

# **SAFETY BULLETIN**



## **On SIGNALLING ASSETS**

**CHIEF SAFETY OFFICER  
EAST COAST RAILWAY, BHUBANESWAR**



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*Bhubaneswar*  
*Dated the 14<sup>th</sup> June' 18*

## **MESSAGE**

I am pleased to know that Safety Department is going to publish the safety bulletin on 'Signal Assets'.

This Safety Bulletin contains a number of useful topics on Signalling Assets like Electric point Machine, Electric Lifting Barrier of LC gate, various types of Block Instruments, Single Section Digital Axle counter, limit of earth resistance for different S&T equipments, Maintenance procedure, Do's & Don'ts for Electronic Interlocking installations, Fire Prevention at RRI etc.

This bulletin will undoubtedly be a handy guide to our Railway men for day to day maintenance works which will be an immense help for increasing the level of knowledge.

I am glad to convey my best wishes to the officers and staff of Safety organization for consistent efforts in bringing out this 3<sup>rd</sup> & last Safety bulletin of this year. Suggestions, articles etc from officers, supervisors and staff for future issues of Safety Bulletin for enhancing Safety consciousness over East Coast Railway should be welcome.

  
(UMESH SINGH) 14/6/18  
GENERAL MANAGER



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## MESSAGE

I am pleased to note that Safety Organization of ECoR is printing a Safety Bulletin on Signal Assets in association with S&T Department. This Bulletin includes extant instructions and circulars pertaining to maintenance of various Signalling *Assets*.

Consolidation of all the important guidelines in one Bulletin shall be found to be very useful by Signal Supervisors & Maintenance Staff.

I wish this joint initiative of Safety Organization together with Signal & Telecom Organization, a great success.



Rajeev Sharma  
Addl. General Manager



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*Date :- 14.6.2018*

## FOREWORD

Safety department of East Coast Railway is continuing its endeavour to sensitize the officers, supervisors and staff on different aspects of safe train operation. Hence, the present effort for bringing out the 3rd safety bulletin on "Signalling Assets".

Signalling system in the Indian Railways plays a vital role in safe train operation. Thus there is always a felt need to renew and upgrade the skills of the supervisors and staff associated with it. Same will surely help in ensuring better maintenance practices.

In view of the above, this bulletin attempts to impart a holistic view of signalling assets by including narratives on various topics like Electronic Interlocking, Point Machine, Axle counter, Data logger, Block instruments, Integrated power supply, Electric lifting barrier of L.C. gate including testing of signalling cables etc.

I hope, this safety bulletin will be useful. I also appeal to all stakeholders to go through the contents of the bulletin and offer their valuable suggestions.

At the end, I wish to place on record my sincere appreciation of the efforts of all the officers and staff of Safety Organisation of East Coast Railway & my sincere gratitude for the continuous guidance as well as encouragement of the General Manager & the Addl. General Manager for bringing out this safety bulletin.

*S. S. Mishra*  
14.6.18  
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Chief Safety Officer



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# CHAPTER - I

## ELECTRIC POINT MACHINE

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 Revision.2 , Amendment .1

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.)
143mm +/- 2	4.0 sec	</= 4.5 Amp	110 V DC	450 Kg	< /=580Kg	1000 Kg
220 mm +4/-1	5.0 sec.	</= 5.5 Amp	110 V DC	450 kg	</= 580 Kg	1000 Kg

### 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.

## Testing :

### 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.
- 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.
- Operate the points against the obstruction.
- Read the motor current as the clutch slips.
- Remove the ammeter from the motor feed.

### 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.

**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.
- Operate the machine electrically from Normal to Reverse.
- Note the working current.
- 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.

(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

### **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.

### **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.
- 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 500V megger and pot box wiring should be performed once in six months.

### **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.

### **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.

### **Maintenance :**

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

## **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 Roding 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.
- Issue disconnection Notice when required.
- Don't operate the machine locally without hand crank.

## **Contact pedestal:**

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

## **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.

## **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.

## CHAPTER - 2

### BLOCK INSTRUMENTS

SGE Double Line Block Instrument :

#### 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) (ii) Filter Unit (iii) (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.R ly.Make	HWHE.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



## 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.
- 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 bevelled.
- 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.

### **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.

**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 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.

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

### 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	<b>24 V.DC</b> , + 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

### 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.

### 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.

#### **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 deenergized.
- 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.

## 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.



## CHAPTER - 3

### MAINTENANCE OF CEL DACF 710 A & DACF 710P SINGLE SECTION DIGITAL AXLE COUNTER

#### Introduction

The system comprises of trackside counting units, installed at both ends near the detection points on the track. No separate evaluator is required. Two versions available

- (i) DACF 710 P (Phase reversal type) The DACF 710 P is not affected by the push trolleys having 4 spoke and 8 spoke wheels; and rail dolly. Trolley suppression track circuit is not required. It counts the following push trolleys: (a) Push trolley with perforated wheel; (b) Dip lorry and (c) Motor trolley.
- (ii) (ii) DACF 710 A (Amplitude Modulation type) The SSDAC remains unaffected with all types of insulated push trolleys but goes into disturbed state (ERROR condition) for non insulated trolleys. Trolley suppression track circuit is required.

#### Maintenance

##### Recording of Signal levels

For maintenance of Single Section Digital Axle Counter various parameters are to be checked periodically. The various signal input and output levels and its limits which are to be recorded and adjusted to correct levels wherever necessary are 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.  
Fig 4.7: Adjustment of Receiver coil with the help of 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
1.	RX Coil 1 (21 KHz)	750 - 1200			
2.	RX Coil 2 (23 KHz)	750 - 1200			

### For Phase Reversal type Digital Axle Counter

S.No.	Parameter	Limit mV rms	Measured Value
1.	RX Coil 1 (21 KHz)	275 - 600	
2.	RX Coil 2 (23 KHz)	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.	SCC-1	2.0 to 2.5 V		< 0.7		>1.7 V	
2.	SCC-2	2.0 to 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	<2V	

### 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 Volt)
	5V	4.75 to 5.25 V	
	12V	11.50 to 12.50 V	
	24V	23.50 to 24.50 V	
	15 v ISO	14.50 to 15.50 V	

### Maintenance Schedule (Monthly)

#### (i) Tx & Rx Coil Axle Detectors (At site)

- Measure the TX coil (21 KHz & 23 KHz) signal levels and record them. These measurements are to be tallied with the previous readings. These should be within the specified limits and should not change more than 10%.
- Measure the Rx coil (21 KHz & 23 KHz) signal levels and record them. These measurements are to be tallied with the previous readings. These should be within the specified limits and should not change more than 10%.
- Check the M12 Bolts & Nuts of web mounted TX & Rx coil Axle detectors. All the nuts should be in tight condition.
- Check and tighten the deflector plates if found loose.

**(ii) SSDAC Unit (At site)**

- The 2.2V DC signal levels of card 1&2 of the SSDAC Counting Units are measured and recorded.
- The level should be between 2.0 to 2.5V DC.
- DC-DC converter output voltages should be measured and recorded.
- The outputs measured should remain within the specified limits and match with the previous readings.
- The modem card output should be measured and recorded. The reading should match with the previous readings
- Check the relay driver output and it should be >20 V DC. This reading is recorded.
- Ensure that screws of modules are tight.
- Ensure that MS circular connectors are tight.

**(iii) Power Supply (Battery Room & Site)**

- The 24V DC power supply should be measured and recorded. The 24V DC should remain within specified limits.
- Inspect the battery charger and check its charging current and ensure it is properly charging the battery.
- Any interference with power supply and connections of SSDAC is likely to cause failure. This should be done only after ensuring that no train is occupying or approaching the section.

**(iv) Inspection of Reset Box (SM' s room)**

- Monitor the reset box while the train is occupying the section. The occupied (red) LED should be glowing.
- When the train clears the section, the clear LED (green) glows.
- The Reset to the system is controlled through the key actuator & Reset button of reset box. This should not be disturbed.
- The LCD displays all the information regarding the system. (Please refer Handbook on Troubleshooting of Digital Axle Counter Section IV)

### **(v) General**

- Check all the cable connections on the CTboard of apparatus case at both locations.
- Ensure that these are in tight condition.
- Check the deflector plates of the Axle detectors are in normal position. If found loose this should be properly tightened.

### **(vi) Repair of Faulty Cards**

- Before declaring any card is faulty, the fault should be analysed and confirmed.
- Repair of cards is a highly technical job and is not possible at site.
- Hence Railways should not carry it out. The card should be sent to CEL for repair.

## **Resetting Procedure**

### **In station area**

#### **Common resetting**

The common resetting of both SSDAC units is to be carried out when used in station area for platform lines, yard lines etc. Last vehicle (LV) proving is used in conjunction with reset box if required.

#### **Resetting operation**

- Insert SM's key, turn right and keep pressed.
- Press Reset button for 2 seconds
- Release SM's key and Reset Button.
- Turn left, remove SM's key and keep in safe custody.  
With the above operation
- 48 V DC from reset box is extended to SSDAC unit.
- Reset command is generated in MLB1 and MLB2 cards (Cards 3 & 4).
- The SSDAC units are reset and counts become zero.
- The SSDAC units attain the preparatory reset state.
- The PR & PPR relays pick up and Prep. Reset indication glows on the reset box.

- The reset counter reading increments by 1 count.
- After one pilot train is passed in the section the system becomes normal.
- Vital Relay picks up.

**Note:** Reset command to Micro-controllers will not be generated if system is in clear/preparatory/occupied state. System can be resetted if it is in error state or out counts were registered after occupied state.

## **In Block Section**

### **Independent resetting**

- The independent resetting of SSDAC units at each station is to be carried out when used in Block Sections. Sometimes SM's key and button contacts are extended to a remote location for resetting purpose.  
Resetting operation Insert SM's key, turn right and keep pressed.
- Press Reset button for 2 seconds.
- Preparatory LED starts flashing.
- Release SM's key and Reset Button.
- Turn left, remove SM's key and keep in safe custody.

### **With the above operation**

- 48 V DC from reset box is extended to SSDAC unit.
- Reset command is generated in MLB1 and MLB2 cards (Cards 3 & 4).
- The SSDAC units are reset and counts become zero.
- The SSDAC units attain the preparatory reset state.
- The PR & PPR relays pick up and Prep. Reset indication glows on the reset box.
- The reset counter reading increments by 1 count.
- After one pilot train is passed in the section the system becomes normal.
- Vital Relay picks up

**Note:** Reset command to Micro-controllers will not be generated if system is in clear/preparatory/occupied state. System can be resetted if it is in error state or out counts were registered after occupied state. Resetting operation by both stations is required and is necessary in BPAC use.

## Do's & Dont's

### **Do's**

- The inter connection drawings are to be followed for connecting the Transmitter & Receiver coils. Tx1 is 21 KHz, Tx2 is 23 KHz & Rx1 and Rx2 coils are 21 KHz & 23 KHz, respectively.
- Ensure that Receiver and Transmitter coil cables have been laid in different pipes.
- Ensure that both the TX coils & Rx coils are having proper alignment on Rail. Ensure that packing of sleepers with ballast on both sides of Axle detector is proper.
- Check that metal sheaths of the outdoor cable are connected to earth at both ends
- The recommended cables for wiring of the system at site should be used.
- The steady Battery voltage 24V should be maintained.
- The cable connections should not be connected loosely.
- The M.S Circular connectors of SSDAC are checked and maintained firmly.
- The SSDAC & Reset box is provided with sealing arrangement. They should be sealed at site.
- Resetting should be done only after ensuring that there is no train in the section

### **Don'ts**

- Don't install the Axle detectors near the rail joint (should be more than 6 sleepers away).
- Don't install the Axle detectors where the rail is badly worn out.
- Don't cut or join the Transmitter / Receiver cables supplied along with the coil. It would result in change of frequency of signal. Don't lay the TX and RX coil cables in the same pipe.
- Don't use any other outdoor cable other than the recommended cables.
- Avoid installing the Axle detectors on curve of rail / too much slope of rail to the possible extent.
- Don't remove the cards from SSDAC units under power ON condition of system.
- Remove card if necessary after Switching OFF the power to the unit.

## **CHAPTER - 4**

### **MULTI SECTION DIGITAL AXLE COUNTER(MSDAC)**

RDSO Specification: RDSO/SPN/176/2013 Ver.3

MSDAC is useful for track detection in point zones, Automatic Signalling sections and IBS section also.

FRAUSCHER ACS 2000 Multi Section Digital Axle Counter

Frauscher make axle counting systems have been designed in such a way that they are modular and scalable. It is easy to configure, commission and maintain.

The Frauscher Axle counting system ACS2000 is a microcontroller based modular system. When fully configured, the system comprises the following components:

#### **1. Trackside equipments**

- i) Wheel sensor RSR180 with moulded cable and protection tube
- ii) Rail claw with clamping bolts
- iii) Rail deflector FRD
- iv) Strain relief clamp SRC
- v) Track lead junction box TLJB
- vi) Line verification box LVB (for 'conditional hard reset' application)

#### **2. Indoor installation**

- i) Fuse board SIC
- ii) Evaluation board IMC (EB)
- iii) Axle counting board (ACB)
- iv) Overvoltage protection board (BSI)
- v) Board rack (BGT)
- vi) Axle counting backplane (ABP)
- vii) Digital input/output board DIOB (optional for transmission mode)



- viii) Reset box RSTBOX (for 'preparatory or conditional hard reset' applications)
- ix) Frauscher Reset acknowledgement PCB FRA (for 'preparatory reset' application only)

**3. Mounting instructions for Wheel Sensor RSR 180**

- i) To be mounted at the inside face of the rail (wheel flange side).
- ii) In curves - to be mounted at the inside face of the curve.
- iii) In point areas, the minimum admissible space between rails is 100 mm (inside width between heads of rail),
- iv) Minimum spacing between two wheel sensors on the same rail is two sleeper spaces,
- v) Minimum spacing between a wheel sensor and the next rail joint or the next rail-weld is 1.5 m to 2.5 m.
- vi) The distance between the centre of the wheel sensor and rail deflectors on either side in the longitudinal rail direction should be at least 350 mm away from the wheel sensor.

**4. Rail claw mounting - Important parameters**

- i) Min. width of foot of rail 110 mm.
- ii) Max. width of foot of rail 155 mm.
- iii) Min. height of rail 130 mm.
- iv) Max. height of rail 180 mm.
- v) Height (vertical) between the top of the railhead and the top of the sensor is 40 to 45 mm.
- vi) Depth (horizontal width) between the side of the railhead and the inner face of the sensor is 0 to 8 mm.

<b>Rail Profile</b>	<b>Claw type</b>	<b>Bolt type</b>
<b>60 Kg</b>	SK140-011	BBK22
<b>52 Kg</b>	SK140-012	BBK 17.5
<b>90 lbs</b>	SK140-013	BBK22.

## 5. Maintenance

- i) Measurements on the IMC when the wheel sensor RSR 180 is connected. Cycle: < 2 years
- ii) Measure voltage at test sockets for Sys1 and/or for Sys2, Specified range: 280 mV to 500 mV DC. The measured voltage corresponds to the wheel sensor system current across an internal 100 Ohm shunt resistance (100 mV corresponds to 1 mA wheel sensor system current). The voltage must be measured in the unoccupied (Clear) status.
- iii) If the difference between the two voltages > 20 mV or 5% (max), then the possible reasons are
  - Incorrect wheel sensor mounting
  - Wheel sensor RSR180 not mounted centrally between the sleepers
  - Metal parts below the wheel sensor RSR180
  - A wheel sensor system is defective

V+, GND — 2 mm test sockets, voltage corresponds to the analogue wheel sensor current via a 100 Ω shunt.
- iv) 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
- v) 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 as given below:

1	Start position: The wheel sensor is not occupied
2	Move (pull) the PB200 constantly in direction of arrow over the first wheel sensor system. Wheel sensor system 1 occupied
3	Move (pull) the PB200 constantly in direction of arrow in the middle of both wheel sensor systems. Wheel sensor system 1 & 2 occupied
4	Move (pull) the PB200 constantly in direction of arrow over the second wheel sensor system. Wheel sensor system 2 occupied

### Important parameters

Outdoor equipment	Wheel Sensor RSR 180
Indoor equipment	ACS 2000 system consisting of BSI, BGT, 'ABP, SIC, IMC (EB), ACB & DIOB boards and reset box
Configurations of axle counting backplanes ABP slots	(i) 1 ACB + 1 SIC + 2/3/4/5/6 evaluation boards IMC & (ii) 1 ACB + 1 SIC + 1 DIOB + 2/3/4/5/6 evaluation boards IMC
No. of counting heads per ACB	6
For more than 6 counting heads (Max. up to 12).	2 ACBs interconnected by null modem cable
Communication between Indoor (ACB) and Outdoor equipment (RSR180)	Four-wire signalling cable (typically star-quad cable)
Length of sensor cables between TLJB and RSR180	5m (10 m & 15m on special requirement)
Input power supply range	+19 V DC to +72 V DC.
Maximum cable length from the TLJB to the backplane ABP	Up to 4.4 km (0.90 mm dia. star-quad cable with a loop resistance of 56.6 Ohms /km.
Max. No. of wheels counted per track section by the ACB	8191
Reset Box input Power Supply	+19 V DC to +30 V DC

**Error codes for troubleshooting Listed below are some generic error codes that may be displayed on ACB during the functioning of the ACS2000 system :**

<b>Error Code</b>	<b>Cause &amp; Remedy</b>
+111/+211 or - 111/- 211 +112/+212 or - 112/-212 +113/+213 or-113/-213 +114/+214 or -114/- 214 +115/+215 or - 115/- 215 +115/+215 or -115/- 215 +116/+216or-116 /-216	Partial traversing e.g. during shunting or Very Small wheel. 1.Check wheel sensor mounting 2. Apply Reset
+121/+221 or -121/- 221 +122/+222 or - 122/-222 +123/+223 or -123/-223	Negative axle at the Evaluation Board. Reset applied when track section
+124/+224 or -124/- 224 +125/+225 or - 125/- 225 +126/+226 or -126/- 226	occupied or presence of at least one wheel in the track section or Very small wheel -Apply Reset
**** flashing	Appears after power up -Apply Reset
**** steady	If after power up and before reset a wheel was counted in or out -Remove fuse on the fuse board, re-insert and apply Reset
////	During power up, a wheel sensor system assigned to the track section is occupied. 1. Check - If sensor is occupied, Sensor wiring, DIP - switch setting for double usage or Double usage RJ45 patch cable. 2. Remove fuse on the fuse board, re-insert and apply Reset
-109/- 209 or +109/+209	Reset applied from reset box or from PC based reset - After train movement it will clear.

## Do's

- ✓ Always carry out adjustment and testing after any work done in the sensor.
- ✓ Check Nuts and bolts of sensor and rail claw in every maintenance round and tighten if found loose.
- ✓ Always ensure that Wheel sensor cables for connection between TUB and RSR- 180 are visible and not buried under ballast or mud.
- ✓ Check the axle counting system fuses at regular interval by checking the LEDs.
- ✓ Axle counting system Powering Down: Switch OFF individual section by pulling the SIC board out of the rack.
- ✓ Axle counting system Powering Up: Switch ON the individual section by pushing the SIC board back into the rack.
- ✓ Check regularly the BSI, BGT and earth connections. Always maintain earth resistance value less than 1 Ohm.

## Don't

- ✗ Attempt to use "pre -Reset" input switch on the the ACB.
- ✗ Change DIP switch and soldering jumper settings on the axle counting backplane ABP and plugin berg jumper position on the PCB inside the reset box.
- ✗ Touch the module components & repair module on your own.
- ✗ Remove/modify axle counting system interface wirings or cables without authorization.
- ✗ Use blower for cleaning the dust or use vacuum cleaner inside the housing.
- ✗ Remove RJ45 cable when axle counting system is ON.



# **CHAPTER - 5**

## **DATA LOGGER**

### **INTRODUCTION**

- Data logger system monitors the railway signaling system by monitoring the status of relays and data generated by processor based signaling equipment. Potential Free contacts of relays are given to data logger as input. Data from processor based equipment is acquired through communication port.
- Based on the change of status of relays with the help of application software the movement of trains, operations by signal operator and health of signaling system is monitored. Data Logger also monitors power supplies.
- Data logger is placed in the relay room. Data logger monitors the relay status and records its change with time stamp.
- Each data logger has number of data output ports for communicating the recorded information to the Central/ Local Fault Analyzing System.
- Data loggers are networked in daisy chain to a Front End Processor provided in central location, usually, divisional control office.
- Data logger can be networked with copper cable [twisted type - in 4 wire mode], voice channels on OFC/MW, data channels [E1] or dark fiber. Data from data logger can be sent to central location by mobile network in GPRS.
- Analog and digital Data from FEP is taken by CMU[Central Monitoring Unit] by NMDL [Network Management of Data Loggers] software to generate online simulation and signaling equipment faults, wrong operations by SM and mistakes of Loco Pilots.
- The NMDL software further stores the data in the server for access through LAN/WAN, by multiple users.

- It is possible to send the faults to signal asset maintenance personnel as SMS in the mobile network to reduce MTTR.
- Reports can be generated to estimate the health of the signaling equipment and inputs required to be provided to increase MTBF of the equipment.

### **DATA LOGGER SYSTEM**

- Micro processor based Embedded system,
- DIGITAL INPUTS : 512 to 4096 [optically isolated] - two data loggers can be connected in tandem to increase the capacity.
- Analog inputs: 32 to 96 [individually isolated].
- Nonvolatile Data Storage: in Flash RAMs up to Ten (10) lakhs of events
- Eight serial ports for data network.
- Dot matrix printer interfacing for online/ offline data printing.
- Data Speed : 57.6Kbps
- In-built dual leased line voice modem or inbuilt dual E1 converter for network
- User interface: LCD and 7-Segment LED display with Keyboard
- Control of potential free relay control from central place.
- Optional GPRS modem connectivity, where copper cable is not available.
- Buffers data in between Central Monitoring Unit and Data logger Network.
- Receives Network data though Eight(8) serial ports and transfers out the data to Two(2) computer ports.
- Data buffering of Ten (10) lakhs of events.
- Software filter for redundant data.

## **RTU**

- RTU is a mini data logger suitable for Auto sections/LCs and IBS.
- Maximum 64 opto isolated digital input @ 16milli sec sampling.
- Maximum 32 individually isolated voltage channels @ 1 sec.
- Nonvolatile data storage of One (1) lakh events in Flash RAM.
- Two(2) serial ports for data network with in-built dual modem.
- Efficient network protocol to effect higher data rate (57.6Kbps).
- Optional GPRS modem connectivity, where copper cable is not available, can directly transfer data to central place.
- Buffers data in between Central Monitoring Unit and Data logger Network.
- Receives Network data though Eight(8) serial ports and transfers out the data to Two(2) computer ports.
- Data buffering of Ten (10) lakhs of events.
- Software filter for redundant data.

## **Network Management of Data Loggers ( NMDL)**

**It is a software** to receive data from Data logger network and to record station wise status of Signaling Relays and Power Supplies in sequence.

### **Features Available**

- On-line Asset-Failure Alarms.
- Online Yard Simulation.
- Asset Lifetime Alerting.
- Auto SMS of Asset Failure.
- Log of events Reports.
- Supervisory System for easy Maintenance of Data logger Network.



- Power Supply variations as Graphs.
- Offline Yard Simulation.
- Summary Report of Asset Failures.
- Auto Mailing Facility of Asset-Failure reports.

### Relays to be wired as digital input

SI	Functions	Recommended digital Input
1	Points	Switch/Button relays, lock relay, Operation command relay, Detection relay, Emergency operation button relay, point stick relay, Siding point control relay.
2	Signal	Switch/button relay, Control relay, lamp relay.
3	Track	Track relay, Track stick relay
4	Level crossing	Operations Command switch/button relays, Gate close relay, Gate locked relay, Emergency gate release relay.
5	Crank handle	Crank handle key IN relay, Crank handle lock relay, Crank handle release relay, Crank handle button relay.
6	Axle counter	Axle counter proving relay. Axle counter Preparatory Reset relay, Axle counter Reset Cooperation relay.
7	Route	Button relay, Route free checking relay, Route checking relay, Route locking relay, Route release relay, Route cancellation Button relay, Route cancellation initiation relay, Route cancellation Timer relay, Overlap locking relay, Overlap cancellation relay, Direction relays.
8	Route sections	Locked/free
9	Push buttons	Pressed/ released
10	SM's key	In/Out
11	Insulation of Signal cables	Good/Bad (through ELDs)
12	Slots (Outgoing)	Given/not given, Locked/released
13	Slots (Incoming)	Received/Absent

14	Switch (Two position)	Normal/Reverse
15	General relay	Pick up/drop
16	Block operations relay	<b>SGE Block</b> : LCPR, SR, QR1,QR2, LSSDR <b>PTJ TLBI</b> : ASCR, TAR, All internal relays with spare contact <b>FM DAIDO Type</b> : HSR, ASR
17	Misc relays	Time element relays, Power monitoring relays, Point & Signal failure relays, SMR, Siding control relay, Siding Switch/button relay, Slot Switch/button relay, Slot control relay, King lever/switch relay, Relay room open/close, ELD contacts, Approach track relay.
18	IPS	Potential free contacts for Inverter 1 fail, Inverter 2 fail, FRBC output fail, DC-DC converter fail, MAINS fail, Call S&T staff, Battery low(50% deep discharge)
19	IBH	Control relays, Pass at ON relay, Stick relays, Reset relays.

### Wiring for Analog inputs

- 1.1 230V all primary power supply input to IPS
- 1.2 110V DC from Battery and SMPS in parallel
- 1.3 110V AC supply to UP track circuits.
- 1.4 110V AC supply to DN track circuits.
- 1.5 110V AC supply to UP Signal lighting.
- 1.6 110V AC supply to DN Signal lighting
- 1.7 DC-DC converters output voltages
  - i) Internal
  - ii) External-1
  - iii) External-2
  - iv) Block local supply-1
  - v) Block local supply-2
  - vi) Block line supply-1
  - vii) Block line supply-2
  - viii) Data logger
  - ix) Axle counter
  - x) RKT

- xi) Spare cells
- xii) EI
- xiii) Panel Indication

## **OUTPUT REPORT**

Output report consists of events detected by the change of status of relays to satisfy a combinational and sequential logic. These reports are also called exception reports. They are categorized into 3 parts based on usage.

1. Maintenance
2. Safety
3. Operations

### Maintenance

- i) Signal bobbing
- ii) Track bobbing
- iii) Point bobbing
- iv) Point failure
- v) Point loose packing
- vi) Timer setting more
- vii) Check the charger
- viii) Blanking of signals
- ix) Fusing of signal lamp
- x) Track circuit failure
- xi) Power supply failure
- xii) Signal flying back to danger
- xiii) Earth leakage detected/disappeared

### 2. Safety

- i) Signal assuming green aspect with one or more points in the route reverse.
- ii) Home/ Main line starter signal assuming green aspect with Advance starter danger
- iii) Point Burst
- iv) Check for passing of defective/ danger signal
- v) Picking up of track circuit when adjacent track circuits are down.

- vi) Route getting released without all the sequential relays in the route picking up.
- vii) Block getting released without picking up of sequential train arrival relays.
- viii) Advance starter off without line clear.
- ix) Timer setting less

### 3. Operation

- i) Premature turning of Block handle of double line Block instrument to TOL.
- ii) Late operation of reception signal
- iii) Button stuck up.
- iv) Relay room opened
- v) Train passing blank signal
- vi) Failure to set point against occupied line.
- vii) Emergency route cancellation
- viii) Point emergency operation
  - x) Axle counter resetting
  - xi) Route not set when operation is valid giving the sequence of relay operations.
  - xii) Late closure of LC gate.
  - xiii) Sluggish operation of point
  - xiv) Late start of train

### **SENDING THE FAULTS TO MAINTENANCE STAFF BY SMS**

Sending SMS to the concerned maintenance staff and officers as soon as failure has occurred reduces the MTTR and detention to train services. Only important failures which cause detention of trains are to be sent to staff on duty.



## **CHAPTER - 6**

### **TESTING OF SIGNAL CABLES**

Signalling cables are manufactured as per specification IRS:S.63/2014 Rev.4.

Working of Signalling system depends upon its health of cables. Maintenance of Signalling cables should be on top priority.

Meggering of Signalling cable is to be done to test the continuity and insulation of cable conductors. During installation meggering is done before and after the cable laying. After this cable testing is done periodically as a maintenance practice.

#### **Procedure of Cable testing:**

- a) Obtain necessary disconnection from Operating department.
- b) Disconnect all working circuits and power supply from the cable at both ends.
- c) Ensure communication between both ends of the cable under testing and competent staff, testing equipments etc.
- d) Ensure both ends are in dry and clean condition.
- e) Before testing short/earth the cable conductors momentarily to discharge the accumulated charge, if any due to capacitance effect.

#### **Tools and equipments.**

- a) Multimeter-2nos
- b) Insulated Wire nipper-2nos
- c) Insulated Box spanner-2nos
- d) Screw driver -2nos
- e) Crocodile clip with wire-4nos
- f) Insulation Tester(Megger) 500V DC.- 1nos

## **Testing:**

Continuity test :

- a) Conductor no.1 at one end is to be connected to one probe of multimeter and other probe to earth or armour if earth is not good at both ends. At other end same conductor is to be connected to earth or armour as the case may be. This will show the continuity of the conductor.
- b) If continuity of conductor no.1 is ok, then all other conductors are to be tested with respect to this tested conductor.

Insulation Test:

1. A 500V Insulation tester (megger) shall be used for this test kept at one end of the cable under test.
2. Disconnect all cores of the cable at both ends. The disconnection may be made through links of ARA terminals if provided.
3. Connect one terminal of the insulation tester to the conductor under test and other terminal to all the conductors being bunched together and connected to earth.
4. Similarly test remaining conductors of the cable one by one as above.

## **Insulation Value**

Insulation resistance value for a new cable should not be less than 200M Ohm/km at 20degree centigrade. For conversion to any other temperature, a table of multiplier constants is to be referred.

## **Periodicity of testing**

All conductors in signalling cables must be tested for their insulation in dry weather every year. A comparison of the test results between successive tests carried on a cable under similar conditions will give an indication of the trend towards

deterioration of the insulating material over a period of time. If a sudden fall in insulation is observed, the cause should be investigated and immediate steps taken up to repair or replace the cable.

In addition to the regular testing of cables in dry weather, random tests in wet weather may also be carried out, where considered necessary, to localise any sudden deterioration in insulation of cables.

**Preventive measures**

If during periodical testing, insulation resistance of a cable is found less than 5 Mega Ohm/km at buried temperature, cause should be investigated and immediate step taken to repair or replace the cable to prevent any malfunctioning of the equipment and circuit.

The result of insulation resistance tests should be recorded in approved proforma. A comparison of test results between successive tests carried out on a cable under similar conditions will give an indication of the trend towards deterioration of the insulation resistance of the cable. If sudden fall in insulation is observed the cause should be investigated and immediate steps taken to repair or replace the cable.

**Proforma for cable testing**

Cable Insulation Resistance Test Sheet

-----Railway Station-----

Main/Tail cable ----- Cable no.

1. Location : From                      To
2. Cores:
3. Size :
4. Grade 250/440/650/1100V
5. Length :
6. Type: Unscreened/Screened/Power:

7. Insulation : PVC/Paper

8. Date of Installation/Commissioning:

9. Name of Manufacturer :

Core No. Date of Test.....Temperature.....Weather: Dry/  
damp/wet

Core No.	Designation	Date of test & weather	Date of test & weather	Date of test & weather	Date of test & weather	Remark
1						
2						
3						
4						
5						
6						

Signature  
Designation

### Do's and Don'ts

Do's

- ✓ Ensure that wire and cable entrances have been properly sealed.
- ✓ Ensure that insulation is not damaged and kept free from oil, grease, acids and alkalis.
- ✓ Ensure that precautions are taken to prevent kinking or twisting of wires and cables during termination on board and racks.



- ✓ Ensure that suitable cable markers are provided at every 15 meters along the route for easy identification.
- ✓ Ensure cable route plan is available at station.
- ✓ Adequate care is to be taken while any digging work is going on near the cable route. Unauthorized digging work is to be stopped near cable route.

#### Don'ts

- ✗ Do not forget to take visual inspection of cable, insulation and continuity test before laying the cable.
- ✗ Do not forget to prepare a register to record the purchase order reference, supplier/manufacture, type of cable, size etc before laying.
- ✗ Do not keep cables exposed at any place or hanging in bridges, culverts without adequate support.
- ✗ Do not keep any underground cable joint.



## **CHAPTER - 7**

### **INTEGRATED POWER SUPPLY**

SMPS based Integrated power supply system(IPS)-RDSO/  
SPN/165/2012, Version 3

#### **IPS using switch mode Technology**

- Integration of various power supply equipments, i.e. Battery charger, Transformer, DC-DC converter, Inverter and voltage regulator.
- Only one battery set of 110V, 200/300AH is used

#### **Modules of IPS**

The SMPS based Integrated Power supply (IPS) system is modular in design. It consists of the following modules.

- SMPS based float cum boost charger panel(FRBC) panel
- AC distribution panel(ACDP)
- DC distribution panel(DCDP)

#### **SMPS based float cum boost charger panel**

*This panel consists of :*

- FRBC (Float Rectifier cum Boost Charger) module
- Distribution/Supervisory control/Alarm(DSA) unit

#### **AC Distribution Panel(ACDP)**

*This cabinet consists of :*

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

## DC Distribution Panel(DCDP)

*This panel consists of :*

- DC-DC converters
- Common digital Voltmeter for voltage measurement
- DC-DC converters provide different Dc voltage from input DC voltage of 98V to 138V.

### MAINTENANCE

*Check Points for DC-DC Converters :-*

Sr	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 Once in a month
2	Paralleling of Converters	Switch OFF main Converter and observe if the stand-by is taking the load.	
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.

## Maintenance Check Points for ACDP

Sr	Check Point	Action Required	Frequency
1	O/P voltages of Inverters, AVR's , Step-Down Transformers as per requirement	Check if the O/P voltages are set as per requirement. If not , check for fuses contactors.	Once in 15 days
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	for this changeover operation as described in instruction manual 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

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

### 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.

**Maintenance of 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.

**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.

**Checking of earth resistance :-**

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

**Do's & Don'ts**

**SMR Module :**

**Do's**

- Keep all the modules in ON position.
- Set equal voltage for float and boost in all modules for proper current sharing.
- Set battery path current to AH/10.

- Set battery voltages according to type of battery. For SMF battery float voltage is 2.25 V/cell and boost voltage is 2.3 V/cell. For low maintenance battery float voltage is 2.15 V/cell and boost voltage is 2.5 V/cell.

**Don'ts**

- Do not take out plugs of modules when working.
- Do not connect battery when modules are ON.
- Do not connect battery in reverse polarity.
- Do not disturb battery under-cut setting.

**Inverters:-**

**Do's**

- Keep the Inverter Input MCBs always ON.
- Ensure correct DC polarity to inverter input.

**Don'ts**

- Do not switch OFF the MCBs of both or any one since both inverters are working in master-slave configuration.
- Do not remove the Inverter input/output connectors with Inverter Input MCB ON.
- Do not switch OFF the incoming of CVT.
- Do not remove input/output connectors when unit is ON.
- Always keep manual mode selector to Auto position.

**Step Down Transformers:-**

**Do's**

- Keep the AC Input switches always ON in Step Down Transformers.
- Always ensure 230V supply to transformer.
- Always load only up to rated current.

**Don'ts**

- Do not short output of transformer.

## **DC-DC Converters :-**

### **Do's**

- Always connect connectors and then switch on DC-DC converters.
- Keep the DC Input switches always ON in Converters.
- Ensure input DC voltage is within the range of 98-138V.
- Always set voltage for modules working in parallel.

### **Don'ts**

- Do not put connectors of different circuits in one paralleling group of connectors on a paralleling card.
- Do not disturb voltage of Converter when working beyond 0.5 V.

## **Automatic Voltage Regulators (AVRs):-**

### **Do's**

- Keep the AC Input switches always ON in Track AVR.
- Ensure proper input supply.
- Ensure frequency of supply is within 50 Hz +2.

### **Don'ts**

- Do not run AVR at no load.

## **Miscellaneous :-**

### **Do's**

- Keep all input MCBs in ON position.
- In case of emergency or any problem, switch OFF all the MCBs
- Remove control cable connector accessible from backside, before pulling out inverters/ step Down Transformers / Bypass AVRs.
- Whenever any module is removed and inserted again, ensure that it is properly inserted and fixed on to the rack.

- Whenever any PCB is replaced, connect the wires as per schematic drawing only. Else a severe damage to PCBs may occur.
- In case of emergency or any problem, switch OFF all the switches
- Check the healthiness of SPD periodically and whenever you feel surge is occurred.
- Do check temperature of Room/Shelter regularly. It should be less than 50 deg. C.
- Keep Maintenance record as per Annexure C.

### **Don'ts**

- Do not connect the Battery Bank to the IPS without removing the battery fuse.
- Do not disturb the potentiometers used in PCBs. They have to be adjusted at factory only.
- Do not restart the system without knowing the basic cause.
- Do not use wire fuses.
- Do not install the equipment in a poor ventilated site.
- Do not remove any fuse from panel in IPS.
- Check all incoming and outgoing connections, they should be tightened properly once in six months.
- Check for function of exhaust fan once in 15 days.
- Check for function of Spare Modules once in a month.





## CHAPTER - 8

### ELECTRIC LIFTING BARRIER OF L.C. GATE

#### 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.

#### 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.

## **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 maintenance**

- Check that machines are kept in good condition free from dust, rust and dirt.
- Check the moving parts are lubricated properly.
- Check the gear box is filled with lubricating oil to its level.
- Check the gate locks are lubricated regularly.
- Audio visual warning and approach warning(where provided)

### **(g) 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.

**(h) Quarterly maintenance**

- Check the time of operation, voltage and current.
- 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.

**(i) 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.



## CHAPTER - 9

### LIMITS OF EARTH RESISTANCE

Maximum values of earth resistances specified for earthing of Signalling and Telecommunication equipments are as under:

Sr. No.	Description	Max. Earth resistance
1.	Block Instrument using earth return circuit	10 $\Omega$
2.	Earths for surge arrestors/ lightning dischargers	10 $\Omega$
3.	Earthing of Signalling equipment	10 $\Omega$
4.	Earthing of signalling cable screen in AC electrified areas	10 $\Omega$
5.	Earthing of Telephone Exchange	5 $\Omega$
6.	Earthing of aluminum sheathed telecom cable in AC electrified area.	1 $\Omega$
7.	Earthing of equipment in VF repeater stations and cable huts.	5 $\Omega$
8.	Axle counter cable screened in AC electrified area	1 $\Omega$
9.	Electronic Interlocking installation	1 $\Omega$
10.	Integrated Power Supply System & its individual modules	2 $\Omega$
11.	Digital Axle Counter EJB and its apparatus case connected to same earth All cable armours connected to same earth.	1 $\Omega$
12.	Reset box of Digital Axle Counter connected to earth (indoor) near SM's Room.	1 $\Omega$

# CHAPTER - 10

## ELECTRONIC INTERLOCKING

### General Maintenance

- i) Make sure that all the equipments are properly fixed in rack with the help of screws.
- ii) Ensure that earth is properly connected with SSI system rack and thick wire used for earth connection.
- iii) Ensure that power supply to DC DC converter is given through fuse and rating of the fuse is between 7-10 amperes.
- iv) Ensure that power supply at DC DC converter end is between 21.6 to 31 volts DC when charger is in OFF condition.
- v) Ensure that AC ripple of battery charger is less than 50 mV.
- vi) Ensure that all relays are fixed and clamped properly.

### Do's and Don'ts

#### Do's

- i) Before any types of maintenance, make sure that there is no train in the section.
- ii) Before removing any card ensure that DCDC converter is off.
- iii) Before inserting any card, ensure that you are putting the card in its correct slot.
- iv) Connect the 24 volts +ve and -ve supply as per the power requirement stipulated and specified units.
- v) Externally accumulated dust must be removed with vacuum cleaners.

#### Don'ts

Replace any card when the system is ON.

- i) Use any kind of solvents, detergents or abrasive cleaners on the card file or internal components.
- ii) Use vacuum cleaners inside the card file.
- iii) Switch on the supply without ensuring the correctness or input or the respective LED's are glowing.

## WESTRACE E.I. MAINTENANCE SCHEDULE

Weekly Maintenance :

Measuring Voltages Schedule [Performed by Signal Maintainer]

Nominal Voltage Range of 24 VDC : 20V-30V

Nominal Voltage Range of 50VDC : 40V-60V

Sl. No.	Date	24V DC WESTRACE Supply [At PSU PFM /ATHOPC PFM/AT OPCR Relay/AT VROM & VPIM Bus bar]	50V DC OPCR & VROM & VPIM Supply	Remarks	Signature
1					
2					

Fuse Checking Schedule [Performed by Signal Maintainer]

Sl. No.	Date	Fuse Checking				Remarks	Signature
		PSU I Fuse WESTRACE Rack	PSU II Fuse WESTRACE Rack	VROM/VPIM Fuses WESTRACE Rack	Paral Supply Fuses Scanner card S2-Rack		
1							
2							

Monthly Maintenance :

Hot Standby - System changeover Schedule : [Performed by Signal Engineer]

Sl. No.	Date & Time	Hot Standby-System Changeover		Remarks	Signature
		Primary to Secondary	Secondary to Primary		
1					
2					

Yearly Maintenance :

Earth Resistance Measurement [Performed by Signal Engineer]

Earth Resistance value should be less than 1 ohm.

Sl. No.	Date	Earth Resistance value								Remarks	Signature
		PI 1	PI 2	PI 3	PI 4	PI 5	PI 6	PI 7	PI 8		
1											
2											

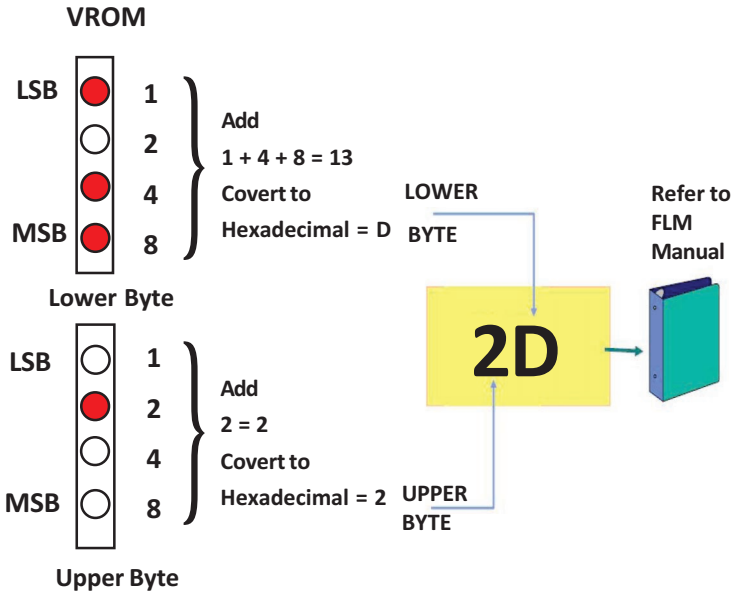
Database Backup Schedule [Performed]

Moviolaw Database Backup should be taken every 45 days

Sl. No.	Backup Date	Moviolaw Data base backup	Storage in PC drive/CD	Remarks	Signature
1					
2					

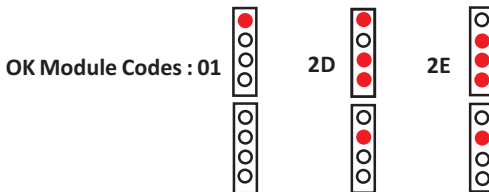
E.I- System Failure Register : [Performed by Signal Engineer]

Sl. No.	Failure in System Module Error code & System	Station Name		Restoration Date & Time	Details of the Failure	Corrective Action		
		Date	Time			Description	Date	Time
1								
2								



Decimal to Hexadecimal Conversion Table

1																
2																
4																
8																
Dec	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hex	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F





## DO'S & DON'TS OF WESTRACE VLM 6

### ✓ DO

- ✓ Keep the WESTRACE – E.I room free from dust & Moisture
- ✓ Ensure all terminations are fully tightened
- ✓ Place the removed faulty Modules with an Identity tag into a antistatic bag
- ✓ Maintain Minimum 24 Volts DC at the WESTRACE power Modules [24 Volts]
- ✓ Maintain Minimum 50V DC at the WESTRACE Input/output Modules [50 Volts]
- ✓ Take back up of MoviolaW- Maintenance terminal user data event/Fault Log files in every 45 days
- ✓ Check Network cables connectivity between WESTRACE to WESTCAD & MoviolaW
- ✓ Use Card Extractor for Removing of WESTRACE modules
- ✓ Read carefully WESTRACE -Fault codes & Fault Description on FLM During Troubleshooting
- ✓ Switch "OFF" the top housing first, during WESTRACE Powering down manually.
- ✓ Switch "ON" the top housing Last, during WESTRACE Powering Up manually.
- ✓ Wait 40 secs time delay Between Powering Down & Up Process
- ✓ System changeover every fortnight, but not later a month

## **✘ DO NOT**

- Attempt WESTRACE trouble shooting if you do not have proper WESTRACE training
- Remove modules, OPCR relays, Fuses, Links, PFM's & I/O module connectors, When the System is ON
- Force modules into the slots during insertion
- Change version Switch settings of VLM 6 & NCDM Modules
- Change Jumper settings in UHVBC & S2- Scanner card
- Touch the module components.
- Repair module on your own
- Alter WESTRACE settings ,MoviolaW & WESTCAD PC settings without Authorization
- Delete /modify Application logic programs without Authorization
- Use any kind of solvents, detergents or abrasive cleaners on the Housing or Internal components
- Use vacuum cleaner/blower INSIDE the Housing
- Remove Optic Fiber cable connector when system is ON
- Installation of Unauthorized software's in WESTCAD / MoviolaW PC's
- View optical Laser light on Exposed Eyes.
- Switch "OFF" MoviolaW diagnostic Terminal.
- Use Mobile Phones & Transceivers within 5 meters of WESTRACE/WESTRONICS [S2] Equipments.



# ABBREVIATIONS OF PCB NAMEING & BASIC FUNCTIONING CHART

## CENTRAL INTERLOCKING UNIT

PCB Name	MEI 633 Part No.	Facia Label	Basic Function(s)
CIU Bottom Backplane	M633CBBP-01	CBBP	Mother board for the CPU, CIF and VHM cards.
Communication Processor	M633CCC -01	C C C	Bridges the field modules and PP with the Vital Interlocking computer through serial interface
Communication Interface card (CIF Card)	M633CIF-01	CIF	CIF Card provides isolated, Full Duplex R5485
Vital Interlocking Computer	M633CVC-01	C V C	Performs the vital interlocking and indication logic computation
CIU Voltage and Health Monitoring card (CVH card)	M633CVH-01	CVHM	Monitors the voltage and health of COMP and VIC cards
CIU Top Backplane	M633CTBP-01	CTBP	Mother board for the Power supply cards
Power Supply Type B	M633PSB-01	CCPSB, CVPSB	To provide power to COMP CPU cards (2 nos) and VIC cards (2 nos.)
Front Panel Display card	M633FPD-01	FPD	to Display fault codes and system status messages received from SVP

## OBJECT CONTROLLER UNIT

PCB Name	MEI 633 Part No.	Facia Label	Basic Function(s)
OC Bottom Backplane	M633OBBP-01	OBBP	Mother board for the WFM cards
Input Wayside function Module CPU card (input WFM (CPU Card)	M633OCI-01	OCCI	Reads the status of input relays
Output Wayside Function Module CPU Card (Output WFM CPU Card)	M633OCO-01	OCCO	Drives the field output relays through the Relay Driver card
WFM Relay Driver Card (ORD Card)	M633ORLD-01	ORLD	Drives the field output relays in a fall-safe manner
Vital cut-off Card (OVC Card)	M633OVC-01	OVCO	Monitors the health of output WFM CUP cards
OC Top Backplane	M633OTBP-01	OTBP	Mother board for the CPU, CIF and VHM cards.

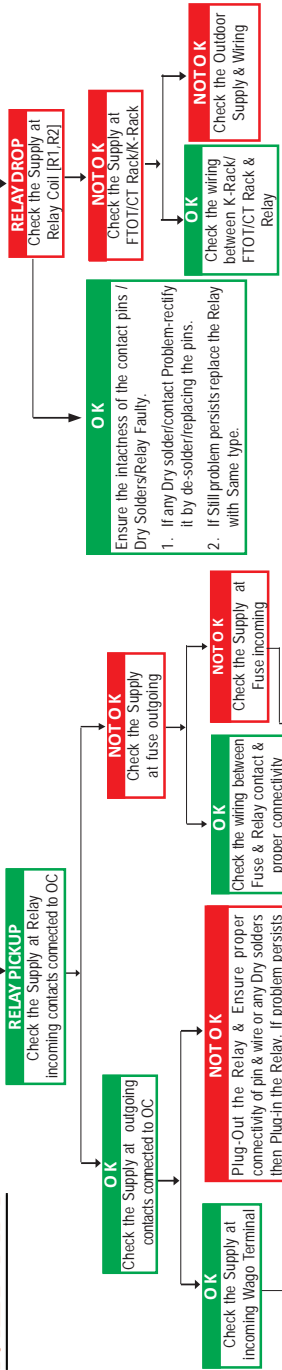
IO communication processor card (IOCOM CPU card)	M6330IC-01	OPSB	Transfers information between COMP and WFMs
Power Supply Type B	M633OPSC - 01	OPSB	To provide power to IOCOM CPU cards (2 nos.)
Power Supply Type C	M633OPSC-01	OPSC	To provide power to WFM CPU cards (2 nos.)
OC Voltage and Health Monitoring card (OVH card)	M633OVH-01	OVH	Monitors the voltage and Health of IOCOM CPU card

### PANEL PROCESSOR UNIT

<b>PCB Name</b>	<b>MEI 633 Part No.</b>	<b>Facia Label</b>	<b>Basic Function(s)</b>
PP CPU Backplane	M633PCBP-01	PCBP	Mother Board for the CPU, PVH, PSB and PExD cards
PP CPU card	M633PCC-01	PPCC	Scans the CCIP Buttons and drives the indication
Power Supply Type B	M633PPSB-01	PPSB	To provide power to the PP CPU cards (2nos.)
PP Extender Driver Card	M633PExD-01	PPDR	Interface between the CPU backplane and IO backplane
PP Voltage and Health Monitoring card (PVH card)	M633PVH-01	PPVH	Monitors the voltage and Health of PP CPU card
PP IO Backplane	M633PBP-01	PPBP	Mother board for PExR, PP Input and Output cards
PP Receiver Card	M633PExR-01	PPRC	Interface card for scanning the CCIP buttons
PP Input Card	M633PIP-01	PIIP	Interface card for scanning the CCIP buttons
PP Output Card	M633POP-01	PPOP	Interface card for driving the CCIP indication outputs.
Power Supply Card-A	M633PSA-01	PPSA	To provide power to PExR, PP input and Output cards.

**INPUT RELAY FAILURE - TROUBLE SHOOTING GUIDE**

**CHECK THE RELAY STATUS IN RELAY ROOM**

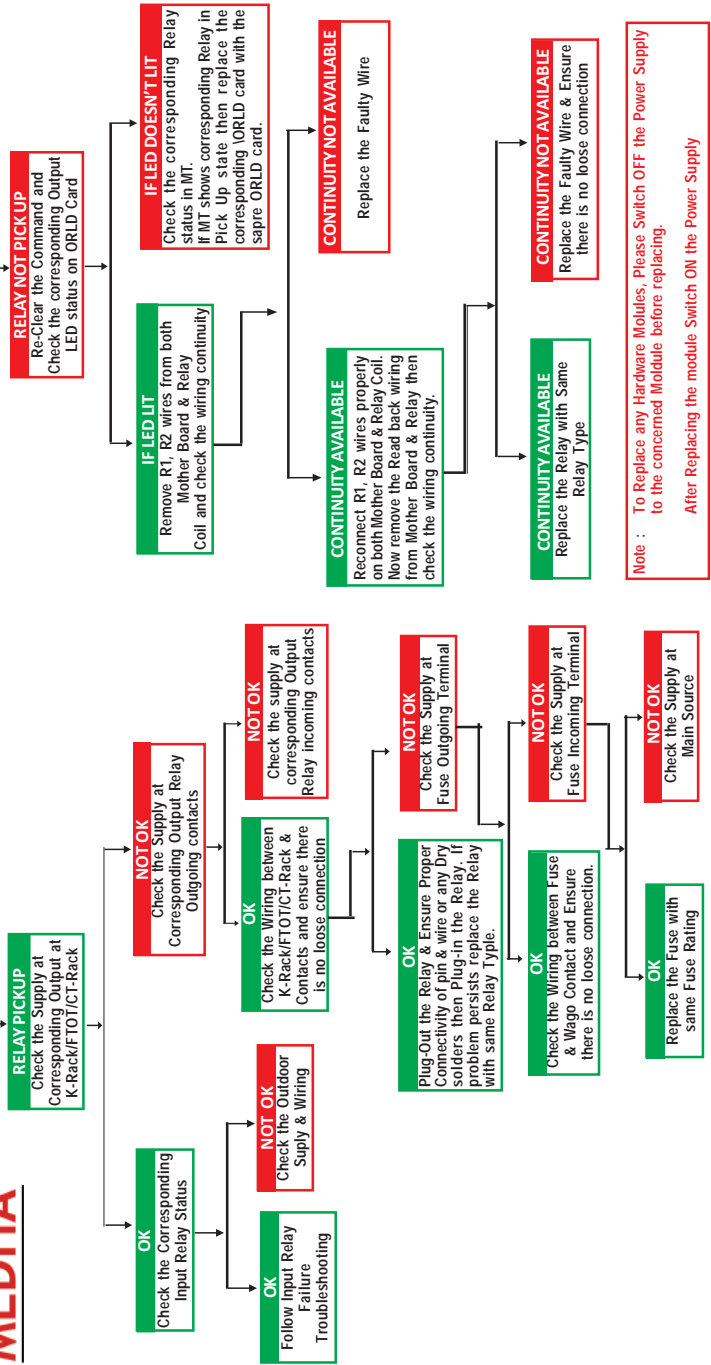


**Note :**  
To Replace any Hardware Modules, Please Switch OFF the Power Supply to the concerned module before replacing.  
After Replacing the module Switch ON the Power Supply.



## OUTPUT RELAY FAILURE - TROUBLE SHOOTING GUIDE

### CHECK THE RELAY STATUS IN RELAY ROOM



**Note :** To Replace any Hardware Modules, Please Switch OFF the Power Supply to the concerned Module before replacing.  
After Replacing the module Switch ON the Power Supply

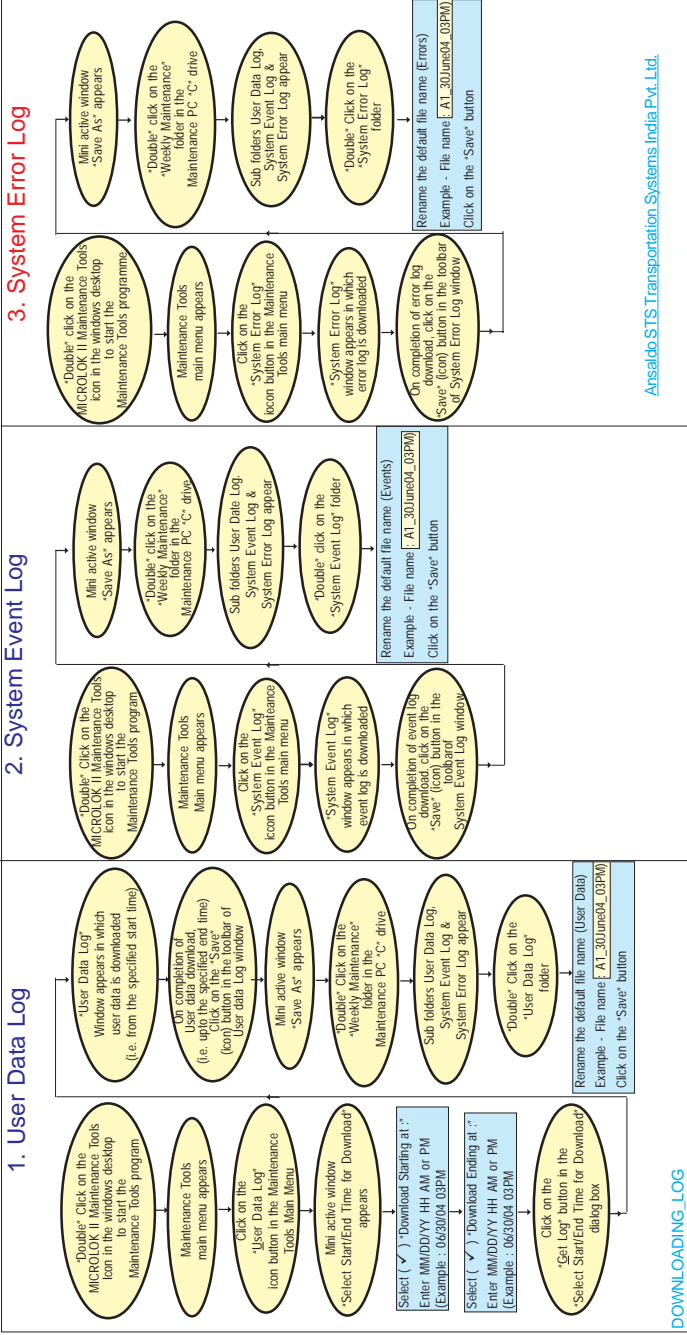






# MICROLOK II

## System Log Downloading



## DO'S & DON'TS OF MICROLOK II

### ✓ DO

- Ensure master Configuration File softcopy of all Switches are preserve properly.
- During replacement of faulty switch, upload master configuration file.
- Regularly monitor NMS for Network Healthiness.
- Regularly Monitor System Indication or failure indication in PANEL/OPVDU/MPVDU
- Keep the Microlock II room free from dust.
- Finger-tighten the boards after insertion.
- Ensure all terminations are fully tightened.
- Place the removed boards witha tag into a conductive shielding bag.
- Maintain minimum 13.5V-16.5V DC at the Power Supply board terminals
- Maintain minimum 24V-28V DC at the Microlock II I/O power modules.
- Check Microlock II system fuses at regular intervals.
- Take backup of User Data Log/Event Log/Error Log Data files weekly.
- Ensure Synchronisation of Microlock II clock time with Dataloggers after the system change over.
- Use Vacuum Cleaner for the EXTERNALLY accumulated dust and dirt.
- Check SPD health indication i.e. whether indication glowing or not in Relay room and IPS room periodically.

## **✘ DO NOT**

- Attempt to change or modify NMS Configuration.
- Attempt to change MOXA Communication Switch Configuration
- Attempt Troubleshooting if you do not have proper Microlok II training.
- Switch on Radio equipment within the vicinity of Microlok II.
- Use non conductive materials such as Styrofoam cups, Plastic ashtrays, Cell phone wrappers in the vicinity of Microlok II.
- Reset the system using Maintenance Tool/CPU front panel Reset push button when system is working.
- Remove boards, VCOR Relays, fuses/Links and 48/96 pin connectors when the system is On.
- Force boards into the Slots during insertion.
- Change Jumper settings in CPU board & Address select PCBs.
- Touch the board components.
- Repair boards on your own.
- Alter Microlock II system, Maintenance PC & Operator PC settings without authorisation.
- Delete/Modify application logic programs without authorisation.
- Apply blower for cleaning dust.
- Use any kind of Solvents, Detergents or Abrasive cleaners on the Cardfile or internal components.
- Use Vacuum Cleaner INSIDE the Cardfile.
- Use PEN drive/Memory Card Reader/CD/DVD in the Operator VDU & Maintenance VDU.
- Put the Quarantine switch in the ON mode of synchronisation board.

## CHAPTER - 11

### FIRE PREVENTION & SAFETY AT RRI

As per S.E.M. Part II, para No. 21.18.2 on Provision of Automatic Fire Detection & Suppression System says

“Fire fighting equipment shall be kept in the power supply equipment room. At major installation, fire detection and alarm shall preferably be provided in the relay room of relay interlocking installations.”

Railway Board’s instructions on Provision of Fire/Smoke Alarm & detection Systems (Ref.: Rly. Board’s letter no. 2013/Sig./Specifications dated 22.06.2015)

“Fire/Smoke Alarm & detection Systems should be provided at all junction stations and major EIs & RRIs (more than 150 routes)”.

- There should not be any false ceiling in the relay room and panel room. The height of roof slab should be decided according to cooling requirement. Accordingly false ceiling wherever available in the relay room and panel room should be removed and the same should not be provided in future installation.

Instructions on Fire prevention based on recommendations/suggestions for system improvement by enquiry committee of BPL division W.C.Rly. (Ref.- CSTE/W.C.Rly./JBP letter no. WCR/N-HQ/110/ET/RRi dated 31.03.2016)

- There should not be any false ceiling in the relay room and panel room. The height of roof slab should be decided according to cooling requirement. Accordingly false ceiling wherever available in the relay room and panel room should be removed and same should not be provided in future installation.
- Inside relay rooms other than relay rack, nothing should be kept there preferably, but if inevitable then steel materials only should be used like steel table, records in steel almirah etc. Example of unwanted material – loose wire pieces, released material etc.

### **Precautions to prevent Fire Incidences :-**

- At stations where Fire Alarm System has been provided, should be tested once in a month.
- Fire extinguisher equipments to be made available at all the places as per requirement and their refilling to be ensured.
- At stations, with shift duty staff, relay room to be opened in each shift and a visual inspection of complete relay room to be done. (Where it is not possible to open the relay room frequently as above, a visual inspection through glass door or window can be done from outside). At other stations or RRI installations with no shift duty staff, the above inspection to be done once in a day. At all other stations the above inspection to be carried out at least once in a week.
- A record of such inspections to be kept. A register to be opened with SSE/Sig/Control, in which position of all junctions and RRI stations to be recorded per day.
- A joint inspection with Electrical department to be done once in a year.



## **CHAPTER - 12**

### **GENERAL SAFETY PRECAUTIONS**

- Never use short cut methods while rectifying a failure.
- Issue Disconnection Notice where required before starting Maintenance.
- 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.

Precautions are to be 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.

