

**NovAtel**  
**WAAS GUS-Type 1**  
**Receiver**  
**(GUST Receiver)**  
**Addendum to OM-20000082**  
**June 2017**

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This addendum is for the WAAS GUS-Type 1 (GUST Receiver) User Manual (OM-20000082) for the following firmware versions:

L1/L2: 2.106

Clock: 3.106

L5: 4.106

This Addendum has the default state of the new SBASPSRCORRECTIONS command:

SBASPSRCORRECTIONS DISABLE

Section 5.1, Table 9: Commands by Function (OM-20000082) adds the new SBASPSRCORRECTIONS command under "SATELLITE TRACKING AND CHANNEL CONTROL":

Command	Description
SBASPSRCORRECTIONS	Enable/Disable corrections on SBAS pseudorange measurements

Section 5.2, Table 9: Command Summary (OM-20000082) adds the new SBASPSRCORRECTIONS command:

Command Name	Message ID	Description	Syntax
SBASPSRCORRECTIONS	2138	Enable/Disable corrections on SBAS pseudorange measurements	sbaspsrcorrections STATUS [SV_CHAN]

## SBASPSRCORRECTIONS (New)

This command is used to apply pseudorange corrections to L1 and L5 SBAS signals. The details of the corrections are not published in this addendum. Note that the corrections are ONLY applied to valid and planned/operational WAAS PRNs (131, 133, 135 and 138). All other SBAS PRNs are not included in the corrections at this time. Also note, if the command is used without an SV channel then DISABLE or ENABLE status is applied to all SBAS channels, which then supersedes any variation of the command that was used earlier.



The SBASPSRCORRECTIONS command should only be used by advanced users of GPS. This command can fundamentally change the way that the receiver operates. Do not alter the default settings unless you are confident that you understand the consequences.

### Syntax:

Message ID: 2138

SBASPSRCORRECTIONS STATUS [SVCHAN]

Field	Field Type	Valid Values		Description	Binary Format	Binary Bytes	Binary Offset
		ASCII Value	Binary Value				
1	header	This field contains the Abbreviated ASCII command name. See Section 4.1 (OM-20000082)			-	H	0
2	status	See <i>Table 1, SBASPSRCORRECTIONS Status Values</i> on page 3		Enables or disables PSR corrections in a channel	Enum	4	H+4
3	svchan	0 to 21 <sup>a</sup>	0	Optional SV channel number to apply the command to. Only applicable for GEO channels as follows (based on the chanconfig):  14GPS8GEO:           14-20 GEOTEST:            0-8 14GPS8GEONAR:     14-21 GEOTESTNAR:        0-9 14GPS7GEONAR:     14-20 9GEOTESTNAR:        0-8	ULong	4	H+8

a. **Warning:** The SBASPSRCORRECTIONS command replies OK when a channel other than a GEO channel is selected, but no corrections are actually applied. Remember the SV channel entered using this command is indeed a valid GEO SV channel.

### Examples:

SBASPSRCORRECTIONS ENABLE 14

SBASPSRCORRECTIONS DISABLE

**Addendum Table 1: SBASPSRCORRECTIONS Status Values**

ASCII	Binary	Description
DISABLE	0	Enables SBASPSRCORRECTIONS
ENABLE	1	Disables SBASPSRCORRECTIONS

## ASSIGN (Section 5.3.3 OM-2000082)



The *ASSIGN* command should only be used by advanced users of GPS.

This command is used to aid in the initial acquisition of a satellite by allowing the automatic satellite/channel assignment and reacquisition processes to be over ridden with manual instructions. The command specifies that the selected tracking channel should search for a specified satellite, at a specified Doppler frequency, within a specified Doppler window.

The instruction remains in effect for the specified SV channel and PRN, even if the assigned satellite subsequently sets. If the satellite Doppler offset of the assigned SV channel exceeds that specified by the window parameter of the assign command, the satellite may never be acquired or re-acquired. If a PRN has been assigned to a channel which is currently tracking that PRN and is set to AUTO tracking, the channel will immediately idle and return to automatic mode

To cancel the effects of *ASSIGN*, issue one of the following:

- The *ASSIGN* command with the *state* set to *AUTO*
- The *UNASSIGN* command
- The *UNASSIGNALL* command

These will return SV channel control to the automatic search engine immediately.



1. Assigning a PRN to an SV channel does not remove the PRN from the search space of the automatic searcher; only the SV channel is removed (i.e., the searcher may search and lock onto this PRN on another channel). The automatic searcher only searches for PRNs 0 to 37 for GPS channels.
2. Assigning an SV channel sets the *Channel Assignment* bit to 1 for forced assignment in the *Channel Tracking Status* field of the *RANGE* log. The *RANGE* log is specified in Section 6.3.10 (OM-2000082).
3. The doppler field does not apply to L2 P(Y) channels.

### Syntax:

Message ID: 27

```
ASSIGN CHANNEL [ STATE ] [ PRN [ DOPPLER WINDOW ] ]
```

Field	Field Name	Valid Values	Description	Format	Binary Bytes	Binary Offset
1	header	This field contains the <i>Abbreviated ASCII</i> command name. See Section 4.1 (OM-20000082)			H	0
2	channel	0 to 21	SV channel number to apply the command to. 0 is the first SV channel and 20 is the last: 14GPS8GEO:           0-13 for GPS and 14-20 for GEO GEOTEST:             0-8 for GEO 14GPS8GEONAR:      0-13 for GPS and 14-21 for GEO GEOTESTNAR:         0-9 for GEO 14GPS7GEONAR:      0-13 for GPS and 14-20 for GEO 9GEOTESTNAR:        0-8 for GEO See Section 5.3.6 and Table 64 (OM-20000082)	ULong	4	H
3	state	See <i>Table 2, Channel State Values</i> on page 5	Optional desired SV channel state. If a value is not given, the default of <i>ACTIVE</i> is used.	Enum	4	H+4
4	prn	0 to 37, 120 to 158	Optional satellite PRN code from 0 -37 for GPS channels and 120-158 for GEO channels. A value is required only when the <i>state</i> field is set to <i>ACTIVE</i> .	Long	4	H+8
5	doppler	-100 000 to 100 000	Optional current L1 Doppler offset of the satellite specified in the <i>prn</i> field in Hz. <i>NOTE:</i> Satellite motion, receiver antenna motion, and receiver clock frequency error must be included in the calculation of Doppler frequency.	Long	4	H+12
6	window	0 to 10 000	Error or uncertainty in the L1 Doppler estimate given in the <i>doppler</i> field, in Hz. <i>NOTE:</i> This is a $\pm$ value. For example, enter 500 for $\pm$ 500 Hz.	ULong	4	H+16

**Examples:**

ASSIGN 0 ACTIVE 29 0 2000

ASSIGN 15 120 -250 0

ASSIGN 11 28 -250 0

The first example sets the first SV channel to acquire satellite PRN 29 in a range from -2000 Hz to +2000 Hz until the satellite signal has been detected. SV channel 11 is set to acquire satellite PRN 28 at an offset of -250 Hz only in the third example.

**Addendum Table 2: Channel State Values**

ASCII	Description
IDLE	Set the SV channel to not track any satellites
ACTIVE	Set the SV channel active
AUTO	Tell the receiver to automatically assign PRN codes to channels

## ASSIGNALL (Section 5.3.4 OM-2000082)



The *ASSIGNALL* command should only be used by advanced users of GPS.

This command is used to override the automatic satellite/channel assignment and reacquisition processes for all channels with manual instructions. This command works the same way as *ASSIGN* except that it affects all SV channels.

### Syntax:

Message ID: 28

ASSIGNALL [ SYSTEM ] [ STATE ] [ PRN ] [ DOPPLER WINDOW ] ]

Field	Field Name	Valid Values	Description	Format	Binary Bytes	Binary Offset
1	header	This field contains the <i>Abbreviated ASCII</i> command name. See Section 4.1 (OM-2000082)			H	0
2	system	See <i>Table 3, Channel System Values</i> on page 6	Optional system that SV channel is tracking. If a value is not given, the default of <i>GPS</i> is used.	Enum	4	H
3	state	See <i>Table 2, Channel State Values</i> on page 5	Optional desired SV channel state. If a value is not given, the default of <i>ACTIVE</i> is used.	Enum	4	H+4
4	prn	0 to 37, 120-158	Optional satellite PRN code from 0-37 for GPS channels and 120-158 for GEO channels. A value is required only when the <i>state</i> field is set to <i>ACTIVE</i> .	Long	4	H+8
5	doppler	-100 000 to 100 000	Optional current Doppler offset of the satellite specified in the <i>prn</i> field in Hz. <i>NOTE:</i> Satellite motion, receiver antenna motion, and receiver clock frequency error must be included in the calculation of Doppler frequency.	Long	4	H+12
6	window	0 to 10 000	Error or uncertainty in the Doppler estimate given in the <i>doppler</i> field, in Hz. <i>NOTE:</i> This is a $\pm$ value. For example, enter 500 for $\pm$ 500 Hz.	ULong	4	H+16

### Example:

ASSIGNALL GPS ACTIVE 29 0 2000

**Addendum Table 3: Channel System Values**

ASCII	Description
GPS	GPS SV channels only
ALL	All channels
WAAS	GEO SV channels only

## SETSATELLITE (Section 5.3.19 OM-2000082)

Use this command to set the health of a PRN to disable it from being tracked or to enable it.



All satellites are defaulted as enabled.

### Syntax:

Message ID: 425

SETSATELLITE

Field	Field Name	Valid Values	Description	Format	Binary Bytes	Binary Offset
1	header	This field contains the <i>Abbreviated ASCII</i> command name. See Section 4.1 (OM-2000082)			H	0
2	prn	0-37, 120-158	A satellite PRN integer number	Long	4	H
3	health	See <i>Table 4, Desired Health Values</i> on page 7	Desired health tracking mode	Enum	4	H+4

### Example:

SETSATELLITE 29 DISABLE

**Addendum Table 4: Desired Health Values**

DISABLE	0	Disable tracking
ENABLE	1	Enable tracking

**Addendum Table 5: Command Type Values for RXCOMMANDS Log**

<b>ASCII</b>	<b>Binary</b>	<b>Description</b>
0	0	ASSIGN command
1	1	ASSIGNALL command
2	2	Reserved
3	3	
4	4	COM command
5	5	ECUTOFF command
6	6	Reserved
7	7	FIX command
8	8	FRESET command
9	9	LOG command
10	10	RESET command
11	11	SETAPPROXTIME command
12	12	SETSATELLITE command
13	13	THRESHOLD command
14	14	PLLTHRESHOLD command
15	15	DLLBW command
16	16	PLLBW command
17	17	Reserved
18	18	
19	19	AGCMODE command
20	20	CHANCONFIG command
21	21	PULSEBLANKING command
22	22	UNLOG command
23	23	CARRIERFREQOFFSET command
24	24	CODEFREQOFFSET command
43	43	SBASPSRCORRECTIONS command



## Performance Specifications

<b>PERFORMANCE</b>	
<i>All values subject to GPS system characteristics</i>	
<b>Frequency</b>	L1(1575.42 MHz), L2 (1227.6 MHz), L5 (1176.45 MHz)
<b>Codes Tracked</b>	GPS L1-C/A Code GPS L2-P(Y) Code SBAS GEO L1-C/A Code SBAS GEO L2-C/A Code SBAS L5 GEO GPS SVN (PRN 0-37) GEO SVN (PRN 120-158)
<b>Satellite Tracking Channels</b>	See the configuration mode values in Table 16 OM-20000082
<b>Position Accuracy (stand-alone)</b>	1.5 m CEP
<b>Pseudorange Measurement Accuracy</b> L1 C/A Narrow L1 C/A Wide L2 P(Y) L5 C5	10 cm RMS, C/No > 44 dB-Hz, DLL BW = 0.05 Hz 1 m RMS, C/No > 44 dB-Hz, DLL BW = 0.05 Hz 50 cm RMS, C/No > 38 dB-Hz, DLL BW = 0.05 Hz 1 m RMS, C/No > 44 dB-Hz, DLL BW = 0.05 Hz
<b>Single Channel Phase Accuracy</b> L1 C/A L2 P(Y) L5 C5	3 mm RMS, C/No > 44 dB-Hz, Loop PLL = 3 Hz 5 mm RMS, C/No > 30 dB-Hz, Loop PLL = 0.2 Hz 3 mm RMS, C/No > 44 dB-Hz, Loop PLL = 3 Hz
<b>C/No Accuracy</b> C/A P(Y) C5	±2.5 dB, 30-65 dB-Hz ±4 dB, 34-54 dB-Hz ±8 dB, 30-33 dB-Hz ±2.5 dB, 30-65 dB-Hz
<b>Raw Data Availability Rate</b> L1SQM/L2/L5 Time Almanac Data	One phase and code measurement per second/per satellite One message per second < 15 minutes after reset
<b>Time to First Fix</b>	100 seconds (95%) with stabilized internal and external oscillators and initial time, almanac and position.
<b>Re-acquisition</b> L1 C/A L2 P(Y) L5 C5 GEO	5 seconds C/No = 44 dB-Hz 1 $\sigma$ 60 seconds C/No = 38 dB-Hz 1 $\sigma$ 60 seconds C/No = 44 dB-Hz 1 $\sigma$ 10 seconds C/No = 44 dB-Hz 1 $\sigma$
<b>Height Measurements</b>	Up to 18,288 metres (60,000 feet) maximum <sup>a</sup>

a. In accordance with export licensing.