Option 5 GSM PCN PCS

2030, 2031, 2032

Generates GMSK modulation to the GSM, DCS1800 standards and PCS standards, allowing internal data to be easily entered and edited for mobile phone, base station and component testing.

- **Wideband cover:**
  10 MHz to 1.35 GHz (2030)
  10 MHz to 2.7 GHz (2031)
  10 MHz to 5.4 GHz (2032)

- **GMSK Bt 0.3 Modulation**

- **Internal data generator**

- **Data editor**

- **External data / clock modulation**

- **Excellent phase accuracy**

- **Wideband FM**

Option 5 GSM PCN PCS for 2030, 2031 and 2032 Signal Generators provide a signal modulated with GMSK Bt 0.3 modulation at a clock rate of 270.833 kHz. The wideband frequency cover enables the generator to be used for testing Global System for Mobile Communications (GSM) and Personal Communications Network/Service (PCN/PCS) receivers. The carrier can be modulated from an internal data generator or from an external data and clock source. Excellent phase accuracy and stability are ensured by the use of a precision modulator.

Internal Modulation

An internal data generator can be used to modulate the carrier. The data can be entered and edited at bit level within a slot and the stored slots assembled into frames, multiframes and superframes either from the keyboard or from an external GPIB controller. Null and pseudo random data slots are also available.

External Modulation

An external source of data and 270.833 kHz clock can be used. The data is internally filtered to provide GMSK Bt 0.3 modulation and the RF envelope can be set to be externally controlled. In this mode the generator frequency standard is phase locked to the external clock signal.

Store and Recall

The availability of non-volatile stores ensures that internal data can be stored for future use and simplifies stand alone operation. The internal data can be edited to bit level within a slot and slots can be assembled into frames, multiframes and superframes.

SPECIFICATION

GENERAL DESCRIPTION

This option adds GMSK (Gaussian Minimum Shift Keying) modulation at a bit rate of 270.833 kHz to the 2030 series. This modulation is used by the GSM and UK PCN systems.

Front panel connectors provide external modulation inputs for Clock, Data and Envelope control.

Facilities are provided for internal modulation by data sequences which can be internally edited and stored. The front panel connectors provide outputs for Clock and Data.

Instruments may be connected using the SYNC connectors to provide multiple RF Outputs with synchronized slot and frame structures.

2030, 2031 or 2032 Signal Generators fitted with the GMSK option conform to the 2030 series specification in the GMSK mode except as follows:

CARRIER FREQUENCY RANGE

Range

2030: 10 MHz to 1.34675 GHz

2031: 10 MHz to 2.69675 GHz

2032: 10 MHz to 5.4 GHz*

*(GMSK modulation limited to 10 MHz - 2.7 GHz)

RF OUTPUT

Range

0 dBm to −144 dBm

(-3 dBm max with Option 12 Electronic Attenuator)

Accuracy

2 dB

Output VSWR

As for 2030 series for levels below −6 dBm

SPECTRAL PURITY

Non-Harmonic Output

GMSK signals are generated by mixing a local oscillator with a 3.25 MHz IF signal carrying the GMSK signal. Additional signals are present at the local oscillator frequency, image frequency and frequencies equivalent to the harmonics of the IF mixed with the local oscillator.

FREQUENCY STANDARD

In GMSK mode an input or output at 13 MHz, 10 MHz, 5 MHz or 1 MHz is available.

GMSK MODULATION

Modulation Type

GMSK Bt 0.3 to GSM recommendation 0.5.04.

Modulation Accuracy

Phase accuracy as defined by GSM 05.05 − 4.6 is 1° RMS, 3° peak for carrier frequencies up to 1 GHz.

A second Bt is available which gives an RMS phase error of 5°.

DATA CODING

Selectable as uncoded, or differentially coded to GSM rec 05.04 − 2.3 for internal or external modulation.

INTERNAL MODULATION

An internal data source provides a Traffic Channel format superframe hierarchy.

Individual slots may be null data, fixed data, or contain $(2^{29}-1)$ PRBS data as defined in CCITT rec V.52. Successive slots contain 156, 156, 156, 157 bits. The internal data source provides data and clock output. Internal data can be edited from the front panel and stored or can be entered using the GPIB.

The RF envelope may be ramped up and down to GSM 05.05 annex 2 and GSM 05.05 − 4.2.2.

The internal data generator can be used with an external clock as in 'External Modulation'.
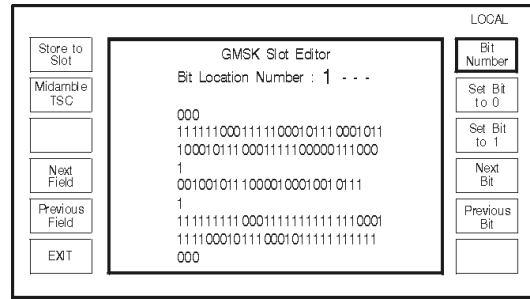
Data Storage

Data in the data generator can be stored and edited from the front panel or via the GPIB.

Store sizes are:

100 slots of which 2 are defined as null (S0) and PRBS (S99).

100 Frames containing any of the stored slots in any order.

100 multiframes containing any of the stored frames in any order.

40 superframes containing any of the stored multiframes in any order.

Internal Modulation Output

Data Output

TTL compatible

Clock Output

TTL compatible

EXTERNAL MODULATION

Clock and Data input at TTL compatible levels. Data must be valid on the falling edge of the clock input.

Data Input level

TTL compatible

Clock Input level

TTL compatible

Clock Input frequency

270.833 kHz ±25 ppm or a clock of the same bit rate but including one clock period of 1¼ bits per slot.

Envelope Input Impedance

15 kΩ nominal

Doppler FM Input Impedance

50 Ω

ENVELOPE CONTROL

Selectable constant level, internal level control, or controlled from the external envelope input: External envelope control voltages are 0 V for off, +1 V for specified RF level. The RF output voltage varies linearly with applied voltage.

External Input risetime

Less than 4 µs.

Off Slot Suppression

Better than −70 dBc.

MODULATION SENSE

Output can be set to use upper or lower sideband. Modulation sense can be inverted.

SYNCHRONIZATION

Instruments may be synchronized by use of the Sync Input/Output. One instrument in MASTER mode sources a bit clock and the SYNC signal. The SYNC signal goes active low for one bit during the transition of the internal data from slot 7, bit 156 to slot 0, bit 0. Instruments in SLAVE mode use Clock and SYNC signals to maintain a synchronized data structure.

Synchronization input/output

Open collector TTL, 2 mA pull-up, active low, bidirectional.

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers
Versions

2030	10 kHz to 1.35 GHz Signal Generator.
2031	10 kHz to 2.7 GHz Signal Generator.
2032	10 kHz to 5.4 GHz Signal Generator.
Option 005	GSM PCN PCS (GMSK Bt 0.3).

Supplied with

AC power lead

Operating Manual

Options

Option 001	Second internal modulation oscillator.
Option 002	Pulse Modulation.
Option 003	19 dBm Output (2030 only).
Option 006	Avionics (requires Option 001, cannot be ordered with Option 003).
Option 008	RF Profiles and complex sweep.
Option 012	Electronic Attenuator (2030 and 2031 only). Not available with options 003 or 010.
Option 105	Modifies the pulse modulation option for slower rise and fall times (order with Option 002).
Option 112	External modulation inputs (2) 600 Ω impedance

Note
Option 5 is not available with option 9 or option 10 or on 2040 and 2050 series