GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

TITLE:

DRAFT SPECIFICATION
for
PORTABLE VSAT TERMINAL

Specification No.

RDSO/ SPN/ TC/86/2008

TELECOM DIRECTORATE

RESEARCH DESIGN & STANDARDS ORGANISATION

MANAK NAGAR, LUCKNOW – 226001

DOCUMENT DATA SHEET		
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Title of Document **Portable VSAT terminal**		
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Abstract **This document specifies technical specification of portable manually quick deploying and satellite acquiring type VSAT terminal for use in Indian Railways**		

DOCUMENT CONTROL SHEET

NAME	ORGANIZATION	FUNCTION	LEVEL
Director/ Telecom-III	RDSO	Member	Prepare
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I. SUMMARY :

This document sets forth general, operational, technical, performance, type test & acceptance test requirements of **portable manually quick deploying and satellite acquiring type VSAT terminal** for use in Indian Railways.

II. SOURCE :

Draft specification no. RDSO/SPN/TC/86/2008 has been prepared by RDSO, Lucknow on advice of Railway Board vide their letter no.2006/Tele/FOIS/Progress dated 11.08.2008 .

III. FOREWORD :

Research Designs and Standards Organisation (RDSO) is an attached office of Ministry of Railways, engaged in design and standardization of equipment for use on Indian Railways.

RDSO/ SPN specification is issued as draft specification for discussion. This specification is circulated to customers/ Railways and field inspection units for comments.

RDSO/ SPN along with comments received from various quarters is discussed in Telecom Standards Committee Meeting (TCSC). Recommendation made by TCSC is put up to Railway Board for approval. After approval from Railway Board, the specification is given an IRS number and issued as Indian Railway Standard Specification.

In the absence of IRS specification, procurement may be made as per RDSO/ SPN specification.

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1 SCOPE:

This document sets forth general, operational, technical, performance, type test & acceptance test requirements of **portable manually quick deploying and satellite acquiring type VSAT terminal** for use in Indian Railways.

2 REFERENCE:

This specification requires the reference to the following documents:

ITU-R recommendation S.580-6

Wherever, reference to any specifications appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

3 INTRODUCTION:

This shall be a very small aperture satellite terminal for quickly setting a communication link from any place (disaster site etc.). This shall provide a communication link from the site to other desired sites such as railway board, zonal and divisional headquarters etc. This shall provide voice, video and data communication to cater for the needs of disaster sites etc. This shall be portable, rugged, all weather, quick deployable and capable of quick manual acquisition of geostationary communication satellites.

4 FUNCTIONAL AND TECHINICAL REQUIRMENTS:

4.1 General

4.1.1 The VSAT terminal shall be able to work with all geostationary satellites visible from India.

4.1.2 It shall work in Ku Band.

4.1.3 Indian Railway has established its own VSAT network including hub. The system should be compatible with the existing Indian railway's own VSAT network. Presently Indian Railways have hired 4MB inbound and 2MB outbound bandwidth from transponder of INSAT-4CR (Ku Band) satellite. Hub for this VSAT network has been set up at New Delhi by M/s Hughes. The network is in star topology.

4.1.4 The VSAT terminal shall be able to deliver bidirectional composite data traffic (Voice, Video and Data) at nominal speed (bandwidth) of 512 Kbps.

4.1.5 The portable VSAT terminal will be kept in Accident Relief Train (ART) and will be used during accidents and other disasters. For this purpose each portable VSAT

terminal shall be able to be packaged in such a manner to facilitate easy transportation to the accident/disaster site including last 500 meters or so from ART to deployment site when this has to be carried manually by one or two persons. For smooth transportation, the portable VSAT terminal unit shall be packaged in minimum no. of easily carrying type containers not exceeding 3 nos.. Weight of the complete packaged VSAT Terminal unit including all accessories shall not exceed 100 kg. **On arrival at the remote site, it should be possible to setup and have satellite connectivity within 30 minutes by a team of two persons.**

4.1.6 The antenna shall be made of lightweight and tough composite material to ensure long life in the rough working environment.

4.1.7 It shall be foldable type for ease in transportation. All fasteners shall be captive type to avoid being lost or misplaced.

4.1.8 It may be required that outdoor unit (Antenna system with RFT & LNBC) is kept some distance away from indoor unit (Modem etc.). To achieve this, all the cables required for interconnection of these two units, shall be of 25 meter length.

4.1.9 The VSAT Terminal must be able to both transmit and receive the required quality video/voice/data over existing Indian railway's own VSAT and telecommunication network.

4.1.10 All regulatory clearances from various regulatory bodies like DOT/WPC etc to operate the VSAT Terminal as applicable shall be available with the vendor and these shall be furnished to Railway.

4.1.11 The IP addressing scheme of VSAT has to be integrated with the existing IP addressing scheme of the Indian Railways.

4.1.12 Any software required for operation of the terminal shall be embedded (located, stored and operated) in the VSAT terminal itself.

4.2 Power supply

4.2.1 The VSAT Terminal shall be able to be powered by both AC and DC.

4.2.2 The AC operating voltage shall be 160 – 250VAC or better.

4.2.3 The DC operating voltage shall be 12VDC or 24VDC nominal with voltage variation range ±10%.

4.2.4 Firm shall submit power consumption of each equipment and the total consumption of VSAT Terminal.

4.3 Satellite acquisition

4.3.1 The latitude and longitude position of the VSAT terminal location shall be determined through some external means. Look angle for the desired satellite shall be calculated. It is expected that the look angle at a central location in a division will remain almost same for any place in the division and therefore look angle will be required to be calculated only once and subsequently the same look angle shall be used for the desired satellite acquisition.

4.3.2 For initial setting of the VSAT terminal, the antenna system shall be provided with a magnetic compass, level meter and inclinometer with suitable markings for the purpose.

4.3.3 The desired satellite acquisition shall be done manually through operation of a handle or other similar means to adjust azimuth and elevation of the antenna.

4.4 Other parameters shall be as below-

Parameter	**Specifications**
Antenna System	
Operating Frequency	13.75-14.5 GHz Tx 10.70-12.75 GHz Rx
VSWR	1.3: 1 max.
Antenna Aperture	≤ 1.2 meter
Polarization	Linear orthogonal
Azimuth Range	360 º continuous
Elevation Range	5º-90º continuous
Polarization Range	±95º continuous
TX.X-Pol Isolation	On-axis – better than 30 dB
RX.X-Pol Isolation	On axis – better than 30 dB
Off axis Tx and Rx radiation pattern	As per ITU-R recommendation S.580-6
RFT & LNBC	
Frequency	13.75-14.5 GHz TX 10.95-11.75 GHz Rx
Conversion Gain	To be specified by supplier
Noise temperature	90 K or better
Gain Flatness	±1.0 dB full band
Gain Slope	+0.6 dB per 40 MHz max.
Spurious at rated P1dB	ETSI, CCIR & FCC compliant
Harmonics at rated P1dB	ETSI, CCIR & FCC compliant
Modem	
Output Interface	Ethernet port

Modulation	QPSK, OQPSK
Burst Data rate	128, 256, 512 Kbps
Data Transport Protocols	TCP/IP and UDP
Bit Error Rate support	Better than $1x10^{-7}$
FEC rate support	½, 2/3, or better
Access technology for Inbound	TDMA/FTDMA/MFTDMA
Access Schemes on Inbound	Slotted Aloha, dynamic access.
Management from NCC	Using SNMP
IP Routing Support	ARP, ICMP, IGMP, Routing (RIP v1 & v2), NAT, PAT

5 OPERATIONAL CONDITIONS

Operational Temperature range:

Antenna & RF Unit (Outdoor Unit) : -10ºC to +55ºC minimum

Modem (Indoor Unit) : 0 ºC to +50ºC minimum

Storage Temperature range: -10ºC to +60ºC or better

Operational Humidity: up to 95% non-condensing

Operational Wind Speed – min. 60 kmph

The antenna system with outdoor RF unit shall be capable of working in rain of at least 10 mm/hour intensity without any appreciable degradation in performance.

6 APPROVALS

The VSAT terminal should have necessary approvals from appropriate statutory bodies for working with Indian communication satellites and particularly with INSAT 4CR.

7 MANUALS

Installation, operation and maintenance manual in 3 hard copies and 3 soft copies (in CD/DVD) shall be provided for each VSAT Terminal.

8 TRAINING

3 days training at end user premises shall be provided for each VSAT Terminal.

9 WARRANTY

The VSAT terminal shall be warranted for a period of 2 years.

10 TYPE TEST

12.1 At least one equipment per lot, randomly selected, shall be type tested.

12.2 Supplier will provide detailed test results for all parameters carried out at OEM premise for the units selected for type testing.

12.3 For type test following Clauses shall be tested-
Sub-clauses 4.1.4, 4.1.5, 4.1.7, 4.1.8, 4.1.9, 4.1.12, 4.2.2, 4.2.3, 4.3.2, 4.3.3, 4.4- all parameters for Antenna System and modem units, Frequency parameter for RFT & LNBC units.

12.4 Supplier shall arrange all necessary test and measuring instruments and other facilities for conducting type test. The type testing shall be done at place/places nominated by the supplier where all test and measuring instruments and other facilities for conducting type test are available. Supplier shall co-ordinate for the type testing.

12.5 For clause 5 (operational conditions) and clause 6 (Approvals) and other technical and non- technical requirements as stipulated in the specification such as clause 4.1.6, 4.1.10, 4.2.4 and regarding all parameters for RFT and LNBC units as specified in sub-clause 4.4 the supplier shall furnish necessary supporting documents, test results and test reports to the satisfaction of purchaser.

12.6 Manuals as per clause 7 for the complete VSAT equipment shall also be furnished by the supplier for approval.

12.7 If the firm do not have their manufacturing base in India and is unable to get the type tests arranged in India, the type test shall be conducted based on the cross approval. The firm has to submit relevant documents required as per guidelines issued by Railway Board for such items. Cross approval shall be issued if the firm meets all the requirement as per Railway Board guidelines.

11 ACCEPTANCE TEST

13.1 All the equipments shall be tested except that equipments which have been type tested.

13.2 Supplier will provide detailed test results and other supporting documents for all parameters carried out at OEM premise for the units selected for acceptance testing.

13.3 For acceptance test following clauses shall be tested-
Sub-clauses 4.1.4, 4.1.5, 4.1.7, 4.1.8, 4.1.9, 4.2.2, 4.2.3, 4.3.2, 4.3.3,

Sub-clause 4.4- For Antenna System following parameters shall be tested- Antenna Aperture, Polarization, Azimuth Range, Elevation Range, Polarization Range, TX.X-Pol Isolation, RX.X-Pol Isolation

For RFT & LNBC units following parameters shall be tested - Frequency

For modem unit- all parameters shall be tested.

13.4 Supplier shall arrange all necessary test and measuring instruments and other facilities for conducting acceptance test and shall co-ordinate for the acceptance testing.

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