14 = IDs of SVs used in position fix (null for unused fields)
15 = PDOP
16 = HDOP
17 = VDOP

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GPGSV :GPS Satellites in view

eg. $GPGSV,3,1,11,03,03,111,00,04,15,270,00,06,01,010,00,13,06,292,00*74
$GPGSV,3,2,11,14,25,170,00,16,57,208,39,18,67,296,40,19,40,246,00*74
$GPGSV,3,3,11,22,42,067,42,24,14,311,43,27,05,244,00,,,,*4D
$GPGSV,1,1,13,02,02,213,,03,-3,000,,11,00,121,,14,13,172,05*67

1 = Total number of messages of this type in this cycle
2 = Message number
3 = Total number of SVs in view
4 = SV PRN number
5 = Elevation in degrees, 90 maximum
6 = Azimuth, degrees from true north, 000 to 359
7 = SNR, 00-99 dB (null when not tracking)
8-11 = Information about second SV, same as field 4-7
12-15= Information about third SV, same as field 4-7
16-19= Information about fourth SV, same as field 4-7

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GPRMC: Recommended minimum specific GPS/Transit data

eg1. $GPRMC,081836,A,3751.65,S,14507.36,E,000.0,360.0,130998,011.3,E*62
eg2. $GPRMC,225446,A,4916.45,N,12311.12,W,000.5,054.7,191194,020.3,E*68

225446 Time of fix 22:54:46 UTC
A Navigation receiver warning A = OK, V = warning
4916.45,N Latitude 49 deg. 16.45 min North
12311.12,W Longitude 123 deg. 11.12 min West
000.5 Speed over ground, Knots
054.7 Course Made Good, True
191194 Date of fix 19 November 1994
020.3,E Magnetic variation 20.3 deg East

*68 mandatory checksum

eg3. $GPRMC,220516,A,5133.82,N,00042.24,W,173.8,231.8,130694,004.2,W*70
1 2 3 4 5 6 7 8 9 10 11 12

1 220516 Time Stamp
2 A validity - A-ok, V-invalid
3 5133.82 current Latitude
4 N North/South
5 00042.24 current Longitude
6 W East/West
7 173.8 Speed in knots
8 231.8 True course
9 130694 Date Stamp
10 004.2 Variation
11 W East/West
12 *70 checksum

eg4. $GPRMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a*hh
1 = UTC of position fix
2 = Data status (V=navigation receiver warning)
3 = Latitude of fix
4 = N or S
5 = Longitude of fix
6 = E or W
7 = Speed over ground in knots
8 = Track made good in degrees True
9 = UT date
10 = Magnetic variation degrees (Easterly var. subtracts from true course)
11 = E or W
12 = Checksum

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GPVTG: Track Made Good and Ground Speed.

eg1. $GPVTG,360.0,T,348.7,M,000.0,N,000.0,K*43
eg2. $GPVTG,054.7,T,034.4,M,005.5,N,010.2,K

054.7,T True track made good
034.4,M Magnetic track made good
005.5,N Ground speed, knots

010.2,K Ground speed, Kilometers per hour

eg3. $GPVTG,t,T,,,s.ss,N,s.ss,K*hh
1 = Track made good
2 = Fixed text 'T' indicates that track made good is relative to true north
3 = not used
4 = not used
5 = Speed over ground in knots
6 = Fixed text 'N' indicates that speed over ground in in knots
7 = Speed over ground in kilometers/hour
8 = Fixed text 'K' indicates that speed over ground is in kilometers/hour
9 = Checksum

The actual track made good and speed relative to the ground.

$--VTG,x.x,T,x.x,M,x.x,N,x.x,K
x.x,T = Track, degrees True
x.x,M = Track, degrees Magnetic
x.x,N = Speed, knots
x.x,K = Speed, Km/hr

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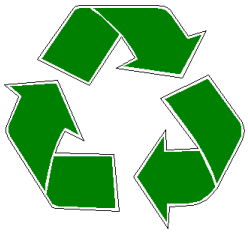
Important:

User must go through hardware and software manuals before using robot and its accessories.

The contents of this manual are subject to change without notice. All efforts have been made to ensure the accuracy of contents in this manual. However, should any errors be detected, NEX Robotics welcomes your corrections. You can send us your queries / suggestions at
info@nex-robotics.com

- **Robot's electronics is static sensitive. Use robot in static free environment.**
- **Read the Robot's manual completely before start using this robot**



Recycling:

Almost all of the robot parts are recyclable. Please send the robot parts to the recycling plant after its operational life. By recycling we can contribute to cleaner and healthier environment for the future generations.

MT3318 GPS receiver Interfacing with Fire Bird VI robot