

ISO 9001:2015	Document No.: RDSO/SPN/TC/66/2007	Version No.: 1.0	Date Effective: 01/09/2021
Document Title: Control Communication Equipments For OFC Using 2-Wire Telephones (CCEO)			



**TELECOM DIRECTORATE
RESEARCH DESIGNS AND STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW-226011**

RDSO/SPN/TC/66/2007

SPECIFICATION FOR

**CONTROL COMMUNICATION EQUIPMENTS FOR OFC USING 2-WIRE TELEPHONES
(CCEO)**

I. AMENDMENT HISTORY:

S. N.	Amendment Date	Version	Reasons for Amendment
1.	2007	Revision 0.0	First Issue.
2.	06.02.2008	Amd. 1	Cl. No. 1.2, 7.6, 10.3.2 & 10.3.4 deleted. Cl. No. 2.2, 4.4, 6.3, 10.2, 10.5 & 11.7 modified.
3.	21.08.2008	Amd. 2	Clause No. 10.3.3 modified.
4.	22.11.2016	Amd. 3	Clause No. 16 added in compliance to vigilance cell RDSO letter 13/Vig/Policy dated 26/07/2016 & 08/09/2016
5.	22.06.2021 w.e.f. 01.09.2021	1.0	Thoroughly reviewed as per directives vide DG's Note No. DG/Misc. dated 10 June 2020. Approved by ED/Tele-I on 22.06.2021 at Note#104 in e-Office file No. RDSO-TELE0LK0 (SPEC)/28/2020-Telecom Directorate/RDSO.

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II. DOCUMENT DATA SHEET:

Specification Number:	RDSO/SPN/TC/66/2007, Version 1.0
Document Title:	Control Communication Equipments for OFC Using 2-Wire Telephones (CCEO)
Prepared by: Director/Telecom-I	
Approved by: Executive Director/Telecom-I	
Abstract:	This document defines specification of Control Communication Equipments for OFC Using 2-Wire Telephones

III. DOCUMENT CONTROL SHEET:

Designation	Organization	Function	Level
JRE/Tele	RDSO	Member	Prepare
ADE/Tele	RDSO	Member	Prepare, Check
Director/Telecom-I	RDSO	Member, Issuing Authority	Prepare, Review, Issue
ED/Telecom-I	RDSO	Approving Authority	Approve

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V. BRIEF DESCRIPTION OF THE SYSTEM:

The main objective of the system development was to use normal 2 wires Electronic Telephone Instrument (ETI) for control communication. The system consists of the components listed in Clause No. 3.1 of the specification. Following are the main features of the system;

1. Uses normal 2 wires Electronic Telephone Instrument as control Telephone in existing omnibus circuit.
2. Also compatible with existing Way station equipment as per IRS: TC- 60 alongwith 2-Wire or 4-Wire Way Station Control Telephone as per IRS: TC 37-97 & IRS: TC 38-97.
3. Group and General call facility as in conventional Control System.
4. 20 Nos. of connections may be provided at HQ at important administrative/control locations. The controller can dial any of these numbers as and when required.
5. At the station, the system can connect upto 4 telephones (ETIs) within the station local area with the help of the MTWE unit. If more than 4 telephones are required, then one TWA unit and one additional MTWE unit may be used to make 8 connections.
As soon as the handset of any telephone is lifted, it is connected to ongoing conversation on the omnibus circuit.
In normal cases, only calls of the controller are received at these telephones if the corresponding number is dialled by the controller.
However, the dialling facility on these telephones (ETIs) can also be activated by programming (if required by the user).
6. The Schematic diagram of the system is given in figure at Annexure-I.

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1.0 FOREWORD:

- 1.1 This specification No. RDSO/SPN/TC/66/2007 has been prepared based on the recommendation of the 34th TCSC approved by Railway Board vide letter No.2004/Tele/TCM/1 dated 01.06.2007.
- 1.2 In the absence of IRS specification, the procurement may be made as per this specification.
- 1.3 This specification requires references to the following standard specifications:

SN	Specification No.	Description
1.	IRS: S-23	Electrical and Electronic based Signaling and Interlocking Equipment
2.	IRS: TC 37-97	2 Wire way station control telephone
3.	IRS: TC 38-97	4 Wire Way Station Control Telephone
4.	IRS: TC-60/2007	4 Wire/2 Wire Train Traffic Control Equipment With Dual Tone Multi Frequency (DTMF) Signalling
5.	IS-9000 (Series)	Basic Environment Testing Procedure for Electronic and Electrical items.
6.	IRS: TC-59-93	Automatic Radio Patching System for Control Circuit using DTMF Signalling in Optic Fibre Communication
7.	RDSO/SPN/TL/23/99 Version 4.0 Amendment 1 or latest	SMPS Based Power Plant for Indian Railway Telecom Equipment.
8.	RDSO/SPN/TC/102-2013 or latest	SMPS Based Telecom Integrated Power Supply System for Station (TIPSS)
9.	IEC 61643-11	Low-voltage surge protective devices –Part 11: Surge protective devices connected to low-voltage power systems –Requirements and test methods

Note:

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

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2. In case of withdrawal/revision of any of reference specification, latest or equivalent specification shall be applicable.

2.0 SCOPE:

- 2.1 This specification covers the requirements of Control Communication Equipments for OFC System using 2-Wire Telephones (CCEO) which will be used for Section Control, Deputy Control, Traction Power Control, Engineering control etc. at a Control Office & Station.
- 2.2 The CCEO System supply does not cover requirements of external underground cables like PIJF, Quad for connection between CCEO Equipments with the Telephones. The CCEO System supply also does not cover the requirement of -48 V DC Power Supply and Surge Protection Devices. Further CCEO System supply also does not include provision of OFC Channels.

3.0 GENERAL REQUIREMENTS

- 3.1 The Control Communication Equipments for OFC System using 2-Wire Telephones (CCEO) shall permit working of voice communication and signaling on Optical Fibre Communication System. The General Block Diagram of CCEO is shown at Annexure-I.
The CCEO shall consists of following eight segments;
 - 3.1.1 Control Room Equipment (CRE)
 - 3.1.2 Test Room Equipment (TRE)
 - 3.1.3 Local Telephone Equipment (LTE)
 - 3.1.4 Multi Telephone Waystation Equipment (MTWE)
 - 3.1.5 Remote Patching Equipment (RPE)
 - 3.1.6 Three Way Amplifier (TWA)
 - 3.1.7 2 wire Electronic Telephone Instrument (ETI)
 - 3.1.8 Ring Indication Unit (RIU)
- 3.2 CCEO System shall work on Optical Fibre Communication System based 4-Wire Voice Frequency (VF) Channel having impedance of $600 \pm 10\%$. This OFC System based 4-Wire Voice Frequency (VF) Channel is provided throughout the Control Section.
- 3.3 CCEO System shall work on this OFC System based 4-Wire Voice Frequency (VF) Channel with DTMF and VF Signal having typical transmission level of -4 dBm to -8 dBm. Although the CCEO System shall be designed for interfacing with OFC System based 4-Wire Voice Frequency (VF) Channel interface at unity input-output level, however it should be able to accommodate a level variation of minimum ± 6 dB.
- 3.4 All the segments of CCEO shall work on -48 V DC, having working voltage range of -48 V DC $\pm 20\%$. All the segments of CCEO except ETI at “-48V Power Line” shall be protected with pluggable Surge Protection Devices (SPDs) which consists of combination of varistors/suppressor diodes and GD tube with voltage & current limiting facilities. These SPDs

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shall have an indication function to indicate the prospective life and failure mode to facilitate the replacement of failed SPDs. This protection at “-48V Power Line” shall be in compliance to IEC 61643-11 and having Nominal Discharge Current of ≥ 700 Amp of 8/20 μ s, Maximum Discharge Current of $\geq 2K$ Amp of 8/20 μ s and Voltage Protection Level of $\leq 350V$.

- 3.5 The TRE, LTE, MTWE, RPE and TWA shall be 19” Rack mountable, however provision shall exist for MTWE to mount it on the wall. All the equipment shall be provided with a “Lock & Key” arrangement to prevent unauthorized use.
- 3.6 All the interconnection between different segments of CCEO System and their connection with OFC System shall be through “Lockable Plug & Socket” arrangement.
- 3.7 All the components used in the equipment shall be of high grade quality from the reputed manufacturer.
- 4.0 **CONTROL ROOM EQUIPMENT (CRE)**
- 4.1 The Control Room Equipment (CRE) shall be a desk type equipment for the controller’s use with following specifications and features.
- 4.2 It shall be a desk type equipment with a single push button calling arrangement. It shall have a minimum 40 Push Buttons with Page-Shift Push Button, for calling ETI or Way Station Equipment. This will yield to a calling capacity of minimum 80.
- 4.3 Provision shall exist to configure minimum 5 Push Buttons or with Page-Shift Push Buttons as Group Buttons for calling a group of ETI or Way Station Equipment (Existing waystation equipment as per IRS: TC-60/2007).
Similarly, provision shall exist to configure a Push button or with Page-Shift Push Button as General call button for calling all ETI or Way Station Equipment (as per IRS: TC-60/2007).
- 4.3.1 For calling a group of existing waystation equipment, DTMF frequency shall be used as per IRS: TC-60/2007.
- 4.3.2 For calling a group of ETI, any other signalling in voice frequency range shall be used which shall not interfere with existing waystation equipment frequency.
- 4.3.3 Similarly, for general call, provision shall be there for calling all ETI or Way Station Equipment. This shall include the provision for connection of all ETI & Way Station Equipment at the same time.
- 4.4 It shall have the facility to call individual ETI, or a group of ETI, by a single push button, directly or following the Page-Shift push button. This action will initiate a ring at the ETI and shall provide an audio feedback to the controller.

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- 4.5 Facility shall exist to backup the station numbers, which are programmed into the Control Room Equipment. This backup record shall be stored in the Test Room Equipment to be used by the Control Room Equipment whenever required. All these actions shall be carried out with normal working connection arrangement, without any need for additional wiring or hardware.
- 4.6 All Push Buttons with Page-Shift Push Button shall be programmable to an ETI number or an ETI group number.
- 4.7 It should also be possible to program these push buttons to Way Station Equipment numbers, which use the 'two digit' codes (details are available in IRS: TC-60/2007) and work in accordance with IRS: TC-60/2007 specification. Whenever the Controller calls any ETI number, it should ring that ETI telephone only and not interfere with DTMF way station equipment as per IRS: TC 60/2007 and vice- versa. (It shall be noted that minimum 80 numbers are limited by this specification, however, all numbers from 01 to 99 shall be configurable as per 2 digit code used in IRS TC: 60 as per requirement during installation).
- 4.8 The Control Room Equipment (CRE) shall also have minimum 10 Push buttons with 'Page-Shift' push button, for calling Local Telephone. This will yield a minimum 20 Local ETI calling capacity.
- 4.9 The Controller shall be able to call any Local Telephone (ETI shall work as Local Telephone), by pressing the corresponding single push button, directly or following the Page-Shift push button.
- 4.10 All the virtual 20 push buttons, for calling the Local Telephone, shall have pre assigned numbers.
- 4.11 The Control Room shall be equipped with microphone and loudspeaker for conversing on line along with individual volume controls for both. The microphone shall be of 50-15000 Hz frequency response and 2 mV/pa sensitivity having 600 Ω Impedance. The Loudspeaker shall be minimum 4 Watt. Microphone and loudspeaker shall be from reputed manufacturers like Philips, Ahuja, Bosch, Sennheiser, Bose, Boat, & JBL.
- 4.12 Besides microphone and loudspeaker the controller equipment shall also be equipped with a handset to converse on line. The changeover from microphone to handset should be automatic along with visual indication.
- 4.13 For monitoring the outgoing speech level, a level indicator shall be provided on the Control Room Equipment. On the Control Room Equipment a display shall be provided for displaying the numbers being called.
- 4.14 The Control Room Equipment will be connected to the Test Room Equipment on four twisted telecom pairs.
- 4.15 The Control Room Equipment shall work on DC, derived from Test Room Equipment. The

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maximum cable length between Test Room and Control Room shall be 200 metre.

- 4.16 Glass epoxy PCB of 1.6 mm minimum thickness shall only be used. The PCB shall be coated with epoxy base anti-fungal 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.
- 4.17 The PCBs shall be of modular constructions to facilitate ease of maintenance. Suitable arrangements of PCB layout shall be provided to ensure fixing of PCBs at its designated place in correct manner. Means of easy extraction of PCB and locking arrangement to prevent loose contacts due to vibrations shall be provided.
- 4.18 The equipment shall be self checking. All status “OK” shall be displayed by displaying two illuminated dots on 7 segment displays.

5.0 TEST ROOM EQUIPMENT (TRE)

- 5.1 The Test Room Equipment (TRE) shall be designed to be installed in a 19”communication rack. The connectors on TRE shall be of Plug-in type to facilitate easy replacement.
- 5.2 The Test Room Equipment shall be directly interfaced to the OFC System for the Control Circuit on 4-Wire configuration. Gain settings of minimum ± 6 dB shall be available for DTMF and VF Signals on the trans and receive channel of the equipment.
- 5.3 The VF channel shall provide interface as a ‘digital branching in both direction’ configuration arrangement with a 600 Ω interfacing impedance with a unity input-output level arrangement.
- 5.4 The TRE shall also have another identical channel with similar characteristics for connecting to another Control Circuit on OFC System, if needed.
- 5.5 The Test Room Equipment shall be provided with a numeric push button pad and an alphanumeric LCD display.
- 5.6 The Test Room staff shall be able to call any ETI, Way Station Equipment (using the IRS: TC-60/2007 code structure) & Local Telephone connected to the Local Telephone Equipment (LTE) by using the numeric push button for composing the number.
Further, provision for Group call & General call shall be provided in TRE as per requirement of the user configured in Control Room Equipment (CRE).
- 5.7 The Test Room staff shall be able to converse on line by using a handset.
- 5.8 A speaker shall be provided along with volume control for monitoring the conversation online.

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- 5.9 A level indicator for monitoring the trans and receive channels shall be available on the panel.
- 5.10 Glass epoxy PCB of 1.6 mm minimum thickness shall only be used. The PCB shall be coated with epoxy base anti-fungal 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.
- 5.11 The PCBs shall be of modular constructions to facilitate ease of maintenance. Suitable arrangements of PCB layout shall be provided to ensure fixing of PCBs at its designated place in correct manner. Means of easy extraction of PCB and locking arrangement to prevent loose contacts due to vibrations shall be provided.
- 5.12 The equipment shall be self checking. All status “OK” shall be displayed by displaying two illuminated dots on 7 segment displays.
- 6.0 LOCAL TELEPHONE EQUIPMENT (LTE)**
- 6.1 The Local telephone Equipment (LTE) shall be designed to be installed in a 19” communication rack.
- 6.2 The Local Telephones Equipment (LTE) shall be able to cater to 20 Local Telephones (The ETI shall work as the Local telephone).
- 6.3 These telephones shall work on a pair and connect on one-to-one basis, in star connection configuration from LTE, using a twisted telecom pair having loop resistance of less than 600 Ω .
- 6.4 The telephone instrument used as Local Telephone will be an ETI instrument, identical to what is used with MTWE.
- 6.5 The Local Telephone connected to the LTE will have a facility to get called by CRE and TRE but will have no dialling facility.
- 6.6 On picking up the handset, the Local Telephone will get connected to the control circuit. The CRE shall have the facility to disconnect any particular Local Telephone, if the controller desires to do so.
- 6.7 Glass epoxy PCB of 1.6 mm minimum thickness shall only be used. The PCB shall be coated with epoxy base anti-fungal 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.
- 6.8 The PCBs shall be of modular constructions to facilitate ease of maintenance. Suitable arrangements of PCB layout shall be provided to ensure fixing of PCBs at its designated place in correct manner. Means of easy extraction of PCB and locking arrangement to prevent loose

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contacts due to vibrations shall be provided.

- 6.9 The equipment shall be self checking. All status “OK” shall be displayed by displaying two illuminated dots on seven segment displays.

7.0 **MULTI TELEPHONE WAYSTATION EQUIPMENT (MTWE)**

- 7.1 The Multi Telephone Waystation Equipment (MTWE) shall work on -48 V DC. This device will be wall-mounting type and will be mounted next to the OFC equipment. Arrangement shall also exist to mount this equipment on a standard 19” rack.
- 7.2 The MTWE shall be directly interfaced to the OFC for the control circuit on 4-wire circuit configuration. Gain settings of minimum ± 6 dB shall be available for DTMF and VF signals on the trans and receive channel of the equipment.
- 7.3 The VF channel shall provide interface as a ‘digital branching in both direction’ configuration arrangement with a 600Ω interfacing impedance with a unity input-output level arrangement.
- 7.4 A total four numbers of 2-Wire Electronic Telephone Instrument (ETI) will be connected to the equipment, each on a twisted telecom pair.
- 7.5 A feedback tone will be generated by the MTWE whenever a ring to one of its ETI is received.
- 7.6 The MTWE shall provide four independent calling numbers for the four ETI connected to it. Each will also be settable for a group number.
- 7.7 The MTWE shall have the facility to program each of the ETI for dialling or non-dialling mode.
- 7.8 The MTWE shall be designed to support working of the Electronic Telephone Instrument on a pair and connect on one-to-one basis, in star connection configuration from MTWE, using a twisted telecom pair having loop resistance of less than 600Ω .
- 7.9 As soon as the handset of ETI is lifted, the telephone should get connected to the control circuit with Rx path being made through but keeping the Tx path disconnected. The Tx of the handset will be enabled either by tapping the cradle switch or by pressing any one of the key switched on the telephone, except # and * switch.
- 7.10 The ring to ETI will last for a period of ONE minute (adjustable from 30 Seconds to 3 Minutes) whenever called, and shall get terminated as soon as the handset is taken off-hook.
- 7.11 MTWE shall have the provision of minimum 4 distinctive ringtones for individual 2-Wire Electronic Telephone Instrument (ETI) which shall be set as per requirement of the user.

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7.12 The MTWE shall have the provision of supplying the required power supply input to the Ring Indication Unit (RIU) through the pair of wires used for individual ETI itself.

8.0 REMOTE PATCHING EQUIPMENT (RPE)

8.1 This device will be wall-mounting type and will be mounted next to the OFC equipment. Arrangement shall also exist to mount this equipment on a standard 19" rack.

8.2 The RPE will be able to interconnect (patch) two VF 4-wire channels of 600Ω impedance to each other. It should be possible to interconnect the two channels by a local command (from the RPE panel) or from a remote command (from TRE).

8.3 The interconnecting path for the two channels will have transformer isolation and active components as well. With this, the channels will remain isolated and also provide impedance isolation between each other.

8.4 The RPE will provide a unity gain path for the patching channels.

8.5 The channel patching status should be seen on the RPE panel. The action of patching and un-patching (releasing) the channel shall be carried out by pressing a push button on the RPE panel, when operated locally.

8.6 For remote operations, RPE will have the following features and functions;

8.6.1 The TRE will be able to perform the 'patching' and 'un-patching' action on any particular RPE by a command addressing its number.

8.6.2 It should also be possible for the TRE to get the status report (patched or unpatched condition) of any particular RPE by addressing a particular RPE.

8.6.3 The addressing numbers of RPE will be from 1 to 9. It shall be possible to manage up to nine RPE on a control circuit.

8.6.4 The remote commands will make use of calling protocols similar to that used for MTWE.

8.6.5 The installed location of a RPE may be anywhere on the control section, from the test room to the far end station point.

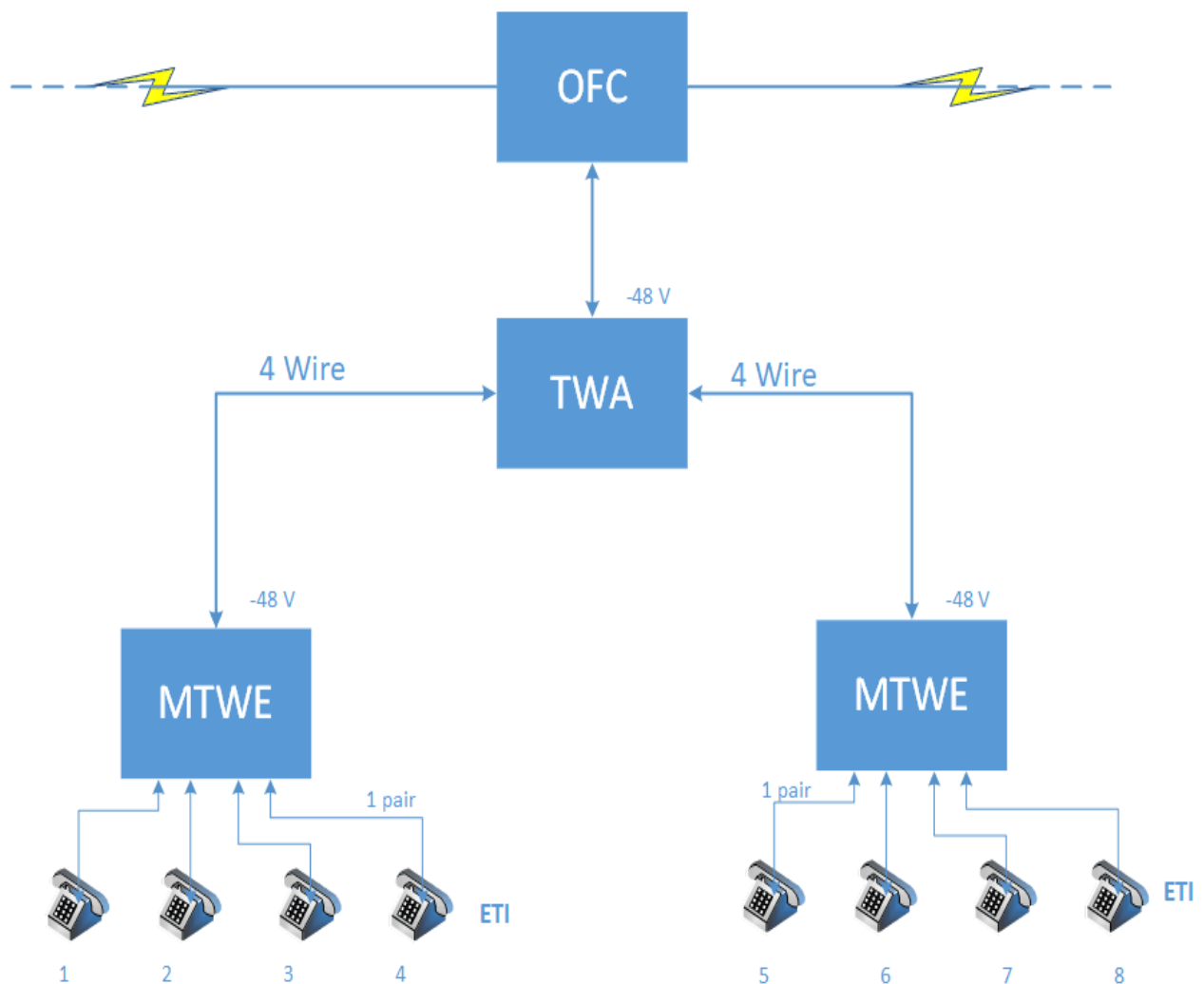
9.0 THREE WAY AMPLIFIER (TWA)

9.1 The Three Way Amplifier (TWA) shall work on -48V DC. This device will be wall-mounting type and will be mounted next to the OFC equipment, within ten meters. Arrangement shall also exist to mount this equipment on a standard 19" rack.

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- 9.2 The equipment will provide a unity gain three way branch amplifier configuration. Wherever more than one MTWE is to be deployed, the TWA can be used to provide the additional 4- wire branch connection while keeping unity gain and impedance isolation.
- 9.3 The TWA shall be directly interfaced to the OFC for the control circuit on 4- wire circuit configuration and have an impedance of $600\ \Omega$. No gain setting will be required for interfacing.
- 9.4 The TWA will be used as a means to provide connections to additional MTWE and not to branch out the control circuit to open lines.



Using Three Way Amplifier (TWA) for working two MTWE at a location

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10.0 **2-WIRE ELECTRONIC TELEPHONE INSTRUMENT (ETI) (used as control Telephone):**

10.1 The ETI will have a minimum of 3x4 standard telephone keypad and will function on a pulse dialing system.

10.2 The Electronic Telephone Instrument having a valid certificate issued by TEC conforming to the Mandatory Essential Requirements of TEC for 2-Wire Telephone Equipments (for Electronic Telephone Instrument) (as revised by TEC time to time) shall be procured from any firm.”

10.3 The CCEO system shall be fully compatible with above telephone instruments and work efficiently with above telephone instruments used as control telephone.

10.4 Since these telephone instruments are manufactured by various firms, Purchaser has an option to procure the above 2 wire electronic telephone instruments with valid Mandatory Essential Requirements for 2-Wire Telephone Equipments issued by TEC (for Electronic Telephone Instrument) either with CCEO system or separately.

11.0 **RING INDICATION UNIT (RIU)**

11.1 The Ring Indication Unit (RIU) shall be a small desktop type unit installed alongside the ETI. It shall have the provision of missed call visual indication in the form of an LED.

11.2 The LED will get “ON” whenever a ring is received and remains “ON” till the ETI undergoes an on-hook to off-hook action.

11.3 The required power supply for RIU shall be derived from the MTWE through the pair of wires used for individual ETI itself. No additional power supply shall be required to achieve this function.

11.4 In case of failure of the RIU, the normal functioning of ETI shall not be affected.

12.0 **TESTS AND PERFORMANCE REQUIREMENT**

Unless otherwise specified, all the tests shall be carried out under prevalent ambient atmospheric conditions.

12.1 **Visual Inspection**

12.1.1 Visual inspection shall be carried out as per relevant clauses of this specification & clause 14.2 of IRS: S-23 to the extent applicable.

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12.1.2 **Manufacturer's Identification:** A metal plate containing the following information shall be firmly secured to the equipment:

12.1.2.1 Manufacturer's Name and Address.

12.1.2.2 Item Name

12.1.2.3 Specification No.

12.1.2.4 Month & Year of manufacture

12.1.2.5 Serial Number.

12.1.2.6 Batch No.

12.2 **Applied High Voltage Test**

The equipment shall withstand without any damage, a test voltage of 1KV, applied for a period of one minute, between the body and all the current carrying terminals looped together.

12.3 **Insulation Resistance Test**

The insulation resistance measured with 500 V DC between the body and the current carrying terminals looped together shall not be less than 20 MΩ.

12.4 **Operation Test**

The Control Office Equipments (CRE, TRE, LTE & TWA) shall be connected to various equipments used at Way Stations (MTWE, RPE, ETI, RIU & 2-Wire/4-Wire way station control Telephone System as defined in IRS TC: 60) and it shall be tested for:

12.4.1 Ringing and Ring Back Tone

12.4.2 Local Telephone Call

12.4.3 Group Calling

12.4.4 General Call

12.4.5 Satisfactory speech

12.4.6 Manual cut and through for RPE

12.4.7 Unity Gain in all directions for TWA

12.4.8 Missed call Indication for RIU

12.4.9 Distinctive Ring tone facility

12.5 **Functional and Performance Test**

Functional and Performance test shall include overall functionality test of the system/subsystems with effect to compliance of functional/technical requirements of the specification. The performance during the test shall be satisfactory & measurements shall be within the limits specified in the specification.

12.6 **Climatic Test-degree of severity**

This shall exclude microphone, loudspeaker, handset, ETI and RIU.

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12.6.1 **Dry Heat:**

Tests shall be done in two phases-operational and storage. The test shall be conducted as per IS: 9000 Part III.

Operational test shall be done at $55^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 16 hrs. and the operation of the equipment shall be tested after completion of the test as per clause No. 12.4.

The storage test shall be conducted at $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 16 hrs with a recovery period of 8 hrs. Operation of the equipment shall be tested after completion of the test as per Clause No. 12.4.

12.6.2 **Damp Heat (steady state):**

The equipment shall be subjected to $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ with RH not less than $93\% \pm 2\%$ for 24 hrs. On completion of the duration of the test the equipment shall be taken out and shall be wiped with dry cloth to remove the condensed water if any from the surface. The equipment shall then be kept in a recovery chamber at $27^{\circ}\text{C} \pm 5\%$ RH for 6 hrs. and the insulation resistance shall be measured as per clause 12.3. The IR value shall not be less than $10\text{ M}\Omega$. The operation of the equipment test shall be done as per clause No. 12.4.

The test shall be conducted as per IS: 9000 Part-IV.

12.6.3 **Cold Storage Test :**

The test shall be done at $-10^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 16 Hours with the recovery period of 8 hrs. The test shall be conducted as per IS: 9000 Part-II. The operation of the equipment shall be tested as per clause No. 12.4.

12.7 **Vibration Test:** This shall exclude microphone, loudspeaker, handset, ETI and RIU.

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

- | | | | |
|-------|---------------------------------|---|-----------------------------------|
| (i) | Freq. Range | : | 10 Hz 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 minutes. |

13.0 **Routine Test:** The following shall constitute the routine test:

All the tests given in para 15.1 on all the equipment offered for inspection.

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14.0 Type Test

14.1 The following shall constitute Type Test:

A minimum of one sample of CRE, TRE, LTE & TWA and two samples of MTWE, RPE, ETI & RIU are required for the type test. These samples shall not form part of supply.

- 14.1.1 Visual Inspection (Clause 12.1)
- 14.1.2 Applied high voltage test (Clause 12.2)
- 14.1.3 Insulation resistance test (Clause 12.3)
- 14.1.4 Operation test (Clause 12.4)
- 14.1.5 Functional and Performance test (Clause 12.5)
- 14.1.6 Climatic test-degree of severity (Clause 12.6)
- 14.1.7 Vibration test (Clause 12.7)
- 14.1.8 Functional and Performance test after Climatic & Vibration test: After completion of climatic and vibration tests the equipment shall be visually inspected to check for any damaged or cracked parts and functional and performance tests shall be carried out as per Clause 12.5.

15.0 Acceptance Test.

15.1 The following shall constitute the acceptance test on MTWE, RPE, ETI & RIU and shall be carried out as per sampling plan specified in Clause No. 18.0. For CRE, TRE, LTE & TWA, the acceptance test shall be carried out on the complete offered lot.

- 15.1.1 Visual Inspection (Clause 12.1)
- 15.1.2 Applied high voltage test (Clause 12.2)
- 15.1.3 Insulation resistance test (Clause 12.3)
- 15.1.4 Operation test (Clause 12.4)
- 15.1.5 Functional and Performance test (Clause 12.5)

15.2 Any other tests as required by the inspecting authority to ensure that equipment is in conformity with the requirement of the specification shall also be done.

15.3 The Acceptance Test Format for the item is issued to field units. However, the latest applicable specification shall be referred during the acceptance test to ensure compliance of AT requirements of the specification. In case of any conflict, specification shall be the master document.

16.0 PACKING

The equipment shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage. The following information shall be given on the packing case:

- 16.1 Name & Address of manufacturer
- 16.2 Year of manufacture

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- 16.3 Arrow indicating top side.
- 16.4 Fragile
- 16.5 Address of consignee.
- 16.6 Any other information felt necessary

17.0 INSTRUCTION BOOKS, MEASURING INSTRUMENTS-AND WARRANTY.

- 17.1 The following documents in booklet forms shall be supplied with each equipment;
 - 17.1.1 Operation manual: The operation manual shall include a chapter namely "Introduction" wherein overall operation of the system with sketches/Schematic diagrams shall be explained.
 - 17.1.2 Maintenance manual and suggestive preventive maintenance schedule to be followed.
 - 17.1.3 Technical manual giving details of circuit diagrams and connection diagrams, values of rating of all components, PCBs wiring etc.
 - 17.1.4 Installation & Configuration Manual; It shall explain the steps to be followed for installation of the system. It should also include configuration of the system & system components for each & every functional requirements.
- 17.2 Complete details of the measuring equipment required for servicing shall be provided.
- 17.3 List of the recommended lifetime spares shall also be provided with the equipment.
- 17.4 **WARRANTY:** Unless otherwise agreed between purchaser and manufacturer, the equipment shall have warranty for satisfactory working for a period of one year after installation or two years from the date of purchase, whichever is earlier.
- 17.5 Data sheet for switches, microphone, loudspeaker, ETI shall be submitted by the manufacturer.

18.0 SAMPLING

- 18.1 Double sample plan given below shall be adopted during Acceptance Test;

Lot consisting of (Nos.) for MTWE/RPE//ETI/RIU (Individually)	1 st Sample Size	2nd Sample Size	Combined Sample Size	Acceptance Number	Rejection Number
1	2 (N1)	3 (N2)	4 (N1+N2)	5 (C1)	6 (C2)
Under 25	3	6	9	0	2
25 to 50	7	14	21	0	3

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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

18.2 The number of MTWE/RPE/ETI/RIU (N1) as given in col 2 shall first be selected and subjected to the acceptance test. If in the first sample, the number of defective MTWE/RPE/ETI/RIU (that is those falling in one or more acceptance tests) is less than/equal to the corresponding number (C1) given in Col 5, the lot shall be considered as conforming to the requirements of the acceptance test. If the number of defective MTWE/RPE/ETI/RIU in the first sample is greater than or equal to the rejection number given in Col 6 (C2), the lot shall be considered as not conforming to the requirement of the acceptance test. If the number of defective MTWE/RPE/ETI/RIU in the first sample lies between (C1) and (C2), a second sample of size (N2) as given in Col 3 shall be selected and subjected to acceptance test. If in the combined sample Col 4 (N1+N2), the number of defective MTWE/RPE/ETI/RIU is less than (C2) the lot shall be considered as conforming to the requirements of acceptance test else the lot shall be considered as non conforming.

Note: The above sampling, testing & acceptance criteria is applicable to respective item i.e. MTWE/RPE/ETI/RIU individually.

18.3 For CRE, TRE, LTE & TWA, the acceptance test shall be carried out on the complete offered lot. All the offered quantity of individual items shall pass in all acceptance tests to be considered as conforming to the requirements of acceptance test else the lot of the item shall be considered as non conforming.

19.0 **TRAINING:** The manufacturer shall provide training to Railway Staff free of cost for one week at his works/onsite as mutually agreed.

20.0 **ORDERING INFORMATION:** Purchaser shall provide the following ordering information;

20.1 **Table-1:** Ordering information for CRE, TRE, LTE, MTWE, RPE, TWA, RIU:

S. N.	Item Name	Specification/Cl. No.	Quantity (To be provided by Purchaser)
1.	Control Room Equipment (CRE)	RDSO/SPN/TC/66/2007 Version 1.0	
2.	Test Room Equipment (TRE)		

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3.	Local Telephone Equipment (LTE)		
4.	Multi Telephone Waystation Equipment (MTWE)		
5.	Remote Patching Equipment (RPE)		
6.	Three Way Amplifier (TWA)		
7.	Ring Indication Unit (RIU)		

20.2 **Table-2:** Ordering Information for 2- Wire Electronic Telephone Instrument (ETI);

S.N.	Item Description	Specification	Quantity (To be provided by Purchaser)	Remark
1.	2-Wire Electronic Telephone Instrument (ETI)	Mandatory Essential Requirements for 2-Wire Telephone Equipments issued by TEC (for Electronic Telephone Instrument)		Purchaser has the option to procure the 2 wire electronic telephone instruments (ETI) with valid Mandatory Essential Requirements for 2-Wire Telephone Equipments issued by TEC, either with CCEO system or separately.

21.0 "All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 latest (titled "Vendor-Changes in approved status") shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways"

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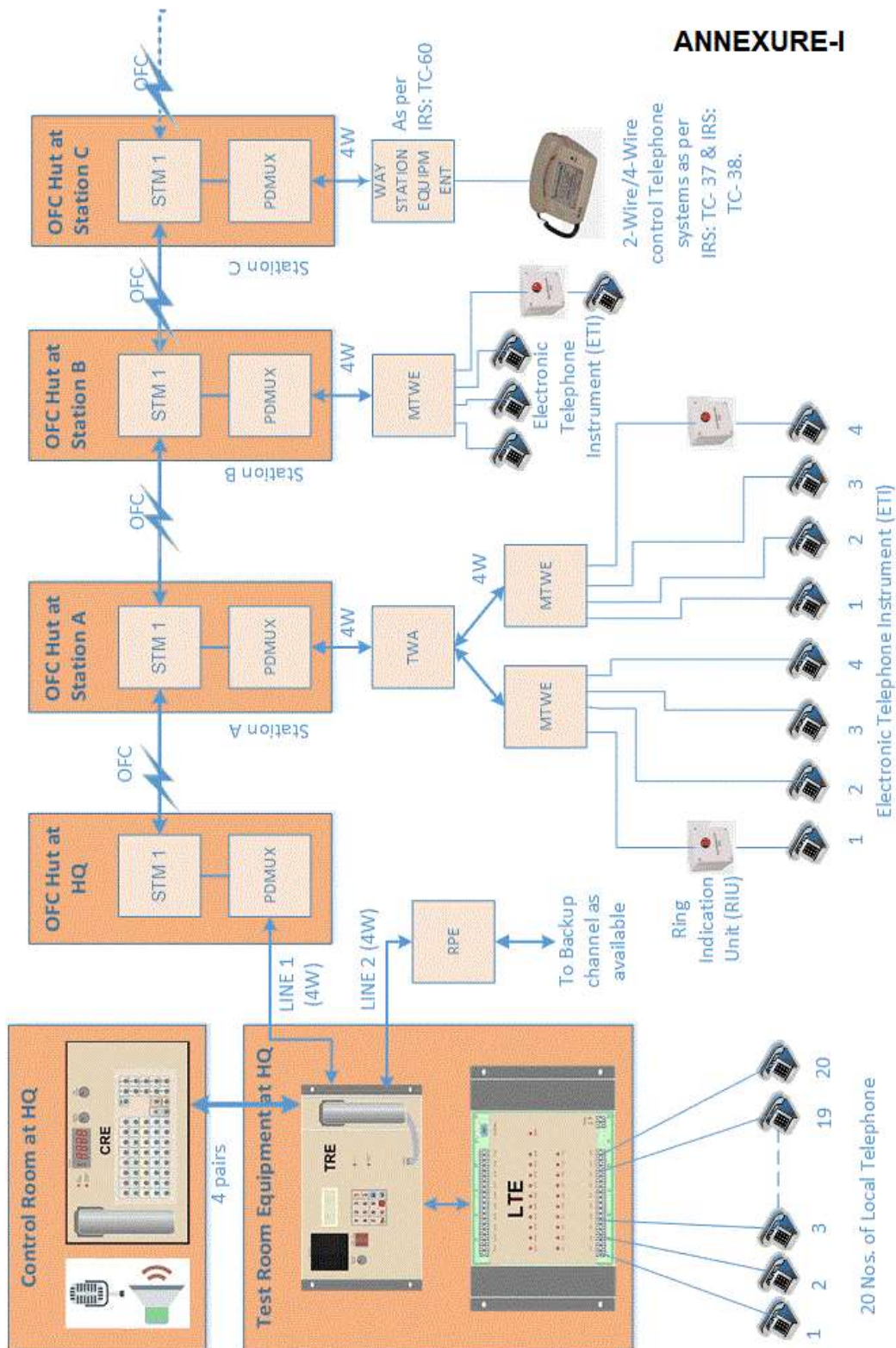
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ANNEXURE-A

Abbreviation Used:

S. N.	Abbreviation	Detail
1	CCEO	Control Communication Equipments for OFC System using 2-Wire Telephones
2	CRE	Control Room Equipment
3	TRE	Test Room Equipment
4	LTE	Local Telephone Equipment
5	MTWE	Multi Telephone Waystation Equipment
6	RPE	Remote Patching Equipment
7	TWA	Three Way Amplifier
8	ETI	2-Wire Electronic Telephone Instrument
9	Way Station Equipment	2-Wire/4-Wire way station control Telephone System as defined in IRS TC: 60. (2 Wire Way Station Control Telephone as per IRS: TC: 37 & 4 Wire Way Station Control Telephone as per IRS TC: 38)
10.	RIU	Ring Indication Unit

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SCHEMATIC DIAGRAM OF CCEO