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**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**



**INDIAN RAILWAY  
STANDARD SPECIFICATION  
FOR  
UNIVERSAL WAY SIDE DTMF CONTROL TELEPHONE**

**(Tentative)  
Serial No. IRS: TC 82-2005**

**ISSUED BY**

**RESEARCH DESIGNS & STANDARDS ORGANISATION  
LUCKNOW-226011**

0- **FOREWORD**

0.1 This specification is issued under the fixed Serial No. IRS: TC 82-2005 followed by the year of adoption as standard or in the case of revision, the year of last revision.

**Adopted, 2005**

0.2 Abbreviations

<u>S.No.</u>	<u>Abbreviation</u>	<u>Full Name</u>
1.	DTMF	Dual Tone Multi Frequency
2.	SPN	Specification
3.	IRS: S	Indian Railway Standard Signal
4.	TC	Telecommunication
5.	ITD	Indian Telegraphs Department
6.	IS	Indian Standards
7.	ASTM	American Standard for Testing and Materials
8.	PVC	Poly Vinyl Chloride
9.	U/G	Under Ground
10.	MW	Microwave
11.	OFC	Optical Fibre Cable
12.	ABS	Acrylonitrile Butadiene Styrene
13.	CDOT	Center for Development of Telematics
14.	CACT	Component Approval Centre of Telecommunication
15.	BSNL	Bharat Sanchar Nigam Limited
16.	PCB	Printed Circuit Board
17.	LCISO	Electrical Components Standard Organisation
18.	DIP	Dual in Package
19.	LED	Light Emitting Diode

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0.3 This specification requires reference to the following Indian Railway Standard (IRS) and Indian Standard (IS) specification.

IRS: S23	Electrical Signalling & Interlocking equipment
IRS: TC 60-93	4 Wire/2 Wire Train Traffic Control Equipment with DTMF Signalling.
IS: 6297	Transformer and Inductors (Power Equipment, Audio Pulse Switching) for Electronic Equipment.
IS: 1079	Hot rolled carbon steel and strips
IS: 1300	Phenolic Moulding materials
IS: 2036	Phenolic Laminated sheet
IS-9000	Basic environmental testing procedures for Electronics and Electrical items.
IS: 5608	Low Frequency wires & cable with PVC insulation and sheath.
IS: 4800 (Pt.I)	Enamelled round winding wire.
ITI/D/2732 (With latest Amendment)	Extensible Telephone Handset Coiled Cords.
ITI/D/2733 (With latest Amendment)	Cordage PVC for Long Cord.

0.4.1 Wherever, in this specification any of the above-mentioned specification are referred to by number only, the latest issue of that specification is implied. Whenever the year of issue is mentioned, the particular issue referred to is meant.

0.4.2 The specification is intended chiefly to cover the general & operating requirements, constructional features, electrical characteriristc and performance requirements of the Universal Way Side DTMF Control Telephone and does not include the necessary provisions of a contract.

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## 1. SCOPE

- 1.1 This specification covers the requirements and provision of test and inspection of Universal Way Side DTMF Control Telephone used for control communication on 4 Wire/2 Wire Railway Control Circuits. The telephone will include the circuitry of conventional control telephone as well as way station equipment for both 4 wire & 2 wire control communication systems.
- 1.2 This specification covers the general, constructional features, electrical characteristic and technical requirements of Universal Way Side DTMF Control Telephone.
- 1.3 This telephone shall work with control office equipment of train traffic control system (U/G, MW & OFC).

## 2. TERMINOLOGY:

- 2.1 For the purpose of this specification, the terminology given in IRS: S-23 shall apply.
- 2.2 The term referred to in this specification but not covered in IRS: S-23 are defined below:
  - 2.2.1 **Lot:** - A lot is constituted by the Universal Way Side DTMF Control Telephone of the same type manufactured in the same factory during the same period using the same process and materials.

## 3. GENERAL REQUIREMENTS:

- 3.1 Universal Way Side DTMF Control Telephone shall be assembled in Siemens type ABS plastic body and workmanship shall conform to good engineering practice so as to ensure that the instrument is free from defects resulting from defective materials, incorrect treatment, rust cracks and other defects that could impair the operation or serviceability while in use or storage. The treatment and finishes shall be such that under operating condition, no deterioration occurs to any of the parts.
- 3.2 The telephone shall be capable to work on both 4 Wire and 2 Wire omni bus circuit of Indian Railways.
  - i) On overhead 2 wire system
  - ii) On underground cable 4-wire system loaded or unloaded.
  - iii) On OFC or Digital Microwave System

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It shall also work with Radio-patch.  
3.3 The telephone shall be provided with: -

- i) Reverse polarity protection
- ii) Surge and Transients protection from lightning
- iii) Acoustic Protection to receiver

#### **4.0 CONSTRUCTION AND MATERIALS:**

4.1 The telephone instrument shall consist of mainly the following ports: -

- a) Body of the Telephone (Handset, rosettee & cords)
- b) Speech circuit
- c) Decoder Circuit
- d) Ringer Circuit
- e) RBT Circuit
- f) Internal wiring & PCB

#### **4.2 Body of the Telephone:**

4.2.1 ABS (Acrylonitrile Butadiene Styrene) Co-polymer shall be used as a material for moulded parts i.e. Telephone body, Handset & rossette. ABS raw material will be procured from reputed manufacturers like Bhansali Polymers, Bayers, LG & HPCL conforming to the properties mentioned in Appendix – ‘A’. Raw material manufacturers test Certificate has to be submitted, at the time of type test. The test carried out on finish product shall be as per para 3 of Appendix ‘A’.

#### **4.2.2 Transmitter and Receiver:**

4.2.2.1 Electrodynamic Transducers (RT-200) shall be used to perform functions of transmitter and receiver. Both transmitter and receiver transducers must be procured from LCSO/CACT approved sources having valid and current type approval certificate, the proof of which is required to be submitted at the time of type test

#### **4.2.3 Handset:**

4.2.3.1 The handset shall be Siemens type made of ABS co-polymer conforming to the requirements of Appendix-A. ABS raw material will be procured from reputed manufacturers like Bhansali Polymers, Bayers, LG & HPCL conforming to the properties mentioned in Appendix – ‘A’. Raw material manufacturers Test Certificate has to be submitted at the time of type test. The test carried out on finish product shall be as per para 3 of Appendix ‘A’.

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#### 4.2.4 **Cordage:**

4.2.4.1 Cordage used for connecting Handset with the telephone instrument shall be as per Spec. No. ITI/D/2732 (with latest amendment) and shall be procured from CACT/LCSO/SISI/CDOT approved sources having valid and current type approval certificate. The proof of which is required to be submitted at the time of type test. This cord shall be minimum 4 core and not be less than 1.5 meters in length.

4.2.4.2 Cordage used for connecting telephone instrument with the line shall be as per Spec. No. ITI/D/2733 (with latest amendments) and shall be procured from CACT/LCSO/SISI/CDOT approved sources having valid current type approval certificate. The proof of the same is required to be submitted at the time of type test. This cord shall have 8 cores and shall not be less than 2 meters in length.

#### 4.2.5 **Cradle Switch:**

4.2.5.1 Cradle switch shall be miniature type which shall be operative with one or two plungers. The plunger shall be pushed/released by the Handset.

#### 4.2.6 **Rosettee:**

4.2.6.1 ABS plastic shall be used as a material for moulding the rosettee and 8 terminal strip shall be provided for connection. ABS raw material will be procured from reputed manufacturers like Bhansali Polymer, Bayers, LG & HPCL conforming to the properties mentioned in the Appendix 'A'. Raw material manufacturers test certificate has to be submitted at the time of type test. The test carried out on finished product shall be as per para 3 of Appendix 'A'. The cover screws shall not fully come out of the cover while unscrewing.

4.3 **Speech Circuit:** The speech circuit shall consist of following parts: -

- i) Trans and receiver amplifier circuit.
- ii) Sets of transformers for isolation and matching
- iii) Changer over switch for 4 Wire/2 Wire selection.

#### 4.3.1 **Trans and Receive Amplifier:**

4.3.1.1 Two amplifier shall be provided one for Trans and one for Receive.

4.3.1.2 The amplifiers shall be designed with New Technology to give the flat frequency response in the range of Voice Frequency with very low distortion.

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The output level of Tx & Rx amplifiers shall be adjustable by preset provided on PCB.

#### **4.3.2 Transformers/Induction Coil**

4.3.2.1 Two sets of transformers shall be provided to match the transmitter and receiver impedances with the line.

4.3.2.2 These transformer shall confirm to functional requirement of the equipment and meet the parameters specified in CI No. 4.3.2.3, 4.3.2.4, 4.3.2.5, 4.3.2.6, 4.3.2.7 & 4.3.2.8.

4.3.2.3 The transformer core shall be of cold rolled grain-oriented silicon steel of suitable grade or of ferrite to meet the electrical characteristics and other parameters of this specification.

4.3.2.4 The terminations shall be such that windings and terminations shall not get disturbed or get loosened when the connections are soldered.

4.3.2.5 Each transformer shall be suitably marked "Tx" and "Rx" to identify the trans and receive transformers respectively.

4.3.2.6 Synthetic enameled winding wire complying to IS: 4800 Pt. I shall be used.

4.3.2.7 Transformers shall be vacuum impregnated.

4.3.2.8 The complete windings shall be protected by proper insulation to avoid ingress of moisture.

#### **4.3.3 Changeover switch:**

4.3.3.1 Changeover switch shall be provided at PCB of the telephone and shall be procured from a reputed manufacturers. It shall work one side with 4-wire control line and opposite side with 2-wire control line. "4 Wire" and "2 Wire" shall be legibly printed on PCB to signify the exact position of the switch.

#### **4.4 Decoder Circuit:**

4.4.1 The decoder circuit shall be designated to work the signaling system of DTMF control office equipment as per specification no. IRS: TC 60-93.

4.4.2 It shall be possible to assign any DTMF Code/Group code to a station in decimal system using 'DIP' switches.

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#### **4.5 Ringer Circuit:**

- 4.4.3 On receipt of the valid code, it shall be decoded and a piezo-electric buzzer shall be activated even if the hand set is OFF cradle.
- 4.4.4 It shall not be possible to activate the buzzer with any frequency or combination of frequencies other than DTMF frequencies mentioned Annexure-II.
- 4.4.5 Along with actuation of buzzer, a visual indication with LED shall be lit on the telephone. The LED indication shall be continued to lit until the hand set is lifted OFF the cradle.
- 4.4.6 The output level of Buzzer shall be adjustable internally by means of fixed pad.

#### **4.6 Ring Back Tone Circuit:**

- 4.6.1 After the buzzer in the telephone is activated, a ring back tone shall be automatically transmitted to the control office in acknowledgement of the receipt of ring. The level of the ring back tone when measured as trans terminal of the telephone shall be within  $-6\text{dBm}$  to  $-10\text{dBm}$  and frequency shall be within 300Hz to 3.4KHz.

#### **4.7 Internal Wiring and Printed Circuit Board.**

- 4.7.1 The wiring shall be by means of coloured wire, multistrand and PVC insulated and shall be capable of carrying the maximum required current of the telephone instrument.
- 4.7.2 The wiring to components shall be provided with sufficient slack to permit the components to be swung clear of the assembly without any disconnection.
- 4.7.3 Glass epoxy PCB having minimum 1.6mm thickness shall only be used. The PCB shall be coated with epoxy base antifungal varnish to provide protection against dust, humidity, fungal infection and mechanical abuses. The copper cladding thickness shall not be less than 35 microns and shall be suitably tinned. The dimension of PCB shall have a tolerance  $\pm 10\%$  of specified value.
- 4.7.4 The internal wiring of components of telephone instrument shall be as per Annexure-I.

### **5.0 ELECTRICAL CHARACTERISTICS:**

#### **5.1 Applied High Voltage Test & Insulation Resistance Test**



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5.1.1 The telephone instrument shall withstand without any damage to a test voltage of 1kV, applied for a period of one minute, between body and all terminals of rosettee tied together.

5.1.2 The insulation resistance measured with 500V DC megger between body and all terminals of rosettee tied together and shall not be less than 10 Mega ohms.

**5.2 Transmission Test:**

5.2.1 Telephone shall be subjected to various transmission tests by connecting in the test set up as indicated in Annexure-III a/b/c

5.2.2 **Send Efficiency:** Test set up shall as per fig1 (a) and 1 (b) of Annexure-III a.

- T1 & T2 : Terminals of Transmitter
- R1 & R2 : Terminals of Receiver
- L1 & L2 : Line Terminals of 2 wire telephone (rosettee)
- B1 & B2 : Battery Terminals
- Tx1 & Tx2 : Trans Terminals
- Rx1 & Rx2 ; Receive terminals
- LM : Level meter.

**5.2.2.1 4 Wire testing (selector switch shall be on 4 wire side) fig 1(a)**

The transmitter of the telephone shall be removed and the receiver replaced by a non-inductive resistance of 200 ohms. Terminals B1 & B2 are to be connected to a 12V battery with proper polarity. The oscillator level shall be adjusted such that it is – 44dBm at 1000Hz measured across the terminals T1 & T2. Trans terminals of rosettee box shall be terminated by non-inductive resistance of 1120 ohms. The level across 1120 ohms shall be greater than 0 (zero) dBm and total Harmonic distortion shall not be more than 3%.

**5.2.2.2 2 Wire testing (selector switch shall be on 2 Wire side) – fig1 (b)**

The transmitter of the telephone shall be removed and the receiver replaced by a non-inductive resistance of 200 ohms. Terminals B1 & B2 are to be connected to a 12V battery with proper polarity. The oscillator level shall be adjusted such that it is – 44dBm at 1000Hz measured across the terminals T1 & T2. L1 & L2 terminals of rosettee box shall be terminated by non-inductive resistance of 600 ohms. The level across L1 & L2 shall be greater than 0 (zero) dBm and total Harmonic distortion shall not be more than 3%.

**5.2.3 Side Tone (For 2 Wire only)**

Test set up shall be as shown in fig 2 of Annexure-III-b.

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The level measured across R1 & R2 at 1000Hz shall not be more than  $-18\text{dBm}$  with the oscillator level maintained at  $-44\text{dBm}$ .

5.2.4 **Receive Efficiency:** The test set up is as shown in fig.3 (a) and 3 (b) of Annexure-III-b and III-c.

**5.2.4.1 4 Wire Testing (Selector Switch shall be on 4 Wire side) – fig.3 (a)**

The line shall be simulated by non-inductive resistance of  $560+560$  Ohms. The level and frequency at Rx terminals of rosettee box shall be adjusted to  $-20\text{dBm}$  and 1000Hz respectively. The level measured across terminals R1 & R2 shall be greater than  $-26\text{dBm}$ . The total harmonic distortion shall not be more than 3%.

**5.2.4.2 2 Wire Testing (Selector switch shall be on 2 Wire side) – fig 3 (b)**

The line shall be simulated by non-inductive resistance of  $300+300$  ohms. The level and frequency across L1 & L2 terminals shall be adjusted to  $-12\text{dBm}$  and 1000Hz respectively. The level measured across terminals R1 & R2 shall not be less than  $-18\text{dBm}$ . The total harmonic distortion shall not be more than 3%.

The frequency response of Cl. 5.2.2 and 5.2.4 shall be  $\pm 3$  dB in the frequency range of 300 to 3400 Hz.

5.2.5 **Insertion Loss:** The test set up is as shown in fig4 (a) and 4 (b) of Annexure-III c.

**5.2.5.1 (a) ON Hook condition (4 Wire)**

With the set up as in fig 4 (a), oscillator level is set to  $0\text{dBm}$  across 1120 ohms without the telephone being connected. The microphone shall be disconnected and terminal T1 & T2 shall be looped together. Then the trans and receive terminals are connected across 1120 ohms resistance as shown in Fig. 4 (a). The drop in the reading of the level meter shall not be greater than 0.5dB in both the cases.

**5.2.5.1 (b) ON Hook condition (2 Wire)**

With the set up as in fig 4 (b), oscillator level is set to  $0$  dBm across 600 ohms without the telephone being connected. The microphone shall be disconnected and terminal T1 & T2 shall be looped together. Then the telephone terminals L1 & L2 to be connected to 600 ohms resistance as shown in fig 4 (b). The drop in the reading of the level meter shall not be greater than 0.5dB.

**5.2.5.2 (a) OFF Hook condition (4 Wire)**

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With the same set up as in fig4 (a), the oscillator level is set to 0 dBm across 1120 ohms without the telephone being connected. Then trans and receive terminals are connected to 1120 ohms. The drop in the reading of the level meter shall not be greater than 1.0dB in both the cases.

#### **5.2.5.2 (b) OFF Hook Condition (2 Wire)**

With the same set up as in fig4 (b), the oscillator level is set to 0dBm across 600 ohms without the telephone being connected. Then the L1 & L2 terminals are connected to 600 ohms. The drop in the reading of the level meter shall not be greater than 0.8dB.

### **5.3 Decoder Test (shall be checked for 4 Wire and 2 Wire)**

5.3.1 The telephone shall respond faithfully for the signaling from DTMF Control Office Equipment with a minimum level of -25dBm and maximum level up to 0dBm even when the line S/N Ratio is 15dB.

5.3.2 Decoder shall not respond for any frequency or combination of frequencies other than DTMF frequencies.

5.3.3 For satisfactory working in 2 Wire Overhead line territory, it should be ensured that 0Hz noise due to power up to 0 (zero) dBm is taken care of and suitable filters shall be provided in decoder to eliminate frequencies outside the speech band.

5.3.4 Equipment shall be provided with solid state quick acting surge and transient arrestors to prevent damage from the lightning and the line circuit.

### **5.4 Performance Test:**

5.4.1 The connection between telephone instrument and control office equipment shall be made as shown in Annexure-I. The conversation and signalling shall be checked for 4 Wire and 2 Wire working. The following will be checked: -

- (i) Clarity of speech audibility
- (ii) Signalling performance shall be checked for: -
  - a) Ring and ring back tone for all station codes.
  - b) Long Ring
  - c) Repeat Ring
  - d) Group Ring
  - e) General call

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6. **POWER SUPPLY REQUIREMENTS:**

6.1 The telephone shall work on 12V DC with  $\pm 20\%$  supply voltage

6.2 The current drain shall not exceed: -

- a) 30mA in idle condition
- b) 75mA during conversation
- c) 125mA during ringing period

7. **INSPECTION:**

7.1 The inspection and test shall be carried out to the satisfaction of inspecting authority.

7.2 The purchaser or his nominee shall have the right to be present during all stages of manufacture and shall be accorded all reasonable/complete facilities to satisfy himself that the Universal Way Side DTMF Control Telephone are being manufactured in accordance with the terms and conditions of the specification. The purchaser or his nominee shall have the right to reject any material that fails to conform to the specification.

7.3 When the inspection is carried out during the manufacturing process, the manufacturer shall supply the material and samples required for testing free of charge and shall at his own cost prepare and furnish the necessary test pieces and appliances for such testing as may be carried out at his own premises in accordance with the specification. The manufacturer shall bear the cost of carrying out the tests at an approved test laboratory for conducting the tests for which firm is not having in-house test facilities.

7.4 Test certificates incorporating the results of the routine test and other manufacturing tests must be furnished in quadruplicate prior to the inspection for the use of purchaser/his nominee.

7.5 **Visual Inspection:**

7.5.1 The instrument shall be visually inspected to ensure that the mouldings are free from cracks (for ABS body), other imperfections and that all the components are fitted properly.

7.5.2 Instruments shall be checked to satisfy General Requirements (Cl.3), Construction (Cl.4) and Marking (Cl.12).

7.5.3 The faulty sub-assembly and or samples failing in routine/acceptance test shall be destroyed effectively. The exercise of effective destruction during the

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manufacture/routine test shall also be shown to the inspecting authority as and when asked for.

#### **8. TYPE TESTS:**

Type tests shall include complete tests in accordance with this specification.

8.1 Type tests shall comprise of the following: -

- 8.2 a) Visual inspection (Cl. 7.5)
- b) Electrical Tests (Cl.5)
- c) Climatic and Environmental Requirement (Cl. 11)
- d) Performance test (Cl. 5.4)

8.3 Two samples shall be selected at random for type tests from the normal production for Maintenance Type Approval.

8.4 The sequence of type test shall be in accordance with the Appendix-B.

#### **8.5 Acceptance Tests:**

8.5.1 Acceptance tests shall comprise of the following tests taken in sequential order as follows: -

- a) Visual inspection (Cl. 7.5)
- b) Electrical requirements (Cl.5)
- c) Performance test (Cl. 5.4)

#### **8.6 Routine Tests:**

8.6.1 Following routine test shall be conducted on the Universal Way Side DTMF Control Telephone.

- a) Visual Inspection (Cl. 7.5)
- b) Electrical Tests (Cl.5)
- c) Performance Test (Cl. 5.4)

8.6.2 Any other tests required by the manufacturer to ensure that Universal Way Side DTMF Control Telephone is in conformity with the requirements of this specification.

9. **SAMPLING:**

9.1 Unless otherwise agreed to by the purchaser and the supplier, the double sample plan given below shall be adopted: -

Lot consisting of Universal Way Side DTMF Control Telephone	1 <sup>st</sup> sample size (N1)	2 <sup>nd</sup> sample size (N2)	Combined sample size (N1+N2)	Acceptance Number (C1)	Rejection Number (C2)
1	2	3	4	5	6
Under 25	3	6	9	0	2
25 to 50	7	14	21	0	3
51 to 100	10	20	30	0	3
101 to 200	13	26	39	0	5
201 to 300	20	40	60	1	5
301 to 500	25	50	75	1	6

9.2 The number of Universal Way Side DTMF Control Telephone ( $N_1$ ) as given in col.2 shall first be selected and subject to the acceptance test. If in the first sample, the number of defective Universal Way Side DTMF Control Telephone, that is those failing in one or more acceptance tests, is less than/equal to the corresponding number ( $C_1$ ) given in Col.5, the lot shall be considered as conforming to the requirements of the acceptance test. If the number of defective Universal Way Side DTMF Control Telephone in the first sample is greater than or equal to the rejection number given in Col.6, the lot shall be considered as not conforming to the requirement of the acceptance test. If number of defective Universal Way Side DTMF Control Telephone in the first sample lies between ( $C_1$ ) and ( $C_2$ ) a second sample of size ( $N_2$ ) as given in col.3 shall be selected and subjected to acceptance test. If in the combined sample, the number of defective Universal Way Side DTMF Control Telephones is less than ( $C_2$ ), the lot shall be considered as conforming to the requirements of acceptance test.

9.3 The sample shall be selected at random from at least 10% of the packages. For random selection of packages, all the packages in the lot shall be arranged in a serial order and every ' $r$ '<sup>th</sup> package shall be selected until the requisite number of packages is obtained: -

' $r$ ' being the integral part of : 
$$\frac{\text{Total number of packages in the lot.}}{\text{Total number packages to be selected.}}$$

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10. **REJECTION:**

10.1 Any of the selected sample which do not comply with the requirements of this specification may be rejected.

11. **CLIMATIC AND ENVIRONMENTAL REQUIREMENTS**

11.1 Universal Way Side DTMF Control Telephone shall function satisfactorily under the following climatic and environmental condition tested as per IS: 9000 series.

11.1.1 Change of Temperature Test (Part XIV – Section 2 )  
 Low Temperature:  $-10^{\circ}\text{C} \pm 3^{\circ}\text{C}$   
 High temperature:  $+55^{\circ}\text{C} \pm 2^{\circ}\text{C}$   
 Rate of change of temperature over a period of not more than 5minutes should be  $1^{\circ}\text{C} \pm 0.2^{\circ}\text{C}/\text{minute}$   
 Duration : 3 hours  
 No. of cycles : 2.

11.1.2 Dry heat test (Part III Section 3):  $55 \pm 2^{\circ}\text{C}$ .  
 Duration: 12 hours.

11.1.3 Damp heat (cyclic test) (Part V Section 2):  
 Duration: 12+12 hours  
 1<sup>st</sup> cycle of two cycles.  
 Upper temperature :  $40^{\circ}\text{C}$   
 Variant: 1.

11.1.4 Cold Test (Part II Section 3):  $10^{\circ}\text{C} \pm 3^{\circ}\text{C}$   
 Duration : 2 hours.

11.1.5 Damp heat cyclic test: 12+12 hours  
 2<sup>nd</sup> cycle of 2 cycles  
 Upper temperature:  $40^{\circ}\text{C}$ .  
 Variant : 1.

11.1.6 Salt Mist Test (Part XI) Procedure 1  
 Duration 48 hours.

11.1.7 **Vibration Test**

11.1.7.1 The equipment shall be subjected to vibration test as per IS: 9000 (Part VIII).

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- i) Freq. Range : 10Hz to 55 Hz
- ii) Vibration amplitude : 0.35mm
- iii) Duration of endurance for sweep: 20 sweeps cycles  
(10Hz-55Hz-10Hz)
- iv) No. of axes : 3 coordinate axes.
- v) Duration at resonant frequency: 30 minutes  $\pm$ 1 minute.
- vi) Value of 'g' : 1 'g'

#### 11.1.8 **Drop Test**

- 11.1.8.1 The equipment shall be allowed to drop freely from the height of 25mm on to a 13mm thick steel plate, which has been wet-floated on, and bolted down to a fully set block of concrete at least 500mm thick.
- 11.1.8.2 The height of drop shall be 25mm measured from that point of the equipment nearest to the surface of the steel plate when suspended prior to dropping.
- 11.1.8.3 The minimum number of drops shall be six.
- 11.1.9 The electrical test (Cl.5) shall be repeated after the completion of Climatic test. Vibration test and drop test. The parameters shall be within  $\pm$ 5% of the initial value. The visual inspection as per (Cl. 7.5) and performance as per (Cl. 5.4) shall also be checked.

#### 12. **MARKING:**

- 12.1 The following shall be legibly and indelibly screen-printed on the outer surface of the Universal Way Side DTMF Control Telephone.
  - a) Manufacture's name
  - b) Year of Manufacture
  - c) Universal Way Side DTMF Control Telephone
  - d) Serial Number.

#### 13. **PACKING:**

- 13.1 Universal Way Side DTMF Control Telephone shall have to undergo arduous transportation before reaching the destination and will have to be stored and handled in tropical climatic conditions (including monsoon) before they are put to actual use. It is, therefore, imperative that the packing is decided by taking into consideration, interalia, the above two vital factors so as to eliminate damage/deterioration of the telephones in transit/transshipment/handling or during storage.



## APPENDIX 'A'

### REQUIREMENTS OF ABS (ACRYLONITRILE BUTADIENE STYRENE) CO-POLYMER MOULDING MATERIAL

#### 1. PROPERTIES

NO.IRS:TC 82-2005

The material shall satisfy the following properties:-

#### 1.1 Mechanical properties: ASTM Test Method

- |       |                              |  |           |
|-------|------------------------------|--|-----------|
| 1.1.1 | Tensile strength :           | 380 kg/sq.cm (MIN)   | D-368     |
| 1.1.2 | Flexural yield strength      | 650 kgf/sq.cm (MIN)  | D-790     |
| 1.1.3 | Izod Impact strength notched | (i) at 23°C – 25 kgcm/cm (MIN)<br>(ii) at 0°C-20 kgcm/cm (MIN) | D-256 (A) |
| 1.3.4 | Gloss%                       | Above 90%  |           |

#### 1.2 THERMAL PROPERTIES:

- |       |                             |  |       |
|-------|-----------------------------|--|-------|
| 1.2.1 | Heat deflection temperature | (i) at 18.5kg/sq. cm 90°C (MIN)<br>(ii) at 4.6kg/sq.cm 100°C (MIN) | D-648 |
| 2.2.2 | Flammability:               | 3.81cm /minute (MAX)   | D-635 |

#### 1.3 ELECTRICAL PROPERTIES

- |       |                     |                               |       |
|-------|---------------------|-------------------------------|-------|
| 1.3.1 | Dielectric strength | 15kV/MM (MIN)                 | D-149 |
| 1.3.2 | Volume Resistivity  | 10 <sup>16</sup> ohm cm (MIN) | D-257 |

#### 1.4 OTHER PROPERTIES:

- |       |                 |                   |       |
|-------|-----------------|-------------------|-------|
| 1.4.1 | Hardness        | 95-110 on R scale | D-785 |
| 1.4.2 | Mould shrinkage | 0.6% (MAX)        | D-955 |

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**2. FASTNESS TO LIGHT:**

The moulding or a portion of it shall be exposed to light together with cutting of standard patterns. The source of light shall be either daylight or a carbon arc of the enclosed type. There shall be no detectable fading or change of colour of the exposed moulding when No.7 of the standard patterns has begun to fade.

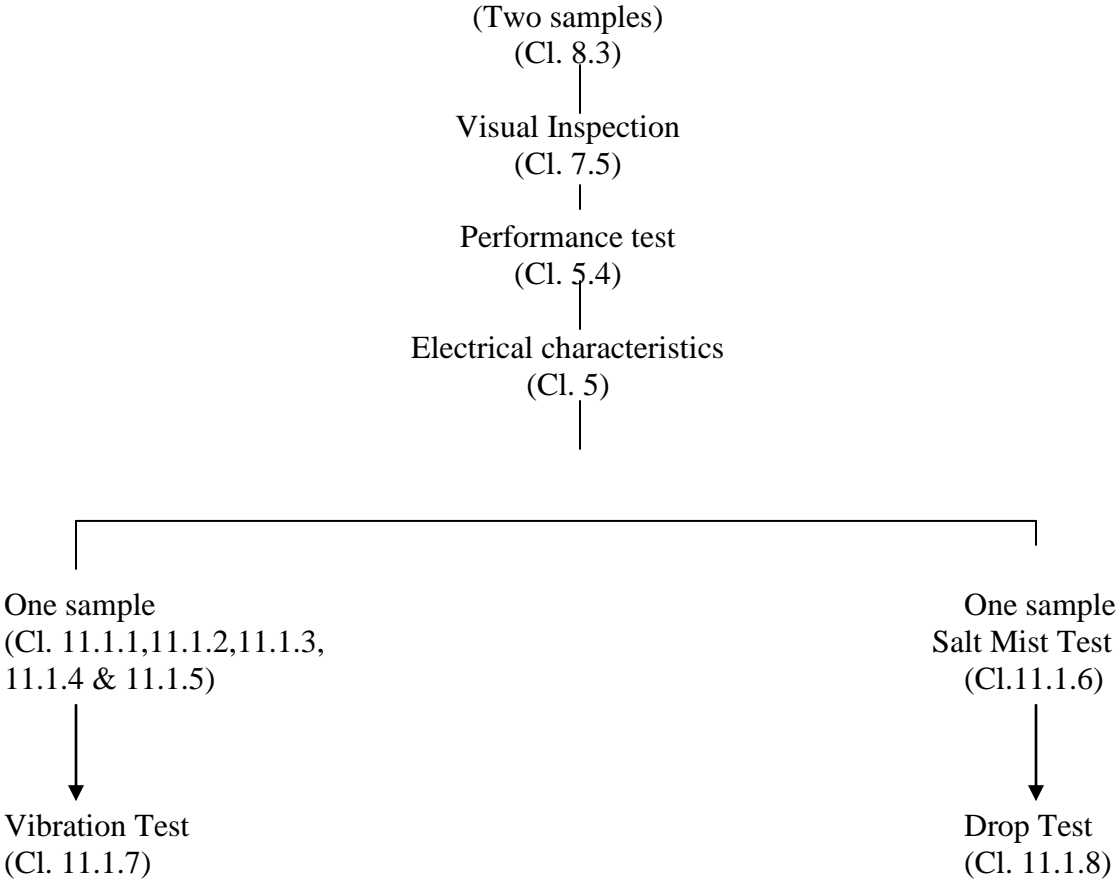
**3. Tests on finished product of ABS material**

A special sample of the size as required and mentioned in the test method ASTM D-1525 and ASTM-D-792, should be manufactured from the same raw material as used for moulding the body of Telephone or a part of the Telephone body will be cut to conduct the tests mentioned below: -

Properties	Specified values	Test Method
1. Specific Gravity	1.04- 1.07	ASTM D-792
2. Vicot Softening Point	100 - 108° C	ASTM D-1525

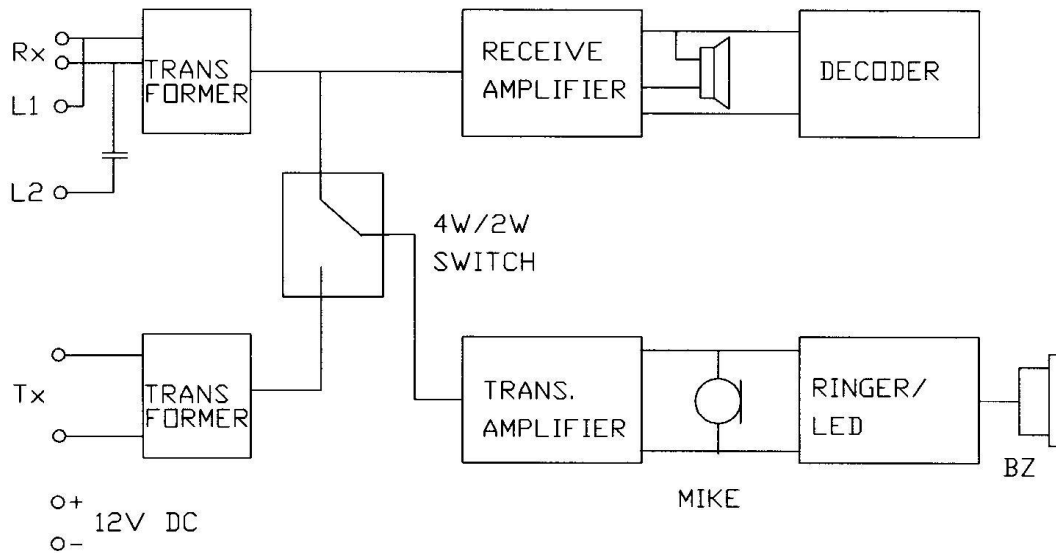
**APPENDIX 'B'**

Sequence of type tests ( Cl. 8.4 )

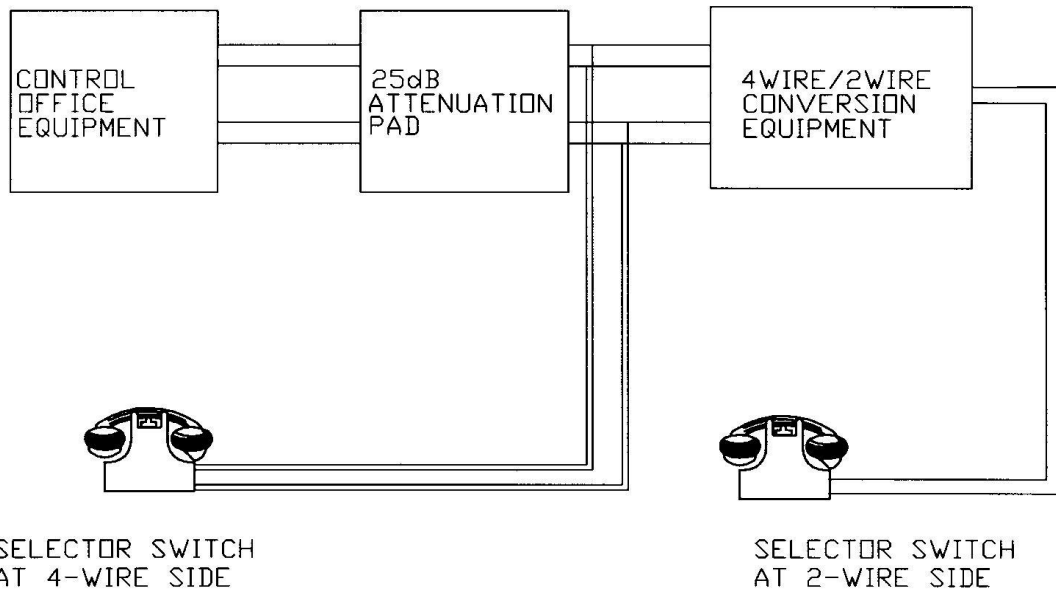


# IRS: TC- 82/2005

## ANNEXURE: I



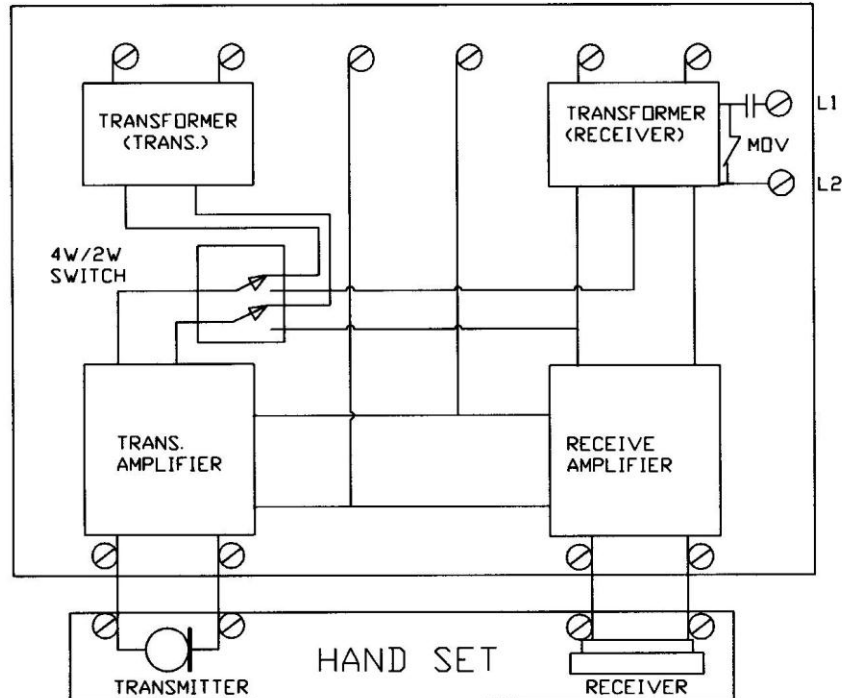
### UNIVERSAL WAY SIDE DTMF CONTROL TELEPHONE



### PERFORMANCE TEST

## IRS: TC/82/2005

## ANNEXURE: II



WIRING DIAGRAM OF UNIVERSAL  
WAY STATION DTMF TELEPHONE

1	2	3	A	697 Hz	
4	5	6	B	770 Hz	LOW GROUP
7	8	9	C	852 Hz	FREQUENCY
G	□	LR	D	941 Hz	

1209 Hz    1336 Hz    1477 Hz    1633 Hz

HIGH GROUP FREQUENCY

- NOTE:
1. THE FREQUENCY TOLERANCE IS 1.5%
  2. ABCD FOR GROUP CALLING.
  3. LR FOR LONG RING.
  4. G FOR GENERAL CALL.

STANDARD DTMF FREQUENCIES (CCITT-48430)

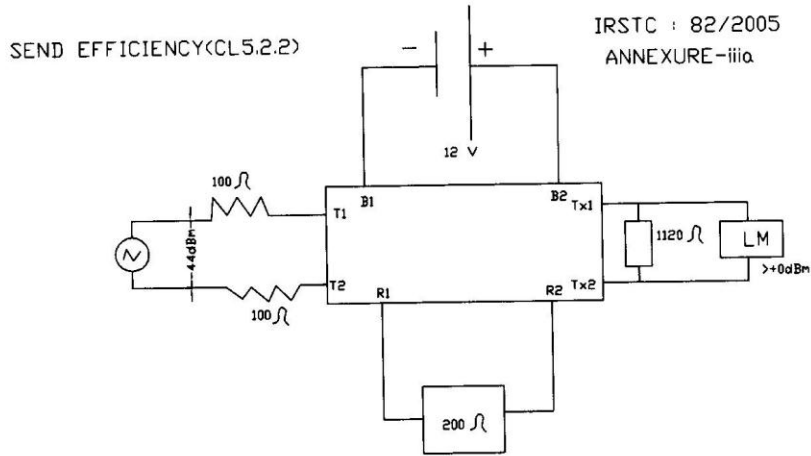


FIG1(a)

TEST SETUP FOR SEND EFFICIENCY<4WIRE>

T1 and T2 : Terminals of Transmitter inset  
 R1 and R2 : Terminals of Receiver  
 L1 and L2 : Line Terminals  
 Tx1 and Tx2 : Trans Terminals  
 Rx1 and Rx2 : Receive Terminals  
 B1 and B2 : Battery Terminals  
 LM : Level Meter

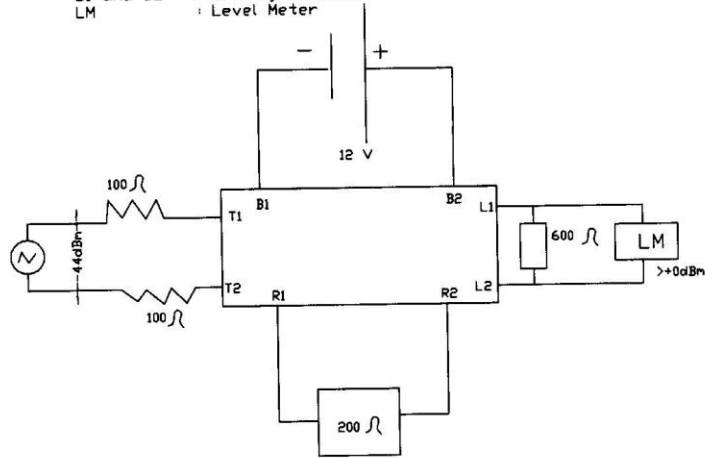


FIG1(b)

TEST SETUP FOR SEND EFFICIENCY<2WIRE>

(ii) SIDE TONE  
(CL5.2.3)

IRS:TC-82/2005  
ANNEXURE-III-b

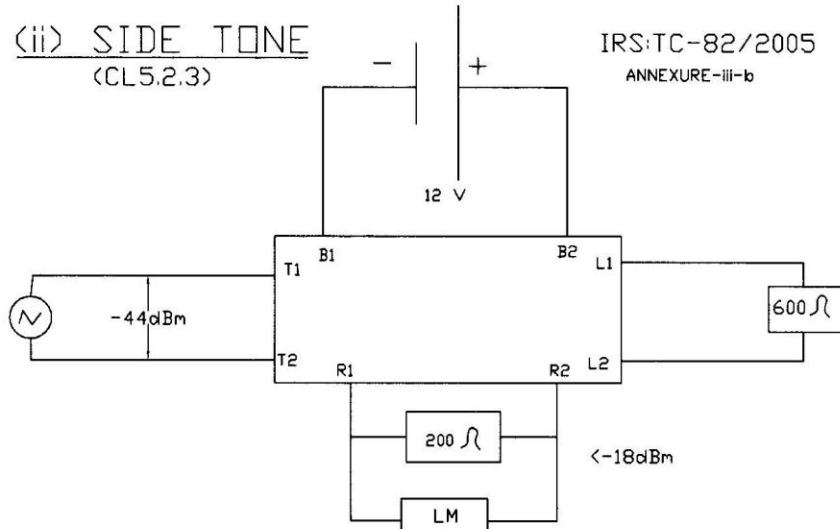


FIG2

TEST SETUP FOR SIDE TONE(2WIRE)

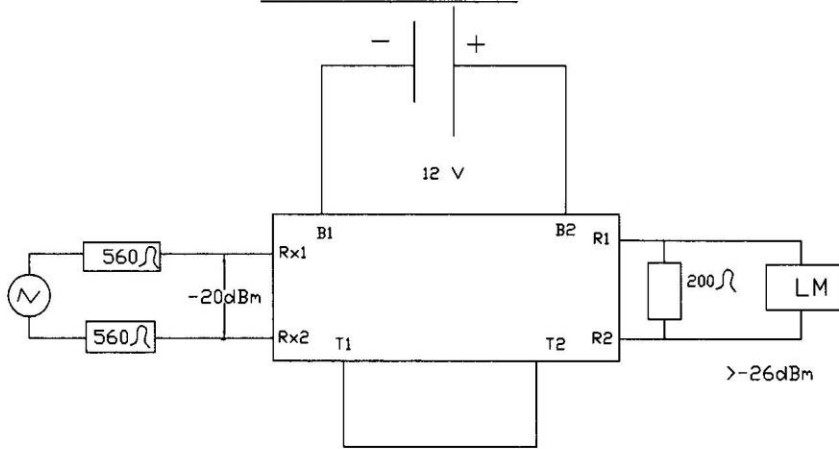


FIG3(a)

TEST SETUP FOR RECEIVE EFFICIENCY(4WIRE)

IRS: TC/-82 2005  
ANNEXUR III-c (CONb)

RECEIVE EFFICIENCY (CL5.2.3)

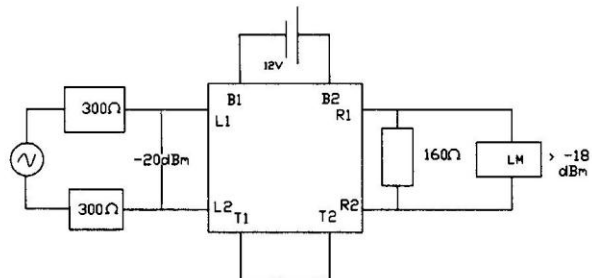


FIG 3(b)

TEST SET UP FOR RECEIVE EFFICIENCY (2 WIRE)

(iv) INSERTION (CL5.2.5)

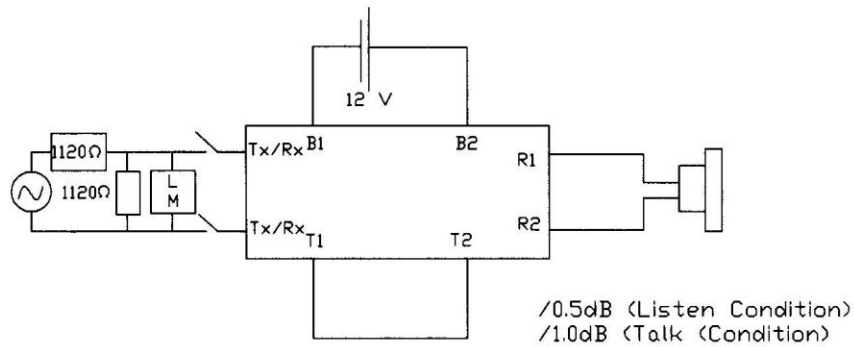


FIG 4(a)

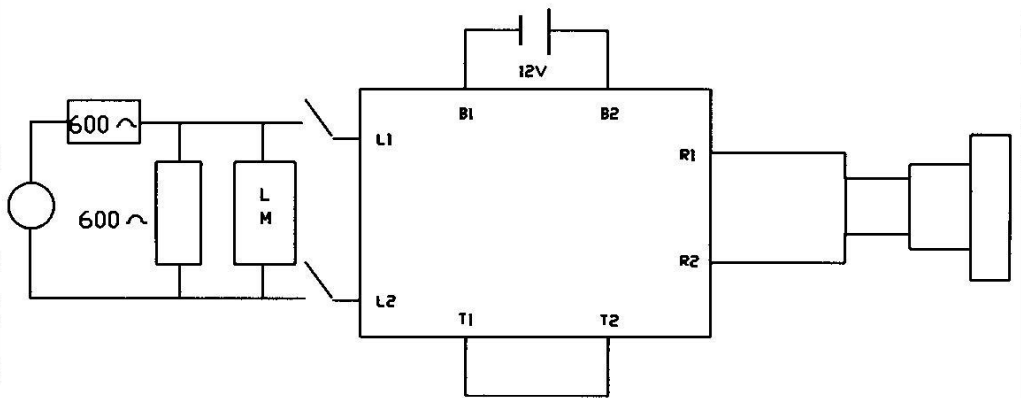
TEST SETUP FOR INSERTION LOSS (4 WIRE)



# IRS: TC- 82/2005

ANNEXURE: III-c

ON LOSS (CL. 5.2.5)



0.2 db (Listen Condition)

0.8 db (Talk Condition)

FIG: 4(b)

TEST SET UP FOR INSERTION LOSS (2WIRE)