

**भारत सरकार**  
**Government of India**  
**रेल मंत्रालय**  
**Ministry of Railways**



**Specification of GPS Based Foot Plate Inspection Device**  
**Spec.No.TM/SM/326 dated 03.07.2012**  
**(First Revision, August 2020)**

**Track Machines & Monitoring Directorate**  
**Research Designs and Standards Organization**  
**Manak Nagar, Lucknow-226011**



SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 1 of 8
Prepared by:	Checked by:	Approved by:	

**1.0 Scope:** This specification covers the functional requirements with testing criteria for GPS (Geo Positioning System) based Foot Plate Inspection Device. The device consists of GPS receiver and recording unit. This device is proposed to be used for marking and storing the locations of track defects while inspecting track on foot plate/brake van/inspection car/push trolley or motor trolley on Indian Railway. This device stores the location ID i.e. location of KM posts/ HPs/EPs as well as track defects in memory which can be retrieved on Graphic LCD display (In term of Latitude and Longitude). The inspection and location ID file stored in device can be transferred to PC through USB port and PC gives fault location in terms of KM posts/HPs/EPs ID (as fed). In this specification GPS (Geo Positioning System) based Foot Plate Inspection Device will be herein after referred to as ‘device’ for convenience.

**2.0 References:** Following codes/specifications have been referred to in this specification. Updated copy of latest version with correction slip/amendments of these codes/specifications shall be followed and available at the works of the firm.

1.	IS: 9000 (Part II/ sec 1 to 4) – 1977(Re-affirmed 2016)	Basic Environmental testing Procedures for Electronic and Electrical Items. Part-II/Sec. 3 Cold Test.
2.	IS: 9000 (Part III/Sec.1 to5) – 1977 (Re-affirmed 2016)	Basic Environmental testing Procedures for Electronic and Electrical Items. Part-III/Sec.-3 Dry Heat Test.
3.	IS:9000(Pt.XV)/Sec1 to 9-1982 (Re-affirmed 2016)	Basic Environmental testing Procedures for Electronic and Electrical Items. Pt.XV Sealing Test

### 3.0 Materials, Processing And Workmanship:

- 3.1 The device shall be made of good and durable light weight material having no weathering effect.
- 3.2 The key pad shall be of proven quality and the markings, embossed/painted on each key shall be durable and shall not be easily erasable and shall be spill-proof.
- 3.3 The surface of the device shall be smooth and there shall be no rough corner/edges.
- 3.4 The LCD display screen shall be scratch-resistant.

### 4.0 Functional Requirements:

- 4.1 The device shall be capable of recording and storing location ID of the locations of KM posts/Fixed structures/conventional chainage in railway track in terms of Latitude and Longitude.
- 4.2 The device shall record and store the short comings/defects in track parameters as observed and fed to the device during inspection.
- 4.3 The system shall have the facility to store the following data on pressing the fault ID button:
  - (a) Date
  - (b) DN/UP/SL/L1 - L9
  - (c) Longitude & Latitude
  - (d) Fault ID
  - (e) Speed

SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 2 of 8
Prepared by:	Checked by:	Approved by:	

4.4 The following types of defects are required to be identified on the track and the key board shall have the provision of marking these defects:

XL	Cross level
AL	Alignment
UN	Unevenness
VER	Versine
BD	Ballast Deficiency
SE	Super elevation on curve
LP	Loose packing
LJ	Low joint
BA	Bridge
LC	Level crossing
Weld	Bad weld
P&C	Point & Xing
OTH	Other Defects/Remarks
SEJ	SEJ
WEED	Weeds on cess

During recording, the system should also give an audio beep sound when the key is pressed, showing the type of defect. There shall be provision to mark Fault Id with \* to indicate that the fault is severe. There shall also be provision to type comments/remarks up to 15 alpha-numeric characters by pressing OTH key.

4.5 The format of the Inspection file transferred on PC shall be as below:-

#### Inspection Report

SN	Date	Line	Speed	Fault	Loc ID (KM/HP/EP/Conventional Chainage)

4.6 The System shall have the facility for making location ID file. Locations ID file stores the location of Km posts/HPs/EPs located along the track. The format of the location ID file on PC shall be as below:

S.No.	Date	Latitude	Longitude	Loc ID (KM/HP/EP/Conventional Chainage)

- 4.7 (a) The system shall have the facility for transferring data from this device to PC through USB port.  
 (b) Data transferred in Computer should also create a file in ASCII format compatible to TMS software as given below:-

**Location Record Format:**

I	,	R	R	R	R	,	D	D	D	D	,	S	S	S	S	-	S	S	S	S	,	W	W	W	W	W	-	N	N	N	N	N	,	L	L
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- I - Record identifier: 1 for location record.  
 RRRR - Name of Railway in 4 Alphanumeric characters.  
 DDDD - Name of Division in 4 Alphanumeric characters.  
 SSSS- SSSS - Name of Section in 9 Alphanumeric characters.  
 WWWWW- NNNNN - Locomotive model in 5 Alphanumeric characters & Locomotive number in 5 Numeric characters.  
 LL - Name/Number of Line in 2 Alphanumeric characters.

**Inspection Record Format:**

I	,	D	D	/	M	M	/	Y	Y	,	A	A	A	,	F...F	,	Y	Y	Y	Y	.	Y	Y	Y	,	X	X	X	X	.	X	X	X	,	*
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- I - Record identifier: 2 for Inspection record.  
 DD/MM/YY - Date, Month & Year.  
 AAA - Speed of Train (kmph) in 3 Numeric characters.  
 F...F - Type of fault recorded in 19 Alphanumeric characters.  
 YYYY.YYY - Latitude (first two digit in degrees, next two in minutes and last three in decimal fraction of minute) in 8 Numeric characters.  
 XXXX.XXX - Longitude(first two digit in degrees, next two in minutes and last three in decimal fraction of minute) in 8 Numeric characters.  
 \* - Indicates fault is severe.

4.8 In normal use, the device shall display following parameters:

- Date & Time
- Latitude & Longitude
- Speed
- Number of Satellites visible
- Battery condition

4.9 Device shall have menu based and user friendly man machine dialogue by using key board and LCD display which enables:

- Recording of location ID & Inspection.
- Transferring of above data to PC.
- Retrieving of above data on LCD display.
- Delete key for deletion of wrong entry in location ID & Inspection.
- Up and Down Arrow keys for scrolling the readings.

Device should be protected by user password.

4.10 The battery charging shall be done by the charger from 230/110 AC supply available in office/train compartment. Charging time should be 8-10 hours.

SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 4 of 8
Prepared by:	Checked by:	Approved by:	

## 5.0 Technical Features:

i)	Power source	Re-chargeable battery
ii)	Battery backup	Minimum 8 hrs. during inspection
iii)	Memory type	EEPROM/Flash
iv)	Memory size	Minimum 1000 events of inspection and minimum 2000 events of locations
v)	Size of the device	Approx.160X100X40 mm which can easily be held in palm.
vi)	Weight of Handheld Device including battery	Maximum 500 gm.
vii)	Resolution of GPS receiver	0.001 Minute of latitude & longitude.
viii)	Accuracy of GPS receiver	Better than 4 m CEP50 and 10 m 2dRMS (CEP95) for horizontal under open and clear sky condition.

## 6.0 Tests:

### 6.1 Tests at the time of initial approval (Type Tests):

The supplier/ manufacturer shall offer two prototypes of the device for type test after successfully carrying out the internal tests. The supplier/manufacturer shall submit internal test certificate to RDSO before commencement of the type tests. Following tests shall be carried out in sequence:

#### 6.1.1 Visual & Dimensional check:

The device shall be checked visually and dimensionally. The device shall be free from all visual defects in material, construction and fabrication. The weight of Handheld Device including battery shall also be taken and recorded by the Inspecting officer.

#### 6.1.2 Accuracy Test: The device shall be checked for its specified accuracy in the following manner:

This test shall be conducted in open and clear sky condition. The inspecting official shall mark at least 4 different location points randomly selected at minimum distance of approximately 50m and these location IDs shall be recorded in the device. After every ten minutes, the device shall be moved over these markings to record the locations again and this operation shall be repeated for twenty times. The latitude & longitude for each location point should fall within the periphery of specified accuracy.

#### 6.1.3 Environmental Tests:

The following tests shall be performed on both prototypes:

##### a) Dry heat test b) Cold test c) Water Immersion Test for GPS receiver/antenna.

**a) Dry heat test:** This test is intended to determine suitability of the device to withstand high temperature severities prevailing in hot days of summer. This test shall be conducted as specified in IS: 9000 (Part III/Section 3) at the following severity:

Temperature	+55±2 <sup>0</sup> C
Duration	4 hrs.

**b) Cold test:** This test is intended to determine the suitability of the device at the specified low temperature likely to be encountered in coldest days of winter. The test shall be conducted as specified in IS: 9000 (Part-II/ sec 3) at the following severity:

SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 5 of 8
Prepared by:	Checked by:	Approved by:	

Temperature	+5±3 <sup>0</sup> C
Duration	4 hrs.

- c) **Water immersion test for GPS receiver/antenna:** Water immersion test shall be carried out in clean water as per IS: 9000(Part-.XV)/Sec.7-1982 under 40 cm water head for 24 hours.

#### 6.1.4 Location ID Recording Test:

This test is intended to ascertain whether the device is capable to record the location ID correctly. The device shall be moved by the inspecting official from a pre-selected location to such a distance so that at least 10 different location points in the route of the movement can be uploaded in the device to form location ID file. The mutual distances between two consecutive location points shall be at least 50 m. The testing route may be along the railway track or along a road having suitable location markings/points at regular intervals. After completing the recording of location ID the device shall be moved back by the inspecting official. Any location point within the periphery of location ID file shall be recognized by the device in terms of latitude and longitude in LCD display. During type test this test shall be done for a patch of about 3 Km along the Railway Track by travelling on foot or on trolley. During acceptance test this test shall be for at least 10 different location points where the mutual distances between two consecutive location points shall be at least 50 m.

#### 6.1.5 Test for Recording Track Defects:

After establishing the location ID file in the device as per clause 6.1.4, the inspecting official shall move with the device along the same route as recorded in location ID file and press the respective keys for feeding the defects as indicated in the table at clause 4.4 at different locations randomly. The fault (Track defects) shall be recorded in the device without any trouble and the same shall be displayed in the LCD screen whenever retrieved.

#### 6.1.6 Test for Transferring Data to PC:

The recorded data shall be transferred to PC by connecting the device through USB port. The data shall be displayed on PC as per the format mentioned in the tables of clauses 4.5, 4.6 and 4.7 respectively. Printing of the displayed data shall be taken and attached to the inspection report.

### 6.2 Tests at the time of supply (Acceptance Test):

Following tests shall be done as acceptance test in sequence for all the samples randomly collected as per clause 7.0:

- (i) Visual and Dimensional Check as per clause 6.1.1.
- (ii) Location ID Recording Test as per clause 6.1.4.
- (iii) Test for Recording Track Defects as per clause 6.1.5
- (iv) Test for Transferring Data to PC as per clause 6.1.6

### 7.0 Inspection:

- 7.1 Inspection of the device against zonal railways purchase order shall be carried out by purchaser zonal railway or any representative /agency authorized by CTE. The cost of inspection and testing shall be borne by the manufacturer/supplier.

SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 6 of 8
Prepared by:	Checked by:	Approved by:	

7.2 05% or min. 2 nos. of the device per lot/PO (randomly selected) shall be inspected for its performance as mentioned in the clause no. 6.2. If the samples satisfy the entire test prescribed as per acceptance criteria, the lot is accepted, otherwise lot is rejected.

**8.0 Warranty & AMC:**

8.1 Any part of the device failing or proving unsatisfactory in service due to defective design, material or workmanship within 12 months from the date of commissioning shall be replaced by the supplier/ manufacturer at his own expenses.

8.2 During procurement of the device railways should go post-warranty AMC with the supplier for a pre-determined period as decided by the purchaser railway. This shall be incorporated in the tender document as a condition of contract/Tender/Supply.

8.3 For procurement of GPS Based Foot Plate Inspection Device with AMC, Comprehensive Guideline on Procurement, Operation, Maintenance and Repair of Small Track Machines (report No.TM-227) may be referred.

**9.0 Service Facility and Spare Parts (including tools):**

9.1 The supplier/manufacturer shall provide service of competent service engineers free of cost during commissioning and warranty period. The service engineer shall guide the operating and maintenance staff during commissioning and warranty period of the device for proper operation and handling.

9.2 The manufacturers/supplier shall have good service network throughout the country for quick and easy access to the users. A prompt response to the call of the customers is expected in case of any problem experienced in field.

9.3 Each device shall be supplied with a complete set battery charger with cables, connection cable to USB port and other necessary attachment as prescribed by the manufacturer/supplier for trouble free operation of the device.

9.4 The manufacturer/supplier shall be responsible for subsequent availability of the spare parts/components/chips etc. to ensure trouble free service for the normal life (5-8 Years) of the device.

**10.0 Documentations:**

10.1 Copies of maker’s test certificate guaranteeing the performance of the device shall be supplied in duplicate alongwith delivery of each device.

10.2 In order to facilitate trouble-free operation, the manufacturer/ supplier shall supply operating and maintenance manual including trouble shooting details. These shall exhibit clearly the details of the various components.

**11.0 Training and Commissioning:**

Adequate training in operation and maintenance of the device shall be imparted to railway operators by the manufacturer either at manufacturer’s premises or at railway premises, as per the convenience of the purchaser/mutually agreed between the purchaser and the supplier, at the rate of two operators per device which shall be treated as part of commissioning.

SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 7 of 8
Prepared by:	Checked by:	Approved by:	

**12.0 Marking and Packaging:**

12.1 Each device shall be legibly and indelibly marked/ stickered with the following details:

- (i) Name and trade mark/brand of the manufacturer.
- (ii) Contact details of manufacturer/ supplier
- (iii) Serial no. of the device.
- (iv) Month & year of supply.

12.2 The device shall be packed in wooden/suitable carton after covering with good quality plastic sheets as per best trade practice.

13.0 All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 (Document Title: Vendor - Changes in approved status), subsequent versions / amendments thereof shall be binding, and applicable on the successful manufacturers/suppliers in the contracts floated by Railways to maintain quality of products supplied to Railways. The update document is available on RDSO Website i.e. <https://rdso.indianrailways.gov>.

14.0 Preference to Make in India:  
The Government of India policy on 'Make in India' shall be applicable.

\*\*\*\*\*

SSRE/SSE/JRE	ARE/DTM/EDTM	PEDTM	Page 8 of 8
Prepared by:	Checked by:	Approved by:	