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TECHNICAL CIRCULAR NO. RDSO/2018/EL/TC/0143 Rev '0' dated 09.01.2018

Sub: Technical Circular for GPS device for Electric Locomotives in Indian Railways

Ref: Specification no. RDSO/2018/EL/SPEC/0132/ Rev. '0'

1.0 INTRODUCTION

1.1 This technical circular describes the details of keypad, data entry process, webpage and future scope of GPS devise proposed to be provided in Electric Locomotives.

1.2 It is proposed to install GPS device in all types of Electric locomotives for transmitting train number, locomotive number, GPS location and speed information to a server. This information can be accessed by authorized users through a website using desktop/laptop/mobile.

2.0 SIZE, MOUNTING DETAILS

The GPS device is proposed to be mounted in the locomotive. Exact mounting location and dimensions will be decided after development of device.

3.0 KEY PAD & DISPLAY UNIT DETAILS:

The GPS device will be provided with a 16 character 2 line black on white backlit LCD display for feeding Loco number and train number and to configure the GPS device. The default display on LCD Display Screen of GPS device shall be as per Clause 5.0.

The following is the protocol for viewing and setting the Loco number and train number on GPS device using Keypad. The data shall be viewed or set with a 15 key membrane Keypad having 10 Alphanumeric Keys containing Numeric digits 0 – 9 and Alphabetical Letters A to Z

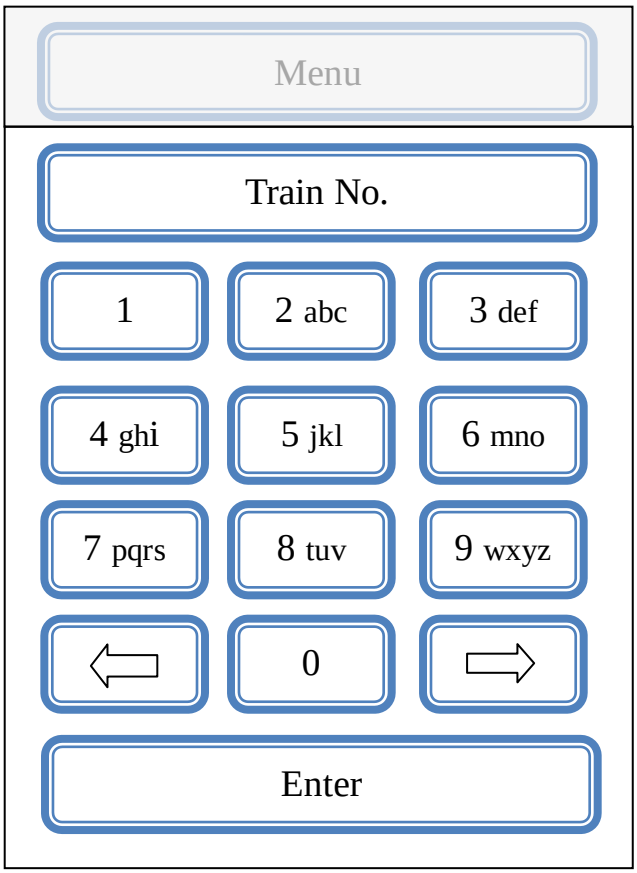
Distribution of letters of Alphabet on numeric keys shall be as given below:

The detailed descriptions of the keys are given below:-

SN	Description	Button
1.	'0' Key	0
2.	'1' Key OR press 10 sec to go view storage data on display screen.	1
3.	'2' Key shall have letters A, B, C	2 abc
4.	'3' Key shall have letters D, E, F	3 def
5.	'4' Key shall have letters G, H, I	4 ghi
6.	'5' Key shall have letters J, K, L	5 jkl
7.	'6' Key shall have letters M, N, O	6 mno
8.	'7' Key shall have letters P, Q, R, S	7 pqrs
9.	'8' Key shall have letters T, U, V	8 tuv
10.	'9' Key shall have letters W, X, Y, Z	9 wxyz
11.	**NAVIGATE LEFT** To move previous character on left side.	⇦

SN	Description	Button
12.	**NAVIGATE RIGHT** To move next character on right side.	⇨
13.	**ENTER** To accept the data	Enter
14.	**TRAIN NO.** To feed the Train Number	Train No.
15.	**Menu** To feed the Loco Number & IP Address	Menu.

4.0 Keypad layout of GPS device



Note: Menu key shall be provided inside the cabinet cover. This shall be used during commissioning and maintenance by the shed only.

On pressing of Key '2' first time, Numeric Digit 2 shall be entered. On pressing Key '2', 2nd time Letter 'A' shall be entered. On pressing Key '2', 3rd time Letter 'B' shall be entered. On pressing Key '2', 4th time Letter 'C' shall be entered and on pressing Key '2', 5th time Numeric digit 2 shall be entered again & this cycle will repeat.

The same procedure will be applicable for keys '3' to '9'.

5.0 Default display screen:

GPS device shall return to default display screen after 5 seconds of last entry of train number setting by the loco crew. The details of display screen are given below;

x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

2 line 16 characters black on white alphanumeric LCD display.

1st screen will show Loco no. and Train no.

Loco No
Train No.

L	N		2	7	5	4	3								
T	N		L	K	O	2	3	4	9						

Default screen-1: Showing Sample Loco No. & Train No.

On pressing Navigate Right key, 2nd screen showing Time and date will be displayed for 20 seconds. After 20 seconds, 1st default screen will be shown again.

HH:MM:SS
DD.MM.YYYY

T		1	1	:	2	5	:	4	1						
D		1	0	.	0	1	.	2	0	1	8				

Default screen-2: Showing Sample Date & time

Note: LN= Loco number, TN= Train number, T= Time & D= Date.

6.0 FUNCTION OF MENU BUTTON:

It shall be possible to enter 3 parameters i.e. Loco no., IP Addrress-1 and IP Address -2 by pressing this MENU key 1st, 2nd and 3rd times in ring buffer manner. Data shall be entered in 2nd line. 1st line will show function name like Loco no. or IP Addrress-1 or IP Addrress-1. At this time only numeric keys shall be active. MENU key will be inside the device cover accessible in shed during commissioning and maintenance period.

7.0 PARAMETER SETTING AND VIEWING PROTOCOL:

7.1 SETTING OF LOCO NUMBER & IP ADDRESS:

- When 'MENU' Key is pressed 1st time, existing loco number (Stored in memory) shall be shown on display in 2nd line with blinking curser at first digit of loco number (left most character in 2nd line of display screen). At this time 1st line will show 'ENTER LOCO No.'

E	N	T	E	R		L	O	C	O		N	O	.		
2	7	4	5	3											

- In this mode only numeric keys are enabled for entry of loco number.

- After pressing any new numeric digit, existing digit will change with new one and curser will shift to next digit in right side. Five digit loco number will be specified in this way, after which ENTER key will be pressed to save new loco number.

- Finally Pressing 'ENTER' Key shall do acceptance of this entry. After pressing 'ENTER' Key the display shall return to default display mode after displaying "Data Recorded" for 10 seconds.

D	A	T	A		R	E	C	O	R	D	E	D			

- Similarly both the IP address will be feed with the help of MENU key, by pressing it 2nd and 3rd time respectively following the procedure similar to above procedure.

7.2 SETTING OF TRAIN NUMBER:

- It shall be possible to enter the Alphanumeric Train Number by pressing 'TRAIN NO.' Key on the Keypad.

- After pressing 'TRAIN NO.' Key existing Train no. (Stored in memory) shall be shown in 2nd line on Display screen with 'ENTER TRAIN No.' showing on 1st Line.

E	N	T	E	R		T	R	A	I	N		N	O	.	
L	K	O	2	3	4	9									

- The new Train Number (Alphanumeric) shall be entered using keypad. Curser can be moved at appropriate position with (left & right) navigation keys.

- Pressing 'ENTER' Key shall do acceptance of this entry. After pressing 'ENTER' Key the display shall return to default display mode after displaying "Data Recorded" for 10 seconds.

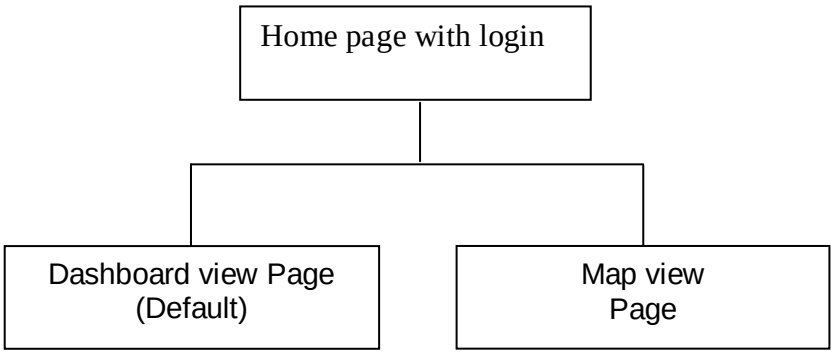
D	A	T	A		R	E	C	O	R	D	E	D			

8.0 Web Page Functional Overview

The GPS device data shall be displayed on webpage in following formats:-

1. Dashboard view.
2. Map view

8.1 Web page display Screens Structure



8.2 Dashboard view:

8.2.1 The following parameters shall be shown in dash board view in tabular format for all the locomotives provided with GPS device:

i. Locomotive number
ii. Train Number
iii. Locomotive status
iv. Date
v. Time
vi. Speed
vii. Location

8.2.2 Following filters will be used in both dashboard and map view pages with default setting of 'All":

i.	Operating Railways	ii.	Operating Division
iii.	Holding Sheds	iv.	Holding Railways
v.	Holding Division/Section	vi.	Loco Number
vii.	Loco Type	viii.	Train number

8.2.3 In dashboard view, locomotive number will be selectable/ Hyperlinked. On selecting any locomotive number, its historical GPS data will be available in tabular view as well as in Map View. In tabular view following data will be shown for the selected locomotive number with option to further filter the data based on the date range:

i. Locomotive number
ii. Train Number
iii. Locomotive status
iv. Date
v. Time
vi. Speed
viii. Location

8.2.4 From dashboard view it will be possible to switch to map view and vice-sversa.

8.2.5 When historical GPS data of a locomotive is displayed, it will be possible to view the movement of selected locomotive on the map for the selected date range.

8.3 Map view:

8.3.1 In Map view, all the locomotives provided with GPS device will be shown on the Map of India.

8.3.2 When a particular locomotive is selected, it will be possible to view the movement of selected locomotive on the map for the selected date range. It will also be possible to view its historical GPS Data in tabular format.

8.3.3 In map view also, filters as given in clause 8.2.2 can be used.

8.3.4 Graphical Legend for locomotive on web portal:

The following legend shall be used for loco condition on map and dashboard

S. no.	Loco indication on map and dashboard		
	Conditions	Color	Legend
1.	Loco Battery is ON & Loco is in running condition	Green with flashes	
2.	Loco Battery is ON & Loco is in stop condition	Green	
3.	Loco Battery is OFF & Loco is in running condition	Blue	
4.	Loco Battery is OFF & Loco is in stop condition	Red	

8.3.5 Call outs shall come when curser will overlay on loco position viewed on web pages and following information shall be displayed:

i. Train number

ii. Loco number

iii. Home shed

iv. Speed

8.3.6 Sample of Map view

9.0 Potential of future development with GPS device:

With the GPS data of locomotive being available through the GPS device, using same device, following functionality can be added by developing software and utilizing GPS mapping data of the Division/Railway and GPS data of the locomotive received:

i. Auto-generation of train control charts
ii. Geo-fencing of stations for entry/exit alerts
iii. Identifying trains that are not running on Maximum Permissible Speed
iv. Observation of caution orders during running of trains
v. Observing quality of train controlling by the loco-pilots during observation of caution orders
vi. Identification of cases of over speeding
vii. Finding cases where wheel diameter is not properly updated in speedometer

9.1.18

(P. K. Saraswat)
For Director General (Elect.)

Encl: as above