



TRANSNET

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**TRANSPORT TELECOMMUNICATIONS
SPECIFICATION**

**COMPLIANCE FOR DIGITAL DATA RADIO TRANCEIVER
WITH INTEGRATED DIGITAL MODEM**

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1. SCOPE	Comply	Comment
1.1. This specification covers the design requirements of Transnet for the supply of digital data radio transceivers and digital modems, for use in SCADA and Telemetry type applications. The equipment offered needs to provide a transparent asynchronous serial data path between a central host computer and remote terminals.		
1.2. The Schedule of Requirements contains the quantities of the equipment to be supplied.		
2. COMPLIANCE		
2.1. The design must comply with this specification.		
3. SERVICE CONDITIONS		
The equipment offered must be suitable for continuous operation under the following conditions :		
Ambient temperature-10° to 60° Celsius		
Relative humidity As high as 95 %		
Altitude 0 to 2 000 metres.		
Air pollution Heavily saline laden industrial and locomotive fumes containing metallic dust.		
3.2. Component parts, including wiring, must be manufactured and processed to ensure reliable operation under these conditions.		
3.3. The equipment must be suitable for operation under the stated conditions without the use of blower fans, heaters or air-conditioners etc.		
4. GENERAL REQUIREMENTS	Comply	Comment
4.1. The radios must be ICASA type approved, approval documents and dealers licence must be provided.		
4.2. The radio must be approved by the Transport Telecoms National Test Centre (011) 774-8227].		
4.3. The offered data radio equipment shall		

<p>consist of a fully integrated, all digital, data radio transceiver and digital data modem inside the one unit. In order to unify responsibility for proper operation, all equipment shall be furnished by a single supplier, combinations of radio transceivers and modems from different suppliers will not be allowed.</p>		
<p>4.4. The offered data radio modem shall consist of a base station linked to the central host PC and communicating to one or more data radios connected to the remote terminals either directly, or if necessary by one or more radio repeater stations or by Transport Telecoms transmission infrastructure.</p>		
<p>4.5. All equipment shall be factory configured or end user configured via personal computer using a terminal Emulation Software or Hyper Terminal without changing internal components. Opening the radio to change parameters is not permitted. It must be possible to upgrade the firmware in the field using a PC. All software must be Microsoft Windows compatible.</p>		
<p>4.5.1. The radio RF output power must be adjustable between 1 and 5 watts, software selectable.</p>		
<p>4.5.2. The equipment must operate from 11 to 16 volt DC power.</p>		
<p>4.5.3. The offered data radio must have provision for external auxiliary alarms</p>		
<p>4.6. LED indicators for DC Power, Tx enable, Rx carrier detect, Data Synchronisation, Tx Data and Rx Data, must be visible on the outside surface of the radio. The LED indicators must also display the alarm condition of the unit in the event of a malfunction.</p>		
<p>4.7. The remote data radio must have a sleep mode facility in order to reduce power consumption.</p>		
<p>4.8. The radio must provide protection by automatically reducing the transmitter output power by 3dB or more in the event of a high VSWR or in the event that the temperature of the radio exceeds the</p>		

maximum specified.		
5. FREQUENCIES	Comply	Comment
5.1. Frequencies		
5.1.1. Except when in simplex mode, the radio must operate in half-duplex (two frequency simplex) mode, with a duplex frequency spacing of 5 MHz, as follows :		
5.1.1.1. The UHF frequency must be in the range 410 — 470 MHz.		
5.1.1.2. Channel spacing must be 12, 5 KHz.		
5.1.1.3. A combination of UHF channels in the above frequency band will be used.		
6. SYSTEM CONFIGURATION	Comply	Comment
6.1. All radio modems shall be configurable to provide point to point and point to multipoint operation. Radio modems must be able to operate in full duplex (PTMP master and PTP link applications), half duplex (PTMP remote) and simplex store and forward modes. PTMP operation must employ a collision avoidance mechanism.		
6.2. The master base station must offer the option of a 19" rack mount unit that has a fully duplicated redundant hot standby configuration.		

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6.3. Data Ports	Comply	Comment
6.3.1. The radio modem must provide two asynchronous V24 compliant RS232 ports for connection to serial data devices. The data format on each port must be independently user configurable. The data rate on each port must be independently user configurable. Each port must be able to support different data protocols if required thus enabling the use of different data protocols on the same radio network.		
6.3.2. Data buffering must be employed.		
6.3.3. Minimum 16 Bit CRC error detection must be employed.		
6.3.4. The data ports must be DB-9F wired as DCE.		
6.3.5. The data ports must be dedicated - they must not have shared functionality for diagnostics, radio configuration etc.		
6.3.6.		
6.3.7. External surge protection boards must be supplied with the radio modem that provides optical isolation of the data ports.		
7. REMOTE DIAGNOSTICS AND NETWORK MANAGEMENT	Comply	Comment
7.1. Products offered must have remote diagnostics and network management capabilities. The remote diagnostics and network management must be transparent and non-intrusive (The payload data must not be affected). The software must operate on a standard Windows PC and connection to the PC must be via RS 232 serial port. The entire network must be accessible by connection to any radio modem in the network.		
7.2. Over the air configuration - Radio modems in the network must have the capability to change all parameters remotely, including the remote switching of systems in a hot standby configuration.		

7.3. The following parameters must be monitored:		
7.3.1. DC Supply Voltage		
7.3.2. RSSI		
7.3.3. Transmitter Power		
7.3.4. VSWR		
7.3.5. Temperature of the unit		
7.3.6. Performance (error rates)		
7.3.7. External Auxiliary alarms		
7.4. All status and alarm logs must be time/date stamped.		
7.5. Alarm thresholds must be user defined.		
7.6. Each radio modem in the network must be identified by a user defined description.		
7.7. An alarm condition must generate a notification on the screen as well as an audible alarm.		
7.8. All alarms must have the capability to be prioritised, acknowledged and logged.		
7.9. All values must be graphically presented; there must be database and trending capabilities.		
7.10. The software and database must be SNMP and ODBC compliant.		
8. EQUIPMENT SPECIFICATIONS.	Comply	Comment
8.1. Base Station Specifications		
8.1.1. Power Supply		
8.1.1.1. Power Supply: 13.8V DC nominal (11-16V DC)		
8.1.2. Radio		
8.1.2.1. Operating Modes: Full duplex, Half Duplex and simplex		
8.1.2.2. Channel Spacing: 12.5 kHz		

8.1.2.3.	Frequency Stability: ± 1 ppm - 10 to 60 °C		
8.1.2.4.	Frequency Aging: ≤ 1 ppm/annum		
8.1.3.	Transmitter		
8.1.3.1.	Tx Power: 1W to 5W - software adjustable		
8.1.3.2.	Duty Cycle 100%		
8.1.3.3.	Tx Key up Time: < 2 ms		
8.1.3.4.	Tx Spurious: must not exceed a level of -36dbm		
8.1.3.6.	The transmitter shall operate into a 50 Ω impedance antenna system.		
Receiver			
8.1.4.1.	Sensitivity: -116 dBm or better for 12 dB SINAD		
8.1.4.2.	Selectivity: 60 dB or better		
8.1.4.3.	Intermediation: 70 dB or better		
8.1.4.4.	Spurious Response: 70 dB or better		
Modem			
8.1.5.1.	Data Ports: Two user data ports independently configurable and must be able to operate using only 3 wires (Tx, Rx and Gnd)		
8.1.5.2.	Data Serial Port 1: RS232, DCE, 600-19 200 bps asynchronous		
8.1.5.3.	Data Serial Port 2: RS232, DCE, 600-19 200 bps asynchronous		
8.1.5.4.	Flow Control: software or hardware selectable		
8.1.5.6.	RF Channel Data Rate: Minimum of 9600bps under ETSI compliance conditions with 12.5 kHz channel spacing		

8.1.5.7.	Data Buffer: 16 Kbytes or more of on-board RAM		
8.1.5.9.	Data Turnaround Time: <10 mS		
8.1.5.11.	Error Checking: Minimum 16 bit CRC		
8.1.6.	Interface Connections		
8.1.6.1.	Data Ports: 2 x DB9 female ports wired as DCE (modem)		
8.1.6.3.	Diagnostic/management: DB9F or functionally equivalent connectors		
8.1.6.5.	Programming Port: DB9F or functionally equivalent connectors		
Master Base Station			
8.1.7.1.	A 19" rack mount unit must be offered as an option.		
8.1.7.3.	A fully duplicated redundant hot standby configuration must be offered as an option.		
8.1.7.4.	Minimum of eight auxiliary alarm inputs must be offered		
8.1.8.	Remote Base station		
8.1.8.1.	The remote base station must have a sleep mode to reduce power consumption.		

9. MAINTENANCE AND SERVICE	Comply	Comment
9.1. The tenderer must give full particulars of the spare parts, maintenance, and service facilities which must be available in the Republic of South Africa. The names and addresses of the companies concerned must be furnished.		
9.2. The tenderer must list the major centres where maintenance facilities can be provided and must state if repairs under guarantee can be undertaken at these centres.		
9.3. The tenderers must state what provision will be made to ensure an adequate supply of spare components for a period of 10 years after the order is placed.		
9.4. Transnet will not consider tenders from tenderers who cannot provide an efficient spares and maintenance service. Tenderers must state whether they are prepared to an inspection of their maintenance premises by the engineering personnel of Transnet.		
9.5. A minimum of twelve month guarantee period required		
9.6. Maximum ten working day turnaround period is required		
10. QUALITY OF MATERIAL	Comply	Comment
10.1. All material used must be of the best quality and of the class most suitable for the purpose for which it is required. Unless otherwise specified or approved, all materials must be to the most recent published standards applicable in the country of origin. Tenderers must quote the authorised standards to which the materials or the equipment offered conform. The workmanship must be of the highest standard.		
10.2. Where rack sides are not fully equipped, blanking-off panels must be fitted to all vacant positions.		
10.3. Special attention must be paid to the dust-proofing of the equipment, as it will generally be used near railway stations in dust and smoke-laden atmosphere.		

<p>10.4. Plastic materials, which may under the influence of heat, light or pressure, decompose or liberate elements or compounds, which are likely to corrode or otherwise affect metals in contact with them must not be used in the construction of the equipment offered by tenderers.</p>		
<p>10.5. Where different metals are used in conjunction with each other, tenderers to explicitly guarantee that no electrolytic corrosion will occur under operating conditions.</p>		
<p>10.6. Mounting screws, where used, must not be self-tapping.</p>		
<p>10.7. The equipment must be solid state throughout.</p>		
<p>10.8. Solid-state devices are to be so constructed that they may be easily tested for correct functioning without having to disturb wiring.</p>		
<p>10.9. Printed wiring boards must be of epoxy glass fibre laminate or better. Phenolic paper or bakelised paperboards are not acceptable.</p>		
<p>10.10. Printed-wiring boards must be properly washed and, if necessary, neutralised after the etching process so that no hygroscopic crystals remain in the board or printed wiring.</p>		
<p>10.11. Printed wiring boards must be guaranteed not to promote or permit the growth of fungi under any conditions.</p>		
<p>10.12. Printed wiring boards must preferably be fitted with robust plugs and sockets or another approved manner of connecting the boards reliably to the wiring. Edge connectors may be used provided that :</p>		

10.12.1.	A suitable tolerance for the correct fitting of the board between guides and the wiring socket can be guaranteed.		
10.12.2.	Sufficient contact area is provided to guarantee reliable contact.		
10.12.3.	Sufficient contact pressure is provided to ensure contact but not to remove precious metal from the contacts.		
10.12.4.	In the final protective coating of the boards, no varnish or other protective materials is permitted to cover the contacts.		
10.12.5.	After 500 insertions and withdrawals, there must be no noticeable deterioration of the contacts of either the board or socket.		
10.13.	All printed wiring board's sockets; plugs or edge connectors must be gold plated or better.		
10.14.	Heavy components must not be mounted on printed wiring boards unless it can be guaranteed that the board will stand up to severe handling without fracturing with the components so mounted.		
10.15.	Solid-state boards must be provided on a plug-in or other approved basis so that they can, when necessary, be readily removed for repairs. Tenderers must recommend the quantities of spare units to be kept on hand.		
10.16.	Only new components must be used.		
10.17.	No unmarked and/or untested components may be used		
10.18.	All components used must be types, which can be readily obtained from local stocks.		
10.19.	The number of component types must be kept to a minimum consistent with good design of the equipment.		
10.20.	All components must be suitably rated for the function they have to perform without interference to		

	neighbouring material.		
10.21.	Resistors and resistive components must not rise in temperature so that mounting boards or marking thereon are burnt or discoloured.		
10.22.	Electrolytic capacitors must not be used in any critical timing or frequency control circuits.		
10.23.	Fuses must be rated to give adequate protection to the circuits served while not rupturing prematurely.		
10.24.	Indication lamps must be rated for reliable long life and must be protected against surges where necessary.		
10.25.	Pilot indicator lamps must be light emitting diode (LED) types.		
10.26.	Full details of the types of lamps and lenses offered must be furnished in the tender. Indication lamps must be easily replaceable from the front of the equipment. Light filters must not fade with age.		
10.27.	Terminations on printed circuit boards must not be made direct to the printed wiring. Where edge connectors are not used, termination to printed wiring must be made via terminal posts.		
10.28.	No printed circuit board must have terminations to points other than the edge of the printed circuit board.		
10.29.	No termination must have more than one conductor per solder joint.		
10.30.	Soldering direct to the chassis of any equipment must not be permitted. All chassis terminations must be made with soldering tags.		
10.31.	All components must be clearly marked and must be capable of easy reference to circuit diagrams and handbooks to be supplied with the equipment.		
10.32.	The functions of all controls, switches, etc. must be clearly engraved or otherwise permanently marked by means of approved symbols in English.		

10.33. All pre-set variable controls must be clearly marked and readily identified in the equipment.		
10.34. All subassemblies and printed circuit boards must be permanently marked with an identification code.		
10.35. All wiring and terminations between subassemblies must be identified.		
10.36. Test pins must be provided on all units, subunits and printed circuit boards for the measurement of all important circuit characteristics without the unsoldering of wires. Such test points must be clearly marked and identified in the equipment.		
10.37. Equipment using plug-in modules must be fitted with guides for the insertion of modules. It must not be possible, to incorrectly insert a module.		
10.38. The module pins and its locating/guide pins must be ruggedly constructed and must not easily bend, warp or break.		
10.39. The equipment must be built in such a manner that faulty modules can be easily and quickly detected, removed and replaced, but steps must be taken to minimise unnecessary movements of plug-in modules on a trial and error basis when locating faults.		
10.40. The equipment layout must be planned to facilitate fault clearance and maintenance.		
11. CONNECTORS	Comply	Comment
The connectors required must be suitable for use with communications circuits and power feed circuits.		

11.1. Electrical Characteristics	Comply	Comment
11.1.1. The contacts must withstand a breakdown voltage of 2 000 volts RMS.		
11.1.2. The contacts must be silver plated, 1.5 mm in diameter and rated for 11 amperes continuously.		
11.1.3. The contact resistance must be equal or smaller than 1.5 milli-ohm.		
11.2. Mechanical Characteristics	Comply	Comment
11.2.1. The insulator must be a neoprene elastomer material.		
11.2.2. The contacts must be silver plated and must be suitable for at least 500 mating/unmating operations.		
11.3. Climatic Conditions	Comply	Comment
11.3.1. The connector must operate from -40 °C to +85 °C.		
11.3.2. The connector must seal as per NFC.20010-IP61.		
11.3.3. The connector must be spray resistant as per NFC.20611.		
12. TECHNICAL HANDBOOKS	Comply	Comment
12.1. Technical handbooks must be clearly printed in English. Photostat copies will not be acceptable, unless they are of the same standard as the original or better		
12.2. Each set of handbooks must include the following :		
12.2.1. Operating instructions.		
12.2.2. Complete maintenance instructions.		
12.2.3. Complete and detailed alignment procedures.		
12.2.4. A detailed technical description of the equipment. Complete circuit diagrams, drawings and photographs of the equipment. The photographs		

	and drawing must clearly indicate component/module location on printed circuit boards etc. All component numbers must be clearly shown.	
12.2.5.	A list of parts giving the values of all components, i.e. resistors, capacitors, integrated circuit numbers etc., for each schematic drawing.	
12.2.6.	Detailed printed circuit board wiring diagrams of all layers showing component numbers and positions must be provided. Panel and or unit wiring diagrams must also be provided.	
12.2.7.	Voltage levels, current values, test points etc., must be clearly indicated on all circuit diagrams.	
12.2.8.	Complete circuit diagrams of individual modules must be included.	
12.2.9.	A block schematic of the complete system, indicating all test points as well as the level readings which should be obtained at these points.	
12.2.10.	All indicated levels in the equipment and in the instruction books must be given in power levels (0 dB = 1 milliwatt into 600 ohms).	
12.2.11.	All symbols and notations used on drawings and circuit diagrams must preferably comply with the requirements laid down in BS 3939. Where symbols and notations do not comply with these requirements each drawing must be accompanied by a legend clearly detailing BS 3939 equivalents.	
12.2.12.	Transnet reserves the right to reproduce in whole or in part, by any means whatsoever, any technical handbook or instruction manual supplied by the successful contractor. Any such reproductions will be for the sole use of Transnet.	
12.2.13.	To enable the personnel of Transnet to become acquainted with the	

	<p>circuitry and design details of the equipment ordered, the successful tenderer must deliver one complete set of handbooks to each centre mentioned in the Schedule of Requirements, delivery to be effected at least one month prior to the commencement of the delivery of the equipment.</p>		
	12.2.14. Service manuals to be available on a CD-ROM		
	12.3. Programming software to be supplied on a CD-ROM.		
13.	SUPPLIER ACCREDITATION	Comply	Comment
	The tenderer must supply proof that they are an official agent for the product supplied in South Africa.		
14.	GUARANTEE AND REPAIRS	Comply	Comment
	The tenderer must supply proof that they have an accredited workshop with all the necessary test equipment to carry out repairs to all equipment provided in the tender without having to ship equipment back to the manufacturer.		
15.	SPARES HOLDING	Comply	Comment
	The tenderer must supply proof that they carry (In Stock) sufficient spares to carry out all repairs on the product supplied.		
16.	TRAINING	Comply	Comment
	Training must be included in the tender pricing. Stipulating as either a no cost item or a cost must be provided as a separate line item. (Per person or per group - Detailed information with regards to Training must be provided.		

17. SOFTWARE KEYS	Comply	Comment
All software keys are to be included in the pricing.		
18. RELEVANT DOCUMENTATION	Comply	Comment
The equipment must comply with the latest issue of the following specifications:		

APPLICABLE

DOCUMENT NO.	DESCRIPTION	LOCATION
ISO 9000	Quality Management Systems	Document Control Centre

RELEVANT

The following additional specifications are referred to:

DOCUMENT NO.	DESCRIPTION	LOCATION
ITU V.24	RS 232	External

END OF DOCUMENT

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