

# Agilent ESG Series RF Signal Generators Option 201 cdma2000 Personality for the Real-Time Baseband Generator

## Product Overview



- Fully-coded, multi-channel, real-time stimulus for cdma2000 mobiles and base stations



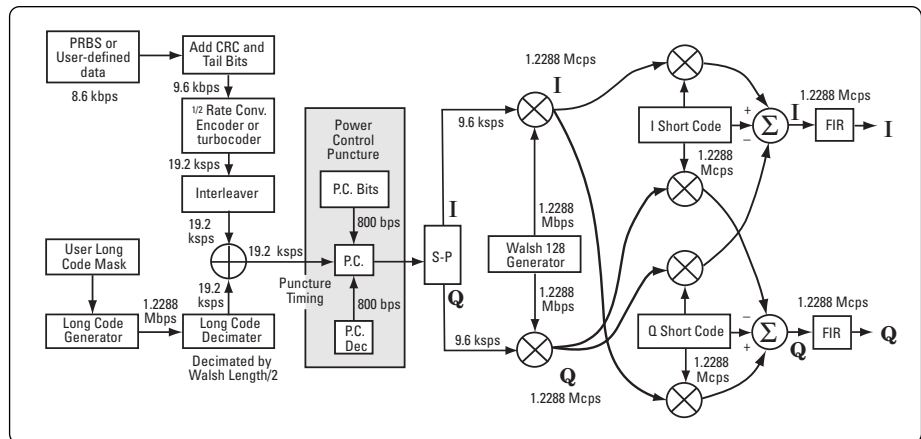
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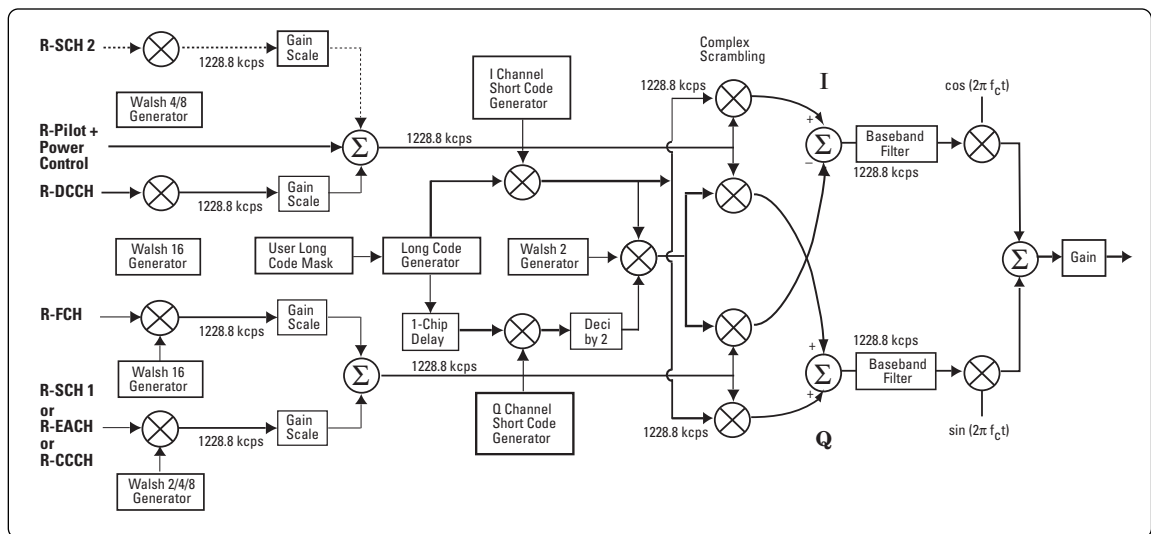
# Introduction

Option 201, cdma2000 personality adds a flexible solution for cdma2000 mobile and base station test to Agilent Technologies' ESG-D and ESG-DP (high spectral purity) series RF signal generators. It is ideally suited for bit level tests of cdma2000 receivers in R&D, sub-system module testing and RF parametric test.

The fully coded nature of this solution in both forward and reverse mode supports long and short codes, cyclic redundancy checks, convolutional or turbo encoding, interleaving, power control, and complex scrambling. Additional capabilities allow flexible channel configurations with individually adjustable power levels and data rates, customizable user data, and variable chip rates. The option is backwards compatible with IS-95A in both the basestation and mobile simulation modes through support of Radio Configuration 1 and 2. Figure 1 shows the fully coded nature of a forward traffic link generated by the personality. The personality offers user control over virtually all parameters shown. Figure 2 shows the reverse channel spreading for Radio Configuration RC3 and RC4 utilizing Spreading Rate 1 (SR1).



**Figure 1. Forward coding path for an IS-2000 SR1 RC4 traffic channel**



**Figure 2. Reverse channel spreading for RC3 and RC4 utilizing spreading rate 1 (SR1)**

# Forward link simulation

The forward link mode simulates a basestation transmitter to test a mobile station. It supports Radio Configuration (RC) 1-5 with Spreading Rate (SR1). Figure 3 is an example of the personality generating four forward channels, each of which can be configured independently.

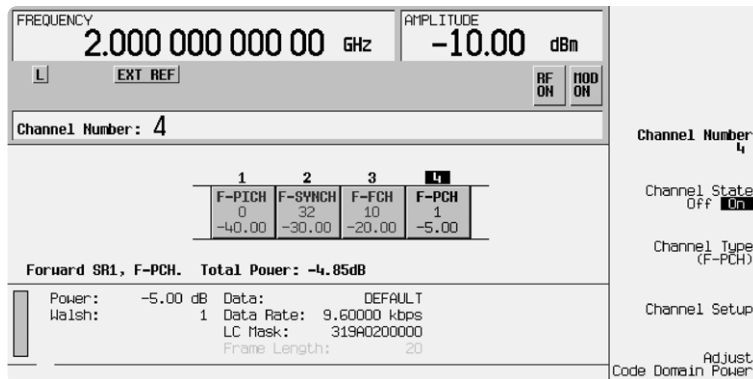


Figure 3. Forward link channel setup

## Forward link features

IS-95A receivers (RC1 or RC2) can be tested using a single ESG. Fully coded channels can be generated including pilot, synchronization, quick paging, fundamental and supplemental traffic channels. Convolutional and turbo coding are supported. A single ESG can be used to transmit a partial IS-2000 signal with a limited number of channels. Two ESG signal generators are required for the complete testing of IS-2000 receivers (RC3-5). Table 1 outlines the features available with one or two ESGs.

Description	1-ESG	2-ESG
Fully-coded channels including pilot, sync, paging, quick paging, and fundamental and supplemental traffic channels	● <sup>1,2</sup>	●
Support for radio configurations 1-5	●	●
Incremental data rates up to 307.2 kbps		●
Full control of the paging message stream (overhead and signaling messages)	●	●
Supports both convolutional and turbo encoding	● <sup>3</sup>	●
Supports quasi-orthogonal functions 0-3	●	●
User data insertion via user files or external data	●	●
Variable chip rates, 50 Hz to 1.3 MHz	●	●
Fully configurable sync channel base station parameters	●	●
OCNS channels	●	●

Table 1. Forward link features by ESG solution

1. IS-95 does not support Quick paging.  
 2. One ESG can generate a group of channels including pilot, sync, paging, and RC1-RC2 fundamental or a group of channels including RC1-RC5 fundamental and RC3-RC5 supplemental channels. A single ESG cannot generate both groups of channels simultaneously.  
 3. IS-95 does not support turbo coding.

# Reverse link simulation

The Option 201 reverse link simulates a mobile station transmitter for testing a base station. It supports RC1-4 with SR1, allowing basestation test using either a single or a two ESG solution. The single ESG solution is viable for both IS-95A and IS-2000. The two ESG solution is only for the IS-2000 format; this allows an additional Reverse Supplemental Channel (R-SCH). Figure 4 is an example of the personality generating four reverse channels, each of which can be configured independently. In this example the ESG is generating an R-PICH, R-DCCH, R-FCH and an R-SCH simultaneously.

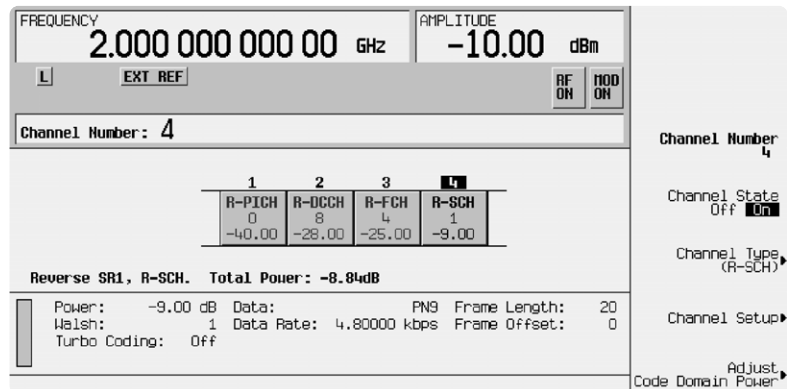


Figure 4. Reverse link channel setup

## Reverse link features

Table 2 outlines the reverse link features by radio configuration.

Description	RC1	RC2	RC3	RC4
IS-95 backwards compatible	●	●	●	●
IS-2000 features			●	●
Pseudorandom number data patterns (PN9 and PN15)	●	●	●	●
4-bit fixed data patterns	●	●	●	●
User defined data patterns	●	●	●	●
Power control bit settings			●	●
Adjustable frame offsets	●	●	●	●
Adjustable frame lengths			●	●
Convolutional encoding	●	●	●	●
Turbo encoding for R-SCH			●	●

Table 2: Reverse link features by radio configuration

# Agilent's cdma2000 solutions

Agilent provides a range of test solutions for cdma2000. Because it allows user data to be inserted and fully encoded, Option 201 is intended for receiver functional and parametric test at the physical layer. Option 101 multichannel cdma2000 personality is intended for component test. It provides more code channels from a single box so the peak to average statistics are better for stressing components. It also offers multicarrier capability and SR3, however it is not fully coded. Refer to figure 5, which outlines the difference between the two solutions.

Both the ESG and the Agilent 8960/E5515T one box tester can create the signals required to test a mobile station. The Agilent 8960/E5515T creates all the required signals simultaneously and is best suited to manufacturing final test. The increased flexibility available with the ESG makes it an ideal solution in many phases of R&D receiver design and verification.

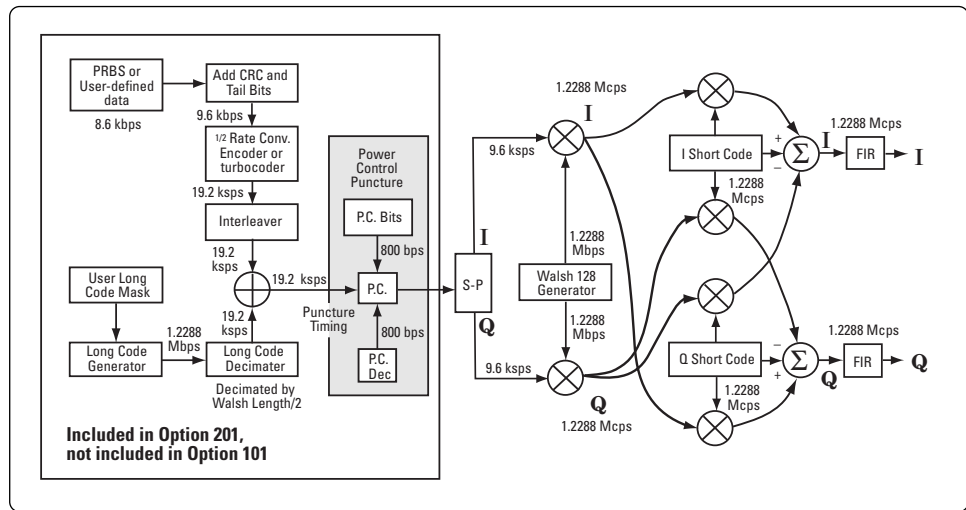


Figure 5. Choose Option 101 or 201, depending on the level of coding required.

# Models and hardware requirements

Option 201 is a firmware personality that requires Option UN8, (hardware Revision C or greater), Real-Time Baseband Generator to be installed in the ESG. The firmware can be activated by purchasing a license key. Firmware updates can be found on the Agilent ESG Web page at <http://www.agilent.com/find/esg>

Option 201, cdma2000 personality is available with all the Agilent ESG-D and ESG-DP (high spectral purity) series models:

<b>E4430B</b>	1 GHz ESG-D series RF signal generator
<b>E4431B</b>	2 GHz ESG-D series RF signal generator
<b>E4432B</b>	3 GHz ESG-D series RF signal generator
<b>E4433B</b>	4 GHz ESG-D series RF signal generator
<b>E4434B</b>	1 GHz ESG-DP series RF signal generator
<b>E4435B</b>	2 GHz ESG-DP series RF signal generator
<b>E4436B</b>	3 GHz ESG-DP series RF signal generator
<b>E4437B</b>	4 GHz ESG-DP series RF signal generator

# Channel types generated

## Forward link

Up to four channels simultaneously, of any of the following:

- Forward Pilot (F-PICH)
- Forward Paging (F-PCH)
- Forward Quick Paging (F-QPCH)
- Forward Synchronization (F-SYNCH)
- Forward Fundamental (F-FCH)
- Forward Supplemental (F-SCH)
- Orthogonal Coded Noise Source (OCNS)

## Reverse link

IS-95 is supported using RC1 or RC2 which utilizes a single, selectable channel type:

- Reverse Access Control Channel (R-ACH)
- Reverse Fundamental Channel (R-FCH)
- Reverse Supplemental Channel (R-SCH)

IS-2000 features are supported using RC3 or RC4. The channel types consist of the following:

- Reverse Pilot Channel (R-PICH) (with or without gating)
- Reverse Dedicated Control Channel (R-DCCH)
- Reverse Common Control Channel (R-CCCH)
- Reverse Enhanced Access Channel (R-EACH)
- Reverse Fundamental Channel (R-FCH)
- Reverse Supplemental Channel (R-SCH)

# Specifications

A wide range of configurations are available for each forward and reverse channel type listed above. Refer to the Agilent ESG Family of RF Signal Generators data sheet, literature number 5965-3096E, for a complete list of these configurations and base instrument specifications.



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