



application note

Morse Code Signalling Simulation on 2030/40 series Avionics Signal Generators

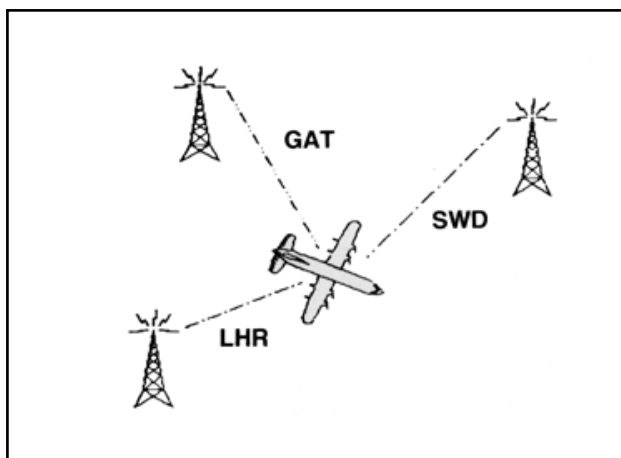


The extensive Calling Tones facilities of the 2030/40 series Avionics Signal Generators can simulate the Morse code identity signal for the testing of ILS and VOR navigational receivers

Introduction

The ILS Localizer and VOR beacons have superimposed on the transmitted signal a three letter Morse code signal to identify the transmission source. For instance, a beacon located at London Heathrow uses the code LHR. En-route VOR beacons use codes that identify their locations, as detailed in aviation route documentation.

ILS Marker Beacons generate pulsed audio modulation tones of dots, dashes or alternate dots and dashes on the inner, middle and outer markers respectively, which are pulsed at the Morse code rate.



The Morse Code Protocol

The Morse code protocol is internationally defined. A dash duration is equal to 3 dots, the inter letter space is a null frequency of one dot and the inter word space is a null frequency of one dash (see Table 1). The duration of a dot is variable and depends on the baud rate of the signal. A duration of 100 ms has been chosen as suitable for avionics tests and the Morse code is superimposed on a tone frequency of 1020 Hz.

Table 1

Protocol	Timing	Frequency
Dot	100 ms	1020 Hz
Dash	300 ms	1020 Hz
Letter Space	100 ms	Null
Word Space	300 ms	Null

Generating Morse Code on the 2030

The CALLING TONES facilities of the signal generator can be configured to generate a Morse code sequence internally. This signal can then be selected as the Ident/Comms modulation signal in the ILS, VOR and Marker modes which enables the receiver under test audio and identity recognition circuits to be exercised. Using the Tones memories, it is possible to store up to 10 user defined Morse code identity sequences.

2030 Set Up

To use the calling tones for Morse code identity simulation the signal generator should be set up as follows:

1. Set the signal generator in the ILS LOCALIZER, VOR, or MARKER MODE in accordance with the operating manual.
2. In ILS or VOR mode, select the IDENT/ COMMS key and set the AM2 modulation depth to 10% AM. Select an INTERNAL MODULATION source set to 1020 Hz.

Note: In MARKER BEACON MODE the source is preset to the appropriate beacon's tone frequency with 95% AM.

3. Using the UTILITIES facility, select the CALLING TONES menu.
4. Using the SELECT STANDARD and EDIT STANDARD keys, set the User 1 Standard as shown in Table 2:

Table 2

Tone No.	Frequency	Duration	Gap
Tone 0	10 Hz	100 ms	100 ms
Tone 1	1020 Hz	100 ms	100 ms
Tone 2	1300 Hz	100 ms	100 ms
Tone 3	3000 Hz	100 ms	100ms
Tone 4	400 Hz	100 ms	100 ms

5. Store these settings to USER 1.
6. Set the EXTENDED DURATION to 300 ms, REPEAT TONE to 1 and START DELAY to 9 seconds.
7. For ILS Localizer and VOR, use the TONE SEQUENCE and TONE DURATION keys to enter the required Morse code letters as a tone sequence in accordance with the following rules:
 - a. For dots enter as Default Tone 1
 - b. For dashes enter as Extended Tone 1
 - c. For inter-Letter spaces enter as Default Tone 0

Example S O S
 1,1,1,0, 1E, 1E, 1E 0,1,1,1

The generator is now set to provide an SOS Morse sequence every 9 seconds. The repeat time can be changed by altering the start delay.

8. For the ILS markers beacon sequence, set the start delay to 0 and enter tone sequence as detailed in Table 3:

Table 3

Marker	Sequence	Protocol
Inner	3	All dots
Middle	2, 2E,	Alternate dots & dashes
Outer	4E	All dashes

9. Press the MODE CONTROL key and set the control as follows:
 - a. Modulation source to AM2
 - b. Number of Repeats to 10 (continuous)
10. Store the sequence in Stores 0 to 10 and in Memory full stores 1 to 48 as required.
11. Select the SIG GEN hard key to return to the main screen
12. To send the Identity sequence press the SEND TONES key. The sequence will repeat every 9 seconds until the STOP TONES is pressed.



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