

**Specification
For a
Downsized Deployable Satellite Terminal System**

1. INTRODUCTION

The downsized deployable satellite terminal (DDST) system will be used for high precision timing experiments on the C band, Ku band, and X band satellites. The DDST system will be used on DSCS satellites and Intelsat satellites. The DDST system will interface with NRL developed two-way satellite time transfer modems.

The DDST system must be portable. It must be able to be shipped in crates that require no more than two people to carry. NRL personnel must be able to assemble, operate, and disassemble the DDST system.

2. SCOPE

The contractor shall furnish a complete DDST system that is Intelsat certified and Defense Satellite Communications System (DSCS) certified for both transmission and reception of signals. The contractor shall furnish all packaging material that will allow for the storage and transportation of the DDST system and all of its components. The contractor shall furnish all components required to operate on the three satellite bands, X, C, and Ku.

3. TECHNICAL REQUIREMENTS

The contractor shall provide a total system in which the individual sections or components must meet or exceed the following specifications as described below:

3.1 Antenna Interface

The reflector size must be 2.4 meters in diameter. The polarization of the antenna feed must be circular and support right-hand and left-hand polarizations for the C-band and X-band. The antenna must support linear polarization for the Ku-band.

3.2 Operation Data Unit Interface

TX IF Input	
Connector	Type "N" female
Impedance	50 Ohms nominal
VSWR	1.5:1 maximum

RX IF Output	
Connector	Type "N" female
Impedance	50 Ohms nominal
VSWR	1.5:1 maximum

RX IF Monitor	
Connector	Type "N" female

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Impedance 50 Ohms nominal
VSWR 1-5:1 maximum

External 10 MHz Input

Connector Type "N" female
Impedance 50 Ohms nominal
VSWR 2.0:1 maximum

Internal 10 MHz Output

Connector Type "N" female
Impedance 50 Ohms nominal
VSWR 2.0:1 maximum

Serial Port/Alarm Connector

HPA Serial Port/Alarm Connector

TX RF Output

Connector Type "N" female
Impedance 50 Ohms nominal
VSW.R 1.5:1 maximum

RX RF/IF

Connector Type "N" female
Impedance 50 Ohms nominal
VSWR 1.5:1 maximum

AC Input

Connector Amphenol T3110-003

3.3 Receive Section

Receive RF Input Frequency

C-Band 3.625 - 4.200 GHz
X-Band 7.250 - 7.750 GHz
Ku-Band (with 3LNB's) 10.950 - 12.750 GHz
Band 1 10.950 - 11.700 GHz
Band 2 11.700 - 12.200 GHz
Band 3 12.250 - 12.750 GHz

Receive IF Output Frequency

C-Band 950 - 1525 MHz
X-Band 950 - 1450 MHz
Ku-Band 950 - 1700 MHz

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LNA/LNB Noise Temperature (K)

C-Band	45K maximum
X-Band	75K maximum
Ku-Band	75K maximum

LNA/LNB Gain

C-Band	59 to 66 dB
X-Band	50 dB minimum
Ku-Band	50.5 to 57 dB

Antenna Gain (@ center frequency)

C-Band	38.06 dB
X-Band	43.80 dB
Ku-Band	44.00 dB

Receive G/F @ center freq., 10 deg. Elevation, clear horizon

C-Band	18.1 dB/K
X-Band	23.4 dB/K
Ku-Band	25.4 dB/K

Receive IF Output Power @ PI dB +8 dBm minimum

Receive IF Gain Adjustment 30 dB in 1 dB steps

Receive Frequency Sense Positive (no spectrum Inversion)

Receive Phase Notice

C/Ku-Band

@ 10 Hz offset	-35 dBc/Hz maximum
@ 100 Hz offset	-60 dBc/Hz maximum
@ 1 KHz offset	-70 dBc/Hz maximum
@ 10 KHz offset	-80 dBc/Hz maximum
@ 100 KHz offset	-90 dBc/Hz maximum
@ 1 MHz offset	<=-90 dBc/Hz maximum

X-Band

@ 10 Hz offset	-35 dBc/Hz maximum
@ 100 Hz offset	-62 dBc/Hz maximum
@ 1 KHz offset	-72 dBc/Hz maximum
@ 10 KHz offset	-82 dBc/Hz maximum
@ 100 KHz offset	-92 dBc/ffz maximum
@ 1 MHz offset	<=-92 dBc/Hz maximum

3.4 Transmit Section

Transmit IF Input Frequency

C-Band	950 - 1525 MHz
X-Band	950 - 1450 MHz
Ku-Band	950 - 1700 MHz

Transmit RF Output Frequency

C-Band	5.850 - 6.475 GHz
X-Band	7.900 - 8.400 GHz
Ku-Band	13.750 - 14.500 GHz

Transmit EIRP (@ center frequency and rated power)

C-Band	65.5 dBw
X-Band	68.6 dBw
Ku-Band	72.3 dBw

Antenna Gain (@ center frequency)

C-Band	42.10 dB
X-Band	44.40 dB
Ku-Band	49.00 dB

TWTA Rated Power (@ TWTA flange)

C-Band	290W
X-Band	400W
Ku-Band	290W

Transmit Intermods (@ TWTA flange)

	C-band Linearized TWTA	X-band Linearized TWTA	Ku-band Linearized TWTA
C-band	-21dBc @251W	-18dBc @126W	-18dBc @126W
X-band	-25 dBc @100W	-25dBc @251W	-25 dBc @1—W
Ku-band	-18 dBc @100W	-18dBc @100W	-21dBc @200W

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Spectral Regrowth

	C-band Linearized TWTA	X-band Linearized TWTA	Ku-band Linearized TWTA
C-band (QPSK,1/2FEC,6.3Mb/s)	-26dBc @251W	-26 dBc @126W	-26 dBc @126W
X-band (QPSK,1/2FEC,6.3Mb/s)	-30 dBc @126W	-30 dBc @251W	-30 dBc @126W
Ku-band (QPSK,1/2FEC,6.3Mb/s)	-26dBc @100W	-26dBc @100W	-26 dBc @200W

Transmit Spurious

AC Line -40 dBc maximum (<500 Hz)

All Others

C/Ku-Band -55 dBc maximum (500 Hz - 1 GHz)

X-Band -70 dBc maximum (>2 kHz - 1 GHz)

Transmit RF Gain Adjustment 25 dB minimum in 1 dB steps

Transmit Frequency Sense

Transmit Phase Noise

C and Ku-Band	@ 10 Hz offset	-35dBc/Hz maximum
	@ 100 Hz offset	-60dBc/Hz maximum
	@ 1 KHz offset	-70dBc/Hz maximum
	@ 10 KHz offset	-80dBc/Hz maximum
	@ 100 KHz offset	-90dBc/Hz maximum
	@ 1 MHz offset	<= -90dBc/Hz maximum

X-Band	@ 10 Hz offset	-35dBc/Hz maximum
	@ 100 Hz offset	-62dBc/Hz maximum
	@ 1 KHz offset	-72dBc/Hz maximum
	@ 10 KHz offset	-82dBc/Hz maximum
	@ 100 KHz offset	-92dBc/Hz maximum
	@ 1 MHz offset	<= -92dBc/Hz maximum

Transmit Frequency Stability

Day 1×10^{-9} maximum

Year 1×10^{-7} maximum

Temperature (-30' to +50' C)

Pattern Beamwidth @ Center Frequency

-3dB Beamwidth

C-Band	1.35 degrees
X-Band	1.02 degrees
Ku-Band	0.60 degrees

-15 dB Beamwidth

C-Band	2.84 degrees
X-Band	2.14 degrees
Ku-Band	1.26 degrees

3.5 MONITOR AND CONTROL

The serial port interface must be compatible RS232 and RS485 interface standards. The DDST system must provide monitor and control functions listed below.

Transmit	Set RF attenuator Enable/Disable transmit Enable/Disable time delay Enable/Disable, TWT Reset latched alarms Monitor alarms Monitor TX frequency Monitor TX power Monitor TWT
Receive	Set IF attenuator Enable/Disable receive Reset latched alarms Monitor alarms Monitor RX attenuator setting

3.6 POWER REQUIREMENTS

The DDST system must operate on 115 +/- 10% volts AC, and 230 +/- 10% volts AC with a line frequency varying from 47 Hz to 60 Hz. The power consumption must not exceed 190 VA with the transmitter off. The transmitter must not exceed 2500 VA in power consumption.

3.7 MECHANICAL REQUIREMENTS

The contractor shall provide cases for storage and transportation of antenna components and systems. The DDST system should be assembled in less than an hour by two trained operators. No more than basic hand tools should be required for assembly or disassembly.

4. DOCUMENTATION

4.1 Technical and Operations Manual

The contractor shall provide a manual that describes the interfaces of the DDST system, assembly and disassembly procedures, operating procedures, and maintenance and troubleshooting procedures.

4.2 Test Data and Certification

The contractor shall provide certification of compliance and registration for use on Intelsat satellites and DSCS satellites. The DSCS certificate shall indicate that the DDST has been tested and approved for operations on DSCS satellites. The document shall include all required registration numbers. The Intelsat certificate shall indicate that the DDST system has been tested and approved to operate on Intelsat satellites. The document shall include all required registration numbers. The contractor shall provide test data indicating the performance levels of the receiver and transmitter sections. Delivery of test data shall take place with the delivery of the DDST system.

5. TECHNICAL SUPPORT

The contractor shall provide telephone/fax/email technical support for a period starting with delivery of the complete DDST and extending 90 days after delivery.

6. WARRANTY

The contractor shall provide a standard commercial warranty for the DDST.

CONTRACT DATA REQUIREMENTS LIST

(2 Data Items)

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0701-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to the above address. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.

A. CONTRACT LINE ITEM NO. 0003	B. EXHIBIT A	C. CATEGORY: TDP _____ TM- <u>X</u> OTHER _____
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D. SYSTEM / ITEM	E. CONTRACT / PR NO.	F. CONTRACTOR
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1. DATA ITEM NO. A001	2. TITLE OF DATA ITEM Technical and Operations Manual	3. SUBTITLE
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4. AUTHORITY (Data Acquisition Document No.) N/A	5. CONTRACT REFERENCE Para. 4.1	6. REQUIRING OFFICE NRL Code 8152
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7. DD 250 REQ No	9. DIST STATEMENT REQUIRED	10. FREQUENCY 1 Time	12. DATE OF FIRST SUBMISSION See Block 16	14. DISTRIBUTION			
8. APP CODE N/A	N/A	11. AS OF DATE N/A	13. DATE OF SUBSEQUENT SUBMISSION	a. ADDRESSEE TM	b. COPIES		
					Draft	Final	
					Reg	Repre	

16. REMARKS The contractor shall provide a manual that describe the interfaces of the DDST system, assembly and disassembly procedures, operating procedures, and maintenance and trouble shooting procedures. Delivery of the manual (s) will take place with the delivery of the system.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"></td> <td style="width: 10%; text-align: center;">0</td> <td style="width: 10%; text-align: center;">1</td> <td style="width: 10%; text-align: center;">0</td> </tr> <tr> <td>15. TOTAL →</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> </tr> </table>		0	1	0	15. TOTAL →	0	1	0
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1. DATA ITEM NO. A002	2. TITLE OF DATA ITEM Test Data and Certification	3. SUBTITLE
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4. AUTHORITY (Data Acquisition Document No.) N/A	5. CONTRACT REFERENCE Para. 4.2	6. REQUIRING OFFICE NRL Code 8152
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7. DD 250 REQ No	9. DIST STATEMENT REQUIRED	10. FREQUENCY 1 Time	12. DATE OF FIRST SUBMISSION See Block 16	14. DISTRIBUTION			
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G. PREPARED BY NRL Cede 8152	H. DATE	I. APPROVED BY	J. DATE
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17. PRICE GROUP
18. ESTIMATED TOTAL PRICE

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