

**TRANSTEL**

A Division of Transnet Limited
Registration Number 1990/000900/06

**GENERAL SPECIFICATION FOR SWITCHED
MODE POWER SUPPLY / CHARGER FOR
FIXED UHF/VHF RADIO TRANSCEIVER
EQUIPMENT**

PREVIEW COPY ONLY

**SPC-00140
NOVEMBER 2006**

Revision 2.00

NON-DISCLOSURE OF INFORMATION

Information contained in this document is proprietary in nature and/or protected by copyright.
Please obtain written permission from the Author prior to reproducing this document, in whole or in part.

Uncontrolled Copy

TABLE OF CONTENTS

I	DISTRIBUTION	3
II	DISTRIBUTION	3
III	DOCUMENT CHANGE HISTORY	3
IV	CHANGES SINCE LAST REVISION	3
V	ABBREVIATIONS, ACRONYMS AND DEFINITIONS	4
VI	RELEVANT DOCUMENTATION.....	4
1.	SCOPE.....	5
2.	COMPLIANCE	5
3.	SERVICE CONDITIONS.....	5
4.	MATERIAL SCHEDULES	5
4.1	Schedule of Requirements	5
4.2	Alternative Schedules of Requirements.....	6
4.3	Schedule of Unit Prices	6
5.	GENERAL DESIGN PARAMETERS.....	6
5.1	General Requirements.....	6
5.2	Power Supply Unit with Charger Construction.....	7
5.3	Output Ratings	8
5.4	Power Supply Unit with Charger Operation after Mains Failure	8
5.5	Alarm Conditions	8
5.6	Indicators	9
5.7	Noise Limitations.....	10
5.8	Load Disconnect (Load shed).....	10
6.	OUTPUT VOLTAGE AND CURRENT.....	10
7.	COMPONENTS.....	11
8.	LAYOUT.....	11
9.	EQUIPMENT FINISH	11
10.	TECHNICAL MANUALS	12
11.	ACCEPTANCE TESTS.....	13
12.	GUARANTEE	13
13.	INSTRUMENTS	14
14.	TEST POINTS AND ACCESSORIES.....	14
15.	INFORMATION REQUIRED	14

Uncontrolled Copy

I DISTRIBUTION

FUNCTION	NAME	TITLE & DIVISION	SIGNATURE	DATE
Compiled by :	M Zulu	Chief Engineering Technician, Transmission	<i>Signed M Zulu</i>	19/01/2007
Reviewed by :	M Nuttall	Divisional Manager, Transmission	<i>Signed M Nuttall</i>	19/01/2007
Reviewed by :	T Dean	Head of Quality Assurance	<i>Signed T Dean</i>	19/01/2007
Authorised by :	DF Botha	Group Executive, Technology	<i>Signed DF Botha</i>	19/01/2007

II DISTRIBUTION

Once updated, a copy of the latest revision will be published in the document management system in use. E-mail to this effect will be sent to the relevant personnel or heads of department.

III DOCUMENT CHANGE HISTORY

ISSUE NO.	DATE ISSUED	ISSUED BY	HISTORY DESCRIPTION
1.00	January 2001	Transmission	New document
2.00	November 2006	Transmission	Converted to ISO standard

IV CHANGES SINCE LAST REVISION

CLAUSE	DESCRIPTION
All clause	Converted to ISO standard

Uncontrolled Copy

V ABBREVIATIONS, ACRONYMS AND DEFINITIONS

ABBREVIATIONS AND ACRONYMS	DESCRIPTION
AC	Alternating Current
dB	Decibel "A" Weighted
DC	Direct Current
DOS	Disk Operating System
IBM	International Business Machines
MTBF	Mean Time Between Failure
MV	millivolt
PC Board	Printed Circuit Board
RMS	Route Means Square
UHF	Ultra High Frequency
VHF	Very High Frequency

VI RELEVANT DOCUMENTATION**APPLICABLE**

DOCUMENT NO.	DESCRIPTION	LOCATION
BS.3939	Graphics Symbols for Electrical, Power, Telecommunications and Electronic Diagrams	External

RELEVANT

DOCUMENT NO.	DESCRIPTION	LOCATION
SCAG-53	Number has changed to SPC-00140	Document Control Centre

PREVIEW COPY ONLY

Uncontrolled Copy

1. SCOPE

This specification covers Transnet's requirements for the supply of power supply unit with battery charging capability for use with fixed VHF, UHF radio transceivers.

2. COMPLIANCE

- 2.1 Tenderers shall submit their main offers in terms of this specification. Deviations which are of a minor nature, and do not depart materially from this specification will be considered at the discretion of Transnet.
- 2.2 Tenderers shall indicate, clause by clause, either that their offers comply in every respect with this specification or if not, precisely how they differ.
- 2.3 A broad statement to the effect that the equipment is in accordance with this specification is **not** acceptable.
- 2.4 Failure to comply with the above requirements may preclude a tender from consideration.

3. SERVICE CONDITIONS

- 3.1 The power supply battery charging equipment is required for service under the following atmospheric conditions :

Altitude	:	0 – 1 800 m above sea level.
Ambient temperature	:	Minimum : Minus -10°C
	:	Maximum : Plus +60°C
Relative humidity	:	As high as 86%.
Lightning conditions	:	Severe.

- 3.1.1 In addition, the atmosphere may be heavily saline laden and polluted by exhaust gases from steam and diesel locomotives and/or industrial sources.

4. MATERIAL SCHEDULES

4.1 Schedule of Requirements

- 4.1.1 The Schedule of Requirements lists the major items of the equipment and work required for the development of the complete system(s) described in the main specification.

Uncontrolled Copy

4.1.2 A quotation per item required, the tender value would be the sum of the totals of every item.

4.2 **Alternative Schedules of Requirements**

4.2.1 Should the Tenderer offer alternatives, and then separate quotations must be made and consecutively numbered.

4.3 **Schedule of Unit Prices**

4.3.1 A price list must be provided of all modules, units, subassemblies and replacement parts that make up items listed in the Schedule of Requirements.

4.3.2 Each item in the Schedule of Requirements must be reducible to the units of this price list. The cost of an item in the Schedule of Requirements must not differ from the sum of its constituent parts.

4.3.3 Should any system reconfiguration be necessary, this price list must be used for establishing the value of the variation order.

4.3.4 Should any spares be require, these will be selected from this price list. The manufacturers' mean time between failure (MTBF) must be stated.

4.3.5 The price list must also indicate country of origin, as it will serve as the basis for the calculation of escalation, rate of exchange differences and local preference (if applicable).

4.3.6 The Schedule of Unit Price should therefore have the following headings :

"UNIT NO", "PART NO", "DESCRIPTION", "PRICE", "MTBF", "ORIGIN", "DELIVERY PERIOD".

5. **GENERAL DESIGN PARAMETERS**

5.1 **General Requirements**

5.1.1 The power supply unit and charger and any other heavy mains driven equipment must be capable of satisfactory operation from a 220/250 volt, 50 hertz single-phase mains supply, with a possible voltage variation of +10% and a possible frequency variation of +2%.

5.1.2 The power supply and charger modules must be capable of continuous operation on full load under the specified climatic conditions without resort to cooling fans.

Uncontrolled Copy

- 5.1.3 The power supply and charger modules must be of the switch mode rectifier type and adequately rated to cater for the output voltages and currents called for. Sealed or encapsulated control boards will not be accepted.
- 5.1.4 Under normal operation, the power supply module must supply continuous rated current to the load and the charger module must supply a specified float voltage and continuous float current to the batteries as specified in the Schedule of Requirements.

5.2 Power Supply Unit with Charger Construction

- 5.2.1 Power supply with charger must be a 19" rack mountable. The enclosure dimensions must be as stipulated in the Schedule of Requirements.
- 5.2.2 The components employed in the manufacturing of the charger must be of a high grade, of sound construction and stable in value under all operating conditions.
- 5.2.3 The rectifier bridge must be of a full-wave silicon type incorporating special fusing and surge suppression facilities for the protection of the silicon diodes against short circuits and forward and reverse voltage transients. Details of the actual precautions taken in offered equipment must be included in the tender.
- 5.2.4 All terminals must be clearly and indelibly designated with the relevant voltages and polarities and must be of a form, which must prevent stranded conductor wires from spreading.
- 5.2.5 A readily accessible fuse shall be provided in the DC output circuit of the charger. It must, however, be possible to isolate the battery and the load individually by the removal of links.
- 5.2.6 The power supply unit and charger must be modular to enable expansion and operate in parallel to increase overall output power.
- 5.2.7 The power supply and charger modules must be marked with the ratings of input voltage, frequency, output voltage and output current as well as type number, serial number and name of manufacturer.
- 5.2.8 Adequate provision must be made in the design of the equipment to protect electronic components in the power equipment and in the load against voltage transients induced by switching or lightning surges conducted into the equipment by the power leads. Details of the protection offered must be included in the tender.

Uncontrolled Copy

5.3 Output Ratings

- 5.3.1 The power supply unit and charger modules must be capable of supplying the full rated load (100%), but must be inherently current-limited to protect against overload from 100% of the nominal rated current up to a short circuit without disconnecting from the mains, blowing fuses.
- 5.3.2 The power supply unit and charger must not have a noise figure greater than 10 mV RMS and 100 mV peak-to-peak.
- 5.3.3 The line regulation must not exceed 1% of output voltage setting, and the load regulation must not exceed 5% of output voltage settings.

5.4 Power Supply Unit with Charger Operation after Mains Failure

- 5.4.1 In the event of the mains or power supply unit module failing, an alarm condition must be extended. The batteries must provide load current without any interruption [instant changeover].
- 5.4.2 On restoration of the incoming supply the power supply unit with charger must continue with normal operation as stipulated in subclause 5.1.4.

5.5 Alarm Conditions

- 5.5.1 An alarm circuit(s), incorporated within the charger, must give local and remote audible and/or visual indication of the following conditions with the tripping and resetting requirements as shown :

CONDITION	INDICATION	TRIPPING	RESET
Mains failure or charger switched off	Yes	Yes	Self
Fuse failure	Yes	Yes	Manual
Battery low non-urgent	Yes	No	Self
Battery low urgent	Yes	No	Self
Load shed	Yes	No	Self

- 5.5.2 Tripping implies that the AC supply Contractor must be opened and be kept open until the fault is cleared, either automatically or manually.
- 5.5.3 The tenderer shall state the minimum adjustment ranges and respective settings for the different alarms.

Uncontrolled Copy

ALARM	MINIMUM ADJUSTABLE RANGE	SETTINGS LEAD-ACID
Battery Over Voltage		
Battery Low Non-Urgent		
Load Shed		
Battery Low Urgent		

5.5.4 For the purpose of remote indication this alarm circuit must be wired to sets of labelled terminals, the contacts used to supply the remote indication must be of the change-over type, with all three contacts wired to terminals and must be able to carry a current of 1 ampere. See subclause 5.1.1 alarms to be extended.

A facility must be provided to silence the audible alarm locally without inhibiting the operation of the relay contacts.

5.5.5 Should the alarm circuit(s) fail, it must be possible for the power supply unit and charger modules to operate in full mode with the alarm circuit(s) removed.

5.5.6 The alarm circuit module should be equipped with standard communications interface, such as RS232 by which various alarm centralized monitoring system can be established. Further details of the protocol to be used may be specified in the Schedule of Requirements.

5.6 Indicators

5.6.1 Alarm and operational conditions as well as the state of any PC board mounted relay must be indicated internally by means of high-brightness type light emitting diodes.

5.6.2 The following conditions must be indicated externally on the front panel of the power supply unit and charger by means of high-brightness type light emitting diodes or liquid crystal display (with back lighting) :

- POWER SUPPLY UNIT SERVICE
- MODULE IN FLOAT
- MODULE IN BOOST
- MAINS FAILURE
- FUSE FAILURE
- BATTERY HIGH/LOW URGENT
- BATTERY LOW NON-URGENT
- LOAD SHED

Uncontrolled Copy

5.7 Noise Limitations

- 5.7.1 The total maximum level of acoustic noise generated by the components of the charger, e.g. transformer hum, under any load conditions must not exceed 55 dBA measured at a distance of 1 metre from the side of the charger in any direction. This must be achieved in the design of the components and not by cabinet silencing.
- 5.7.2 Wide-band noise should not exceed 55 mV (3,4 – 150 kHz) and 25 mV (150 kHz – 30 MHz).
- 5.7.3 The radiation of spurious frequencies in the radio operating band must not be greater -119,0 dBm, measured at 1m from the PS & Charger.
- 5.7.4 Desensitisation of radio receiver (conductive). The PS & Charger must not desensitise any connected radio receiver with more than 1 dB, with a power lead of 1 m in length.

5.8 Load Disconnect (Load shed)

- 5.8.1 The load is to be automatically disconnected (load shed), from the charger, when the battery voltage has dropped to 8% volts. On restoration of power to the charger, the load must be automatically re-connected.

6. OUTPUT VOLTAGE AND CURRENT

- 6.1 The nominal output voltage and current will be specified in the "Schedule of Requirements".
- 6.2 When charging, the float charger voltage for 12 volt batteries shall be 13,5 volts to 13,8 volts.
- 6.3 When charging the float charger voltage for 48 volts batteries shall be 54 volts to 55,2 volts.
- 6.4 The line regulation shall be such as to maintain the charge voltage and current within the specified limits over line voltage variations of $\pm 10\%$.
- 6.5 The response of the charger module on application of full load shall during power supply module/mains failure be less than 10 milliseconds and shall be stated by the tenderer.
- 6.6 The efficiency of the PS & Charger shall be $\geq 70\%$.

Uncontrolled Copy

7. COMPONENTS

- 7.1 Equipment must only use semiconductor devices as active elements.
- 7.2 The Tenderer must state if any components are single-sourced, or custom made to a design not available elsewhere in South Africa.
- 7.3 Should any component or unit be programmable, a software listing of the programs must be provided. This listing must be available on a flexible diskette or another (stated) medium suitable for loading into a personal computer, operating on an IBM or compatible DOS system.

8. LAYOUT

- 8.1 The equipment layout shall be planned to facilitate fault clearance and maintenance.
- 8.2 Where adjustment is made by soldering, the tags must be accessible and clearly marked.
- 8.3 All the units must be clearly marked with their type and code numbers, which must be cross-referenced to the relevant circuit diagrams.
- 8.4 All units and printed circuit boards must be of the plug in type and the contacts must be cross-referenced to the relevant circuit diagrams.
- 8.5 Printed circuit board contacts must be of generous design to ensure reliability and long life.
- 8.6 The cabling of equipment must be executed with colour coded insulated wires, the colours being clearly marked on the relevant wiring diagrams. Ribbon cable may be used, but must be clearly labelled.
- 8.7 Locking mechanisms must be provided to ensure that plugged-in units are not dislodged in any circumstances.

9. EQUIPMENT FINISH

- 9.1 The equipment must have a glossy finish, which will not mark or scratch easily and will be durable. Tenderers must state the colour of the equipment offered in the tender and submit a sample if not already approved by Transnet.
- 9.2 Where rack sides are not fully equipped, blanking-off (dummy) panels must be fitted to all vacant positions.
- 9.3 Special attention shall be paid to the dust-proofing properties of the equipment, as it will generally be used near railway stations in dust- and smoke-laden atmosphere.

Uncontrolled Copy

10. TECHNICAL MANUALS

- 10.1 Technical handbooks shall be clearly printed in English. Photostat copies will not be acceptable.
- 10.2 The technical handbooks shall be packet with the equipment.
- 10.3 Each set of handbooks shall include the following :
- 10.3.1 Operating instructions.
 - 10.3.2 Complete maintenance instructions.
 - 10.3.3 Complete and detailed set-up procedures.
 - 10.3.4 A detailed technical description of the equipment.
 - 10.3.5 Complete circuit diagrams, drawings and photographs of the equipment. The photographs and drawings shall clearly indicate component/module location on printed circuit boards etc. all component numbers shall be clearly shown.
 - 10.3.6 A list of parts giving the values of all components i.e. resistors, capacitors, integrated circuit numbers etc. for each schematic drawing.
 - 10.3.7 Detailed printed circuit board wiring diagrams showing component numbers and positions.
 - 10.3.8 Voltage levels, current values, test points etc. shall be clearly indicated on all circuit diagrams.
 - 10.3.9 Complete circuit diagrams of individual modules shall be included.
 - 10.3.10 All symbols and notations used on drawings and circuit diagrams shall preferably comply with the requirements laid down in BS 3939. Where symbols and notations do not comply with these requirements each drawing shall be accompanied by a legend clearly detailing BS 3939 equivalents.
 - 10.3.11 Transnet reserves the right to produce 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.
 - 10.3.12 Payment for the equipment will not be authorized until the requirements of subclauses 10.3.1 to 10.3.9 have been fully met.
 - 10.3.13 A copy of the entire technical manual must be available on CD.

Uncontrolled Copy

11. ACCEPTANCE TESTS

- 11.1 Transnet will conduct acceptance tests on the equipment. The equipment will not be accepted until these tests have been completed and it has been confirmed that the equipment supplied is fully in accordance with the requirements of the specification and/or the stated claims of the tenderer as accepted by Transnet.
- 11.2 The tenderer shall agree to rectify any defects at no cost to Transnet where the equipment does not meet the tender requirements, and/or the stated claims of the supplier, as accepted by Transnet.
- 11.3 The equipment will be examined in terms of clause 6 to determine its suitability for the use as far as quality and maintenance is concerned.

11.4 Maintenance and Service

- 11.4.1 The tenderer shall give full particulars of the maintenance, spare parts and service facilities, which will be available in the Republic of South Africa. The names and addresses of the persons concerned shall be furnished.
- 11.4.2 The tenderer shall list the major centres where maintenance facilities can be provided and shall state if repairs under guarantee can be undertaken at these centres.
- 11.4.3 Tenderers shall state what provision shall be made to ensure an adequate supply of locally available spare components for a period of 10 years after the order is placed.
- 11.4.4 Transnet will not consider tenders from these tenderers who cannot provide an efficient spares and maintenance service. Tenderers shall state whether they are prepared to agree to an inspection of their maintenance premises by Transnet's engineering personnel.

12. GUARANTEE

- 12.1 All equipment offered should be covered by a twelve (12) months guarantee, valid from the date that the equipment is accepted by Transnet.
- 12.2 Transnet will not consider tenders, which do not include a guarantee for the full 12 month period.
- 12.3 The tenderer's quotation for the equipment offered shall be inclusive of any assessed costs, which may be incurred in effecting repairs to defective equipment in terms of the guarantee.
- 12.4 The terms of the guarantee shall be clearly stated.

Uncontrolled Copy

- 12.5 If any urgent repairs have to be carried out during the guarantee period by the Administration, the contractor shall inspect such repairs to ensure that the guarantee is unaffected.
- 12.6 The tenderer shall note that repairs required to be done in terms of the guarantee will need to be effected at the various sites. Tenderers shall state how they propose to meet this requirement.
- 12.7 Tenderers shall state for how long they are prepared to guarantee the availability of spare components etc. for the equipment offered.
- 12.8 The tenderer shall state how long the equipment offered has been and is likely to remain in production.

13. INSTRUMENTS

- 13.1 Instruments suitable and necessary to perform first and second line maintenance of the equipment offered must be recommended, together with their specifications to the main offer.
- 13.2 If certain propriety instruments are essential to the installation or configuration of the equipment, they must be included within the cost of the equipment in the Schedule of Requirements.

14. TEST POINTS AND ACCESSORIES

- 14.1 The equipment must provide for test points at all points where important measurements, counting and/or recordings are made, e.g. alignment, voltages and currents.
- 14.2 Tenderers must supply a full set of test cords, plugs and special tools required for carrying out all installation and maintenance tests and adjustments.
- 14.3 For each station, Tenderers must supply a complete set of adapters (extender cards) to extend any card in every subunit. The extender card must be so designed to be sturdy, provide easy access to both sides of the card to be tested as well as the plug-in points. Where possible test links must be provided on the card to test the input and output to cards.

15. INFORMATION REQUIRED

- 15.1 Tenderers must submit the following information :
- 15.1.1 Manufacturer's name and address.
- 15.1.2 Overall dimensions power supply unit and of charger.

Uncontrolled Copy

- 15.1.3 Mass of power supply unit and charger.
- 15.1.4 Values of output voltages during float and boost mode.
- 15.1.5 Values of maximum output current during float and boost mode.
- 15.1.6 Values of current limiting during float and boost mode.
- 15.1.7 Power requirements of the power supply unit and charger.

END OF DOCUMENT

PREVIEW COPY ONLY

Uncontrolled Copy