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

IN REPLY
REFER TO Networks and Transport Division (JTE) **4 Mar 04**
(Certification 361.307)

ViaSat Incorporated
ATTN: Doug Poorman
6155 El Camino Real
Carlsbad, CA 92009

Dear Mr. Poorman:

The Joint Interoperability Test Command (JITC) has completed a technical analysis of the ViaSat white paper, "Software Changes to the RT-1830(P)/S Terminal," April 2003, and has determined that software modifications implemented in the terminal do not affect Dedicated Satellite Communications or Demand Assigned Multiple Access (DAMA) functionality.

Military standard (MIL-STD)-188-181B conformance testing and certification (231.307, 10 June 2002) was previously completed on the RT-1830(P)/S Ultrahigh Frequency (UHF) Satellite Communications (SATCOM) Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers. Subsequent to that test, MIL-STD-188-181B conformance testing and certification (301.307, 21 April 2003) was completed on the RT-1828(P)/G UHF SATCOM Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers. The RT-1830(P)/S and RT-1828(P)/G UHF SATCOM Terminals use the same VME (Versa Module Europa) architecture and have identical hardware modules. The RT-1830(P)/S terminal is the single-channel configuration and the RT-1828(P)/G terminal is the four-channel configuration. This certification will certify the RT-1830(P)/S with the same operational software as the RT-1828(P)/G terminal.

The RT-1830(P)/S UHF SATCOM Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers are certified as meeting the applicable requirements of MIL-STD-188-181B, "Interoperability Standard for Single-Access 5-kHz and 25-kHz UHF Satellite Communications Channels," 16 October 2001, to the extent detailed in the enclosed summary. The system components and associated software versions are:

RT-1830(P)/S ..... UHF SATCOM Terminal
  Digital Signal Processor (DSP) and
    Orderwire Encryption Board (OEB) VSW-VM300-DSP-16.14
  Input/Output Processor (IOP) VSW-VM300-IOP-3.0.11
  ViaSat Network Terminal Controller (VNTC) ..... Version 2.7
Ophir Model 4039 ..... High Power Amplifier
Ophir Model 4039R ..... High Power Amplifier

Although the terminal 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) levels do not exceed the levels in the table below when operating in narrowband mode, including cable losses and antenna gain.

Table 1. Narrowband EIRP

INPUT/OUTPUT DATA RATE (bps)	MODULATION TYPE	CODING TYPE	MAXIMUM EIRP (dBWi)
1200	SBPSK	None	26.0
2400	SBPSK	None	18.96
4800	CPM	None	20.04
*6000	CPM	None	21.4
*7200	CPM	None	22.1
*8000	CPM	None	21.9
9600	CPM	None	20.0

*Optional Data Rate
bps = bits per second
CPM = Continuous Phase Modulation
dBWi = decibels referenced to 1 watt, relative to isotropically radiated power
EIRP = Effective Isotropically Radiated Power
SBPSK = Shaped Binary Phase-Shift Keying

When operating in wideband mode, the operator must ensure the EIRP levels do not exceed the levels in table 2.

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.

Table 2. Wideband EIRP

INPUT/OUTPUT DATA RATE (bps)	MODULATION TYPE	CODING TYPE	MAXIMUM EIRP (dBWi)
*9600	SBPSK	None	18.9
19200	CPM	None	32.18
*28800	CPM	None	33.1
32000	CPM	None	32.4
38400	CPM	None	30.0
48000	CPM	None	27.5
*56000	CPM	None	28.5

*Optional Data Rate
bps = bits per second
CPM = Continuous Phase Modulation
dBWi = decibels referenced to 1 watt, relative to isotropically radiated power
EIRP = Effective Isotropically Radiated Power
SBPSK = Shaped Binary Phase-Shift Keying

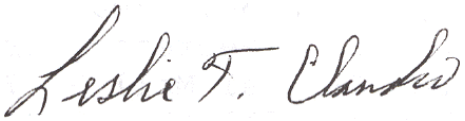
In accordance with the Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6251.01A, "Ultrahigh Frequency (UHF) Satellite Communications Demand Assigned Multiple Access Requirements," 21 April 2003, users are required to have systems certified compliant to MIL-STD-188-181 series, -182 series, and -183 series. This certification declares that the MIL-STD-188-181B portion of the overall Joint Chiefs of Staff mandated requirement has been met for the RT-1830(P)/S UHF SATCOM Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers.

Previous testing has demonstrated that even though a product conforms to standards, there is still a potential for incompatibility between UHF terminals that implement technical requirements differently. Therefore, prior to an initial operational capability assessment, terminal users must define the specific terminal operational requirements. Additionally, the terminals must be tested and certified for interoperability by JITC in accordance with CJCSI 6212.01B, "Interoperability and Supportability of National Security Systems, and Information Technology Systems," 8 May 2000.

JITC distributes test documentation via the JITC Electronic Report Distribution (ERD) system which uses unclassified (NIPRNET) e-mail. More comprehensive information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/.gov users on the NIPRNET at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNET) or http://199.208.204.125 (SIPRNET). JITC also provides a DAMA Certification Register on the JITC public website under "Product Registers." The DAMA Certification Register can be reached directly at http://jitc.fhu.disa.mil/reg/dama1.html. The UHF SATCOM DAMA Test Facility homepage can be reached directly at http://jitc.fhu.disa.mil/reg/uhfdama.htm.

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

Sincerely,



LESLIE CLAUDIO
Chief
Networks and Transport Division

1 Enclosure:
Conformance Certification
Testing Summary

Distribution:
Joint Chiefs of Staff, Director for Command, Control, Communications, and Computer Systems (J6), Room 1E833, The Pentagon, Washington, DC 20318-6000
Joint Chiefs of Staff (J6S), ATTN: CDR Brigger, Room IC832, The Pentagon, Washington, DC 20318-6000
Office of the Secretary of Defense, Director Operational Test and Evaluation, Room 3E318, The Pentagon, Washington, DC 20301-1700
Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), ATTN: C3I, The Pentagon, Washington, DC 20301-8000
Defense Information Systems Agency (IN42), ATTN: Andy Pappas, 5600 Columbia Pike, Falls Church, VA 22041-2717

CONFORMANCE CERTIFICATION TESTING SUMMARY
(Certification 361.307)

1. CERTIFICATION TITLE. MIL-STD-188-181B Conformance Certification of the RT-1830(P)/S Ultrahigh Frequency (UHF) Satellite Communications (SATCOM) Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers.

2. PROPONENT. ViaSat Incorporated
6155 El Camino Real
Carlsbad, CA 92009

3. PROGRAM MANAGER/USER POC. Doug Poorman, (760) 476-2486
E-mail: doug.poorman@viasat.com

4. TESTERS. Joint Interoperability Test Command (JITC):
Mr. Larry Metz, (520) 538-5215
Ms. Norma Vega, (520) 538-1741

5. SYSTEM UNDER TEST DESCRIPTION. The RT-1830(P)/S is a full-duplex UHF SATCOM Terminal capable of both dedicated and Demand Assigned Multiple Access (DAMA) modes of operation. The terminal has eight input/output (I/O) ports which can be independently configured and selected for half- or full-duplex operations. The terminal operates with an embedded Transmission Security (TRANSEC) device, which is used for DAMA orderwire encryption, and uses external Communication Security (COMSEC) devices for data and voice security. The terminal can be controlled by a serial asynchronous interface or an Ethernet interface using ViaSat Network Terminal Control (VNTC) software. The Ophir Model 4039 High Power Amplifier provides up to 250 watts of output power for the terminal. The Ophir Model 4039R High Power Amplifier is identical in electrical specifications and operational capabilities to the Model 4039, but is two inches shorter in height.

6. TEST NETWORK DESCRIPTION. Not Applicable. This certification is being issued on the basis of a JITC technical review of the ViaSat white paper, "Software Changes to the RT-1830(P)/S Terminal," April 2003. Figure 1 shows the certified system configuration.

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

RT-1830(P)/S	UHF SATCOM Terminal
Digital Signal Processor (DSP) and Orderwire Encryption Board (OEB)	VSW-VM300-DSP-16.14
Input/Output Processor (IOP)	VSW-VM300-IOP-3.0.11
ViaSat Network Terminal Controller (VNTC)	Version 2.7
Ophir Model 4039	High Power Amplifier
Ophir Model 4039R	High Power Amplifier

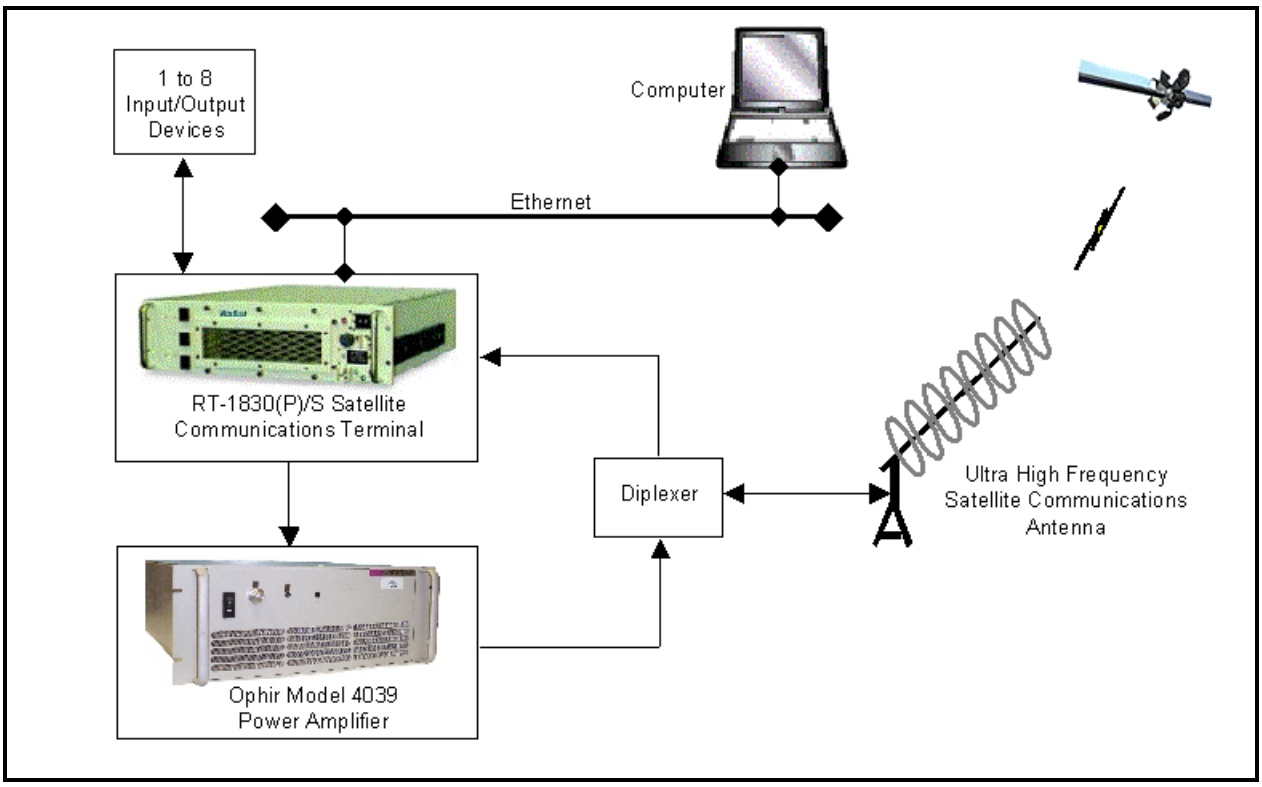


Figure 1. Tested System Configuration

8. MODES OF OPERATION. All military standard (MIL-STD)-188-181B mandatory and implemented optional data rates have been verified. Optional data rate capabilities implemented by this terminal are contained in Tables 1 and 2.

9. TESTING LIMITATIONS. Not Applicable.

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," "Not Applicable," or "Previously Met." Through technical analysis of the ViaSat white paper, "Software Changes to the RT-1830(P)/S Terminal," April 2003, the requirements marked "Previously Met" are requirements determined not to have been affected by the software modifications implemented in the terminal. Sufficient analysis has been performed to determine that the RT-1830(P)/S UHF SATCOM Terminal with the Ophir Models 4039 and 4039R High Power Amplifier meets the mandatory requirements set forth in MIL-STD-188-181B. The following provides details and impacts to several requirements that were noted after the RT-1830(P)/S UHF SATCOM Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers was originally tested in June 2002.

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 as "Maximum EIRP" in table II [of the MIL-STD]."

(1) Met with Comment. As tested, the maximum Effective Isotropically Radiated Power (EIRP) level allowed, including cable loss and antenna gain, to meet the high-power Adjacent Channel Emission (ACE) requirement is specified in table 1 for all narrowband data rates tested.

Table 1. Maximum Narrowband EIRP

INPUT/OUTPUT DATA RATE (bps)	MODULATION TYPE	CODING TYPE	MAXIMUM EIRP (dBWi)
1200	SBPSK	None	26.0
2400	SBPSK	None	18.96
4800	CPM	None	20.04
*6000	CPM	None	21.4
*7200	CPM	None	22.1
*8000	CPM	None	21.9
9600	CPM	None	20.0

*Optional Data Rate
bps = bits per second
CPM = Continuous Phase Modulation
dBWi = decibels referenced to 1 watt, relative to isotropically radiated power
EIRP = Effective Isotropically Radiated Power
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 losses 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 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."

(1) Met with Comment. As tested, the maximum EIRP level allowed, including cable loss and antenna gain, to meet the high-power ACE requirement is specified in table 2 for all wideband data rates tested.

(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

losses and antenna gain, is normally more than enough power to maintain adequate link quality.

Table 2. Maximum Wideband EIRP

INPUT/OUTPUT DATA RATE (bps)	MODULATION TYPE	CODING TYPE	MAXIMUM EIRP (dBWi)
*9600	SBPSK	None	18.9
19200	CPM	None	32.18
*28800	CPM	None	33.1
32000	CPM	None	32.4
38400	CPM	None	30.0
48000	CPM	None	27.5
*56000	CPM	None	28.5

*Optional Data Rate
bps = bits per second
CPM = Continuous Phase Modulation
dBWi = decibels referenced to 1 watt, relative to isotropically radiated power
EIRP = Effective Isotropically Radiated Power
SBPSK = Shaped Binary Phase-Shift Keying

11. TEST AND ANALYSIS REPORT. JITC distributes test documentation via the JITC Electronic Report Distribution (ERD) system which uses unclassified (NIPRNET) e-mail. More comprehensive information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/.gov users on the NIPRNET at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNET) or http://199.208.204.125 (SIPRNET). JITC also provides a DAMA Certification Register on the JITC public website under "Product Registers." The DAMA Certification Register can be reached directly at http://jitc.fhu.disa.mil/reg/dama1.html. The UHF SATCOM DAMA Test Facility homepage can be reached directly at http://jitc.fhu.disa.mil/reg/uhfdama.htm. The testing agent point of contact is Norma Vega, DSN 879-1741, Commercial (520) 538-1741, e-mail vegan@fhu.disa.mil.

Table 3. MIL-STD-188-181B Requirements Matrix for the RT-1830(P)/S Ultrahigh Frequency (UHF) Satellite Communications (SATCOM) Terminal with the Ophir Models 4039 and 4039R High Power Amplifiers

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.	**Previously Met**
2	4.1(2)	Interoperable access modes **shall** be single access on a satellite channel.	**Previously 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.	**Previously Met**
4	4.2.2(2)	A preamble **shall** not be used for FSK modulation in the wideband mode.	**Previously 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 embedded COMSEC.			
6	4.2.4	The waveform **shall** interface with Fleet Satellite Communications (FLTSATCOM) and UHF Follow-On (UFO) satellites.	**Previously Met**
7	4.2.5	If the terminal implements FEC, it **shall** be compliant with the FEC requirements of this standard.	**Not Applicable (Note)**
Note: This terminal does not implement Forward Error Correction.			
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.	**Previously 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.	**Previously Met**
10	5.1.1.2	The terminal **shall** maintain EIRP accuracy of ±1.5 dB, assuming antenna gain and passive losses are fixed.	**Previously 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.	**Previously 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 (μs).	**Previously Met (Note)**
Note: This requirement was previously 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.	**Previously 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].	**Previously Met**
14	5.1.1.4.1(2)	These values **shall** apply when the transmitter carrier frequency is either unmodulated or modulated.	**Previously Met**

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
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].	**Previously Met (Note)**
Note: The maximum terminal EIRP to meet the requirement is listed in Table 1.			
16	5.1.1.4.2(2)	These values **shall** apply when the transmitter carrier frequency is either modulated or unmodulated.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously Met**
20	5.1.2.1a	The terminal **shall** achieve a bit error ratio (BER) of $1x10^{-5}$ 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.	**Previously 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.	**Previously 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.	**Previously 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].	**Previously Met**
24	5.1.3	Modulation **shall** be as shown in table III [of the MIL-STD].	**Previously Met**
25	5.1.3.1(1)	The phase vector rotation caused by modulation **shall** not cause a frequency shift in the transmitted data.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously Met**

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
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.	**Previously Met**
34	5.1.4.1.2.3 (2)	The following five fill bits **shall** be all zeros.	**Previously Met**
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.	**Previously Met**
36	5.1.4.1.2.4 (2)	The data traffic **shall** be modulated, coded, and interleaved, as specified in the header.	**Previously Met**
37	5.1.4.2 (1)	For CPM, the receiver **shall** determine data rate, modulation parameters, coding, and interleaving from the preamble.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously 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%.	**Previously 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%.	**Previously Met**
43	5.1.4.5 (2)	Terminal **shall** maintain bit synchronization if the carrier is interrupted (lost and returns within 230 ms).	**Previously 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.	**Previously Met**
45	5.1.4.6	The terminal **shall** maintain the frequency of its receive clock output to data terminal equipment within ±1% of the clock frequency for the selected operating data rate under all conditions where bit synchronization can be maintained.	**Previously 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.	**Previously 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.	**Previously Met (Note)**
48	5.1.6 (2)	It **shall** be interoperable with the CV-3591.	**Previously Met (Note)**
Note: These requirements were met using external COMSEC equipment.			
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 the 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.	**Previously Met (Note)**
Note: This requirement was met using external COMSEC equipment.			

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
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 the terminal.			
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.	**Previously Met (Note)**
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.	**Previously Met (Note)**
Note: These requirements were met using external COMSEC equipment.			
54	5.1.8(1)	All baseband data following the preamble bit pattern **shall** be differentially encoded for BPSK/SBPSK and OQPSK/ SOQPSK modulation.	**Previously 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].	**Previously 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].	**Previously Met**
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.	**Not Applicable (Note)**
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, 1110001000011000111101001101110110010 1.	
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].	
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.	
67	5.1.9.2(2)	The codes used **shall** be as defined in table III [of the MIL-STD] and...	
68	5.1.9.2(3)	...**shall** be derived in accordance with 5.1.9.2.1.	
Note: This terminal does not implement Forward Error Correction.			

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
69	5.1.9.2.1	The field generator polynomial **shall** be, $p(x)=x^6 + x + 1$ (Data Encoding)	**Not Applicable (Note)**
Note: This terminal does not implement Forward Error Correction.			
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.	**Previously 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.	**Previously 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: This terminal does not implement Forward Error Correction.			
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.	**Previously Met**
82	5.1.11.2(2)	The information bit stream **shall** be appended with *N* bits of the pattern 1100.	**Previously Met**
83	5.1.11.2(3)	The value of *N* **shall** be between 0 and 47 and...	**Previously 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.	**Previously Met**
85	5.1.11.2(5)	The preamble, SOM, and header bits **shall** not be counted as part of the input bits.	**Previously Met**
86	5.1.11.2(6)	The EOM sequence **shall** follow the appended bits.	**Previously 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.	**Previously Met**
88	5.1.11.2(8)	The left-most hexadecimal digit **shall** be transmitted first.	**Previously Met**
89	5.1.11.2(9)	After the EOM sequence is transmitted, the transmitter **shall** be disabled.	**Previously Met**

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
90	5.1.11.3(1)	For coded CPM the end of message bit sequence **shall** be generated and transmitted without FEC encoding.	**Not Applicable (Note)**
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.	
92	5.1.11.3(3)	The EOM sequence **shall** follow the last interleaver block.	
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.	
94	5.1.11.3(5)	The left-most hexadecimal digit **shall** be transmitted first.	
95	5.1.11.3(6)	After the EOM sequence is transmitted, the transmitter **shall** be disabled.	
Note: This terminal does not implement Forward Error Correction.			
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.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously 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 (μs).	**Previously Met**
Note: This requirement was previousley met during MIL-STD-188-183 certification testing.			
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.	**Previously 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.	**Previously Met (Note)**
Note: The maximum terminal EIRP allowable to meet this requirement is listed in Table 2.			
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.	**Previously Met**
103	5.2.1.6	Phase noise **shall** be as specified in 5.1.1.6.	**Previously Met**
104	5.2.2.1a	The terminal **shall** achieve a bit error ratio (BER) of 1 x 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.	**Previously Met**

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
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.	**Previously 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.	**Previously 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.	**Previously Met**
108	5.2.3.1	The FSK modulation characteristics **shall** be specified in 5.2.3.1.1 and 5.2.3.1.2.	**Previously Met**
109	5.2.3.1.1(1)	The deviation of the modulated signal **shall** be 5.6 kHz ±1 kHz for a binary 0 and -5.6 kHz ±1 kHz for a binary 1.	**Previously Met**
110	5.2.3.1.1(2)	The demodulator **shall** be interoperable with modulated signals that have deviations of 5.6 kHz ±1.2 kHz for a binary 0 and -5.6 ±1.2 kHz for a binary 1.	**Previously 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.	**Previously Met**
112	5.2.3.2	The phase vector rotation caused by modulation **shall** not cause a frequency shift in the transmitted data.	**Previously 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-*h* CPM modulation signal **shall** be interoperable with the CPM waveform that is generated in accordance with appendix E [of the MIL-STD].	**Previously Met**
115	5.2.4.1	The transmitting radio **shall** generate a preamble as specified in 5.1.4.1.	**Previously Met**
116	5.2.4.2	The requirements stated in 5.1.4.2 **shall** apply.	**Previously Met**
117	5.2.4.3	The terminal **shall** achieve acquisition and demodulate the signal for carrier frequency uncertainties up to ±1.2 kHz from the desired channel center frequency.	**Previously Met**
118	5.2.4.4	The probability of achieving acquisition on the first attempt under the conditions of 5.2.4.3 and *Eb/N0* equal to or higher than the reference *Eb*/*N0* **shall** exceed 95 percent, with a confidence level of 90 percent.	**Previously 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.	**Previously 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.	**Previously 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.	**Previously Met**

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
122	5.2.4.6	The terminal **shall** maintain the frequency of its receive clock output to data terminal equipment within ±1 percent of the clock frequency for the selected operating data rate, under all conditions where bit synchronization can be maintained.	**Previously Met**
123	5.2.5	The frequency generation system **shall** provide long-term plus short-term frequency accuracy within ±1.0 ppm across the full range of environmental conditions outlined in the terminal specification.	**Previously 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.	**Previously Met (Note)**
125	5.2.7	The COMSEC device **shall** be interoperable with the TSEC/KY-57 and TSEC/KY-58.	**Previously Met (Note)**
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.	**Previously Met (Note)**
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.	**Previously Met (Note)**
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.	**Previously Met (Note)**
Note: These requirements were met using external COMSEC equipment.			
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.	**Previously Met**
130	5.2.9	FEC coding, if implemented, **shall** be as defined in 5.1.9.	**Not Applicable (Note)**
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.	
132	5.2.9.1(2)	The codes used **shall** be as defined in table VIII [of the MIL-STD], and...	
133	5.2.9.1(3)	...**shall** be derived in accordance with 5.1.9.1.1.	
134	5.2.9.1.1	The field generator polynomial **shall** be, $p(x) = x^7 + x^3 + 1$ (Data Encoding)	
135	5.2.9.2	Interleaving **shall** be as defined in 5.1.9.2.4, except that there are seven bits per symbol.	
Note: This terminal does not implement Forward Error Correction.			
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].	**Previously Met**
137	5.2.11	Postamble **shall** be as defined in 5.1.11.	**Previously Met**
138	E.3.1	The terminal **shall** be interoperable with the specific quaternary full-response multi-*h* CPM waveform described below.	**Previously Met**
139	E.3.3(1)	The first data symbol is transmitted immediately after the preamble and **shall** use the h_1 modulation index.	**Previously Met**
140	E.3.3(2)	The next data symbol **shall** use the h_2 modulation index.	**Previously Met**
141	E.3.3(3)	Subsequent data symbols **shall** alternate modulation indices {h_1, h_2, h_1, h_2...}.	**Previously 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.	**Previously Met**

JITC REQ #	MIL-STD Paragraph Number	REQUIREMENT DESCRIPTION	STATUS
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.	**Previously 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.	**Previously Met**
145	E.3.4(4)	The first data symbol **shall** be received immediately after the preamble and...	**Previously Met**
146	E.3.4(5)	...**shall** use the h_1 modulation index.	**Previously Met**
147	E.3.4(6)	The next data symbol **shall** use the h_2 modulation index.	**Previously Met**
148	E.3.4(7)	Subsequent data symbols **shall** alternate modulation indices {h_1, h_2, h_1, h_2...}.	**Previously Met**

Legend:
∆f – change in frequency
ACI – Adjacent Channel Interference
ANDVT – Advanced Narrowband Digital Voice Terminal
BER – Bit Error Ratio or Bit Error Rate
bps – bit(s) per second(s)
BPSK – Binary Phase Shift Keying
CELP – Code Excited Linear Prediction
C/kT – Carrier Noise Power Density
COMSEC – Communications Security
CPM – Continuous Phase Modulation
CVSD – Continuous Variable Slope Delta
dB - decibel(s)
dB/K - decibel(s)/kelvin(s)
dBW – decibel(s) relative to 1 watt
E_b/N_o – Energy Per Bit To Noise Power Spectral Density Ratio
EIRP – Effective Isotropically Radiated Power
FEC – Forward Error Correction
FEDSTD – Federal Standard
FLTSATCOM – Fleet Satellite Communications
FSK – Frequency Shift Keying
G/T – Antenna Gain To Noise Temerature In dB/K
h – modulation indices (or *h* values)
Hz – hertz
IAW – in accordance with
JITC – Joint Interoperability Test Command
k – kelvin(s)
Kbps – kilobit(s) per second(s)
kHz – kilohertz
LEASAT – Leased Satellite
MARISAT – Maritime Satellite (Also Known As Gapfiller)
MHz - Megahertz
MIL-STD – Military Standard
ms – milisecond(s)
N – any digit 2 through 9
NSA – National Security Agency
OQPSK – Offset Quadrature Phase Shift Keying
OTAR – Over The Air Rekeying
ppm – part per million
PSK – Phased Shift Keying
REQ – Requirement
RF – Radio Frequency
SBPSK – Shaped Binary Phased Shift Keying
SOM – Start Of Message
SOQPSK – Shaped Offset Quadrature Phase Shift Keying
STANAG – Standardization Agreement
TDMA – Time Division Multiple Access
UFO – UHF Follow-On Satellites
UHF – Ultrahigh Frequency
us – microsecond(s)

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