ILS Test Procedures
using the
Signal Generator SMT

Application Note 1GPAN11E

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Products:

Signal Generator SMT

ROHDE&SCHWARZ

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ILS Receiver Tests using the Signal Generator SMT

The following paragraphs are intended to show the capabilities of the Rohde&Schwarz Signal Generator SMT performing ILS*) and Marker Beacon receiver tests.

The procedures presented should not be considered binding or mandatory.

It is expected that the user once familiar with the use of SMT for VOR/ILS receiver tests will design and implement procedures which satisfy equipment and regulatory requirements.

This application note is part of a series of three application notes describing the use of the Signal Generator SMT for air navigation receiver testing. The other application notes are:

VOR/ILS Testing with the Signal Generator SMT (1GPAN09E), which gives an overview of the capabilities of the SMT for air navigation receiver testing and describes the basics of the VOR and ILS systems.

and

ILS Test Procedures using the Signal Generator SMT (1GPAN11E), which presents a collection of ILS and Marker Beacon tests.

Introduction

To be able to generate ILS test signals the SMT has to be equipped with option SM-B6, Multifunction Generator.

The ILS tests included do not require any other equipment besides SMT.

For high precision deflection measurements the measurement of the ILS instrument's current is recommended.

To prevent incorrect settings of the SMT, each test starts with the "PRESET" command.

The sequence of the settings should be followed.

In addition to the manual settings the corresponding IEEE commands are given.

The ILS and Marker Beacon tests included are part of an application software also available.

Equipment connections

To perform receiver tests the antenna input of the receiver has to be connected to the signal generator's output connector. No other connections are necessary.

Attention!

In order to avoid damage of the receiver front end, the output level of the generator SMT must not exceed the maximum allowed input level of the receiver.

1   ILS Receiver Tests

1.1 ILS Centering Accuracy Test

Purpose: This test checks the centering accuracy of the receiver under different signal conditions.

1.1.1 Standard Centering Signal

SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz*)	":FREQ 108.100MHz" *)
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz*)	":FREQ 334.700MHz" *)
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"

*) In all examples a carrier frequency of 108.1 MHz for the Localizer tests and 334.7 MHz for the Glide Slope tests was choosen. For other ILS frequencies see appendix (Table 1).

Receiver test:

- CDI (Course Deviation Indicator) pointer should be centered. Record centering error in μA or pointer deflection. Compare result with manufacturer's specifications.

1.1.2 Carrier Level Variation

SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -73 dBm	":POW -73dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -67 dBm	":POW -67dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"

Receiver test:

- Record centering error due to a level variation in μA or pointer deflection.
- Pointer error must not exceed receiver specification

Repeat test with RF level setting of -27 dBm for the Localizer Test and -17 dBm for the Glide Slope Test.

1.1.3 Carrier Frequency Variation

SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
FREQ. OFFSET -9 kHz	":FREQ:OFFS -9kHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
FREQ. OFFSET -21 kHz	":FREQ:OFFS -21kHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"

Receiver test:

- Record centering error due to carrier frequency variation of -9 kHz for the Localizer and -21 kHz for the Glide Slope test in μA or pointer deflection.
- Pointer error must not exceed receiver specification

Repeat test with a carrier frequency variation of +9 kHz for the Localizer Test and +21 kHz for the Glide Slope Test.

1.1.4 Simultaneous Variation of 90 and 150Hz Modulation Depth

SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
SUM OF DEPTH: 44%	":ILS:LOC:SOD 44PCT"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
SUM OF DEPTH: 85%	":ILS:GS:SOD 85PCT"

Receiver test:

- Record centering error due to a modulation variation of + 4% (+5% for Glide Slope) in μA or pointer deflection.

Repeat test with a setting of 36% for the localizer test and 75% for the glide slope test.

1.1.5 Variation of 90 and 150 Hz Phase Relationship

SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"
L/R PHASE: 12 deg	":ILS:LOC:PHAS 12deg"
COM/ID FRQ.: 1020 Hz	":ILS:COM:FREQ 1020Hz
COM/ID DEPTH: 30%	":ILS:COM:DEPT 30pct"
COM/ID STATE ON	":ILS:COM ON"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"
U/D PHASE: 12 deg	":ILS:GS:PHAS 12deg"

Receiver test:

- Record centering error due to a tone phase shift in μA or pointer deflection.

Repeat test with a setting of -12 degree.

1.2 ILS CDI Characteristics and Deflection Balance Test

Purpose: This test determines the effect of RF input variation to the Localizer and Glide Slope indication. The deflection caused by the variation of the RF input level should not exceed $\pm$20% of the standard deflection.

1.2.1 SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"
FLY: LEFT	":ILS:LOC:DDM:DIR LEFT"
DDM: 0.155	":ILS:LOC:DDM 0.155"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"
FLY: UP	":ILS:GS:DDM:DIR UP"
DDM: 0.175	":ILS:LOC:DDM 0.155"

Receiver test:

- Verify CDI (Course Deviation Indicator) pointer to be left (up) full scale (150μA)

1.2.2 SMT setting:

Localizer Test

Manual operation:	Remote control:
FLY: RIGHT	":ILS:LOC:DDM:DIR RIGHT"

Glide Slope Test

Manual operation:	Remote control:
FLY: DOWN	":ILS:GS:DDM:DIR DOWN"

Receiver test:

- Verify CDI (Course Deviation Indicator) pointer to be right (down) full scale (150μA)

1.2.3 SMT setting:

Localizer Test

Manual operation:	Remote control:
ILS-LOC: DDM 0.0	":ILS:LOC:DDM 0pct"

Glide Slope Test

Manual operation:	Remote control:
ILS-GS: DDM 0.0	":ILS:GS:DDM 0pct"

Receiver test:

- Verify that LOC/GS CDI (Course Deviation Indicator) pointer is centered.

1.2.4 SMT setting:

Localizer Test

Manual operation:	Remote control:
ILS-LOC: FLY LEFT	":ILS:LOC:FLY LEFT
ILS-LOC: DDM 0.093	":ILS:LOC:DDM 0.093"

Glide Slope Test

Manual operation:	Remote control:
ILS-LOC: FLY UP	":ILS:LOC:FLY UP
ILS-GS: DDM 0.091	":ILS:LOC:DDM 0.091"

Receiver test:

- CDI (Course Deviation Indicator) should indicate 60% of full scale deflection (90μA) for Localizer and 52% of full scale deflection (78μA) for Glide Slope (Left / Up Standard Deflection)

1.2.5 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -73 dBm	"POW -73dBm"

Glide SlopeTest

Manual operation:	Remote control:
RF LEVEL: -67 dBm	"POW -67dBm"

Receiver test:

- Record variation of CDI pointer deflection due to level variation. Pointer variation should not exceed the receiver specification.

Repeat tests 1.2.4 and 1.2.5 with a level setting of -27 dBm for the localizer test and -17 dBm for the glide slope test.

1.2.6 SMT setting:

Localizer Test

Manual operation:	Remote control:
ILS-LOC: FLY RIGHT	":ILS:LOC:FLY RIGHT
ILS-LOC: DDM 0.093	":ILS:LOC:DDM 0.093"

Glide SlopeTest

Manual operation:	Remote control:
ILS-LOC: FLY DOWN	":ILS:LOC:FLY DOWN
ILS-GS: DDM 0.091	":ILS:LOC:DDM 0.091"

Receiver test:
- Record variation of CDI pointer deflection due to level variation. Pointer variation should not exceed receiver specification.

1.2.7 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -73 dBm	"POW -73dBm"

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -67 dBm	"POW -67dBm"

Receiver test:
- Record variation of CDI pointer deflection due to level variation. Pointer variation should not exceed receiver specification.

Repeat tests 1.2.6 and 1.2.7 with a level setting of -27 dBm for the localizer test and -17 dBm for the glide slope test.

1.3 ILS RF Sensitivity Test

Purpose: This test determines the minimum RF signal input level required of a standard Localizer/Glide Slope deviation signal to produce at least 60 % of full scale deflection on a linear scaled indicator. A standard Localizer deviation signal is defined as a Localizer signal with a sum of depth of the two modulation tones of 40% and a difference in depth of the two tones of 9.3% (DDM=0.093). A standard Glide Slope deviation signal is defined as a signal with a sum of depth of 80% and a DDM value of 0.091. The minimum RF level should not exceed 30μV or -77dBm for Localizer or 40μV / -75dBm fo Glide Slope.

1.3.1 SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"

Receiver test:
- Verify that CDI (Course Deviation Indicator) pointer is centered.

1.3.2 SMT setting:

Localizer Test

Manual operation:	Remote control:
IILS-LOC: DDM 0.093	":ILS:LOC:DDM 0.093"

Glide Slope Test

Manual operation:	Remote control:
IILS-GS: DDM 0.091	":ILS:LOC:DDM 0.091"

Receiver test:
- Verify that CDI (Course Deviation Indicator) pointer is deflected 60% of full scale (90uA) for Localizer and 52% of full scale (78uA) for Glide Slope (Standard deflection)

1.3.3 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -77 dBm	"POW -77dBm"

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -75 dBm	"POW -75dBm"

Receiver test:

- Verify that CDI (Course Deviation Indicator) pointer is deflected more than 60% of standard deflection (>36% of full scale deflection or >54μ A for Localizer, and >31% of full scale or >46μA for Glide Slope)

Repeat test for different carrier frequencies. A list of carrier frequencies is provided in the appendix (Table 1)

1.4   ILS Warning Signal Test

Purpose: This test checks the operation of the Localizer and Glide Slope alarm system under various signal conditions.

1.4.1 SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"

Receiver test:

- Verify that the receiver's alarm system is off (warning flag out of sight)

1.4.2 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -77 dBm	"POW -77dBm"

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -67 dBm	"POW -67dBm"

Receiver test:

- Verify that the receiver's alarm system is off (warning flag not visible)

1.4.3 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -27 dBm	"POW -27dBm"

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -17 dBm	"POW -17dBm"

Receiver test:

- Verify that the receiver's alarm system is off (warning flag out of sight)

1.4.4 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: OFF	"OUTP OFF"

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: OFF	"OUTP OFF"

Receiver test:

- Verify that the receiver's alarm system is visible (warning flag visible)

1.4.5 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -47 dBm	"POW -47dBm"
MODULATION: ILS-LOC MODE: 90Hz	":ILS:MODE:LLOB

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -50 dBm	"POW -50dBm"
MODULATION: ILS-GS MODE: 90Hz	":ILS:MODE:ULOB

Receiver test:

- Verify that the receiver's alarm system is visible (warning flag visible)

1.4.6 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -47 dBm	"POW -47dBm"
MODULATION: ILS-LOC MODE: 150Hz	":ILS:MODE:RLOB

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -50 dBm	"POW -50dBm"
MODULATION: ILS-GS MODE: 150Hz	":ILS:MODE:LLOB

Receiver test:

- Verify that the receiver's alarm system is visible (warning flag visible)

1.4.7 SMT setting:

Localizer Test

Manual operation:	Remote control:
RF LEVEL: -47 dBm	"POW -47dBm"
MODULATION: ILS-LOC MODE: OFF	":ILS:MODE:STATE OFF

Glide Slope Test

Manual operation:	Remote control:
RF LEVEL: -50 dBm	"POW -50dBm"
MODULATION: ILS-GS MODE: OFF	":ILS:MODE:STATE OFF

Receiver test:

- Verify that the receiver's alarm system is visible (warning flag visible)

1.4.8 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC MODE: NORM DDM: 0.093	":ILS-LOC:MODE NORM ":ILS:DDM 0.093"

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS MODE: NORM DDM: 0.091	":ILS-GS:MODE NORM "ILS: DDM 0.091"

Receiver test:

- Verify that the receiver's alarm system is off (warning flag not visible)

1.4.9 SMT setting:

Reduce RF level until CDI pointer is deflected 30% of full scale deflection (27μA) for Localizer, 26% of full scale deflection (39μA) for Glide Slope (50% of standard deflection).

Receiver test:

- Verify that the receiver's alarm system is visible (warning flag visible)

1.5 ILS Course Deviation Indication

Purpose: This test checks the accuracy of the CDI pointer deflection.

1.5.1 SMT setting:

Localizer Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 108.100 MHz*)	":FREQ 108.100MHz"
MODULATION: ILS-LOC	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE LOC"

Glide Slope Test

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -50 dBm	":POW -50dBm"
FREQUENCY: 334.700 MHz*)	":FREQ 334.700MHz"
MODULATION: ILS-GS	":ILS:PRESET;STATE ON"
ILS DEFAULT SETTING	":ILS:TYPE GS"

*) For other ILS frequencies see appendix (Table 1)

Receiver test:

- Verify that the CDI pointer is centered.

1.5.2 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC	":ILS-LOC:DDM:DIR LEFT"
FLY: LEFT	":ILS:LOC:DDM 0.155"
DDM: 0.155	

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS	":ILS-GS:DDM:DIR UP"
FLY: UP	":ILS:GS:DDM 0.175"
DDM: 0.175	

Receiver test:

- CDI (Course Deviation Indicator) pointer should reach 67% of full scale deflection within 2 seconds and stop at full scale. Overshoot should not exceed 5% of full scale deflection.

1.5.3 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC	":ILS-LOC:DDM:DIR RIGHT"
FLY: RIGHT	":ILS:LOC:DDM 0.155"
DDM: 0.155	

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS	":ILS-GS:DDM:DIR DOWN"
FLY: DOWN	":ILS:GS:DDM 0.175"
DDM: 0.175	

Receiver test:

- CDI (Course Deviation Indicator) pointer should reach 67% of full scale deflection within 2 seconds and stop at full scale. Overshoot should not exceed 5% of full scale deflection.

1.5.4 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC	":ILS-LOC:DDM 0.2"
DDM: 0.200	

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS	":ILS-GS:DDM 0.2"
DDM: 0.200	

Receiver test:

- Check that CDI pointer deflection does not decrease from full scale deflection.

1.5.5 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC	":ILS-LOC:DDM:DIR LEFT"
FLY: LEFT	

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS	":ILS-GS:DDM:DIR UP"
FLY: UP	

Receiver test:

- Check that CDI pointer deflection does not decrease from full scale deflection.

1.5.6 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC DDM: 0.093	":ILS-LOC:DDM 0.093"

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS DDM: 0.091	":ILS-GS:DDM 0.091"

Receiver test:

- Check that CDI pointer is deflected 60% of full scale deflection (90μA) for Localizer and 52% of full scale deflection (78μA) for Glide Slope (Left / Up Standard Deflection).

1.5.7 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC FLY: RIGHT	":ILS-LOC:DDM:DIR RIGHT"

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS FLY: DOWN	":ILS-GS:DDM:DIR DOWN"

Receiver test:

- Check that CDI pointer is deflected 60% of full scale deflection (90μA) for Localizer and 52% of full scale deflection (78μA) for Glide Slope (Left / Up Standard Deflection).

1.5.8 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC DDM: 0.046	":ILS:LOC:DDM 0.046"

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS DDM: 0.045	":ILS:GS:DDM 0.045"

Receiver test:

- Check that CDI pointer is deflected 30% of full scale deflection (45μA) for Localizer and 26% of full scale deflection (39μA) for Glide Slope (Right/Down Half Standard).

1.5.9 SMT setting:

Localizer Test

Manual operation:	Remote control:
MODULATION: ILS-LOC FLY: LEFT	":ILS-LOC:DDM:DIR LEFT"

Glide Slope Test

Manual operation:	Remote control:
MODULATION: ILS-GS FLY: UP	":ILS-GS:DDM:DIR UP"

Receiver test:

- Check that CDI pointer is deflected 30% of full scale deflection (45μA) for Localizer and 26% of full scale deflection (39μA) for Glide Slope (Right/Down Half Standard).

2 Marker Beacon Receiver Test

Purpose: This test checks the operation of the marker beacon receiver.

2.1 Outer Marker Test

2.1.1 Receiver setting:

Set the receiver senstivity setting to High Sense Mode.

2.1.2 SMT setting:

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 74.600 MHz*)	":FREQ 74.600MHz"
MODULATION: MKR-BCN MARKER FREQUENCY: 400Hz	":MBE:FREQ 400Hz"
MARKER DEPTH: 95%	":MBE:DEPTH 95pct"
MARKER BEACON STATE: ON	":MBE:STATE ON"

*) For other Marker Beacon frequencies see appendix (Table 2)

Receiver test:

- Verify that the blue Outer Marker lamp is on.

2.1.3 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -77 dBm	"POW -77dBm"

Receiver test:

- Verify that the blue Outer Marker lamp is still on.

2.1.4 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -17 dBm	"POW -17dBm"

Receiver test:

- Verify that the blue Outer Marker lamp is still on.

2.1.5 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -117 dBm	"POW -117dBm"

Increase RF level until blue Outer Marker lamp comes on.

Receiver test:

- Compare RF level with receiver specifications.

2.2 Middle Marker Test

2.2.1 Receiver setting:

Set receiver sensitivity to High Sense Mode.

2.2.2 SMT setting:

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 74.600 MHz	":FREQ 74.600MHz"
MODULATION: MKR-BCN MARKER FREQUENCY: 1300Hz	":MBE:FREQ 1300Hz"
MARKER DEPTH: 95%	":MBE:DEPTH 95pct"
MARKER BEACON STATE: ON	":MBE:STATE ON"

Receiver test:

- Verify that the amber Middle Marker lamp is on.

2.2.3 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -77 dBm	"POW -77dBm"

Receiver test:

- Verify that the amber Middle Marker lamp is still on.

2.2.4 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -17 dBm	"POW -17dBm"

Receiver test:

- Verify that the amber Middle Marker lamp is still on.

2.2.5 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -117 dBm	"POW -117dBm"

Increase RF level until amber Middle Marker lamp comes on.

Receiver test:

- Compare RF level with receiver specifications.

2.3 Inner Marker Test

2.3.1 Receiver setting:

Set receiver senstivity to High Sense Mode.

2.3.2 SMT setting:

Manual operation:	Remote control:
PRESET	"*RST;*CLS"
RF LEVEL: -47 dBm	":POW -47dBm"
FREQUENCY: 74.600 MHz	":FREQ 74.600MHz"
MODULATION: MKR-BCN	
MARKER FREQUENCY: 3000Hz	":MBE:FREQ 3000Hz"
MARKER DEPTH: 95%	":MBE:DEPTH 95pct"
MARKER BEACON STATE: ON	":MBE:STATE ON"

Receiver test:

- Verify that the white Inner Marker lamp is on.

2.3.3 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -77 dBm	"POW -77dBm"

Receiver test:

- Verify that the white Inner Marker lamp is still on.

2.3.4 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -17 dBm	"POW -17dBm"

Receiver test:

- Verify that the white Inner Marker lamp is still on.

2.3.5 SMT setting:

Manual operation:	Remote control:
RF LEVEL: -117 dBm	"POW -117dBm"

Increase RF level until white Inner Marker lamp comes on.

Receiver test:

- Compare RF level with receiver specifications.

2.4 Generating pulsed Marker Beacon Signals

The MEMORY SEQUENCE facilities of the Signal Generator SMT can be configured to generate pulsed Marker Beacon signals.

In order to distinguish between the three Marker Beacons three different pulse sequences are used:

Outer Marker: 300ms ON, 100ms OFF, ...

Middle Marker: 300ms ON, 100ms OFF, 100ms ON, 100ms OFF, ...

Inner Marker: 100ms ON, 100ms OFF, ...

To use the MEMORY SEQUENCE function for the generation of pulsed Marker Beacon signals the signal generator should be set up as follows:

1. Set the signal generator in the desired Marker Beacon mode and store the setting with MARKER DEPTH = 95% in a memory location. This setting represents the "ON" signal.

2. Store the same setting with MARKER DEPTH = 0% in another memory location ("OFF" signal)

3. Use the MEMORY SEQUENCE function to enter the timing according to the tables below.

Outer Marker:

Index	Memory	Dwell	Remark
1	11	300ms	Dash
2	10	100ms	Space

Middle Marker :

Index	Memory	Dwell	Remark
1	11	300ms	Dash
2	10	100ms	Space
3	11	100ms	Dot
4	10	100ms	Space

Inner Marker :

Index	Memory	Dwell	Remark
1	11	100ms	Dot
2	10	100ms	Space

Select "AUTO" mode to start Memory Sequence.

3 Appendix

Table 1: Specified Localizer/Glide Slope frequency pairs (MHz)

Localizer (MHz)	Glide Slope (MHz)	Localizer (MHz)	Glide Slope (MHz)
108.10	334.70	110.10	334.40
108.15	334.55	110.15	334.25
108.30	334.10	110.30	335.00
108.35	333.95	110.35	334.85
108.50	329.90	110.50	329.60
108.55	329.75	110.55	329.45
108.70	330.50	110.70	330.20
108.75	330.35	110.75	330.05
108.90	329.30	110.90	330.80
108.95	329.15	110.95	330.65
109.10	331.40	111.10	331.70
109.15	331.25	111.15	331.55
109.30	332.00	111.30	332.30
109.35	331.85	111.35	332.15
109.50	332.60	111.50	332.90
109.55	332.45	111.55	332.75
109.70	333.20	111.70	333.50
109.75	333.05	111.75	333.35
109.90	333.80	111.90	331.10
109.95	333.65	111.95	330.95

Table 2: Specified Marker Beacon frequencies (MHz)

74.600	74.775	74.950	75.125	75.300
74.625	74.800	74.975	75.150	75.325
74.650	74.825	75.000	75.175	75.350
74.675	74.850	75.025	75.200	75.375
74.700	74.875	75.050	75.225	75.40
74.725	74.900	75.075	75.250	
74.750	74.925	75.100	75.275	