
GNX20/10/10L/5P Reference Manual

Command reference and parameter definitions

Date	December 2013
Revision	3.4
Status	Released
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Revision History:

Revision	Date	Author	Change Description
0.1	October 29, 2004	S. Taylor	Created
0.2	Jan 19 2005	S. Taylor	Updated
0.3	Feb 28 2005	S. Taylor	Added all parameter tables
0.4	May 26 2005	S. Taylor	Updated to include all features of 1.4.1
0.5	Nov 3 2005	S. Taylor	Updated and revised description of messaging features.
0.6	Dec 13 2005	S Taylor	Corrected errors in Ethernet parameter numbers.
0.7	Feb 7 2006	S Taylor	Revised to firmware 1.5.10
0.8	Jun 6 2006	S Taylor	Revised to firmware 1.5.19
0.9	August 14 2006	S Taylor	Revised to firmware 1.5.26
1.1	Sept 28 2006	S Taylor	Revised to firmware 1.5.27
1.2	October 31 2006	S Taylor	Revised to GNX10 1.5.28, GNX10L 1.5.27GO
1.3	April 2007	S Taylor	Corrected document errors and updated to match 1.5.30 GNX10 and 1.5.29GO GNX10L firmware
1.4	April 2007	K Nguyen	Updated Document to reflect 10L and 5P
1.5	May 2007	S Taylor	Minor corrections

1.6	August 2007	S Taylor	Added LED reference, and brought to date with 1.5.35 firmware.
1.7	August 2007	S Taylor	Minor corrections.
1.8	October 2007	S Taylor	Added extra parameters and PVTs for version 1.5.37 firmware.
1.9	December 2007	S Taylor	Minor revisions and clarification of GNX10/10L/5P functional differences.
2.0	April 2008	S Taylor	Updated to firmware version 1.x.41 release
2.1	March 2009	S Taylor	Updated to firmware version 1.x.50, and added corrections. Added GNX5 references.
2.2	September 2009	S Taylor	Minor corrections and updates to 1.x.53, in particular new SETLANDMARK options.
2.3	March 2010	S Taylor	Updates to 1.x.55 and introduction of super-5
2.4	September 2011	S Taylor	Updated to 1.x.74, GNX20 and includes hardware with accelerometer
2.5	September 2011	S Taylor	Added PVT_QUALIFIER_X description
2.6	October 2011	S Taylor	Added description of IP and port setting
2.7	March 2012	S Taylor	Updated with .76 firmware features
2.9	June 2012	S Taylor	Updated with .77 firmware features, minor error corrections.
3.0	September 2012	S Taylor	Updated with .78 firmware features
3.1	March 2013	S Taylor	Updated with .80 firmware features
3.2	May 2013	S Taylor	Updated with .81 firmware features
3.3	August 2013	S Taylor	Updated with .82 firmware features
3.4	December 2013	S Taylor	Updated with .83 firmware features

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1. Introduction

This document is a reference manual for the command syntax and parameter settings. For a general purpose introduction the reader is referred to the Primer and Troubleshooting Guide, also available from GenX Mobile Inc. There are also a number of application notes available that deal in much greater with specific functions.

Through the document the GNX20/10/10L/5P are collectively referred to as GNX. Only where functionality differs are they referred to individually.

1.1 Super-GNX5

Introduced in late 2009 the new GNX5P offers much of the functionality previously only available in the GNX10, such as messaging, Garmin and 1-wire tempsensor support. The new GNX5P is referred to in this document as a the Super-5, and in the tables S5 is shown where functions are available on the super-5 but not on older GNX5Ps. GenX can identify the serial number ranges on a per-customer basis to identify the cut-over. All GNX5Ps sold in Q2 2010 and later are Super-5s.

2. Command Reference

2.1 Methods of sending the commands and receiving responses

The methods by which the GNX can receive commands include SMS messages, UDP datagrams, TCP socket, TFTP or FTP file transfers, and AT commands on the external UART. The format of the commands is identical via all interfaces, with the exception that all commands on the external UART must be preceded by:

at!gxapp

All functions of the GNX are accessible via any of the above methods, and this can be very useful in allowing commands to be tested conveniently using the external UART interface and a terminal emulator program, before using the commands wirelessly.

The GNX listens for commands on UDP/TCP port 9494.

The responses to commands can be redirected to use any interface and to go to any IP or email address using the constructs VIATFTP, VIAFTP, VIASMS, VIAUART, VIAUDP and VIAEMAIL. Commands entered via the UART will, by default, be responded to on the UART. Commands sent via any other method should explicitly specify the desired mechanism and endpoint for the response.

For example if the user types

at!gxapp diag gps

on a terminal emulator connected to the UART interface then the GPS diagnostic information will be returned on the UART interface. If the user were to type

at!gxapp diag gps viaudp 10.10.1.2

then the GPS diagnostics would be sent to UDP port 9494 on IP address 10.10.1.2.

at!gxapp diag gps viaemail john@johnco.com

Sends the same diagnostics via SMTP to an email recipient john@johnco.com.

at!gxapp diag gps viasms 5105558892

Sends the diagnostics, truncated to 160 characters to the SMS destination number 5105558892.

As can be seen by the examples the GNX looks after the VIA... tag for the destination IP, email, or SMS address.

If a response is to be sent via UDP, TFTP or SMTP then the GNX10/20 checks the destination IP address to determine whether the data should be sent via the Ethernet, the UART (assuming a dialup networking connection is active) or the modem. Data is only routed via the Ethernet or UART if the IP address is on the local subnet. All other data is sent via the modem, which acts as the WAN interface. The GNX10L, GNX5P and GNX5 do not support either Ethernet or dialup networking clients.

If the data is to be sent via the modem but the modem is not currently in an active data session then the GNX queues the request and replies when the data session is active. The GNX can store up to 10 outstanding requests, and there is no time limit on their storage, unless the command has a validity period explicitly specified, as described later in this document.

2.1.1 REPLYTOME tag (used with VIAUDP/VIASMS)

When sending a command to a GNX where you want the reply to come back to the same IP/port (for UDP) or the same phone number (for SMS) then the REPLYTOME tag can be used.

For example

DIAG STATE VIASMS REPLYTOME

DIAG PARAMS=501,502 VIAUDP REPLYTOME

This saves having to explicitly add the phone number (for SMS) or the IP & port (for UDP).

This tag is not valid for VIATFTP VIAFTP or VIATCP. When communicating via a TCP socket replies are automatically routed back to the sender using the open socket.

2.2 UART specific issues

In order to minimize the chance of a GNX accidentally receiving an SMS, UDP datagram or file containing text causing resetting of parameters or other behavior changes many of the keywords below are required to be entered in uppercase only.

In order to simplify the use of the UART interface the GNX (will, by default, set all typed characters to uppercase before submitting them to the parser. For example

at!gxdiag modem

Is submitted to the command parser as

AT!GXDIAG MODEM

When setting certain parameters via the UART it may be desired to disable this auto-uppercasing function. To do so type

atu0

To reenable auto-uppercasing type

atu1

Certain simple AT commands are case-insensitive, such as **at**, **atq0** **ate0**, **atd**, **at+ipr**.

If an AT command is not recognized the GNX will return ERROR. If a command is not recognized and the auto-uppercasing is currently disabled the GNX will return

ERROR (upper off - type atu1)

In case the lack of auto-uppercasing is causing the parser to fail.

2.3 Use of semi-colons as command separators

The GNX command parser uses semicolons to delimit commands on a single line. For example:

SETPARAM UART_FUNCTION=4;UART_BAUD=4;BACKUPNVRAM;

It is important to ensure that semicolons do not appear in the middle of commands or else the command could be broken in two leading to unexpected results. For example

GETFILE VIAFTP FILENAME G602_06_67GX.gxb; OTAP; // WRONG !!!

The semicolon at the end of the filename will cause the parser to not associate the OTAP keyword with that GETFILE command, causing the firmware image file to be loaded as if it were a parameter file (with no ill effects: the file transfer will simply fail due to lack of RAM).

The correct form would be

GETFILE VIAFTP FILENAME G602_06_67GX.gxb OTAP;

2.4 IP addresses and ports

To specify an IP address and port to the GNX whether in a command or in a parameter the address and port are entered as six digits, four for the IP address, and two for the port.

Each of these digits are one byte, with a range 0-255, and since the port is from 0-65535 the fifth and sixth digits of the address are the upper and lower byte of the port.

To convert a port number to the two digit representation two approaches can be used:

- 1) Convert the port to hexadecimal and insert the two hex numbers directly.
(The windows calculator will convert decimal to hex.)

e.g. 9494 = 2516 (hex)

75.12.250.41 port 9494 is 75.12.250.41.x25.x16

The x tells the GNX that the number is hexadecimal.

2) Take the port and divide by 256. The result goes in the first digit and the remainder in the second.

e.g. $9494/256 = 37$, with a remainder of 22 ($9494 - 256 \times 37 = 22$)

so 75.12.250.41 port 9494 is 75.12.250.41.37.22

3. Command reference

Commands can be broken into categories, parameter settings, application diagnostic requests, engine diagnostic requests, requests for specific actions, landmark settings and boundary settings. Parameter settings are dealt with in a specific section below.

3.1 Command modifiers

Command modifiers can be used to defer operation of commands, to impose a validity period on the command (useful if sending via SMS, which can be delivered days later), to restrict the command to a particular serial number, which is useful if sending via UDP.

Modifier	Extra parameters	Description	10 20	10L	5P	5
VALID_UNTIL	DD/MM/YY HH:MM:SS	Sets the validity period of the command. If the command is received after the specified time it is discarded.	X	X	X	X
SERIAL	12 digit serial number	If the command is received by a GNX with a different serial number (e.g. on a dynamic IP network) then it is discarded.	X	X	X	
NOACK	None	Instructs the GNX not to acknowledge receipt of the command. Implicit in an SMS message.	X	X	X	X
REPLYTOME	None	If sending a command via UDP then this causes the response to be sent back to your IP/port. If sending VIASMS then GNX will use caller ID to direct the reply.	X	X	X	X
SERIALFILTER	12 digit serial number with wildcard	If the command is received by a GNX with a different serial number (e.g. on a dynamic IP	X	X	X	X

	characters X,x, or ?	network) then it is discarded. Allows a range of serial numbers to be specified by wildcard				
#START# #END#	None	Optional tags that can be placed before and after a command to ensure that the GNX will only parse the command if it is not truncated (may be especially useful for commands sent via a TCP socket where the server may not be able to control the fragmentation). In .83 and newer firmware.	X	X	X	
DOIFION DOIFIOFF	None	Can be added to any command to make the execution of that command conditional on the state of the vehicle ignition. In .83 and newer firmware.	X	X	X	

3.2 Application Diagnostic Requests

All diagnostic requests must start with the keyword DIAG. Following the DIAG keyword there can be multiple diagnostic information types requested:

Diagnostic tag	Extra parameters	Description	10 20	10L	5P	5
PVT	None	Returns the position, velocity, heading and UTC time of the most recent position fix. In firmware 1.5.19 and newer also returns the vehicle state (Idling, Moving, parked) and the ignition state.	X	X	X	X
TIME	None	Returns the current UTC time. Eg. TIME:05/13/2008 19:03:16(GMT)	X	X	X	X
LANDMARKS	None	Returns a list of all landmarks configured in the GNX, with their current calculated distance and heading (crow flies) from the GNX.	X	X	X	
BOUNDARIES	None	Returns a list of all boundaries configured in the GNX, with an indication of whether the GNX is currently inside or outside the boundary, and with accumulated mileage inside the boundary.	X	X	X	
ALLPARAMS	Optional starting parameter and ending parameter separated by a comma.	Returns the settings of all configurable parameters in the GNX, or a list of those parameters between the supplied start and end parameter.	X	X	X	X
PARAMS	Comma separated list of up to 3 parameter names or numeric tags.	Returns the settings of up to 3 specified parameters.	X	X	X	X

STATE	None	Returns the current state of the GNX (ignition state, moving status, how long it has been in the current state).	X	X	X	X
COMMS	None	Returns a list of all queued requests pending service, the state of the communications link, and the number of TFTP or SMTP failures.	X	X	X	X
CANNED_MSGS	None	Returns a list of all canned messages configured in the GNX. See 3.3.11	X		S5	
1WIRE	None	Returns the state of the 1 wire bus on units equipped with Maxim 1 wire capability	X		X	
SERNUM	None	Returns the serial number. Can be used in conjunction with other diagnostics to tag a diagnostic response with the serial number of the sending GNX.	X	X	X	X

3.3 Requests for specific actions

The following commands must be preceded by at!gxapp if sent via the UART interface.

3.3.1 Resetting data or hardware

Command	Extra parameters	Description	10 20	10L	5P	5
RESETGNX10 (RESETGNX5)	FACTORY or CLEARNV or none.	Resets the GNX. If optional CLEARNV is specified then the non-volatile RAM is cleared. If optional FACTORY is specified then a full factory reset is performed, which also resets the GPS receiver. See section 3.3.2.	X	X	X	X
RESETALLPARAMS	None	Resets all parameters to factory default without rebooting the GNX.	X	X	X	X
PWROFFGNX	None.	Performs a controlled shutdown of the GNX. (Requires ignition to be off)	X	X	X	X
RESETGPS	None.	Performs a complete reset of the GPS receiver.	X	X	X	X
RESETPVTQ	None.	Erases and resets the internal event/position queue.	X	X	X	X
RESETPAQ	None.	Resets the internal queue of pending actions (see DIAG COMMS for listing of queue entries).	X	X	X	X
RESETCOMM	None	Resets the communication state machine if it is	X	X	X	X

		stuck in a failed communication.				
RESYNCNOW	None	Force immediate parameter download from the configuration TFTP server.	X	X	X	X
ZERODATA	None	Resets the data and SMS counters.	X	X	X	X
SETRELAYDRIVE1ON	None	Activates the number 1 relay drive (same command exists for relay drive 2, substitute 2 for 1 in the command).	X	X	X	
SETRELAYDRIVE1OFF	None	Deactivates the number 1 relay drive (same command exists for relay drive 2, substitute 2 for 1 in the command).	X	X	X	
SETRELAYDRIVE1XFF FFFFFF	8 digit hexadecimal number following X	Allows a pulse pattern of activation/deactivation on relay 1. At the end of the pattern relay 1 will be deactivated. Each bit of the 32 bit number corresponds to 100ms duration, so total pattern cannot exceed 3.2 seconds.	X	X	X	
REPEAT	None	Optional qualifier can be added to SETRELAYDRIVE command to cause the pattern to be repeated until the unit powers off, or a new SETRELAYDRIVE is received	X			
ARMALARM	None	Arms the alarm (movement or power disconnected) if it is not already automatically armed	X	X	X	X
CLEARALARM	None	Ends an alarm state in the device (movement, power disconnect or panic button)	X	X	X	X
STARTCALL	None	Prompts the modem to start a data call at the next available opportunity.	X	X	X	X
ENDCALL	None	Prompts the modem to end the current data call.	X	X	X	X
BACKUPNVRAM	None	Copy non-volatile settings to FLASH memory so that they are recovered in the event of power failure.	X	X	X	X
TURN12VON	Time in seconds	Will turn on the GNX switched 12v output for a specified period, after which it is automatically turned off. e.g. TURN12VON 300 will turn on for 5 minutes. In .83 and newer firmware.	X	X	X	

3.3.2 RESETGNX10/RESETGNX5 recommendations and warnings

For all problems for which a reset is felt to be required the commands should be tried in this order:

RESETGNX10

if that doesn't work

RESETGNX10 CLEARNV

if that doesn't work

RESETGNX10 FACTORY

In very special circumstances **RESETALLPARAMS** can be used to preserve unsent position data: consult GenX for more information.

RESETGNX10 CLEARNV will clear all parameter settings except the GPRS_APN, username and password (if they are set) and the GENX_SERVER_IP(37). It also resets the position queue.

RESETGNX10 FACTORY will clear all of the above plus it resets the GPRS_APN, username, and password and the GENX_SERVER_IP(37) back to the factory default values for the firmware version loaded into the device.

RESETALLPARAMS clears all parameters while preserving the position queue and does not reset the GNX10. Unfortunately it does clear the APN and GENX_SERVER_IP, so if this is issued after the GENX_SERVER_IP has changed it will need to be reset to the new IP with a second command.

3.3.3 Commands affecting the GPRS/CDMA/iDEN modems

Command	Extra parameters	Description	10	10L	5P 20	5
SETSIMPIN	Pin code	Sets the PIN code to lock the GSM SIM to the GNX.	X			
SIMPIN	Pin code	Supplies a PIN to unlock a GSM SIM	X	X	X	
MDMCMD	AT command for specific modem. E.g. MDMCMD AT+HPR=9600	Allows an AT command to be issued remotely to the modem.	X	X	X	

3.3.4 Commands requesting current, or historical, position data

Command	Extra parameters	Description	10/ 10L	10L	5P	5
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			20			
POLL	None.	Request the current position to be sent in alert (human readable) format.	X	X	X	X
POLLQ	None	Request the current position to be sent in report format (comma separated text or binary, exactly the same as a single row of the activity report).	X	X	X	X
DUMPQ	Many ... see section 3.3.12.	Requests to dump out its internal queue of events in activity report format (1 row per event of comma separated text).	X	X	X	X

3.3.5 Setting parameters, landmarks, boundaries (perimeter zones)

Command	Extra parameters	Description	10 20	10L	5P	5
SETPARAM	See section 3.5	Sets one or more parameters. Optionally closed with ENDPARAM tag (recommended to prevent accidental parsing of non-parameters).	X	X	X	X
SETPARAMVERIFY	See section 3.5	Same as SETPARAM, except that parameter settings are ignored if mandatory ENDPARAM tag is not found. This can prevent parameter corruption in the case of command or file truncation.	X	X	X	X
SETLANDMARK	See section 3.6	Sets one or more landmarks. Optionally closed with ENDLANDMARK tag (recommended to prevent accidental parsing).	X	X	X	
SETBOUNDARY	See section 3.7	Sets one or more polygon boundaries. Optionally closed with ENDBOUNDARY tag (recommended to prevent accidental parsing).	X	X	X	

3.3.6 Miscellaneous commands

Command	Extra parameters	Description	10/ 20	10L	5P	5
SETPOSITION	Latitude, longitude in fractional degrees.	Allows boundary or landmark testing by forcing the GPS position to a certain location.	X	X	X	
ZERODATA	None.	Zeros all data and SMS counters (see !GXDIAG USAGE).	X	X	X	X

GETFILE	See section 3.4	Instructs the GNX to download a file using TFTP or FTP.	X	X	X	X
UDPACK	Data length of acknowledged frame.	Allows a server to provide application level acknowledgement of a UDP datagram. Used to add integrity when position data is sent via a UDP socket. See parameter UDP_MAX_RETRIES See "GNX Acknowledged UDP" app note for full details.	X	X	X	X
MAXDATAUSAGE <allocation in kilobytes>	Quantity of data in kilobytes (1-131072)	This command allows the user to control the maximum amount of user data that can be sent and received by the GNX between configuration attempts. This can either be used to prevent data overage due to overuse, or due to a bug or misconfiguration. When the GNX has exhausted this limit all vehicle activity is recorded as normal, but it will not be delivered to the server until the data usage is replenished, usually when the GNX next reconfigures. Note that this is a simple decrementing counter, and when it hits zero the GNX will stop transmitting, and must be refreshed with this command.	X	X	X	X

3.3.7 Substituting unit specific information into commands

Sometimes it is necessary to send a command to multiple units and have each unit substitute information specific to that unit into the command. This is especially the case with configuration files, but can also be applied to commands sent using SMS, UDP or TCP.

Command	Description	10/20	10L	5P	5
%DATE%	MMDDYY format current date	x	x	x	
%NAME%	UNIT_NAME (parameter string)	x	x	x	
%ICCID%	ICCID (SIM card ID)	x	x	x	
%IMEI%	IMEI (of modem)	x	x	x	
%ESN%	ESN (of modem)	x	x	x	
%PN%	Phone number of modem/SIM	x	x	x	

%SN%	12 digit Serial Number (with leading zeros)	x	x	x	
%SNNLZ%	Serial Number with no leading zeros	x	x	x	

For example:

DIAG ALLPARAMS VIATFTP FILENAME %SNNLZ%_%DATE%.txt
SETPARAM UNIT_NAME=%SNNLZ%;

3.3.8 Two-way Messaging commands (GNX10 & Super-5 only)

The messaging commands are included to allow a simple two-way messaging application to be developed on an external terminal connected via the UART or (less likely) Ethernet. A more capable Ethernet-connected terminal would more likely use standard messaging tools, such as email or instant messaging.

See also parameters SEND_GMSG_MODE(198), UMSG_REDUCE (205), UMSG_ID (215) which control the behavior of the SENDGNXMSG command.

All messages sent from the GNX10 are tagged with the time and position and appear similar in format to a GNX10 alert.

Command	Extra parameters	Description	10/20	10L	5P	5
GNXMSG [BEGINTEXT] <user text> [ENDTEXT]	Text string of up to 500 characters. BEGINTEXT and ENDTEXT are optional delimiters. Their use is recommended, but not mandatory.	UART or Ethernet client requests the GNX10 to send the text string as a user message to the programmed ALERT destination (see parameters ALERT_EMAIL, SEND_ALERT_MODE). Although multiple such messages can be stored and forwarded by the GNX10 it is recommended not to store more than 3.	X		S5	S
READGNXMSG <0-29> [COUNT]	0-29 specifies message index, OR COUNT returns a count of the number of received user messages stored in the GNX10, along with the indices at which they are stored.	UART or Ethernet client requests a received message from the GNX10. GNX10 replies with READGNXMSG:<message index><message text>, or with a NAK indicating that there is no message stored in that index.	X		S5	
DELETEDGNXMSG <0-19>	0-19	Allows UART or Ethernet client to delete a received message in one of the internal GNX10 message stores.	X		S5	
SENDGNXMSG <user message> [ENDTEXT]	Text string of up to 1000 characters.	Tag sent by a message server to instruct the GNX10 that this UDP datagram contains a user	X		S5	

		message				
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3.3.9 Binary/free form message to and from UART client (GNX5P/20/10 only)

From server to GNX command is GNX2UART

GNX2UART<optional byte length>:<User data>

e.g.

Message over the air:

GNX2UART:Hello this is a simple ASCII message to the UART

Presented on the UART as:

+GNX2UART:Hello this is a simple ASCII message to the UART

Message over the air:

GNX2UART10:Hello another message

Presented on the UART as:

+GNX2UART10:Hello anot

From GNX UART client to server, via the position queue (sent as a canned message, see below)

AT!GXAPP SENDSHORTBIN <your binary data up to 128 bytes>

The binary data must start and end with 0x7E and is byte stuffed with 0x7D the same as described in section 4 of RFC1662 "HDLC-like Framing".

The binary data is delivered to the server in the position data appended to the reason code, similarly to canned messages. The data is delivered byte stuffed and framed with 0x7E bytes. E.g.

SB:~*G}4*}*B*I*D} **C**~**

3.3.10 Real time binary messaging up to 512 bytes from UART client to the server (SENDLONGBIN) (GNX5P/20/10 only)

This feature was added in the .79 firmware release (December 2012) and allows a UART client to send chunks of up to 512 bytes to the server (as specified by DATA_SERVER_IP parameter).

AT!GXAPP SENDLONGBIN<length of binary 1-512>

Client waits for response from GNX :

OK-SendData

Client submits the number of bytes specified in the command above.

When the final byte is received the GNX send OK and forwards the data in a single UDP datagram to the IP/port in parameter 30.

Note: the GNX does not prepend anything to the data, so the UART client must add identifying information. The GNX5P DOES NOT EXPECT a UDPACK response to this data because it assumes that an end-end ACK will be sent to the client from the server using GNX2UART. However if the server does send a UDPACK it will cause no problems: it will be silently discarded by the GNX.

In firmware .82 and newer this feature will also work over TCP sockets if SEND_Q_MODE=32;

Instead of OK-SendData other possible responses are

NAK-OFFLINE if the modem is not online (client should check DIAG COMMS)

NAK-LEN if the specified len is > 512

NAK-MEMORY if the GNX is low on memory (shouldn't happen)

After the data is sent by the client if the GNX receives insufficient data it will respond with NAK-DATA(x/y) where x=bytes specified in SENDLONGBIN y=number of bytes received.

3.3.11 Canned messaging commands (GNX10/20 & Super-5 only)

Canned messages differ from the above two way messages because they offer pre-formatted text configured from a TFTP or FTP server, and with the option for the user to attach a short text sting of up to 128 characters to each message. The advantage of the canned messages for the driver is that relatively little typing may be required so a low cost and/or ruggedized user interface module can be used. Additionally, because the canned messages themselves are integrated into the position queue a virtually unlimited (thousands) number of canned messages can be store-and-forwarded when the GNX10 is outside of radio coverage. Each message is tagged with its location, speed and time at which it was submitted to the GNX10 for sending, and this information is retained no matter for how long the GNX10 is outside of radio coverage.

Up to 100 canned messages, with a total maximum length of up to 2kbytes can be defined in the GNX. The 2kbytes can be divided between the 100 canned messages in any way, though UI limitations will probably define the maximum upper limit.

The canned message text can be requested by the client messaging application so that it can be presented on the user interface. To send a canned message the messaging terminal need only supply the index of the canned message, along with any optional user text (up to 20 bytes) that is to be appended to the canned message.

The canned messages index 0-99 are treated as the PVT reason codes 256 through 355, and the action to be taken when each message is added to the PVT queue is set by the bitmap variable CMSG_PVT_QUALIFIER, and uses the same values as defined for the PVT_QUALIFIER variable, described in section 4.8.1. It is impossible to configure a non-zero value in an element of CMSG_PVT_QUALIFIER that corresponds to an undefined

canned message (i.e. submitting a canned message for which no text is defined causes no action).

Please note that each new SETCANNEDMSG overwrites previous canned messages, so all canned messages should be set by a single command or configuration file (this is unlike landmarks and boundaries, which are cumulative).

Command	Extra parameters	Description	10 20	10L	5P	5
SETCANNEDMSG <string of message text separated by : or ;> [<ENDCANNEDMSG>]	The string contains all canned message text and is separated by ;. Newline characters (any char less than ' ') are ignored. The optional ENDCANNEDMSG tag is recommended.	This command is placed in the configuration file to configure the canned message text in the GNX. (Can also be sent by UDP or TCP socket).	X		S5	
DIAG CANNED_MSGS	None.	This command, sent by a messaging client terminal returns all currently defined canned messages. Response from GNX10 is of the form: CANNED_MSGS: <text of canned msg #0>; <text of canned msg #1>; <text of canned msg #N>; END_CANNED_MSGS	X		S5	
SENCANNEDMSG <0-99>[,<appended text up to 128 chars>];<ECHOPVT>	The message index (0- 99) must be supplied. Optionally a short user supplied text string can be added, following a comma.	This command causes the canned message at the specified index to be inserted into the PVT queue, and the supplied text to be tagged to that entry. The GNX10 responds with either ACK < SENDCANNEDMSG 1,Bye for now> Or ACK <Error 2> If an undefined index is supplied. If the ECHOPVT tag is placed after a semicolon at the end of the line then instead of replying with an ACK the GNX10 will return the row of csv data exactly as it will be delivered to the server. This might be useful if the messaging application needs to know the exact time and/or position at	X		S5	

		which the message was recorded by the GNX10.				
--	--	--	--	--	--	--

3.3.12 Options for the DUMPQ command

The DUMPQ command has many options that can be specified. If it is specified without options then the box will return only those points that have not already been sent to the data server. However when points are sent by the GNX they are not deleted from internal memory, and since the GNX several thousand events in non-volatile memory it is possible to request activity reports from many weeks previous, and with extra diagnostic information that is not normally shown in the periodic activity reports.

Note that sending the queue via SMTP, TFTP or FTP the file is limited to 64kbytes on the GNX10 and GNX20 and about 3k bytes on the GNX10L and GNX5P. Typically each event (row) requires around 100bytes, though this varies depending on the configuration, and adding debug information can increase this significantly. Therefore if the user requires to access historical data it is recommended to use the STARTTIME and ENDTIME values, or better STARTID and ENDID, if these are known.

If the queue is sent via the UART then there is no bound on the amount of data sent out of the UART though it can take several minutes to output thousands of entries, so you might want to enable logging to a text file before issuing the command!

DUMPQ Modifier tag	Extra parameters	Description	10 20	10L	5P	5
ALLQ	None	Output the entire internal queue. Note that this is only really useful on the UART as it will usually overload the maximum file size if sending via SMTP / TFTP.	X	X	X	X
DELETE	None	Mark all points as sent to prevent resending to the data server.	X			
INTERVAL	Value in seconds.	Only include points in the report if they are at least N second from the previous point in the report. In other words decimate the output. Useful if dumping a long period of time via SMTP	X	X	X	

		or TFTP. This does not remove PTO or ignition points from the report, only periodic (time driven) events.				
STARTTIME	DD/MM/YY HH:MM:SS	Local time at which to start the report (must be in the past).	X	X	X	X
ENDTIME	DD/MM/YY HH:MM:SS	Local time at which to end the report (must be in the past).	X		X	X
STARTID	Unsigned integer	UniqueID at which the report should start. (Useful if filling gaps in past data).	X	X	X	X
ENDID	Unsigned integer	UniqueID at which the report should end (useful if filling gaps in past data).	X		X	X
DEBUG	None	Add columns of debug information to the end of each row, including voltage, temperature, modem and GPS information.	X	X	X	X
DEBUGMODEM	None	Add columns of modem debug information to the end of each row, including serving system, signal strength and registration status.	X	X	X	X
DEBUGGPS	None	Add columns of GPS debug information to the end of each row, including number of satellites tracked, in the fix, and the maximum signal strength of a satellite.	X	X	X	X
COMPRESSED	None.	If the COMPRESSED tag is added then the requested data will be sent compressed according to the gzip standard. gzip -d can be used to decompress the data upon reception. This can save significant airtime. Not available on all firmware versions.	X			
MAXPOINTS	Unsigned integer	Send the maximum number of MOST RECENT positions (overrides STARTID, STARTTIME, ENDID, ENDTIME)	X			
INTERVAL	Unsigned integer	Time interval in seconds to decimate PERIODIC events (reduce transmitted data.	X	X	X	X
LISTID	Array of up to 100 Unique IDs	Allows for selective retransmission of selected PVT qualifier codes.	X			
FILESIZE	Unsigned integer	On GNX10 overrides parameter MAX_REPORT_FILE_SIZE, to allow larger diagnostic reports.	X			

CODES	Array of up to 10 PVT codes	Selects transmission of only specified event types.	X			
GNXBIN<FRAME> / DETAILED	None	If omitted then the position will be output in the format specified in parameter 129 (REPORT_FORMAT). These keywords can override the default and force output in (framed) GNX binary, or full csv text (DETAILED). Only supported in 1.x.5X firmware and newer.	X		X	

3.4 GETFILE command

To instruct the GNX to download a file the GETFILE command can be used. The GNX can only download a text file using TFTP or FTP, though it is possible to send the same text using UDP sockets or in an SMS.

GETFILE VIATFTP 10.10.10.1 FILENAME foo\bah.txt

This instructs the GNX to download the file bah.txt in the path foo under the TFTP root directory, from the TFTP server at IP address 10.10.10.1.

Note that if the IP address is omitted then the IP address in parameter 7, TFTP_CONFIG_SERVER_IP will be used.

Note that parameter number 54, CONFIGURATION_MODE defaults to 4, which means that GETFILE defaults to using TFTP, and the TFTP <ip> can be omitted.

3.4.1 GETFILE using FTP

GETFILE VIAFTP 10.10.10.1 FILENAME foo\bah.txt

If VIAFTP is selected then the FTP server should either be configured for anonymous downloads, or have username/password combination that is preconfigured into the GNX in parameters 52, FTP_CONFIG_USERNAME, and 53, FTP_CONFIG_PASSWORD.

Note that if the IP address is omitted then the IP address in parameter 7, TFTP_CONFIG_SERVER_IP will be used.

Note that parameter number 54, CONFIGURATION_MODE defaults to 4, which means that GETFILE defaults to using TFTP. Setting 54=64 will set the default configuration download mode to FTP.

3.4.2 VER and OTAP modifier tags for GETFILE

If a VER tag is placed after a GETFILE then that file will only be reloaded by the GNX if the VER number changes, or if the RESYNCNOW command is received. This can be used to prevent the GNX from wasting data by repeatedly downloading the same file, for example every 24 hours when it resyncs:

GETFILE VIAFTP 10.10.10.1 FILENAME foo\bah.txt VER 1;

If the file bah.txt is changed then the VER tag must be modified in all files that contain the GETFILE.

The OTAP tag after a GETFILE does two things. First it tells the GNX to treat the file as a binary image file, rather than a file containing GNX commands, and second it tells the GNX to check the file and filename for compatibility with its hardware. The GNX will not download firmware that is incompatible with its hardware options:

```
GETFILE VIATFTP FILENAME G801_06_73GX_KEYCRC_B417.GXE OTAP;
```

3.5 Parameter Setting

Parameters are set using the following construct.

```
SETPARAM[VERIFY]  
<param textual or numeric tag>=<value>;  
<param textual or numeric tag>=<value>;  
<param textual or numeric tag>=<value>;  
ENDPARAM
```

The SETPARAM and ENDPARAM tags delimit the parameters within a larger text file that could contain other commands, such as GETFILE. If SETPARAMVERIFY is used then the ENDPARAM tag must be present. The ENDPARAM tag need not be included if the text ends immediately after the parameters end. The newline characters are optional. Each parameter must be separated by semicolons.

If setting parameters via the UART the newlines must be omitted (else the AT command interpreter will try to interpret a partial line as soon as Enter is pressed). Multiple parameters can be set in a single line by separating them with semicolons.

```
AT!GXAPP SETPARAM <tag1>=<value1>;<tag2>=<value2>;
```

The parameters are specified with numeric or textual tags, a complete list of which are given in the following section.

3.5.1 Specifying parameter values

Arrays of numeric values are always entered in decimal with a "." between each number. For example:

```
SETPARAM 9=1134.1138.89.84;
```

Character arrays (strings) are entered as a string.

```
SETPARAM ALERT_EMAIL=john@johnco.com;
```

When setting arrays if the specified values do not completely fill the array the GNX pads the array with values of zero. If the specified values exceed the array bounds the GNX truncates the array, and in the case of strings replaces the last character with 0 to correctly terminate the string.

3.5.1.1 Entering hexadecimal values

All numeric parameters can be entered as hexadecimal by preceding the number with x or X:

SETPARAM TFTP_DATA_SERVER_IP=71.65.178.12.x12.x34;

This may aid legibility of configuration files, particularly for internet port numbers and bitmap parameters.

3.5.2 Querying parameter values

When querying parameter values the parameters can be identified using either the textual or numeric tags, but the GNX will always report the parameters using only the numeric tags.

DIAG ALLPARAMS

Will return a list of the settings of all parameters in the GNX. This typically requires more than a kilobyte of data, and may not fit into the screen of a terminal emulator, or into a single UDP datagram / SMS. Multiple UDP datagrams will be sent if necessary.

DIAG ALLPARAMS <tag1>,<tag2>

Will output all parameters whose numeric tag falls between tag1 and tag2.

To request the values of up to 3 individual parameters the following command can be used

DIAG PARAMS=<tag1>,<tag2>,<tag3>

3.6 Landmarks

A landmark is defined by a name (text string up to 20 characters in the GNX10, 7 characters in the GNX20/10L/5P), and a position, specified as decimal latitude.

The GNX10 stores up to 350 landmarks. The current GNX5p and GNX20 store 100 landmarks. Old GNX10L and GNX5P sold prior to mid 2009 can store only 10 landmarks.

The reference manual gives only a brief overview of landmarks. It is recommended to read the application note "GNX Advanced landmark /polygon boundaries" for further information about landmark specific speed alerts, overlapping landmarks etc.

3.6.1 Setting a landmark

Note: individual landmark radii and DELETE_ON tags were introduced in firmware version 1.x.53, and are unavailable in earlier firmware releases.

SETLANDMARKS

<name>,<latitude>,<longitude>[,<radius>][<delete tag>]

<name>,<latitude>,<longitude>[,<radius>][<delete tag>]

<name>,<latitude>,<longitude>[,<radius>][<delete tag>]

<name>,CURRENT_LOCATION[,<radius>][<delete tag>]

ENDLANDMARKS

The SETLANDMARKS tag allows the GNX to identify the state of landmarks definitions, possibly within a larger text file that also contains commands, boundary and parameter settings. The ENDLANDMARKS tag may be omitted if the end of the landmarks definitions is also the end of the text in the command / file. The landmark definitions may be separated by a newline or by a semicolon. The name, latitude and longitude must be separated by commas.

3.6.2 Setting a landmark at the current location

Replace the latitude and longitude with `CURRENT_LOCATION` to set a landmark at the current location of the vehicle. If combined with `DELETE_ON_EXIT` this can provide a useful alert when the GNX leaves its current location.

3.6.3 Automated landmark deletion / expiry

[<delete tag>]

Is an optional tag to allow the landmark to auto-delete to aid in landmark management. There are five variants :

DELETE_ON_ENTRY	deletes landmark upon arrival
DELETE_ON_EXIT	deletes landmark upon exit
DELETE_ON_TRIP	deletes landmark on arrival or exit
DELETE_ON_FULL	deletes landmark if landmark storage overflows
VALID_UNTIL <time>	deletes landmark at specified time

These will automatically delete the landmark, freeing the entry to accept a new landmark whenever the condition is met. The <time> should be specified either as DD/MM/YY HH:MM:SS GMT or UNIX<epoch time>.

Beware using `DELETE_ON_ENTRY` or `DELETE_ON_TRIP` in conjunction with landmarks defined in a configuration file, since if the unit remains at that landmark and resyncs (reloads the same landmarks) it will trigger a duplicate event 12 (arrived). If landmarks are loaded from a configuration file then `DELETE_ON_EXIT` or `VALID_UNTIL` are better options.

There are also other landmark options to create landmarks that only trip if they are approached from a certain direction, and large landmarks with their own speeding threshold (useful to stop drivers from speeding in a yard). For full details about using all of the advanced landmark features please see the Advanced Landmark application note.

3.6.4 Landmark name uniqueness

Each landmark must have a unique name.

If the GNX detects that the landmark definition has the same name as an existing landmark then it compares the latitude and longitude in the definition with those in the GNX. If the position matches that of the existing landmark then the new definition is ignored. If the position is different then the position of the existing landmark is updated.

3.6.5 Landmark position uniqueness

The GNX does not enforce landmark position uniqueness, so it is possible to define two or more landmarks with identical or near-identical positions. If the positions are truly identical then this will cause unpredictable behavior as the GNX does not calculate distances from all landmarks instantaneously, so the nearest landmark to the current position could oscillate between the two (or more) identically placed landmarks.

3.6.6 Deleting a landmark

To delete all landmarks held in the GNX send the command

```
SETLANDMARKS DELETEALL  
<name>,<latitude>,<longitude>  
<name>,<latitude>,<longitude>  
<name>,<latitude>,<longitude>  
ENDLANDMARKS
```

It is not necessary to define new landmarks, as shown in the example above, but it is possible. If no new landmarks are defined the ENDLANDMARKS tag may be omitted.

To delete individual landmarks

```
SETLANDMARKS DELETE <name>;<name>;<name>;<name>;ENDLANDMARKS
```

3.6.7 Querying all defined landmarks

```
DIAG LANDMARKS
```

Beware that the response can be very large if many landmarks are defined.

In firmware .82 and newer DIAG LANDMARKS BRIEF was added: this will return only those boundaries that the GNX is currently within.

3.7 Boundaries (Geofences)

A boundary is a polygon defined by the latitude and longitude coordinates of its vertices, and an associated name (text string up to 20 characters in the GNX10, 7 characters in the GNX10L/5P/20, 9 characters in .74GX and newer firmware on new GNX5Ps). The GNX10 supports up to 50 boundaries, each with up to 100 vertices. Both the GNX20 and GNX5P supports up to 5 boundaries, each with up to 50 vertices. A boundary also has an ASCII text name (which cannot include any whitespace), and an alert modifier that states whether the boundary should generate alerts when the GNX enters or leaves the boundary, or on both occasions.

Boundaries also have an associated layer. Layering of boundaries allows the user to have a boundary that overlaps another boundary, and have the GNX report when it is within the smaller boundary.

The reference manual gives only a brief overview of landmarks. It is recommended to read the application note "GNX Advanced landmark /polygon boundaries" for further information about landmark specific speed alerts, overlapping landmarks etc.

3.7.1 Setting boundaries

To set 1 or more boundaries in the GNX the following command can be used:

```
SETBOUNDARY  
<name> [<alert_modifier>] <lat1>,<lon1> <lat2>,<lon2>  
<lat3>,<lon3> [<latN>,<lonN> ... to a max of 80 vertices];  
<name2> [<alert_modifier>] <lat1>,<lon1> <lat2>,<lon2>  
<lat3>,<lon3> [<latN>,<lonN> ... to a max of 80 vertices];  
ENDBOUNDARY
```

The name is an ASCII text string consisting of characters with an ASCII value greater than ' ' (0x20) and less than '~' (0x7e). It must not contain the semi-colon character, or whitespace. The name is terminated by the first whitespace (0x20) character.

The <alert modifier> is optional. If it is not specified then the boundary will not trigger an alert. If it is specified it must be one of the following strings:

ALERT_ALWAYS
ALERT_ON_ENTRY
ALERT_ON_EXIT

The latitude, longitude pairs that define each vertex are comma-separated floating point fractional degrees. The latitude ranges from +90 (North pole) to -90 (South pole), and the longitude from -180 (West) to +180 (East). Internally the GNX converts the floating-point degrees into integer milliarc-seconds for accuracy down to 1 meter. Each latitude-longitude pair is separated from the next by whitespace of 1 or more ' ' characters.

The landmark definition is terminated by a semicolon, or a carriage return.

3.7.2 Deleting boundaries

To delete all boundaries held in the GNX send the command

SETBOUNDARY DELETEALL
<name> <ALERT_ON_ENTRY> <lat1>,<lon1> <lat2>,<lon2>
<lat3>,<lon3>;
ENDBOUNDARY

It is not necessary to define new boundaries, as shown in the example above, but it is possible.

To delete individual boundaries

SETBOUNDARY DELETE <name>;<name>;<name>;<name>;ENDBOUNDARY

3.7.3 Boundary name uniqueness

The GNX does not enforce boundary name uniqueness, so if you define more than one boundary with the same name, but with different vertices, then you will have to decide which of the identically names boundaries the GNX reports crossing, based on the reported latitude or longitude of the crossing point.

3.7.4 Defining more than one identical boundary

The GNX does not prevent defining multiple identical boundaries with different names. This is not recommended as it could generate multiple concurrent alerts when the boundary is crossed.

3.7.5 Querying all defined boundaries

To query the currently defined list of boundaries, along with extra information use the following command:

DIAG BOUNDARIES

The format of the response is shown below

BOUNDARIES

CP 42.xxxx, -71.xxxx

Region, In/Out, TimeLastInOut, Alerts

Norfolk , IN, 15:28 09/21 (0/1/1)

Plymouth, OUT, 00:00 01/01 (0/1/1)

CP is the current position of the GNX5P.

Next is a list of the boundaries showing if the GNX is currently in or out of the boundary, and the time at which the boundary perimeter was last crossed. Finally the configured alerts for that boundary are shown x/y/z where x = alert on speeding (event 18), y = alert on entry (event 14), z = alert on exit (event 15).

Note that the response does not show the lat/lon coordinates of the individual vertices.

In firmware .82 and newer DIAG BOUNDARIES BRIEF was added: this will return only those boundaries that the GNX is currently within.

3.8 Engine diagnostic requests

The GNX software is split internally into two components, an application, which performs the fleet management functions, and formats data in the activity reports and alerts, and an engine component, which provides all underlying functions, including IP stack, modem handling, GPS handling, Ethernet and UART handling.

In general the engine diagnostic commands are only used to troubleshoot the GNX, and GenX Mobile reserves the right to modify the responses to these commands without notice.

To access the engine diagnostic commands on the UART diagnostic tags must be preceded by

AT!GXDIAG

On all other interfaces (SMS, TFTP, UDP) the diagnostic tags must be preceded by

GXENGINE

For guidance on interpreting the response to these diagnostic requests please consult the GNX troubleshooting guide.

Diagnostic tag	Extra parameters	Description	10 20	10L	5P	5
HARDWARE	None	Returns hardware and software versions.	X	X	X	X
USAGE	None	Returns data and SMS usage of the cellular modem.	X	X	X	X
ETHER	None	Returns the current state of the Ethernet DHCP	X			

		driver.				
MODEM	None	Returns detailed information on the current state of the modem, including serving system, signal strength, APN username and password, and hardware and firmware version.	X	X	X	X
GPS	None	Returns detailed information on the current state of the GPS receiver, including current position, current time, time of last fix, satellites being tracked, with signal strength, azimuth and elevation, and the hardware and firmware versions of the GPS receiver. It will also indicate if the antenna is open or short, and if the almanac data is known.	X	X	X	X
LICKEY	None	Returns the current license key value and expiration date.	X	X	X	X
UARTSTATE	None	Returns the state of the external UART	X		S5	

3.8.1 Accessing engine diagnostics via the application layer

In firmware 1.x.38 and newer engine diagnostics can be accessed via application commands. In simple terms this means that they can be accessed with

AT!GXAPP DIAG [MODEM][GPS][ETHER]

On the UART, and via SMS, UDP, TCP the DIAG commands no longer need to be preceded by !GXDIAG. It also allows for mixing of application and engine diagnostics e.g.:

DIAG COMMS MODEM VIAEMAIL

See the GNX troubleshooting guide for further information.

3.8.2 Brief diagnostic responses to fit in SMS or UDP datagram

See GNX troubleshooting guide for explanation of BRIEF and VBRIEF keywords. BRIEF and VBRIEF can be combined with some diagnostic requests to reduce the size of the response. This can be helpful if the response has to fit into an SMS (160 characters) or a single UDP datagram (512 bytes).

4. Parameter reference

The GNX contains many parameters each with a large number of different settings. Parameter settings are often interactive, requiring many parameters to be set to specific values to achieve the desired behavior. For this reason the table below is provided as a guide, but it is recommended that an initial configuration file is generated by GenX Mobile, and from this base the customer can make small changes to fine-tune behavior.

Short strings are 25 characters (including the termination character)
Long strings are 55 characters (including the termination character)

4.1 Controller parameters

ASCII Tag (Numeric Tag)	Default value	Range	Description	10 20	10L	5P	5
I_ON_INTERVAL(101)	900	0-2^32-1	0-disabled, else interval in seconds between recording position when ignition is on.	X	X	X	X
I_OFF_INTERVAL(102)	7200	0-2^32-1	0-disabled, else interval in seconds between recording position when ignition is off.	X	X	X	X
ALARM_INTERVAL (103)	0	0-2^32-1	0-disabled, else interval in seconds between recording position when alarm is active.	X		X	X
ALARM_DURATION (104)	0	0-2^32-1	0-disabled, else duration of alarm state.	X		X	X
POWER_OFF_TIME (105)	604800.0 .10	0-2^32-1	0-disabled, else interval in seconds between ignition going off and when GNX powers off. Default value changed from 4 hours to 1 week in .77 release. In .81 release a second array entry was added. If set to 1 (default 0) this will force a complete shutdown to draw < 1mA. If left at 0 the GNX may remain in low power mode to monitor the switch inputs. In .82 added a third array entry to control power off time if the GNX is running exclusively on the internal Lilon battery (in seconds, default 0)	X	X	X	X
FAKE_IGNITION (107)	0.0.0.0	See description	Leave set to zero if ignition wire is connected to real vehicle ignition. Set to 1 if ignition wire is connected to brake light, or other pseudo-ignition. Set to a value from 15 to 119 to set a delta-voltage (between the ignition on and off states). The parameter is multiplied by 10 to give mV. A value of 60 is recommended (600mV delta	X	X	X	X

			between ignition on and off). Set to a value from 120-254 to specify an absolute voltage from 12000mV-25400mV. This mode is generally not recommended since absolute levels can vary from vehicle to vehicle. The second array value was added in version .78 and optionally specifies the hysteresis timeout (in minutes) in transitioning from ignition on -> ignition off. This can be combined with a voltage based ignition to prevent false ignition off events if the vehicle idles (at intersections/drive thru etc) and the voltage drops below the on threshold. For example setting 107=40.3; If left as 0 the default is 30 seconds. In .79 firmware two additional array entries were added to the parameter. The 3rd array entry specifies an acceleration threshold in milli-Gs above which the vehicle will be assumed to be moving with the ignition on. The 4th array entry, if non-zero, will allow the GNX to override the parameter setting and use the physical ignition input to determine ignition state, if the GNX observes the physical ignition is at 0 volts (or open circuit) for a continuous 15 minutes.				
MAX_LANDMARK_DIST (109)	10	0-65535	Set in km (not meters !) If the GNX is closer than the specified distance to a landmark then the landmark will be reported in columns 18-22. If it is further then it will not be reported in any of these columns. Special case: if set to 0 then the landmark is only reported in columns 18-22 if the GNX is within the radius of that landmark.	X	X	X	X
GPS_ALARM_IGN_TIME (110)	1800.0	0-2^32-1	Amount of ignition on time for which GPS must be without position fix before GPS alarm occurs and GPS_LOST PVT is queued. 0	X	X	X	X

			disables. In .77 and newer second array entry will cause GPS diagnostic bitmap to be appended to the REASON column when GPS_LOST event occurs to aid with remote diagnostics of the GPS problem. By default this feature is disabled.				
IPSUMM_RPT_TIME(111) (added in .78, Sept 2012)	0	0.0	First index gives time of day or interval of reporting input summary event. If < 1440 then this is the minute of the day (UTC) when the event should be reported. If > 1440 then the first parameter is interpreted as an interval in seconds, but reports are not synchronized with time of day. The second array entry, if set to 1 will cause input counters to all be reset to 0 when the report is sent, so that each input summary event (107) contains only information since the last reported input event.	X		X	
TEMP_INTERVAL(112)	0.0.0	0-65535.0-65535	Added in .81 release to allow the server to command the GNX to temporarily update its position more rapidly. Two index unsigned 16 bit integer parameter. First index shows the update rate / interval in seconds, and second index shows the remaining duration at which this higher update rate will be used. Unlike other parameters the second index of this parameter is updated constantly by the GNX as the remaining duration elapses. Third index added in .83 firmware: if 0 then updates are only sent if the ignition is on, to match prior behavior. If set to 1 then updates are sent regardless of ignition state.				
LANDMARK_ALERT_DIST (115)	300	0-65535 meters	Global landmark radius for any landmarks that do not have an explicit/unique radius. GNX must be within this radius of landmark to queue ARRIVED event, unless the landmark has a unique	X	X	X	

			radius (see SETLANDMARK)				
LANDMARK_ALERT_TIME (116)	30	0-2^32-1 seconds	GNX must be within the above radius for this long to queue ARRIVED event.	X	X	X	
LANDMARK_ALERT_IGN (117)	1	0, 1	If 1 ignition must go off within above radius in order to queue ARRIVED event. If 0 then no ignition event is required to cause ARRIVED event.	X	X	X	
BOUNDARY_HYSTERESIS_TIME (118)	10	0-2^32-1	Hysteresis time during which GNX will not report multiple crossings of the same boundary.	X	X	X	
ALARM_DISTANCE (119)	1000	0-65535 meters	Trip point for traveled distance when alarm is armed (typically when ignition is off)	X	X	X	X
PVT_QUALIFIER (120)	All 1s (1.1.1.1)	Bitmap See 4.8.1	Array of bitmap BYTE values for each event. Indexed by the event code (See 4.8)	X	X	X	X
REPORT_INTERVAL (122)	0	0, 1-3600	(see GNX BRIEF REPORTS application note) Can be used to generate shorter form data at a higher frequency for high frequency low data tracking.	X	X	X	X
IDLE_TIMER (123)	0.0.0.0.0	Array of up to 5 u32 (1-2^32-1) in seconds	Allows definition of up to 5 durations of idling, after each the GNX queues an IDLE_TIMER event. Can be used to draw attention to idling activity of vehicle. Note that in firmware .76 and newer if all 5 entries are non-zero then infinitely recurring IDLE events will be generated at the period between the 4 th and 5 th array entries.	X	X	X	X
PARK_TIMER (124)	0.0.0.0.0	Array of up to 5 u32 (1-2^32-1) in seconds	Allows definition of up to 5 durations of idling, after each the GNX queues a PARK_TIMER event. Can be used to draw attention to parking activity of vehicle.	X	X	X	X
LOW_SPEED_ALERT_THRESHOLD (125)	0.0	Array of 2 0-255 km/h	After remaining below this speed for SPEED_HYSTERESIS_TIME seconds the GNX records a SPEEDING(2)_END event. Note there are 2 values, allowing 2	X	X	X	X

			separate speeding alerts.				
HIGH_SPEED_ALERT_THRESHOLD (126)	0.0	Array of 2 0-255 km/h	After remaining above this speed for SPEED_HYSTERESIS_TIME seconds the GNX records a SPEEDING(2)_START event. Can be used to flag excessive vehicle speed. Note there are 2 values, allowing 2 separate speeding alerts.	X	X	X	X
SPEED_HYSTERESIS_TIME (127)	0	0-65535 seconds	Time for which GNX must be above or below speed threshold to issue an event	X	X	X	X
SPEED_ALERT_BACKOFF_TIME (128)	0	0-2^32-1 seconds	Minimum time interval for issuing a second SPEEDING_START event. Setting this parameter allows the user to be alerted to speeding events without being inundated with events from a single vehicle.	X	X	X	X
REPORT_FORMAT (129)	0.0		Allows runtime switching between ASCII csv and binary position reporting. See "GNX10/10L/5P Binary data format" app note for details. Second array index added in version .78 : any value set in this second array 0-255 will be placed in the new report column 87.	X	X	X	
SWITCH_ON_TIME (130)	10.10.10.10.10	Array of 5 values, each 1-2^32-1 seconds	Extended debouncing time for PTO switches 1-4 and A2D input. PTO must be on for greater than this time to cause SW<1-4>_ON event PTO5 is based on the external ADC input (see PTO5_VOLTAGE (164))	X	X	X	
SWITCH_OFF_TIME (131)	10.10.10.10.10	Array of 5 values, each 1-2^32-1 seconds	Extended debouncing time for PTO switches 1-4 and A2D input. PTO must be off for greater than this time to cause SW<1-4>_OFF event	X	X	X	
STOP_SPEED (108)	5.0	0-65000 km/h	Speed below which GNX determines when to send BEGIN_STOP event. Second array entry can be set to 1 in newer firmware (.76) to force BEGIN_STOP event to always be sent before IGNITION_OFF.	X	X	X	X

MOVE_SPEED (132)	20	0-65000 km/h	Speed above which GNX determines its state to be moving	X	X	X	X
STOP_TIMER (133)	120	0-3600 seconds	Time for which speed must be less than STOP_SPEED to make GNX send BEGIN_STOP event .	X	X	X	X
MOVE_TIMER (134)	20	0-3600 seconds	Time for which speed must be greater than MOVE_SPEED to transition to moving state.	X	X	X	X
DISTANCE_INTERVAL (135)	0.0	0-65535 meters.	Interval at which to queue DISTANCE events in meters. 0 is disabled. In newer firmware second array entry can be set to 1 to cause DISTANCE events to reset the PERIODIC event timer.	X	X	X	X
POWER_DOWN_VOLTAGE (136)	8000	0-65535 millivolts.	If power supply falls below this value and the ignition is off the GNX powers off to prevent damaging a vehicle's battery.	X	X	X	X
GMT_OFFSET (121)	0	-14-+14	Offset of local time from GMT in hours. If defined then all time of day parameters are local times, and reports can be configured to show local time).	X	X	X	X
TIME_ZONE_NAME (137)	"GMT"	3 character ASCII string.	User assigned to correspond to the GMT offset. Used only for information in alerts and reports.	X	X	X	X
IGNITION_DEBOUNCE (138)	10	0-255 seconds.	Provides extended ignition input debouncing / hysteresis. If set to zero then ignition debouncing is 1 second.	X	X	X	X
SPEED_DECAY_INTERVAL (139)	4	0-255	This parameter controls the rate of decay of the time-averaged vehicle speed if GPS tracking is lost. The speed is decayed by 1km/h every N seconds, where N is the value of this parameters. If zero then speed decay is disabled.	X	X	X	X
ODOMETER_IGNITION_LOCK (140)	1	0, 1	If 1 then odometer will never change when the ignition is off. If 0 then the odometer can change when the ignition is off if GPS movement is	X	X	X	X

			detected.				
PTO_ALERT_ON_MOVE_MASK (141)	0	4 bit bitmask (0-15)	If a bit is 1 then the corresponding PTO will cause a SW_MOVING_START alert if it is active at any time when the vehicle is moving.	X	X	X	
PTO_ALERT_ON_MOVE_TIMER (142)	0	0-65535	Time in seconds for which PTO must be active AND vehicle moving to trigger alert.	X	X	X	
RSSI_IN_COVERAGE (143)	-105dBm	-127-0	Trigger level for modem to be determined to be in-coverage for alerting purposes.	X	X	X	X
RSSI_OUT_COVERAGE (144)	-110dBm	-127-0	Trigger level for modem to be determined to be out-of-coverage for alerting purposes.	X	X	X	X
RSSI_HYSTERESIS_TIME (145)	120.0	0-240 seconds.	Time hysteresis value for recording modem in or out of coverage. In seconds. In .77 and newer second array entry will cause CallsSupported diagnostic bitmap to be appended to the REASON column when IN_COVERAGE/NO_COVERAGE events occurs to aid with remote diagnostics of the modem problem. By default this feature is disabled.	X	X	X	X
ALARM_MODE (146)	0	Bitmap	0: disabled 1: arm when ignition off, disarm ign on 2: arm when ign off, disarm on PTO 3: PTO arm/disarm only when ign on 4: PTO arm/disarm 0x20: only trip movement alarm once per ignition cycle 0x40: do not alarm power disconnection (set if using battery backed unit on known intermittent power supply)	X	X	X	X
ALARM_IGN_TIME (147)	1800	0-65535 seconds	0: disable > 0: trigger alarm if ignition on for more than this time and alarm is armed (ALARM_MODE=2,3,4)	X	X	X	

ALARM_DIST_TIME(148)	0	0-65535	How long must be outside radius in parameter 146 before trigger. Set to several minutes to prevent GPS jumps causing false alarms	X	X	X	
MAX_ALARM_FIX_AGE (149)	0	0-65535	Maximum age of GPS position fix (in seconds) for that fix to be used as the stop position of the vehicle (for radius checking see param 119). Recommend 30 seconds.	X	X	X	X
ARM_DISARM_PTO (150)	0	1-4	If ALARM_MODE=2,3, or 4 then this param. sets the PTO to use as the ARM/DISARM button.	X	X	X	
PANIC_PTO (151)	0	1-4 (0= disabled)	Set non-zero to have the corresponding PTO input act as a panic button and put the GNX into the alarm state.	X	X	X	
IGNORE_GPS_I_OFF (152)	0.4.100	0-use GPS, 1- ignore GPS, > 1 radius in meters	Two dimension array. First entry is 0,1 or radius of movement to be ignored in meters. Second array entry is minimum number of satellites in the position fix in order to use the GPS fix. e.g. 152=1000.5; will cause all GPS fixes with fewer than 5 satellites, or showing movement less than 1000 meters to be ignored. See app note on tracking parked vehicles for more information. In .77 release a third array entry was added for units with an internal accelerometer. If non-zero then this specifies a milli-gs threshold which must be exceeded in order for the GNX to allow GPS movement to be recorded (for the next 15 minutes). Recommended setting is 100milli-gs (default). This array entry will reset to zero if the GNX does not have an internal accelerometer fitted.	X	X	X	X
MAX_VEHICLE_SPEED (153)	193kmh (120mph)	0 (disabled)- 65000	Speed filter used to detect erroneous GPS movement caused by multipaths in the GPS receiver. May be tuned to specific vehicle. Firmware .76 and newer adds a second array entry which specifies the minimum number of satellites for	X	X	X	X

			a GPS fix to be used, and defaults to 0. Firmware .83 adds a third array entry that sets the maximum allowable PDOP for the GNX to use a GPS position. Value set is PDOPx10, so 20 would correspond to PDOP of 2.				
EXT_12V_OFF_TIME (156)	0 seconds	0 – 2^31	How long the 12v supply from the GNX is left on for after the ignition goes off. In newer firmware may be an array of 3 values for controlling the power of attached peripherals (e.g. Port expander)	X	X	X	
CMSG_PVT_QUALIFIER (157)	0.0.0.0...		Determines action to be taken when a canned message is submitted for addition to the PVT queue. Follows the same pattern as PVT_QUALIFIER variable. See 3.3.11	X		S5	
HEADER_ROW_FORMAT (158)	2	0-2	0: Header row is comma separated text 1: Header row is comma separated numeric tags 2: No header row is sent. Note that this only affects data sent by TFTP, FTP, TCP and SMTP. UDP socket data never contains a header row.	X	X	X	X
GPS_CYCLING_PERIOD (159)	60	0-240	0: GPS is on permanently regardless of ignition state (Unless IGNORE_GPS_I_OFF=1, in which case GPS is switched off when the ignition is off). >=1: GPS cycles for 1 minute every N minutes where N is the value of this parameter. This can save up to 15mA of current consumption @ 12V. Default value changed from 0 to 60 in .77 firmware release.	X	X	X	X
EXT_12V_ON_TIME (160)	0	0-2^32	0: external 12V power is disabled.	X	X	S5	

			>=1: external 12V power comes on N seconds after the GNX powers up, where N is the value of this parameter. In newer firmware may be an array of 3 values for controlling the power of attached peripherals (e.g. Port expander)				
NAP_ON_TIME (161)	15	1-2^16	When the ignition goes off this specifies how many seconds to stay on for while napping. Recommend setting to 15. Default value changed from 0 to 15 in .77 firmware release.	X	X	X	
NAP_OFF_TIME (162)	45	1-2^16	When the ignition goes off this specifies how many seconds to stay off for while napping. Recommend setting to 45. Default value changed from 0 to 45 in .77 firmware release.	X	X	X	
START_NAPPING (163)	14400 (4 hours)	1-2^32	When the ignition goes off this specifies how many seconds to wait before starting napping. Recommend setting to 300. Default value changed from 0 to 14400 in .77 firmware release.	X	X	X	
PTO5_VOLTAGE (164)	0	1-15000 (mV)	Setting this value causes the external A2D input to be interpreted as a digital switch (PTO 5) switching from off to on at the specified voltage level.	10 only (not 20)	X	X	
PANIC_PTO_BEEPS (165)	0	32 bit bitmap	If one of the PTOs is configured as a panic button then this parameter specifies a beep pattern for relay drive 1, that is sent each time the panic button is pressed. The bitmap is bit-shifted every 100ms (>>) activating the relay when a 1 is in the lsb. Thus a total time period of 3.2 seconds is specified with up to 32 segments of on or off.	X	X	X	
DRIVER_ALERT_BEEPS (166)	0.0	32 bit bitmap	This parameter specifies a beep pattern for relay drive 2, that is sent each time an event occurs where the PVT_QUALIFIER has bit 5 (32) set.	X	X	X	

			For bitmap description see parameter 165, above. A second array entry added in firmware version .79 allows the user to direct the driver alerts to a relay other than 2. Valid settings for this second array entry are 1,2,3,4 with a default of 2 (to match behavior of older firmware version).				
WOL_PERIOD (168)	0	1-2^32 (seconds)	If non-zero then the GNX10 will send Wake-On LAN magic packets at this interval each time the ignition goes from off to on, until it receives a valid IP frame from the Ethernet client.	X			
MOVE_INTERVAL (169)	0.0	1-2^32 (seconds)	If non-zero then the GNX will queue PERIODIC events every N seconds only when the vehicle is moving. This can reduce data usage in vehicles that idle excessively. In .77 and newer firmware there is a second array entry. If set non-zero then this specifies the minimum speed in km/h to generate these positions (this can be higher than the MOVE_SPEED parameter)	X	X	X	X
EXT_12V_ON_RELAY (170)	0	1-4	If non-zero, then the relay indicated 1-4 mimics the action of the switched 12V output, according to parameters 156, 160	X	X	X	
ALERT_INTERVAL (171)	0	1-2^32 (seconds)	If non-zero then the GNX generates a human readable alert (usually sent via email) at this interval.	X	X	X	X
HEADING_CHANGE (172)	0.0	0-360 degrees	If non-zero then the GNX generates a HEADING change event (60) when the course deviates from the prior course by more than this amount. In newer releases the second array entry, if set to 1 restarts the PERIODIC event timer if a heading change event occurs to reduce data usage.	X	X	X	X
HEADING_TIME (173)	0	1-2^32 (seconds)	If non-zero then this prevents HEADING events from being sent	X	X	X	X

		)	more frequently than this interval.				
GPS_ACCEL_LIMIT (174)	0	1-100	In km/h per second. If acceleration greater than this limit is detected for two consecutive seconds then an alert event (61) is queued. Do not use for new hardware with internal accelerometer, use parameter ACCEL_CONFIG.	X	X	X	X
GPS_DECEL_LIMIT(175)	0	-1 - 100	In km/h per second. If deceleration greater than this limit is detected for two consecutive seconds then an alert event (62) is queued. Do not use for new hardware with internal accelerometer, use parameter ACCEL_CONFIG.	X	X	X	X
PVT_RELAY_ON (178)	0.0.0.0.0. 0.0.0	Each entry 1-max PVT	If non-zero then the occurrence of this PVT event will switch on the relay number in the corresponding array entry in parameter 180.	X	X	X	
PVT_RELAY_OFF (179)	0.0.0.0.0. 0.0.0	Each entry 1-max PVT	If non-zero then the occurrence of this PVT event will switch off the relay number in the corresponding array entry in parameter 180.	X	X	X	
PVT_RELAY_OUT (180)	0.0.0.0.0. 0.0.0	Each entry 1-4	If non-zero then this specifies which relay will be switched on/off by the events specified in 178,179	X	X	X	
STOP_INTERVAL (187)	0.0	0-2^32-1	If non-zero then PERIODIC events are generated at this interval when the vehicle is not moving (can be combined with MOVE_INTERVAL). In .76 and newer firm ware there is a second array entry. If set non-zero then this second entry will prevent PERIODIC events from being generated by STOP_INTERVAL when the ignition is off.	X	X	X	X
MIN_PERIODIC_OOC (188)	0.0	0-2^32-1	If non-zero then this decimates PERIODIC events when the modem is out of coverage (see params 143,144,145). This reduces the amount of store-and-forward data.	X	X	X	X

			In .77 and newer firmware there is a second array entry. If set non-zero then this second entry will decimate PERIODIC events if the modem indicates that it is roaming. This may help to reduce data roaming charges.				
EPH_SERVER_IP (189)			No longer supported. There was insufficient evidence that this feature provided any benefit.				
EPH_AID_TIME (190)			No longer supported.				
CANCEL_DRIVER_ID (191)	0.0.0.0.0. 0.0.0	Each entry 1- max PVT	If non-zero then the occurrence of this PVT event will zero out an IDLEiButton based driver ID associated with the GNX. Contact GenX further details.	X		X	
EPH_REPORT_TIME (193)			No longer supported. There was insufficient evidence that this feature provided any benefit.				
ACKRESP_LEN (199)	0	0-25	This acknowledgement extension parameter specifies the number of bytes to include from the received GNXMSG message (up to 25) in the ACK (only used for GNXMSG command)	X		S5	
UMSG_REduced (205)	0/1	0	If set to 1 then SENDGNXMSG user messages contain no extra diagnostic information (lower overhead)	x		S5	
UMSG_ID (215)	Bitmap	0	1: Add USERMSGID=<i> to uniquely identify each message. Value reported is an incrementing unsigned 32 bit integer 2: Add USERMSGTS=<unixepoch> to message, to timestamp each message	x		S5	
CUSTOM_UPDATE_RELAY (207)			See section 4.1.1	X		S5	
ACCEL_CONFIG (216)			See application GNX accelerometer. Contact GenX Mobile for availability of feature on your hardware.				

4.1.1 Custom update rate and relay outputs based on speed and PTO inputs

This feature, added in 1.6.55 and 2.6.55 firmware allows the position reporting update rate and relay outputs to be controlled by a combination of vehicle speed and PTO inputs. The parameter 207 (CUSTOM_UPDATE_RELAY) is an array of unsigned 16 bit integer values, some of which are bitmaps.

The array indices are as follows:

MASK_WORD_OFFSET	0	// mask
SWITCH_WORD_OFFSET	1	// switch state (inc ignition)
SPEED_WORD_OFFSET	2	// speed threshold (km/h)
UR_WORD_OFFSET	3	// update rate (seconds: ignored if zero)
RELAY_WORD_OFFSET	4	// Relay action to take
RELAY_PULSE_OFFSET	5	// Relay pulse pattern

The mask word is a bitmap that defines how the speeds and PTOs should be combined in order to make the condition true or false.

BIT_SPEED_GREATER	0x0100	// if set speed must be > value
BIT_SPEED_LESS	0x0200	// if set speed must be < value
BIT_SW1	0x0001	// if set must match PTO 1 value
BIT_SW2	0x0002	
BIT_SW3	0x0004	
BIT_SW4	0x0008	
BIT_SW5	0x0010	
BIT_SW_AND	0x0080	// AND switch inputs, default=OR
BIT_IGN	0x8000	// must match ignition state specified

The bits in this bitmap control how the SWITCH_WORD_OFFSET and SPEED_WORD_OFFSET values are combined to form the true/false condition.

If speed is part of the decision then one of the BIT_SPEED_XXXX bits must be set. For each PTO contributing to the condition its corresponding bit must be set. Finally if the condition is to be an AND of all PTO inputs then set BIT_SW_AND bit. If this is not set then the condition will be an OR of PTO inputs (i.e. true when any of the specified PTOs matches).

The RELAY_WORD_OFFSET value determines the action on the relay.

RELAY1_ON	0x0001	
RELAY2_ON	0x0002	
RELAY3_ON	0x0004	
RELAY4_ON	0x0008	
RELAY1_OFF	0x0010	
RELAY2_OFF	0x0020	
RELAY3_OFF	0x0040	
RELAY4_OFF	0x0080	
RELAY1_PULSE	0x0100	// Single pulse on the relay
RELAY2_PULSE	0x0200	
RELAY3_PULSE	0x0400	
RELAY4_PULSE	0x0800	
RELAY1_PULSE_REPEAT	0x1000	// repeated pulse on the relay
RELAY2_PULSE_REPEAT	0x2000	
RELAY3_PULSE_REPEAT	0x4000	
RELAY4_PULSE_REPEAT	0x8000	

The RELAY_PULSE_OFFSET defines a pulse pattern similar to the SETRELAYDRIVE1XXXXXXXXX command, except that the maximum pulse pattern duration is 1.6 seconds (though the pulse pattern can repeat).

Some examples:

207=x8083.x8083.0.10.x0001;

would mean that when ignition AND PTO1 AND PTO2 (x8083) are simultaneously active then the update rate changes to 10 seconds, and relay drive 1 is activated (x0001).

207=x8183.x8083.20.10.x0001;

This is the same as above, except the speed must be above 20kmh

207=x8283.x8083.30.10.x0001;

And this is the same except the speed must be below 30kmh.

Finally

207=x0103.x0103.50.60.x8000.x5555;

This is active(update rate = 10 seconds, relay 1 on) if the speed is above 50kmh and PTO1 OR PTO2 are active. When active the update rate is 60 seconds and relay 5 (x8000) starts a repeating pulse pattern of 100ms on 100ms off until a future event turns it off.

There are new events C_START(87) and C_END (88)to signal the start and end of the specified conditions being met. This might help with troubleshooting if a customer is reporting the function not working as intended.

For further assistance setting up this parameter to meet your requirements please contact GenX.

4.2 Communication parameters

ASCII Tag (Numeric Tag)	Default value	Range	Description	10 20	10L	5P	5
CCT_CALL_INTERVAL(1)	0	0-2^32-1 seconds.	Configures the interval between placing circuit data calls if circuit calls are supported on the cellular modem.	10			
PKT_CALL_INTERVAL(2)	0	0-2^32-1 seconds.	Configures the interval between placing packet (GPRS, iDEN, CDMA 1xRTT) data calls to send the position queue. In .77 firmware and newer a second index array was added which disconnects data call if spam is received (useful on systems	X	X	X	X

			with no firewall). By default it is zero and does not disconnect the call. Recommended Setting PKT_CALL_IDLE=<duration>.10;				
CCT_CALL_IDLE(3)	15	0-2^32-1 seconds.	How long a circuit data call is left open for when no data is being exchanged. This would usually be a short duration as circuit calls are charged by duration.	10			
PKT_CALL_IDLE(4)	300.10	0-2^32-1 seconds.	How long a packet (GPRS/1x/HSPA) data call is left open for when no data is being exchanged. This can be a long duration if packet data is charged by data usage and not connection time. In .77 firmware release a second array entry was added. If non-zero this second entry will disconnect a data call if a greater number of TCP or UDP frames are received on a port that the GNX is not monitoring. This can prevent spam related overage charges on networks with no firewall (Sprint/Verizon)	X	X	X	X
SEND_Q_MODE(5)	4	BYTE bitmap	The mode used for sending activity reports. UDP=2, TFTP=4, EMAIL=16, TCP=32, FTP=64	X	X	X	X
APN_CYCLING_RATE(6)	1	0-255	GSM/HSPA only. If this parameter is non-zero then each time a data call fails the GNX may attempt to use a different APN, depending on the SIM being used.	X	X	X	
TFTP_CONFIG_SERVER_IP (7)	N/A	IP address	IP address of configuration server.	X	X	X	X
TFTP_DATA_SERVER_IP (30)	N/A	IP address	IP address of data server.	X	X	X	X
TFTP_CONFIG_SERVER_NAME (31)	N/A	Domain name, Long string	Domain name of configuration server. (DNS lookup overwrites parameter 7)	X	X	X	X

TFTP_DATA_SERVER_NAME (32)	N/A	Domain name, long string	Domain name of data server. (DNS lookup overwrites parameter 30)	X	X	X	X
TFTP_MAX_DURATION (8)	300	0-65535 seconds	Maximum duration of a TFTP transfer before it is determined to have failed.	X	X	X	X
UNIT_NAME (9)	None	Short string	User assigned identifier for GNX. Used only for alert and report purposes.	X	X	X	X
SMS_DESTINATION (10)	Carrier specific	Telephone number.	Destination for all alerts sent via SMS. Defaults to the SMS-email gateway of the carrier if this is known.	X	X	X	X
SMS_SVC_CENTER (11)	Carrier specific	Telephone number	Usually this value is set automatically for the carrier and requires no user intervention.	X	X	X	X
USER_PASSWORD (29)	None	Short string	Setting this password prevents unauthorized users from requesting the position of the GNX.	X	X	X	X
ADMIN_PASSWORD (13)	None	Short string	Setting this password prevents unauthorized users from reconfiguring the position of the GNX. This password can also be used to add an HMAC-MD5 signature to each position report to guard against spoofing of the position of a mobile unit.	X	X	X	X
Q_DUMP_TIME_OF_DAY (14) / COMMAND_TIME_OF_DAY	0.0.0.0.0. .	Array of five values 0-1440 (extended to 24 values in 1.x.5X firmware)	By setting one or more entries in this array the GNX can be configured to send its position queue at up to 5 defined times of day. Each entry is the minute of the day, counted from midnight. If a GMT offset is set then this is applied, else the times are GMT. Note the array was extended to 24 entries in 1.x.5X and newer firmware. In .83 and newer parameter name extended to *_TIME_OF_DAY since it is now linked with the SCHEDULED_COMMAND parameter.	X	X	X	X

TFTP_SUBDIRECTORY (15)	None	Short string	This value is set to force all activity reports sent to a TFTP server to have a directory path prepended to the filename.	X	X	X	X
SMTP_SERVER (16)	NA	IP address	An IP address or domain name for an SMTP relay agent to be used by the GNX if reports or alerts are to be sent via email.	X	X	X	X
SMTP_SOURCE_ADDRESS (17)	None	Short string	This string can be set to a specific source email address, to which a user could reply. The GNX sets a default value for some networks to force replies through the SMS-email gateway.	X	X	X	X
GPRS_APN (18)	Carrier specific	Short string	This parameter can be modified to force the GNX to use a custom APN, or for Mobile networks for which the GNX does not have a default APN.	X	X	X	X
PACKET_USERNAME (19)	None	Short string	If the packet data service requires a specific username set it here. Not usually required as GPRS, CDMA and iDEN use default values.	X	X	X	X
PACKET_PASSWORD (20)	None	Short string	If the packet data service requires a specific password set it here. Not usually required as GPRS, CDMA and iDEN use default values.	X	X	X	X
CIRCUIT_NUMBER (21)	None	Telephone number	If the chosen modem (GPRS, CDMA, iDEN) supports circuit switched data then this parameter can specify the number to be dialed to place a circuit data call.	10			
CIRCUIT_USERNAME (22)	None	Short string	If the circuit data service requires a specific username set it here.	10			
CIRCUIT_PASSWORD (23)	None	Short string	If the circuit data service requires a specific password set it here.	10			
REPORT_COLUMNS (24)			Comma separated list of numeric values corresponding to the column descriptions in the section 4.6.	X	X	X	X
REPORT_DEBUG (25)	0	MODEM x01 GPS	Diagnostic usage only. Bitmap.	X	X	X	X

		x02 HARDW ARE x04					
SEND_ALERT_MODE (26)	SMTP (email)	BYTE bitmap	Defines how alerts are transmitted, SMS=1,UDP=2,TCP=32,EMAIL=16.	X	X	X	X
EMAIL_FORMAT (27)	1 (MIME attachme nt)	0, 1	If set to 0 then report data is sent in the message body, if set to 1 it is sent as a MIME attachment.	X	X	X	X
ALERT_EMAIL (28)	No default	Email address.	Destination email address if alerts are to be sent via SMTP.	X	X	X	X
REPORT_EMAIL (12)	No default.	Email address.	Destination email address if reports are to be sent via SMTP.	X	X	X	X
MAP_HTTP_LINK (33)	None	Long string with tags %LAT% %LON% for true lat, lon substituti on.	A long text string of the form http://<domain> containing %LAT% and %LON% substitution tags. This is appended to all alerts to allow the user to bring up a map of the vehicle location.	X	X	X	X
DNS_IP (34)	0.0.0.0.0. 0.0.0	Unsigned char[8]	This parameter allows the use to specify the IP address of DNS servers to use in preference to those allocated by the modem, or by a DHCP host on the Ethernet.	X	X	X	X
REPORT_FILE_EXTENSION (35)	"csv"	Char[3]	Allows the user to specify a file extension to be used for activity report files sent via FTP, TFTP, or SMTP (MIME). Allows a windows file type to be created to link to a particular application.	X	X	X	X
ETHERNET_ENABLE (36)	0	Unsigned char bitmap.	Bitmap controlling Ethernet port functionality. 16=GNX10 is DHCP client (802.11 client) Values 1,2,3 configure GNX10 as DHCP server. 1=Access GNX internal	X			

			2=Access internet 3=Access internet and GNX internal				
UDP_MAX_RETRIES (39)	0	Unsigned char	If non-zero then any data sent via UDP socket requires an explicit acknowledgment, or it will retry. Set to 0 for unacknowledged UDP and 1 for acknowledged UDP.	X	X	X	X
ADMIN_PASSWORD_MODE (41)	0	0 or 99	If set to 0 then the admin password in parameter 13 must be present in all commands in plain text. If set to 99 then the HMAC-MD5 digest of the command and the password must be present in all commands sent to the GNX for added security.	X	X	X	X
NTP_SERVER_IP (43)	GNX server IP	IP address or 0.0.00 to disable	Added in .81 firmware this IP address can be configured to the address of a Network Time Protocol server to provide time updates to the GNX if GPS is unable to track to satellites.	X	X	X	
SMTP_SERVER_NAME (49)	None	Long string	If defined then the GNX uses a DNS lookup to resolve this name to the IP address of the SMTP relay agent.	X	X	X	X
FTP_USERNAME (50)	"Anonymous"	Long string	If data is to be sent using FTP to a server not supporting anonymous FTP then this username must be set accordingly.	X	X	X	X
FTP_PASSWORD (51)	<serialNumber>@GenX Mobile.com	Long string	If data is to be sent using FTP to a server not supporting anonymous FTP then this password must be set accordingly.	X	X	X	X
FTP_CONFIG_USERNAME (52)	"Anonymous"	Long string	If configuration is to be downloaded using FTP from a server not supporting anonymous FTP then this username must be set accordingly.	X	X	X	X
FTP_CONFIG_PASSWORD (53)	<serialNumber>@GenX Mobile.c	Long string	If configuration is to be downloaded using FTP from a server not supporting anonymous FTP then this	X	X	X	X

	om		username must be set accordingly.				
CONFIGURATION_MODE (54)	4 (TFTP)	BYTE bitmap	Selects mode by which GNX downloads configuration files. TFTP=4 FTP=64	X	X	X	X
MAX_REPORT_FILE_SIZE (55)	100Kbytes (GNX10) 3Kbytes (GNX5)	512- 100Kbytes (GNX10) or 3Kbytes (GNX5) in bytes	Selects the maximum report file size that can be sent using TFTP, FTP, or EMAIL. Larger files allow more data to be contained in a single transfer, but may be more prone to file transfer failure in a cellular environment. Recommended setting when using UDP or TCP socket to send position data: 1024 bytes. In .76 firmware and newer: If set to 0 and SEND_Q_MODE=2 then the GNX5p will send one location per UDP datagram, regardless of the number of unsent positions.	X	X	X	X
SMTP_USERNAME (56)	None	Long string	If using an SMTP relay agent requiring SMTP authentication then the username is programmed in this parameter. The GNX supports AUTH LOGIN and AUTH CRAM MD5 type authentication.	X	X	X	X
SMTP_PASSWORD (57)	None	Long string	If using an SMTP relay agent requiring SMTP authentication then the password is programmed in this parameter.	X	X	X	X
UART_BAUD (60)	7	BYTE	This parameter allows the baud rate of the GNX uart to be changed to work with fixed-baud peripherals. 1=2400baud 2=4800baud 3=9600baud 4=19200baud 5=38400baud 6=57600baud 7=115200baud 8=230400baud	X	X	X	
SEND_COMPRESSED (61)	0	0/1	If 1 then all data is sent compressed as a gzipped file to reduce airtime	X			

			usage.				
UART_FUNCTION (63)	0	0-4	0: AT modem emulation with DUN host (GNX10 only) 1: Iridium satellite modem 2: Sensatronics tempsensor (GNX10 only) 4: Stream NMEA GPS information. (All platforms) 11: PAD (requires special firmware build) 15: GarminPND	X		S5	
BRIEF_REPORT_COLUMNS(64)	0.0.0.0		Used to generate brief reports to the server (see GNX BRIEF REPORTS application note).	X		X	
TCP_TIMEOUT(66)	30	0-2^32	0: TCP sockets are never closed by the GNX >=1: Idle TCP sockets are closed by the GNX after N seconds.	X	X	X	X
ALWAYS_ONLINE (67)	0.0.0.0	0, 1, 2	0: Modem is forced into a data call only when required by an action. 1: Modem attempts to keep a permanent data connection, regardless of activity. (This setting only useful with static or semi-static IP addresses) 2: Modem attempts to keep a permanent data connection, and will also send event code 9 to the server whenever a new connection is started (may be helpful in a dynamic IP system) Array entries 2,3,4 added in .78 firmware for purposes of adding a heartbeat function to keep IP connections alive over UDP or TCP on dynamic IP systems or through firewalls. See section 4.2.1	X	X	X	X
IRIDIUM_REPORT_COLUMNS	0.0.0		Specify report columns for data sent via attached Iridium modem. See	X		X	

(68)			Iridium application note for full description.				
PERIODIC_BACKUP (69)	0	3600 suggested	Causes the GNX10L/5P to periodically save its internal state to non-volatile memory, for better recovery from power glitches. Duration in seconds.		X	X	X
DHCP_LEASE_TIME (71)	86400	0-2^32	This parameter controls the DHCP IP lease time when the GNX10 is operating as a DHCP server to an attached Ethernet client.	X			
DEAD_CALL_DETECT(73)	0	0-10	If non-zero then for each transaction failure (file download, server ACK) a counter is incremented, and every time the counter reaches this value the modem call is restarted.	X	X	X	X
DNS_REFRESH_RATE (74)	0	0-2^32-1	If zero then DNS names are resolved each time a parameter resync occurs. If non-zero then DNS names are re-resolved more frequently (in seconds). Useful if using DNS to switch data centers.	X	X	X	X
ONE_WIRE_ENABLE (86)	0	bitmap	On GNX5 and GNX10 equipped with Maxim 1-wire support this bitmap enables driver ID and temperature sensor operation. These are documented separately. Please contact GenX.	X		X	
USE_PASV_FTP (88)	0	0/1 boolean	If 1 then all FTP transactions use passive mode (PASV, see RFC 959). This may aid compatibility with carrier firewalls.	X	X	X	X
SEND_GMSG_MODE(98)	See description	2.0.0	The mode used for sending user messages (SENDGNXMSG command). UDP=2, TFTP=4, EMAIL=16, TCP=32, FTP=64 Second array entry added in .81, may be set to a non-zero value to specify a number of retries in the event that the server is offline or there is a problem with the cellular link.	x		S5	

			Recommended setting is 5 retries. Third array entry added in .82. If set to 1 then messages are stored in FLASH memory and forwarded when the GNX is within coverage. This limits the user message to 250 bytes/characters, but provides store and forward of up to 1000 user messages (the storage is shared with the position queue so if more messages are stored fewer locations can be stored and forwarded).				
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4.2.1 Heartbeat / keep alive feature (new in .78)

Firmware version .78 adds a heartbeat /keep alive feature that allows the GNX to be configured to send small chunks of data to the server at regular intervals to keep the return path from the server to the GNX ready for immediate communication.

ALWAYS_ONLINE is now a 4 element array:

- 0: 1-always online, 2-send PVT (as prior firmware)
- 1: Keep alive interval in minutes
- 2: How many failed heartbeats before call closed
- 3: 0: send SN, 1: send 0xFF, 2: send IMEI, 3: send UNIT_NAME

Heartbeat uses TFTP_DATA_SERVER_IP and SEND_Q_MODE parameters to decide how and where to send the heartbeat.

Use the following settings for an always TCP connection with IMEI heartbeat every 5 minutes:

```
TCP_TIMEOUT=600; // keep idle socket open for 10 minutes (heartbeat prevents idle)
ALWAYS_ONLINE=1.5.1.2;
SEND_Q_MODE=32;
```

For a UDP heartbeat set SEND_Q_MODE=2; If SEND_Q_MODE=2 (UDP) then each heartbeat requires a standard UDPACK response or it will be counted as failed by the GNX. With TCP the ACK is implicit (Though the TCP implicit ACK will still add more data usage than the UDP ack due to the larger TCP/IP header)..

4.3 Parameters for Ethernet data-delivery (GNX10 & GNX20)

Please contact GenX for more information about this feature. In general this approach is not worthwhile for airtime savings due to the extra hardware cost (vs GNX5P), and the greatly increased system complexity.

ASCII Tag (Numeric Tag)	Default value	Range	Description
ETHER_DATA_SERVER_NAME (42)	None	Domain name of data server to be used for Ethernet	If set GNX10 uses DNS lookup to resolve this name to an IP address and overwrites the value in parameter 144, below.
ETHER_DATA_SERVER_IP (44)	0.0.0.0	IP address of data server to be used for Ethernet sending.	This IP address could be the same as that of the server used for sending data via the GPRS/CDMA/iDEN modem, or it could be different if subnet connectivity prevents the use of the same address.
ETHERNET_REPORT_INTERVAL (45)	0 (disabled)	0-2 ³² -1	Set in seconds. If non-zero then the GNX10 will attempt to send any unsent data in the queue to the Ethernet data server or Ethernet SMTP server (see SEND_Q_MODE param) at this interval. Data is only sent if GNX10 detects that the Ethernet is active and the server is accessible from its current subnet.
ETHER_SMTP_SERVER_NAME (47)	None	Domain name of SMTP relay agent to be used for Ethernet	If set GNX10 uses DNS lookup to resolve this name to an IP address and overwrites the value in parameter 148, below.
ETHER_SMTP_SERVER_IP (48)	0.0.0.0	IP address of SMTP relay agent to be used for Ethernet sending.	This IP address could be the same as that of the relay agent used for sending data via the GPRS/CDMA/iDEN modem, or it could be different if subnet connectivity prevents the use of the same address.
Q_DUMP_MODEM_FALLBACK (46)	1	0 or 1	If 0 then the Q_DUMP_TIME_OF_DAY parameter will only force data to be sent via the Ethernet. If 1 then the parameter will cause data to be sent via Ethernet if the connection is available, else it will use the cellular modem.

ETHER_SMTP_USERNAME (58)	None	Long string	If using an SMTP relay agent requiring SMTP authentication then the username is programmed in this parameter. The GNX10 supports AUTH LOGIN and AUTH CRAM MD5 type authentication.
ETHER_SMTP_PASSWORD (59)	None	Long string	If using an SMTP relay agent requiring SMTP authentication then the password is programmed in this parameter.

4.4 Generic parameters

ASCII Tag (Numeric Tag)	Default value	Range	Description	10/20	10L	5P	5
PARAM_VERSION (500)	None.	Short string	Text string assigned by user for identification of configuration revision.	X	X	X	X
PARAM_VERSION_ADD(5000)	None	string	Text string assigned by user for identification of configuration revision, appended to parameter 500 to allow identification of configuration file daisy-chain. Added in .82 firmware	X		X	
PARAM_RESYNC_TIME (501)	3600 (1 hour)	0, 3600-604800	Number of seconds between automatic downloading of configuration files. 0 disabled.	X	X	X	X
PARAM_ODOMETER (502)	None.	0-2^32-1, in meters.	Allows setting of odometer to a precise value, or zeroing.	X	X	X	X
WATCHDOG_ENABLE (503)	0/100 depending on hardware	0-255	If non-zero enables the GNX CPU software watchdog. Decrements with each firmware restart (whether triggered by power cycle or software reset) Recommended set to 100.	X	X	X	X
GPS_TIME_DELAY (505)	0	0 – disable, 1-36 enable	In increments of 5 seconds. If non-zero this parameter allows the GNX startup to be delayed pending the GPS receiver determining the time so that timestamp of the ignition on and powerup is valid.	X		X	
VALID_IB_CRC (506)	0	Binary array	See application note “ iButton based Driver ID”	X		X	

SCHEDULED_COMMAND	Empty string	100 character string	See page 56		X	X		
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4.5 Scheduled command parameter (new in .83 firmware)

The SCHEDULED_COMMAND (507) string parameter can be configured to hold a command string to be executed at a specified time of day (every day: this is a recurring command). The parameter is limited to 100 characters and in the parameter a colon (:) must be used instead of semicolon (;) which is used to terminate parameter strings. When the command is executed the colons are substituted with semicolons.

To trigger the scheduled command the pre-existing parameter Q_DUMP_TIME_OF_DAY (14) which defines up to 24 times of the day by the minute of the day (1-1440) is reused. In .83 and newer firmware this parameter can be called *_TIME_OF_DAY, where * is any string, e.g.

COMMAND_TIME_OF_DAY, WAKEUP_TIME_OF_DAY

Taken together the following can be setup:

```

SETPARAM
SCHEDULED_COMMAND=DOIFIOFF TURN12VON 600:SETPARAM
TEMP_INTERVAL=60.600.1;
COMMAND_TIME_OF_DAY=360; // 6am GMT
ENDPARAM

```

At 6am each day, if the ignition is off the GNX will turn on the external 12V for 10 minutes, and transmit events at 60 second intervals. After 10 minutes 12v is turned off and transmissions cease.

4.6 MAC filters for Ethernet clients (GNX10 only)

If the parameter ETHERNET_ENABLE is set to 1,2, or 3 then the GNX10 emulates a DHCP server and allows a single DHCP client to connect. To prevent unauthorized access to the GNX10 it is possible to specify up to 50 authorized MAC addresses (6 bytes as Hex).

If 1 or more MAC addresses are specified then all other MAC addresses will be excluded from accessing the GNX10.

To set the 50 MAC addresses set parameters 600 through 649. The MACs can be set using decimal, or the more common hexadecimal notation thus:

```

SETPARAM
601=255.255.255.255.255.255;
602=xFF.xFF.xFF.xFF.xFF.xFF;
ENDPARAM

```

Note that the case of the hexadecimal digit is not important.

To check the current filter settings via the UART

AT!GXAPP DIAG ALLPARAMS 600,649

Note that the GNX10 packs all defined MAC values into the lowest entries, so if parameter 649 was programmed with a MAC when all other MAC filters were zero then the value would be assigned to parameter 600.

4.7 Report columns (as configured by parameter 24)

For all data columns relating to OBD or J1708/J1939, or Garmin operation please refer to separate application notes.

When defining which columns will be reported the numeric column identifiers will be used. When the GNX sends its report it will, by default, include a header row giving a textual description of the contents of each column. This row could be used by a parsing function to distinguish between different GNXs that use different column configurations.

For example to configure the GNX to report only the GMT time, the latitude in degrees and the longitude in degrees parameter 24, the REPORT_COLUMNS would be set as follows:

REPORT_COLUMNS=2.3.4;

Each CSV activity report file from the GNX would then look like this:

EventTime(GMT),Latitude,Longitude
2/15/05 12:45:05,37.5879,-121.7893
2/15/05 12:57:05,37.8974,-121.1456

Column Name (numeric identifier)	Description	10 20	10L	5P	5
UnitName (1)	Textual name tag assigned to the GNX by the user for ease of reference. (See parameter 9)	X	X	X	X
EventTime(GMT)(2)	GMT timestamp of event MM/DD/YY HH:MM:SS	X	X	X	X
Latitude (3)	Latitude of event in fractional degrees, -90 to 90	X	X	X	X
Longitude (4)	Longitude of event in fractional degrees, -180(W) to 180(E)	X	X	X	X
Latitude(MAS) (5)	Latitude of event in milliarcseconds, -324000000 to 324000000	X	X	X	X
Longitude(MAS) (6)	Longitude of event in milliarcseconds, -648000000 to 648000000	X	X	X	X
UniqueID(7)	A 32 bit unsigned integer that increments with each position sent, to allow unique identification (and reference) of each position. Very useful for troubleshooting.	X	X	X	X
LocAge(mins) (8)	Age of the position fix at the time of recording the event, in minutes, 0-240. 0-position fix was current and good.	X	X	X	X
Reason (9)	The reason that caused the GNX to queue this event, see section 4.8	X	X	X	X

	below.				
ReasonCode (10)	As above, but a numeric code, rather than text. This can reduce data usage at the expense of human readability.	X	X	X	X
Ign (11)	"ON" or "OFF". The state of the true, or pseudo-ignition at the time the event was recorded.	X	X	X	X
StopDur(mins) (12)	The duration of a stop in minutes, at the time the event was recorded.	X	X	X	X
Speed(km/h) (13)	The speed of the GNX in km/h at the time the event was recorded.	X	X	X	X
Speed(mph) (14)	The speed of the GNX in mph at the time the event was recorded.	X	X	X	X
Speed(m/s) (15)	The speed of the GNX in meters per second at the time the event was recorded.	X	X	X	X
VehHdg (16)	Textual heading (N, NE, E, SE, S, SW, W, NW)	X	X	X	X
VehHdg (17)	Heading in degrees.	X	X	X	X
Landmark (18)	Name of closest landmark, if one is defined.	X	X	X	
LandmarkDist(km) (19)	Distance from above landmark in km.	X	X	X	
LandmarkDist(miles) (20)	Distance from above landmark in miles.	X	X	X	
LandmarkBearing (21)	Bearing <i>from</i> above landmark N,NE etc	X	X	X	
LandmarkBearing (22)	Bearing <i>from</i> above landmark in degrees.	X	X	X	
Odometer(km) (23)	GNX odometer in km. (Piecewise linear approximation, with maximum resolution of 1 second of travel).	X	X	X	X
Odometer (24)	GNX odometer in miles.	X	X	X	X
Region (25)	Name of region (boundary) in which the GNX is located. If within multiple regions then this is the name of the highest-layer region. If within multiple regions of the same level then the first region defined in the GNX memory is used. This behavior is not predictable if multiple region-definition files are used. If reason for recording event is a boundary crossing then the name of boundary crossed is present.	X	X	X	
Altitude(m) (26)	Altitude in meters.	X	X	X	X
Altitude(f) (27)	Altitude in feet.	X	X	X	X
SerialNumber (28)	12 digit GenX Mobile assigned serial number. A unique identifier for a GNX.	X	X	X	X
Localtime (29)	Local timestamp of event MM/DD/YY HH:MM:SS. Local time is calculated based on GMT time plus the offset value specified by	X	X	X	X

	parameter GMT_OFFSET.				
IdleTime (30)	Duration of idling (speed < STOP_SPEED and ignition on) in minutes.	X	X	X	X
State (31)	MOVING, IDLING, or PARKED, based on parameters STOP_SPEED, MOVE_SPEED, STOP_TIMER, MOVE_TIMER, and the ignition input.	X	X	X	X
AvgSpeed(km/h) (32)	Speed average used for state determination.	X	X	X	X
CRC16_CCITT (33)	CCITT-CRC16 checksum of all prior characters in a row of data, including commas.	X	X	X	X
EventTime(GMTUnix) (36)	UNIX epoch timestamp of event. This is a 32 bit unsigned integer second count, starting on Jan 1 st 1970. No GMT offset is applied.	X	X	X	X
Switch_1 (37)	ON or OFF: current state of switch input 1	X	X	X	
Switch_2 (38)	ON or OFF: current state of switch input 2	X	X	X	
Switch_3 (39)	ON or OFF: current state of switch input 3	X	X	X	
Switch_4 (40)	ON or OFF: current state of switch input 4	X	X	X	
PwrSupply (41)	GNX primary power supply voltage level in millivolts.	X	X	X	X
ExtADC (42)	External A2D convertor input voltage in millivolts. May be used for peripherals such as temperature sensor.	X	X	X	
SID (43)	Diagnostic purposes. Current serving system identifier of the cellular modem.	X	X	X	X
RSSI (44)	Diagnostic purposes. Current received signal strength of the cellular modem in dBm.	X	X	X	X
CallsSupported (45)	Diagnostic purposes. Current services supported by the cellular modem. Bitmap for GenX Mobile use only.	X	X	X	X
SVFix(46)	Diagnostic purposes. Number of satellites used in the most recent position fix by the GPS receiver (0-12).	X	X	X	X
SVTrk (47)	Diagnostic purposes. Number of satellites being tracked by the GPS receiver (0-12)	X	X	X	X
GPSSat (48)	Diagnostic purposes. Current status of GPS receiver. Bitmap for GenX Mobile use only.	X	X	X	X
GPSSNR (49)	The received signal strength of the strongest satellite being tracked by the GPS receiver.	X	X	X	X
PDOP(135)	Added in .83 shows GPS PDOPx10 (as an integer value). (PDOP=Position Dilution of Precision, a measure of how accurate the	X	X	X	

	fix is)				
Temp (50)	Internal GNX temperature in Celsius	X	X	X	
HMD5 (51)	HMAC-MD5 message digest of all preceeding characters in the row, with the secret password specified by parameter ADMIN_PASSWORD. This protects against spoofing of the position of the GNX, and variations in row content (in particular the UniqueID column) provides replay protection.	X	X	X	X
WakeCode (52)	GenX engineering diagnostic purposes only	X	X	X	X
ExternalTemp1 (57)	Temperature of external probe connected to input #1 of Sensatronics IT temperature model F RS232 convertor	X		S5	
ExternalTemp2 (58)	Temperature of external probe connected to input #2 of Sensatronics IT temperature model F RS232 convertor	X		S5	
PhoneNumber (62)	The phone number of the cellular modem (or SIM card).	X	X	X	X
ICCID (63)	The ICCID of the modem SIM card.	X	X	X	X
SecCnt (64)	Linear second count of the number of seconds since the GNX last powered on.	X	X	X	X
Switches (65)	State 0/1 of all 5 PTO switches (12345)eg 00000 11111 (Reports 12 PTO switches on GNX20, and 13 on a GNX5P equipped with a GNX port expander)	X	X	X	
Switches(133)	Extended switch summary which sends as unsigned 16 bit integer on GNX20 configured for binary position data reporting.	X	X	X	
Relays(1234) (79)	Summary of the current state of the output relay drives on the GNX5/10	X	X	X	
FWVers (80)	Firmware version	X	X	X	X
IBID (82)	Currently associated iButton driver ID	X		X	
PID(87)	Packet identified: takes the value of the second array entry of parameter REPORT_FORMAT: is intended to be used by the server's receiver to determine the content of received data.	X		X	
DeltaOdo(98)	Delta odometer from prior event in meters	X	X	X	
ExternalTemp(130)	Up to 4 external 1 wire tempsensor values, separated by colon. Celsius or Fahrenheit depends on the 1 Wire configuration.	X		S5	
RH(%) (131)	Up to 4 external 1wire humidity sensor (DS1923) values, separated by colon.	X		S5	
PNDStat [152]	The upper byte is a bitmap: the most significant bit is 1 when the GNX external 12v supply is on. the bit 0x40 is 1 when the GNX is configured for Garmin (UART_FUNCTION parameter) Sample values would be (shown as ASCII hex): C6 : this is the normal value when the Garmin is on, communicating;	X		S5	

	all's good. 40 : the external 12v power is off: check config. and ignition state C0: the power is on and the GNX is configured but no Garmin comm: check cabling 80 or 00: the GNX is not configured for Garmin: check configurations				
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4.8 Reasons for queuing events

Reason text (numeric code)	Description	10 20	10L	5P	5
POWERUP (0)	GNX powers up..	X	X	X	X
SHORT_PWROUT(1)	Brief power glitch or GNX reset.	X	X	X	X
IGNITION_OFF (2)	Ignition goes off.	X	X	X	X
IGNITION_ON (3)	Ignition goes on.	X	X	X	X
ALARM_TRIPPED (4)	GNX alarm is tripped.	X	X	X	X
POWER_OFF (5)	GNX powers off.	X	X	X	X
PERIODIC (6)	Timer expiry event (see parameters I_ON_INTERVAL, I_OFF_INTERVAL).	X	X	X	X
ILLEGAL_PWRUP (7)	GNX restarts unexpectedly.	X	X	X	X
POLL (8)	Remote user requests location of GNX.	X	X	X	X
GPS_LOST (10)	GPS has not made a position fix in N minutes during which the ignition has been on. (Not sent when ignition is off to prevent false alarms when vehicle may be parked undercover). See parameter GPS_ALARM_IGN_TIME	X	X	X	X
GPS_FOUND (11)	GPS has been reacquired and GPS_LOST event was previously queued.	X	X	X	X
ARRIVED (12)	GNX arrived at a landmark. Arrival may be defined by a radius, period of elapsed time, and by the ignition state. See parameters 115-117.	X	X	X	
DEPARTED (13)	GNX departed from the landmark at which it previously arrived. This is defined only by the radius of the landmark, not by time or ignition state.	X	X	X	
IN-REGION (14)	GNX entered a region (boundary)	X	X	X	
OUT_REGION (15)	GNX left a region (boundary)	X	X	X	
IDLE_TIMER (16)	GNX has been in state IDLING for N minutes, and has tripped a timer set in parameter IDLE_TIMER.	X	X	X	X

PARK_TIMER (17)	GNX has been in state PARKED for N minutes, and has tripped a timer set in parameter PARK_TIMER.	X	X	X	X
SPEEDING_START (18)	GNX speed has been above value specified by parameter HIGH_SPEED_ALERT_THRESHOLD for SPEED_HYSTERESIS_TIME.	X	X	X	X
SPEEDING_STOP (19)	GNX speed has been below value specified by parameter LOW_SPEED_ALERT_THRESHOLD for SPEED_HYSTERESIS_TIME.	X	X	X	X
S1_ON (20)	External switch1 goes active	X	X	X	
S2_ON (21)	External switch2 goes active	X	X	X	
S3_ON (22)	External switch3 goes active	X	X	X	
S4_ON (23)	External switch4 goes active	X	X	X	
S1_OFF (24)	External switch1 goes inactive	X	X	X	
S2_OFF (25)	External switch2 goes inactive	X	X	X	
S3_OFF (26)	External switch3 goes inactive	X	X	X	
S4_OFF (27)	External switch4 goes inactive	X	X	X	
BEGIN_STOP (28)	GNX speed has been below value specified by parameter STOP_SPEED for STOP_TIMER seconds.	X	X	X	X
BEGIN_MOVE (29)	GNX speed has been above value specified by parameter MOVE_SPEED for MOVE_TIMER seconds.	X	X	X	X
DISTANCE (30)	GNX has traveled DISTANCE_INTERVAL meters since last DISTANCE event was queued.	X	X	X	X
POWER_OFF_BATT (31)	GNX main supply voltage has been below POWER_DOWN_VOLTAGE for at least 2 minutes.	X	X	X	X
USER_MESSAGE (32)	User application on UART or Ethernet interface sent a text message.	X			
USER_RESET (33)	GNX received a RESETGNX10 command.	X	X	X	X
Q_RESET (34)	GNX received a RESETPVTQ command.	X	X	X	X
START_OTAP (35)	GNX started OTAP process, triggering the sending of its position queue.	X	X	X	X
CR: (36)	Magnetic card reader input detected. The string of characters encoded on the magnetic card follows the text tag.	X		S5	
SW_MOVING_START (37)	Indicates that a PTO is active while the vehicle is moving, and that this	X	X	X	

	has been the case for a period of time.				
SW_MOVING_END (38)	Must follow the previous PVT. Indicates that either the PVT went inactive, OR the vehicle stopped moving.	X	X	X	
GPS_ANT_SHORT (39)	Indicates that the GPS module is signaling a short-circuit on the antenna connection	X	X	X	X
GPS_ANT_OPEN (40)	Indicates that the GPS module is signaling a open-circuit on the antenna connection (not supported in very early production GNX10s).	X	X	X	X
IN_COVERAGE (41)	Indicates that the cellular modem signal strength (RSSI) has been above the defined threshold RSSI_IN_COVERAGE for the hysteresis time.	X	X	X	X
NO_COVERAGE (42)	Indicates that the cellular modem signal strength (RSSI) has been below the defined threshold RSSI_OUT_COVERAGE for the hysteresis time.	X	X	X	X
SIM_REMOVED (43)	Indicates that the SIM was removed from the GNX (GPRS modems only).	X	X	X	X
EMERGENCY (44)	Caused by pushing of external panic button which can be configured to be connected to any of the four switch inputs.	X	X	X	
TEMP_HIGH (45)	If external tempsensor is connected this indicates a high-temperature condition (levels are parameterized)	X		S5	
TEMP_LOW (46)	As above, but a low temperature event	X		S5	
POWER_CONNECTED (48)	If a backup battery is fitted this PVT indicates that main power was restored.	X	X	X	
POWER_DISCONNECTED (49)	If a backup battery is fitted this PVT indicates that main power was disconnected.	X	X	X	
BACKUP_POWER_GOOD (50)	If a backup battery is fitted this PVT indicates that backup power was restored.	X	X	X	
BACKUP_POWER_BAD (51)	If a backup battery is fitted this PVT indicates that main power was disconnected or fell to a low level (discharged).	X	X	X	
FIRST_FIX (54)	If the GNX is not making a current GPS position fix when the ignition goes from off to on (e.g. when parked in a garage) then this event captures the first position fix made following the ignition change.	X	X	X	X
S5_ON (55)	If the analog A2D input is configured to act as a voltage based PTO (see param 164) then this event captures the transition from below the specified voltage to above the specified voltage.	X	X	X	
S5_OFF (56)	If the analog A2D input is configured to act as a voltage based PTO (see param 164) then this event captures the transition from above the	X	X	X	

	specified voltage to below the specified voltage.				
SPEEDING2_START (57)	GNX speed has been above value specified by parameter HIGH_SPEED_ALERT_THRESHOLD[2] for SPEED_HYSTERESIS_TIME.	X	X	X	X
SPEEDING2_END (58)	GNX speed has been below value specified by parameter LOW_SPEED_ALERT_THRESHOLD[2] for SPEED_HYSTERESIS_TIME.	X	X	X	X
ILLEGAL_POWEROFF (59)	Recorded when the GNX next comes on, prior to recording ILLEGAL_PWRUP, this shows when and where the GNX10 lost power.	X	1*	1*	X
HEADING (60)	If the GNX is configured with parameters 172 and 173 then this event records a change in heading. This can be useful for tracing a path through an urban area without having excessive data usage.	X	X	X	X
GPS_ACCEL (61)	If a GPS acceleration limit (param 174) is set then this alert is generated when the acceleration limit is exceeded for two consecutive seconds.	X	X	X	X
GPS_DECEL (62)	If a deceleration limit (param 175) is set then this alert is generated when the deceleration limit is exceeded for two consecutive seconds.	X	X	X	X
IB_IN (65)	Driver ID iButton was detected on the 1 wire interface	X		X	
IB_OUT (66)	Driver ID iButton was removed from the 1 wire interface	X		X	
CALLFAILED (70)	Attempt to establish a data call failed (for diagnostics)	X	X	X	X
ALARMEND (77)	An alarm condition (movement, power disconnection, panic button) ended.	X	X	X	X
C_START (87)	Marks start of customizable condition (see section 4.1.1)	X		S5	
C_END (88)	Marks end of customizable condition	X		S5	
AGPS(95)	Network Assisted GPS position fix (where supported by hardware)	X		S5	
SHORT_BIN(96)	External UART application sent a short binary string using AT!GXAPP SENDSHORTBIN (see 3.3.8)	X		S5	
M_OFF(97)	Indicates modem was switched off by driver (special firmware build to allow modem switching for flammable/explosive environments).			S5	
M_ON(98)	Indicates modem was switched on by driver (special firmware build to allow modem switching for flammable/explosive environments).			S5	
PEPTO (99)	If a port expander or Jbox peripheral is connected to a GNX5P then this indicates that the peripheral was connected or disconnected, or that the supplementary PTO inputs on the port expander changed. Connection and disconnection can be due to the GNX powering and de-powering			X	

	the peripheral according to parameters 56, 60.				
HARSH_TURN(100)	Indicates that the accelerometer detected harsh cornering (see GNX accelerometer application note). Not supported on all hardware			Some	
IB_BAD (102)	Indicates the ID ibutton checksum did not match any of the entries in parameter 506.	X		S5	
PTO (99)	GNX20/5p with port expander only: indicates change of state on one of PTO inputs 5-15 (port expander), 5-12 (GNX20). If multiple inputs change in the same 1 second interval only a single PTO event is generated.	20		S5	
TILT (103)	On hardware with 3 axis accelerometer fitted this event can be configured to occur when a parked vehicle is tilted (e.g. Being towed). See accelerometer application note.				
SBD (104)	Indicates GNX attempted to send location via Iridium Short Burst Data modem	X		S5	
105-reserved					
INTFC(106)	On GNX devices equipped with some Ublox GSM/HSPA modems this event signifies that the modem has detected interference that is preventing a data connection. (.77 firmware and newer)	X	X	X	
IPSUM (107)	Input summary event: gives summary of action on the ignition and PTO inputs since the last event. Can be a useful daily summary of activity. See section 4.7.2 below for more information.	X		X	
GPSJAM(108)	On GNX devices with a ublox GPS receiver with software version 7 and above this event will show if the GPS receiver thinks that the lack of position fix may be for jamming reasons. This has been found to be prone to false positives so please bear this in mind.	X		X	

1*: The timestamp in the ILLEGAL_POWEROFF message may be old on the GNX5P and GNX10L according to how long prior to the poweroff the GNX last performed an nvram backup. (BACKUPNVRAM or PERIODIC_BACKUP)

4.8.1 Configuring the action to be taken when particular events occur

Each of the events listed in section 4.8 can be configured to cause a number of different actions in the GNX using parameter PVT_QUALIFIER(120) (section 4.1)

The PVT qualifier variable is an array of bitmaps, where the index of the array corresponds to the numerical value of the event code in the table above. The bitmap values are :

0: no action, the event is discarded
 1: the event is added to the queue. No other action is taken
 2: the event triggers a human-readable alert to be sent immediately
 4: the event triggers the sending of all unsent events in the queue in the form of an activity report.
 8: the event triggers the sending of a single event in the form of a single row from an activity report (comma-separated row)
 16: The queue is immediately sent, but only if a connection can be made to the server via the Ethernet, not the cellular modem.
 32: A driver alert is sent by activating a pulse pattern on relay drive 2 (parameter 166 must also be defined for this function).

Thus the PVT_QUALIFIER should be set to 0 for events which are of no interest, 1 for events not requiring immediate attention, 3 or 9 for events requiring immediate attention (if 3 alert sent directly to user, if 9 via a server) and 5 for events that should cause the queue to be flushed to the server, for example a PVT_POWER_OFF. A simple PVT_QUALIFIER might look like this:

PVT_QUALIFIER=3.0.1.1.0.5.3;

In this case the IGNITION_ON, IGNITION_OFF points would simply be queued as they occurred. The POWER_UP and PERIODIC would be added to the queue and cause an immediate human-readable alert. The POWER_OFF would cause all unsent data to be flushed from the queue. The SHORT_PWRROUT would be discarded.

4.8.1.1 PVT_QUALIFIER X

Firmware versions x.x.56 and newer there is an additional method for setting PVT_QUALIFIER codes, to simplify what has become a very large array.

PVT_QUALIFIER_<numeric value>=x.y.z.xx.yy.zz;

will assign the value <numeric value> to the PVT codes x,y,z,xx,yy,zz;

For example

PVT_QUALIFIER_5=7.9.11.41.56;

would set PVT_QUALIFIER array entries 7,9,11,41,56 to value 5;

Similarly

PVT_QUALIFIER_X<hex value>=x.y.z;

would set PVT codes x,y,z to the hex value (which might sometimes be useful since the PVT qualifiers are a bitmap).

Note that you cannot use this method to set the value of PVT_QUALIFIER 0 (POWERUP).

At factory reset the PVT_QUALIFIER is all 1s apart from PVT_DATACALL_FAILED which defaults to 0.

Setting PVT_QUALIFIER=0; sets all values to zero. So you could combine:

```
PVT_QUALIFIER=0; // set all PVT qualifiers to 0
PVT_QUALIFIER_5=5.7.9;
```

the net result would be to assign value 5 to PVT codes 5,7,9, with all others set to zero.

4.8.2 Input summary event (107)

The event 107 sends additional information, appended to the reason code/reason text column.

```
IPSUM:1003:533:1:535:154:2:0:0:385:3:555:2
107:1003:533:1:535:154:2:0:0:385:3:555:2
```

1003 Total run time (subtract all on times from this to get off time)

533 Ignition on time (total)

1 Number of ignition switches (off->on)

535 total idle time

154 PTO1 on time

2 PTO1 transitions (off->on)

0 PTO2 on time

0 PTO2 transitions (off->on)

385 PTO3 on time

3 PTO3 transitions (off->on)

555 PTO4 on time

2 PTO4 transitions (off->on)

If the GNX is configured to transmit binary location data then 12 extra uint32 values (48 bytes) are appended to the end of the regular binary data point, after the final configured report column. The order of the data is the same as shown above.

5. Alerts

The GNX generates activity reports, which were described above to be rows of comma-separated columns, with each row representing an event.

In addition the GNX can be configured to generate a human-readable alert when certain events occur (See section 4.8.1). These alerts can be sent directly to a person's email account, and can contain an http link to a map to alert them to key events, without requiring them to look through detailed activity report. For example a supervisor can be

alerted if a vehicle leaves its geographical operational area, or if an installer has been at an installation for longer than the scheduled time.

An example of an alert sent by email is shown below:

Subject: SeansGX10 4/22 20:54 EDT IN-REGION

Entered Connecticut Moving NE at 84kph 40.0km NE of New York City NY

<http://www.multimap.com/map/browse.cgi?lat=40.9954&lon=-73.65834&scale=25000&icon=x>

Ignition is ON,Odo:4176.5km,Lat:40.99543 Lon:-73.65834,SN:000000020012

Notice that the reason code (see section 4.8) is included in the subject line, along with the local time and the unit name, so a supervisor can immediately recognize the alert without having to open the email.

The email body contains detailed information along with an optional http link that opens a map showing the location of the vehicle.

The use of landmarks, in this case New York City, NY can also give the reader a good feeling for the location of the vehicle, without having to resort to a map. GenX Mobile can supply generic landmark and state boundary files for the US, and can advise on creation of custom landmark files for specific clients.

6. Reprogramming hardware attached to the GNX UART (GNX10/20/Super-5 only)

If a peripheral is attached to the GNX then in some instances it might be desirable to allow that peripheral to be configured and / or reprogrammed via the cellular modem, as is done with the GNX. If the application is connected via the Ethernet connection of the GNX then it is recommended that the application use the GNX purely as a conduit to the internet, and use TFTP, FTP or another protocol as appropriate.

If the application is connected to the UART then the GNX provides a method to allow files to be transferred from a TFTP or FTP server via the GNX to the external application, using the same process as is used to download new firmware to the GNX itself. The procedure entails running the application data file through a preprocessing program on a PC in order to add a header that it recognized by the GNX, along with a checksum to guarantee data integrity during the file transfer process.

A GETFILE instruction is then sent to the GNX to instruct it to download the preprocessed file from a TFTP or FTP server. When the file transfer has completed the GNX sends an alert to the external application. The application can then query the file details, and then use Xmodem to download the file across the UART. The file is held in the GNX in non-volatile memory, and so it need not be immediately processed by the external application.

Command	Extra parameters	Description	10/20/
---------	------------------	-------------	--------

			S5
AT!GXDIAG CHECKAPPPFILE	None.	Command checks whether there is an application file present in the GNX non-volatile memory. Response format is shown below.	X
AT!GXDIAG GETAPPPFILE	None.	Command requests the download of an application file from GNX non-volatile memory. After issuing the command the external application should start an Xmodem client to download the file from the GNX.	X

Format of response to CHECKAPPPFILE command.

**+GXAPPPDATA:GenXExtAppData;tmp.txt;Mon Jan 30 13:17:56 2006
FILECRC 1969 DATALEN 24111**

Where

Tmp.txt is the filename of the original file prior to preprocessing.

Jan 30 .. is the date and time of file preprocessing

FILECRC is the crc16 of the file, excluding the header

DATALEN is the length of the user data portion, excluding the header. The application uses this to exclude extra CTRL-Z characters in the final Xmodem frame.

7. Green & Red LED reference

The green and red LEDs are intended to troubleshoot installations. Below is a summary of their behavior.

7.1 Green LED

When the ignition is first turned on the GNX will powerup. The Green LED will show solid for approximately 30 seconds (there may be some brief flickers initially while the processor initializes). At no other time should the green LED remain on solid for such a long period.

After 30 seconds the green LED will start to flash at the following rates :

- 25 times on-off every 10 seconds when the ignition is on (this is quite rapid)
- 8 times on-off every 10 seconds when the ignition is off (this is quite slow)
- Very short blip once every 3 seconds when napping

The green LED will also show if there is a PTO active by flashing a number of times corresponding to the PTO (1,2,3,4). For example if PTO 4 is active then there will be 4 short flashes every 3 seconds.

7.2 Red LED

The RED LED flashes 2-digit codes. Roughly speaking the first digit tells you what general area is having a problem (hardware, modem, GPS, end-end service). The second digit gives specific error information. Since there can be more than one error condition the GNX rotates through the error codes (for example if GPS is tracking no satellites and the modem is not registered).

7.2.1 1 – X error codes : GNX specific errors

1-1 The GNX has an expired license key due to failure to resync. with the GenXMobile configuration server. Contact GenX with the serial number of the device.

1-2 Low supply voltage. This could be caused by a true low voltage condition (<8v) or a high impedance supply that dips in voltage when the current draw spikes due to modem transmit. This feature was introduced in 1.x.53 firmware.

1-3 Allocated data usage exhausted. Resync the unit to restore (see MAXDATAUSAGE)

7.2.2 2 – X error codes: Modem related error codes

2-1 Modem module fault. RMA unit to GenXMobile for failure analysis and repair.

2-2 No SIM inserted. Make sure SIM drawer contains SIM and is correctly seated in the socket. If it is then RMA unit to GenXMobile for failure analysis and repair.

2-3 No signal. Check that the cellular antenna is correctly attached. Try to substitute a known-good cellular antenna to see if the antenna may be broken. If this cures the problem then reinstall new antenna. If not then RMA unit to GenXMobile for failure analysis and repair.

2-4 Network not found. For GSM remove the SIM card and try in a known-good GNX. If that GNX displays the same problem then the SIM card or account may be the source of the problem. For CDMA check that the account is still active. If it is then RMA the unit and transfer the account to the new ESN.

2-5 Last data session failed. This means that an attempt to establish a data session (GPRS, CDMA1x) failed. This could be because of an account problem, an incorrect APN, username or password, or simply due to network loading, temporary network outage, or poor radio coverage. This failure will occasionally happen in a working unit, but if the problem is persistent then further investigation is required.

2-6 GPRS is not attached, or CDMA 1xRTT data is not available.

7.2.3 3 – X error codes: GPS related error codes

3-1 GPS module fault: RMA the GNX to GenXMobile for failure analysis.

3-2 GPS antenna fault: Try replacing the GPS antenna with a known good antenna. If the condition is not corrected (wait 2 minutes for the LED to update) then RMA to GenXMobile for failure analysis.

3-3 GPS not tracking any satellites. Check that the GPS antenna has a clear, unobstructed view of the sky, and has been operating for at least 5 minutes. Check that the GPS antenna is facing the correct way up. If the condition persists RMA to GenXMobile for failure analysis.

3-4 GPS no fix (<3 satellites). If antenna has only partial view of sky due to the position of the vehicle (under a cover, close proximity to a building) then try to move the vehicle to ensure that it will be able to make fixes when standing in the open. If the vehicle has a full view of the sky and the error condition persists then try to reposition the GPS antenna to get less obstructed view of the sky.

3-5 GPS has no time. The GPS receiver sets its internal clock from the satellite signals. If the GPS receiver has no time then it has never seen a single satellite since the GNX5/10 was last power cycled.

7.2.4 4 - X error codes : end-end application error codes

4-2 Data transfer failed. This could be a TFTP, FTP, SMTP file transfer or a data transfer via TCP or UDP socket. It could indicate a failure to resync with the GenX Mobile server, or a failure to upload position data to the customer server. If the condition persists then contact GenX with the serial number and the phone number or IP. Note that since mobile data communication is inherently unreliable this code can appear from time to time even on a perfectly healthy GNX, and is not necessarily indicative of a hardware, firmware, or installation problem.

8. Reprogramming a GNX

8.1 Explanation of firmware version names

The firmware names are of the format:

GXVF_VM_VmVO_KEYCRC_CCCC.gx[ez]

X:Hardware family 1=older GNX10, 2= new GNX10, 4=GNX5, 6=GNX5P, 7=GNX10L, 8=GNX20

VF:Version family, usually 01

Vm:Version minor

VO:Version option, e.g GX=standard, GK=Kore SIM only, CX=CDMA only, IX=iDEN only

KEYCRC_CCCC is optional, and defines the CRC of the encryption key used to create the image. This is checked by the firmware to prevent reprogramming of a unit with incompatible firmware. It's checked during the reprogram command, during the file transfer,

and prior to reprogramming for maximum safety against reprogramming with incompatible code.

GNX10s generally use a gxz, compressed binary file format.

GNX5P/GNX10L/GNX20 use a gxe encrypted, uncompressed binary file format.

8.2 Reprogramming via the serial port

Start a terminal emulator (hyperterminal, teraterm etc) running at 115200 baud, 8 data bits, 1 stop bit, no parity, no flow control. (NOTE: the GNX5 must have hardware flow control enabled !)

Type

ATI0

And check the response is

GenX Mobile Inc.

Next type

AT!GXREPROGRAM

On the terminal emulator select 1K Xmodem and transfer the firmware image file.

The transfer should complete in less than 1 minute. Do not disconnect power from the GNX while this is happening as it's possible, though very unlikely that the GNX would be corrupted.

At the end of the transfer reprogramming occurs and the GNX reboots running the new code.

Check that the new firmware is loaded using the command

AT!GXDIAG HARDWARE

8.3 Over the air programming (OTAP)

The command to reprogram GenX units over the air is

GETFILE [VIATFTP <x.x.x.x>] [VIAFTP <x.x.x.x>] FILENAME <firmware image filename> OTAP;

The GNX checks that the firmware filename is compatible with the hardware version, checks that the version is not the same that it is already running, waits for the vehicle to be stationary for 5 minutes or more (to minimize the chance of a dropped call during the transfer) and then downloads the firmware image.

The firmware images are between 180k and 350k in size, and transfer at 1k per second for TFTP and a bit faster for FTP. Thus the transfer time is up to 4 minutes. (The

firmware image of the GNX5 is around 300k, so the transfer time is slightly longer). Note that the firmware image transfer is much faster on HSPA (3G) networks.

If VIAFTP is selected then the FTP server should either be configured for anonymous downloads, or have username/password combination that is preconfigured into the GNX in parameters 52, FTP_CONFIG_USERNAME, and 53, FTP_CONFIG_PASSWORD.

If the commands are placed in a shared configuration file that is accessed by multiple hardware types (GNX5P, GNX10L, GNX10) then contact GenX to verify how to proceed.

9. Credits

The GNX contain portions of code from the uIP micro TCP/IP stack, and from zlib data compression libraries. Both use the GNU/BSD style license, and so the following credits appear within the source code, and also here in the documentation.

UIP can be found here

http://www.sics.se/~adam/uiip/index.php/Main_Page

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Zlib can be found here

<http://www.zlib.net/>

/* zlib.h -- interface of the 'zlib' general purpose compression
library

version 1.2.2, October 3rd, 2004

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