
NX 1500 GPS S Registers

Applies to NX1500 firmware versions, with GPS enabled, after (and not including): **3.24**

S150 Auto reporting maximum interval seconds. (0-59)

S151 Auto reporting maximum interval minutes. (0-59)

S152 Auto reporting maximum interval hours. (0-23)

**Zero's in the auto report field disables auto reporting.

S154 GPS report format (Lat/Long not optional. Always included)

1 UTC Time
2 Age of last fix
4 GPS quality indicator & Number of Satellites
8 True Bearing
16 Speed in knots
32 Height in meters
64 Date
128 PDOP

S155 Respond to broadcast GPS poll enable (0 or 1). Default 0

S156 Remote fleet address for GPS (0-999)

S157 Remote group address for GPS (0-999)

S158 Remote user address for GPS (0-999)

Auto reports are sent to this address or are broadcast

For polls unit will respond to a master in the same way that broadcast mode works

S159 Group address response hold-off

0 - Variable. Delay expressed as 10's of ms in AT%GP command

1 - 999 Fixed. Delay in 100's of ms

S160 (Future Option)

S161 Ignore receive busy for GPS Auto reporting. Note GPS polled response always ignores busy.

0 - Disabled

1 - Enabled

S162 PIN Code (write only register)

0 - 65535 Key used for GPS privacy.

All modes originating a poll request will embed this code immediately after the AT%G. For a remote modem to respond the pin number sent with the AT%G must match this register. A value of 0 means **don't care**. The remote unit will respond to a GPS poll request without checking the pin code.

Commands

For use at the remote end (with GPS receiver connected):

AT%G - Returns local GPS data to console

AT%GS - Immediate GPS data send to remote device whose address is in S156 - S158

For use at the base end (with GPS tracking application running):

AT%GP - GPS poll. Used to poll multiple units.

For broadcast mode the commands are detailed below.

Packet format over air.

Responses in broadcast mode are in binary format as follows

- Unit fleet address 2 bytes
- Unit group address 2 bytes
- Unit user address 2 bytes
- Format (S154) 2 bytes
- Then following enabled fields from S154 in the following order

- UTC Time hhmmss as three 8 bit bytes hh mm ss
- Latitude 2 x 16 bit words for whole part + decimal part of lat with high bit of the LSB of the first word set for north and cleared for south
- Longitude 2 x 16 bit words for whole part + decimal part of long with high bit of the LSB of the first word set for east and cleared for west
- Age of last fix three 8 bit bytes showing hh mm ss since last fix. DOES NOT rollover at 99h 59m 59s.
- Number of satellites lower half of same byte as GPS quality
- GPS quality indicator upper half of one byte
- True Bearing one 16 bit word showing bearing tenths of a degree
- Speed in knots one 16 bit word showing speed in tenths of a knot
- Height in metres one signed 16 bit word
- Date ddmmyy as three 8 bit bytes dd mm yy
- PDOP one 8 bit byte showing tenths

GPS Poll request in broadcast mode - AT%GP command

AT%GP followed by

(1 16 bit word holding the pin number from S162 automatically inserted here)

1 byte giving time to send one response in 10's of ms

1 16 bit word giving fleet

1 16 bit word giving group

Multiple 16 bit words specifying user address's to respond

At remote end each unit examines the broadcast poll to see if their address is present. If it is then they multiply their position in the poll by the time to send one response and use this for the time slice to respond at from the end of last character in the broadcast poll.

At the master end we must take a command of the form **AT%GP55,1,2,3,4** and send a broadcast poll to units 1,2,3 and 1,2,4 with a calculated time for response based on a 55 * 10ms window unless ats159 is greater than 0. For this example, if we assume that ats159=0 (ie the response window is determined by the command parameter 55,) unit 1,2,3 will respond in the first 550ms, unit 1,2,4 will wait 550ms and respond in the second 550ms.

At the master end the broadcast response must be outputted in the following format:

```
Fleet,group,user, UTC Time, Lat,N/S,Long,E/W,      Age of last fix, Number of satellites,
xxx,xxx,xxx,      hhmmss,      xxxx.xxx,N,xxxxx.xxx,E, xxxxx,      xx,
```

```
Quality, True Bearing, Speed (knots), Height (metres), Date,      PDOP
x,      xxx.x,      xxx.x,      xxxx.x,      ddmmyy,      x.x
```

Any fields not selected by the S154 fields is to be left blank but comma delimited as in , ,

Examples

ATS154 Response from AT%GP10,1,2,4

```
0      001,002,004,,3900.000,N,09500.000,W,,,,,,,,,
1      001,002,004,114732,3900.000,N,09500.000,W,,,,,,,,,
2      001,002,004,,3900.000,N,09500.000,W,000000,,,,,,,,,
3      001,002,004,114934,3900.000,N,09500.000,W,000001,,,,,,,,,

8      001,002,004,,3900.000,N,09500.000,W,,,,,360.0,,,,
9      001,002,004,115054,3900.000,N,09500.000,W,,,,,360.0,,,,
10     001,002,004,,3900.000,N,09500.000,W,000001,,,,,360.0,,,,

16     001,002,004,,3900.000,N,09500.000,W,,,,,000.0,,,,
17     001,002,004,115234,3900.000,N,09500.000,W,,,,,000.0,,,,
18     001,002,004,,3900.000,N,09500.000,W,000000,,,,,000.0,,,,

110    001,002,004,,3900.000,N,09500.000,W,000000,00,01,360.0,,329.3,160100,
111    001,002,004,115420,3900.000,N,09500.000,W,000001,00,01,360.0,,329.3,160100,

254    001,002,004,,3900.000,N,09500.000,W,000001,00,01,360.0,000.0,329.3,160100,0.0
255    001,002,004,114225,3900.000,N,09500.000,W,000000,00,01,360.0,000.0,329.3,160100,0.0
```

Sample Garmin GPS messages used to construct data:

```
$GPRMC,063715,A,3900.000,N,09500.000,W,000.0,360.0,170100,003.9,E*6C
$GPGLL,063715,3900.000,N,09500.000,W,1.00,2.0,329.3,M,-29.4,M,,*7B
$GPGSA,A,3,,,,,,,,,,,,,-0.0,2.0,3.0*1E
```

Quick start procedure for setting up 2 modems and retrieving GPS data

1. For each modem ("base" and "remote") connect serial terminal (19200, N, 8, 1) and power up modem.
2. (Optional) Check connection: **ATI**
3. (Optional) Reset to factory settings: **AT&F**
4. (Optional) Select over air baud rate: **ATS108=3** (0 - 3)
5. Set Fleet, Group, User of base modem: **ATS100=1, ATS101=2, ATS102=3**
6. Set Fleet, Group, User of remote modem: **ATS100=1, ATS101=2, ATS102=4**
7. On **remote** modem, enable 'Respond to broadcast GPS poll': **ATS155=1**
8. On **remote** modem, set password: **ATS162=100**
9. On **remote** modem, disable hangup on DTR loss: **ATS127=0**
This prevents the remote modem refusing any calls to it (with an ATDT command) when there is no terminal attached to it (for example, in the case where the remote modem has a GPS on com2 but nothing on COM1). This is optional if you have 2 serial terminals connected to the modems. If there is only one serial terminal available, then this must be done at the remote end before it will pick up an incoming connection request.
10. (Optional) On **remote** modem, set the Group Address Response Hold Off to 'variable': **ATS159=0**
11. (Optional) On **remote** modem, set the Format Field to 255 so that remote replies with all available information: **ATS154=255**
12. On **base** modem, set password: **ATS162=100**
Note, if in step 8, the password is set to 0, then step 12 is not required.
13. On the **remote** modem connect a GPS device to serial port 2 of the NX1500 (4800, N, 8, 1)
14. (Optional) Save S registers on both the **base** and **remote**: **AT&W**
15. On **base** modem, issue broadcast GPS Poll command: **AT%GP10,1,2,4**

The remote modem will now respond to the base with GPS data.

Some GPS tests at the remote modem:

- At the remote end, GPS data coming from the locally connected GPS receiver can be viewed: **AT%G**
- At the remote end, GPS data can be sent automatically (as a broadcast message - no acknowledge, no retries) by configuring the Remote Fleet/Group/User fields, and the Auto Reporting Interval registers: **ATS156=1, ATS157=2, ATS158=3, ATS159=10** (auto report every 10 seconds). The base will now receive GPS information every 10 seconds
- At the remote end, Auto report GPS data transmitted to the base is triggered by the expiration of the auto report timer. This data transmission may also be manually triggered by issuing the **AT%GS** command.

Detecting No GPS Device Connected

The initial values for latitude and longitude are **9959.599,a,19959.599,a**. These are intentionally outside the normal range for latitude (± 90) and longitude (± 180). These may be used to detect that no valid GPS device is connected to the NX1500, or that no valid RMC or GGA messages have been received by the NX1500.

Connecting GPS Device to the NX1500

The NX1500 expects 4800, N, 8, 1 data (NMEA-0183) on com port 2. Since no data is transmitted to the GPS receiver by the NX1500, only RX and GND of COM2 are required to be connected. Please see the Nexion Modem Installation Guide for information on the Com port pin numbers. There is a feature in the NX1500 bootloader for checking the communications on Com port 2. If the NX1500 is running the bootloader version of the firmware, it echo's all characters received on Com port 2 to the serial terminal (Com 1). This is handy for checking the GPS receiver is configured correctly to 4800, N, 8, 1 and is sending data to the NX1500. To bootup the NX1500 into the bootloader firmware do the following:

1. Connect a serial terminal to the NX1500 on Com port 1 and make sure you can talk to the modem (e.g. with an AT&V command or an ATI command.)
2. Enter the ATZ command (to reset the modem) and immediately after pressing the Enter key (to issue the command), press and hold the 0 (zero) key for at least 2 seconds.

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3. Press the Enter key once to clear the first 'error' message (due to the modem trying to interpret all the zeros as a command)
 4. Issue an ATI command to check for a bootloader version of the code (greater than 3.8)
 5. The modem will now echo all Com 2 incoming data to the serial terminal. If the GPS receiver is correctly connected, NMEA strings will appear on the serial terminal.
 6. To reset the NX1500 into the normal firmware, issue an ATZ command and don't press any keys on the keyboard for the first 2 seconds during the boot period