AVIO Modulation Option Application Note

Purpose

This application note describes the AVIO modulation option of the BNC signal generators.

Introduction

Option AVIO adds modulation schemes used in aviation.
The schemes are:

VOR (VHF Omnidirectional Radio Range) is a radio navigation system enabling aircraft to determine its direction relative to the VOR ground station.

ILS (Instrument Landing System) is a radio navigation system providing aircraft with horizontal and vertical guidance for landing.
ILS consists of two independent subsystems:
ILS LOC (ILS Localizer) provides lateral guidance.
ILS G/S (ILS Glide Slope) provides vertical guidance.

VOR

VOR uses radio channels between 108 and 117.95 MHz.
A 30 Hz reference signal is frequency modulated on a 9960 Hz amplitude modulated subcarrier.
A variable 30 Hz amplitude modulated signal can be compared to the 30 Hz reference signal. The phase difference indicates the direction relative to the VOR ground station.

ILS LOC

ILS LOC uses radio channels between 108.1 and 111.95 MHz.
Two amplitude modulated beams provide lateral guidance.
90 Hz amplitude modulation is used on the right and 150 Hz on the left beam.
The difference of received modulation depths indicates lateral deviation from the axis of the runway.

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ILS G/S

ILS G/S uses radio channels between 329.15 and 335 MHz.
Two amplitude modulated beams provide vertical guidance.
90 Hz amplitude modulation is used on the upper and 150 Hz on the lower beam.
The difference of received modulation depths indicates vertical deviation from the nominal glide path.

Common commands and queries

***RST**

Resets the device to factory default settings. This disables VOR, ILS LOC and ILS G/S modulations and resets all modulation settings.

VOR commands and queries

[:SOURce]:VOR[:STATe]?

[:SOURce]:VOR[:STATe] 0|OFF|1|ON

Enables or disables VOR modulation.
Performance is guaranteed only in the nominal VOR frequency range of 108 to 117.95 MHz.
*RST value: OFF

[:SOURce]:VOR:AM0[:DEPTh]?

[:SOURce]:VOR:AM0[:DEPTh] <depth>

Sets the modulation depth of the 30 Hz amplitude modulated reference signal.
*RST value: 0.3 (30 %)

[:SOURce]:VOR:AM1[:DEPTh]?

[:SOURce]:VOR:AM1[:DEPTh] <depth>

Sets the modulation depth of the 9960 Hz amplitude modulated subcarrier.
*RST value: 0.3 (30 %)

[:SOURce]:VOR:BEARing?

[:SOURce]:VOR:BEARing <bearing>

Sets the phase of the variable 30 Hz frequency modulated signal in radians. This setting equals the direction relative to the VOR ground station: 0 for north, π/2 (1.57) for east, π (3.14) for south, π·3/2 (4.71) for west.

*RST value: 0 rad (0 degrees)

[:SOURce]:VOR:FM:INDex?

[:SOURce]:VOR:FM:INDex <index>

Sets the frequency modulation index of the variable 30 Hz frequency modulation signal.

*RST value: 16

[:SOURce]:VOR:TEST NORTh|EAST|SOUTh|WEST|1|2

Loads predefined VOR test settings.

NORTh: AM0 depth 0.3, AM1 depth 0.3, bearing 0 (north), FM index 16.

EAST: AM0 depth 0.3, AM1 depth 0.3, bearing 1.57 (east), FM index 16.

SOUTh: AM0 depth 0.3, AM1 depth 0.3, bearing 3.14 (south), FM index 16.

WEST: AM0 depth 0.3, AM1 depth 0.3, bearing 4.71 (west), FM index 16.

1: AM0 depth 0.2, AM1 depth 0.2, bearing 0 (north), FM index 15.

2: AM0 depth 0.4, AM1 depth 0.4, bearing 0 (north), FM index 17.

Command only. No query. No *RST value.

ILS LOC commands and queries

[:SOURce]:ILS:LOC[:STATe]?

[:SOURce]:ILS:LOC[:STATe] 0|OFF|1|ON

Enables or disables ILS LOC modulation.

Performance is guaranteed only in the nominal ILS LOC frequency range of 108.1 to 111.95 MHz.

*RST value: OFF

[:SOURce]: ILS:LOC:AM0[:DEPTh]?

[:SOURce]: ILS:LOC:AM0[:DEPTh] <depth>

Sets the modulation depth of the 90 Hz amplitude modulated left beam signal.

*RST value: 0.2 (20 %)

[:SOURce]: ILS:LOC:AM1[:DEPTh]?

[:SOURce]: ILS:LOC:AM1[:DEPTh] <depth>

Sets the modulation depth of the 150 Hz amplitude modulated right beam signal.

*RST value: 0.2 (20 %)

[:SOURce]:ILS:LOC:TEST DDM0|LEFT|RIGHt|FLAG

Loads predefined ILS LOC test settings.

DDM0: AM0 depth 0.2, AM1 depth 0.2 (centerline).

LEFT: AM0 depth 0.1225, AM1 depth 0.2775 (fly left).

RIGHt: AM0 depth 0.2775, AM1 depth 0.1225 (fly right).

FLAG: AM0 depth 0.15, AM1 depth 0.15.

Command only. No query. No *RST value.

ILS G/S commands and queries

[:SOURce]:ILS:GS[:STATe]?

[:SOURce]:ILS:GS[:STATe] 0|OFF|1|ON

Enables or disables ILS GS modulation.

Performance is guaranteed only in the nominal ILS G/S frequency range of 329.15 to 335 MHz.

*RST value: OFF

[:SOURce]: ILS:GS:AM0[:DEPTh]?

[:SOURce]: ILS:GS:AM0[:DEPTh] <depth>

Sets the modulation depth of the 90 Hz amplitude modulated upper beam signal.

*RST value: 0.4 (40 %)

[:SOURce]: ILS:GS:AM1[:DEPTh]?

[:SOURce]: ILS:GS:AM1[:DEPTh] <depth>

Sets the modulation depth of the 150 Hz amplitude modulated lower beam signal.

*RST value: 0.4 (40 %)

[:SOURce]:ILS:GS:TEST DDM0|LEFT|RIGHt|FLAG

Loads predefined ILS G/S test settings.

DDM0: AM0 depth 0.4, AM1 depth 0.4 (centered on glide path).

UP: AM0 depth 0.3125, AM1 depth 0.4875 (fly up).

DOWN: AM0 depth 0.4875, AM1 depth 0.3125 (fly down).

FLAG: AM0 depth 0.35, AM1 depth 0.35.

Command only. No query. No *RST value.

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