MLS-800 Microprocessor Controlled Ground Station Simulator

The MLS-800 provides diagnostic test capabilities for microwave landing system angle receivers.

- ***Test Operational Menu supports ICAO 1985 and EUROCAE ED-53A and ED-36A***
- ***Complete Main Path Simulation:***
  Approach (AZ) and High Rate Azimuth (HiAZ)
  Elevation (EL)
  Back Azimuth (BAZ)
  Flare (FL)
- ***Complete Multi-path (MP) Simulation Capability:***
  Interference Pulses
  Selectable Fade Rate Modulation of 0.05, 1 and 1000 Hz
- ***Control of all Beam Parameters:***
  Angular Position
  Beam Amplitude Referenced to the Preamble
  Norm and Half Width Pulse
  Selectable Beam Width at 0.5°, 1°, 2°, 3°, 4° or 5°
- ***Sync Capability for:***
  External Monitoring
  Designating PFE and CMN Function
  Designating Multi-path Function
- ***Preamble Parity, Symmetry and Percent Update***
- ***Simulates all Basic Data Words plus Auxiliary Data Words with Parity Selection***
- ***Full Range of MLS Channels***

IFR is a leader in the design, manufacture and marketing of Avionics test systems.

The MLS-800 is a microprocessor controlled Ground Station Simulator designed to operate from a bench test environment. Test parameters are selected via a 44-position keyboard and displayed on test operational menus.

Other Features

- *OCI Control for Right (RT), Left (LT) and Rear (RR)*
- *75 dB AZ to EL Ratio Capability*
  Propellor/Rotor Modulation at 1 to 100 Hz Variable in 1 Hz steps
  Morse Code Identification Capability
- *ARINC 429 Receiver with PFE and CMN calculations*
- *External RF Reference Input*
- *Clearance Pulse Simulation*
- *6.75 Hz Modulation*
- *IEEE-488-1978 Interface for Remote Control Operation*

SPECIFICATION

GENERAL REQUIREMENTS

- Unless otherwise noted the following equipment performance characteristics are warranted over the specified environmental conditions following a 20 minute warm-up period.
- All RF measurements are referenced to 50 Ω.
- Accuracy and resolution stated in percent are referenced to measured or desired values.
- Where resolution exceeds accuracy, resolution takes precedence.
- Notes are intended to provide information useful in applying the instrument by giving specific setup information. Notes are found in the notes section of this specification.

RF SIGNAL GENERATOR

FREQUENCY

Frequency Range

5031.0 to 5090.7 MHz

Steps

0.3 MHz

Accuracy

±1.0 kHz

OUTPUT POWER

Level Range

-17 to -122 dBm

Level Accuracy

±2.0 dB

Level Flatness

±0.5 dB at -20 dBm (Note 1 and 2)

Attenuator Accuracy

±1.0 dB

Attenuator Monotonicity

±0.5 to 1.5 dB (Each Step)

Spectral Purity

Noise Floor

Offset ± 0.3 to 1.2 MHz from Cf

-105 dBc/Hz (Note 3 and 4)

Residual FM Modulation

<1 kHz peak, 0.01 to 15 kHz BW

Residual Phase Modulation

<0.5 radians peak, 0.3 to 15 kHz BW

Spurious Signal Rejection (in-band)

From ±0.3 to 1.2 MHz

-45 dBc

From ±1.2 to 30 MHz (band end)

-65 dBc

Spurious Signal Rejection (out of band)

From 5120 to 5250 MHz

-50 dBm

From 50 kHz to 12.4 GHz (excluding 5000 to 5250 MHz)

-35 dBm

MODULATION (Note 5, 6 and 7)

MAIN PATH FUNCTIONS

BEAM ANGLES

Azimuth

±62°

High Rate Azimuth

±42°

Elevation

-1.5° to 29.5°

Flare

-2° to 10°

Back Azimuth

±42°

Angle Resolution

±0.05° steps

Angle Accuracy

±0.005°

Basic Data

All functions selectable on menu with selectable data values and parity

Auxiliary Data

All auxiliary data words selectable

BEAM SHAPE

Approximately sinx/x or 1/2 sinx/x waveforms at 1/2 width that fills time slot. Sidelobes for 1/2 sinx/x are present on pulse side only.

BEAM WIDTH

Selectable to 0.5°, 1°, 2°, 3°, 4°, 5°

Accuracy

±10% of setting

BEAM LEVEL

Adjustable relative to preamble

Range

-3.0 to +13.0 dB (Note 6)

Resolution

1.0 dB steps

Accuracy

±1.0 dB

SIDE LOBES

Relative to beam level

Level

-20.0 dB, ±1.0 dB

OCI PULSES (Right, Left, Rear)

Width

100 μs, ±10 μs

Level

Adjustable relative to preamble

RANGE

-4.0 to +7.0 dB

RESOLUTION

1.0 dB steps

ACCURACY

±1.0 dB

DPSK MODULATION

Phase Shift

Logic Zero (0)

No transition

Logic One (1)

180°, ±10°

AMPLITUDE BALANCE

±0.4 dB

TRANSITION TIME

<10 μs, 10% to 90%

MULTI-PATH FUNCTION

BEAM ANGLE

Selectable to maximum angle for selected function

ANGLE RESOLUTION

0.05° steps

ANGLE ACCURACY

±0.05°

BEAM SHAPE

Approximately sinx/x or 1/2 sinx/x waveforms at 1/2 width that fills time slot. Sidelobes for 1/2 sinx/x are present on pulse side only.

BEAM WIDTH

Selectable to 0.5°, 1°, 2°, 3°, 4°, 5°

Accuracy

±10% of setting

BEAM LEVEL

Adjustable relative to preamble (Note 6, 8 and 10)

Range

-14.0 to +13.0 dB

Resolution

1.0 dB steps

Accuracy

±1.0 dB, -3.0 to +13.0 dB

±2.0 dB, -14.0 to -4.0 dB

SIDE LOBES

Relative to beam level

Level

-20.0 dB, ±1.0 dB

MAIN PATH TO MULTI-PATH

±1.0 dB tracking error

FADE RATE

Frequency Range

Selectable 0.05, 1 and 1000 Hz

Accuracy

±1.0 %

Steps

Eight discrete steps that approximate a sine wave

CLEARANCE PULSES (Note 9)

Position

Two pulses spaced equidistant from 0.0°

Angle Resolution

±0.05°

Angle Accuracy

±0.05°

Pulse Width

50.0 μs, ±5.0 μs

AMPLITUDE

Range

-3.0 to +13.0 dB

Resolution

1.0 dB steps

Accuracy

±1.0 dB

ADDITIONAL FUNCTIONS

AZ to EL RATIO

Selectable so Azimuth to Elevation function ratio is 0 or -75 dB

Accuracy

±2 dB

Interference Modulation

Propeller Modulation

Frequency

Variable 1 to 199 Hz

Resolution

1.0 Hz steps

Accuracy

±1%

Duty Cycle

-12 dB, ±2 dB applied for 15%, ±1%

Sync

Not in sync with any function

6.75 HZ MODULATION

Frequency

6.75 Hz

Accuracy

±1%

Level

Selectable ±6.0 dB square wave modulation to main beam (Note 6 and 10)

Accuracy

±1.0 dB

Sync

Not in sync with any function

MORSE CODE

Selection

Off, selectable or Continuous Tone

OSCILLOSCOPE SYNC

Selection

Selectable to occur at start of any function, basic or auxiliary data word

Amplitude

Positive TTL pulse approximately 14 μs wide.

Note: Sync control specifies to which function or data word the tests in Table 1 apply.

FUNCTION	APPLICATION
P PARITY	CONTROLS PREAMBLE PARITY
6.75 Hz	ENABLES OR DISABLES 6.75 Hz MODULATION
UPDATE	CONTROLS % UPDATE RATE
FADE RATE	CONTROLS FADE RATE (APPLIED TO MULTI-PATH BEAM)
SYMMETRY	CONTROLS BEAM SYMMETRY
PROP MOD	CONTROLS PROPELLER MODULATION FREQUENCY
PFE	MEASUREMENT OF PATH FOLLOWING ERROR
CMN	MEASUREMENT OF CONTROL MOTION NOISE

Table 1 - Oscilloscope Sync

FUNCTION UPDATE RATE

Selection

100%, 75%, 55%, 45%, 25% and 0%

Accuracy

±3.9 %

FUNCTION	UPDATE RATE	AVERAGE RATE OVER 10 SECONDS
AZ	100 %	13.0 ±0.5 Hz
HiAZ	100 %	39.0 ±1.5 Hz
BAZ	100 %	6.5 ±0.25 Hz
EL	100 %	39.0 ±1.5 Hz

FUNCTION PREAMBLE PARITY

Selection

Function identified by Oscilloscope Sync selection is candidate to have its parity bits individually inverted to provide a change in parity.

SCANNING BEAM TIME SYMMETRY

Selection

0 (OFF), ±60 μs in 1 μs steps referenced to proper timing from preamble Receiver Time Reference Code

External Reference Input

Variable 9.999940 to 10.000060 MHz at 3.0 dBm nominal

ARINC 429 RECEIVER

Rates

12.5 and 100 kbps data rates

Format

Return to Zero (RZ)

Levels

Logic "1" = +5 to 10 V input, typical

Logic "0" = -5 to -10 V input, typical

Transitions

Rise and fall times <1.5 μs

GPIB

Conforms to IEEE-488-1978 Standard for Talker/Listener

POWER

AC

Voltage

103.5 to 240 VAC

Frequency

45.0 to 440 Hz

Power Consumption

85.0 W, maximum

Fuse Requirements

2.5 A, 250 V, Type F

DC

Voltage

11.0 to 30.0 VDC

Fuse Requirements

7.5 A, 32 V min., Type F

BATTERY

Time Out

10 minute time out circuit to prevent accidental discharge. Low voltage detect turns unit off prior to performance being affected.

Charge Cycle

At least 3 cycles or 30 minutes of charge life before recharge

ENVIRONMENTAL

Weight

22.7 kg (50 lbs.) Maximum

Dimension (with lid)

234.9 mm wide x 539.75 mm high x 355.6 mm deep

9.25 in. wide x 21.25 in. high x 14.0 in. deep

Operating Temperature

+10° C to +40° C

Storage Temperature

-40° C to +71° C

REFERENCE NOTES

Note 1: Measured with 1000 Hz Fade Rate applied to Multi-path with Multi-path OFF, 14 dB Pad applied, and Main Path in CW, 0 dB modulation

Note 2: 0.2 to 0.4 dB variation in level at Fade Rate is normal operation and is due to residual component of Multi-path signal. 0.8 dB variation is normal for Multi-path signal at Multi-path = 0 dB, Main Path = OFF.

Note 3: -105 dBc/Hz is approximately equal to -60 dBc in a 30 kHz bandwidth.

Note 4: Total spurious power should not exceed -15 dBc or -35 dBm at -20 dBm level setting from 50.0 kHz to 12.4 GHz.

Note 5: Angular range is limited to slightly less than maximum range for beam widths of 0.5° and 1.0° according to following table:

FUNCTION	***RANGE 0.5°***	***RANGE 1.0°***
AZ	-61° to 61°	-61.95° to 61.95°
EL	-1.0° to 29.5°	-1.0° to 29.5°
BAZ	-41.75° to 41.75°	-41.75° to 41.75°
FL	-1° to 9°	-1° to 9°
HiAZ	-41° to 41°	-41.95° to 41.95°

Note 6: RF preamble level plus modulation level should not exceed --10.0 dBm.

Note 7: Beam modulation level of +6 dB above preamble is assumed unless specified.

Note 8: When clearance is selected, each pulse is individually selectable in amplitude.

Note 9: Selectable for AZ, HiAZ and BAZ functions only. Angular range is ±1° to ±61° for AZ and ±41° for HiAZ and BAZ.

Note 10: Combined modulation level in a given time slot not to exceed +15 dB relative to preamble. Includes main path and multi-path +6.75 Hz modulation.

IFR - "Working together to create solutions for the world of communications."

IFR is a world leader in developing leading edge test and measurement equipment. The priority at IFR is to understand your communications test needs and respond to them. IFR has the flexibility and expertise to create just the right test solution for you. We understand that just as you are the expert in designing wireless products, we are expert in wireless test.

Combining the quality of our test products with their reliability, excellent price/performance ratio and minimal requirements for maintenance, every IFR test system represents an outstanding lifetime value.

IFR - "Working together with our customers to be flexible and innovative in providing effective test solutions for the rapid design, manufacture and maintenance of communications systems."

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IFR will continue to build upon our technology resources with an aggressive commitment that will enable you to excel in some of the world's most dynamic, high growth markets.

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