



DEFENSE INFORMATION SYSTEMS AGENCY
 JOINT INTEROPERABILITY TEST COMMAND
 2001 BRAINARD ROAD
 FORT HUACHUCA, ARIZONA 85613-7051

IN REPLY
 REFER TO Networks, Transmission and
 Integration Division (JTE)

14 Nov 03

MEMORANDUM FOR DISTRIBUTION

SUBJECT: MIL-STD-188-181B Conformance Certification of the MD-1324A(c)/U Modem with the RT-1107(V)17/WSC-3(V) Transceiver (Certification 353.015)

- References:
- (a) DOD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 11 Jan 2002
 - (b) CJCSI 6212.01B, "Interoperability and Supportability of National Security Systems, and Information Technology Systems," 8 May 2000

1. References (a) and (b) establish the Defense Information Systems Agency (DISA), Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification. Additional references are provided in enclosure 1.

2. The MD-1324A(c)/U Modem with the RT-1107(V)17/WSC-3(V) Transceiver is certified as conforming to the requirements of military standard (MIL-STD)-188-181B (reference (c)) to the extent detailed in the Conformance Certification Testing Summary (enclosure 2). The tested terminal components and associated software versions are:

Transceiver.....	RT-1107(V)17/WSC-3(V)
Modem	MD-1324A(c)/U
Digital Signal Processor (DSP)	VSW-TURBO-DSP-12.26
Orderwire Encryption Board (OEB).....	VSW-VM200-OEB-6.9
ViaSat Terminal Control Software (VTC-300 for Windows NT 4.0)	Version 2.5

3. Testing was conducted at the JITC Ultra High Frequency (UHF) Satellite Communications (SATCOM) test facility using the JITC procedures contained in "MIL-STD-188-181/MIL-STD-188-181A/MIL-STD-188-181B Conformance Test Procedure," May 2001. A summary of the test results is provided in enclosure 2.

4. Although the system is being certified compliant to MIL-STD-188-181B, an operational problem can exist if the transmit power is too high. The operator must ensure the transmit Effective Isotropically Radiated Power (EIRP) level does not exceed the levels listed in table 1 when operating in narrowband mode, including cable loss and antenna gain.

Table 1. Narrowband EIRP

INPUT/OUTPUT DATA RATE (bps)	MODULATION TYPE	CODING TYPE	MAXIMUM EIRP (dBWi)
1200	SBPSK	None	26.6
2400	SBPSK	None	19.7
4800	CPM	None	21.2
*4800	CPM	RS: e=6 [60, 48]	22.4
*6000	CPM	RS: e=5 [60, 50]	22.8
*6000	CPM	None	22.6
*7200	CPM	RS: e=3 [60, 54]	21.8
*7200	CPM	None	22.4
*8000	CPM	RS: e=5 [60, 50]	20.5
*8000	CPM	None	21.8
9600	CPM	None	20.5
*Optional Data Rates bps = bits per second CPM = Continuous Phase Modulation dBWi = decibels referenced to 1 watt, relative to isotropically radiated power EIRP = Effective Isotropically Radiated Power RS = Shortened Reed Solomon (63,k) Encoding SBPSK = Shaped Binary Phase-Shift Keying			

5. When operating in wideband mode, the operator must ensure the EIRP level does not exceed the levels listed in the table 2, including cable loss and antenna gain.

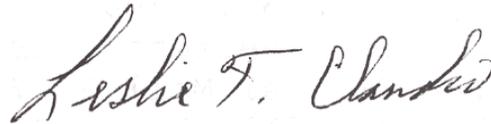
6. Higher transmit EIRP levels will result in out-of-band emissions that exceed the limits set by the MIL-STD, and may cause friendly jamming in adjacent channels.

JITC Memo, Networks, Transmission and Integration Division (JTE), MIL-STD-188-181B
Conformance Certification of the MD-1324A(c)/U Modem with the RT-1107(V)17/WSC-3(V)
Transceiver (Certification 353.015)

<http://jitc.fhu.disa.mil/reg/uhfdama.htm>.

10. The testing agent point of contact is Norma Vega, DSN 879-1741, Commercial (520) 538-1741, e-mail vegan@fhu.disa.mil.

FOR THE COMMANDER:



- 2 Enclosures:
- 1 Additional References
- 2 Conformance Certification
Testing Summary

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ADDITIONAL REFERENCES

- (c) MIL-STD-188-181B, "Interoperability Standard for Single-Access 5-kHz and 25-kHz UHF Satellite Communications Channels," 16 October 2001
- (d) Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6251.01A, "Ultrahigh Frequency (UHF) Satellite Communications Demand Assigned Multiple Access Requirements," 21 April 2003

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CONFORMANCE CERTIFICATION TESTING SUMMARY
(Certification 353.015)

1. CERTIFICATION TITLE. MIL-STD-188-181B Conformance Certification of the MD-1324A(c)/U Modem with the RT-1107(V)17/WSC-3(V) Transceiver.

2. PROPONENT. Commanding Officer
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4. TESTERS. Joint Interoperability Test Command (JITC):
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Ms. Norma Vega, (520) 538-1741

5. SYSTEM UNDER TEST DESCRIPTION. The MD-1324A(c)/U Modem configured with the RT-1107(V)17/WSC-3(V) Transceiver is a half-duplex or full-duplex shipboard Ultrahigh Frequency (UHF) Satellite Communications (SATCOM) system capable of both dedicated and Demand Assigned Multiple Access (DAMA) modes of operation. The RT-1107(V)17/WSC-3(V) is configured with an MD-1324 Interface Module that replaces the A20 Channel Preset Module to provide frequency control of the transceiver via the modem control software. The MD-1324A(c)/U Modem provides internal Transmission Security (TRANSEC) for orderwire encryption in the DAMA mode and uses external Communication Security (COMSEC) devices for data and voice security.

6. TEST NETWORK DESCRIPTION. The test networks varied for each military standard (MIL-STD) requirement being verified. Testers used various terminal configurations with commercial off-the-shelf test equipment to verify each MIL-STD requirement. Detailed test configurations and data collection information are in the appropriate sections of the JITC test procedure, "MIL-STD-188-181/MIL-STD-188-181A/MIL-STD-188-181B Conformance Test Procedure," May 2001. Figure 1 shows the system configuration of the tested terminal.

7. SYSTEM CONFIGURATION. Terminal components and software versions include:

Transceiver.....	RT-1107(V)17/WSC-3(V)
Modem.....	MD-1324A(c)/U
Digital Signal Processor (DSP)	VSW-TURBO-DSP-12.26
Orderwire Encryption Board (OEB).....	VSW-VM200-OEB-6.9
ViaSat Terminal Control Software (VTC-300 for Windows NT 4.0).....	Version 2.5

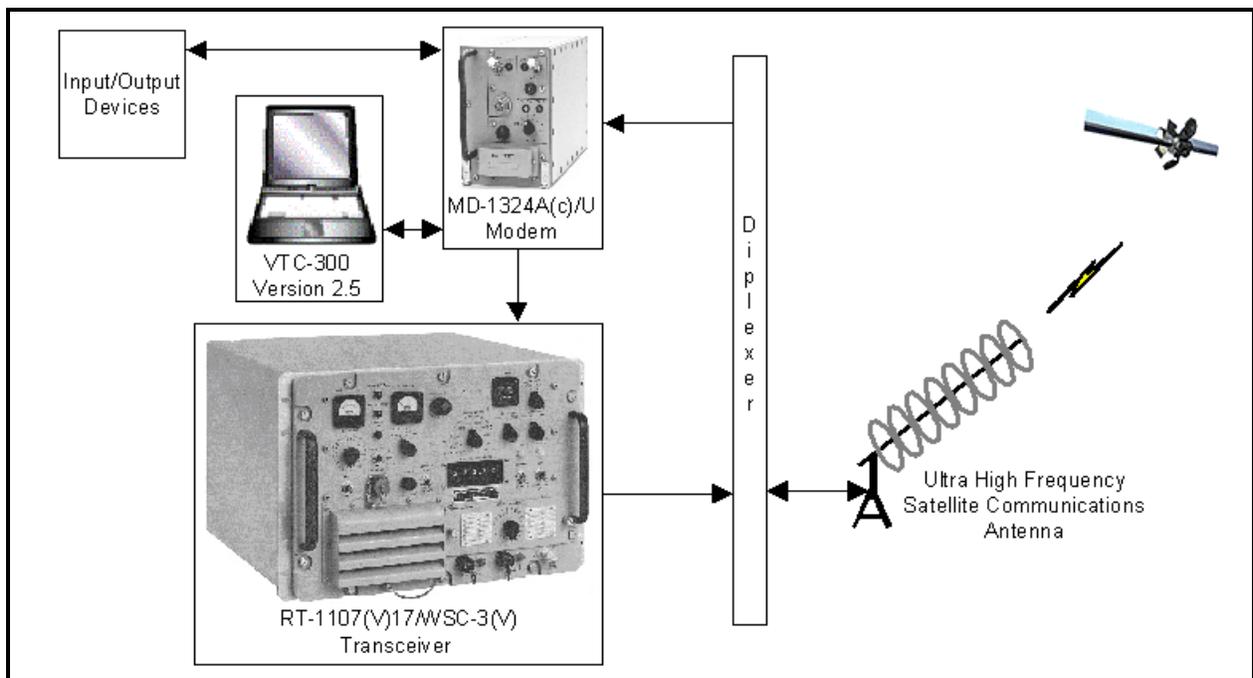


Figure 1. Tested System Configuration

8. MODES OF OPERATION. All MIL-STD-188-181B mandatory and implemented optional data rates and functions have been verified. Optional data rates implemented in this system are depicted in tables 1 and 2.

9. TESTING LIMITATIONS. None.

10. REQUIRED STANDARDS AND CONFORMANCE. The required standard is MIL-STD-188-181B, "Interoperability Standard for Single-Access 5-kHz and 25-kHz UHF Satellite Communications Channels," 16 October 2001. Table 3 delineates all the MIL-STD requirements and indicates the status as "Met," "Not Met," "Not Tested," or "Not Applicable." The MD-1324A(c)/U Modem with the RT-1107(V)17/WSC-3(V) Transceiver meets the mandatory requirements set forth in MIL-STD-188-181B. The following provides details and impacts for some of the noted requirements.

a. Requirement 15, paragraph 5.1.1.4.2(1), "For carrier EIRP levels equal to or greater than +18 dBW, the maximum EIRP values shall not exceed the values specified table II [of the MIL-STD]."

(1) Met with Comment. As tested, the maximum Effective Isotropically Radiated Power (EIRP) levels allowable, including cable losses and antenna gain, to stay within the high-power Adjacent Channel Emission (ACE) limits are listed in table 1.

Table 1. Narrowband EIRP

INPUT/OUTPUT DATA RATE (bps)	MODULATION TYPE	CODING TYPE	MAXIMUM EIRP (dBWi)
1200	SBPSK	None	26.6
2400	SBPSK	None	19.7
4800	CPM	None	21.2
*4800	CPM	RS: e=6 [60, 48]	22.4
*6000	CPM	RS: e=5 [60, 50]	22.8
*6000	CPM	None	22.6
*7200	CPM	RS: e=3 [60, 54]	21.8
*7200	CPM	None	22.4
*8000	CPM	RS: e=5 [60, 50]	20.5
*8000	CPM	None	21.8
9600	CPM	None	20.5

*Optional Data Rates
 bps = bits per second
 CPM = Continuous Phase Modulation
 dBWi = decibels referenced to 1 watt, relative to isotropically radiated power
 EIRP = Effective Isotropically Radiated Power
 RS = Shortened Reed Solomon (63,k) Encoding
 SBPSK = Shaped Binary Phase-Shift Keying

(2) Impact. Minor. If the terminal is operated at an EIRP level greater than those specified in the table, ACE will potentially cause friendly jamming and transmission disruption in adjacent channels. The EIRP level specified, including cable loss and antenna gain, is normally more than enough power to maintain adequate link quality.

b. Requirement 101, paragraph 5.2.1.4(2), “For modulations other than FSK at 16000 bps, in a nominal 25-kHz bandwidth whose center frequency is displaced Δf from the terminal transmitter’s carrier frequency, the EIRP shall not exceed the values specified in table VIIa [of the MIL-STD] for a carrier level less than +18 dBW and table VIIb [of the MIL-STD] for a carrier level greater than or equal to +18 dBW.”

(1) Met with Comment. As tested, the maximum EIRP levels allowable, including cable losses and antenna gain, to still meet the high-power ACE requirement are specified in table 2.

(2) Impact. Minor. If the terminal is operated at an EIRP level greater than those specified in the table, ACE will potentially cause friendly jamming and transmission disruption in adjacent channels. The EIRP level specified, including cable loss and antenna gain, is normally more than enough power to maintain adequate link quality.

Table 3. MIL-STD-188-181B Requirements Matrix for the MD-1324A(c)/U Modem with the RT-1107(V)17/WSC-3(V) Transceiver

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
1	4.1(1)	Optional capabilities that are implemented shall be as specified in this standard.	Met
2	4.1(2)	Interoperable access modes shall be single access on a satellite channel.	Met
3	4.2.2(1)	For coherent demodulation (PSK or CPM), the terminal shall transmit a preamble (see 5.1.4.1 and 5.2.4.1) to allow demodulator synchronization before the communications security (COMSEC) synchronization preamble is transmitted.	Met
4	4.2.2(2)	A preamble shall not be used for FSK modulation in the wideband mode.	Met
5	4.2.3	Hardware implementation of the terminals with imbedded COMSEC shall include provisions for future implementation of Over-the-Air Rekeying (OTAR).	Not Applicable (Note)
Note: This terminal does not implement imbedded COMSEC.			
6	4.2.4	The waveform shall interface with Fleet Satellite Communications (FLTSATCOM) and UHF Follow-On (UFO) satellites.	Met
7	4.2.5	If the terminal implements FEC, it shall be compliant with the FEC requirements of this standard.	Met
8	5.1.1.1(1)	The terminal shall be capable of providing eirp of at least 16 dBW with respect to right-hand circular polarization.	Met
9	5.1.1.1(2)	The terminal eirp shall be incrementally or continuously adjustable between a minimum setting no greater than 10 dBW and the maximum eirp, with a power setting resolution of 2 dB or better.	Met
10	5.1.1.2	The terminal shall maintain eirp accuracy of ± 1.5 dB, assuming antenna gain and passive losses are fixed.	Met
11a	5.1.1.3(1)	Transmitter turn-on time requirement is dependent upon whether operating in non-TDMA or TDMA mode as follows: (a) When performing non-TDMA transmissions, the transmitter turn-on time shall not exceed 50 ms. The transmitter turn-on time will be measured only for table III options that do not include Reed-Solomon coding due to interleaver-block delays introduced by the interleaving used with Reed-Solomon coding.	Met
11b	5.1.1.3(2)	(b) When transmitting within a time slot (TDMA operation), the transmitter turn-on time shall not exceed 875 microseconds (μ s).	Met (Note)
Note: This requirement was met during MIL-STD-188-183 certification testing.			
12	5.1.1.4	In a nominal 5-kHz bandwidth whose center frequency is displaced by Δf from a terminal transmitter's carrier frequency, the eirp shall be as specified in 5.1.1.4.1 and 5.1.1.4.2.	Met
13	5.1.1.4.1(1)	The eirp, relative to the transmitter's total output eirp, shall not exceed the values specified in table II [of the MIL-STD].	Met
14	5.1.1.4.1(2)	These values shall apply when the transmitter carrier frequency is either unmodulated or modulated.	Met
15	5.1.1.4.2(1)	For carrier eirp levels equal to or greater than +18 dBW, the maximum eirp values shall not exceed the values specified as "maximum eirp" in table II [of the MIL-STD].	Met (Note)
Note: The maximum terminal eirp levels to meet these requirements are listed in table 1 of the Conformance Certification Testing Summary.			

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
16	5.1.1.4.2(2)	These values shall apply when the transmitter carrier frequency is either modulated or unmodulated.	Met
17	5.1.1.5	The transmit frequency shall be tunable in 5-kHz increments over the frequency range of 291.000 to 318.300 MHz.	Met
18	5.1.1.6(1)	The phase noise power spectral density at 10 Hz offset from the carrier shall not exceed -46 dBc/Hz.	Met
19	5.1.1.6(2)	The single side-band root-mean-square value of the phase noise shall not exceed 2.5 degrees over the bandwidth of 10 Hz to 100 kHz.	Met
20	5.1.2.1a	The terminal shall achieve a bit error ratio (BER) of 1×10^{-5} or better at the C/kT specified in table III [of the MIL-STD], when it receives a bandlimited and hardlimited downlink desired signal having the characteristics of a representative 5-kHz UHF SATCOM transponder.	Met
21	5.1.2.1b	The BER performance shall not be degraded by more than 1 dB from the numbers in table III [of the MIL-STD] in the presence of ACI that is: (1) 15 dB or more below the average power of the desired PSK signal. (2) 20 dB or more below the average power of the desired CPM signal.	Met
22	5.1.2.2	The receive frequency shall be tunable in 5-kHz increments over a frequency range of 243.000 to 270.000 MHz.	Met
23	5.1.2.3	The G/T performance of the terminals, assuming a sky noise temperature of 290 K, shall be equal to or greater than the values shown in table IV [of the MIL-STD].	Met
24	5.1.3	Modulation shall be as shown in table III [of the MIL-STD].	Met
25	5.1.3.1(1)	The phase vector rotation caused by modulation shall not cause a frequency shift in the transmitted data.	Met
26	5.1.3.1(2)	The modulation for OQPSK/SOQPSK, if implemented, shall be interoperable with the SOQPSK signal described below, where the shaping factor α can be any value between 0 and 0.5, provided that requirements for adjacent channel emissions are met.	Not Applicable (Note)
Note: Optional requirement not implemented in this terminal.			
27	5.1.3.2	The multi-h CPM modulation signal shall be interoperable with the CPM waveform that is generated in accordance with appendix E.	Met
28	5.1.4.1	The transmitting radio shall generate a preamble as specified by 5.1.4.1 and 5.1.4.2.	Met
29	5.1.4.1.1 (1)	The preamble shall be as specified on figure 2A [of the MIL-STD] for BPSK/ SBPSK and figure 2B [of the MIL-STD] for OQPSK/SOQPSK, if applicable.	Met
30	5.1.4.1.1 (2)	Baseband data shall follow the preamble bit pattern without a shift in data bit timing greater than 25% of a bit interval.	Met
31	5.1.4.1.2 (1)	The CPM preamble shall be as shown on figure 2C [of the MIL-STD], and as specified in 5.1.4.1.2.1 to 5.1.4.1.2.3.	Met
32	5.1.4.1.2 (2)	The preamble shall be binary single-h CPM [8/16] modulated and transmitted at the symbol rate.	Met
33	5.1.4.1.2.3 (1)	The first fill bit shall be determined such that there is even parity (even number of 1s) on the entire header field.	Met
34	5.1.4.1.2.3 (2)	The following five fill bits shall be all zeros.	Met

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
35	5.1.4.1.2.4 (1)	Data traffic shall be transmitted immediately following the preamble without a shift in timing and at the same symbol rate as the preamble.	Met
36	5.1.4.1.2.4 (2)	The data traffic shall be modulated, coded, and interleaved, as specified in the header.	Met
37	5.1.4.2 (1)	For CPM, the receiver shall determine data rate, modulation parameters, coding, and interleaving from the preamble.	Met
38	5.1.4.2 (2)	For uncoded PSK, the terminal shall output, as a minimum, all baseband data that immediately follows the preamble bit pattern.	Met
39	5.1.4.2 (3)	For coded PSK and all CPM waveforms, the terminal shall output only the baseband data that immediately follows the preamble bit pattern.	Met
40	5.1.4.2	The terminal shall achieve acquisition and demodulate the signal for carrier frequency uncertainties up to ± 1.2 kHz at the receive antenna.	Met
41	5.1.4.4	The probability of achieving acquisition on the first attempt under the conditions described in 5.1.4.3 and E_b/N_o equal to or higher than the reference E_b/N_o shall exceed 95% with a confidence level of 90%.	Met
42	5.1.4.5 (1)	The probability of maintaining bit synchronization for at least 10 seconds, when the $(G/T)/(E_b/N_o)$ is degraded by up to 3 dB from that specified in 5.1.2.1, shall be 90% with a confidence level of 90%.	Met
43	5.1.4.5 (2)	Terminal shall maintain bit synchronization if the carrier is interrupted (lost and returns within 230 ms).	Met
44	5.1.4.5 (3)	If, after a 250-millisecond interruption another carrier is received, the terminal shall synchronize to and process the new carrier.	Met
45	5.1.4.6	The terminal shall maintain the frequency of its receive clock output to data terminal equipment within $\pm 1\%$ of the clock frequency for the selected operating data rate under all conditions where bit synchronization can be maintained.	Met
46	5.1.5	The frequency generation system shall provide long-term plus short-term frequency accuracy within ± 1 part per million (ppm) across the full range of environmental conditions outlined in the terminal specification.	Met
47	5.1.6 (1)	For 2400 bps voice, the voice digitization shall be interoperable with equipment that meets the requirements of Standardization Agreement (STANAG) 4198.	Met
48	5.1.6 (2)	It shall be interoperable with the CV-3591.	Met
49	5.1.6 (3)	If 4800 bps voice is implemented, the voice digitizer shall comply with requirements of FED-STD-1016.	Not Applicable (Note)
Note: Optional requirement not implemented in this terminal.			
50	5.1.7.1a	The COMSEC voice waveform shall be interoperable with the AN/USC-43 (ANDVT) waveform, used in application 3, IAW MIL-C-28883A, when transmitting and receiving.	Met
51	5.1.7.1b	Secure voice at 4800 bps shall be interoperable with the digitization techniques specified in FED-STD-1016, and the encryption techniques used by the TSEC/KG-84A/C, as specified in NSA NO. 82-2.	Not Applicable (Note)
Note: Optional requirement not implemented in this terminal.			

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
52	5.1.7.2a	[Data] The COMSEC waveforms shall be interoperable with the AN/USC-43 (ANDVT) waveform used in application 3, as specified in MIL-C-28883, when transmitting and receiving.	Met
53	5.1.7.2b	[Data] The COMSEC waveforms shall be interoperable with the TSEC/KG-84A/C when transmitting and receiving as specified in NSA NO 82-2.	Met
54	5.1.8(1)	All baseband data following the preamble bit pattern shall be differentially encoded for BPSK/SBPSK and OQPSK/ SOQPSK modulation.	Met
55	5.1.8(2)	For BPSK/SBPSK with or without FEC, and for OQPSK/SOQPSK with FEC, the differential encoding shall be as follows: [defined in paragraph 5.1.8 of the MIL-STD].	Met
56	5.1.8(3)	For OQPSK/SOQPSK without FEC the differential coding shall be as follows: [defined in paragraph 5.1.8 of the MIL-STD].	Not Applicable (Note)
57	5.1.8(4)	When optional FEC is used with PSK modulation, the differential encoding shall precede the FEC in the processing of data to be transmitted.	
58	5.1.9.1(1)	If FEC coding is implemented, the terminal shall add a Start-Of-Message (SOM) data field to the preamble shown in figures 2A or 2B [of the MIL-STD] preceding the baseband transmission.	
59	5.1.9.1(2)	For BPSK/SBPSK, the SOM shall be the 37-bit sequence, 11100010000110001111010011011101100101.	
60	5.1.9.1(3)	For OQPSK/SOQPSK, the 42-bit SOM shall be a 21-bit sequence in each I and Q channel, where the I channel sequence is 000000101110100111001 and the Q channel sequence, offset one-half symbol later, is 001101100001000010101.	
61	5.1.9.1(4)	The SOM shall be transmitted in the order shown with the left-most bit transmitted first.	
62	5.1.9.1(5)	For OQPSK/SOQPSK modulation with FEC coding, the first FEC-encoded user data bit shall be sent on the I channel.	
63	5.1.9.1(6)	The output of the FEC encoder shall be identical to the output of the rate 1/2 constraint length 7 convolutional encoder shown on figure 5 [of the MIL-STD].	
64	5.1.9.1(7)	For rate 3/4 the output of the encoder shall be identical with the output described in 5.1.9.1.2.	
65	5.1.9.1.1	The encoder tap connections shall be as shown in figure 5 [of the MIL-STD].	
Note: Optional requirements not implemented in this terminal.			
66	5.1.9.2(1)	If FEC is implemented [for CPM] it shall be a Reed Solomon (RS) code that is derived from a (63,k) RS code.	Met
67	5.1.9.2(2)	The codes used shall be as defined in table III [of the MIL-STD] and...	Met
68	5.1.9.2(3)	... shall be derived in accordance with 5.1.9.2.1.	Met
69	5.1.9.2.1	The field generator polynomial shall be, $p(x)=x^6 + x + 1$ (Data Encoding)	Met

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
70	5.1.10	The terminal shall comply with the BER requirements of 5.1.2.1a, under the Doppler rate of change conditions defined below, with no more than an additional 1 dB degradation allowed to the C/kT numbers in table III [of the MIL-STD]. a. 32 Hz per second, for modulation rates ≥ 600 sps, and b. 5 Hz per second, for modulation rates < 600 sps.	Met
71	5.1.11	To enable quick end-of-burst detection, an End of Message (EOM) bit sequence shall be used for all CPM and FEC coded PSK waveforms.	Met
72	5.1.11.1(1)	For FEC-encoded PSK the end of message bit sequence shall be encoded in the same manner as the information bit stream.	Not Applicable (Note)
73	5.1.11.1(2)	The information bit stream shall be appended with N zero bits.	
74	5.1.11.1(3)	The value of N shall be between 0 and 47 and...	
75	5.1.11.1(4)	... shall be selected such that the total number of information bits (input bits + appended zero bits) is divisible by 48 without a remainder.	
76	5.1.11.1(5)	The preamble or SOM bits shall not be counted as part of the input bits.	
77	5.1.11.1(6)	The EOM sequence shall follow the appended zeros.	
78	5.1.11.1(7)	The EOM sequence shall be a 144-bit sequence defined by repetition of the 48-bit sequence equivalent to hexadecimal F740 141F EC1B transmitted three times.	
79	5.1.11.1(8)	The left-most hexadecimal digit shall be transmitted first.	
80	5.1.11.1(9)	After the EOM sequence is transmitted, the transmitter shall be disabled.	
Note: Optional requirements not implemented in this terminal.			
81	5.1.11.2(1)	For uncoded CPM the end of message bit sequence shall be modulated in the same manner as the information bit stream.	Met
82	5.1.11.2(2)	The information bit stream shall be appended with N bits of the pattern 1100.	Met
83	5.1.11.2(3)	The value of N shall be between 0 and 47 and...	Met
84	5.1.11.2(4)	... shall be selected such that the total number of information bits (input bits + appended bits is divisible by 48 without a remainder.	Met
85	5.1.11.2(5)	The preamble, SOM, and header bits shall not be counted as part of the input bits.	Met
86	5.1.11.2(6)	The EOM sequence shall follow the appended bits.	Met
87	5.1.11.2(7)	The EOM sequence shall be a 144-bit sequence defined by repetition of the 48-bit sequence equivalent to hexadecimal F740 141F EC1B transmitted three times.	Met
88	5.1.11.2(8)	The left-most hexadecimal digit shall be transmitted first.	Met
89	5.1.11.2(9)	After the EOM sequence is transmitted, the transmitter shall be disabled.	Met
90	5.1.11.3(1)	For coded CPM the end of message bit sequence shall be generated and transmitted without FEC encoding.	Met
91	5.1.11.3(2)	The information bit stream shall be appended with a sufficient number of bits of pattern 1100 which, when encoded, will fill the last interleaver block.	Met

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
92	5.1.11.3(3)	The EOM sequence shall follow the last interleaver block.	Met
93	5.1.11.3(4)	The EOM sequence shall be a 144-bit sequence defined by repetition of the 48-bit sequence equivalent to hexadecimal F740 141F EC1B transmitted three times.	Met
94	5.1.11.3(5)	The left-most hexadecimal digit shall be transmitted first.	Met
95	5.1.11.3(6)	After the EOM sequence is transmitted, the transmitter shall be disabled.	Met
96	5.2.1.1(1)	The terminal shall be capable of providing eirp of at least 16 dBW with respect to right-hand circular polarization.	Met
97	5.2.1.1(2)	The terminal eirp shall be incrementally or continuously adjustable between a minimum setting no greater than 10 dBW and the maximum eirp, with a power setting resolution of 2 dB or better.	Met
98	5.2.1.2	The terminal shall maintain an eirp accuracy of ± 1.5 dB, assuming antenna gain and passive losses are fixed.	Met
99a	5.2.1.3(1)	When performing non-TDMA transmissions, the transmitter turn-on time shall not exceed 50 ms. The transmitter turn-on time will be measured only for table VIII [of the MIL-STD] options that do not include Reed-Solomon coding due to interleaver-block delays introduced by the interleaving used with Reed-Solomon coding.	Met
99b	5.2.1.3(2)	When transmitting within a time slot (TDMA operation), the transmitter turn-on time shall not exceed 875 microseconds (μ s).	Met
100	5.2.1.4(1)	For FSK modulation, the total of all emissions outside to the 3 dB bandwidth of the 25-kHz channel (i.e., 30kHz) shall be less than 1 percent of the total transmitted power.	Met
101	5.2.1.4(2)	For modulations other than FSK at 16000 bps, in a nominal 25-kHz bandwidth whose center frequency is displaced by Δf from the terminal transmitter's carrier frequency, the eirp shall not exceed the values specified in table VIIa [of the MIL-STD] for a carrier level less than +18 dBW and table VIIb [of the MIL-STD] for a carrier level greater than or equal to +18 dBW.	Met (Note)
Note: The maximum terminal eirp levels to meet these requirements are listed in table 2 of the Conformance Certification Testing Summary.			
102	5.2.1.5	Transmit frequency shall be tunable in 25-kHz increments over a frequency range of 291.000 to 318.300 MHz.	Met
103	5.2.1.6	Phase noise shall be as specified in 5.1.1.6.	Met
104	5.2.2.1a	The terminal shall achieve a bit error ratio (BER) of 1×10^{-5} or better at the C/kT specified in table VIII [of the MIL-STD], when it receives a bandlimited and hardlimited downlink desired signal having the characteristics of a representative 25-kHz UHF SATCOM transponder.	Met
105	5.2.2.1b	The BER performance shall not be degraded by more than 1 dB from the numbers in table VIII [of the MIL-STD] in the presence of adjacent channel interference that is: (1) 15 dB or more below the average power of the desired PSK signal, and (2) 20 dB or more below the average power of the desired CPM signal.	Met
106	5.2.2.2	The receive frequency shall be tunable in 25-kHz increments over a frequency range of 243.000 to 270.000 MHz.	Met
107	5.2.3	Modulation shall be as shown in table VIII [of the MIL-STD], and as specified in 5.2.3.1 and 5.2.3.4.	Met

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
108	5.2.3.1	The FSK modulation characteristics shall be specified in 5.2.3.1.1 and 5.2.3.1.2.	Met
109	5.2.3.1.1(1)	The deviation of the modulated signal shall be 5.6 kHz \pm 1 kHz for a binary 0 and -5.6 kHz \pm 1 kHz for a binary 1.	Met
110	5.2.3.1.1(2)	The demodulator shall be interoperable with modulated signals that have deviations of 5.6 kHz \pm 1.2 kHz for a binary 0 and -5.6 \pm 1.2 kHz for a binary 1.	Met
111	5.2.3.1.2	A binary 1 shall be indicated by a voltage that is negative with respect to the reference point, and a binary 0 by a voltage that is positive with respect to the reference point.	Met
112	5.2.3.2	The phase vector rotation caused by modulation shall not cause a frequency shift in the transmitted data.	Met
113	5.2.3.3	OQPSK and SOQPSK modulation shall be as defined in 5.1.3.1.	Not Applicable (Note)
Note: Optional requirement not implemented in this terminal.			
114	5.2.3.4	The multi- <i>h</i> CPM modulation signal shall be interoperable with the CPM waveform that is generated in accordance with appendix E [of the MIL-STD].	Met
115	5.2.4.1	The transmitting radio shall generate a preamble as specified in 5.1.4.1.	Met
116	5.2.4.2	The requirements stated in 5.1.4.2 shall apply.	Met
117	5.2.4.3	The terminal shall achieve acquisition and demodulate the signal for carrier frequency uncertainties up to \pm 1.2 kHz from the desired channel center frequency.	Met
118	5.2.4.4	The probability of achieving acquisition on the first attempt under the conditions of 5.2.4.3 and E_b/N_0 equal to or higher than the reference E_b/N_0 shall exceed 95 percent, with a confidence level of 90 percent.	Met
119	5.2.4.5(1)	The probability of maintaining bit synchronization for at least 10 seconds when the C/kT is degraded by up to 3 dB from that which is specified in 5.2.2.1, shall be 95 percent with a confidence level of 90 percent.	Met
120	5.2.4.5(2)	For PSK or CPM signals, the terminal shall maintain bit synchronization if the carrier is lost for up to 230 ms.	Met
121	5.2.4.5(3)	For any signal (PSK, CPM, or FSK), the terminal shall synchronize to and process a new carrier if the original carrier is lost and does not return and a new carrier is detected within 250 ms of the time of loss of original carrier signal.	Met
122	5.2.4.6	The terminal shall maintain the frequency of its receive clock output to data terminal equipment within \pm 1 percent of the clock frequency for the selected operating data rate, under all conditions where bit synchronization can be maintained.	Met
123	5.2.5	The frequency generation system shall provide long-term plus short-term frequency accuracy within \pm 1.0 ppm across the full range of environmental conditions outlined in the terminal specification.	Met
124	5.2.6	Secure voice at 16 kbps shall be interoperable with continuously variable slope delta (CVSD) digitization techniques used by the VINSON encryption device, as specified in NSA NO. CSESD-14.	Met

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125	5.2.7	The COMSEC device shall be interoperable with the TSEC/KY-57 and TSEC/KY-58.	Met
126	5.2.7.1	Secure voice at 16 kbps shall be interoperable with techniques used by the VINSON, as specified in NSA NO. CSESD-14.	Met
127	5.2.7.2a	Mandatory: The COMSEC waveforms shall be interoperable with the TSEC/KY-57/58 VINSON waveform when transmitting and receiving, as specified in NSA NO. CSESD-14.	Met
128	5.2.7.2b	Optional. The COMSEC waveforms shall be interoperable with the TSEC/KG-84A/C waveform when transmitting and receiving, as specified in NSA NO. 82-2.	Met
129	5.2.8	For PSK modulation at all bit rates, all baseband data following the preamble bit pattern shall be differentially encoded as specified in 5.1.8.	Met
130	5.2.9	FEC coding, if implemented, shall be as defined in 5.1.9.	Met
131	5.2.9.1(1)	If FEC is implemented, it shall be a Reed Solomon (RS) code that is derived from a (127,k) RS code.	Met
132	5.2.9.1(2)	The codes used shall be as defined in table VIII [of the MIL-STD], and...	Met
133	5.2.9.1(3)	... shall be derived in accordance with 5.1.9.1.1.	Met
134	5.2.9.1.1	The field generator polynomial shall be, $p(x) = x^7 + x^3 + 1$ (Data Encoding)	Met
135	5.2.9.2	Interleaving shall be as defined in 5.1.9.2.4, except that there are seven bits per symbol.	Met
136	5.2.10	In the presence of a Doppler rate of change of 32 Hz per second, the BER requirements of 5.2.2.1a shall be met with an additional 1 dB allowed to the C/kT numbers in table VIII [of the MIL-STD].	Met
137	5.2.11	Postamble shall be as defined in 5.1.11.	Met
138	E.3.1	The terminal shall be interoperable with the specific quaternary full-response multi- h CPM waveform described below.	Met
139	E.3.3(1)	The first data symbol is transmitted immediately after the preamble and shall use the h_1 modulation index.	Met
140	E.3.3(2)	The next data symbol shall use the h_2 modulation index.	Met
141	E.3.3(3)	Subsequent data symbols shall alternate modulation indices $\{h_1, h_2, h_1, h_2, \dots\}$.	Met
142	E.3.4(1)	The demodulator shall use the 192 symbols of preamble pattern shown on figure 2C [of the MIL-STD] in order to synchronize to the amplitude, phase and timing of the incoming data burst.	Met
143	E.3.4(2)	The Frame timing and modulation parameters shall be determined by correctly demodulating the start of message and header of the preamble.	Met
144	E.3.4(3)	Immediately following the six fill bits of the preamble sequence, data and clock shall be sent to the baseband interface.	Met
145	E.3.4(4)	The first data symbol shall be received immediately after the preamble and...	Met
146	E.3.4(5)	... shall use the h_1 modulation index.	Met
147	E.3.4(6)	The next data symbol shall use the h_2 modulation index.	Met
148	E.3.4(7)	Subsequent data symbols shall alternate modulation indices $\{h_1, h_2, h_1, h_2, \dots\}$.	Met