Aster GPS Installation & User Manual ver 1.0

Hardware Installation

Follow these steps to install & run the Aster GPS receiver on PC or Laptop.

Step1:

Check the package for the following items
- Aster GPS Receiver unit
- Active antenna (magnetic base) with SMA connector at one end
- RS 232 cable with 9 pin D-type connectors
- Power supply adaptor 9VDC/1Amp.

Step 2:

Apart from the above, the user will also need the following to set up the receiver:
- IBM compatible Notebook PC or desktop
- Hyperterminal or equivalent serial data capture program

Step 3:

Connect the Aster GPS Receiver to the Notebook PC through the RS 232 cable.

Step 4:

Fix the supplied antenna on a metallic surface which is horizontal and smooth. If you are placing the antenna on the top of your car, you may use a small piece of paper underneath the antenna. This will prevent any possible scratches on your car due to the magnetic antenna mount.
The location of the antenna should be so chosen that it has a clear view of the sky.

Step 5:

Connect the antenna cable with the SMA connector to Aster GPS receiver unit. **Route the cable in such a way that it does not get jammed through the doors or window panes**. Ensure the SMA connector is properly connected at the receiver end.

Step 6:

Power the Aster GPS receiver from the supplied 9V DC Power Supply cable. The Power indicator LED on the front of the receiver glows.

Step 7:

Power and boot your Notebook PC.

Step 8:

Configure the com port as follows:

Select COM port to which the GPS receiver is connected.
Set Baud rate = 9600 (default),
Set Stop bits = 1,
Set Data bits = 8,
Set Parity = None

Status bar indicates **Connected** if Power supply and RS232 connections are correct. The GPS statements will appear on the screen. Valid data will start filtering in after 2-3 minutes of connection. (See statement details later in the manual)

Custom ASCII Message Format

Custom ASCII Messages can be used to send different commands to the receiver.

Input Messages are of the form **$AC*MSG*,*data***CS*<CR><LF>** where,

$AC is the message header.
MSG is the message identifier.
data is message data.
* is optional checksum delimiter

If * is transmitted, Check Sum(***CS***) should also be transmitted.
If * is not transmitted, ***CS*** should not be sent.
CR is carriage return.
LF is line feed.

It is recommended that for error free transmission, ***CS*** is sent along with the message.
CS should include all characters except **$** ***[CR]*** and ***[LF]***

Sending an ASCII command stream

Any serial communication software can be used to command the receiver with an ASCII stream. Most commonly used software such as Windows 3.1 Terminal and the Windows Hyper Terminal also can be used.

Following steps will illustrate the procedure to transmit an ASCII stream.

1. Type in the ASCII stream in a file opened in any text editor. The command line should be terminated with a carriage return (press <ENTER> key after the command line).

2. Invoke Terminal / Hyper Terminal.

3. Correctly set the Serial port parameters. Refer to the beginning of manual for details.

4. Send the text file with the ASCII stream after appending the Line feed.

If you are using Window's Hyper Terminal, you can append the Line feed from *File/Properties/Settings/ASCII Setup/ASCII Sending*.

If the receiver baud rate has been changed, the Communication port settings on Terminal or Hyper Terminal have to be accordingly changed. The command to change the baud rate back to 9600 has to be transmitted with the same configuration.

ASCII input messages

Receiver Configuration Messages

Cold start message:

$ACCSM*_CS_<_CR_><_LF_>

This message is used to force the receiver to cold start. Almanac, ephemeris and position in the receiver are invalidated. The receiver starts collecting data afresh without using any previously stored estimates. EEPROM and RTC are not cleared but information from them is not used. Message configuration such as COM port settings is not changed.

Warm start message

$ACWSM*_CS_<_CR_><_LF_>

This message is used to force the receiver to warm start. In response to this message, receiver will start afresh by ignoring the ephemeris data stored in the EEPROM. If almanac and time are present in the receiver along with the estimate of user position, the receiver will enter warm start. Message configuration such as COM port settings is not changed.

Hot start message

$ACHSM*_CS_<_CR_><_LF_>

This message is used to force the receiver to hot start. In response to this message, receiver will start afresh. If almanac, time, ephemeris and estimate of user position is available, receiver will enter hot start. Message configuration such as COM port settings is not changed.

Set HCOM port

$ACHCM , a , n , s , p *CS<CR><LF>
This message is used to set the baud rate of the HCOM port.

a 0->300 , 1->600 , 2->1200 , 3->2400 , 4->4800 , 5->9600, 6->19200
n Number of start bits (0->1, 1->2)
s Number of stop bits (0->1, 1->2)
p Parity (0-> no parity, 1-> odd parity, 2-> even parity)

The change in port setting will be effective after about 250msec. The data type currently supported is only 8 of 8 format. Change in Start bits and Parity bits are not supported.

Set Output messages

$ACMCC , a , nn *CS<CR><LF>

This message is used to control the ON/OFF of various NMEA and binary messages.

a	Message Index
0	ZDA
1	GGA
2	GLL
3	RMC
4	GSA
5	GSV
6	VTG
A	All messages

Remaining alphabets are reserved.

Nn	Rate of message transmission
00	Message/mode is switched OFF
01	Once a second,
02	Once in 2 seconds,
03	Once in 3 seconds.

Values of **nn** range from **0** to **255** (i.e. **0x0** to **0xFF)**.

Messages to be enabled based on the baud rate.

Set Mask angle

$ACMSA , saa*CS<CR><LF>

This message is used to set the elevation mask angle of the receiver.

Saa +90 to -90 degrees.

All satellites below the specified mask angle are not programmed in the channels and the satellites, which are already tracking, are not used for position computation. In case the number of visible satellites above the mask angle is less than 3, the receiver ignores the mask angle and uses all the available satellites. The mask angle will be used only after the receiver has obtained fix, time and almanac.

Set Datum number

$ACDAT , aaa *CS<CR><LF>

This message is used to set the datum number.

aaa Values from 000-188.

The geodetic position is likely to change once this message is given.

Receiver Configuration Message

$ACCFG ,x,n *CS<CR><LF>

where
n ON/OFF (**0**-> OFF , **1**-> ON)
x F,V,E where
F Position filter
V Velocity filter.
E Extrapolation request.

Other values of **x** and **n** are invalid.

Position filter: The raw position is filtered with velocity.
Velocity filter: If the speed is less than 1m/s, the speed is made zero and the position is held constant.
Extrapolation request: If enabled, at the loss of fix the position will be extrapolated with velocity for next 10 fixes.

DOP Configuration Message

$ACDOP,hh*CS<CR><LF>

where,
hh Horizontal DOP limit (**00** – **99**)
Note: If the computed HDOP is greater than the limit specified, fix will not be given.

Receiver Configuration Request Message

$ACREQ*CS<CR><LF>

In response to this message, the receiver generates a message $ACRCS only once indicating the receiver's present configuration.

ASCII output messages

Message Size
Messages should be enabled based on message size and baud rate. If total message size exceeds the bytes transmitted per second, messages may get corrupted.

The following table gives a break up of the message sizes.

Message	Max. Size in Bytes
GGA	81
GLL	47
GSA	66
GSV	70 per message
RMC	76
VTG	49
ZDA	35

The following table gives the maximum bytes that can be transmitted at different baud rates for different settings

The messages output by the receiver in different modes are given in table below.

Normal mode with fix update rate on 1 Hz

Output Message	Message Type	Condition
GPZDA	NMEA	Enabled by host
GPRMC	NMEA	Enabled by host
GPGSA	NMEA	Enabled by host
GPGGA	NMEA	Enabled by host
GPGLL	NMEA	Enabled by host
GPVTG	NMEA	Enabled by host
GPGSV	NMEA	Enabled by host

Standard NMEA Message Formats

NMEA 0183 interface protocol defines the communication interface and the data format for the navigation equipment. This chapter provides an overview of the NMEA messages supported in Aster GPS receiver.

General Information

The NMEA message structure is defined below.

$MSGID,dl,d2,d3,.....dn*_CS_[_CR_]{_LF_}

MSGID	5 character mnemonic identifying the message .e.g., GPGGA
d*n*	data field.
“ ,”	delimiters for the data fields
“*”	Check sum delimiter

Check sum calculation

Check sum (***CS***) of all NMEA messages are calculated by XORing for all fields excluding **$ *** [***LF***] [***CR***].

Aster GPS NMEA Messages

Setting	Message	Description
Factory Default	GGA	GPS Fix Data
Factory Default	GLL	Geographic Position
Factory Default	GSA	GPS DOP and active satellites
Factory Default	GSV	GPS Satellites in view
Factory Default	RMC	Recommended Minimum specific GPS/Transit data
Factory Default	VTG	Track made good and ground speed
Factory Default	ZDA	Time and date

UTC time will be transmitted only if almanac is available in the receiver. If almanac is not present in the receiver, GPS time will be transmitted. GPS time is ahead of UTC time by about 13 seconds as on June 2001. Once almanac is collected, UTC time is transmitted. Therefore there can be a jump of 13 seconds in time field of NMEA messages when the receiver switches from no almanac state to almanac available state.

NMEA message formats

GPZDA message

ZDA message contains UTC time, day, month, year and the local time zone.

$GPZDA , hhmmss . s ,dd , mm , yyyy ,aa, bb *_CS_<_CR_><_LF_>

Field Details

hhmmss.s	UTC time

hh 2 digits of hour.
mm 2 digits of minutes
ss.s 2 decimal digits and one fractional digit of second
dd 2 digits of day
mm 2 digits of month
yyyy 4 digits of year
aa Zonal Time offset in hours with respect to GMT. If the time offset is negative a "**-**" sign is padded before the hours field. This field is not updated.
bb Zonal Time offset in minutes with respect to GMT.
Sign is same as that of the hour field. This field is not updated.
* Check sum delimiter
CS Check sum

GPGGA message

The GGA message includes time, position fix and other position related information of GPS receiver.

$GPGGA , hhmmss . s , llll . llll , a , yyyyy . yyyy , b , q , nn , hh .h , aaaaa . a , M , sss .s , M , aa , aaaa *CS<CR><LF>

Field Details
hhmmss.s UTC time of position fix
hh 2 digits of hour.
mm 2 digits of minutes
ss.s 2 decimal digits and one fractional digit of second
llll.llll Latitude in **<**degree degree minutes minutes **.** minutes minutes minutes minutes**>** format
a **N** for North, **S** for South
yyyyy.yyyy Longitude in < degree degree degree minutes minutes minutes minutes minutes minutes **>** format
b **E** for East, **W** for west
q Quality indicator **0** -**>** No GPS, **1->** GPS, **2**->DGPS
nn Number of satellites in use
hh.h HDOP
aaaaa.a Altitude in meters, If altitude is negative "**-**" is padded before aaaaa.a
M Units of altitude **M ->** meters.
sss.s Geoidal separation in meters. If negative, "**-**" is padded before sss.s
M Units of geoidal separation in meters
Aa Age of DGPS data (Field valid only when the quality indicator is 2 DGPS)
Aaaa Station ID: **0**-**9999**. Valid only in DGPS fix mode.
***** Check sum delimiter
CS Check sum

GPGLL message
This message includes latitude, longitude, time of position fix and the status information

$GPGLL , llll . llll , a , yyyyy . yyyy , b , hhmmss . s , c *CS<CR><LF>

Field Details

llll.llll	Latitude in <degree degree minutes minutes **.** minutes minutes minutes minutes> format
a	**N** for North, **S** for South
yyyyy.yyyy	longitude in < degree degree degree minutes minutes . minutes minutes minutes minutes >format
b	**E** for East, **W** for west
hhmmss.s	UTC time of position fix.
hh	2 digits of hour.
Mm	2 digits of minutes
ss.s	2 decimal digits and one fractional digit of second
c	**A** -> position is available. **V** -> position is not available
*	Check sum delimiter
CS	Check sum

GPRMC message

This message includes time, date, position and speed information from the GPS receiver

$GPRMC , hhmmss . s , A , llll . llll , a , yyyyy . yyyy , b , ssss . ss , hhh . hh , ddmmyy , mm . m , d *CS<*CR*><*LF*>

Field Details

hhmmss.s	UTC time of position fix
hh	2 digits of hour.
Mm	2 digits of minutes
ss.s	2 decimal digits and one fractional digit of second
A	**A** -> position is available. **V** ->position is not available.
llll.llll	Latitude in <degree degree minutes minutes. Minutes minutes minutes minutes **>** format`
a	**N** for North, **S** for South
yyyyy.yyyy	Longitude in < degree degree degree minutes minutes . minutes minutes minutes minutes> format
b	**E** for East, **W** for west
ssss.ss	Speed over ground in Knots
hhh.hh	Heading in degree with respect to true north
ddmmyy	<day day month month year year>
mm.m	Magnetic variation in degree This field is not valid
d	Direction of magnetic variation, This field is not valid
*	Check sum delimiter
CS	Check sum

GPGSA message

This message indicates the satellite used for navigation, DOP values of the position fix

$GPGSA , a , m , s1 , s2 , s3 , s4 , s5 , s6 , s7 , s8 , s9 , s10 , s11 , sl2 , pp . p , hh . h , vv .v *CS<CR><LF>

Field Details

A Mode could be manual or automatic
A Automatic mode. In this mode the receiver automatically switches between 2D and 3D mode depending on the PDOP and satellite masks.
M Manual mode. In this mode the receiver is forced to operate in either 2D or 3D mode.
M Mode **1** -> Fix not available, **2 ->** 2D position fix, **3**-> 3D position fix.
sl....sl2 PRN number of the satellites used for position fix. If less than 12 satellites are used, null in unused fields
pp.p PDOP
hh.h HDOP
vv.v VDOP
* Check sum delimiter
CS Check sum

GPGSV message

This message sends the information of all the visible satellites. The C/No is updated for all tracking satellites.

$GPGSV , t , n , xx , aa , ee , zzz , cc , aa , ee , zzz , cc , aa , ee , zzz , cc , aa , ee , zzz , cc *CS<CR><LF>

Field Details

t Total number of messages which is 3 always
n Message number (1 to 3)
xx Total number of satellites in view
aa Satellite PRN number
ee Elevation angle in degree. 00 to 90
zzz Azimuth in degree with respect to true north. 000 to 359
cc SNR of tracking satellites in dB. Null if not tracking
* Check sum delimiter
CS Check sum

GPVTG message

This message indicates the heading and speed relative to ground

$GPVTG , ddd . dd , T , ddd . dd , M , ssss . ss , N , ssss . ss , K *CS<CR><LF>

Field Details

ddd.dd Track degree 0-360
T True North
ddd.dd Magnetic track. This field is not valid
M Magnetic
ssss.ss Speed in Knots

N	Knots
ssss.ss	Speed in Km/hr
K	Km/hr
*	Check sum delimiter
CS	Check sum

Factory Default settings

This table lists the factory default settings in the receiver. Whenever factory reset message is received, the following parameters of the receiver are initialized according to the table below.

Parameter	Value
HCOM UART settings	9600 baud, 1 start, 1 stop, No parity, 8 of 8 format
Mask angle	5 degrees
Start mode	Cold start
ON messages	All NMEA messages
Message update rate	Once a second
Datum	WGS84
Fix update rate	1 Hz
Hdop limit	10
Position filter	ON
Velocity filter	ON
Extrapolation	ON