सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

सिग्नलिंग उपकरणों के

अनुरक्षण निर्देशों का

सार - संग्रह

Compendium of
Maintenance instructions on
Signalling equipments





कैमटेक/एस/प्रोज/2016-17/कॉम्प-सिग/1.0

अक्टूबर 2016

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

अभामासंरडीसो
रेल अग्रदूत Transforming Railways
An ISO 9001:2008 Certified Organisation
उत्कृष्ट अनुरक्षण प्रौद्योगिकी केन्द्र
EXCELLENCE IN MAINTENANCE
Indian Railways
Centre for Advanced Maintenance Technology

Maharajpur, Gwalior (M.P.) - 474005

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FOREWORD

Signalling system plays a vital role in the movement of trains. On Indian Railways the signalling system consists of a variety of equipments and gears, such as LED Signals, Axle Counters, Electric Point machines etc. For efficient working of all these equipments, the maintenance staff should have a fair knowledge of important parameters, maintenance procedures and schedules.

CAMTECH has made an effort in this direction by compiling the available information on some important signalling equipments in brief in a single document. It gives me pleasure in presenting this compendium to Signal personnel and I hope that this will help them in their day to day working.

CAMTECH Gwalior **A.R.Tupe**
Date: 25.10.2016 **Executive Director**

PREFACE

For safe operation of trains, a large variety of gears are provided in a signalling system. Every equipment has different specific parameters and maintenance procedures. Some equipments are vendor-specific and require specific tools for maintenance. For maintaining such a large variety of equipments, the maintenance staff has to keep themselves updated with the latest information.

This compendium has been prepared for quick reference of parameters, maintenance schedules and instructions by the maintenance personnel. The compendium has been divided into sections; containing maintenance information on some important signaling gears. Railway Board and RDSO's latest available circulars are also included at appropriate places.

We are sincerely thankful to Shri O.P.Gupta, Sr.D.S.T.E.(Co.)/Nagpur/C.Rly., Shri T.A.Ansari, Sr.D.S.T.E.(Co.)/Jhansi/N.C.Rly., Railway Board, RDSO and RDSO approved firms and field personnel who helped us in preparation of the compendium.

Since technological upgradation and learning is a continuous process, you may feel the need for some addition/modification in this compendium. If so, please give your comments on email address dirsntcamtech@gmail.com or write to us at Indian Railways Centre for Advanced Maintenance Technology, In front of Adityaz Hotel, Airport Road, Maharajpur, Gwalior (M.P.) 474020.

CAMTECH Gwalior
Date: 25.10.2016

D.K.M.Yadav
Director (S&T)

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सुधार पर्चियों को जारी करना

ISSUE OF CORRECTION SLIPS

इस हस्तपुस्तिका के लिए भविष्य में जारी की जाने वाली सुधार पर्चियों के क्रमांक इस प्रकार से रहेंगे:

The correction slips to be issued in future for this handbook will be numbered as follows:

केमटेक/एस/प्रोज/2016 - 17/कोम्प -सिग /1.0 # XX दि .....

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0# XX date .....

जहां "XX" सम्बंधित सुधार पर्ची की क्रम संख्या है (01 से शुरू होकर)
Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

सुधार पर्चीयाँ जारी की गयीं

CORRECTION SLIPS ISSUED

सुधार पर्ची की क्रम संख्या Sr. No. of Correction Slip	जारी करने की तारीख Date of issue	संशोधित पृष्ठ क्रमांक एवं मद संख्या Page no. and Item No. modified	टिप्पणियाँ Remarks

डिस्क्लेमर

यह स्पष्ट किया जाता है कि इस सार-संग्रह में दी गयी जानकारी सिग्नल इंजीनियरिंग मैन्युअल, रेलवे बोर्ड प्रकाशनों तथा आर डी एस ओ प्रकाशनों के किसी भी वर्तमान आलेखों को विस्थापित नहीं करतीं है | यह दस्तावेज वैधानिक नहीं है वरन इसमें दिए गए निर्देश केवल मार्ग दर्शन हेतु हैं | यदि किसी बिन्दु पर विरोधाभास दृष्टीगोचर होता है, तब सिग्नल इंजीनियरिंग मैन्युअल, रेलवे बोर्ड प्रकाशनों, आर डी एस ओ मार्गदर्शन अथवा जोनल रेलवे के निर्देशों का पालन करें |

DISCLAIMER

It is clarified that the information given in this compendium does not supersede any existing provisions laid down in the Signal Engineering Manual, Railway Board and RDSO publications. This document is not statuary and instructions given are for the purpose of guidance only. If at any point contradiction is observed, then SEM, Railway Board/RDSO guidelines may be referred or prevalent Zonal Railways instructions may be followed.

हमारा उद्देश्य

अनुरक्षण प्रौद्योगिकी और कार्यप्रणाली का उन्नयन करना तथा उत्पादकता और रेलवे की परिसम्पत्ति एवं जनशक्ति के निष्पादन में सुधार करना जिससे अंतर्विषयों में विश्वसनीयता, उपयोगिता और दक्षता प्राप्त की जा सके |

OUR OBJECTIVE

To upgrade Maintenance Technologies and Methodologies and achieve improvement in Productivity and Performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability and Utilisation.

यदि आप इस सन्दर्भ में कोई विचार और सुझाव देना चाहते हैं तो कृपया हमें इस पते पर लिखें :

संपर्क सूत्र : निदेशक (संकेत एवं दूरसंचार)

पत्राचार का पता : भारतीय रेल उच्च अनुरक्षण प्रौद्योगिकी केंद्र,
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COMPENDIUM OF MAINTENANCE INSTRUCTIONS ON SIGNALLING EQUIPMENTS

Section 1

Axle Counters

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

1.1 Az LS Eldyne Single Section Digital Axle Counter

1.1.1 Tool Kit - Test equipment ETU001

1) True RMS digital multimeter with probe set (Type Fluke-177)– 1 no.
2) Extended wired Socket to interface with diagnostic plug – 1 no.
3) Selector Switch on panel-base – 1 no.
4) Adjustable reversible torque wrench (Type Norbar –6013011)- 1 no.
5) Deep Socket inserts with (13 mm & 19 mm) – I set.
6) 19 mm combined double ended spanner – 1 no.
7) Dummy wheel – 1 no.
8) Screw driver individual (Type Wago-210119) – 1 no.
9) Screw driver set (Type Taparia 812) – 1 set.
10) Screw driver individual (Taparia-932) – 1 no.

1.1.2 Important parameters

Frequency of TX heads of SK30H	approx. 30.6 kHz and 28 kHz
Standard lengths of cables for connection between TX/RX coils to the electronic junction box (EAK30H)	4m, 5.5m and 8m
Reset Relay	1000 ohm AC immunized Q series
Vital Relay	1000 Ohm AC immunized Q series 24 V 8F/8B
Recommended power supply for EAK	21.5 V DC to 28.8 V DC (for 24V version) 54 – 120VDC (for 60 – 120V version).

1.1.3 Installation of Track devices

- Installation between two sleepers.
- Web without embossing is to be chosen.
- Minimum distance 1 m from insulated joint & 2 m from neighboring rail contact.
- Tx heads mounted on Al casting with two M8 bolts, bowed pressure plates, washers and self locking nuts. The teeths and grooves must be lined-up carefully.
- Torque applied 25 Nm.
- Brackets, protecting tube and cable to be installed as per guideline.
- Track devices (Tx & Rx coils) are fixed on 3 holes drilled on rail web as per following approximation formula: a = (0.409 * h), where a = height of the mounting hole, h = height of the rail.

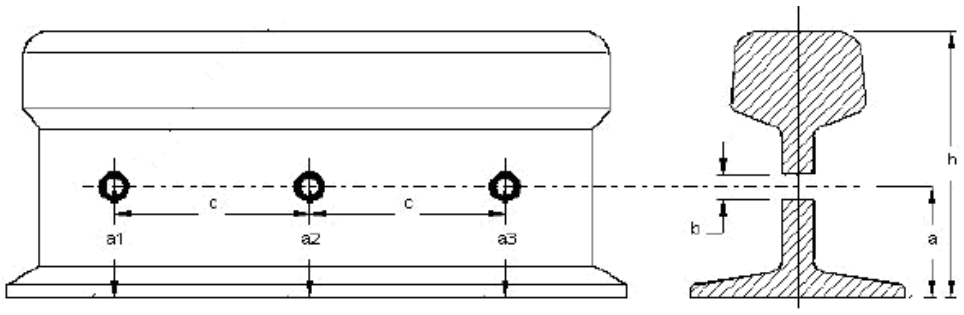


Fig. 1.1: Position of mounting holes for installation of Rail Contacts

a1 or a2 or a3 = a calculated ±1.5 mm
b =13 mm ± 0.2 mm
c =148 mm ± 0.2 mm
Height of mounting hole for different rail profiles is given below:

Rail Profile	**90 lbs**	**52 Kg**	**60 Kg**
a [mm]	56 mm	63 mm	68 mm

- Clean the area, mark and punch the three holes on rail web. The final three holes of diameter 13mm are drilled on the rail web with the help of drilling jig consisting of:
  a) Drilling template
  b) Mounting device for the drilling machine
  c) Templates for the standard rail profiles
  d) Fastening device
  e) The drilling machine
- Run a pilot drill of 6 mm diameter if required
- Drill the three 13 mm holes accurately.
- Clean the burrs on the drilled holes.
- Fix the Tx heads on the outside and Rx heads on the inside of the rail.
- Mount the protecting tube on the brackets with integral cable as per specified bends and clamping**.**
- Install the deflector plates (2 Nos. per dual rail contacts) to protect the rail contacts from hanging metal objects from passing train.

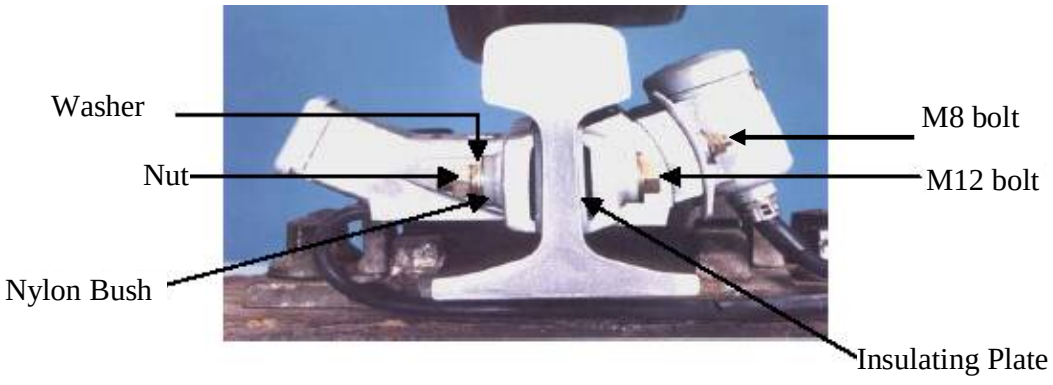


Fig.1.2: Mounting of Rail Contacts* (*Tx heads on outside and Rx heads on inside of the rail)

1.1.4 Potentiometers in Analog board of EAK for adjustment

PCB	**Pot.**	**Function**	**Rotation**
Analogue	R1	Potentiometer for sk1 reference voltage PEGUE1	Clockwise to increase and Anti-clockwise to decrease the respective voltage
	R2	Potentiometer for sk1 voltage MESSAB1	
	R3	Potentiometer for sk2 reference voltage PEGUE1	
	R4	Potentiometer for sk2 voltage MESSAB2	



Fig.1.3: Potentiometers in Analog board for adjustment

1.1.5 Adjustment of Tx head with Dummy wheel & Tool kit

Dummy wheel is normally set to 40 mm and must be kept vertically at the centre of RX head. Connect the test equipment to the diagnostic port of EAK. Following parameters are to be adjusted with the help tool kit:

MESSAB1 (Rectified Rx1 voltage)

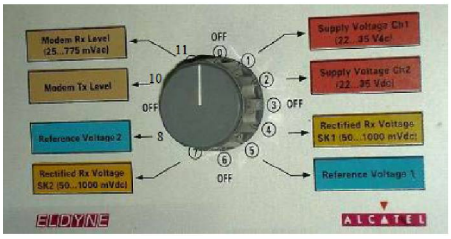


Fig.1.4: Selector switch of Test equipment.

- Keep the Test Equipment Selector Switch to position 4
- Measure the rectified Rx1 voltage with & without dummy wheel.
- Turn Pot. R2 to positive max.
- Adjust Tx head to optimum position.
- Adjust using R2 such that received rectified voltages with & without dummy wheel have the same amplitude but the opposite polarity.(Tol.<=30 mV).

Trolley suppression

For Trolley suppression to be effective, the positive voltage (without dummy wheel) should be greater than the negative voltage (with dummy wheel) by a value not less than 30 mV so that the rectified Rx voltage does not go to negative with the specified trolley wheel. It is recommended that the adjustment should be done using a spoke trolley wheel that is normally used in the section.

MESSAB2 (Rectified Rx2 voltage)

Repeat the above procedure for MESSAB2 (using Selector Switch position 7, and Potentiometer R4 on the Analog board).

PEGUE1

- Put Selector Switch to position 5
- Measure voltage
- Adjust using potentiometer R1 on analog board such that PEGUE1 = MESSAB1(without dummy wheel) Tolerance +-2%

PEGUE2

- Repeat for PEGUE2 using Selector Switch position 8 and potentiometer R3 such that PEGUE2 = MESSAB2 (without dummy wheel) Tolerance +-2%.

1.1.6 Parameters to be checked

Voltage & Frequency of Tx heads

Check the voltage and frequency of the transmitter heads at connector terminals S1 & S2 of both Sk1 & Sk2 inside EAK by true RMS Multimeter only.

Power supply voltage to EAK

Measure the power supply voltage fed to EAK at terminals 2 (+) & 18 (-).

Vital Relay output

If Digital Card is installed in outer slot

- Check at Connector 33 and 39 or 34 and 40 for on-board vital relay input

If Digital Card is installed in middle slot

- Check at Connector 36 and 42 or 37 and 43 for on-board vital relay input

Voltage at relay should be more than 20 V.

1.1.7 Log Sheet

This should be periodically updated and kept as future reference.

Log item AzLS		**Tolerance range**	**DP:**	**DP:**	**DP:**
Rail Profile					
Switch S1 & S2 address for CPU1 Outer Slot		Bit 16.....1			
Switch S3 & S4 address for CPU2 Outer Slot		Bit 16 1			
Switch S1 & S2 address for CPU1 Middle Slot		Bit 16.....1			
Switch S3 & S4 address for CPU2 Middle Slot		Bit 16.....1			
Selector position in test unit ETU001	Input power supply (terminal 2 & 18 of EAK)	21.5 V to 28.8 VDC			
1	a)Power supply Channel 1	22...35 VDC			
2	b)Power supply Channel 2	22...35 VDC			
4	c) MESSAB1 (Rx1 voltage w/o dummy wheel)	+80..+1000mVDC			
	d) With dummy wheel set on 40 mm	-80....-1000mVDC			
5	e) Reference voltage PEGUE1	Adjust (as per c)			
7	f) MESSAB2 (Rx2 voltage w/o dummy wheel)	+80..+1000mVDC			
	g) With dummy wheel set on 40 mm	-80.....-1000mVDC			
8	h) Reference voltage PEGUE2	Adjust as per (f)			
Terminal SK1/S1 & SK1/S2	Transmitter frequency SK1	30.0..... 31.25KHz			
	Transmitter voltage SK1	40.....85 VAC			
Terminal SK2/S1 & SK2/S2	Transmitter frequency SK2	27.4.....28.6KHz			
	Transmitter voltage SK2	40.....85 VAC			

1.2 DACF 710 A & DACF 710 P CEL Single Section Digital Axle Counter

1.2.1 Tool Kit

The following tool kit and spares are required for installation and maintenance:

1.	Portable data analyzer for downloading event logger data for analysis and report generation.	1 No.
2.	Pure sine wave Digital Multimeter make Fluke model 187/Rishabh model 285/ Kusum Meco model 859CF or equivalent.	1 No.
3.	Train simulator, Model TS 267P CEL make	1 No.
4.	Extender card (Card No.557)	1 No.
5.	Dummy wheel	1 No.
6.	Ring spanner 17-19, 24-26	1 No. each
7.	Open end spanner 17-19, 24-26	1 No. each
8.	Socket spanner with handle	1 No.
9.	Torque wrench (Jaicom JPR65 or equivalent, 88NM)	1 No.
10.	Screw driver No. 902	1 No.
11.	Screw driver No. 935	1 No.
12.	Marking jig for drilling	1 No.
13.	Dummy load to check power supply (resistive)	1 No.

1.2.2 Important parameters

Frequency of TX heads	21 kHz and 23 kHz
Standard lengths of cables for connection between TX/RX coils to the electronic junction box	10 m
Relays VR & PR	QN1K type Relay, 24 V, 1000 Ohm, 6F/6B
Recommended power supply for EJB	19.2 V to 28.8 V

1.2.3 Fixing of Tx & Rx Coils



Fig.1.5: Fixing of Marking jig and marking using punching guide

- Use marking jig and punch to mark 3 holes on the web of rail at a distance of 0 - 170 – 340 mm.
- Drill the 3 Holes of specified dimension on the web with the help of drill machine by ratchet drill method, as given below on the markings at each location:

Rail Profile	90 lbs	52 Kg	60 Kg
Distance from top of the rail	86 mm	86 mm	86 mm

The detectors have to be fixed on the clear spacing between two sleepers, at least 2 m from another axle detector and more than 6 sleepers away from rail joint.

1.2.4 List of supportive equipment and accessories for different installations

S. No.	Supportive equipment and accessories	Station Area (1 No. SSDAC)	Block Section (S/L) 1 No. of SSDAC	Block Section (D/L) (2 No. of SSDAC)
1.	24 V, 40 AH low maintenance battery or 24 V, 5 Amp output from one module of IPS.	1 No.	2 Nos.	2 Nos.
2.	24 V, 5 A Axle Counter type Battery Charger	1 No.	2 Nos.	2 Nos.
3.	4/6 Quad cable For SSDAC (Station to Station) For reset box (From Location to SM's Room)	0.9 mm (1 Pair) (1 Pair)	0.9 mm (1 Pair) (1 Pair)	0.9 mm (2 Pair) (2 Pair)
4.	Apparatus Case with termination board	2 Nos.	2 nos.	4 Nos.
5.	25 Sq. mm. 'AL' Power Cable, 2 Core	Length as required	Length as required	Length as required
6.	1.5 Sq. mm., Signalling cable (6 Core required + 4 spare for S/L) (12 Core required + 4 spare for D/L)	Length as required	Length as required	Length as required
7.	Earthing of Apparatus case (Locations)	2 Nos.	2 nos.	4 Nos.
8.	Surge Voltage Protection Device	2 Nos.	2 nos.	4 Nos.
9.	Deflectors for Axle Detectors supplied.	4 Nos.	4 Nos.	8 Nos.
10.	QN1K type Relay, 24 V, 1000 Ohm, 6F/6B	2 Nos.	4 Nos.	8 Nos.

1.2.5 Recording of Signal levels

Adjust and record the various signal input and output levels as given in following tables:

24 V DC Supply (Battery)

Measure the DC 24 V input to the system with charger ON, charger OFF condition with all the units connected (i.e. on load) or using dummy load.

S. No.	Input Range near SSDAC unit (In DC Volts)	Actual measured value	
		With Charger ON	Charger OFF
1.	19.2 V to 28.8 V		

Note: Keep Charger OFF for 15 minutes before taking measurements.

Oscillator Output (TX Coils)

Measure the oscillator output, frequency of TX coil of Axle detectors.

S. No.	Parameter	Limit	TX coil 1 (21 KHz)	TX coil 2(23 KHz)
1.	Oscillator output	30V to 40V rms		
2.	Oscillator frequency	(i) 20.80 to 21.20 KHZ (ii) 22.80 to 23.20 KHz		

Receiver Coil Output

Measure the RX coil signal output with and without dummy wheel.

For Amplitude Modulation type Digital Axle Counter

S. No.	Parameter	Signal Limit mV rms		Signal Measured Value	Dip 15% of signal (mV rms)	Dip measured value
		DACF 710A	DACF 710P			
1.	RX Coil 1 (21 KHz)	750 - 1200	275 - 600			
2.	RX Coil 2 (23 KHz)	750 - 1200	275 - 600			

SCC Cards (Cards 1 & 2)

Measure the DC voltages at monitoring sockets of SCC cards 1 & 2 with respect to ground

S No	Card	Measured output voltage (DC volts)					
		Without dummy wheel		With dummy wheel		With push trolley (4/8 spokes) on axle detectors	
		Limit	Measured value	Limit	Measured value	Limit	Measured value
1.	SCC1	2.0 - 2.5 V		<0.7		>1.7 V	
2.	SCC2	2.0 - 2.5 V		<0.7		>1.7 V	

Modem Output (Card 6)

Check and record the modem signal output of SSDAC during normal working condition of the system.

S. No.	Measuring Limit (mV rms)	Measured Output (mV rms)
1.	>400 mV (-6 dB)	

Relay Drive (Card 7)

Check and record Relay drive output to the Vital Relay with section clear and section occupied condition. (This may be checked across R1 & R2 of relay coil in vital relay box).

S. No.	Parameter	Measuring Limit (DC volts)	Measured output (DC volts)
1.	Clear mode	>20 V	
2.	Occupied mode	<2 V	

DC –DC Converter Card (Card 8)

Measure the DC –DC Converter output voltages with respect to respective ground for 24 V DC input fed to the SSDAC.

S. No.	Parameter	Limit (DC Volts)	Measured output (DC Volts)
1.	5 V	4.75 to 5.25 V	
2.	12 V	11.50 to 12.50 V	
3.	24 V	23.50 to 24.50 V	
4.	15 v ISO	14.50 to 15.50 V	

1.2.6 Maintenance Schedule (Monthly)

Tx & Rx Coil Axle Detectors

- Measure TX coil (21 KHz & 23 KHz) signal levels and Rx coil (21 KHz & 23 KHz) signal levels. These should be within the specified limits.
- Check and tighten M12 Bolts & Nuts of web mounted TX & Rx coil Axle detectors if found loose.
- Check and tighten the deflector plates if found loose.

SSDAC Unit

Measure & Record:

- 2.2V DC signal levels of card 1&2 of the SSDAC Counting Units
- DC-DC converter output voltages.
- The modem card output.
- Relay driver output.

Check & Tighten the screws of modules and MS circular connectors if found loose.

1.2.7 Recommended Spares

The following spares are to be recommended to be kept for 5 Nos. of working Single Section Digital Axle Counter in a particular section.

1.	SCC Cards (Card 1 & 2)	2 Nos
2.	MLB Cards (Card 3 & 4)	2 Nos
3.	Modem Card (Card6)	1 No
4.	Relay driver (Card 7)	1 No.
5.	Event Logger Card (Card 5)	2 Nos.
6.	DC –DC Converter (Card 8)	1 No.
7.	Axle Detectors (AD710) 21 KHz/23KHz (Tx coil)	1 No.
8.	Axle Detectors (AD710) 21 KHz/23KHz (Rx coil)	1 No.
9.	Hardware for mounting Axle Detectors	1 Set
10.	MS circular connectors (6 Nos.)	1 Set
11.	Reset box RB -259	1 Set
12.	SSDAC unit (housing with mother board, without cards)	1 No.
13.	Vital Relay Box with Relay 24 V, 1000 Ohm, QN1K type	1 No.
14.	Surge Voltage Protection Device box (SV – 121)	1 No.

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1.3 SSDAC-G36 G.G.Tronics Single Section Digital Axle Counter

1.3.1 Tool Kit

Sr. No.	Tools	Quantity
1.	Portable data-logger for downloading event logger data for analysis and report generation.	1
2.	Pure Sine wave Digital Multimeter (Fluke 187 or Rishab 28S or similar)	1
3.	Train Simulator	1
4.	Extender module	1
5.	Dummy Wheel	1
6.	Ring spanner 17-19,24-26	1
7.	Open end spanner 17-19, 24-26	1
8.	Socket spanner with handle	1
9.	Torque wrench, Jaicom make JPR65 or Equivalent -88 Nm.	1
10.	Screw Driver No.902	1
11.	Screw Driver No.935	1
12.	Marking jig for drilling	1

1.3.2 Important parameters

Frequency of TX heads	21 KHz & 25 KHz
Standard lengths of cables for connection between TX/RX coils to the electronic junction box	15 m
Relays VR & PR	
System	Microcontroller based system with 2 out of 2 architecture
Configurations	1. Two detection points Single section: In straight line [2DP1S]. 2. Three detection points Single section: In point zone [3DP1S]. 3. Three-detection points for two consecutive sections in a straight line [3DP2S]
Recommended power supply for EJB	22 V and 26 V DC

1.3.3 Power Supply Arrangement

S. No.	Configuration	Continuous current drain	Battery capacity	Charger capacity
1.	2DP1S version	< 2 Amp.	24 V/40 A.H. – 1 set	5 Amp. – 2 Nos.
2.	3DP1S version	< 3 Amp.	24 V/40 A.H. – 1 set	5 Amp. – 1 No.
3.	3DP2S version	< 3 Amp.	24 V/40 A.H. – 3 sets	5 Amp. – 3 Nos.

1.3.4 Fixing of TX/RX coils

Marking & Drilling holes on the Rail

The 3 Holes of 13 mm dia. are required to be marked and drilled for fixing web mounted TX/RX coils at each location with spacing of 183mm.

From bottom of the rail drill the holes at 68 mm for 52 Kg, 84 mm for 60 Kg and 57 mm for 90 R. A standard MS jig with pilot holes for marking the drilling of rails of different gauges is provided for the installation of the system.

1.3.5 Maintenance

Adjustments required in the field

The adjustment has to be done after measuring the voltages at monitoring points provided on different modules, tabulated in the Table A.

Table A: Monitoring points of SSDAC

Module	Monitoring item	Measured values range
DC-DC Converter	+5V DC and GND	4.75V to 5.25 V
	+18V DC and GND	17.75V to 18.25 V
	+12V DC and GND	11.75V to 12.25 V
	-12V DC and GND	11.75V to 12.25 V
	+24V DC and GND	22V to 26V
CPU1	EN1B O/P and GND (For SF, CF, 3DP1S units)	11.5V to 12.5V DC
	EN1A O/P and GND (For EF, CF)	11.5V to 12.5V DC
CPU2	EN2B O/P and GND (For SF, CF, 3DP1S units)	11.5V to 12.5V DC
	EN2A O/P and GND (For EF, CF)	11.5V to 12.5V DC
RELAY DRIVE 1 (For EF,CF)	VITAL RELAY A O/P(+) VITAL RELAY A O/P(-)	>20V DC
RELAY DRIVE (For SF,CF,3D units)	VITAL RELAY B O/P(+) VITAL RELAY B O/P(-)	>20V DC

Table B – Settings of PD cards

Module	Monitoring point	Expected values	
		Without wheel	**With wheel**
Phase Detector (PD1 and PD2)	RX-SIG and GND (Rx Adj.)	900 mV to 1.2 V AC	< 350 mV AC
	SUP-OUT and GND	4V to 5V DC	3 V to 3.9 V DC
	WHEEL-M-OUT and GND	4.5V to 5V DC	3 mV to 5 mV DC
	WHEEL-S-OUT and GND	4.5V to 5V DC	3 mV to 5 mV DC
	RX-PH-SIG and GND (PH Adj.)	10V to 12V DC	0.1 or 0.2 V (Min.)
	SUP-ADJ and GND (SUP Adj.)	4V to 5V DC	3 V to 3.9 V DC
	Wheel influencing both detectors	--	< 2 V in both PD cards

Note: (i) The above monitoring points should be checked monthly.

(ii) Presence of train wheel condition is to be created with the help of dummy wheel.

Maintenance schedule specified by manufacturer

Schedule	Maintenance
Daily	NIL
Weekly	NIL
Monthly	Check and record the readings of Power Supply module and PD module and check the Tx/Rx coil voltages as per the log sheet
Half yearly	Replace if any parts broken

1.3.6 Precautions

- Use 120 AH battery with axle counter type charger to take care of severe interruption of 230 V mains supply.
- Ensure an earth resistance of 1 to 2 ohms by providing parallel or special earth.
- For push trolleys, avoid solid wheels. Instead use spoked wheel.
- After power ON, check that amber LEDs on PD cards do not glow under no wheel condition. If they glow, interchange Rx wire connections of the module (21/25 KHz) to put off the LEDs. Amber LEDs shall glow under wheel presence.

1.3.7 Maintenance Log Sheet for SSDAC – G36

Block Section : …… Station…….. SF/EF

Sr. No.	Date	Battery	AC Volts			
			TX1 V rms/freq	TX2 V rms/freq	RX1 V rms/freq	RX2 V rms/freq
		FTB 1&2	FTB 52 & 53	FTB 56 & 57	FTB 54& 55	FTB 58& 59
		22-30V	40-70 V 20.802 to 21.302 kHz	40-70 V 24.750 to 25.250 kHz	300 mV to 1.2 V	300 mV to 1.2 V

Phase Detector 1				Phase Detector 2			
RX Sig & GND AC Volts	SUP level & GND DC volts	RX PH-SIG & GND socket DC volts		RX Sig & GND AC volts	SUP level & GND DC volts	RX PH-SIG & GND socket DC volts	
		Normal	Dummy Wheel			Normal	Dummy wheel
		10 to 12 V	< 1 v			10 to 12 V	< 1 v

With push trolley on Axle Detector (4 spokes)		DC-DC Converters (DC Volts)				
RX PH – SIG & GND socket		5 V	+12 V	-12 V	+18V	24V
PD1	PD2	Monitor sockets on DC-DC Converter card				
10 to 12 V	10 to 12 V	4.75 to 5.25 V	11.75 to 12.25 V	-11.75 to -12.25 V	17.75 to 18.25 V	22 to 26 V

1.3.8 Recommended Spares

The following spares are to be procured separately for 5 nos. of Single Section Digital Axle Counter working in field.

Sr. No.	Spares	Part no.	Quantity
1.	Phase detector modules 1 (PD1)	H001M01R1	2
2.	Phase detector modules 2 (PD2)	H001M02R1	2
3.	CPU1 Module of SF	H001M09R1	1
4.	CPU2 Module of SF	H001M10R1	1
5.	CPU1 Module of EF	H001M11R1	1
6.	CPU2 Module of EF	H001M12R1	1
7.	Communication module 1	H001M04R1	1
8.	Communication module 2	H001M05R1	1
9.	Relay drive module 1	H001M07R1	1
10.	Relay drive module 2	H001M06R1	1
11.	Event logger/SM-CPU module	H001M03R1	2
12.	DC-DC Converter module	H001M08R1	2
13.	Axle detectors 21 kHz/25 kHZ (TX coil)	G36 – T212500	2
14.	Axle detectors 21 kHz/25 kHZ (RX coil)	G36 – R212500	2
15.	Hardware for mounting axle detectors	--	1
16.	MS circular connectors (6 No.)	--	2
17.	SSDAC - Reset box with error display	G36 – RSBX01	2
18.	SSDAC - SF unit (housing with motherboard, without modules)	H001M21R1	1
19.	SSDAC - EF unit (housing with motherboard, without modules)	H001M21R1	1
20.	Relay box	G36 – RB2R00	2

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1.4 Az LM Eldyne Multi Section Digital Axle Counter

1.4.1 Tool Kit - Test equipment ETU001

The tool kit is same as that used for AzLS (Please refer section 1.1)

1.4.2 Fixing of track devices

The procedure for fixing of track devices is same as that for AzLS Eldyne SSDAC. (Please refer Section 1.1) .

1.4.3 Adjustment of Rail contact Tx head with Dummy wheel and Tool Kit

The procedure for adjustment of TX head is same as that for AzLS (Please refer Section 1.1).

1.4.4 Parameters to be checked for adjustment of rail contact

Outputs of DC-DC Converters, Rx Voltages MESSAB1 & MESSAB2, Reference Voltages PEAGUE1 & PEAGUE2 are checked in the same way as per the procedure given for AzLS. (Please refer Section 1.1). The other parameters can be checked as follows:

(i) Axle Counter Evaluator (ACE)

Power Supply Voltage range at ACE is 21.5 – 28.8V_{DC} which can be measured at the connectors U1 & U2 at the backplane of the ACE. Alternatively the input voltage to the ACE can be measured at fuse terminals on CTB.

(ii) Power Data Coupling Unit

Check outgoing voltage for trackside connection box at terminal nos. 4 & 5 of PDCU.

(iii) Checking Frequency of Tx heads

The frequency of the transmitter heads are to be measured by true RMS Multimeter only. For this purpose additional probe set is provided with Tool Kit ETU001. These readings can be taken at connector terminals S1 & S2 of both Sk1 & Sk2 inside EAK.

(iv) Checking of Power supply voltage to Trackside unit EAK

Recommended power supply for EAK is 54 – 120 $V_{DC.}$ Measure the power supply voltage fed to the track side electronic unit with the meter and the probe set directly at the power supply connector terminals 1 & 11 if separate pair of conductors is used for 60 V DC power supply and at 3 & 13 if the communication line and 60 V DC power are superimposed in the same pair of conductors**.**

Adjustment procedure

Adjustment procedure is same as that for AzLS.(Please refer Section 1.1)

1.4.5 Maintenance

Outdoor equipment EAK

The maintenance check points for outdoor equipment are same as those for AzLS (Please refer section 1.1).

Indoor equipment ACE

- Check the PDCUs are correctly installed on DIN rail and all connections are tight.
- Check all fans inside the ACE cabinet are working.
- Check the physical condition of connections in vital relays and snubbing diodes.
- Check the backplane connections are proper and fuses are properly held.
- Check all the cards are properly housed in the sub rack.
- Check that the reset boxes are properly fixed on the base.
- Check that the reset boxes are properly sealed and no termination is exposed outside.
- Check that all earth connections are intact and making good contact and earth lead wire, nut connecting earth wires etc. are not corroded.
- Check all spare conductors of communication 6/4 quad cable are properly earthed.
- Check that all the indications of DP on ACE are displaying the normal function.
- Check the DP profile in the Diagnosis of AzLM system using diagnostic software and take required action as per diagnostic software report.
- Measure the earth resistance and paint its value on earth enclosures/nearest wall. If required take suitable steps to improve the earth resistance. It should be less than 1 Ohm.
- Check voltage at VR, it should be more than 20 V DC.
- Remove and replug parallel I/O cards of seldom occupied sections (clear section will indicate occupied on removal; after re-plugging, will get clear after an internal check**.**

1.4.6 Log Sheet

All the measurements should be recorded in the following format:

Indoor equipment :ACE & PDCU

DP & PDCU No.	**Date**	**Input Voltage**		**PDCU Voltage**		**Remarks**
		ACE Voltage > 21.5 V DC	Ripple Voltage <10 mV rms	Input to PDCU > 5 V DC	Ripple Voltage < 10 mV rms	

Outdoor Equipment: EAK

Date		Item	Permissible range	Recorded value
Selector switch in test unit	1	(a) Power Supply Channel 1	22…35 V DC	
	2	(b) Power Supply Channel 2	22…35 V DC	
	4	(c) Rectified RX1 Voltage w/o Dummy wheel) MESSAB1	+80…….1000mV DC	
		(d) With Dummy wheel set on 40 mm	-80…….-1000mV DC	
	5	(e) Reference Voltage PEAGUE 1	Adjust as per (c)	
	7	(f) Rectified RX1 Voltage w/o Dummy wheel) MESSAB2	+80…….1000mV DC	
		(g) With Dummy wheel set on 40 mm	-80…….-1000mV DC	
	8	(h) Reference Voltage PEAGUE 2	Adjust as per (f)	
Terminal 3 & 13 of EAK	(i) Input Power Supply Voltage		54 V to 72 V DC	
Terminal Sk1/S1 & Sk1/S2	(j) Transmitter Frequency Sk1		30….31.25 kHz	
	(k) Transmitter Voltage Sk1		40….85V AC	
Terminal Sk1/S1 & Sk1/S2	(l) Transmitter Frequency Sk2		27.4….28.6 kHz	
	(m)Transmitter Voltage Sk2		40….85V AC	
Indications Analog Board	(n) H1-1 Red/H1-2 Green		Note	
	(o) H2-1 Red/H2-2 Green		Note	
	(p) H3-1 Red/H3-2 Green		Note	
Indications Digital Board	(q) H1-1 Green/H2-1 Green		Note	
	(r) H1-2 Green/H2-2 Green		Note	
	(s) Signature			

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1.5 Az S 350 U Siemens Multi Section Digital Axle Counter

1.5.1 Tools and Test Equipment required for adjustment & maintenance

- Drilling machine or drilling jig C25326-A28-A1
- Twist drill, Ø 13 mm
- Countersink, 90°, Ø 25 mm
- Torque spanner, opening 19
- Fixed or ring spanner, opening 19
- Open-end, ring or box spanner, width across flats 13
- Fixed spanner, opening 24
- Fixed spanner, opening 30
- Screwdriver, 0.6 x 2.8, as per DIN 7437
- Screwdriver, 0.6 x 3.5, as per DIN 7437
- Cable stripping knife
- Test equipment: Probe adapter board and multi-meter (Fluke-189 or equivalent) with measuring ranges:
  (i) DC measuring range: 300 mV to 100 V
  (ii) AC measuring range: 40 mV to 100 V
  (iii) Frequency measuring range: 2.5 kHz to 45 kHz

1.5.2 Important parameters

Outdoor equipment	ZP 43 V wheel detection equipment (counting head) consisting of DEK43 Double Wheel Detector (Tx & Rx)
Indoor equipment	Evaluation Computer Az S 350 U
Transmitter frequency of the double wheel detector	43 kHz(Tolerance range 42.8 kHz to 43.2 kHz)
Standard length of connecting cables for connection between TX/RX coils to ZP 43	10 m
Recommended input power supply to Power Supply module of Evaluation Computer	24 VDC to 60 VDC (+20%; -10%)
Output Power Supply	5 V for operation of Evaluation computer, 70 V for operation of max. five counting heads
Configuration	2 out of 2 configuration system operating on Siemens fail-safe microcomputer system (SIMIS) principle
Wire used for Earthing of Trackside Connection Box	35 sq mm Copper or 96 sq mm Steel earthing cable

1.5.3 Fixing of track devices

Two holes of 13 mm dia. are to be drilled on rail web as per dimensions shown below:

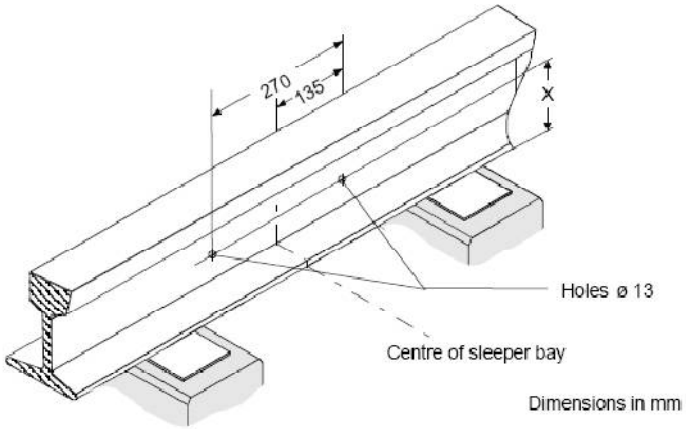


Fig.1.6: Drilling of holes on rail web for installation between sleepers

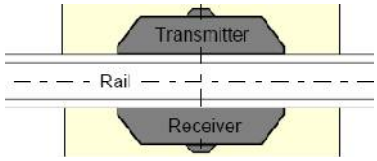


Fig.1.7: Top view of ZP43 Double Wheel Detector fitting

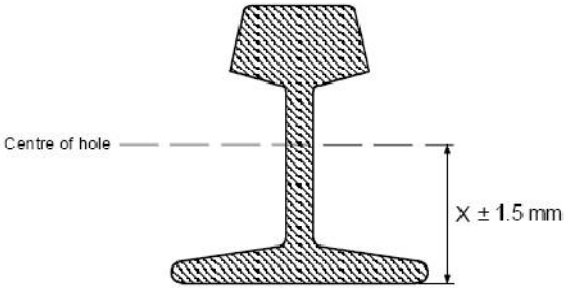


Fig.1.8: Section of rail

Height X of the hole depends upon the rail profile and shall be as per table given below:

Rail profile	60 Kg	52 Kg	90 lbs
Height X	85 mm	69 mm	56 mm
Height of new rail	172 mm	156 mm	143 mm
Permissible wear & tear	13 mm	8 mm	5mm

1.5.4 Adjusting ZP 43 V Wheel Detection Equipment

Procedure for measurement/adjustment

- Plug the test adapter board into the connector provided on the backplane.
- Set the required AC/DC range on the multi-meter.
- Connect the probes of multi-meter to the relevant measuring sockets provided on the front panel of test adapter board and take the measurements and adjust the parameters if required as follows:

Parameter	**Description**	**Standard value**	**Tolerance range**	**Procedure**
U60	WDE voltage	60 V DC	30 V to 72 V	Measured at measuring sockets U60
U24	Operating voltage	24 V DC	21.3 V to 22.4 V	Measured at measuring sockets U24
FS	Transmitter frequency of the double wheel detector	43 kHz	42.8 kHz to 43.2 kHz	Frequency is adjusted using the rotary switch on the backplane. Measured at measuring sockets FS
F 1	Signal frequency 1	3.50 kHz	3.47 kHz to 3.53 kHz	Adjust the potentiometer f1 on the front of the generator board (slot 4) using a 0.6 x 2.8 mm screwdriver
F 2	Signal frequency 2	6.37 kHz	6.31 kHz to 6.43 kHz	Adjust the potentiometer f2 on the front of the generator board (slot 4) using a 0.6 x 2.8 mm screwdriver
Ur1	Standard voltage 1	3.55 V DC	3.45 V to 3.65 V	Measured after adjusting the signal frequencies f1 and f2
Ur2	Standard voltage 2	3.35 V DC	3.25 V to 3.45 V	Measured after adjusting the signal frequencies f1 and f2
uE 1	Receiver voltage 1	AC	60 mV to 150 mV	Measure at the socket UE1
uE 2	Receiver voltage 2	AC	60 mV to 150 mV	Measure at the socket UE2

Note: Difference between UE1& UE2 should not be more than 10 mV

1.5.5 Adjustments and measurements at Evaluation Computer

On the front panel of each VESBA board, there are measuring sockets for fault diagnostics as well as LEDs for displaying the state of passage and a potentiometer for adapting to different cable lengths and setting the transmission level.

Sr. No.	Parameter	Acceptable Range	Observed Values					
			CH1	CH2	CH3	CH4	CH5	CH6
1	Signal F1	2.9 to 3.1 V DC						
2	Signal F2	2.9 to 3.1 V DC						

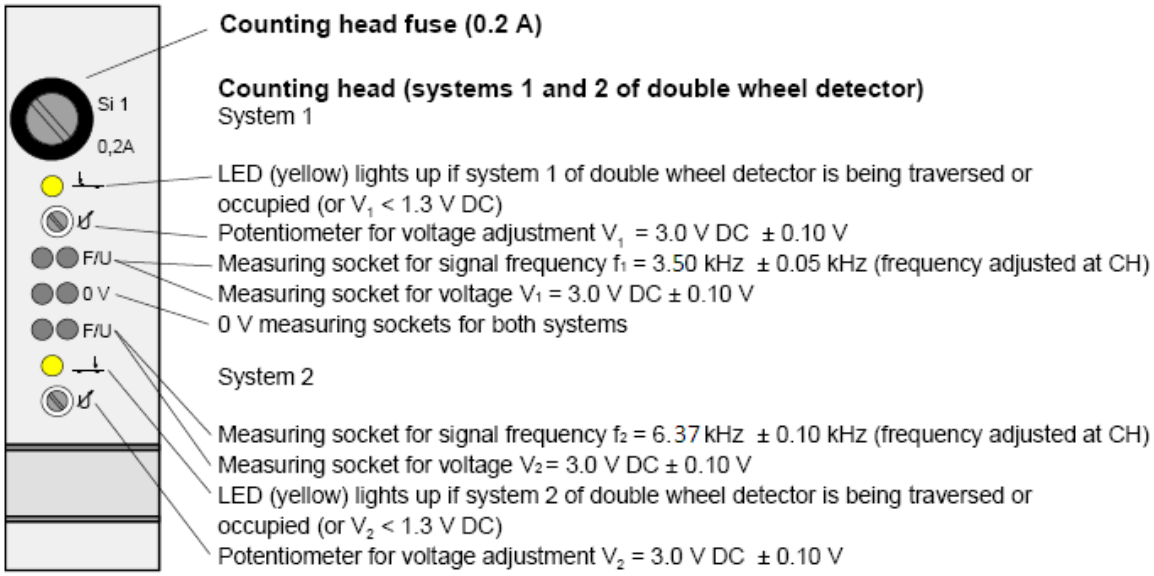


Fig.1.9: Front view of VESBA board

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1.6 Frauscher ACS 2000 Multi Section Digital Axle Counter

1.6.1 Tools and Measuring instruments

- Steel wire brush and WD40 spray - used to clean the rail surface area for easy fixing of rail claw.
- Torque wrench (range 15 - 60 Nm) -used to fasten the bolts at specified torque.
- Socket spanner SW19 and SW17 & screw drivers.
- Fixed spanner SW36/Friction type ratchet – used to fix rail claw in the rail.
- Steel tape measure (Fibre/wooden tape measure recommended in RE area)
- Plumb bob for level measurement (2 m length).
- Multi-meter: Range 1000 mV DC, precision ± 0.5 %
- Two probes with 2 mm male connectors (for connection of evaluation board with mV meter).
- Testing plate PB200.

1.6.2 Important parameters

Outdoor equipment	Wheel Sensor RSR180
Indoor equipment	Evaluation Board ACS 2000
Communication between Indoor & Outdoor equipment	Four-wire signalling cable (typically star-quad cable)
Standard length of connecting cables for connection between RSR180 to ACS2000	5m (10 m & 15m on special requirement)
Recommended input power supply range	+19 V DC to +72 V DC.
Modes of operation	(a) Isolated mode (generally used within station area) (b) Transmission mode [with optional Digital input/output module (DIOB)]

1.6.3 Mounting instructions for Wheel Sensor RSR 180

- Wheel sensor RSR180 is to be mounted at the inside face of the rail (wheel flange side).
- In point areas, the minimum admissible space between rails is 100 mm (inside width between heads of rail).
- Minimum spacing between two wheel sensors on the same rail is two sleeper spaces.
- Minimum spacing between a wheel sensor and the next rail joint or the next rail-weld is 1.5 m to 2.5 m.
- The wheel sensor must be mounted concentrically between two sleepers.
- The wheel sensor housing must not touch the head of rail



Fig. 1.10.: Installation of Wheel sensor & TLJB

Rail claw mounting

The following parameters and guiding values are to be considered for rail claw mounting of wheel sensor RSR180 to the rail:

min. width of foot of rail	110 mm
max. width of foot of rail	155 mm
min. height of rail	130 mm
max. height of rail	180 mm
height (vertical) between the top of the railhead and the top of the sensor (**Measurement A**, see Figure)	40 to 45 mm
depth (horizontal width) between the side of the railhead and the inner face of the sensor (**Measurement B**, see Figure)	0 to 8 mm

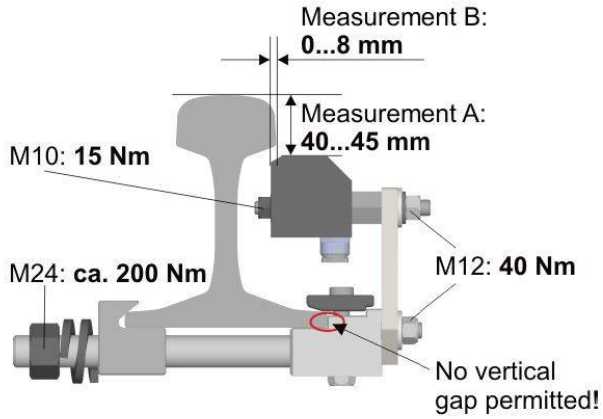


Fig. 1.11: Wheel sensor measurement of A and B

Following are the type of rail claw and clamping bolts according to the rail profiles:

Rail profile	Claw type	Bolt type
60 Kg rail	SK140-011	BBK 22
52 Kg rail	SK140-012	BBK 17.5
90 lb rail	SK140-013	BBK 22

1.6.4 Maintenance

Measurements at the test sockets of the Evaluation board

Cycle: < 2 years

Measurement of Wheel sensor current

100 mV at the test sockets across an internal 100 Ohm shunt resistance corresponds to a Wheel sensor current of 1 mA. Sensor current in system 1 and system 2 must have a value between 2.8 mA and 5.0 mA, which corresponds to 280 mV and 500 mV DC at the test sockets. System 1 measured voltage must not differ from system 2 measured voltage by more than 20 mV DC (0.2 mA or 5% maximum of the sensor current).The wheel sensor system currents must be measured in the undamped (unoccupied) status, with the sensor correctly mounted. If necessary, adjust the evaluation board.

Testing of Wheel sensor RSR180

Cycle: < 2 years

Test: Perform visual inspection and mechanical checks of wheel sensor RSR180.

Traverse wheel sensor with a train or Damp (occupy) the wheel sensor using the testing plate PB200. This is done by means of traversing (both system 1 and system 2) of at least one axle, which must be counted in and out correctly by the corresponding ACB.

Checking of Rail deflector

Cycle: < 2 years

Check 1: Perform visual inspection and mechanical checks of rail deflectors mounted on both sides of a wheel sensor.

Check 2: Measure the distance between the centre of the wheel sensor and rail deflectors on either side in the longitudinal rail direction; it should be at least 350 mm away from the wheel sensor.

Testing of ACB

Cycle: < 2 years

Test (a) Traversing of a counting head connected to the ACB to be tested and counting in and out of at least one axle or

Test (b) Counting in and out of at least one axle, using the testing plate PB200

Within a period of 2 years, the axle counting system must at least once switch from clear track status to occupied track status and from occupied track status to clear track status (clear-occupied-clear or occupied-clear-occupied).

Testing of DIOB

Cycle: < 1 year

Test: There are two options to test the DIOB functionality:

Option 1:

For the purposes of testing, the installation (e.g. signalling box) must be able to selectively switch on and off the information at the inputs of the DIOB. The information from the DIOB outputs evaluated by the downstream installation (e.g. signalling box) must be visible for control purposes. This testing activity requires a second person at the other subsystem (for switching on and off of the input information and monitoring of output information).

Option 2:

Testing of the installation requires test plugs. The testing activity requires a second person at the other subsystem (for connecting the test plug).

Note: The installation does not have to supply test signals. All inputs and outputs are tested in one single test step, as the test plug in the second subsystem returns the output signals of DIOB through its inputs to the outputs of the first subsystem. The DIOB outputs used require testing within one year so as to determine whether they open when the respective input is not triggered.

Testing of Reset box

Cycle: < 1 year

Test 1: Perform visual inspection of LED indicators, reset push button and reset counter on the reset box.

Test 2: Carry out reset operation, 'preparatory reset' or 'conditional hard reset' as applicable for the respective track section.

Within a period of 1 year, the reset box must at least once execute the reset operation according to the applicable reset type.

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ANNEXURE I

RDSO's Technical Advisory Notes on

Digital Axle Counter

सी एस टी ई कान्फ्रेंस 31.07.2014 से 01.08.2014 - डिजिटल एक्सल काउंटरों हेतु टेक्नीकल एडवाइजरी

CSTE Conference 31.07.2014 to 01.08.2014: Technical Advisory for Digital Axle Counters

Quad Cable

1. Technical advisory note no. 6001 (wiring discipline) to be followed.
2. Periodic checking of Quad cable parameters including IR, Loop Resistance, attenuation and cross talk. Parameters are mentioned in PCCL also. IR should preferably be equal to or better than 10 Mega Ohms, Loop resistance should generally not exceed 56 ohms/km, attenuation loss should not be greater than 30dB, FEXT/NEXT should be better than 55dB.
3. Twisting of quad cable pair should be upto the terminations - one twist/inch.
4. Earthing connections to quad cable screen should preferably be through clamps soldered to screen to have good connection.
5. Avoid using same cable as DP information for long distance relay circuits. Under unavoidable cases, the quads used should be farthest in spatial distance.

Power Supply

6. Measurement of Voltage levels and AC ripples at DAC input. Ideally ripples should be less than 50mVp-p,
7. Separate power supply/module for DAC to be used.
8. Avoid bunching of power and DAC cables in relay room.
9. Line-wise segregation of Evaluators and its power supply to be followed.

Earthing and SPDs

10. Earthing of cable armor& screen to achieve a low screening factor. Continuity also to be ensured.
11. Surge protection arrangement on power/communication/reset lines is required to be provided by Vendors.
12. SPD & their wiring - short and straight wire with low inductance away from other wiring of electronics, SPD of proper quality needs to be ensured. Periodic checking of SPD should also be undertaken.

Others

13. Continuity of Traction bonds in the vicinity of the sensors (50 m) should be ensured to keep earth potential rise near DP minimum.
14. DP should be away from neutral section by 30m. Distance separation between 2 adjacent DPs should be min. 2m.
15. Sensors should not be installed near rail joints.
16. Redundancy in media can be planned where communication failures are high. Media changeover arrangement/ switch should be provided for this.
17. Use of High availability SSDAC in high density traffic areas can give more availability and reliability of system (BPAC applications).
18. For MSDAC, Evaluators should be kept in dust free and ventilated rooms.
19. Interactive website developed by CEL & Eldyne to log complaints and get feedback.
20. Siemens have also circulated email id for logging complaints. Railways may utilize these.
21. OEMs have been advised to give onsite training to staff as per requirement of Railway. Implement effective Installation and Commissioning procedures as pet PCCL. Person signing the PCCL should be different from installer so that additional check is enforced.

Abbreviations

AC	Alternating Current
BPAC	Block Proving by Axle Counter
CEL	Central Electronics Limited
dB	Decibel
DP	Detection Point
FEXT	Far End Cross Talk
IR	Insulation Resistance
MSDAC	Multi Section Digital Axle Counter
NEXT	Near End Cross Talk
OEM	Original Equipment Manufacturer
PCCL	Pre-Commissioning Check List
SPD	Surge Protection Device
SSDAC	Single Section Digital Axle Counter

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आर डी एस ओ टेक्नीकल एडवाइजरी नोट नं. एस टी एस /ई /टी ए एन /7005 – लाइटनिंग प्रोन एरिया में संस्थापित डी ए सी की आकाशीय विद्युत् से सुरक्षा हेतु अनुदेश

RDSO Signal Directorate - Technical Advisory Note No. STS/E/TAN/7005 Ver. 1.0 dated 11.11.2014 - Guidelines for lightning protection arrangements for DACs installed in lightning prone areas

Quite a few incidences of failures of MSDAC/SSDAC are being reported where main cause is lightning. Accordingly, guidelines for protection for installations in lightning prone areas are given below. These are not exhaustive and Railways may have additional measures also if so required.

1. Availability and intactness of Class B& C SPDs which are being supplied along with IPS in a separate wall mountable box should be checked and provided wherever not available.
2. The equi-potential bonding of indoor signalling equipments including IPS racks should be provided in the power room and connected to low resistance earth of less than 1 Ohm.
3. The length of cables from SPDs to earth bus bar and from equipment to earth bus bar should be shortest possible without any bends. Loops should not be present.
4. The size of cable from SPD to earth bus bar should be minimum 16 sq. mm copper cable and the size of cable from equipment to earth bus bar should be minimum 10 sq. mm copper cable.
5. All connections from equipment or SPD to earth bus bar shall be exothermic welded or soldered.
6. Suitable Class C SPDs should be provided in the power line, communication line and reset line for surge protection in DACs.
7. High quality, high speed & self-diagnosing type SPDs should preferably be used.

Annexure I – *Guidelines for lightning protection arrangements for DACs installed in lightning prone areas* ***October 2016***

8. Intactness and availability of SPDs in DAC should be checked periodically and recorded in maintenance logbooks.
9. Record of provision of SPDs with make and model details should be made in PCCL by OEM & Railways.
10. Only Shielded cable should be used in indoor wiring of DAC.
11. All equipments, cables in the location box need to be connected firmly to the earth bar inside location. Periodical checking of earth bus bar continuity and earth values should be undertaken and recorded.
12. Low resistance earth of value less than 5 Ohms needs to be provided in the location boxes where field unit of Digital Axle Counter is provided.
13. It has to be ensured that wherever power cables/data lines go out of location/relay room, proper SPDs need to be provided at both ends.
14. The armour of all Quad cables should be properly earthed at both ends.
15. Cable armour continuity should be maintained while making joints in Quad cable.

Abbreviations

DAC	Digital Axle Counter
IPS	Integrated Power Supply
MSDAC	Multi Section Digital Axle Counter
OEM	Original Equipment Manufacturer
PCCL	Pre-Commissioning Check List
SPD	Surge Protection Device
SSDAC	Single Section Digital Axle Counter

For any issues related to this TAN (technical advisory note) please contact Director/Signal-VII at RDSO, Lucknow (Rly phone- 032-42659, DOT-0522-2465751, Email: edsig@rdso.railnet.gov.in)

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Annexure I – *Guidelines for lightning protection arrangements for DACs installed in lightning prone areas* ***October 2016***

आर डी एस ओ टेक्नीकल एडवाइजरी नोट नं. एस टी एस /ई /टी ए एन /6001- डिजिटल एक्सल काउन्टर – वायरिंग की व्यवस्था

RDSO Signal Directorate - Technical Advisory Note No. STS/E/TAN/6001 Ver. 1.0 dated 04.10.2011- Digital Axle Counter- Wiring discipline

In order to overcome intermittent failures due to electromagnetic interference from parallel circuits RDSO had issued a Technical Advisory Note No.TAN/6001 vide letter No. STS/E/AC/Digital/GenI dated 04.10.2011:

1. Parallel circuits

a. Requirement is that **parallel circuits shall be as far spaced,** spatially, as possible. Long parallel circuits shall be avoided in the same quad. So, one long and one short circuit can be accommodated in same quad but not both long circuits.
b. DAC circuits in BPAC of UP and DN lines in double line sections shall be in **separate quads** and kept one/two quad distance away from each other to avoid mutual interference in long parallel circuits.
c. DAC circuits in location shall not be bunched along with parallel relay/power circuits. Relay circuits are known to generate switching transients that can couple enough energy in parallel circuits nearby and **interfere** with low power DAC data circuits.
d. Any other parallel wiring (relay circuits/power circuits/earthing wires etc) shall cross DAC circuits at perpendicular and any parallel portion shall be kept at **minimum 150 mm** (lateral distance) away from the wiring for DAC circuits.
e. Relay circuits shall preferably not be taken in same cable as DAC circuits. In unavoidable circumstances relay circuits shall be in furthest quad (spatially) from the one containing DAC circuits.

Note: Relays driven by quad cables may be provided with free whelling diodes.

2. Twisting of cable pair

a. Twisted pairs are required to avoid **mutual interference** between low level data signals. Even short lengths of non- twisting (few inches) can couple enough noise to interfere low voltage DAC communication signals.
b. Quad cable twisting shall be ensured during termination so that **minimum one twist per inch** is maintained till the last inch into terminations.
c. Any wiring from quad cable terminations to equipment shall be done using **twisted singles** of indoor signal1ing cable (1 mm square) or any other approved indoor twisted pair cable.
d. Signalling cable or any other untwisted cable pair **shall never** be used in DAC communication circuits to avoid intermittent type of failure.

3. Wiring & Terminations

a. Preferably, quad cable shall be terminated in **cage clamp type terminals** that provide solid 360 degree surface connection and sufficient pressure on the wire to make a good electrical contact.
b. Cables shall be terminated at the bottom portion of location keeping equipment and their wiring at higher level inside location. This will help in keeping wiring of different types segregated from each other. All earth wires and surge protection devices also shall be kept at the lower levels for the same reasons.
c. Wiring and cabling **shall not be bent abruptly** and shall be given sufficient bending radius to ensure that conductors inside the cabling/wiring are not damaged due to bending.
d. Wiring shall be **properly supported** by channels troughing, cable clamps and other means to ensure that connections are not under pressure due to wire hang.
e. Wiring and cabling shall not be supported at any **sharp edged object** to ensure that conductors are not damaged during their installation/maintenance.

4. Continuity and Earthing of cable armor & screen at intermediate terminations/ Joints

a. Screening of quad cable is effective only when sufficient induced current can flow in the screen thereby cancelling/reducing the induction from 25KV AC for the cable conductors. For adequate induced current to flow in screen, it is necessary that **good earth connections** are provided for cable screen & armor.
b. Quad cable screen & armor shall be made **electrically continuous** at the intermediate terminations/joints by soldering and connecting both ends of cable screens & amours at the locations.
c. Connections to screen shall preferably be made by thin metallic clamps soldered to screens to ensure **good surface connection** for electrical continuity.
d. Combined Earth for armor and screen at intermediate locations shall have earth values as low as possible but shall be never more than 5 ohms.
e. Earth connections shall be kept **as short and as straight** as possible because any loop or turns can create inductive elements that impede quick discharge of transients and surges to ground.

Abbreviations

AC	Alternating Current
BPAC	Block Proving by Axle Counter
DAC	Digital Axle Counter
KV	Kilo Volt

For any issues related to this TAN (technical advisory note) please contact Director/Signal-VI at RDSO, Lucknow (Rly phone- 032-42656, DOT-0522-2465748, Email: dsig6@rdso.railnet.gov.in)

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आर डी एस ओ टेक्नीकल एडवाइजरी नोट नं. एस टी एस /ई /टी ए एन /6002- एम् एस डी ए सी का उपयोग करते हु ए ए बी एस तथा आई बी एस की योजनायें

RDSO Signal Directorate - Technical Advisory Note No. STS/E/TAN/6002 Ver. 1.0 dated 12.12.2011 - ABS & IBS schemes using MSDAC

There has been long duration failures of MSDAC based Automatic Block Signalling (Bina-Katni section) and Intermediate block signalling (Bhusaval- Manmad section) that resulted in traffic disruption on both the lines due to failure of common items for both the lines. Such failures result into widespread train punctuality loss and long duration use of manual processes for train operations. In view of above, following guidance is given for the railways to improve availability and maintainability of ABS/IBS systems that are mostly employed in high density sections.

1. Line wise Electronics & cabling:

a. Requirement is that **there shall be no single point of failure** that can affect both the lines at the same time**.** MSDAC can provide multiple track section monitoring by single evaluator but it shall be ensured that one evaluator failure does not affect signals on both UP & Down lines. This primarily leads to provision of line wise evaluators with separate power supply modules.

b. Cabling, as far possible, shall be planned line wise in such a way that single cable failure does not affect the signalling on other line and there are sufficient spares for concerned line.

2. Power Supply arrangements:

a. Evaluator for each line shall be supplied from independent power supply module.

b. Power supply for evaluator shall not be shared for anything else like cabinet fan or track section relays.

c. Power supply module feeding external circuits shall never be used for feeding indoor electronic systems like evaluators that require separate isolated supply.

d. Power supply ripples shall be ensured to be less than 50mv peak to peak as per IPS specifications. This should be part of routine maintenance measurements and records.

3. Line side Cabinets (Portable cabins):

a. These line side cabinets shall have sufficient space for keeping circuit books, manuals, and diagnostic PC on a table of adequate size and also for movement of staff during routine maintenance and fault finding.

b. Battery shall not be installed in the same space where electronic systems are installed. Battery room shall be separate and sufficiently ventilated.

c. These shall be preferably located near Level crossings for quick access otherwise a suitable access route shall be identified and approved by open line.

Abbreviations : ABS –Automatic Block Signaling, IBS- Intermediate Block Signalling, IPS – Integrated Power Supply, PC – Personal Computer

For any issues related to this TAN (technical advisory note) please contact Director/Signal-VI at RDSO, Lucknow (Rly phone- 032-42656, DOT-0522-2465748, Email: dsig6@rdso.railnet.gov.in)

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आर डी एस ओ टेक्नीकल एडवाइजरी नोट नं. एस टी एस /ई /टी ए एन /6003 – एनालॉग तथा डिजिटल एक्सल काउंटरों को सामानांतर करना

RDSO Signal Directorate - Technical Advisory Note No. STS/E/TAN/6003 Ver. 1.0 dated 03.02.2012 - Paralleling of Analog and Digital Axle Counters

In redundant train detection systems, if any one of the systems is showing clear then signalling circuits remain functional. This arrangement provides enhanced availability since trains can be dealt on signals even if one of the train detection systems has failed.

But, if any one of the systems has failed in wrong-side then signalling circuits are affected in wrong side since the other system working correctly gets masked by wrong-side failure of parallel system. This needs to be taken care of during detailed circuit design by judicious proving of back contacts of certain relays in signaling circuits.

In a recent case of unusual failure, in Ratlam division of Western Railway, SSDAC of Eldyne make was used for paralleling of UAC in IBS application. Existing arrangement included two UAC sections and one DC track circuit (QTA2) of 400 m length for IBS working.

While implementing redundant train detection by using SSDAC, Westerrn Railway used 4DP-3S configuration of Thales (Eldyne) SSDAC and paralleled all the three track sections (two UAC sections and one DC QTA2 section) of each line.

Recently, 400 m track circuit failed on the wrong side and was found to be in clear state for more than 4 hours even when there were trains over the section. Since this track circuit is also used for trolley suppression of analog axle counters, no in-counts were registered for the analog axle counter used for BPAC and the same remained in clear state despite there being a train inside the monitored section. Even though SSDAC system went correctly in occupied state, this was masked by clear state of parallel analog axle counter as explained previously. Due to above, IB signal also remained in OFF (Green) state despite a train occupying the section in advance of the signal.

Advance starter at the rear station could also be cleared as SSDAC section between advance and IB had cleared after the passage of previous train. In the same section analog axle counter failed in occupied state as no out-counts were received due to wrong side failure of common trolley suppression track at the exit detection point. In this case, occupied state of analog axle counter was masked by the clear state of SSDAC since the section was actually clear.

Due to above, it is necessary that signaling circuit for IBS applications are designed in such a way that single wrong-side failure shall not result into an undesirable state of the signaling system. One of the design techniques normally used for this is quick self-disclosure of the failed

part by circuit design where certain relays are proved down before signal is taken off for next train movement.

Recommendations:

In IBS working, before taking off the advanced starter, it shall be proved that IB signal has gone back to 'ON' (RECR enegised) after the previous train.

It was noticed that trolley suppression input to analog axle counter was given after 'OR'ing the track circuit and parallel SSDAC. This shall be changed to 'AND' operation so that analog axle counter starts counting when either the track circuit or the parallel SSDAC assumes occupied state.

Datalogger shall be used to monitor sequential operation of track sections in IBS and suitable alarms generated when a track section goes from occupied to clear state out of sequence without next section assuming occupied state, i.e. track section between advance and IB signal assuming clear state without a track section on either side of it going to occupied state. These alarms can be useful for identifying such failures that may go undetected sometimes.

It shall be ensured that automatic resetting is used with systems having **Preparatory mode only.** No automatic resetting of any kind is permitted without preparatory mode being enabled in the axle counter systems. (This has always been emphasized with every scheme using redundant train detection and auto resetting).

Abbreviations

DC	Direct Current
IBS	Intermediate Block Signalling
RECR	ON Aspect Checking Relay
SSDAC	Single Section Digital Axle Counter
UAC	Universal Axle counter

For any issues related to this TAN (technical advisory note) please contact Director/Signal-VI at RDSO, Lucknow (Rly phone- 032-42656, DOT-0522-2465748, Email: dsig6@rdso.railnet.gov.in)

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COMPENDIUM OF MAINTENANCE INSTRUCTIONS ON SIGNALLING EQUIPMENTS

Section 2

Block Instruments

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

2.1 SGE Double Line Block Instrument

2.1.1 Recommended tools

- Tension Gauge of 0-500 grams range.
- Multimeter
- Hydrometer
- Cutting Plier 8 inch
- Nose Plier
- Screw driver (small)
- Megger

2.1.2 Important parameters

Sr. No.	Parameter	Description		
1	Line wire	RE area- 4 line wire, with Phantom circuit & earth. Non-RE area- Three line wire & individual earth as return wire		
2	Power Supply	(i) Line supply 12V DC + line drop (ii) Local supply 12V DC or 24 V DC		
3	Additional equipment for RE area	(i) Block bell unit (ii) Filter Unit (iii) Isolation Transformer 2 Nos		
4	Overhauling period	7 years		
5	Top indicator coil resistance & operating current	140 Ohms V & 17 to 25 mA		
6	Bottom indicator coil resistance & operating current	140 Ohms V & 17 to 25 mA		
7	Polarised relay coil resistance & operating current	77 Ohms & 25 mA		
	Parameters for different make Block instrument	**Byculla C.Rly. Make**	**PTJ S. Rly. Make**	**HWH E. Rly. Make**
8	Door lock mechanism	Mechanical stick	Electrical stick	Mechanical stick
9	Block bell relay resistance & working current	500 Ohms & 20 mA	400 Ohms & 25 mA	400 Ohms & 25 mA
10	Block bell resistance	60 Ohms	48 Ohms	30 Ohms
11	Resistance of Door coil/TOL lock coil	50 Ohms	48 Ohms	14.8 Ohms
12	Working current of Door coil/TOL Lock coil	200 mA	250 mA	250 mA

2.1.3 Testing

- Check double locking arrangement on back cover. Ensure that sealing is intact.
- Check that SM`s key is effective & commutator gets locked in its last operated position.
- Check all springs for proper tension of 250 + 5 grams.
- Check for the correspondence between commutator handle & Indicator (except where auto "Train On Line" feature is provided.)
- Check line battery and telephone battery voltage. Also measure the working current of block instrument and compare with the standard value.
- Check single stroke bell for its efficient functioning.
- Check door lock assembly for perfect working including force drop arrangement.
- Check full notch and half notch on locking plate, they should be correctly shaped and are in square. Holding pin is not worn out, full notch should be square and half notch should be beveled.
- Ensure that LSS cannot be taken "OFF" without obtaining line clear from receiving station.
- Ensure that LSS assumes "ON" aspect automatically when FVT is occupied by first vehicle and it could not be retaken "OFF" on same line clear.
- Ensure that commutator could not be turned back from Train On Line to Line Clear position when turned from Line Clear to Train On Line directly, unless the train sequentially operates the two track circuits and after the passage of train, all reception signals have been put back to "ON".
- Check that Sealing of polarised relay is intact.
- Measure earth resistance. Value should not be more than 10 ohm.

Testing of door lock mechanism

Half lock & force drop testing

Turn commutator slowly from 'Line Closed' position to 'Line Clear' position and ensure that before appearing of 'Line Clear' indication, armature drops on the periphery of commutator disc. After this going to 'Line Closed' position turn the commutator handle gradually to 'Train On Line (TOL)' position. Ensure that before the TOL indication appears, the armature drops inside half lock notch. It means that TOL indication should appear only after commutator gets locked by half lock.

After getting TOL indication, it should not be possible to turn the commutator to 'Line Closed' position. If after energizing of door coil, the armature of the door coil remains stuck up due to mechanical jamming or residual magnetism, then block handle should not come from TOL to 'Line Closed' position until the armature drops over Holding Paul.

2.1.4 Maintenance

- Needle indicators must be properly maintained so that they operate fully and return to the normal position, when the commutator is brought to Line Closed position.
- It should be ensured that the commutator movement is smooth while turning it from one position to another position.
- It should be ensured that commutator gets locked, when it is turned from Line Clear to Train On Line position, before Train On Line indication contacts are made.
- See that all terminals screws, nuts, lock nuts and locking screws are tight and all split pins are open.
- Inspect the contact surfaces on the butterfly assembly. If pitted, clean them with chamois leather.
- Check the resistance of indicator coil, lock coil and their working currents. If considerable difference is noted between subsequent readings, locate the fault and rectify the same.
- Check the full lock notch and half lock notch on the locking drum, for their correct shape & squareness. Correct them if necessary.
- Check that no loose wires get trapped in the moving parts.
- Check that only correct springs make when commutator is in "Line Clear" & "Train On Line" positions.
- Check that the desired springs make when bell plunger is pressed and that bell beats are registered properly when bell plunger is pressed by the adjacent station.
- Check the coil resistance of bell relay, bell coil and their working currents during inspections. If considerable difference is noticed between subsequent readings, locate the fault and rectify it.
- Check the telephone battery, replace if necessary.
- All batteries must be kept clean. Terminals must be free from dirt and corrosion.
- Ensure that wire connections at the terminals are firm.
- Check and ensure that earth and earth connections are effective and in good condition.
- Ensure that common earth is not used for indication circuit because in case of leakage or breakage of one earth, both the instruments will come in series.
- In case of "Train On Line" position +ve will on line & -ve on earth from the line battery. At that time for another line clear the -ve will be on line & + ve on earth, during this period if earth breaks PR (Polarised relay) may attract to Train On Line position & a PD (potential drop) is created. If the value of PD is more than 5 volts, PR will attract to line closed position when a train is in the section. This enables the Last stop signal to be off for 2nd train which is unsafe hence common earth should not be provided.

2.1.5 Precuations, Do's & Don't's

(a) Ensure that for same block instrument, batteries for Indication and bell circuit are separate. Indication battery for two block instruments of adjacent section at a station should also be separate

(b) Ensure that the Stick relays i.e. SR relays in LSS circuit have minimum pick time of 300 milliseconds, achieved by having them as slow Shelf type relays or QSPA1 type or two Nos. of QNA1 Type relays.

(c) Polarised relays in LSS circuit shall conform to IRS-S31-80 should only be used in the block circuits. However, AEI-GRS polarised relays with contact gap of 2.5 mm and minimum pick up current of 16 mA can be allowed to continue till they are progressively replaced with polarised relays conforming to IRS-S31-80.

(d) 3-position polarised relays should be overhauled along with block instrument.

(e) All block instruments used should be of manufactured to IRS design only.

(f) Sequential clearance of two circuits should be provided for block clearance circuit.

(g) The line voltage shall be maintained between 18 to 24V DC considering the line current of 25 ma & block section length of say 10 kilometres.

(h) If any of the following conditions are observed, the lock and block should be treated as defective and its working should be suspended immediately: -

(i) The last stop signal is not restored to ON position automatically by the passage of the train.

(ii) If it is found possible to take OFF the last stop signal without containing the "Line clear" indication on the top indicator of the instrument.

(iii) If the block instruments commutator could be turned from TOL to Line Clear position without the arrival of train

(iv) When the block instrument shows erratic movements of the indicators or is defective in any other way.

2.2 Single line Handle type Token less block instrument (FM coded)

2.2.1 Important parameters

Power Supply		(i) Line Battery 24 V DC (dry cells or DC-DC converter or Dual bank battery) for working current of 100 mA on line (ii) Local Battery 24 V DC (Secondary cells) for supply to the transmitter and receiver and also operating relays, indicators, lock magnet etc. (iii) External Battery 24 V DC to repeat the external conditions
Transmitter	Supply voltage	24 V.DC, + 20%, - 20%
	Carrier frequency	1800 Hz, 2700 Hz, + 2%
	Modulated frequency	65 Hz + 1.5 Hz or 85 Hz + 1.5 Hz
	Shift frequency	+ 15%
	Power consumption	1.2 W at 24 V.DC
Receiver	Supply voltage	24 V.DC, + 20%, - 20%
	Carrier frequency	1800 Hz, 2700 Hz, + 2%
	Modulated frequency	65 Hz + 1.5 Hz or 85 Hz + 1.5 Hz
	Shift frequency	+ 15%
	Power consumption	8 W. Max. at 24 V.DC
Periodicity of overhauling		7 years

2.2.2 Earthing

- A separate earth should be provided for each block instrument.
- The resistance of earth shall not exceed 10 Ohm.
- The earth shall be located on lower level soft ground far from underground cable, water and gas pipes.

2.2.3 Safety check

- Ensure that double lock is provided and seal is intact.
- Try to operate the instrument without cooperation i.e. without receipt of functional code, it shall not be possible to turn the block handle from Line Closed to Train Going To or Train Coming From position.
- On receipt of TGT code, turn block handle from Line Closed towards Train Going to & stop midway. Disconnect Line & try to turn the handle further. It shall lock in check lock position. Ensure armature of electric lock on block handle is force dropped in check lock notch and the block handle cannot be turned to Train Going to position.
- With a train in Block Section, try to bring the block handle to Line closed with & without cooperation from other station, it shall not be possible to turn the block handle to line closed position. The Block handle should remain locked in last operated position.

For Last Stop Signal

- Try to take OFF the Last Stop Signal without taking line clear ("L" position of block handle), the signal should not clear.
- Shunt the FVT track, the Last Stop Signal shall go back to danger automatically.
- It is not possible to take OFF the Last Stop Signal again unless a fresh line clear is obtained.

2.2.4 Maintenance

- Always keep each part clean to ensure its proper working.
- Keep Terminals, bolts and plugs of Transmitter and Receiver always well tightened to prevent any looseness of fixtures and consequent poor contact.
- All Contacts in. Block Handle, PB1, PB2 buttons S1, S2 switches are clean and free from grease or dirt.
- All springs are in good condition and kept properly adjusted.
- Contact and switches are under appropriate pressure. The Contacting Portion should be maintained smooth as they wear out at the time of sliding.
- All mechanical moving parts inside the token less Instrument work freely and are well lubricated. Special Care to be taken during rainy weather to prevent rusting and sticking of parts.
- Locking piece and locking segments inside the tokenless instrument shall be cleaned regularly specially during rainy weather.
- No oil or grease should be applied in the locking piece and locking segment.
- At respective handle stops, there shall not be more than 0.5 mm clearance between locking piece and the projection of locking segment.
- Between locking piece and the upper edge of the locking segment when the former is in locked condition and between the Locking piece and the lower edge of locking segment when the former is in unlocked condition there shall be a slight clearance and there shall be no possibility of the locking piece being lifted up.
- The lock armature works freely and the locking portion is properly forced down for each locking portion.
- There is no undue tendency for the Lock Magnet to be held when electrically de-energized.
- The magnet coil does not retain any Magnetism.
- Switches S1 and S2 should be checked regularly. Number of counter operates serially;
- Number in every case is clear and visible.
- Connecting rod with shunt key and Block Handle assembly shall be checked frequently.
- The minimum line battery voltage should be maintained at 21.5 V.D C.
- The minimum line battery voltage should be maintained and ensure operating voltage at the other instrument at 21.5 V D.C.
- The output voltage of receiver for operating CR1 or CR2 shall be 19. 2 V min.
- Transmitter - Source voltage - 24 V.DC Output
- Receiver - Source voltage - 24 V.DC, Input voltage - 0.2 V to 1.0 V (with VTVM).

- TOLK armature should be checked for its placement in the center channel putting the finger tip at the edge of the armature on both sides lightly to check easy play and full operation of parabolic indicator.
- When the input voltage is in the range of 0.2 V to 1.0 V (by VTVM) the output terminal voltage should be 19.2 volt min.

2.2.5 Precautions

- The local battery voltage at the instrument terminals on load should not be below 24 volts. Secondary cells of sufficient capacity may be used as the maximum working current per instrument is about 2 Amps (when thermal time element relay is used) and 0.6 Amp (when Electronic time element relay is used)
- The upper limit of local battery on load should not exceed 29 V as it may affect the Zener diode working.
- The line battery shall be capable of circulate 110 mA in Line circuit measured at code receiving station.
- The line current shall be measured both at the transmitting end and the receiving end.
- There shall not be an appreciable variation.
- Separate battery or DC-DC converter shall be provided for line circuit of each block instrument. Whenever the line battery/ DC-DC converter is changed, the line current should be checked.
- Whenever old type condenser units are changed (with 4 BA fixing screw), ensure that the other interconnected instrument condenser unit is also changed to the same type since the values are different.
- Care shall be taken to ensure that the relay jack boards and relays are clean and dust free.
- During the periodical Maintenance/ Inspection, the charger shall be switched "OFF" and the working of the relays shall be observed for few operations. The terminal voltage should be monitored during the code transmission in order to ensure the condition of the battery.
- Whenever the instrument fails, interchanging of relays and units shall not be restored to, without ascertaining the actual cause and this change may be effected only if it is warranted.
- While plugging in relays/ units, excessive force should not be exerted as it may affect the jack board clips.

2.3 Push button tokenless Block instrument (PTJ make)

2.3.1 Important parameters

Power Supply arrangement

Sr. No.	Circuit	Power supply
1	Telephone Circuit	3 V Battery
2	Local Circuit	24 V 120 AH Battery
3	Line circuit	Battery to supply minimum of 60 mA Line current. The battery voltage depends on Length of block section and hence it varies from one section to other section.
4	External circuit	24 V battery

The external circuit battery is generally provided at home or Adv. Starter location in Mechanical signalling Yards and in case of power signalling.

2.3.2 Guidelines for installation and maintenance

- Line Circuit with EARTH RETURN shall not be used.
- Local Battery voltage at the Instrument terminals on load should not be below 24 Volts.
- Secondary cells of sufficient capacity may be used, as the maximum working current per Instrument is about 1.2 Amps.
- The Local battery voltage on load should not exceed a maximum of 29 V as it may affect the zener diode working.
- The difference between the local battery voltages of the interconnected instruments on load should be kept to a maximum of 4 volts. i.e. between 24 V & 29 V.
- The line battery shall be capable of supplying a minimum current of 60 mA on line but not more than 70 mA.
- The Line current shall be measured both at the transmitting and receiving ends. There shall not be appreciable variations.
- Separate line battery should be provided for each instrument. Whenever the line battery is changed the line current should be checked.
- Wherever dual bank batteries are used for line circuit, the current should be measured before and after every change over. This is to assess the level of charging required for the discharged battery bank.
- While installing these instruments, care shall be taken to ensure that the Relay plug boards and the Relay contact springs are not damaged. (Keep the Relays parallel while plugging/removing the Relays).
- Maintain correct polarity while connecting HOOTER leads.
- HMT cord should be connected to the respective terminals to ensure that no current is drawn from the telephone battery when the HMT button is not pressed.

- Whenever the instrument fails, interchanging of Relays and units shall not be resorted to, without ascertaining the actual cause and this change may be effected only if it is warranted.
- Relays and timer units shall not be left without the Relay retaining clip.
- Whenever the resistance or condensers are replaced in the units correct values have to be selected and soldered properly.
- Oiling of TLB switch contacts shall be avoided.
- During periodical maintenance/Inspection, the charger shall be switched 'OFF' and the working of the Relays has to be observed for few operations. The terminal voltage should also be monitored during the working in order to ensure the condition of the battery.
- All Instruments should be paired with similar type only.
- The entire latch Relays (QL1 Relays) should be in de-latched condition while commissioning the equipment.
- Ensure all the removable connectors are locked perfectly in the plug board.

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COMPENDIUM OF MAINTENANCE INSTRUCTIONS ON SIGNALLING EQUIPMENTS

Section 3

Electric Lifting Barrier

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

Electric Lifting Barrier

3.1 Spares and Tool kit

Following spares shall be supplied alongwith each set (02 nos.) of Electric lifting barrier as per requirement of the purchaser-

- GI boom - 1 no. complete.
- Belt - 1 no.
- Crank handle - 1 no.
- Motor Contactor - 1 no.
- Motor protection MCB - 1 no.
- Push button complete - 2 nos.
- Limit switch - 3 nos. (1 lever type and 2 top roller type)
- Fuses used - 2 sets

Tool kit consisting of standard sizes of wrench/ spanner and Allen keys should also be supplied with each set (02 nos.) of Electric Lifting barrier.

Recommended tools for installation & maintenance

S.No.	Description	Qty.
1	Spanner Set – (for 1/8 " Bolt to 3/4" Bolt)	1 Set
2	Screw driver set	1 Set
3	Allen keys (For 1/8" to 5/8" Allen Bolt)	1 Set
4	Plier	1 No.
5	Tester Screw Driver	1 No.

3.2 Important parameters

RDSO Specification No.: RDSO/SPN/208/2012 (Ver 2.0)

Voltage and current

Type	Rated Voltage	Normal (max.) Optg. Current per barrier, boom length upto 9.76 m (≈ 10 m)	Max. rated current for each barrier, boom length upto 9.76 m (≈ 10 m)
AC	110 V	2.5 Amps	4 Amps
DC	24 V	4 Amps (3 Amps*)	7Amps (5 Amps*)
DC	110 V	1.0Amps (0.7 Amps*)	1.8Amps (1.2 Amps*)

Switches & Indications of Control Panel

Indications for Availability of power (Amber), Boom locking of Barrier A (Green) and Barrier B (Green), Closed position of Barrier A (Green) and Barrier B (Amber)

Switches for opening (Amber), closing (Green) of the boom and for emergency clearing of train signal in case of failure of main detection contact (Red) and a selector switch for Hand Generator/Auto Push button operation*. ***(*** *For barriers with hand generator)*

Parameters as per RDSO Spec. No. RDSO/SPN/208/2012

Time of operation -Less than 12 sec. at rated voltage
Open position of boom - 85-90 deg. from the horizontal.
Closed position - 0-2 deg. from the horizontal.
Lifting barrier boom – GI sheet, octagonal in shape, telescopic structure, painted alternately with 300-mm bands of black and yellow colour and provided with luminous stripes (reflective tape). (RDSO drg. No. RDSO/S 11600).
The length of the boom - 4.88/ 7.32/ 9.76m (16/24/32 ft) as per requirement, divided into max. 4 sections of 2.44 m (8 ft) each joined by nuts and bolts. Clearance between the road surface and the boom in closed position - 0.8 to 1 metre.
A 600 mm dia red disc (min. 20 SWG GI) at the centre, with red reflector buttons/ luminous stripes facing the road traffic. A "STOP" sign (50mm width) in white luminous paint/ stripes.
Boom light – LED type.

3.3 Operation

Push button electric operation

Check that on opening, the operating feed disconnects at 85 deg. and above and on closing, at 5 deg. and below. Stop pushing the button during operation, the barriers should stop in this position. After a delay of 2 sec., press opposite button, the reverse operation should start.

Hand generator operation (where provided)

Keep Auto/ manual switch in "MANUAL". Rotate the hand generator crank anti-clockwise for opening and clockwise for closing. Both lifting barriers should operate simultaneously. On stopping the cranking, the operation should stop For reversing, crank in opposite direction after at least 2 sec.

Emergency direct crank operation

Insert the barrier crank into the hole provided in the mechanism box rear door and engage into the shaft of the gear drive unit. For closing, rotate handle clockwise and for opening anti-clockwise.

3.4 Adjustments

(a) Balancing of Boom

Adjust counter balance weights until operating current is almost the same in opening and closing of barrier and the boom tip rests properly on the boom stand rubber. Applying a slight finger force at the tip should lift the boom. On removing the force, the boom should again close and rest on the rubber pads.

(b) Boom Lock adjustment

For barriers with locking lever & solenoid

Adjust the position of lock box and boom hook so that boom hook falls properly into the lock box opening.

Adjust the position of switch and magnet so that switch contact makes when boom hook falls in and lock lever engages it.

Check the integrity of switch contact with the help of continuity meter.

The contact should not break by physically shifting the boom in horizontal and vertical directions. By moving the locking lever to unlocked position by hand, the contact should break.

For barriers with motorized locking arrangement

Check that after closing the barrier, the boom hook enters through the slot provided on the boom lock box and hits the arm of limit switch. The motor is energized and pushes the rack towards left to lock the boom. On opening, the motor pushes the rack towards right to unlock the boom.

(c) Friction Clutch Adjustment

Completely loosen adjusting nut until gate fails to operate when motor is started, and the clutch slips continuously.

Tighten the nut until the slippage torque of clutch is just sufficient to drive the barrier.

(d) Timing belt adjustment

Loosen the motor fixing bolts.

Adjust the position of the motor, until desired belt tension is achieved, by providing suitable packing below motor/adjusting the motor.

Re-tighten the fixing bolts.

(e) Limit switch adjustment.

Adjust the position of contoured cams fixed on gear box shaft and main boom shaft actuating limit switches inside pedestal:

Loosen the cam fixing screws with Allen Key. Adjust the position of the cam as required, by rotating it on the boom shaft. Tighten all fixing screws after cam position is finally adjusted.

(f) Fortnightly/Monthly maintenance

Check for smooth operation of Barrier and auto stop of barrier in the fully open and closed position. Adjust limit switches if required.

Clean the inside and outside of mechanism.

Tighten all fixing nuts and bolts of the mechanism base, gear box, motor, boom and counterbalance channels.

Operating current measurement.

(g) Quarterly maintenance

Check clutch slippage torque. Adjust if required.

Check Timing Belt tension, Adjust if required.

Check and replace limit switches if contacts worn out.

Check contact of Boom Lock Proving switch. Replace if required.

(h) Annual maintenance

Replace the oil in the barrier and Hand Generator gear unit. Use gear oil SAE 90 or equivalent.

Replace Timing Belts if worn out.

Replace Clutch plate if required.

Oil the clutch slippage bush.

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COMPENDIUM OF MAINTENANCE INSTRUCTIONS ON SIGNALLING EQUIPMENTS

Section 4

Electric Point Machine

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

Electric Point Machine

4.1 Important parameters for Non-Trailable Electric Point Machine 143 mm throw and 220 mm throw with internal locking

IRS Specification No.- IRS:S 24 –2002 with Amendment 2.0
Rated voltage-110 V DC

Operating characteristics

Throw of point machine	Time of operation (Max.)	Current consumption	Test voltage	Test load on throw bar	Slipping load	Stalling load (Min.)
143 mm ± 2	4.0 sec.	≤ 4.5 Amp.	110 V DC	450 Kg	≤ 580 Kg	1000 Kg
220 mm +4/-1	5.0 sec.	≤ 5.5 Amp	110 V DC	450 kg	≤ 580 Kg	1000 Kg

4.2 Tools & Spares

4.2.1 Recommended Tools and measuring instruments

Following tools and measuring instruments should be kept in the duty room for installation and maintenance of Electric point machine:

- Spanner set
- 32 mm (11/4") single end spanner
- Adjustable pipe wrench
- Screw driver
- Hammer
- Tommy bar
- Measuring tape
- Test gauge
- Cutting pliers
- Wire cutter
- Insulation peeler
- DC Ammeter with centre '0' incase of Analog (0-30 Amp)
- DC Voltmeter (0-250V)
- Track shunt resistance.

4.2.2 Spares and Consumables

Following spares and consumables are necessary for maintenance and inspection.

- SAE 30/SHELL 100 oil
- Grease IS 507/508
- Chamois leather
- Cotton waste grade A
- Carbon brush
- Contact assembly
- MS-pins and split pins
- D-bracket and stretcher bar insulation material sets

4.2.3 Tools and accessories to be supplied with new point machines

The following set of tools in a suitable box shall be supplied along with every set of eight point machines or less:

1. Hand operated square drive socket wrenches of 12.5 mm driving square (short type) as per IS: 7381 for M8, M10, M12 & M18 threads. (One 250 mm long 12.5 mm square extension bar as per IS: 7991 alongwith compatible Tee handle Square drive as per IS: 7975 suitable for above socket wrenches.
2. Open jaw wrenches (spanners) for M10, M12, M20, M24 & M33 threads as per IS: 2028.
3. Adjustable wrench.
4. Screw driver 300 mm long

4.3 Technical data

IRS Type Electric Point Machine

- Motor – DC series split field motor
- Rated voltage 110 V DC capable of working at +/-25% of rated voltage.
- RPM 1700+/-15%
- Rated current 5.3A and maximum 8.5A.
- Operating time 4 to 5 seconds.
- Power 440 Watts.
- Gear oil SAE 30.
- Locking- Independent locking of each switch with rotary type locking arrangement.

Siemens Electric Point Machine

- Type of motor…… ……110 V Split field, series wound motor.
- Minimum operating voltage……60 V DC
- Normal operating current ……2.5 to 3.0 Amps
- Operating current during obstruction …3.6 to 3.8 Amps.
- R.P.M……1700
- Output of the motor……0.44 KW.
- Minimum throw of the machine……94 mm
- Maximum throw of the machine……143 mm
- Type of machine……Combined
- Operating time……3 to 4 Secs
- Locking ……common lock rod for locking both the switch rails with rotary type locking arrangement.

4.4 Testing

4.4.1 General testing after adjustment

- Operate the machine several times to see that the locking segment goes smoothly inside the circular locking notches of the lock slides and the driving slide.
- Operate the machine several times by hand cranking and ensure that one of the two lock detection rollers drop into the respective notch of the control disc and detection contacts make only at the end of locking operation.
- The control contacts make with the beginning of the unlocking stroke.
- Check the correspondence between the switches and the point operating lever/group and with the point indication.

4.4.2 Testing of Friction Clutch

- Place an obstruction test piece between closed switch and stock rail at 150 mm from toe of the switch.
- Connect an ammeter in series with the motor feed.
- Shunt operating windings of the overload relay, if provided.
- Operate the points against the obstruction.
- Read the motor current as the clutch slips.
- Remove the shunt of the overload relay after the test.
- Remove the ammeter from the motor feed.

4.4.3 Obstruction Test (Ref: SEM Part II Para 19.38)

The point driving rod and the lock connections of the machine must be so adjusted that with 5 mm thick test piece obstruction placed between the switch and the stock rail at 150 mm from the toe of the switch:

- The point cannot be locked.
- The point detector contacts should not assume the position indicating point closure and
- Friction clutch should slip.

4.4.4 Measurement of working voltage and Current

Operate the machine electrically and measure working current and voltage for both Normal and Reverse operations with and without obstruction. Ensure that the friction clutch declutches during operation with obstruction.

(i) Current measurement

Method 1

- Disconnect the tail cable conductor on common motor terminal.
- Connect the ammeter in series with this conductor and common motor terminal as shown in Fig.
- Operate the machine electrically from Normal to Reverse.
- Note the working current.
- Current reading should be less than 3 amps. This may vary according to site condition.

- Repeat the above for Reverse to Normal operation.
- Measure the current with obstruction in point for Normal to Reverse operation and vice-versa.

Method 2

- Insert the crank handle key and turn to break crank handle cut-out contacts.
- Connect the ammeter in series between CH1 and CH2 terminals.
- Operate the machine electrically.
- Measure the working current as above.

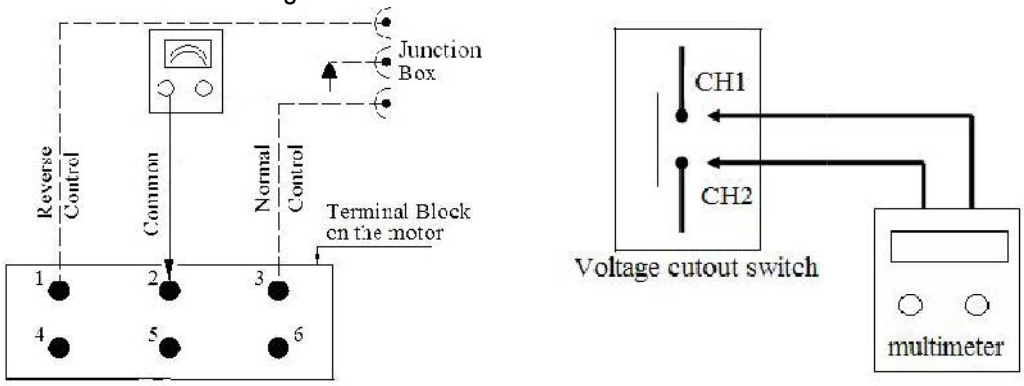


Fig.: Measurement of working current by
(a) Method 1 ***(b) Method 2***

(ii) Voltage measurement

Measure the voltage for normal and reverse operation by connecting voltmeter probes directly to the motor terminals (1 & 2 for Reverse operation, 2 & 3 for Normal operation). The above parameters of current and voltage measurement should be taken every 3 months and recorded as given in following table:

Point No.	Without obstruction				With obstruction			
	Voltage		Current		Voltage		Current	
	N to R	R to N	N to R	R to N	N to R	R to N	N to R	R to N

4.4.5 Crank handle cut out contact testing

Check the wire connections to the terminals of voltage cut-out switch and ensure their intactness. Open the voltage cut-out switch and ensure that the contact is not giving break in circuit and making with sufficient pressure.

4.4.6 Detection contact testing

To check the individual integrity of point detection contacts:

- Open the transparent cover of switch pedestal.
- Break each detection contact one by one manually.
- Check that the corresponding detection relay in the relay room drops each time the detection contact is broken.

- Operate the machine by power and check that the contacts are making with sufficient pressure.

4.4.7 Electrical and Insulation Testing

- Operating values of point machine, point motor insulation and switch bracket insulation should be tested once in three months.
- Tail cable testing with 500 V megger and pot box wiring should be performed once in six months.

4.4.8 Correspondence testing

Correspondence testing of point at site with respect to point group/relay and panel indication must be done after cable meggering and each time the point is reconnected after disconnection for maintenance/repair.

4.4.9 Track locking testing

Shunt any one of the track circuit on point portion with proper track shunt and ensure that the point track indication on the lever frame/panel is showing occupied. Operate the point from the cabin/panel. Ensure that the point does not operate in this condition. Remove the shunt and ensure that the point gets operated. This test shall be done both for normal to reverse and reverse to normal operation. Track locking should be tested once in three months.

4.5 Maintenance

For maintenance of Electric point machine, Maintenance schedules as laid down in SEM part II must be followed strictly.

4.5.1 General

- Ensure cleaning and lubricating of moving parts.
- Ensure that all bolts and nuts including point machine mounting bolts are tight and split pins are opened properly, during every maintenance visit.
- Check that electrical wire connections inside the cable termination box and inside the machine are tight and the wiring is laced properly.
- Check the rodding connections for tightness and friction free movement.
- Lubricate the slide chair plates frequently for smooth working of points.
- Ensure that the rodent entry points in the point machine and CTB etc. if any are properly plugged.
- Lubricate all moving parts with lubricating oil/grease as per manufacture's specifications (refer Para 4.8).

4.5.2 Contact pedestal

Inside the contact assembly, check that spring contacts press against the fixed contacts with sufficient pressure.

4.5.3 Carbon brush

Check that the carbon brushes are exerting sufficient pressure on the commutator. Once in three months check the carbon brushes and commutator, clean the commutator with chamois leather until carbon deposits are disappeared.

4.6 Overhauling

As per IRS:S24 -2002, the life cycle of Electric Point Machine is one million operations. The schedule for overhauling of point machine with one million operations should be as given below (ref.: Recommendations of 7th MSG meeting approved by Rly. Board vide letter No. No. 2000/SIG/M/4 dated 08.02.2001).

- Sub-urban and Trunk routes – 10 years.
- Other than Sub-urban and trunk routes – 15 years.

OR

- 5 lakh operations whichever is earlier.

Overhauling of point machine should be done only at an authorized centralized depot of the division or S & T workshop.

4.7 Painting

Check the point machine for rusting. Remove the rust and apply red oxide and paint to repair it.

The point machine shall be painted black, as stipulated in Annexure – 29 of para 19.106, SEM Part – II.

Arrows showing the direction rotation of crank handle for manual operation of point (N and R) should be painted on the cover beside the socket in which the crank handle is inserted.

4.8 Oiling and lubrication

Lubricate all moving parts with lubricating oil/grease as under:

4.8.1 Oiling

Motor transmission

Pour 100 cc lubricating oil SAE 30 or Shell 100X through oil inlet (1) (provided on the reduction gear box) into the oil reservoir as shown below. Allow some time for soaking of oil and pour oil in intervals and in quantities of approx-10 ccm at a time until oil emerges out of overflow tube (2). This way excessive overflow of oil is avoided.

The periodicity for oiling of motor transmission is as under:

At the time of installation and after 10,000 operations or at 6 month's interval for less frequently operated point machines or as per manufacture's specifications/Zonal Railway instructions. The period may be reduced as and when required according to local climatic conditions.

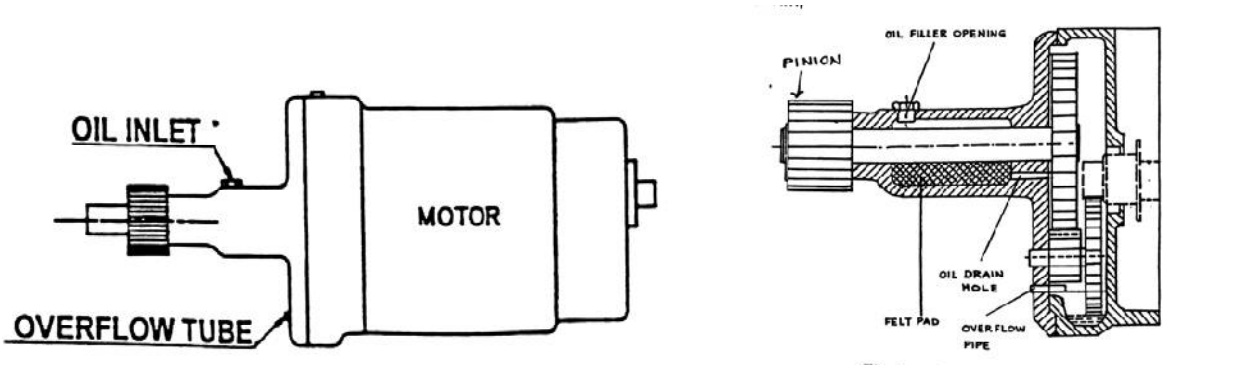


Fig.: (a)Oiling of gear box (1) Oil inlet (2) overflow outlet (b) The inside view of gear train for oiling

Throw bar, lock and detection slides

Pour 10 cc lubricating oil SAE 30 or Shell100X in inlets provided on the cover with felt pad for throw bar, lock and detection slides.

Contact assembly

Apply 10 drops of spindle oil on the helical spring guides of contact assembly.

Miscellaneous

Apply medium grade lubricating oil on all pin connections, detection slides, chair plates, lug and sleeve assembly on drive rod etc.

Drainage of excessive oil

To drain out excessive lubricating oil or water accumulated at the bottom of the point machine casting, unscrew the spring loaded drain outlet and close it afterwards.

4.8.2 Greasing

Apply non-corrosive all temperature grease through all the grease nipples by a grease gun, once in 6 months or as local conditions need to the following:

- Bearings of the gear rack.
- Locking bars.
- Detection slides
- External gears of the transmission assembly.
- Contact assembly of lever bearing.

After approximately 100,000 operations or with less frequently used points, once annually, wipe off all superfluous grease from nipples to prevent clogging and lubricate thoroughly all internal and external lubricating points.

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COMPENDIUM OF MAINTENANCE INSTRUCTIONS ON SIGNALLING EQUIPMENTS

Section 5

Integrated Power Supply

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
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Integrated Power Supply

5.1 Tool kit

S. No.	Description of tools	Size	Make	Quantity
1	Double ended spanner	6-7, 8-9, 10-11 & 12-13	Taparia	01 each
2	Box spanner	6-7, 8-9, 10-11 & 12-13	Taparia	01 each
3	Screw driver set (05 pieces)	6”	Taparia	01 set
4	Screw driver small/ aligner	--	Taparia	01
5	Screw driver big	12”	Taparia	01
6	Cutting plier	6”	Taparia	01
7	Nose plier	6”	Taparia	01
8	Plier	6”	Taparia	01

5.2 Important parameters

RDSO Specification No.: RDSO/SPN/165/2012 (Version 3.0)

(a) AC Distribution Panel (ACDP)

This cabinet consists of:

- Inverters 110 V DC/230 V AC.
- Ferro resonant based Automatic Voltage Regulator (AVR) or Bypass AVR 230 V /230 V AC.
- Transformers 230 VAC/110 V AC for Signals and Track Circuits.

(b) SMPS based Float cum Boost Charger (FRBC) or Switch Mode rectifier (SMR)

Rating -110 V DC 20 Amp.

Auto Float Mode

The float voltage of each rectifier module shall be set as given in the following table:

No. of cells	Auto Float mode voltage	
	VRLA Cells	Conv. LA Cells
55	123.8 V	118.25 V

Normal Float voltage for VRLA battery = 2.25 V/Cell
for conventional battery = 2.15 V/Cell.

Auto Boost Mode

The Boost voltage of each rectifier module shall be set as given in the following table:

No. of cells	Auto Boost mode voltage	
	VRLA Cells	Conv. LA Cells
55	126.5 V	133.1 V

Normal Boost voltage for VRLA battery is 2.3 V/Cell and for conventional battery it shall be 2.42 V/Cell**.**

(c) DC Distribution Panel (DCDP)

This panel consists of DC-DC converters with following ratings:

Sr. No.	Equipment	Rating
1.	Relay Internal	24-32V, 5/10A OR 60-66V,5A
2.	Relay External	24-40V, 5/10A OR 60-66V,5A
3.	Axle Counter	24-32V, 5/10A
4.	Block Local UP	24-32V, 5 A
5.	Block Local DN	24-32V, 5A
6.	Panel Indication	12-28 V,5/10A
7.	Block Line UP	12-40V, 1 A
8.	Block Line DN	12-40V, 1A
9.	Block Tele UP	3-6V, 0.1A
10.	Block Tele DN	3-6V, 0.1A

5.3 Adjustments of output parameters

SMR/FRBC Module

Float and boost voltage adjustment

Available range of adjustment	Voltage to be set to	
	For VRLA battery	For Conventional Lead Acid battery
Float 98 – 138 V	Float 2.25 x 55 = 123.8 V	Float 2.15 x 55 =118.25 V
Boost 98 – 138 V	Boost 2.3 x 55 = 126.5 V	Boost 2.42 x 55 = 133.1 V

To set the DC output voltage of SMR/FRBC, disconnect the battery and switch on one SMR at a time. Turn the potentiometer anti-clockwise for reducing the values and clock-wise for increasing. Set the voltage as per above table. Increase voltage in all the modules by 1.0 volt above the settings for blocking diodes voltage drop.

Note: All modules must be set at same voltage preferably by monitoring voltage at voltage monitoring jack through multi-meter.

Float and boost current adjustment

Available range of adjustment: Float - 9 A – 22A, Boost - 9 A – 22A

Turn the potentiometer anti-clockwise for reducing the values and clock- wise for increasing. The current settings shall have to be same for all SMR modules.

DC-DC Converter

All converter voltages are factory set. However, the user can adjust Converter voltages as per requirement. Each DC-DC Converter is provided with a potentiometer. Turning clockwise will increase the voltage, while the output voltage reduces in anti-clockwise direction.

Inverter

The inverter output voltage can be varied by rotating the voltage adjustment potentiometer mounted on the front panel of the inverter with the help of preset driver (range allowed is 200 – 400 V) factory setting is at 230 V. Rotate the pot in clock-wise direction to increase the output set voltage and anticlockwise direction to decrease the output set voltage.

5.4 Maintenance

5.4.1 Maintenance Check Points for DC-DC Converters

Sr. No.	Check Point	Action Required	Frequency
1.	Converter O/P voltage	Check if the O/P voltages are set as per requirement. If not, correct them	Once in 15 days
2.	Paralleling of Converters	Switch OFF main Converter and observe if the stand-by is taking the load.	Once in a month
3.	Paralleling of Converters	Switch OFF Stand-by Converter and observe if the main is taking the load.	Once in a month
4.	Converter Mechanical Alignment	Check if all the converters are inserted properly	Once in 3 months
5.	Converter Cleaning	Remove one by one and clean the converter using a soft cloth. Gently blow some air from top or Bottom to remove the dust inside.	Once in 3 months
6.	Converter failure	Check for failure Signal	Once in 3 months

Adjustment during system working (without disturbing loads)

- Pull DC-DC Converter from front for adjustment.
- Connect the Converter to the rack with both I/P and O/P card extenders.
- Connect the test points to Digital Voltmeter.
- Adjust the potentiometer to get the desired output.
- Check all the converters voltages pertaining to individual applications will be equal.

5.4.2 Maintenance Check Points for ACDP

Sr. No.	Check Point	Action Required	Frequency
1.	O/P voltages of Inverters, AVRs , Step-Down Transformers as	Check if the O/P voltages are set as per requirement. If not, check for fuses contactors.	Once in 15 days

Sr. No.	Check Point	Action Required	Frequency
	per requirement		
2.	Inverter O/P current	Check if the DPM is showing the signal current as per original settings.	Once in 15 days
3.	Auto changeover between Inverters and Bypass CVT	Check for this changeover operation as described in 5.3.3	Once in a month
4.	Connector Mechanical Alignment	Check if all the connectors of various sub systems are inserted properly	Once in a month
5.	Sub System Cleaning	Remove one by one and clean them using a soft cloth. Gently blow some air to remove the dust inside.	Once in 3 months

5.4.3 Testing of ACDP Auto-Changeover

- Connect one of the signal transformers outputs to the Digital Voltmeter provided.
- Stop Inverter1 by pressing STOP button.
- Check 'Load on Inverter' LED on Inverter2.
- Check voltage on digital display.
- Now stop Inverter2.
- Check voltage on display.
- The voltage displayed indicates load on CVT.
- For checking Auto-Changeover in Reverse order:
  - Start Inverter2 – load should shift on Inverter2 automatically.
  - Start Inverter1- load should shift on Invertrer1 automatically.

5.4.4 ACDP Manual Changeover

- A manual changeover switch is provided in the backside of ACDP.
- At the time of Auto-Changeover failure, this switch can be used to connect signal loads to Inverter1 or Inverter2 or CVT manually.
- This switch has four positions namely:
  AUTO, INVERTER1, INVERTER2 & CVT
- In normal working, the switch position is kept at AUTO.

5.4.5 SMR Maintenance

SMRs are fully alarmed and operate in an active loop sharing arrangement. However, some regular checks can be an early warning of problems waiting to happen. Check for failure signal by switching off one SMR at a time once in a month.

Current sharing (when number of modules is more than one number)

Under normal conditions the currents contributed by every rectifier should be within +/-2 Amps of each other.

5.5 Battery maintenance

For maintenance of Battery, manufacturer's maintenance manual and instructions of Zonal Railways to be followed.

Some important points for battery maintenance are given below:

VRLA battery

- Cleaning of all cells near its terminals.
- Reading of all cell's voltage with Charger ON.
- Reading of all cell's voltage with Charger switched OFF.
- Boosting of Sick cell using Sick cell Charger.
- Replacement of the faulty cell with new cell.

Low Maintenance Battery

- Cleaning of all cells around top cover and terminals periodically.
- Applying petroleum jelly over the terminals.
- Periodically recording of all cell voltages and their specific gravity.
- Periodically checking of electrolytic level of cells.
- Periodically recording of all cell voltages with Battery Charger switched OFF.
- Boosting of Sick cell using Sick cell Charger.
- Replacement of non-reparable cell in a bank by fresh charged cell.

5.6 Cleanliness

Apart from these instructions regular cleaning of IPS and battery room should be done. Cleaning of dust collected inside the IPS panels (SMPS, DCDP & ACDP) should be done with the help of blower once in a month.

5.7 Checking of earth resistance

Check earth resistance every 3 months with earth resistance meter. It should be less than 2 Ohm.

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COMPENDIUM OF MAINTENANCE INSTRUCTIONS ON SIGNALLING EQUIPMENTS

Section 6

LED Signal

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

6.1 LED Signal

6.1.1 Important parameters

- RDSO Specification no.: RDSO/SPN/153/2011 Revision: 4.1 (Draft)
- The minimum visibility distance of Main signal LED signal lighting Units shall be 600 m. in clear daylight with peak sunrays at rated voltage.
- The minimum visibility distance of Direction type Route Indicator with three lit LED signal lighting units shall be 400 m. in clear daylight with peak sun rays at rated voltage
- The minimum visibility distance of LED signal lighting units, other than Main and Route signal lighting units, shall be 200 m in clear daylight with peak sunrays at rated voltage.

Operating parameters

Parameter	**Main Signal**	**Calling-on Signal**	**Route Indicator**	**Position Light Shunt Signal**
Rated voltage at Input terminals of Current Regulator	110V AC +25 %	110V AC ± 20%	110V AC ± 20%	110V AC ± 20%
Current at rated voltage per unit at Input terminals of Current Regulator	140 mA +10%, -20% (rms) *	150 mA +10%, -20% (rms)	25 mA ± 5%(rms)	35 mA ± 5%(rms)
Colour	Red ,Yellow, Green	Yellow	Lunar White	Lunar White

In **blanking mode**, a Main Signal Lighting Unit shall extinguish when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is not less than 40% of nominal illumination due to a failure or any other reason. In such case, current regulator should not draw input current more than 30 mA at maximum rated voltage.

In **non-blanking mode**, a Main Signal Lighting Unit shall remain lit when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is less than 40% of nominal illumination due to a failure or any other reason. In such case, input current drawn by current regulator shall be limited to less than 40 mA to ensure dropping of ECR. Limit on input current shall apply when illumination has deteriorated to a value, which is not less than 40% of nominal illumination.

As per RDSO guidelines, for RED aspect, Non – Blanking mode should be selected in Current Regulator & for Green Aspect, the Blanking mode should be selected. For Yellow aspect, it should be selected based on installation.

6.1.2 Jumper Selection on CR

(i) For CR of General Auto Electricals

Main Signal aspects	
1& 2	LED ECR mode
3 &4	Conventional ECR mode
5 & 6	Blanking mode
6 & 7	Non-Blanking mode

Subsidiary Signal aspects			
Calling On	**Shunt**	**Route**	**ECR used**
1 & 2	1 & 2	1 &2	LED ECR
	4 & 5	4 & 5	
3 & 4	2 & 3	2 & 3	Conventional ECR
	5 & 6	5 & 6	

(ii) For CR of Power Technologies

Main Signal aspects	
2 & 3, 6 & 7	AC LED ECR mode
2 & 3, 5 & 6	AC conventional ECR mode
1 & 2, 4 & 5	DC LED ECR mode
9 &10	Non- blanking mode
8 & 9	Blanking mode

Route and Shunt Signal aspects	
1&2, 6&7, 8&9	AC LED ECR mode
1&2, 5&6 8&9	AC Conventional ECR
2&3, 4&5 9&10	DC LED ECR

(iii) For CR of Urban Engg. Association

Main Signal aspects	
Non-Blanking mode	
2&3,4&5,7&8,10&11	AC LED ECR
2&3, 5&6, 8&9, 11&12	Conventional ECR
Blanking Mode	
1&2,4&5,7&8,10&11	AC LED ECR
1&2, 5&6, 8&9, 11&12	Conventional ECR

Route & Shunt Signal aspects	
1&2,4&5, 7&8	AC LED ECR mode
2&3,5&6, 8&9	AC Conventional ECR
1&2,5&6, 8&9	DC LED ECR
Calling On Signal aspects	
1&2,4&5	AC LED ECR mode
2&3,5&6	AC Conventional ECR
1&2,5&6	DC LED ECR

6.1.3 Maintenance

- Input Voltage range available to Signal Aspect on load at site >82.5V to <137.5 V AC.
- Ensure that terminations on CR and fuse terminal block are proper and tight.
- Ensure that interconnecting cable between CR and LED/Signal lighting Unit is properly connected and tight.
- Ensure that mounting screws of LED Signal Lighting Unit, CR and fuse terminal block are properly fixed.
- Ensure that protective Caps are placed on the supply terminals of CR.
- Tighten all terminals in CT rack, junction Box, LED Signal Lighting Unit, Current Regulator, HMU, Route Signals, Shunt Signals and Calling-On Signal periodically or as per instructions given by the railways.
- Ensure that mounting bolts/screws have been tightened for LED signal lighting unit, current regulator and Health monitoring unit once in a six month or as instructed by railways.
- Clean the LED signal lighting units, all terminals and current regulator periodically with soft cloth.
- Ensure that LED signal does not vibrate during the running of trains.
- Ensure that the all LEDs of LED signal lighting unit are properly lit.
- LED signal lighting unit should be stored in suitable cover provided with thermocol packing on the inner side surface.
- Ensure that the protection cover is provided on the current regulator terminals to avoid external interference.
- The connections in the location boxes should be cleaned for removing oxidation, rusting etc. regularly.
- After any check opening/refitting CRC spray should be provided.
- The LED signal lighting unit clear lens should be cleaned once in a six month to remove the dust with anti-static soft cloth or as per instruction give by the railways.
- Ensure that the AC supply used for lightening the LED Signal Lighting units is pure sine wave (i.e.50Hz ± 2 Hz).
- Ensure that correct polarity is connected while connecting power supply in case of DC lit signals.
- Check periodically and ensure that signal housing door is kept shut and locked properly.
- Safety validation test as per the pre-commissioning check list may be conducted once in a year.

Visibility check

Check each LED signals lighting unit at monthly interval or as per instructions issued by the Railways, and ensure that the minimum visibility distance of LED signals in clear day light with peak sun rays at rated voltage are as shown in 3.1.1.

Ensure that the LED signal lighting unit is also visible to a driver stopping at the foot of the signal.

6.1.4 Testing

The following testing should be carried out as per schedule of maintenance (Monthly) or as per the instructions issued by the Railways:

(a)Route Signal

Ensure that UECR of Route signal is dropped while three numbers of LED Signal Lighting units of route signal is extracted.

Ensure that ECR should pick up with five route LED signal lighting units are lit in parallel.

(b) Main Signal

Ensure that cascading of the signals is working properly.

Ensure that current regulator draw proper current (as per table under 3.1.1) while LED signal lighting unit is lit and the concerned ECR is picked up.

Ensure that most respective aspect is in non-blanking mode and other aspects are in blanking mode.

(c) Health monitoring device

Check that audio alarm and visual indication appears while LED signal lighting unit is disconnected.

Check that audio alarm is silenced while acknowledge button is pressed.

(d) Insulation resistance test

Check the insulation resistance as given below after every six months or as per instructions issued by the Railways:

- Check that insulation resistance for LED signal lighting unit, current regulator and health monitor unit with 500 Volt megger between the body and the current carrying terminals shall not be less than 100 M Ohms.
- Check that the insulation resistance of cable conductor connected for lighting the LED signal lighting unit shall not be less than 100 M Ohms.

(e) Check for lamp, CR, Correspondence of ECR & Fuse terminal block.

(a)	After taking off signal remove the fuse in the Fuse terminal block.	(i) Aspect at site extinguishes and more restrictive aspect lights (In case of RED aspect signal in rear goes to danger) (ii) Fuse blown indication appears on terminal block. (iii) ECR of the aspect drops
(b)	Restore the fuse in fuse terminal block	(i) Aspect at site lights normal (ii) ECR of the aspect picks up

(f) Check for Lamp, CR and correspondence of ECR

(a)	After taking OFF an aspect disconnect interconnecting cable between CR and LED Signal Lighting Unit from LED Signal lighting Unit (In case there are two Inter connecting cables between CR and LED Signal Lighting Unit– Disconnect the Cable other than optical sensing cable. The cable with 2 pin connector is optical sensing cable.)	(i) Aspect at the site extinguishes and more restrictive aspect lights (In case of Red aspect, signal in rear goes to danger.) (ii) ECR of aspect drops.
(b)	Reconnect disconnected cable and take off the aspect again	(i) Aspect at site lights normal **(ii)** ECR of the aspect Picks up
(c)	Disconnect the optical sensing cable (i.e. 2 pin round cell connector) from LED signal lighting unit.	(i) In case CR is configured for Non-blanking mode. Aspect at site lights with deteriorated illumination with input current of CR restricted to < 40 mA. In blanking mode Aspect at site Extinguishes with input current restricted to < 30 mA. (ii) More restrictive aspect lights (In case of Red aspect, signal in rear goes to danger. (iii) ECR of the aspect drops
(d)	Reconnect disconnected cable	(i) Aspect at site lights normal (ii) ECR of the aspect picks up.

■■■

ANNEXURE II

Railway Board's letter on LED Signal

Government of India
Ministry of Railways
(Railway Board)

No.2001/Sig/SGF/12(LED)Pt. New Delhi, dated: 21.1.2015

To
CSTEs
All Indian Railways

Sub: Failure of Route Signal leading to unusual situation.
Ref : Rly. Bd's letter of even no. dated 10.11.2014, 11.11.2014.

Vide above, an unusual failure of route LED aspect were reported in which the Home Signal was glowing without route being lit. The matter was investigated by the RDSO. It is desired that a drive be launched checking the following items:-

(i) Fuse rating used in LED lighting circuits should be of 630 mA as recommended by RDSO vide its letter No. STS/E/EL-LE/GenXIV dated 16.11.12 till further directions.

(ii) The jumper selections of the aspect should be as per the ECR being used viz. if the conventional ECR is being used, then jumper selection should be in conventional ECR mode and when LED ECR is being used, then the jumper selection of the aspect should be of universal LED ECR mode.

(iii) All aspects should be of the same vendor as per earlier advice of RDSO.

Format of the drive should be as under:-

S. No	Div.	No. of fuses replaced with 630 mA fuses	No. of aspects for which Jumper selection executed	No. of Aspects where different make Route LEDs	
				Found	Replaced

The result of the drive should be sent to the Board's office by 21.2.2015.

(Harsh Deep Srivastava)
Director (Signal)
Dt. 21.1.2015

Section 7

Panel Interlocking & Route Relay Interlocking

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

7. Panel Interlocking & Route Relay Interlocking

7.1 Periodical Testing

The following testing shall be done periodically as per pro- forma given for each type of testing:

7.1.1 Approach Locking Testing

Approach locking should be tested Quarterly. Approach locking must be tested with each track circuit failed, which is a part of Approach track. Approach lock timer will start on doing three button cancellation. Try to do three button cancellation with timer flashing. Route should not be released. Only after timer becomes steady, It should be possible to release the route by three button.

Pro-forma

TESTING OF APPROACH LOCKING

Periodicity: Quarterly

Signal No.: ……..

Approach locked by Track circuit ……..

Approach locked Time 60/120 Secs……..

Sr. No.	Time tested	Date tested	Name of JE/SE/SSE	Signature	Remarks

7.1.2 Track Locking Testing

Track locking must be tested quarterly for each track circuit of any point/ cross-over individually. Fail one track circuit with the other track circuit of point/cross-over as pick up. It must not be possible to operate the point by WN and WWN buttons. Point can be operated only by pressing buttons WN and EWN. Now fail other track circuit with the first track circuit of point-cross as pick up. It must not be possible to operate the point by WN and WWN
buttons. Point/cross-over can be operated only by EWN and WN buttons.

Track locking must be tested with each tack circuit of point/cross-over failed one at a time and other as pick up individually for each and every point/cross-over.

Pro-forma

TESTING OF TRACK LOCKING

Periodicity: Quarterly

Point No.: ……..

Track Circuit No…….

Sr. No.	Time tested	Date tested	Name of JE/SE/SSE	Signature	Remarks

7.1.3 Back Locking Testing

Back locking should be tested quarterly by failing each track circuit of the route one at a time individually. Take off the signal for each and every route. Fail any one track circuit of the route and do three button cancellation by pressing GN and EUUYN button and keeping GN button in pressed position, press UN button. Route must not be released. Route must be released only when all track circuits of the route are picked up position except berthing track circuit, overlap track circuit and isolation track circuit.

Pro-forma

TESTING OF BACK LOCKING

Periodicity: Quarterly

Signal No.: …….

Route Section…….

Back locked by Track circuits ……

Released by Track circuits……..

Sr. No.	Time tested	Date tested	Name of JE/SE/SSE	Signature	Remarks

7.2 Precautions, Do's & Don'ts for stations with PI or RRI

7.2.1 Operating Panel

- Check that Emergency Point Operation (EWN) button and Emergency Route Section (EUYN) buttons are sealed. If found not sealed, then check the entry in the concerned register and ensure that it is correctly maintained, get it sealed and ascertain the cause.
- Check that all the counters are working properly and in accordance with entries in respective register i.e.
  - EWN Counter Increments on each emergency point operation.
  - EUYN Counter Increments on each emergency route section release.
  - EUUYN Counter Increments on each emergency route release.
  - OYN Counter Increments on each overlap release.
  - COGGN Counter Increments on each calling-on signal clearance operation.
- Check that, when SM's key is taken out, it shall not be possible to do any operation from control panel. Also ensure that the signal can be put back to 'ON' in this condition without altering the route.
- Check that the buzzers and indicators for signal failure, point failure and button pressed for long duration and train acknowledgement are in working order.
- Always obtain a written memo from the on duty ASM before doing emergency route section release by EUYN key or emergency point operation by EWN button. This does not apply to zonal railways who have assigned the responsibility of these operations to the operating department.
- Check that the panel indication for flasher is working properly.
- Check that adequate numbers of button collars are provided on the operating panel.
- Don't do any such operation on the panel, which interferes with the movement of trains.
- Do not release a locked route unless a properly written memo indicating complete movement is received from the panel operator on duty.

- When the point zone track circuit is showing occupied indication, do not try to operate the point with EWN button without ascertaining that track circuit is dropped and no vehicle is standing on the track.
- For testing of points, do not operate the points without getting consent from outdoor staff on VHF set or group telephone.
- Don't break any seal without getting a written memo and entry being made in the concerned register.
- Don't do any cleaning / oiling maintenance work on points without the knowledge of ASM panel and other works without having proper disconnection memo.

7.2.2 Relay Room

- Ensure double locking arrangements in relay room where provided. Every time when key is taken ensure entry in the register.
- Always keep footwear outside relay room.
- Always ensure to paint/write nomenclature on relay after replacement.
- Check for proper fuses in the relay rack and ensure that no fuse is bypassed
- Check that each relay is properly plugged.
- Check for clean and neat soldering on tag blocks.
- Ensure that tube-lights/lamps are in working condition.
- Ensure that the circuit diagrams are kept upto-date and maintained in good condition.
- Keep relay room free from dust and moisture and equipped with Air conditioner.
- Ensure proper tightening of cable terminals on racks
- Don't do any maintenance work in the relay room during the train movement in the station yard.
- Do not tamper with the code pins of the relay while replacing.
- Do not keep any extra material such as loose wires, released components etc. inside relay room.
- Do not keep any inflammable material like kerosene, acid etc. inside relay room.

■■■

Section 8

Electronic Interlocking

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

8. Electronic Interlocking

8.1 MICROLOK II Electronic Interlocking System

8.1.1 System Maintenance

(i) Weekly Maintenance

(a) Measuring Voltages

(Performed by Signal Maintainer)

S.No.	Date	12 V DC MLK II Cardfile Supply		24 V DC MLK II I/O Supply		Observation	Signature
		At IPS	At MLK II Rack	At IPS	At MLK II Rack		
1	12.03.08	15.5 V	13.5 V	30 V	28 V		

(b) Fuse Checking

(Performed by Signal Maintainer)

S. No.	Date	Fuse Checking						
		MLK II Power Supply Board Fuses	MLK II I/O Board Fuses	Switching Circuit Fuse	Panel Supply Fuses	Converter Cum isolator fuses	Observation	Signature
		MLK II Rack	MLK II & Relay Racks	MLK II Rack	Relay Rack	MLK II Rack		
1	12.03.08	OK	OK	OK	OK	OK		

(c) Backup Schedules

(Performed by Signal Engineer)

The User Data Log, Event Log and Error Log backups are to be taken in Hard Disk as well as Floppy Disk for remote storage.

S.No.	Backup Date	User Log Backup	Event Log Backup	Error Log Backup	Observation	Signature
1	12.03.08	Done	Done	Done		

(ii) Monthly Maintenance

(a) System Changeover

(Performed by Signal Engineer)

Sr.No.	Date	System Changeover		Observation	Signature
		A > B	B > A		
1	10.01.08	Done			

During Changeover, SGE block instrument must be kept in TOL condition.
Ensure Synchronization Microlok II clock time with Maintenance PC time after changeover.

(c) Measuring Earth Resistance Value

(Performed by Signal Engineer)

SR.	Date	Earth Resistance value								Observa-tion	Sig
		Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6	Pit 7	Pit 8		
1	10.01.08	0.3 Ohm	0.8 Ohm	0.5 Ohm	0.7 Ohm	0.4 Ohm	0.6 Ohm	0.8 Ohm	0.2 Ohm		

Note: Earth Resistance value should be less than 1 Ohm.

(iii) Annual Maintenance

(Performed by Signal Engineer)

- Replace the Lithium Battery.
- Check the Converter cum Isolator.
- Remove the VCOR relay from the installation and inspect it.
- Perform the inspection activities mentioned under *Preventive Maintenance***.**

(iv) Five Years Maintenance

(Performed by Signal Engineer)

- Inspect Surge Protection Devices (SPDs).
- Replace if found deteriorated.

System failure Register

S. No.	Failure			Changeover		Interlo-cking Down Time	Equipment or Component failed	Corrective Action			
	Type	Date	Time	Date	Time			Descrip tion	Date	Time	By
1	System reset	14.01.08	11.10 Hrs.	14.01.08	11.14 Hrs.	04 min.	CPU-RAM error	CPU replace d	14.01.08		

(v) Preventive Maintenance

The following checks should be performed at least on an annual basis:

- Clean the outside of the cardfile/enclosure using a soft clean cloth.
- Inspect the cardfile/enclosure for dents and scratches and internal damage.
- Ensure that the all cardfile modules are properly mounted and securely fastened.
- Remove all printed circuit boards from the cardfile. Inspect the cardfile back-plane for loose or damaged connectors. Also, thoroughly inspect each printed circuit board for physical damage, discoloured or damaged components and wiring insulation, cracked or broken component leads and copper traces. Questionable circuit boards should be replaced from the spares inventory.
- If necessary, vacuum-clean the interior of the cardfile without disturbing any wiring. Use a non-metallic, insulated vacuum head.
- Re-install the circuit boards into the cardfile. Tighten the board retaining screws finger tight.
- Check all power input and signal supply leads for frayed or discoloured insulation and loose connections. Also check all lightning arrestor/voltage suppressor devices for any signs of physical degradation.
- Visually examine all wire and cable harnesses for proper bundling and slack.
- Remove the VCOR relay from the installation and inspect it.

☞ **Caution**

When handling any MICROLOK II circuit board or board component, observe all *Electrostatic Discharge (ESD) Precautions*. Improper handling of boards or components may result in damage to static sensitive circuitry.

Do not install or remove any MICROLOK II printed circuit board with battery power applied to the cardfile. Damage to the circuit board or the cardfile backplane may result.

(vi) Corrective maintenance

Corrective maintenance on the MICROLOK II system is limited to the correction of basic wiring and hardware problems and the replacement of modular system components.

If a component has been determined faulty, return it to M/s Ansaldo STS Transportation Systems Pvt. Ltd for repair or replacement.

☞**Warning**

Do not attempt to repair any MICROLOK II system Printed Circuit Board or peripheral device in the field. This equipment must be returned to M/s Ansaldo for repair or replacement. Any attempt to repair the MICROLOK II system may jeopardize the safety related functions of the system.

8.1.2 Precautions, do's & don'ts

(i) Electrostatic Discharge Precautions

When working on the Electronic Interlocking System, contact with the system printed circuit boards cannot be avoided. Hence following guidelines to be observed:

- Always stand on an approved conductive floor mat when touching or handling printed circuit boards.
- Always wear a strap grounding device. The wrist strap should have a 1.0 megohm current limiting resistor. Connect the wrist strap grounding connector to suitable ground connection.
- Periodically check each wrist strap for continuity using an approved tester. Continuity readings must be between 500 k ohms and 10 megohms. Discard any wrist strap that does not meet this criterion.
- Always handle printed circuit boards by the edges. Do not touch board components.
- Keep the work area clean and free of debris. Avoid using non-conductive materials such as Styrofoam cups, plastic ashtrays, cellophane wrappers, or plastic covered binders in the vicinity of the cards and modules.
- Once removed from the cardfile/rack, immediately place printed circuit boards into an anti-static conductive-shielded bag. Wrap the bag in conductive foam to protect the circuit board during transport and shipment. Modules fitted with batteries may require special packaging.
- Avoid wearing clothing made of synthetic fabric when handling modules. Cotton overalls are preferred.

(ii) Packing

All plug-in modules and cards shall be packaged in anti-static packaging to prevent damage to Electro-Static Sensitive Devices (ESSD) from electro-static discharge. When so packed, the modules may be stored and transported without further precaution.

(iii) Storage

For storage of Modules and cards following precautions shall be taken:

Must not be in close proximity to magnets, e.g. Automatic Warning System (AWS) magnets.
Must be protected from damage due to electrostatic discharge.
Must be protected from the environment including physical handling damage.
If many modules are involved, it is permissible to use conductive card frames or racks. However bags and wraps are preferred.

(iv) Transport

The equipment or modules must not be transported in close proximity to magnets e.g. AWS magnets.

(v) Handling Lithium Batteries

Following precautions should always be observed while handling Lithium Batteries:

Packaging

Package all modules with batteries in a non-conductive anti-static bag. An electrically conductive bag may short the battery terminals causing premature discharge of the battery.

Damage

The lithium batteries contain very highly corrosive electrolyte. If a battery is damaged:

- Ensure unnecessary personnel do not enter the affected area.
- Ventilate the immediate area.
- Avoid contact with any liquid or internal components by wearing the appropriate safety equipment.
- Thoroughly wash the affected area with clean water and allow it to dry.
- Return the module that may have been in contact with the electrolyte to the firm for inspection duly packaged with an appropriate safety warning.

Disposal

Dispose of the battery according to the local regulations.

Don't

- Short the terminals together.
- Attempt to recharge.
- Crush.
- Disassemble.
- Incinerate or heat above 100 deg. C.(212 Deg F)
- Attempt to solder the cell.

(vi) Do's and Don'ts

Do's

- To avoid possible damage to the diagnostic computer when connected to the Electronic Interlocking equipment, if the power supply of the diagnostic computer is connected to an AC power source, isolate the power source from earth ground by way of a 3-prong to 2-prong adapter.
- Before powering up the Electronic Interlocking equipment, ensure that there is no train entering into the section in both Up and Down Direction.
- Observe all Electrostatic discharge precautions while handling any Printed Circuit Board or board component
- For repair or replacement if any, return the equipment to the firm

Don'ts

- Do not use Radio equipment within the immediate vicinity of Electronic Interlocking system as Radio transmissions can affect electronic equipment.
- Do not make circuit alterations or repairs to the Electronic Interlocking system.
- Do not install or remove any printed circuit board with battery power applied to the system.
- Do not attempt to repair any Electronic Interlocking system printed circuit board or peripheral device in the field.

***

8.2 WESTRACE VLM6 Electronic Interlocking System

8.2.1 Maintenance

Following are the general guidelines which should be followed for maintenance of the WESTRACE system:

(i) Connections & cable

Regularly carry out normal continuity checks on the cables and connections.
Do not perform these tests while the cables are connected to electronic equipment.

(ii) Exercising OPCR

Manually exercise (i.e. de-energise and re-energise) the OPCR where this is not performed automatically as part of the application logic.

At the specified intervals:

- Obtain the permission from Station Master/Panel Operator.
- Remove power to housing1.
- Verify that OPCR and all aspects de-energise.
- Restore power to housing1 after 40 seconds.
- Verify correct operation.
- Return control to the Station Master/Panel Operator

Note: Exercising OPCR, presently achieved in application logic

(iii) Replacing Lithium Battery

WESTRACE Network Communications Module (NCDM) has Lithium batteries installed. Replace Lithium batteries of WESTRACE NCDM module every 5 years.

(iv) Measurement of voltages

Measurement of voltages at following busbars of WESTRACE is to be done:

24 V DC Busbar Specified range 22 V to 25.8 V

50 V DC Busbar Specified range 48 V to 52 V

Measuring of voltage at PSU PFM (Input voltage from DC-DC Converter) is done at terminal nos. 1 (+) & 4 (-).

Measuring of voltage at OPC PFM (Input voltage from DC-DC Converter) is done at terminal nos. 1 (+) & 2 (-).



Fig 8.1: Measurement of voltage at 24 DC Busbar

(v) Checking of fuses

Check all the fuses according to the schedule.
Any fuse is showing Red indication means the fuse is blown and has to be replaced.
After replacing the fuse it is to be ensured that it is refitted properly without any loose connection.

8.2.2 Standard format for WESTRACE Maintenance Schedule

Weekly Maintenance

Measuring voltages schedule [Performed by Signal Maintainer]
Nominal Voltage Range 24 V DC
Nominal Voltage Range 50 V DC

Sr. No.	Date	24 V DC WESTRACE Supply		50 V DC OPCR, VROM & VPIM Supply		Remarks	Signature
		At PSU PFM	At HOPC PFM	At OPCR Relay	At VROM & VPIM Busbar		

Fuses checking schedule [Performed by Signal Maintainer]

Sr. No.	Date	Fuse checking					Remarks	Signature
		PSU I Fuse	PSU II Fuse	VROM/V PIM Fuses	Panel Supply Fuses/Scanner Card Fuses	Network switch/ Modem Fuses		
		WESTRACE Rack	WESTRACE Rack	WESTRACE Rack	S2 Rack (Panel Processor)	WESTRACE Rack		

Monthly Maintenance

Earth Resistance Measurement [Performed by Signal Engineer]
Earth Resistance value should be less than 1 Ohm

Sr. No.	Date	Earth Resistance Value								Remarks
		Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6	Pit 7	Pit 8	

Database Backup schedule [Performed by Signal Engineer]

MoviolaW Database Backup should be taken every 45 days only
(All data to be saved in a separate folder called Backup folder)

Sr. No.	Backup Date	MoviolaW Database backup	Storage in PC drive	Remarks	Signature

EI System Failure Register [Performed by Signal Engineer]

Sr. No.	Failure in System	Interlocking Downtime	Details of the failure	Equipment or Component failed	Corrective action			
					Description	Date	Time	By

Hot Standby – System Changeover Schedule
[Performed by Signal Engineer – once in a month]

Sr. No.	Date & Time	Hot standby system changeover		Remarks	Signature
		Primary to Secondary	Secondary to Primary		

- Clear the signal after setting a route.
- Observe indications on panel.
- Suppose WESTRACE A is Online system and WESTRACE B is standby.
- Switch off WESTRACE A by removing fuse.
- System should immediately changeover to WESTRACE B.
- Green Watchdog LEDs on VLM and NCDM cards of standby System B should start flashing showing System B functioning properly.
- The changeover should not disturb the signal and route on the panel.

8.2.3 Anti-static Protection

Keep all spare modules received for installation or kept as a reserve for maintenance in anti-static packaging. Module fitted with batteries may require special packaging.
Use appropriately grounded earthing mats to prevent damage to equipment.
Wear conductive wrist straps when handling modules.
Avoid wearing clothing made of synthetic fabric when handling modules. Cotton overalls are preferred.



Fig. 8.2: Anti-static protection accessories

8.2.4 Do's & Don'ts

Do's

- Keep the WESTRACE EI room free from dust and moisture.
- Ensure all terminations are fully tight.
- Place the faulty modules removed from the system with an identity tag into a conductive shielding bag.
- Maintain minimum 24 V DC between the WESTRACE power fuse and negative terminals on the WESTRACE rack (24 Volts).
- Maintain minimum 50 V DC between the WESTRACE input/output modules (50 V) fuse and negative terminals on the WESTRACE rack.
- Check the WESTRACE system fuses at regular interval.
- Take backup of MoviolaW- maintenance terminal user data log file once in every 45 days.
- Use card extractor for removing of WESTRACE modules.
- Use vacuum cleaner for the EXTERNALLY accumulated dust and dirt.
- Read carefully WESTRACE Fault codes and Fault description on WESTRACE First Line Maintenance manual during troubleshooting.
- WESTRACE powering Down – Switch OFF the top housing ***first.***
- WESTRACE powering Up – Switch ON the top housing ***last*** after switching ON all other housings.
- Give a delay of 40 seconds between powering down and powering up again.

Don'ts

- Attempt WESTRACE troubleshooting if you do not have proper WESTARCE training.
- Remove modules, OPCR relays, Fuses, Links, PFMs and I/O module connectors when the System is ON.
- Force modules into the slots during insertion.
- Change version switch settings of VLM6 and NCDM modules.
- Change jumper settings in UHVBC and S2 Scanner card.
- Touch the module components.
- Repair module on your own.
- Switch OFF MoviolaW.
- After WESTRACE settings, MoviolaW and WESTCAD PC settings without Authorization.
- Delete/Modify Application Logic program without Authorization.
- Use blower for cleaning the dust. Use vacuum cleaner on INSIDE the housing.
- Use any kind of solvents, detergents or abrasive cleaners on the Housings or internal components.
- Remove optic fibre cable connector when optical modem is ON.
- Installation of Unauthorized software in WESTCAD/MoviolaW PC.
- View optical laser light on exposed eyes.

■■■

Section 9

Data Logger

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

9. Data Logger

9.1 Do's & Don'ts for Data Loggers

9.1.1 Do's

(a) Data logger

(i) Digital inputs

- Check the non working inputs periodically.
- In case problem is confirmed with hardware of data logger in digital inputs, then only use spare input terminations if available.
- Observe the chattering inputs if any in the report available in the CMU.

(ii) Analog inputs

- Observe the voltages periodically for accuracy.
- Use calibrated multi meters for measuring the results.
- Make sure whether all voltages which are terminated through fuse are properly rated.
- Observe the graph reports from CMU for better understanding of behavior of power supplies.

(iii) Power Supply

- Periodically monitor the battery condition by switching off the power to the charger.
- Ensure the proper inter connections of batteries.
- Connect the potential free contact of the charger to one digital input to monitor the health of the charger from CMU.

(iii) Network

- Reset the modem by using keyboard of data logger only.
- Ensure that the leased line cable is maintained noise free.
- Use the leased line cable permanently for data logger purpose only.

(iv) General

- Read the firm's instruction manual completely for proper understanding of the system.
- Always keep the front and Rear doors of the data logger / FEP / RTU in closed.
- Check for loose connection of cables, plugging of modules and euro connectors.
- Whenever a service / Maintenance work is carried out on DC input supply, ensure that the connections are in correct polarity while reconnecting them.

(b) CMU

- Install the CMU in a Dust free and cool environment.
- Ensure that the system is running, with the approved software, round the clock.
- Ensure from time to time that the system has enough free space in the 'C' Drive.
- Take the backup of data on regular basis depending upon the section.
- Ensure that the CMU system is connected to Online Backup supply (UPS).

- Regularly ensure that the CMU and the LAN Network, to which it is connected, are free from Virus.
- Ensure that the Database files (.gdb files) and Application files (.exe) should be handled with proper care.
- Ensure that only authorized personnel are allowed to operate the CMU.

9.1.2 Don'ts

(a) Data logger

(i) Digital inputs

- Do not remove and terminate on spare inputs if existing input is problematic.
- Do not forget to change the information both in data logger and in CMU, in case of any modification carried out in the input information.
- Do not change inputs or any cards for chattering inputs.

(ii) Analog inputs

- Do not adjust or manipulate the voltages in the circuit for not generating the alarms in the system.
- Do not measure the readings at different points for one input.
- Do not use over rated fuses or non-standard fuses for protection.
- Do not depend only on the present values to confirm the behavior of power supplies.

(iii) Power Supply

- Do not discharge the batteries deeply.
- Do not use different capacities of batteries in a set.
- Verify the availability of charger in running (power on time) condition through the report.

(iv) Network

- Do not make a practice to remove the modem from its place always for resetting purpose.
- Do not run the cable via noise creating equipment area.
- Do not use the cable for any other purpose even for temporary usage.

(v) General

- Don't use excess length of cables in the form of a coil.
- Don't connect printer/modem while it is in ON condition.
- Don't disclose the passwords to un-authorized users.
- Don't connect power supply with reverse polarity.

(b) CMU

- Do not open Floppys / CDs in the CMU without confirming that they are Virus Free.
- Do not use the CMU for other software like Signal failures entry / Signal Incidence software / Auto CAD etc as the system settings required for Data logger software Modules may be disturbed.
- Do not install Games / Screen savers / Wall papers etc as they may occupy Maximum RAM, disturbing the proper working of data logger software Modules.
- Do not Shutdown the system without properly closing the Data logger software and other modules.

■■■

ANNEXURE III

Railway Board's letters on miscellaneous matters of signalling equipments

GOVERNEMENT OF INDIA (भारत सरकार)
MINISTRY OF RAILWAYS (रेल मंत्रालय)
RAILWAY BOARD (रेलवे बोर्ड)

No.2011/Sig/SF/1 New Delhi, Dt. 19.08.2011

The Chief Signal & Telecom Engineers,
All Indian Railways.

Sub: IMMEDIATE ACTION PLAN FOR PREVENTING SIGNAL INCIDENCES DUE TO LIGHTNING EFFECT.

Increasing signal incidences due to lighting has been a cause of concern. Failures of BPAC, EI, LED and IPS modules or their resetting cases are prominent during lighting. To improve the reliability of signalling equipment as well as availability of Signalling, detailed discussions/meeting was held with Railways and with RDSO wherein the various measures were proposed to be taken immediately. These measures are summarized as under:

I. Integrated Power Supply (IPS) for Signalling gears at stations:
1. Availability and intactness of Class B & C SPDs which are being supplied along with IPS in a separate wall mountable box shall be checked and provided wherever not available.
2. The equi-potential bonding of indoor signaling equipments including IPS racks should be provided in the Power and EI rooms and connected to low resistance earth of less than 1 Ohm as per RDSO scheme.
3. The length of cables from SPDs to earth bus bar and from equipment to earth bus bar should be shortest possible without any bends.
4. The size of cable from SPD to earth bus bar should be minimum 16 sq mm copper cable and the size of cable from equipment to earth bus bar should be minimum 10 sq mm copper cable.
5. All connections from equipment or SPD to earth bus bar shall be using exothermic welding.
6. In order to achieve low resistance of less than one Ohm, multiple earth pits may be provided. This should be checked at the time of installation.
8. Type sketch indicating SPDs for indoor signalling equipments at station is enclosed as Annexure- I.

II. Universal Axle Counter (UAC) and Single Section Digital Axle Counters (SSDAC):
1. Suitable Class C SPDs should be provided in the power line, communication line and reset line for surge protection. Typical sketch indicating SPDs is enclosed as Annexure-II & III for UAC & SSDAC respectively.
2. Low resistance earth of value less than 5 Ohms needs to be provided in the location boxes where EJB of universal axle counters or field unit of Digital axle counters is provided. Typical sketch for Earthing of location box is enclosed as Annexure-IV.

III. Electronic Interlocking:
1. Railways should take action to achieve earthing/surge protection arrangements as approved by RDSO as per the direction issued on 22.06.2011 within next six months for major items. Immediate action should be taken to meet all basic requirement of the scheme including checking of all installations by 31.07.2011. Specific items to be ensured are indicated in Annexure- V.
2. No new EI shall be commissioned until the OEM has certified and given a certificate at an appropriate level that the installation work complies with all

the points of the check list and that earthing and surge protection arrangements are as needed for the EI. CSTE Open line shall ensure this before the NI for the station is taken for commissioning. Once the OEM has given such a certificate, they will also take responsibility to ensure that the system functions without failures. Practice of OEM certificate shall also be followed for IPS, DACs, Data Loggers, AFTCs, etc. including their installation and commissioning.

3. It was concluded that the weakest link in regard to failures due to lightening is Control Panel. To avoid this, adoption of only VDUs appears the only solution. M/s Ansaldo would expedite SIL-2 Certification for Operating VDU Software by 30th Sept, 2011. Lightning prone Operating-cum-Indication Panels may be progressively replaced with Operating VDU with dual arrangements. RDSO will advise details/ specifications of VDUs to be used.
4. The practice of switching off Operating-cum-indication panel during bad weather condition and working on Operating VDU panel should also be adopted immediately in lightning prone stations. During monsoon season, power supply cards, CPU cards and non-vital I/O cards should be unplugged further from the card file of the standby system of EI.

IV. Track Circuits:

1. Track feed chargers should be monitored using potential free contact available in the charger.
2. Industrial grade rectifier element should be provided for improving the quality.
3. Two chokes should be provided in parallel at the feed end.
4. Sliding type variable resistance should be replaced with Disc Type Variable Resistance. Disc Type Variable Resistance should be provided in parallel at feed end.
5. Self type restoring type PPTC fuses to be provided.

V. LED Signal:

1. Modified Current Regulator Units (CRUs) shall be provided replacing the existing current regulators to make it more reliable.

V. General:

1. The armouring of all cables should be properly earthed at both ends.
2. Cable armour continuity to be maintained while making joint of the Cable.

Annexures referred above will be approved and issued by RDSO.

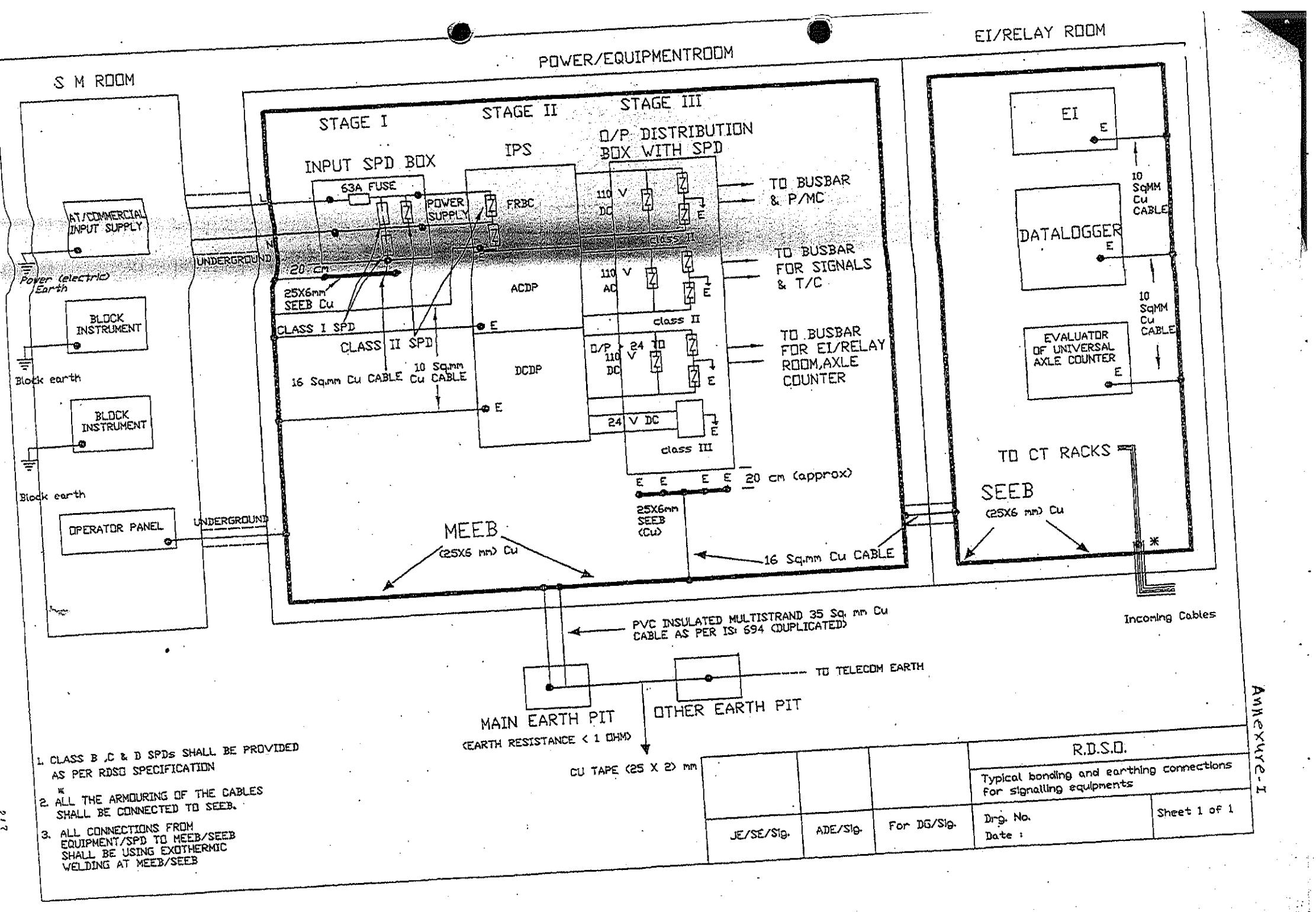
Further, RDSO should also be involved in monitoring the failures due to lightning so as continuously guide the Railways after doing a cause effect analysis to solve these problems forever. RDSO is also advised the quickly finalize the Isolation or any other arrangement to control cases of CRU going defective.

Railways are advised to send their compliance/remarks at the earliest latest by 15.09.2011.

Encl: As above

(Arun Saksena)
Adviser (Signal)

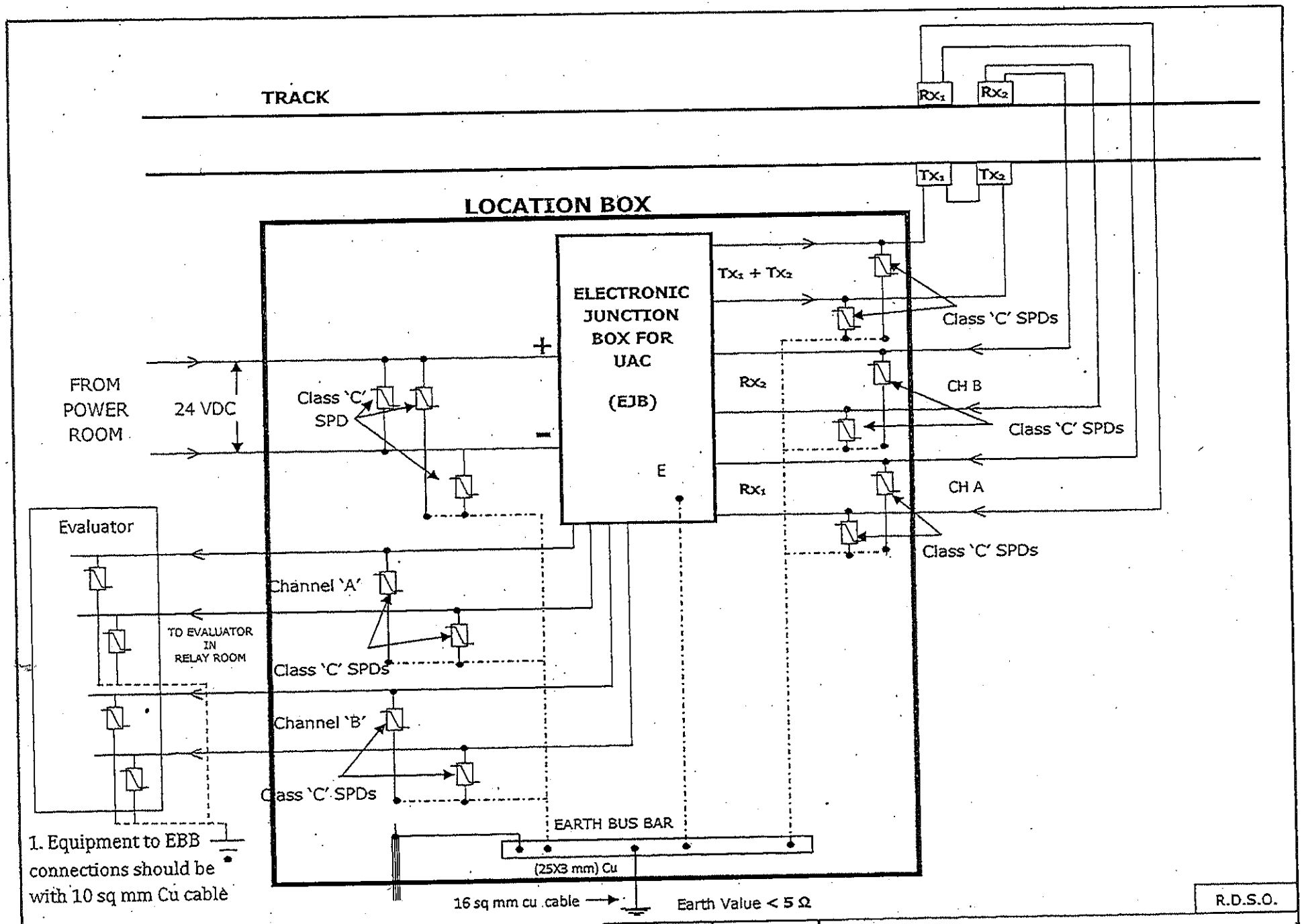
Copy to:
1. Sr.ED/Signal RDSO/LKO for necessary action.
2. CSTE/CORE/ALD
3. Director/IRISET/SC



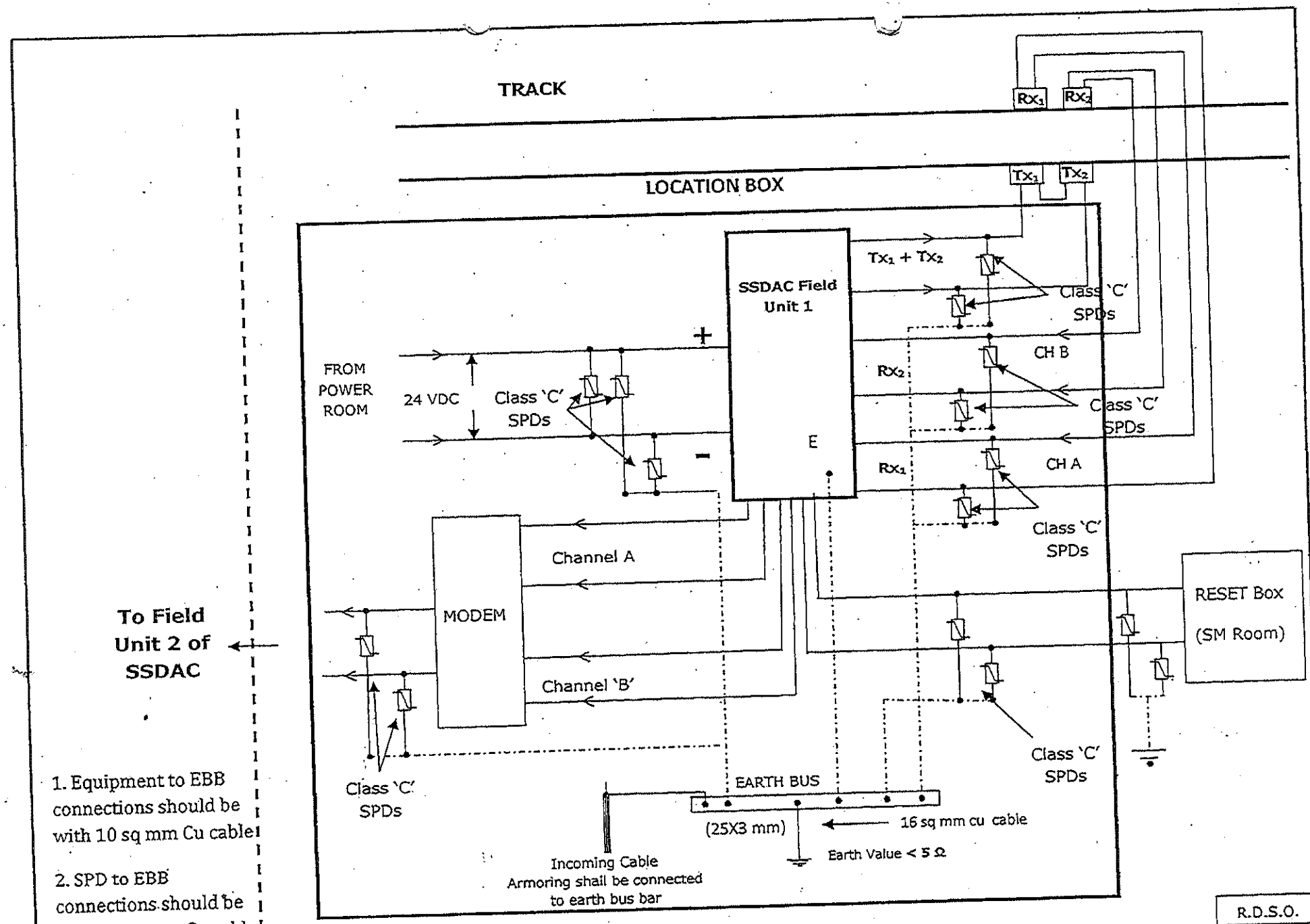
1. CLASS B ,C & D SPDs SHALL BE PROVIDED AS PER RDSO SPECIFICATION
2. ALL THE ARMOURING OF THE CABLES SHALL BE CONNECTED TO SEEB.
3. ALL CONNECTIONS FROM EQUIPMENT/SPD TO MEEB/SEEB SHALL BE USING EXOTHERMIC WELDING AT MEEB/SEEB

			R.D.S.O.	
			Typical bonding and earthing connections for signalling equipments	
JE/SE/Sig.	ADE/Sig.	For DG/Sig.	Drg. No. Date :	Sheet 1 of 1

Annexure-I


TRACK
RX1
RX2
TX1
TX2
LOCATION BOX
ELECTRONIC JUNCTION BOX FOR UAC
(EJB)
TX1 + TX2
Class 'C' SPDs
FROM POWER ROOM
24 VDC
Class 'C' SPD
+
-
E
RX2
CH B
Class 'C' SPDs
RX1
CH A
Class 'C' SPDs
Evaluator
Channel 'A'
TO EVALUATOR IN RELAY ROOM
Class 'C' SPDs
Channel 'B'
Class 'C' SPDs
EARTH BUS BAR
(25X3 mm) Cu
16 sq mm cu cable
Earth Value < 5 Ω
1. Equipment to EBB connections should be with 10 sq mm Cu cable
2. SPD to EBB connections should be with 16 sq mm Cu cable
Incoming Cable Armoring shall be connected to earth bus ba
R.D.S.O.
Surface Protection For Universal Axle counter
DRN BY
CHKD BY
Drg. No:
Date:
Sheet 1 of 1

Annexure-II

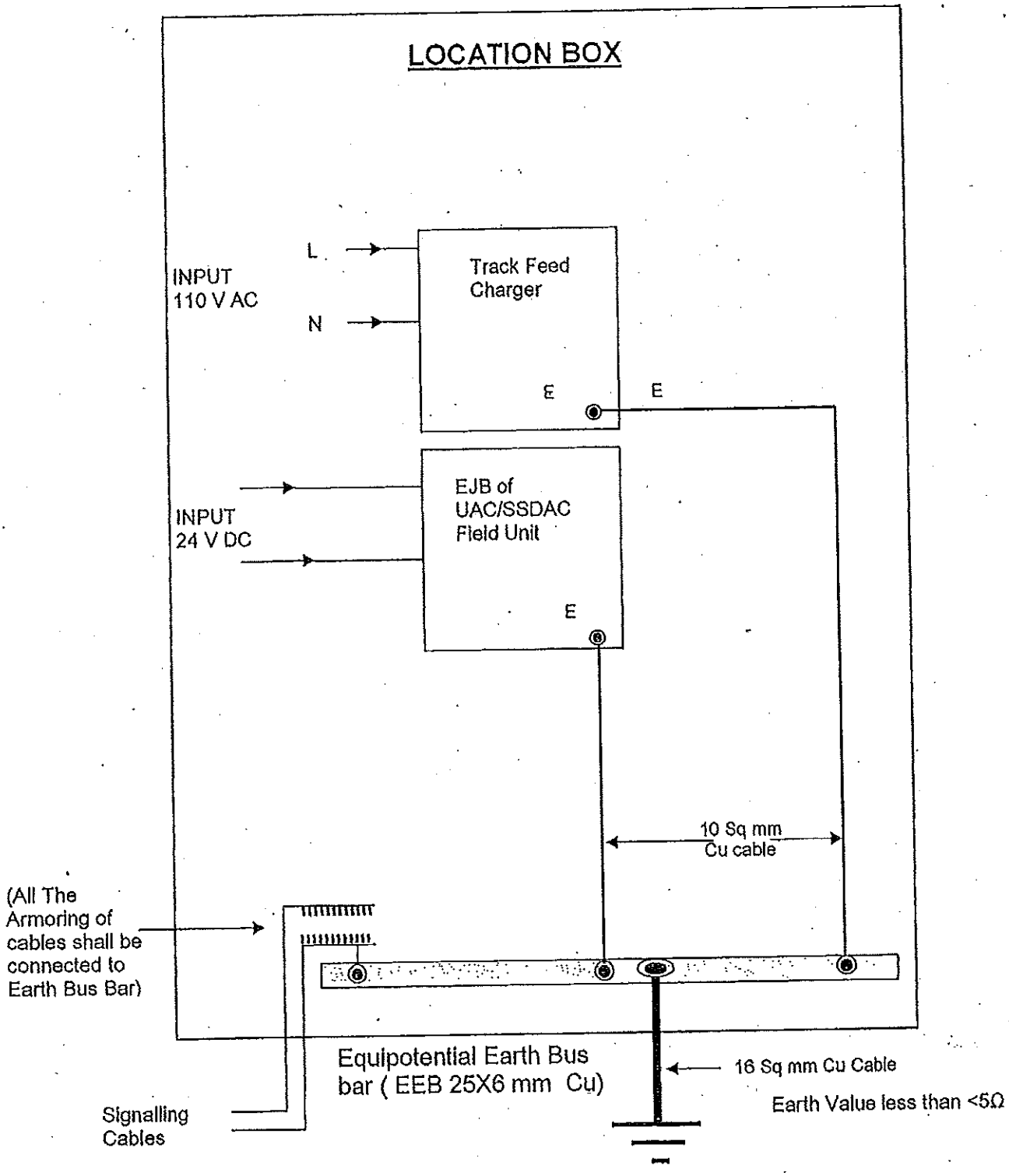


1. Equipment to EBB connections should be with 10 sq mm Cu cable.

2. SPD to EBB connections should be with 16 sq mm Cu cable.

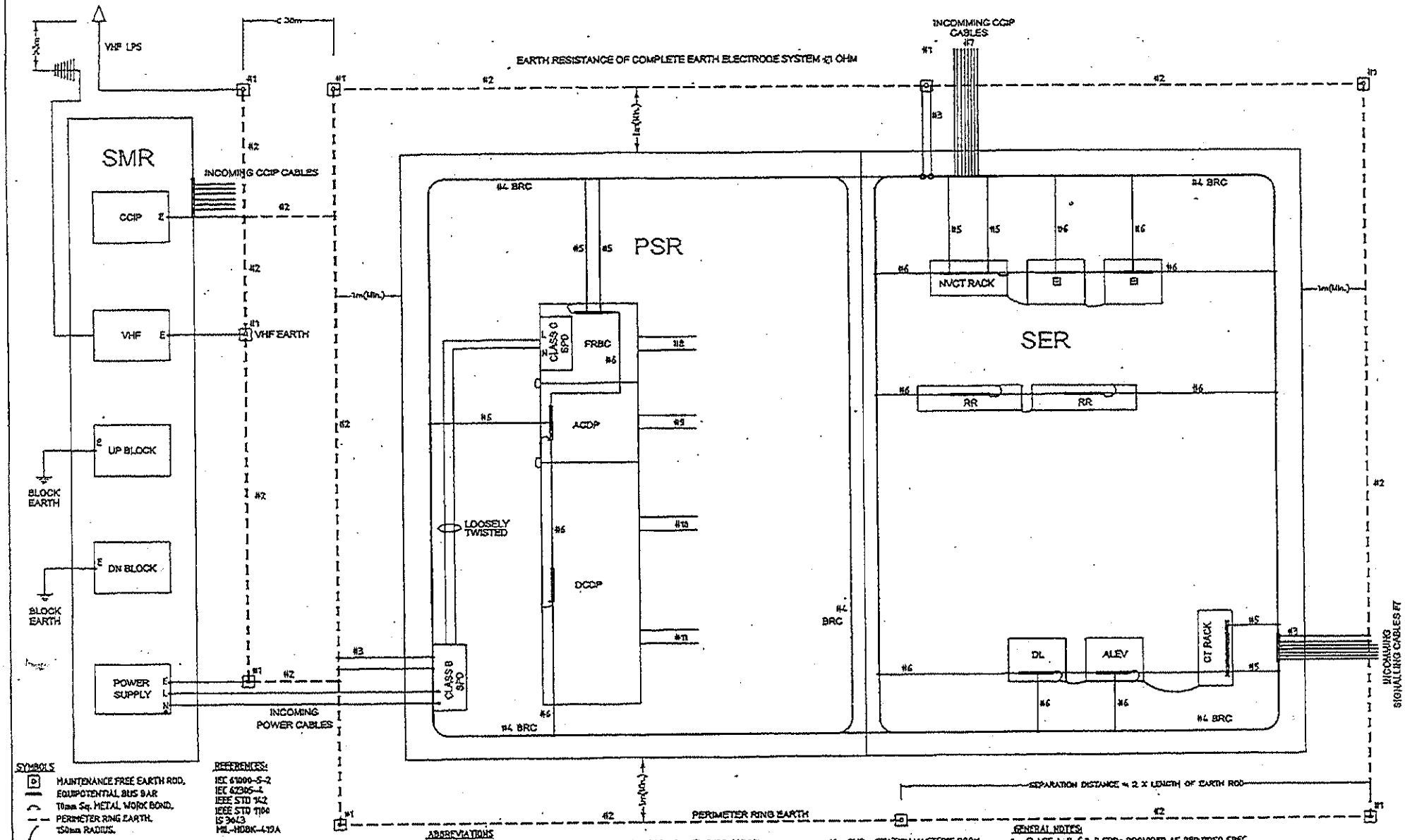
		Surge Protection For Single Section Digital Axle counter	R.D.S.O.
DRN BY	CHKD BY	Drg. No: Date:	Sheet 1 of 1

Annexure-III



Note:- 1. Earthing shall be as per RDSO/SPN/197/2008 with single Earth Pit.
2. Surge protection arrangement shall be as per relevant drawing

		RDSO	
		Earthing arrangement in Location Box	
DRN BY	CHKD BY	Drg. No.	Sheet No. 1 of 1



SYMBOLS

- MAINTENANCE FREE EARTH ROD.
- EQUIPOTENTIAL BUS BAR
- 10mm Sq. METAL WORK BOND.
- PERIMETER RING EARTH.
- 150mm RADIUS.

REFERENCES:

IEC 61000-5-2
IEC 62305-4
IEEE STD 142
IEEE STD 7100
IS 3043
MIL-HDBK-419A

SPECIAL NOTES:

1. #1 MAINTENANCE FREE EARTH (RDSO SPEC)
2. #2 6x50mm GALVANIZED STEEL TAPE BURIED AT 600mm.
3. #3 2 nos 3x25mm COPPER TAPES OR 4 nos 35mm Sq. COPPER CABLE (RDSO SPEC).
4. #4 3x25mm COPPER TAPE (BONDING RING CONDUCTOR) MOUNTED ON INSULATED STAND-OFFS.
5. #5 16mm Sq. COPPER CABLE (15m LENGTH MAX).
6. #6 10mm Sq. COPPER CABLE (15m LENGTH MAX)
7. #7 ARMOURING OF CABLES CONNECTED TO EBB (AT WALL FOR NEW STATIONS).
8. #8 110V DC SUPPLY (BUSBAR & POINT MACHINES)
9. #9 110V AC SUPPLY (BUSBAR FOR SIGNALS & TRACK CIRCUITS)
10. #10 24V DC SUPPLY (EXT).
11. #11 24V DC SUPPLY (INT).

ABBREVIATIONS

1. ACDP – AC DISTRIBUTION PANEL.
2. ALEV – AXLE COUNTER EVALUATOR.
3. BRC – BONDING RING CONDUCTOR.
4. CCIP – CONTROL CUM INDICATION PANEL
5. CT – CABLE TERMINATION.
6. DCDP – DC DISTRIBUTION PANEL.
7. DL – DATA LOGGER.
8. EI – ELECTRONIC INTERLOCKING.
9. FRBC – FLOAT RECTIFIER CUM BOOST CHARGER.
10. LPS – LIGHTNING PROTECTION SYSTEM.
11. NVCT – NON-VITAL CABLE TERMINATION
12. PEC – PARALLEL EARTH CONDUCTOR.
13. PSR – POWER SUPPLY ROOM.
14. RR – RELAY RACK.
15. SER – SIGNALLING EQUIPMENT ROOM.
16. SMR – STATION MASTER'S ROOM.
17. SPD – SURGE PROTECTION DEVICES.
18. VHF – VERY HIGH FREQUENCY

GENERAL NOTES:

1. CLASS A, B, C & D SPDs PROVIDED AS PER RDSO SPEC.
2. ALL BURIED CONNECTIONS SHALL BE EXOTHERMICALLY WELDED.
3. ALL CABLE TRAYS SHALL BE FULLY BONDED TO EACH OTHER AND SUPPORTING METAL WORK (PEC).

R.D.S.O.

TYPICAL BONDING AND EARTHING CONNECTIONS FOR MLK II INTERLOCKING SYSTEMS

DRG NO:
DATE:

SHEET 1 OF 1

Annexure-X

(19) Adl/Sig Signal Policy (BS) folder

PS 24.02.12

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

No. 2011/SIG/SF/1/Pt

New Delhi, Dt: 23.02.2012

General Managers
All Indian Railways

Sub: Burning of S&T Cables due to Fire – Preventive Measures.

Ref: (1). IRSEM Chapter XV - Planning and cable laying.
(2). RDSO's letter no. STS/E/Cable Laying Practices dt 31.10.2011 - guidelines for Signalling cable laying.
(3). JPO No. 1/Sig/2004 issued by AM(Sig), AM(Tele), AM(Electrical) and AM(Works) for undertaking digging work in the vicinity of underground S&T and Electrical Cables (copy enclosed).

In recent past, incidences of signal failures due to burning of S&T cables have been reported from Railways. Signalling Cables got burnt due to fire in garbage over Cable route, Dry grass & bushes around relay huts and also fire under GI pipes carrying Signalling cables at culverts wherein garbage mixed with waste diesel oil from yard caught fire.

Board has viewed above incidences seriously as these are indicative of very poor field level inspections at all levels i.e. from supervisors to officers, non-observance of instructions for embedding the cables in a specific channel underground and of encasing them in concrete / steel pipes at vulnerable locations and lack of adequate preparedness in such emergency situations.

To control cable damage due to fire in vicinity of track, following instructions are hereby issued with the approval of ML, ME and DG/RHS:-

1. Earth work in Railway premises should be allowed only after getting approval of open line ASTE, AEN & AEE so that S&T and Electrical cables can be protected wherever required.
2. Burning of Garbage should not be allowed in station yard. In case it is unavoidable, burning should be done in a controlled manner under supervision of concerned staff after getting clearance of Section In-charges from Signal, Telecom & Electrical deptt.
3. Garbage should be dumped at identified marked locations and to be disposed off at regular intervals by shifting or by burning in a controlled manner under supervision of concerned staff (Health, Engineering or Commercial).
4. Patrolling of station/section by S&T Supervisors, Technician and Helper khalasi should be done along with periodic maintenance and record be maintained for any unusual things noticed like cable exposed, fire in vicinity of track, earth work, garbage around cables etc and also corrective action taken thereafter.
5. Cable cuttings on Bridges are most vulnerable and therefore cables should be laid in two sets with sufficient spares, half on up line and balance on down line. Spare cables on bridge shall be laid and terminated in location boxes so as to use in emergency.
6. Vulnerable locations are identified and time bound action plan to be made for remedial measures.

Railways are advised to ensure strict compliance of above instructions.

Encl: As above

23.2.2012
(Rajmal Khoiwal)
Director (Signal)

Copy to: CSTEs, PCEs, CEEs & CMDs of All Indian Railways
N.O.O. PPS to ML & ME for kind information of ML & ME
PPS to DG/RHS for kind information of DG/RHS

(6)

SN42.

Pl. issue
Ltr
4/6/14

भारत सरकार (GOVERNMENT OF INDIA)
रेल मंत्रालय (MINISTRY OF RAILWAYS)
रेलवे बोर्ड (RAILWAY BOARD(

No. 2013/Sig/Safety Performance/01 New Delhi, Dt.03.06.2014

The CSTEs
All Indian Railways,

Sub: Safe Operation of Trolleys and Lorries.

An unfortunate incident has occurred in one of the railways wherein non observance of rules of running trolleys has led to collision of a moped trolley with a Passenger train leading to death of one S&T Khalasi.
Several shortcomings have come to notice in this incident in the system of plying of trolleys in the railways. In particular in this case,

1. One ESM and 4 Khalasis were travelling in the Moped trolley which entered in the Block section. The incharge of Moped Trolley failed to take precaution before placing it on track.
2. The trolley was being plied after sunset.
3. Khalasis were being used instead of Trolleymen.

The rules for plying trolleys and lorries are enumerated in the GR and the SRs of railways in Chapter XV, from para 15.18 to para 15.28 . It is desired that Railways should launch a one month drive to check and ensure that each of the above instructions are being followed diligently in the Railways.

Please acknowledge receipt of the letter.

(हर्ष दीप श्रीवास्तव)
निदेशक(संकेत)

O/C

14

Government of India
Ministry of Railway
(Railway Board)

No. 2012/Sig/E NonGaz/1

New Delhi, dt 9.3.2015

The CSTEs,
All Indian Railways.

Sub : Safety of Personnel during maintenance and/or construction work.

Recently two unfortunate incidents have occurred on Northern Railway and Southern Railways wherein one Senior-Scale Construction Officer of NR and two maintenance staff of SR lost their lives while performing supervision/maintenance work near the track. Similar incidences have been reported in the past as well. This is a serious cause of concern.

Railways are advised to conduct extensive counselling for every Officer and Staff regarding precautions to be taken while working near the track. Instructions laid out in Signal Engineering Manual regarding use of safety appliances, to remain vigilant while working on the line and to deploy look out men where necessary shall be strictly followed.

Please acknowledge receipt of the letter and submit compliance at the earliest.

(S. Manohar)
Additional Member/Signal
Railway Board

GF

भारत सरकार GOVERNMENT OF INDIA

रेल मंत्रालय MINISTRY OF RAILWAYS

(रेलवे बोर्ड) (RAILWAY BOARD)

No. 2014/Sig/SF/Summer Precautions New Delhi, dated, 15–04–2015

CSTEs,
All Indian Railways

Sub: Summer and Pre-Monsoon Precautions.

Followings measures, apart from local requirements, shall be taken to minimise effect of high temperatures on Signalling systems during the ensuing Summer.

a. Track Circuits:
- Adjustment of track circuit parameter to keep track relay pick up voltage within safe limit.
- Arresting of creep to avoid crushing of end posts of insulated joints. At least one rail length on either side of the insulated joint should be provided with anti-creep devices by Engineering Deptt.
- Provision of J-clip at glued joints by Engineering Deptt.

b. Points:
- Adjustment of point rodding, adjustable crank, rod compensators for rod operated points.
- Joint inspections with P.Way staff of points & crossing and track circuits and compliance of deficiencies noted during joint inspections.

c. Signals:
- Adjustment of wire run for semaphore signals.
- Ensuring provision of hood on CLS Signals.

d. Power Supply:
- Proper maintenance of IPS and functioning of exhaust fan of IPS.
- Proper ventilation and exhaust fan in IPS and Battery rooms.
- Proper working of auto-change over arrangement of Power Supply.
- In coordination with Sr.DEE/DEE, improvement in local power supply of State Electricity Board at identified stations having unreliable & low voltage supply.
- Proper working of stabilisers and inverters at CLS Stations.
- Proper working of distilled water plant.
- Checking of battery & ensuring adequate distilled water in cells for maintaining required specific gravity.
- Cleaning of Solar panels and its proper functioning.

e. DG Sets
- Proper functioning of DG sets and availability of sufficient spare parts.
- Availability of portable DG sets at strategic locations for use in emergency.
- Adequate stock of diesel oil for working of DG sets during prolonged power cuts.

Contd/...

In continuation of lr no. 2014/Sig/SF/Summer Precautions dtd 15.04.15

f. Relay Room:

- Proper working of air conditioning equipment wherever available.
- Proper ventilation in relay room for air circulation.
- Cleaning of relay room to make it dust free.
- Visual inspection of relay wiring to ensure proper locking of connector clips.
- Cable entries to be sealed.
- Provision of fire alarm / fire extinguisher systems

g. General (Electronic Signalling System / Cable / Block):

- Ensuring proper Earthing for all electronic signalling systems and Block circuits.
- Tightening of terminals used for cables, equipments, wiring etc.

h. Lightning and Surge Protection System:

- Check all existing A,B,C and D type protections available for their effectiveness and replace ineffective ones.
- Earths connected to these devices should be less than 1 ohm.
- Type A,B,C and D type protections should be provided in Lightening prone areas, especially in locations where such incidences have occurred in the past.

Compliance of above measures to be submitted to Board by 30.04.2015.

Please acknowledge receipt of the letter.

16/4/15

(हर्ष दीप श्रीवास्तव)
(Harsh Deep Srivastava)
निदेशक (संकेत) Director (Signal)

भारत सरकार (GOVERNEMENT OF INDIA)
रेल मंत्रालय (MINISTRY OF RAILWAYS)
रेलवे बोर्ड (RAILWAY BOARD)

No. 2015/Sig/SF/Monsoon Precautions New Delhi, Dt. 18.05.2015

The GMs
All Indian Railways,
Metro Railway, Kolkata &
CORE/Allahabad

Sub: Monsoon Precautions for Signalling Systems.

Ref : Railway Board's letter of even no. dated 30.4.2014

During the monsoon season, failures of signal, track circuits and points increase not only due to water leakage, water accumulation in the service buildings and in the points/track circuited area but also on account of surge and lightening strikes. Instructions are issued to Divisions by Zonal Railways to minimise Signal Failures during monsoon season, which also stipulate Joint Inspection by Supervisors/Officers of Signal and Engineering Departments in accordance with Joint Procedure Order and for attending deficiencies before the onset of monsoon.

Based on feedback from Railways, Monsoon Precautions for Signalling System have been Standardised and were issued vide reference above for uniform adoption on all Zonal Railways. Monsoon precaution measures should be reiterated to Divisions every year, Signed jointly by the concerned HODs of S&T, Engineering, Electrical, Medical and Traffic Departments before onset of monsoon. Areas of concern should be identified and action to be taken should be quantified and monitored intensively to ensure timely completion of all activities. Necessary coordination between the departments including S&T, Engineering, Electrical, Medical and Traffic should be ensured.

Encl: As above

18/5/15
(हर्ष दीप श्रीवास्तव)
निदेशक(संकेत)

Copy to: CSTEs all Indian Railways, Metro Railways/Kolkata, and CORE.

Monsoon Precautions for Signalling System

1. TRACK CIRCUITS:

(a) Provision and cleaning of drainage system in yards to avoid water accumulation in points and track circuited area. Temporary drains need to be provided wherever required. Cross and longitudinal drains are made effective and are cleaned regularly during Monsoon and Rainy Season.

(b) Joint inspection of major yards prone to water logging by a team consisting of ADEN, ADSTE, AOM, ADEE and ADMO be carried out and action to be taken to improve the drainage before onset of monsoon. The concerned department shall take necessary action to ensure proper drainage.

(c) Joint inspection by SSE/PWay & SSE/Sig to ensure:

1. Cleaning of ballast and ensuring at least 50 mm clearance of ballast from bottom of rail to avoid leakage of track circuit currents.
2. Provision of 100% insulated GFN liners and rubber pads in track circuited area with PSC sleepers.
3. Replacement of worn out wooden sleepers, if any, and Proper packing of ballast/sleepers below insulated joints.
4. Removal of vegetation, mud and muck from track circuited portion of the track as well as on either side of tracks and in vicinity.
5. All nylon pieces of insulated joints, Insulation of stretcher bars & point rodding are intact and replace those in bad condition.
6. Defective/worn out glued joints are replaced before onset of monsoon.
7. Provision of 'J' clips at all insulated joints on PSC sleepers.

(d) Track lead Junction Boxes in flood prone areas are raised without infringing SOD so that water does not enter in them.

(e) Adjustment of track circuit parameters to keep track relay pick up voltage within safe working limits.

(f) Proper working of track feed charger failure Alarm wherever provided.

(g) Provision of Self restoring type PPTC fuses at all lightning prone stations.

(h) Proper tuning and adjustment of parameters of AFTCs within permissible limit, where existing.

(i) Checking of all traction bonds in track Circuited Portion of track and attending deficiencies through Electrical Traction department.

(j) Checking and ensuring proper Earthing for axle counter field equipments and Evaluator.

(k) Checking & ensuring all connection like rods, transverse bonds, feeds of adjacent track circuits etc. do not touch the bottom of the rail.

(l) Timely replacement of old rusted track circuit bond wires.

2. POINTS:

(a) Joint inspections with P.Way staff of points & crossing and compliance of deficiencies noted during joint inspections.

(b) Adjustment of point rodding, adjustable crank, rod compensators for rod operated points.

(c) Testing of all emergency crossovers for their proper working.

(d) Insulation of point machines be checked. All point motors carbon brush covers shall be sealed with silicon sealant after proper cleaning of commutators. Gear oil shall be filled in gear box and top cover sealed. Proper lacing and wiring, and greasing of the point machines should be completed. Crank handle contacts should be cleaned. Availability of Gasket and Carbon at point machine to be ensured.

(e) Lifting of point machines wherever required at identified water logged area.

(f) Cable entries be checked to ensure that the cable is in a healthy condition physically besides meggering and ELD monitoring. All the terminals be cleaned to avoid deposition of moisture on the accumulated dust, to avoid low insulation.

(g) Waterproofing of point motors shall be done for the points situated in low lying flood prone areas.

(h) Drills to be conducted for removal, replacing of point motors, detection contact assembly and clamping of points.

(i) Spare point motors and contact assemblies shall be kept at stations.

3. SIGNALS:

(a) All signal units shall be examined to check the possibility of water seepage/leakage inside the Signal Units. Signal units have to be sealed with proper gasket to prevent seepage of moisture/water. All signal unit lamps should be completely sealed including any holes to prevent moisture ingress.

(b) Additionally a plastic cover wherever required shall be provided from the back of the Signal units, in case, leakage/seepage persists. After the first showers, the signal units have to be re-examined and action to be taken to avoid water seepage/leakage.

(c) Any mechanical discrepancies/damages in the signal units should be attended to ensure that the unit cover fits properly on the body and the locking arrangement is proper and watertight.

(d) Strengthening of foundations of signal posts/location boxes should be done wherever required.

4. RELAY ROOMS, CABINS AND EQUIPMENT ROOMS:

(a) Based on history of previous years, joint inspection by section ADEN's and ADSTE's should be carried out to identify cabins/relay and

equipment rooms prone to rain water leakage/seepage and corrective steps be taken on a war footing.

(b) Damaged/broken window panes and doors etc. should be repaired to prevent water getting into relay rooms/cabins/equipment rooms, which may cause serious damage to the systems.

(c) Ventilators should be cleaned. Aluminium stainless steel wire mesh be replaced wherever required. Broken glasses and structures should be repaired.

(d) Treatment of service buildings to avoid seepage of water in equipment rooms.

(e) Roof over the relay room/battery room/panel room is cleaned to prevent accumulation of water on the roof. Drain pipes are available and cleaned.

(f) Battery rooms, cabin basement etc. are checked and repairs, if required, carried out. Entry of water at cabin basement should be prevented.

5. POWER SUPPLY ARRANGEMENT:

(a) Working of all stand-by Power Supply arrangements shall be ensured.

(b) Working of Auto change-over for Power supplies at Stations, IBS & Auto sections have to be checked and ensured.

(c) To ensure the availability of power supply to Signalling System, Diesel Generators wherever provided be checked and should be made functional and kept in good fettle. Adequate quantity of Diesel, Mobil Oil, etc. should be stocked at the stations provided with DG sets. Essential spares of DG sets shall be made available. Diesel Generators shall be covered under AMC/Overhauling should be carried out wherever warranted/required.

(d) Secondary cells working beyond codal life have to be identified and replaced on priority. All battery terminals are to be inspected regularly to be free from sulphation.

(e) All IPSs must be checked at SE/SSE's level for running the IPS on battery for at least 2 hours, checking the auto change over functions, the functioning of the DC-DC converters, the status of the CVT and inverters, class B protection against power surge etc. earthing and all relevant values checked, rectified and recorded by SE/SSE concerned. Annual Maintenance Contract for IPS shall be kept in force.

(f) Availability and intactness of Class B & C Surge Protection Devices which are wired in a separate wall mountable box shall be checked for their indications, if available.

(g) All defective modules of IPS should be repaired and kept ready.

(h) Fuses, terminals and all connections, especially those carrying heavy current have to be checked to find if they are generating any heat and, if so, they have to be attended. As far as possible, they should be kept in moisture proof housing and exposed/naked wires, connectors, etc. Should be avoided.

(i) Earth leakage on existing power supplies should be removed by isolating the faults and replacing the conductors. ELD indications shall be linked

with data logger, and the data obtained should be studied to isolate and remove the faults quickly.

(j) Wherever Signalling installation at station / in mid-section are working only on solar panels, arrangement for back up DG sets be made for charging of Battery.

6. S&T CABLES:

(a) Testing of main, tail and power cables should be completed and low insulation conductors to be transferred on healthy conductor in time.

(b) Earth Leakage Detectors, where provided, have to be tested for their working for monitoring for any low insulation of conductors. ELD data be linked to Data loggers for effective monitoring.

(c) All defective tail cables have to be replaced before monsoon. All tail cables at entry of Junction Boxes, Location boxes, Signal posts be checked for breakage of insulation. All the earth faults should be removed.

(d) Minimum 5% healthy spare conductors are to be made available in each location / goomty / relay room. These identified spare conductors have to be kept labelled/marked so that restoration time for attending signal failure on account of defective cables can be minimized. All spare conductors must be tested. Spare cable details shall also be recorded in cable corage plan and Insulation register .

(e) All Supervisors shall familiarize themselves with the position of spare conductors in their respective sections. JPO should be strictly followed while doing Earth work in the station yards.

(f) Protective works provided for the cables at places like track crossings, culverts, bridges, etc shall be inspected prior to onset of monsoon and special attention has to paid to these protective works soon after the first shower

(g) Drills have to be conducted for all Maintainers and Supervisors in the Section for transferring functions to spare conductors in case working conductors become defective.

(h) Earthing of armour of all cables and continuity of cable armour be ensured.

(i) Spare S&T cables of various core sizes be kept at identified stations. One dedicated 12C/19C/24C signalling cable from relay room to either side shall be kept tested and tagged for easy identification for use in emergency.

(j) Quad cable meant for Block should be tested for their insulation resistance, cross talk, loop resistance and db losses. Parameters should be brought within acceptable limits. Position of cable joints should be known accurately and joints repaired if required before onset of rains.

(k) Gain of OFC channels used for BPAC/UFSBI should be adjusted within permissible limits.

7. LOCATION BOXES:

(a) It should be ensured that doors of all location boxes close properly and there are no extra vents, which may allow entry of water or insects/ rodents inside the location boxes.

(b) Damaged/corroded portions of the location boxes should be repaired / replaced. There should not be any space between the base of the location box and its foundation. Any such space, if existing, should be filled up by mortar.

(c) Location boxes on the banks should be kept vertical by providing strong foundation. Location boxes which are likely to tilt should be attended so as to prevent tilting. Suitable measures shall be taken to prevent ingress of water in location boxes and junction boxes.

(d) Telephones in location boxes, if provided, to be tested for proper functioning.

8. EARTHING & LIGHTNING PROTECTION DEVICES:

(a) Proper Earthing and Lightning Protections are provided as per extant instructions on all the equipments like Block Instruments, IPS, Axle Counters(UAC/DAC/MSDAC), EI etc. It should be ensured that all these devices are in proper working order. Defective devices should be identified and replaced.

(b) Earth resistance value of all Earthings should be measured and ensured that it is within permissible limits by adopting necessary measures. Provision of additional Earths or overhauling of Earths may be undertaken wherever warranted.

(c) Earth connection at the Earth bar/location body/equipment side and at the Earthing rod/pipe must be thoroughly cleaned to provide proper connectivity. Rusted bond wires used for Earthing should be replaced.

9. OPERATING CUM INDICATION PANEL:

(a) 40/60c indoor cable between panel and relay room shall be checked for proper working. Sufficient spare cores shall be ensured.

(b) ASMs room shall be attended to prevent water falling on the Operating Cum Indication panel.

(c) Working of 'Calling On' signals have to be ensured.

(d) Joint Drill has to be conducted with Operating for Emergency operation of Point through Panel, extraction of Emergency Crank Handles and cranking of point machines.

(e) Testing of farthest points & crossings and emergency crossovers to be done for proper working.

(f) All Panel Indications shall be checked and defective bulbs or LEDs have to be replaced.

(g) Spare items viz., all type of Panel buttons, ECRs, Relays, Timers, Condensers, Resistors, Fuses, track feed chargers have to be made available at each station during monsoon. One pair of spare Transmitter

and Receiver of each frequency shall be made available for section where Daido types TLBIs exist.

10. LEVEL CROSSING GATE:

(a) Defective wire insulators, rusted wire ropes and rod insulator are to be replaced.
(b) Pipes through which rods or wires run should be cleared regularly.
(c) Gate telephones shall be tested and telephone battery shall be replaced if required.
(d) Area on either side of road & across the gate tracks to be specifically inspected to ensure that no water is getting accumulated.
(e) Sliding booms, wherever provided, shall be kept in working order.

11. ELECTRONIC INTERLOCKING:

(a) Earthing arrangement as well as Surge and Lightning Protection Measures should be checked to be available as stipulated.
(b) Both Main as well as Standby systems, DC-DC converters, CCIPP and VDU or both the VDUs (as the case may be) should be tested to be in working order. Record of testing should be maintained in a register.
(c) Spare cards of EI and spare DC-DC converters etc. Should be kept at all critical locations.
(d) In areas highly vulnerable to lightning, safeguards as per local Railway's practice as decided by CSTE of the Railway be put in place to ensure trouble free working of EI during Monsoon.

12. GENERAL:

(a) Signalling Equipment like SSDAC, MSDAC, EI, IPS, Data Logger, UFSBI, AFTC etc shall be got checked and audited with OEMs and maintenance check list of the equipment shall be complied with.
(b) Modification/up-gradation of IPS of 2000 specification as per RDSO latest guidelines.
(c) All spare cards of EIs, AFTCs and Digital Axle Counters etc. should be checked by putting them in working circuits and thereafter properly stacked.
(d) Where overhead lines are in use for slot, block circuits and control circuits, strengthening of posts, checking and replacing broken jumpers, insulators, etc. cutting of vegetation, removal of sag in line wires, etc. be got attended.
(e) Sufficient quantity of spares like fuses, AFTC cards/Tuning units, AWS track magnet/opto-coupler card, relays, relay groups, point machines including its parts, various types of signalling cables, should be stocked at vulnerable stations so as to minimise restoration time.
(f) Working of ovens in Repair Centre to be checked and their proper working ensured.
(g) Emergency lights, torches and petromax should be checked and kept in readiness with adequate quantity of torch cells/kerosene oil, etc.

(h) All the measuring instruments like cable testers, cable route locators, meggers, earth resistance tester, multimeters available with ESM/JE must be checked for their proper functioning.

(i) Transport facilities (with vehicle and driver) should be made available round the clock at critical locations during monsoon to move the staff at the earliest during emergency.

(j) Night failure gangs may be formed by pooling resources and stationed at critical locations for attending defects of signalling system due to heavy rain, etc. in shortest possible time. Their contact nos. shall be displayed in bold in Test rooms.

(k) On Suburban sections where AWS is provided, all AWS track magnets along with opto-coupler covers shall be sealed with silicon sealant and covered with plastic sheet.

(l) All the terminals in the location boxes and junction boxes should be cleaned to avoid low insulation due to moisture deposition on the accumulated dust.

(m) Special Precautions shall be taken for EI as per OEM's instructions and RDSO guidelines. Addresses and Mobile/Land Line Telephone numbers of all concerned S&T staff officers shall be kept with in-charge Signal Supervisors and Signal Fault Controller/Test room.

After inspections, compliance from each sectional JE/SE/SSE shall be obtained by the officer incharge. Sr. DSTEs shall send consolidated compliance of the Divisions to Head Quarter. Sr. DSTEs of Divisions, CSE and other Headquarters officers shall conduct surprise checks to confirm compliance of above instructions.

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भारत सरकार (GOVERNMENT OF INDIA)
रेल मंत्रालय (MINISTRY OF RAILWAYS)
रेलवे बोर्ड (RAILWAY BOARD)

No. 2008/Sig./SGF/4/EI/GEN/Pt.-I

New Delhi. 26.06.2015
30.6

The CSTEs
All India Railways

CSTE
CORE
Allahabad

Sr. E.D.(Sig.)/RDSO
Lucknow

Director
IRISET
Secunderabad

Sub:- Failure of EI at Purna due to lightning.

There has been a catastrophic failure due to lightning in which the EI at one of the stations of Indian Railways remained failed for more than 33 hours. A meeting was held in Board and it is decided that the following course of action be taken:-

(A) Technical Issues:

1) **Timing Window** for synchronization to be specifically defined by the OEM for less than 100 routes for centralized EI and greater than 100 routes for centralized and distributed EI individually and shall be submitted to RDSO while obtaining Technical System approval.

2) CFCR provided for **Microlok to Microlok Communication** in the same location shall be removed at the stations which are under AMC. For other communication links, a strategy shall be made by zonal railway and OEM to replace them gradually.

3) To prevent lightning strikes at EI installations, **Franklin Rod** should be placed near to the VHF antenna and at a height of more than 3m. This shall also be governed by RDSO TAN STS/E/TAN/3006 dated 02.11.2012.

(B) **Installation, Maintenance and Troubleshooting procedures:**

1) SSE of the section shall **Download Event Log** every month. He shall look for any warnings and clear them with the help of OEM. The TAN No. STS/E/TAN/3004 Ver1 circulated vide STS/L/SSI dated 09.05.2012 shall be implemented in the letter and spirit.

2) Whenever **Up gradation/ Installation of EI** is done, CSTE shall certify that all the TANs issued by RDSO are implemented.

Contd.2/

3) **Panel to VDU Change Over Procedure** shall be done by concerned SSE in the presence of OEM every month.

4) There have to be **three experts trained for each EI location** who shall be moved to attend such failures. In case of any catastrophic failures, at least three to four knowledgable staff, supervisor and officer shall be moved to site to tackle the situation and the failure.

5) The TAN STS/E/TAN/2003 dated 23.04.2012 (**Monsoon Precautions**) issued by RDSO shall be reiterated. Electrostatic protection shall be provided at all EI rooms. It was observed that OEM had implemented system logics without the consultation/knowledge of the Railway.

a. In particular they had introduced time duration of link failure in reset logic, defining panel communication linked as vital etc. RDSO should review and finalise the diagnostics mode logic implemented by OEM to avoid delay in restoration of failure in such cases.

6) In stations at isolated locations, full **set of spares** (CPU Card, PS Card, , Vital Input Card, Vital Output Card, Non- vital I/O Card, CFCR and Pig tails etc.,) shall be made available. They shall be placed inside an almirah in relay room for early restoration of any failure.

7) Zonal Railways in consultation with OEM shall prepare Station **Specific Recovery Procedure**. This shall be displayed on the wall of the EI Room.

8) The **Version Control Sheet** shall be placed on the Microlok duly signed by concerned officer commissioning the station.

9) **Application Logic Data** shall be made available in the drawing office of CSTE and Sr.DSTE. IRISET shall host a centralised repository of all stations' data and logic. Data Centre at Railtel may also be utilized.

10) All changes made to the EI leading to change in **Check Sum** should be entered in SI 26 duly incorporating the authority viz. SIP, corrected upto date, name of the work, check sum and other details as required.

11) SSE concerned shall be empowered to buy the **Accessories** like mouse, keyboard etc., meant for electronic interlocking through imprest so that the VDU operation is kept functional and operations through panel should be during emergencies only.

Contd. 3/-

(C) **Training:**

1) IRISET shall have **Database of All the Officers/Supervisors trained** on Electronic Interlocking and keep circulating this list quarterly to Railway Board and all Zonal Railways. **Trouble shooting Course** shall be organized on Microlok EI for the next six months involving the OEM.

2) All Indian Railways to be trained by dividing into four regions. All JEs and above shall be trained in SCR in Microlok EI on priority. IRISET has to be strengthened in this regard by transferring one revenue post of SSE from South Central Railway immediately.

3) All Zonal Railways will transfer one revenue SSE post to IRISET to augment the training facilities within next month, it is targeted that all the officers(up to SG)/supervisors shall be trained on latest technology in the next six months to one year.

4) One latest system of Microlok-II in distributed architecture shall be installed by OEM at IRISET.

Feedback of Action Taken may be sent to Board's Office by 1st August, 2015.

30/6/15

(Harsh Deep Srivastava)
Director (Signal)

Copy to:-

M/s. Ansaldo STC Transportation Systems India Pvt. Ltd.
SLV Complex, AVS Compound, #35, 80 Feet Road, 4th Block
Koramangala
Bangalore- 560 034

Government of India
Ministry of Railways
(Railway Board)

No.2013/Sig/SF/1 New Delhi, dated 19.04.2016.

The CSTEs
All Indian Railways.

Sub:- Damage of S&T cables due to Fire- Preventive Measures

Ref: (i) This office letter of even No. 2011/Sig/SF/1/Pt. dt. 23.2.12
(ii) CRB's DO letter to GMs with No. 2015/EnHM/06/12 dt. April 12, 2016

In a recent case of damage to S&T cables due to fire on one of the Railways, it has come to the notice that underground signal cable was exposed and garbage was being dumped on the cable. The fire in the garbage resulted in the Signalling cable also getting burnt and damaged which caused heavy dislocation to the train services.

2. Board has viewed it seriously. To avoid such incidences, it has been decided that :

i) Each yard and block section may be got inspected to identify the locations, if any, where cable is exposed.

The above exercise may be completed within two weeks and a report duly signed by CSTEs may be sent to Board's office. Board(ME) desires that CSTE should take this compliance from Sr.DSTEs who should get the same inspected at ASTEs/Sr. Supervisor's level and sent a compliance report to CSTE under their own signature.

ii) The Action Plan to protect exposed cables should be drawn up and sent to Board's office with clear time frame. The protection work need to be monitored at Headquarter at CSE/CSTE's level and once completed, a compliance report should be sent to Board's office under signature of CSTE.

iii) The Cable Route Plan of the station may be updated for location/depth with the help of Cable Route locater. The cable depth and distance should be painted at the nearest rail at every 30

meter distance. This exercise should be completed within six months time and a compliance report sent to Board's office.

In order to ensure that the Cable Route Plan for the new works is correct, it may be legislated that sample testing of Cable Route Plan will be carried out by the above line officials before taking over all the assets from projects/construction units. Provision of cable markers may also be ensured.

iv) Cleanliness campaign be organised under "Swatchh Bharat Mission" as directed by CRB vide his DO letter No. 2015/EnHM/06/12 dt. 12.4.16 and awareness be created to dump garbage at nominated place in the yard and to be disposed of at regular intervals. Burning of garbage in the yard should be avoided as far as possible. If considered essential, then it should be burnt in controlled manner away from cables under strict supervision.

3. Receipt of the above letter may be acknowledged and reports as per targets may be sent without fail.

(Arvind Mital)
Executive Director(Signal)-I
Railway Board.

Section 10

General Safety Precautions & Firefighting at Worlplace

CAMTECH/S/PROJ/2016-17/Comp-Sig/1.0
October 2016

10.1 General Safety Precautions

- Never use short cut methods while rectifying a failure.
- While connecting measuring equipment ensure that the measuring instrument are connected with proper setting as per given.
- Always use the instrument on higher range of the value if not known.
- Before energization of a circuit, check all the connections are proper as per circuit diagram and fully tightened.
- Before disconnection of the circuit ensure that information is to be issued to the users / operating persons.
- Maintain properly and ensure that all the measuring instruments are in working condition.
- Good & qualitative maintenance is the key of reliability.
- Always use proper and standard tools and measuring instruments. Use of non-standard tools may result in damage of the equipment. It may also reduce the codal life of the equipment.
- Your efficiency is judged by your quality of maintenance. Quality of maintenance is worth for department.

The following precautions are taken during maintenance, operation, and repairing of electric / electronic equipment:

- Do not touch the electric / electronic equipment unless sure that there is no leakage current in the body of the equipment.
- While working on the electrical/electronic equipment always use rubber shoes, rubber mattress, rubber gloves or dry wooden platform to maintain the separation from the earth.
- Before switching on the equipment always ensure that the circuit is properly connected and no person is working on the circuit.
- Before doing any experiment always have full knowledge of experiment and all required tools; equipment and circuits with you.
- Before starting any maintenance, repair, always disconnect equipment from mains. Never pull the plug from the socket by holding the lead wire of mains.
- Whenever working on the mains your hands should be dry. Never touch the mains, electrical equipment with wet hands.
- If there is any high voltage capacitor in the circuit always touch or disconnect the capacitor after discharging it.

10.2 Firefighting at work place

At any working place, fire may occur due to either short circuit or any other reason, So to extinguish the fire, firefighting equipment are used and, its knowledge is necessary.

10.2.1 Types of Fire Extinguishers

The following types of extinguishers are generally used:

(i) Fire buckets filled with water or sand



A **fire bucket** is a bucket filled with water or sand which is used to prevent or extinguish fires.

Typically, fire buckets are painted bright red and have the word *fire* stencilled on them. Often they have a convex, protruding bottom, rendering them useless for other purposes, thus reducing the potential for theft or misuse.

Fire buckets are a low-technology method of fighting small fires. Although largely superseded by more modern forms of firefighting equipment, they retain some distinct advantages and remain the preferred method for fighting small fires in certain situations. The main advantages of fire buckets are that they are cheap, reliable, easy to use and can be quickly refilled and reinstated.

Normally, they are hung on dedicated fire bucket stands and placed in prominent positions in rooms or corridors, next to fire prone areas such as control cabin.

Oil fires are resistant to water, but small fires can be effectively extinguished when the sand in the bucket is dumped on the fire to starve it of the oxygen it needs to stay alight. This method of fighting liquid fires has generally been replaced by modern foaming agents.

The sand from a fire bucket can also be used to absorb spills of flammable liquids and render them less dangerous, by reducing the risk of ignition and explosion. Fire buckets are often provided at petrol filling stations to absorb any small fuel spills.

(ii) Carbon dioxide Extinguisher (CO2 type)



These extinguishers are Sodium Bicarbonate chemical extinguisher. Those are also known as soda acid extinguisher. It can be applied to fire developed in wood, cotton, and cloths etc.
It is made of a cylindrical iron cell filled with sodium Bicarbonate solution and on the neck of the cylinder there is a glass cell filled with sulphuric acid.
Whenever it is required for use, press the cock of the equipment with a force and keep the cylinder downward after shaking it, so

a chemical reaction takes place in the cylinder i.e.

$2NaHCO_3 + H_2SO_4 = Na_2SO_4 + 2\ H_2O + 2CO_2$

Due to this chemical reaction a huge quantity of carbon dioxide gas is produced along with water and through nozzle it comes out with a great force. When it is applied on fires it cuts off the supply of oxygen of that area and also reduces the temperature causing fire to extinguish.

(iii) Foam Type Extinguisher

This extinguisher is also same as soda acid but the solution of the sodium Bicarbonate is mixed with Turkey red oil. When it is applied over the fire, Oil is sprayed over the fired material and deposits a layer of foam over it, which cuts off the supply of the oxygen and fire is extinguished.
It is suitable for inflammable material like electric equipment, kerosene, petrol and places like petrol pumps, airport etc., where highly inflammable material is kept.



(iv) Water used as fire extinguisher

Water is also used for fire extinguishing. When any fire take place, the fire fighting equipment spray water over it with a great pressure.
Due to high pressure of water the temperature goes down, and fire is extinguished but it should never be used over fire developed in the area containing oil, because water is heavier than oil and the oil comes over water and fire continues.
Water should also not be applied over the electrical fire because water is a good conductor and may cause shock to the fighting staff.

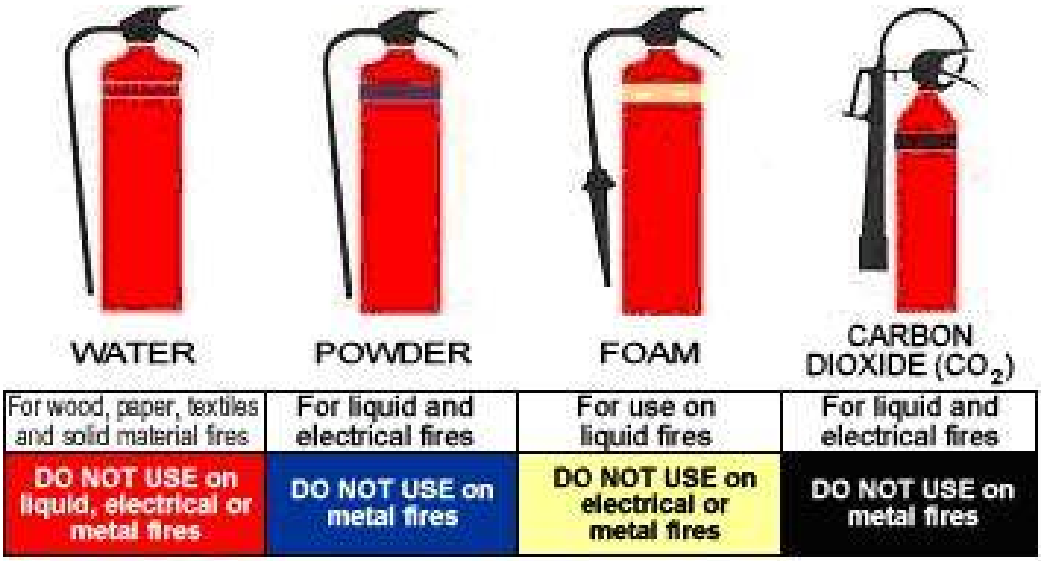
(v) CTC fire extinguisher

In this equipment there is a cylinder filled with carbon tetra chloride gas with a very high pressure.
When it's cock is pressed, the liquid carbon is spread over the fire and the carbon particles deposit over the surface of affected material and cut off the supply of oxygen, and the fire is extinguished.
This apparatus is normally used on electrical appliances but never kept inside the room since CTC chemical produces the poisonous Phosphine gas.
Always use the equipment after covering your nose and mouth with wet cloth.

10.2.2 Firefighting Precautions

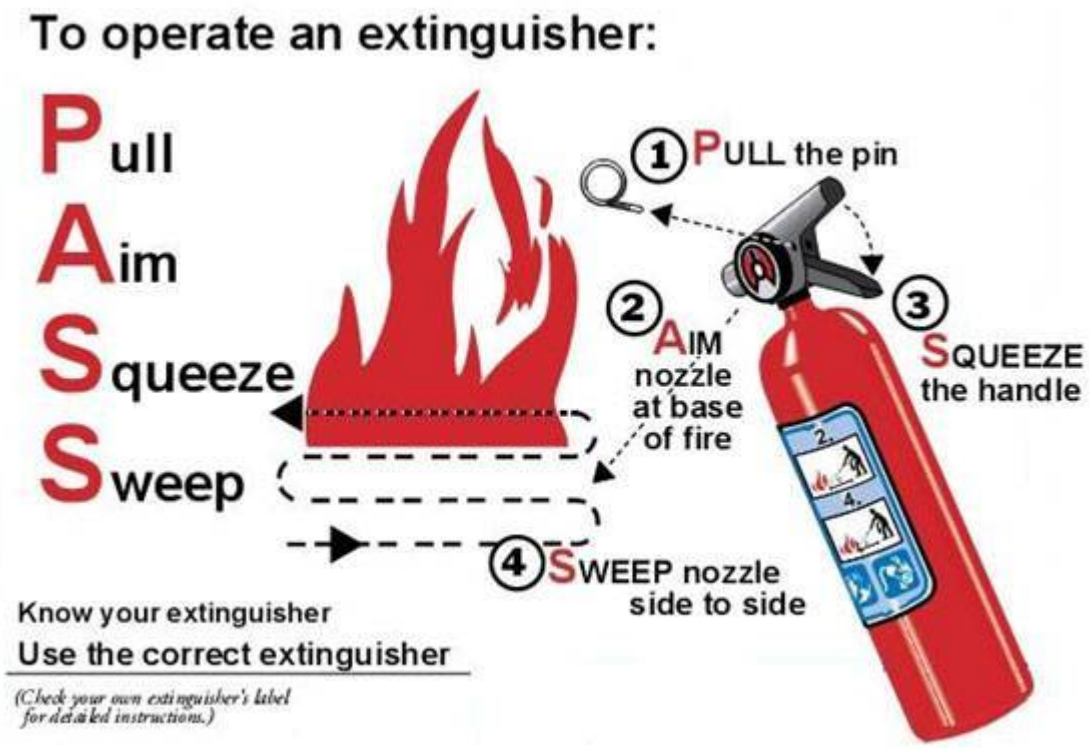
- Ensure availability of firefighting equipment / First aid box in equipment room.
- The firefighting equipment should be placed at such locations from where equipment is clearly visible and easily approachable from working place.
- Ensure that adequate fire fighting equipments are available in the relay room, equipment room, operating panel room and battery room
- Periodically check the effectiveness of fire alarm system and smoke detectors if provided as per zonal railways instructions.
- Always keep sufficient space between stacks of material placed inside store room so that if one stack catches fire it can be quickly extinguished and cannot spread to other stacks.
- Ensure that fire-fighting equipments are not over due for recharging.
- Always use the correct type of fire extinguisher

A summary for use of different types of fire extinguishers is given below in the figure:



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- Get aquatinted how to use it. Steps for use of a basic fire extinguisher are give below:



■■■

गुणवत्ता नीति

रेलों में यात्री और माल यातायात की बढ़ती मांग को पूरा करने के लिए गुणवत्ता प्रबंध प्रणाली में अनुसंधान, डिजाइनों और मानकों में उत्कृष्टता तथा सतत सुधारों के माध्यम से सांविधिक और नियामक अपेक्षाओं को पूरा करते हुए सुरक्षित, आधुनिक और किफायती रेल प्रौद्योगिकी का विकास करना ।

Quality Policy

To develop safe, modern and cost effective Railway technology complying with Statutory and Regulatory requirements, through excellence in Research, Designs & Standards and Continual improvements in Quality Management System to cater to growing demand of passenger and freight traffic on the Railways.



INDIAN RAILWAYS

Centre for Advanced Maintenance Technology

Maharajpur, Gwalior (M.P.) Pin Code – 474 020