CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

6730.2
CHG 15

07/20/2005

SUBJ: MAINTENACE OF DISTANCE MEASURING EQUIPMENT (DME) FACILITIES

1. PURPOSE. This change adds the model 415SE DME, FA-18200 to Order 6730.2, Maintenance Of Distance Measuring Equipment (DME) Facilities. This directive adds data for a new system. This directive implements Configuration Control Decision (CCD) No. N30277, Add Thales 415 SE to 6730.2, Maintenance of Distance Measuring Equipment (DME) Facilities.

2. DISTRIBUTION.

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1	2/11/94	1 (and 2)	07/20/2005

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Director, Safety and Operations Support

Distribution: 12E **Initiated By:** Navigation and Landing Branch

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Section 4. ASII Model 1118 DME (Continued)

Parameter	*Reference Paragraph*	*Standard*	*Tolerance/Limit*	
			Initial	*Operating*
(4) LVPS (1A13/1A28)				
(a) TP1		+ 28 Vdc	+ 27.5 to + 28.5 Vdc	+ 27.5 to + 28 Vdc
(b) TP2	240-19d(4)	+ 12 Vdc	+ 11.75 to + 12.25Vdc	+ 11.75 to + 12.25 Vdc
(c) TP3	240-19d(5)	-12 Vdc	-11.75 to -12.25 Vdc	-11.75 to -12.25 Vdc
(d) TP4		Ground	Ground	Ground
(e) TP5	240-19d(3)	+ 28 Vdc	+ 27.5 to + 28.5 Vdc	+ 27.5 to + 28 Vdc
(f) TP6	240-19d(6)	+5.2 Vdc	+ 5.0 to + 5.4 Vdc	+ 5.0 to + 5.4 Vdc
(5) DC voltage	240-12d(4) 240-13d(l)(d) 240-13d(2)(d)	+ 28 Vdc	+ 27.5 to 28.5 Vdc	+ 27.4 to + 28 Vdc
(6) Shutdown time delay after alarm	240-18d(12) 240-18d(18) 240-23d(6)(f)	7 seconds	4 to 10 seconds	4 to 10 seconds

*

*

Section 5. FA-18200 MODEL 415SE DME

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
* **88. Transponder and Monitor**				
a. Transmitter				
→ (1) Frequency	241-6d(5)	Assigned frequency	+/-.01%	+/-.01%
→ (2) Power Out	241-4d(4), 241-4d(9)	100 W	100 W	≥ 50 W
(3) Reply Pulse Characteristics				
(a) Rise Time	241-5d(4)	2.5 µs	1.0 to 3.5 µs	1.0 to 3.5 µs
(b) Decay Time	241-5d(6)	2.5 µs	1.0 to 3.5 µs	1.0 to 3.5 µs
→ (c) Duration (Width)	241-5d(5)	3.5 µs	3.0 to 4.0 µs	3.0 to 4.0 µs
→ (d) Pulse Spacing				
(1) X Channel	241-7d(5)	12 µs	11.9 to 12.1 µs	11.9 to 12.1 µs
(2) Y Channel	241-7d(5)	30 µs	29.8 to 30.2 µs	29.8 to 30.2 µs
→ (4) Transmission Rate (Squitter)	241-8e(2)	800 pulses	700 to 900 pulses	700 to 900 pulses
(5) Identification				
→ (a) Identification Tone Frequency	241-14d(6)	1350 HZ	1340 to1360 HZ	1340 to1360 HZ
(b) Identification Timing	241-14d(3)			
(1) Dot		120 ms	114 to 126 ms	114 to 126 ms
(2) Dash		350 ms	342 to 378 ms	342 to 378 ms
(3) Space		120 ms	114 to 126 ms	114 to 126 ms
→ (6) Reply Delay	241-11d(7)			
(a) X Channel		50 µs	49.80 to 50.20 µs	49.80 to 50.20 µs
(b) Y Channel		56 µs	55.80 to 56.20 µs	55.80 to 56.20 µs *

Section 5. FA-18200 MODEL 415SE DME (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
* **b. Receiver**				
→ (1) Sensitivity On Channel	241-15			
(a) Terminal		-82 dBm	-82 dBm	-79 dBm
(b) Low altitude enroute		-87 dBm	-87 dBm	-84 dbm
(c) High altitude enroute		-89 dBm	-89 dBm	-86 dbm
→ (2) Sensitivity at ±200 kHz	241-15d(2) 241-15d(4) 241-15d(6)	> 70% Replies	> 70% Replies	> 70% Replies
→ (3) Sensitivity at ±900 kHz	241-15d(8) 241-15d(10)	No replies	< 5 percent	< 5 percent
c. Decoder Aperture				
(1) Acceptance				
(a) X channel				
(1) 12.0 µs	241-12d(2)	100 percent	> 80 percent	> 80 percent
(2) 11.0 µs	241-12d(4)	100 percent	> 80 percent	> 80 percent
(3) 13.0 µs	241-12d(6)	100 percent	> 80 percent	> 80 percent
(b) Y channel				
(1) 36.0 µs	241-12d(2)	100 percent	> 80 percent	> 80 percent
(2) 35.0 µs	241-12d(4)	100 percent	> 80 percent	> 80 percent
(3) 37.0 µs	241-12d(6)	100 percent	> 80 percent	> 80 percent
(2) Rejection				
(a) X channel				
(1) 10.0 µs	241-12d(10)	< 10 percent	< 10 percent	< 10 percent
(2) 14.0 µs	241-12d(8)	< 10 percent	< 10 percent	< 10 percent
(b) Y channel				
(1) 34.0 µs	241-12d(10)	< 10 percent	< 10 percent	< 10 percent
(2) 38.0 µs	241-12d(8)	< 10 percent	< 10 percent	< 10 percent *

Section 5. FA-18200 MODEL 415SE DME (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
* **d. Monitor Interrogation**				
→ (1) Interrogation Pulse Spacing	241-9d(7)			
(a) X Channel		12 µs	11.9 to 12.1 µs	11.9 to 12.1 µs
(b) Y Channel		36 µs	35.9 to 36.2 µs	35.9 to 36.2 µs
→ (2) Interrogation Pulse Level	241-9d(8)	3 Vp	1.3 to 3.3 Vp	1.3 to 3.3 Vp
(3) Interrogation Pulse Shape				
(a) Rise Time	241-9d(4)	< 2.0 µs	< 2.2 µs	< 2.2 µs
(b) Decay Time	241-9d(6)	< 3.5 µs	< 3.7 µs	< 3.7 µs
(c) Pulse Duration	241-9d(5)	3.0 to 4.0 µs	2.8 to 4.2 µs	2.8 to 4.2 µs
e. Executive Alarm Parameters	241-16e(4)			
(1) Reply Delay				
(a) X Channel		50 µs	49.8 to 50.2 µs	49.8 to 50.2 µs
(b) Y Channel		56 µs	55.8 to 56.2 µs	55.8 to 56.2 µs
→ (2) Reply Efficiency	241-16e(5)	>70%	>70%	>70%
(3) Pulse Spacing				
(a) X Channel		12 µs	11.75 to 12.25 µs	11.75 to 12.25 µs
(b) Y Channel		30 µs	29.75 to 30.25 µs	29.75 to 30.25 µs
(4) Peak Power Output		100 Watts	> 50 Watts	> 50 Watts
(5) Transmission Rate		800 ppps	720 to 840 ppps	720 to 840 ppps
(6) Transmitter Frequency Alarm		Assigned frequency +/- .01%	Assigned frequency +/- .01%	Assigned frequency +/- .01%
(7) Transmitted Power		Established Value	Established Value ≤-3db	Established Value ≤-3db
→ (8) Identification Shutdown	241-1d(11)	80 seconds	75 to 139 seconds	75 to 139 seconds
→ (9) Alarm Shutdown	241-1d(6)	< 10 sec	< 10 sec	< 10 sec

*

Section 5. FA-18200 MODEL 415SE DME (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
* **f. Monitor Integrity Test**	241-1d(3)			
(1) Reply Delay				
(a) Lower Alarm Threshold				
(1) X Channel				
(a) Alarm (LT-.20)		49.6 µs	49.6 to 49.8 µs	49.6 to 49.8 µs
(b) Normal (LT+.20)		50.0 µs	49.8 to 50.0 µs	49.8 to 50.0 µs
(2) Y Channel				
(a) Alarm (LT-.20)		55.6 µs	55.6 to 55.8 µs	55.6 to 55.8 µs
(b) Normal (LT+.20)		56.0 µs	55.8 to 56.0 µs	55.8 to 56.0 µs
(b) Upper Alarm Threshold				
(1) X Channel				
(a) Alarm (HT+.20)		50.4 µs	50.4 to 50.6 µs	50.4 to 50.6 µs
(b) Normal (HT-20)		50.0 µs	50.0 to 50.2 µs	50.0 to 50.2 µs
(2) Y Channel				
(a) Alarm (HT+.20)		56.4 µs	56.2 to 56.4 µs	56.2 to 56.4 µs
(b) Normal (HT-.20)		56.0 µs	56.0 to 56.2 µs	56.0 to 56.2 µs
(2) Reply Efficiency ..... Lower Limit (Alarm)		>70%	>70%	>70%
(3) Pulse Spacing				
(a) Lower Alarm Threshold				
(1) X Channel				
(a) Alarm (LT-.15)		11.60 µs	11.60 to 11.75 µs	11.60 to 11.75 µs
(b) Normal (LT+.15)		11.90 µs	11.75 to 11.90 µs	11.75 to 11.90 µs
(2) Y Channel				
(a) Alarm (LT-.15).....		29.60 µs	29.60 to 29.75 µs	29.60 to 29.75 µs
(b) Normal (LT+.15)		29.90 µs	29.75 to 29.90 µs	29.75 to 29.90 µs
(b) Upper Alarm Threshold				
(1) X Channel				
(a) Alarm (HT+.15)		12.40 µs	12.25 to 12.40 µs	12.25 to 12.40 µs
(b) Normal (HT-.15)		12.10 µs	12.10 to 12.25 µs	12.10 to 12.25 µs
(2) Y Channel				
(a) Alarm (HT+.15).....		30.40 µs	30.25 to 30.40 µs	30.25 to 30.40 µs
(b) Normal (HT-.15)		30.10 µs	30.10 to 30.25 µs	30.10 to 30.25 µs
(4) Peak Power Output (Lower Limit).....		>50 Watts	>50 Watts	>50 Watts
(5) Transmission Rate		720 ppps	670 to 770 ppps	670 to 770 ppps *

Section 5. FA-18200 MODEL 415SE DME (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
* (6) Identification		80 seconds	75 to 95 seconds	75 to 95 seconds
g. Routine Checks TX On Antenna	241e(9)			
(1) Pulse Spacing				
(a) X Channel		12 µs	11.9 to 12.1 µs	11.9 to 12.1 µs
(b) Y Channel		30 µs	29.8 to 30.2 µs	29.8 to 30.2 µs
(2) Peak Power Output				
(a) 1st Pulse		80 to 120 W	78 to 122 W	78 to 122 W
(b) 2nd Pulse		80 to 120 W	78 to 122 W	78 to 122 W
(3) Transmission Rate		800 ppps	>700 ppps	>700 ppps
(4) Peak Power Droop		0 to 0.5dB	0 to 0.5dB	0 to 0.5dB
(5) Reply Efficiency		> 70 percent	> 70 percent	> 70 percent
(6) Transmitter Frequency		Assigned frequency	+/- 1MHz	+/- 1MHz
(7) Reply Pulse Shape				
(a) 1st Pulse Rise Time		1.5 µs	1.5 to 3.5 µs	1.5 to 3.5 µs
(b) 1st Pulse Decay Time		< 3.5 µs	< 3.5 µs	< 3.5 µs
(c) 1st Pulse Duration		3.5 µs	3.0 to 4.0 µs	3.0 to 4.0 µs
(d) 2nd Pulse Rise Time		1.5 µs	1.5 to 3.5 µs	1.5 to 3.5 µs
(e) 2nd Pulse Decay Time		< 3.5 µs	< 3.5 µs	< 3.5 µs
(f) 2nd Pulse Duration		3.5 µs	3.0 to 4.0 µs	3.0 to 4.0 µs
(8) Reply Delay Variation with Level				
(a) -10 dBm X-mode		50.0 µs	49.8 to 50.2 µs	49.8 to 50.2 µs
Y-mode		56.0 µs	55.8 to 56.2 µs	55.8 to 56.2 µs
(b) -30 dBm X-mode		50.0 µs	49.8 to 50.2 µs	49.8 to 50.2 µs
Y-mode		56.0 µs	55.8 to 56.2 µs	55.8 to 56.2 µs
(c) -50 dBm X-mode		50.0 µs	49.8 to 50.2 µs	49.8 to 50.2 µs
Y-mode		56.0 µs	55.8 to 56.2 µs	55.8 to 56.2 µs
(d) –70 dBm X-mode		50.0 µs	49.8 to 50.2 µs	49.8 to 50.2 µs
Y-mode		56.0 µs	55.8 to 56.2 µs	55.8 to 56.2 µs
(e) –78 dBm X-mode		50.0 µs	49.6 to 50.4 µs	49.6 to 50.4 µs
Y-mode		56.0 µs	55.6 to 56.4 µs	55.6 to 56.4 µs *

* **Section 5. FA-18200 MODEL 415SE DME (Continued)**

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
(9) Sensitivity				
(a) –79dBm		> 70 percent	> 70 percent	> 70 percent
(b) –80dBm		> 70 percent	> 70 percent	> 70 percent
(c) –81dBm		> 70 percent	> 70 percent	> 70 percent
(d) –82dBm		> 70 percent	> 70 percent	> 70 percent
(e) –83dBm		> 70 percent	> 70 percent	> 70 percent
(f) –84dBm		> 70 percent	> 70 percent	> 70 percent
(g) –85dBm		> 70 percent	> 70 percent	> 70 percent
(10) Bandwidth				
(a) –200 kHz at –88 dBm		> 70 percent	> 70 percent	> 70 percent
(b) +200 kHz at –88 dBm		> 70 percent	> 70 percent	> 70 percent
(11) Adjacent Channel Rejection				
(a) –900 kHz at –10dBm		< 10 percent	< 10 percent	< 10 percent
(b) +900 kHz at –10dBm		< 10 percent	< 10 percent	< 10 percent
(12) Decoder				
(a) -10 dBm				
X-mode 10.0 µs		< 10 percent	< 10 percent	< 10 percent
Y-mode 34.0 µs		< 10 percent	< 10 percent	< 10 percent
(b) -90 dBm				
X-mode 11.0 µs		> 70 percent	> 70 percent	> 70 percent
Y-mode 35.0 µs		> 70 percent	> 70 percent	> 70 percent
(c) -90 dBm				
X-mode 13.0 µs		> 70 percent	> 70 percent	> 70 percent
Y-mode 37.0 µs		> 70 percent	> 70 percent	> 70 percent
(d) -10 dBm				
X-mode 14.0 µs		< 10 percent	< 10 percent	< 10 percent
Y-mode 38.0 µs		< 10 percent	< 10 percent	< 10 percent
(e) Single Pulse / -10 dBm		< 10 percent	< 10 percent	< 10 percent
(13) Dead Time				
(a) –70 dBm / -70 dBm / 58.0 µs		< 10 percent	< 10 percent	< 10 percent
(b) –70 dBm / -70 dBm / 77.0 µs		> 70 percent	> 70 percent	> 70 percent
(14) Echo Suppression				
(a) Long Distance				

*

Section 5. FA-18200 MODEL 415SE DME (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
(1) –17 dBm / 7dB / 106.0 µs		> 70 percent	> 70 percent	> 70 percent
(2) –17 dBm /-1dB / 106.0 µs		< 30 percent	< 30 percent	< 30 percent
(3) –17 dBm /-1dB / 118.0 µs		> 70 percent	> 70 percent	> 70 percent
(b) Short Distance				
(1) –15 dBm / -8dB / 7.0 µs		< 30 percent	< 30 percent	< 30 percent
(2) –50 dBm / -8dB / 7.0 µs		< 30 percent	< 30 percent	< 30 percent
(3) –64 dBm / -8dB / 7.0 µs		< 30 percent	< 30 percent	< 30 percent
(15) Transmitted Power				
(a) 1st Pulse		Established Value	+/- 20 percent	+/- 20 percent
(b) 2nd Pulse		Established Value	+/- 20 percent	+/- 20 percent
h. Routine Check On Monitor	241e(11)			
(1) Interrogation Pulse Level				
(a) X Channel				
(1) 1st Pulse.....		1.0 to 2.5 Vdc	1.3 to 2.7 Vdc	1.3 to 2.7 Vdc
(2) 2nd Pulse.....		1.0 to 2.5 Vdc	1.3 to 2.7 Vdc	1.3 to 2.7 Vdc
(b) Y Channel				
(1) 1st Pulse.....		1.0 to 2.5 Vdc	1.3 to 2.7 Vdc	1.3 to 2.7 Vdc
(2) 2nd Pulse.....		1.0 to 2.5 Vdc	1.3 to 2.7 Vdc Vdc	1.3 to 2.7 Vdc
(2) Interrogation Pulse Spacing				
(a) X Channel.....		12 µs	11.9 to 12.1 µs	11.9 to 12.1 µs
(b) Y Channel.....		36 µs	35.8 to 36.2 µs	35.8 to 36.2 µs
(3) Interrogation Pulse Shape (X & Y)				
(a) 1st Pulse Rise Time		< 2.0 µs	< 2.2 µs	< 2.2 µs
(b) 1st Pulse Decay Time.....		< 3.5 µs	< 3.7 µs	< 3.7 µs
(c) 1st Pulse Duration		3.0 to 4.0 µs	2.8 to 4.2 µs	2.8 to 4.2 µs
(d) 2nd Pulse Rise Time		< 2.0 µs	< 2.2 µs	< 2.2 µs
(e) 2nd Pulse Decay Time		< 3.5 µs	< 3.7 µs	< 3.7 µs
(f) 2nd Pulse Duration.....		3.0 to 4.0 µs	2.8 to 4.2 µs	2.8 to 4.2 µs

Section 5. FA-18200 MODEL 415SE DME (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit Initial	Tolerance/Limit Operating
* **89. Power Supply And Voltage Specifications**				
a. 50 V supply low-power transmitter (TX).	241-10d(6)	+ 50 Vdc	+ 48 to 52 Vdc	+ 48 to 52 Vdc
→ **b. 5 V supply.....**	241-10d(1)	+5 Vdc	+ 4.75 to 5.25 Vdc	+ 4.75 to 5.25 Vdc
→ **c. 15 V supply .....**	241-10d(2)	+ 15 Vdc	+ 14.75 to 15.25 Vdc	+ 14.75 to 15.25 Vdc
→ **d. – 15 V supply .....**	241-10d(3)	- 15 Vdc	- 15.25 to -14.75 Vdc	- 15.25 to -14.75 Vdc
e. DC BUS Voltage	241-10d(5) 241-3e(4)	54 Vdc	+53 to 55 Vdc	+53 to 55 Vdc
f. DC BUS Voltage (system on batteries).....	241-3e(6)	50 Vdc	+49 to 51 Vdc	+44 to 54 Vdc
g. DC BUS Voltage (system on batteries)				
(1) 5 minutes	241-3e(7)	Stabalized value < -.2 Vdc	Stabalized value < -.2 Vdc	Stabalized value < -.2 Vdc
(2) 20 minutes.....	241-3e(8)	Stabalized value -.4 Vdc	Stabalized value -.4 Vdc	Stabalized value -.4 Vdc
h. Voltage Across Each Battery.....	241-3e(9)	+13.5 Vdc	13.0 to 13.7 Vdc	13.0 to 13.7 Vdc
→ **i. CSB Battery Voltage .....**	241-13d(5)	3.6 Vdc	3.0 to 5.0 Vdc	3.0 to 5.0 Vdc *

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Section 1. PERFORMANCE CHECKS (Continued)

Performance Check	*Reference Procedures*	
	Standards and Tolerances	*Maintenance Procedures*
(3) Transponder Performance Check	87	240-15
(4) Transmitter Video CCA (1A27) Performance Check	87	240-16
(5) Transponder Monitor Performance Check	87	240-17
(6) Low Voltage Power Supply (1A13/1A28) Performance Check.	87	240-19
(7) Monitor A and Signal Generator Video Performance Check.	87	240-20
(8) Monitor A and RF Signal Generator Performance Check.	87	240-21
(9) Decoder CCA (1A25) Performance Check	87	240-22
(10) Monitor B, CCA (1A12) Performance Check	87	240-23
(11) Detector Assembly (1A4/1A5) Performance Check.	87	240-24
(12) High Voltage Power Supply (1A14) Performance Check.	87	240-25
* **108. FA-18200 415SE DME SYSTEM.**		
a. Semiannually.		
(1) Routine Checks	88g	241
(2) Monitor Integrity Test	88f	241-1
(3) Standby Power Operation	89f, 89g, 89h	241-3
(4) Transmitter Pulse Characteristics	88a(3)(a), 88a(3)(b), 88a(3)(b)	241-5
(5) Receiver Sensitivity and Selectivity check	88b(1), 88b(2), 88b(3),	241-15
(6) Identification	88a(5)(a), 88a(5)(b	241-14
(7) Decoder Aperture	88c(1), 88c(2	241-12
(8) Transponder Pulse Spacing	88a(3)(d)(1)(2)	241-7
(9) Transponder Pulse Rate	88a(4)	241-8 *

Section 1. PERFORMANCE CHECKS (Continued)

Performance Check	*Reference Procedures*	
	Standards and Tolerances	*Maintenance Procedures*
* (10) Power Supply and Voltage	89a, 89b, 89c, 89d, 89e,	241-10
(11) Transponder Reply Delay	88a(6)(a), 88a(6)(a)	241-11
(12) Monitor Alarm Parameters	88e	241-16
c. Annually.		
(1) Control Status Board (CSB) Battery	89i	241-13
(2) Peak Power Output	88a(2)	241-4
(3) Transponder Frequency	88a(1)	241-6
(4) Check the Monitor Interrogation Signal Characteristics	88d(1), 88d(2), 88d(3), 88d(4), 88d(5)	241-9
109. RESERVED.		*

Section 2. OTHER MAINTENANCE TASKS

Performance Check	*Reference Procedures*	
	Standards and Tolerances	*Maintenance Procedures*
110. WILCOX 596B/C, BUTLER 1020, AEROCOM 5351A, E-SYSTEMS MARK III, DTD, CARDION FA-8974, FA-9639, AND FA-9783 EQUIPMENT. Perform the following tasks as required.		
a. Visual Inspection	NA	241
b. General Cleaning	NA	242
c. Lubricate All Fan Motors	NA	NA
d. Replace Equipment Cabinet Air Filters	NA	NA
e. Perform facility performance tests on batteries in accordance with the latest edition of Order 6980.25		6980.25
111.-114. RESERVED.		
115. ASII MODEL 1118 SYSTEM. Visual Inspection as required.	NA	246-1 through 246-3
* **116. FA-18200 Model 415 SE DME.** Routine Cleaning	N/A	241-2 *
117-119. RESERVED.		

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TECHNICAL PERFORMANCE RECORD — CONTINUATION OR TEMPORARY RECORD/REPORT FORM

FACILITY: DME (ATCT, FSS, ARTCC, VOR, LOC, ETC.)
DATES: FROM 11/27/78 TO
SUPERVISOR'S SIGNATURE:
LOCATION: DALLAS, TX DAL (CITY, STATE, AIRPORT, OTHER)
EQUIPMENT: WILCOX 596B (A/G, DF, COMPONENTS, ETC.)
FREQ.: CHAN 39X
#1 EQUIPMENT

DATE 1978	TIME	2nd L.O. (±0.005%) Hz	PULSE PAIR GEN OSC (±0.005%)	TEST UNIT TIME-MARKER (±0.005%)	REMARKS (SHEET 2 of 2)	INITIALS
NOMINAL		54 250 000	16 000 000	16 000 000		
11/27	1600	54 249 120	16 001 600	15 999 300		TGT

SAMPLE

FAA Form 6000-8 (3-76) FORMERLY FAA FORM 418-24

Figure 5-4. Sample of FAA Form 6000-8 For Use With Wilcox 596B/C Frequency Checks (Sheet 2).

TECHNICAL PERFORMANCE RECORD — 415 SE DISTANCE MEASURING EQUIPMENT (DME) — SHEET 1 OF 2

FACILITY	LOCATION (CITY, STATE, AIRPORT, OTHER)	DATE (FROM - TO)
DCI DME	GREELEY, COLORADO	1/10/2005 -

DME TYPE	SERIAL NUMBER	CHANNEL NUMBER	SUPERVISOR'S (SIGNATURE)
FA-18200	034	36X	

DATE 2005	TIME	TRANSPONDER: Reply Delay (µs)	Pulse Spacing (µs)	Reply Efficiency (%)	Peak Power Output * (W)	Transmission Rate (PPP)	Ident Frequency (Hz)	Pulse Width (µs)	Transponder Frequency * (MHz)	Receiver Sensitivity/Selectivity: On Channel (-dBm)	- 200 KHZ (%)	+ 200 KHZ (%)	- 900 KHZ (%)	+ 900 KHZ (%)	INITIALS
Nominal		50.00	12.00	>70	100	800	1350	3.5	997.000000	82	100	100	0	0	YMB
		50.20	12.10	—	—	900	1360	4.0	997.099700	≥82	100	100	<5	<5	YMB
		49.80	11.90	>70	>50	700	1340	3.0	996.900300	≥79	>70	>70	<5	<5	YMB
1/14	1300	50.05	12.03	96	—	824	1349	3.2	—	98	96	96	3	1	YMB
4/6	1115	50.02	12.06	97	99	854	1351	3.7	997.073510	99	97	97	2	3	J.I.
4/6	1130	50.03	11.98	97	98	760	1351	3.3	997.073790	98	97	97	0	3	J.I.
4/20	1400	—	—	—	—	—	—	—	—	—	—	—	—	—	YMB
5/4	0900	Franklin Dust													F.D.
6/28	1030	50.01	12.02	~~92~~ J.I. 98	99	810	1349	3.7	997.045715	99	98	98	3	4	J.I.

SAMPLE

FAA Form 6780-5 (07/20/2005)

* Annual Checks

Figure 5-4a. Sample FAA Form 6780-5 DME Equipment

TECHNICAL PERFORMANCE RECORD — 415 SE DISTANCE MEASURING EQUIPMENT (DME) CONTINUED — SHEET 2 OF 2

FACILITY	LOCATION (CITY, STATE, AIRPORT, OTHER)	DATE (FROM - TO)
DCI DME	GREELEY, COLORADO	1/10/2005

DME TYPE	SERIAL NUMBER	CHANNEL NUMBER	SUPERVISOR'S (SIGNATURE)
FA-18200	034	36X	

DATE 2005	TIME	MONITOR: Interr Spacing * (µs)	MONITOR: Interr Level * (V p)	MONITOR: Shutdown Time (sec)	MONITOR: Ident Shutdown (sec)	POWER SUPPLY: CSB Battery Voltage * (Volts)	POWER SUPPLY: + 5 Volts DC (Volts)	POWER SUPPLY: + 15 Volts DC (Volts)	POWER SUPPLY: - 15 Volts DC (Volts)	REMARKS	INITIALS
Nominal		12.00	3	<10	80	3.6	5.0	15.0	-15.0	NOMINAL VALUE	YMB
		12.10	3.3	<10	95	5.0	5.25	15.25	-14.75	UPPER LIMIT	YMB
		11.90	1.5	—	75	3.0	4.75	14.75	-15.25	LOWER LIMIT	YMB
1/14	1300	—	—	4-8 YMB	95	—	5.20	15.09	-14.98	Semi-Annual Checks	YMB
4/6	1115	12.20	3.2	7	95	3.2	5.12	15.15	-15.05	Trouble Call	J.I.
4/6	1130	12.00	3.3	6	94	3.7	4.87	15.05	-15.12	Remove and replace monitor board	J.I.
4/20	1400	—	—	—	—	—	—	—	—	Quarterly Checks	YMB
5/4	0900	Franklin		Dust						TPR Admin. Review	J.D.
6/28	1030	12.00	3.2	6	92	3.2	4.98	15.20	-15.06	Annual and Semi-Annual Checks	J.I.

SAMPLE

FAA Form 6780-6 (07/20/2005)

Figure 5-4b. Sample FAA Form 6780-6 DME Equipment

* Subsection 1. CARDION FA-8974, AEROCOM 5351A, E-SYSTEMS MARK III, AND DTD EQUIPMENT PERFORMANCE CHECKS *

126. PEAK POWER.

a. Object. This procedure provides a method to verify the peak power output.

b. Test Equipment Required. Power meter or oscilloscope.

c. Conditions. Normally operating facility.

d. Detailed Procedure.

(1) Make connections according to the DME system under test.

(2) Measure peak power using one of the following methods:

(a) Connect an oscilloscope to view the output pulse pair at the power-calibrated output jack and compare the amplitude to the power calibration chart.

(b) Read the output power using the internal power meter or connect an output peak power meter and record the value.

(3) Verify that the peak power is within operating limits. Refer to standards and tolerances, paragraph 55a(2).

(4) Return equipment to normal configuration.

127. RECEIVER SENSITIVITY.

a. Object. This procedure provides a method to verify the receiver sensitivity.

b. Test Equipment Required. Counter.

c. Conditions. Normally operating facility.

d. Detailed Procedure.

(1) Make connection according to the DME system under test.

(2) Determine reply count with a strong interrogation level and known repetition rate.

(3) Decrease interrogation level to 65 or 70 percent reply count, depending on system. Record interrogation output level.

(4) Verify that receiver sensitivity is within operating limits. Refer to standards and tolerances, paragraph 55b(l).

(5) Return equipment to normal configuration.

128. REPLY DELAY.

a. Object. This procedure provides a method to verify the reply delay.

b. Test Equipment Required. Oscilloscope.

c. Conditions. Normally operating facility.

d. Detailed Procedure.

(1) Make connection according to the DME system under test.

(2) Measure reply delay from half amplitude point of the interrogation pulse pair to the half amplitude point of the reply pulse pair. Record reply delay time.

(3) Verify that the reply delay is within operating limits. Refer to standards and tolerances, paragraph 55c(4).

(4) Return equipment to normal configuration.

129. RECEIVER SELECTIVITY.

a. Object. This procedure provides a method to verify the receiver selectivity.

b. Test Equipment Required. Counter.

c. Conditions. Normally operating facility.

d. Detailed Procedure.

(1) Make connection according to the DME system under test.

(2) Measure ON channel receiver selectivity for a frequency deviation of +0 kHz, + 160kHz, or +200kHz, depending on system, with a known interrogation rate. Record reply count.

(3) Verify that the receiver selectivity is within operating limits. Refer to standards and tolerances, paragraph 55b(2)(a).

SUBSECTION 6. FA-18200 MODEL 415SE DME EQUIPMENT PERFORMANCE CHECKS

* **241. ROUTINE TESTS.**

a. Object. Routine performance tests verify the proper performance of the distance measuring equipment (DME) transponder. All limits should conform to the tolerances listed in section 3. All tests must pass. If any test fails, repeat the test two or three times to verify the failure; then refer to section 7 of the TI for corrective maintenance.

b. Discussion. This procedure's data can be printed or saved to disk. To save it to a disk, choose the save to file option on the printer routine test screen. The information can then be accessed as historical data. A generic, text only printer can be set up using Windows. With this type of printer, a print to file will result in an ASCII file that can be read by any word processor or text editor.

c. Test Equipment Required. MDT (maintenance data terminal) or portable MDT and WinSV software.

d. Conditions. Normally Operating Facility.

e. Detailed Procedure.

(1) Log ON.

(2) Request control of the DME.

(3) Select *Checks* and then *Executive Monitoring on Antenna*.

(4) Select *Abort* to freeze the data. Review and confirm that all data is within tolerances. Refer to monitor alarm parameter paragraph 88e.

(5) Print the displayed data or save it to a file and exit the screen.

(6) Select *Checks* and then *Monitor self-check*. Review and confirm that all data indicates OK.

(7) Select *Abort* to freeze the data.

(8) If a copy of the data is needed print the displayed data or save it to a file and *exit* the screen.

(9) Select *Checks* and then *Routine Check - Trx on Antenna*. Wait for the tests to complete (tests will take a few minutes). When the END ROUTINE CHECK box appears, press RETURN or click on OK. Review and confirm that all data are within tolerances. Refer to standards and tolerances paragraph 88g.

(10) If a copy of the data is needed print the displayed data or save it to a file and exit the screen.

(11) Select *Checks* and then *Routine Check - On Monitor*. Wait for the tests to complete (tests will take several seconds). When the END ROUTINE CHECK box appears, press RETURN or click OK. Review and confirm all data are within tolerances. Refer to standards and tolerances paragraph 88h.

(12) If a copy of the data is needed print the displayed data or save it to a file and exit the screen.

(13) Select *Status* and then *List of Settings*.

(14) If a copy of the data is needed select *Print All* or save it to a file and exit the screen. If a printer is not available, use the print to file feature in Windows to record the setup.

(15) Log OFF.

241-1. MONITOR INTEGRITY AND ALARM SHUTDOWN.

a. Object. This test verifies that the monitor will alarm and that a shutdown will occur if an executive monitor parameter exceeds its threshold. This test will take the system off the air in normal mode of operation.

b. Test Equipment Required. Stopwatch or time piece with a second hand.

NOTE: The following maintenance procedures interrupt normal operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

c. Conditions. Facility NOTAM issued.

d. Detailed Procedure.

(1) Log ON.

(2) Request control of the DME.

(3) Select *Maintenance* and *OK*. This bypasses the monitor. Select *Checks* and then *Monitor Integrity Test*. Select Start to begin the test. The test will take a few minutes. Review and confirm that all parameters pass. Refer to standards and tolerances paragraph 88f.

(4) Print the displayed data and exit the screen. *Exit* maintenance mode. Return the system to NORMAL operation.

(5) With the system operating in NORMAL mode (transmitter radiating and not in bypass). Remove the monitor cable from the N connector on the inside/back of the cabinet. The left cable is the monitor cable. This *

* will cause the transmission rate and radiated power parameters to alarm.

(6) Measure and record with a stopwatch or timepiece that the alarm shutdown time is within the tolerances listed in paragraph 88e(9).

(7) Verify that there are no green light-emitting diodes (LEDs) illuminated on the transmitter assembly (TX). This confirms the transmitter is off.

(8) Replace monitor cable.

(9) From the front panel, restore the system to NORMAL operation to clear the OTHER WARNINGS indication.

(10) Disconnect the IDENT sync input from the co-located facility. This will cause an Ident alarm.

(11) Measure and record with a stopwatch or timepiece that the Ident shutdown time is within the tolerances listed in paragraph 88e(8).

(12) Verify that there are no green light-emitting diodes (LEDs) illuminated on the transmitter assembly (TX). This confirms the transmitter is off.

(13) Replace the Ident sync input.

(14) From the front panel, restore the system to NORMAL operation to clear the OTHER WARNINGS indication.

241-2. ROUTINE CLEANING.

a. Object. This test provide methods of cleaning the equipment and general inspection.

b. Test Equipment Required. None.

c. Conditions. Facility NOTAM issued.

WARNING

Dangerous voltage (240 V ac or 120 V ac) exists within the DME 415SE system. Contact with this voltage can cause personnel injury or death.

d. Detailed Procedure.

(1) Verify that the equipment is powered down before attempting any general maintenance work.

(2) Use a soft cloth; do not use corrosive or abrasive substances. Moisten a cloth with ethyl alcohol, glycol, or clean water and remove dirt from the local control status unit (LCSU) panel.

(3) Clean subassemblies as required. This will require removal from the cardcage.

(4) Return system to NORMAL operation.

241-3. STANDBY POWER OPERATION TEST.

a. Object. This procedures provides for checking the station batteries under equipment load.

b. Discussion. Flooded batteries generate an explosive gas under NORMAL operating conditions. Take care to avoid creating sparks that could ignite this gas. Ensure that no tools or other metal objects can fall onto the batteries or otherwise contact the batteries and cause a short. Batteries contain a very corrosive electrolyte that can cause serious injury to the skin and eyes. Wear proper protective clothing and eye, hand, and face protection when working with the batteries.

c. Test Equipment Required. Digital Multimeter .

d. Conditions. Normally Operating Facility.

NOTE: Instructions are provided below for both sealed and flooded batteries.

e. Detailed Procedure.

(1) Inspect each battery and verify it has no bulges, cracks, or other deformations. If there is electrolyte on the surface of a sealed battery, the battery has failed and should be replaced.

(2) Replace any defective batteries.

(3) Check all battery terminal connections and verify they are tight and corrosion-free.

(4) Using a digital multimeter measure the DC BUS Voltage. Refer to standards and tolerances paragraph 89e.

(5) Turn OFF the ac power and record the time that power was turned off (This is not a TPR entry).

(6) Using a digital multimeter measure the DC BUS Voltage (voltage atabalizes after approximately 2 minutes). Refer to standards and tolerances paragraph 89f.

(7) Five minutes after the power is turned OFF, measure voltage across all batteries. Refer to standards and tolerances paragraph 89g(1).

(8) Twenty minutes after the power is turned OFF, measure the voltage across all batteries . Refer to standards and tolerances paragraph 89g(2). *

* (9) If batteries fail either check, measure the voltage across each battery. The voltage across each battery should meet the tolerance in standards and tolerance paragragh 89h. Replace the battery that is causing the drop in voltage. Charge the new battery and repeat steps 241-4e(6) and (7).

(10) Turn ON the ac power.

241-4. PEAK POWER OUTPUT MEASUREMENT.

a. Object. This paragraph measures peak output power.

b. Test Equipment Required.

(1) Peak power meter (Agilent 4416) with 9323 probe or equivalent.

(2) Precision 40 dB directional coupler designed for operation in the DME frequency band.

c. Conditions. Facility NOTAM issued.

NOTE: The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

d. Detailed Procedure.

(1) Log ON.

(2) Request control of the DME.

(3) Select *Checks* and then *Executive Monitoring on Antenna*.

(4) Verify that the value for peak power is in tolerance. Refer to standards and tolerances paragraph 88a(2).

(5) Abort and exit *Executive Monitoring on Antenna*.

(6) Enter *Maintenance* mode. From the commands menu set Transponder 1 to *Standby*.

(7) Connect a peak power meter via directional coupler to the output of the equipment as shown in figure 5-9, Output Power Measurement, Test Set-up Using Peak Power Meter. Refer to the instructions from the power meter manufacturer for proper operation of the power meter.

CAUTION

Always ensure that the transmitter is terminated into a proper load before setting the beacon to *Operating* (transmitter on).

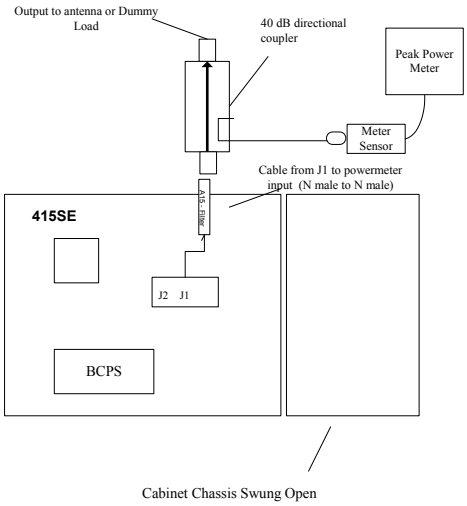
(8) Set the beacon to *Operating* and measure and record the power with the peak power meter.

(9) Verify that the peak power value read is in tolerance. Refer to standards and tolerances paragraph 88a(2).

(10) Set the beacon to STANDBY.

(11) Disconnect thepower meter..

(12) Restore DME to NORMAL operation.



*

Figure 5-9. Output Power Measurement, Test Set-up Using Peak Power Meter

* **241-5 TRANSMITTER PULSE CHARACTERISTICS.**

a. Object. This procedure allows the operator to measure the pulse shape of the transmitter output. The procedure uses an oscilloscope. The results obtained using the scope will typically be within ±5 percent of the readings displayed by the monitor.

b. Test Equipment Required. Oscilloscope, dual or four channels, at least 100 MHz.

c. Conditions. Facility NOTAM issued.

> **NOTE:** The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

d. Detailed Procedure.

(1) Connect channel one to transmitter test point AN7. See figure 5-10, Transmitter Test Points.

(2) Trigger the oscilloscope from Transmitter test point AN11 (negative trigger). See figure 5-10.

(3) Adjust the time base and trigger to allow the replies on channel one to be displayed on the screen.

(4) Set the oscilloscope time base to 1 or 2 µs. Measure the rise time of the pulse from 10 percent of the leading edge of the to 90 percent of its peak value. Verify that the value read is in tolerance. See figure 5-11, Typical Transmitter Pulse Shape. Refer to standards and tolerances paragraph 88a(3)a.

(5) Measure and record the pulse duration (width) between the 50 percent point of a pulse rising edge and the 50 percent point of the pulse falling edge. Verify that the value read is in tolerance. See figure 5-11. Refer to standards and tolerances paragraph 88a(3)(c).

(6) Measure the decay time from the trailing edge of the pulse to transition from 90 percent of its peak value to 10 percent of its peak value. Verify that the value read is in tolerance. See figure 5-11. Refer to standards and tolerances paragraph 88a(3)(b).

(7) Return the DME station to NORMAL operation.

241-6. TRANSPONDER FREQUENCY MEASUREMENT.

a. Object. This procedure measures the DME transponder frequency. The frequency source used by the transmitter and receiver is located in the receiver module.

b. Test Equipment Required. Frequency Counter capable of measurements in the DME frequency range, BNC female to backplane female adapter.`

c. Conditions. Facility NOTAM issued.

d. Detailed Procedure.

(1) Log ON.

(2) Use Commands to turn beacon one OFF.

(3) Remove the low-power transmitter module (TX). The module may be removed with input power ON.

(4) Connect frequency counter to the upper RF connector in the cardcage that interfaces with the removed transmitter assembly. Use the BNC female to backplane female adapter (supplied with equipment) to convert the top connector to a BNC female connector. This will allow a cable with BNC male connectors on both ends to be used with the frequency counter.

(5) Measure and record the station assigned carrier frequency. Refer to standards and tolerance paragraph 88a(1).

(6) Remove power from system using ac and battery disconnect switches. Disconnect adapter, cable, and frequency counter.

(7) Replace the transmitter and restore the system to NORMAL operation.

(8) Log OFF. *

*

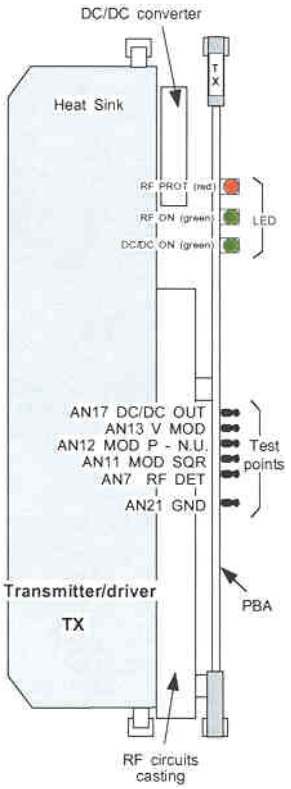


Figure 5-10. Transmitter Test Points

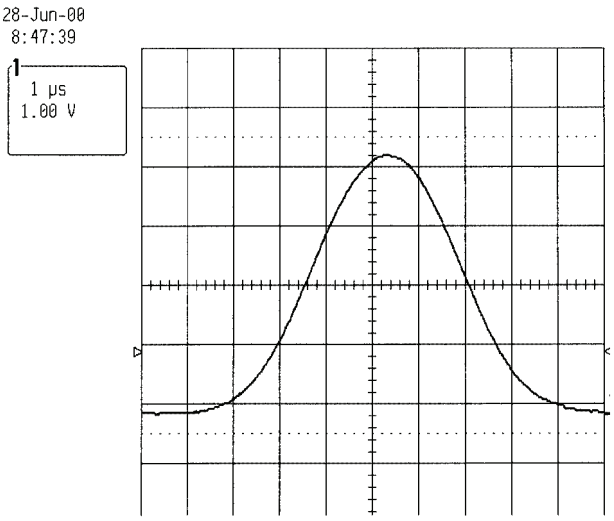


Figure 5-11. Typical Transmitter Pulse Shape *

* **241-7. PULSE SPACING MEASUREMENT.**

a. Object. This procedure allows the operator to measure spacing of the transmitter output pulses. The procedure uses a dual channel oscilloscope and is not as accurate as the technique used in the monitor. The results obtained using the scope will typically be within ±5 percent of the readings displayed by the monitor.

b. Test Equipment Required. Oscilloscope, dual or four channels, at least 100 MHz.

c. Conditions. Facility NOTAM issued.

d. Detailed Procedure.

(1) Connect oscilloscope channel to transmitter test point AN7. See figure 5-10.

(2) Set the oscilloscope for positive trigger.

(3) Adjust the time base to allow both reply pulses to be displayed on the screen.

(4) Examine the pulse pair on the oscilloscope. Measure and record the time between the 50 percent point of the pulse rise time of the first pulse and the 50 percent point of the pulse rise time of the second pulse. See figure 5-12, Pulse Spacing Measurement.

(5) Verify that the value read is in tolerance. Refer to standards and tolerances paragraph 88a(3)(d).

(6) Return the DME station to NORMAL operation.

241-8. TRANSPONDER PULSE RATE MEASUREMENT.

a. Object. This procedure measures pulse rate of the DME transponder.

b. Discussion. Because of the random nature of DME output pulses, the frequency counter will not display a constant value. The reading will be affected by aircraft interrogations. Do not use a value measured during a DME identification period. The counter reading will increase during the DME identification period. Divide the frequency counter reading by two to get the frequency of pulse pairs (as read by the monitor).

c. Test Equipment Required. Frequency Counter.

d. Conditions. Operating Facility.

e. Detailed Procedure.

(1) Select the Executive Monitoring on Antenna screen.

(2) Verify that the transmission pulse rate value is within the limits indicated standards and tolerances paragraph 88a(4).

(3) Connect the frequency counter to AN7 test points of transmitter TX module. See figure 5-10.

(4) Measure and record the transmission pulse rate. Verify that the reading (divided by two) is approximately the same as that displayed on the *Executive Monitor* screen.

241-9. MONITOR INTERROGATION - PULSE SHAPE, PULSE SPACING, AND PEAK PULSE LEVEL MEASUREMENT.

a. Object. This test measures the pulse shape, spacing and peak pulse level of the monitor interrogation signal.

b. Test Equipment Required. Oscilloscope 100 Mhz.

c. Conditions. Facility NOTAM issued.

NOTE: The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personel before removing a DME from service.

d. Detailed Procedure.

(1) Connect the external trigger input of the oscilloscope is monitor test point AN2. See figure 5-13, Monitor Test Points.

(2) Connect channel one of the oscilloscope to monitor test point AN23. See figure 5-13.

(3) Use the PMDT to enter the *Maintenance* mode. Select *Checks* and then *Configurable Measurement*. Set up the *Configurable Measurement* screen as follows.

Test Type: Signal generator

Monitor: 1

Level: -40

Freq dev from nom: 0

Spacing: 12 for X channel or 36 for Y channel

Repetition Rate: 1000

Select: START *

*

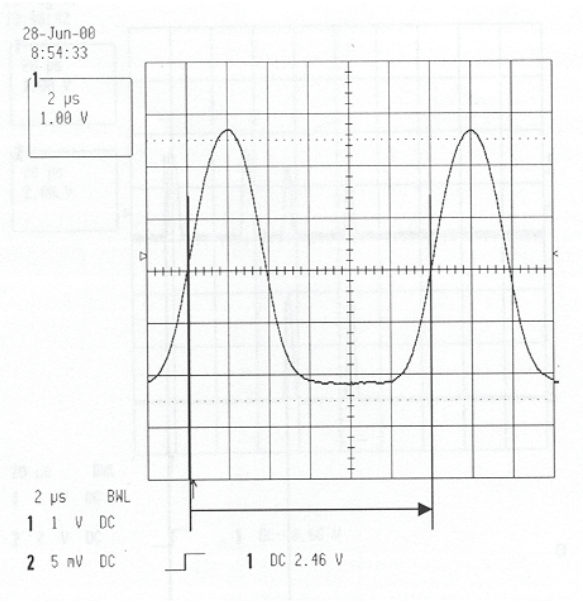


Figure 5-12. Pulse Spacing Measurement

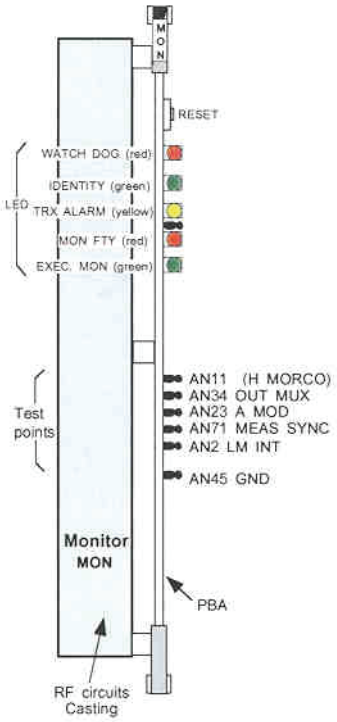


Figure 5-13. Monitor Test Points *

* (4) Set the oscilloscope time base to 1 or 2 µs. To measure the rise time, measure the time for the leading edge of the pulse to transition from 10 percent of its peak value to 90 percent of its peak value. Refer to standards and tolerances paragraph 88d(3)(a).

(5) Set the oscilloscope time base to 1 or 2 µs. To measure the duration, measure the time between the 50 percent point of a pulse rise time and the 50 percent point of the pulse fall time. Refer to standards and tolerances paragraph 88d(3)(c).

(6) Set the oscilloscope time base to 1 or 2 µs. To measure the decay time, measure the time for the trailing edge of the pulse to transition from 90 percent of its peak value to 10 percent of its peak value. Refer to standards and tolerances paragraph 88d(3)(b).

(7) Set the oscilloscope time base to 10 µs. To measure interrogation pulse spacing, measure and record the time between the 50 percent point of the pulse rise time of the first pulse and the 50 percent point of the pulse rise time of the second pulse. Refer to standards and tolerances paragraph 88d(1).

(8) Measure and record the interrogation pulse level of the pulses and verify that they are within the standards and tolerances in paragraph 88d(2).

(9) Return the system to NORMAL operation.

241-10. POWER SUPPLY MEASUREMENTS.

a. Object. This test measures the key power supply voltages in the FA-18200 415SE DME.

b. Test Equipment Required. Digital Multimeter.

c. Conditions. Normal Operating Facility.

d. Detailed Procedure.

(1) Measure and record the +5 volt level using the test points on the PWS module. See figure 5-14, Pws Test Points, for the location of the test points. Refer to standards and tolerances paragraph 89b.

(2) Measure and record the +15 volt level using the test points on the PWS module. See figure 5-14 for the location of the test points. Refer to standards and tolerances paragraph 89c.

(3) Measure and record the -15-volt levels using the test points on the PWS module. See figure 5-14 for the location of the test points. Refer to standards and tolerances paragraph 89d.

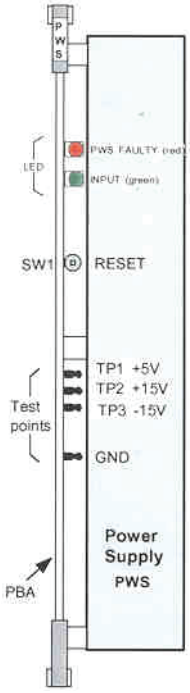


Figure 5-14. PWS Test Points

WARNING

Dangerous voltage (115 or 240 V AC) exists within the DME system. Contact with this voltage can cause personnel injury or death.

(4) Measure the AC input voltage. The voltage should be measured on the power supply terminal where AC power comes into the cabinet.

(5) Measure the DC bus voltage. Connect the voltmeter between W1 (48 VDC-) and W2 (48 VDC +) at the back of the cabinet. Refer to standards and tolerances paragraph 89e.

(6) Measure the output of the 50 volt supply on the low-power transmitter module (TX). See figure 5-10 (AN17) for the location of the test point. Refer to standards and tolerances paragraph 89a.

241-11. TRANSPONDER REPLY DELAY MEASUREMENT.

a. Object. This procedure allows the operator to measure the system reply delay. The procedure uses a dual channel oscilloscope. The results obtained using the scope will typically be within ±5 percent of the readings displayed by the monitor.

b. Test Equipment Required. Oscilloscope, dual or four channels, at least 100 MHz.

c. Conditions. Facility NOTAM issued. *

* **d. Detailed Procedure.**

(1) Connect channel one to monitor test point AN23. See figure 5-13.

(2) Connect channel two to transmitter test point AN7. See figure 5-10.

(3) Trigger the oscilloscope from monitor test point AN2. See figure 5-13.

(4) Adjust the time base and trigger to allow the interrogations on channel one and the replies on channel two to be displayed on the screen.

(5) Use the portable maintenance data terminal (PMDT) to enter the *Maintenance Mode*. Select *Checks* and then *Configurable Measurement*. Set up the configurable measurement screen as follows:

Test Type: Signal generator

Monitor: 1

Level: -40

Freq dev from nom: 0

Spacing: 12 for X channel or 36 for Y channel

Repetition Rate: 1000

Select: START

(6) Channel one shows the interrogation pulses. Channel two shows the transmitter pulses. Set the oscilloscope time base to 10 or 20 µs. Using the appropriate technique for the oscilloscope used, accurately measure and record the time from the 50 percent point of the leading edge of the first constituent pulse of the pulse pair on channel one to the 50 percent point of the leading edge of the first constituent pulse of the pulse pair on channel two. See figure 5-15a or 5-15b, Reply Delay Measurement.

(7) Verify that the value read is in tolerance. Refer to standards and tolerances paragraph 88a(6).

(8) Return the DME station to NORMAL operation.

241-12. TRANSPONDER DECODER TOLERANCE MEASUREMENT.

a. Object. This test measures acceptance and rejectance of the DME decoder for X or Y mode of operation.

b. Test Equipment Required. MDT (maintenance data terminal) or portable MDT and WinSV software.

c. Conditions. Facility NOTAM issued.

NOTE: The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

d. Detailed Procedure.

(1) Use the PMDT to enter the *Maintenance* mode. Select *Checks* and then *Configurable Measurement*. Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1

NSFA: 100

ANCIL: No

Level: -60

Freq dev from nom: 0

Spacing: 12 for X channel or 36 for Y channel

Select: START

(2) Observe the RESULT section and verifythat the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88c(1)(a)(1) for X mode or paragraph 88c(1)(b)(1) for Y mode.

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(3) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1 NSFA: 100

ANCIL: No

Level: -60

Freq dev from nom: 0

Spacing: 11 for X channel or 35 for Y channel

Select: START *

*

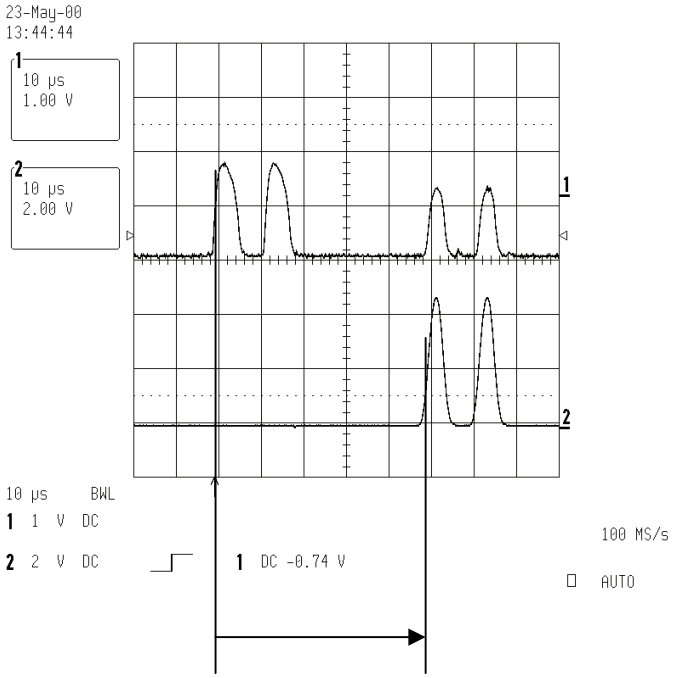


Figure 5-15a. Reply Delay Measurement (X Channel)

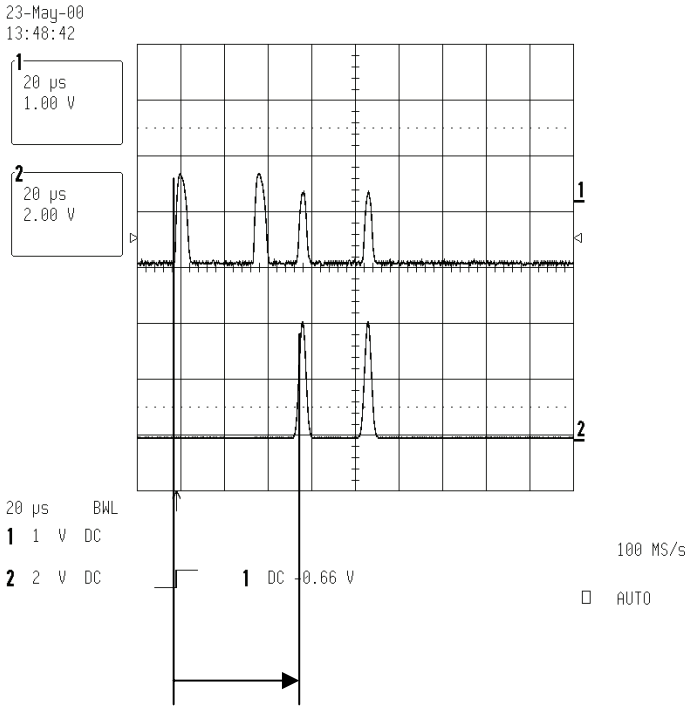


Figure 5-15b. Reply Delay Measurement (Y Channel)

*

(4) Observe the RESULT section and verify that the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88c(1)(a)(2) for X mode or paragraph 88c(1)(b)(2) for Y mode. *

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(5) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1

NSFA: 100

ANCIL: No

Level: -60

Freq dev from nom: 0

Spacing: 13 for X channel or 37 for Y channel

Select: START

(6) Observe the RESULT section and verify that the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88c(1)(a)(3) for X mode or paragraph 88c(1)(b)(3) for Y mode.

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(7) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1

NSFA: 100

ANCIL: No

Level: -60

Freq dev from nom: 0

Spacing: 14 for X channel or 38 for Y channel

Select: START

(8) Observe the RESULT section and verify that the value read for *Reply Efficiency* drops significantly lower than the standards and tolerances in paragraph 88c(2)(a)(2) for X mode or paragraph 88c(2)(b)(2) for Y mode.

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(9) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1

NSFA: 100

ANCIL: No

Level: -60

Freq dev from nom: 0

Spacing: 10 for X channel or 34 for Y channel

Select: START

(10) Observe the RESULT section and verify that the value read for *Reply Efficiency* drops significantly lower than the standards and tolerances in paragraph 88c(2)(a)(1) for X mode or paragraph 88c(2)(b)(1) for Y mode.

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(11) Exit *Configurable Measurement* and *Maintenance mode*.

(12) Return the DME station to NORMAL operation.

241-13. CONTROL STATUS BOARD (CSB) BATTERY MEASUREMENT.

a. Object. This test measures voltage of the 3.6 volt battery.

b. Test Equipment Required. Voltmeter.

c. Conditions. Facility NOTAM issued.

NOTE: The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

d. Detailed Procedure. *

* (1) With the system operating normally unplug the PWS power supply from the cardcage but do not pull it completely out.

(2) Locate the CSB board on the back of the front panel. See figure 5-16.

NOTE: The CSB can be accessed from the rear of the cabinet by swinging the system away from the wall.

(3) Locate the CSB battery BT1. See figure 5-16, CSB Test Points.

(4) Connect the voltmeter leads to the + and – terminal, measure and record the CSB battery voltage.

(5) Verify that voltage is within the standards and tolerances in paragraph 89i.

(6) Remove all power (including battery backup) from the system.

(7) Plug the PWS power supply back into the cardcage and return the system to NORMAL opration.

(8) From the DME menu select Status and CSB Detail.

(9) Verify that the CSB battery indicates OK.

(10) Exit the CSB menu and return to NORMAL.

241-14. IDENTIFICATION.

a. Object. This test measures identification frequency and morse code.

b. Test Equipment Required. Frequency Counter Oscilloscope, dual or four channels, at least 100 MHz with single sweep function.

c. Conditions. Facility NOTAM issued.

NOTE: The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

d. Detailed Procedure.

(1) Connect the scope probe to test point AN17 of the DPR CCA with the GND connected to DPR test point AN43. See figure 5-17, DPR Module – Test Points.

(2) Set the scope for 2 Volts/DIV, .2 Sec/DIV, Trigger from channel 1 and Positive slope. Activate the Single Sweep function.

(3) Measure the duration of a Dot, Dash, Space and the Interval below. See figure 5-18, Identification Timing. Verify that the values read are within the standards and tolerances in paragraph 88a(5)(b).

NOTE: Ident is transmitted every 32 seconds, it might take that long for the ident trace to appear on the scope.

(4) Disconnect the scope.

(5) Connect the frequency counter to DPR test point AN15. See figure 5-17.

(6) Measure and record the identification frequency. Verify that the values read are within the standards and tolerances in paragraph 88a(5)(a).

(7) Return the system to NORMAL operation.

241-15. RECEIVER SENSITIVITY AND SELECTIVITY.

a. Object. This test measures sensitivity and selectivity of the receiver.

b. Test Equipment Required. None.

c. Conditions. Facility NOTAM issued.

NOTE: The following maintenance procedures interrupt NORMAL operation of the DME. Follow local regulations to notify air traffic personell before removing a DME from service.

d. Detailed Procedure.

(1) Use the PMDT to enter the *Maintenance* mode. Select *Checks* and then *Configurable Measurement*. Set up the *Configurable Measurement* screen as follows. Gradually decrease level in step 2 to find sensitivity.

Test Type: REPLY EFFICIENCY

Monitor: 1

NSFA: 100

ANCIL: No

Level: See paragraph 88b(1) for start value.

Freq dev from nom: 0

Spacing: 12 for X channel or 36 for Y channel

Select: START *

*

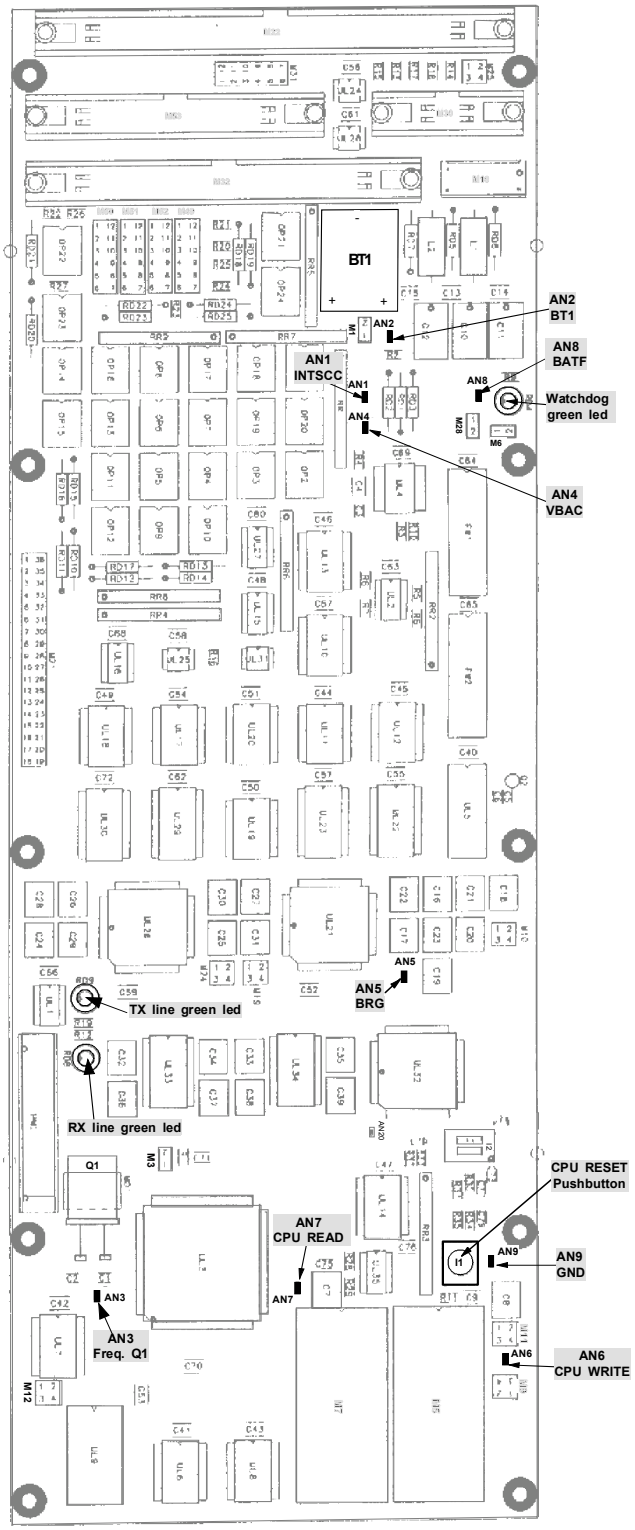


Figure 5-16. CSB Test Points *

*

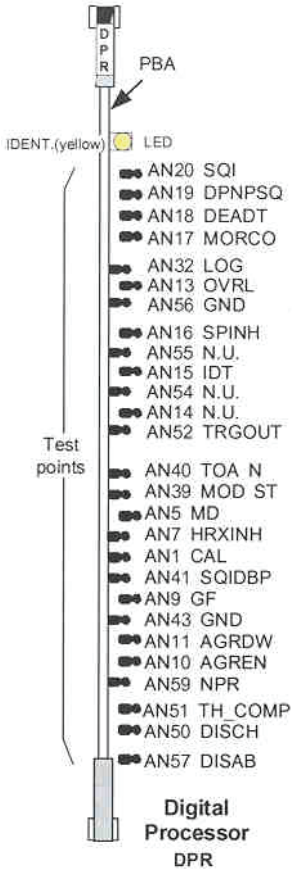


Figure 5-17. DPR Module – Test Points

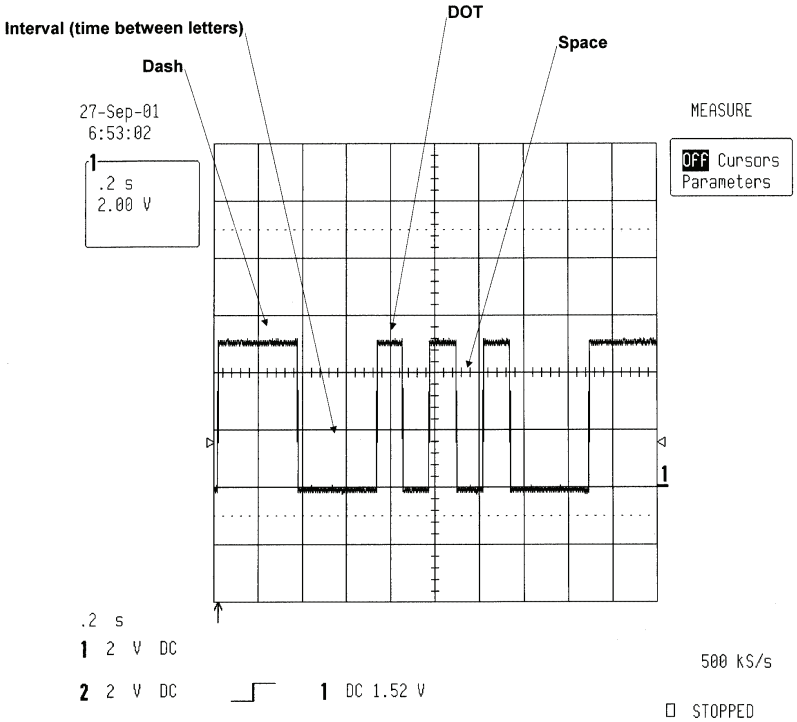


Figure 5-18. Identification Timing *

* (2) Observe the RESULT section while incrementally decreasing the level until the value read for *Reply Efficiency* starts to go less than but the average is still greater than 70 percent. Verify and record that sensitivity is within the standards and tolerances in paragraph 88b(1).

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green. The level at 70 percent represents the receiver sensitivity.

(3) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1 NSFA: 100

ANCIL: No

Level: See Paragraph 88b(1)

Freq dev from nom: -200

Spacing: 12 for X channel or 36 for Y channel

Select: START

(4) Observe the RESULT section and verify and record that the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88b(2).

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(5) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1 NSFA: 100

ANCIL: No

Level: See Paragraph 88b(1)

Freq dev from nom: +200

Spacing: 12 for X channel or 36 for Y channel

Select: START

(6) Observe the RESULT section and verify and record that the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88b(2).

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(7) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1 NSFA: 100

ANCIL: No

Level: See Paragraph 88b(1)

Freq dev from nom: -900

Spacing: 12 for X channel or 36 for Y channel

Select: START

(8) Observe the RESULT section and verify and record that the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88b(3).

NOTE: The RESULTS field will be updated with new data when the box adjacent to the field flashes green.

(9) Set up the *Configurable Measurement* screen as follows.

Test Type: REPLY EFFICIENCY

Monitor: 1 NSFA: 100

ANCIL: No

Level: See Paragraph 88b(1)

Freq dev from nom: +900

Spacing: 12 for X channel or 36 for Y channel

Select: START

(10) Observe the RESULT section and verify and record that the value read for *Reply Efficiency* is within the standards and tolerances in paragraph 88b(3).

NOTE: The RESULT field will be updated with new data when the box adjacent to the field flashes green.

(11) Return the DME station to NORMAL operation. *

* **241-16. MONITOR ALARM PARAMETERS**

a. Object. This procedure provides a method to evaluate the monitor executive data.

b. Discussion. This procedure checks the DME monitor executive data. The data is measured continuously by the monitor when the system is in operation.

c. Test Equipment Required. None.

d. Conditions. Normally operating Facility.

e. Detailed Procedure.

(1) Log ON.

(2) Request control of the DME.

(3) Select *Checks* and then *Executive Monitoring on Antenna*.

(4) Verify that all data values are within tolerance. Refer to standards and tolerances paragraph 88e.

(5) Verify and record the Reply Efficiency value.

(6) Abort and exit *Executive Monitoring on Antenna*.

(7) Return the DME to NORMAL operation. *

Section 2. OTHER MAINTENANCE TASKS PROCEDURES

* **242. VISUAL INSPECTIONS.** *

a. Object. This procedure provides a method to perform visual inspection of the system.

b. Test Equipment Required. None.

c. Conditions. Normally operating facility.

d. Detailed Procedure. Visually inspect interconnecting cables for cracked insulation or weak spots that would indicate possible internal breaks.

* **243. GENERAL CLEANING.** *

a. Object. This procedure provides a method to perform general cleaning of the system.

b. Test Equipment Required. Standard cleaning material.

c. Conditions. Normally operating facility.

d. Detailed Procedure. Clean all exposed external surfaces and remove dust accumulated internally.

* **244.-245. RESERVED.** *

246. OTHER MAINTENANCE PROCEDURES (MODEL 1118 DME SYSTEM).

246-1. QUARTERLY VISUAL INSPECTION OF DME SYSTEM.

a. Object. This procedure provides a method for quarterly visual inspection of the DME system. The visual inspection must be made prior to operating or touching equipment.

b. Test Equipment Required. None.

c. Conditions. Normally Operating Facility.

d. Detailed Procedure.

(1) Visually inspect connectors (ground and antenna) for corrosion, cracks, breaks, or burns.

(2) Visually inspect all equipment connected to and with the 1118 for overheating.

(3) Visually inspect front panel indicators and verify that the following system LEDs are illuminated:

Status LED - NORMAL (Green)
Test LED - (Green)
DC Power LED - (Green)

If Status shutdown (red) LED shows, depress RESET. Equipment will reset and Status LED indicator will go to NORMAL (green) condition.

246-2. ANNUAL VISUAL INSPECTION OF DME ANTENNA SYSTEM.

a. Object. This procedure provides a method for annual visual inspection of the DME antenna system.

b. Test Equipment Required. None.

c. Conditions. Normally Operating Facility.

d. Detailed Procedure.

(1) Check for antenna stability, and make sure it is securely affixed to its base or substructure.

(2) Check cables and connections for burns, cracks or breaks, due to friction, vibrations or weathering.

(3) Inspect ground cable connections ensure they are secure and in good condition.

246-3. ANNUAL VISUAL INSPECTION OF DME CABINET.

a. Object. This procedure provides a method for annual visual inspection of the DME cabinet.

b. Test Equipment Required. None.

c. Conditions. Normally Operating Facility.

d. Detailed Procedure.

(1) Check for a secure mounting to structure.

(2) Check RF cables and connections for corrosion, cracks or breaks, due to friction or vibrations.

(3) Check for burns due to arcing and overheating.

(4) Check for functional operation of all indications:

Status - Green
Test – Green
DC Power - Green

246-4. SPEAKER VOLUME ADJUSTMENT.

a. Object. This procedure provides a method for adjusting speaker volume.

b. Test Equipment Required. None.

c. Conditions. Normally Operating Facility.

d. Detailed Procedure.

(1) Place all system operation switches to the initial settings listed in table 5-1.

(2) Turn the TEST SELECT switch to the IDENT position.

(3) Remove the screws on the right-hand side of the Test Panel Assembly (1A1) and open it.

(4) Locate Power Measurement CCA (1A1A3) and adjust potentiometer 1A1A3R16 for desired volume from the panel speaker.

(5) Close and secure Test Panel Assembly (1A1).

247.-249. RESERVED.

Appendix 1. CERTIFICATION REQUIREMENTS

* Table 1. DME System

Service	*Certification Parameter*	*Reference Paragraph Stds and Tol/Limits*
1. Coverage	Receiver sensitivity	55b, 65b, 75b, 87c(2), 88b(1)
	Reply pulse spacing	55a(3)(c), 65a(3)(a), 75a(3)(a), 87a(6), 88a(3)(d)
	Receiver decoder	55c(1), 65c(1), 75c(1), 87d(1)(a), 88c
	Peak power	55a(2), 65a(2), 75a(2), 87a(4), 88a(2)
2. Distance accuracy	Reply delay	55c(4), 65a(6), 75a(6), 87a(3), 88a(6)
3. Identification	Identification	55c(3), 65a(5)(a), 75a(5)(a), 87a(2), 88a(5)
4. Operational continuity and integrity	Automatic transfer/ shutdown and remote monitor alarm	None (go/no go)
5. Monitor	Reply efficiency	56c, 66b(6), 76b(6), 88e(2)
	Reply pulse spacing alarm	56e, 66b(2), 76b(2), 87b(1), 88e(3)
	Peak power alarm	56a, 66b(3), 76b(3), 87b(3),88e(4)
	Reply delay alarm	56d, 66b(1), 76b(1), 87b(2), 88e(1)

NOTE: Reference paragraphs 55 and 56 apply to Cardion FA-8974, Wilcox 596B, Butler 1020, Aerocom 5351A, E-Systems Mark III, and DTD Equipment.
Reference paragraphs 65 and 66 apply to Cardion FA-9639.
Reference paragraphs 75 and 76 apply to Cardion FA-9783.
Reference paragraph 87 applies to ASII Model 1118 DME.
Reference paragraph 88 applies to FA-18200 Model 415SE.

NORMAL CERTIFICATION INTERVAL: Monthly for tube type equipment.
Quarterly for fully solid-state type equipment.

MAXIMUM CERTIFICATION INTERVAL: 60 Days for tube type equipment.
120 Days for solid-state equipment.

PERSON RESPONSIBLE FOR CERTIFICATION: Person assigned the appropriate certification authority and responsibility.

CERTIFICATION ENTRY IN FACILITY MAINTENANCE LOG: DME certified

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