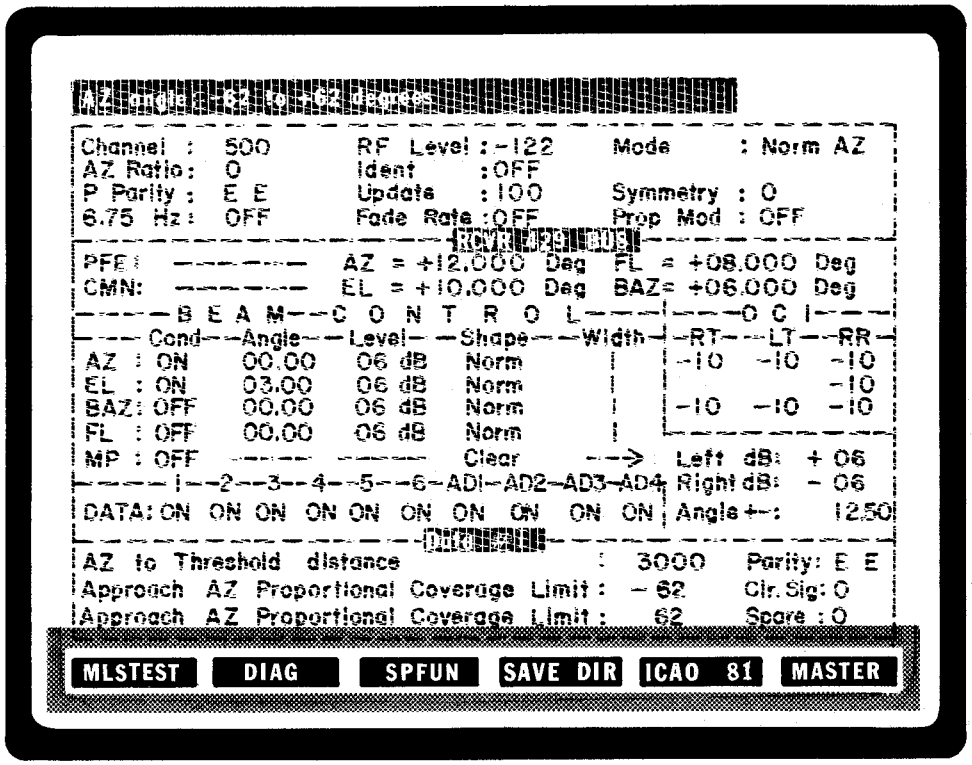
(h) Special Function Key Label Field (Refer to Figure 40)



Special Function Key Label Field
Figure 40

1 MLSTEST - Displays the Test Operational Menu.

2 DIAG - Displays the Diagnostic Menu.

3 SPFUN - Displays the Special Function Menu.

4 SAVEDIR - Displays the Save Test Menu Directory.

5 ICAO 81/ ICAO 85 - When followed by the Enter Key, ICAO Modes are switched from ICAO 1981 Standard to ICAO 1985 Standard.

WARNING: SWITCHING ICAO MODES WILL CAUSE THE FOLLOWING MENU TO APPEAR (REFER TO FIGURE 41) AND THE MLS-800 TEST OPERATIONAL MENU TO BE REINITIALIZED TO THE DEFAULT VALUES.

1 ICAO 1985 General Purpose Auxiliary Data Word AD1 Showing Raw Data Format for all Undefined Auxiliary Data Words (Refer to Figure 39)

Data AD1						
Aux Data : A	Addr : 000	Parity : E E E E E E E				
Data-1 : 000	Data-2 : 000	Data-3 : 000				
Data-4 : 000	Data-5 : 000	Data-6 : 000	Data-7 : 0			

ICAO 1985 Raw Data Format (AD1-AD4)
Figure 39

1' Aux Data (A,B,C)

2' Address (0 to 377 Octal)

3' Parity - Seven Binary Fields (Odd or Even)

4' Data-1 (0 to 377 Octal)

5' Data-2 (0 to 377 Octal)

6' Data-3 (0 to 377 Octal)

7' Data-4 (0 to 377 Octal)

8' Data-5 (0 to 377 Octal)

9' Data-6 (0 to 377 Octal)

10' Data-7 (0 to 1 Octal)

NOTE: Auxiliary Data Word inputs are: A, B, C, AD1, AD2, AD3 or AD4.

k ICAO 1985 General Purpose Data Word AD4 Showing Auxiliary Data Word A-4 Format (Refer to Figure 38)

Data AD4			
Aux Data	: A4	Parity	: E E E E E E E
BAZ Ant. Offset	: 000	BAZ Ant. Align.	: 00.00
BAZ to MLS Datum	: 0000	Spare	: 000 000

ICAO 1985 Data Word AD4 (A-4 Format)
Figure 38

1' Aux Data (A4)

2' Parity - Seven Binary Fields (Odd or Even)

3' Back Azimuth Antenna Offset (-511 to +511m in 1m Increments)

Represents the minimum distance between the Back Azimuth antenna phase center and a vertical plane containing the runway center line.

4' Back Azimuth Antenna Alignment with Runway Center Line (-20.47° to +20.47° in 0.01° Increments)

Represents the minimum angle between the Back Azimuth antenna zero-degree guidance plane and the runway center line.

5' Back Azimuth to MLS Datum Point Distance (0 to 2047m in 1m Increments)

Represents the minimum distance between the Back Azimuth antenna and the vertical plane perpendicular to the center line which contains the MLS datum point.

6' Spare (Two Transmission Fields)

Field-1 (0 to 377 Octal)
Field-2 (0 to 377 Octal)

NOTE: Auxiliary Data Word inputs are: A, B, C, AD1, AD2, AD3 or AD4.

j ICAO 1985 General Purpose Data Word AD3 Showing Auxiliary Data Word A-3 Format (Refer to Figure 37)

Data AD3			
Aux Data	: A3	Parity	: E E E E E E E
DME Offset	: 000		
DME to MLS Datum	: 0000	Spare	: 000 000 000 0

ICAO 1985 Data Word AD3 (A-3 Format)
Figure 37

1' Aux Data (A3)

2' Parity - Seven Binary Fields (Odd or Even)

3' DME Offset (-511 to +511m in 1m Increments)

Represents the minimum distance between the DME antenna phase center and a vertical plane containing the runway center line.

4' DME to MLS Datum Point Distance (-8191 to +8191m in 1m Increments)

Represents the minimum distance between the DME antenna phase center and a vertical plane perpendicular to the center line which contains the MLS datum point.

5' Spare (Four Transmission Fields)

Field-1 (0 to 377 Octal)
Field-2 (0 to 377 Octal)
Field-3 (0 to 377 Octal)
Field-4 (0 to 1 Octal)

NOTE: Auxiliary Data Word inputs are: A, B, C, AD1, AD2, AD3 or AD4.

3' Elevation Antenna Offset (-511 to +511m in 1m Increments)

Represents the minimum distance between the Elevation antenna phase center and the vertical plane containing the runway center line.

4' Elevation Antenna Height (-6.3 to +6.3m in 0.1m Increments)

Represents the height of the Elevation antenna phase center relative to the height of the MLS datum point.

5' MLS Datum Point to Threshold (0 to 1023m in 1m Increments)

Represents the distance measured along the runway center line from the MLS datum point to the runway threshold.

6' Spare (Three Transmission Fields)

Field-1 (0 to 377 Octal)
Field-2 (0 to 377 Octal)
Field-3 (0 to 77 Octal)

NOTE: Auxiliary Data Word inputs are: A, B, C, AD1, AD2, AD3 or AD4.

4' Approach Azimuth to MLS Datum Point Distance (0 to 8191m in 1m Increments)

Represents the minimum distance between the approach antenna phase center and the vertical plane perpendicular to the center line which contains the MLS datum point.

5' Approach Azimuth Alignment with Runway Center Line (-20.47° to 20.47° in 0.01° Increments)

Represents the minimum angle between the approach Azimuth antenna zero-degree guidance plane and the runway center line.

6' Approach Azimuth Antenna Coordinate System (0 - Conical, 1 - Planar)

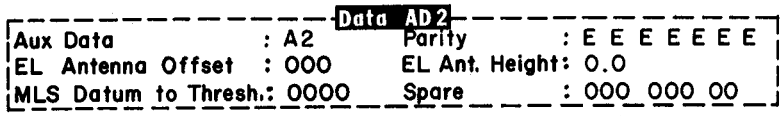
Represents the coordinate system of the angle data transmitted by the approach Azimuth antenna.

7' Spare (Two Transmission Fields)

Field-1 (0 to 377 Octal)
Field-2 (0 to 37 Octal)

NOTE: Auxiliary Data Word inputs are: A, B, C, AD1, AD2, AD3 or AD4.

i ICAO 1985 General Purpose Data Word AD2 Showing Auxiliary Data Word A-2 Format (Refer to Figure 36)

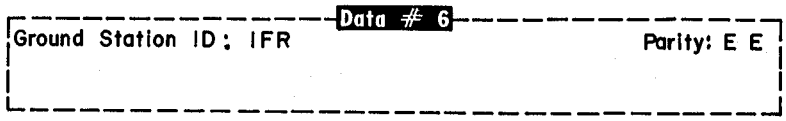


ICAO 1985 Data Word AD2 (A-2 Format)
Figure 36

1' Aux Data (A2)

2' Parity - Seven Binary Fields (Odd or Even)

g ICAO 1985 Data Word #6 (Refer to Figure 34)



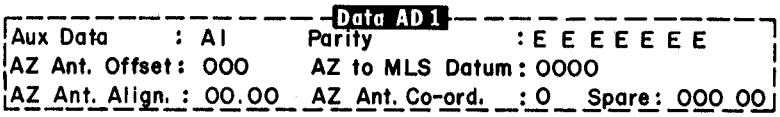
ICAO 1985 Data Word #6
Figure 34

1' MLS Ground Station Identifier (IFR)

Represents the last three (3) characters of the system identification. The characters are encoded in accordance with the 5-unit code of the International Telegraph Alphabet No. 2. Each character is followed by a parity bit.

2' Parity - Odd or Even (OO,OE,EO,EE)

h ICAO 1985 General Purpose Data Word AD1 Showing Auxiliary Data Word A-1 Format (Refer to Figure 35)



ICAO 1985 Data Word AD1 (A-1 Format)
Figure 35

1' Aux Data (A1)

2' Parity - Seven Binary Fields (Odd or Even)

3' Approach Azimuth Antenna Offset (-511 to +511m in 1m Increments)

Represents the minimum distance between the approach Azimuth antenna phase center and a vertical plan containing the runway center line.

f ICAO 1985 Data Word #5 (Refer to Figure 33)

Data # 5	
BAZ Prop. Cov. Neg.: 42	Parity : E E
BAZ Prop. Cov. Pos.: 42	
BAZ Beamwidth : 1.0	Spare : 0 0 0 0 0

ICAO 1985 Data Word #5
Figure 33

1' Back Azimuth Proportional Coverage Negative Limit (0° to 42° in 2° Increments)

Represents the limit of the sector in which proportional Back Azimuth guidance is transmitted.

2' Parity - Odd or Even (OO,OE,EO,EE)

3' Back Azimuth Proportional Coverage Positive Limit (0° to 42° in 2° Increments)

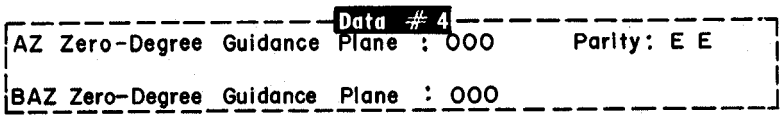
Represents the limit of the sector in which proportional Back Azimuth guidance is transmitted.

4' Back Azimuth Beamwdith (0.5° to 4.0° in 0.5° Increments)

Represents the actual width of the scanning beam main lobe measured at the -3 dB points.

5' Spare - Five Binary Fields (0 or 1)

e ICAO 1985 Data Word #4 (Refer to Figure 32)



ICAO 1985 Data Word #4
Figure 32

1' Approach Azimuth Zero-Degree Guidance Plane (0° to 359° in 1° Increments)

Represents the angle measured in the horizontal plane clockwise from Magnetic North to the zero-degree angle guidance plane of the approach Azimuth antenna. The vertex of the measured angle will be the approach Azimuth antenna phase center.

2' Parity - Odd or Even (OO,OE,EO,EE)

3' Back Azimuth Zero-Degree Guidance Plane (0° to 359° in 1° Increments)

Represents the angle measured in the horizontal plane clockwise from Magnetic North to the zero-degree angle guidance plane of the Back Azimuth antenna. The vertex of the measured angle will be the Back Azimuth antenna phase center.

d ICAO 1985 Data Word #3 (Refer to Figure 31)

Data # 3	
AZ Beamwidth : 1.0	Parity : E E
EL Beamwidth : 1.0	
DME Distance : 0000.0	Spare : 0 0 0

ICAO 1985 Data Word #3
Figure 31

1' Approach Azimuth Beamwidth (0.5° to 4.0° in 0.5° Increments)

Represents the width of the scanning beam main lobe measured at the -3 dB points and defined in angular units on the antenna boresight in horizontal plane.

2' Parity - Odd or Even (OO,OE,EO,EE)

3' Elevation Beamwidth (0.5° to 2.5° in 0.5° Increments)

Represents the width of the scanning beam main lobe measured at the -3 dB points and defined in angular units on the antenna boresight in vertical plane.

4' DME Distance (0 to 6387.5m in 12.5m Increments)

Represents the distance measured parallel to the runway center line from the DME antenna phase center to the MLS datum point.

5' Spare - Three Binary Fields (0 or 1)

c ICAO 1985 Data Word #2 (Refer to Figure 30)

Data # 2					
Min. Glide Path	: 03.0	BAZ Status	: 1	Parity	: E E
DME Status	: 0 0	AZ Status	: 1		
EL Status	: 1	Spare	: 0 0 0 0 0 0		

ICAO 1985 Data Word #2
Figure 30

1' Minimum Glide Path (2.0° to 14.7° in .1° Increments)

Represents the lowest angle of descent along the zero degree Azimuth that is consistent with published approach procedures and obstacle clearance criteria.

2' Back Azimuth Status (0 - Not Radiated, 1 - Radiated in Normal Mode)

Represents the operational status of Back Azimuth equipment

3' Parity - Odd or Even (00,0E,E0,EE)

4' DME Status (00,01,10,11)

Represents the operational status of the DME equipment by the following:

00 - DME Transponder inoperative
10 - Only IA mode or DME/N available
01 - FA mode, Standard 1 available
11 - FA mode, Standard 2 available

5' Approach Azimuth Status (0 - Not Radiated, 1 - Radiated in Normal Mode)

Represents the operational status of the approach Azimuth equipment.

6' EL Status (0 - Not Radiated, 1 - Radiated in Normal Mode)

Represents the operational status of the approach Elevation equipment.

7' Spare - Six Binary Fields (0 or 1)

b ICAO 1985 Data Word #1 (Refer to Figure 29)

Data # 1			
AZ to Threshold Distance	: 3000	Parity	: E E
AZ Prop. Cov. Limit Neg.	: 60	Clr. Sig.	: O
AZ Prop. Cov. Limit Pos.	: 60	Spare	: O

ICAO 1985 Data Word #1
Figure 29

1' Approach Azimuth to Threshold Distance (0 to 6300m in 100m Increments)

Represents the distance measured parallel to the runway center line from the approach Azimuth antenna to the runway landing threshold.

2' Parity - Odd or Even (OO,OE,EO,EE)

3' Approach Azimuth Proportional Coverage Negative Limit (0° to 60° in 2° Increments)

Represents the limit of the sector in which proportional approach Azimuth guidance is transmitted.

4' Clearance Signal Type (Ø = Pulse, 1 = Single Sideband)

Indicates the method of providing the Azimuth clearance signal.

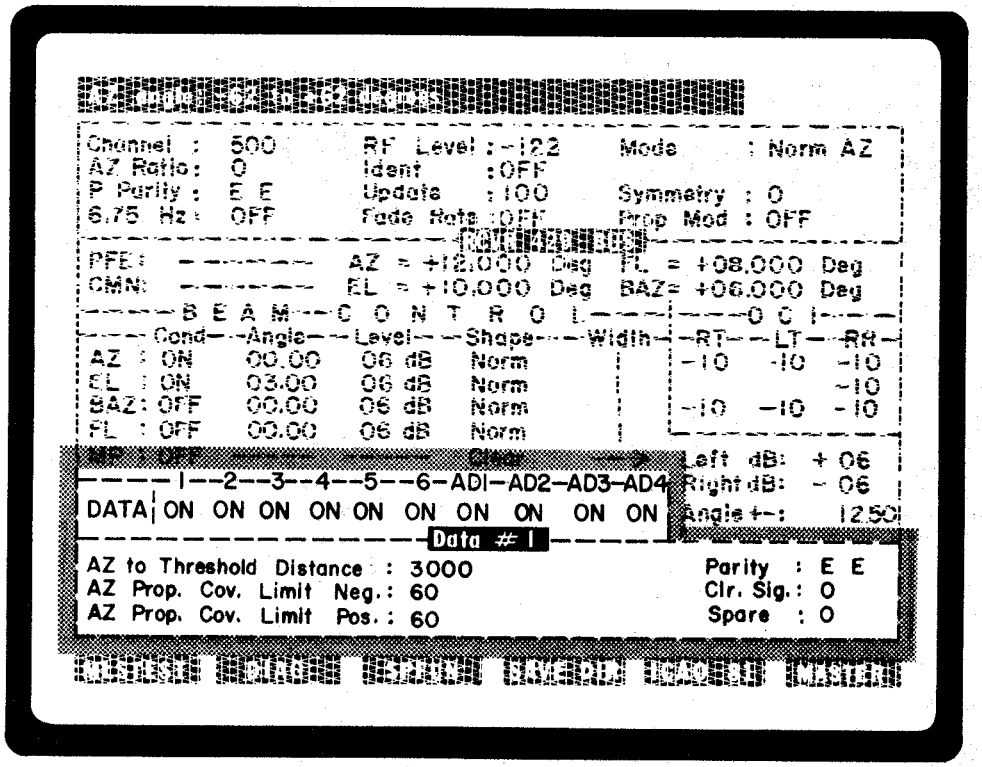
5' Approach Azimuth Proportional Coverage Positive Limit (0° to 60° in 2° Increments)

Represents the limit of the sector in which proportional approach Azimuth guidance is transmitted.

6' Spare - One Binary Field (0 or 1)

2 ICAO 1985 Data Word Field (Refer to Figure 28)

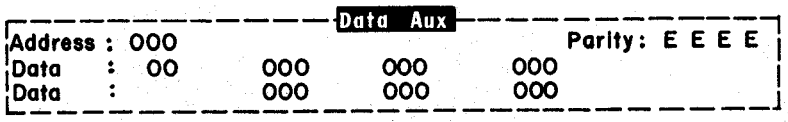
There are six defined Data Words which perform certain designated functions, plus four Auxiliary Data Words left open so each installation may define them to their specifications. A detailed explanation of the Data Word ON/OFF Switches and each Data Word within the Data Word field is shown as follows:



ICAO 1985 Data Word Field
Figure 28

a Data Word ON/OFF Switches - Enables ICAO 1985 Data Words 1 thru 6, AD1, AD2, AD3 or AD4.

j ICAO 1981 Data Word AUX (Refer to Figure 27).



ICAO 1981 Data Word AUX
Figure 27

The ICAO 1981 Data Word AUX is left open for the operator to program their own data using Octal coded numbers.

1' Address Transmission (0 to 377, First Eight Bits)

2' Parity (Four Bits-Odd or Even)

3' Data Transmission (0 to 17, First Four Bits of Fifty-two Bits)

4' Data Transmission (0 to 377, Second Part-Eight Bits)

5' Data Transmission (0 to 377, Third Part-Eight Bits)

6' Data Transmission (0 to 377, Fourth Part-Eight Bits)

7' Data Transmission (0 to 377, Fifth Part-Eight Bits)

8' Data Transmission (0 to 377, Sixth Part-Eight Bits)

9' Data Transmission (0 to 377, Seventh Part-Eight Bits)

i ICAO 1981 Data Word #8 (Refer to Figure 26)

```
Data # 8
EL Antenna Height    : -1.0                    Parity : E E
EL Antenna Offset    : -150
MLS Datum Point to Threshold Distance: 000
```

ICAO 1981 Data Word #8
Figure 26

1' Elevation Antenna Height (-1.0 to +6.2m in 0.2m Increments)

Represents the height of the Elevation antenna phase center relative to the height of the MLS datum point.

2' Parity - Odd and Even (OO/OE/EO/EE)

3' Elevation Antenna Offset (-150 to +150m in 10m Increments)

Represents the minimum distance between the Elevation antenna phase center and the vertical plane containing the runway center line.

4' MLS Datum Point to Threshold Distance (0 to 635m in 5m Increments)

Represents the distance measured along the runway center line from the MLS datum point to the runway threshold.

h ICAO 1981 Data Word #7 (Refer to Figure 25)

Data # 7		
Ground Equip. : O O		Parity : E E
BAZ Ant. Dist.: OOOO	BAZ Prop. Cov. Neg.: -40	
BAZ Beamwidth: 1	BAZ Prop. Cov. Pos.: 40	Spare : O

ICAO 1981 Data Word #7
Figure 25

1' Ground Equipment Performance Level - Two Binary Bits (0 or 1)

Represents the operational status of the equipment in use.

2' Parity - Odd or Even (OO/OE/EO/EE)

3' Back Azimuth Antenna Distance (0 to 3100m in 100m Increments)

Represents the horizontal distance measured parallel to the runway center line from the Back Azimuth antenna plane center to the Back Azimuth reference datum.

4' Back Azimuth Proportional Coverage Limit (Negative Limit) (-10° to -40° in 2° Increments)

Represents the limit of the sector in which proportional Back Azimuth guidance is transmitted.

5' Back Azimuth Beamwidth (1.0° to 4.0° in 1° Increments)

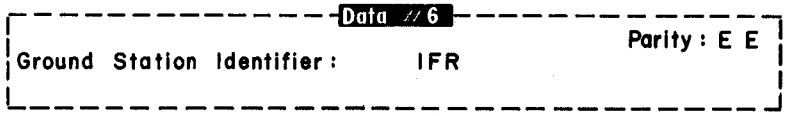
Represents the width of the scanning beam main lobe measured at the -3 dB points.

6' Back Azimuth Proportional Coverage Limit (Positive Limit) (+10° to +40° in 2° Increments)

Represents the limit of the sector in which proportional Back Azimuth guidance is transmitted.

7' Spare - One Binary Field (0 or 1)

g ICAO 1981 Data Word #6 (Refer to Figure 24)



ICAO 1981 Data Word #6
Figure 24

1' MLS Ground Station Identifier (IFR)

Represents the last three (3) characters of the system identification. The characters are encoded in accordance with the 5-unit code of the International Telegraph Alphabet No. 2. Each character is followed by a parity bit.

2' Parity - Odd or Even (OO/OE/EO/EE)

f ICAO 1981 Data Word #5 (Refer to Figure 23)

```
Data # 5
AZ Antenna Offset:  -126                    Parity: E E
DME Channel     :   0 0 0 0 0 0 0 0 0       Spare:  0
DME P           :   NO
```

ICAO 1981 Data Word #5
Figure 23

1' Approach Azimuth Antenna Offset (-126 to +126m in 2m Increments)

Represents the minimum distance between the approach Azimuth antenna phase center and a vertical plane containing the runway center line.

2' Parity - Odd or Even (OO/OE/EO/EE)

3' DME Channel - Nine Binary Bits (0 or 1)

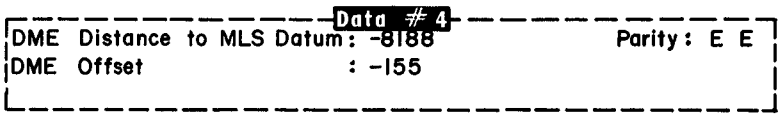
Represents the DME channel associated with the selected MLS channel.

4' DME/P (Yes = DME/P, No = DME)

Represents whether the equipment in use is DME or DME/P.

5' Spare - One Binary Field (0 or 1)

e ICAO 1981 Data Word #4 (Refer to Figure 22)



ICAO 1981 Data Word #4
Figure 22

1' DME Distance to MLS Datum (-8188 to +8188m in 4m Increments)

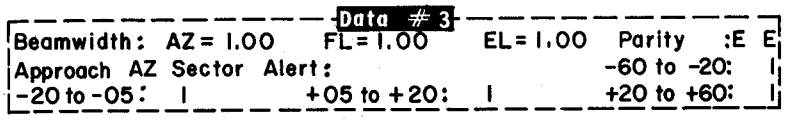
Represents the distance measured parallel to the runway center line from the DME antenna phase center to the MLS datum point.

2' Parity - Odd or Even (OO/OE/EO/EE)

3' DME Offset (-155 to +155m in 5m Increments)

Represents the minimum distance between the DME antenna phase center and a vertical plane containing the runway center line.

d ICAO 1981 Data Word #3 (Refer to Figure 21)



ICAO 1981 Data Word #3
Figure 21

1' Approach Azimuth Beamwidth

Represents the width of the scanning beam main lobe measured at the -3 dB points and defined in angular units on the antenna bore sight, in the horizontal plane for the Azimuth and vertical plane for the Elevation.

AZ - (0.5° to 4.0° in 0.5° Increments)
FL - (0.5° to 1.0° in 0.25° Increments)
EL - (0.5° to 2.5° in 0.5° Increments)

2' Parity - Odd or Even (OO/OE/EO/EE)

3' Approach Azimuth Sector Guidance Alert

Represents the Elevation angle in the specified Azimuth sector below which guidance is unreliable or unsafe.

-60° to -20° for Elevation Angles 1° to 8° in 1° Increments

-20° to -5° for Elevation Angles 1° to 4° in 1° Increments

+5° to +20° for Elevation Angles 1° to 4° in 1° Increments

+20° to +60° for Elevation Angles 1° to 8° in 1° Increments

c ICAO 1981 Data Word #2 (Refer to Figure 20)

Data # 2			
Ground Equipment Status	: 0 0	Parity	: E E
BAZ Next	: YES	Min Glide Path	: 3.0
DME Status	: 0 0	Spare	: 0 0 0 0 0 0 0

ICAO 1981 Data Word #2
Figure 20

1' Ground Equipment Status (Use is not specified)

Represents the operational status of the equipment in use.

2' Parity - Odd or Even (OO/OE/EO/EE)

3' Back Azimuth Next (Yes or No)

Indicates if the next function to be transmitted is Back Azimuth.

4' Minimum Glide Path (2.0° to 8.3° in 0.1° Increments).

Represents the lowest angle of descent along the zero degree Azimuth that is consistent with published approach procedures and obstacle clearance criteria.

5' DME Status (Use is not specified)

Represents the operational status of the DME equipment in use.

6' Spare - Seven Binary Fields (0 or 1)

b ICAO 1981 Data Word #1 (Refer to Figure 19)

Data # 1			
AZ to Threshold Distance	: 3000	Parity:	E E
Approach AZ Proportional Coverage Limit:	-60	Clear :	0
Approach AZ Proportional Coverage Limit:	60	Spare :	0

ICAO 1981 Data Word #1
Figure 19

1' Approach Azimuth to Threshold Distance (0 to 6300m in 100m Increments)

Represents the distance measured parallel to the runway center line from the approach Azimuth antenna to the runway landing threshold.

2' Parity - Odd or Even (OO/OE/EO/EE)

3' Approach Azimuth Proportional Coverage Limit (Negative Limit) (-10° to -62° in 2° Increments).

Represents the limit of the sector in which proportional approach Azimuth guidance is transmitted.

4' Clearance Signal type (Ø = pulse, 1 = Single Sideband)

Indicates the method of providing the Azimuth Clearance Signal.

5' Approach Azimuth Proportional Coverage Limit (Positive Limit) (+10° to +62° in 2° Increments)

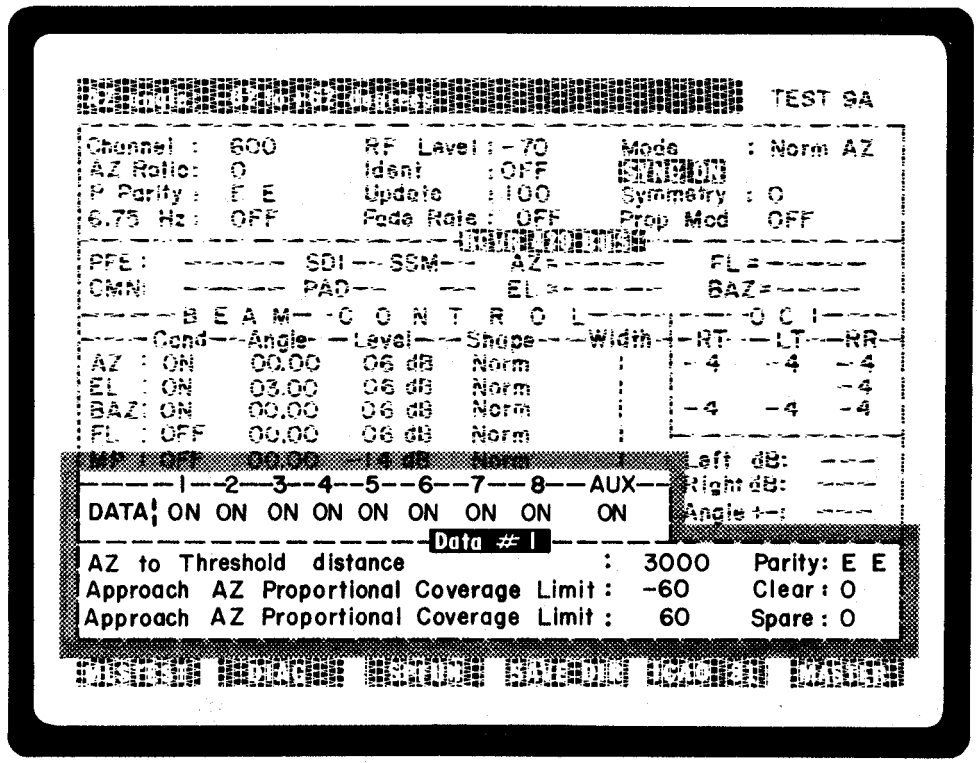
Represents the limit of the sector in which proportional approach Azimuth guidance is transmitted.

6' Spare - One Binary Field (0 or 1)

(g) Data Word Field

1 ICAO 1981 Data Word Field (Refer to Figure 18)

There are eight defined Data Words which perform certain designated functions, plus one AUX Data Word which is left open for the operator's use. The AUX Data Word is left open so each installation may define it to their specifications. A detailed explanation of the Data Word ON/OFF Switches and each Data Word within the Data Word field is shown as follows:



ICAO 1981 Data Word Field
Figure 18

a ICAO 1981 Data Word ON/OFF Switches - Enables ICAO 1981 Data Words 1 thru 8 or AUX Data Word.

4 Shape - Displays the Beam Shape (Normal Pulse/½ Pulse) for Azimuth, Elevation, Back Azimuth and Flare.

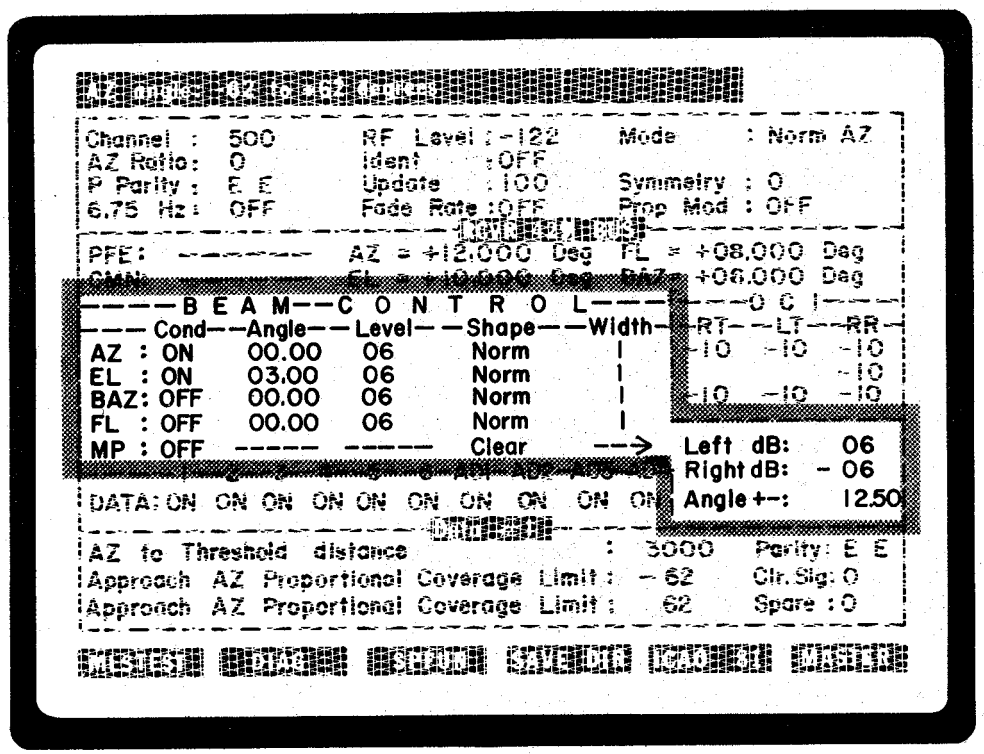
NOTE: The Multipath Beam Shape has three selections (Normal Pulse, ½ Pulse and Clearance Pulse). When the Beam Shape is switched to Clearance Pulse, the Beam Control Field changes, allowing control of the left and right Clearance Beam level, and their common angle (Refer to Figure 17). ½ Pulse will appear as Normal Pulse for Angles at the midpoint.

5 Width - Displays the Beam Width in degrees (0.5, 1, 2, 3, 4, 5).

6 Left dB - Displays Left Clearance Beam Level in dB relative to preamble level (-3 dBc to +13 dBc).

7 Right dB - Displays Right Clearance Beam Level in dB relative to preamble level (-3 dBc to +13 dBc).

8 Angle - Displays Clearance Beam Pair Offset from center ±1° minimum to ±61° for Azimuth, ±1° to ±41° for High Rate AZ and Back Azimuth, and not applicable for Elevation and Flare.

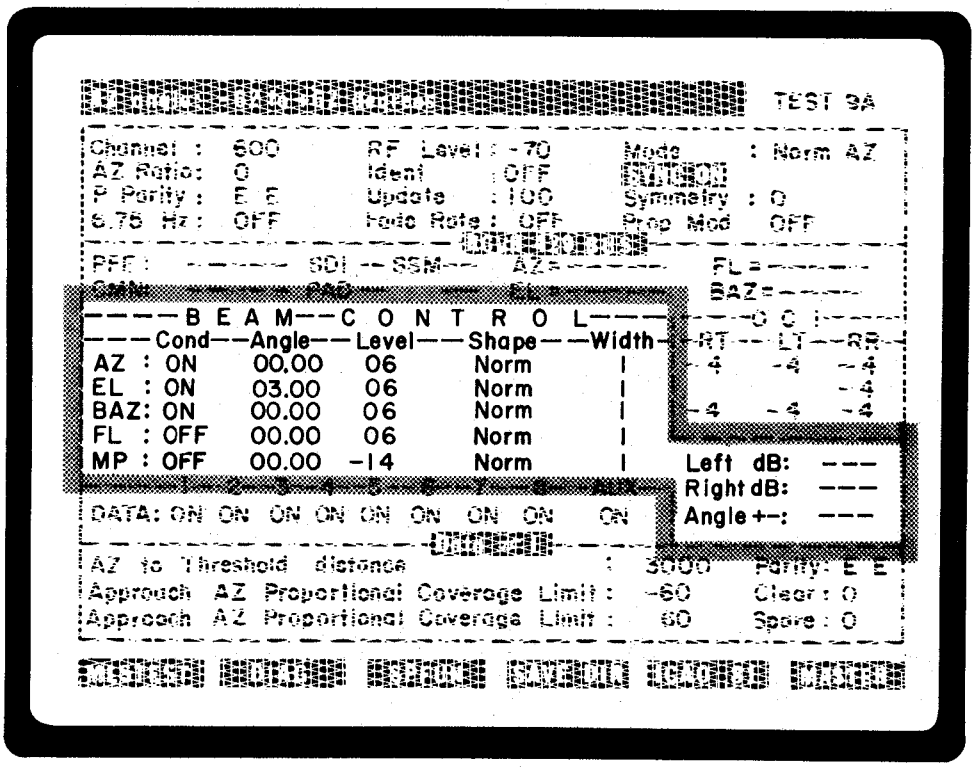


Clearance Beam Enabled
Figure 17

(f) Beam Control Field (Refer to Figure 16)

Allows control of individual beam functions. The Switch Condition, Beam Angle, Beam Modulation Level, Beam Shape and Beam Width are displayed within this field for the Azimuth, Elevation, Back Azimuth, Flare or Multipath Beams.

NOTE: Azimuth, Elevation, Back Azimuth and Flare are selected for editing by the Function Select Keys with Sync (1), and Multipath is selected for editing by the Function Select Keys without Sync (4).



Beam Control Field
Figure 16

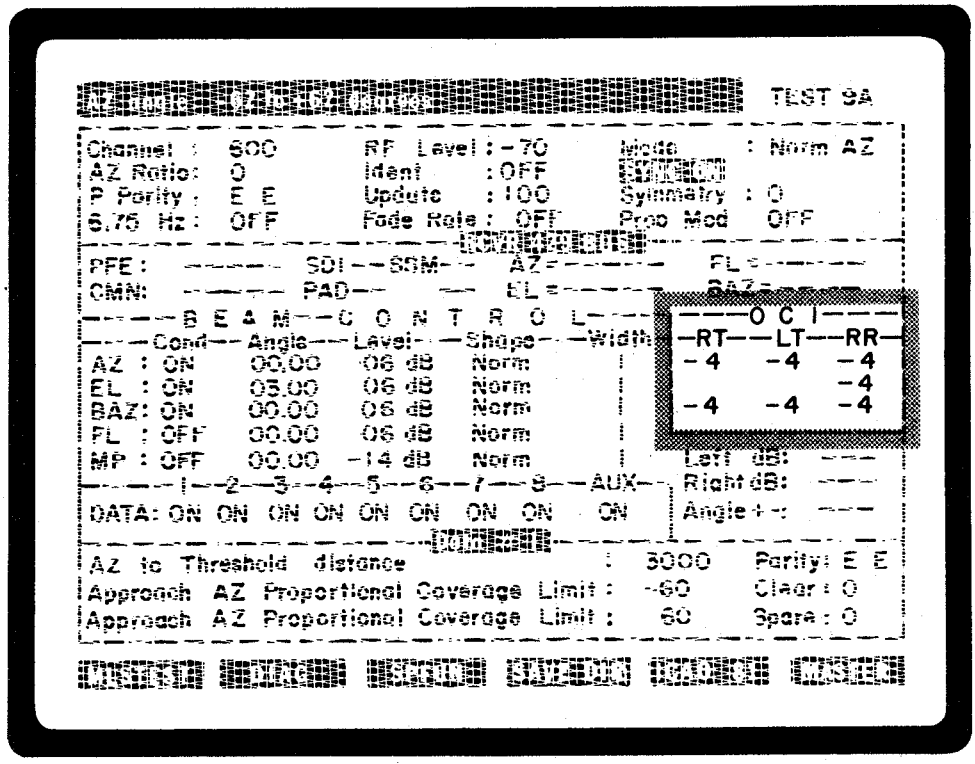
1 Switch Condition - Displays the operating status (ON/OFF) for Azimuth, Elevation, Back Azimuth, Flare or Multipath.

2 Angle - Displays the Beam Angle in degrees.

3 Level - Displays the Beam Modulation Level in dB relative to the preamble level.

(e) Out of Coverage Indicator (OCI) Field (Refer to Figure 15)

The Out of Coverage Indicator Right (RT), Left (LT) and Rear (RR) is displayed in decibels within this field for Azimuth, Elevation or Back Azimuth, when one or the other is selected by the front panel controls. The level of the simulated signal being transmitted can vary from -4 to +7 dB relative to preamble.



Out of Coverage Indicator (OCI) Field
Figure 15

1 RT - Displays the Right Out of Coverage Level in decibels, relative to the preamble level for either Azimuth or Back Azimuth.

2 LT - Displays the Left Out of Coverage Level in decibels, relative to the preamble level for either Azimuth or Back Azimuth.

3 RR - Displays the Rear Out of Coverage Level in decibels, relative to the preamble level for either Azimuth, Elevation or Back Azimuth.

2 CMN - Displays in degrees the Control Motion Noise for Azimuth, Elevation, Back Azimuth or Flare, according to the Filter Configuration for Control Motion Noise as shown in Appendix C. The Control Motion Noise displayed depends on which Sync function is selected within the Beam Control Field. The Control Motion Noise is dashed when >1°.

3 SDI - Displays the condition (0 or 1) of ARINC 429 Data Bits 9 and 10 for the Source Designation Identifier of the function in Sync. (Refer to Receiver Manufacturer Manual for Bit Definition).

4 PAD - Displays the condition (0 or 1) of ARINC 429 Data Bits 11 and 12 for the Pad of the function in Sync. (Refer to Receiver Manufacturer Manual for Bit Definition).

5 SSM - Displays the condition (0 or 1) of ARINC 429 Data Bits 30 and 31 for the Sign Status Matrix of the function in Sync. (Refer to Receiver Manufacturer Manual for Bit Definition).

6 OFF - Displays OFF when no data is being received. When data is being received the field is blank or displaying the following Receive Error Messages:

a PE - Parity Error in 429 Data.

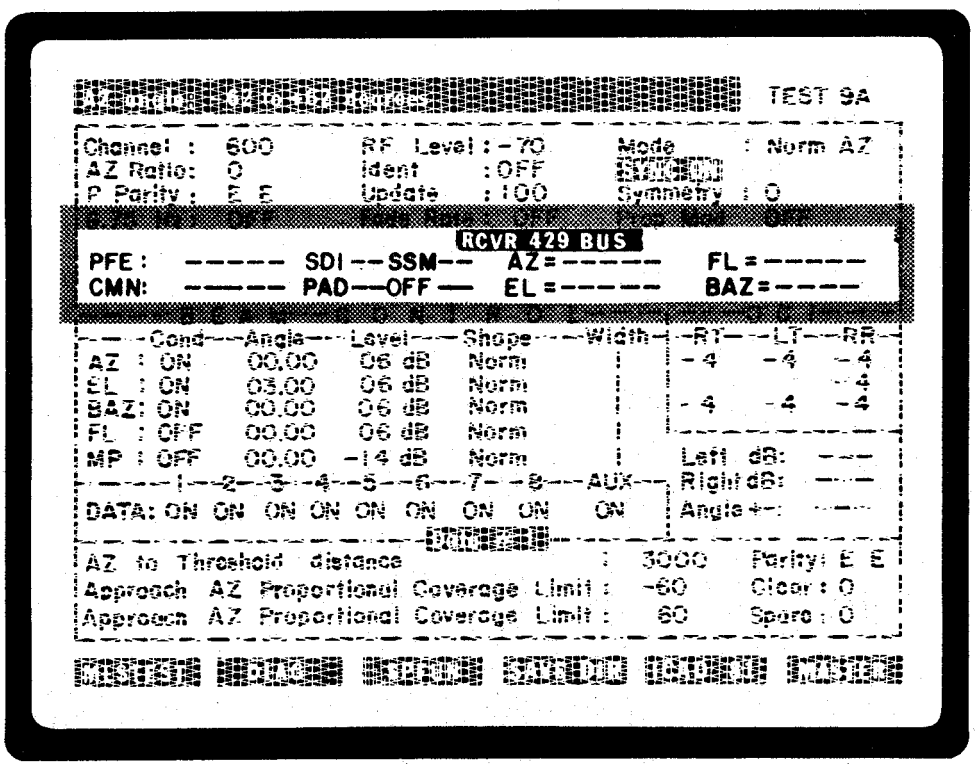
b OE - Overrun Error for data not being read before new data is written.

c WE - Word Error for data not able to be received correctly.

(d) RCVR 429 Received Data Field (Refer to Figure 14)

The RF data beam from the MLS-800 Test Set to the MLS receiver (UUT) is interpreted, returned via the ARINC 429 BUS Connector (13) and observed on The Test Menu Display (15). The returned data displayed on the CRT is:

Azimuth	±62°
Elevation	-1.5° to +29.5°
Back Azimuth	±41°
Flare	-2° to +10°



RCVR 429 Received Data Field
Figure 14

1 PFE - Displays in degrees the Path Following Error for Azimuth, Elevation, Back Azimuth or Flare, according to the Filter Configuration for Path Following Error as shown in Appendix C. The Path Following Error displayed depends on which Sync function is selected within the Beam Control Field. The Path Following Error is dashed when error is >1° or <-1°.

7 Pre Parity - Displays the selected even or odd preamble parity bits (00/0E/ E0/EE) for the beam which the Sync signal is applied.

8 Update - Displays the variable update rate for Sync Beam (0%, 25%, 45%, 55%, 75% or 100%).

9 Symmetry - Displays the Sync beam pair offset that produces a variation from the receiver time reference code for receiver testing at -60 to +60 in 1 µs steps.

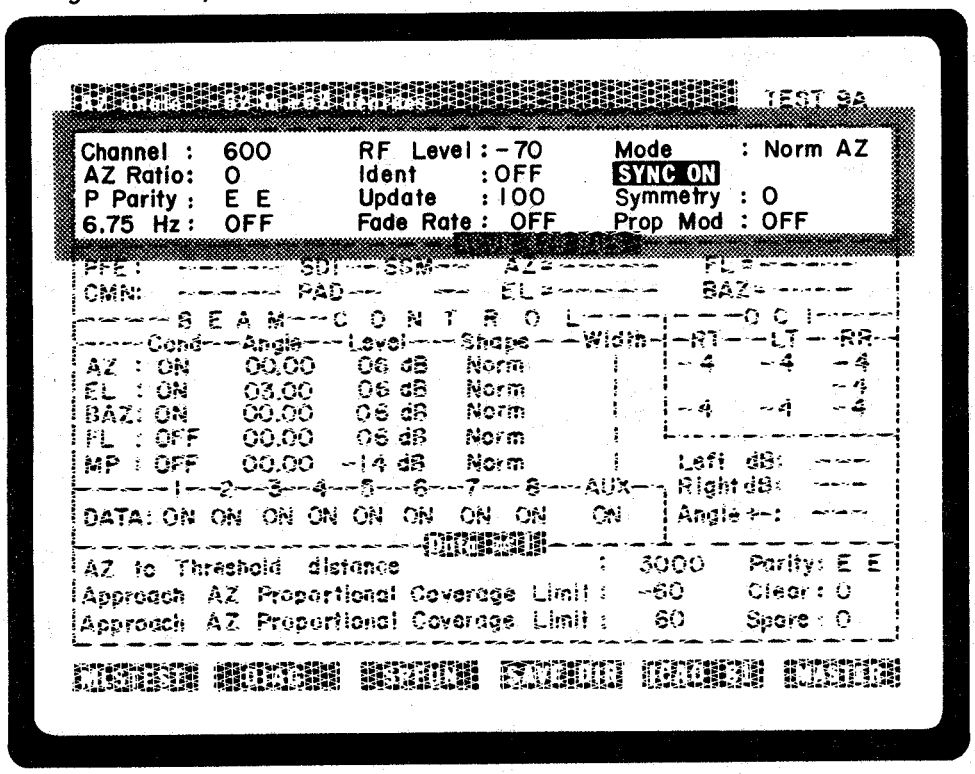
10 6.75 Hz - Displays the condition (ON/OFF) required for the Signal Level Variation Test.

11 Fade Rate - Displays the simulation of ground reflections causing modulation level to oscillate (1 KHz, 1 Hz, 0.05 Hz or OFF).

12 Prop Mod - Displays propeller or rotor modulation simulation (0 to 199 Hz in 1 Hz steps or OFF).

NOTE: Only one of the functions (6.75 Hz, Fade Rate, Prop Mod) can operate at any one time. When one function is switched ON, the other two functions are automatically switched OFF.

(c) Transmission Characteristics Field (Refer to Figure 13)



Transmission Characteristics Field
Figure 13

1 Channel - Displays the MLS Channel, selectable from 500-699.

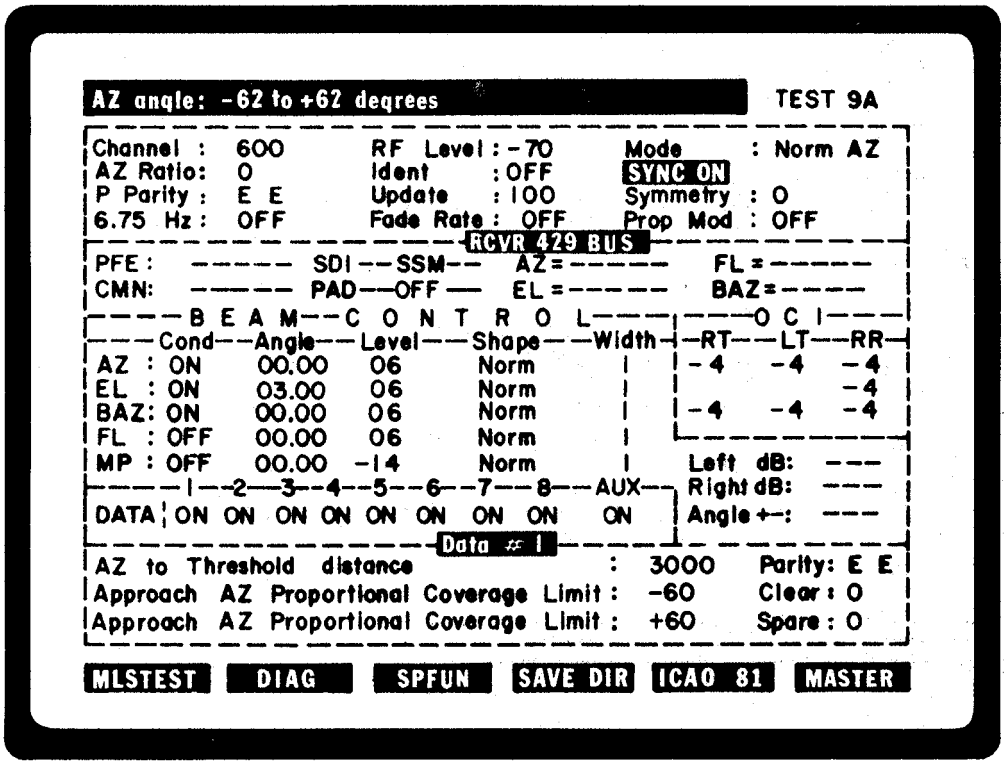
2 RF Level - Displays the RF Output Level, selectable from -17 to -122 dBm.

3 Mode - Displays the selected primary mode of operation (Normal Azimuth or High Rate Azimuth).

4 AZ Ratio - Displays the status (0 dBc or -75 dBc) of the Azimuth to Elevation ratio (a 75 dB pad is inserted).

5 Ident - Displays the Ident Code (Morse Code Identification Sequence) in an active, inactive or continuous tone state (ON/OFF/CONT).

6 Sync Flag - Displays the condition (SYNC ON or "BLANK") and the Sync Beam selected (AZ, EL, BAZ, FL or DATA).

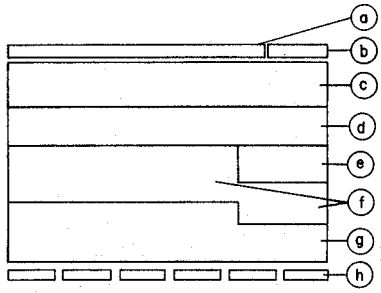


Test Operational Menu
Figure 9

(4) Test Operational Menu (Refer to Figure 9)

The displayed Test Operational Menu is grouped into a Prompt Line and seven distinct fields (Refer to Figure 10) which include:

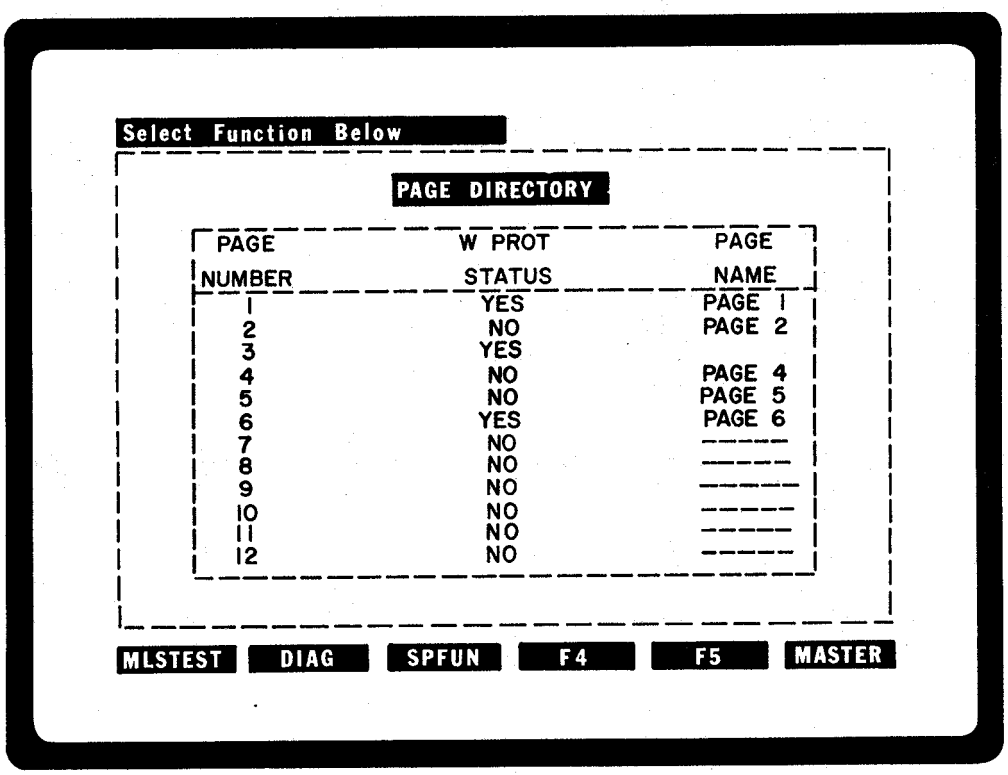
(a) Prompt Line
(b) Menu Label Field
(c) Transmission Characteristics Field
(d) ARINC 429 Received Data Field
(e) Out Of Coverage Indicator (OCI) Field
(f) Beam Control Field
(g) Data Word Field (ICAO 1981) (ICAO 1985)
(h) Special Function Key Label Field



Test Operational Menu Fields
Figure 10

(3) Save Page Directory Menu (Refer to Figure 8)

The Save Page Directory Menu displays the current state of the twelve available storage pages in the MLS-800 Non-Volatile memory.



Save Page Directory Menu
Figure 8

(a) Page Number - Displays each of the twelve storage pages.

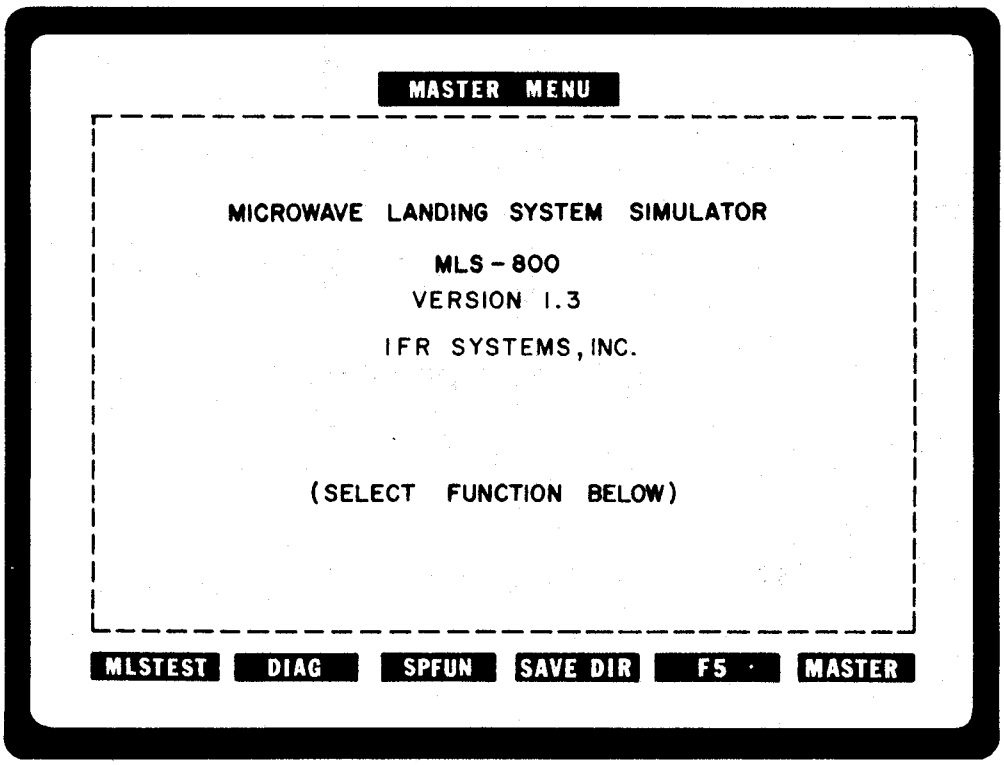
(b) Write Protect (W PROT) Status - Displays the condition of Write Protect for the twelve storage pages.

(c) Page Name - Displays the operator selected name given to the menu in the storage page (Refer to 1-2-4, Para. 4A(2) for writing name).

NOTE: Dashes indicate a nonactive or non-applicable data field.

(2) Master Menu (Refer to Figure 7)

The Master Menu is the log-in point of the MLS-800. The Master Menu allows the operator to program for display the Test Operational Menu, Diagnostic Menu, Special Function Menu or Save Page Directory Menu.



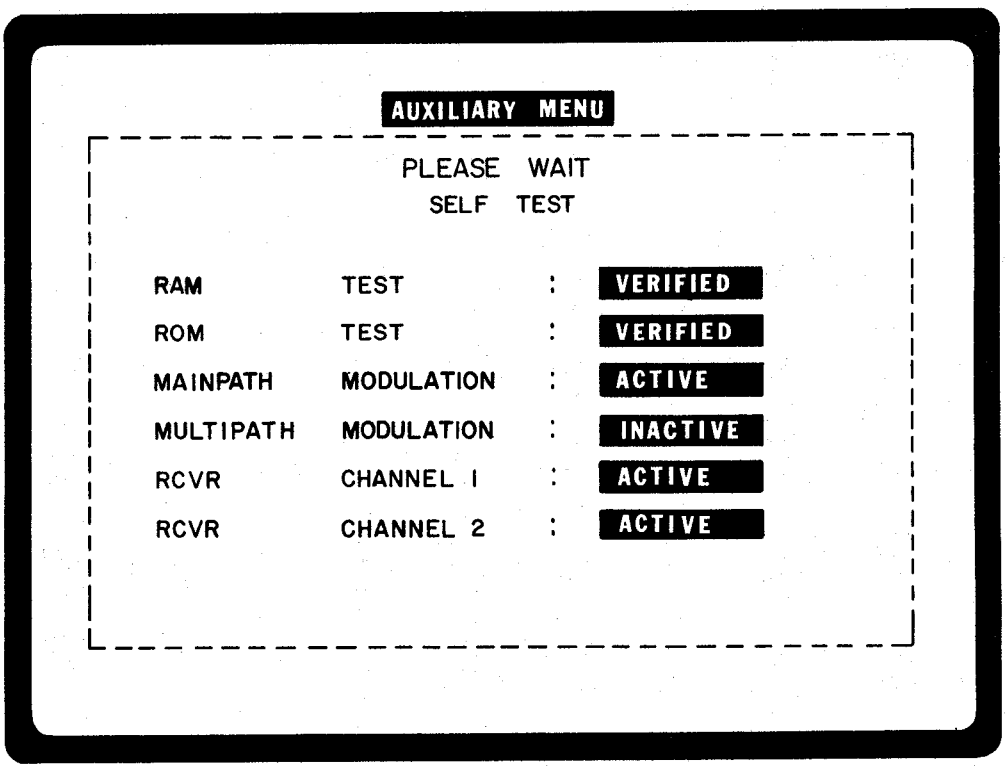
Master Menu
Figure 7

D. Menu Definition

The displayed menu functions are defined as follows:

(1) Power Up Self Test (Refer to Figure 6)

The Power Up Self Test is displayed when the MLS-800 test set is switched on to alert the operator of the condition of the Ram, Rom, Mainpath, Multipath, RCVR Channel 1 and RCVR Channel 2.



Power Up Self Test
Figure 6

(a) Displays the condition of the Ram and Rom as follows:

VERIFIED - Ram or Rom is operating properly.
FAILED - Ram or Rom is not operating properly.

(b) Displays the condition of the Main Path Modulation, Multipath Modulation, 429 Channel 1 and 429 Channel 2 as follows:

ACTIVE - System is operating properly.
INACTIVE - System is not operating properly.

B. Operational Display Menus

The Operational Display Menus are utilized by the Keyboard controls for the execution of menu programming and component testing. The five Operational Display Menus are:

(1) Master Menu
(2) Test Operational Menu
(3) Diagnostic Menu
(4) Special Function Menu
(5) Save Page Directory Menu

C. Operator Intervention

When operating the MLS-800 Test Set utilizing the front panel Keyboard Data Entry Keys, the operator can change data value or status within the data field by use of the Keyboard Data Entry Keys or Slew Keys in conjunction with the Cursor Keys.

NOTE: The cursor is displayed as blinking reverse video. The entire data field that the cursor is pointing towards will be displayed as non- blinking reverse video.

(1) Changing data value or status within the data field using the Keyboard Data Entry Keys:

(a) Using Cursor Keys, position cursor directly over data field prior to making value change.

(b) Use Keyboard Data Entry Keys to change data value.

(c) Press Enter Key.

(2) Changing data value or selection within the data field using the Slew Keys:

(a) Using Cursor Keys, position cursor directly over data field prior to making value change.

(b) Using Slew Keys to change data value, simply press the ↑ Key to increase value and the ↓ Key to decrease value. The ← or → Slew Key will change selections within the data field. The selections may be continuously cycled either forward (↑ Slew Key) or backwards (↓ Slew Key). The "FAST" Slew Keys will generally cause the most significant half of a data field to either increase or decrease whereas the "SLOW" Slew Keys cause the least significant half to change.

Example #4 - Sync ICAO 1985 Data Words (Data AD3)

Key	Menu
SYNC	Select SYNC: AZ, EL, FL, BAZ, or DATA SYNC ON
AUX	Select Auxiliary Data Word : AD1 thru AD4 SYNC ON OFF
3	DATA: Using SLEW select ON or OFF SYNC ON AD3 DATA OFF

Example #3 - Sync ICAO 1981 Data Words (Data #1)

Key	Menu
SYNC	Select SYNC: AZ, EL, FL, BAZ, or DATA SYNC ON
DATA	Select DATA WORD: 1 thru 8 or AUX SYNC ON OFF
1	DATA: Using SLEW select ON or OFF SYNC ON DATA 1 DATA OFF

NOTE: The "Warning" Prompt Line will blink on and off four times, then return to previous prompt line.

Example #2 - Switching AZ ON

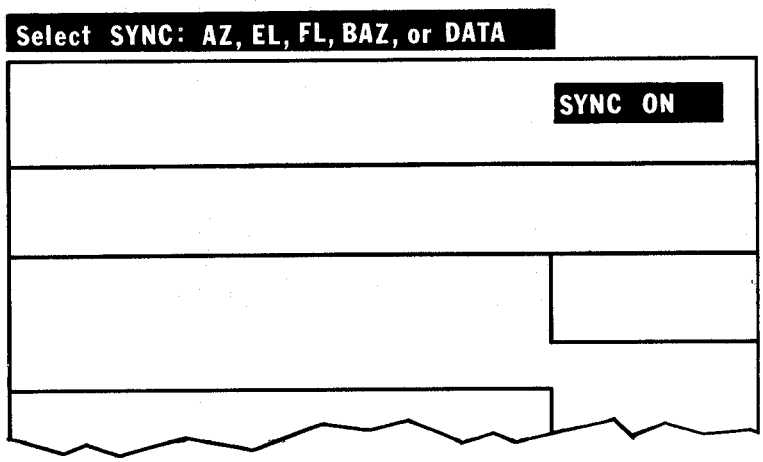
Key	Menu
AZ	AZ angle: -62 to +62 degrees
	SYNC ON AZ
	PFE
	CMN
	00.00
←	AZ Cond: Using SLEW select ON or OFF
	SYNC ON AZ
	PFE
	CMN
	OFF
SLEW	AZ Cond: Using SLEW select ON or OFF
	SYNC ON AZ
	P Parity
	PFE
	CMN
	AZ ON

(d) Operating Instructions

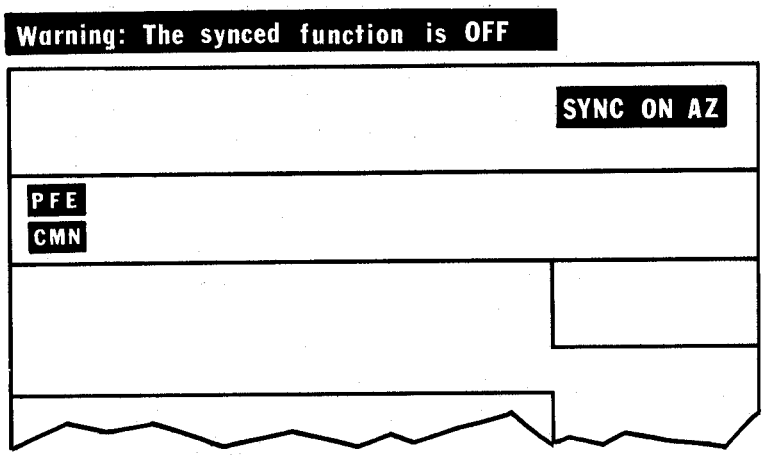
Example #1 - Sync AZ Beam

Key — Menu

SYNC



AZ



NOTE: The "Warning" Prompt line will blink on and off four times, then return to previous prompt line.

(7) Sync

(a) Sync Key

The Sync function operates on a push ON/OFF key. To activate and deactivate the Sync function, the Sync key must be used.

NOTE: The Sync function stays on the assigned beam until the Sync function is deactivated. The Sync function is active on only one function at any one time.

(b) Sync Flag

The Sync function is used to put a Sync beam on the following Function Select Keys (AZ, EL, FL, BAZ and DATA). Whenever the Sync Flag function is activated, the Sync Flag is displayed in the Transmission Characteristics field of the Test Operational Menu. The Sync Flag appears as one of the following:

SYNC ON	SYNC ON DATA 2	SYNC ON DATA 8
SYNC ON AZ	SYNC ON DATA 3	SYNC ON DATA AUX
SYNC ON EL	SYNC ON DATA 4	SYNC ON AD1
SYNC ON FL	SYNC ON DATA 5	SYNC ON AD 2
SYNC ON BAZ	SYNC ON DATA 6	SYNC ON AD3
SYNC ON DATA I	SYNC ON DATA 7	SYNC ON AD4

(c) Corresponding Sync Beam Functions

The Corresponding Sync Beam Functions operate only when the Sync beam is activated. When the Sync beam is activated, the function titles appear in reverse video if functions are active. The Corresponding Sync Beam Functions operate on the AZ, EL, FL, BAZ and DATA WORD transmissions.

Symmetry	PAD	PFE
P Parity	SDI	CMN
Update	SSM	MP

NOTE: When the Sync beam is deactivated, the Corresponding Sync Beam Functions (which are internally active) change from reverse video to normal video, and the functions are disabled.

(6) Escape

The Escape function provides the operator with the option of changing the projected command before it is entered into the Test Operational Menu.

(a) Command Escape

Example #1 - Escape Command (-58.60)

Step #1: Desired Command displayed **-58.60**

Step #2: Press Escape Key 

Using the Escape Key, the operator returns to the previous field value.

NOTE: If the operator presses the Enter key after the desired command, the Escape key will not return to previous field value.

(b) Data Word Escape

Example #1 - Escape Data Word

Step #1: Press Data Key 

Step #2: Press Escape Key 

NOTE: The Escape function is the only key which allows the operator to disregard the Data Word Prompt Line instructions above the Test Operational Menu.

NOTE: If the operator depresses a number key after the Data key, the Escape key will not return the field readout to previous field value.

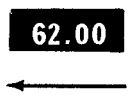
(5) Delete

The Delete function allows the operator to delete parts or entire commands from the fields of the Test Operational Menu. At any time, the operator may stop the delete process and insert into the deleted spaces the desired command. The command digit to be deleted is marked by the flashing cursor.

(a) The Delete function will change all command numbers to (0), and the negative value (-) to positive value (+) when deleting the entire command.

PRESENT COMMAND DELETED COMMAND

(b) The Delete function acts as a backspace key, going from right (least significant digit) to left (most significant digit).



NOTE: When the Delete function has been started, the desired replacement command must be entered into the Test Operational Menu before the cursor is free to move to other fields.

(3) Purge

The Purge function allows the operator to erase a test menu from the twelve available storage pages provided in the MLS-800 Non-Volatile Memory. The Purge function will erase the test menu and all preserving functions pending the test menu (Refer to 1-2-4, Para. 4A(2)).

Example #1 - Purge Page 6

Key	Prompt Line
PURGE	PURGE: Select page number 1 to 12; press ENTER
6	PURGE: Select page number 1 to 12; press ENTER
ENTER	

NOTE: The Purge function will not erase the test menu displayed in front of the operator. When the operator switches to another test menu the displayed test menu will be deleted.

(4) Write Protect (W PROT)

The Write Protect function allows the operator to protect a test menu from being overwritten in the twelve available storage pages provided in the MLS-800 Non-Volatile Memory. The Write Protect function is an immediate option in the Save function (Refer to 1-2-4, Para. 4A(2)).

Example #1 - Write Protect Page 6

Key	Prompt Line
W PROT	W PROT: Select page number 1 to 12; press ENTER
6	W PROT: Select page number 1 to 12; press ENTER
ENTER	

Example #2 - Save w/ Write Protect Test Menu 6

Key	Prompt Line
SAVE	SAVE: Select page number 1 to 12; press ENTER
6	SAVE: Select page number 1 to 12; press ENTER
ENTER	SLEW in the name and ENTER; press ESC to ignore name
SLEW	SLEW in the name and ENTER; press ESC to ignore name
ENTER	Write Protect Required: Yes="W PROT" No="ENTER"
W PROT	— — — — — — — — — —

NOTE: Name is selected character by character. Choice of character is: A-Z, 0-9, -, # or Blank Space. When desired character is displayed, move cursor to next character. When name is finished, press Enter to log on to Save Page Directory (Refer to Figure 8).

(2) Save

The Save function allows the operator to store a test menu in the twelve available storage pages provided in the MLS-800 Non-Volatile Memory.

Example #1 - Save w/o Write Protect Test Menu 6

Key	Prompt Line
SAVE	SAVE: Select page number 1 to 12; press ENTER
6	SAVE: Select page number 1 to 12; press ENTER
ENTER	SLEW in the name and ENTER; press ESC to ignore name
SLEW	SLEW in the name and ENTER; press ESC to ignore name
ENTER	Write Protect Required: Yes="W PROT" No="ENTER"
ENTER	— — — — — — — — — — —

NOTE: Name is selected character by character. Choice of character is: A-Z, 0-9, -, # or Blank Space. When desired character is displayed, move cursor to next character. When name is finished, press Enter to log on to Save Page Directory (Refer to Figure 8).

If desired Save page is full, the following Prompt Line will appear:

Page 6 is full, press ENTER if overwrite is desired

If desired Save page is Write Protected, the following Prompt Line will flash on and off four times, then return to previous Prompt Line:

Cannot save; Page 6 is Write Protected

4. General Operating Procedures

A. Keyboard Operation

Using the MLS-800 Keyboard, the operator can display, store, retrieve, erase and automatically execute test data according to the Keyboard operating requirements.

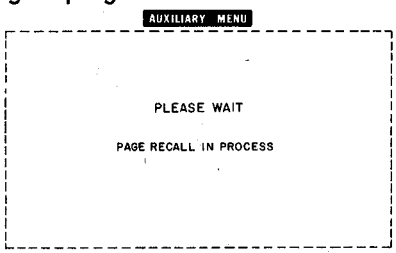
(1) Recall

The Recall function allows the operator to pull a test menu from the twelve available storage pages provided in the MLS-800 Non-Volatile Memory.

Example #1 - Recall Storage Page 6

Key	Prompt Line
RECALL	RECALL: Select page number 1 to 12; press ENTER
6	RECALL: Select page number 1 to 12; press ENTER
ENTER	— — — — — — — — — —

Depressing the Keyboard keys above will initialize the Recall function and the Please Wait Menu (below) will appear on the CRT, followed by the test menu stored in the desired storage page.



If desired Recall page is empty, the following Prompt Line will flash on and off four times, then return to previous Prompt Line.

Page 6 is empty

NOTE: The Recall projects a copy of the test menu in the storage pages, so the operator is not required to apply the Save function to the test menu which is recalled.

3. MLS-800 Performance Evaluation

A. General

The MLS-800 is equipped with a Power Up Self Test (Refer to 1-2-4, Figure 6) which is performed each time power is reinstated to the test set, and six Diagnostic Tests (Refer to 1-2-4, Figure 48) for the operator to program and perform whenever power is applied to the test set.

NOTE: The 50Ω Loads (Refer to Appendix F) must be connected to the Rear Panel of the test set (Refer to 1-2-2, Figure 4) when performing the Performance Evaluation.

B. MLS-800 Rear Panel

ITEM	NAME	DESCRIPTION

(18) 750 MHz RF Output Connector

750 MHz Modulated RF Output.

(19) External Reference Input Connector

Input Connector for an external 10 MHz (±60 Hz) reference signal to be connected to the source generation circuit.

(20) 800 MHz VCO ÷ 4 Output Connector

800 MHz VCO ÷ 4 Output.

(21) GPIB Connector

24 PIN female connector conforming to IEEE standard 488-1978 for interface of general purpose programmable instrumentation (active only with GPIB option installed).

(22) DC Fuse

10 Amp - 32 Volt

(23) DC Power Connector

DC Power Input Connector for 11 to 30 VDC supply.

(24) AC Power Connector

AC Power Input Connector for 103.5 to 266 VAC supply at 45 to 440 Hz.

(25) AC Line Fuse

2 Amp - 250 Volt

ITEM	NAME	DESCRIPTION

(9) Power Indicator Lamp

Illuminates when internal or external power is applied to test set.

(10) Video Output Connector

Provides an output from the Video Detector for use by an external Oscilloscope to verify proper operation of the test set.

(11) Sync Output Connector

Provides a Sync signal for an Oscilloscope trigger.

(12) Special Function Keys

Functions are defined by the 24th line of the displayed menu.

(13) ARINC 429 BUS I/O Connector

Input/Output Connector for ARINC 429 data.

(14) RF Out Connector

Provides the RF Output signal to the MLS Receiver.

(15) Test Menu Display

7" Diagonal CRT for Data Display.

(16) Remote Indicator Lamp

Illuminates when MLS-800 is in Remote (GPIB) Operation.

(17) Intensity Control

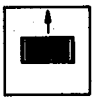
Controls intensity of CRT. Clockwise rotation of control increases intensity, while counter-clockwise rotation of control decreases intensity.

CAUTION: DO NOT OPERATE CRT DISPLAY WITH THE INTENSITY SET EXCESSIVELY HIGH, AS PERMANENT DAMAGE TO THE CRT MAY RESULT.

ITEM	NAME	DESCRIPTION

(6) Cursor Keys

These keys are used to control the movement and positioning of the CRT cursor. The cursor is displayed as blinking reverse video, which moves from field to field, not character to character, on the Test Operational Menu.



- Moves the cursor UP the test menu from data field to data field.

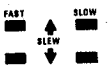
- Moves the cursor RIGHT on the test menu from data field to data field.

- Moves the cursor DOWN the test menu from data field to data field.

- Moves the cursor LEFT on the test menu from data field to data field.

(7) Data Slew Keys

The Slew Keys are used as an alternate method, to the Data Entry Keys, for changing data within the data field. The fast Slew Keys will increment/decrement the most significant digits within the data field; whereas, the slow Slew Keys will increment/decrement the least significant digits.



- Increments data with the data field.

- Decrements data within the data field.

(8) PWR/OFF/BATT Switch

Applies/Interrupts power to MLS-800 as follows:

"PWR" Position - MLS-800 is powered by external AC or DC power source.

"OFF" Position - MLS-800 is "OFF".

"BATT" Position - MLS-800 is powered by internal battery (this is a momentary spring-loaded switch to the "OFF" position).

NOTE: Internal battery is continuously charged when external AC power or external DC power above 15 VDC is connected to set.

ITEM	NAME	DESCRIPTION

(4) Function Select Keys Without Sync

These keys move the cursor to the selected special function data field on the Test Menu Display (MP-Multipath, RF LVL-RF Level and CHNL-Channel).

- Moves the cursor to the Multipath angle item within the Beam Control field of the Test Operational Menu.

- Moves the cursor to the RF Level field within the Transmission Characteristics field of the Test Operational Menu.

- Moves the cursor to the RF Frequency channel number within the Transmission Characteristics field of the Test Operational Menu.

NOTE: A reference list of the ICAO assigned channel numbers is listed in Appendix B.

(5) Data Control Keys

- The Write Protect Key is used to protect a test menu, created by the operator, from being inadvertently overwritten.

- The Delete Key is used to delete each digit of the displayed data field one digit at a time before it is entered into the Test Menu.

- The Escape Key allows the operator to restart at the previous data command or field when a multiple key sequence is in progress.

ITEM	NAME	DESCRIPTION

(2) Stored Data Keys

These keys are used for maintaining the stored twelve Test Operational Menus. Rather than key-in all the data for the Test Operational Menus every time they are required, the data for the different Test Operational Menus can be stored in the MLS-800 Internal Non-Volatile Memory, and will remain in memory when power is removed for the 10-year life of the battery. The stored and recalled set-ups include all of the non-displayed data words.

- Recall followed by a number (1 through 12) will recall the stored Test Operational Menu and display it on the Test Menu Display (15). This includes all data words.

- Save followed by a number (1 through 12) will store the displayed Test Menu in the Internal Non-Volatile Memory.

- Purge followed by a number (1 through 12) will erase the displayed Test Menu in the Internal Non-Volatile Memory.

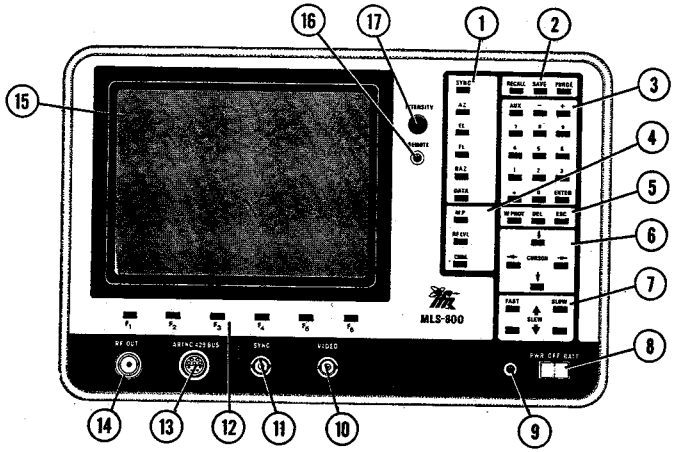
(3) Data Entry Keys

These keys which are used to enter data into the Test Operational Menu are the Standard Numerical Value Keys 0-9, Polarity Keys (+) and (-), AUX Key, Decimal Key (.) and ENTER Key.

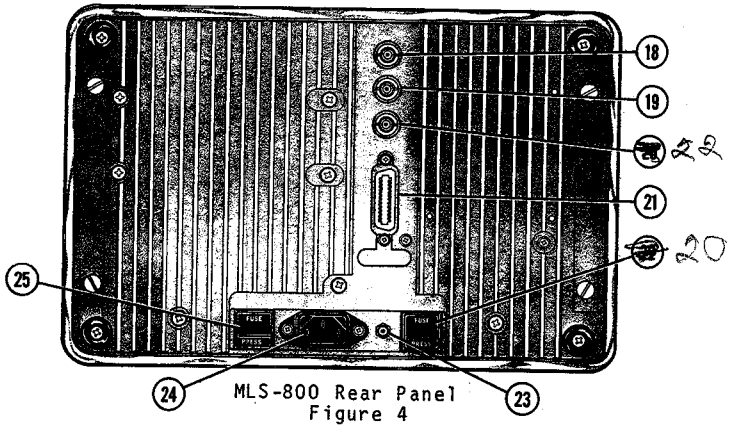
- Selects Auxiliary Data Words on Test Operational Menu.

- Instructs processor that a key-in sequence has been completed.

2. Description of Controls, Connectors and Indicators



MLS-800 Front Panel
Figure 3



MLS-800 Rear Panel
Figure 4

1. Function Select Keys with Sync
2. Stored Data Keys
3. Data Entry Keys
4. Function Select Keys without Sync
5. Data Control Keys
6. Cursor Keys
7. Data Slew Keys
8. PWR/OFF/BATT Switch
9. Power Indicator Lamp
10. Video Output Connector
11. Sync Output Connector
12. Special Function Keys
13. ARINC 429 BUS I/O Connector
14. RF Out Connector
15. Test Menu Display
16. Remote Indicator Lamp
17. Intensity Control
18. 750 MHz RF Output Connector
19. External Reference Input Connector
20. DC Fuse
21. DC Power Connector
22. 800 MHz VCO ÷ 4 Output Connector
23. GPIB Connector
24. AC Power Connector
25. AC Line Fuse

A. MLS-800 Front Panel

The MLS-800 Keyboard was designed to control the Test Menu Display, thus eliminating the need for Thumbwheel Switches, Rotary Knobs and resolvers for changing data value. (The I/O Ports/Connector Pin-Out Tables are provided in Appendix A.)

ITEM	NAME	DESCRIPTION

(1) Function Select Keys with Sync

These keys determine the main path beam functions being addressed by the operator and displayed on the Test Operational Menu Display (AZ-Azimuth, EL-Elevation, FL-Flare and BAZ-Back Azimuth):

SYNC - The Sync Key is used in conjunction with one of the Main Path Function Keys to enable a Sync output at the front panel Sync Connector (11) for Azimuth, Elevation, Flare, Back Azimuth or Data Word, depending on which main path beam function was selected. The Sync function also enables various peripheral functions already selected, which are active only when Sync is selected. These functions include Multipath Beam, P Parity, Update, Symmetry, PFE and CMN.

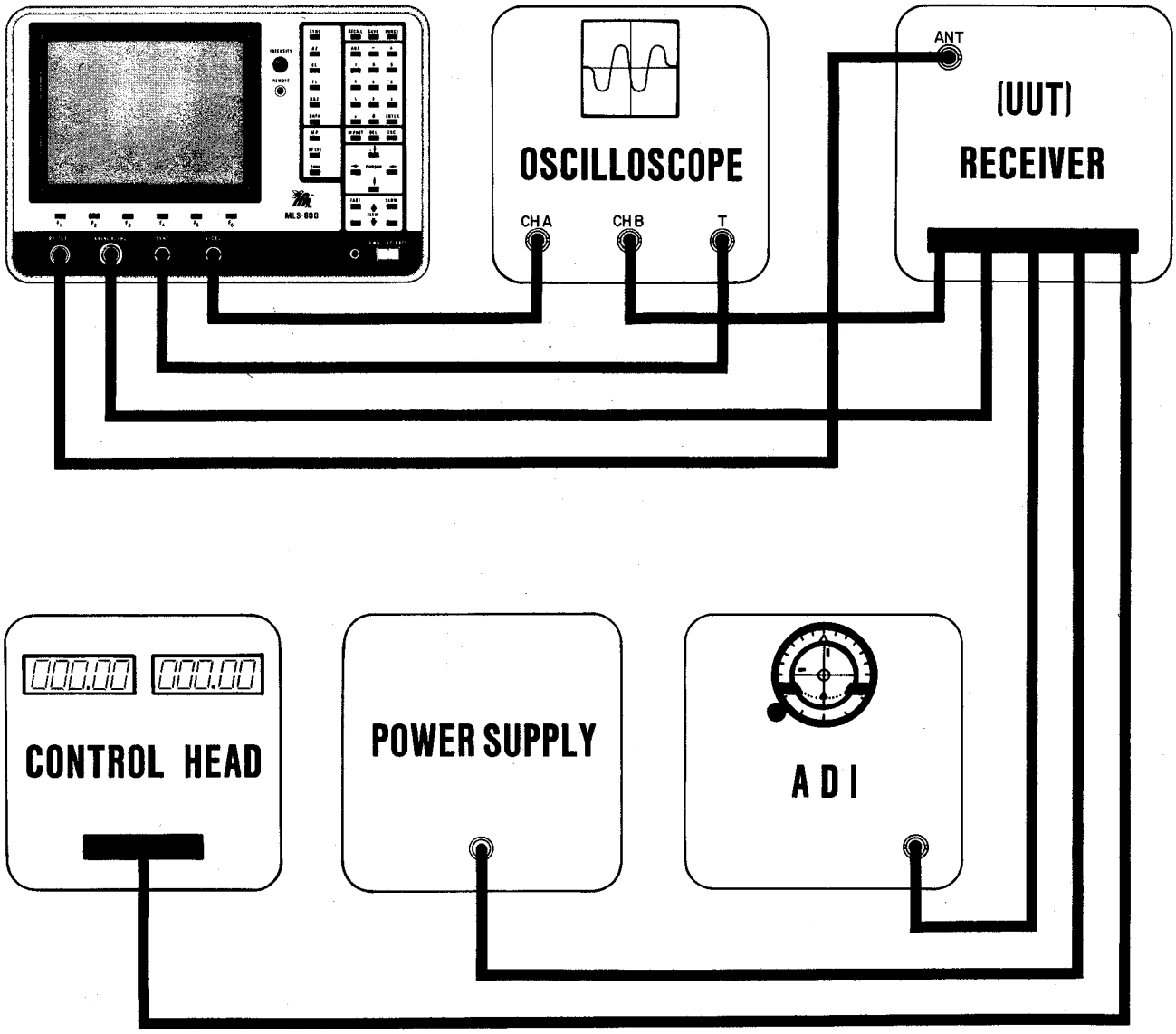
AZ - Moves the cursor to the Azimuth angle item within the Beam Control Field of the Test Operational Menu.

EL - Moves the cursor to the Elevation angle item within the Beam Control Field of the Test Operational Menu.

FL - Moves the cursor to the Flare angle item within the Beam Control Field of the Test Operational Menu.

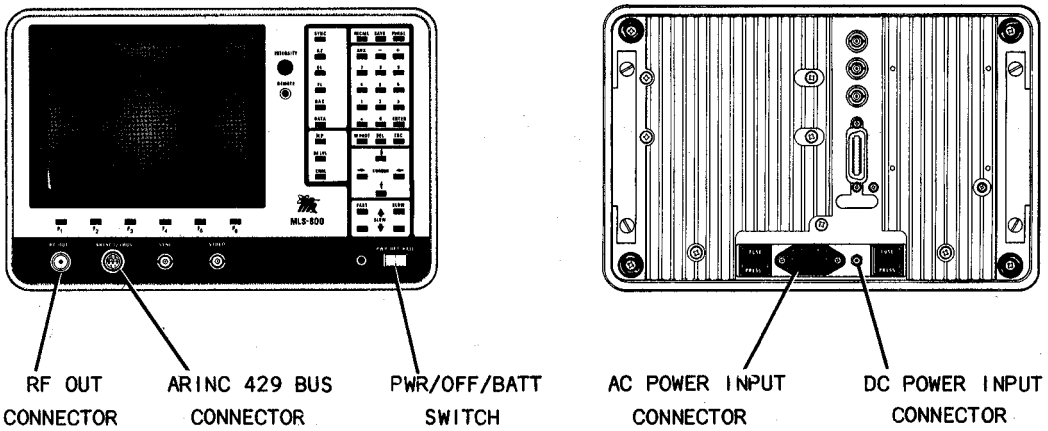
BAZ - Moves the cursor to the Back Azimuth angle item within the Beam Control Field of the Test Operational Menu.

DATA - Selects any of the Data Words to be displayed on the Test Operational Menu.



NOTE: Refer to Manufacturers Manual for Receiver Connector Hookup Points.

MLS-800 System Interface
Figure 2



MLS-800 Front and Rear Panels
Figure 1

NOTE: The low voltage detect circuit switches test set OFF before performance is affected by low battery voltage.

B. Installation and Operating Precautions (Refer to Figure 2)

(1) To prevent possible damage to the MLS-800, do not apply any signals into the MLS-800 other than those defined in the operating instructions.

(2) The following power input and general operating precautions should be observed at all times:

CAUTION: DO NOT OPERATE CRT DISPLAY WITH EXCESSIVE INTENSITY.

CAUTION: DO NOT APPLY RF SOURCE TO THE RF OUT CONNECTOR.

CAUTION: ARINC 429 BUS CONNECTOR CONFORMS TO ELECTRICAL SPECIFICATIONS OF ARINC 429 STANDARD.

CAUTION: TO PROVIDE MAXIMUM PROTECTION OF NON-VOLATILE MEMORY CONTENTS, OBSERVE THE FOLLOWING STEPS IN REGARD TO THE PWR/OFF/BATT SWITCH:

1. DO NOT RAPIDLY CYCLE POWER ON AND OFF. ALLOW A MINIMUM OF ONE SECOND BETWEEN ON/OFF CYCLE.

2. ENSURE POWER IS NOT SHUT OFF DURING DATA ENTRY BEFORE ENTER KEY IS PRESSED, AS THE DATA BEING ENTERED WILL BE LOST.

SECTION 2 - OPERATION

1. Installation

A. General

Preparing the MLS-800 for operation consists of the following steps (Refer to Figure 1):

(1) Set the MLS-800 into a vertical or horizontal operating position, with cover removed.

(2) Connect MLS Receiver to RF OUT Connector (Refer to Figure 1).

NOTE: When performing a complete Loop Test on the MLS Receiver, connect the UUT to both the RF OUT Connector (Refer to Figure 1) and ARINC 429 BUS Connector (Refer to Figure 1).

(3) Furnish electrical power to MLS-800 as follows:

(a) External AC Power

Connect furnished AC power cable between 103.5-266 VAC at 45-440 Hz power source and AC Power Connector on rear panel of MLS-800. Place PWR/OFF/BATT Switch to "PWR" position.

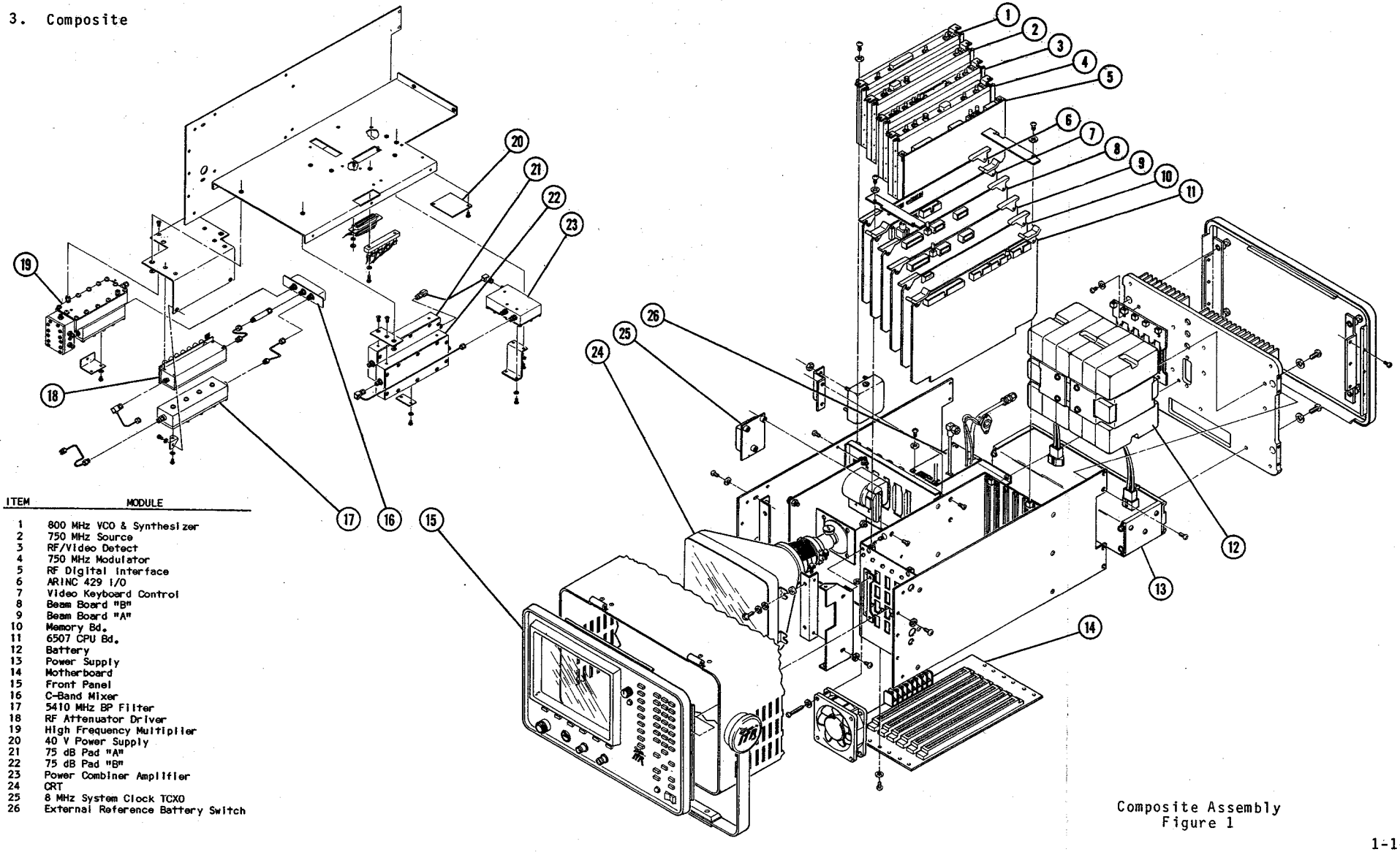
(b) External DC Power

Connect furnished DC power cable between external 11-30 VDC power source and DC Power Input Connector on rear panel of MLS-800. Place PWR/OFF/BATT Switch to "PWR" position.

(c) Internal Battery Operation

Place PWR/OFF/BATT Switch to "BATT" position. (This is a momentary spring-loaded switch to "OFF" position.) When operating the test set on battery, an internal timer will interrupt power after approximately ten minutes. Depress PWR/OFF/BATT Switch to "BATT" position to restore power to the test set.

3. Composite



ITEM	MODULE
1	800 MHz VCO & Synthesizer
2	750 MHz Source
3	RF/Video Detect
4	750 MHz Modulator
5	RF Digital Interface
6	ARINC 429 I/O
7	Video Keyboard Control
8	Beam Board "B"
9	Beam Board "A"
10	Memory Bd.
11	6507 CPU Bd.
12	Battery
13	Power Supply
14	Motherboard
15	Front Panel
16	C-Band Mixer
17	5410 MHz BP Filter
18	RF Attenuator Driver
19	High Frequency Multiplier
20	40 V Power Supply
21	75 dB Pad "A"
22	75 dB Pad "B"
23	Power Combiner Amplifier
24	CRT
25	8 MHz System Clock TCXO
26	External Reference Battery Switch

Composite Assembly
Figure 1

(4) Sync Capability For:

(a) External Monitoring.

(b) Designating PFE and CMN Function.

(c) Designating Multipath Function.

(d) Preamble Parity, Symmetry and Percent Update.

(5) Simulates all Basic Data words plus Auxiliary Data Words with Parity Selection.

(6) Full Range of MLS Channels.

(7) OCI Control for Left, Right and Rear.

(8) 75 dB AZ to EL Ratio Capability.

(9) Propeller/Rotor Modulation at 1 to 100 Hz Variable in 1 Hz steps.

(10) Morse Code Ident. Capability.

(11) ARINC 429 Receiver with PFE and CMN calculations.

(12) External RF Reference Input.

(13) Clearance Pulse Simulation.

(14) 6.75 Hz Modulation.

B. Optional Features

(1) IEEE-488, 1978 Interface for Remote Control Operation.

SECTION 1 - DESCRIPTION

1. General

The MLS-800 is a microprocessor controlled Ground Station Simulator designed to operate from a test bench or as a ramp tester. Test parameters are selected via 44-position Keyboard and displayed on the Test Menu Display.

There are five menus in the MLS-800 system:

A. Master Menu (Link to Next Menu)
B. Test Operational Menu (Test Functions - ICAO 1981 and ICAO 1985)
C. Diagnostic Menu
D. Special Function Menu
E. Save Page Directory Menu

2. Functional Capabilities

The MLS-800 incorporates the following features and capabilities:

A. Standard Features

(1) Complete Mainpath Simulation Including:

(a) Approach and High Rate Azimuth.

(b) Elevation.

(c) Flare.

(d) Back Azimuth.

(2) Complete Multipath Simulation Capability with:

(a) Interference Pulses.

(b) Selectable Fade Rate Modulation of 0.05, 1, and 1000 Hz.

(3) Control Of All Beam Parameters:

(a) Angular Position.

(b) Beam Amplitude Referenced to the Preamble.

(c) Norm and ½ Width Pulse.

(d) Selectable Beam Width at 0.5, 1, 2, 3, 4, or 5 Degrees.

LIST OF ILLUSTRATIONS

CHAPTER ONE

MLS-800 MICROWAVE LANDING SYSTEM TEST SET

OPERATION MANUAL

TABLE OF CONTENTS

INTRODUCTION - MLS-800 MICROWAVE LANDING SYSTEM TEST SET

This manual contains instructions for the MLS-800 for testing and calibrating MLS (Microwave Landing Systems Equipment). It is strongly recommended that the operator be thoroughly familiar with Section 2 of this manual before attempting to perform any operating procedures. It is also recommended the operator be familiar with the following:

1. Minimum Operational Performance Standards for MLS Airborne Receiving Equipment; Document No. RTCA/DO-177, July 1981.

2. MLS Interoperability and Performance Requirements; FAA-STD-022b, Oct 27, 1983.

3. International Civil Aviation Organization (ICAO) Document - International Standards and Recommended Practices (SARPS) as contained in Aeronautical Telecommunications, Annex 10, both 1981 and 1985 Standards.

4. ARINC Spec 429-6 Mark 33 Digital Information Transfer System (DITS).

This manual is divided into five sections as follows:

Section 1 - DESCRIPTION (physical and mechanical description of test set and a list of features.)

Section 2 - OPERATION (installation instructions; description of controls, connectors and indicators; operation performance check; general operating procedures; and GPIB operating procedures.)

Section 3 - SPECIFICATIONS

Section 4 - SHIPPING

Section 5 - STORAGE (for extended periods)

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1-APPENDIX E	1 thru 8	Jan 1/86
1-APPENDIX F	1/2	Jan 1/86
1-APPENDIX G	1/2	Jan 1/86

RECORD OF REVISIONS

REV NO.	ISSUE DATE	DATE INSERTED	BY	REV NO.	ISSUE DATE	DATE INSERTED	BY

CAUTION: INTEGRATED CIRCUITS AND SOLID STATE DEVICES SUCH AS MOS FET'S, ESPECIALLY CMOS TYPES, ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGES RECEIVED FROM IMPROPER HANDLING, THE USE OF UNGROUNDED TOOLS, AND IMPROPER STORAGE AND PACKAGING. ANY MAINTENANCE TO THIS UNIT MUST BE PERFORMED WITH THE FOLLOWING PRECAUTIONS:

1. BEFORE USE IN A CIRCUIT, KEEP ALL LEADS SHORTED TOGETHER EITHER BY THE USE OF VENDOR-SUPPLIED SHORTING SPRINGS OR BY INSERTING LEADS INTO A CONDUCTIVE MATERIAL.

2. WHEN REMOVING DEVICES FROM THEIR CONTAINERS, GROUND THE HAND BEING USED WITH A CONDUCTIVE WRISTBAND.

3. TIPS OF SOLDERING IRONS AND/OR ANY TOOLS USED MUST BE GROUNDED.

4. DEVICES MUST NEVER BE INSERTED INTO NOR REMOVED FROM CIRCUITS WITH POWER ON.

5. PC BOARD, WHEN TAKEN OUT OF THE SET, MUST BE LAID ON A GROUNDED CONDUCTIVE MAT OR STORED IN A CONDUCTIVE STORAGE BAG.

   NOTE: Remove any built-in power source, such as a battery, before laying PC Boards on conductive mat or storing in conductive bag.

6. PC BOARDS, IF BEING SHIPPED TO THE FACTORY FOR REPAIR, MUST BE PACKAGED IN A CON-DUCTIVE BAG AND PLACED IN A WELL-CUSHIONED SHIPPING BOX.

CAUTION: THE USE OF SIGNAL GENERATORS FOR MAINTENANCE AND OTHER ACTIVITIES CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE TO AVIATION RECEIVERS, WHICH CAN CAUSE DISRUPTION AND INTERFERENCE TO AERONAUTICAL SERVICE OUT TO A DISTANCE OF SEVERAL MILES.

CAUTION: USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION WHICH RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND ENSURE COMPLIANCE WITH INSTRUCTIONS OUTLINED IN FAA CIRCULAR AC 170-6C, DATED FEBRUARY 19, 1981.

WARNING:

HIGH VOLTAGE EQUIPMENT

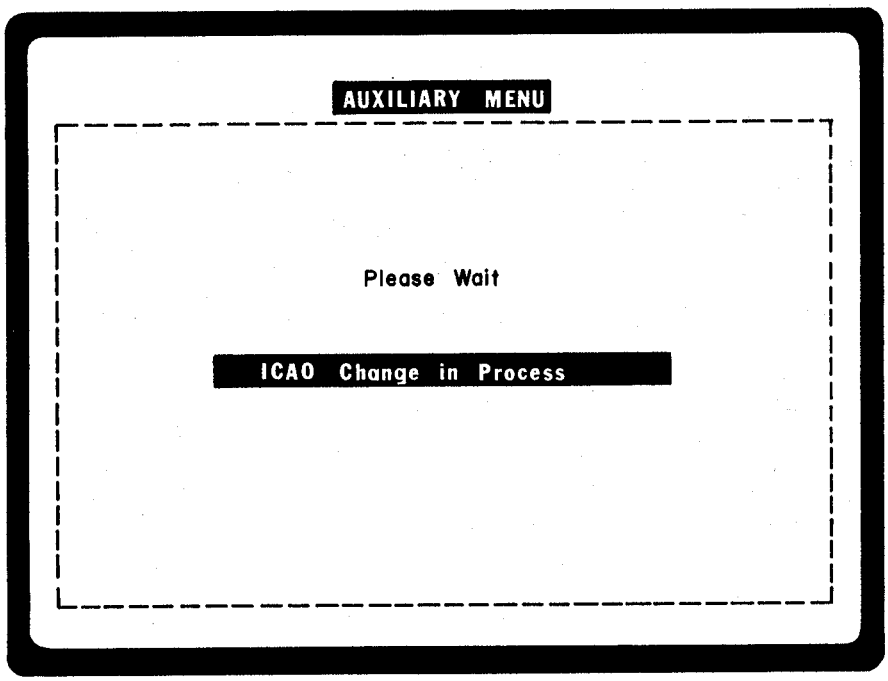
THIS EQUIPMENT CONTAINS CERTAIN CIRCUITS AND/OR COMPONENTS OF EXTREMELY HIGH VOLTAGE POTENTIALS, CAPABLE OF CAUSING SERIOUS BODILY INJURY OR DEATH. WHEN PERFORMING ANY OF THE PROCEDURES CONTAINED IN THIS MANUAL, HEED ALL APPLICABLE SAFETY PRECAUTIONS.

RESCUE OF SHOCK VICTIMS

1. DO NOT ATTEMPT TO PULL OR GRAB THE VICTIM
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER.
3. IF YOU CANNOT TURN OFF ELECTRICAL POWER, PUSH, PULL OR LIFT THE VICTIM TO SAFETY USING A WOODEN POLE, A ROPE OR SOME OTHER DRY INSULATING MATERIAL.

FIRST AID

1. AS SOON AS VICTIM IS FREE OF CONTACT WITH SOURCE OF ELECTRICAL SHOCK, MOVE VICTIM A SHORT DISTANCE AWAY FROM SHOCK HAZARD.
2. SEND FOR DOCTOR AND/OR AMBULANCE.
3. KEEP VICTIM WARM, QUIET AND FLAT ON HIS/HER BACK.
4. IF BREATHING HAS STOPPED , ADMINISTER ARTIFICIAL RESUSCITATION. STOP ALL SERIOUS BLEEDING.



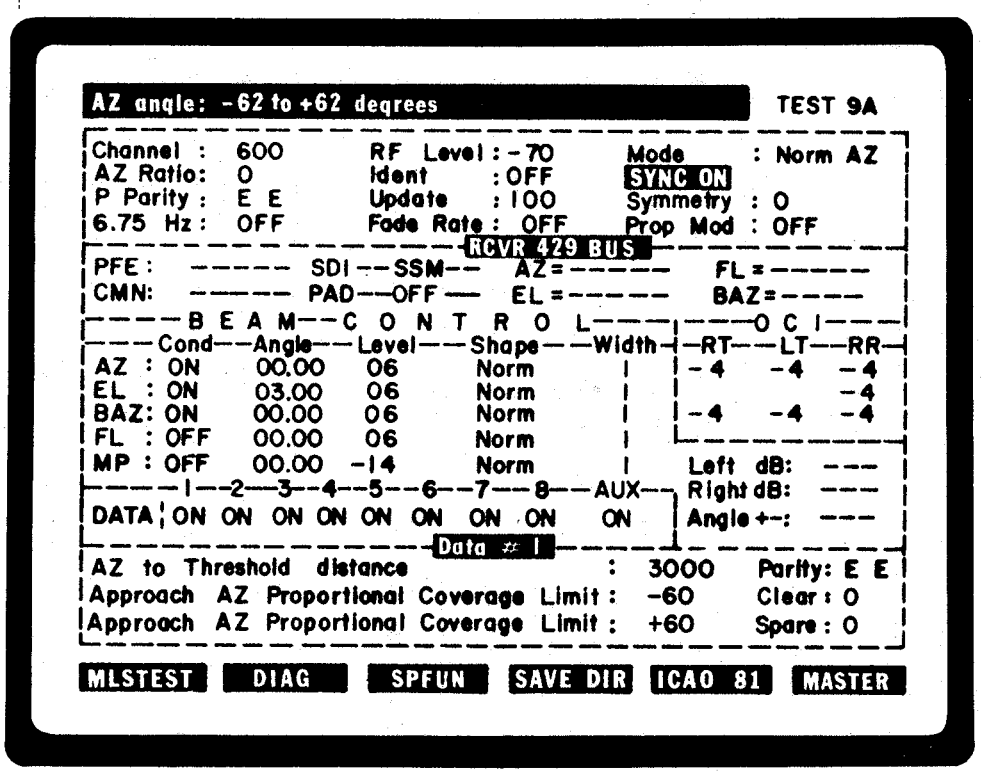
ICAO Mode Change Menu
Figure 41

6 MASTER - Displays the Master Menu.

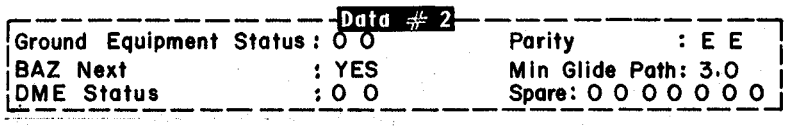
(i) Standard Test Conditions per RTCA/DO-177 -ICAO 1981 Test Operational Menu (Refer to Figures 42 thru 44)

The following Menu includes the standard test signals used to test the MLS equipment. The main parameters involved in this test are:

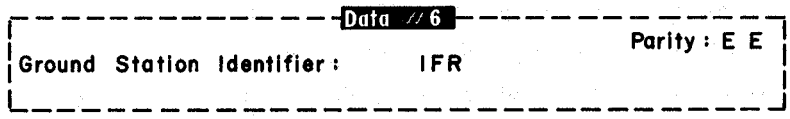
Channel : set to 600 (5061.000 MHz)
RF Level : set to -70 dBm
OCI : set to -4 dB
AZ angle : set to 0.0°
EL angle : set to 3.0°
Scanning Beam Level : set to 6 dB
Scanning Beam Width : set to 1°
AZ to Threshold distance : set to 3000m (Figure 42)
Approach AZ Prop. Cov. Limit: set to ±60° (Figure 42)
Minimum glide path : set to 3.0° (Figure 43)
Ground Station Identifier : set to "IFR" (Figure 44)



Standard Test - ICAO 1981 Test Operational Menu w/ Data Word #1
Figure 42



Standard Test - ICAO 1981 Data Word #2
Figure 43

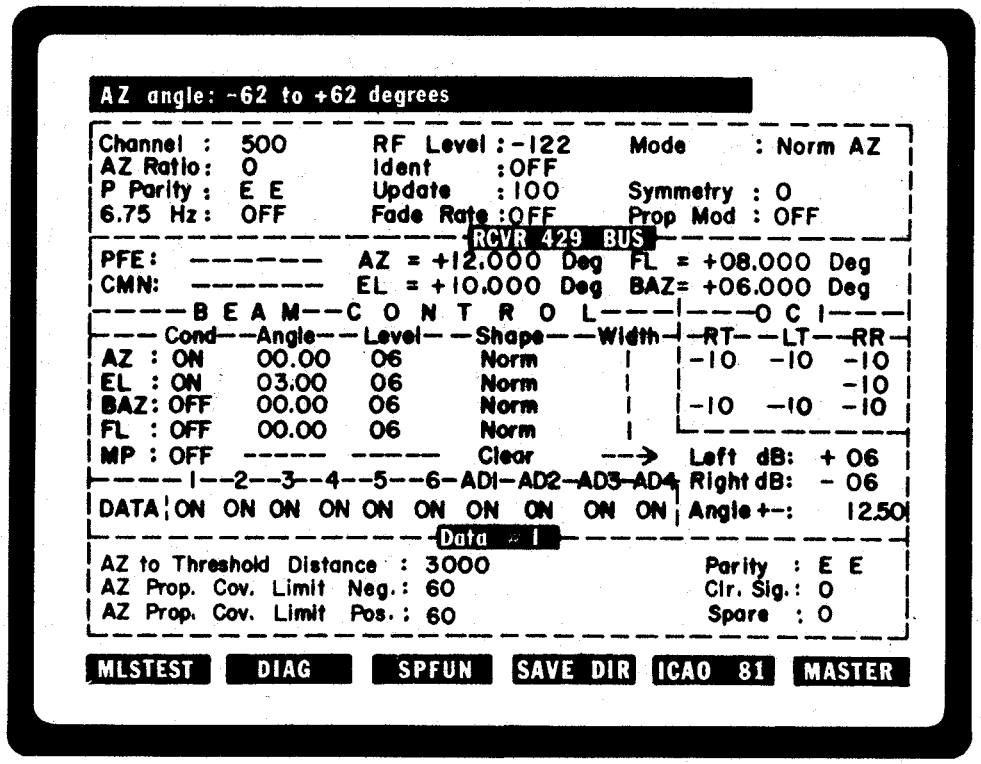


Standard Test - ICAO 1981 Data Word #6
Figure 44

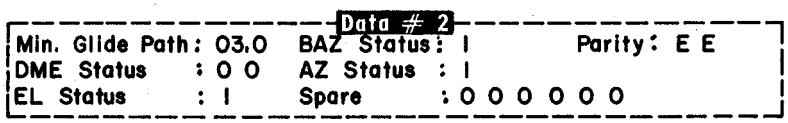
(j) Standard Test Conditions per RTCA/DO-177 -ICAO 1985 Test Operational Menu (Refer to Figures 45 thru 47)

The following Menu includes the standard test signals used to test the MLS equipment. The main parameters involved in this test are:

Channel : set to 600 (5061.000 MHz)
RF Level : set to -70 dBm
OCI : set to -4 dB
AZ angle : set to 0.0°
EL angle : set to 3.0°
Scanning Beam Level : set to 6 dB
Scanning Beam Width : set to 1°
AZ to Threshold distance : set to 3000m (Figure 45)
Approach AZ Prop. Cov. Limit: set to ±60° (Figure 45)
Minimum glide path : set to 3.0° (Figure 46)
Ground Station Identifier : set to "IFR" (Figure 47)



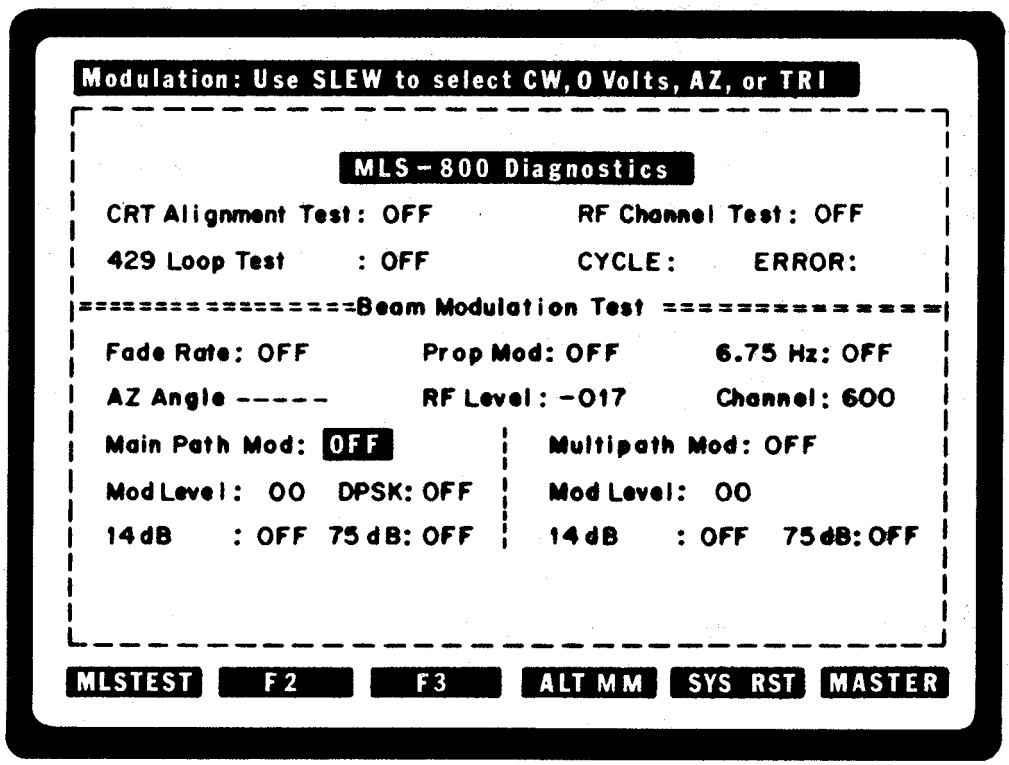
Standard Test - ICAO 1985 Test Operational Menu w/ Data Word #1
Figure 45



Standard Test - ICAO 1985 Data Word #2
Figure 46

Standard Test - ICAO 1985 Data Word #6
Figure 47

(5) Diagnostic Menu (Refer to Figure 48)



Diagnostic Menu
Figure 48

The Diagnostic Menu is designed to aid testing and alignment of the MLS-800. Test operations which cannot be accomplished in the Test Operational Menu can be performed in the Diagnostic Menu. The Diagnostic Menu consists of four Test Function Fields.

Only one test in the upper portion of the Diagnostic Menu may be active at a time. For 429 Loop Test, only one of the two channels may be under test at a time. 429 Loop Test results are displayed to the right of the 429 Loop Test field. For Beam Modulation tests (Main Path and Multipath), either test or both may be running in any of the available modes, and may run during any tests in the top portion. At the completion of the RF Channel test, the channel will be restored to the value indicated in the Beam Modulation Test Channel field.

Tests from the upper portion which are active will be displayed in inverse video. To start a test from the upper portion, move cursor to and slew the Test's field to the desired test condition and press ENTER. All commands must use the ENTER Key to maintain desired value selected with the SLEW Key. There are three ways to halt a test from the top portion:

Slew the test's field to OFF and press ENTER.

Start up another test in the upper portion.

Press one of the function keys under the menu to exit diagnostics.

Only one of the top three fields under the Beam Modulation test portion may be active at a time (Fade Rate, Prop Mod, 6.75 Hz). If one is activated, all other fields which are active will be disabled. If Main Path Beam is not OFF, SYNC will be applied to the main beam. Non-Azimuth Multipath beams should be run with the Main Path beam OFF. Fields related to each Beam Path will be displayed in inverse video if active and relevant to the Modulation type.

The cursor may be moved around while certain tests are executing (RF Channel, 429 Loop, Main Path and Multipath). Each of the test fields may be edited, however the response to the editing inputs slower.

(a) Diagnostic Functions

The following functions in the Diagnostic Menu allow the operator to set conditions for the desired tests, run the desired tests, and display other menus contained in the MLS-800:

1 CRT Alignment Test - Refer to D.(5)(b).

2 RF Channel Test - Refer to D.(5)(b).

3 429 Loop Test - Refer to D.(5)(b).

4 CYCLE - Displays the cycle count for the 429 Loop Test in progress. (Display only.)

5 ERROR - Displays the error count for the 429 Loop Test in progress. (Display only.)

6 Fade Rate - Displays the simulation of ground reflections causing modulation level to oscillate (1 kHz, 1 Hz, 0.05 Hz or OFF). (Applied to Multipath Modulation only.)

7 Prop Mod - Displays propeller or rotor modulation simulation (0 to 199 Hz in 1 Hz steps or OFF). (Applied to Main Path Modulation only.)

8 6.75 Hz - Displays the condition (ON/OFF) required for the Signal Level Variation Test. (Applied to Main Path Modulation only).

9 AZ Angle - Displays the Azimuth angle ±0.1° when modulation level is +6 dB to +13 dB (Display only). (Active on Main Path Modulation test only.)

10 RF Level - Displays the RF Output Level, selectable from -17 to -122 dBm. Used to set RF Levels during the CW test for accurate measurement.

11 Channel - Displays the MLS-800 Channel, selectable from 500-699 (Active on Main Path and Multipath Modulation tests only).

12 Modulation - Displays the Modulation Function selectable as one of the following:

a OFF - Beam Modulation Output is 0 Volts. 75 dB Pad and 14 dB Pad are enabled.

b 0 VOLTS - Beam Modulation Output is 0 Volts.

c CW - Outputs a continuous Preamble signal from the Beam Modulation Synthesizer.

d +60 AZ - Normal AZ signal at +60 Degrees with SYNC AZ enabled. Used to verify TO/FRO pulse operation.

e -60 AZ - Normal AZ signal at -60 Degrees with SYNC AZ enabled. Used to verify TO/FRO pulse operation.

f 0 AZ - Normal AZ signal at 0 Degrees with SYNC AZ enabled. Used to verify TO/FRO pulse operation.

g 1000 TRI - 1000 Hz triangular wave ranging from -14 dB to +13 dB Output from the Beam Modulation Synthesizer. Used to verify modulation linearity.

h 500 TRI - 500 Hz triangular wave ranging from -14 dB to +13 dB Output from the Beam Modulation Synthesizer. Used to verify modulation linearity.

i 250 TRI - 250 Hz triangular wave ranging from -14 dB to +13 dB Output from the Beam Modulation Synthesizer. Used to verify modulation linearity.

13 Mod Level - Displays the Beam Modulation Level, selectable from -14 dB to +13 dB.

14 DPSK - Displays the DPSK condition, selectable as ON, OFF or CONT. Used to cycle the DPSK level during the CW test for accurate measurement of the 180 Degree phase shift requirement for transmitting digital data. The DPSK can be cycled at a continuous 15.625 kHz rate which is the specified MLS data rate (not active for Main Path AZ or OFF Beam Modulation).

15 14 dB - Displays the 14 dB Pad condition, selectable as ON or OFF. Used to cycle the 14 dB Pad, normally used to attenuate beam side lobes, during the CW test for accurate measurement (not active for AZ or OFF Beam Modulation).

16 75 dB - Displays the 75 dB Pad condition, selectable as ON or OFF. Used to cycle the 75 dB Pad, normally used to disable (OFF) a function (and in the case of the Main Path Beam, for the 75 dB AZ Ratio test), during the CW test for accurate measurement (not active for AZ or OFF Beam Modulation). Used to attenuate combined Main Path and Multipath signals or Multipath signal only.

17 MLSTEST - Displays the Test Operational Menu.

18 F2 - Not Used.

19 F3 - Not Used.

20 ALT MM - Swaps preset test conditions (Beam Mod, Mod Level, 14 dB Pad) between Mainpath and Multipath modulations.

21 SYS RESET - Resets the system to the Power-Up state.

22 MASTER - Displays the Master Menu.

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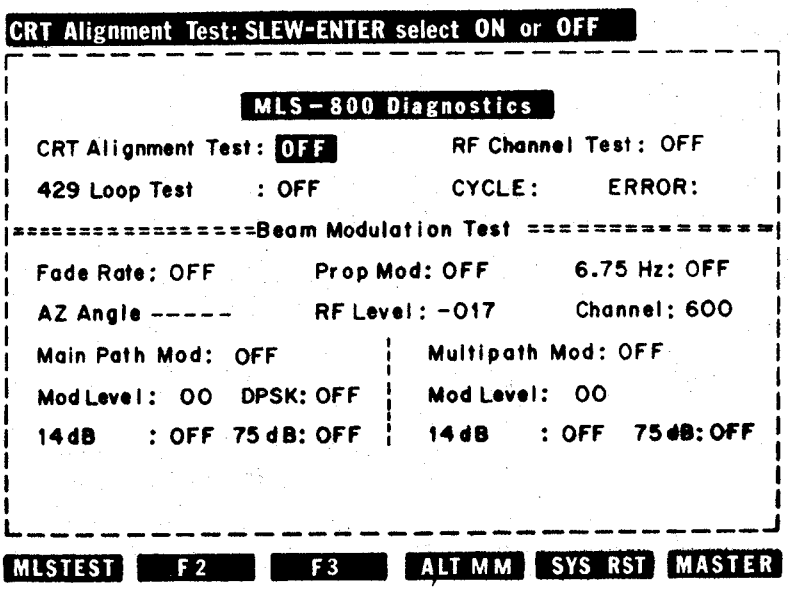
(b) Operating Instructions

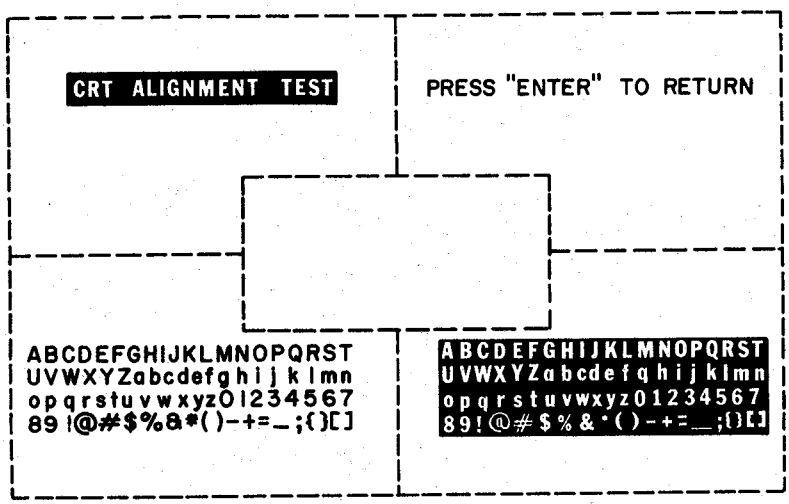
Example #1 CRT ALIGNMENT TEST

Step 1. Present Menu



Step 2. Press 

and 



Step 3. Press 

Example #2 RF CHANNEL TEST

Step 1. Present Menu

RF Channel Test:SLEW-ENTER select ON or OFF

MLS-800 Diagnostics

CRT Alignment Test: OFF RF Channel Test: OFF
429 Loop Test : OFF CYCLE: ERROR:

==========Beam Modulation Test ==========

Fade Rate: OFF Prop Mod: OFF 6.75 Hz: OFF
AZ Angle ----- RF Level: -017 Channel: 600

Main Path Mod: OFF	Multipath Mod: OFF
Mod Level: 00 DPSK: OFF	Mod Level: 00
14dB : OFF 75dB: OFF	14dB : OFF 75dB: OFF

MLSTEST F2 F3 ALT MM SYS RST MASTER

Step 2. Press SLEW and ENTER

RF Channel Test:SLEW-ENTER select ON or OFF

MLS-800 Diagnostics

CRT Alignment Test: OFF RF Channel Test: ON
429 Loop Test : OFF CYCLE: ERROR:

==========Beam Modulation Test ==========

Fade Rate: OFF Prop Mod: OFF 6.75 Hz: OFF
AZ Angle ----- RF Level: -017 Channel: 600

Main Path Mod: OFF	Multipath Mod: OFF
Mod Level: 00 DPSK: OFF	Mod Level: 00
14dB : OFF 75dB: OFF	14dB : OFF 75dB: OFF

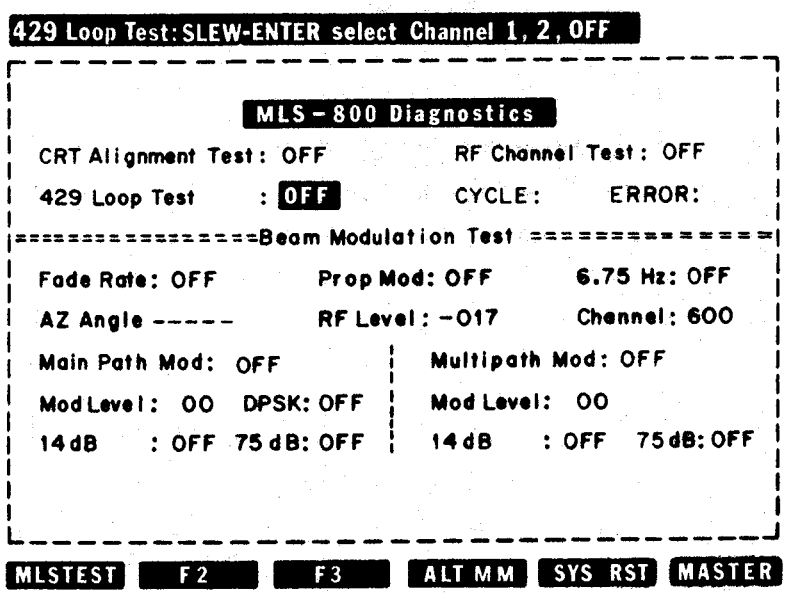
MLSTEST F2 F3 ALT MM SYS RST MASTER

NOTE: RF Synthesizer is stepped from Channel 500 to 699 and back in increments of 10. Cycle repeats at approximately 1.5 seconds.

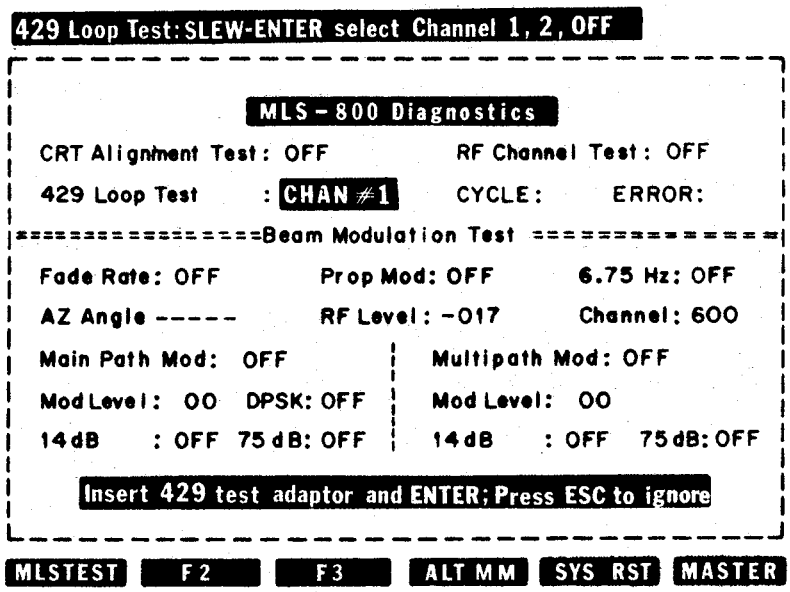
Step 3. Press SLEW and ENTER

Example #3 429 LOOP TEST CHANNEL #1

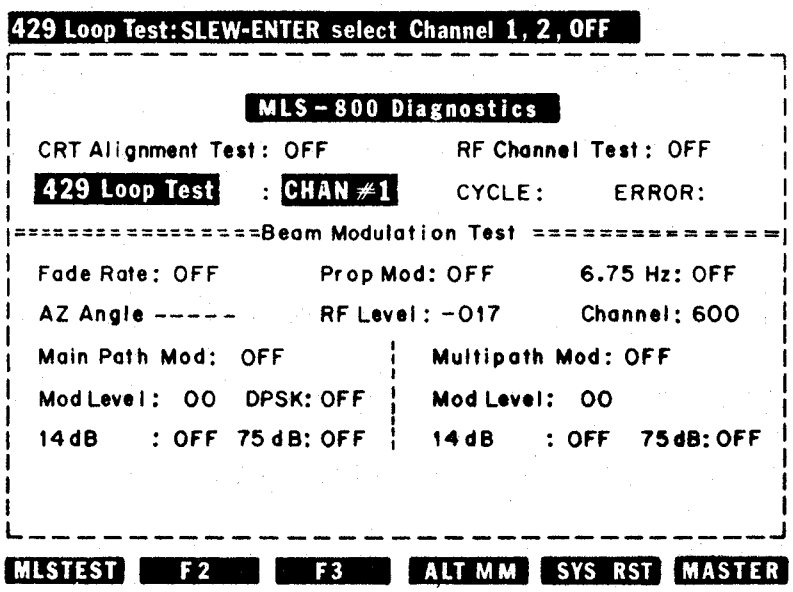
Step 1. Present Menu



Step 2. Press SLEW and ENTER



Step 3. Press ENTER



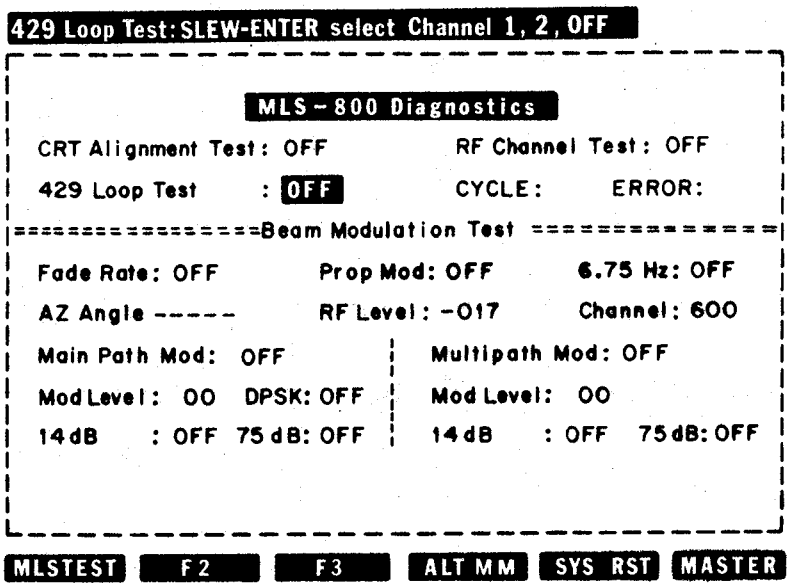
Step 4. Press SLEW twice.

Step 5. Press ENTER

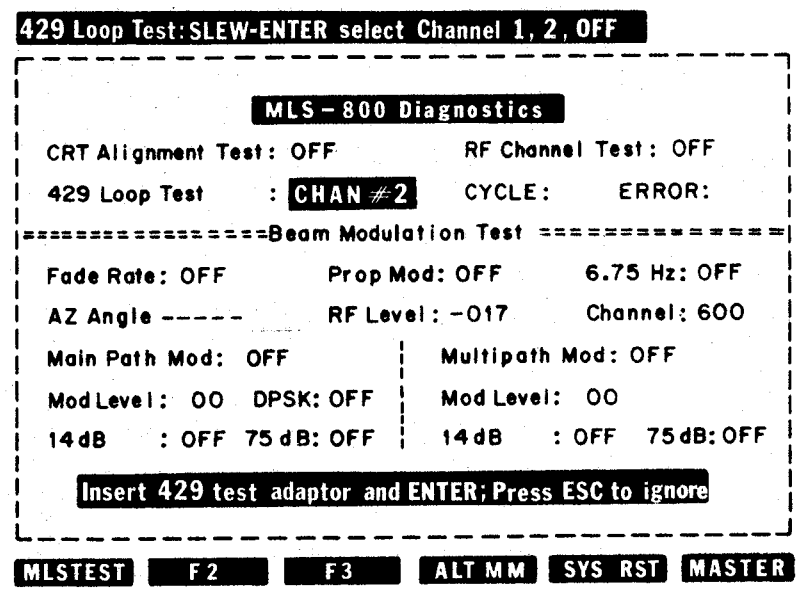
NOTE: Upon completion of desired test cycles, the CYCLE and ERROR counters will restart when test is reinstated.

Example #4 429 LOOP TEST CHANNEL #2

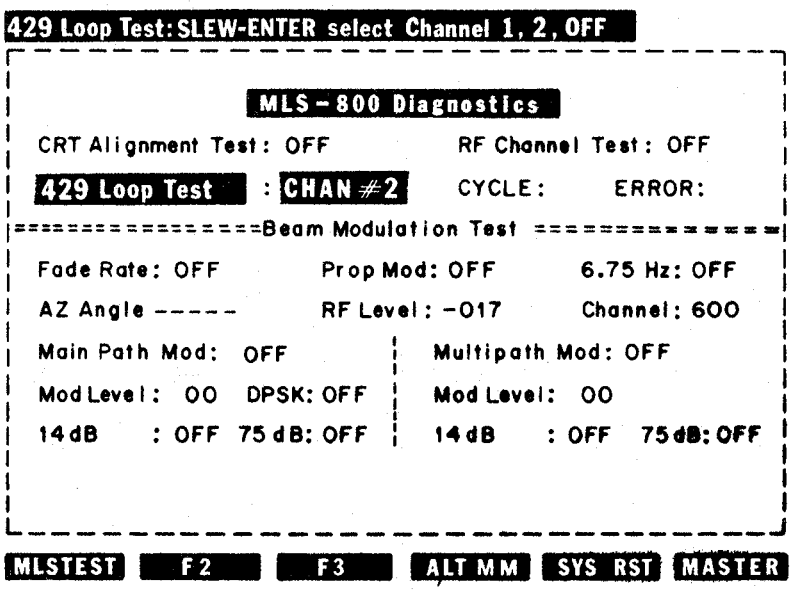
Step 1. Present Menu



Step 2. Press SLEW and ENTER



Step 3. Press ENTER

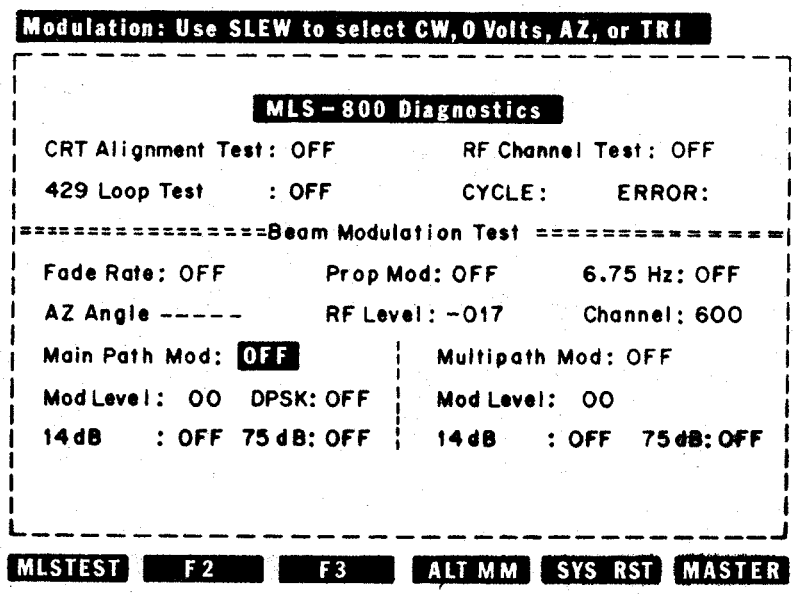


Step 4. Press SLEW and ENTER

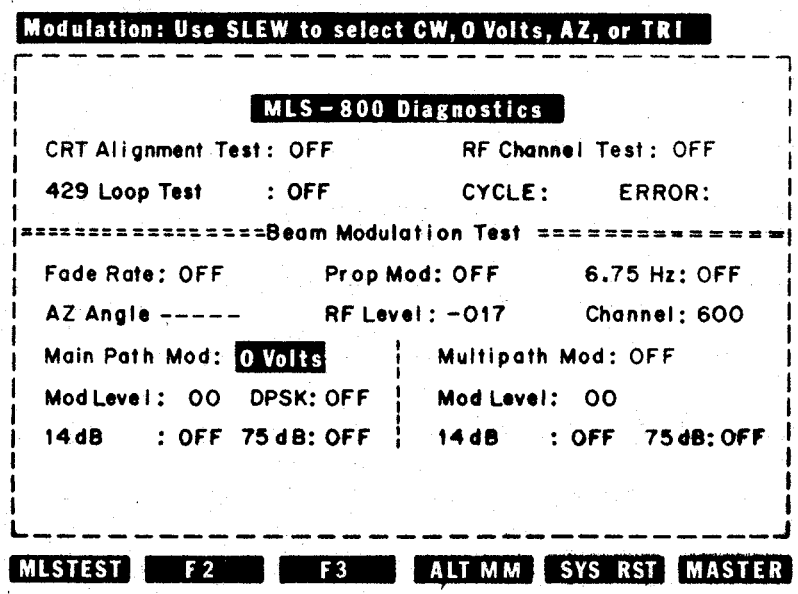
NOTE: Upon completion of desired test cycles, the CYCLE and ERROR counters will restart when test is reinstated.

Example #5 MAINPATH MODULATION TEST

Step 1. Present Menu



Step 2. Press SLEW to desired value.

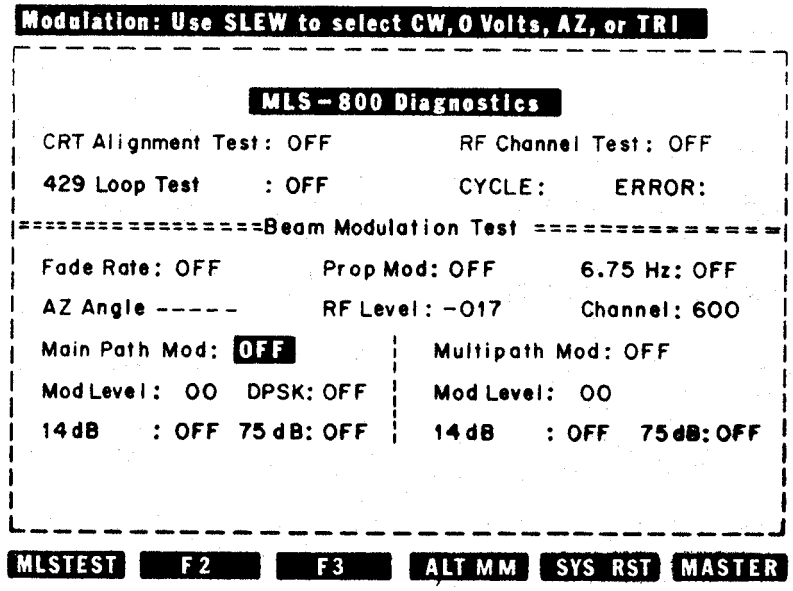


Step 3. Adjust Functions

Step 4. Press SLEW to OFF position on Main Path Modulation Test

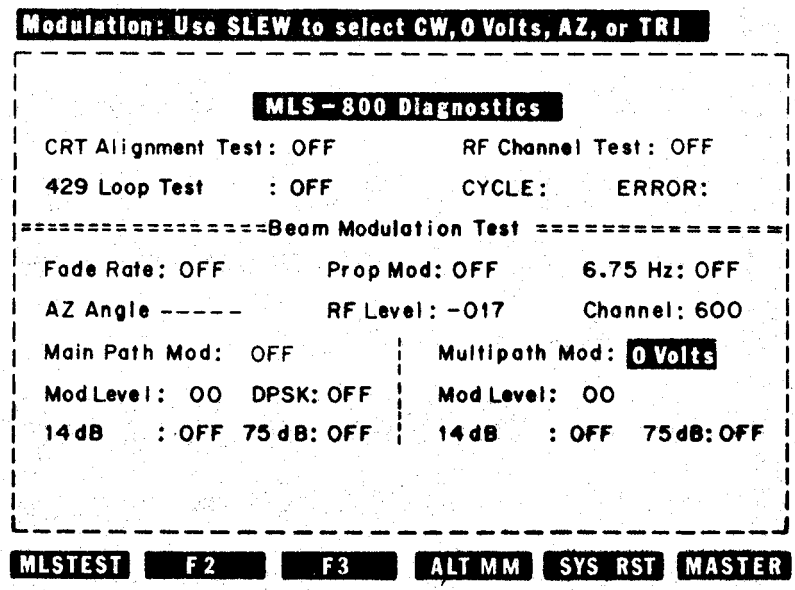
Example #6 MULTIPATH MODULATION TEST

Step 1. Present Menu



Step 2. Press 

to desired value.

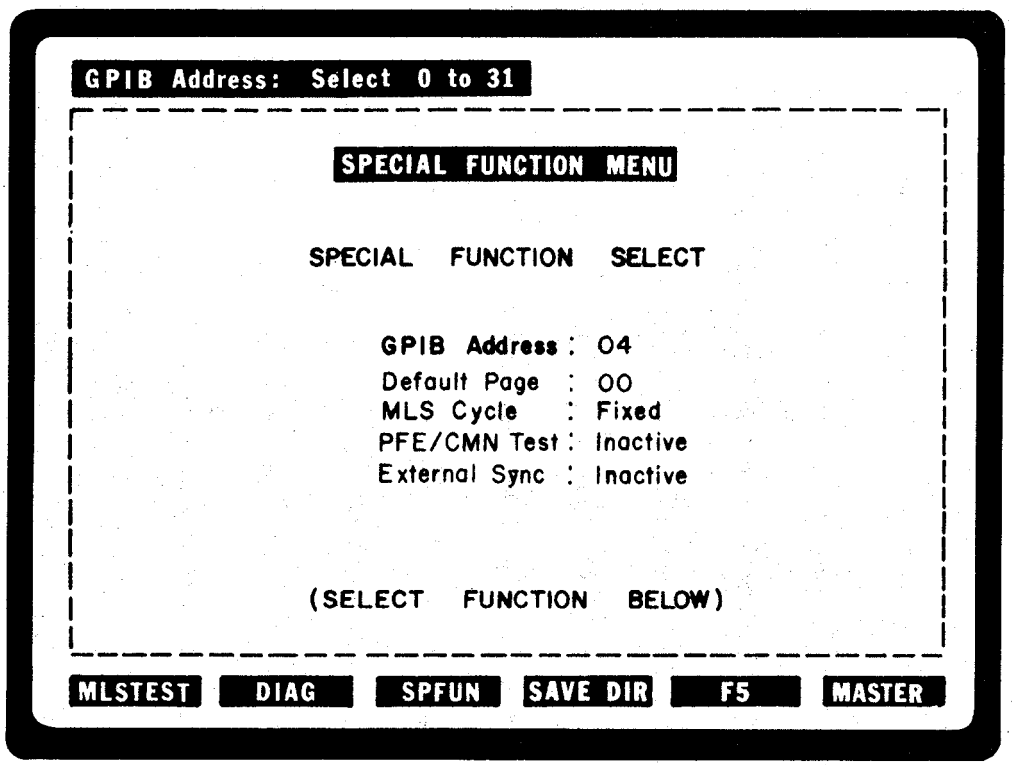


Step 3. Adjust Functions

Step 4. Press 

to OFF position on Multipath Modulation Test.

(6) Special Function Menu (Refer to Figure 49)



Special Function Menu
Figure 49

(a) GPIB Address - Displays the optional GPIB Address selectable from 0 to 31 using the Keyboard Number Keys or Slew. The GPIB Address is stored in Non-Volatile Memory.

(b) Default Page - Displays the number of the page from the Save Directory that will be recalled on power up. If it is 0 or no page is stored at this memory address, then the standard test condition for ICAO 1985 is the default page and MASTER menu is displayed as a default menu.

(c) MLS Cycle - The cycle time can be fixed or can vary ±5 mSec in a random fashion to avoid interference problems. The cycle length is always fixed during Diagnostics operation.

(d) PFE/CMN Test - Displays the maximum value for PFE and the 95% value for CMN every 10 seconds or 40 seconds when Multipath is active. Values are displayed in the PFE and CMN data fields in inverse video to distinguish them from the PFE and CMN data.

(e) External Sync - This allows the MLS-800 to be synced with another MLS-800.

E. Remote Control (GPIB) Operation

Remote communications with the MLS-800 is provided by use of the General Purpose Interface Bus (GPIB) which conforms to the latest IEEE-Standard-488-1978. The test set will perform to the following IEEE-488-1978 Subsets: SH1, AH1, T6, TEØ, LA, LEØ, SR1, RL2, PPØ, DC1, DT1 and CØ. These subsets mean the MLS-800 has the following capabilities using ASCII encoded character strings:

Complete Source and Accepter Handshake

Talker with Serial Poll

Listener

Service Request

Remote/Local (No local lockout capability)

Device Clear

Device Trigger

The GPIB Address is set by the MLS-800 Front Panel Keyboard Entry Keys in the Special Function Menu.

All communication with the MLS-800 over the GPIB is implemented with ASCII encoded character strings. Invalid or improperly formatted characters are discarded and an error status bit will be set. The exceptions to this rule are the IEEE-488 defined BUS messages listed in Table 5-1. Any of these messages will cause an immediate response within the MLS-800. The ASCII String Commands are stored in a 128 Byte Buffer until receipt of a Carriage Return, Line Feed, Null Character or an "END", "IDY" or "GET" message. At this time, all commands will be executed and measurements made.

MNEMONIC MESSAGE	ASCII CODE (HEX)	IEEE-488 INSTRUCTION
ATN	bus signal line	ATTENTION
DAB	ØØ-7F	Data Byte
DAC	bus signal line	Data Accepted
DAV	bus signal line	Data Valid
DCL	14	Device Clear
END or EOI	bus signal line	End
GET	Ø8	Group execute trigger
GTL	Ø1	Go to Local
IDY	bus signal line	Identify
IFC	bus signal line	Interface clear
MLA	2Ø-3F	My listen address
MTA	4Ø-5F	My talk address
REN	bus signal line	Remote enable
RFD	bus signal line	Ready for data
SPD	19	Serial poll disable
SPE	18	Serial poll enable
SRQ	bus signal line	Service Request
STB	ØØ-FF	Status Byte
UNL	3F	Unlisten
UNT	5F	Untalk

Refer to the IEEE-Standard-488-1978 for further explanation.

IEEE-488-1978 BUS Messages
Table 1

MNEMONIC MESSAGE	DEFINITION
ATN	The MLS-800 GPIB I/O device responds immediately to process the incoming GPIB controller commands.
DAB	The MLS-800 microprocessor responds by status testing of the GPIB I/O device to accept the data byte.
DAC	The MLS-800 GPIB I/O device responds immediately to signal the talker that it has accepted the data byte.
DAV	The MLS-800 GPIB I/O device responds immediately to signal the interceptor that it has put valid data on the BUS.
DCL	The MLS-800 processor responds to reset the GPIB Interface to its initialized state.
END or EOI	The MLS-800 responds to terminate the command input from the source and begin processing the commands available up to the last valid delimiter.
GET	The MLS-800 responds to terminate any further inputs and executes the commands available up to the last available delimiter.
GTL	The MLS-800 processor responds to remove itself from control over the test set, therefore returning control over to the front panel.
IDY	Same as "END" or "EOI".
IFC	The MLS-800 processor responds by returning to local mode.
LLO	No response to this message.
MLA	The MLS-800 GPIB I/O device responds immediately by comparing its address with the listen address given. If the two are the same, it instructs the processor to listen.

MLS-800 GPIB Message Interface Definitions
Table 2

MNEMONIC MESSAGE	DEFINITION
MTA	The MLS-800 GPIB I/O device compares its address with the talk address given. If the two are the same, it instructs the processor to talk.
REN	The MLS-800 processor responds from the interface to put the test set into remote, which disables front panel operation.
RFD	The MLS-800 GPIB I/O device signals the source that it is ready for data to be transmitted on the bus.
SPD	The MLS-800 GPIB I/O device terminates the service request operation by disabling the serial poll.
SPE	The MLS-800 GPIB I/O device places the status byte on the BUS addressed to talk.
SRQ	The MLS-800 processor instructs the interface to signal the controller that servicing is desired. (This is done under MLS-800 software control.)
STB	The MLS-800 GPIB I/O device responds immediately after the SPE and MTA messages by placing the status byte on the BUS.
UNL	The MLS-800 GPIB I/O device and the processor responds to unlisten the test set.
UNT	The MLS-800 GPIB I/O device and the processor responds to untalk the test set.

MLS-800 GPIB Message Interface Definitions
Table 2 (Cont.)

(1) GPIB Transactions

Two examples of GPIB transactions showing the ASCII Character String to be transmitted followed by the necessary BUS operations to complete the transactions are shown below. These examples were generated and executed using a GPIB controller that uses an ANSI Standard Basic Interpreter with enhancements allowing direct communication over GPIB using special GPIB interface hardware. In the examples, the ASCII Character String to be transmitted is shown first, followed by the bus operations required to complete the transaction.

(a) Example #1 - Instruct the MLS-800 to set the Channel to 699.

1 ASCII String: "CHNL = 699" (Followed by carriage return and line feed.)

2 BUS Transaction: UNT, UNL, MTA, DAB "C", DAB "H", DAB "N", DAB "L", DAB "=", DAB "6", DAB "9", DAB "9", DAB CR, DAB LF.

(b) Example #2 - Instruct the MLS-800 to return the RF Level which is -100dB.

1 ASCII String: "RFLVL?"

2 BUS Transaction:

a Output Cycle - UNT, UNL, MLA, MTA, DAB "R", DAB "F", DAB "L", DAB "V", DAB "L", DAB "?", DAB CR, DAB LF.

b Input Cycle - UNT, UNL, MLA, MTA, DAB "-", DAB "1", DAB "Ø", DAB "Ø", DAB CR, DAB LF.

(2) Status and Service Request Transactions

The MLS-800 has the capability to trigger a service request, based on one to six trigger conditions which can be set by the user with the "SRQ=" command. After the MLS-800 is placed in remote operation mode, it may be interrogated for the one byte status information. If an internal error or status condition becomes true and the matching trigger bit of the SRQ trigger byte has been set, Bit 6 will also be set. Bit 6 is generally used as the service request bit, signaling the GPIB controller that the MLS-800 desires servicing. For an explanation of the other bits returned through Serial Poll, refer to Table 3.

STATUS BIT NO.	STATE	DEFINITION
Ø	Ø = Local 1 = Remote	Local/Remote Status
1	Not Defined	Not Defined
2	Ø = No Error 1 = Error	System Error Status
3	Ø = No Error 1 = Error	429 Comm Error Status
4	Not Defined	Not Defined
5	Not Defined	Not Defined
6	Ø = Not Triggered 1 = Triggered	SRQ Trigger Status
7	Not Defined	Not Defined

Table 3 Status Bit Definition

For a description of the System Error Status, the GPIB command "ERRM?" can be executed. The Warning or Error message is cleared when "ERRM?" is executed. The 429 Comm Error Status information is returned by the "STAT429?" Command.

F. Command and Data Structure

All MLS-800 functional commands and data information are transferred over the GPIB as uppercase ASCII Alphanumeric Character Strings and are designed to replace the front panel controls.

(1) ASCII Output Commands to the MLS-800

All input commands sent to the MLS-800 are placed on an Internal Stack that will accommodate up to 128 bytes of data. Command Strings may be packed together, but the individual commands must be separated by delimiters. The delimiters are:

ASCII COLON ":" or SLASH "/"

ASCII PERIOD "."

ASCII QUESTION MARK "?"

NOTE: The Colon (":") or Slash ("/") are general delimiters and may be used after the Period or Question Mark. Care must be exercised in using the Period or Question Mark at the end of a command as they may change the interpretation of that command. Upon receipt of the Slash ("/"), the command preceding will be executed immediately.

(a) When the MLS is the assigned listener, the following ASCII Characters will terminate the output command or series of commands:

ASCII Carriage Return (ØD) - CR

ASCII Line Feed (ØA) - LF

NULL Character (Ø) - NL

(b) When the MLS-800 is the assigned talker, the EOI line will be set when the specified termination sequence is sent.

NOTE: The command "TERM = XXXX" specifies the termination sequence.

(2) ASCII Output Command Data Format

All spaces will be ignored. Below are some examples of commands which are valid.

Example #1: "MODE = NORMAZ: MODE?"

Example #2: "UPDATE?"

Example #3: "RFLVL = -1ØØ:"

NOTE: If no CR, LF, NULL, GET, SLASH or EOI is included, then the line may be continued and the commands will not be executed until one of above is received.

Maximum command string length including spaces and delimiters is 128 characters. If the command string exceeds 128 characters, everything up to the most recent delimiter will be accepted and the rest ignored. Commands ending with an ASCII Question Mark ("?") would normally require the operator to input using an ASCII String input command after issuing the output command.

Example #1:

Command : "CHNL?UPDATE?RID=ON:RFLVL"

Response: "699:1ØØ:RFLVL = 1ØØ?"

The above commands set the Reply Identifier Flag which caused the command label following "RID=ON" to be attached to the response.

(3) Return Data Format

The returned data format convention is similar to the Output Command Data Format in that all returns will be packed together and separated by ASCII Colon (":") delimiters. The number of responses returned is determined by the number of commands transferred in one block. If the number of responses required causes the internal response buffer to overflow by being larger than 128 bytes, then only the responses up to the most recent delimiter will be returned. For an example of a response, refer to ASCII Output Command Data Format.

Data inputs that are out of specific range will generally default to the minimum values, maximum values, or previous values.

(4) Command Groups

The command mnemonics used in the MLS-800 are longer than normally seen in GPIB controlled equipment. This process is used to give the unfamiliar programmer a clear understanding of the functions they will be executing. Because the possibility exists that the long transmission time required for these commands could seriously impede overall ATE systems performance, three command group buffers and associated commands: "CGX=", "CGX?", and "CGX." have been included (X=1, 2 or 3). These groups will allow the programmer to input up to 124 characters (128-"CGX=") to one of three command buffers for later execution by the "CGX." command. The "CGX." commands may be stacked as long as not more than one "CGX." command is included at the end of another "CGX=" input. As soon as the command input interpreter sees the "CGX." command, it will immediately append that command group buffer to the input buffer and proceed with normal command interpretation and execution. An example of the proper usage of command buffer stacking would be:

Example #1 Command Buffer Stacking:

"CG1=RID=ON:CHNL?"

"CG2=CHNL?CG1."

"CG3=UPDATE?CG2."

Executing a "CG3." command will return:

100:699:CHNL=699

NOTE: Do not use the same numbers (1, 2 or 3) in commands ("CG1", 2 or 3) within the same command group, e.g. "CG1 = XXX... CG1....". This will cause a system failure.

(5) Reply Identifier

When the Reply Identifier is activated by the command "RID=ON", the returned information for data or status requests will be preceeded by the command nmemonic and an "=" character. This will continue until the command "RID=OFF" is given or the MLS-800 power is cycled. This feature is especially useful for data returned from a series of commands.

G. MLS-800 Instruction Set

The following paragraphs define the ASCII Commands used to control the MLS-800 under GPIB operation. The commands are grouped under paragraph headings according to the applicable function of each command.

Qualifiers for each command are used throughout the following paragraphs and are defined as follows:

An "=" represents a "set" operation for that command.
A "?" represents a "get" operation for that command.
A "." represents an "enable" operation for that command.

Data listed under the range column reflects input/output data of the MLS-800. Data shown in parentheses is input data, that not enclosed in parentheses is output data, and a dash is used for commands having no input/output data.

(1) Menu Functions

COMMAND	RANGE	DEFINITION
CHNL=	5ØØ to 699	Set MLS channel number.
CHNL?	(5ØØ to 699)	Get current status of channel number.
RFLVL=	-17 to -122 dBm	Set RF power output level.
RFLVL?	(-17 to -122 dBm)	Get current status of RF power setting.
MODE=	NORMAZ/HIGHAZ	Set mode of operation.
MODE?	(NORMAZ/HIGHAZ)	Get current status of operation mode.
PPAR=	OO/OE/EO/EE	Set preamble parity bits (Even/Odd) for the Sync word/beam.
PPAR?	(OO/OE/EO/EE)	Get current status of preamble parity bits.

COMMAND	RANGE	DEFINITION
FADE=	OFF/Ø.Ø5/1/1ØØØ Hz	Set Fade Rate.
FADE?	(OFF/Ø.Ø5/1/1ØØØ Hz)	Get current status of Fade Rate.
6.75=	ON/OFF	Set 6.75 Hz.
6.75?	(ON/OFF)	Get current status of 6.75 Hz.
PROP=	OFF/Ø to 199 Hz	Set Prop Mod.
PROP?	(OFF/Ø to 199 Hz)	Get current status of Prop Mod.
UPDATE=	Ø/25/45/ 55/75/1ØØ%	Set Update rate in percent of transmissions for the Sync word/beam.
UPDATE?	(Ø/25/45/ 55/75/1ØØ%)	Get current status of Update rate.
SYMM=	-6Ø to +6Ø	Forces an offset of the Sync word/beam for MLS testing.
SYMM?	(-6Ø to +6Ø)	Get current status of off-set of Sync word/beam.
AZRAT=	Ø/-75 dB	Set Azimuth beam ratio.
AZRAT?	(Ø/-75 dB)	Get current status of Azimuth ratio.
AZ429?	(-62.ØØØ to +62.ØØØ Deg. or "-------")	Returns ARINC 429 Azimuth data in Ø.ØØ5 Degree steps, or 7 ASCII dashes if no data.
EL429?	(-1.5ØØ to +29.5ØØ Deg. or "-------")	Returns ARINC 429 Elevation data in Ø.ØØ5 Degree steps.
FL429?	(-2.ØØØ to +29.5ØØ Deg. or "-------")	Returns ARINC 429 Flare data in Ø.ØØ5 Degree steps.
BAZ429?	(-41.ØØØ to +41.ØØØ Deg. or "-------")	Returns ARINC 429 Back Azimuth data in Ø.ØØ5 Degree steps.

COMMAND	RANGE	DEFINITION
STAT429?	(OE/ON/OFF)	Returns status of Flag in 429 Mod.
PFE?	-1 to +1 possible in Ø.ØØ1° steps, or --------- if value is greater than ±1 or nothing in Sync.	Returns value of measured Path Following Error in .ØØ1 Degree Steps or 7 ASCII dashes if no data or nothing in Sync. NOTE: Requires some angle function, i.e., AZ, EL, BAZ, FL to be placed in Sync.
CMN?	-1 to +1°possible in Ø.ØØ1 steps, or --------- if value is greater than ±1 or nothing in Sync.	Returns value of Control Motion Noise in .ØØ1 Degree Steps or 7 ASCII dashes if no data or nothing in Sync. NOTE: Requires some angle function, i.e., AZ, EL, BAZ, FL to be placed in Sync.
SDI?	(ØØ to 11 Binary or "--")	Returns status of bits 10 and 9 of 429 word or two ASCII dashes if no data or nothing in Sync.
SSM?	(ØØ to 11 Binary or "--")	Returns status of bits 31 and 30 of 429 word or two ASCII dashes if no data or nothing in Sync.
PAD?	(ØØ to 11 Binary or "--")	Returns status of bits 12 and 11 of 429 word or two ASCII dashes if no data or nothing in Sync.
AZ=	ON/OFF; -62.ØØ to +62.ØØ (Deg.); -3 to +13 (dB Preamble); NORM/ HALF; Ø.5/1/2/3/4/5 (Deg.)	Set Azimuth beam conditions.
AZ?	(Same as for "AZ")	Get current status of Azimuth Beam.

COMMAND	RANGE	DEFINITION
EL=	ON/OFF; -1.5Ø to 29.5Ø (Deg.); -3 to +13 (dB); NORM/ HALF; Ø.5/1/2/3/4/5 (Deg.)	Set Elevation Beam conditions.
EL?	(Same as for "EL=")	Get current status of Elevation Beam.
FL=	ON/OFF; -2.ØØ to +1Ø.ØØ (Deg.); -3 to +13 (dB); NORM/ HALF; Ø.5/1/2/3/4/5 (Deg.)	Set Flare Beam conditions.
FL?	(Same as for "FL=")	Get current status of Flare Beam.
BAZ=	ON/OFF; -41.ØØ to +41.ØØ (Deg.); -3 to +13 (dB); NORM/ HALF; Ø.5/1/2/3/4/5 (Deg.)	Set Back Azimuth Beam conditions.
BAZ?	(Same as for "BAZ=")	Get current status of Back Azimuth Beam.
MP=	ON/OFF; -62.ØØ to +62.ØØ (Deg.); -14 to +13 (dB); NORM/ HALF/CLEAR; 0.5/1/ 2/3/4/5 (Deg/); -3 to +13 (left dB); -3 to +13 (right dB); Ø to 62.ØØ (Deg.).	Set Multipath conditions (last three fields apply only to Clearance).
MP?	(Same as for "MP=")	Get current status of Multipath Beam.
SYNCAZ.	----	Enable Sync on Azimuth Beam.
SYNCEL.	----	Enable Sync on Elevation Beam.
SYNCFL.	----	Enable Sync on Flare Beam.
SYNCBAZ.	----	Enable Sync on Back Azimuth Beam.

COMMAND	RANGE	DEFINITION
SYNCDAT1.	----	Enable Sync on Data #1
SYNCDAT2.	----	Enable Sync on Data #2
SYNCDAT3.	----	Enable Sync on Data #3
SYNCDAT4.	----	Enable Sync on Data #4
SYNCDAT5.	----	Enable Sync on Data #5
SYNCDAT6.	----	Enable Sync on Data #6
SYNCDAT7.	----	Enable Sync on Data #7 NOTE: Applicable in ICAO 1981 Mode Only.
SYNCDAT8.	----	Enable Sync on Data #8 NOTE: Applicable in ICAO 1981 Mode Only.
SYNCDATA.	----	Enable Sync on Data AUX NOTE: Applicable in ICAO 1981 Mode Only.
SYNCOFF.	----	Turn Sync off.
SYNC?	(AZ/EL/BAZ/FL/ DATA#1,DATA#2, DATA#3,DATA#4, DATA#5,DATA#6, DATA#7,DATA#8, DATA#8,DATAAUX)	Get current status of Sync.
AZOCIRT=	-4 to +7 dB Preamable	Set right Out-of-Coverage Indicator Beam for Azimuth.
AZOCIRT?	(-4 to +7 dB Preamble)	Get current status of right Out-of-Coverage Indicator Beam for Azimuth.
BAZOCIRT=	-4 to +7 dB Preamble	Set right Out-of-Coverage Indicator Beam for Back Azimuth.
BAZOCIRT?	(-4 to +7 dB Preamble)	Get current status of right Out-of-Coverage Indicator Beam for Back Azimuth.

COMMAND	RANGE	DEFINITION
AZOCILT=	-4 to +7 dB Preamble	Set left Out-of-Coverage Indicator Beam for Azimuth.
AZOCILT?	(-4 to +7 dB Preamble)	Get current status of left Out-of-Coverage Indicator Beam for Azimuth.
BAZOCILT=	-4 to +7 dB Preamble	Set left Out-of-Coverage Indicator Beam for Back Azimuth.
BAZOCITL?	(-4 to +7 dB Preamble)	Get current status of left Out-of-Coverage Indicator Beam for Back Azimuth.
AZOCIRR=	-4 to +7 dB Preamble	Set rear Out-of-Coverage Indicator Beam for Azimuth.
BAZOCIRR=	-4 to +7 dB Preamble	Set rear Out-of-Coverage Indicator Beam for Back Azimuth.
ELOCIRR=	-4 to +7 dB Preamble	Set rear Out-of-Coverage Indicator Beam for Elevation.
AZOCIRR?	(-4 to +7 dB Preamble)	Get current status of rear Out-of-Coverage Indicator Beam for Azimuth.
BAZOCIRR?	(-4 to +7 dB Preamble)	Get current status of rear Out-of-Coverage Indicator Beam for Back Azimuth.
ELOCIRR?	(-4 to +7 dB Preamble)	Get current status of rear Out-of-Coverage Indicator Beam for Elevation.
IDENT=	ON/OFF/CONT	Set Ident Tone to an active/inactive/continuous tone state.
IDENT?	(ON/OFF/CONT)	Get current status of Ident Tone.

ICAO 1981 DEFINITION SECTION----------

COMMAND	RANGE	DEFINITION
DW1=		Set Data Word #1
	ON/OFF;	a. Enable Switch
	Ø to 63ØØ;	b. Approach Azimuth to Threshold Distance, LSB = 100m
	-1Ø to -62;	c. Approach Azimuth Proportional Coverage (Negative Limit), LSB = 2°
	+1Ø to +62;	d. Approach Azimuth Proportional Coverage (Positive Limit), LSB = 2°
	Ø/1;	e. Spare - (One bit)
	Ø/1;	f. Clear - (One bit)
	OO/OE/EO/EE	g. Parity - Odd or Even
DW1?	(Same as for "DW1=")	Get current status of Data Word #1.
DW2=		Set Data Word #2
	ON/OFF;	a. Enable Switch
	YES/NO;	b. Back Azimuth Next - Yes or No
	2.Ø to 8.3;	c. Min Glide Path - 2.0° to 8.3°, LSB = 0.1°
	Ø to 3;	d. Ground Equipment Status (Two bits)
	Ø to 3;	e. DME Status - (Two bits)
	Ø to 127;	f. Spare - (Seven bits)
	OO/OE/EO/EE	g. Parity - Odd or Even
DW2?	(Same as for "DW2=")	Get current status of Data Word #2.

COMMAND	RANGE	DEFINITION
DW3=		Set Data Word #3
	ON/OFF;	a. Enable Switch
	Ø.5 to 4.Ø	b. Approach Azimuth Beamwidth, LSB = 0.5°
	Ø.5 to 2.5	c. Approach Elevation Beamwidth, LSB = 0.5°
	Ø.5 to 1.Ø	d. Flare Elevation Beamwidth, LSB = 0.25°
		Approach Azimuth Sector Guidance Alert.
	1 to 8	e. Azimuth Sector: -60° to -20°, LSB = 1°
	1 to 4	f. Azimuth Sector: -20° to -5°, LSB = 1°
	1 to 4	g. Azimuth Sector: +5° to +20°, LSB = 1°
	1 to 8	h. Azimuth Sector: +20° to +60°, LSB = 1°
	OO/OE/EO/EE	i. Parity - Odd or Even
DW3?	(Same as for "DW3=")	Get current status of Data Word #3.
DW4=		Set Data Word #4
	ON/OFF;	a. Enable Switch
	-8188 to 8188;	b. DME Distance, LSB = 4m
	-155 to +155;	c. DME Offset, LSB = 5m
	OO/OE/EO/EE	d. Parity - Odd or Even
DW4?	(Same as for "DW4=")	Get current status of Data Word #4.
DW5=		Set Data Word #5.
	ON/OFF;	a. Enable Switch
	-126 to +126;	b. Approach Azimuth Antenna Offset, LSB = 2m
	YES/NO;	c. DME/DME-P - Yes or No
	Ø to 511 (Binary);	d. DME Channel - (Nine bits)
	Ø/1;	e. Spare - (One bit)
	OO/OE/EO/EE	f. Parity - Odd or Even

COMMAND	RANGE	DEFINITION
DW5?	(Same as for "DW5=")	Get current status of Data Word #5.
DW6=	ON/OFF; OO/OE/EO/EE	Set Data Word #6. a. Enable Switch b. Parity - Odd or Even
DW6?	(Same as for "DW6=")	Get current status of Data Word #6.
DW7=	ON/OFF; Ø to 3; Ø to 31ØØ; -1Ø to -4Ø; +1Ø to +4Ø; 1 to 4; Ø/1; OO/OE/EO/EE	Set Data Word #7. a. Enable Switch b. Ground Equipment Performance Level (Two Bits) c. Back Azimuth Antenna Distance, LSB = 100m d. Back Azimuth Proportional Coverage Limit (Negative), LSB = 2° e. Back Azimuth Proportional Coverage Limit (Positive), LSB = 2° f. Back Azimuth Beamwidth, LSB = 1° g. Spare - (One Bit) h. Parity - Odd or Even
DW7?	(Same as for "DW7=")	Get current status of Data Word #7.
DW8=	ON/OFF; -1 to +6.2; -15Ø to +15Ø; Ø to 635 OO/OE/EO/EE	Set Data Word #8 a. Enable Switch b. Elevation Antenna Height, LSB = 0.2m c. Elevation Antenna Offset, LSB = 10m d. MLS Datum point to Threshold Distance, LSB = 5m e. Parity - Odd or Even
DW8?	(Same as for "DW8=")	Get current status of Data Word #8.

COMMAND	RANGE	DEFINITION
DWA=	ON/OFF; Ø to 377 (Octal); Ø to 17 (Octal); Ø to 377 (Octal); Ø to 377 (Octal); Ø to 377 (Octal); Ø to 377 (Octal); Ø to 377 (Octal); 0000 to EEEE	Set The Auxiliary Data Word. a. Enable Switch b. Address Transmission (Eight Bits) c. Data Transmission (First Four Bits of 52 Bits) d. Data Transmission (Second Part - Eight Bits) e. Data Transmission (Third Part - Eight Bits) f. Data Transmission (Fourth Part - Eight Bits) g. Data Transmission (Fifth Part - Eight Bits) h. Data Transmission (Sixth Part - Eight Bits) i. Data Transmission (Seventh Part - Eight Bits) j. Parity - Four Bits Odd or Even.
DWA?	(Same as for "DWA=")	Get current status of Auxiliary Data Word.
ICAO 1985 DEFINITION SECTION----------		
ICAO1985.	----------	Run in 1985 ICAO mode.
ICAO1981.	----------	Run in 1981 ICAO mode.
ICAO?	(1985/1981)	Return current ICAO mode.
SYNCAD1.	----------	Sync on Aux Data #1 in 1985 ICAO.
SYNCAD2.	----------	Sync on Aux Data #2 in 1985 ICAO.
SYNCAD3.	----------	Sync on Aux Data #3 in 1985 ICAO.
SYNCAD4.	----------	Sync on Aux Data #4 in 1985 ICAO.

COMMAND	RANGE	DEFINITION
SYNC?	DATA#1,DATA#2, DATA#3,DATA#4, DATA#5,DATA#6, AD1,AD2,AD3,AD4	Gets current status of Sync.
DW1=	 ON/OFF; Ø to 63ØØ; Ø to 62; Ø to 62; Ø/1; Ø/1; OO/OE/EO/EE	Set Data Word #1 in 1985 ICAO. a. Enable switch b. Approach Azimuth to Threshold Distance, LSB = 100m c. Approach Azimuth proportional coverage negative limit, LSB = 2° d. Approach Azimuth proportional coverage positive limit, LSB = 2° e. Clearance signal type f. Spare (One Bit) g. Parity - One Odd or Even
DW1?	(Same as "DW1=")	Get current status of Data Word #1.
DW2=	 ON/OFF; 2 to 14.7; Ø/1; Ø to 3; Ø/1; Ø/1; Ø to 63; OO/OE/EO/EE	Set Data Word #2 in 1985 ICAO. a. Enable switch. b. Minimum glidepath, LSB = 0.1° c. Back Azimuth status d. DME status e. Approach Azimuth status f. Approach Elevation status g. Spare (Six Bits) h. Parity - Odd or Even
DW2?	(Same as "DW2=")	Get current status of Data Word #2.
DW3=	 ON/OFF; Ø.5 to 4.Ø; Ø.5 to 2.5; Ø to 6387.5; Ø to 7; OO/OE/EO/EE	Set Data Word #3 in 1985 ICAO. a. Enable switch b. Approach Azimuth beamwidth LSB = 0.5° c. Approach Elevation beamwidth LSB = 0.5° d. DME distance LSB = 12.5m e. Spare (Three bits) f. Parity - Odd or Even

COMMAND	RANGE	DEFINITION
DW3?	(Same as "DW3=")	Get current status of Data Word #3.
DW4=	ON/OFF; Ø to 359; Ø to 359; 00/0E/E0/EE	Set Data Word #4 in 1985 ICAO. a. Enable switch b. Approach Azimuth zero-degree guidance plane, LSB = 1° c. Back Azimuth zero-degree guidance plane, LSB = 1° d. Parity - Odd or Even
DW4?	(Same as "DW4=")	Get current status of Data Word #4.
DW5=	ON/OFF; Ø to 42; Ø to 42; Ø.5 to 4.Ø; Ø to 31; 00/0E/E0/EE	Set Data Word #5 in 1985 ICAO. a. Enable switch b. Back Azimuth proportional coverage negative limit, LSB = 2° c. Back Azimuth proportional coverage positive limit, LSB = 2° d. Back Azimuth beamwidth LSB = 0.5° e. Spare (Five bits) f. Parity - Odd or Even
DW5?	(Same as "DW5=")	Get current status of Data Word #5.
DW6=	ON/OFF; 00/0E/E0/EE	Set Data Word #6 in 1985 ICAO. a. Enable switch b. Parity - Odd or Even
DW6?	(Same as "DW6=")	Get current status of Data Word #6.
ADX=	ON/OFF; A/B/C/A1/A2/A3/A4; DATA.....; 0000000 to EEEEEEE	Set aux data word for 1985 ICAO. Up to four aux data words may be sent where X is 1 to 4. a. Enable switch b. Data type (Note 1) c. Data (Note 2) d. Parity - Odd or Even

COMMAND	RANGE	DEFINITION

Note 1: Type may be A,B,C,A1,A2,A3,A4 and determines the type of data sent.

Note 2: If type A, B or C, data is transmitted as follows:

	Ø to 377 (Octal);	a. address
	Ø to 377 (Octal);	b. data-1
	Ø to 377 (Octal);	c. data-2
	Ø to 377 (Octal);	d. data-3
	Ø to 377 (Octal);	e. data-4
	Ø to 377 (Octal);	f. data-5
	Ø to 377 (Octal);	g. data-6
	Ø to 1 (Octal);	h. data-7

(2) Additional Auxiliary Types

Type A1:	-511 to 511;	a. Approach Azimuth antenna offset, LSB = 1m
	Ø to 8191;	b. Approach Azimuth to MLS datum point distance, LSB = 1m
	-2Ø.47 to 2Ø.47;	c. Approach Azimuth antenna alignment with runway center line, LSB = 0.01°
	Ø/1;	d. Approach Azimuth antenna coordinate system
	Ø to 377;	e. Spare (Eight Bits - Octal)
	Ø to 37;	f. Spare (Five Bits - Octal)
	0000000 to EEEEEEE	g. Parity - Odd or Even
Type A2:	-511 to 511;	a. Approach Elevation antenna offset, LSB = 1m
	Ø to 1Ø23;	b. MLS datum point to LSB = 1m
	-6.3 to 6.3;	c. Approach Elevation antenna height, LSB = 0.1m
	Ø to 377;	d. Spare (Eight Bits - Octal)
	Ø to 377;	e. Spare (Eight Bits - Octal)
	Ø to 77;	f. Spare (Six Bits - Octal)
	0000000 to EEEEEEE	g. Parity - Odd or Even

COMMAND	RANGE	DEFINITION
Type A3:	-511 to 511; -8191 to 8191; Ø to 377; Ø to 377; Ø to 377; Ø to 1; 0000000 to EEEEEEE	a. DME offset LSB = 1m b. DME to MLS datum point distance, LSB = 1m c. Spare (Eight Bits - Octal) d. Spare (Eight Bits - Octal) e. Spare (Eight Bits - Octal) f. Spare (One Bit - Octal) g. Parity - Odd or Even
Type A4:	-511 to 511; Ø to 2Ø47; -2Ø.47 to 2Ø.47; Ø to 377; Ø to 377; 0000000 to EEEEEEE	a. Back Azimuth antenna offset, LSB = 1m b. Back Azimuth to MLS datum point distance, LSB = 1m c. Back Azimuth antenna alignment with runway center line, LSB = 0.01° d. Spare (Eight Bits - Octal) e. Spare (Eight Bits - Octal) f. Parity - Odd or Even
ADX?	(Same as ADX=)	Get current status of 1985 Auxiliary Data Words.

(3) Keyboard Functions not Included in the Menu Functions

RECALL(nn).	----	Recall a menu from MLS memory (nn = 1 to 12).
SAVE(nn)=	Only printable ASCII letters.	Store a menu into MLS Memory (nn = 1 to 12 with an optional 8 character label).
SAVE(nn)?	Max. 8 ASCII letters or spaces.	Returns label for Saved Menu.
WPROT(nn).	----	Apply write protection to stored menu (nn = 1 to 12).
PURGE(nn.)	----	Erase the stored menu.

(4) Special Functions

COMMAND	RANGE	DEFINITION
CG1=	ASCII Char.;...; ASCII Char.	Store up to 128 characters (MLS-800 GPIB Commands) for later execution by the "CG1." Command.
CG1?	(Same as for "CG1=")	Returns current status of CG1.
CG1.	----	Execute series of commands stored in the CG1 internal buffer.
CG2=	ASCII Char.;...; ASCII Char.	Store up to 128 ASCII Characters (MLS-800 GPIB Commands) for later execution by the "CG2." Command.
CG2?	(Same as for "CG2=")	Returns current status of CG2.
CG2.		Execute series of commands stored in the CG2 internal buffer.
CG3=	ASCII Char.;...; ASCII Char.	Store up to 128 ASCII Characters (MLS-800 GPIB Commands) for later execution by the "CG3." Command.
CG3?		Returns current status of CG3.
CG3.		Execute series of commands stored in the CG3 internal buffer.
RID=	ON/OFF	Controls the Reply Identifier Switch. When ON, will add the command name followed by "=" as a prefix to a command's response.
RID?	(ON/OFF)	Returns current status of RID.

<table>
<tr><th>COMMAND</th><th>RANGE</th><th>DEFINITION</th></tr>
<tr><td>TERM=</td><td>1 (CRLF)/2 (LFCR)/
3 (CRCR)/4 (LFLF)</td><td>This command allows the operator to specify the desired terminator for the end-of-string output of the MLS-800 GPIB.
CR = Carriage Return
LF = Line Feed</td></tr>
<tr><td>TERM?</td><td>(Same as for "TERM=")</td><td>Returns current status of TERM.</td></tr>
<tr><td>SRQ=</td><td>ØØØØØØØ to 1111111 (Binary)</td><td>Set the GPIB SRQ line interrupt mask. An SRQ interrupt will occur for each error or status condition that occurs whose status bit has been set (1). The error/status conditions are:
<table>
<tr><th>BIT/S</th><th>STATE</th><th>CONDITION</th></tr>
<tr><td>0</td><td>0 = Local</td><td>Local/ Remote Status</td></tr>
<tr><td>1</td><td>Not Defined</td><td></td></tr>
<tr><td>2</td><td>0 = No Error
1 = Error</td><td>System Error Status</td></tr>
<tr><td>3</td><td>0 = No Error
1 = Error</td><td>429 Comm Error Status</td></tr>
<tr><td>4</td><td>Not Defined</td><td></td></tr>
<tr><td>5</td><td>Not Defined</td><td></td></tr>
<tr><td>6</td><td>0 = Not Triggered
1 = Trig-gered</td><td>SRQ Trigger Status</td></tr>
<tr><td>7</td><td>Not Defined</td><td></td></tr>
</table></td></tr>
</table>

COMMAND	RANGE	DEFINITION
SRQ?	(ØØØØØØØ to 1111111 (Binary))	Returns current status of SRQ.
ERRM?	Return system error warning message or "No Warning".	1. DATA OUT OF RANGE. 2. INVALID COMMAND. 3. THE FUNCTION IN SYNC IS OFF. 4. MAIN BEAM BOARD INACTIVE. 5. MULTIPATH BEAM BOARD INACTIVE. 6. INVALID PAGE NUMBER. 7. PAGE IS WRITE PROTECTED. 8. PAGE IS EMPTY.

NOTE: This Warning or Error message is cleared when this command is executed.

SECTION 3 - SPECIFICATIONS

1. Following are the specifications for the MLS-800 Microwave Landing System Test Set:

   A. RF Signal Generator

Frequency Range:	5031-5090.7 MHz in 0.3 MHz steps
Frequency Accuracy:	±2 kHz
RF Output Power:	-17 dBm to -122 dBm (±2 dB) preamble level
Modulation:	AM and DPSK
	A DPSK "zero" is represented by 0° (±10°) phase shift and a DPSK "one" is represented by 180° (±10°) phase shift.

   B. Functions

Azimuth:	±62° in 0.05° steps, ±0.005° accuracy (See Note 1).
High Rate Azimuth:	±42° in 0.05° steps, ±0.005° accuracy (See Note 1).
Elevation:	-1.5° to +29.5° in .05° steps ±0.005° accuracy (See Note 1).
Flare:	-2° to +10° in 0.05° steps ±0.005° accuracy (See Note 1).
Back Azimuth:	±41° in 0.05° steps, ±0.005° accuracy (See Note 1).
Basic Data:	All functions selectable on menu with selectable parity error
Auxiliary Data:	All auxiliary data words selectable.

C. Mainpath Beam

Beam Shape:	Approximately sinx/x and ½ sinx/x waveforms with -20 dBc side lobes at ½ width that fills time slot.
Beam Width:	0.5, 1, 2, 3, 4, 5, degrees (±10%) width. (See Note 1).
Level:	Adjustable relative to preamble, +13 to -3 dB (±1 dB) in 1 dB steps. (See Note 2).

D. OCI Pulses (Right, Left, Rear)

Width:	100 µs, ±10 µs
Level:	+7 to -4 dB (±1 dB) relative to preamble in 1 dB steps.

E. Multipath Beam

Angle:	Selectable in 0.05° steps with ±0.05° accuracy and to the maximum angle available for the particular function (azimuth, elevation, etc.).
Beam Shapes:	Approximately sinx/x, ½ sinx/x waveforms on all functions and clearance pulse pairs on AZ, Hi Rate AZ and BAZ.
Beam Width:	0.5, 1, 2, 3, 4, 5 degrees (±10%) width. (See Note 1).
Level:	+13 dB to -14 dB (±1 dB) relative to preamble in 1 dB steps; when clearance is selected, each pulse is individually selectable in amplitude. (See Note 2).
Fade Rate:	Selectable as 0.05 Hz, 1 Hz, or 1000 Hz.

Clearance Pulse:	Two pulses, spaced equidistant from 0° and selectable in 0.05° steps with ±0.05° accuracy. Each pulse is 50 µs (±5 µs) wide. The Amplitudes are selectable from +13 to -3 dB (±1 dB) relative to preamble, in 1 dB steps for left and right clearance pulses with angular displacement related to function in Sync. (NORM, Hi Rate and BAZ functions only.) Angular range is ±1° to ±61° for Normal Azimuth and ±41° for High Rate Azimuth and Back Azimuth.

F. Azimuth To Elevation Ratio

Selection:	Selectable so Azimuth to Elevation Ratio is 0 dB or -75 dB (±2 dB).

G. Propeller Modulation

Frequency:	Variable 1 Hz to 199 Hz in 1 Hz steps.
Duty Cycle:	-12 dBc (±1 dB) is applied for 15% (±1%) of cycle.
Timing:	Not in Sync with any function.

H. 6.75 Hz Modulation

Selection:	Selectable ±6 dBc (±1 dB) square wave modulation to the main path beam. Not in Sync with any function.

I. Morse Code

Selection:	Off, "IFR" or Continuous Tone

J. Oscilloscope Sync

Selection:	Selectable to coincide with the start of the preamble of Azimuth, Elevation, Flare, Back Azimuth, basic or auxiliary Data Words.
Amplitude:	Positive TTL pulse approximately 14 µs wide.

K. Function Update Rate

Selection: The function in Sync is reduced in repetition rate, selectable as 100%, 75%, 55%, 45%, 25%, or 0%, (±2.5%) measured over a ten-second interval. The 100% update rate is as follows:

Function	Average Rate Over 10 Seconds
AZ	13 ±0.5 Hz
High Rate AZ	39 ±1.5 Hz
BAZ	6.5 ±0.25 Hz
EL	39 ±1.5 Hz

L. Function Preamble Parity

Selection: The function identified by the oscilloscope Sync selection is the candidate to have its preamble function code parity bits individually inverted to provide parity error.

M. Scanning Beam Time Symmetry

Selection: -60 to +60 in 1 µs steps; variable scanning beam offset referenced to the preamble Receiver Time Reference Code (active on same function as is selected by Sync).

N. System Clock

Selection: 8.0 MHz, ±80 Hz

O. External Reference Input

Selection: Variable 9.999940 MHz to 10.000060 MHz, +3 dBm Nominal.

P. ARINC 429 Data

Selection:	12.5 and 100 K BPS data rates in RZ format. Input and Output Levels are as follows: Logic "1" = +5 to +10 V Logic "0" = -5 to -10 V Rise and Fall Time is <1.5 µs.

Q. GPIB (Option)

Selection:	Conforms to IEEE-488 1978 Standard for Talker/Listener.

R. CRT

Type:	Green display
Size:	7" diagonal

S. Power

DC:	11-30 Volts, 100 Watts
AC:	103.5-266 Volts 45-440 Hz, 85 Watts
Battery:	Ten minute time-out circuit to prevent accidental discharge. Low voltage detect turns off unit prior to performance being affected. Minimum of 30 minutes total usable time before recharging, assuming full charge initially.

T. Physical Characteristics

Weight:	47 lbs.
Operating Temperature:	-10° to +55°C
Size:	12.5" Wide 9" High 19.5" Deep

U. Reference Notes

Note 1: Angular range is limited to slightly less than maximum range with a beamwidth of 0.5° according to the table below:

Function	Range
AZ	-61° to +61°
EL	-1.0° to +29.5°
BAZ	-41° to +41°
FL	-2° to +10°
HI AZ	-41° to +41°

Note 2: When -17 dBm RF Level is applied, the modulation level should not exceed +10 dB relative to preamble level.

SECTION 4 - REPACKING FOR SHIPMENT

1. The following information applies to shipping and repacking procedures for the MLS-800.

   A. Shipping Information

   IFR test sets returned to factory for calibration, service or repair must be repackaged and shipped subject to the following conditions:

   (1) Do not return any products to factory without first receiving authorization from IFR Customer Service Department.

   CONTACT:

   Customer Service Dept.
   IFR, Inc.
   10200 West York Street
   Wichita, Kansas 67215

   Telephone: (800)-835-2350
   TWX: 910-741-6952

   (2) All test sets must be tagged with:

   (a) Owner's identification and address.
   (b) Nature of service or repair required.
   (c) Model No.
   (d) Serial No.

   (3) Sets must be repackaged in original shipping containers using IFR packing models. If original shipping containers and materials are not available, contact IFR Customer Service Dept. for shipping instructions.

   (4) All freight costs on non-warranty shipments are assumed by customer. (See "Warranty Packet" for freight charge policy on warranty claims.)

   B. Repacking Procedure (Refer to Figure 1)

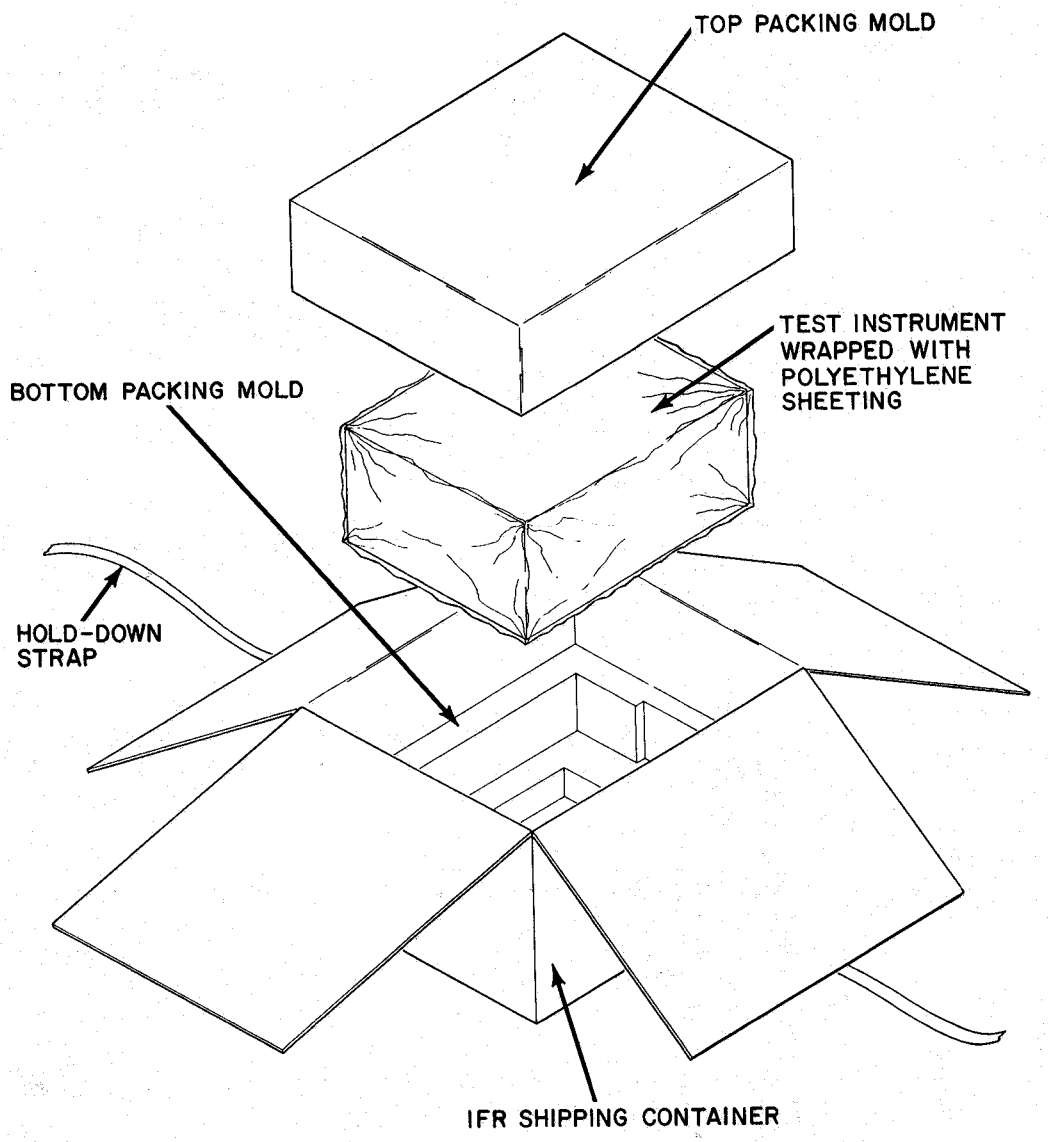
   (1) Make sure bottom packing mold is seated on floor of shipping container.

   (2) Carefully wrap test set with polyethylene sheeting to protect finish.

   (3) Place test set into shipping container, making sure set is securely seated in bottom packing mold.

(4) Place top packing mold over top of set and press down until mold rests solidly on bottom packing mold.

(5) Close shipping container lids and seal with shipping tape or an industrial stapler. Tie all sides of container with break resistant rope, twine or equivalent.



Repacking Procedure
Figure 1

SECTION 5 - STORAGE

1. Please note the following storage precautions.

   A. No particular storage requirements are necessary during extended periods in which the Test Set will not be utilized.

   B. The following common sense practices should be done, however:

      (1) Disconnect the Test Set from any electrical power source.

      (2) Disconnect and store the AC power cable and any other accessories with the Test Set.

      (3) Cover the Test Set to prevent dust and debris covering and entering the Test Set.

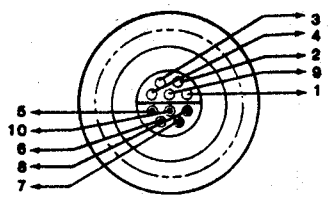
APPENDIX A: TABLE OF USER I/O PORTS/CONNECTOR PIN-OUT TABLES

1. Table of I/O Ports

CONNECTOR NAME	CONNECTOR TYPE	SIGNAL INPUT/OUTPUT	SIGNAL TYPE
RF OUT	Type N	OUTPUT	RF
ARINC 429 BUS	10-pin LEMO	INPUT/OUTPUT	See Pin Out
SYNC	BNC	OUTPUT	TTL
VIDEO	BNC	OUTPUT	Video
EXT REF	BNC	INPUT	RF
GPIB	IEEE 488/ANS1 MC1.1	INPUT/OUTPUT	See Pin Out

2. Pin Out Table for ARINC 429 BUS Connector

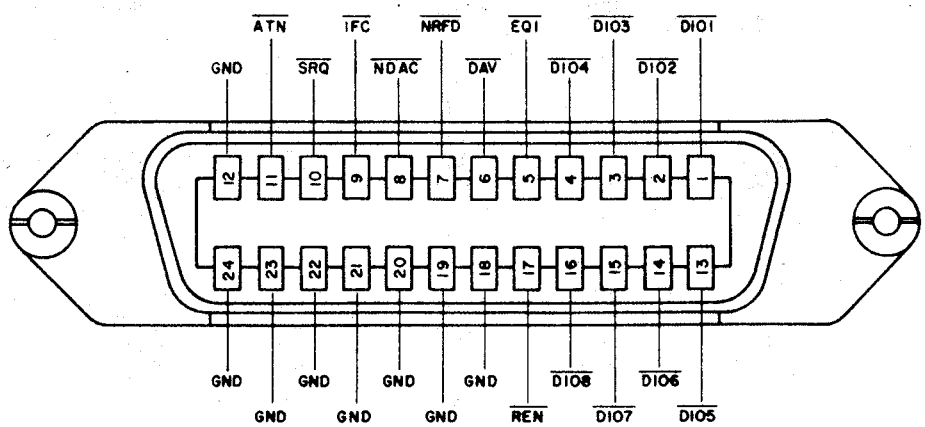
PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	TXIA LOW SPEED (12.5 K bps) 429 Transmit	RZ format	Output
2	TXIB LOW SPEED (12.5 K bps) 429 Transmit	RZ format	Output
3	GND	---------	------
4	RXIA LOW SPEED (12.5 K bps) 429 Receive	RZ format	Input
5	RXIB LOW SPEED (12.5 K bps) 429 Receive	RZ format	Input
6	TX2A HIGH SPEED (100 K bps) 429 Transmit	RZ format	Output
7	TX2B HIGH SPEED (100 K bps) 429 Transmit	RZ format	Output
8	GND	---------	------
9	RX2A HIGH SPEED (100 K bps) 429 Receive	RZ format	Input
10	RX2B HIGH SPEED (100 K bps) 429 Receive	RZ format	Input



ARINC 429 BUS Connector
Figure 1

3. Pin Out Table for GPIB Connector (Refer to Figure 1)

PIN NO	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
1	$\overline{\text{DIO1}}$	TTL	Input/Output
2	$\overline{\text{DIO2}}$	TTL	Input/Output
3	$\overline{\text{DIO3}}$	TTL	Input/Output
4	$\overline{\text{DIO4}}$	TTL	Input/Output
5	$\overline{\text{EOI}}$	TTL	Input
6	$\overline{\text{DAV}}$	TTL	Input/Output
7	$\overline{\text{NRFD}}$	TTL	Input/Output
8	$\overline{\text{NDAC}}$	TTL	Input/Output
9	$\overline{\text{IFC}}$	TTL	Input
10	$\overline{\text{SRQ}}$	TTL	Output
11	$\overline{\text{ATN}}$	TTL	Input
12	GND	---	----------
13	$\overline{\text{DIO5}}$	TTL	Input/Output
14	$\overline{\text{DIO6}}$	TTL	Input/Output
15	$\overline{\text{DIO7}}$	TTL	Input/Output
16	$\overline{\text{DIO8}}$	TTL	Input/Output
17	$\overline{\text{REN}}$	TTL	Input
18	Paired with 6	---	----------
19	Paired with 7	---	----------
20	Paired with 8	---	----------
21	Paired with 9	---	----------
22	Paired with 10	---	----------
23	Paired with 11	---	----------
24	GND	---	----------



GPIB Connector
Figure 1

APPENDIX B: MLS ANGLE, DATA AND DME/P CHANNELING CHART

1. The MLS channel pairing along with the DME parameters is listed below:

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
* 1X	-	-	-	1025	12	-	-	962	12
** 1Y	-	-	-	1025	36	-	-	1088	30
* 2X	-	-	-	1026	12	-	-	963	12
** 2Y	-	-	-	1026	36	-	-	1089	30
* 3X	-	-	-	1027	12	-	-	964	12
** 3Y	-	-	-	1027	36	-	-	1090	30
* 4X	-	-	-	1028	12	-	-	965	12
** 4Y	-	-	-	1028	36	-	-	1091	30
* 5X	-	-	-	1029	12	-	-	966	12
** 5Y	-	-	-	1029	36	-	-	1092	30
* 6X	-	-	-	1030	12	-	-	967	12
** 6Y	-	-	-	1030	36	-	-	1093	30
* 7X	-	-	-	1031	12	-	-	968	12
** 7Y	-	-	-	1031	36	-	-	1094	30
* 8X	-	-	-	1032	12	-	-	969	12
** 8Y	-	-	-	1032	36	-	-	1095	30
* 9X	-	-	-	1033	12	-	-	970	12
** 9Y	-	-	-	1033	36	-	-	1096	30
* 10X	-	-	-	1034	12	-	-	971	12
** 10Y	-	-	-	1034	36	-	-	1097	30
* 11X	-	-	-	1035	12	-	-	972	12
** 11Y	-	-	-	1035	36	-	-	1098	30
* 12X	-	-	-	1036	12	-	-	973	12
** 12Y	-	-	-	1036	36	-	-	1099	30
* 13X	-	-	-	1037	12	-	-	974	12
** 13Y	-	-	-	1037	36	-	-	1100	30
* 14X	-	-	-	1038	12	-	-	975	12
** 14Y	-	-	-	1038	36	-	-	1101	30
* 15X	-	-	-	1039	12	-	-	976	12
** 15Y	-	-	-	1039	36	-	-	1102	30
* 16X	-	-	-	1040	12	-	-	977	12
** 16Y	-	-	-	1040	36	-	-	1103	30
∇ 17X	108.00	-	-	1041	12	-	-	978	12
17Y	108.05	5043.0	540	1041	36	36	42	1104	30
17Z	-	5043.3	541	1041	-	21	27	1104	15
18X	108.10	5031.0	500	1042	12	12	18	979	12

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
18W	-	5031.3	501	1042	-	24	30	979	24
18Y	108.15	5043.6	542	1042	36	36	42	1105	30
18Z	-	5043.9	543	1042	-	21	27	1105	15
19X	108.20	-	-	1043	12	-	-	980	12
19Y	108.25	5044.2	544	1043	36	36	42	1106	30
19Z	-	5044.5	545	1043	-	21	27	1106	15
20X	108.30	5031.6	502	1044	12	12	18	981	12
20W	-	5031.9	503	1044	-	24	30	981	24
20Y	108.35	5044.8	546	1044	36	36	42	1107	30
20Z	-	5049.1	547	1044	-	21	27	1107	15
21X	108.40	-	-	1045	12	-	-	982	12
21Y	108.45	5045.4	548	1045	36	36	42	1108	30
21Z	-	5045.7	549	1045	-	21	27	1108	15
22X	108.50	5032.2	504	1046	12	12	18	983	12
22W	-	5032.5	505	1046	-	24	30	983	24
22Y	108.55	5046.0	550	1046	36	36	42	1109	30
22Z	-	5046.3	551	1046	-	21	27	1109	15
23X	108.60	-	-	1047	12	-	-	984	12
23Y	108.65	5046.6	552	1047	36	36	42	1110	30
23Z	-	5046.9	553	1047	-	21	27	1110	15
24X	108.70	5032.8	506	1048	12	12	18	985	12
24W	-	5033.1	507	1048	-	24	30	985	24
24Y	108.75	5047.2	554	1048	36	36	42	1111	30
24Z	-	5047.5	555	1048	-	21	27	1111	15
25X	108.80	-	-	1049	12	-	-	986	12
25Y	108.85	5047.8	556	1049	36	36	42	1112	30
25Z	-	5048.1	557	1049	-	21	27	1112	15
26X	108.90	5033.4	508	1050	12	12	18	987	12
26W	-	5033.7	509	1050	-	24	30	987	24
26Y	108.95	5048.4	558	1050	36	36	42	1113	30
26Z	-	5048.7	559	1050	-	21	27	1113	15
27X	109.00	-	-	1051	12	-	-	988	12
27Y	109.05	5049.0	560	1051	36	36	42	1114	30
27Z	-	5049.3	561	1051	-	21	27	1114	15
28X	109.10	5034.0	510	1052	12	12	18	989	12
28W	-	5034.3	511	1052	-	24	30	989	24
28Y	109.15	5049.6	562	1052	36	36	42	1115	30
28Z	-	5049.9	563	1052	-	21	27	1115	15
29X	109.20	-	-	1053	12	-	-	990	12
29Y	109.25	5050.2	564	1053	36	36	42	1116	30
29Z	-	5050.5	565	1053	-	21	27	1116	15
30X	109.30	5034.6	512	1054	12	12	18	991	12

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
30W	-	5034.9	513	1054	-	24	30	991	24
30Y	109.35	5050.8	566	1054	36	36	42	1117	30
30Z	-	5051.1	567	1054	-	21	27	1117	15
31X	109.40	-	-	1055	12	-	-	992	12
31Y	109.45	5051.4	568	1055	36	36	42	1118	30
31Z	-	5051.7	569	1055	-	21	27	1118	15
32X	109.50	5035.2	514	1056	12	12	18	993	12
32W	-	5035.5	515	1056	-	24	30	993	24
32Y	109.55	5052.0	570	1056	36	36	42	1119	30
32Z	-	5052.3	571	1056	-	21	27	1119	15
33X	109.60	-	-	1057	12	-	-	994	12
33Y	109.65	5052.6	572	1057	36	36	42	1120	30
33Z	-	5052.9	573	1057	-	21	27	1120	15
34X	109.70	5035.8	516	1058	12	12	18	995	12
34W	-	5036.1	517	1058	-	24	30	995	24
34Y	109.75	5053.2	574	1058	36	36	42	1121	30
34Z	-	5053.5	575	1058	-	21	27	1121	15
35X	109.80	-	-	1059	12	-	-	996	12
35Y	109.85	5053.8	576	1059	36	36	42	1122	30
35Z	-	5054.1	577	1059	-	21	27	1122	15
36X	109.90	5036.4	518	1060	12	12	18	997	12
36W	-	5036.7	519	1060	-	24	30	997	24
36Y	109.95	5054.4	578	1060	36	36	42	1123	30
36Z	-	5054.7	579	1060	-	21	27	1123	15
37X	110.00	-	-	1061	12	-	-	998	12
37Y	110.05	5055.0	580	1061	36	36	42	1124	30
37Z	-	5055.3	581	1061	-	21	27	1124	15
38X	110.10	5037.0	520	1062	12	12	18	999	12
38W	-	5037.3	521	1062	-	24	30	999	24
38Y	110.15	5055.6	582	1062	36	36	42	1125	30
38Z	-	5055.9	583	1062	-	21	27	1125	15
39X	110.20	-	-	1063	12	-	-	1000	12
39Y	110.25	5056.2	584	1063	36	36	42	1126	30
39Z	-	5056.5	585	1063	-	21	27	1126	15
40X	110.30	5037.6	522	1064	12	12	18	1001	12
40W	-	5037.9	523	1064	-	24	30	1001	24
40Y	110.35	5056.8	586	1064	36	36	42	1127	30
40Z	-	5057.1	587	1064	-	21	27	1127	15
41X	110.40	-	-	1065	12	-	-	1002	12
41Y	110.45	5057.4	588	1065	36	36	42	1128	30
41Z	-	5057.7	589	1065	-	21	27	1128	15

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
42W	-	5038.5	525	1066	-	24	30	1003	24
42Y	110.55	5058.0	590	1066	36	36	42	1129	30
42Z	-	5058.3	591	1066	-	21	27	1129	15
43X	110.60	-	-	1067	12	-	-	1004	12
43Y	110.65	5058.6	592	1067	36	36	42	1130	30
43Z	-	5058.9	593	1067	-	21	27	1130	15
44X	110.70	5038.8	526	1068	12	12	18	1005	12
44W	-	5039.1	527	1068	-	24	30	1005	24
44Y	110.75	5059.2	594	1068	36	36	42	1131	30
44Z	-	5059.5	595	1068	-	21	27	1131	15
45X	110.80	-	-	1069	12	-	-	1006	12
45Y	110.85	5059.8	596	1069	36	36	42	1132	30
45Z	-	5060.1	597	1069	-	21	27	1132	15
46X	110.90	5039.4	528	1070	12	12	18	1007	12
46W	-	5039.7	529	1070	-	24	30	1007	24
46Y	110.95	5060.4	598	1070	36	36	42	1133	30
46Z	-	5060.7	599	1070	-	21	27	1133	15
47X	111.00	-	-	1071	12	-	-	1008	12
47Y	111.05	5061.0	600	1071	36	36	42	1134	30
47Z	-	5061.3	601	1071	-	21	27	1134	15
48X	111.10	5040.0	530	1072	12	12	18	1009	12
48W	-	5040.3	531	1072	-	24	30	1009	24
48Y	111.15	5061.6	602	1072	36	36	42	1135	30
48Z	-	5061.9	603	1072	-	21	27	1135	15
49X	111.20	-	-	1073	12	-	-	1010	12
49Y	111.25	5062.2	604	1073	36	36	42	1136	30
49Z	-	5062.5	605	1073	-	21	27	1136	15
50X	111.30	5040.6	532	1074	12	12	18	1011	12
50W	-	5040.9	533	1074	-	24	30	1011	24
50Y	111.35	5062.8	606	1074	36	36	42	1137	30
50Z	-	5063.1	607	1074	-	21	27	1137	15
51X	111.40	-	-	1075	12	-	-	1012	12
51Y	111.45	5063.4	608	1075	36	36	42	1138	30
51Z	-	5063.7	609	1075	-	21	27	1138	15
52X	111.50	5041.2	534	1076	12	12	18	1013	12
52W	-	5041.5	535	1076	-	24	30	1013	24
52Y	111.55	5064.0	610	1076	36	36	42	1139	30
52Z	-	5064.3	611	1076	-	21	27	1139	15
53X	111.60	-	-	1077	12	-	-	1014	12
53Y	111.65	5064.6	612	1077	36	36	42	1140	30
53Z	-	5064.9	613	1077	-	21	27	1140	15
54X	111.70	5041.8	536	1078	12	12	18	1015	12

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
54W	-	5042.1	537	1078	-	24	30	1015	24
54Y	111.75	5065.2	614	1078	36	36	42	1141	30
54Z	-	5065.5	615	1078	-	21	27	1141	15
55X	111.80	-	-	1079	12	-	-	1016	12
55Y	111.85	5065.8	616	1079	36	36	42	1142	30
55Z	-	5066.1	617	1079	-	21	27	1142	15
56X	111.90	5042.4	538	1080	12	12	18	1017	12
56W	-	5042.7	539	1080	-	24	30	1017	24
56Y	111.95	5066.4	618	1080	36	36	42	1143	30
56Z	-	5066.7	619	1080	-	21	27	1143	15
57Z	112.00	-	-	1081	12	-	-	1018	12
57Y	112.05	-	-	1081	36	-	-	1144	30
58Y	112.10	-	-	1082	12	-	-	1019	12
58Y	112.15	-	-	1082	36	-	-	1145	30
59X	112.20	-	-	1083	12	-	-	1020	12
59Y	112.25	-	-	1083	36	-	-	1146	30
** 60X	-	-	-	1084	12	-	-	1021	12
** 60Y	-	-	-	1084	36	-	-	1147	30
** 61X	-	-	-	1085	12	-	-	1022	12
** 61Y	-	-	-	1085	36	-	-	1148	30
** 62X	-	-	-	1086	12	-	-	1023	12
** 62Y	-	-	-	1086	36	-	-	1149	30
** 63X	-	-	-	1087	12	-	-	1024	12
** 63Y	-	-	-	1087	36	-	-	1150	30
** 64X	-	-	-	1088	12	-	-	1151	12
** 64Y	-	-	-	1088	36	-	-	1025	30
** 65X	-	-	-	1089	12	-	-	1152	12
** 65Y	-	-	-	1089	36	-	-	1026	30
** 66X	-	-	-	1090	12	-	-	1153	12
** 66Y	-	-	-	1090	36	-	-	1027	30
** 67X	-	-	-	1091	12	-	-	1154	12
** 67Y	-	-	-	1091	36	-	-	1028	30
** 68X	-	-	-	1092	12	-	-	1155	12
** 68Y	-	-	-	1092	36	-	-	1029	30
** 69X	-	-	-	1093	12	-	-	1156	12
** 69Y	-	-	-	1093	36	-	-	1030	30
70X	112.30	-	-	1094	12	-	-	1157	12
** 70Y	112.35	-	-	1094	36	-	-	1031	30
71X	112.40	-	-	1095	12	-	-	1158	12
** 71Y	112.45	-	-	1095	36	-	-	1032	30
72X	112.50	-	-	1096	12	-	-	1159	12
** 72Y	112.55	-	-	1096	36	-	-	1033	30

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
73X	112.60	-	-	1097	12	-	-	1160	12
** 73Y	112.65	-	-	1097	36	-	-	1034	30
74X	112.70	-	-	1098	12	-	-	1161	12
** 74Y	112.75	-	-	1091	36	-	-	1035	30
75X	112.80	-	-	1099	12	-	-	1162	12
** 75Y	112.85	-	-	1099	36	-	-	1036	30
76X	112.90	-	-	1100	12	-	-	1163	12
** 76Y	112.93	-	-	1100	36	-	-	1037	30
77X	113.00	-	-	1101	12	-	-	1164	12
** 77Y	113.05	-	-	1101	36	-	-	1038	30
78X	113.10	-	-	1102	12	-	-	1165	12
** 78X	113.15	-	-	1102	36	-	-	1039	30
79X	113.20	-	-	1103	12	-	-	1166	12
** 79Y	113.25	-	-	1103	36	-	-	1040	30
80X	113.30	-	-	1104	12	-	-	1167	12
80Y	113.35	5067.0	620	1104	36	36	42	1041	30
80Z	-	5067.3	621	1104	-	21	27	1041	15
81X	113.40	-	-	1105	12	-	-	1168	12
81Y	113.45	5067.6	622	1105	36	36	42	1042	30
81Z	-	5067.9	623	1105	-	21	27	1042	15
82X	113.50	-	-	1106	12	-	-	1169	12
82Y	113.55	5068.2	624	1106	36	36	42	1043	30
82Z	-	5068.5	625	1106	-	21	27	1043	15
83X	113.60	-	-	1107	12	-	-	1170	12
83Y	113.65	5068.8	626	1107	36	36	42	1044	30
83Z	-	5069.1	627	1107	-	21	27	1044	15
84X	113.70	-	-	1108	12	-	-	1171	12
84Y	113.75	5069.4	628	1108	36	36	42	1045	30
84Z	-	5069.7	629	1108	-	21	27	1045	15
85X	113.80	-	-	1109	12	-	-	1172	12
85Y	113.85	5070.0	630	1109	36	36	42	1046	30
85Z	-	5070.3	631	1109	-	21	27	1046	15
86X	113.90	-	-	1110	12	-	-	1173	12
86Y	113.95	5070.6	632	1110	36	36	42	1047	30
86Z	-	5070.9	633	1110	-	21	27	1047	15
87Z	114.00	-	-	1111	12	-	-	1174	12
87Y	114.05	5071.2	634	1111	36	36	42	1048	30
87Z	-	5071.5	635	1111	-	21	27	1048	15
88X	114.10	-	-	1112	12	-	-	1175	12
88Y	114.15	5071.8	636	1112	36	36	42	1049	30
88Z	-	5072.1	637	1112	-	21	27	1049	15
89X	114.20	-	-	1113	12	-	-	1176	12

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
89Y	114.25	5072.4	638	1113	36	36	42	1050	30
89Z	-	5072.7	639	1113	-	21	27	1050	15
90X	114.30	-	-	1114	12	-	-	1177	12
90Y	114.35	5073.0	640	1114	36	36	42	1051	30
90Z	-	5073.3	641	1114	-	21	27	1051	15
91X	114.40	-	-	1115	12	-	-	1178	12
91Y	114.45	5073.6	642	1115	36	36	42	1052	30
91Z	-	5073.9	643	1115	-	21	27	1052	15
92X	114.50	-	-	1116	12	-	-	1179	12
92Y	114.55	5074.2	644	1116	36	36	42	1053	30
92Z	-	5074.5	645	1116	-	21	27	1053	15
93X	114.60	-	-	1117	12	-	-	1180	12
93Y	114.65	5074.8	646	1117	36	36	42	1054	30
93Z	-	5075.1	647	1117	-	21	27	1054	15
94X	114.70	-	-	1118	12	-	-	1181	12
94Y	114.75	5075.4	648	1118	36	36	42	1055	30
94Z	-	5075.7	649	1118	-	21	27	1055	15
95X	114.80	-	-	1119	12	-	-	1182	12
95Y	114.85	5076.0	650	1119	36	36	42	1056	30
95Z	-	5076.3	651	1119	-	21	27	1056	15
96X	114.90	-	-	1120	12	-	-	1183	12
96Y	114.95	5076.6	652	1120	36	36	42	1057	30
96Z	-	5076.9	653	1120	-	21	27	1057	15
97X	115.00	-	-	1121	12	-	-	1184	12
97Y	115.05	5077.2	654	1121	36	36	42	1058	30
97Z	-	5077.5	655	1121	-	21	27	1058	15
98X	115.10	-	-	1122	12	-	-	1185	12
98Y	115.15	5077.8	656	1122	36	36	42	1059	30
98Z	-	5078.1	657	1122	-	21	27	1059	15
99X	115.20	-	-	1123	12	-	-	1186	12
99Y	115.25	5078.4	658	1123	36	36	42	1060	30
99Z	-	5078.7	659	1123	-	21	27	1060	15
100X	115.30	-	-	1124	12	-	-	1187	12
100Y	115.35	5079.0	660	1124	36	36	42	1061	30
100Z	-	5079.3	661	1124	-	21	27	1061	15
101X	115.40	-	-	1125	12	-	-	1188	12
101Y	115.45	5079.6	662	1125	36	36	42	1062	30
101Z	-	5079.9	663	1125	-	21	27	1062	15
102X	115.50	-	-	1126	12	-	-	1189	12
102Y	115.55	5080.2	664	1126	36	36	42	1063	30
102Z	-	5080.5	665	1126	-	21	27	1063	15
103X	115.60	-	-	1127	12	-	-	1190	12

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
103Y	115.65	5080.8	666	1127	36	36	42	1064	30
103Z	-	5081.1	667	1127	-	21	27	1064	15
104X	115.70	-	-	1128	12	-	-	1191	12
104Y	115.75	5051.4	658	1128	36	36	42	1065	30
104Z	-	5081.7	669	1128	-	21	27	1065	15
105X	115.80	-	-	1129	12	-	-	1192	12
105Y	115.85	5082.0	670	1129	36	36	42	1066	30
105Z	-	5082.3	671	1129	-	21	27	1066	15
106X	115.90	-	-	1130	12	-	-	1193	12
106Y	115.95	5082.6	672	1130	36	36	42	1067	30
106Z	-	5082.9	673	1130	-	21	27	1067	15
107X	116.00	-	-	1131	12	-	-	1194	12
107Y	116.05	5083.2	674	1131	36	36	42	1068	30
107Z	-	5083.5	675	1131	-	21	27	1068	15
108X	116.10	-	-	1132	12	-	-	1195	12
108Y	116.15	5083.8	676	1132	36	36	42	1069	30
108Z	-	5084.1	677	1132	-	21	27	1069	15
109X	116.20	-	-	1133	12	-	-	1196	12
109Y	116.25	5084.4	678	1133	36	36	42	1070	30
109Z	-	5084.7	679	1133	-	21	27	1070	15
110X	116.30	-	-	1134	12	-	-	1197	12
110Y	116.35	5085.0	680	1134	36	36	42	1071	30
110Z	-	5085.3	681	1134	-	21	27	1071	15
111X	116.40	-	-	1135	12	-	-	1198	12
111Y	116.45	5085.6	682	1135	36	36	42	1072	30
111Z	-	5085.9	683	1135	-	21	27	1072	15
112X	116.50	-	-	1136	12	-	-	1199	12
112Y	116.55	5086.2	684	1136	36	36	42	1073	30
112Z	-	5086.5	685	1136	-	21	27	1073	15
113X	116.60	-	-	1137	12	-	-	1200	12
113Y	116.65	5086.8	686	1137	36	36	42	1074	30
113Z	-	5087.1	687	1137	-	21	27	1074	15
114X	116.70	-	-	1138	12	-	-	1201	12
114Y	116.75	5087.4	688	1138	36	36	42	1075	30
114Z	-	5087.7	689	1138	-	21	27	1075	15
115X	116.80	-	-	1139	12	-	-	1202	12
115Y	116.85	5088.0	690	1139	36	36	42	1076	30
115Z	-	5088.3	691	1139	-	21	27	1076	15
116X	116.90	-	-	1140	12	-	-	1203	12
116Y	116.95	5088.6	692	1140	36	36	42	1077	30
116Z	-	5088.9	693	1140	-	21	27	1077	15
117X	117.00	-	-	1141	12	-	-	1204	12

CHANNEL PAIRING				DME PARAMETERS					
				INTERROGATION				REPLY	
					PULSE CODES				
						DME/P MODE			
DME	VHF FREQ.	MLS ANGLE FREQ.	MLS CH	FREQ.	DME/N	IA	FA	FREQ.	PULSE CODES
No.	MHz	MHz	No.	MHz	µs	µs	µs	MHz	µs
117Y	117.05	5089.2	694	1141	36	36	42	1078	30
117Z	-	5089.5	695	1141	-	21	27	1078	15
118X	117.10	-	-	1142	12	-	-	1205	12
118Y	117.15	5089.8	696	1142	36	36	42	1079	30
118Z	-	5090.1	697	1142	-	21	27	1079	15
119X	117.20	-	-	1143	12	-	-	1206	12
119Y	117.25	5090.4	698	1143	36	36	42	1080	30
119Z	-	5090.7	699	1143	-	21	27	1080	15
120X	117.30	-	-	1144	12	-	-	1207	12
120Y	117.35	-	-	1144	36	-	-	1081	30
121X	117.40	-	-	1145	12	-	-	1208	12
121Y	117.45	-	-	1145	36	-	-	1082	30
122X	117.50	-	-	1146	12	-	-	1209	12
122Y	117.55	-	-	1146	36	-	-	1083	30
123X	117.60	-	-	1147	12	-	-	1210	12
123Y	117.65	-	-	1147	36	-	-	1084	30
124X	117.70	-	-	1148	12	-	-	1211	12
** 124Y	117.75	-	-	1148	36	-	-	1085	30
125X	117.80	-	-	1149	12	-	-	1212	12
** 125Y	117.85	-	-	1149	36	-	-	1086	30
126X	117.90	-	-	1150	12	-	-	1213	12
** 126Y	117.95	-	-	1150	36	-	-	1087	30

* These channels are reserved exclusively for national allotments.

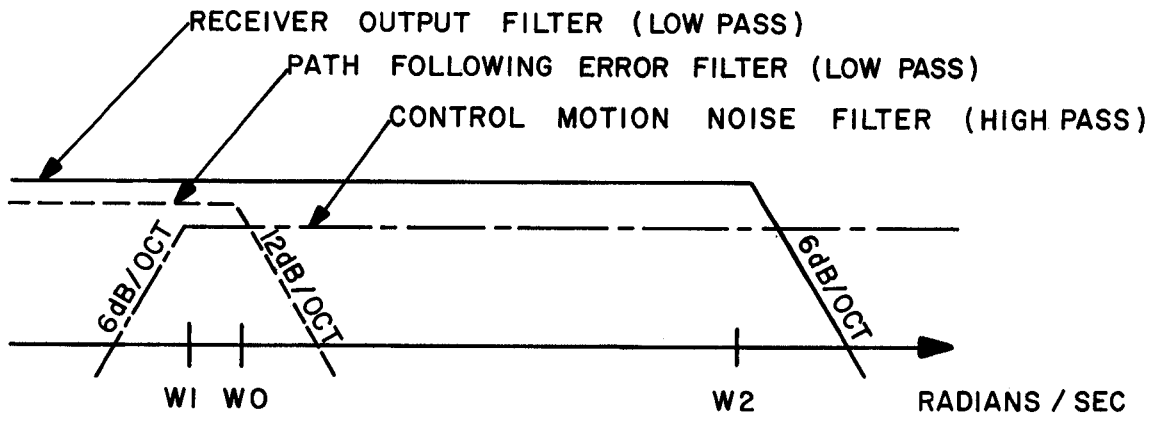
** These channels may be used for national allotments on a secondary basis. The primary reason for reserving these channels is to provide protection for the Secondary Surveillance Radar (SSR) system.

∇ 108.0 MHz is not scheduled for assignment to MLS Service. The associated DME operating channel No. 17X may be assigned to the emergency service.

APPENDIX C PFE AND CMN FILTER DEFINITIONS

GUIDANCE FUNCTION	CORNER FREQUENCIES (RADIANS / SEC)		
	WO	W I	W 2
APPROACH AZIMUTH	0.5	0.3	10
BACK AZIMUTH	0.5	0.3	10
APPROACH ELEVATION	1.5	0.5	10
FLARE	2.0	0.5	10

Filter Definitions
Table 1



Filter Definitions
Figure 1

APPENDIX D - ABBREVIATIONS

ARINC	Aeronautical Research Inc.
ASCII	American National Standard Code for Information Interchange
AUX	Auxiliary
AZ	Azimuth
BATT	Battery Operation Enabled
BAZ	Back Azimuth
CMN	Control Motion Noise
CRT	Cathode Ray Tube
dB	Decibel
dBc	Decibel Relative To Peak Value
dBm	Decibel Relative To 1 Millivolt
Deg	Degree
DME	Distance Measurement Equipment
DMEP	Precision Distance Measurement Equipment
DPSK	Differential Phase Shift Keying
EL	Elevation
FA	Final Approach
FL	Flare
GPIB	General Purpose Interface Bus
Hz	Hertz
IA	Initial Approach
ICAO	International Civil Aviation Organization
IDENT	Identification
kHz	Kilohertz
M	Meter
MHz	Megahertz
MP	Multi-path
PFE	Path Following Error
PFN	Path Following Noise
RCVR	Receiver
RF	Radio Frequecy
TDM	Time Division Multiplex
TTL	Transistor - Transistor Logic
UUT	Unit Under Test
VAC	Volts AC
VDC	Volts DC

APPENDIX E MLS-800 TIMING SEQUENCES

1. ICAO 1981 Normal AZ Cycle

Seq 1	Time (ms)	Seq 2	Time (ms)	Seq 1	Time (ms)	Seq 2	Time (ms)
ELEVATION	00.0	ELEVATION	66.7	ELEVATION	145.3	ELEVATION	229.7
FLARE	05.6	FLARE	72.3	FLARE	150.9	FLARE	235.3
APPROACH AZIMUTH	10.9	APPROACH AZIMUTH	77.6	APPROACH AZIMUTH	156.2	APPROACH AZIMUTH	240.6
FLARE	26.8	FLARE	93.5	FLARE	172.1	FLARE	256.5
ELEVATION	32.1	ELEVATION	98.8	ELEVATION	177.4	ELEVATION	261.8
DATA WORD #2	37.7	DATA WORD #1	104.4	DATA WORD #2	183.0	DATA WORD #4	267.4
BACK AZIMUTH	40.8	TIME DELAY	107.5	BACK AZIMUTH	186.1	TIME DELAY	270.5
DATA WORD #6	52.7	ELEVATION	122.6	DATA WORD #7	198.0	ELEVATION	285.6
ELEVATION	55.8	FLARE	128.2	ELEVATION	201.1	FLARE	291.2
FLARE	61.4	TIME DELAY	133.5	FLARE	206.7		296.5
	66.7	AUX WORD	139.4	TIME DELAY	212.0		
			145.3	TIME DELAY	217.9		
				AUX WORD	223.8		
					229.7		

1. ICAO 1981 Normal AZ Cycle (Continued)

Seq 1	Time (ms)
	296.5
ELEVATION	
	302.1
FLARE	
	307.4
APPROACH AZIMUTH	
	323.3
FLARE	
	328.6
ELEVATION	
	334.2
DATA WORD #2	
	337.3
BACK AZIMUTH	
	349.2
DATA WORD #3	
	352.3
ELEVATION	
	357.9
FLARE	
	363.2
TIME DELAY	
	369.1
TIME DELAY	
	375.0
AUX WORD	
	380.9

Seq 2	Time (ms)
	380.9
ELEVATION	
	386.5
FLARE	
	391.8
APPROACH AZIMUTH	
	107.7
FLARE	
	413.0
ELEVATION	
	418.6
DATA WORD #1	
	421.7
TIME DELAY	
	436.8
ELEVATION	
	442.4
FLARE	
	447.7
TIME DELAY	
	453.6

Seq 1	Time (ms)
	453.6
ELEVATION	
	459.2
FLARE	
	464.5
APPROACH AZIMUTH	
	480.4
FLARE	
	485.7
ELEVATION	
	491.3
DATA WORD #2	
	494.4
BACK AZIMUTH	
	506.3
DATA WORD #8	
	509.4
ELEVATION	
	515.0
FLARE	
	520.3

Seq 2	Time (ms)
	520.3
ELEVATION	
	525.9
FLARE	
	531.2
APPROACH AZIMUTH	
	547.1
FLARE	
	552.4
ELEVATION	
	558.0
DATA WORD #5	
	561.1
TIME DELAY	
	576.2
ELEVATION	
	581.8
FLARE	
	587.1
TIME DELAY	
	593.0
TIME DELAY	
	598.9
AUX WORD	
	604.8

2. ICAO 1981 High Rate AZ Cycle

Seq 1	Time (ms)
ELEVATION	00.0
HIGH RATE AZIMUTH	05.6
DATA WORD #6	17.5
TIME DELAY	20.6
TIME DELAY	23.7
DATA WORD #1	26.8
HIGH RATE AZIMUTH	29.9
ELEVATION	41.8
HIGH RATE AZIMUTH	47.4
ELEVATION	59.3
	64.9

Seq 1	Time (ms)
ELEVATION	64.9
HIGH RATE AZIMUTH	70.5
DATA WORD #2	82.4
BACK AZIMUTH	85.5
HIGH RATE AZIMUTH	97.4
ELEVATION	109.3
HIGH RATE AZIMUTH	114.9
ELEVATION	126.8
TIME DELAY	132.4
AUX WORD	138.3
	144.2

Seq 1	Time (ms)
ELEVATION	144.2
HIGH RATE AZIMUTH	149.8
DATA WORD #7	161.7
TIME DELAY	164.8
TIME DELAY	167.9
DATA WORD #4	171.0
HIGH RATE AZIMUTH	174.1
ELEVATION	186.0
HIGH RATE AZIMUTH	191.6
ELEVATION	203.5
TIME DELAY	209.1
TIME DELAY	215.0
AUX WORD	220.9
	226.8

Seq 1	Time (ms)
ELEVATION	226.8
HIGH RATE AZIMUTH	232.4
DATA WORD #2	244.3
BACK AZIMUTH	247.4
HIGH RATE AZIMUTH	259.3
ELEVATION	271.2
HIGH RATE AZIMUTH	276.8
ELEVATION	288.7
	294.3

2. ICAO 1981 High Rate AZ Cycle (Continued)

Seq 1	Time (ms)
ELEVATION	294.3
HIGH RATE AZIMUTH	299.9
DATA WORD #3	311.8
TIME DELAY	314.9
TIME DELAY	318.0
DATA WORD #1	321.1
HIGH RATE AZIMUTH	324.2
ELEVATION	336.1
HIGH RATE AZIMUTH	341.7
ELEVATION	353.6
TIME DELAY	359.2
TIME DELAY	365.1
AUX WORD	371.0
	376.9

Seq 1	Time (ms)
ELEVATION	376.9
HIGH RATE AZIMUTH	382.5
DATA WORD #2	394.4
BACK AZIMUTH	397.5
HIGH RATE AZIMUTH	409.4
ELEVATION	421.3
HIGH RATE AZIMUTH	426.9
ELEVATION	438.8
TIME DELAY	444.4
	450.3

Seq 1	Time (ms)
ELEVATION	450.3
HIGH RATE AZIMUTH	455.9
DATA WORD #8	467.8
TIME DELAY	470.9
TIME DELAY	474.0
DATA WORD #5	477.1
HIGH RATE AZIMUTH	480.2
ELEVATION	492.1
HIGH RATE AZIMUTH	497.7
ELEVATION	509.6
	515.2

Seq 1	Time (ms)
ELEVATION	515.2
HIGH RATE AZIMUTH	520.8
DATA WORD #2	532.7
BACK AZIMUTH	535.8
HIGH RATE AZIMUTH	547.7
ELEVATION	559.6
HIGH RATE AZIMUTH	565.2
ELEVATION	577.1
TIME DELAY	582.7
TIME DELAY	588.6
AUX WORD	594.5
	600.4

3. ICAO 1985 Normal AZ Cycle

Seq 1	Time (ms)
ELEVATION	00.0
FLARE	05.6
APPROACH AZIMUTH	10.9
FLARE	26.8
ELEVATION	32.1
DATA WORD #2	37.7
BACK AZIMUTH	40.8
DATA WORD #6	52.7
ELEVATION	55.8
FLARE	61.4
	66.7

Seq 2	Time (ms)
ELEVATION	66.7
FLARE	72.3
APPROACH AZIMUTH	77.6
FLARE	93.5
ELEVATION	98.8
DATA WORD #1	104.4
TIME DELAY	107.5
ELEVATION	122.6
FLARE	128.2
TIME DELAY	133.5
AUX WORD AD1	139.4
	145.3

Seq 1	Time (ms)
ELEVATION	145.3
FLARE	150.9
APPROACH AZIMUTH	156.2
FLARE	172.1
ELEVATION	177.4
DATA WORD #2	183.0
BACK AZIMUTH	186.1
TIME DELAY	198.0
ELEVATION	201.1
FLARE	206.7
TIME DELAY	212.0
TIME DELAY	217.9
AUX WORD AD2	223.8
	229.7

Seq 2	Time (ms)
ELEVATION	229.7
FLARE	235.3
APPROACH AZIMUTH	240.6
FLARE	256.5
ELEVATION	261.8
DATA WORD #4	267.4
TIME DELAY	270.5
ELEVATION	285.6
FLARE	291.2
	296.5

3. ICAO 1985 Normal AZ Cycle (Continued)

Seq 1	Time (ms)
ELEVATION	296.5
FLARE	302.1
APPROACH AZIMUTH	307.4
FLARE	323.3
ELEVATION	328.6
DATA WORD #2	334.2
BACK AZIMUTH	337.3
DATA WORD #3	349.2
ELEVATION	352.3
FLARE	357.9
TIME DELAY	363.2
TIME DELAY	369.1
AUX WORD AD3	375.0
	380.9

Seq 2	Time (ms)
ELEVATION	380.9
FLARE	386.5
APPROACH AZIMUTH	391.8
FLARE	407.7
ELEVATION	413.0
DATA WORD #1	418.6
TIME DELAY	421.7
ELEVATION	436.8
FLARE	442.4
TIME DELAY	447.7
	453.6

Seq 1	Time (ms)
ELEVATION	453.6
FLARE	459.2
APPROACH AZIMUTH	464.5
FLARE	480.4
ELEVATION	485.7
DATA WORD #2	491.3
BACK AZIMUTH	494.4
TIME DELAY	506.3
ELEVATION	509.4
FLARE	515.0
	520.3

Seq 2	Time (ms)
ELEVATION	520.3
FLARE	525.9
APPROACH AZIMUTH	531.2
FLARE	547.1
ELEVATION	552.4
DATA WORD #5	558.0
TIME DELAY	561.1
ELEVATION	576.2
FLARE	581.8
TIME DELAY	587.1
TIME DELAY	593.0
AUX WORD AD4	598.9
	604.8

4. ICAO 1985 High Rate AZ Cycle

Seq 1	Time (ms)
ELEVATION	00.0
HIGH RATE AZIMUTH	05.6
DATA WORD #6	17.5
TIME DELAY	20.6
TIME DELAY	23.7
DATA WORD #1	26.8
HIGH RATE AZIMUTH	29.9
ELEVATION	41.8
HIGH RATE AZIMUTH	47.4
ELEVATION	59.3
	64.9

Seq 1	Time (ms)
ELEVATION	64.9
HIGH RATE AZIMUTH	70.5
DATA WORD #2	82.4
BACK AZIMUTH	85.5
HIGH RATE AZIMUTH	97.4
ELEVATION	109.3
HIGH RATE AZIMUTH	114.9
ELEVATION	126.8
TIME DELAY	132.4
AUX WORD AD1	138.3
	144.2

Seq 1	Time (ms)
ELEVATION	144.2
HIGH RATE AZIMUTH	149.8
TIME DELAY	161.7
TIME DELAY	164.8
TIME DELAY	167.9
DATA WORD #4	171.0
HIGH RATE AZIMUTH	174.1
ELEVATION	186.0
HIGH RATE AZIMUTH	191.6
ELEVATION	203.5
TIME DELAY	209.1
TIME DELAY	215.0
AUX WORD AD2	220.9
	226.8

Seq 1	Time (ms)
ELEVATION	226.8
HIGH RATE AZIMUTH	232.4
DATA WORD #2	244.3
BACK AZIMUTH	247.4
HIGH RATE AZIMUTH	259.3
ELEVATION	271.2
HIGH RATE AZIMUTH	276.8
ELEVATION	288.7
	294.3

4. ICAO 1985 High Rate AZ Cycle (Continued)

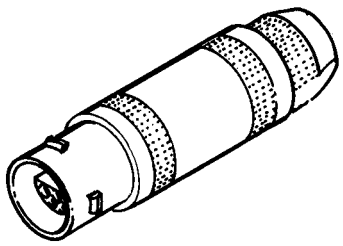
Seq 1	Time (ms)
ELEVATION	294.3
HIGH RATE AZIMUTH	299.9
DATA WORD #3	311.8
TIME DELAY	314.9
TIME DELAY	318.0
DATA WORD #1	321.1
HIGH RATE AZIMUTH	324.2
ELEVATION	336.1
HIGH RATE AZIMUTH	341.7
ELEVATION	353.6
TIME DELAY	359.2
TIME DELAY	365.1
AUX WORD AD3	371.0
	376.9

Seq 1	Time (ms)
ELEVATION	376.9
HIGH RATE AZIMUTH	382.5
DATA WORD #2	394.4
BACK AZIMUTH	397.5
HIGH RATE AZIMUTH	409.4
ELEVATION	421.3
HIGH RATE AZIMUTH	426.9
ELEVATION	438.8
TIME DELAY	444.4
	450.3

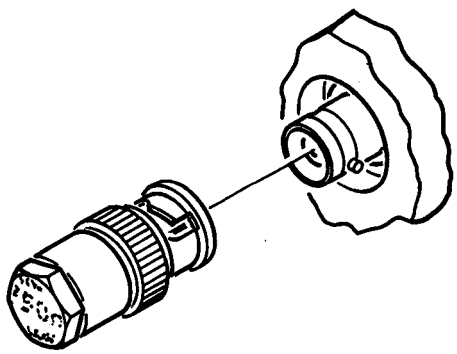
Seq 1	Time (ms)
ELEVATION	450.3
HIGH RATE AZIMUTH	455.9
TIME DELAY	467.8
TIME DELAY	470.9
TIME DELAY	474.0
DATA WORD #5	477.1
HIGH RATE AZIMUTH	480.2
ELEVATION	492.1
HIGH RATE AZIMUTH	497.7
ELEVATION	509.6
	515.2

Seq 1	Time (ms)
ELEVATION	515.2
HIGH RATE AZIMUTH	520.8
DATA WORD #2	532.7
BACK AZIMUTH	535.8
HIGH RATE AZIMUTH	547.7
ELEVATION	559.6
HIGH RATE AZIMUTH	565.2
ELEVATION	577.1
TIME DELAY	582.7
TIME DELAY	588.6
AUX WORD AD4	594.5
	600.4

APPENDIX F AUXILIARY EQUIPMENT

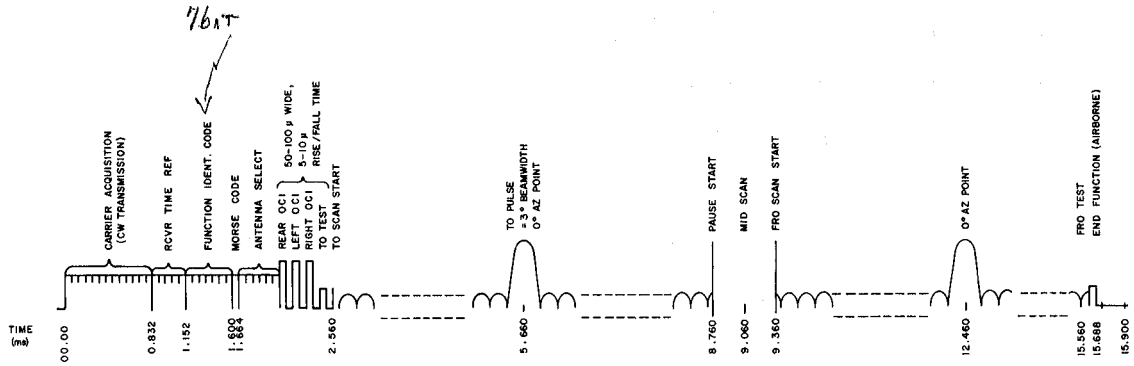


429 Terminator
Figure 1



50Ω Load
Figure 2

APPENDIX G MLS-800 APPROACH AZIMUTH BEAM BOARD DATA



MLS-800 Approach Azimuth Beam Modulation Data
Figure 1