

# Agilent GPS Personality for the E4438C ESG Vector Signal Generator Option 409

## Product Overview



The Global Positioning System (GPS) personality (option 409) for the E4438C ESG vector signal generator simulates a single GPS satellite signal for GPS receiver testing. This firmware option provides the flexibility to support both manufacturing and R&D applications.

With the GPS personality, a few keystrokes enables you to transmit a standard signal with one of 37 available satellite (space vehicle) ID numbers to test how accurately

and quickly your GPS receiver can acquire the "satellite" signal. This option also transmits an RF signal to test the GPS functionality of cellular phones that are under a special test mode and placed in an RF test fixture. In addition, you can capture the signal to noise ratio and bit error rate (BER) of your receiver, or observe the effect of adding Doppler shifts.

The GPS personality can be used with any of the E4438C ESG's wireless format options for a complete mobile phone test solution.



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## Main features

- L1 or L2 carrier
- C/A code with data modulation
- Choice of data source
- Selectable satellite (space vehicle) ID
- Doppler shift from -125 kHz to +125 kHz
- Adjustable filters, satellite clock, code phase, P or C/A+P code
- GPIB, RS232 and LAN connectivity

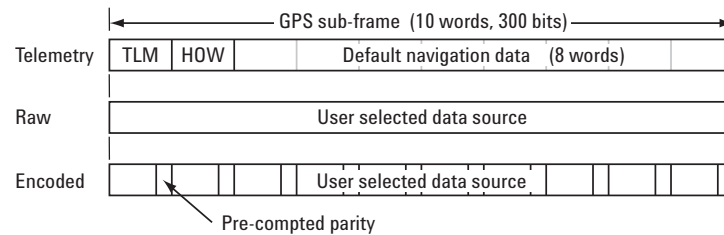
### Data choices

The GPS personality offers three data modes – telemetry (TLM), raw and encoded – to support different test applications. In each mode, data is continuously modulated with the C/A code at 50 bps.

**TLM** mode is designed for receiver sensitivity tests. TLM mode structures the continuous GPS sub-frames with a formatted TLM word, formatted handover word (HOW), and a default navigation data message per the 1995 NAVSTAR SPS GPS Signal Specification.

**Raw** mode supplies a pseudorandom noise (PN) sequence for BER calculations. Also in this mode, user-supplied data can be modulated onto the GPS signal for your proprietary testing. Raw mode generates a continuous data bitstream from one of several available data sources: PN9 or PN15 sequence, repeating 4-bit pattern, or a user-created file downloaded into the instrument.

**Encoded** (Enc) mode is ideal for parity detection tests. Encoded mode computes parity bits from the selected data source, and inserts the 6 parity bits after every 24 bits in a GPS word. Data sources include: PN9/PN15 sequence, repeating 4-bit pattern, and user-created files.



### Sub-frame structure for the data modes

## Save time with factory presets

After frequency and power level are set, simply turning on the GPS personality configures and transmits a basic GPS signal with the following characteristics:

- C/A ranging code
- 1.023 Mcps chip rate
- Satellite ID of 1
- 0.0 Hz Doppler shift
- PN9 sequence in place of navigation data

## Benefits

### Characterize your receiver's sensitivity

- Detect the signal level for signal to noise (C/No) calculations
- Level accuracy <0.5 dB down to -120 dB<sup>1</sup>
- Programmable instrument for automated tests

### Determine BER of receiver

- Select data formats for the GPS signal that enable bit error calculations
  - Calculate BER using a PN9 or PN15 sequence and the optional internal BER analyzer for the ESG (option UN7)
  - Test for bit errors with a user-created data file that suits your own BER analyzer

### Detect parity errors

- Parity bits are pre-computed for both user-created and ESG data files for parity detection tests

1. Requires external attenuator and shielding to reach levels below -136 dBm and to maintain accuracy below -127 dBm. Specifications apply to frequencies < 2.2 GHz. Refer to E4438C ESG data sheet, literature number 5988-4039EN.

### Custom applications

- Download your own data files of any frame structure into the ESG for modulation onto the GPS signal
- Modify the GPS signal by adjusting filters, reference frequency, clock, code phase, or ranging (P or C/A+P) code
- Test Doppler effects using wide, 250-kHz range Doppler shift without RF signal dropout

### Versatile vector signal generator

- Tightly-specified RF performance
- Digital arbitrary (ARB) waveform generator for building custom waveforms
- Options available for every wireless communications format: IS-95, cdma2000, 1xEV-DO, 3GPP W-CDMA, GSM, EDGE, 802.11a/b
- Serves many of the functions of high-cost, dedicated GPS test equipment for single-channel receivers

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## GPS personality features<sup>2</sup> [option 409]

<b>Ranging code</b>	Choice of code: C/A, P, C/A+P Preset: C/A
<b>Satellite ID</b>	Valid range: 1 to 37 Preset: 1
<b>Carrier frequency</b>	User-settable for 250 kHz up to 6 GHz depending on purchase of option 501, 502, 503, 504 or 506 for the ESG
<b>Doppler shift</b>	Valid range: -125 kHz to +125 kHz Preset: 0.0
<b>Data modes for C/A code only</b>	Choice of mode: telemetry, raw, encoded Preset: raw
TLM	Choice of data: not user-selectable
Raw	Choice of data: PN9, PN15, fix-4, user file Preset: PN9
Encoded	Choice of data: PN9, PN15, fix-4, user file
<b>GPS reference frequency (<math>f_0</math>)</b>	Valid range: 1 kcps to 12.5 Mcps Preset: 10.23 Mcps
<b>Chip rate</b>	C/A chip rate is automatically set equal to one-tenth of $f_0$ -value; P chip rate set equal to $f_0$ -value Preset: C/A chip rate 1.023 Mcps, P chip rate 10.23 Mcps
<b>GPS reference clock</b>	Choice of internal (equal to $f_0$ ) or external (user supplied) clock source Preset: internal
<b>Relative P code power</b>	Valid range: 0 to -40 dB
<b>Filter types</b>	Rectangular, IS-95 standard, IS-95 modified (improved ACP), IS-2000, root Nyquist, Nyquist, Gaussian, user FIR Preset: rectangular
<b>I/Q code phase</b>	Choice of normal (P code phase lags C/A code phase) or inverted Preset: normal
<b>Amplitude (output power) level<sup>1</sup></b>	-136 dBm to +10 dBm
<b>Amplitude level accuracy<sup>1</sup></b>	<+0.5 dB above -120 dBm; <+0.6 dB above -127 dBm

1. Requires external attenuator and shielding to reach levels below -136 dBm and to maintain accuracy below -127 dBm. Specifications apply to frequencies < 2.2 GHz. Refer to E4438C ESG data sheet, literature number 5988-4039EN.

2. Features subject to change.

### Alternate Agilent solution for gpsOne

For the gpsOne technology developed by QUALCOMM/SnapTrack, the recommended test solution is the Agilent CDMA mobile test set family (E8924C/E8285A/E5515C) plus the Spirent GSS 4100 GPS simulator.

The GPS personality for the ESG, option 409, does not support<sup>1</sup> gpsOne.

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### Ordering information

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The GPS personality is option 409 for the Agilent E4438C ESG vector signal generator. The GPS personality requires that the ESG is equipped with the optional baseband generator (option 001 or 002). A minimum frequency of 2 GHz (option 502) is required to transmit an L-band (for example, L1 or L2) carrier.

### Upgrade kits

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If you currently own an Agilent E4438C ESG vector signal generator and wish to obtain an upgrade kit only (license key), order E4438CK option 409.

### Related literature

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- *E4438C ESG Vector Signal Generator*, data sheet, literature number 5988-4039EN
- *Measuring Bit Error Rate using the Agilent ESG-D Series RF Signal Generators, Option UN7*, product note, literature number 5966-4098E
- *Comparison of IS-95/IS-2000 Test Sets*, product note, literature number 5988-3128EN
- *8960 Series 10 Wireless Communications Test Set*, brochure, literature number 5968-7876E

### Web resources

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For more information on the ESG, visit [www.agilent.com/find/esg](http://www.agilent.com/find/esg)



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1. Features subject to change.

