Template for submitting comments/inputs on Draft Test Guide titled "Electronic Locator System (Draft Test Guide No. TEC73071:2026)"

Name of Manufacturer/Stakeholder:

Organization:

Contact details:

Clause No.	Clause Description	Comments, if any	Remarks, if any

Note: The comments/inputs on the draft Test Guide (Draft Test Guide No. TEC 73071:2026) may be furnished in the above format through email to adgfa-tec-dot@gov.in with copy to dirfa.tec@gov.in and ddgfla.tec@gov.in at the earliest and within prescribed time period.

अनंतिम टेस्ट गाइड
टीईसी ७३०७१:२०२६
PROVISIONAL TEST GUIDE
TEC 73071:2026

for

इलेक्ट्रॉनिक लोकेटर सस्टम
(मानक संख्या.: टीईसी ७३०७०:२०२५)
ELECTRONIC LOCATOR SYSTEM
(STANDARD No.: TEC 73070:2025)

ISO 9001:2015

दूरसंचार अ भयांत्रिकी केंद्र
खुर्शीदलाल भवन , जनपथ, नई दिल्ली-110001, भारत
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FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of Electronic Locator System as per GR No. TEC 73070:2025.

CONTENTS

A. HISTORY SHEET

Sl. No.	*Standard/Document No.*	*Title*	*Remarks*
1	TEC 73071:2026	Electronic Locator System	Release 1

B. INTRODUCTION

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of Electronic Locator System as per GR No. TEC 73070:2025.

C. General information:

Sl. No.	General Information	Details (to be filled by testing team)	
1	Name and Address of the Applicant		
2	Date of Registration		
3	Name and No. of GR/IR/Applicant's Spec. against which the approval sought	Electronic Locator System	TEC 73070:2025
4	Details of Equipment		
	Type of Equipment	Model No.	Serial No.
(i)			
(ii)			
5	Any other relevant Information:-		

D. Testing team: *(to be filled by the testing team)*

Sl. No.	Name	Designation	Organization	Signature
1.				
2.				
3.				

E. List of the Test Instruments:

S. No.	Name of the test instrument	Quantity	Make /Model (to be filled by the testing team)	Validity of calibration (to be filled by the testing team)	Remark
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

F. **Equipment Configuration Offered:** *(to be filled by the testing team)*

(a) **<Equipment/product name> Configuration:**

Sl. No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

(b) **<Other equipment name> Configuration:**

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

G. Equipment System Manuals: *(to be filled by the testing team)*

Availability of Maintenance manuals, Installation manual, Repair manual & User Manual etc. **(Y/N)**

H. Clause-wise Test Type and Test No.:

Clause No.	Clause	Type of Test / Test No. etc.
1.0	**INTRODUCTION** The Electronic Locator System is a precise method of marking and subsequently locating the underground cable system. To effectively manage the outside plant, there is a need for a direct linkage between the cable route map and the actual field cable route. The map presently provides the general information about location of the cable route but does not pin point underground plant such as for cable joint, bend, road crossing etc. The Electronic Locator System can be used so that the operator can exactly locate the underground point where the marker is buried. Electronic marker consists of passive RFID or without RFID marker. Each marker contains a unique identification number and once installed, the marker's location is recorded using the Electronic Locator System, which features an integrated GNSS (Global Navigation Satellite System) module. This enables accurate geotagging (latitude and longitude) of every marker. Additionally, the purchaser may order the system having additional optional functionalities like seamless synchronization of marker-related data with a secure cloud storage platform, accessibility of the marker data via an Android-based mobile application or from Personal Digital Assistant (PDA) [b-ITU-T L.362/Ex.L.69] or similar devices. The system consists of electronic locator unit and underground buried electronic markers (Fig.1& Fig.2).	Information

	 **Fig.1** Different types of Electronic Locator Systems  **Fig.2** Different types of Disc and Ball marker	
1.1	Marker Locator unit consists of an Inbuilt GNSS (Global Navigation Satellite System) (e.g. NAVIC/GPS etc.) to take the geo-coordinates of a particular location, tuned Transceiver antenna having a day readable display unit and Loudspeaker, housed in a light weight probe.	Information & Physical Check
1.2	The Electronic locator generates and transmits a specific frequency signal to the buried electronic marker. The Electronic Marker, tuned to this frequency, reflects the signal back to the locator. The locator verifies the reflected signal picked up through the probe and the location is indicated with a visual indication and an audible tone.	Physical Check
2.0	**TECHNICAL REQUIREMENTS:**	
2.1	**Cable Route Tracing Mode**: Radio Frequency Mode.	Certificate/Undertaking to be taken from the OEM mentioning the Frequency
2.2	**Accuracy of Location:** The Electronic Locator System shall be capable of locating the Marker buried upto a Max. depth	Test case-5

	of 220 cms. The Marker shall be located within a radius of 30 cms from the spot where the peak signal has been detected.	
2.3	**Transmitter Frequencies**: i) 101.4 KHz. OR ii) 121.6 KHz. OR iii) 145.7 KHz. (as per the requirement of the user depending upon the application.)	Certificate to be taken from the OEM specifying the Application type and standard frequency used for the application as per below:- 101.4KHz : Telecommunication Cables 121.6 KHz : Wastewater pipelines 145.7 kHz: Water pipelines
2.4	**Frequency Tolerance & Drift** : < ±1 %	Test case-1 and Certificate/Undertaking to be taken from the OEM
2.5	**Transmitter Output Power**: 1.5 Watts (Max.)	Test case-2 and Certificate/Undertaking to be taken from the OEM
2.6	**Type of Modulation:** Output Carrier 100% modulation, with 500 Hz. Carrier (varying tone). Carrier ON time 800 Micro	Test case-3 and

	Seconds (approx.)	Certificate/Undertaking to be taken from the OEM
2.7	**Antenna:** Type of antenna to be specified by the manufacturer. **Fixed Type OR Removable type.**	Declaration, Physical check
2.8	**Receiver:** Detects the radio frequencies reflected by the buried Marker. The Locator shall have facilities of Peak & Null reception. (a) 'PEAK' Reception: Tone/deflection shall be at highest. (b) 'NULL' Reception: Tone/deflection shall be weak or cancelled	Test case-6
2.9	**Indications: a)** Audible indication in the loudspeaker and deflection in the meter. Tone/ Deflection shall be highest when Marker Locator antenna is over the buried marker**.** **b) Marker ID read function:** Marker locator shall able to read the Marker Unique ID and shall indicate over the display**.**	Test case-6
2.10	**Power Requirements**: **a)** The instrument / System to work on dry cells for outdoor working. The cells used shall be of standard type and commonly available like AA/AAA type. **b)** The purchaser may opt for pre-fitted Li-ion battery rechargeable cells in place of dry cells. **c)** In case of requirement of dry cells, the instrument with the dry cells should work continuously for 8 hours. d) Low battery indication to be provided.	Declaration to be taken from the OEM
2.11	**Dimensions & Weight:** The electronic locator with its probe and marker shall be portable, compact and robust. The dimensions and weight shall be specified and furnished by the manufacturer.	Information & Physical Check

2.12	**Environment :** Operating Temperature -10 °C to +55°C	Test Reports/ Certificates from accredited test labs are to be submitted.
2.13	**Cabinet/Casting for locator :** Suitable sheet metal or reinforced plastic or ABS.	Declaration to be taken from the OEM
2.14	**Painting:** Enamel Painting for metal cabinet preferred.	Information
2.15	**Marker Casing:** The Marker shall have passive resonant network and sealed with HDPE material or any other suitable engineering plastic which is resistant to rodents or any other insects in the underground environment, and shall have suitable holes for fixing purpose.	Test Reports/ Certificates from accredited test labs are to be submitted.
2.16	**Colour/application of Marker**: The marker shall follow internationally accepted frequencies and colour conventions i.e. 101.4 KHz, orange colour for underground Telecommunication cables/ plants."	Physical Check for all applications mentioned in clause 3.10.6 of GR.
2.17	**Tensile Strength & Elongation:** The tensile strength and elongation of the Marker shall be carried out. The tensile strength at yield for finished material shall be 20 N/sq. mm. minimum. & elongation at break shall not be less than 350%.	Test Reports/ Certificates from accredited test labs or witness testing at OEM in house test facility, are to be submitted
2.18	**Thermal stress crack resistance:** The Marker shall be under compression load test of 10 Kg at a temperature of 55°C for 750 hours. There shall not be any indication of stress cracking or split on the surface of the marker.	Test Reports/ Certificates from accredited test labs or witness testing at OEM in house

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		test facility, are to be submitted.
2.19	**Hot-Cold Cycle :** The marker is kept between -10°C and 55°C for one week with weight. There shall not be any indication of stress cracking.	Test Reports/ Certificates from accredited test labs or witness testing at OEM in house test facility, are to be submitted
2.20	**Sealing of marker :** This consists of one minute immersion in mineral oil at 100°C. The sealing shall not show any functional abnormalities (It should meet Cl. 2.2 of GR)	Physical Check/ Test Reports/ Certificates from accredited test labs or witness testing at OEM in house test facility, are to be submitted
2.21	**RFID Memory:** Markers with RFID tag shall have a non-volatile memory chip embedded. Memory of RFID marker must be sized in order to store either unique identification ID or minimum information about the underground utilities viz. cable, name of the owner, etc as per the requirement of the purchasers for their applications.	Declaration and Physical check
2.22	**Marker Type:** Electronic Marker with passive RFID (buried underground), Ball Marker of diameter atleast 10cm or Disc Type marker of diameter atleast 20cms with RIFD chip. N.B. The type of marker to be used shall be as per purchaser's requirement.	Declaration and Physical Check
2.23	**Storage on System/Instrument**: The locator device shall have internal memory to store data for a minimum of 500	Test case- 4

	markers.	
2.24	**Additional Requirements (Optional and as per Purchaser's Requirements):**	
2.24.1	**Data Saving and Security**	
2.24.1.1	**External Storage:** System /instrument shall be capable to extend storage capacity by connecting external hard disk / pen drive to the system to store more data of the markers.	Test case-4
2.24.1.2	**Local PC Storage:** The system shall support data transfer and storage to a local computer using manufacturer-provided software.	Physical Check Note down the availability/ Link to download the Software from the OEM Website.
2.24.1.3	**Cloud Storage**: The system shall provide an option to upload all marker data to a secure cloud- based platform. Access to the cloud must be protected by user-specific login credentials to maintain data confidentiality and security.	Physical Check
2.24.1.4	Above storage options shall function independently to provide redundancy and ensure that critical data is not lost under any circumstance.	Declaration to be taken from the OEM
2.24.2	**Data base management software (DBMS):** This software is to be provided by the OEM/Manufacturer as per purchaser's requirements and it shall have the capability to store comprehensive marker information as per data structure determined by the purchaser and support for upload image of location where marker has been installed. The software must facilitate seamless synchronization of this data with a cloud storage platform, ensuring that all	Physical Check Enclose the Instructions manual. Note down the availability/ Link to download the

	marker information is consistently and reliably accessible through the associate Android-based mobile application or through PDA or similar devices. DBMS software shall also supply advanced features and data sharing for effective and efficient use of marker information as per the requirements of the purchaser. The software shall be supplied either via a CD or through an official web download link provided by the OEM/ Manufacturer. The installation process must be simple and user - friendly, requiring minimal technical expertise.	Software from the OEM Website. Or a CD
2.24.3	The instrument / System shall be able to extend connectivity to external high-accuracy GNSS devices (RTK, DGPS, etc.) if specified by the purchaser.	Physical Check Enclose the Instructions manual.
2.24.4	In case of sharing of data / information related to marker, applicable regulation / rule of Government of India shall be complied by the OEM/ Manufacturer wherever applicable.	Declaration to be taken from the OEM
3.0	GENERAL REQUIREMENTS:	
3.1	The Electronic Locator System shall be fully solid state and field proven employing state of the art technology.	Declaration to be taken from the OEM
3.2	The instrument shall be portable and light weight. The actual dimensions and weight of the instrument shall be furnished by the manufacturer.	Information & Physical Check
3.3	All connectors and cables shall be of low loss, suitably shielded, reliable and of standard type to ensure failure free operation over long periods and under specified environmental conditions.	Declaration to be taken from the OEM
3.4	The mechanical design and construction of each card/unit shall be inherently robust and rigid under all conditions of	Test Reports/ Certificates from

	operation, adjustment, replacement, storage and Transport and conforming to para 12 (Vibration Test) of "TEC GR No. 14016: 2010 (Old no. SD QM-333), Standard for environment testing of Telecommunication equipment". The instrument shall have self cooling arrangement without use of fans.	accredited test labs or witness testing at OEM in house test facility, are to be submitted.
3.5	Manufacturer's Name, Model, Sl. No. and month/year of manufacturing shall be clearly indicated on the instrument and in the operating manual. Printing and finishing shall be of high quality.	Declaration and Physical Check
3.6	Detailed information for components/module accessories used shall be clearly indicated in the manual / handbook.	Declaration to be taken from the OEM
3.7	All controls, switches and indicators shall be clearly marked to show their circuit designation and functions.	Declaration and Physical Check
3.8	The Electronic Locator shall be IP54 compliant or above.	Test Reports/Certificates from accredited test labs are to be submitted.
3.9	The Electronic Locater shall have high Contrast Display Suitable for all weather and light conditions.	Declaration to be taken from the OEM
3.10	**OPERATIONAL REQUIREMENTS:**	
3.10.1	The Electronic Locator System shall be able to pin point earmarked buried Telecom facilities such as cables, joints telecom ducts etc. where markers have been installed.	Test case- 5
3.10.2	**The electronic locator system shall be in two Part:** **a)** Electronic Marker with passive RFID or without RFID	Physical Check

<table>
<tr><td></td><td>(buried underground)
b) Electronic Marker Locator Unit
N.B. The type of marker to be used shall be as per purchaser's requirement</td><td></td></tr>
<tr><td>3.10.3</td><td>The Marker Locator unit shall compose of a transmitter, tuned frequency receiver and a suitable antenna housed in a light weight probe.</td><td>Physical Check</td></tr>
<tr><td>3.10.4</td><td>The Electronic locator shall generate and transmit a specific frequency signal to the buried electronic marker. The Electronic Marker, tuned to this frequency, reflects the signal back to the locator. The locator verifies the reflected signal picked up through the probe and the location is indicated with a visual indication and an audible tone.</td><td>Test case-5</td></tr>
<tr><td>3.10.5</td><td>The Electronic locator shall be provided with sensitivity control facility so that the indicator system viz., needle deflection/ display graph and audible signal can be conveniently set during the use.</td><td>Test case-6</td></tr>
<tr><td>3.10.6</td><td>The locator shall be capable of locating markers of any of the frequencies through a selection feature on the front panel of the locator.
<table>
<tr><td>83.0 kHz</td><td>Gas pipelines</td><td>Yellow</td></tr>
<tr><td>101.4 kHz</td><td>Telecommunication cables / plants</td><td>Orange</td></tr>
<tr><td>121.6 kHz</td><td>Waste water pipelines</td><td>Green</td></tr>
<tr><td>134.0 kHz</td><td>Energy cables</td><td>Red</td></tr>
<tr><td>145.7 kHz</td><td>Water pipelines</td><td>Blue</td></tr>
</table></td><td>Test case-6</td></tr>
</table>

<table>
<tr><td>3.10.7</td><td>Electronic locator should have facility to be able to read & write data on the marker RFID memory. RFID memory should be on the marker. However, the purchaser may not opt the requirement of Electronic marker having ability to write data on the marker RFID memory in case of marker is having only unique identification ID embedded in its memory chip and no other data is stored in the marker memory.</td><td>Test case-7</td></tr>
<tr><td>3.10.8</td><td>The electronic marker part which is buried underground consists of a passive tuned resonant circuit sealed in a casing. This casing shall be made of HDPE or any other suitable engineering plastic material. It shall not be affected by chemicals, minerals and temperature variations normally found in underground environments. It shall not be prone to damage due to rodents or any other insects in the underground environment.

<table><tr><th>Type of Marker</th><th>Distance(in feet's)</th></tr><tr><td>Full Range Disc Marker (with or without RFID)</td><td>8"</td></tr><tr><td>Medium Range Disc(with or without RFID)</td><td>6"</td></tr><tr><td>Near Surface Disc Marker (with or without RFID)</td><td>2"</td></tr><tr><td>Ball Marker (with or without RFID)</td><td>5"</td></tr></table>
N.B.: The purchaser shall decide the type of electronic marker to be ordered as per the requirements.</td><td>Test Reports/ Certificates from accredited test labs are to be submitted.</td></tr>
<tr><td>3.10.9</td><td>The marker shall be buried sufficiently clear of (with a minimum clearance of 30 cms all round) any metallic</td><td>Test case-5</td></tr>
</table>

	objects such as water conduits, power cables etc., and when the marker is buried as stated here in the Electronic Locator system shall not be affected by such objects.	
3.10.10	The Marker shall be colour coded to a specific frequency, as given in this GR.	Physical check
3.11	**QUALITY REQUIREMENTS:**	
3.11.1	The manufacturer shall furnish the MTBF and MTTR values. The calculations shall be based on the guidelines given in BSNL QA document No.QM-115 (January 1997) "Reliability Methods and Predictions" or any other international standard.	Undertaking/ Certificate to be taken from OEM
3.11.2	The instrument shall be manufactured in accordance with international quality standards ISO 9001: 2015 or latest issue for which the manufacturer should be duly accredited. A quality plan describing the quality assurance system followed by the manufacturer would be required to be submitted by the manufacturer.	Test Reports/ Certificates from accredited test labs are to be submitted.
3.11.3	The instrument shall conform to the requirements for Environment specified TEC GR No. 14016:2010 (old SD QM-333, Issue March 2010). The applicable tests shall be for environmental category 'D' including those for dust, vibration and corrosion.	Test Reports/ Certificates from accredited test labs are to be submitted.
3.12	**POWER SUPPLY:**	
3.12.1	The instrument shall work on dry cells for outdoor working. The purchaser may also opt for pre-fitted Li-ion battery rechargeable cells in place of dry cells. In case of requirement of dry cells, the cells used shall be of standard type and commonly available like AA/AAA type. The	Physical Check

	instrument with these dry cells should work continuously for 8 hours.	
3.12.2	The manufacturer shall furnish the power consumption of the instrument.	Declaration to be taken from the OEM
3.13	**PROTECTION REQUIREMENTS:**	
3.13.1	All switches/controls on front panel shall have suitable safeguards against accidental operation.	Declaration And Physical Check
3.13.2	The instrument shall be adequately safeguarded to "prevent entry of dust, Insects and lizards.	Declaration to be taken from the OEM
3.14	**MAINTENANCE REQUIREMENTS:**	
3.14.1	The calibration of the instrument shall be valid for at least one year.	Declaration from the OEM ~~Certificates from accredited test labs are to be submitted~~
3.14.2	The instrument shall have easy access for servicing and maintenance.	Information
3.14.3	Ratings and types of fuses used are to be indicated by the supplier.	Declaration to be taken from the OEM
3.14.4	The manufacturer/supplier shall furnish the list of recommended spares for three years maintenance.	Declaration to be taken from the OEM
3.14.5	The supplier shall have maintenance/repair facility in India.	Undertaking
3.14.6	Supplier should guarantee the spares so long as the instrument is in service, at least for 10 years from the date of supply. The purchaser would like to stock spares as and when the supplier decides to close down the production of the offered instrument. In such an event, supplier shall give	Undertaking

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	a two years notice to the purchaser so as to stock the spares.	
3.15	ACCESSORIES:	
3.15.1	The supplier shall provide one complete set of a) All the necessary accessories like antenna, connecting cables, power cord, etc. as required for proper operation of the instrument. Types of connectors, adopters to be used and the accessories of the approved quality shall be clearly indicated in the operating manuals. b) Software (if any), along with software version and the arrangement to load the software at site. Any updating of software shall be supplied free of cost. (Additional sets may be ordered optionally). This upgrade shall be done at the site via internet / /OTA (over the air) / external storage devices, if required.	Declaration And Physical Check
3.15.2	Special tools, extender boards, extender cables and accessories essential for installation, operation maintenance and repair of the instrument shall be clearly indicated and supplied along with the instrument, as per the user's requirement.	Declaration And Physical Check
3.15.3	Suitable carrying case shall be supplied for ease of transportation and safety of the instrument.	Declaration to be taken from the OEM
3.16	DOCUMENTATION:	
3.16.1	Technical literature in English with complete layout, detailed block schematic and circuit diagram of various assemblies with test voltages / waveforms at different test points of the units shall be provided in hard copy. Additionally, a soft copy /QR code on the system in respect	Required documents to be provided by OEM.

	of technical literature shall also be provided both in Hindi and English. All aspects of installation operation, maintenance and repair shall be covered in the manuals. The manuals shall include the following: - **i) Installation, operation and maintenance manual** a) Safety measures to be observed in handling the Instrument b) Precautions for setting up, measurements and maintenance; c) Test equipment required for routine maintenance and calibration including their procedures; d) Illustration of internal and external mechanical parts. e) The detailed description about the operation of the software used in the equipment, if any, including its configuration procedure, installation, loading and debugging etc. **ii) Repair Manual** a) List of replaceable parts used including their sources and the approving authority; b) Detailed ordering information for all the replaceable parts shall be listed to facilitate reordering of spares as and when required; c) Procedure for trouble shooting of instrument shall be provided. Test fixtures and accessories required for repair shall also be indicated. Systematic trouble shooting charts (fault tree) shall be given for the probable faults with their remedial actions.	
4.0	**SAFETY REQUIREMENTS:**	
4.1	The operating personnel shall be protected against shock	Test Reports

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	hazards as per IS 8437 {1993} - "Guide on the effects of current passing through the human body" [equivalent to IEC publication 60479-1 (1984)]. The Manufacturer/supplier shall submit a certificate in respect of compliance to these requirements.	Certificates from accredited test labs are to be submitted
4.2	The equipment shall conform to relevant safety requirements as per IS 17724 (Part 1): 2023/IEC 61010-1: 2010 + AMD1:2016 + COR1:2019, as prescribed under Table no. 1 of the TEC document 'SAFETY REQUIREMENTS OF TELECOMMUNICATION EQUIPMENT- TEC 10009: 2024'. The Manufacturer/supplier shall submit a certificate in respect of compliance to these requirements.	Test Reports Certificates from accredited test labs are to be submitted
4.3	The instrument should follow proper construction practice to minimize unintended radiation due to leakage from any gap or monitoring points. All unused ports and monitoring points should be terminated. The power flux density shall not exceed 1mW/cm^2 at a distance of 2.5 cms.	Test Reports Certificates from accredited test labs are to be submitted
5.0	**EMI/EMC Requirements:**	
5.1	**General Electromagnetic Compatibility (EMC) Requirements: -** The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report shall be furnished from a test agency. **a) Conducted and radiated emission:** **Name of EMC Standard:** "CISPR 11 {2024} - Industrial, scientific and medical equipment- radio- frequency disturbance characteristics- Limits and methods of measurement" **Limits:-**	Test Reports Certificates from accredited test labs are to be submitted

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	i) To comply with the category of Group 1 of ClassA of CISPR 11 {2024} or latest. ii) The values of limits shall be as per relevant tables under CISPR11 (2015) or latest. **b) Immunity to Electrostatic discharge:** **Name of EMC Standard:** IEC 61000-4-2 {2001) IEC 61000-4-11 (2020) "Testing and measurement techniques of Electrostatic discharge immunity test". **Limits: -** i) Contact discharge level 2 {± 4 kV} or higher voltage; ii) Air discharge level 3 {± 8 kV} or higher voltage; **c) Immunity to radiated RF:** **Name of EMC Standard:** IEC 61000-4-3 (2006) IEC 61000-4-11 (2020) "Testing and measurement techniques-Radiated RF Electromagnetic Field Immunity test" **Limits:-** **For Telecom Equipment and Telecom Terminal Equipment with Voice interface(s)** i) Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and ii) Under test level 3 (10 V/m) for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz. **For Telecom Terminal Equipment without Voice interface (s)**	

	Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz. **d) Immunity to fast transients (burst):** **Name of EMC Standard:** IEC 61000- 4- 4 {2004) IEC 61000-4-11 (2020) "Testing and measurement techniques of electrical fast transients/burst immunity test" **Limits:-** Test Level 2 i.e. a) 1 kV for AC/DC power lines; b) 0. 5 kV for signal / control / data /telecom lines; **e) Immunity to surges:** **Name of EMC Standard:** IEC 61000-4-5 (2005) IEC 61000-4-11 (2020) “Testing & Measurement techniques for Surge immunity test" **Limits:-** i) For mains power input ports : (a)1.0 kV peak open circuit voltage for line to ground coupling (b) 0.5 kV peak open circuit voltage for line to line coupling ii) For telecom ports : (a) 0.5 kV peak open circuit voltage for line to ground (b) 0.5 KV peak open circuit voltage for line to line coupling. **f) Immunity to conducted disturbance induced by Radio frequency fields:**	

	Name of EMC Standard: IEC 61000-4-6 (2003) with amendment 1 (2004) & amd. 2 (2006) "Testing & measurement techniques-Immunity to conducted disturbances induced by radio- frequency fields" **Limits:-** Under the test level 2 {3 V r.m.s.} in the frequency range 150 kHz-80 MHz for AC / DC lines and Signal /Control/telecom lines. **g) Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any):** **Name of EMC Standard:** IEC 61000-4-11 (2020) "Testing & measurement techniques- voltage dips, short interruptions and voltage variations immunity tests" **Limits:-** i) a voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms(i.e. 70 % supply voltage for 500 ms) ii) a voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms) and iii) a voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s. **Note 1**: Classification of the equipment: **Class B:** Class B is a category of apparatus which satisfies the class B disturbance limits. Class B is intended primarily for use in the domestic environment and may include: • Equipment with no fixed place of use; for example, portable equipment powered by built in batteries;	

	• Telecommunication terminal equipment powered by the telecommunication networks; • Personal computers and auxiliary connected equipment. Please note that the domestic environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the apparatus connected. **Class A:** Class A is a category of all other equipment, which satisfies the classA limits but not the class B limits. **Note 2:** The test agency for EMC tests shall be an accredited agency and details of accreditation shall be submitted. **Note 3:-** For checking compliance with the above EMC requirements, the method of measurements shall be in accordance with TEC Standard No. TEC 11016:2016 (Old no. TEC/SD/DD/EMC-221/05/OCT-16) or latest release and the references mentioned therein unless otherwise specified specifically. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (g) and TEC Standard No. TEC 11016:2016 (Old no. TEC/SD/DD/EMC-221/05/OCT-16) or latest release. The details of IEC/CISPR and their corresponding Euro Norms are as follows: **IEC/CISPR Norm** — **Euro** CISPR 11 — EN	

	55011 IEC 61000-4-2 EN 61000-4-2 IEC 61000-4-3 EN 61000-4-3 IEC 61000-4-4 EN 61000-4-4 IEC 61000-4-5 EN 61000-4-5 IEC 61000-4-6 EN 61000-4-6 IEC 61000-4-11 EN 61000-4-11	

I. TEST SETUP & PROCEDURES:

Note:

(a) The test set-up given in this document are tentative and may be changed by testing officer, taking in to account, network/testers/ analyzer/simulator availability. In case of any discrepancy between this TSTP and GR, GR clause shall prevail.

(b) Since this is provisional TSTP, on the basis of inputs received, setup was prepared. Therefore, whenever the first testing will be offered, this provisional TSTP would be revised.

(c) Actual setup and tester/simulator may vary at the time of testing.

(d) Testing of L&SP will be done on the basis on testing facility available for testing L&SP. If no testing facility is available for testing L&SP, then undertaking from OEM may be taken.

Test No.	**Test Case-1 (Frequency Tolerance & Drift)**
Test Details	For Clause no. 2.4
Test Setup	1. Electronic Locator Unit (Transmitter mode) 2. Calibrated Frequency Counter 3. Near-field pickup loop / non-contact RF probe 4. Environmental Chamber (–10°C to +55°C) 5. Fresh set of batteries / rated DC supply 6. Digital Multimeter
Test Procedure	**A. Initial Frequency Accuracy Test (Room Temperature)** 1. Insert fresh batteries and power ON the locator unit and select the required transmitter frequency. 2. Allow a warm-up stabilization period of 5 minutes after power ON and position the pickup loop in proximity to the transmitting antenna without introducing any loading effect and connect the pickup loop output to a calibrated frequency counter to measure transmitted frequency continuously for 60 seconds. 3. Record the average frequency value and compare with nominal set frequency. **B. Temperature Drift Test** 1. Switch OFF the locator and place it inside a temperature chamber and soak the unit for 2 hours at each temperature point:–10°C, +25°C, +55°C. 2. After soaking, switch ON the locator while still inside the

	chamber and allow 5 minutes for operational stabilization. 3. Then, measure the transmitted frequency using pickup loop and frequency counter. 4. Record frequency deviation from nominal value at each temperature point. **C. Supply Voltage Drift Test** 1. Operate the locator at 100% rated battery voltage to measure and record transmitted frequency and reduce supply to 75% of rated battery voltage using a variable DC source or battery simulator then measure and record transmitted frequency. 2. Reduce supply further to 50% of rated battery voltage and again measure and record the transmitted frequency to compare frequency variation at all voltage levels with nominal frequency. **D. Warm-Up Drift Test** 1. Keep locator powered OFF at room temperature for sufficient time to ensure cold start condition then Power ON the locator and select the nominal transmitter frequency. 2. Start frequency measurement immediately using pickup loop and frequency counter and record the reading at 1-minute intervals for 10 minutes to determine and record the maximum frequency deviation observed during warm-up period.
Test limits	Ensure that the frequency tolerance at any condition shall limit within ±1% of nominal frequency.
Expected Results	Check measurement accuracy and limit as specified in GR

Test No.	**Test Case-2 (Transmitter Output Power)**
Test Details	For Clause no. 2.5
Test Setup	1. Electronic Locator Unit (Transmit mode) 2. Calibrated RF Power Meter with LF/RF sensor 3. 50 Ω Dummy Load (power rating ≥ 5 W) 4. Oscilloscope (optional for waveform verification) 5. Fresh batteries / rated DC supply
Test Procedure	1. Switch OFF the locator and connect transmitter output to RF power meter through dummy load of power rating ≥ 5 W. 2. Power ON locator and select the operating frequency and allow 5 minutes warm-up. 3. Measure average output power for at least 1 minute. Repeat test at: Low battery condition (≈75% voltage) and high temperature (+55°C) and record all the readings.
Test limits	Ensure that the transmitter output power shall limit within 1.5 Watts (Max.).
Expected Results	Check measurement accuracy and limit as specified in GR.

Test No.	**Test Case-3 (Type of Modulation)**
Test Details	For Clause no. 2.6
Test Setup	1. Electronic Locator Unit (Transmit mode) 2. Digital Storage Oscilloscope 3. RF Pickup Loop / Near-field probe 4. Frequency Counter (for tone verification) 5. Fresh batteries / rated supply
Test Procedure	**A. Carrier Modulation Depth (100%)** 1. Power ON locator and select the transmit frequency and place pickup loop near antenna and observe RF waveform envelope on oscilloscope (AM mode). 2. Measure envelope peaks and troughs. 3. Modulation Index m= {(Vmax-Vmin)/ (Vmax+Vmin)} 4. Calculate modulation percentage. **B. Modulating Tone Frequency** 1. Observe envelope repetition on oscilloscope. 2. Measure frequency of modulation envelope using scope cursors and confirm modulating tone frequency ≈ 500 Hz. **C. Carrier ON Time Measurement** 1. Zoom into time domain of RF burst. 2. Measure duration of carrier burst using cursors and record the ON time.

Test limits	Ensure that the transmitter modulation shall be 100% amplitude modulation, with a 500 Hz carrier (varying tone), and the carrier ON time shall be approximately 800 microseconds (approx.), as specified in the GR.
Expected Results	Check measurement accuracy and limit as specified in GR.

Test No.	**Test Case-4 (Storage on System/Instrument)**
Test Details	For Clause no. 2.23, 2.24.1.1
Test Setup	1. Electronic Locator Unit 2. Set of RFID markers / simulated marker IDs 3. OEM software interface (if required) 4. PC/Laptop for data verification 5. Power source (battery/adapter) 6. External storage device (USB pen drive / external hard disk)
Test Procedure	1. Power ON the locator. 2. Create or read marker entries sequentially (ID + geo-coordinates + associated data) and continue storing the entries until memory full indication appears. 3. Note the total number of successfully stored marker records. 4. Switch OFF and ON the device to verify data retention. 5. Retrieve stored records through device interface or PC software and check whether data corruption or missing entries. 6. Connect external storage device and verify extension of storage of the marker data.
Test limits	Ensure that the locator device shall have internal memory to store data for a minimum of 500 markers and ensure that the system shall successfully store and retrieve marker data using an external storage device.

Expected Results	Check measurement accuracy and limit as specified in GR.

Test No.	**Test Case-5**
Test Details	Clause no. 2.2, 3.10.1 , 3.10.4,3.10.9
Test Setup	1. Install one electronic marker at a known location in a test pit. 2. Bury the marker at a controlled and documented depth as per manufacturer recommendations. 3. Ensure the test area is free from metallic objects such as water conduits, power cables or other electronic markers with a minimum clearance of 30 cms all round to avoid interference. 4. Power on the electronic locator and select the appropriate marker detection mode corresponding to the marker frequency.
Test Procedure	1. Signal Transmission • Activate the locator in electronic marker detection mode. • Verify that the locator transmits the designated frequency intended for marker excitation. 2. Marker Excitation and Signal Reflection • Sweep the locator probe slowly over the expected marker location. • Confirm that the buried marker, tuned to the transmitted frequency, is energized and reflects the signal. 3. Signal Reception and Validation • Verify that the reflected signal is received by the locator

	probe. • Confirm that the locator validates the signal as a marker response and not as interference or noise. 4. Location Indication • Observe the visual indication on the locator display (signal strength, peak response, or directional guidance). • Verify the presence of an audible tone that increases or peaks when directly above the marker. • Identify and mark the position of maximum signal response as the detected marker location.
Test limits	The test shall be considered PASS if all the following conditions are satisfied: • The locator transmits the specified marker frequency. • The buried electronic marker reflects the transmitted signal. • The locator successfully receives and verifies the reflected signal. • A clear visual indication of marker detection is displayed. • A distinct audible tone is generated and peaks at the marker location. • The detected marker position matches the known installed location within acceptable tolerance.

Test No.	**Test Case-6(Sensitivity control facility, Deflection in indicator system)**
Test Details	For Clause no. 2.8, 2.9, 3.10.5, 3.10.6
Test Setup	1. Electronic Locator Unit 2. Set of frequency-coded markers (83.0, 101.4, 121.6, 134.0, 145.7 kHz) 3. Test field with markers buried at known depth 4. Measuring tape
Test Procedure	**A. Sensitivity Control Verification** 1. Power ON locator and select a test frequency and position locator above corresponding buried marker. 2. Observe baseline visual (needle/display graph) and audible indication. 3. Adjust sensitivity control and confirm the proportional change in display/needle deflection and audio tone intensity. **B. Multi-Frequency Selection Verification** 1. Select each frequency sequentially from front panel. 2. For each selected frequency, scan area and detect only the marker tuned to that frequency. 3. Confirm no indication from markers of other frequencies. 4. Repeat detection with sensitivity optimized.

	C. Marker ID Read Test 1. Keep the locator probe positioned directly above the detected marker. 2. Initiate the marker read function on the locator and observe the display for Marker ID / Unique ID.
Test limits	Ensure that the electronic locator shall be provided with sensitivity control facility so that the indicator system viz., needle deflection/ display graph and audible signal can be conveniently set during the use. The locator shall be capable of locating markers of any of the frequencies through a selection feature on the front panel of the locator. Full deflection shall be observed when the locator is above the marker and No deflection shall be observed when the locator is away from the marker with Marker ID / Unique ID shall be correctly displayed on the locator screen upon detection.
Expected Results	Check measurement accuracy and limit as specified in GR.

Test No.	**Test Case-7(RFID Read/Write Capability of Electronic Locator)**
Test Details	For Clause no. 3.10.7
Test Setup	1. Electronic Locator Unit with RFID function 2. RFID-enabled Electronic Markers 3. PC/Laptop with OEM interface software (if required) 4. Test data set (ID, utility type, owner name, etc.)
Test Procedure	**A. RFID Read Function** 1. Power ON locator and enable RFID mode. 2. Bring locator near RFID marker and initiate the read command. 3. Verify marker Unique ID and stored data displayed correctly. **B. RFID Write Function (If Applicable)** 1. Select marker and enter test data into locator interface. 2. Execute write command to RFID memory. 3. Re-read marker memory and verify whether the written data matches the input data. **C. UID-only Marker Condition (Optional Case)** 1. Use marker containing only factory-programmed UID. 2. Confirm locator reads UID correctly and verify that write function is disabled or not required.
Test limits	Ensure that electronic locator should have facility to be able to read

	& write data on the marker RFID memory. RFID memory should be on the marker. However, the purchaser may not opt the requirement of Electronic marker having ability to write data on the marker RFID memory in case of marker is having only unique identification ID embedded in its memory chip and no other data is stored in the marker memory.
Expected Results	Check measurement accuracy and limit as specified in GR.

J. SUMMARY OF TEST RESULTS

TEC Standard No._____

TEC Guide No._____

Equipment name & Model No._____

Clause No.	***Compliance*** *(Complied /Not Complied / Submitted/Not Submitted / Not Applicable)*	***Remarks / Test Report Annexure No.***

[Add as per requirement]

Date:

Place:

Signature & Name of TEC testing Officer /

* Signature of Applicant / Authorized Signatory

* *Section J as given above is also to be submitted by the Applicant/ Authorised signatory as part of in-house test results along with Form-A. The Authorised signatory shall be the same as the one for Form 'A'.*