

GPS Containment: RF Sniffer/Status Unit PC Interface Manual v3

Initial File Date: 04/03/2012

Author: Scott McFarland

Revision File Date: 09/10/2012

Related Documents:

[1] US Patent - Maddox 6,903,682 B1

[2] GPSC System Manual v4

[3] GPSC Mobile Unit PC Interface Manual v4

[4] GPSC Base Unit PC Interface Manual v41

[4] 37287.00 DRAFT Revised Application (clean) (00259633).PDF "Actionable Position and Speed"

Revision History:

04/03/2012 Version v1

Initial release.

09/10/2012 Version v2

SAM Converted TRACE200000 to a single line trace. Effects S23, S24, S25, S26, S27, S28, and S32.

09/10/2012 Version v3

Updated "Base Ping" with "Base GPS" and "Mobile Ping" with "Mobile GPS" per our current naming conventions. Changed from using the word "Packet" to describe an RF transmission to the word "Block".

Contents

1.0 Connection Diagram

2.0 Personal Computer Requirements

2.1 Hardware

2.2 Software

2.3 Port Settings

3.0 Input and Output Formats

3.1 Input Format

3.2 Output Format

4.0 Available Commands

4.1 Commands For All Likely Users

4.2 Commands Specific to Factory Test, Engineering, and/or Emissions Compliance

5.0 Decoding Output Headers and Messages

5.1 (Trace) Headers

5.2 [Task] Headers

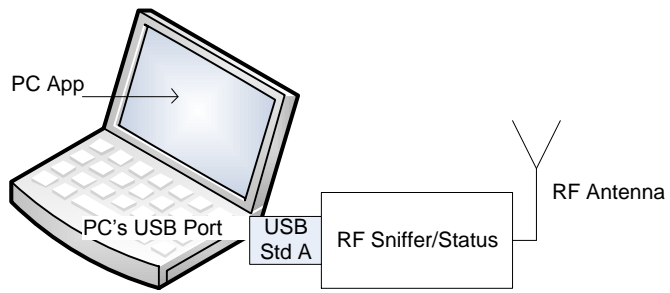
6.0 Hex Bit Maps

6.1 Event Types (HEX):

7.0 RF Transmissions

7.1 Block Types

1.0 Connection Diagram



2.0 Personal Computer Requirements

2.1 Hardware

A "GPSC RF Sniffer/Status" assembly.

A personal computer equipped with at least one USB port.

Connect per figure in section 1.0.

2.2 Software

Terminal Emulation Software: i.e. TeraTerm

TeraTerm (tterm23.zip) is available at <http://hp.vector.co.jp/authors/VA002416/teraterm.html>.

Device Drivers: FTDI USB drivers for the FT232RQ at <http://www.ftdichip.com>.

RSC GPSC PC application software.

2.3 Port Settings

Baud Rate: 38400.

Data/Stop/Parity: 8 1 None.

Flow Control: None.

Pay particular attention to which port the USB Interface Board was assigned when installed. Note that subsequent USB Interface Boards will be assigned different port numbers.

For text file transfers, under Setup/Serial Port, set "Transmit Delay" as follows:

5 msec/character 500 msec/line

3.0 Input and Output Formats

A **Sniffer/Status Command Prompt** will appear on the terminal emulator screen as, "SNIFF> ". Prior to entering or transferring command text, depress the <enter> key to force a Sniffer command prompt. If a command prompt does not appear, check all connections and PC port settings.

3.1 Input Format

A **Command** is entered or transferred as text in CAPITAL LETTERS. The characters entered are echoed and appended to the end of the command prompt. A command is executed by depressing the <enter> key following the command text. For example, SNIFF> COMMAND<enter>. Some commands have a numeric input value which may accompany the command. For these commands, the input sequence is SNIFF> COMMANDxx.x<enter>, where xx.x is the numeric input value. The number of digits and range of the numeric value is command dependent. DO NOT put a SPACE between the command and the numeric input value. The numeric input value is always a WHOLE number, NO DECIMAL POINT. Items that typically require a decimal point (i.e. latitude and longitude) are entered in units that provide sufficient accuracy without a decimal point (i.e. 10e-06 degrees). If a text entry cannot be executed as typed, the SNIFFER will respond with either a [?] or it will display the command and setting as it is currently (i.e. did not accept the numeric input or one was not provided).

3.2 Output Format

All responses from the unit will begin with one of two HEADERS.

A (trace header) – precedes a display message activated by a command (i.e. the TRACExx.x command).

A [task header] – precedes an informative message from a specific task. Informative [task] output may occur at any time.

All fields following a header are comma delimited for easy parsing (i.e. capturing and decoding) by a computer. In general, the response to a command will be one or more lines starting with a (trace) or [task] header. See section, "Decoding Output Messages" for the meaning of each of the response fields.

Example - After a POWER UP RESET

As seen on the terminal emulator display:

```
[SNV],POR

[SNV],RESTORE-FFS

[S],GPSC,Sniffer,V0.100,03-30-2012,(c)RSC
SNIFF>
```

Above is a multi-line output in response to a reset. [SNV] is a task header. The first line indicates a "power on reset" has occurred. The second line indicates that non-volatile parameters have been accessed and restored from the flash file system. [S] is also a task header. In this instance the SHELL task is displaying the firmware revision.

Prior to entering or transferring command text, depress the <enter> key to force a Sniffer command prompt.

4.0 Available Commands

Commands are initiated by typing or transferring one of the following in ALL CAPITAL LETTERS and the <enter> key. Prior to entering or transferring command text, depress the <enter> key to clear any orphaned characters from the serial port buffers and force a command prompt.

Commands for all likely users

"VERSION"	Display firmware version.
"PRINTNV"	Display parameter settings.
"DEFAULTNV"	Set parameters to their default settings.
"DEVID"	Display/Set Sniffer Unit Device ID.
"BASEREFID"	Display/Set Base Reference Unit Device ID.
"CLEARMOBILESTATUS"	Clear ALL mobile status information.
"BOOT"	Cause the unit to enter USB Boot mode.

Commands Specific to Factory Test, Engineering, and/or Emissions Compliance

"LEDTEST"	Execute an LED TEST – Red/Grn.
"TXTEST"	Place RF transceiver into one of several transmit test modes (periodic or continuous).
"TXTESTEND"	Ends TXTEST, restores RF transceiver to normal operation.
"RXTEST"	Place RF transceiver into continuous receive mode.
"RXTESTEND"	Ends RXTEST, restores RF transceiver to normal operation.
"DEST"	Send a TEXT COMMAND to a remote device via the RF link.
"TRACE"	Selects one or more diagnostic messages, numeric value in HEX.
"."	Provided on a need to know only basis for setting Manufacturing ID 1.
"."	Provided on a need to know only basis for setting Manufacturing ID 2.

4.1 Commands For All Likely Users

See section, "Decoding Output Headers and Messages" for the meaning of each of the response fields.

VERSION<enter>

Description: Display firmware version.

Numeric Input Range: N/A

Example (Inquiry):

```

SNIFF> VERSION
[S],GPSC,Sniffer,V0.100,03-30-2012,(c)RSC
SNIFF>

```

PRINTNV<enter>

Description: Display parameter settings.

Numeric Input Range: N/A

Example (Inquiry):

```

SNIFF> PRINTNV

[SNV],DEVID,30
[SNV],BASEREFID,39
[SNV],MFG1,T
[SNV],MFG2,A

SNIFF>

```

DEFAULTNV<enter>

Description: Display parameter settings.

Numeric Input Range: N/A

Example (Set):

```

SNIFF> DEFAULTNV
[S],DEFAULTNV
[SNV],RESTORE-DEFAULTS

```

```
SNIFF>
```

Suggested Numbering Convention:

It is REQUIRED to have a unique DEVID for each Base, Sniffer/Status, and Mobile unit within 2000 ft. of the installation.

BASE ID's should set for 10, 20, 30, 40, etc.

Mobile DEVID's associated with BASE ID 10 should be set to 11, 12, ... 18 (8 max per Base)

Sniffer/Status DEVID associated with BASE ID 10 should be set to 19

Mobile DEVID's associated with BASE ID 20 should be set to 21, 22, ... 28 (8 max per Base)

Sniffer/Status DEVID associated with BASE ID 20 should be set to 29

etc.

DEVIDxx . . x<enter>

Description: Display or set the Sniffer/Status Unit DEVICE ID. If a bad or no numeric input is supplied, the current DEVID is displayed. When a valid numeric input is supplied, non-volatile memory will be updated with the numeric value and displayed. The Sniffer/Status DEVICE ID (set with this command) must match the ID set with the "STATUSID" command on each Base and Mobile reporting to this device.

Numeric Input Range: 1 - 65535.

Example (Inquiry):

```

SNIFF> DEVID
[S],DEVID,19
SNIFF>

```

Example (Set):

```

SNIFF> DEVID29
[SNV],UPDATE

```

```

[S],DEVID,29
SNIFF>

```

BASEREFIDxx . . x<enter>

Description: Display or set the Base Reference Unit ID. A Sniffer/Status unit periodically communicates information with the Base Reference Unit. If a bad or no numeric input is supplied, the current BASEREFID is displayed. When a valid numeric input is supplied, non-volatile memory will be updated with the numeric value and displayed.

Numeric Input Range: 1 - 65535.

Example (Inquiry):

```

SNIFF> BASEREFID
[S],BASEREFID,10
SNIFF>

```

Example (Set):

```

SNIFF> BASEREFID20
[SNV], UPDATE

[S], BASEREFID, 20
SNIFF>

```

CLEARMOBILESTATUS<enter>Description: Clear ALL mobile status accumulated in RAM data structure.Numeric Input Range: N/AExample (Inquiry):

```

BASE> CLEARMOBILESTATUS
[S], CLEARMOBILESTATUS
BASE>

```

BOOT<enter>Description: Cause the unit to enter USB Boot mode.Numeric Input Range: N/AExample (Inquiry):

```

SNIFF> BOOT

```

4.2 Commands Specific to Factory Test, Engineering, and/or Emissions Compliance

Manufacturing ID commands are made available on an as needed basis only! The operator must end the current test before beginning a new test.

LEDTEST<enter>Description: A red – green sequence will be executed.Numeric Input Range: N/AExample (Execute):

```

SNIFF> LEDTEST
[S], LEDTEST
SNIFF>

```

RXTEST<enter>Description: The RF transceiver is placed into continuous receive only mode.Numeric Input Range: N/AExample (Execute):

```

SNIFF> RXTEST
[S], RXTEST
SNIFF>

```

RXTESTEND<enter>Description: Ends "RXTEST", restores RF transceiver to normal operation.Numeric Input Range: N/AExample (Execute):


```

SNIFF> RXTESTEND
[S], RXTESTEND
SNIFF>

```

TXTESTx<enter>

Description: Places RF transceiver into one of several transmit test modes.

Numeric Input Range: NONE, 1, 4, 5

Examples (Execute):

```

SNIFF> TXTEST<enter>      full data blocks are transmitted every 2 secs (periodic).
SNIFF> TXTEST1<enter>    produces a continuous carrier only signal.
SNIFF> TXTEST4<enter>    continuous 1010 modulated data signal.
SNIFF> TXTEST5<enter>    continuous PN9 modulated data signal (random data).

```

Example (Execute a full data block periodic test):

```

SNIFF> TXTEST
[S], TXTEST, 0
SNIFF>

```

The following information will be displayed for a **TXTEST** command and will continue for 100 transmission blocks or until a **TXTESTEND** command is entered.

```

[S], TXTEST, 100
[S], TXTEST, 99
[S], TXTEST, 98
.
.
.
[S], TXTEST, 1

```

Example (Execute a continuous test):

```

SNIFF> TXTEST1
[S], TXTEST, 1
SNIFF>

```

When performing tests 1, 4, or 5, the RF channel is 100% consumed and no longer available for other routine transmissions. Therefore, you will also see the following when performing one of these tests. The following text also serves as a reminder to execute a **TXTESTEND** command.

```
[Event], !!WIP
```

TXTESTEND<enter>

Description: Ends "TXTEST", restores RF transceiver to normal operation.

Numeric Input Range: N/A

Example (Execute):

```

SNIFF> TXTESTEND
[S], TXTESTEND
SNIFF>

```

DESTxxxxxcommandtext<enter>

Description: Forward a text command over the RF channel to a specific unit. Since the RF transceiver in a Mobile Unit is predominantly off, commands for a Mobile Unit must be queued and await transmission until the destination Mobile is ready to receive.

Numeric Input Range: Mobile ID (5 digits with leading 0's) followed by Mobile command text and any numeric input.

Example (Execute):

```
SNIFF> DEST00032TONE
[S], Command-in-Queue
```

```
[S], TONE, 32
```

```
SNIFF>
[S], Command-Accepted, 32
```

TRACEx<enter>

Description: Selects one or more diagnostic output messages, numeric value in HEX. See section, "Decoding Output Headers and Messages" for the meaning of each of the response fields. Setting more than one bit location to a one will display each trace diagnostic message. It is STRONGLY RECOMMENDED that only one message is selected at a time. The command response includes a timer used to automatically shut all traces off after 300 seconds.

Numeric Input Range: value 0 to FFFFFFFF (HEX), leading zeros are not required

Example (Execute):

```
SNIFF> TRACE200000
[S], TRACE, 0x00200000, 300
```

Example (to see how many seconds are left before auto-shutoff):

```
SNIFF> TRACE
[S], TRACE, 0x00200000, 187
```

5.0 Decoding Output Headers and Messages

Most status and diagnostic messages are turned “ON” and “OFF” by the `TRACExx...x` command. Trace activated messages are suitable for parsing by a computer program as part of a GUI. Each `(trace)` activated display line will begin with one of the `(trace)` HEADERS detailed below. A `(trace)` will automatically shut-off once the `(trace)` timer decrements to zero. When a `(trace)` is executed, the timer is set for 300 seconds.

Individual FIRMWARE TASKS will also display messages deemed informative regardless of the `TRACExx...x` command. Their output can occur at any time and is also suitable for parsing by a computer program. Each `[task]` output line and will begin with one of the `[task]` HEADERS detailed below.

Each header, `(trace)` or `[task]`, can be uniquely identified (either individually or by using the secondary parse strings that accompany the header). Once identified, the defined comma delimited fields that follow may be decoded.

The receive program must check for the correct number of fields associated with each HEADER and/or check each input character for the beginning of a NEW HEADER (either a "(" or "["). The receive program may abort the decoding if the message is garbled due to multiple output messages.

Example: !!WIP

5.1 (Trace) Headers

A (trace) diagnostic message is turned “ON” or “OFF” by the `TRACExx...x` command. The `xx...x` (HEX) numeric input value represents a 32 bit map. A message is activated by turning on the corresponding bit in the bit map and is deactivated by turning the bit off. A (trace) header is bracketed by “()”. To end any and all TRACE(s), type `TRACE0`. All (traces) will end if the (trace) timer decrements to zero. Below is a list of available (trace) activated messages.

Hex Map:	Message Description:	Command:
0x00000010	RF Receive Block in BLOCK Format	<code>TRACE10</code>
0x00000020	RF Receive Block in WORD Format	<code>TRACE20</code>
0x00001000	RF Receive Block in BLOCK Format containing Bit Errors	<code>TRACE1000</code>
0x00002000	RF Receive Block in WORD Format containing Parity Error	<code>TRACE2000</code>
0x00004000	Mobile Status	<code>TRACE4000</code>
0x00100000	Low level RF Channel activity	<code>TRACE100000</code>
0x00200000	RF Received Block in Readable Format	<code>TRACE200000</code>
0x00400000	RF Noise Floor Measurements	<code>TRACE400000</code>

Multiple TRACES (i.e. messages) may be active simultaneously, however it is NOT RECOMMENDED. To end any and all TRACE(s), type `TRACE0` at any time, regardless of the characters being displayed on the screen.

The (S#) header, where # is a unique number, precedes a trace message that has been turned on by command. Each header identifies the proper way to interpret the comma delimited fields that follow.

(S6) – Header for RF Receive Blocks in BLOCK Format, a continuous response activated by `TRACE10` or Header for RF Receive Block in BLOCK Format containing Bit Errors, a continuous response activated by `TRACE1000`

```

SNIFF> TRACE10 or TRACE1000
[S],TRACE,0x00000010,300

```

```
(S6),0,0,-70
```

```

.
```

where,

line (parse header) = S6

field 1: Block Codeword Errors

field 2: Block Bit Errors

field 3: Received Signal Strength

Note, `TRACE1000` will only display blocks with bit errors.

(S7) – Body for RF Receive Blocks in BLOCK Format, a continuous response activated by `TRACE10` or Body for RF Receive Block in BLOCK Format containing Bit Errors, a continuous response activated by `TRACE1000`

```
(S7),0x00203474
```

```
(S7),0x001E7567
```

```
(S7),0x012A011F
```

```
(S7),0x2E20063B
```

```
(S7),0x1404A4CF
```

```
(S7),0x1388067C
```

```
(S7),0x00000000
```

```
(S7),0x00000000
```

```
(S7), 0x00410126
(S7), 0x0039FE7A
(S7), 0xDF2B2E8C
(S7), 0x6000A297
(S7), 0x00005EAE
(S7), 0x19209168
(S7), 0x40064071
(S7), 0x00C84D1A
.
```

where,

line (parse header) = S7

field 1: 32 bit Receive Data Word (HEX)

Note, **TRACE1000** will only display blocks with bit errors.

(S8) – Header for RF Receive Block WORD Format, a continuous response activated by **TRACE20** or Header for RF Receive Block WORD Format containing Parity Error, a continuous response activated by **TRACE2000**

```
SNIFF> TRACE20 or TRACE2000
[S], TRACE, 0x00000020, 300

(S8), 32, 30, 6, 0, 1, 4, 0, 0, 5, -73
.
```

where,

line (parse header) = S8

field 1: Source ID

field 2: Destination ID

field 3: Block Type

field 4: Multi-Block transmission, 1 is yes, 0 is no

field 5: Last Block of transmission, 1 is yes, 0 is no

field 6: Transmit #

field 7: Block Codeword Errors

field 8: Block Bit Errors

field 9: Block Ones Count

field 10: Received Signal Strength

Note, **TRACE2000** will only display blocks with errors.

(S9) – Body for RF Receive Block WORD Format, a continuous response activated by **TRACE20** or Body for RF Receive Block WORD Format containing Parity Error, a continuous response activated by **TRACE2000**

```
(S9), 0x012A
(S9), 0x0171
(S9), 0x0008
(S9), 0x0128
(S9), 0x2710
(S9), 0x0000
(S9), 0x0000
(S9), 0x0000
(S9), 0x00F5
(S9), 0x0006
(S9), 0x06DF
(S9), 0x2C28
(S9), 0x0004
```

```
(S9), 0x0000
(S9), 0x1632
(S9), 0x6120
(S9), 0x005A
(S9), 0x005B
```

.

.

where,

line (parse header) = S9

field 1: 16 bit Receive Data Word (HEX)

Note, **TRACE2000** will only display blocks with errors.

- (S16)** – Mobile Status, a continuous response activated by **TRACE4000**. Information presented here is collected from received MOBILE GPS and CONTAINMENT STATUS blocks. The information collected is maintained in RAM memory. Information is collected for up to 8 Mobile's.

```
SNIFF> TRACE4000
[S], TRACE, 0x00004000, 300
(S16), 32, 0.266, -119, -90, 3829, 1, 3, 7, 35.914260, -84.134736, 1, 1, 4, 0.0, 22.1, 35.914271, -84.134734, 5, 0, 0, 0
```

.

.

where,

line (parse header) = S16

field 1: Mobile ID

field 2: Mobile Firmware Version Alias

field 3: Mobile RF Noise Floor

field 4: Mobile average receive level for Base RF transmissions

field 5: Mobile Battery (mV)

field 6: Mobile Navigation has Started, 1 is yes, 0 is no

field 7: Mobile Fix Quality Metric (3=hi, 2=par, 1=lo, 0=no fix)

field 8: Mobile most recent Time to First Useable Fix

field 9: Mobile GNSS latitude (decimal degrees)

field 10: Mobile GNSS longitude (decimal degrees)

field 11: Mobile within Containment Area, 1 is yes, 0 is no

field 12: Mobile is Armed for Corrections, 1 is yes, 0 is no

field 13: Mobile Seconds without Motion

field 14: Mobile Actionable Speed

field 15: Mobile Distance to Nearest Boundary Segment

field 16: Mobile Actionable latitude (decimal degrees)

field 17: Mobile Actionable longitude (decimal degrees)

field 18: Containment Correction Level Setting

field 19: WARNING Event Count

field 20: CORRECTION Event Count

field 21: DISARM Event Count

- (S18)** – RF Noise Floor Measurements, a continuous response activated by **TRACE400000**

```
SNIFF> TRACE400000
[S], TRACE, 0x00400000, 300
(S18), -116
(S18), -116
(S18), -120
(S18), -125
(S18), -123
```

.

.

where,
 line (parse header) = S18
 field 1: RF Noise Floor (dBm)

(S22) – Header for RF Received RF Blocks in Readable Format, a continuous response activated by **TRACE200000**. This header is the generic output for all other RF Blocks that are not otherwise printed in readable format for by S23, S24, S25, S26, S27, S28, or S32.

```
SNIFF> TRACE200000
[S],TRACE,0x00200000,300
```

```
(S22),32,30,0,6,0,-71
```

where,
 line (parse header) = S22
 field 1: Source ID
 field 2: Destination ID
 field 3: Transmit #
 field 4: Block Type
 field 5: Block Bit Errors
 field 6: Received Signal Strength

(S23) – Readable Text for a Transmit Test Block, a continuous response activated by **TRACE200000**

```
(S23),32,30,0,6,0,-71,100
```

```
.
```

```
.
```

```
(S23),32,30,0,6,0,-71,99
```

where,
 line (parse header) = S23
 field 1: Source ID
 field 2: Destination ID
 field 3: Transmit #
 field 4: Block Type
 field 5: Block Bit Errors
 field 6: Received Signal Strength
 field 7: Test Block #

(S24) – Readable Text for a Mobile Post Block, a continuous response activated by **TRACE200000**

```
(S24),32,30,0,6,0,-71,1,-75,44,322,164,4,4,35.914286,-84.134748
```

```
.
```

```
.
```

where,

line (parse header) = S24
 field 1: Source ID
 field 2: Destination ID
 field 3: Transmit #
 field 4: Block Type
 field 5: Block Bit Errors
 field 6: Received Signal Strength
 field 7: Post #
 field 8: RF Received Signal Strength

field 9: Hdop Position Error (0.01 meters)
 field 10: Time to Acquire Post (seconds)
 field 11: Post Weight
 field 12: Post Latitude (decimal degrees)
 field 13: Post Longitude (decimal degrees)

(S25) – Readable Text for a Mobile GPS Block, a continuous response activated by **TRACE200000**

```
(S25),32,30,0,6,0,-71,1,1,3,35.914275,-
84.134731,45,45,0,9,9,0x0C010B1A,35.914280,-84.134730,-116,-86,3924,0.265,0
.
```

where,

line (parse header) = B25

field 1: Source ID

field 2: Destination ID

field 3: Transmit #

field 4: Block Type

field 5: Block Bit Errors

field 6: Received Signal Strength

field 7: Mobile Navigation is Started, 1 is yes, 0 is no

field 8: Mobile Navigation Fix is valid, 1 is yes, 0 is no

field 9: Mobile Fix Quality Metric (3=hi, 2=par, 1=lo, 0=no fix)

field 10: Mobile GNSS Latitude (decimal degrees)

field 11: Mobile GNSS Longitude (decimal degrees)

field 12: Mobile Average Observable GPS Signal Level

field 13: Mobile Average Eligible GPS Signal Level

field 14: Mobile Ephemeris Needed Count

field 15: Mobile Observable PRN count

field 16: Mobile Eligible PRN count

field 17: Mobile used GPS PRN bit map

field 18: Mobile Actionable Latitude (decimal degrees)

field 19: Mobile Actionable Longitude (decimal degrees)

field 20: Mobile RF Noise Floor (dBm)

field 21: Mobile Signal Level for Received Base RF Transmissions (dBm)

field 22: Mobile Battery (mV)

field 23: Mobile Firmware Version Alias

field 24: System Transmit Power Setting: 0= +13dBm, 1= +5dBm, 2= -3dBm, 3= -11dBm

(S26) – Readable Text for a Base GPS Block, a continuous response activated by **TRACE200000**

```
(S26),32,30,0,6,0,-71,-118,1,35.914253,-84.134741,281.98,0xE1A22C00,35.914284,-
84.134724,290.04,255,0.200,0
.
```

where,

line (parse header) = S26

field 1: Source ID

field 2: Destination ID

field 3: Transmit #

field 4: Block Type

field 5: Block Bit Errors

field 6: Received Signal Strength

field 7: Base RF Noise Floor (dBm)

field 8: Base Reference Location Valid, 1 is yes, 0 is no

field 9: Base Reference Latitude (decimal degrees)

- field 10: Base Reference Longitude (decimal degrees)
- field 11: Base Reference Altitude (meters)
- field 12: Base used GPS PRN bit map
- field 13: Base Most Recent Fix Latitude (decimal degrees)
- field 14: Base Most Recent Fix Longitude (decimal degrees)
- field 15: Base Most Recent Fix Altitude (meters)
- field 16: Base Hdop Position Error
- field 17: Base Firmware Version Alias
- field 18: System Transmit Power Setting: 0 = +13dBm, 1 = +5dBm, 2 = -3dBm, 3 = -11dBm

(S27) – Readable Text for a Pseudo Range Error Block, a continuous response activated by **TRACE200000**

```
(S27) , 32, 30, 0, 6, 0, -71, 11, 31, 1630, 507717954, 890620389, 25, -
0.2, 31, 0.0, 32, 2.1, 14, 1.1, 16, 3.7, 20, 1.0, 22, 2.2, 24, 3.2, 30, 2.6, 23, 3.0, 29, 1.6
.
.
```

where,

line (parse header) = B27

- field 1: Source ID
- field 2: Destination ID
- field 3: Transmit #
- field 4: Block Type
- field 5: Block Bit Errors
- field 6: Received Signal Strength
- field 7: PRN Count
- field 8: Highest Elevation PRN
- field 9: GPS Week Number
- field 10: Time of Week (msec)
- field 11: Time of Week Fraction (psec)
- field 12: PRN
- field 13: Net Filtered Range Error (0.1 meters)
- field 14: PRN
- field 15: Net Filtered Range Error (0.1 meters)
- . (repeats until PRN Count is reached)
- .
- .

(S28) – Readable Text for a Containment Status Block, a continuous response activated by **TRACE200000**

```
(S28) , 32, 30, 0, 6, 0, -71, 1, 1, 3, 11, 35.914278, -
84.134707, 4, 1, 1, 22.1, 3.1, 7.1, 45, 45, 35.914255, -84.134734, 5, 0, 0, 0
.
.
```

where,

line (parse header) = S28

- field 1: Source ID
- field 2: Destination ID
- field 3: Transmit #
- field 4: Block Type
- field 5: Block Bit Errors
- field 6: Received Signal Strength
- field 7: Navigation is Started, 1 is yes, 0 is no
- field 8: Navigation Fix is valid, 1 is yes, 0 is no
- field 9: Mobile Fix Quality Metric (3=hi, 2=par, 1=lo, 0=no fix)
- field 10: Mobile most Recent Time to First Useable Fix (secs)
- field 11: Mobile GNSS Latitude (decimal degrees)

- field 12: Mobile GNSS Longitude (decimal degrees)
- field 13: Mobile Seconds without Motion
- field 14: Mobile is within the Containment Area, 1 is yes, 0 is no
- field 15: Mobile is Armed for Corrections, 1 is yes, 0 is no
- field 16: Mobile Distance to Nearest Boundary Segment (ft.)
- field 17: Mobile Actionable Speed (ft. / sec)
- field 18: Mobile Time to Nearest Boundary Segment (secs) – 1000 if the time is not relevant
- field 19: Mobile Average Observable GPS Signal Level
- field 20: Mobile Average Eligible GPS Signal Level
- field 21: Mobile Actionable Latitude (decimal degrees)
- field 22: Mobile Actionable Longitude (decimal degrees)
- field 23: Containment Correction Level Setting
- field 24: WARNING Event Count
- field 25: CORRECTION Event Count
- field 26: DISARM Event Count

(S29) – not used

(S30) – RF Receive Block in WORD Format containing Parity Error, a continuous response activated by TRACE2000

(S30), 76

.

where,

line (parse header) = S30

field 1: Ones Count Sum (Compare to field 9: Block Ones Count of the header line (B8))

(S31) – Low level RF channel activity, a continuous response activated by TRACE100000 !!WIP

```

SNIFF> TRACE100000
[S],TRACE,,0x00100000,300
    
```

(S31), Rx

(S31), Rx

(S31), Rx, , , , ,

(S31), Rx

(S31), Rx

(S31), Rx

(S31), QTx, , ,

(S31), ChnFree

(S31), RdyTx

(S31), Tx

(S31), Tx

(S31), Tx

(S31), RdyRx, , , , , , , ,

(S31), Rx

(S31), Rx, , , , , , , ,

(S31), Rx

(S31), Rx

(S31), Rx

(S31), QTx, , ,

(S31), ChnFree

(S31), RdyTx

(S31), Tx

(S31), Tx

(S31),Tx
 (S31),RdyRx,,,,.

where,

line (parse header) = S31

field 1: informative text and secondary parse string from the following list

RdyRx	- ready RF receiver
RdyTx	- ready RF transmitter
RxPdn	- power down RF
Rx	- receiving an RF block
ChnFree	- channel is free to transmit
ChnBusy	- channel is occupied
QTx	- queue block for RF transmission
Q-FULL	- transmit queue is full
Tx	- transmitting RF block
x	- RSSI diagnostic
z	- RSSI diagnostic
,	- waiting to a receive block

(S32) – Readable Text for a Ack/Nak Block, a continuous response activated by **TRACE200000**

(S32),32,30,0,6,0,-71,TEST ID NUMBER1,TEST ID NUMBER2,0.265,-47

where,

line (parse header) = S32

field 1: Source ID

field 2: Destination ID

field 3: Transmit #

field 4: Block Type

field 5: Block Bit Errors

field 6: Received Signal Strength

field 7: Device Mfg ID 1

field 8: Device Mfg ID 2

field 9: Device Firmware Version Alias

field 10: Device RF Received Signal Level for Command that Prompted the ACK/NAK (dBm)

5.2 [Task] Headers

A [task header] is bracketed by “[]” and identifies the line as an informative task output message. All fields following the header are comma delimited. Specific task headers are:

- [T] Periodic Task Header
- [P] Protocol Task Header
- [PSwi] Protocol Software Interrupt Header
- [R] RF Comm Task Header
- [S] Shell Task Header
- [Event] Diagnostic Event Activity Header
- [SNV] Sniffer Non-Volatile File Activity Header

5.2.3 [S] task header.

Additional informative text and output fields that accompany the [S] task header.

```
[S], "Command Text"          (See also "Available Commands" section).
[S], GPSC, Sniffer, V0.100, 03-30-2012, (c) RSC
[S], Command-in-Queue
[S], Command-Accepted
[S], Command-Failed
[S], Pls End Current Test First
```

Example ("Command Text" Inquiry):

```
SNIFF> DEVID
[S], DEVID, 19
SNIFF>
```

line 1: [task header] = S
 field 1: DEVID, informative text displaying the command to be executed
 field 2: numeric value for DEVID

Example ("Command Text" Set):

```
SNIFF> DEVID20
[SNV], UPDATE

[S], DEVID, 20
SNIFF>
```

line 1: (parse header) = NV
 field 1: UPDATE, informative text, secondary parse string
 line 2: [task header] = S
 field 1: DEVID, informative text displaying the command to be executed
 field 2: numeric value for DEVID

Example ("DEST" Command):

```
SNIFF> DEST00032TONE
[S], Command-in-Queue

[S], TONE, 32

SNIFF>
```

[S], Command-Accepted, 32

line 1: [task header] = S

field 1: Command-in-Queue informative text indicating the command is in queue and awaiting transmission

line 2: [task header] = S

field 1: TONE informative text displaying the command is being forwarded to a device

field 2: DEVID of the Unit to receive the command

(Note: this action mimics a typed command, therefore the Base prompt is also displayed.)

line 3: [task header] = S

field 1: Command-Accepted informative text indicating the command has been accepted by the device

field 2: DEVID of the unit accepting the command

Example ("VERSION" Command):

SNIFF> VERSION

[S], GPSC, Sniffer, V0.74, 04-14-2011, (c) RSC

where,

line 1: [task header] = S

field 1: GPSC informative text and secondary parse string

field 2: Base informative text and secondary parse string

field 3: Version number

field 4: Version date

field 5: RSC copywrite

5.2.4 [SNV] task header.

Additional informative text and output fields that accompany the [SNV] task header. The [SNV] header signifies an operation involving non-volatile parameter activity. Non-volatile parameters are copied to RAM for real time access. When a parameter is accessed for display, it is accessed from RAM and a message of type [SNV], informative-text, value will appear. When a parameter is changed, it is first changed in RAM and then a new file is written to the non-volatile FLASH FILE SYSTEM. Whenever a change is made to the non-volatile FLASH FILE SYSTEM, the [SNV], UPDATE message will be displayed.

!!WIP

Instances of the [SNV] HEADER will appear as follows:

[SNV], UPDATE	- a update to non-volatile FLASH FILE SYSTEM
[SNV], POR	- a power on reset
[SNV], RESTORE	- a non-volatile file restore operation
[SNV], RESTORE-DEFAULTS	- a non-volatile file restore and set to default operation

where,

line (parse header) = SNV

field 1: informative text and secondary parse string

The [SNV] header is also used when accessing and displaying non-volatile memory parameters in response to various commands, (i.e. PRINTNV). When accessing and displaying non-volatile memory parameters one or more of the following will appear:

[SNV], DEVID, 39

where,

line (parse header) = SNV

field 1: DEVID, informative text and secondary parse string
[SNV],BASEREFID,30

where,

line (parse header) = SNV

field 1: BASEREFID, informative text and secondary parse string

field 2: BASEREFID, the destination ID that this unit will use to report status information

5.2.5 [Event] task header.

Additional informative text and output fields that accompany the [Event] task header. The [Event] task header precedes an event diagnostic message. This message type may appear at any time.

Example:

[Event],!!WIP

where,

line (parse header) = Event

field 1: Task ID Number

field 2: Event ID Number

field 3: Event Debug Value

6.0 HEX Bit Maps

6.1 Event Types (HEX)

These flag bits refer to events (recoverable and un-recoverable) as they MAY occur.

0x00000002	Interrupt Service Task was forced to block an RF block for Transmission
0x00000010	Enable RF Transceiver Failed
0x00000020	Set RF Transceiver for Receive Mode Failed
0x00000040	Illogical Request to go to Receive Mode
0x00000800	Set RF Transceiver for Transmit Mode Failed
0x00010000	Illogical Request for an RSSI measurement
0x00080000	Unsuccessful attempt at an RSSI measurement
0x00100000	Clear Channel attempts exhausted, transmission blocked by a busy channel
0x00200000	Transmission blocked due to a test or not in WAIT FOR SYNC mode
0x00800000	Device is illogically stuck in TX or RX mode
0x10000000	Too many mobiles reporting status to this device

7.0 RF Transmissions

7.1 Block Types

Recall, that **TRACE200000** activates display messages for "RF Received Block in Readable Format". Each received block contains a field that identifies its type.

(S22) , 30, 32, 6, **8**, 0, -71

where,

line (parse header) = S22

field 4: Block Type

Block types currently used in the GPS Containment System are:

TYPE 1: MOBILE GPS – This block type is sent periodically from a Mobile to its assigned Base and Hub/Sniffer Unit. It contains a range of navigation status information. When directed to a BASE Unit, the MOBILE GPS Block also serves as a REQUEST for time or pseudo range correction data.

TYPE 2: PSEUDO RANGE CORRECTIONS - This block type is sent in response to a Mobile GPS. It is sent from a Base to a Mobile and contains GPS Time and Pseudo Range Corrections.

TYPE 4: ACQUIRED POST LOCATION - no longer used.

TYPE 5: REMOTE TEXT COMMAND - This block type is sent from a Base or Hub/Sniffer to the destination ID specified.

TYPE 6: CONTAINMENT STATUS - This block type is sent periodically from a Mobile to its assigned Base and Hub/Sniffer. It includes containment status information.

TYPE 8: BASE REFERENCE GPS - This block type is sent periodically to the Hub/Sniffer Unit.

TYPE 9: TRANSMIT TEST - This block type is sent by the unit that has been commanded to execute a TXTEST. Destination ID is 65535.

TYPE 10: ACKNOWLEDGEMENT - This block type is sent by a unit that has received and decoded a valid Remote Text Command (TYPE 5).

TYPE 11: NEGATIVE ACKNOWLEDGEMENT - This block type is sent by a unit that has received and decoded a Remote Text Command (TYPE 5) which contains an un-executable command.

TYPE 12: REQUEST EPHEMERIS DATA - When sent from a Mobile to a Base, this block type serves as a request for ephemeris data. When sent from a Base to a Mobile, it contains ephemeris data.

TYPE 13: REQUEST IONOSPHERIC MODEL - When sent from a Mobile to a Base, this block type serves as a request for ionosphere model data. When sent from a Base to a Mobile, it contains ionosphere model data.



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Modification or changes to this equipment not expressly approved by Radio Systems® Corporation may void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a specific installation. If interference does occur to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult customer care, the dealer, or an experienced radio/TV technician for help.