

TACAN/DME Mode Specifications

SIGNAL GENERATOR

A 5-minute warm-up period is required for all specifications.

Output Frequency

Reply Frequency

Range 962 to 1213 MHz
Accuracy ± 10 kHz

Variable Channel Selection 1 to 126 (X & Y)

Preset Channel Selection

Preset 1 (DoD)

T/R Mode 17X, 18X

A/A Mode 17X, 17Y

Inverse A/A Mode 80X, 80Y

Preset 2 (AN/ASM-663)

5X, 5Y, 47X, 47Y, 89X, 89Y

Preset 3 (AN/ARM-184) No Preset

Preset 4 (2650/2655)

18X, 18Y, 47X, 47Y, 100X, 100Y, 123X, 123Y

Output Level

Antenna Port

Range -67 to -5 dBm (T/R Norm, T/R Inv, A/A Beacon, A/A Inv)
-67 to -2 dBm (T/R Rng Only, A/A Rng Only)

Resolution 0.5 dB

Accuracy ± 2 dB

Distance to UUT antenna 6 to 250 ft. with supplied antenna

RF I/O Port

Range -115 to -50 dBm (T/R Norm, T/R Inv, A/A Beacon, A/A Inv)
-115 to -47 dBm (T/R Rng Only, A/A Rng Only)

Resolution 0.5 dB

Accuracy -95 dBm to -50 dBm ± 1 dB

Accuracy -115 dBm to <-95 dBm ± 2 dB

Reply Pulse Spacing

P1 to P2 $12 \mu\text{s} \pm 0.1 \mu\text{s}$ (T/R X Channel)
@ 50% peak

P1 to P2 $30 \mu\text{s} \pm 0.1 \mu\text{s}$ (T/R Y Channel)
@ 50% peak

Reply Pulse Width

P1/P2 $3.5 \mu\text{s} \pm 0.5 \mu\text{s}$

Echo Reply

Control On/Off

Position 30 nmi ± 1 nmi

Amplitude -11 dB ± 1 dB relative to reply level

Reply Pulse Rise and Fall Times

All Pulses

Rise Time $2.0 \mu\text{s} \pm 0.25 \mu\text{s}$ (10% to 90%)

Fall Time $2.5 \mu\text{s} \pm 0.25 \mu\text{s}$ (90% to 10%)

Reply Delay

T/R X Channel

Fixed Reply Delay $50 \mu\text{s} \pm 100$ ns

T/R Y Channel

Fixed Reply Delay $56 \mu\text{s} \pm 100$ ns

A/A X Channel

Fixed Reply Delay $62 \mu\text{s} \pm 100$ ns

A/A Y Channel

Fixed Reply Delay $74 \mu\text{s} \pm 100$ ns

Variable Range Delay

X and Y Channel

Range 0 to 450.00 nmi

Resolution 0.01 nmi

Accuracy ± 0.01 nmi

Preset Range Delay

X and Y Channel

Preset 1 (DoD) Range 0, 3, 10, 30, 100, 200, 300, 400 nmi

Preset 2 (AN/ASM-663) Range 0, 10, 150, 297 nmi

Preset 3 (AN/ARM-184) Range 0, 50, 100, 150, 200, 250, 300, 350, 400 nmi

Preset 4 (2650/2655) Range 0, 5, 125, 283 nmi

Resolution 0.01 nmi

Accuracy ± 0.01 nmi

Variable Range Rate

X and Y Channel

Range 0 to 6500 kts

Resolution 1 kts

Accuracy $\pm 0.01\%$ typical, tested to $\pm 0.5\%$

Preset Range Rate

X and Y Channel

Preset 1 (DoD) Rate 0, 250 kts (1000 kts in A/A modes)

Preset 2 (AN/ASM-663) Rate No Rate

Preset 3 (AN/ARM-184) Rate 0, 2400 kts

Preset 4 (2650/2655) Rate No Rate

Resolution 1 kts

Accuracy $\pm 0.01\%$ typical, tested to $\pm 0.5\%$

Squitter

PRF

<i>T/R(X) & T/R(Y) NORM, INVERSE, RNG ONLY</i>	2700 Hz
<i>A/A RNG ONLY, BEACON, INVERSE</i>	1350 Hz
<i>Accuracy</i>	± 2%
<i>Distribution</i>	Per MIL STD 291C and ARINC 568

Reply Efficiency

<i>Range</i>	0 to 100%
<i>Resolution</i>	1% increments
<i>Accuracy</i>	± 0.5%

Ident Tone Pulse Pair

T/R(X) & T/R(Y) Modes Selection

Selectable four letter code or tone

<i>Frequency</i>	1350 Hz
<i>Accuracy</i>	± 2 Hz
<i>Equalizer pulse pair</i>	Spacing from Ident pair 100 µs ± 10 µs

Ident Tone Single Pulse

A/A(X) & A/A(Y) Modes Selection

Selectable four letter code or tone

<i>Frequency</i>	1350 Hz
<i>Accuracy</i>	± 2 Hz

Inverse Mode

A/A(X), A/A(Y), T/R(X), T/R(Y)

Active Low North Reference Trigger Sync Output

A/A Mode Interrogation

<i>P1 to P2</i>	12 µs ± 0.1 µs (A/A X Channel)	
	@ 50% peak	
<i>P1 to P2</i>	24 µs ± 0.1 µs (A/A Y Channel)	
	@ 50% peak	
<i>Interrogation Rate</i>	150 PPS, ± 5 Hz	

15/135 HZ Bearing Signal

<i>Modulation Levels</i>	15 Hz	20% ± 2.5%
	135 Hz	20% ± 2.5%
<i>Frequency</i>	15/135 Hz	<± 0.2%
<i>Distortion</i>	<2.5%	

Bearing

<i>Variable</i>	0 to 359.5° in 0.5° increments
<i>Accuracy</i>	± 0.1°

Preset

<i>Preset 1 (DoD) Range</i>	0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°
<i>Preset 2 (AN/ASM-663) Range</i>	0°, 45°, 180°, 225°
<i>Preset 3 (AN/ARM-184) Range</i>	0°, 90°, 180°, 337.5°
<i>Preset 4 (2650/2655) Range</i>	90°, 230°, 320°

Interrogation Pulse Decoding

<i>Must Reply nominal code pair spacing</i>	< ± 0.5 µs
<i>Must Not Reply nominal code pair spacing</i>	> ± 1.0 µs

MRB T/R(X)

<i>Group</i>	12 pairs of pulses
<i>Pulse Spacing</i>	12 µs ± 0.1 µs
<i>Pulse Pair Spacing</i>	12 µs ± 0.1 µs

MRB T/R(Y)

<i>Group</i>	13 single pulses
<i>Pulse Spacing</i>	30 µs ± 0.1 µs

MRB A/A Beacon (X & Y)

<i>Group</i>	10 single pulses
<i>Pulse Spacing</i>	30 µs ± 0.1 µs

ARB T/R(X)

<i>Group</i>	6 pairs of pulses
<i>Pulse Spacing</i>	12 µs ± 0.1 µs
<i>Pulse Pair Spacing</i>	24 µs ± 0.1 µs

ARB T/R(Y)

<i>Group</i>	13 single pulses
<i>Pulse Spacing</i>	15 µs ± 0.1 µs

UUT MEASUREMENTS

ERP

<i>Range</i>	+47 to +64 dBm
<i>Resolution</i>	0.1 dB
<i>Accuracy</i>	±2 dB

Direct Connection Peak Pulse Power

<i>Range</i>	+4.7 to +64 dBm
<i>Resolution</i>	0.1 dB
<i>Accuracy</i>	± 1 dB

Frequency

<i>Range</i>	1025.00 to 1150.00 MHz
<i>Resolution</i>	10 kHz
<i>Accuracy</i>	± 20 kHz

Interrogation Pulse Width

P1 and P2 Pulse Widths

Range	2.00 to 5.00 μ s
Resolution	1 ns
Accuracy	\pm 50 ns

Interrogation Pulse Spacing

P1 to P2 Spacing	10 to 14 μ s (T/R X and A/A X Channel)
P1 to P2 Spacing	22 to 26 μ s (A/A Y Channel)
P1 to P2 Spacing	34 to 38 μ s (T/R Y Channel)
Resolution	10 ns
Accuracy	\pm 20 ns

Interrogation PRF

Range	1 to 300 Hz
Resolution	1 Hz
Accuracy	\pm 2 Hz

A/A Reply Delay

A/A(X)	62 μ s (-2 +4 μ s accept)
A/A(Y)	74 μ s (-2 +4 μ s accept)
Resolution	10 ns
Accuracy	\pm 100 ns

Transponder Mode Specifications

SIGNAL GENERATOR

RF Output Frequency

Interrogation Frequency	1030 MHz
Accuracy	\pm 10 kHz

RF Output Level

Antenna Port

(MTL + 6 dB typical, automatically controlled for a MTL range of -83 to -68 dBm)

Range	-67 to -2 dBm at antenna port
Resolution	0.5 dB
Accuracy	\pm 2 dB
Distance to UUT antenna	6 to 200 ft with supplied antenna

RF I/O Port

(MTL + 6 dB typical, automatically controlled)

Range	-115 to -47 dBm
Resolution	0.5 dB
Accuracy	-95 to -47 dBm, \pm 1 dB
Accuracy	-115 to <-95 dBm, \pm 2 dB

ATCRBS/SIF/Mode S Interrogation Pulse Spacing

Mode 1

P1 to P2	2.00 μ s \pm 25 ns
P1 to P3	3.00 μ s \pm 25 ns

Mode 2

P1 to P2	2.00 μ s \pm 25 ns
P1 to P3	5.00 μ s \pm 25 ns

Mode 3A

P1 to P2	2.00 μ s \pm 25 ns
P1 to P3	8.00 μ s \pm 25 ns

Mode C

P1 to P2	2.00 μ s \pm 25 ns
P1 to P3	21.00 μ s \pm 25 ns

MODE S

P1 to P2	2.00 μ s \pm 25 ns
P1 to P6	3.50 μ s \pm 25 ns
P1 to SPR	4.75 μ s \pm 25 ns
P5 to SPR	0.40 μ s \pm 50 ns

Intermode Interrogation Pulse Spacing

MODE A

P1 to P3	8.00 μ s \pm 25 ns
P1 to P4	10.00 μ s \pm 25 ns

MODE C

P1 to P3	21.00 μ s \pm 25 ns
P1 to P4	23.00 μ s \pm 25 ns

Interrogation Pulse Widths

Mode A,C,S, Intermode

P1,P2,P3	0.80 μ s \pm 50 ns
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Mode S

P6 (Short DPSK Block)	16.25 μ s \pm 50 ns
P6 (Long DPSK Block)	30.25 μ s \pm 50 ns
P5	0.80 μ s \pm 50 ns

Intermode

P4 (Short)	0.80 μ s \pm 50 ns
P4 (Long)	1.60 μ s \pm 50 ns

Interrogation Pulse Rise and Fall Times

All Modes

Rise Time	50 to 100 ns
Fall Time	50 to 200 ns

Phase Modulation

All Modes

Transition Time	< 80 ns
Phase Shift	180 $^{\circ}$ \pm 10 $^{\circ}$

SLS Levels

SLS Level (P2)
 -9 dB, -1 to +0 dB relative to P1 level
 0 dB, -0 to +1 dB relative to P1 level
 Off

MODE S

SLS Level (P5)
 -12 dB, -1 to +0 dB relative to P6 level
 +3 dB, -0 to +1 dB relative to P6 level
 Off

Note: SLS level is automatically controlled in the SLS LEVEL test.

Interrogation Test Signals

Mode S

PRF 50 Hz \pm 5 Hz

ATCRBS/SIF

PRF 235 Hz \pm 5 Hz

UUT MEASUREMENTS

ERP (@ 1090 MHz)

Range + 45.5 to + 59 dBm (35.5 to 800 watts)
 Resolution 0.1 dB
 Accuracy \pm 2 dB

Direct Connection Peak Pulse Power (@ 1090 MHz)

Range + 46.5 to + 59 dBm (45 to 800 watts)
 Resolution 0.1 dB
 Accuracy \pm 1 dB

Transmitter Frequency

Range 1087.000 to 1093.000 MHz
 Resolution 10 kHz
 Accuracy \pm 50 kHz

Receiver Sensitivity, Radiated MTL

Range -67 to -79 dBm into 0 dBi antenna
 Resolution 0.1 dB
 Accuracy \pm 2 dB, typical

Receiver Sensitivity, Direct Connection MTL

Range -67 to -79 dBm
 Resolution 0.1 dB
 Accuracy \pm 2 dB

Reply Delay

ATCRBS/SIF

Range 1.80 to 7.00 μ s
 Resolution 10 ns
 Accuracy \pm 50 ns

Reply Delay, Mode S and ATCRBS Mode S All -Call

Range 125.00 to 131.00 μ s
 Resolution 10 ns
 Accuracy \pm 50 ns

Reply Delay Jitter

ATCRBS/SIF

Range 0.00 to 2.30 μ s
 Resolution 1 ns
 Accuracy \pm 20 ns

Mode S and ATCRBS Mode S All-Call

Range 0.00 to 6.00 μ s
 Resolution 1 ns
 Accuracy \pm 20 ns

Pulse Spacing

F1 TO F2

Range 19.70 to 21.60 μ s
 Resolution 1 ns
 Accuracy \pm 20 ns

Mode S Preamble

Range, P1 to P2 0.8 to 1.2 μ s
 Range, P1 to P3 3.3 to 3.7 μ s
 Range, P1 to P4 4.3 to 4.7 μ s
 Resolution 1 ns
 Accuracy \pm 20 ns

Pulse Decoder

Modes 1,2,3/A 4096 code & binary equivalent displayed, including X pulse. Ident & Emergency Replies displayed.

Mode C Altitude

Pulse Widths

F1 AND F2

Range 0.25 to 0.75 μ s
 Resolution 1 ns
 Accuracy \pm 20 ns

Mode S Preamble

Range 0.25 to 0.75 μ s
 Resolution 1 ns
 Accuracy \pm 20 ns

Pulse Amplitude Variation

Range, Mode S
 (Relative to P1) +3 to -3 dB
 Range, ATCRBS/SIF
 (Relative to F1) +3 to -3 dB
 Resolution 0.1 dB (0.01 dB via RCI)
 Accuracy \pm 0.5 dB

DF 11 Squitter Period

Range	0.10 to 4.88 sec
Resolution	10 ms
Accuracy	± 10 ms

Diversity Isolation

Range	0 to >20 dB (Depending on Test Distance)
Test Distance	1.83m (6ft) to 28.96m (95ft)
Resolution	0.1 dB
Accuracy	± 3 dB

TCAS/E-TCAS Mode Specifications

SIGNAL GENERATOR

Output Frequency

Reply Frequency	1090 MHz
Accuracy	± 10 kHz

Output Level (Simulated ERP)

Antenna Port Note 1

Radiated power at 0 dBi UUT antenna

-68 dBm typical @ 10 Nmi Range, automatically controlled

Range	-67 to -2 dBm at Antenna port
Resolution	0.5 dB
Accuracy	± 2 dB
Distance to UUT antenna	6 to 300 ft with supplied antenna

RF I/O Port

Automatic mode	-68 dBm @ 10 Nmi Range, automatically controlled
Manual mode Range	-115 to -47 dBm
Resolution	0.5 dB
Accuracy	-95 to -47 dBm, ± 1 dB
Accuracy	-115 to <-95 dBm, ± 2 dB

Reply Pulse Spacing

Mode C

F1 to F2	20.30 µs ± 25 ns
F1 to C1	1.45 µs ± 25 ns
F1 to A1	2.90 µs ± 25 ns
F1 to C2	4.35 µs ± 25 ns
F1 to A2	5.80 µs ± 25 ns
F1 to C4	7.25 µs ± 25 ns
F1 to A4	8.70 µs ± 25 ns
F1 to B1	11.60 µs ± 25 ns
F1 to D1	13.05 µs ± 25 ns
F1 to B2	14.50 µs ± 25 ns
F1 to D2	15.95 µs ± 25 ns
F1 to B4	17.40 µs ± 25 ns
F1 to D4	18.85 µs ± 25 ns

Mode S

P1 to P2	1.00 µs ± 25 ns
P1 to P3	3.50 µs ± 25 ns
P1 to P4	4.50 µs ± 25 ns
P1 to D1	8.00 µs ± 25 ns
D1 to Dn (n=2 to 112)	1.00 µs times (n-1) ± 25 ns

Reply Pulse Widths

Mode C

All Pulses	0.45 µs ± 50 ns
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Mode S

P1 through P4	0.50 µs ± 50 ns
D1 through D112	0.50 µs ± 50 ns, 1 µs chip width

Reply Modes

TCAS I/II Mode C (with altitude reporting)
 TCAS II Mode S formats 0, 11, 16
 E-TCAS Modes formats 0, 4, 5, 11, 16, 20, 21

Reply Pulse Amplitudes

ATCRBS	± 1 dB relative to F1
Mode S	± 1 dB relative to P1

Reply Pulse Rise and Fall Times

All Modes

Rise Time	50 to 100 ns
Fall Time	50 to 200 ns

Percent Reply

Range	0 to 100%
Resolution	10%
Accuracy	± 1%

Reply Delay

ATCRBS	3.0 µs ± 50 ns
Mode S	128 µs ± 50 ns

Range Delay

Range	0 to 260 nmi
Resolution	0.1 nmi
Accuracy	±0.02 nmi

Range Rate

Range	-1200 to +1200 kts
Resolution	10 kts
Accuracy	10%

Altitude Range

Range	-1000 to 126,000 ft
Resolution, Mode C	100 ft
Resolution, Mode S	25 ft

Altitude Rate

Range	-10,000 to +10,000 fpm
Resolution	100 fpm
Accuracy	10%

Squitter

Control	On/Off
Rate	0.8 to 1.2 seconds, randomly distributed

Receiver

Pulse Spacing

<i>ATCRBS (Mode C All Call)</i>	
S1 to P1	2.0 us
Accepts	< ±200 ns
Rejects	>±1.0 us
P1 to P3	21.0 us
Accepts	< ±200 ns
Rejects (<10% Replies)	>±1.0 us
P1 to P4	23.0 us
Accepts	< ±200 ns
Rejects (<10% Replies)	>±1.0 us

Mode S

P1 to P2	2.0 us
Accepts	< ±200 ns
Rejects (<10% Replies)	>±1.0 us
P1 to SPR	4.75 us
Accepts	< ±200 ns
Rejects (<10% Replies)	>±1.5 us

Suppression

ATCRBS (P2 or S1)	
>0.5 dB above level of P1	<10% Replies

UUT MEASUREMENTS

ERP (@ 1030 MHz)

ATCRBS	
Range	+43 to +58 dBm (20 to 631 watts)
Resolution	0.1 dB
Accuracy	± 2 dB

Mode S

Range	+43 to +58 dBm (20 to 631 watts)
Resolution	0.1 dB
Accuracy	± 2 dB

Direct Connection Peak Pulse Power (@ 1030 MHz)

ATCRBS	
Range	+43 to +58 dBm (20 to 631 watts)
Resolution	0.1 dB
Accuracy	± 1 dB

MODE S

Range	+43 to +58 dBm (20 to 631 watts)
Resolution	0.1 dB
Accuracy	± 1 dB

Frequency

Range	1029.900 to 1030.100 MHz
Resolution	1 kHz
Accuracy	± 10 kHz

TCAS Broadcast Interval

Range	1.0 to 12.0 sec
Resolution	0.1 sec
Accuracy	± 0.2 sec

Misc. Inputs/Outputs Specifications

RF I/O

Type	Input/Output
Impedance	50 Ω typical
Maximum Input Level	4 kW peak, 10 W average
VSWR	<1.35:1

Antenna

Type	Input/Output
Impedance	50 Ω typical
Maximum Input Level	10 W peak, 0.5 W average

Video

Type	Output
Impedance	50 Ω typical
Generate Video Level	0.2 V to 1.5 V peak to peak into 50 Ω
Receive Video Level	Proportional to IF level
Baseline	±0.5 V referenced to ground

Test Antenna

VSWR	<1.5:1
Gain	6 dB, Typical

Time Base (TCXO)

Temperature Stability	± 1 ppm
Aging	± 1 ppm per year
Accuracy	± 1 ppm
Test Limit	± 0.3 ppm

Battery

Type	Li Ion
Duration	> 4 hrs continuous operation > 6 hrs, Typical

Input Power (Test Set)

Input Range	11 VDC to 32 VDC
Power Consumption	55 W Maximum 16 W Nominal at 18 VDC with charged battery
Fuse Requirements	5 A, 32 VDC, Type F

Input Power (Supplied External AC to DC Converter)

Input Range	100 to 250 VAC, 1.5 A Max, 47-63 Hz
Mains Supply Voltage Fluctuations	<10% of the nominal voltage
Transient Over-voltages	According to Installation Category II

Environmental

Test Set

Use	Pollution Degree 2
Altitude	≤ 4800 meters
Operating Temp. ^{NOTE 2}	-20°C to 55°C
Storage Temp. ^{NOTE 3}	-30°C to 71°C
Relative Humidity	95% ±5% from 5° to 30°C 75% ±5% from 30° to 40°C 45% ±5% from 40° to 55°C

Supplied External AC to DC Converter

Use	Indoors
Altitude	< 10,000 meters
Operating Temperature	0° to 40°C
Storage Temperature	-20°C to 71°C

Physical Characteristics

Height	11.2 in. (28.5 cm)
Width	9.1 in. (23.1 cm)
Depth	2.7 in. (6.9 cm)
Weight	8 lbs. (3.6 kg), test set only 34 lbs. (15.4 kg), shipping weight

Supplemental Information

Test Set Certifications

Altitude, operating	MIL-PRF-28800F	Class 2
Altitude, not operating	MIL-PRF-28800F	Class 2
Bench Handling	MIL-PRF-28800F	Class 2
Blowing Dust	MIL-STD-810F	Method 510.4, Procedure I
Drip-proof	MIL-PRF-28800F	Class 2
Explosive Atmosphere	MIL-STD-810F	Method 511.4, Procedure 1
Relative Humidity	MIL-PRF-28800F	Class 2
Shock, Functional	MIL-PRF-28800F	Class 2
Vibration Limits	MIL-PRF-28800F	Class 2
Temp, operating ^{NOTE 5}	MIL-PRF-28800F	Class 2
Temp, not operating ^{NOTE 6}	MIL-PRF-28800F	Class 2
Transit Drop	MIL-PRF-28800F	Class 2
Safety Compliance	UL-61010B-1 EN 61010-1 CSA 22.2 No 61010-1	
EMC	EN 61326	

External AC-DC Converter Certifications

Safety Compliance	UL 1950 DS CSA 22.2 No. 234 VDE EN 60 950
EMI/RFI Compliance EMC	FCC Docket 20780 Curve "B" EN 61326

Transit Case Certifications

Drop Test	FED-STD-101C, Method 5007.1 Paragraph 6.3, Procedure A, Level A
Falling Dart Impact Vibration, Loose Cargo Vibration, Sweep Simulated Rainfall	ATA 300, Category I FED-STD-101C, Method 5019 ATA 300, Category I MIL-STD-810F, Method 506.4 Procedure II of 4.1.2
FED-STD-101C Immersion	Method 5009.1, Sec 6.7.1 MIL-STD-810F, Method 512.4

NOTES

- ^{NOTE 1} Simulates a 50.5 dBm XPDR ERP at 10 nMi range.
- ^{NOTE 2} Level automatically controlled based on actual distance to UUT antenna
- ^{NOTE 3} Battery charging temperature range: 5°C to 40°C (controlled by internal charger).
- ^{NOTE 4} Li Ion Battery must be removed below -20°C and above 60°C.
- ^{NOTE 5} Temperature range extended to -20°C to 55°C.
- ^{NOTE 6} Temperature range reduced to -30°C to 71°C.

This product is subject to the Export Administration ("EAR") (15 CFR 730-774) and may not be exported, re-exported or otherwise transferred to a foreign person, or outside the United States without authorization from the U.S. Department of Commerce.

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