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*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

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### FREQUENCY

#### Frequency Range

5031.0 to 5090.7 MHz

#### Steps

0.3 MHz

#### Accuracy

$\pm 1.0$  kHz

### OUTPUT POWER

#### Level Range

-17 to -122 dBm

#### Level Accuracy

$\pm 2.0$  dB

#### Level Flatness

$\pm 0.5$  dB at -20 dBm (Note 1 and 2)

#### Attenuator Accuracy

$\pm 1.0$  dB

#### Attenuator Monotonicity

$\pm 0.5$  to 1.5 dB (Each Step)

### Spectral Purity

#### Noise Floor

Offset  $\pm 0.3$  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  $\pm 0.3$  to 1.2 MHz

-45 dBc

From  $\pm 1.2$  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)

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### MAIN PATH FUNCTIONS

#### BEAM ANGLES

##### Azimuth

$\pm 62^\circ$

##### High Rate Azimuth

$\pm 42^\circ$

##### Elevation

-1.5° to 29.5°

##### Flare

-2° to 10°

##### Back Azimuth

$\pm 42^\circ$

##### Angle Resolution

$\pm 0.05^\circ$  steps

##### Angle Accuracy

$\pm 0.005^\circ$

##### Basic Data

All functions selectable on menu with selectable data values and parity

##### Auxiliary Data

All auxiliary data words selectable

### BEAM SHAPE

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

### BEAM WIDTH

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

#### Accuracy

$\pm 10\%$  of setting

### BEAM LEVEL

Adjustable relative to preamble

#### Range

-3.0 to +13.0 dB (Note 6)

#### Resolution

1.0 dB steps

#### Accuracy

$\pm 1.0$  dB

### SIDE LOBES

Relative to beam level

#### Level

-20.0 dB,  $\pm 1.0$  dB

### OCI PULSES (Right, Left, Rear)

#### Width

100  $\mu$ s,  $\pm 10$   $\mu$ s

#### 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  $\sin x/x$  or  $1/2 \sin x/x$  waveforms at  $1/2$  width that fills time slot. Sidelobes for  $1/2 \sin x/x$  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 SECONDS	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

## GPIO

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

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### 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

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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.

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