Stevens GHT
GOES HiDataRate
Transmitter

INSTRUCTION 93481B

August 2004

Contents

SECTION LIST:

NOTE: A detailed Section Index is located on the first page of each Section.

Safety and Equipment Protection

WARNING!

ELECTRICAL POWER CAN RESULT IN DEATH, PERSONAL INJURY OR CAN CAUSE DAMAGE TO EQUIPMENT.

If the instrument is driven by an external power source, disconnect the instrument from that power source before attempting any repairs.

WARNING!

BATTERIES ARE DANGEROUS. IF HANDLED IMPROPERLY, THEY CAN RESULT IN DEATH, PERSONAL INJURY OR CAN CAUSE DAMAGE TO EQUIPMENT.

Batteries can be hazardous when misused, mishandled, or disposed of improperly. Batteries contain potential energy, even when partially discharged.

WARNING!

ELECTRICAL SHOCK CAN RESULT IN DEATH OR PERSONAL INJURY.

Use extreme caution when handling cables, connectors, or terminals; they may yield hazardous currents if inadvertently brought into contact with conductive materials, including water and the human body.

CAUTION!

Be aware of protective measures against environmentally caused electric current surges.

In addition to the previous warnings and cautions, the following safety activities should be carefully observed.

Safety and Equipment Protection

Children, Adolescents

NEVER give batteries to young people who may not be aware of the hazards associated with batteries and their improper use or disposal.

Jewelry, Watches, Metal Tags

To avoid severe burns, NEVER wear rings, necklaces, metal watch bands, bracelets, or metal identification tags near exposed battery terminals.

Heat, Fire

NEVER dispose of batteries in fire or locate them in excessively heated spaces. Observe the temperature limit listed in the instrument specifications.

Charging

NEVER charge "dry" cells or lithium batteries that are not designed to be charged.

NEVER charge rechargeable batteries at currents higher than recommended ratings.

NEVER recharge a frozen battery. Thaw it completely at room temperature before connecting charger.

Unvented Container

NEVER store or charge batteries in a gas-tight container. Doing so may lead to pressure buildup and explosive concentrations of hydrogen.

Short circuits

NEVER short circuit batteries. High current flow may cause internal battery heating and/or explosion.

Damaged Batteries

Safety and Equipment Protection

Personal injury may result from contact with hazardous materials from a damaged or open battery. NEVER attempt to open a battery enclosure. Wear appropriate protective clothing, and handle damaged batteries carefully.

Disposal

ALWAYS dispose of batteries in a responsible manner. Observe all applicable federal, state, and local regulations for disposal of the specific type of battery involved.

NOTICE

Stevens makes no claims as to the immunity of its equipment against lightning strikes, either direct or nearby.

The following statement is required by the Federal Communications Commission:

WARNING - This equipment generates, uses, and can radiate radio frequency energy, and, if not installed in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

USER INFORMATION

Stevens makes no warranty as to the information furnished in these instructions and the reader assumes all risk in the use thereof. No liability is assumed for damages resulting from the use of these instructions. We reserve the right to make changes to products and/or publications without prior notice.

1 Introduction

SECTION 1 INDEX:

FIGURES

1 Introduction

Figure 1.1 The Stevens GOES HDR Transmitter (GHT)

1.1 GENERAL DESCRIPTION

The Stevens GOES Hi-Data-Rate Transmitter (GHT) is a fully compliant 100/300 baud GOES transmitter designed for remote applications. It performs as a satellite modem, collecting data from a data logger or other similar serial data output device for packetization and transmission over the GOES satellite system. It is capable of random and/or self-timed transmissions, at any combination of 100/300 baud rates.

Key features of the Stevens GHT are:
. OCXO crystal controlled frequency reference
. Digital synthesizer for transmit frequency
. Onboard GPS module for accurate time keeping

1.2. BASIC PRINCIPLES OF OPERATION

The Stevens GHT operates similar to a standard telephone modem. It has a single serial port, operating in two standard modes, command mode and online mode. Command mode can be entered at any time from the operational mode by typing a sequence of three

1 Introduction

ESCAPE characters (ESC). Online mode can be entered from command mode by issuing the two letter command, “OL” followed by the <ENTER> key. All necessary setup information can be entered in command mode via simple, two letter commands, using an ASCII terminal or terminal emulation program on a PC.

Once a unit is programmed, it can be placed online and connected to the particular data logger to be used. If continuous self-timed message buffering is enabled, all serial transmissions received from the data logger will be placed in a buffer awaiting transmission at the next self-timed interval. A serial transmission beginning with the sequence ++R, will be placed in the random transmission buffer and will trigger the random transmission mode. The data in the buffer will not include the ++R characters. Data will be buffered for 60 seconds, or until the receipt of ++E, indicating the end of the random data stream. This end sequence would also not be included in the random message. In random transmission mode, the unit will transmit a message as soon as is allowable, determined by unit warm up requirements. Once a random transmission has been sent, additional transmission will be sent at a random time averaging the programmed random time interval, based on the time of the receipt of the message, and repeat until the number of random transmissions reaches the random transmission count. Standard transmissions will take priority, but will not be included as a transmission in figuring the random transmission count. The random transmission maximum length is fixed at 64 bytes for 300 baud. Longer data packets received from the data logger will be truncated.

Self-timed transmissions will begin at the exact time programmed as the start time for transmissions. There is no option for “window centering”. Transmission time will be limited to that set as the standard transmission length. Longer messages received from the attached data logger will be truncated. The maximum message window shall be 120 seconds, or a length of 3600 bytes.

If continuous self-timed message buffering is not enabled, the GHT will turn on the CTS line 15 seconds before it is time to transmit the message. This is done to wake up the data logger and give it enough time to transmit the data for the next message to the GHT. The number of seconds can be adjusted. Setting the CTS time to zero

will enable continuous standard data buffering, and any data received by the GHT when in Online mode, which is not otherwise designated as a random message, will be put into the standard message buffer for transmission as a standard, timed message.

All transmissions will require a set unit warm up time to allow for frequency stabilization. This is fixed at 5 minutes. At the same time as OCXO warm-up begins, the unit will enable the GPS for a time fix. If a valid GPS time fix is not obtained before the transmission time, the transmission will continue. If a GPS update has not been obtained for 24 hours, self-timed transmissions will be inhibited.

RF power output is fixed at 6.3 watts. It is not adjustable by the user.

Note: Either random or self-timed messages, or both, can be enabled. One or the other must be enabled for the unit to enter the Online Mode.

1.3 SAFETY INFORMATION

Before performing any procedures in this manual, please read all applicable warnings and cautions in the preceding section. Power sources, *including batteries*, can be a particular hazard to the user.

2 Installation

SECTION 2 INDEX:

FIGURES

2 Installation

2.1 GENERAL DESCRIPTION

The Stevens GHT is housed in a sheet metal enclosure, which provides a durable housing as well as appropriate rf shielding. The GHT should be protected from weather and vandals, when used in remote, outdoor applications, by mounting the equipment in an existing gage house or other suitable structure. For areas of extreme humidity, a NEMA-4 housing is recommended.

2.2 MECHANICAL INSTALLATION

1. Unpack and examine the GHT carefully. If there is any apparent shipping damage, contact the shipper immediately. Also contact the factory for replacement of the unit.

2. Observe the front panel of the unit. All electrical connections are made via this front panel. See *Figure 2.1 GHT Electrical Connectors* for the following discussion.

Fail safe rest button GPS antenna GOES RF output

Power input 10.5 – 14.3 VDC RS-232 serial communications Indicator lights

Figure 2.1 GHT Electrical Connectors

3. The GHT may be mounted on a shelf or a wall. Position it so the power, signal and antenna cables can be connected to the power source, logger or other monitoring device, and appropriate antennas.

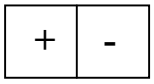
2.3 ELECTRICAL INSTALLATION

1. There are several connections to the GHT:

- Power cable: 2-pin connector, removable, with screw terminals,
- GPS antenna, for GPS module needed for accurate time keeping,
- GOES RF output connection, to go to Stevens GOES V4TH antenna
- Serial communications cable, for programming and data transfer from attached logging or monitoring device.

2. Connect the serial cable from GHT to a PC or other programming device using a straight-through DB9-to-DB9 cable. Use a terminal program on the computer, such as windows HYPERTERMINAL, and configure the settings for 9600 BAUD, 8 bits, 1 stop bit, no parity

3. The power cable is supplied with two bare wires and loose Faston® and spade connectors. Crimp the Faston connectors to the cable if it is to go to a battery with tab-type output connectors. Crimp the spade connectors to the wires when connecting to the Stevens Battery Charger, Solar Panel or power supply. The black wire connects to the negative (-) and the red wire to the positive (+) output of the 12 volt power source. Connections to the GHT, viewing the front panel straight-on, are as shown below:



WARNING: TAKE CARE TO OBSERVE PROPER POLARITY OF POWER CONNECTIONS. IMPROPER POLARITY COULD RESULT IN DAMAGE TO THE GHT.

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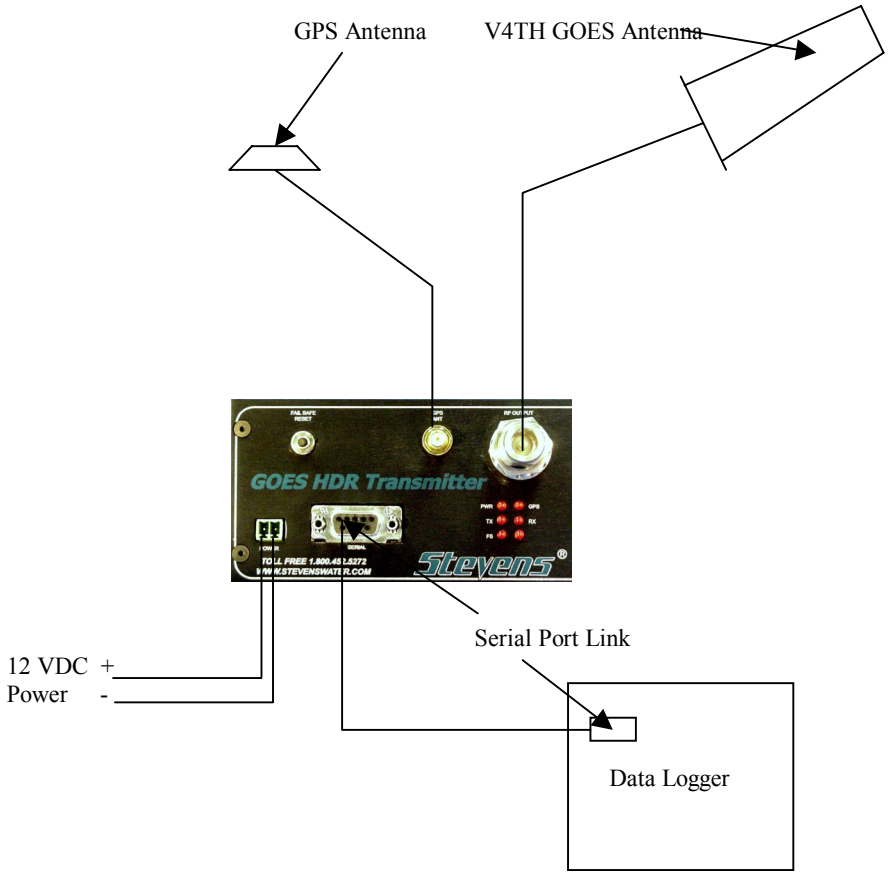

Figure 2.2 Typical GHT System Configuration

There is no power switch to the GHT. Making the proper power connections as shown above will power the unit on. The user should see the "PWR" light illuminate on the front panel, and the following sign-on message should appear on the computer screen:

2 Installation

```
Stevens GHT
Version: 1.C  August 16 2004
```

The unit will attempt a GPS time synchronization. The progress of this activity will be displayed on the screen in a manner similar to the following:

```
Getting time from GPS (Press ESC to Cancel)
................................................
................
Complete
GPS Satellites: 8
GPS time: 01:50:51
Latitude: 45.481 degrees N
Longitude: 122.783 degrees W
Timezone: 8
```

If a GPS antenna is connected, a proper time sync should occur. The user can also manually enter date and time as discussed in section 3.

Once the GPS cycle is complete, the screen should display the following:

```
GHT Main Menu
CM: Command/Control Menu
CO: Console Setup
CS: Channel Setup
HE: Help
MM: GHT Main Menu
SI: Satellite Information
SS: System Setup

>
```

The unit is now ready to program.

3 Quick Start

SECTION 3 INDEX:

3 Quick Start

3.1 INTRODUCTION

This section is a brief checklist to remind the experienced user of tasks to be done during periodic service of an installed system. It assumes that the user is already familiar with the menu command structure as described in *Section 4 Operation*.

3.2 INSTRUMENT CHECK

3.2.1 If the unit is "on-line", press the "ESCAPE" key three times to bring it into command mode. This may take up to 20 seconds, depending upon current activity in which the unit may be engaged. Press the "ENTER" key periodically and look for a response of a ">" character.

3.2.2 Once into the Command Mode, the following setup items should be verified as a minimum for proper GHT operation:

ID: NESDIS ID
CH: GOES Standard Channel
HR: GOES Random Channel
RB: GOES Standard Transmission Rate
RR: GOES Random Transmission Rate
IS: GOES Standard Transmission Interval
TO: GOES Standard Transmission Time Offset
IR: GOES Random Transmission Interval
RP: GOES Random Transmission Repeat
ML: GOES Message Length
XS: Enable Standard Transmission Mode
XR Enable Random Transmission Mode
DA: Date
TI: Time
OL: Set Unit in Online Mode
MF: Format mode (ASCII, Pseudo-binary, binary)

Those items relating to random transmissions need not be checked if random transmissions are not to be used.

3 Quick Start

Remember that Date and Time are to be in UTC format (GMT or Zulu time), not local time. These can be set by the user if a GPS update has not occurred. However, the unit will only operate for 24 hours without a proper GPS update, so it is important to verify proper GPS operation. You can force a GPS time update by using the "GS" command.

Under normal operation, the unit will obtain a GPS update prior to each transmission. If no GPS update is obtained for 24 hours, time scheduled transmissions will be prohibited until a good GPS time is achieved.

3.2.3 Check the system voltage using the BV command. This value should be in the range of 12 to 14 volts for battery or power supply operation. For a rechargeable lead-acid type, replace the battery when the indicated voltage drops to 12.0 volts, as there is very little useful energy remaining.

3.2.4 If the GHT is operated in a humid or condensing environment, place a fresh bag or two of desiccant together with the instrument inside of the NEMA-4 enclosure being used. Replace and recharge the desiccant on a regular basis.

3 Quick Start

3.3 STATION LOG

We recommended that a station log be maintained for each field site, for future reference. Record such useful information as:

- Installation date for system battery
- Transmit interval, transmit time offset, and assigned NESDIS ID and channel
- System voltage, to establish a history for battery usage
- Other pertinent environmental or station operation data.

4 Operation

SECTION 4 INDEX:

TABLES:

4 Operation

4.1 INTRODUCTION

The Serial Port Interface permits connecting the GHT to a computer or other serial communications device. Commands may be entered and data may be transferred through the Serial Port, as previously described in Section 3. In the following discussion, Section 4.2 describes the physical connections to the Serial Port, while Section 4.3 provides a detailed description of the serial commands.

4.2 CONNECTIONS

The connections and signal definitions for the DB-9F front panel Serial Port connector is described in *Table 4.1 Serial Port Connections*, below.

CONNECTOR PIN NUMBER	SIGNAL NAME	SIGNAL DESCRIPTION	VOLTAGE LEVELS
1	DCD	Data Carrier Detect (Output)	12 VDC nominal
2	TXD	Transmitted Data (Output)	±5 VDC nominal
3	RXD	Received Data (Input)	Active: ≥2.5 VDC inactive: ≤1.4 VDC
4	DTR	Data Terminal Ready	Connected to DSR
5	GND	Common	Common
6	DSR	Data Set Ready	Connected to DTR
7	RTS	Request to Send	Connected to CTS
8	CTS	Clear to Send (Output)	Connected to RTS (GHT Wake-up for external device)
9	N.C.	N.C.	N.C.

Table 4.1 Serial Port Connections

4 Operation

To connect the GHT front panel connector to an IBM-compatible computer which has a 9 position serial connector, use a straight-through cable equipped with the appropriate DB-9 connectors. To connect to an IBM-compatible computer with a 25-position serial connector, use a Port Adapter between the cable and the 25-position connector. This adapter is available in most computer stores.

4.3.1 CONSOLE COMMANDS

These commands provide various means of configuring the serial interface for communications with the attached pc for programming and the data logger for data transfer.

```
CONSOLE

  BR  Baud Rate                          LI  Lines per page
  CO  Console Setup                      LL  Line Length
  CT  CTS Time                           R+  Random Enter
  DX  Expanded Format                    R-  Random Exit
  EC  Echo Incoming Data Enable          RO  Random Timeout
  ED  Escape Delay                       RP  Random Repeat
  ES  Console Escape                     VE  Verbose Enable
  HE  Help                               Z8  User Timeout
  IC  Init Console
```

Table 4.2 Console Serial Command Summary

a. BR (Baud Rate) Command: This command allows the user to select the Baud (data communications) Rate for the GHT to communicate with a computer or other serial device. Type: **BR**<Enter>.

```
>br
Baud Rate
  1: 2400
  2: 4800
  3: 9600
  4: 19200
  5: 38400
    Current value is: 3: 9600
    Enter Selection:  (The user selected: 2<Enter>)
"New Baud: 4800"
```

NOTE: To continue communication, the serial communications device (computer, etc.) must be also be set to the new baud rate.

b. CO Console Setup: Displays the current settings for the console setup, giving the user a quick method of console verification.

```
>co
Console Setup
BR: Baud Rate . . . . . 9600 baud

Display Format Controls
DX: Expanded Format . . . . . Expanded
EC: Echo Incoming Data. . . . . Enabled
VE: Verbose . . . . . Enabled
LI: Lines per page. . . . . 22
LL: Line Length . . . . . 80

Timeout Settings
CT: CTS Time. . . . . 15 seconds
ED: Escape Delay. . . . . 3 seconds
RO: Random Timeout. . . . . 60 seconds
Z8: User Timeout. . . . . 300 seconds

Special Characters
ES: Console Escape. . . . . 0x1B
R+: Random Enter. . . . . ++R
R-: Random Exit . . . . . ++E
```

c. CT CTS Time: Sets the time prior to a transmission that the CTS line will come high to wake-up an attached data logger or other device. The default is 15 seconds. Setting this value to zero will disable the CTS control, and will place the GHT in a continuous "listen" mode, where all characters received over the serial port are placed in the transmission buffer for transmit at the next GOES standard timed message.

```
>ct
CTS Time
    Current value is: 15
    Enter new value:
```

d. DX Expanded Format: Allows selection of TERSE or EXPANDED format for responses during ONLINE mode. The unit will output certain messages to the attached terminal in EXPANDED Format during online activity. TERSE format suppresses these messages.

```
>dx
Expanded Format
  1: Terse
  2: Expanded
    Current value is: 2: Expanded
    Enter Selection:
```

e. EC Serial Echo Enable: Commands can be echoed to the attached console device (pc, laptop, etc). This command toggles the echo mode on and off.

```
>ec
Echo Incoming Data Disabled

>ec
Echo Incoming Data Enabled
```

f. ED Escape Delay: Amount of time needed before and after the Console Escape character to be repeated three times. Default is 3 seconds. The user must allow 3 seconds of no serial activity before entering the Console Escape character 3 times, then wait 3 seconds with no additional serial activity for the escape sequence to be recognized.

```
>ed
Escape Delay
    Current value is: 3
    Enter new value:
```

g. ES Console Escape: Selects the character that will interrupt the ONLINE mode and place the unit in the COMMAND mode. The character must be repeated three times, allowing a length of time equal to or greater than the ESCAPE DELAY set in the "ED" command, above, to occur before and after the Console Escape sequence.

```
>es
Console Escape
    Current value is: 0x1B
    Enter new value:
```

h. HE (Help) Command: This command displays a summary of all the available GHT commands.

i. IC Initialize Console: This command will reset console values to the factory defaults

```
>ic
Init Console
Error initializing Console
```

j. LI Lines per page: The display can be set to pause after a certain number of lines have been received. Setting this value to 0 will disable this activity, and cause data displays to go on continuously until completed or interrupted by the ESCAPE key.

```
>li
Lines per page
    Current value is: 22
    Enter new value:
```

k. LL Line Length: Sets the length of a line output to match the display window. Typical setting is 80 characters per line.

```
>ll
Line Length
    Current value is: 80
    Enter new value:
```

l. R+ Random Enter: Sets the character sequence that indicates the beginning of a random message string. The character string described by this command will NOT be included in the random message. All characters received after this sequence will be placed

in the random transmit buffer until the random exit sequence is received (see below, R- command). The default is "++R"

```
>r+
Random Enter
        Random Enter: ++R
```

m. R- Random Exit: Sets the character sequence that indicates the end of a random message string. The character string described by this command will NOT be included in the random message. This sequence must be preceded by the Random Enter sequence, and any data to be placed in the random transmit buffer. The default is "++E"

```
>r-
Random Exit
        Random Exit: ++E
```

n. RO Random Timeout: Sets the amount of time allowed for the input of a random message. If the GHT does not receive a Random Exit sequence to terminate a random message entry before this timeout is reached, the random message will be automatically terminated at that point. The default is 60 seconds.

```
>ro
Random Timeout
    Current value is: 60
    Enter new value:
```

o. RP Random Repeat: Sets the number of times a random message will be repeatedly sent.

```
>rp
Random Repeat
    Current value is: 10
    Enter new value:
```

p. VE Verbose Enable: This command enables the display of various additional information when any particular command is executed. It also can be toggled on or off.

```
>ve
0

>ve
Verbose Enabled
```

q. Z8 User Timeout: Sets the amount of seconds of console inactivity that will result in the unit automatically returning to "ONLINE" mode. Default is 300 seconds. If no transmit modes have been enabled (either timed or random), the unit will immediate revert back to command mode after a user timeout.

```
>z8
User Timeout
    Current value is: 300
    Enter new value:
```

4.3.1 SYSTEM SETUP COMMANDS

These commands provide various means of configuring the system operation of the GHT.

```
SYSTEM

  BV  Battery Voltage                  OL  On-Line
  CE  Clear Error                      PW  Enter Password
  CM  Command/Control Menu             RS  Reset
  CP  Change Password                  SC  Save Configuration
  DA  Date                             SS  System Setup
  GS  GPS Status                       SV  Version
  GT  GPS Time Output                  TH  Temp & Humidity
  LD  Log Dump                         TI  Time
  MM  GHT Main Menu                    OP  Op Mode
```

Table 4.3 System Serial Command Summary

a. BV Battery Voltage: Read-only command to verify voltage of main power source connected to GHT.

```
>bv
Battery Voltage
12.7 Volts
```

b. CE Clear Error: Resets any fault error codes to 0. Fault error codes are logged and can be used for diagnostic purposes. Use the Log Dump command, below, to view the Log File.

```
>ce
Clear Error
Fault Code: 0000, cleared to zero.
```

c. CM Command/Control Menu: Displays the Command/Control Menu.

d. CP Change Password: Changes the system password. This allows the user to enter a particular password to provide a level of setup security from unauthorized users.

```
>cp
Change Password
Enter new password:
Repeat new password:
```

e. DA Date: Allows for the user to manually set the date. Date information normally comes through the GPS time link. Remember that date and time are in UTC, or Zulu, time and date reference format.

```
>da
Date
Current Date is: 10/13/03
 Enter New Date:
```

f. GS GPS Status: This command will force a manual GPS time update. Progress of the update will be shown on the terminal screen as shown below. This will take approximately 1 minute.

```
>gs
Getting time from GPS (Press ESC to Cancel)
..................................................
..............
Complete
GPS Satellites: 8
GPS time: 01:50:51
Latitude: 45.481 degrees N
Longitude: 122.783 degrees W
Timezone: 8
```

g. GT GPS time output command: Normal default to zero (0). Consult factory for use of this command.

h. LD Log Dump: This command will dump the current error log record to the screen. This can be used for various diagnostic purposes.

```
>ld
Log Dump
 10/13/03  00:41:35 Not enough satellites
 10/12/03  23:41:35 Not enough satellites
 10/12/03  22:41:35 Not enough satellites
 10/12/03  21:41:35 Not enough satellites
```

i. MM Main Menu: Displays the GHT main menu.

j. OL Online: Places the GHT in the online mode.

k. PW Enter Password: Enter the system password to allow access to various commands. The default is no password (or simply press the ENTER key when prompted for a password). Use the Change Password command, above, to enter a new password.

```
>pw
Enter Password
```

l. RS Reset: Resets the GHT to all original factory conditions. Use with caution.

```
>rs
Reset
This command will reset all configuration data to
factory defaults.
Do you want to continue? (Yes)
```

m. SC Save Configuration: This command saves all the configuration settings. This automatically occurs when a unit is placed in the Online Mode, but otherwise settings can be lost if the unit is powered down without executing this command.

```
>sc
Save Configuration Data
```

n. SS System Setup: Displays the current system setup configuration.

```
>ss
System Setup

Stevens GHT
Version: 0.8  September 25, 2003
Zulu Time:     10/13/03  17:59:25
Local Time:    10/13/03  09:48:17
Last GPS Time: 10/13/03  17:36:55
GT: GPS Satellites Tracked. . . 3
```

o. SV Software Version: Displays the software version number or letter for the operational firmware within the GHT.

```
>sv
Version

Stevens GHT
Version: 0.8  September 25, 2003
```

p. TH Temperature & Humidity: Not implemented.

q. TI Time: Allows for the user to manually set the time. Time information normally comes through the GPS time link. Remember

that date and time are in UTC, or Zulu, time and date reference format.

```
>ti
Time
Current Time is: 18:00:38
 Enter New Time:
```

r. OP Op Mode: See Appendix, Page 48, for more information.

4.3.3 CHANNEL SETUP COMMANDS

These commands provide for setting up channel operating parameters.

CHANNEL

CH	Channel Standard	IS	Interval Standard
CS	Channel Setup	NX	Next Time
HR	Channel Random	RB	Radio Baud Rate
IR	Interval Random	RR	Radio Baud Rate - Random

Table 4.4 Channel Serial Command Summary

a. CH Channel, Self-timed: Sets the NESDIS channel number for standard, timed transmissions. Allowable values are 1 to 266.

```
>ch
Channel Standard
    Current value is: 195
    Enter new value:
```

b. CS Channel Setup: Read-only command which displays the current channel related settings for the GHT. The display shows both standard, or timed, transmission information as well as random transmission information.

```
>cs
Channel Setup
Standard Transmit
CH: Channel Standard. . . . . 195
IS: Interval Standard . . . . . 01:00:00
RB: Radio Baud Rate . . . . . 300
VS: Interleave Standard . . . . None
XS: Transmit Standard . . . . . Enabled
GH: GHT Header. . . . . 0x010a
NX: Next Time . . . . . 00:00:00
MF: Message Format. . . . . ASCII
ML: Message Limit . . . . . 3600 bytes
TO: Transmit Offset . . . . . 00:41:40

Random Transmit
HR: Channel Random. . . . . 195
IR: Interval Random . . . . . 00:06:00
RR: Radio Baud Rate - Random. . 300
VR: Interleave Random . . . . . None
XR: Transmit Random . . . . . Enabled
GH: GHT Header. . . . . 0x0100
NX: Next Time . . . . . 00:00:00
MF: Message Format. . . . . ASCII
ML: Message Limit . . . . . 64 bytes
RP: Random Repeat . . . . . 10 times
```

c. HR Channel, Random: Sets the NESDIS channel number for random transmissions. This is different than the self-timed channel. Allowable values are 1 to 266.

```
>hr
Channel Random
    Current value is: 195
    Enter new value:
```

d. IR Interval, Random: Sets the transmit interval for random transmissions. Transmissions will be sent at random times, averaging around the programmed interval, when the unit is online and after a valid random message has been received over the serial port. The random transmission will repeat for the number of times set by the RP (random repeat) command (see below).

```
>ir
Interval Random
```

```
  1: 00:01:00
  2: 00:05:00
  3: 00:06:00
  4: 00:10:00
  5: 00:15:00
  6: 00:30:00
  7: 01:00:00
  8: 02:00:00
  9: 04:00:00
 10: 06:00:00
 11: 08:00:00
 12: 12:00:00
 13: 24:00:00
    Current value is: 3: 00:06:00
    Enter Selection:
```

e. IS Interval, Self-timed: Sets the transmit interval for standard, timed transmissions. Transmissions will be sent each interval, synchronized to midnight Zulu or UTC time by the GPS clock, and offset by the amount set by the TO (transmit offset) command (see below). This parameter is specified by NESDIS for each GHT installation.

```
>is
Interval Standard
  1: 00:01:00
  2: 00:05:00
  3: 00:06:00
  4: 00:10:00
  5: 00:15:00
  6: 00:30:00
  7: 01:00:00
  8: 02:00:00
  9: 04:00:00
 10: 06:00:00
 11: 08:00:00
 12: 12:00:00
 13: 24:00:00
    Current value is: 7: 01:00:00
    Enter Selection:
```

f. NX Next Time: A diagnostic command not implemented at this time.

g. RB Radio Baud Rate, Self-timed: Allows for the user to set the transmission baud rate for standard, timed messages. Allowable settings are 100 and 300 baud. 1200 baud is currently not supported by the GHT. Note that transmission baud rates can be different for self- timed transmissions and random transmissions.

```
>rb
Radio Baud Rate
  1: 100
  2: 300
  3: 1200
    Current value is: 2: 300
    Enter Selection:
```

h. RR Radio Baud Rate, Random: Allows for the user to set the transmission baud rate for random messages. Allowable settings are 100 and 300 baud. 1200 baud is currently not supported by the GHT. Note that transmission baud rates can be different for self- timed transmissions and random transmissions.

```
>rr
Radio Baud Rate - Random
  1: 100
  2: 300
  3: 1200
    Current value is: 2: 300
    Enter Selection:
```

4.3.4 RADIO COMMANDS

These commands relate to the transmitter rf parameters setup

```
RADIO

   SL  Synthesizer Load
```

Table 4.5 Radio Command Summary

a. SL Synthesizer Load: Allows for the user to manually offset the frequency synthesizer to tune the output frequency of a specific channel. This requires the user either know from empirical receive site data that the frequency is off, or the use of a precision frequency counter to verify the channel frequency. Entries can be made for both the self- timed channel frequency and for the random channel frequency format. Each unit represents approximately 40 Hz of frequency shift. So if a frequency is known to be 100 Hz high, an entry of –2 will shift the frequency lower by approximately 80 Hz. If a frequency is known to be 150 Hz low, an entry of 4 will shift the frequency approximately 160 Hz higher.

```
>sl
Synthesizer Load
  1: Standard
  2: Random
    Current value is: 1: Standard
    Enter Selection:  1
    New value is:     1: Standard
    Current value is: 0
    Enter new value:
```

Note: This command is only intended to be used by qualified technicians under bench test conditions, where the rf output is connected to a dummy load, and is not being broadcast over the air. For further information, please contact Stevens Support at 1-800-452-5272.

4.3.4 SATELLITE COMMANDS

These commands relate to various message transmission parameters.

```
SATELLITE

  GH  GHT Header                  SI  Satellite Information
  ID  NESDIS ID                   TO  Transmit Offset
  MF  Message Format              VR  Interleave Random
  ML  Message Limit               VS  Interleave Standard
  PB  Pseudo_Binary               XR  Transmit Random Enable
  QP  Carrier Preamble            XS  Transmit Standard Enable
```

Table 4.5 Satellite Command Summary

a. GH GHT Header: This command allows the user to select certain operational parameters and place them in a data packet to be sent off at the beginning of every transmission. Different packets can be specified for self-timed messages and random messages. If the message format is ASCII, the data will appear in a readable, ASCII format. If message format is pseudo-binary, the data will be in pseudo-binary format, and the user can specify a packet header number (0 to 63, the default being 0).

```
>gh
GHT Header
  1: Standard
  2: Random
    Current value is: 1: Standard
    Enter Selection:
GHT Header Control Values:
A: Off Fault Code
B: On  Battery Voltage
C: Off Data Age
D: On  GPS Synchronization Age
E: Off Temperature
F: Off Humidity
G: Off Latitude & Longitude
```

```
H: Off High Precision Latitude & Longitude
I: On  Message Number
        Select Item(s) to Include: BDI
Enter header number to use with this data in Pseudo-
Binary format
    Current value is: 0
    Enter new value:
Number of bytes required in pseudo-binary format: 6
```

b. ID NESDIS ID: Command to set the GHT NESDIS ID. This needs to be obtained from NESDIS, and entered into the GHT so transmissions can be properly received and processed.

```
>id
NESDIS ID
    Current value is: 0x964006fc
    Enter new value:
```

c. MF Message Format: Selects the appropriate format for either self-timed messages, or for random messages. Format may be either ASCII or Pseudo-binary. Binary formats are not yet defined, and may not be used. Selecting Pseudo-binary will cause the GHT to check incoming messages over the serial port for valid Pseudo-binary characters. Invalid characters will be replaced by the "/" character. In both cases of ASCII and Pseudo-binary, messages are checked for invalid characters, and any occurrence of such characters is also replaced with the "/" character.

```
>mf
Message Format
  1: Standard
  2: Random
    Current value is: 1: Standard
    Enter Selection:
  1: Binary
  2: ASCII
  3: Pseudo Binary
    Current value is: 2: ASCII
    Enter Selection:
```

d. ML Message Limit: This sets the maximum size of a message, also referred to as the message window. The limit for self- timed messages can be up to 3600 bytes, or 120 seconds at 300 baud.

The limit for random messages can be up to 64 bytes, or a little over 2 seconds at 300 baud. Any value smaller than these can be entered. If a message is received in excess of the set limit, the message will be truncated.

```
>ml
Message Limit
  1: Standard
  2: Random
    Current value is: 1: Standard
    Enter Selection:  1
    New value is:     1: Standard
    Current value is: 3600
    Enter new value:


>ml
Message Limit
  1: Standard
  2: Random
    Current value is: 1: Standard
    Enter Selection:  2
    New value is:     2: Random
    Current value is: 64
    Enter new value:
```

e. PB Pseudo Binary: A diagnostic check function which is not enabled at this time. This command is not operational.

f. QP Carrier Preamble: Select the desired carrier preamble. Most current applications use the short preamble. However, the user can enable the long preamble.

```
>qp
Carrier Preamble
  1: Short
  2: Long
    Current value is: 1: Short
    Enter Selection:
```

g. SI Satellite Information: A read-only command that displays various satellite configuration parameter values

```
>si
Satellite Information
ID: NESDIS ID . . . . . 964006FC
QF: Reference Frequency . . . . 9,999,850 Hz
QP: Carrier Preamble. . . . . Short
SL: Synthesizer Load. . . . . 0 Standard
SL: Synthesizer Load. . . . . 0 Random
```

h. TO Transmit Offset: Sets the offset time from midnight for the first transmission of a given day, based on UTC time. This is also specified by NESDIS, together with the standard, or timed, transmit interval.

```
>to
Transmit Offset
Current Transmit Offset is: 00:41:40
 Enter New Transmit Offset:
```

i. VR Interleave, Random: Inter leavers can be selected to provide additional error correction encoding, primarily for burst errors. These selections are then automatically detected at the receive site due to different header information in the message, and are therefore decoded properly.

```
>vr
Interleave Random
  1: None
  2: Short
  3: Long
    Current value is: 1: None
    Enter Selection:
```

j. VS Interleave, Standard: Inter leavers can be selected to provide additional error correction encoding, primarily for burst errors. These selections are then automatically detected at the receive site due to different header information in the message, and are therefore decoded properly.

```
>vs
Interleave Standard
  1: None
  2: Short
```

```
  3: Long
    Current value is: 1: None
    Enter Selection:
```

k. XR Transmit Random Enabled/Disabled: Toggle command to enable or disable random transmission capability in the GHT. If this is enabled, and a properly encoded random message is received, it will be processed and transmitted. If it is not enabled, random message received from the data logger will be ignored.

```
>xr
Transmit Random Disabled

>xr
Transmit Random Enabled
```

l. XS Transmit Self-timed Enabled/Disabled: Toggle command to enable or disable standard, or timed, transmission capability in the GHT. If this is enabled, and a message is received, it will be processed and transmitted. If it is not enabled, the message received from the data logger will be ignored.

```
>xs
Transmit Standard Disabled

>xs
Transmit Standard Enabled
```

Note: Either random or self-timed messages, or both, can be enabled. One or the other must be enabled for the unit to enter the Online Mode.

5 Maintenance and Troubleshooting

SECTION 5 INDEX:

5 Maintenance and Troubleshooting

5.1 MAINTENANCE

5.1.1 Check battery voltage and condition during each site visit.

a. System battery voltage: greater than 10.5 volts d.c. (12.0 VDC for a lead-acid battery).

b. Maintain a battery log. A well-documented record and long experience are the best indicators of battery performance and condition. Battery life will be reduced with extended high temperature operation. Battery capacity will generally be reduced with extended periods of cold weather, but will recover when warmed up.

c. Rechargeable batteries will gradually lose capacity through multiple charge-discharge cycles, with shorter operating time periods between charging cycles. Maximum operating life will be obtained when the battery and GHT are both connected to an appropriately filtered charger, such as the Stevens® Battery Charger or a solar panel and JL-2 Solar Charge Regulator. The solar panel can be used to obtain maximum battery life with minimum maintenance in remote field installations.

5.1.2 Avoid moisture entry into the GHT area when servicing the system. When operating in humid conditions or where there may be condensation, place and maintain a bag or two of *fresh* desiccant near the GHT and inside any other protective NEMA-4 enclosure that is being used

5.2 TROUBLESHOOTING

The following is a guide to use for troubleshooting various operational problems with the GHT transmitter System. These are conditions that should be checked before contacting the factory for assistance. If you cannot solve the problem in the field, call and ask for a Stevens Customer Technical Representative. The toll-free number for Stevens is 1-800-452-5272, and the call is free from Canada or the U.S.A. An alternative number is: 503 469 8000. Please provide an instrument description and serial number, when possible. Many questions can be answered by telephone, or you may obtain an authorization for return of the equipment, should that be necessary. The factory is open Monday through Friday from 7 a.m. to 5 p.m., in

the Pacific Time Zone. If no one is available, leave a message at any time on an excellent phone mail system; just clearly tell us your name, location, telephone number and how to reach you.

SYMPTOM	PROBLEM	AREA TO CHECK
No Power LED indication	No power to GHT	• Power supply connections or failure • Voltage level low
No transmissions	Antenna failure or programming error	• Antenna connections • NESDIS ID, interval, channel, transmit offset
No serial communication	Serial Port error	• Wrong serial cable or poor connections • Baud, bit count or parity not correct
FailSafe LED on or flashing	FailSafe error	• Messages are too long or two frequent • Press FS Reset to clear

Table 5.1 Troubleshooting Guide

Service Record Notes:

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SECTION 6 INDEX:

6 Appendices

6.1 SPECIFICATIONS:

a. Power Requirements: 10.5 – 14.2 VDC, <6 mA standby current
<150 mA GPS Acquire
< 4 A transmit

b. User interface: IBM style 9-pin "D" connector

c. Timekeeping: GPS discipline before each transmission

d. Transmit Baud: 100/300, random or self-timed

e. Antenna: Stevens V4TH, gain 10dB

f. Power output: 6.3 watts nominal

g. Environmental: -40 to +50 degrees C, 0 – 95% humidity, non-condensing

h. Indicators: Pwr (unit is on, flashes once per second)
TX (Transmit is active)
FS (Failsafe trip indicator)
GPS (GPS time acquire active)
RX (Serial port ready to receive data)

i. Dimensions: 5.0 x 6.9 x 2.5 inches (w x d x h)
126 x 176 x 64 mm

j. Weight: 2.2 lbs.
1 kg

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6.2 SERIAL PORT CONNECTIONS

DB- 9F Connector	Signals, Relative to GHT (out ➔)
2	TXD ➔
3	RXD ➔
5	Serial Common (Ground)
7	CTS ➔ (Activates Logger)

Table 6.1 Serial Port Connections

6.3 NESDIS CHANNELS AND FREQUENCY DESIGNATIONS, 100/300 BAUD

GOES CHANNELS AND FREQUENCIES

Chan	Freq (MHz)	Chan	Freq (MHz)	Chan	Freq (MHz)
1	401.7010	51	401.7760	101	401.8510
2	401.7025	52	401.7775	102	401.8525
3	401.7040	53	401.7790	103	401.8540
4	401.7055	54	401.7805	104	401.8555
5	401.7070	55	401.7820	105	401.8570
6	401.7085	56	401.7835	106	401.8585
7	401.7100	57	401.7850	107	401.8600
8	401.7115	58	401.7865	108	401.8615
9	401.7130	59	401.7880	109	401.8630
10	401.7145	60	401.7895	110	401.8645
11	401.7160	61	401.7910	111	401.8660
12	401.7175	62	401.7925	112	401.8675
13	401.7190	63	401.7940	113	401.8690
14	401.7205	64	401.7955	114	401.8705
15	401.7220	65	401.7970	115	401.8720
16	401.7235	66	401.7985	116	401.8735
17	401.7250	67	401.8000	117	401.8750
18	401.7265	68	401.8015	118	401.8765
19	401.7280	69	401.8030	119	401.8780

20	401.7295	70	401.8045	120	401.8795
21	401.7310	71	401.8060	121	401.8810
22	401.7325	72	401.8075	122	401.8825
23	401.7340	73	401.8090	123	401.8840
24	401.7355	74	401.8105	124	401.8855
25	401.7370	75	401.8120	125	401.8870
26	401.7385	76	401.8135	126	401.8885
27	401.7400	77	401.8150	127	401.8900
28	401.7415	78	401.8165	128	401.8915
29	401.7430	79	401.8180	129	401.8930
30	401.7445	80	401.8195	130	401.8945
31	401.7460	81	401.8210	131	401.8960
32	401.7475	82	401.8225	132	401.8975
33	401.7490	83	401.8240	133	401.8990
34	401.7505	84	401.8255	134	401.9005
35	401.7520	85	401.8270	135	401.9020
36	401.7535	86	401.8285	136	401.9035
37	401.7550	87	401.8300	137	401.9050
38	401.7565	88	401.8315	138	401.9065
39	401.7580	89	401.8330	139	401.9080
40	401.7595	90	401.8345	140	401.9095
41	401.7610	91	401.8360	141	401.9110
42	401.7625	92	401.8375	142	401.9125
43	401.7640	93	401.8390	143	401.9140
44	401.7655	94	401.8405	144	401.9155
45	401.7670	95	401.8420	145	401.9170
46	401.7685	96	401.8435	146	401.9185
47	401.7700	97	401.8450	147	401.9200
48	401.7715	98	401.8465	148	401.9215
49	401.7730	99	401.8480	149	401.9230
50	401.7745	100	401.8495	150	401.9245

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GOES Channel and Frequencies (Continued)

Chan	Freq (MHz)	Chan	Freq (MHz)	Chan	Freq (MHz)
151	401.9260	201	402.0010	251	402.0760
152	401.9275	202	402.0025	252	402.0775
153	401.9290	203	402.0040	253	402.0790
154	401.9305	204	402.0055	254	402.0805
155	401.9320	205	402.0070	255	402.0820
156	401.9335	206	402.0085	256	402.0835
157	401.9350	207	402.0100	257	402.0850
158	401.9365	208	402.0115	258	402.0865
159	401.9380	209	402.0130	259	402.0880
160	401.9395	210	402.0145	260	402.0895
161	401.9410	211	402.0160	261	402.0910
162	401.9425	212	402.0175	262	402.0925
163	401.9440	213	402.0190	263	402.0940
164	401.9455	214	402.0205	264	402.0955
165	401.9470	215	402.0220	265	402.0970
166	401.9485	216	402.0235	266	402.0985
167	401.9500	217	402.0250		
168	401.9515	218	402.0265		
169	401.9530	219	402.0280		
170	401.9545	220	402.0295		
171	401.9560	221	402.0310		
172	401.9575	222	402.0325		
173	401.9590	223	402.0340		
174	401.9605	224	402.0355		
175	401.9620	225	402.0370		
176	401.9635	226	402.0385		
177	401.9650	227	402.0400		
178	401.9665	228	402.0415		
179	401.9680	229	402.0430		
180	401.9695	230	402.0445		
181	401.9710	231	402.0460		
182	401.9725	232	402.0475		
183	401.9740	233	402.0490		
184	401.9755	234	402.0505		
185	401.9770	235	402.0520		
186	401.9785	236	402.0535		
187	401.9800	237	402.0550		
188	401.9815	238	402.0565		
189	401.9830	239	402.0580		
190	401.9845	240	402.0595		
191	401.9860	241	402.0610		
192	401.9875	242	402.0625		

193	401.9890	243	402.0640		
194	401.9905	244	402.0655		
195	401.9920	245	402.0670		
196	401.9935	246	402.0685		
197	401.9950	247	402.0700		
198	401.9965	248	402.0715		
199	401.9980	249	402.0730		
200	401.9995	250	402.0745		

6.4 SAMPLE MESSAGES RECEIVED AT GR3320 DEMOD

6.4.1 ASCII MESSAGE WITH SPECIAL GOES HEADER DATA

The following is a standard ASCII message as output by an attached data logger to the Stevens GHT. Included at the beginning of the message is a GOES header as set by the GH command. In this case, the header includes battery voltage (BV), time in minutes since last GPS update (GA), and a message number counter (MN).

```
CS101000001011001110N964006FC42 BV:13.5 GA:4 MN:3
10/03/03  14:45:00  001:       0.00
10/03/03  14:50:00  001:       0.00
10/03/03  14:55:00  001:       0.00
10/03/03  15:00:00  001:       0.00
10/03/03  15:05:00  001:       0.00
10/03/03  15:10:00  001:       0.00
10/03/03  15:15:00  001:       0.00
10/03/03  15:20:00  001:       0.00
10/03/03  15:25:00  001:       0.00
10/03/03  15:30:00  001:       0.00
10/03/03  15:35:00  001:       0.00
10/03/03  15:40:00  001:       0.00

Bytes Received: 487
```

6.4.2 PSEUDO BINARY MESSAGE

The following is a data message in pseudo binary format. The first byte in each packet (after a space) represents the header byte.

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```
CS101000001011001110N964006FC62
A@AAB@BC@CD@DE@EF@FG@GH@HI B@IJ@JK@KL@LM@MN@NO@OP
C@PQ@QR@RS@ST@TU@UV@VW D@WY@YZ@Z[@[\@\]
E@]^@^_@_`@`a@ab@bc F@cd@de@ef@fg@gh@hi@ij
G@jk@kl@lm@mn@no@op@pq@qr H@rs@st@tu@uv@vw@wx@xy
I@yz@z{@{|@|}@}~@~? //////////////
J@AAB@BC@CD@DE@EF@FG@GH@HI K@IJ@JK@KL@LM@MN@NO@OP
L@PQ@QR@RS@ST@TU@UV@VW M@WY@YZ@Z[@[\@\]
N@]^@^_@_`@`a@ab@bc O@cd@de@ef@fg@gh@hi@ij
P@jk@kl@lm@mn@no@op@pq@qr Q@rs@st@tu@uv@vw@wx@xy
R@yz@z{@{|@|}@}~@~? //////////////
S@AAB@BC@CD@DE@EF@FG@GH@HI T@IJ@JK@KL@LM@MN@NO@OP
U@PQ@QR@RS@ST@TU@UV@VW V@WY@YZ@Z[@[\@\]
W@]^@^_@_`@`a@ab@bc@cd@de@ef@fg@gh@hi@ij
X@jk@kl@lm@mn@no@op@pq@qr Y@rs@st@tu@uv@vw@wx@xy
Z@yz@z{@{|@|}@}~@~?

Bytes Received: 697
```

6.5 GOES OPERATION WITH STEVENS DOT LOGGER

The DOT Logger can conveniently be operated together with the Stevens GHT GOES transmitter for remote data gathering and transmission over the GOES satellite system.

The DOT Logger will buffer up readings for GOES transmissions to be triggered by the GHT at the appropriate transmit time interval and offset. For example, a particular channel on the DOT Logger can have its report mode enabled (RE command) and have a report interval selected (RN command). The interval selects how often the logger will place a reading from the particular channel in the GOES buffer. *It must be equal to or a multiple of the logging interval (TN command).* For example, if the logging interval is 5 minutes, then the report interval could be 5, 10 or 15 minutes. However, it could not be 6 minutes.

Readings are buffered up from all enabled channels. The Stevens GHT will bring a hardware trigger line high which will cause the DOT logger to transfer a formatted data message to the GHT for transmission. The GHT will do this based on its appropriate transmit time interval and offset. The GHT typically will generate this trigger

20 seconds before a transmission. The following are examples of typical messages as received by a GOES DRGS receive station:

```
964020100423402550 2G49-1NN196WFF00210$ Channel:5
Time:4 +51.06 +51.04 Channel:6 Time:4 +50.97 +50.94
Channel:7 Time:4 +51.22 +51.20 Channel:8 Time:4
+51.11 +51.06 Channel:9 Time:4 +0.76 +0.76
Channel:12 Time:9 +12.99 Channel:15 Time:4 -1.14
-1.14
```

The above is an ASCII formatted message. The channel numbers are indicated, and the time value indicates the age of the most recent reading, in minutes, based on the time of transmission, which is in the GOES header. Readings are listed newest to oldest, based on the report interval set in the DOT Logger.

```
964020100423416550 2G48-1NN196WFF00132$X*@@@@@
AD@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
ED□Y@□Y@□Y@□Y@□Y@□Y@□Y@□Y@
FD□Y@□Y@□Y@□Y@□Y@□Y@□Y@□YA□Y@
ID@@A@@A@@A@@A@@A@@A@@A@@A@@A 0_
```

This message is in pseudo-binary format. The channel information is indicated by the first letter in each data group (A = channel 1, E = channel 5, etc), and the following letter indicates the age of the first reading, in minutes (D = 4 minutes). What follows are 3 character pseudo-binary readings, listed from newest data to oldest, in standard 18 bit format for pseudo-binary messages.

Note: Channels can have different reporting intervals. Not all channels need to be reported.

Report Mode (RM) command must be set to TIMED. Report Wait (RW) command must be set to 1000. Report Baud (RB) is typically set to 9600 to match the default of the GHT. Report Format (RF) can be any of selections 4 through 7 (see page 32).

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If the GHT triggers a data transfer from the DOT Logger at the same time the Logger is to do a data recording, that recording may be missed. For example, if the GHT is to transmit at 5 minutes and 15 seconds after the hours, and the DOT Logger is recording every 5 minutes, the DOT Logger may miss the data recording due to the trigger from the GHT. This can be minimized, when necessary, by adjusting the trigger time offset in the GHT. The normal default for the GHT is 20 seconds before the transmission (CT command set to 15 in the GHT). The trigger offset could be reduced to 10 seconds (CT command set to 5), so that the DOT Logger can take its 5 minute readings before the GHT trigger occurs. Five seconds is normally long enough for the DOT Logger to transfer its data at 9600 BAUD rate to the GHT. Another approach is to offset the DOT Logger clock by the necessary number of seconds or minutes.

The DOT Logger will synchronize to the GHT clock based on the GHT trigger time. When the first GHT trigger occurs, the DOT Logger stores its current value of seconds from the real time clock. On subsequent triggers, the DOT Logger will perform any minor time corrections needed to keep this seconds value consistent, thereby synchronizing the DOT Logger clock to the GHT GPS clock. The DOT Logger time doe not need to be the same as the GHT Time. All this process does is insure that the two clocks stay in sync. It is possible to have the DOT Logger clock showing local time, while the GHT clock must be in UTC time, or the DOT Logger clock could be offset by a certain amount of seconds from the GHT GPS clock. If an offset in the DOT Logger clock is needed, this offset will be maintained by this process.

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6.6 Transmitter Test Modes for Field Verification. A special operating mode is available to the user for field or bench verification of the GHT. This mode is accessed by the "OP" command. The response is as follows:

```
>op
Enter Password:
Opmode
  1: Normal
  2: Test Mode East
  3: Test Mode West
    Current value is: 1: Normal
    Enter Selection:  2
```

The user can put the unit in a special test mode to check operation over either the GOES East or GOES West satellite. An appropriate antenna should be connect for this test mode to operate properly. Putting the unit in the test mode will cause the GHT to set the appropriate channel, Test ID, and a 6 minute timed interval for transmission of a pre-defined header. If the user wished to test the GHT over the GOES East satellite, the response would be as follows:

```
    New value is:     2: Test Mode East
Enter Test Mode Timeout (minutes)
    Current value is: 30
    Enter new value:
```

This would set the unit to send a series of 6 minute transmissions of a fixed header message (about 1 second in length) with a zero time offset. The user then needs to put the unit "On Line" (OL Command) to begin the sequence, as follows:

```
>ol
On-Line
08/21/04 01:51:48 Saving Configuration...
08/21/04 01:51:50 Waiting for Data...
```

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If the unit were to be put in this test mode at 3 minutes after the hour, the first transmission should occur at 12 minutes after the hour (the unit needs at least 5 minutes to warm up the OCXO crystal reference oscillator before a transmission). The user can then monitor the test cycle with an attached PC operating in terminal mode. At the end of the 30 minute sequence, the GHT will revert to all previous settings programmed into the unit. The user can also abort the test mode with the ESCAPE sequence, and manually reset the "OP" mode to "Normal". The default for the sequence length is 30 minutes. However, the user can enter a different time length, in minutes, at the appropriate prompt.

With a power meter in series with the antenna connection, the user can verify the output power at the appropriate time of transmission. Also, the user can contact Stevens prior to the test sequence, for verification of end-to-end transmission capability of the GHT. Stevens can monitor the receipt of the test message at the factory DRGS system, and respond to the user with information on the integrity of their transmitted signal. This works well if the user can reach Stevens via cell or satellite phone for immediate verification in the field.