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स्थापन मैनुअल

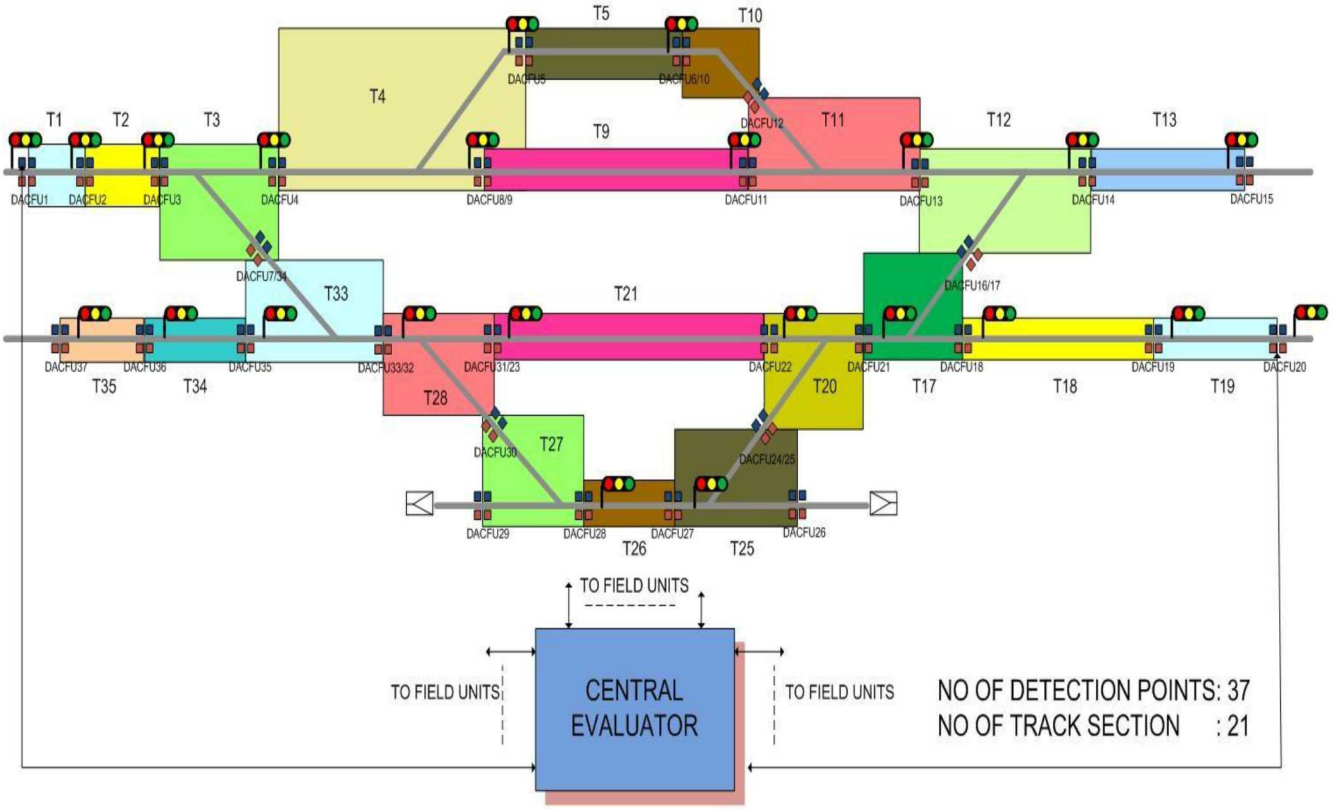
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INSTALLATION MANUAL OF MULTI SECTION DIGITAL AXLE COUNTER

MSDAC-730

RDSO/SPN/176/2013 Ver 3.0



रेलवे यार्ड में बहु खण्डीय सांख्य धुरी गणक स्थापन

MULTI SECTION DIGITAL AXLE COUNTER INSTALLATION IN RAILWAY YARD

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(आई एस ओ 9001:2015 प्रमाणित कम्पनी)

CENTRAL ELECTRONICS LIMITED

AN ISO 9001:2015 CERTIFIED COMPANY

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Abstract:

This document defines the installation & maintenance procedure for Multi Section Digital Axle Counter.

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SR. NO.	AMENDMENTS IN CHAPTER / ANNEXURE	ISSUE NO.	DATE
1.0	Draft	1.0	-
2.0	Toolkit	1.1	Oct 2012
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5.0	Wiring Detail for full MSDAC Updated	2.3	April 2014
6.0	Pre-Commissioning Check List	2.4	August 2014
7.0	Modular Central Evaluator Rack	2.5	January 2015
8.0	Do's and Don'ts modified, Old figure 8 Removed, Fig.11 connection details corrected	2.6	February 2019

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CHAPTER 1 - OVERVIEW

1. GENERAL INFORMATION

1.1. PRE-REQUISITES

It is strongly recommended to read the installation manual of SSDAC to understand the following documents.

It is also strongly recommended to follow the pre-commissioning as approved by RDSO for installation of field unit. The guidelines for installing the Central Evaluator will be given in the current document.

After going through this document, it is expected that you will carry out the complete installation of MSDAC for monitoring of yard as per layout defined. In case of any other details, kindly contact your dealer or CEL.

In order to carry out the installation you should have the following tools which are supplied as toolkit approved by RDSO and is supplied by CEL.

1.2. SYSTEM DEFINITION

MSDAC system consists of axle detectors & Field units known as Digital Axle Counter field units (maximum up to 40 detection points) configuring maximum up to 40 track sections. It is capable of counting axles, compares the count after detection the train direction, supervision, relay drive and transmission of counts and health of axle detectors & field units.

The above functions are performed by the subsystems of MSDAC that are described in details in the following

1.2.1. DIGITAL AXLE COUNTER FIELD UNIT (DACFU)

It detects axles by using axle detector comprising of TX and RX coils. These sensors operate on 21 KHz and 23 KHz frequencies. These detectors are mounted directly on the web of the rail and completed sealed hence they are not affected by flooding of the track.

The axle detectors are of two types Amplitude detection type and phase Reversal detection type. In Amplitude Modulation detection type trolley suppression circuit is required to differentiate between trolley & train wheel whereas Phase Reversal type does not require any such trolley suppression circuit and they are designed in such a way that they detects train wheel flanges only and do not detect the movement of push trolley and hence they will be used in the MSDAC system.

The DACFU consists of microcontroller card designed on 2 out of 2 architecture. The logic has been implemented using identical hardware and identical software. The state machine has been designed to implement the logic of detection of train direction, counting the axles and communicating these counts to central evaluator on the fail safe packet protocol implemented on the similar lines as that of Single section Digital Axle Counter. The software also checks the removal or damage of its subassemblies like TX & RX detectors, Card assemblies etc.

The Digital axle counter Field unit is connected to Central Evaluator in star configuration using 2- wire modem in Full Duplex mode in V.21 mode.

Field unit has the 8 bit address port for configuring the field unit as the yard layout. This setting is used to configure each DP on the basis of its address, its respective EM08 card in the central evaluator

The Central Evaluator shall be connected to DACFU in star configurations. Each track section can be reset independently from the reset panel. The event logger logs all the events occurring in MSDAC.

1.2.2. CENTRAL EVALUATOR

The Central Evaluator unit is housed in the 19" pre wired rack for monitoring up to 40 relays.

The Central Evaluator is based on the concept of 2-out-of-3 decision for high reliability and availability.

The Central Evaluator consists of 8 channel evaluator module, 8 channel relay Driver card, configuration card, Event Logger card & monitoring unit. Up to 5 such EM08 cards can be installed in the CEU allowing up to a maximum of 40 detection points and capable of giving 40 track relay output to form complete MSDAC system. Each Evaluator module consists of 3 controllers running on the identical software using FPGA module works on the 2 out of 3 decision. The FPGA module then generates the final relay output control signal for relay output for respective track sections. The Relay Driver card then generates the required driving voltage to drive Q type 1000 ohm fail safe relays. The pickup and drop contacts of the relays are read back for giving fail safe output.

The configuration card in the central evaluator stores the different configuration using configuration station. The station is used to configure 40 Field units as per railways requirement to form track sections.

Each Central Evaluator consists of the event logger card for recording various events occurring in the MSDAC system. The event logger card can be interface to commercial PC using one of the 3 serial ports available in the facial plate of the card. The 2nd serial port is used to interface with the Electronics interlocking system and the 3rd serial port for interfacing with the standard data logger system.

1.2.3. RELAY UNIT

One relay is used to give output of one track section. The Q type 1000 ohm relay is used to drive each track section output. The rack is prewired to give output in multiples of 4 relays. The relays pick up and drop

indications are provided on the back panel. The RED & Green indication of LED gives the status of the Relay Pickup and drop.

1.2.4. SM'S RESET PANEL

Reset Panel is used by Station Master for applying the reset in case any section fails to become clear.

The salient features of SM's panel are as follows

- Graphical yard layout on the panel
- Power OK indication has been provided.
- Reset Button & SM's Key
- Indications for giving track section CLR, track section OCCUPIED, track section in PREPARATORY, LINE VERIFICATION have been provided.
- 6 digit reset counter provided for recording the resets.

The SM's Panel operates on 24V DC supplied from DC to DC converter card and of its own 8 channel reset card for controlling the resetting and display of information functionality and thus Maximum of 5 such cards interface with EM08 card of Central Evaluator.

The software verifies the SM's Key and generates the packet in the form of reset command that is sent on 4 wire interface with SM's Panel and Central Evaluator. The packet protocol on similar lines as of EM08 has been used for generating the reset Packet.

1.2.5. MONITORING UNIT

Monitoring unit is used to display the status of all the field units and track section status. It is interfaced with Central Evaluator Rs422 protocol. The data to monitoring unit is transmitted by EM08 card. Monitoring unit receives the details from EM08 and processed to display the same on LCD panel for easy

It displays the complete information of the field unit i.e. counts, address of the DP, contribution of the field unit in the required track section, health and error code with its description.

It displays the track section information, track status condition whether the section is healthy, unhealthy, occupied or Clear, Its Error code in case track section is unhealthy, Section balancing with offset value.

The information is displayed for each EM08 card on same Panel in different pages on a timely basis through the backend software. The monitoring unit operates on 24V DC which it derives from Central Evaluator rack and this unit is not critical as per the RDSO specification.

1.2.6. LINE VERIFICATION BOX

LV is line verification; it is interfaced with the SM Reset panel. This is 24 Volt proving method used for physical verification of the Track section for it un-occupancy at the time of reset of that tracks section. When rest is applied from the SM panel, it is required to prove the command interface at the LV box. If LV box is not proved, then pressing of reset button does not generate the reset command.

CHAPTER 2 DETAIL DESCRIPTION

2. INTRODUCTION

The Central Evaluator unit is housed in the pre wired rack for monitoring relays that are prewired in multiples of 4 relays.

The Central Evaluator is based on the concept of 2-out-of-3 decision for high reliability and availability.

The Central Evaluator consists of 8 channel evaluator module, 8 channel relay Driver card, configuration card, Event Logger card & monitoring unit. Up to 5 such EM08 cards can be installed in the CEU allowing up to a maximum of 40 detection points and capable of giving 40 track relay output to form complete MSDAC system. Each Evaluator module consists of 3 controllers running on the identical software using FPGA module works on the 2 out of 3 decision.

The System interconnection diagram is given below

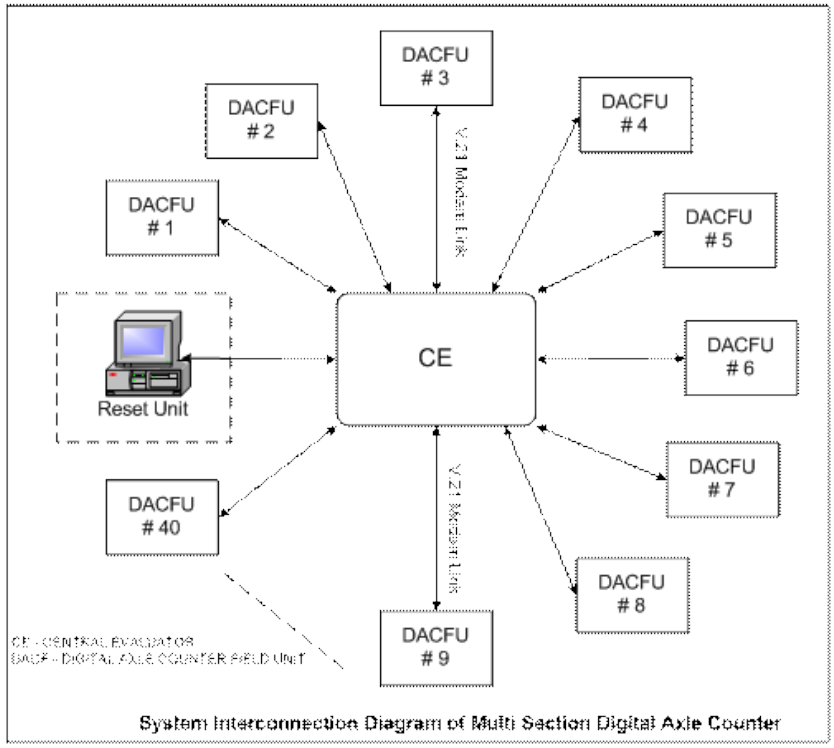


Figure 1 : System Interconnection Diagram

2.1. BLOCK DIAGRAM OF CENTRAL EVALUATOR

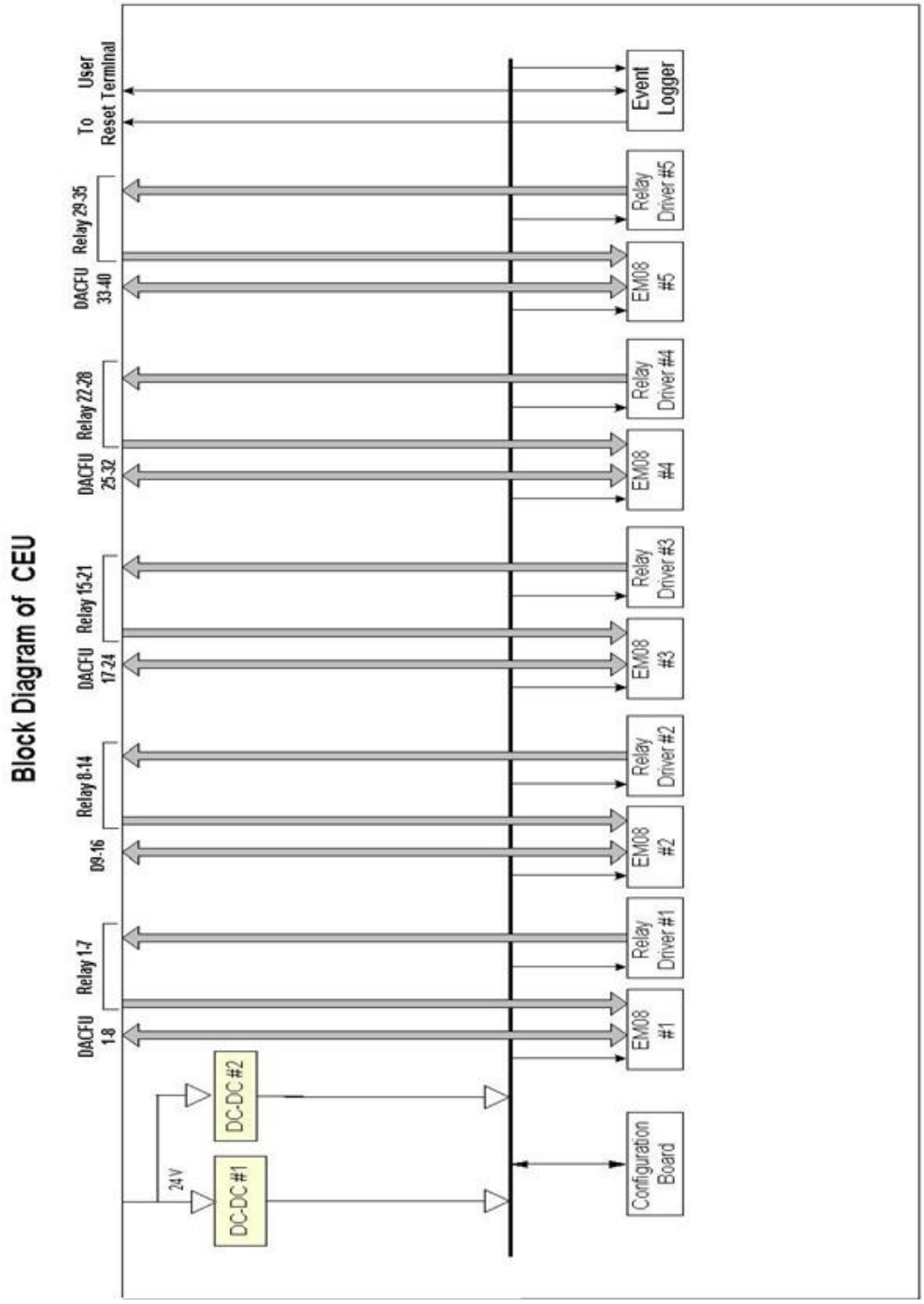


Figure 2 : Block Diagram of Evaluator

2.2. BLOCK DIAGRAM OF EM08 CARD

Each EM08 can handle 8 Detection Points and the block diagram is given below

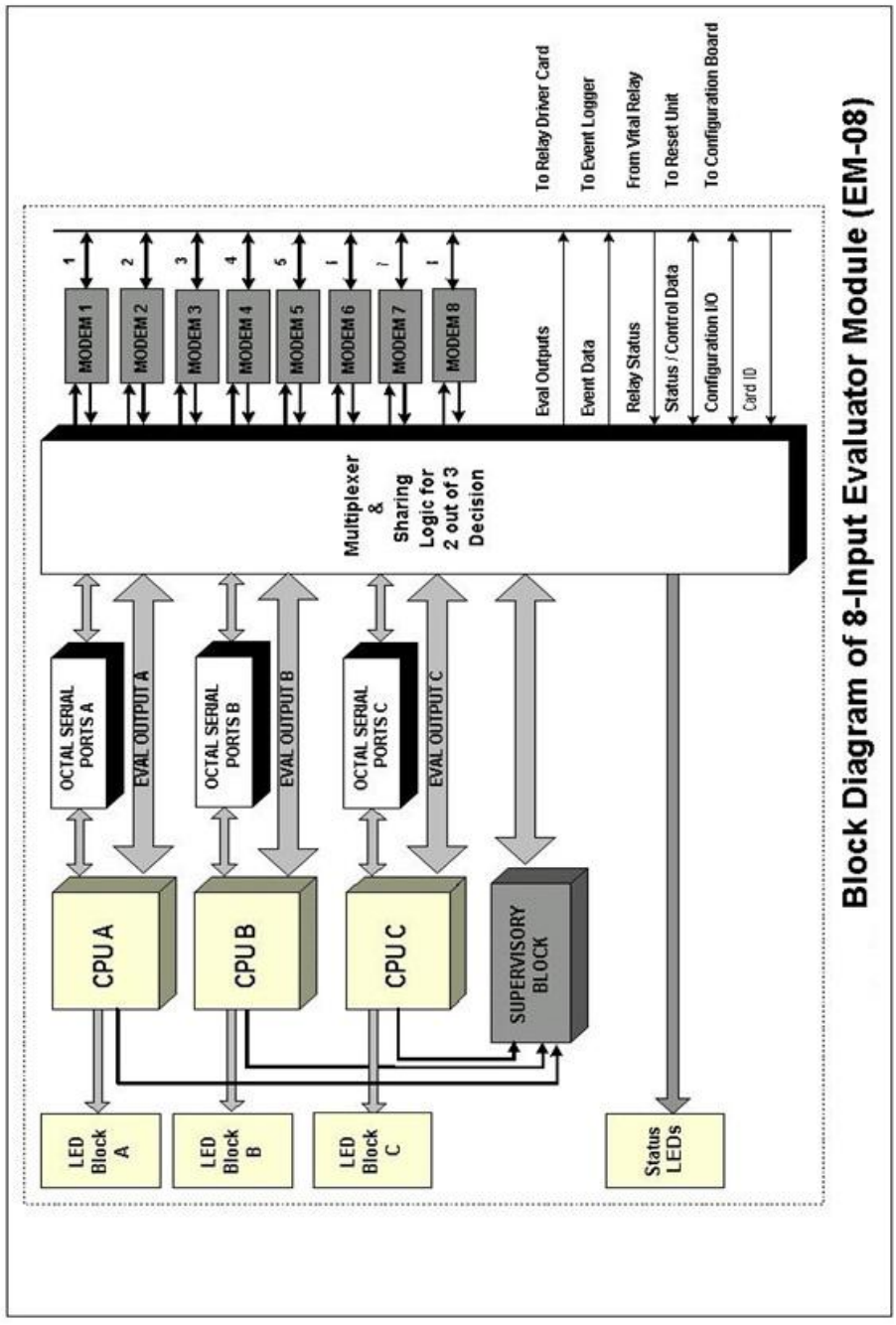


Figure 3 : Block Diagram of EM08 card

2.3. PRODUCT OVERVIEW

2.3.1. DIFFERENT MODELS OF MSDAC

The MSDAC DACF-730/40DP can be customised and are available in following different models.

- MSDAC-730/8DP
- MSDAC-730/16DP
- MSDAC-730/24 DP
- MSDAC-730/40 DP
- MSDAC-730/8DP

2.3.1.1. MSDAC-730/8DP

This system is capable of interacting with 8 detection points and can generates max of 8 track sections output.

The front side of 8DP central evaluator consists of following modules

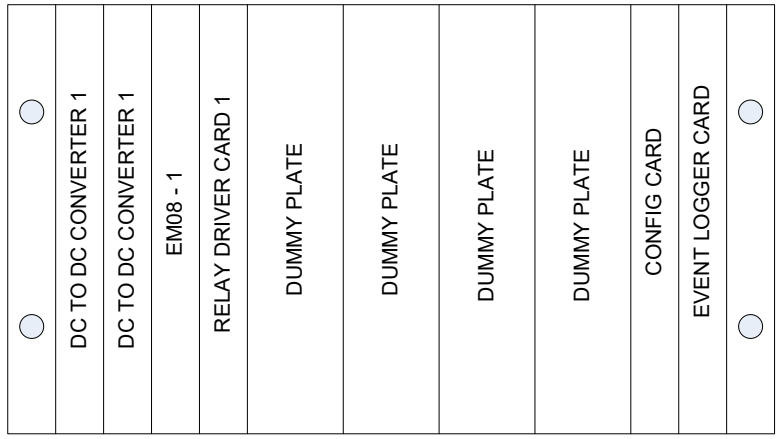


Figure 4: MSDAC-730/8DP

2.3.1.2. MSDAC-730/16DP

This system is capable of interacting with 16 detection points and can generates max of 16 track sections output.

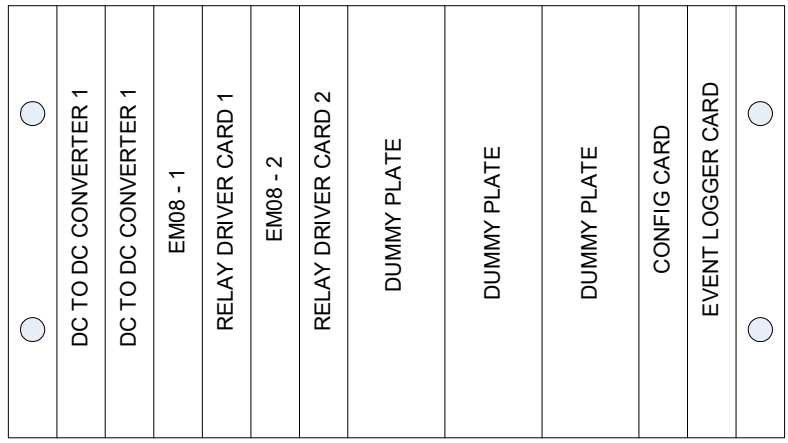


Figure 5: MSDAC-730/16DP

2.3.1.3. MSDAC-730/24DP

This system is capable of interacting with 24 detection points and can generates max of 24 track sections output.

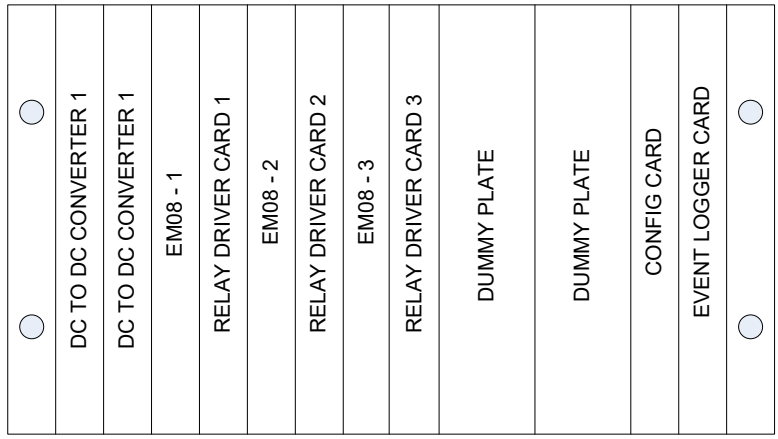


Figure 6: MSDAC-730/24DP

2.3.1.4. MSDAC-730/40 DP

This system is capable of interacting with 40 detection points and can generates max of 40 track sections output.

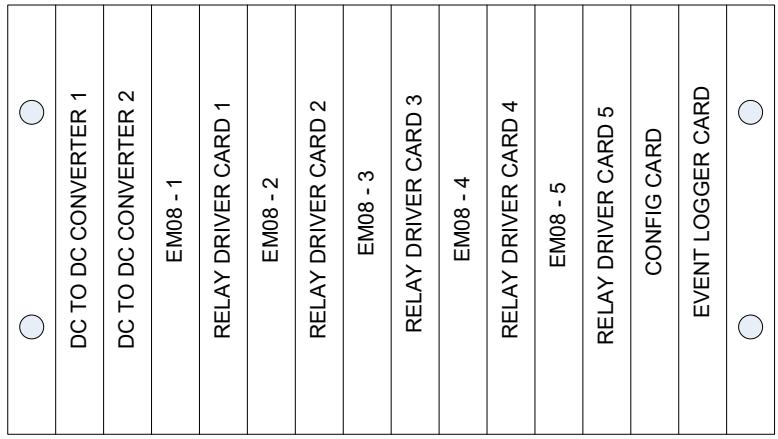


Figure 7: MSDAC-730/40DP

2.3.2. BACK PANEL

The back panel of central evaluator is same for all the models of MSDAC and is prewired to cater to 40DP as a standard factory arrangement.

2.4. COMPONENTS OF MSDAC

Each MSDAC consist of the following

SNO	DESCRIPTION	NO OF CARDS FOR UPTO				
		MSDAC-730/8DP	MSDAC-730/24DP		MSDAC-730/40DP	
		8 DP	16 DP	24 DP	32 DP	40 DP
1	**CENTRAL EVALUATOR RACK**	19" 20U/ 26U/36U				
2	**CENTRAL EVALUATOR**					
	DC-DC CONVERTER	2 NOS				
	EM08 CARDS	1 NO.	2 NOS.	3 NOS.	4 NOS.	5 NOS.
	RELAY DRIVER CARDS	1 NO.	2 NOS.	3 NOS.	4 NOS.	5 NOS.
	CONFIGURATION CARDS	1 NO.				
	EVENT LOGGER	1 NO.				
	MOTHERBOARD	1 NO. WIRED FOR 40 DPS				
3	**DIGITAL AXLE COUNTER FIELD UNIT**	8NOS.	16NOS	24NOS.	32NOS.	40NOS.
	SCC CARD 21 KHZ					
	SCC CARD 23 KHZ					
	DUAL MLB CARD					
	MODEM CARD					
	HIGH VOLTAGE DC TO DC CONVERTER CARD					
4	**AXLE DETECTORS**					
	TX HOUSING CONSISTING OF TX 21 & TX 23	8	16	24	32	40
	RX HOUSING CONSISTING OF RX 21 & RX23	8	16	24	32	40
5	**POWER & DATA COUPLING UNIT**	16	32	48	64	80
6	**HIGH VOLTAGE DC TO DC CONVERTER**	1	2	3	4	5
7	**TOOLKIT FOR FIELD UNIT**	1				
8	**ADDITIONAL REQUIREMENTS(Will be supplied on request)**					
	a)CONFIGURATION TERMINAL WITH SOFTWARE	1 NO.				
	b)PORATBLE DATA ANALYSER	1 NO.				
	c)MONITORING UNIT	1 NO.				
9	**POWER SUPPLY**					
	BATTERY BANK	MIN 120 AH OR AS PER SITE REQUIREMENT				
	BATTERY CHARGER	24V, 30A(Axle Counter Type Only)		24V,50A(Axle Counter Type Only)		

2.5. POWER CONSUMPTION

Power Consumption = < 12W at 24V

2.6. APPLICATIONS

MSDAC can be used in following applications

1. Monitoring of yard Layout
2. Monitoring of Platform Lines
3. Monitoring of terminal Lines / sidings
4. Monitoring of point zones – 3D/ 4D & Ladder
5. Monitoring of continous sections in single line
6. Monitoring of sections of Auto Block Signalling.

CHAPTER 3

3. INSTALLATION OF MSDAC

3.1. GUIDELINES FOR INSTALLATION

For installing the field unit of MSDAC, it is important to follow the following guidelines

3.1.1. CONFIGURING FIELD UNIT AS POSITIVE OR NEGATIVE

The contribution of each field unit is to be determined on the basis of train Direction and this referebnce has to be kept same for all the field unit. The mismatch will occur if for certain field unit reference train direction is changed at the time of configuration.

The sample contribution is explained below in the figure as well.

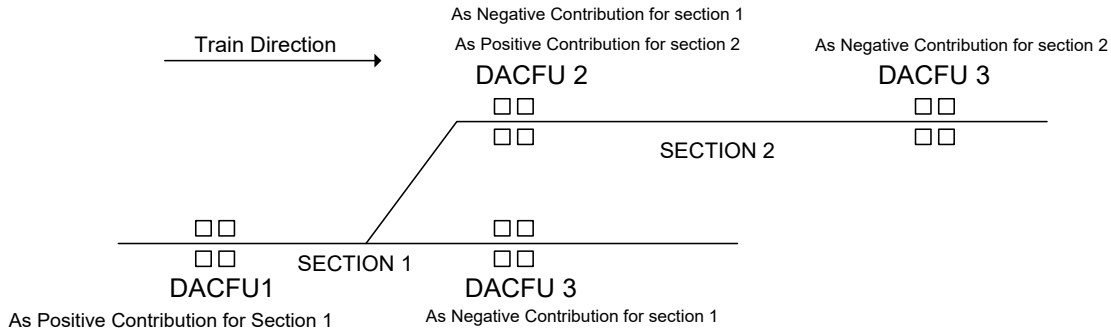


Figure 9: Example of Defining DP contribution

The contribution of each field unit is different for every section as shown.
The steps involved in configuration has been defined in detail in Chapter 8

3.1.2. SELECTION OF POINT FOR MOUNTING DETECTION POINT

a) Kindly ensure to take all necessary precautions and consideration for overlap, shunting limits before installing field unit.
b) Kidly ensure the fixing of axle detectors in clear spacing between the two sleepers.
c) Kindly ensure the axle detectors separation between two field units should be greater than 2 m.
d) Kindly ensure that the rail is not badly worn out within limits recommended by RDSO causing wheel flanges to graze over the fittings.
e) Kindly ensure of using the correct rail type for fixing the axle detectors. i.e 52Kg & 60 Kg.
f) Kindly ensure not to install the axle detectors on any embossing or near to rail joint i.e. fishplated or welded or insulation joint.

3.1.3. FIXING OF AXLE DETECTORS

3.1.4. MARKING & DRILLING HOLES ON WEB OF RAIL

- The marking jig is to be fixed from top of the rail and tightened to the rail with clamp.
- The marking for 3 holes with punch is to be made on the Web of rail using marking jig **.**
- The marking for 3 holes is given at a distance of 0 - 170 - 340mm.
- For 90 R or 90Lb mark is 86mm from Top whereas in 52 Kg & 60Kg is 88mm from top of Rail.
- The drilling is to be carried out on the web of rail at marked places by using drill machine/ ratchet drill method. 3 Nos. of holes of 14 mm dia are made on the web as per the markings.
- The burr is to be removed from the holes after drilling is over.

IMPORTANT: The marking and drilling of holes on the web to the dimensions given are very important for proper working of the system.

3.1.5. FIXING OF COILS (TRANSMITTER AND RECEIVER COIL)

The Axle detectors are to be fixed on web of the rail at the drilled holes by means of M12 bolts & nuts with spring washers and check nuts. ***(NOTE: the torque wrench, specified in the checklist, should be used for tightening of nuts and bolts.)***

i. M12 x 100mm - 3 Nos. bolts & nuts are used for fixing the axle detectors. 2nd nut is with Nylon washer and is to be used on each bolt.

ii. Transmitter coil assembly (21 KHz & 23 KHz) should be fixed on the outer side of rail. The transmitter assembly should sit properly on the web of rail.

iii. Receiver coil assembly (21 KHz & 23 KHz) should be fixed on the inner side of rail. The receiver assembly should be placed properly on the web of rail.

iv. It should be ensured that transmitter coil assembly and receiver coil assembly are facing opposite to each other (21 KHz TX to 21 KHz Rx and 23 KHz TX to 23 KHz Rx) on either side of rail with centre line of coils matching each other.

v. The TX coil cables 21 KHz & 23 KHz are taken together in one HDPE pipe to the location Box. Similarly both 21 KHz & 23 KHz Rx coils are taken together but separately from TX coil cables to the location box.

vi. The 1st set of Transmitter and Receiver Coils is made of 21 KHz signal and 2nd set is made of 23 KHz signal at each Location.

Very Important

vii. Both at the Entry & Exit of the section, the axle detectors should be fixed on same rail i.e. either on left side or on right side rail of the track. This should not be installed with 1st set on left rail and 2nd set on right rail of the track at Entry & Exit of the section. **Note**: If it is installed on alternate rails of the track, the counting will not match and the system will not function normally for train movement.

viii. Power supply to DP shall be switched OFF before removing Tx/Rx coil from the rail web.

ix. No metal parts / metal sheets / metal foils shall be placed near Tx/Rx coils.

FIXING OF RAIL DEFLECTOR

i. To protect axle detectors against the damage from hanging parts of train, rail deflector plates (protectors) should be mounted on both sides of the axle detectors. These should be installed in the sleeper space (approx 30 cm to 40 cm next to the axle detectors). The deflector clamps are first fixed to bottom of rail. These deflector plates are fitted to deflector clamp with bolts and nuts on each side.
ii. While fixing deflector plates, it should be ensured that the deflector plates are positioned in front of transmitter and receiver coil.

3.1.6. INSTALLATION OF ELECTRONIC COUNTING UNIT

3.1.6.1. SETTING UP OF LOCATION BOX

- The location Box should be installed as close as possible to the detection Point so that length of axle detector cable doesnot exceed 10 meters.
- One shelf should be provided in the location Box for placing electronic counting unit.
- One 35mm size DIN rail should be provided to install the feedthrough connectors for making connections. These connectors may be purchased separately from OEM or may be procured by CEL as additional items. The incoming and outgoing cables from the axle detectors, electronic counting unit and cable going to central evaluator is required to be terminated on these terminals. These terminals should have the facility for measuring various parameters.
- For setting up one field unit, half size location box should be provided.

3.1.6.2. CONFIGURATION OF ELECTRONIC COUNTING UNIT

Each field unit of the MSDAC needs to be configured according to the site installation.

These address can be set by use of DIP switches provided on the motherboard of the electronic counting unit.

These DIP switches can be accessed by removing the back panel. The switches can be slide to

move to Right (ON or 0) or Left (OFF or 1) as required. It consists of following information
Bit 0 – NC
Bit 1 , Bit 2, Bit 3 – Dp Address from 0 to 8

Bit 4, Bit 5, Bit 6 – EM08 card No from 1 to 5
Bit 7 – Network mode -

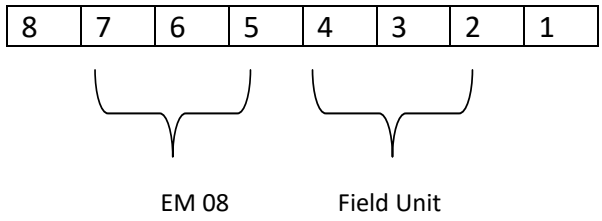
- The possible address setting are given below

Field Unit	Address set	Field Unit	Address set	Field Unit	Address set
Field Unit 1	10010000	Field Unit 15	10101100	Field Unit 29	11001000
Field Unit 2	10010010	Field Unit 16	10101110	Field Unit 30	11001010
Field Unit 3	10010100	Field Unit 17	10110000	Field Unit 31	11001100
Field Unit 4	10010110	Field Unit 18	10110010	Field Unit 32	11001110
Field Unit 5	10011000	Field Unit 19	10110100	Field Unit33	11010000
Field Unit 6	10011010	Field Unit 20	10110110	Field Unit 34	11010010
Field Unit 7	10011100	Field Unit 21	10111000	Field Unit 35	11010100
Field Unit 8	10011110	Field Unit 22	10111010	Field Unit 36	11010110
Field Unit 9	10100000	Field Unit 23	10111100	Field Unit 37	11011000
Field Unit 10	10100010	Field Unit 24	10111110	Field Unit 38	11011010
Field Unit 11	10100100	Field Unit 25	11000000	Field Unit 39	11011100
Field Unit 12	10100110	Field Unit 26	11000010	Field Unit 40	11011110
Field Unit 13	10101000	Field Unit 27	11000100		
Field Unit 14	10101010	Field Unit 28	11000110		

For Crossover DP i.e. DP participating in EM08 card 1 & EM08 card, the address setting is to be done by using both SW1 & SW2 on the back panel.

INSTALLATION OF FIELD UNIT

The field unit is installed on the wooden/Hylam/NFTC plank inside the location Box. This is firmly fixed using clamps, nuts & bol



1 - OFF
0 - ON

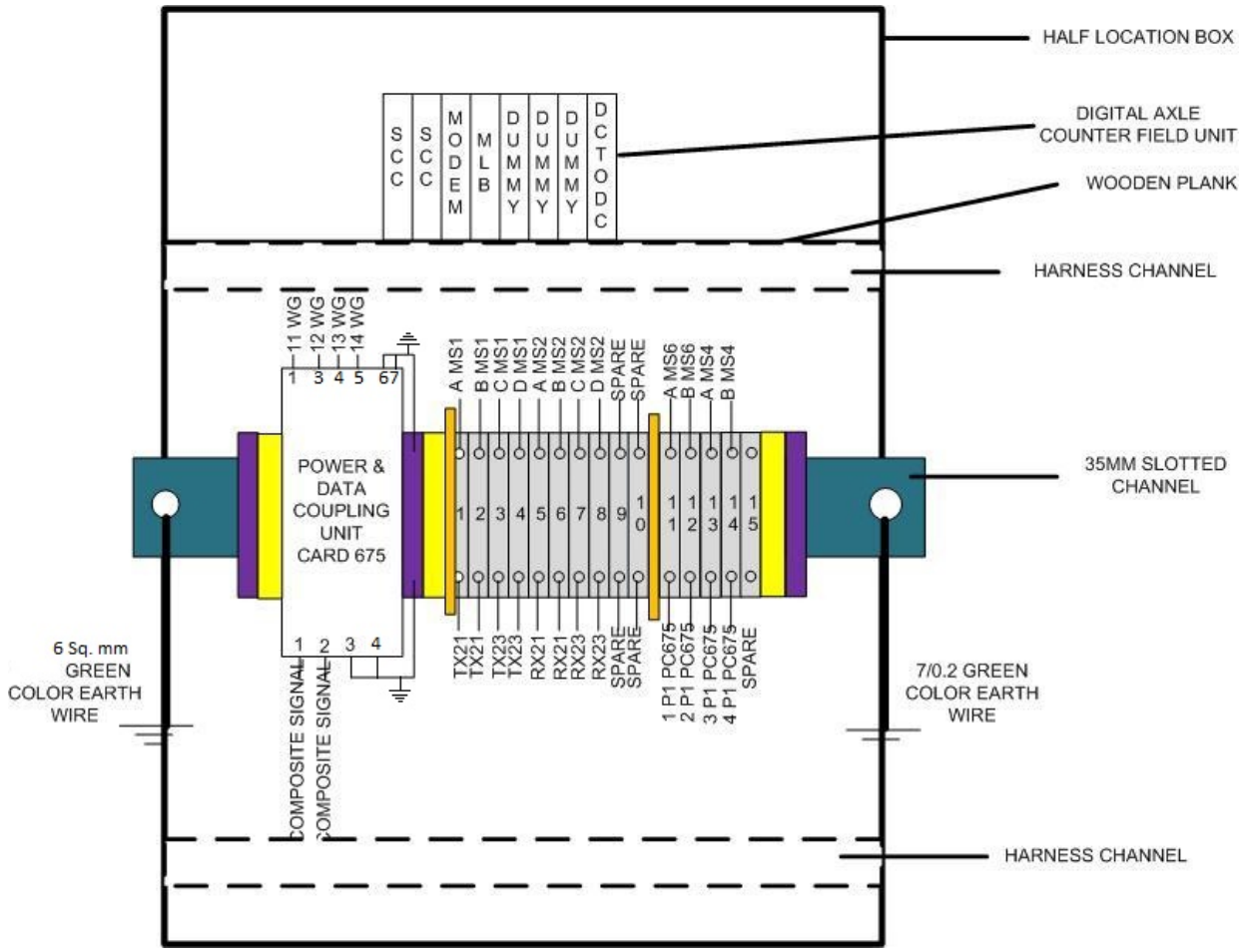


Figure 11 : Placement of Field unit in Location Box

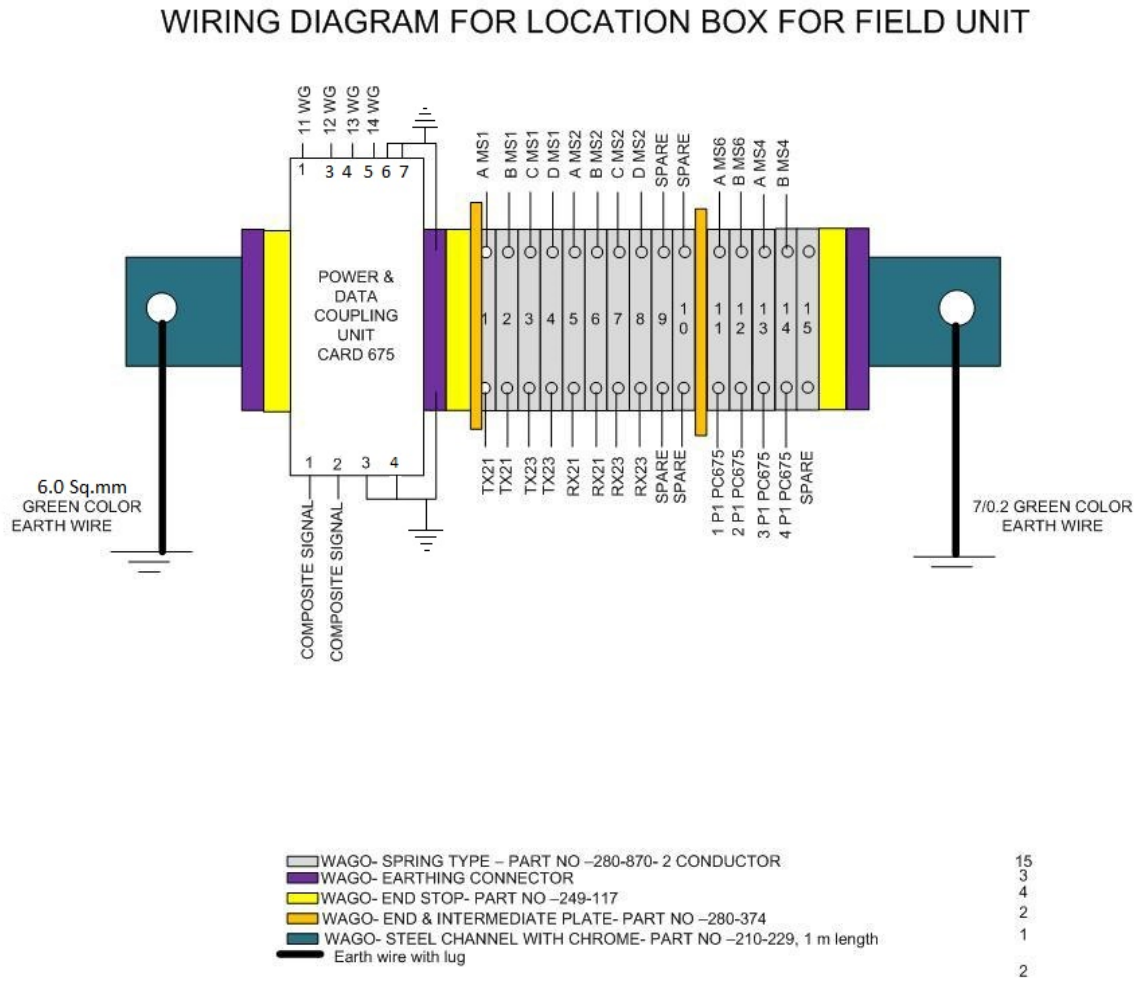


Figure 12:- Wiring Diagram of Field unit

3.2. POWER SUPPLY ARRANEMENT

Three different kind of DC to DC converter are available for working of MSDAC

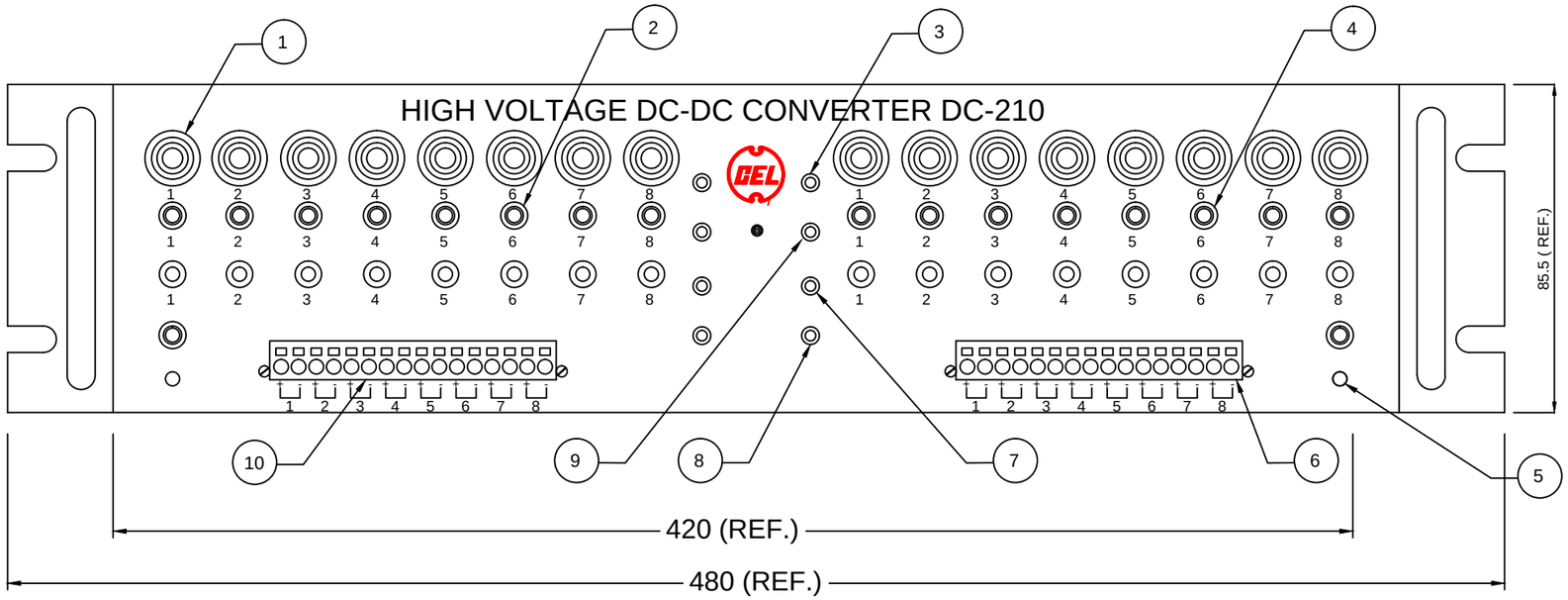
DC TO DC CONVERTER 24V FOR FIELD UNIT. This DC to DC Converter will be used in Field unit and is designed to work at input range of 17V to 28V. The power consumption of one field unit is around 12W. This is to be used in the areas where power cable is already available.

DC TO DC CONVERTER 96V DC FOR FIELD UNIT. This DC to DC converter is used when power & data are required to be send on Quad pair. The DC to DC converter will be used in field unit and is designed to work at input range of 40V to 96V. The power consumption of one Field unit is around 9W.

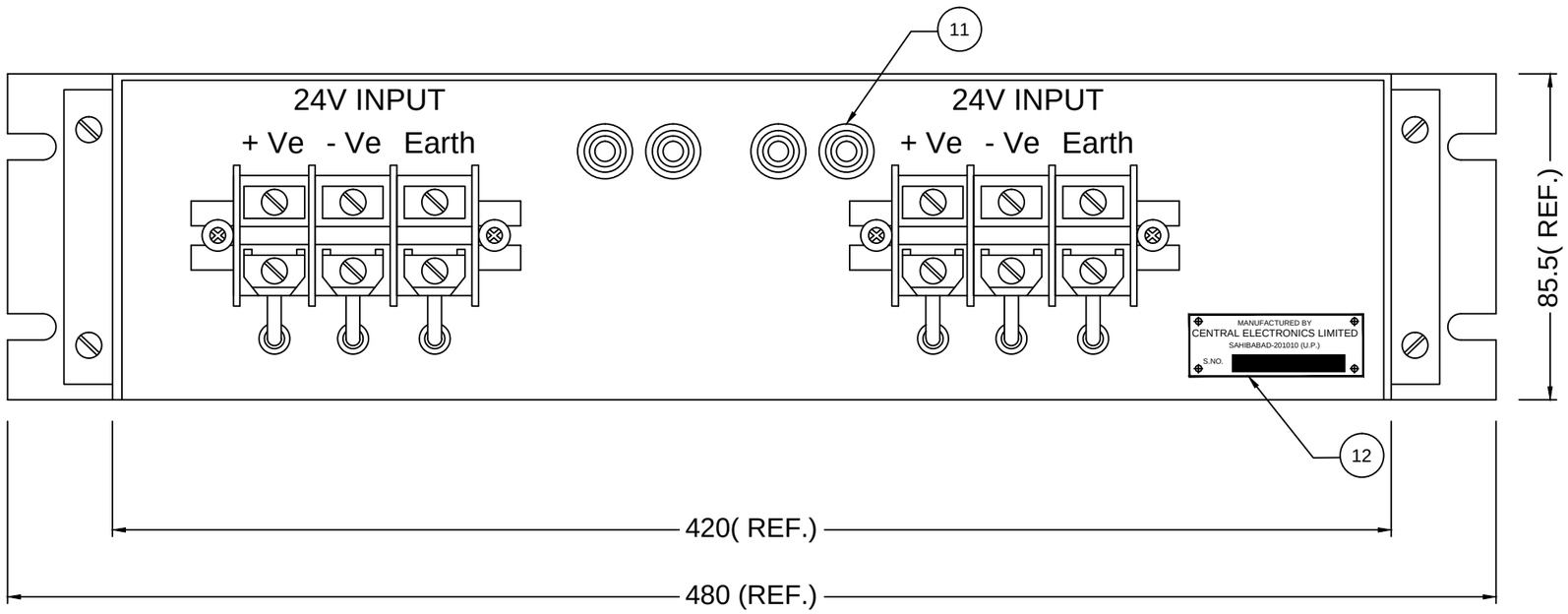
CENTRALISED DC TO DC CONVERTER – 8 CHANNEL : The card is available in 19" mechanical housing rack mountable type. The unit can be installed on the CT Rack and is capable of giving 16 channels of 96V output. The power consumption of one 16 channel DC to DC converter is around .

High voltage DC to DC converter is to be used with Centralised DC to DC converter only.

FRONT



BACK



S.NO.	DRG.NO.	DESCRIPTION	NO. OFF
12	—	S.N.O. PLATE	1
11	—	SPARE FUSE	4
10	—	96V OUT PUT TO POWER AND DATA COUPLING CARD	1
9	—	INPUT OVER VOLTAGE LED	2
8	—	OUTPUT OVER VOLTAGE LED	2
7	—	INPUT UNDER VOLTAGE LED	2
6	—	SPARE 96V OUTPUT	1
5	—	GND	2
4	—	STATUS LED	8
3	—	INPUT REVERSE LED	2
2	—	TEST POINT	8
1	—	FUSE	16

GEN TOL.
FULL FIG = ±0.5
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A2

DESIGNED	SIG.	DT.
DRAWN	DESHRAJ	21.10.13
CHECKED		
APPROVED		

MATL | DIM MM | NO.OFF 01
FINISH - | SCALE NTS

PROJECT: MSDAC

TITLE: CENTRALISED DC DC CONVERTER ASSEMBLY (DC-210)

DRG.NO. A008904 24 | REV.N 00 | SHEET NO. 1

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CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

3.3. IDENTIFYING THE CABLE REQUIREMENT

The following type of cables are required for installing field unit

Quad cable – ½ Quad of proper matched pair from PET QUAD cable is required to connect modem & power of one Field unit.

- Kindly ensure the use of correct pair of Quad cable for connections.
- Kindly ensure to check all the cable parameters as per pre commissioning checklist before switching ON of the system.

Twisted & Shielded Cable – 4 wire per one evaluator module is required for display of track section status on Reset Panel . Therefore for displaying information of 40 track sections minimum 20 wires depending upon the available EM08 card will be required.

It is highly recommended to use proper twisted & shielded cable from Evaluator to SM's Reset panel. Kindly ensure to terminate screen of this cable at both ends .

Power cable (Optional) – 2 core 25sq. mm AL cable or 12 core signaling cable for giving 24V DC in case it is required to operate MSDAC on 24V.

3.4. INSTALLATION OF POWER DATA COUPLING UNIT

The PDCU is enclosed in DIN mounted enclosure. In order to install the unit it is recommended to remove the top cover sheet and then connect the PDCU as per connections given below.

SNO	DESIGNATOR	SIGNAL	DESCRIPTION
1	CONNECTOR P1 – PIN 1	+Ve	+96 V FROM DC TO DC CONVERTER(In Field Unit)
2	CONNECTOR P1 – PIN 2	+Ve	+96 V To DACFU(In Relay Room)
3	CONNECTOR P1 – PIN 3	-Ve	-96V(IN Field Unit & Relay Room)
4	CONNECTOR P1 – PIN 4	TX/RX 1	1
5	CONNECTOR P1 – PIN 5	TX / RX 2	Wire 2 from modem
6	CONNECTOR P1 – PIN 6	EARTH	EARTH
7	CONNECTOR P1 – PIN7	EARTH	EARTH
8	CONNECTOR P2– PIN 1	+ve	Composite Signal (96V & Modem)
9	CONNECTOR P2 – PIN 2	-ve	Composite Signal (96V & Modem)
10	CONNECTOR P2 – PIN 3	Earth	Earth
11	CONNECTOR P2 – PIN 4	Earth	Earth

Guidelines

- Ensure the earthing in PDCU on relevant terminal.
- Ensure the use of correct pair of Quad cable.
- Ensure the pair is correctly matched
- Ensure using 2 wire twisted shielded cable for indoor wiring for connections from Evaluator to CT Rack.
- Reinstall the top cover after making all the connections.
- Replace the PDCU unit if LED shows red or any component is found to be damaged.

3.5. BATTERY & BATTERY CHARGER

The 24V, 200AH low maintenance battery bank may be used for powering 40 field units of MSDAC. The batteries are to be procured as per latest RDSO specifications from vendors approved by RDSO.

Ensure the battery bank to be installed as per guidelines recommended by OEM of the batterys.

The charging of the battery bank has to be done as recommended by the OEM installation Manual.

The Axle Counter type (Low ripple) battery charger as per latest RDSO specification is to be procured and installed in the equipment room. The battery chargers are usually lept on teak wood shelf fixed on MS Angles

The 24V 50A battery charger has to be installed and connected to battery on Auto mode. The current consumption of each field unit is 12W @ 24 Volts.

Ensure the ripple content at the output of charger should not exceed more than 50mV.

Ensure the use of surge voltage protection devices at the input of the charger.

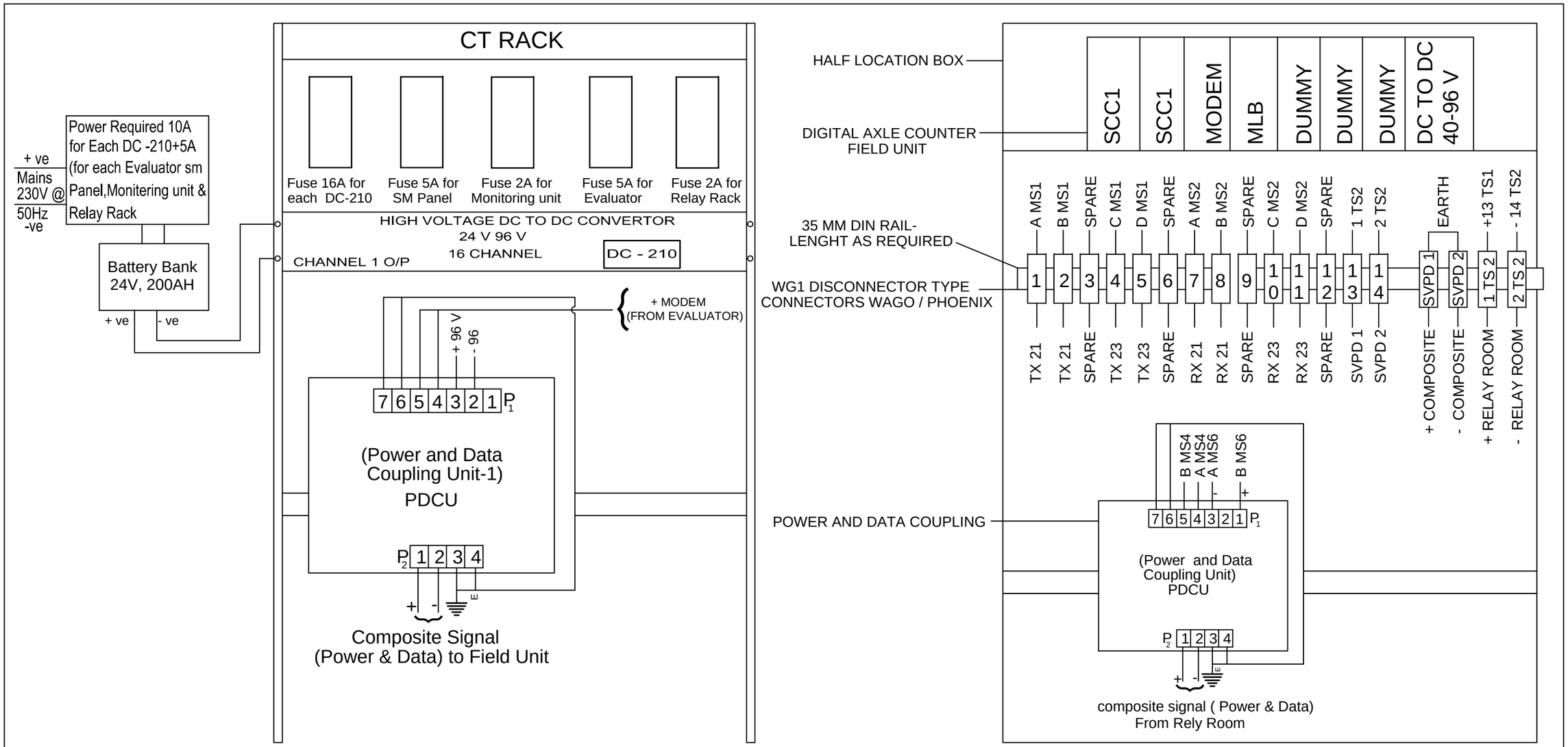
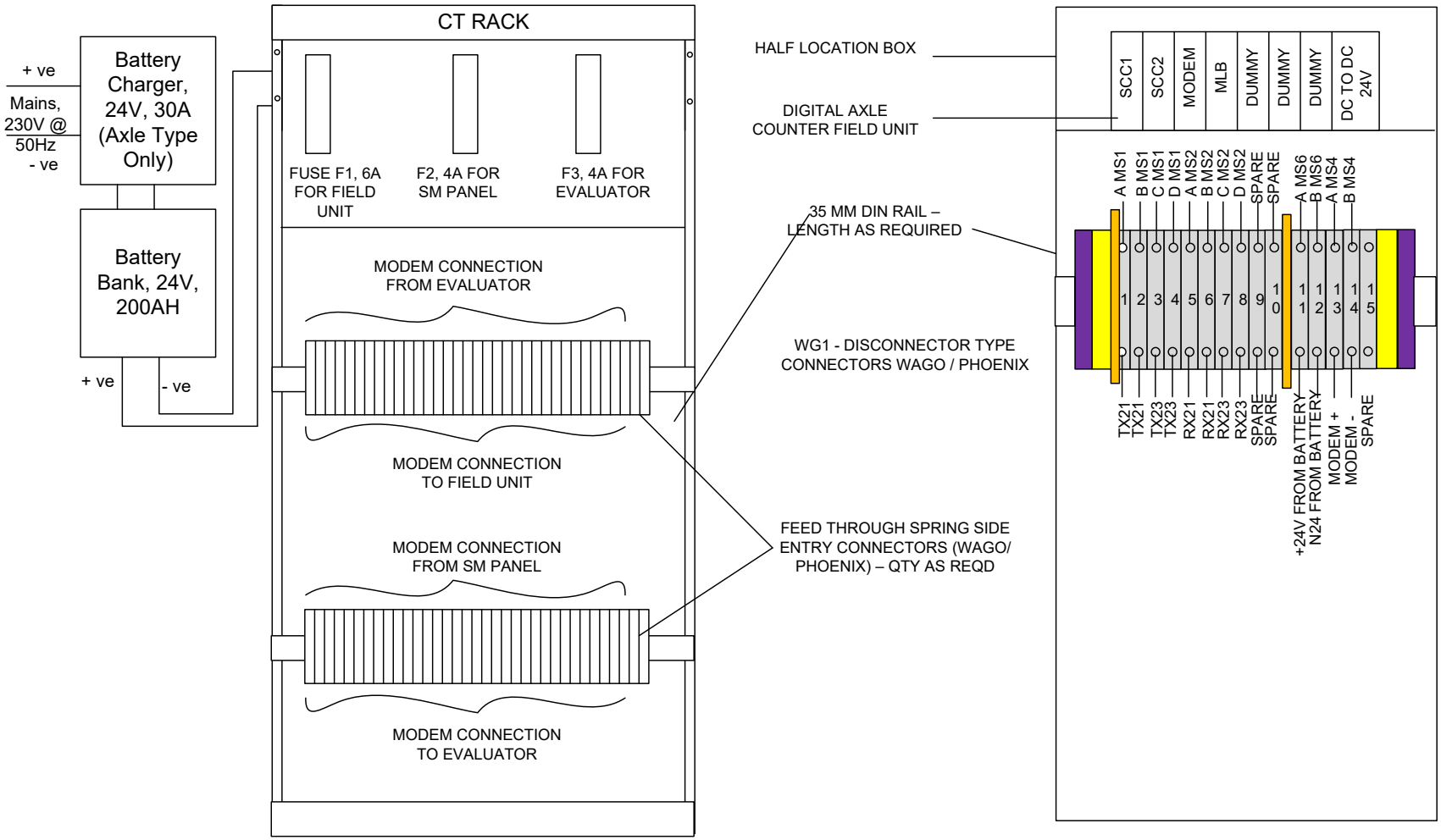


Fig. 14: POWER SCHEME WHEN USED FROM 24V FROM BATTERY & CENTRALIZED 16 CHANNEL CONVERTER



MSDAC POWER SCHEME WHERE POWER CABLE (24V) IS USED

Figure 15: Power Scheme when used with Power cable and 24V DC

CHAPTER 4

4. INSTALLATION OF CENTRAL EVALUATOR

MSDAC Model No MSDAC-730 is a 40 detection system designed on 2 out of 3 decision logic.

The system has been designed to handle 40 detection points through single central evaluator and can generate relay drive for upto 40 track sections.

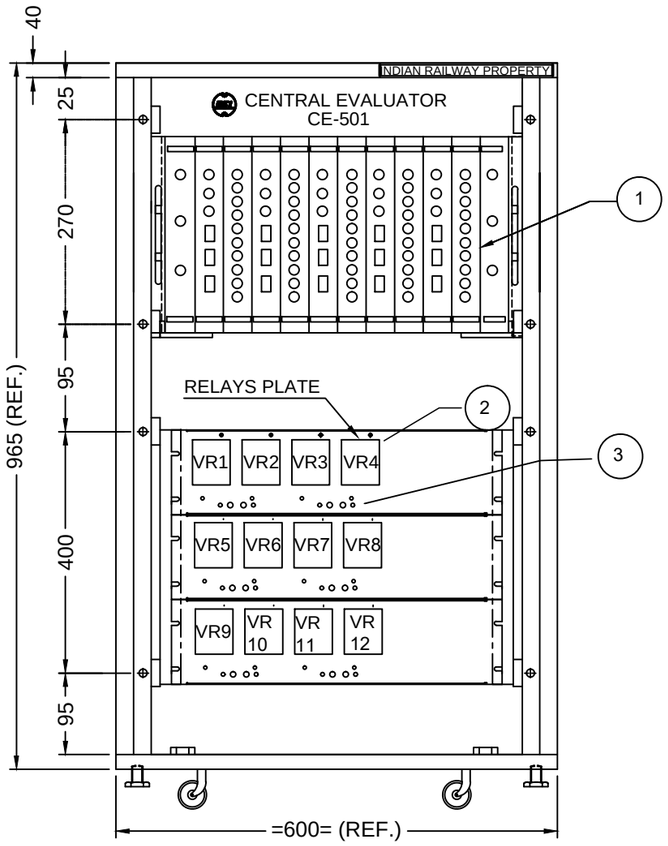
The central evaluator is housed in 19" inch rack that is pre wired for 40 DP and can be scaled down or up in multiples of 8 DP as per the requirement.

Ensure the following before the start of planning of MSDAC of a particular station.

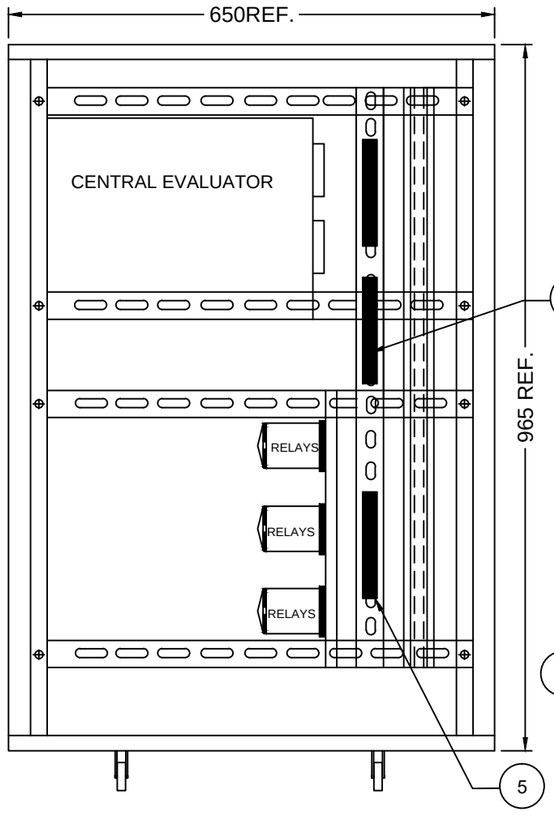
1) The identifications of different sections and placement of different Detection points and the placement of their location boxes based on the yard layout of station.
2) Identifying the number of Dual DP used in the configuration. Dual DP gives the user flexibility of sharing 2 EM08 or 2 Evaluators.
3) The configuration of MSDAC starts from the data preparation and different activities. The entire activities are given in separate chapter of Configuration Management.

4.1. INSTALLATION OF CENTRAL EVALUATOR RACK

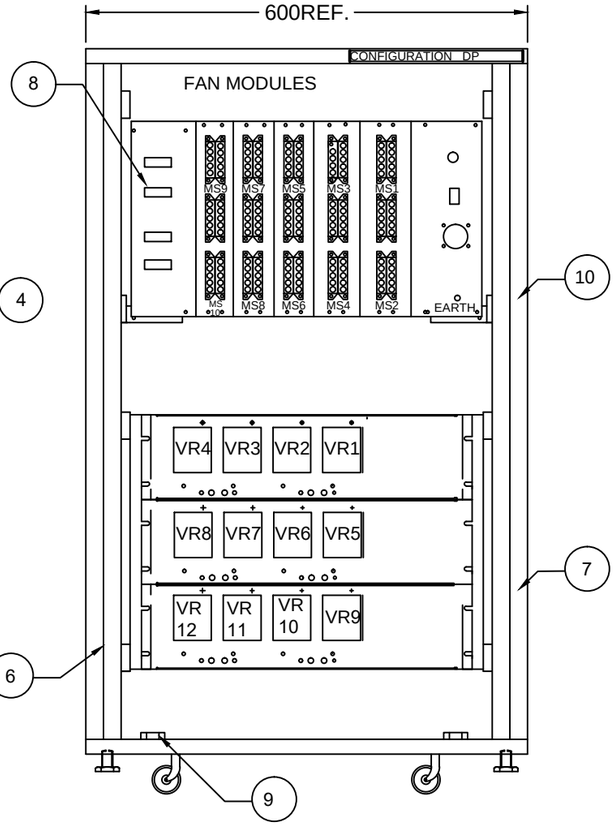
The MSDAC rack is the decision making unit that consists of Central Evaluator, Relays & Monitoring unit. The rack is 19" 36U height that can be grouted on a plane surface inside the relay room. The platform of around 4" may be built to fix the rack with option for having opening for cable entry from Top or Bottom. The wires from top side may be used for entry of cables used for wiring of modem connections by using ladder. The wires from bottom side may be used for entry of cables for wiring for relay proving and power supply.



FRONT



SIDE



REAR

S.NO.	DRG.NO.	DESCRIPTION	NO. OFF
			1
10	—	FILTER	1
9	—	EARTHING BLOCK	4
8	—	RS422 CARD TERMINATIONS TO SM'S PANEL AND MONITORING UNIT	1
7	—	SURGE MODULE	1
6	—	TS2(FREE RELAY CONTACT FOR RAILWAYS)	—
5	—	TS1(SUPPLY TERMINATION)	—
4	—	TS3 (FREE PICK UP CONTACT FOR DATA LOGGER)	—
3	—	VITAL RELAY STATUS LED	—
2	—	VITAL RELAY	
1	—	CENTRAL EVALUATOR (CE-501)	1

GEN TOL.
FULL FIG = Ñ0.5
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A2

	SIG.	DT.
DESIGNED		
DRAWN	DESHRAJ	20.06.13
CHECKED		
APPROVED		

MATL | DIM MM | NO.OFF 01
FINISH - | SCALE NTS

PROJECT: MSDAC

TITLE: RACK ASSEMBLY 11DP

DRG.NO. A008859 30 | REV.NO. 00 | SHEET NO. 2 OF 2

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SAHIBABAD - 201010 (U.P.)

The cable routing for modem wiring, SM panel wiring & relay wiring is given below

While using the power and data on same pair, the following are guidelines are to be followed:-

a. It is advisable to keep minimum of 12” between the DC voltage and Quad cable on the CT rack.
b. The Quad cable from field unit to the CT rack is to be entered from Top side of the rack.
c. The relay proving connections is to be taken from the connections provided at Wago Terminals.
d. The SM panel connections from the rack to the SM Panel is to done only by using Twisted cable or 2 pair of Quad cable.

Earthing plays a major role in correct functionality of any Digital system. Each subsystem of MSDAC is provided with the earthing terminal which is required to be terminated properly using Lugs.

The proper earthing procedure is given in chapter 8

4.2. CABLE REQUIREMENT

QUAD CABLE REQUIREMENT (0.9 Sq mm)

Evaluator to Field Unit (DP)	[At least 1/2 quad for each DP]
Evaluator to SM Panel	[1 quad for each EM08]
Evaluator to Monitoring Unit	[1/2 quad for each EM08]

SIGNALING CABLE REQUIRMENT (1.5 Sq mm)

S.M. Panel to each L.V. Box	[1 pair of signaling cable]
IPS to Monitoring Unit	[1 pair of signaling cable for 24V supply]
IPS to SM Pannel	[1 Pair for Supply]

TWISTED & SHIELDED CABLE(16C*0.2 Sq. mm)

From DC-210 to PDCU	[1 pair for each PDCU]

POWER CABLE REQUIRMENT (10 Sq mm Copper or 25 Sq mm Aluminum)

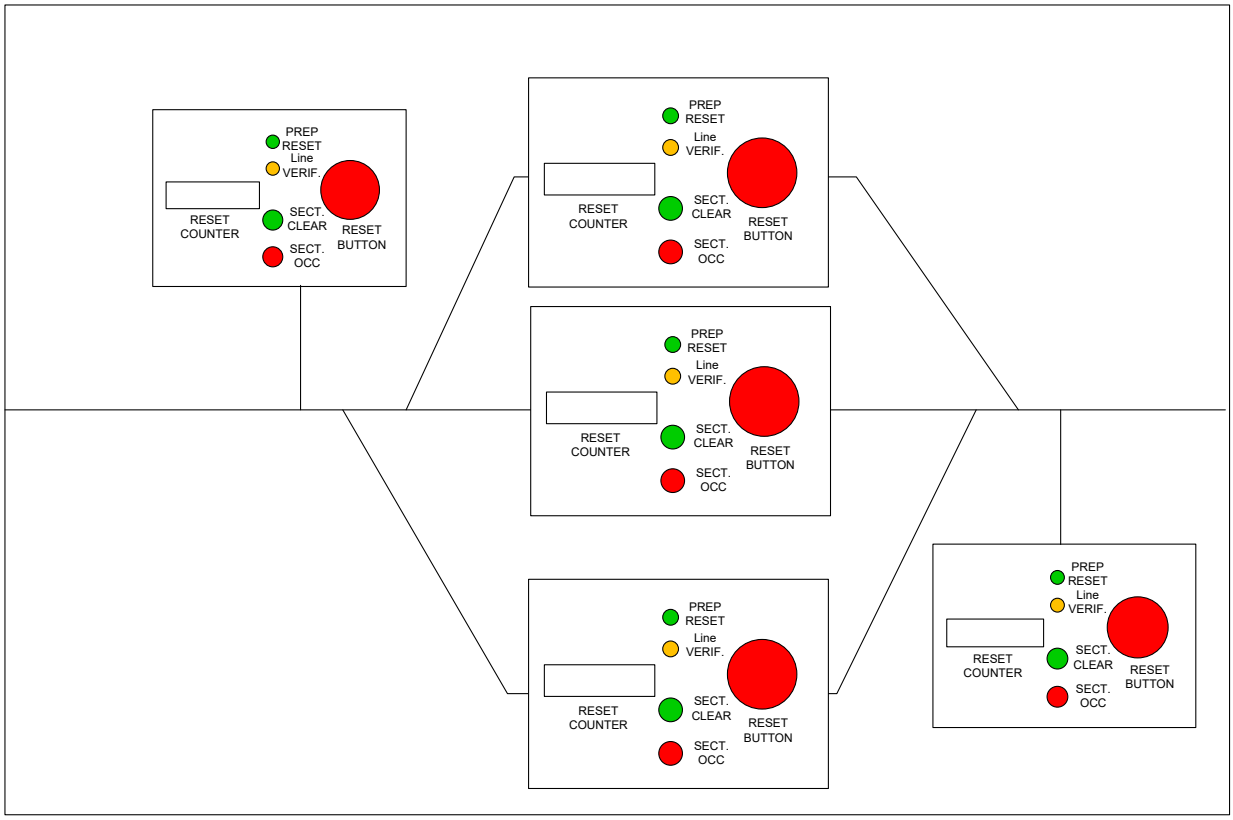
IPS to DC-210	[1 pair to each DC-210]

CHAPTER 5

5. INSTALLATION OF SM'S PANEL

SM's Reset Panel has been designed to give information to the operating staff and to normalize system by applying reset in case section goes to error state.

SM'S Panel will be designed having customized front end consisting of dominos based on different track sections. This will be designed for the different system based on their yard layout. The back end of the SM's panel will also be modified accordingly.



5.1. WORKING OF SM'S PANEL

The SM's Panel operates on 24V DC supplied from DC to DC converter card and of its own 8 channel reset card for controlling the resetting and display of information functionality and thus Maximum of 5 such cards interface with EM08 card of Central Evaluator.

The software of SM's panel verifies the SM's Key and generates the packet in the form of reset command that is sent on 4 wire interface with SM's Panel and Central Evaluator. The packet protocol on similar lines as of EM08 has been used for generating the reset Packet.

The back end of the Sm's panel consist of housing having the following

- 8-channel Reset card – 5 Nos
- 24V DC TO DC converter card - 1 No
- Motherboard - 1 No

The motherboard of the SM's panel has the provision of WAGO connectors for interconnection with the front display panel. The voltage extended to Line Verification box for physically verifying the presence of train is carried out by pressing LV is connected directly from CN1 to CN5

The 8-channel Reset card is the heart of the reset panel & has been designed to process the reset command, process the LV information (if required) generates the display for sections, generates the pulse for counter etc. This card control the display information of 8 channels only. For other models, these card may be added in the space provided in the housing.

The DC to DC converter generates the required voltages for normal working of the cards.

The SM's panel is provided with sealing arrangement for protection against the unauthorized access.

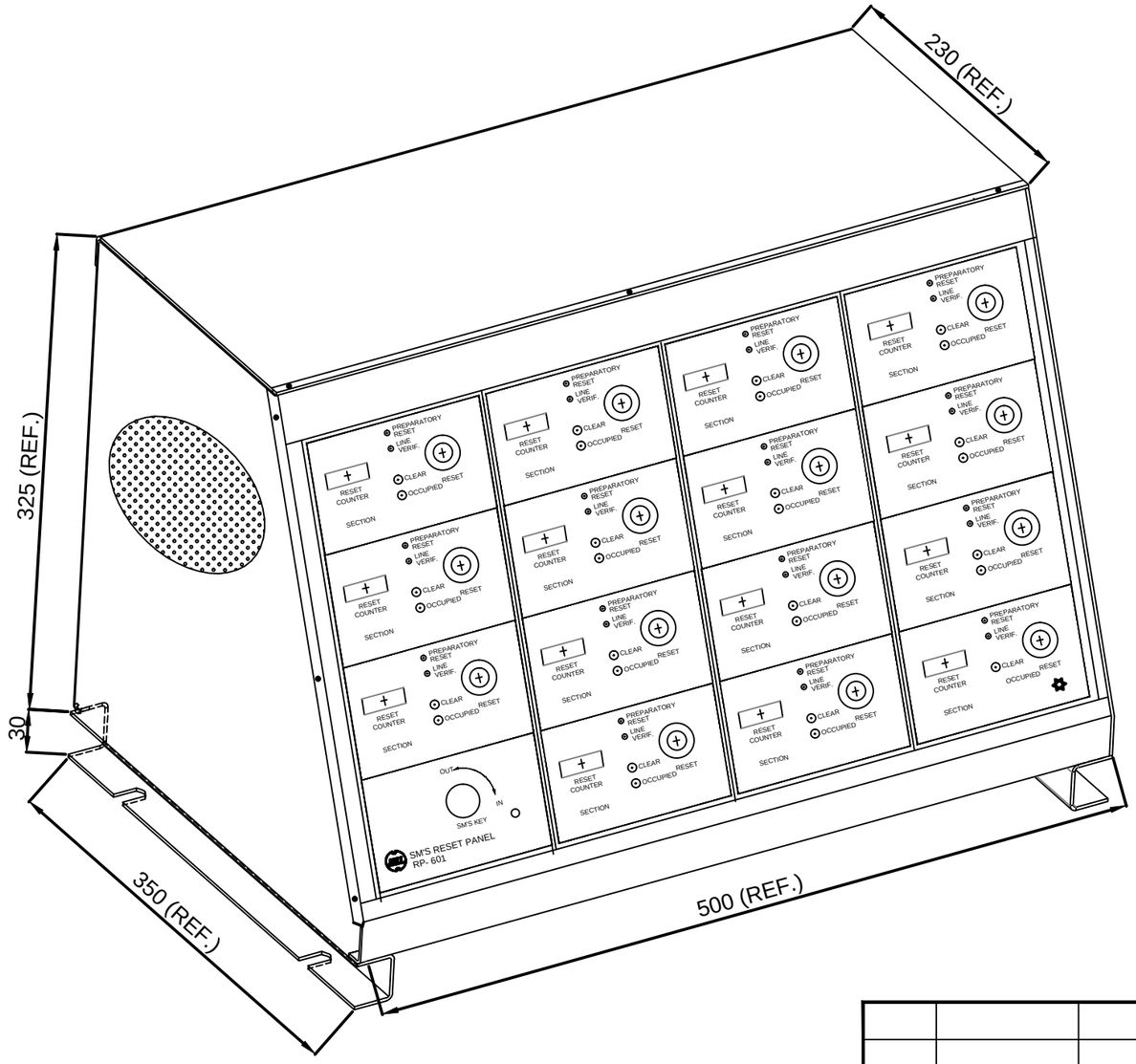
5.2. DETAILS OF SM'S PANEL FRONT PANEL

The SM Panel consist of front panel consisting of several small modules like Domino, Back panel consisting of required electronics. The front and back view of SM panel is given below:-

DIMENSIONS

The dimension for a standard 40 Track Section SM Panel will have the following dimension:-

Heigth x Width x Depth = 480 X 710 X 360 (in MM)



NOTE -

✡ MODULES AS PER REQUIRMENT

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.

GEN TOL.
FULL FIG = Ñ0.5
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	DESHRAJ	11/10/13
CHECKED		
APPROVED		

MATL | DIM MM | NO.OFF 1
FINISH | SCALE NTS

PROJECT: MULTI SECTION DIGITAL AXLE COUNTER

TITLE: SM'S RESET PANEL RP- 601 (ISOMETRIC VIEW)

DRG.NO. A008902 | REV.NO. 0 | SHEET NO. 1

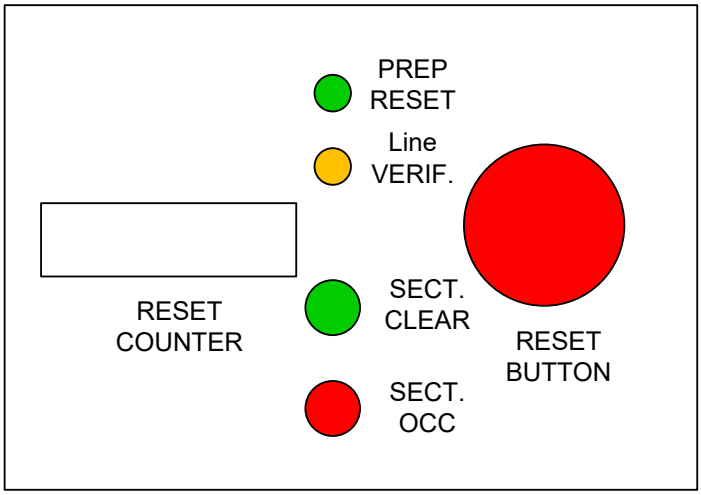
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SAHIBABAD - 201010 (U.P.)

SYSTEM4/DESHRAJ/A008902A3

Each Domino gives the the following indications for one section.

1. RESET BUTTON
2. RESET COUNTER
3. PREPARATORY RESET INDICATION - GREEN
4. LINE VERIFICATION - YELLOW
5. SECTION CLEAR INDICATION - GREEN
6. SECTION OCCUPIED – RED
7. SM'S KEY



5.3. CONNECTIONS TO SM'S PANEL

Each SM's Panel will be customized to the MSDAC system as per yard layout. The SM's Panel front panel are connected by use of Wago Connectors to the motherboard of the SM's Panel.

The data to the SM's Panel will be displayed on 4 wire RS422 interface with Central Evaluator. Therefore for each Evaluator modeule card, 4 Wire connections are required. The maximum distance from SM's panel to Central Evaluator is approx 500 m.

The connections to these will be made by use of WAGO connectors supplied along with the SM's panel. These 4 pin connectors are to be connected on the motherboard directly using twisted & shielded pairs. CEL recommends the use of Quad cable with properly matched pair for such connection from SM's Panel to Central Evaluator.

The cable screen at both the ends is to be properly earth to avoid any corruption of data.

5.4. RESETTING OPERATION FOR TRACK SECTION WITH HARD RESETTING

5.4.1. MSDAC WHEN USED FOR TRACK CIRCUITING AT STATION YARD

The station master inserts the SM'S KEY and turn to extends the voltage for Line verification. After physical verification, LV indication glows on the Domino PCB for the section under resetting. In this state, when reset Button of that section is pressed, preparatory reset indication flashes to confirm that reset packet has been generated and is sent to central evaluator. The central evaluator process the reset packet and resets the track section and sends the reset command to DP if is required. If track section is configured for hard resetting, vital relay picks up. The flashing Preparatory indication becomes steady and reset counter is increamented by one.

5.4.2. RESETTING OPERATION FOR TRACK SECTION WITH PREPARATORY RESET

1. i.Insert SM's key, turn right
   ii. Press Reset button for 2 seconds
   iii. Release Reset Button
   iii. Turn left, remove SM's key and keep in safe custody.
2. With the above operation, on successful reset operation the reset packet is generated by SM panel and is received by Evaluator that resets the required track section or field unit and bring the track section to preparatory reset state. The preparatory reset state glows on the SM panel
3. The counter reading also increments by 1 count. The counter reading should be recorded.
4. One pilot train is to be passed in the section to make the system normal. Thereafter, the vital relay picks up.

5.5. INSTALLATION OF SM'S PANEL

i. The SM'S PANEL is to be installed on SM's /Cabin man table.

ii. The SM'S PANEL is to be firmly fixed to the table by means of bolt & nut.

iii. The SM'S PANEL is to be wired as WIRING DIAGRAM

iv. The SM'S PANEL body is to be connected to the earth in SM's room. The earth available for other equipment can be connected.

v. The SM'S PANEL back panel is to be sealed after wiring has been completed. The seal can be broken for maintenance etc. as per SWR rules.

vi. B24 used for MSDAC is to be connected / extended to SM'S PANEL for power ON and other indications.

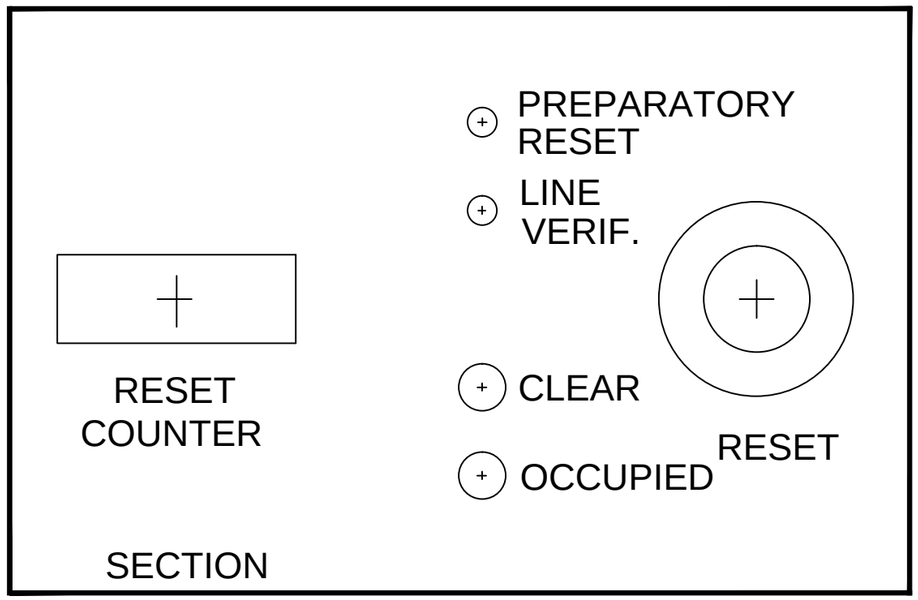
5.6. EARTHING OF SM'S PANEL

The earthing of the SM'S PANEL has to be done by using earth wire of 6.0 Sq.mm by using lugs and to be terminated at the separate earth less than 1 ohm.

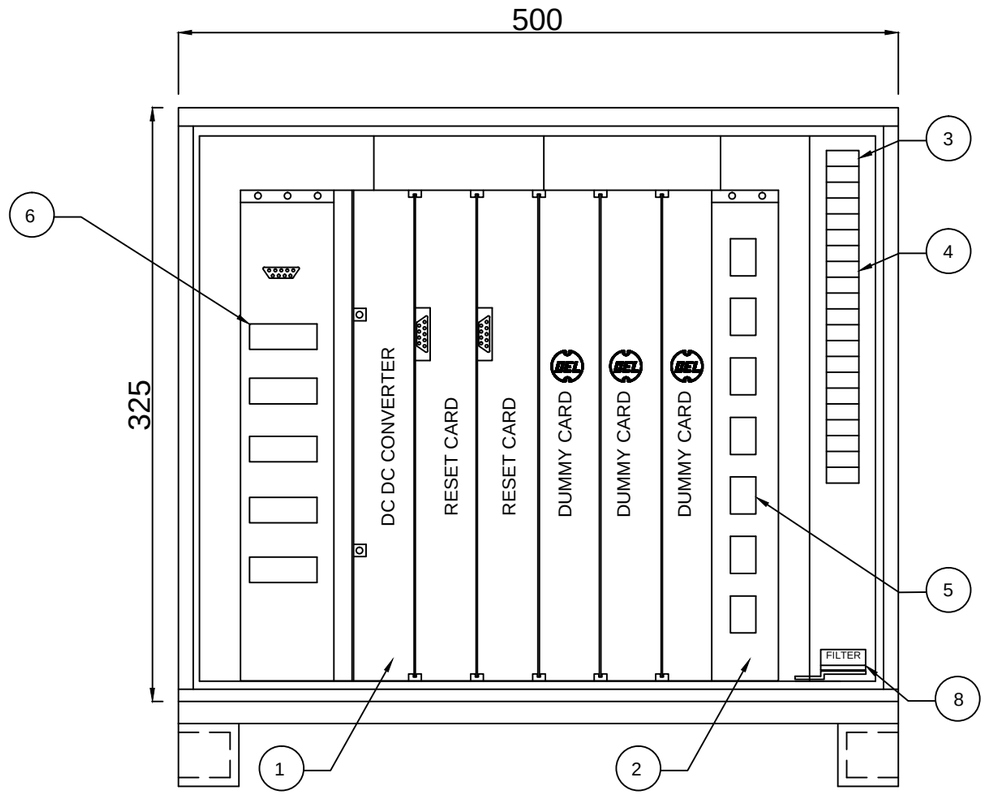
The cable screen at both the ends is to be properly earth to avoid proper display of data.

The Surge Voltage provided in the housing has to be properly earthed.

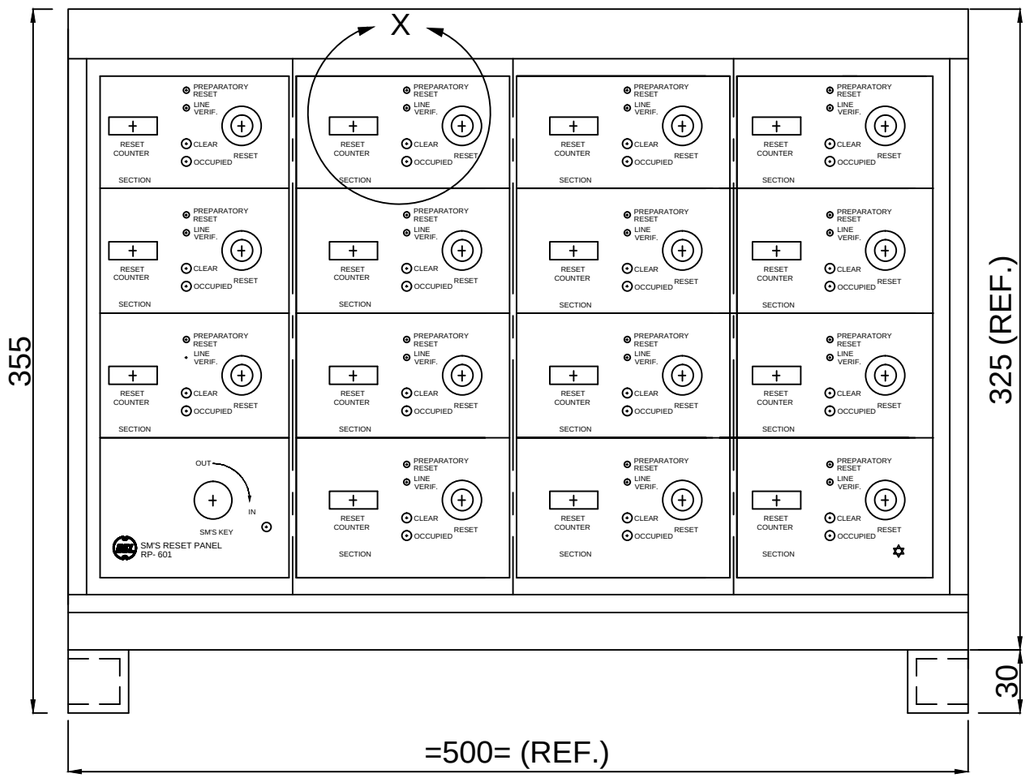
5.7 WIRING DETAIL



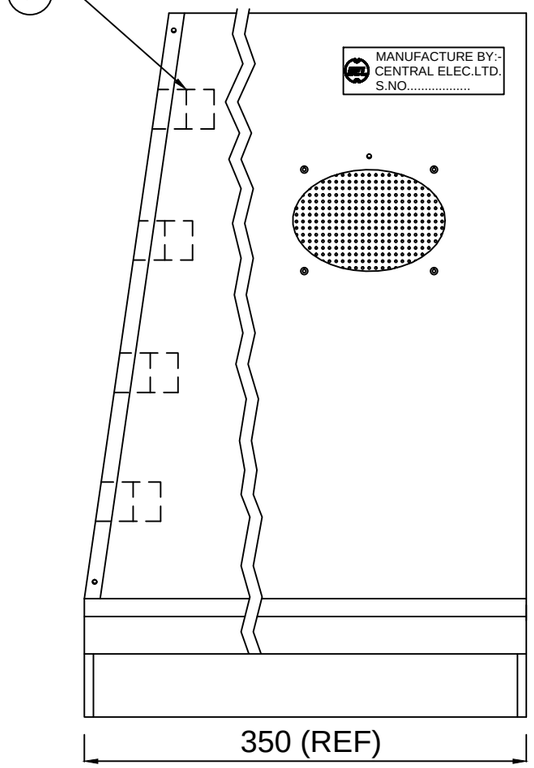
ENLARGE VIEW OF X



BACK WITHOUT COVER



FRONT



SIDE

NOTE -

✡ (1) MOUDLE AS PER REQUIRMENT

(2) ONE RESET CARD REQUIRED FOR 8 DETECTION POINT.

S.NO.	DRG.NO.	DESCRIPTION	NO. OFF
8	—	FILTER	1
7	—	DOMINO CARD	—
6	—	LINE VERIFICATION TERMINATION	—
5	—	RS 422 TERMINATION FROM TS1	—
4	—	TS1 TERMINAL STRIPS	—
3	—	SURGE MODULE FOR 24V DC	1
2	—	MOTHER BOARD	1
1	—	EVALUATOR SM'S RESET PANEL	1
A	—	DC DC CONVERTER CARD	1
B	—	RESET CARD (ONE REQUIRED FOR 8 DETECTION POINT)	—

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.

GEN TOL.
FULL FIG =
DEC 0.X = ±0.1
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A2

DESIGNED	SIG.	DT.
DRAWN	DESHRAJ	23/10/13
CHECKED		
APPROVED		

MATL | DIM MM | NO.OFF 1
FINISH | SCALE NTS

PROJECT: MULTI SECTION DIGITAL AXLE COUNTER

TITLE: SM'S PANEL,ASSEMBLY RP- 601 38

DRG.NO. A008905 | REV.NO. 0 | SHEET NO. 1 OF 1

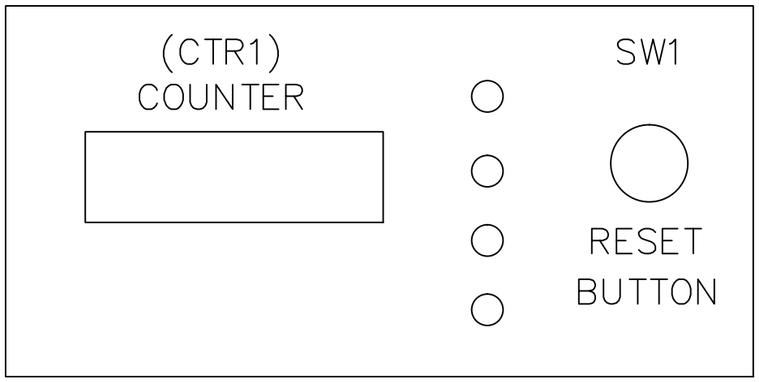
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SAHIBABAD - 201010 (U.P.)

PANEL (FRONT VIEW)

DOMINO NO.1	5	11	17	23	29	35
2	6	12	18	24	30	36
3	7	13	19	25	31	37
4	8	14	20	26	32	38
SW2 ⓘ PWR ON	9	15	21	27	33	39
	10	16	22	28	34	40

DETAIL VIEW (FRONT) OF DOMINO.





COUNTER TYPE–W16.40 (PART NO.1.160.401.013)

1. SW1–MICRO CONTROL SWITCH 5A, (MV1 SP3 OR 712–221R)
2. MOD1–24V SURGE MODULE OF PHOENIX MAKE.
3. FILTER–FILTER FOR I/P SUPPLY.
4. TS1–TERMINAL BLOCK (280–101)
5. CTR1– COUNTER W16.40, PART NO. 1.160.401.013

01	16.12.13	3012	AS PER CHANGE NOTE	
REV.NO.	DATE	CHANGE NOTE NO.	CHANGE	
DRN	ADITYA	CHKD	APPD	DATE 18-08-09

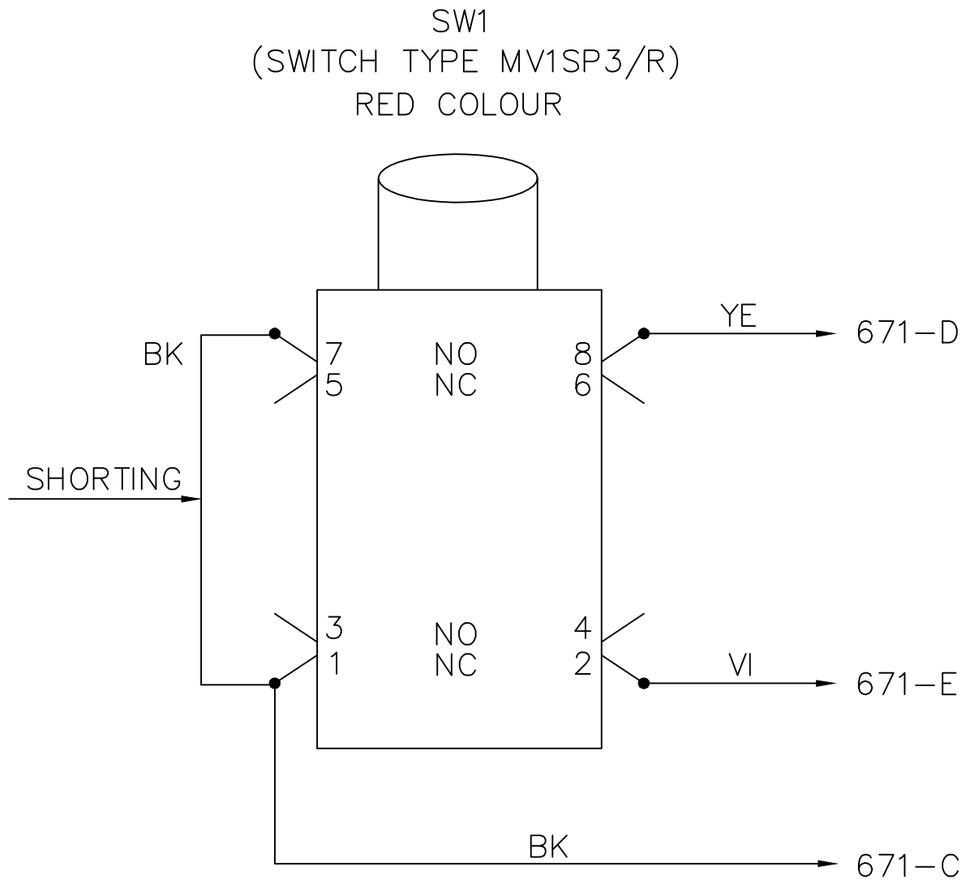
WIRING DIAGRAM
SM'S RESET PANEL FOR MSDAC-730-40D

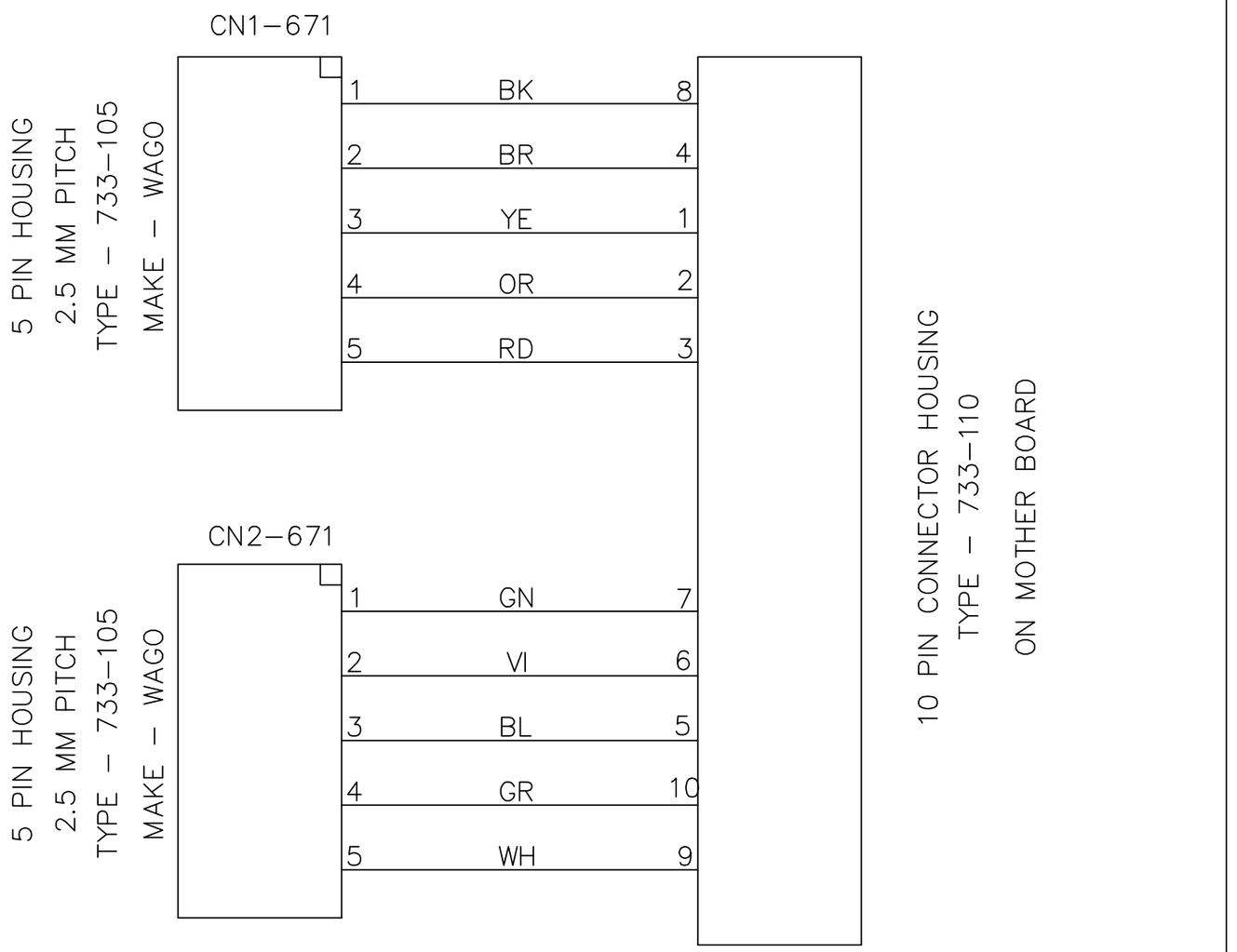
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DRG.NO. W008555A4
SHEET 1 OF 4

22.01.14

SYSTEM4/ADITYA/ELEC/8555A4





NOTE: –

1– ALL WIRES ARE 7/0.2 PVC INSULATED TINNED COPPER WIRE CONFORMING TO IS–694,GRADE 660V OF DIFFERENT COLOURS AS SPECIFIED.

2– 671–DISPLAY DOMINO CARD, CARD NO. 671.

3– MB–MOTHER BOARD.

4– SW2–KEY ACTUATOR CAT NO.SS91522 WITH CONTACT ELEMENT (1NO & 1NC)

01	16.12.13.	3012		AS PER CHANGE NOTE			
REV.NO.	DATE	CHANGE NOTE NO.		CHANGE			
DRN	ADITYA	CHKD		APPD		DATE	18–08–09

WIRING DIAGRAM
SM'S RESET PANEL FOR MSDAC–730–40D

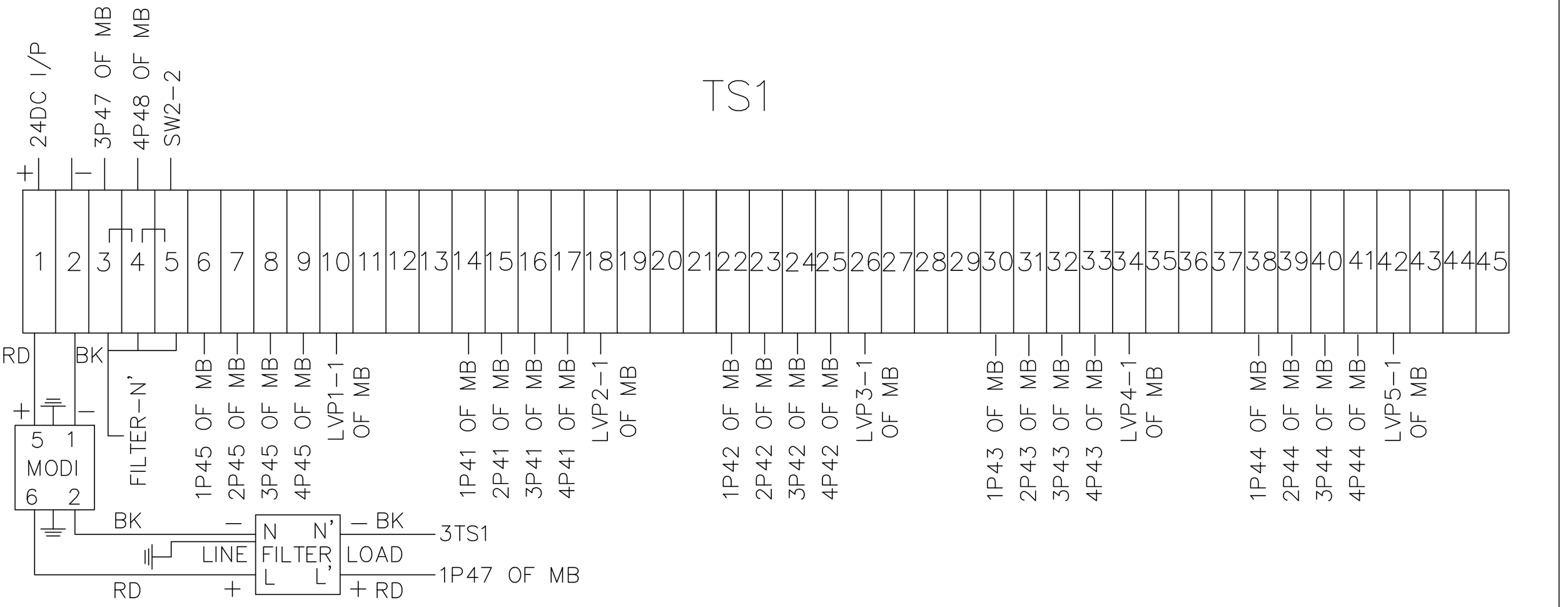
SYSTEM PRODUCTION DIVISION
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SAHIBABAD – 201010 (U.P.)

DRG.NO. W008555A4

SHEET 2 OF 4

22.01.14

SYSTEM4/ADITYA/ELEC/8555A4–2



NOTE –FOR 16D WIRING TO BE MADE FROM 1TS1 TO 21 TS1,
FOR 24D WIRING TO BE MADE FROM 1 TS1 TO 29 TS1 AND
FOR 40D WIRING TO BE MADE FROM 1 TS1 TO 45 TS1.

01	16.12.13.	3012	AS PER CHANGE NOTE
REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN	ADITYA	CHKD		APPD		DATE	18-08-09

WIRING DIAGRAM
SM'S RESET PANEL FOR MSDAC-730-40D

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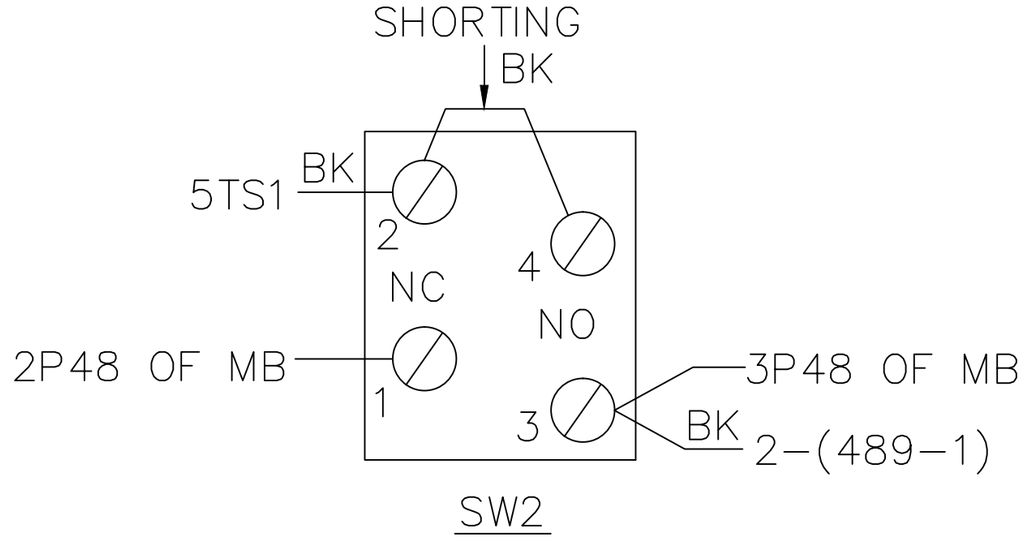
DRG.NO. W008555A4

SHEET 3 OF 4

22.01.14

DOMINO NO. (CARD NO. 671)	MOTHER BOARD PORT CONNECTOR (10 PIN)
1	P1
2	P2
3	P3
4	P4
5	P5
6	P6
7	P7
8	P8
9	P9
10	P10
11	P11
12	P12
13	P13
14	P14
15	P15
16	P16
17	P17
18	P18
19	P19
20	P20
21	P21
22	P22
23	P23
24	P24
25	P25
26	P26
27	P27
28	P28
29	P29
30	P30
31	P31
32	P32
33	P33

DOMINO NO. (CARD NO. 671)	MOTHER BOARD PORT CONNECTOR (10 PIN)
34	P34
35	P35
36	P36
37	P37
38	P38
39	P39
40	P40



SW2

WAGO JUMPER

01	16.12.13.	3012	AS PER CHANGE NOTE
REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN	ADITYA	CHKD		APPD		DATE	18-08-09

WIRING DIAGRAM
SM'S RESET PANEL FOR MSDAC-730-40D

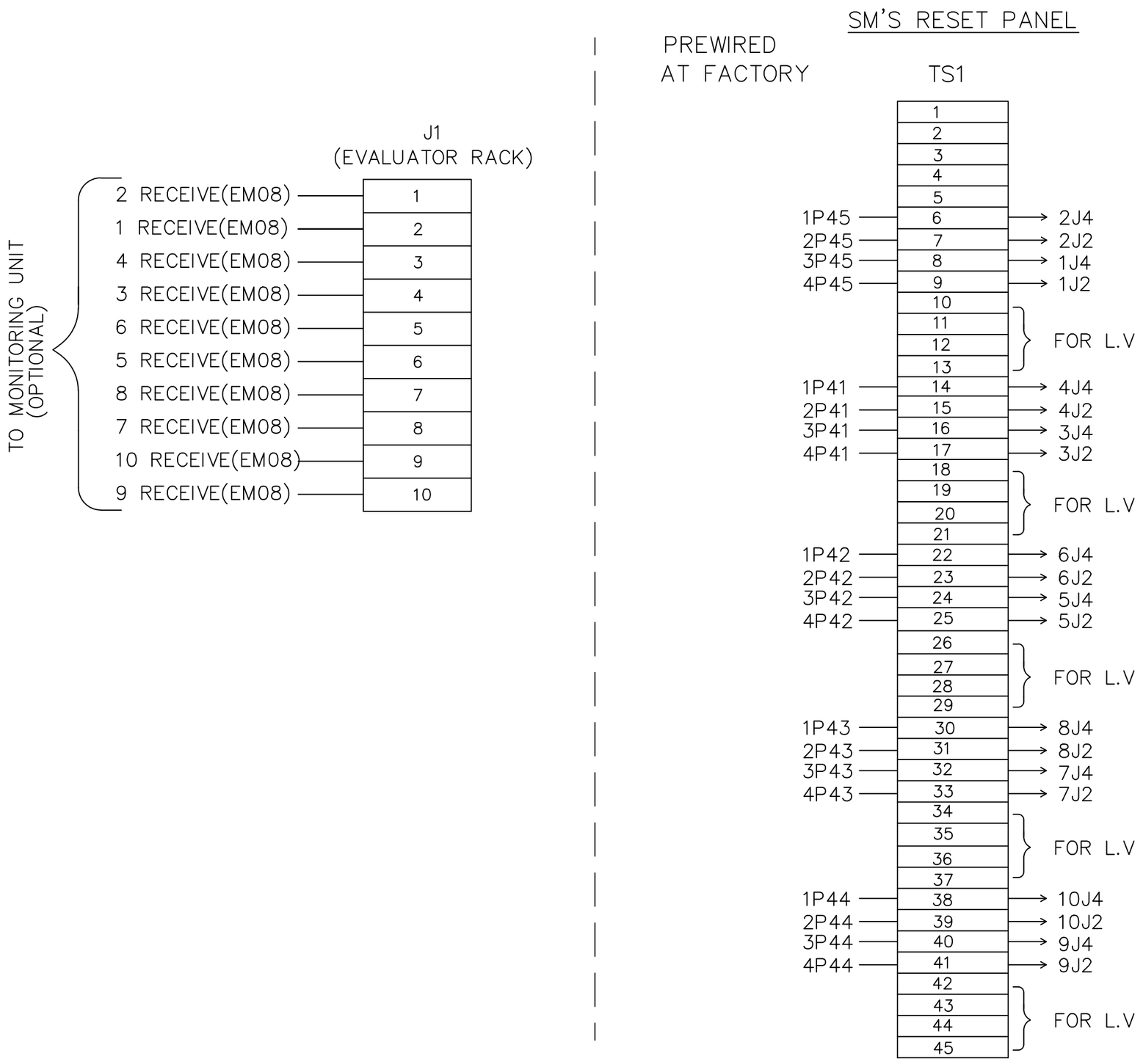
SYSTEM PRODUCTION DIVISION
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DRG.NO.
W008555A4

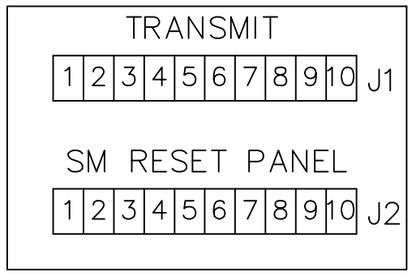
SHEET 4 OF 4

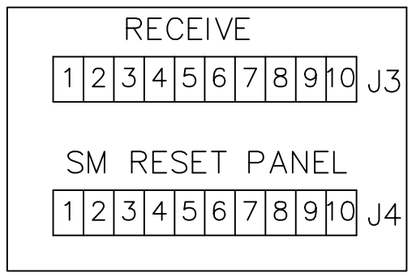
22.01.14

INTERCONNECTION WIRING DIAGRAM BETWEEN CENTRAL EVALUATOR UNIT AND SM'S RESET PANEL



RELAY ROOM
EVALUATOR RACK





NOTE – TWISTED PAIR SHIELDED CABLE TO BE USED FOR INTERCONNECTION BETWEEN CENTRAL EVALUATOR AND SM'S RESET PANEL

SR.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	DESHRAJ	CHKD	APPD	DATE	07–10–13

MSDAC INTERCONNECTION WIRING DIG B/W CEU AND SM'S RESET PANEL

SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. W008895A3

SHEET 1 OF

CHAPTER 6

6. INDICATIONS

6.1. INDICATIONS OF FIELD UNIT

The LED indications are provided on the facial plate i.e. on front side of different modules of Field Unit of MSDAC to indicate OK or Error condition. These are as follows: -

SCC CARDS (SCC1 & SCC2)

SNO	LED INDICATION	DESCRIPTION
I	OSC OK (Green LED)	This LED will be ON for Oscillator OK condition.
II	LD OK (Green LED)	The LED will be ON for Level Detector OK condition.If this is OFF, SUPERVISORY is not OK.
III	PULSE OK (Green LED)	This will glow when Pulse signal is OK. If this does not glow during installation, check the coil connections
IV	TP CON (Green LED)	This will glow when trolley suppression circuit is connected

MLB CARD

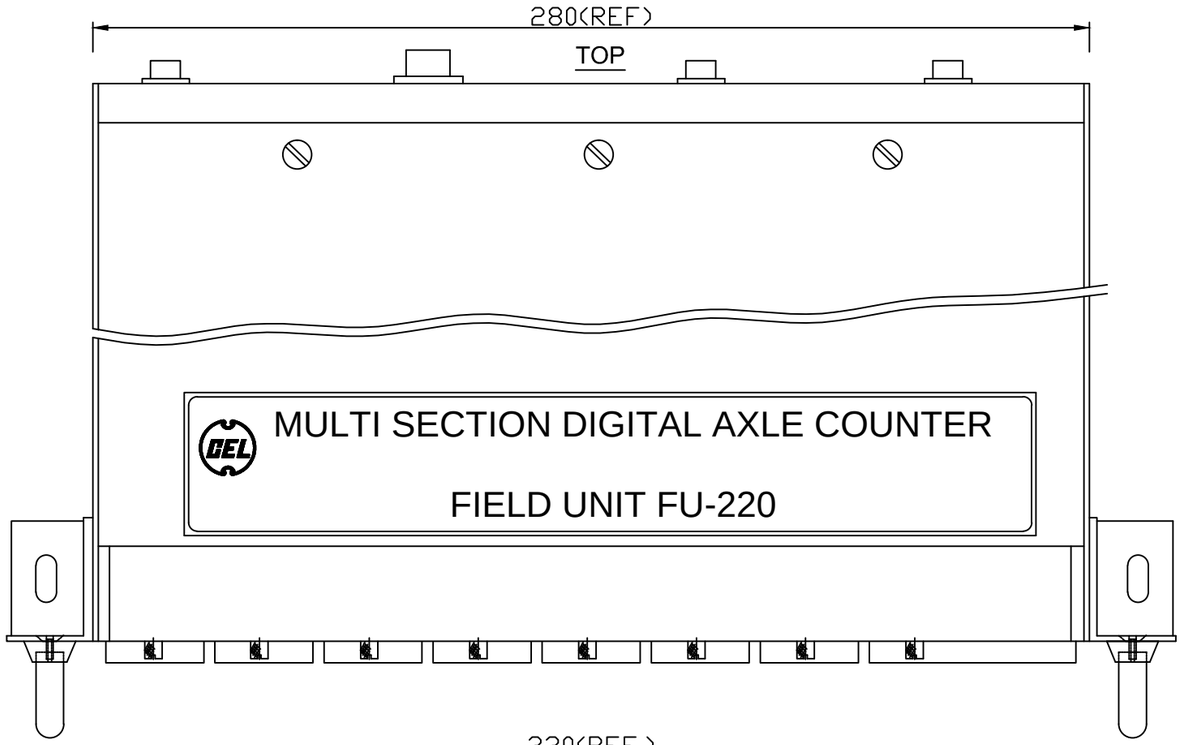
SNO	LED INDICATION	DESCRIPTION
I	BLOCK1 of 8 LEDs	This Block of LED of red color will glow in case of any error to display error code or during train movement.
II	BLOCK2 of 8 LEDs	This Block of LED of red color will glow in case of any error to display error code or during train movement.

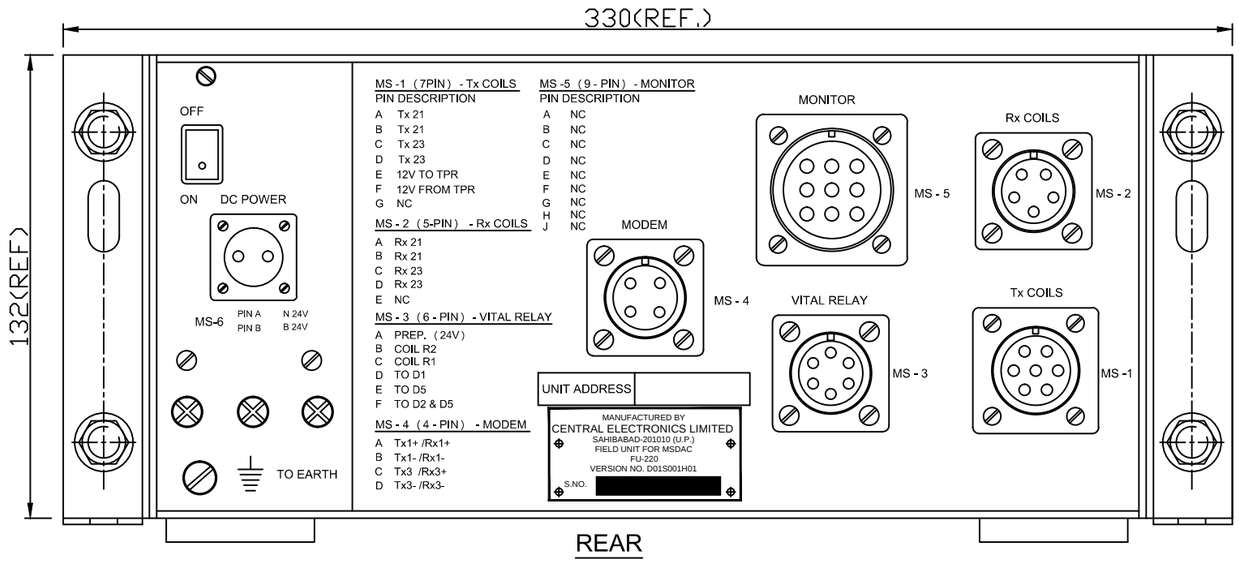
MODEM CARD

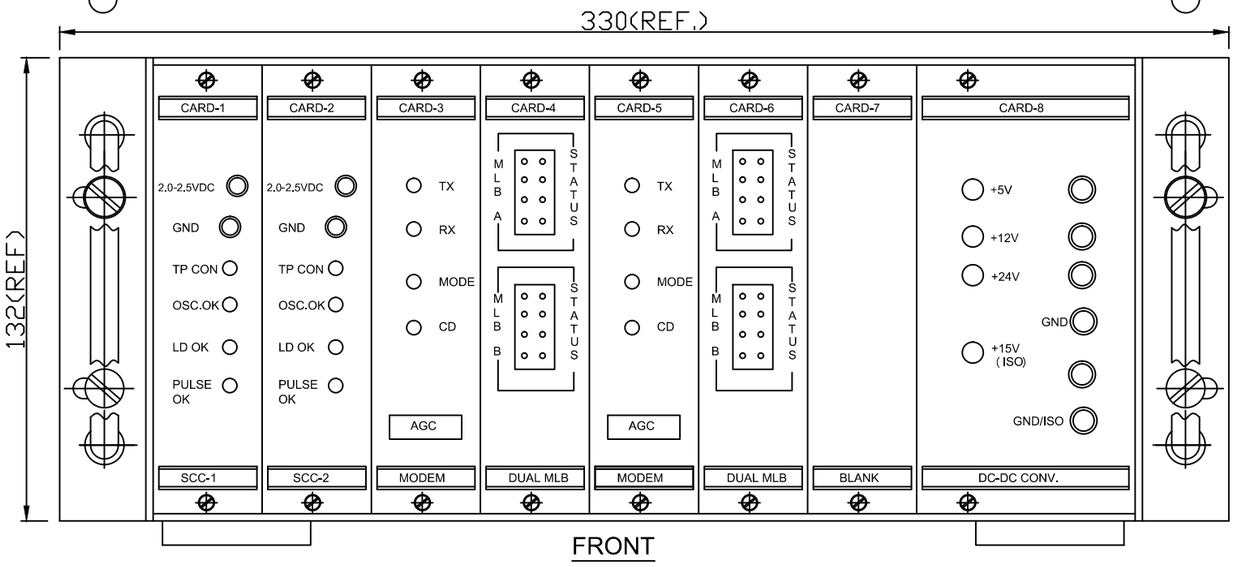
SNO	LED INDICATION	DESCRIPTION
I	TX (Green LED)	The Transmitting of the signal when LED is flashing is OK
II	Rx (Green LED)	The reception of signal from Evaluator is OK
III	MODE (Green LED)	
IV	CD (Green LED)	The Carrier Detect LED will be OFF if link is OPEN or cable is cut

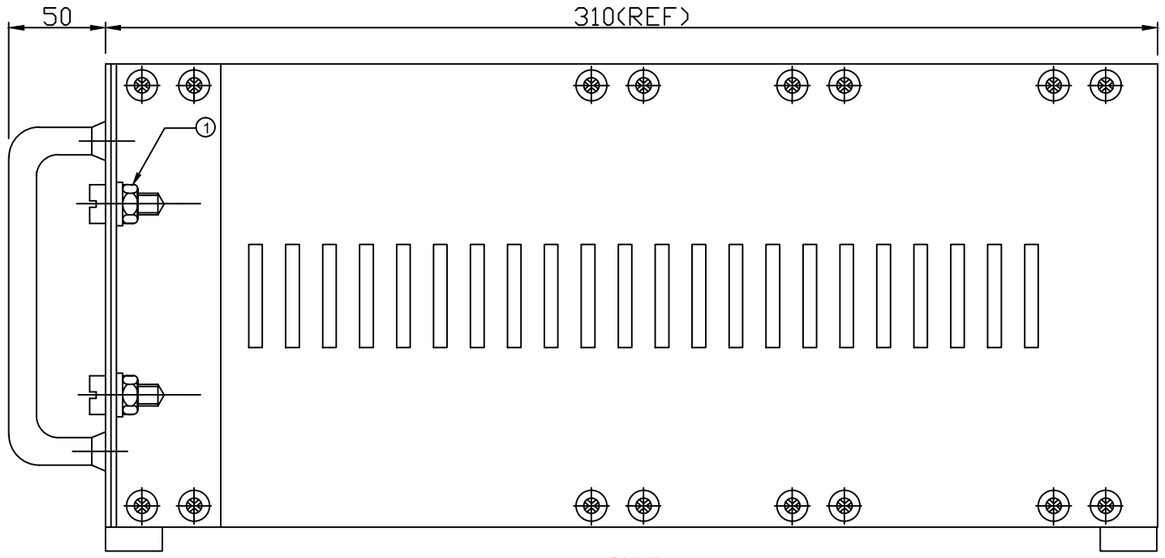
DC-DC CONVERTER

SNO	LED INDICATION	DESCRIPTION
I	+ 5V (Red LED)	The LED will glow when 5V is available
II	+ 12V (Red LED)	The LED will glow when 12V is available
III	+24V (Red LED)	The LED will glow when 24V is available
IV	+ 15V ISO(Red LED)	The LED will glow when 15V (ISO) is available









S NO.		DESCRIPTION	QUANTITY
1	CARD 1 & 2	SSC-1 & 2, CARD NO. 596-1, 21KHz, 23KHz	ONE EACH
2	CARD 3	MODEM CARD, CARD NO. 699	ONE
3	CARD-4	DUAL MLB CARD NO. 22754 REV. A	ONE
4	CARD-5	MODEM CARD (TO BE USED IN DUAL DETECTION POINT) - IF REQUIRED	-
5	CARD-6	DUAL MLB CARD (TO BE USED IN DUAL DETECTION POINT) - IF REQUIRED	-
6	CARD-7	DUMMY CARD / RELAY CARD (IF REQUIRED)	
7	CARD-8	DC-DC CON. CARD, 96V/24V, CARD NO. 678/CARD NO. 22092-01 REV. 2	ONE
8	MSC-001	MS COUPLER PLUG 02 PIN STANDARD PLUG TYPE MS 3106 F 10SL-4S	ONE
9	MSC-002	MS COUPLER PLUG 04 PIN STANDARD PLUG TYPE MS 3106 F 14S-2P	ONE
10	MSC-005	MS COUPLER PLUG 05 PIN STANDARD PLUG TYPE MS 3106 F 14S-5P	ONE
11	MSC-035	MS COUPLER PLUG 07 PIN STRAIGHT INSERT PLUG TYPE MS 3106 F 14S-1S	ONE

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.

GEN TOL.
FULL FIG =
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =
Ñ1

SIZE A2

DESIGNED	SIG.	DT.	MATL ---	DIM MM	NO.OFF 1
DRAWN	ADITYA	26-12-11	FINISH ---	SCALE NTS	
CHECKED					
APPROVED					

PROJECT
MULTI SECTION DIGITAL AXLE COUNTER
FIELD UNIT FU-220

TITLE
CHASSIS ASSEMBLY
45

DRG.NO. A008655 | REV.NO. --- | SHEET NO. 1 OF 1

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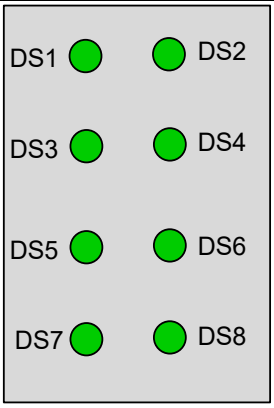
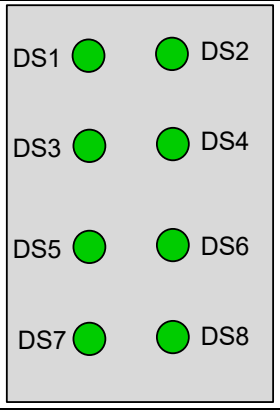
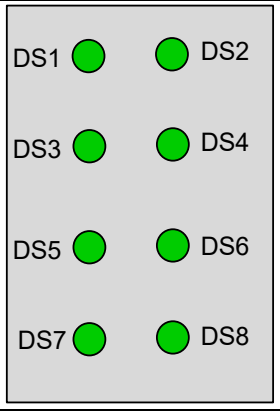
6.2. INDICATIONS ON MSDAC RACK

The details of all the indications available on all the cards of Evaluator and relay rack are as follows.

DC TO DC CONVERTER (CARD 1 & CARD 2)

SNO	LED INDICATION	DESCRIPTION
I	+ 5V (Green LED)	The LED will glow when 5V is available
II	+ 15V (Green LED)	The LED will glow when 12V is available
III	ON/OFF switch	To switch OFF the DC to DC converter press to OFF. In this mode this DC to DC converter will get excluded from the evaluator.

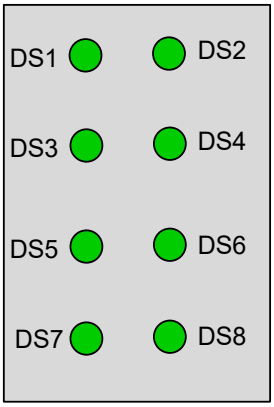
EM08 CARD (CARD 3/CARD5 /CARD 7/CARD 9/CARD11)

SNO	LED INDICATION	DESCRIPTION
I	CPU A	Green LED glows steady when CPUA is present and is working
II	CPU B	Green LED glows steady when CPUB is present and is working
III	CPU C	Green LED glows steady when CPUC is present and is working
iV	CPU A	Green LED flashes if CPU A is master
V	CPU B	Green LED flashes if CPU B is master
VI	CPU C	Green LED flashes if CPU C is master
VII	LED Block 1	This indicates section movement or Section in Error mode by CPU A
		DS1 – Green LED flashes only when train movement in TS1 or TS1 in error DS2 – Green LED flashes only when train movement in TS2 or TS2 in error DS3 – Green LED flashes only when train movement in TS2 or TS3 in error DS4 – Green LED flashes only when train movement in TS2 or TS4 in error DS5 – Green LED flashes only when train movement in TS2 or TS5 in error DS6 – Green LED flashes only when train movement in TS2 or TS6 in error DS7 – Green LED flashes only when train movement in TS2 or TS7 in error DS8 – Green LED flashes suggesting the correct working of Software
VII	LED Block 2	This indicates section movement or Section in Error mode by CPU B
		DS1 – Green LED flashes only when train movement in TS1 or TS1 in error DS2 – Green LED flashes only when train movement in TS2 or TS2 in error DS3 – Green LED flashes only when train movement in TS2 or TS3 in error DS4 – Green LED flashes only when train movement in TS2 or TS4 in error DS5 – Green LED flashes only when train movement in TS2 or TS5 in error DS6 – Green LED flashes only when train movement in TS2 or TS6 in error DS7 – Green LED flashes only when train movement in TS2 or TS7 in error DS8 – Green LED flashes suggesting the correct working of Software
VII	LED Block 3	This indicates section movement or Section in Error mode by CPU C
		DS1 – Green LED flashes only when train movement in TS1 or TS1 in error DS2 – Green LED flashes only when train movement in TS2 or TS2 in error DS3 – Green LED flashes only when train movement in TS3 or TS3 in error DS4 – Green LED flashes only when train movement in TS4 or TS4 in error DS5 – Green LED flashes only when train movement in TS5 or TS5 in error DS6 – Green LED flashes only when train movement in TS6 or TS6 in error DS7 – Green LED flashes only when train movement in TS7 or TS7 in error DS8 – Green LED flashes suggesting the correct working of Software

RELAY DRIVER CARD (CARD 4/CARD6/CARD8/CARD10/CARD12)

1	CLOCK1	The Green LED flashes in presence of Clock for TS1 output
	LVL 1	The Green LED glows in presence of Count equal state for TS1
	VR1 OK	The Green LED glows in presence of Relay Drive for TS1
2	CLOCK2	The Green LED flashes in presence of Clock for TS2 output
	LVL 2	The Green LED glows in presence of Count equal state for TS2
	VR2 OK	The Green LED glows in presence of Relay Drive for TS2
3	CLOCK3	The Green LED flashes in presence of Clock for TS3 output
	LVL 3	The Green LED glows in presence of Count equal state for TS3
	VR3 OK	The Green LED glows in presence of Relay Drive for TS3
4	CLOCK4	The Green LED flashes in presence of Clock for TS4 output
	LVL 4	The Green LED glows in presence of Count equal state for TS4
	VR4 OK	The Green LED glows in presence of Relay Drive for TS4
5	CLOCK5	The Green LED flashes in presence of Clock for TS5 output
	LVL 5	The Green LED glows in presence of Count equal state for TS5
	VR5 OK	The Green LED glows in presence of Relay Drive for TS5
6	CLOCK6	The Green LED flashes in presence of Clock for TS6 output
	LVL 6	The Green LED glows in presence of Count equal state for TS6
	VR6 OK	The Green LED glows in presence of Relay Drive for TS6
7	CLOCK7	The Green LED flashes in presence of Clock for TS7 output
	LVL 7	The Green LED glows in presence of Count equal state for TS7
	VR7 OK	The Green LED glows in presence of Relay Drive for TS7
8	CLOCK8	The Green LED flashes in presence of Clock for TS8 output
	LVL 8	The Green LED glows in presence of Count equal state for TS8
	VR8 OK	The Green LED glows in presence of Relay Drive for TS8

EVENT LOGGER CARD (CARD 14)

1	DSUB 1	9 pin connector gives data of all the 5 cards to be downloadable for SSI or for Online monitoring
2	DSUB2	The 9 pin connector to be used for downloading data from memory of EM08 card to be analysed for report generation
3	DSUB3	The 9 pin connector to be used for downloading data for external data logger.
4	LED Block	This gives information on Event logger working
		DS1 – Green LED flashes if data for EM08 card1 is getting logged DS2 – Green LED flashes if data for EM08 card2 is getting logged DS3 – Green LED flashes if data for EM08 card3 is getting logged DS4 – Green LED flashes if data for EM08 card4 is getting logged DS5 – Green LED flashes if data for EM08 card5 is getting logged DS6 – NC DS7- NC DS8 – Green LED flashing for correct working of card.

VR PICK / VR DROP

The Green LED glows when corresponding track section relay is picked up. The RED indication will glow in case the relay is occupied.

POWER AND DATA COUPLING UNIT

One Bicolor LED has been provided on the PDCU. Green LED will glow in OK condition and in case of failure RED indication will glow.

6.3. INDICATIONS OF SM PANEL

1	POWER ON	Yellow LED will glow when SM's Key is turned ON
2	SM's Key	Key to be inserted and move to right for any operation
3	OCC	RED LED glows when track section is in OCCUPIED state
4	PREP	Green LED flashes when reset is applied to the track section and it becomes steady when reset is successful and section enters in Preparatory state
5	CLEAR	GREEN LED glows when track section is in CLEAR State
6	LV	LED glows when Line Verification is extended from site
7	RESET BUTTON	Red Button for executing reset command
8	RESET COUNTER	Counter increments by 1 on successful resetting

6.4. ERROR CODES

The Error codes appeared on the front panel of field unit are displayed on the LEDs. These codes are also available on the monitoring unit. The use of monitoring unit in displaying the error codes information of field unit are given clearly in CHAPTER 7

6.4.1. ERROR CODE OF FIELD UNIT.

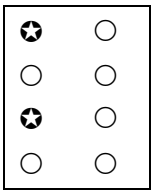
S. No	ERROR NAME	Error Code	DESCRIPTION
1	ROM_TEST_CONST	0x11	ROM TEST DURING POST
2	RAM_TEST_CONST	0x12	RAM TEST DURING POST
3	SERIAL_TEST_CONST	0x13	SERIAL PORT TEST DURING POST
4	CARD_TEST_CONST	0x14	CARD PRESENCE TEST DURING POST
5	RELAY_TEST_CONST	0x15	RELAY TEST DURING POST
6	ROM_TEST_DURING SYS WORKING	0x21	ROM TEST FAIL DURING SYSTEM WORKING
7	RAM_TEST_DURING SYS WORKING	0x22	RAM TEST FAIL DURING SYSTEM WORKING
8	CARD_TEST_DURING SYS WORKING	0x24	CARD PRESENCE FAIL DURING SYSTEM WORKING
9	LINK ERROR	0x30	LOSS OF CARRIER OR LINK
10	SEQUENCE ERROR	0x31	SEQUENCE OF INPUTS MISMATCH
11	SELF_COUNT_MISMATCH	0x32	SELF COUNT MISMATCH ERROR
12	INOUT_ERROR	0x33	MOVEMENT OF TRAIN BEFORE PREPARATORY RESET
13	OUT_B4_IN_ERROR	0x34	REGISTRATION OF OUTCOUNT BEFORE INCOUNT
14	NEGATIVE_COUNT_ERROR	0x35	NEGATIVE COUNT ERROR
15	SHUNT_ERROR	0x36	SHUNT ERROR
16	SUPERVISORY_ERROR	0x37	SUPERVISORY ERROR
17	INTERNAL_SHUNT_ERROR	0x38	INTERNAL SHUNT ERROR
18	COUNT UNEQUAL ERROR	0x39	COUNTS MISMATCH IN MLB OF SAME UNIT
19	COMMUNICATION_ERROR	0x40	CORRUPTION OF PACKETS
20	CRC_ERROR_CONST	0x41	CORRUPTION OF DATA
21	EOB_ERROR_CONST	0x42	CORRUPTION OF DATA
22	WHEEL_SHUNT_ERROR	0x43	WHEEL SHUNT ERROR
24	INDEPENDENT PULSE ERROR(REVERSE)	0x45	OCCURRENCE OF NON OVERLAPPNG PULSE IN REVERSE DIRECTION
26	TRACING_ERROR_CONST	0x60	CORRUPTION OF SOFTWARE IN MICRO CONTROLLERS.
27	SECONDARY_CPU_ERROR_CONST	0x61	DECISION OF BOTH MLB'S MISMATCHES
28	SECONDARY_CPU_FAIL_CONST	0x62	SECONDRY CPU FAILS
29	WATCH_DOG_RESET_CONST	0x66	MICRO CONTROLLER'S WATCHDOG TIMER RESETS
30	CONFIG_ERROR_CONST	0x70	CHANGE IN CONFIGURATION DURING POST
31	J_CONFIG_ERROR_CONST	0x71	J PACKET CONFIGURATION ERROR
32	R_CONFIG_ERROR_CONST	0x72	R PACKET CONFIGURATION ERROR
33	CONFIG_ERROR_IN_LINE_CONST	0x73	ADDRESS CHANGE DURING SYSTEM RUNNING
34	U_CONFIG_ERROR_CONST	0x74	U PACKET CONFIGURATION ERROR
35	REMOTE_RESET_ERROR_CONST	0X7f	REMOTE UNIT IS RESETTED, LOCAL IS NOT
36	SELF_RESET_ERROR_CONST	0x3f	LOCAL UNIT IS RESETTED, REMOTE IS NOT

ERROR CODES DESCRIPTION AND ACTION REQUIRED FOR RECTIFICATION

The system may give the following errors for the conditions given below:

1. ERROR NO 11: ROM TEST DURING POST

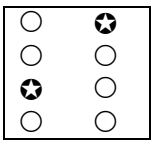
The ROM of the microcontroller is checked during the Power on Self test (POST). If the memory test is passed, this error will not appear. If any location of ROM is corrupted, the error No. 11 is displayed.



Error No.	Action required
The error No. 11 is displayed in the MLB of which the memory is corrupted	Replace the microcontroller IC or MLB card.

2. ERROR NO. 12 – RAM TEST DURING POST

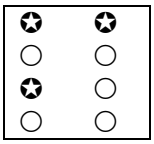
The RAM of the microcontroller is checked during the Power on Self test (POST). If the memory test is passed, this error will not appear. If any location of RAM is corrupted, the error No. 12 is displayed.



Error No.	Action required
The error No. 12 is displayed in the MLB of which the memory is corrupted.	Replace the microcontroller IC or MLB card.

3. ERROR NO 13 – SERIAL PORT TEST DURING POST

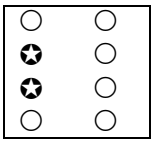
The Serial port of the microcontroller is checked during the Power on Self test (POST). If the serial port test is passed, this error will not appear. If any serial port test is failed, the error No. 13 is displayed.



Error No.	Action required
The error No. 13 is displayed in the MLB of which the on chip serial port is corrupted.	Replace the microcontroller IC or MLB card.

4. ERROR NO 14 - CARD PRESENCE TEST

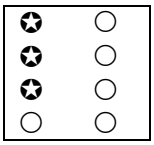
The presence of each card is checked in the system. If all the cards are intact and present in the system, this error will not appear. If any card is removed or not inserted properly in the unit, the error No. 14 is displayed.



Error No.	Action required
The error No. 14 is displayed as flashing if any card is removed or not inserted properly.	Insert all the cards properly or replace the MLB cards

5. ERROR NO 15 - RELAY TEST DURING POST

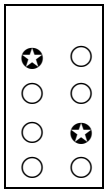
During Self Test (POST) the vital relay connected to the system is also checked. If the relay is present, this error will not appear. If relay is not connected, the error No. 15 is displayed.



Error No.	Action required
The error No. 15 is displayed as flashing if the relay and its connections are not proper.	Check the presence of relay. Check the connections of relay. Make proper connections.

6. ERROR NO 21 – ROM TEST FAIL DURING SYSTEM WORKING

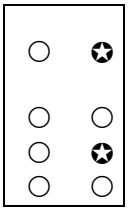
The ROM of the microcontroller is checked during the normal working of the system. At all times, ROM is checked. If any location of ROM is corrupted during system working, the error No. 21 is displayed.



Error No.	Action required
The error No. 21 is displayed in the MLB of which the memory is corrupted.	Replace the microcontroller IC or MLB card.

7. ERROR NO 22 - RAM TEST FAIL DURING SYSTEM WORKING

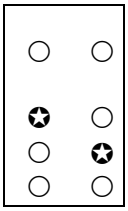
The RAM of the microcontroller is checked during the normal working of the system. If the RAM is found faulty at any time of operation, the error No. 22 is displayed.



Error No.	Action required
The error No. 22 is displayed in the MLB of which the memory is corrupted	Replace the microcontroller IC or MLB card

8. ERROR NO 24 - CARD PRESENCE CHECK DURING SYSTEM WORKING

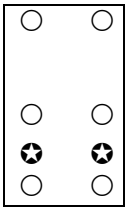
This error is displayed when any of the cards are taken out from the unit.



Error No.	Action required
Error No. 24 is displayed when any of the card is not present in the system	Check all the cards are properly installed in the unit. If the problem persists replace the MLB card.

9. ERROR NO 30 – LINK ERROR

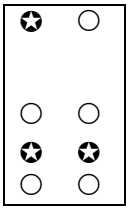
The link error is detected when the link between the two SSDAC units is open or loss of carrier detect or CD. This is displayed as error No. 30.



Error No.	Action required
Error No. 30 is displayed when link is open.	Check the communication link between the units and rectify the fault.

10. ERROR NO 31 - SEQUENCE ERROR

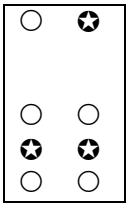
Software checks the pulse sequence when axle is detected on the sensor.



Error No.	Action required
Error No. 31 is displayed when the sequence of pulses is not correct.	Check the arrangement of the detectors. It shall be at proper height from top of rail. Check card 1 & 2 and replace if necessary.

11. ERROR NO 32 – SELF COUNT MISMATCH

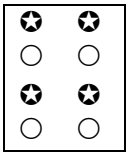
Software checks matching of counts in MLB cards after detection of all the axles passed over the axle detectors. If difference of counts is noticed, then the error 32 is displayed.



Error No.	Action required
Error No. 32 is displayed if there is difference between the counts of the two MLB cards in local unit.	Reset the system. If error persists replace the MLB cards with the spare cards. Send the cards for repair.

12. ERROR NO 33 – INOUT ERROR

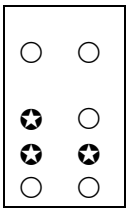
This error will be displayed if the system is in error state and after that there is train movement in the section. Error 33 will be displayed in the unit having error 80. Secondly, error 33 will be displayed after reset is applied in the system and while the system is trying to synchronize, there is train movement in the section.



Error No.	Action required
Error No. 33 is displayed if the number of axles going out of the section is more than coming into the section	Check the system for error and apply reset to normalize the system.

13. ERROR NO 34 – OUT BEFORE IN ERROR

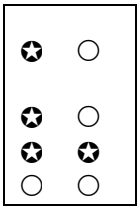
This error will be displayed when the system is in preparatory state and there is train movement out of the section without entering the section.



Error No.	Action required
Error No. 34 is displayed when system is in preparatory state and train exits from the section without entering into the section.	Check the axle detectors A. Check SCC1 card & replace if found faulty.

14. ERROR NO 35 – NEGATIVE COUNT ERROR

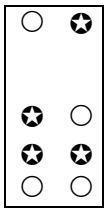
This error will be displayed if counts registered in the system are less at the Entry end while train entering the section than the counts registered at the Exit end while train is leaving out of section i.e. counts into the section are less than the counts out of the section.



Error No.	Action required
Error No. 35 is displayed with flashing LED's when count out of the section are more than the counts into the section	Check signals dip at both locations in single line section. Check signals dip and coil position at entry end in double line block section. Check DC voltage in SCC 1 & 2 cards.

15. ERROR NO 36 – SHUNT ERROR

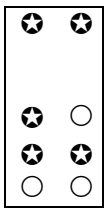
This error will be displayed when train moving forward & backwards (shunting) on axle detectors without proper direction influencing only external detector twice without affecting internal detector. The system checks and locks this as an error.



Error No.	Action required
Error No. 36 is displayed for improper shunting on axle detectors.	Station master has to apply reset after section is verified as per SWR. Movement of pilot train in the section makes system clear.

16. ERROR NO 37 – SUPERVISORY ERROR

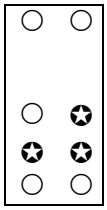
Supervisory error is displayed if any of the axle detectors signal level becomes low. Immediately MLB cards detect this and error 37 flashes on the MLB.



Error No.	Action required
Error No. 37 is displayed when any of the axle detector signals becomes low.	Check the Tx & Rx signal level of the axle detectors. It should be as per the recorded readings. Check the SCC 1 & 2 card DC voltages. Adjust or replace if any of the above is not OK.

17. ERROR NO 38 – INTERNAL SHUNT ERROR

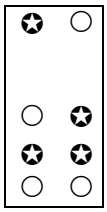
This error will be displayed when train is moving forward & backwards (shunting) on axle detectors without proper direction in such a way that both detectors are influenced & internal detector is influenced twice. The system checks and locks this as an error.



Error No.	Action required
Error No. 38 is displayed for improper shunting on axle detectors	Station master has to apply reset after section is verified as per SWR. Movement of pilot train in the section makes system clear.

18. ERROR NO 39 – COUNT UNEQUAL ERROR

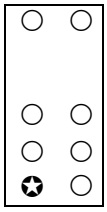
This error will be displayed when counts counted by the MLB card does not matches. Count Unequal Error is displayed. The system checks and locks this as an error.



Error No.	Action required
Error No. 39 is displayed for mismatch of counts by both MLB cards.	If continuously the error is displayed, replace the MLB cards.

19. ERROR NO 40 – COMMUNICATION ERROR

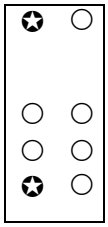
The communication error is displayed when communication between the two units is not proper i.e. packet information is corrupted due to noise in the Quad Pair used.



Error No.	Action required
Error No. 40 is displayed when communication between two units is improper.	Check the pair used for the communication. Check that no parallel wires are used for modem communication. Check that correct Quad pair is used for communication. If problem persists, replace the spare pair.

20. ERROR NO 41 – CRC ERROR

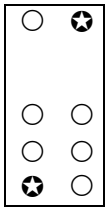
The CRC Error is displayed when data of the packets gets corrupted. Due to this the CRC of the packet does not matches.



Error No.	Action required
Error No. 41 is displayed when CRC of the packet gets corrupted.	Check the pair used for communication. Check that no parallel wires are used for modem communication. Check the correct Quad pair is used for communication. If problem persists replace the spare pair or improve the earthing to the unit.

21. ERROR NO 42 – EOB ERROR

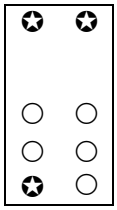
The EOB error is displayed when data of the packets gets corrupted. Due to this the End of packet is not detected.



Error No.	Action required
Error No. 42 is displayed End of packet information gets corrupted.	Check link between the two units. Check the modem cards and apply reset in the system.

22. ERROR NO 43 – WHEEL SHUNT ERROR

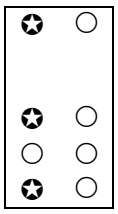
This is the Error related to the sequence of pulses from the axle detectors and SCC cards.



Error No.	Action required
Error No. 43 is displayed when the sequence of pulses is disturbed.	Check whether the position of axle detectors is OK and correct. Check for failure due to motor trolley, perforated push trolley, dip lorry, etc and apply reset in the system.

24. ERROR NO 45 – INDEPENDENT PULSES ERROR(REVERSE)

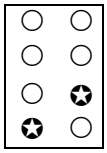
The Error occurs if the wheel is moved in such a way that independent pulses are generated by system in reverse direction. This happens only if motor trolley wheel that are similar in diameter is moved beyond the permissible limit.



Error No.	Action required
Error No. 45 is displayed when both the channels are giving independent pulses in reverse direction.	Check whether the position of axle detectors is OK and correct. Check for failure due to motor trolley, perforated push trolley, dip lorry, etc and apply reset in the system.

32. ERROR NO 60 – TRACING ERROR

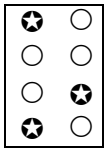
Both MLB's will be working in tandem and software shall follow a particular sequence. If any sequence is missed, then Tracing Error is generated.



Error No.	Action required
Error No. 60 is generated	Replace the MLB card which is displaying the error.

33. ERROR NO 61 – SECONDRY CPU ERROR

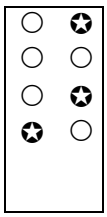
Both MLB's will be working in tandem and should be in agreement for any decision. Suppose MLB1 card is in different state from that of MLB2 card or vice versa, the system will generate the error 61.



Error No.	Action required
Error 61 is generated if MLB1 detects that the adjacent MLB2 is in different state or vice versa.	Apply reset to normalise the system.

34. ERROR NO 62 – SECONDRY CPU FAILS

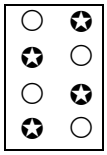
The error is generated if any of the CPU fails to respond with its adjacent CPU due to failure of any components.



Error No.	Action required
Error 62 is generated in case the MLB card detects the adjacent MLB card is faulty.	The adjacent MLB card is faulty. Replace the adjacent MLB card with spare card.

35. ERROR NO 66 – WATCHDOG RESET

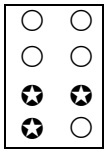
This error is generated if the power supply interruptions are taking place in the system.



Error No.	Action required
Error 66 is displayed when power supply is interrupted thereby DC-DC converter voltages are also interrupted in the system.	Check the power supply to the system and rectify.

36. ERROR NO 70 – CONFIGURATION ERROR DURING SELF TEST

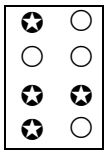
The error is generated if address of the units is found to be different as per the factory settings or both Entry and both Exit Units have been used in the section.



Error No.	Action required
Error 70 is generated if the unit address of any unit is disturbed or both units have the same address	Check and install the Entry and Exit Units in the section.

37. ERROR NO 71 – J PACKET CONFIGURATION ERROR

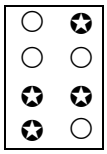
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



Error No.	Action required
Error 71 is generated if the unit address of any unit is disturbed or both units have the same address	Check and install the Entry and Exit units in the section.

38. ERROR NO 72 – R PACKET CONFIGURATION ERROR

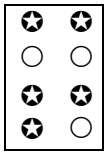
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



Error No.	Action required
Error 72 is generated if the unit address of any unit is disturbed or both units have the same address	Check and install the Entry and Exit units in the section.

39. ERROR NO 73 – CONFIGURATION ERROR DURING NORMAL WORKING

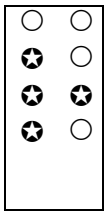
The error is detected when the address of unit is changed while the system is running.



Error No.	Action required
Error 73 is generated in the unit whose address is disturbed / changed while the system is working normally.	The unit address is rectified to as per the factory setting. Reset is applied.

40. ERROR NO 74 – U PACKET CONFIGURATION ERROR

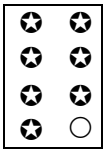
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



Error No.	Action required
Error 74 is generated if the unit address of any unit is disturbed or both units have the same address.	Check and install the Entry and Exit units in the section.

42. ERROR NO 7F – REMOTE RESET ERROR

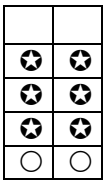
The error is generated in the local unit when remote unit is resetted.



Error No.	Action required
Error 7F is generated in local unit if the remote unit has been resetted.	Apply reset in the local unit or else apply reset in both SSDAC units.

43. ERROR NO 3F – SELF RESET ERROR

The error is generated if the local unit has been resetted.



Error No.	Action required
Error 3F is generated in the local unit when it is resetted and it is waiting for remote unit to be resetted	Remote unit is to be resetted or else both SSDAC units are to be resetted

6.4.2. ERROR CODES OF EVALUATOR

S. No	ERROR NAME	ERROR CODE	DESCRIPTION
1	ROM_TEST	0X01	ROM CHECK
2	RAM_TEST	0X02	RAM CHECK
3	RAM_TEST_INLINE	0X05	RAM CHECK DURING SYSTEM WORKING
4	RELAY_CARD_NOT_PRESENT	0X06	RELAY CARD TEST DURING POST
5	FPGA_MEMORY_ERR	0X0D	FPGA MEMORY CHECK
6	INVALID_CARD_NO	0X0E	CARD NO IS GREATER THAN “5”
7	INVALID_CPU_NO	0X0F	CPU NO IS GREATER THAN “3”
8	CONFIG_CARD_NOT_PRESENT	0X1F	CONFIG CARD NOT PRESENT AT POWER ON
9	FPGA_PORT_ERROR	0X20	CHECK FPGA PORT READ/WRITE AT POWER ON
10	SIGNATURE_MISMATCH_ERROR	0X32	SIGNATURE MISMATCH WITH ADJACENT CPUs
11	FPGA_MEMORY_INLINE_ERROR	0X33	FPGA MEMORY CHECK DURING WORKING
12	DACFU_BLOCK_ADDR_ERROR	0X34	DACFU BLOCK ADDRESS CHECK DURING WORKING
13	NEGATIVE_COUNT_ERROR	0X10	NEGATIVE COUNT CHECK DURING WORKING
14	RELAY_OPEN	0X11	RELAY OPEN CHECK DURING WORKING
15	RELAY_ERR	0X12	RELAY ERROR CHECK DURING WORKING
16	RELAY_UNOCCUPIED	0X13	RELAY UNOCCUPIED CHECK DURING WORKING
17	RELAY_OCCUPIED	0X14	RELAY OCCUPIED CHECK DURING WORKING
18	DP_RESET_ERROR	0X16	DP NOT RESETTED, AFTER APPLYING RESET FROM SM PANEL
19	FINAL_EVAL_UNOCC	0X17	FINAL UNOCCUPIED EVAL MISMATCH
20	FINAL_EVAL_OCC	0X18	FINAL OCCUPIED EVAL MISMATCH
21	LINK_ERROR	0X20	LOSS OF CARRIER OR LINK OPEN
22	COMM_ERROR	0X21	CORRUPTION OF DATA PACKETS
23	CONFIG_ERROR	0X22	INVALID CONFIGURATION
24	DACFU_ADDR_ERROR	0X23	FIELD UNIT ADDRESS MISMATCH ERROR
25	SYNC_ERROR	0X25	DP UNABLE TO SYNCHRONISE
26	DIAG_ROM_TEST	0X30	ROM TEST DURING SYSTEM WORKING
27	DIAG_SERIAL_TEST	0X31	SERIAL PORT
28	LAST_NOP_ERROR	0X44	1 NOP DETECTION
29	RLY_CARD_NOT_PRESENT_ERROR_CONST	0X45	RELAY CARD NOT PRESENT
30	MSDAC_BLOCK_ADDR_ERROR	0X38	TRACK SECTION NOT CONFIGURED IN BLOCK MODE AND INVOLVE DP HAVING BLOCK MODE ADDRESS SETTINGS
31	CPU_RESET_CONST	0X41	WATCH DOG RESET ERROR
32	TRACING_ERROR_CONST	0X39	CORRUPTION OF SOFTWARE IN MICRO CONTROLLER.
33	TWO_ADJ_ERROR_CONST	0X3A	CPU STATUS MISMATCH WITH ADJACENT CPUs
34	PREP_SHUNT_ERROR_CONST	0X42	SHUNTING IN PREPARATORY RESET
35	CPU_SELF_RESET	0X55	CPU SELF RESET AT POWER ON

6.4.3. ERROR CODES OF SM PANEL

S. No	LEDs Display Indication	Error Description
1	OCCUPIED AND UNOCCUPIED LED GLOWS	RAM ERROR
2	ALL LEDs OFF FOR MORE THAN 1 MINUTES	CORRUPTION OF SOFTWARE IN MICRO CONTROLLER.
3	PREPARATORY AND LV LED GLOWS	ROM ERROR

CHAPTER 7

7. MONITORING UNIT

7.1. INTRODUCTION

The following chapter will help the users in understanding the usage of monitoring unit and get the information from central evaluator along with field units. The monitoring unit can be used by maintenance staff for maintenance purposes.

7.2. MONITORING UNIT

Monitoring unit is used to display the status of all the field units and track section status. It is interfaced with Central Evaluator Rs422 protocol. The data to monitoring unit is transmitted by EM08 card. Monitoring unit receives the details from EM08 and processed to display the same on LCD panel for easy

It displays the complete information of the field unit i.e. counts, address of the DP, contribution of the field unit in the required track section, health and error code with its description.

It displays the track section information, track status condition whether the section is healthy, unhealthy, occupied or Clear, Its Error code in case track section is unhealthy, Section balancing with offset value.

The information is displayed for each EM08 card on same Panel in different pages on a timely basis. The monitoring unit operates on 24V DC which it derives from Central Evaluator rack.

The context diagram is given below

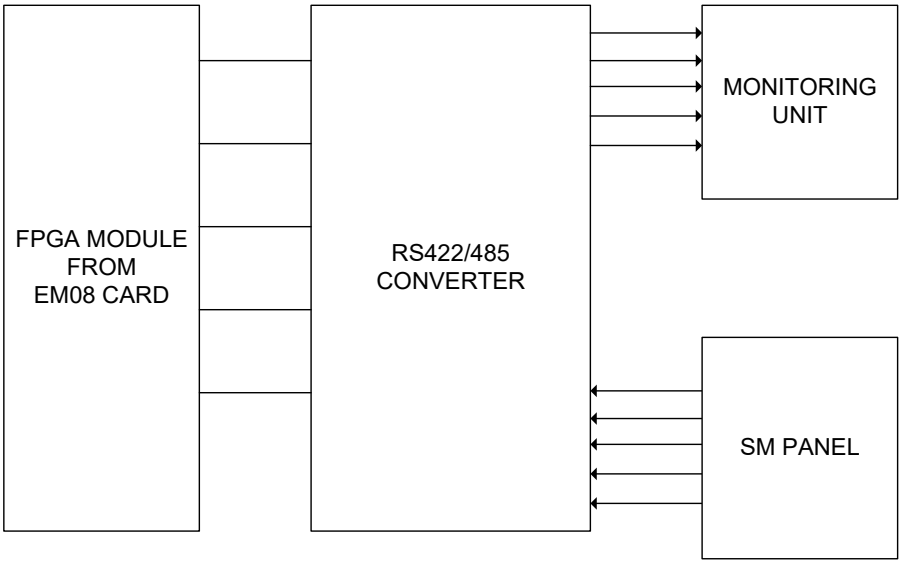


Figure 19: Context Diagram of Monitoring Unit

Each EM08 interacts on 4 wires with monitoring unit to send and receive the information. The transmission line of the EM08 card goes to Monitoring unit. The transmission line is used to send the reset command from the Monitoring unit during testing.

7.3. TECHNICAL SPECIFICATION

The technical specification of monitoring unit is given below

1. Processing Module

Features

- Microprocessor: running at 29.4 MHz.
- 52 parallel 5V tolerant I/O lines: 44 configurable for I/O, 4 fixed inputs, 4 fixed outputs.
- Two additional digital inputs, two additional digital outputs.
- External reset input.
- Alternate I/O bus can be configured for 8 data lines and 6 address lines (shared with parallel I/O lines), I/O read/write.
- Six serial ports: maximum asynchronous baud rate of 1.84 Mbps.
- Ten 8-bit timers and one 10-bit timer with two match registers.
- 256K–512K flash memory, 128K–512K SRAM.
- Inbuilt Real Time Clock (RTC).
- 10/100-compatible RJ-45 Ethernet port with 10Base-T interface.
- Two-channel Input Capture can be used to time input signals from various port pins
- Normal Operating voltage is 3.3V+/- 10%.
- Size: 1.85" x 2.65"” x 0.86" (47 mm × 67 mm × 22 mm).
- Normal Temperature Range is -55°C to +85°C.

2. Output/Display Module (4" Touch Screen)

Features

- SLCD6 Controller with 4" LCD TFT panels.
- Touch Controller (4 wire resistive) on board.
- Beeper for audible touch feedback and alarms.
- Low power (40mA typical at 5V).
- RS232 or TTL level interface up to 115200 baud.
- Backlight enable

3. Input Power Supply Module

Features

- Input supply 24V DC.
- DC-DC convertor module
    - OUT: 5V/3A
    - IN: 9~36V
    - Switching frequency 200 KHz
    - 1500Vdc input/output isolation
    - Output voltage Accuracy: +/-2%.
    - Short Circuit Protection : Continuous(auto-recovery)
    - Over load protection : >= 110% of full load.
    - Operating Temperature Range (Ambient) -40°C to +75°C.
    - Humidity : 95%
    - Dimension 1.0" x 2.0" x 0.4"

7.4. KNOW YOUR MONITORING UNIT

The back panel interface is given below

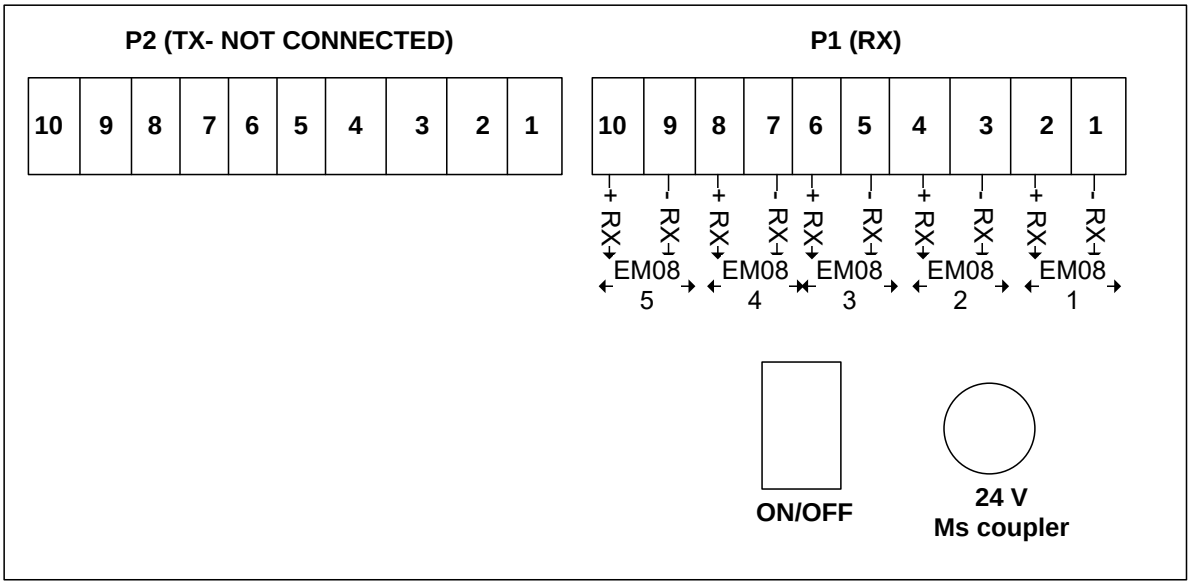


Figure 20: Rear View of Monitoring Unit

The front panel is given below



Figure 21: Welcome Screen of Monitoring Unit

The monitoring unit is supplied as a standard in the rack all the models of MSDAC.

7.5. INFORMATION DISPLAYED ON MONITORING UNIT

1. START UP MESSAGE



Figure 22: Start Up message

2. Press Configuration by pressing Configuration button on the keypad
3. Enter the station Name and No of EM08 cards
4. Press Start Monitoring

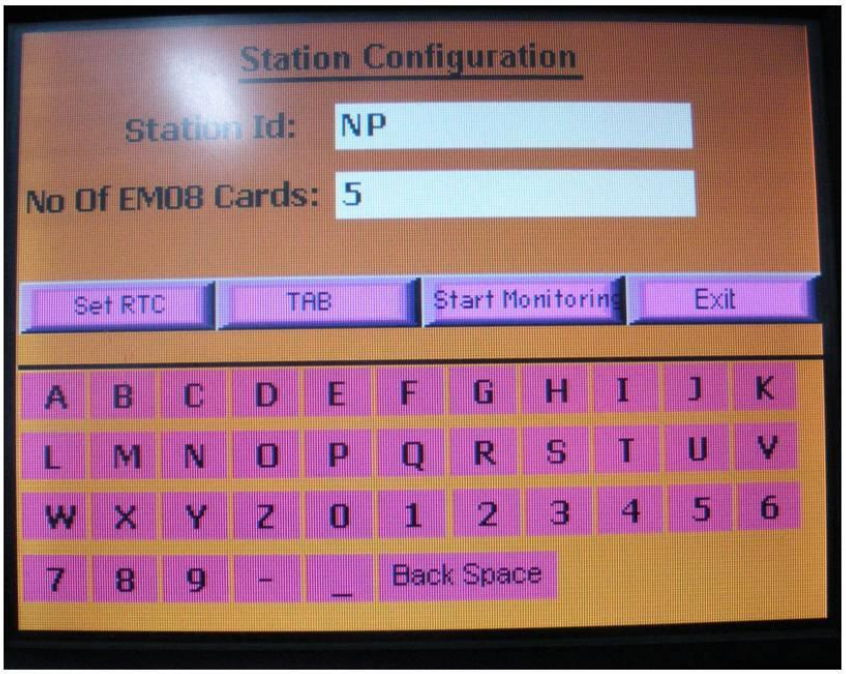


Figure 23:Feeding Station ID

5. The unit displays the configuration of each card

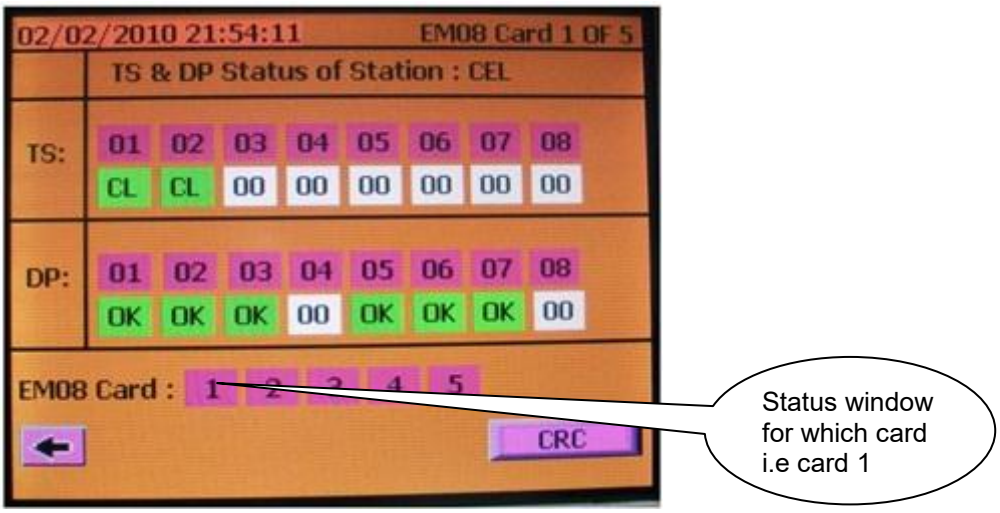


Figure 24 : Detail information of TP & TS status

6. In order to view the configuration of EM08 card 2 press 2 and similarly for card 3, 4, 5 if present.

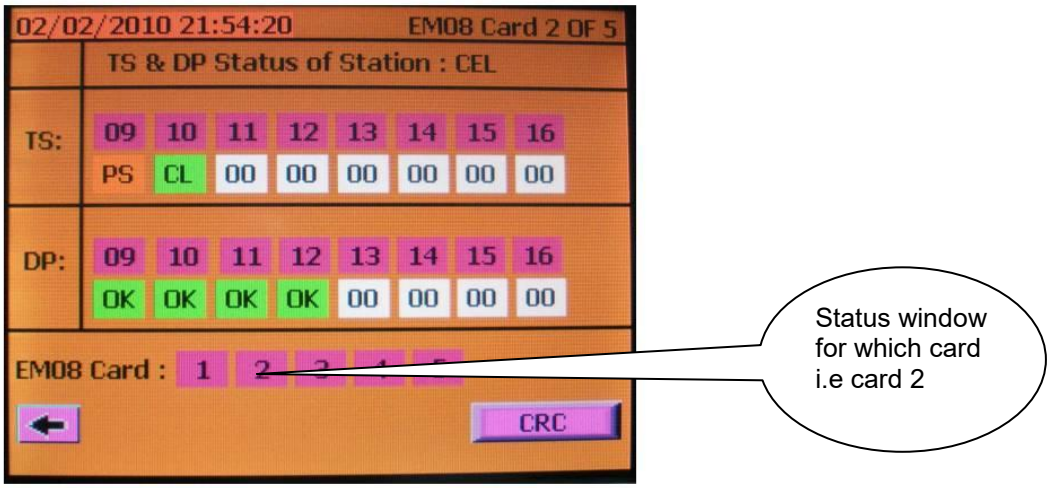


Figure 25: Displaying Status of card

2 The above shows that Section 09 is in Preparatory reset state

7. To view the track section status, press corresponding TS number (01 to 08)

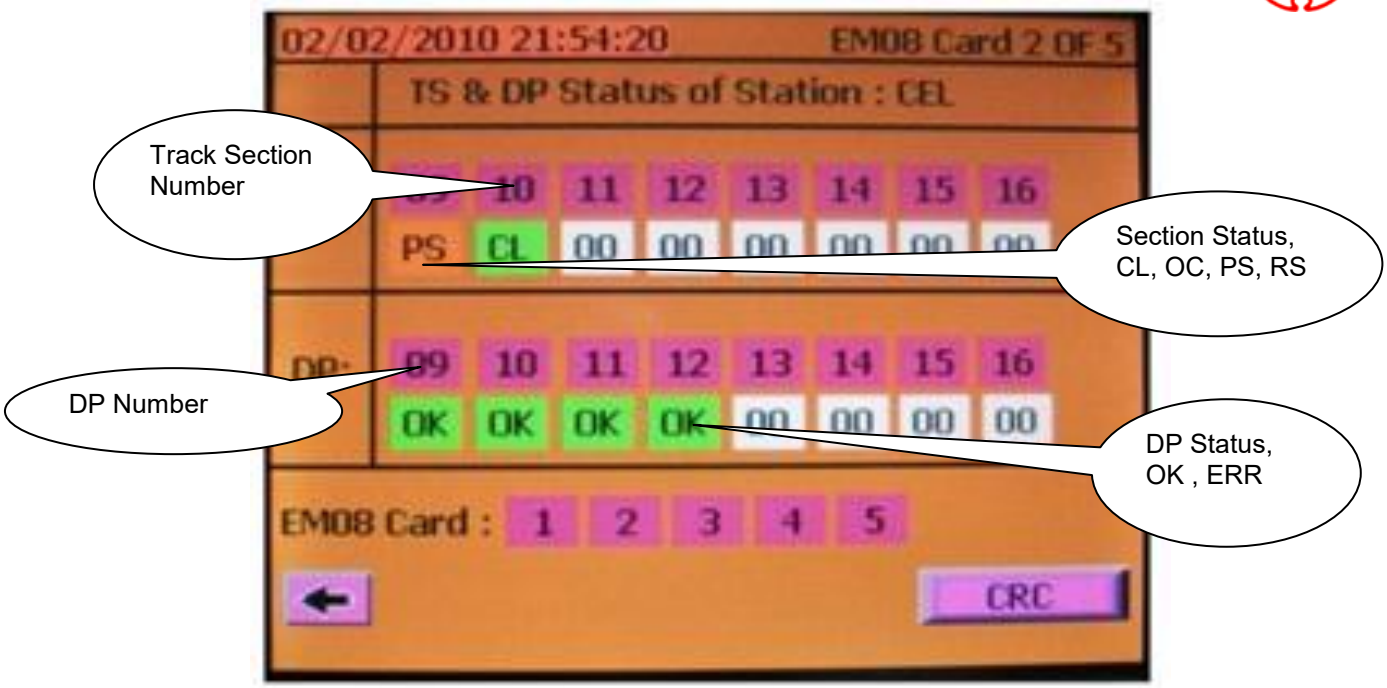


Figure 26 : Displaying Section Status

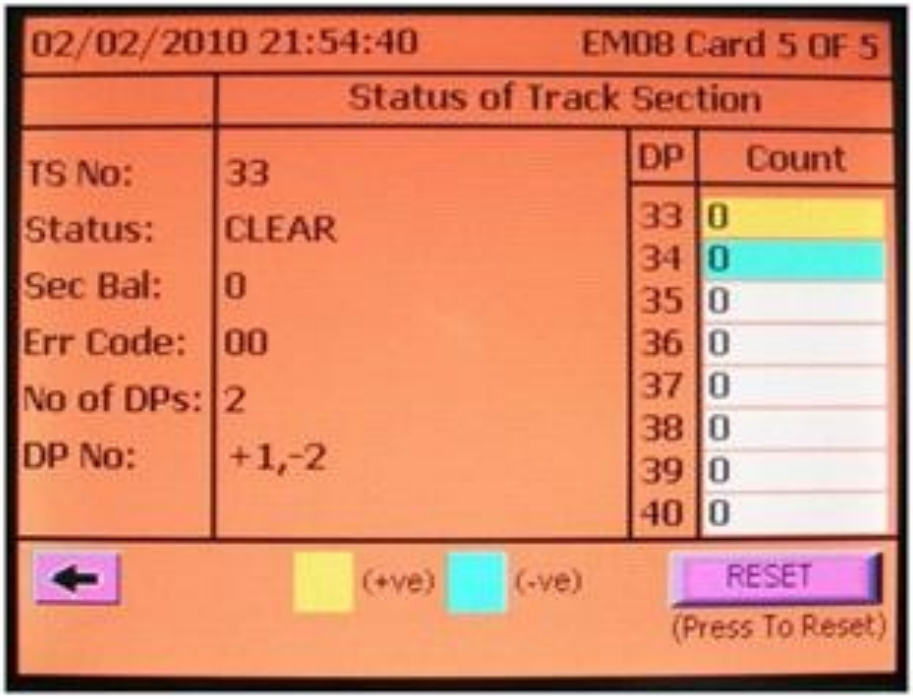


Figure 27 : Displaying Count information and Error Status

The above shows that Track Section No 33 is clear with 0 error code involving 2 DPs (DP1 & DP2) and counts of individual DPs. The contribution of each DP i.e. positive or Negative is also given in different colour.

8. To view the DP status press corresponding DP number (01 to 08)

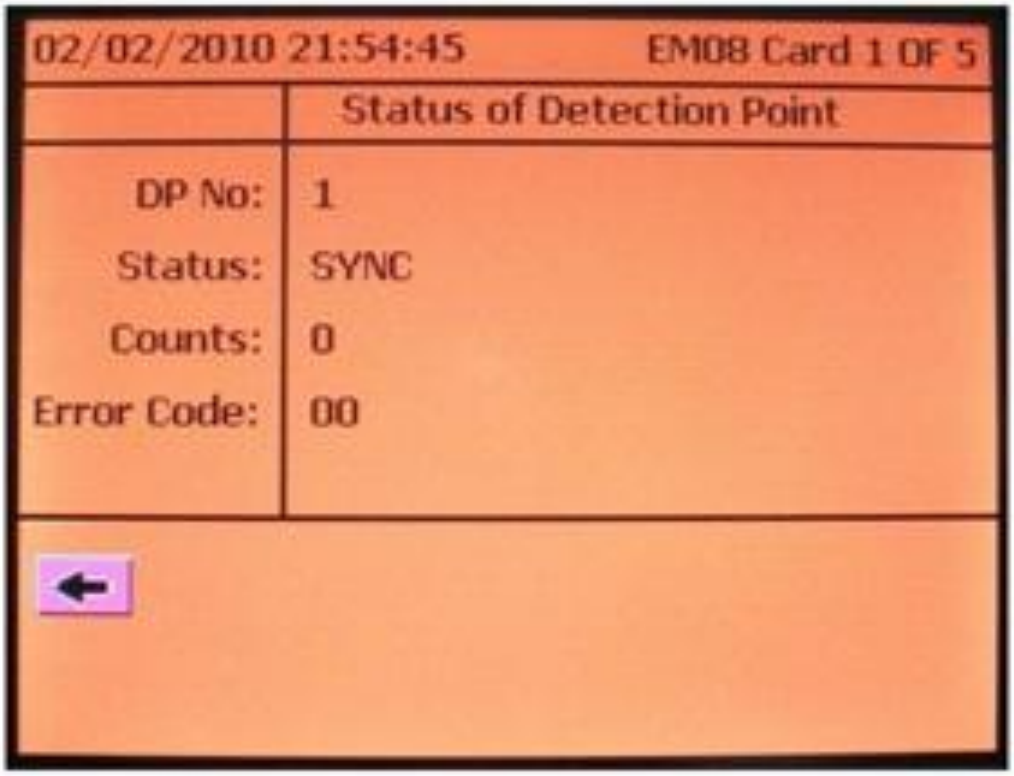


Figure 28: Status of DP

The above shows the status of Detection point 1 with 0 counts and no error and is presently synchronised with Evaluator.

9. To view the CRC of the software of EM08 cards press CRC



Figure 29: Displaying CRC

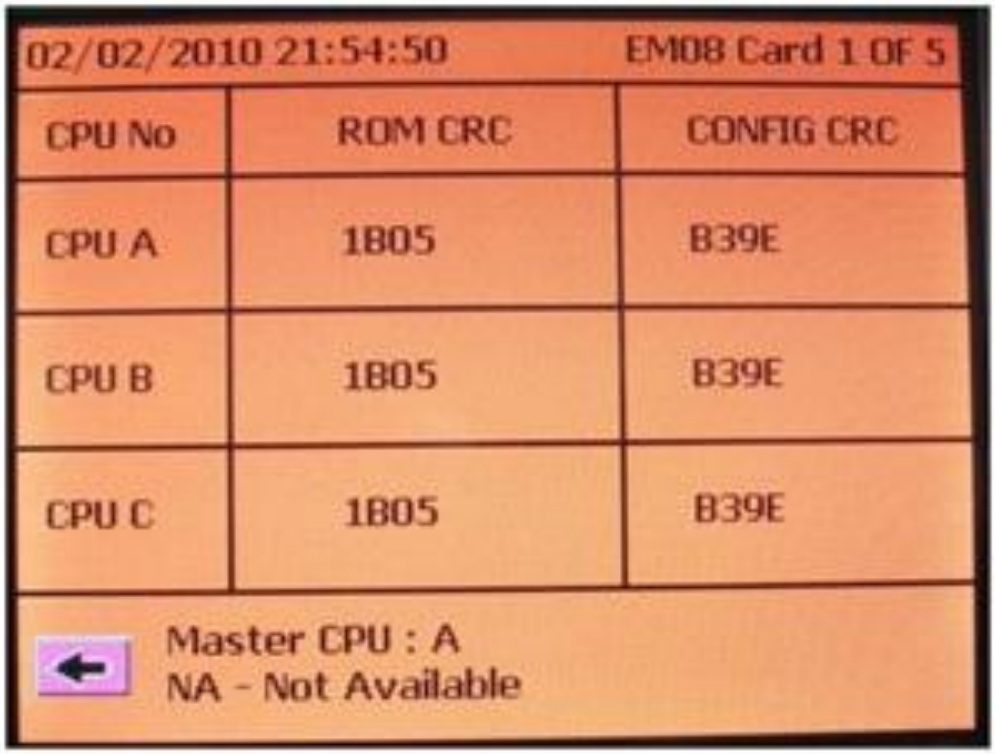


Figure 30: CRC of Software

10. To view the progress of the counting, press the corresponding status TS

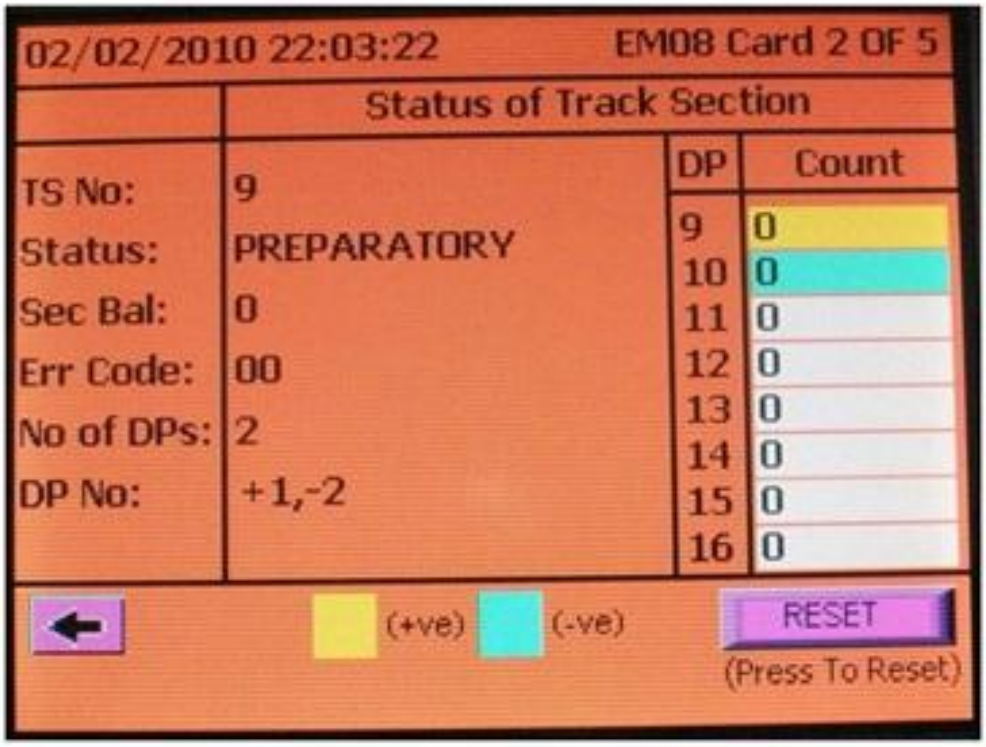


Figure 31: Progress of Counting

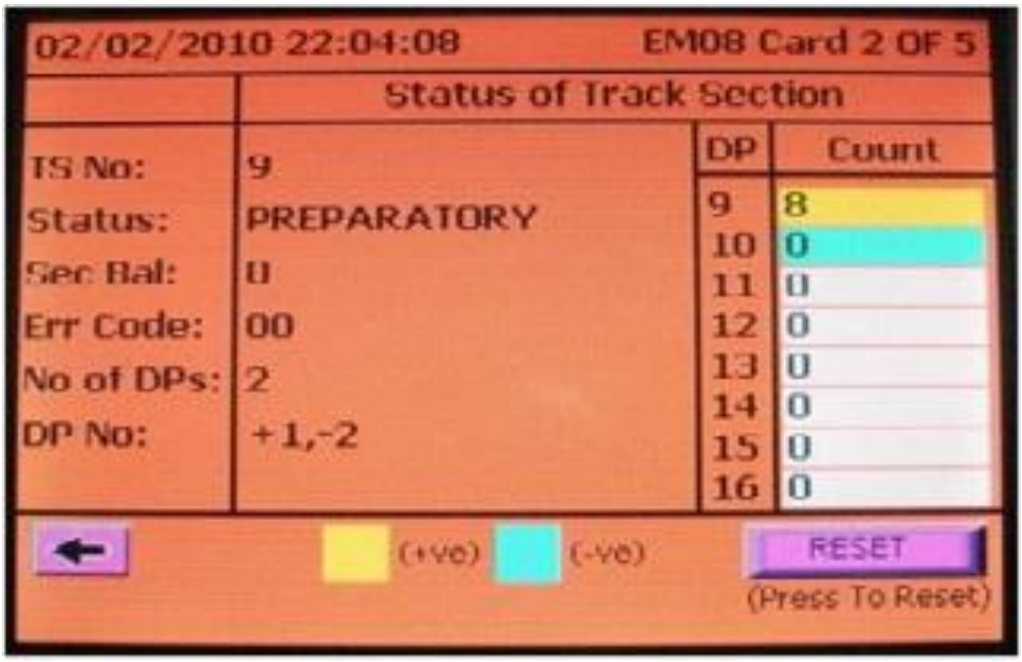


Figure 32 : Status of Track Section with Section in Preparatory

7.6. CONNECTION DIAGRAM

- WAGO Connector P2 (10-pin)

PIN NO.	CONNECTION
1	EM01 TX-
2	EM01 TX+
3	EM02 TX-
4	EM02 TX+
5	EM03 TX-
6	EM03 TX+
7	EM04 TX-
8	EM04 TX+
9	EM05 TX-
10	EM05 TX+

- WAGO Connector P1 (10-pin)

PIN NO.	CONNECTION
1	EM01 RX-
2	EM01 RX+
3	EM02 RX-
4	EM02 RX+
5	EM03 RX-
6	EM03 RX+
7	EM04 RX-
8	EM04 RX+
9	EM05 RX-
10	EM05 RX+

- POWER Connector P3 (Circular Connector 2-pin)

PIN NO.	CONNECTION
A	GND
B	24 V

CHAPTER 8

8. CONFIGURATION OF MSDAC

The following chapter will help the users in configuring the central evaluator as per the yard layout along with field units. This stage is to be performed one time by authorized personnel or by CEL engineers only. The data is configured and then needs to be validated by railways during the parallel working and commissioning.

8.1. CONFIGURATION OF CENTRAL EVALUATOR

DATA PREPARATION

It includes the conversion of yard layout requirement into track sections in effective way. This stage requires the study of all the train movements and requirements of railways to monitor the different portions of the tracks using axle counter.

The following information is filled in the sheet.

- Configuration Id of the station
- Number of track sections required
- For each Track section whether piloting is required or not, piloting required for atleast one field unit , piloting required for all the field units or piloting required for one Entry and one Exit field unit.
- Relay output is required or not
- And Direction of field unit whether positive or Negative.

This information is filled up as per requirement and is repeated similarly for each EM08 card.

INPUT DOCUMENTS – YARD LAYOUT

OUTPUT DOCUMENT – CONFIGURATION SHEET

DATA VALIDATION

The configuration sheet generated by the data preparation sheet will be verified independently by validation team with the yard layout.

INPUT DOCUMENT – CONGURATION SHEET & YARD LAYOUT

OUTPUT DOCUMENT – CONTROLLED CONFIGURATION SHEET

DATA CREATION

Once controlled configuration sheet is generated, the evaluator is configured by use of software utility by CEL engineer only. The configuration card is plugged out from the evaluator and is connected to the configuration terminal which is connected to the PC through a serial port.

Configuration card is required to be plugged out by switching off the power supply of the evaluator and plug the card in the configuration board. All the information from controlled configuration is filled up and the stored on the configuration card.

The configuration card is then read back and the stored configuration is verified with the controlled configuration sheet. Once it is verified the configuration card is plugged in the evaluator and it is switched ON. Kindly verify by using Dummy wheel basic train movement tests for all the track sections by giving incounts and outcounts. The details of the basic tests to be performed are given in the precommissioning checklist. Once these tests are cleared the configuration card is sealed. If there are some problems or configurations are done wrongly then repeat all the above steps again.

The configuration procedure can be divided into the following

Creating the configuration file which is to be loaded in the configuration cards.

Writing the configuration file into the configuration card.

Verifying the report generated by configuration

These steps are explained below.

STEP 1: Open the configuration utility installed in the PC.



Figure 33: Startup Screen of Configuration Application

STEP 2: Go to File>Select Port.

SELECTING THE COM PORT:

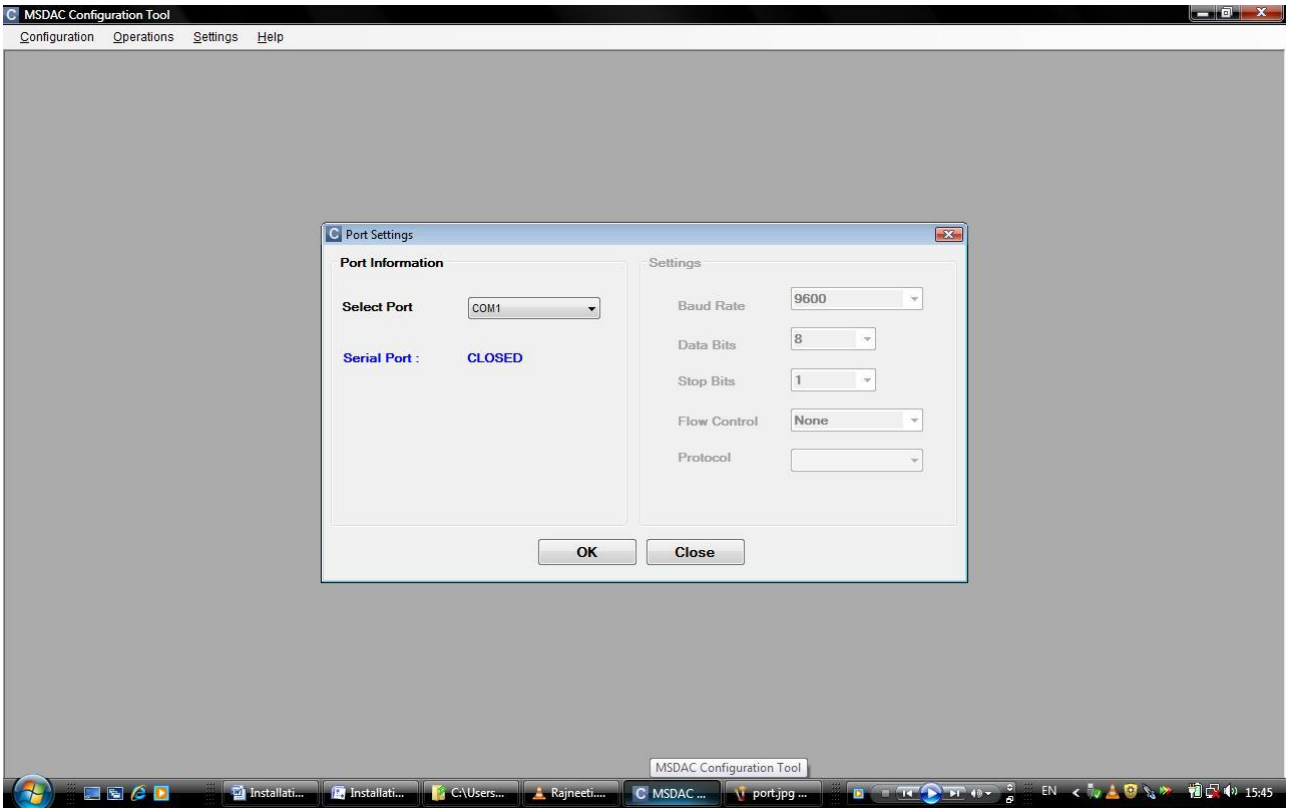


Figure 34: Selection of COM port

STEP 3: Select the required port and click OK.

8.2. DATA PREPARATION

8.2.1. CREATION OF CONFIGURATION FILE

STEP 1: For making a new configuration, go to Configuration>New Configuration >

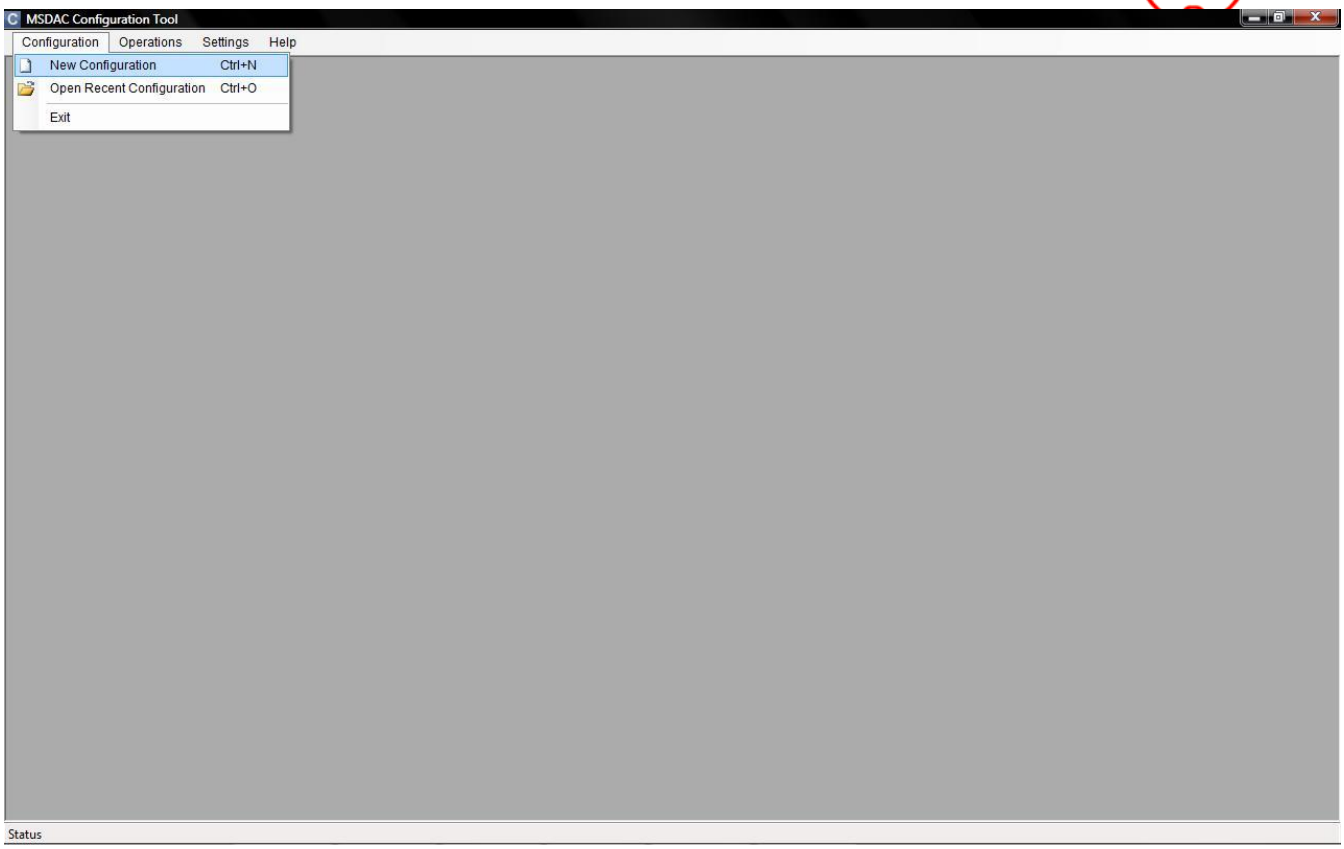


Figure 35 :Creating New Configuration

STEP 3: Give the ID of the station for the configuration is to be set (e.g., NDLS01) in the Station ID Field.

Select the number of track sections for card1. A maximum of eight track sections can be configured for one EM08 card.

Select the number of track sections per EM08.

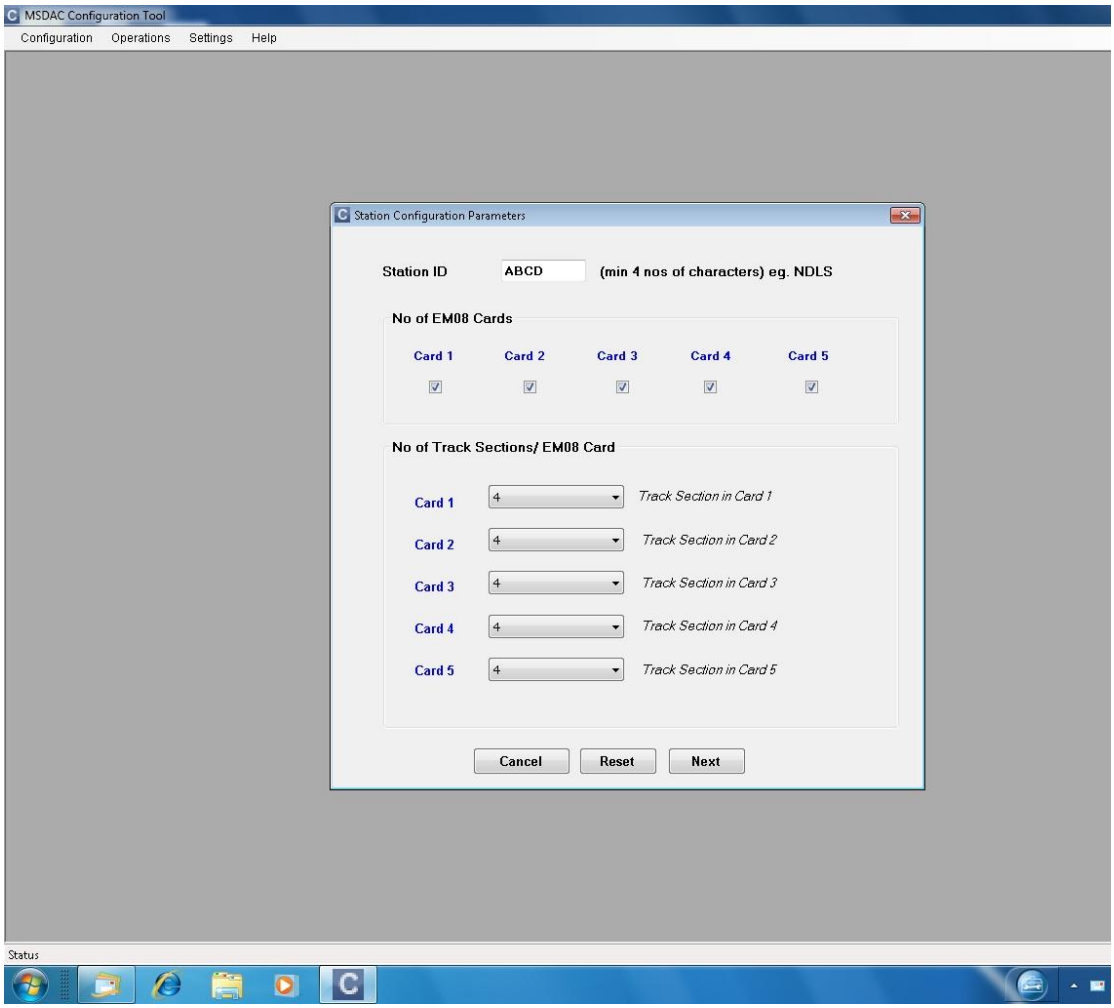


Figure 36: Setting up of parameters of Configuration

STEP 4: Select the EM08 card 1 and number of track sections output in EM08 card. Select from 1 to 8. As in the above screen shot it may be seen that all the EM08 cards has 4 track section output.

STEP 5: Click Next to configure each track section independently.

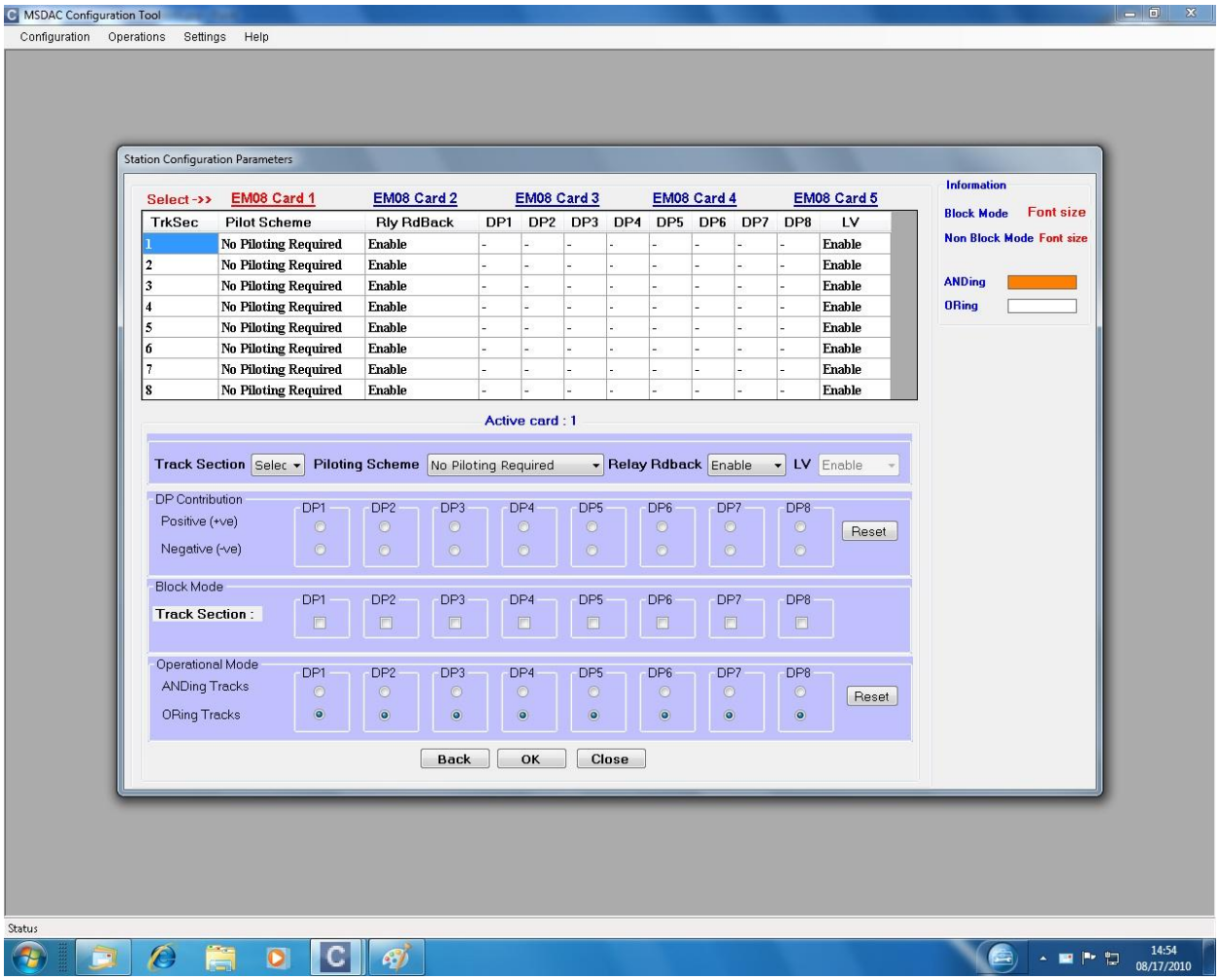


Figure 37: Configuring DP for track section

STEP 6: In the above window (obtained in step 5),**select the EM08 card to be configured**(from EM08 card 1 to EM08 card 5)

STEP 7:**Select Track Section number** that you wanted to assign as first track section. Select the piloting scheme. The piloting scheme has the following sub-options.

a) No piloting required: Piloting of train is not required.The track section relay is picked directly on successful reset of track section.

b) One Enter and one Exit: The train should be piloted from at least one DP (configured as Entry) to one DP (configured as Exit).

c) All Enter and all Exit: The train should be piloted from all DP's configured as Entry to all DP's piloted as Exit of the particular track section.

RECOMMENDATIONS:- As per rdso guidelines, the following configuration shall have the no piloting required with line verification. Track section configuration LIKE 3DP- 2 SECTION, 4DP – 1 SECTION, LADDER CONFIGURATION

STEP 8:- **RELAY READBACK**:- Default value is Enable. The relay is read back by evaluator and in case of any relay removal or high contact resistant of the read contacts, the relay read back error is generated.

STEP 9: **LV ENABLE/DISABLE**: - The default value for LV is enable for all the track sections set with piloting scheme as No piloting required. For track sections with preparatory reset feature will have this feature disabled.

STEP 10: DP CONTRIBUTION: To select contribution of DP as positive or negative. All the DP's from which the train Enters into the track section should be configured as positive and all the DP's from which the train Exits from the track section should be configured as negative.

STEP 11:BLOCK MODE : This option is to be selected if it is required to generate the relay drive voltage in specific DP at location itself. For this option you need to have relay driver card and vital relay box. Kindly order these spares along with the system.

STEP 12 : OPERATIONAL MODE: (ANDing or ORing) :- The default value selected is ORing for each DP. Let us suppose that the DP1 is a common DP of two track sections, say TS1 & TS2. With DP1 is also connected to VR. Now, there are two conditions to set the clear indication in VR. They are:

1. VR indicates clear status only when both TS1 **AND** TS2 get clear.
2. VR indicates clear status only when any one of TS1 **OR** TS2 gets clear.

In case 1, we use the ANDing operation on DP1 while in case 2, we select the ORly operation for DP1.

STEP 13 : REPEAT THE SAME FOR ALL EM08 CARDS AS SHOWN BELOW

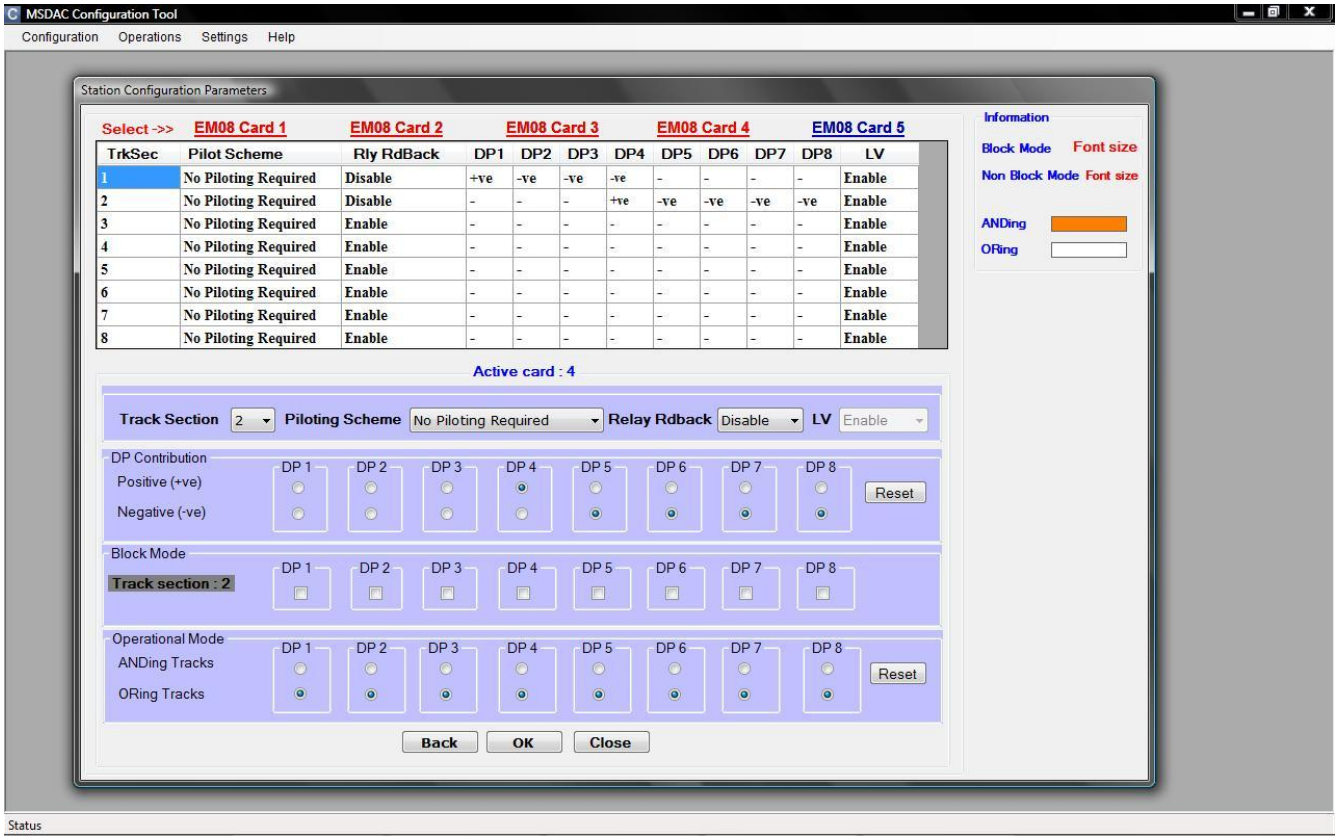


Figure 38 : Configuration of all EM08 cards

STEP 14: After configuring all the track sections for all the evaluator cards, click

OK

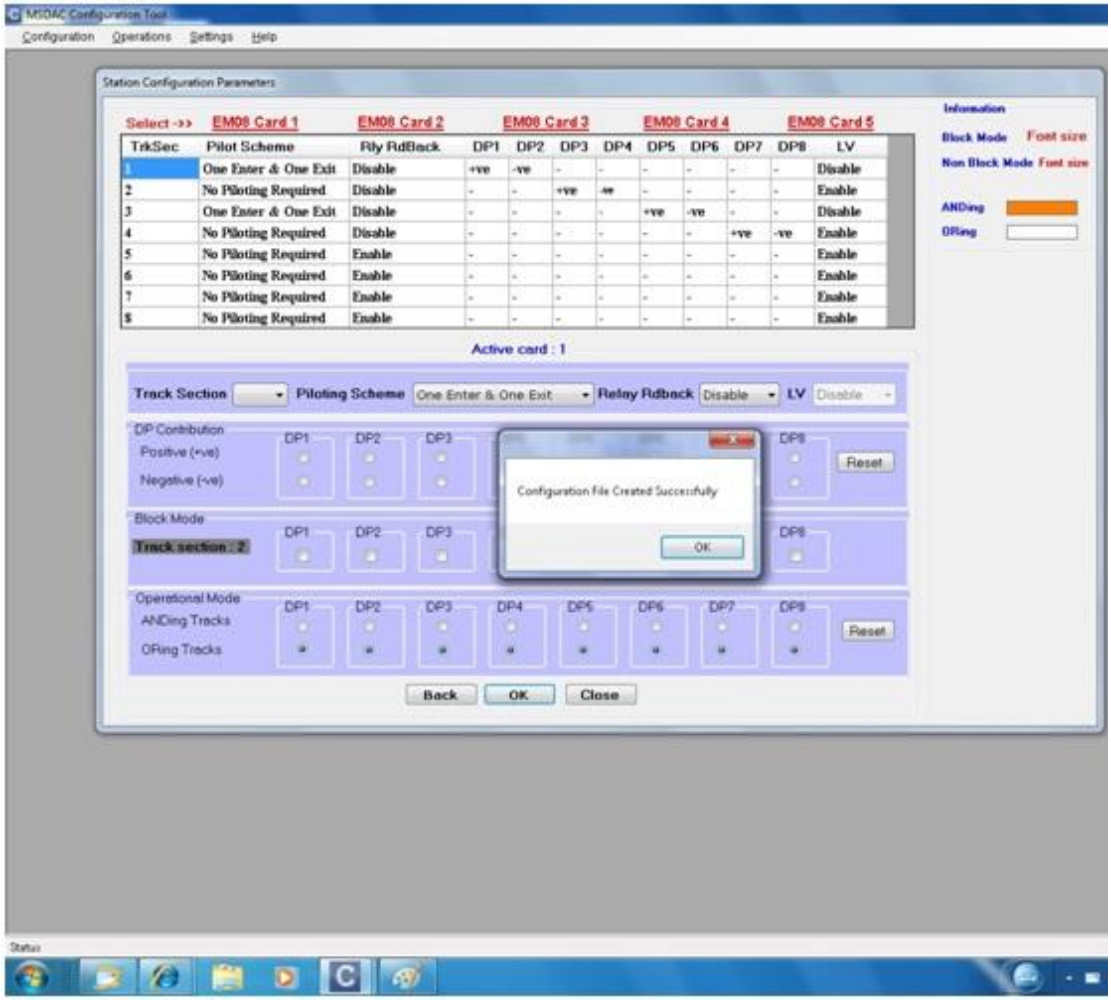


Figure 39 : Successfully Configuration Message

STEP 15: Once you received the message “CONFIGURATION FILE CREATED SUCCESSFULLY”, you will get the save dialog for saving the same in configuration report.

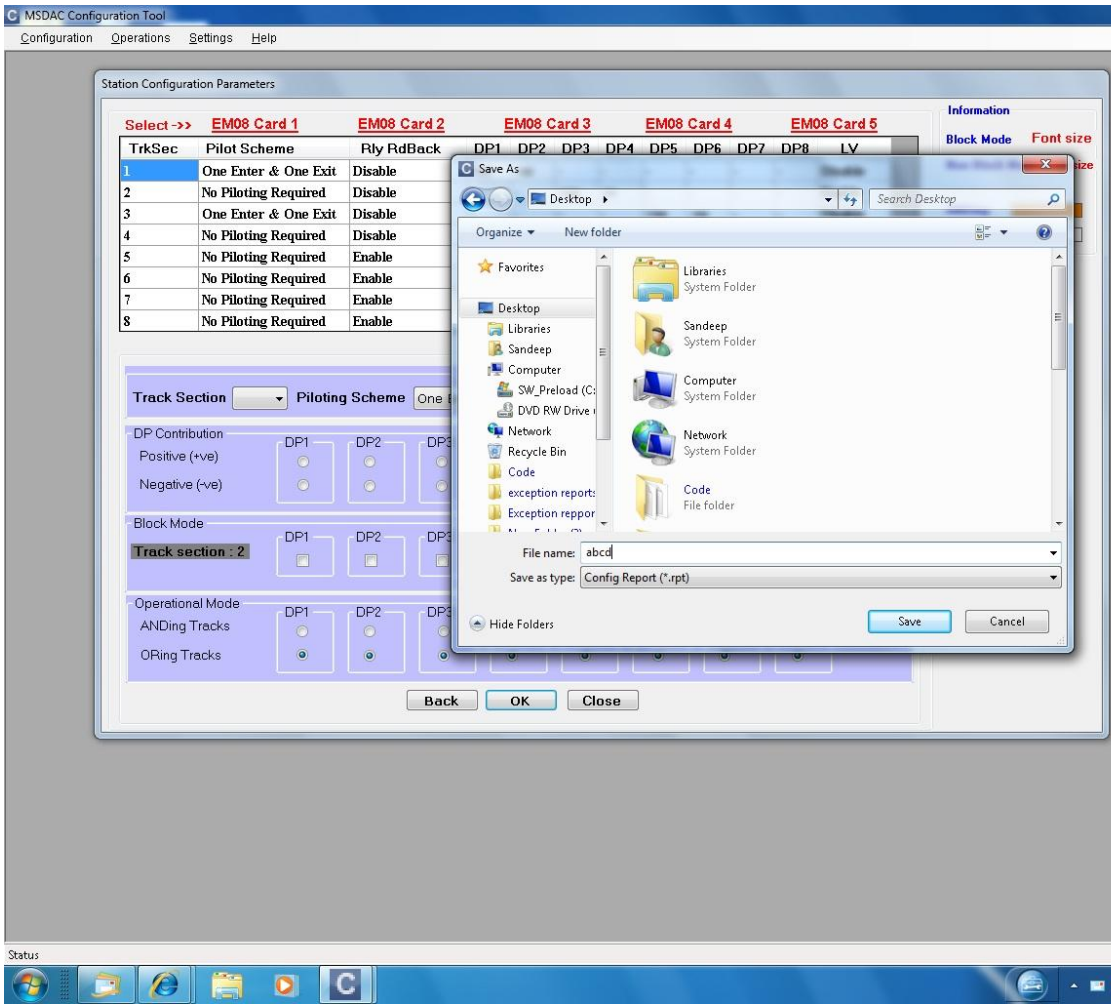


Figure 40: Saving Report File

STEP 16: Once the report file is generated the layout file dialog is open. Give the filename and save in default directory.

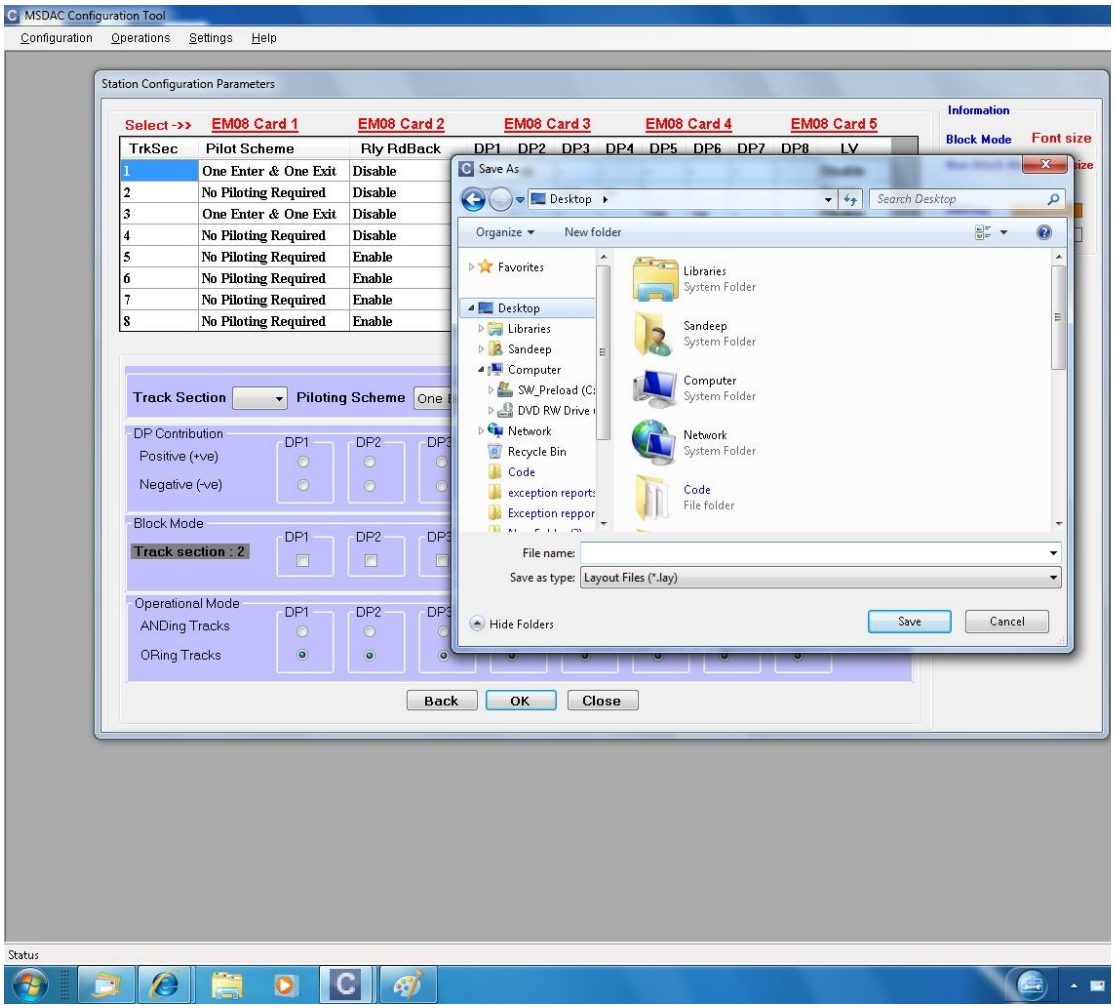


Figure 41 : Saving Configuration File

STEP 17: After giving the filename, click on the save and close the configuration chart window.

8.3. DATA VERIFICATION:

STEP 1:- Once the track section is configured, you can verifiy the same by opening the *.rpt file.

i.e. report file.

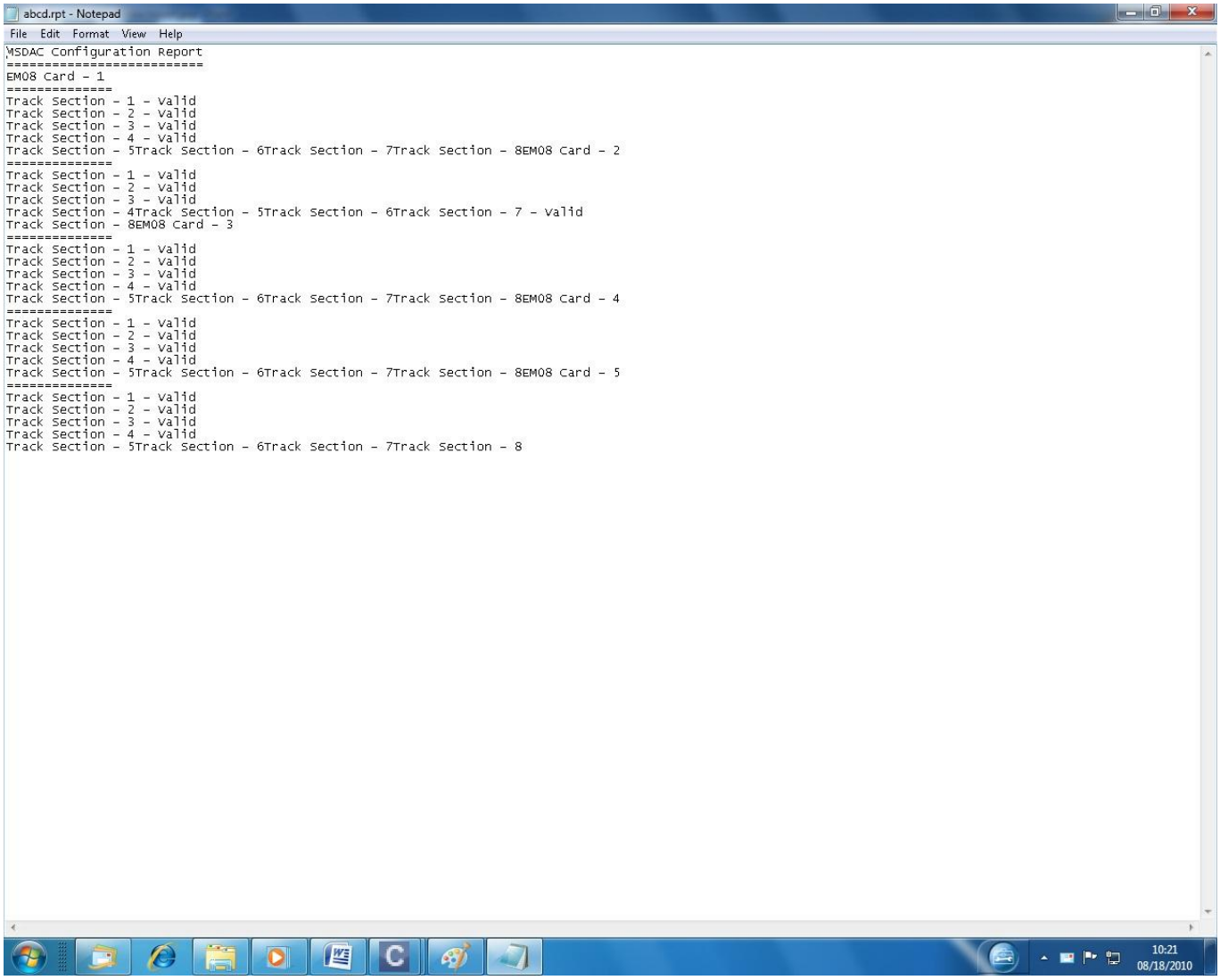


Figure 42:Viewing Configuration Report

STEP 2: Similarly the layout file generated by the system needs to be printed for record purposes with one copy to be kept in for record purposes with one copy for manufacturer and other with railways.To open the layout text file, open the file in notepad as shown below.

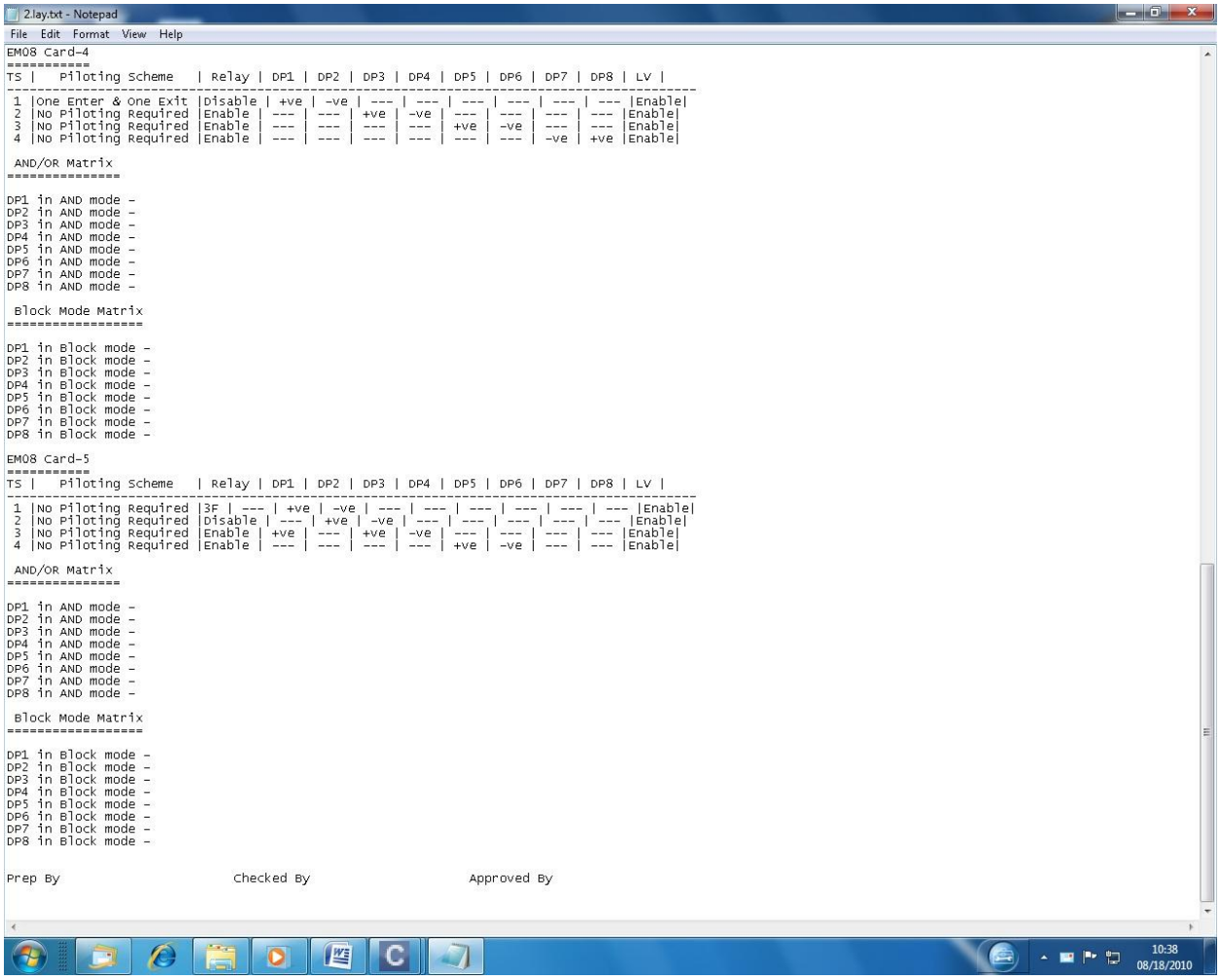


Figure 43: View data verification report

8.4. DATA CREATION

WRITING CONFIGURATION FILE TO CONFIGURATION CARD

To load the configuration file into the configuration card, you should have the configuration station. The configuration station is normally supplied as toolkit along with the equipment.

The configuration station is a subsystem that will be connected to PC using Serial interface in which the configuration card can be plugged in. The configuration station requires 24V for its operation. The following is a block diagram of the configuration station.

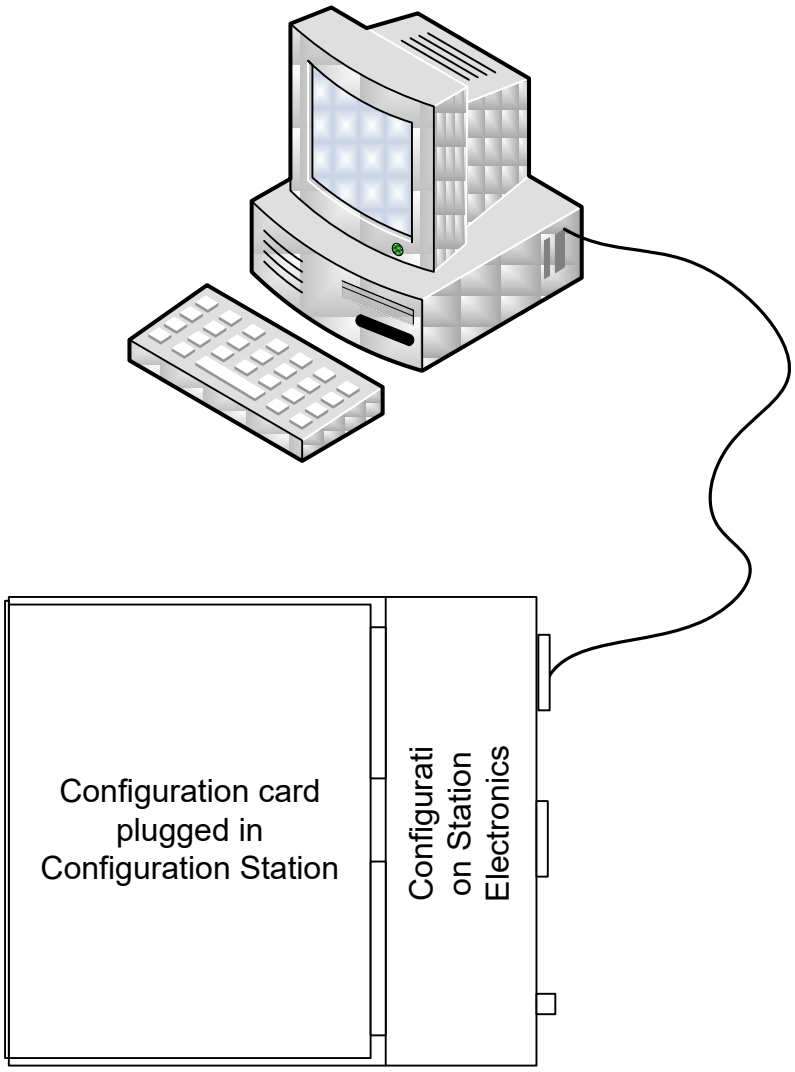


Figure 44: Setup of Configuration Terminal

Once the configuration station is connected follow the steps to write the configuration file into the configuration card.

STEP 1: Plug in the configuration card in the configuration station.

STEP 2: Connect the configuration station to the computer using serial cross cable.

STEP 3: Power ON the configuration station.

STEP 4: For loading a configuration file go to Operations>Write Configuration to Card.

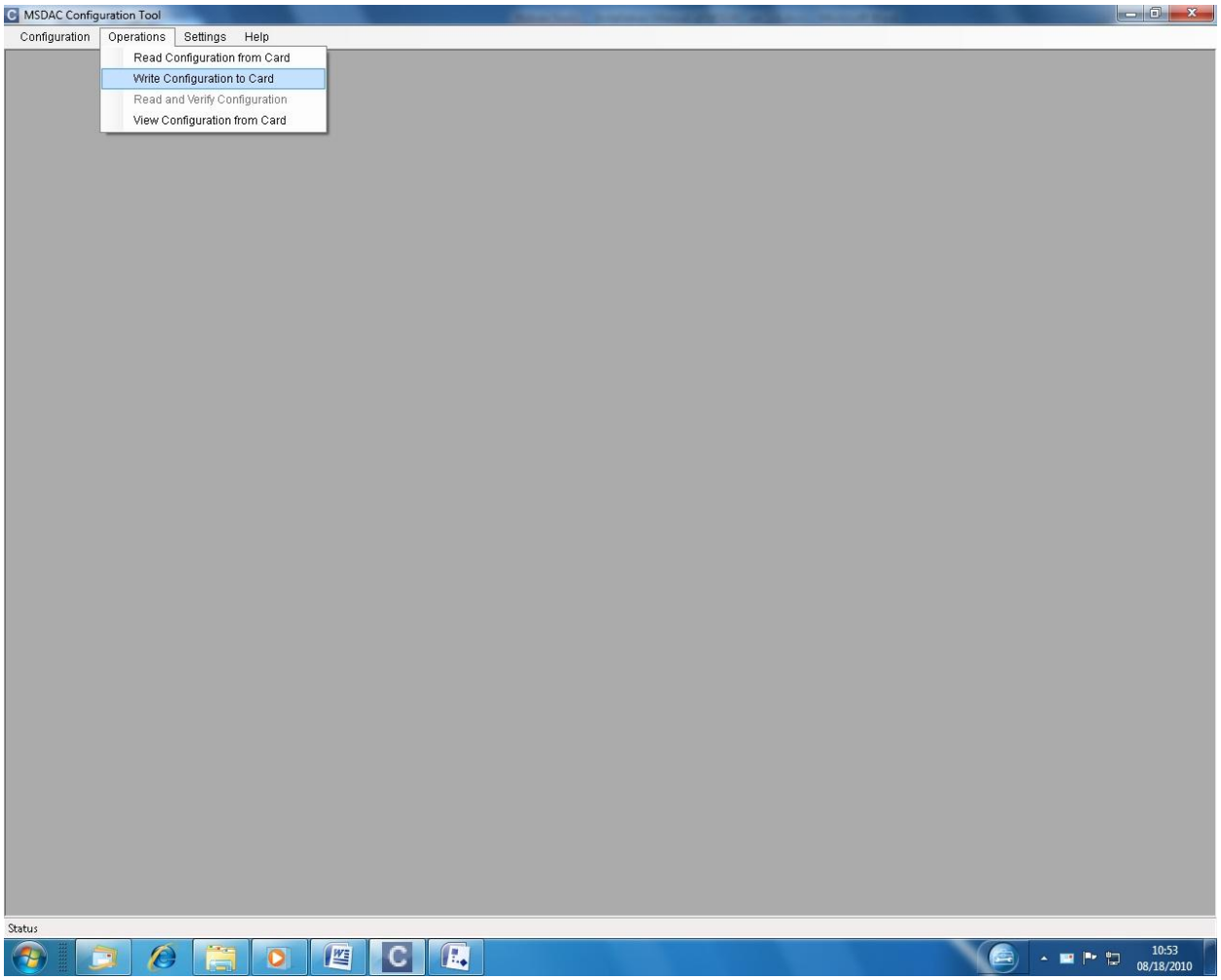


Figure 45 : Writing Configuration to Card

STEP 5: On clicking the option , we will be ready to write the configuration: -

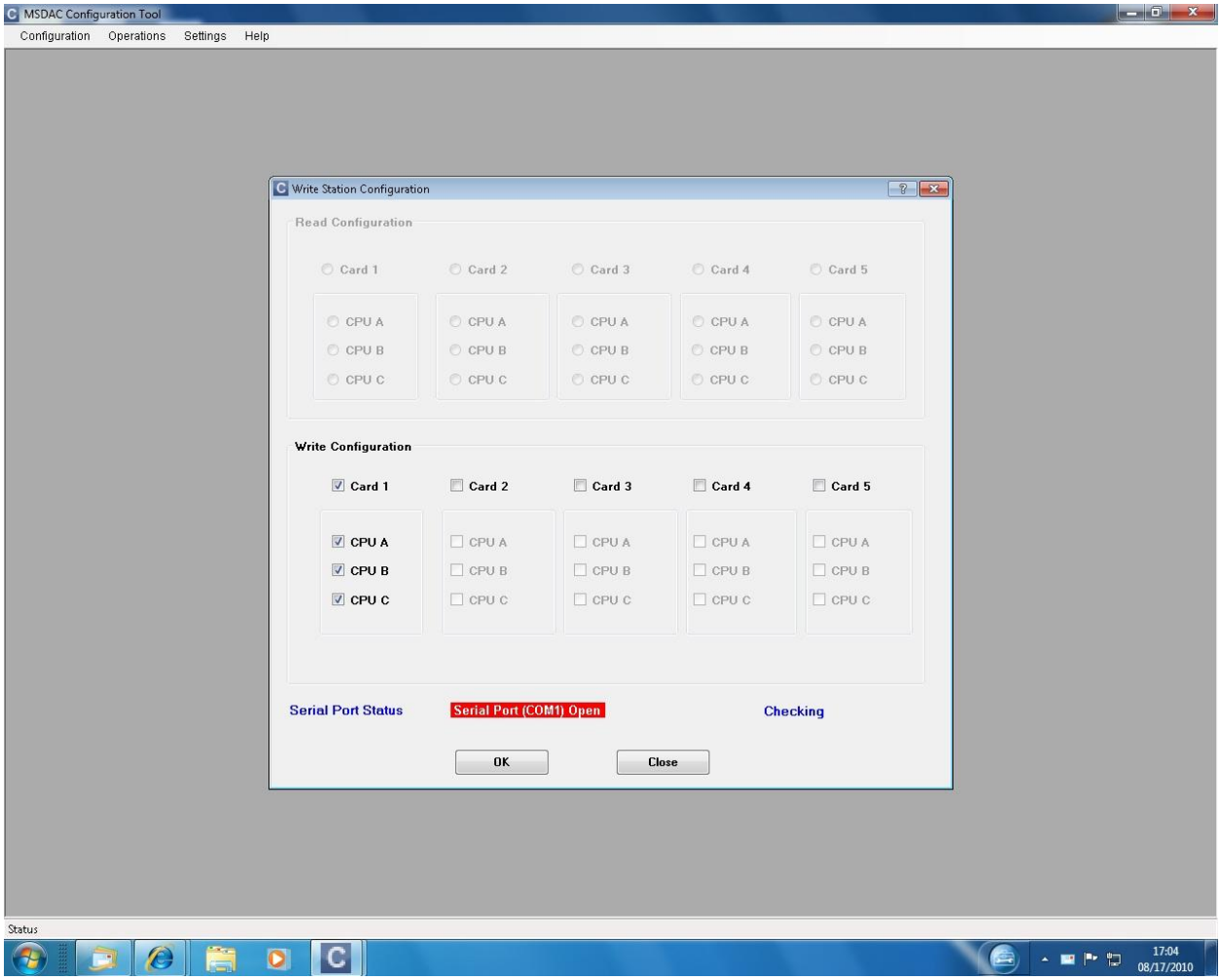


Figure 46 : Progress of writing of Configuration

The above window has the following options:

a) You can select all the em08 card for writing in all the 5 EM08 cards or you can select and pick the EM08 card for writing the configuration. Click in all the cards.

b) Send configuration: Opens the configuration file to be loaded in the Card

c) Write configuration from memory: Writes the opened configuration file into the configuration card.

STEP 6: The configuration station will verify the serial link and in case it is not present, you will receive the following message. Check the cable connection and rerun.

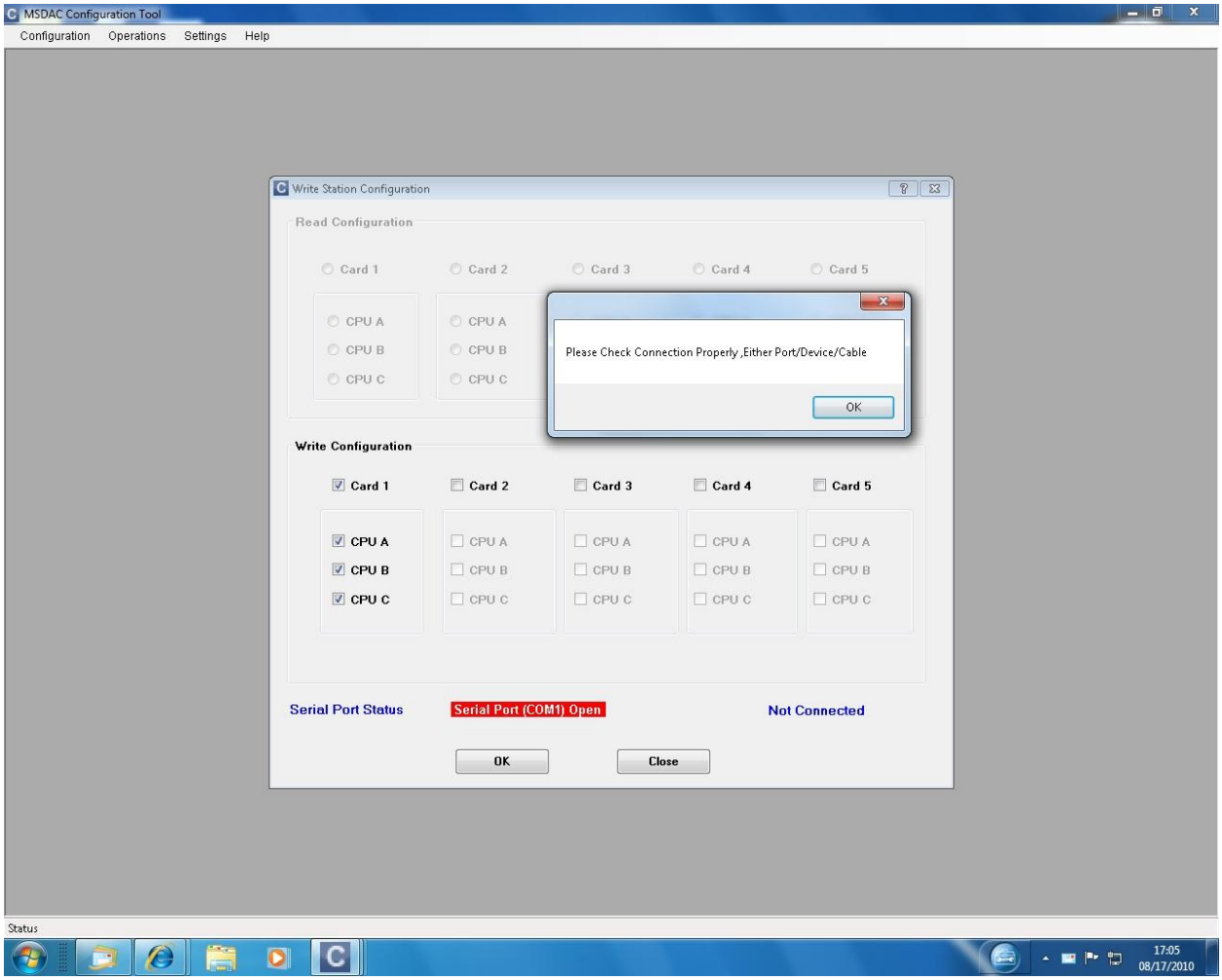


Figure 47: Message of Connection not found

STEP 7: Select the layout file (*.lay) and click ok.

STEP 8: The writing process will begin and the progress of the writing process is shown

8.5. OTHER FEATURES

8.5.1. READ CONFIGURATION FROM CARD

To view the configuration , you need to plug the config card from evaluator and plug it into the configuration terminal.

8.5.2. WRITE CONFIGURATION TO CARD

To write the configuration or to write the new configuration for new EM08 card, select this option. It will ask for the file name and then proceed as per the onscreen display of instructions.

8.5.3. VIEW CONFIGURATION FROM CONFIG CARD

To view the configuration that is configured in the card, plug the card in the configuration terminal and click on the option View configuration.

The application will read and will display the stored configuration.

8.6 EVENT LOGGER CARD

	TERMINAL	BAUD RATE
For data downloading	USER I/F	38400
For online Monitoring	SSI I/F	57600

CHAPTER 9

9. EARTHING

9.1. EARTHING OF FIELD UNIT

The earthing terminals are provided at the back plate of field unit.The DIN channel provided with WAGO connectors for terminations for earthing. These Earthing Terminals are to be connected firmly with earthing wire of 6.0 sq.mm with lugs and then should be terminated with the separate maintenance free earthing having value less than 1 ohm.

EQUIPMENT TO BE EARTHED

A Common Earth should be provided for filed unit at the outdoor

i. The Apparatus Case is to be connected to earth (the chassis of Field unit & PDCU along with Surge Voltage Protection Devices which will be mounted on DIN rail connected to apparatus case).

ii. Metallic sheath and armouring of all the underground main cables are to be earthed

   a. The metallic sheath and armouring of main telecom cables are earthed at both ends.

   b. The armouring of jelly filled cable shall be earthed at both ends.

iii. The Earthing shall be provided at every location box where cables are terminated.

GUIDELINES FOR EARTHINGS

Where the earthing arrangement for other equipment is required in railways, the distance between earthing electrodes shall not be less than 2m.

The Earth leads for separate earthing arrangements should be electrically insulated from each other throughout and also from metallic structures in contact with the different earthing arrangements.

The minimum clearance of equipment earths provided by the electrical department (RE) of the Railways or of the other administration should be 20 meters away from SSDAC Axle Counter earth.

The earth wire should be soldered to the screen/armouring and securely connected to the earth electrode.

MAINTENANCE AND TESTING OF MAINTENANCE FREE EARTHS

I. All earth connections should be examined at an interval of not more than one month, to ensure that all connections are intact and soldered joints are in proper condition.

II. Resistance of every earth should be measured at an interval not exceeding one year. Earth Resistance, date of last test and location of earth should be entered in the register/ signal failures register. Earth resistance and date of testing should also be painted on the wall of a nearby structure post at a convenient place.

9.2. EARTHING OF EVALUATOR RACK & CT RACK

i. The earth connections provided in the MSDAC Rack should be properly earth using wire 6.0 sq. mm with lugs connected to separate maintenance free earthing having value less than 1 ohm.

ii. The screens/shielding of cables used for modem connections is recommended to be connected to rack and should not be loose.

iii. The CT rack is also required to be earthed. The earth connections of all the PDCUs may ve terminated on the CT Rack.

9.3. EARTHING OF SM'S PANEL

i. The earth connection provided in the SM's Panel should be preoperly earth using wire 6.0 sq. mm with lugs connected to separate maintenance free earthing having value less than 1 ohm.

ii. The screens/shielding of the cables used for terminations is recommended to be connected to this earth.

CHAPTER 10

10. COMMISSIONING

10.1. PRE-REQUISITES

10.1.1. The axle counter system has been installed as per the yard layout submitted by the railways.

10.1.2. The installation has been checked as per pre commissioning checklist and after thorough inspections have been carried out jointly with railways and signed and no deficiency has been observed or if observed has been corrected.

10.2. CONFIGURATION CHECK

10.2.1. The final checking of configuration sheet along with the complete field unit addressing has been carried out.

10.2.2. The configuration sheet has been certified by Railway Authority and signed by the CEL authorized personnel.

10.3. TESTS TO BE PERFORMED

The following tests are to be conducted whenever the MSDAC has been newly installed or the yard layout has been modified. The following needs to be done for each field unit and each track section.

10.3.1. CONFIGURATION TO BE CHECKED – The configuration sheets is required to be verified along with the details by using configuration terminal.

10.3.2. NORMAL TRAIN MOVEMENT TESTS – By using Dummy Wheel, each field unit that is connected by sending the counts in the direction of train movement and verifies the corresponding track section output is CLEAR and SM's reset panel display the same track section output as CLEAR. Move the Dummy wheel to generate some in counts to bring the corresponding track section as OCCUPIED. The status of the same track section shall be displayed as OCCUPIED on Reset Panel. The counts shall be verified on the monitoring unit.

10.3.3. RESETTING A TRACK SECTION – Bring the track section under tests to failure mode by removing the modem link and restoring the link. Extend the voltage from SM Reset Panel and by pressing the LV Box verify the LV indication of Track section under test. Yellow indication shall be displayed. Now Apply the Reset by pressing

the reset button. Verify for track section status after successful completion of reset.

10.3.4. RESETTING THE FIELD UNIT – Bring the field unit under tests into error by influencing single channel twice. Repeat the reset procedure and verify the resetting takes place at the field unit.

10.3.5. OPERATION OF COMMON FIELD UNIT – Send in few in counts by using Dummy wheel to a common DP in a proper way and verify both the track sections are OCCUPIED when train touches the common DP and Shows as CLEAR when count balances at the other end.

10.3.6. PREPARATORY RESET STATE – The track sections under hard resetting and preparatory reset should be marked and verified and notified to the operating staff during the testing.

10.3.7. **TESTS WITH TROLLEY –** The tests may also be conducted by moving all possible types of motor trolley and push trolley before commissioning and results of the same may be attached along with the commissioning test reports.Drawings of approved Trolley wheel is as shown in Drg. No. P008697.

10.4. TRAINING

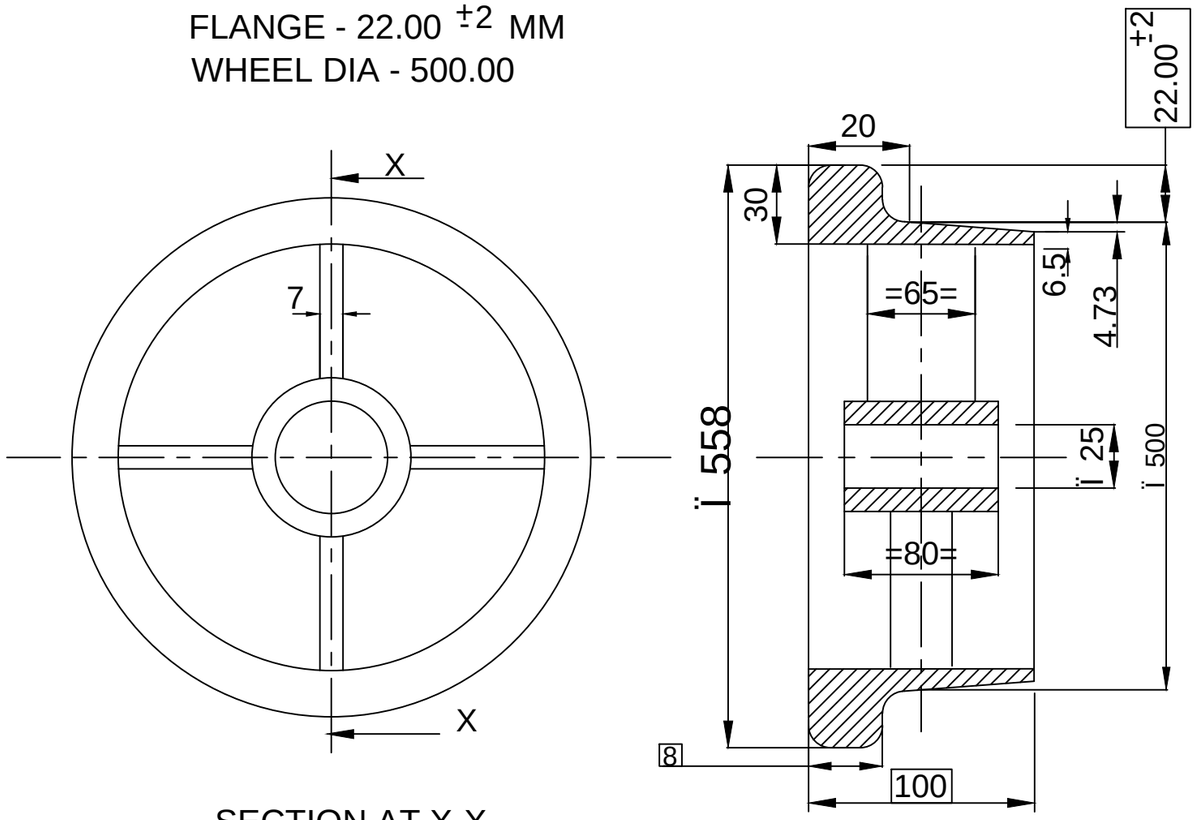
Ensure the training to the staff of operating, maintenance & installation has already been provided before the commissioning and the certified by the railway authorities. The copy of reports of the complete commissioning activities has to be submitted to CEL and RDSO for record purposes.

10.5. COMMISSIONING TO BE CARRIED OUT AFTER PARALLEL WORKING

The copies of final wiring diagrams and rack wiring diagram may be kept in secured place for future maintenance purposes. All the normal procedures as per Railway requirement are also to be performed for commissioning.

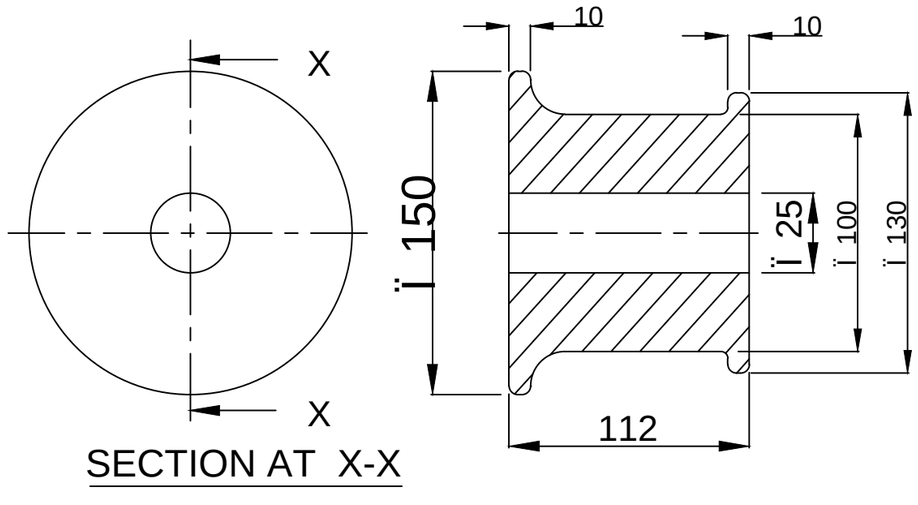
1. PUSH TROLLEY (4 SPOKE)

FLANGE - 22.00 $^{+2}$ MM
WHEEL DIA - 500.00



SECTION AT X-X

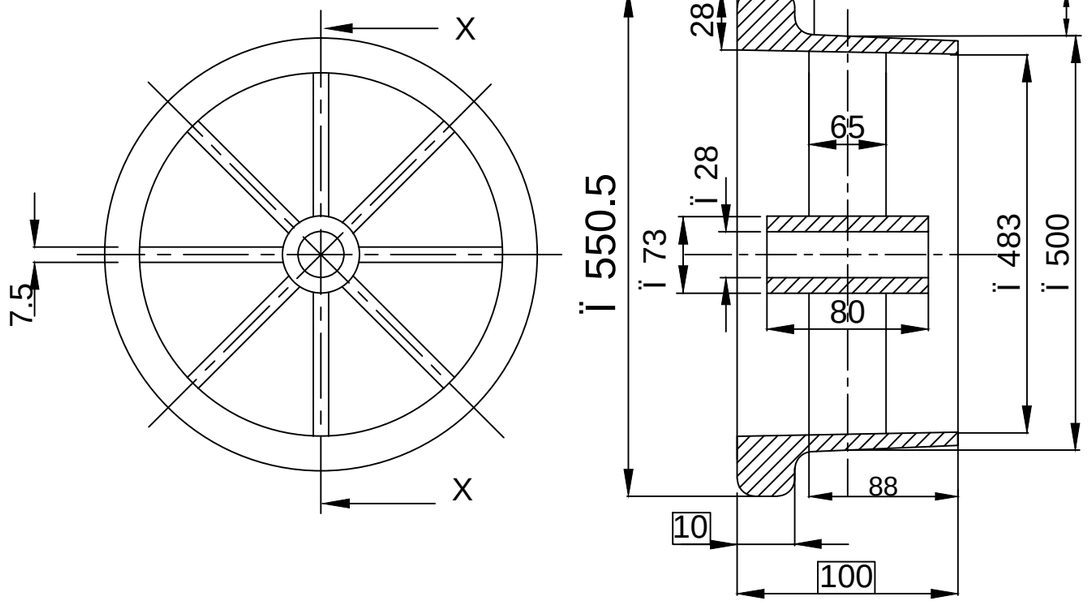
2. RAIL DOLLY SOLID WHEEL
FLANGE - 25mm
WHEEL DIA - 100.00



SECTION AT X-X

3. PUSH TROLLEY (8 SPOKE WHEEL)

FLANGE - 22.00 $^{+2}$ MM
WHEEL DIA - 500.00



SECTION AT X-X

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.

GEN TOL.
FULL FIG =
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	SHASHI BHUSHAN	21.04.2012
CHECKED		
APPROVED		

MATL M.S. ALLOY. | DIM M.M. | NO.OFF 01
FINISH | SCALE N.T.S.

PROJECT
R.D.S.O.

TITLE
TROLLEY WHEELS

DRG.NO. POO8697 | REV.NO. 0 95 | SHEET NO. 1

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SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

CHAPTER 11

11. MAINTENANCE SCHEDULE (MONTHLY)

11.1. TX & RX COIL AXLE DETECTORS (At site)

i. 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%.

ii. 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%.

iii. Check the M12 Bolts & Nuts of web mounted TX & Rx coil Axle detectors. All the nuts should be in tight condition.

iv. Check and tighten the deflector plates if found loose.

11.2. FIELD UNIT (At site)

i. 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.

ii. 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.

iii. The modem card output should be measured and recorded. The reading should match with the previous readings

iv. Check the relay driver output and it should be >20 V DC. This reading is recorded.

v. Ensure that screws of modules are tight.

vi. Ensure that MS circular connectors are tight.

11.3. POWER SUPPLY (Battery Room & Site)

i. The 24V DC power supply should be measured and recorded. The 24V DC should remain within specified limits.

ii. Inspect the battery charger and check its charging current and ensure it is properly charging the battery.

iii. 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.

11.4. INSPECTION OF SM'S RESET PANEL (SM's room)

i. Monitor the reset box while the train is occupying the section. The occupied (red) LED should be glowing.

ii. When the train clears the section, the clear LED (green) glows.

iii. The Reset to the system is controlled through the key actuator & Reset button of reset box. This should not be disturbed.

iv. The LCD displays all the information regarding the system as given in Chapter 13.

11.5. GENERAL

I. Check all the cable connections on the CT board of apparatus case at both locations. Ensure that these are in tight condition.

II. Check the deflector plates of the Axle detectors are in normal position. If found loose this should be properly tightened.

11.6. REPAIR OF FAULTY CARDS

i. Before declaring any card is faulty, the fault should be analysed and confirmed.

ii. 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.

NOTE :

i. Load requirement from 24V I/P supply for each DC-210 is 10A.
ii. Load requirement from 24V I/P supply for each evaluator,SM Panel,Monitoring Unit &Relays is 5A.

FUSE RATINGS

i. 10A fuse for DC-210
ii. 5A for Evaluator
iii. 2A for SM Panel
iv. 2A for Monitoring Unit
v. 2A for Relays

CHAPTER 12

12. DO'S AND DON'TS FOR MULTI SECTION DIGITAL AXLE COUNTER

12.1. DO'S

i. 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.

ii. Ensure that Receiver and Transmitter coil cables have been laid in different pipes.

iii. Ensure that both the TX coils & Rx coils are having proper alignment on Rail.

iv. Ensure that packing of sleepers with ballast on both sides of Axle detector is proper.

v. Check that metal sheaths of the outdoor cable are connected to earth at both ends

vi. The recommended cables for wiring of the system at site should be used.

vii. The steady Battery voltage 24V should be maintained.

viii. The cable connections should not be connected loosely.

ix. The M.S Circular connectors of SSDAC are checked and maintained firmly.

x. The SSDAC & Reset box is provided with sealing arrangement. They should be sealed at site.

xi. Resetting should be done only after ensuring that there is no train in the section

12.2. Don'ts

i. Don't install the Axle detectors near the rail joint (should be more than 6 sleepers away).

ii. Don't install the Axle detectors where the rail is badly worn out.

iii. Don't cut or join the Transmitter / Receiver cables supplied along with the coil. It would result in change of frequency of signal.

iv. Don't lay the TX and RX coil cables in the same pipe.

v. Don't use any other outdoor cable other than the recommended cables.

vi. Avoid installing the Axle detectors on curve of rail / too much slope of rail to the possible extent.

vii. Don't remove the cards from SSDAC units under power ON condition of system.

viii. Remove card if necessary after Switching OFF the power to the unit.

ix. Donot remove Tx/Rx Coil from web of the rail without switching OFF power Supply to DP/FU.

x. Donot place any metal parts, Rails, metal sheets or metal foils near Tx/Rx coils.
if required metal parts shall be placed at least half meter away from energised Tx/Rx coils.

CHAPTER 13

13.0 TOOLS AND SPARES

The following tool kit and spares may be procured separately for installation and maintenance.

13.1 TOOL KIT:

1	Pure sine wave Digital multimeter make Fluke model 287/ Rishabh model 285 or 6016, Kusum Meco model 859CF or Equivalent	1 No.
2	Dummy wheel (as per Drg No. L007750A3, D14)	1No.
3	Ring spanner 17-19, 24-26	1 No. each
4	Open end spanner 17-19, 24-26	1 No. each
5	Socket spanner with handle	1 No.
6	Torque wrench (Jaicom JPR65 or equivalent, 88NM)	1 No.
7	Screw Driver No. 902	1 No.
8	Screw Driver No. 935	1 No.
9	Marking Jig for drilling (Drg.No.F008300,on D29 & D29A)	1 No.

Optional Items:

1	Portable data analyzer for downloading event logger data for analysis and report generation.	1 No.
2	Configuration Terminal	1 No.
3	Monitoring Unit	1 No.
4.	Serial to USB Converter with driver CD make MOXA.	1 No.

13.2. RECOMMENDED SPARES:

The following spares are to be procured separately for 1 nos. of Single 40 DP MSDAC working in field

FIELD UNIT

1.	SCC 1&2 cards (Card 1 & 2)	2 Nos.
2.	MLB CARD (Card 4)	2 Nos.
3.	Modem card (Card 3)	2 No.
4.	DC-DC converter (HV)(Card 8)	1 No.
5.	DC TO DC CONVERTER (24V) if it is being used	1 No.
6.	Axle detectors (AD711) 21 KHz/23KHz (TX coil)	1 No.
7.	Axle detectors (AD711) 21 KHz/ 23 KHz (Rx coil)	1 No.
8.	Hardware for mounting axle detectors	1 Set
9.	MS circular connectors (6 No.)	1 Set
10.	Power & Data Coupling Unit	2 Nos

CENTRAL EVALUATOR

1.	EVALUATOR CARD(Card 3)	1 Nos.
2.	RELAY DRIVER CARD(Card 4)	1 Nos.
3.	CONFIGURATION CARD	1 No
4.	VITAL RELAY	2 Nos
5.	POWER & DATA COUPLING UNIT	2 Nos
6.	HIGH VOLTAGE DC TO DC CONVERTER	1 No

SM PANEL

1.	DC TO DC CONVERTER CARD (Card 1)	1 Nos.
2.	8 CHANNEL INPUT CARD(Card 2,3,4,5)	2 Nos.

CHAPTER 14

14.0 MODULAR CENTRAL EVALUATOR UNIT RACK

Modular Central Evaluator unit Rack is introduced to make the wiring of MSDAC flexible and mountable to 19" Rack.

At back plate of MSDAC Central evaluator Unit now two 26 Pin MS couplers are introduced in MS2 for RELAY(1-4) and RELAY(5-8). Also Relay base plate namely Pre Wired Relay Kit is introduced consisting of 4 Vital Relays. That means one MS Coupler is connected to one Relay base plate through a group of pre wired wires.

So, now if there is need of Vital Relays 1 to 4 then you have to connect MS Coupler in MS2 to RELAY(1-4) and for Vital Relays 5 to 8 MS coupler to be connected in MS2 to RELAY(5-8).

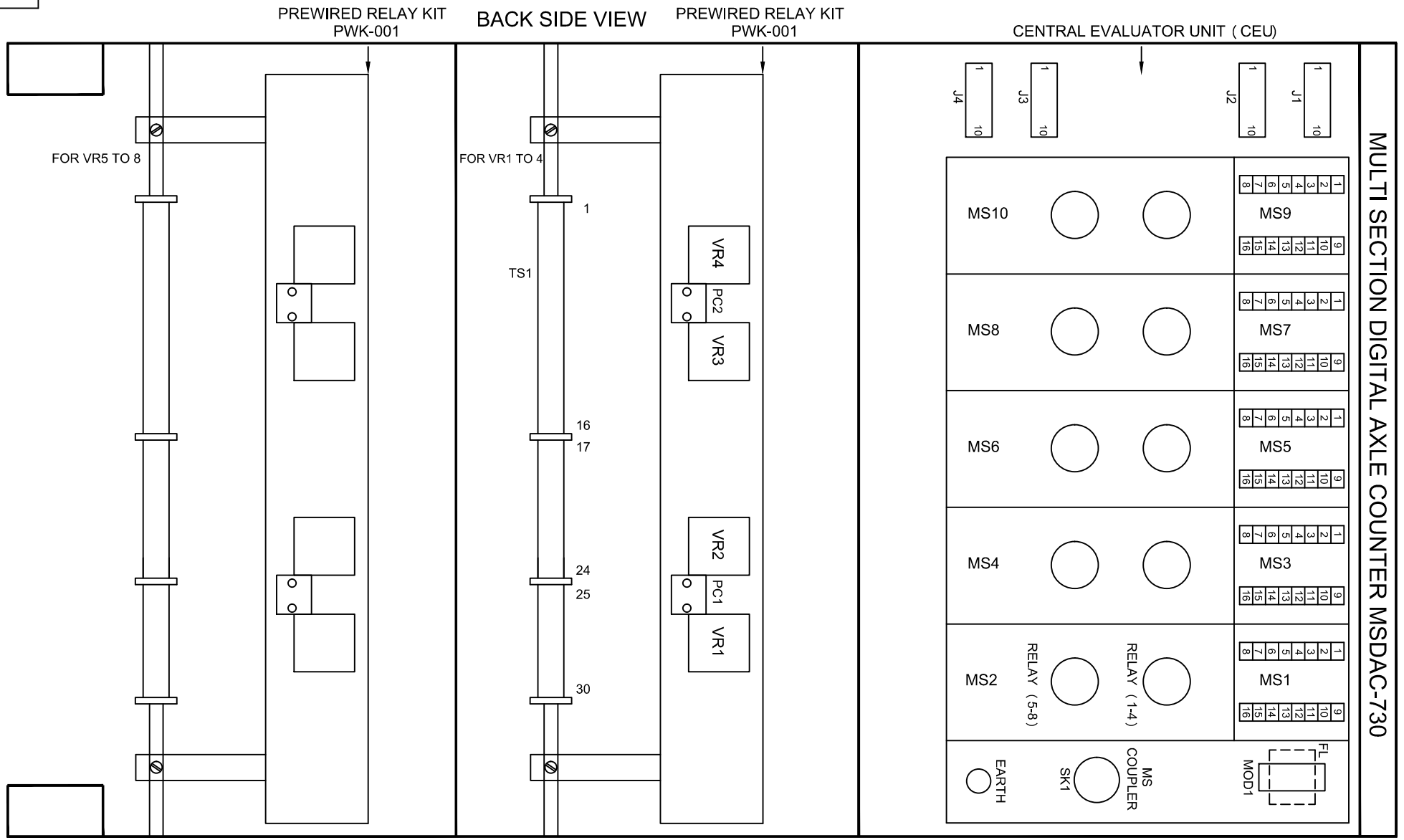
24V DC input is to be connected to the Surge Module connected at the back plate of CEU. Also +24 V dc is to be connected to 25 TS1 and -24 V dc is to be connected to 28 TS1 as shown in Drg. no. 9009A3-4.

In TS1 from 1 to 16 potential free pick up and drop contacts of Vital Relay is given, from 17 to 24 potential free pick up contacts for Data Logger use is given and from 25 to 30 termination for next VR Relay strip i.e. Pre Wired Relay Strip from 5 to 8 is given.

MS4, MS6, MS8, MS10 is used for Vital Relays VR 9 to 16, VR 17 to 24, VR 25 to 32, VR 32 to 40 respectively. In this respective Pre Wired Relay kit will also be used.

In MS1, MS3, MS5, MS7, MS9 MODEM connections are to be terminated. In J1, J2, J3, J4 connections from SM's Reset panel and Monitoring unit is to be terminated.

Drg. No. 9009A3-1 shows the back view of the Modular MSDAC central Evaluator Rack.
Drg. No. 9009A3-2 and 9009A3-3 shows the wiring detail of Vital Relay (VR1 to VR4) connected.
Drg. No. 9009A3-4 shows the Connection detail at Terminal strip TS1, which shows the free pick up and drop contacts and termination for next Pre wired Relay Strip.
Drg. No. 9009A3-5 shows the connection detail of 26 Pin MS Coupler.
Drg. No. 9009A3-6 shows the connection detail for 24 VDC input supply and routing of that supply.
Drg. No. 9009A3-7 shows the back view of Central evaluator Unit.



NOTE:-

1. VR1-4 - RELAY TYPE 6F/6B, QNIK OR HNIK WITH BASE.
2. PC1-2 - LED CARD, CARD NO. 669.
3. TS1 - TERMINAL BLOCK (TYPE -280-101) 30 NOS.
4. MS1,3,5,7,9 - 8 WAY TERMINAL BLOCK X 2 NOS. EACH
5. MS2,4,6,8,10 - 26PIN MS COUPLER X 2NOS. EACH
6. D1-4 - DIODE IN4007/BY 127/IN5408.
7. ALL WIRES ARE 16/0.2 GREY COLOUR OTHERWISE SPECIFIED.
8. OR - 16/0.2 ORANGE COLOUR WIRE
9. FL- FILTER & I/P FOR SUPPLY
10. MODI - 24V,SURGE MODULE
11. MS4,6,8,10 ARE TO BE USED FOR VR9 TO16,VR17 TO 24,VR25 TO 32,VR33 TO 40 RESPECTIVILY.

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Aditya	CHKD	APPD	DATE 22.10.14

MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730-4D
WIRING DIAGRAM RELAY RACK

SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.) 102

DRG.NO. W009009A3

SHEET 1 OF 7

SYS4/ADITYA/ELECT/9009A3-1

VR1

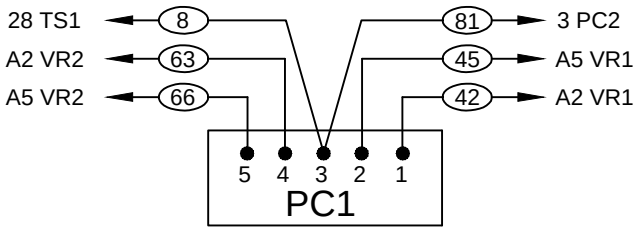
	A	B	C	D
1	41 A6 VR1 9 25 TS1	47 1 TS1 849 C3 VR1	55 17 TS1 (OR)	57 D MS2 49 B3 VR1
2	42 1 PC1	48 2 TS1 850 C4 VR1	56 18 TS1 (OR)	50 B4 VR1
3	43 3 TS1 847 C5 VR1	49 D1 VR1	849 B1 VR1	
4	44 4 TS1 848 C6 VR1	50 D2 VR1 51 D5 VR1	850 B2 VR1	
5	45 2 PC1	52 D5 VR1 53 E MS2	847 A3 VR1	51 B4 VR1 52 B5 VR1
6	41 A1 VR1 46 A6 VR2	54 D6 VR1	848 A4 VR1	54 B6 VR1 58 C MS2
7				
8				

R1	59 A MS2	D1	R2 60 B MS2
R3			R4

VR2

	A	B	C	D
1	61 A6 VR2 62 A1 VR3	67 5 TS1 853 C3 VR2	75 19 TS1 (OR)	77 G MS2 69 B3 VR2
2	63 4 PC1	68 6 TS1 854 C4 VR2	76 20 TS1 (OR)	70 B4 VR2
3	64 7 TS1 851 C5 VR2	69 D1 VR2	853 B1 VR2	
4	65 8 TS1 852 C6 VR2	70 D2 VR2 71 D5 VR2	854 B2 VR2	
5	66 5 PC1	72 D5 VR2 73 F MS2	851 A3 VR2	71 B4 VR2 72 B5 VR2
6	61 A1 VR2 46 A6 VR1	74 D6 VR2	852 A4 VR2	74 B6 VR2 78 H MS2
7				
8				

R1	80 K MS2	D2	R2 79 J MS2
R3			R4



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN. Aditya CHKD APPD DATE 22-10-14

MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730-4D
WIRING DIAGRAM RELAY RACK

SYSTEMS PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. W009009A3

SHEET 2 OF 7

SYS4/ADITYA/ELECT/9009A3-2

VR3

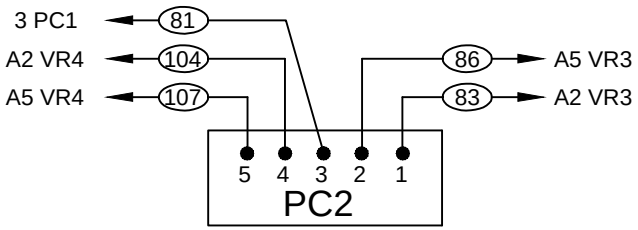
	A	B	C	D
1	82 A6 VR3 62 A1 VR2	88 9 TS1 857 C3 VR3	96 21 TS1 (OR)	98 P MS2 90 B3 VR3
2	83 1 PC2	89 10 TS1 858 C4 VR3	97 22 TS1 (OR)	91 B4 VR3
3	84 11 TS1 855 C5 VR3	90 D1 VR3	857 B1 VR3	
4	85 12 TS1 856 C6 VR3	91 D2 VR3 92 D5 VR3	858 B2 VR3	
5	86 2 PC2	93 D5 VR3 94 R MS2	855 A3 VR3	92 B4 VR3 93 B5 VR3
6	82 A1 VR3 87 A6 VR4	95 D6 VR3	856 A4 VR3	95 B6 VR3 99 N MS2
7				
8				

R1	100 L MS2	D3	R2 101 M MS2
R3			R4

VR4

	A	B	C	D
1	102 A6 VR4	108 13 TS1 861 C3 VR4	116 23 TS1 (OR)	118 T MS2 110 B3 VR4
2	104 4 PC2	109 14 TS1 862 C4 VR4	117 24 TS1 (OR)	111 B4 VR4
3	105 15 TS1 859 C5 VR4	110 D1 VR4	861 B1 VR4	
4	106 16 TS1 860 C6 VR4	111 D2 VR4 112 D5 VR4	862 B2 VR4	
5	107 5 PC2	113 D5 VR4 114 S MS2	859 A3 VR4	112 B4 VR4 113 B5 VR4
6	102 A1 VR4 87 A6 VR3	115 D6 VR4	860 A4 VR4	115 B6 VR4 119 U MS2
7				
8				

R1	121 W MS2	D4	R2 120 V MS2
R3			R4



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN. Aditya CHKD APPD DATE 22-10-14

MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730-4D
WIRING DIAGRAM RELAY RACK

SYSTEMS PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

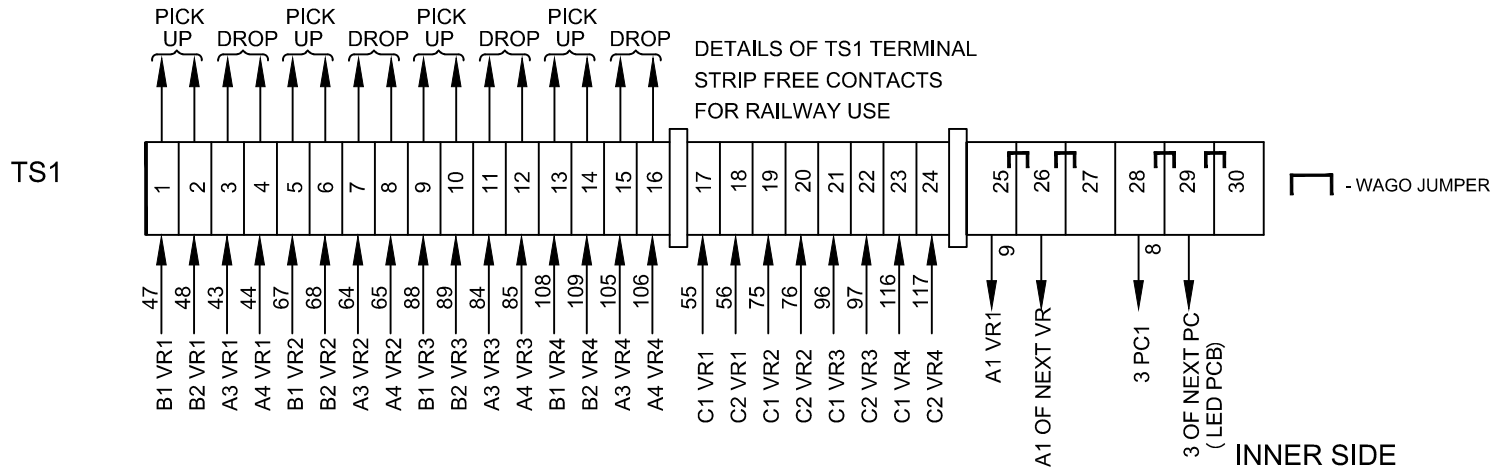
DRG.NO. W009009A3

SHEET 3 OF 7

SYS4/ADITYA/ELECT/9009A3-3

DETAILS OF TS1 TERMINAL STRIP
FREE CONTACTS FOR RAILWAY USE

OUTER SIDE (FIELD WIRES)



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN	Aditya	CHKD		APPD		DATE	22.10.14

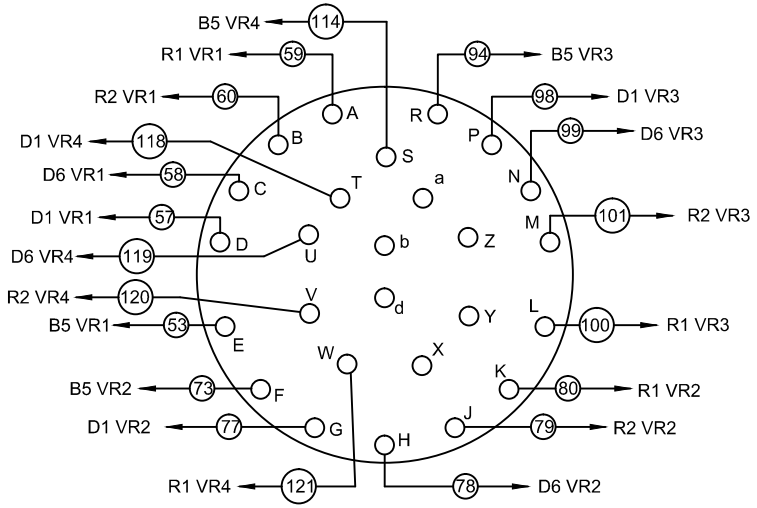
MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730-4D
WIRING DIAGRAM RELAY RACK

SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. W009009A3

SHEET 4 OF 7

SYS4/ADITYA/ELECT/9009A3-4



26 PIN MS COUPLER PLUG

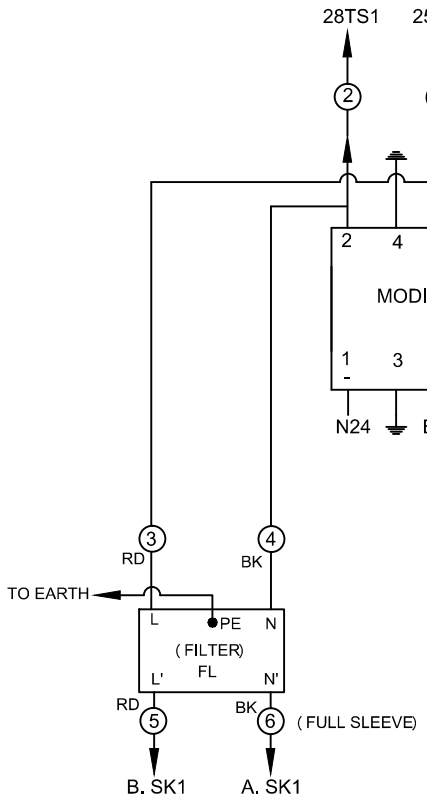
REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Aditya	CHKD	APPD	DATE 22.10.14

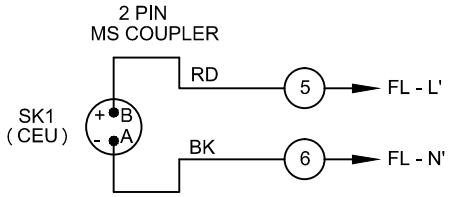
MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730 4D
WIRING DIAGRAM RELAY RACK

SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. W009009A3

SHEET 5 OF 7





NOTE -

(1) PIN, 25&26,26&27,28&29,29&30 TO BE SHORTED WITH WAGO JUMPER

(2) FL- FILTER & I/P FOR SUPPLY

(3) MODI - 24V,SURGE MODULE

(4) PC1→ FOR VR STATUS

(5) MU - MONITORING UNIT

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN	Aditya	CHKD		APPD		DATE	22.10.14

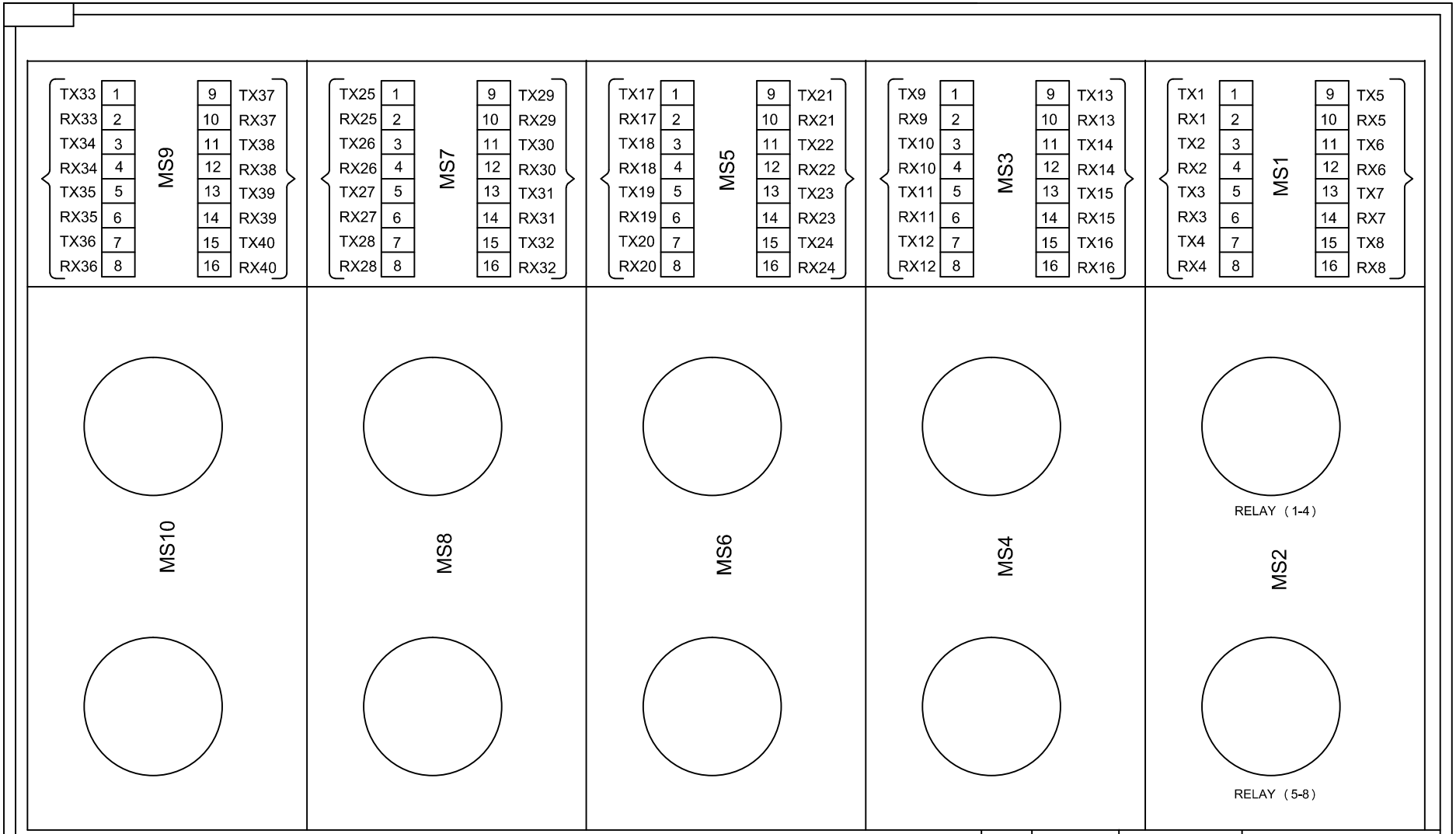
MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730-4D
WIRING DIAGRAM RELAY RACK

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CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. W009009A3

SHEET 6 OF 7

SYS4/ADITYA/ELECT/9009A3-6



EVALUATOR WIRING DETAILS

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Aditya	CHKD	APPD	DATE 22.10.14

MULTI SECTION DIGITAL AXLE COUNTER MSDAC-730-4D
WIRING DIAGRAM RELAY RACK

SYSTEM PRODUCTION DIVISION
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SAHIBABAD - 201010 (U.P.)

DRG.NO. W009009A3
SHEET 7 OF 7

SYS4/ADITYA/ELECT/9009A3-7

	EM-08 1	EM-08 2	EM-08 3	EM-08 4	EM-08 5
MODEM	L P2 R P6	P3 P7	P11 P14	P12 P15	P13 P16
COUPLER 1	L P20 R P25	P21 P29	P22 P26	P23 P27	P24 P28
COUPLER 2	L P33 R P35	P34 P36	P30 P37	P31 P39	P32 P38

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.

GEN TOL.
FULL FIG =
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE
A3

DESIGNED	SIG.	DT.
DRAWN	AMIT KUMAR	18-11-19
CHECKED		
APPROVED		

MATL | DIM MM | NO.OFF 1
FINISH- | SCALE NTS

PROJECT
MSDAC

TITLE
MSDAC-730
INTERNAL WIRING DIAGRAM OF BACK PLATE

SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. SKT-1618 109 | REV.NO. 00 | SHEET NO. 1 OF 1

SYS-4/AMIT/SKT/1618

ORDERING INFORMATION

SNO	DESCRIPTION	QTY
1	**Multi Section Digital Axle Counter system** (MSDAC) as per **RDSO Specification No-RDSO/SPN/176/2005 version 2.0 or latest** suitable for monitoring **8/16/24/32/40 Detection Points*** consisting of the following:-	1 System
a	**Central Evaluator (CE-501)** unit consisting of DC-DC Converter card (Part No73054 Rev B) – 2 No's Event Logger Card (Part No 73056 Rev D) – 1 No's Configuration Card (Part No 73055 Rev A) – 1 No's	1 no
b	**Evaluator Module card** (Part No 73054 Rev B) for 8 DPs	As required*
c	**Relay Driver Card** (Part No 584-1) for 8 Vital Outputs	As Required*
d	**Field Unit FU-220** Consiting of *Signal Conditioning card 1 & 2 (Part No – 596-1)* *Dual MLB Card (Part No – 22754 Rev A)* *Modem card (Part No 699)* *DC to DC Card (Part No – 678 (96VDC) or Part No 22092 Rev 2(24VDC))PDCU Unit Model No PDCU – 230 (Part No675-1)*	As Required*
e	**Pre Wired Relay Rack** MSDAC 730	1 No.*
f	**SM's Reset Panel RP-601** consisting of Power Supply Card (Part No 73049 Rev B) – 1 No Reset card for 8 Input (Part No 73067 Rev C) - Yard Layout on Reset Panel (Optional Supply only on Order)*	As Required*
g	**Vital Relays**	As Required
2	**Toolkit for Multi Section Digital Axle Counter**	1 Set
3	**Monitoring Unit (optional)**	1 No
4	**Configuration Terminal (Optional)**	1 No

Note*:- The quantity have to be given by Railways or to include Yard Layout so that quantity will be calculated



RESEARCH DESIGNS AND STANDARDS ORGANISATION

MANAK NAGAR, LUCKNOW

SIGNAL DIRECTORATE

Pre-commissioning checklist for Multi Section Digital Axle Counter MSDAC

Of M/s Central Electronics Ltd, Sahibabad

S.N.	Date of amendment	MSDAC Version	Page No.	Version	Reasons for amendment
1.	First Issue				First Issue

Prepared by:
Director / Signal –VII
Name: P.K. Varma

Signature:

Approved by:
Sr. ED / ED / Signal
Name: Mahesh Mangal

Signature:

Pre-commissioning check list for Multi Section Digital Axle Counter
MSDAC [DACF 730-8D/16D/24D/32D/40D]
(As per RDSO/SPN/176/2005 Ver. 2.0)

0. General Information

Station/Yard Name:	
Section:	
Division/Zonal Railway:	
Contact Details of Railways in Site:	
Contact Details of Railway at HQ/Division:	
Total Nos. of Detections & Section:	
Total Nos. of Central Evaluators :	
Name & Address of manufacturer/Supplier:	
Serial No of Equipment:	
Contract No:	
Date of Pre-commissioning Inspection:	

Note:

1 The system should be installed and commissioned by authorized technical staff of M/s. Central Electronics Limited only.
2 The installation practices should be strictly adhered to and checked before commissioning, covering all points in the following documentation.
3 OEM shall certify that verification of system installation has been completed by representative authorized by OEM and all necessary arrangements meet the required standards of engineering for trouble free working of installed system, as per **Annexure-VI**.

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1) Location (outdoor):

Sl. No.	Item	Required	Observed	OK /Not OK
1.1	Sl. No. of Field Units of MSDAC	Should have serial no's on the back plate		
1.2	Placement of Cards	Should be in order		
1.3	Placement of Modules	Should be tight		
1.4	MS Couplers	Installed and tightened properly		
1.5	MS coupler cables	Wired properly as per color code		
1.6	Wiring of TX/Rx coils & MS coupler cables	Wired on WAGO/Phoenix Disconnect Type Spring Type Connectors		
1.7	Earthing of Field units	Should be provided firmly through copper strips or other standard copper cable. Value $\leq$ 1 Ohms		
1.8	Fixing of Field unit	Firmly fixed using clamp		
1.9	Condition of Rail	Should be within vertical limit of worn out. (60 Kg - 13 mm, 52 Kg - 8 mm, 90R – 5 mm.)		
1.10	Marking of holes on rail	The marking should be done by using CEL marking Jig		
1.11	Drilling of holes in the web of rail	a. Should be of 14mm diameter b. Should be square (perpendicular), c. Should not be oblong.		
1.12	Torque applied to fix track device using Torque wrench	Jaicom make JPR65 or equivalent – 88Nm		
1.13	Fixing of TX	Outside the rail		
1.14	Fixing of Rx	Inside the rail		
1.15	Fixing of axle detectors	On the same rail		
1.16	Laying of axle detector cable	In corrugated/HDPE pipe		
1.17	Screen of axle detector cable	Should be earthed		
1.18	Fixing of deflector plates	Should be proper (next available sleeper on both site)		
1.19	Insulation of QUAD cable	Should be >= 10 M ohm		
1.20	Dressing of Quad Pair	To be properly dressed with insulated tape		
1.21	Length of quad cable	As measured.		

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1.22	Unused Quad Pair	To be terminated on terminals. **Annexure-I** for Quad cable may be referred. Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See **Annexure -III**		
1.23	Training	It should be installed & commissioned by personnel trained by the manufacturer. Rly personnel shall be trained before commissioning.		
1.24	Power supply for axle counter	Charger should be fit for axle counter use. There should not be any other load to the power supply except axle counter.		
1.25	Address of Field Unit	Address of field unit for one-track section shall be as per the configuration finalized by Railways.		
1.26	Embossing on rail	Should not be covered by Track device		
1.27	Height of deflector	Should not be higher than the rail top		

2) Indoor Relay Room (Power Supply & CT Rack)

Sl. No.	Item	Required	Observed	OK/Not OK
2.1	Power Supply	Power supply should be suitable for use with axle counter system. (b) There should not be any other load on the power supply except the axle counter system.		
2.2	Cable	Minimum 6 mm^2 multi-strand copper cable or 25 mm^2 multi-strand Aluminum cable must be used for the power supply.		
2.3	Rating of main indoor fuse	• Fuse 2A rating to be used for Central Evaluator. • Fuse 2 A rating to be used for SM panel		
3.4	Voltage available at the Central Evaluator keeping battery charger off for 15minutes	Should not go below 22V.		
3.5	Input voltage at the Trackside connection box keeping the charger off for 15 minutes	Should not go below 50VDC.		
2.6	Ripple content of power supply	Should not exceed 50 mV rms.		
2.7	Terminal blocks between evaluator &CT Rack	Wago/Phoenix make cage clamp type terminals to be used.		
2.8	Cable from the evaluator to the CT Rack	4-core, 24 x 2 twisted, shielded cable to be used.		
2.9	Earthing	Connected to earth with soldered		

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3) Reset Box Location

Sl. No.	Item	Required	Observed	OK /Not OK
3.1	Reset Box wiring	The Data cable from Central Evaluator to SM Panel should be twisted and shielded.		
3.2	Power Supply	Input to SM's Panel should not increase more than 29V DC		
3.3	Terminal blocks between evaluator &SM's Panel	Wago/Phoenix make cage clamp type terminals to be used.		
3.4	Reset Box Earthing.	Connected to earth properly.		
3.5	Reset function	Reset not possible when Axle Counter section is clear and healthy. Reset not possible when Axle counter section is in Preparatory reset mode.		
3.6	Ripple content of power supply	Should not exceed 50 mV rms at Reset Box		

4) Centralised DC-DC Converter (24V to 96V DC supply to Field Unit)

Sl. No.	Item	Required	Observed	OK /Not OK
4.1	Input voltage with Charger ON	22 V to 30 v DC		
4.2	Input voltage with Charger OFF.(Keep charger OFF for 15 minutes before reading)	22 V to 30 v DC		
4.3	96V DC Voltage output for each channel at CT Rack	Should be in range of 94V to 98V DC.		
4.4	Earthing	Connected to earth with soldered.		
4.5	Cable	4-core twisted and shielded cable to be used from terminal to PDCU		
4.6	Connections	Minimum 4 DC to DC converter channels to be used		

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5) OSCILLATOR OUTPUT (TX Coils)

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

Sl. No.	Item	Required	Observed	OK /Not OK
5.1	TX 1	30V to 40Vrms, 20.80 to 21.20 KHz		
5.2	TX 2	30V to 40Vrms, 22.80 to 23.20 KHz		

6) RECEIVER COIL OUTPUT

Measure the Rx coil signal output when it is not influenced by any wheel / dummy wheel.

Sl. No.	Item	Required	Observed	OK /Not OK
6.1	Rx 1	275 to 600 mV rms		
6.2	Rx 2	275 to 600 mV rms		

7) SCC CARDS (CARD 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)						OK / Not OK
		Without dummy wheel		With dummy wheel		With push trolley (4/8 spokes) on axle detectors		
		Limit	Measured Value	Limit	Measured Value	Limit	Measured Value	
7.1	SCC 1	2.0 to 2.5V		< 0.7V		> 1.7 V		
7.2	SCC 2	2.0 to 2.5V		< 0.7V		> 1.7 V		

Note:- The observations for remaining field unit is to be recorded on the recording sheet kept in the location box

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8.0 COMMISSIONING

8.1 Commissioning Log sheet of MSDAC model**: DACF 730-8D/16D/24D/32D/40D, version: D01S001H01**

Item No.	Item Description	Part No(Please Tick whichever is applicable)	Version No.	Remarks (Ok/Not OK)
1	Axle Detector - TX Coil	**AD-711**	D02 H02	
2	Axle Detector -RX Coil	**AD-711**	D02 H02	
3	Digital Axle Counter Field unit	**FU 220**	D01 S001 H01	
4	Power Data Coupling Unit	**PDCU-230**	D01 H02	
5	Central Evaluator	**CE-501-8D/16D/24D/32D/40D**	D01 S001 H01	
6	MSDAC Rack	**MSDAC-730-8D/16D/24D/32D/40D**	D01 H01	
7	SM's Reset Panel	**RP-601-8D/16D/24D/32D/40D**	D01 S001 H01	
8	Line Verification Unit	**LV-261**	D01 H01	
9	Centralised DC to DC converter	**DC-210**	D01 H01	

8.2

Sl. No.	Item	Required	Measured / Observed	Remarks (OK/Not OK)
1	Commissioning	System should be installed & commissioned by persons trained by the manufacturer.		
2	Training	Railway personnel should be trained before commissioning.		
3	Verification of working	After complying to all items as per pre-commissioning checklist, system to be monitored for 72 hours for trouble free operation before commissioning. During this period, effect of various trolley wheels used in the section should be checked as per Annexure V		
4	Configuration	The configuration report should be attached along with this document signed by CEL and by railways.		
5	Checksum of the Configuration	The checksum of the configuration may be noted and recorded		
6	Checksum of the Software	Checksum of the Central Evaluator to be displayed on PC or Monitoring unit		
7	Record the reset Box Counter reading at the time of Commissioning for each track section.			

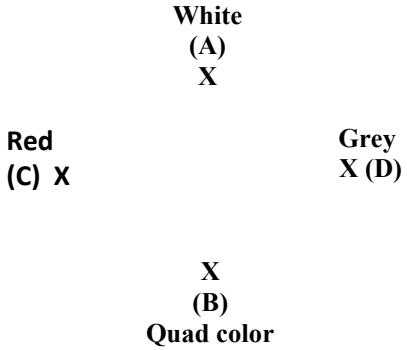
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Annexure- I

Precautions to be taken care during the wiring/connections are to be done at the time of commissioning of SSDAC/MSDAC/BPAC/SSBPAC (D)

Position of One Quad in Quad cable:



1st pair = White & Quad colour i.e A & B Wires

2nd pair= Red & Grey colour i.e C & D Wires of designated colour of Quad.

Each Quad is binded by the respective Quad colour binder

Table-1

Colour scheme of PE insulated Quads							
Quad Colour							
	Quad No	**Pair No.**	**A - Wire**	**B -Wire**	**Pair No.**	**C- Wire**	**D - Wire**
Orange	1	1A	White	Orange	1B	Red	Grey
Blue	2	2A	White	Blue	2B	Red	Grey
Brown	3	3A	White	Brown	3B	Red	Grey
Green	4	4A	White	Green	4B	Red	Grey
Yellow	5	5A	White	Yellow	5B	Red	Grey
Black	6	6A	White	Black	6B	Red	Grey

Precautions to be taken for using QUAD Cable:

- Designated pair of wire of the same quad (mentioned in Table -1) should be used.
- Do not use one wire from one quad and another wire from some other quad.
- If any wire of a pair of the quad is broken/Non functional, then use fresh pair of wire.
- Do not parallel wires of quad cable.

Annexure-II

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TEMPERATURE CORRECTION FACTOR FOR CONDUCTOR RESISTANCE FOR ANNEALED HIGH CONDUCTIVITY COPPER

Temp. Deg C 1.	Corre. factor 2.	Temp. deg C 1.	Corre. Factor 2.	Temp deg C 1.	Corre. factor 2.	Temp. deg C 1.	Corre. factor 2.	Temp. deg C 1.	Corre. Factor 2
5.	1.0638	17	1.0122	29	0.9653	41	0.9225	53	0.8834
5.5	1.0618	17.5	1.0101	29.5	0.9634	41.5	0.9208	53.5	0.8818
6.	1.0593	18	1.0081	30	0.9615	42	0.9191	54	0.8803
6.5	1.0571	18.5	1.0060	30.5	0.9597	42.5	0.9174	54.5	0.8787
7.	1.0549	19.	1.0040	31.	0.9579	43.	0.9158	55.	0.8772
7.5	1.0526	19.5	1.0020	31.5	0.9560	43.5	0.9141	55.5	0.8757
8.	1.0504	20.	1.0000	32.	0.9542	44..	0.9124	56.	0.8741
8.5	1.0482	20.5	0.9980	32.5	0.9524	44.5	0.9107	56.5	0.8726
9.	1.0460	21.	0.9960	33.	0.9506	45.	0.9091	57.	0.8711
9.5	1.0438	21.5	0.9940	33.5	0.9488	45.5	0.9074	57.5	0.8696
10.	1.0417	22.	0.9920	34.	0.9470	46.	0.9058	58.	0.8681
10.5	1.0395	22.5	0.9900	34.5	0.9452	46.5	0.9048	58.5	0.8667
11.	1.0373	23.	0.9881	35.	0.9434	47.	0.9025	59.	0.8651
11.5	1.0352	23.5	0.9862	35.5	0.9416	47.5	0.9009	59.5	0.8636
12.	1.0331	24.	0.9843	36.	0.9398	48.	0.8993	60.	0.8621
12.5	1.0309	24.5	0.9823	36.5	0.9380	48.5	0.8977	60.5	0.8606
13.	1.0288	25.	0.9804	37.	0.9363	49.	0.8961	61.	0.8591
13.5	1.0267	25.5	0.9785	37.5	0.9346	49.5	0.8945	61.5	0.8576
14.	1.0246	26.	0.9766	38.	0.9328	50.	0.8929	62.	0.8562
14.5	1.0223	26.5	0.9747	38.5	0.9311	50.5	0.8913	62.5	0.8547
15.	1.0204	27.	0.9728	39.	0.9294	51.	0.8897	63.	0.8532
15.5	1.0183	27.5	0.9709	39.5	0.9276	51.5	0.8881	63.5	0.8518
16.	1.0163	28.	0.9690	40.	0.9259	52.	0.8863	64.	0.8503
16.5	1.0142	28.5	0.9671	40.5	0.9242	52.5	0.8850	64.5	0.8489

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Annexure - III

Technical Advisory Note			
Subject	Digital Axle Counter – Wiring Discipline		
Document Number	STS/E/TAN/6001	Version	1.0
Dated	04/10/2011	Pages	2

It has come to notice that usage, termination and wiring of quad cable is far from satisfactory for trouble-free working of electronic equipments like digital axle counters/UFSBI. Basic issue pertains to electromagnetic interference from parallel circuits in the cable and location.

Following guidelines are recommended to enhance performance of DAC systems.

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 down 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 150mm** (lateral distance) away from the wiring for DAC circuits.

e. Relay circuits shall preferably be not taken in same cable as DAC circuits. In unavoidable circumstances relay circuits shall be in furthest quad (spatially) from the one containing DAC circuits.

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 with 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 signalling cable (1 mm square) or any other approved indoor twisted pair cable.

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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.

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Annexure - IV

A Test format for testing of QUAD cable before commissioning of SSDAC/MSDAC/BPAC/SSBPAC (D)

Sl No		Item	Expected	Measured/ Observed	Remarks if any
1	a	Communication Media Type of Cable	Only Proper pair of wires of Quad cable is to be used for connectivity between field units. No Signaling Cable is to be used in totality / parts. **Annexure-I** for Quad cable may be referred. Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See **Annexure -III**		
	b	Use of pair	Proper pair of wires to be used for connectivity. **Annexure – I** for quad cable may be referred. Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See **Annexure - III**		
	c	Parallelism of Wires	No wires to be paralleled.		
	d	Insulation resistance of Quad cable	Shall be greater than /equal to 10 M ohm.		
	e	Loop resistance of designated pair	Not to exceed 56 ohm/Kms at 20^0 C. See **Annexure -II** for correction factor.		
	f	Attenuation loss measured at 2 KHz	Shall not be greater than 30.0 dB for full length of the cable used.		
	g	Near End Cross Talk (NEXT)	Shall be better than 55 dB.		
	h	Far End Cross Talk (FEXT)	Shall be better than 55 dB.		
	i	Continuity of cable armour	Continuity shall be there and armour of the cable must be earthed Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See **Annexure -III**		
	j	Earth of Quad cable	Shall be less than 1 ohm		
	k	Cable allocation table	Shall be filled up and attached		

Note: Procedure for test-
Attenuation Loss: The output/Input impedance of signal generator/dB meter shall be 600 ohm.
Near End Crosstalk: Test tone of 150 **KHz** to be fed in the adjacent pair of the same quad & NEXT to be measured at the same end on the other pair of the same quad.
Far End Cross talk: Test tone of **150 KHz** to be fed in the adjacent pair of the same quad & FEXT to be measured at the far end on the other pair of the same quad.

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B Test format for testing of OFC cable before commissioning of SSDAC/MSDAC/BPAC/SSBPAC (D)

Sl No.		Item	Expected	Measured/ Observed	Remarks if any
1	a	Communication Media Type of Cable	Jelly filled telecom cable/ Quad cable to be used between field units & OFC Equipment room. Signaling Cable shall not be used at all. **Annexure-I** for Quad cable may be referred. Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See **Annexure - III**		
	b	Use of pair	Proper pair of wires to be used for connectivity. **Annexure-I** may be referred. Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See **Annexure -III**		
	c	Parallelism of Wires	No wires to be paralleled.		
	d	Insulation resistance of Quad cable	Shall be greater than /equal to 10 M ohm.		
	e	Loop resistance of designated pair	Not to exceed 56 ohm/Kms at 200 C for quad cable &		
	f	Channel line up	For Trans signal levels introduce the attenuation of 12dB for each channel, For RX signal introduce the attenuation of 12dB.-		

Note: Procedure for test-
Attenuation Loss: The output/Input impedance of signal generator / dB meter shall be 600 ohm.
Near End Crosstalk: Test tone of 150 KHz to be fed in the adjacent pair of the same quad & NEXT to be measured at the same end on the other pair of the same quad.
Far End Cross talk: Test tone of 150 KHz to be fed in the adjacent pair of the same quad & NEXT to be measured at the far end on the other pair of the same quad.

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Annexure-V

Response test of digital Axle Counter with different type of Trolley Wheels done jointly with railways

S.No.	Type of Trolley wheel	Observed Result(No infuence / Goes to error / Counted / other)	Remarks
1	4 spoke wheel Wheel Dia with flange – Wheel Width – Flange width – Flange depth – Spoke width –		
2	6 spoke wheel Wheel Dia with flange – Wheel Width – Flange width – Flange depth – Spoke width –		
3	Solid Wheel with 6 holes Wheel Dia with flange – Wheel Width – Flange width – Flange depth –		
4	8 spoke wheel Wheel Dia with flange – Wheel Width – Flange width – Flange depth – Spoke width – 		
5	8 spoke with slots Wheel Dia with flange – Wheel Width – Flange width – Flange depth – Spoke width –		

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S.No.	Type of Trolley wheel	Observed Result(No infuence / Goes to error / Counted / other)	Remarks
6	Perforated		
	No. of perforation with dia.		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		
	Spoke width –		
7	Solid wheel		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		
8	Motor trolly wheel , Solid		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		
9	Rail Dolly Wheel solid		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		
10	Material Trolley solid wheel		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		
11	Motor Trolley wheel with 6 holes		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		
12	Tower Wagon		
	Wheel Dia with flange –		
	Wheel Width –		
	Flange width –		
	Flange depth –		

Signature of CEL Rep.
Name, Designation & Date

Signature of Railway Rep.
with Name, Designation & Date

ANNEXURE – VI

OEM's Site Installation Certificate

(Ref: This office letter no.: STS/E/AC/Dig/Genl Dt. 21.06.2011)

To

CSTE/ Railway

This is to certify that verification of system installation (details given below) has been completed by undersigned (OEM representative) and all necessary arrangements like earthing, surge protection, power supply, power & communication cables and equipment wiring meet the required standards of engineering for trouble free working of installed system.

1. System being commissioned:
2. Station/Section:
3. Division:
4. Date of commissioning:

Name of RDSO approved Original Equipment Manufacturer

Name of OEM representative with Designation

Signature of OEM representative with Date:

Signature of CEL Rep.
Name, Designation & Date

Signature of Railway Rep.
with Name, Designation & Date

Maintenance log sheet for MSDAC (FIELD UNIT)

Sr. no.		Battery (24V)	Tx1 Vrms / freq	Tx2 Vrms / freq	Rx1 Vrms	Rx2 Vrms	Modem Tx Level (Card 3) AC Vrms	SCC1 (Card 1) DC Volts		SCC2 (Card 2) DC Volts		With Push Trolley on axle detectors (4 spokes / 8 spokes)		DC – DC Converter			
														DC Volts			
														5 V	12 V	24 V	15 V ISO
Test Points		TS1 13 & 14	TS1 1 & 2	TS1 4 & 5	TS1 7 & 8	TS1 7 & 8	TS1 10 & 11	Red & Black Socket		Red & Black Socket		Red & Black Socket		Monitoring Sockets on card 8			
								Normal	Dummy wheel	Normal	Dummy wheel	SCC1	SCC 2				
(Limit) for Phase			30 to 40 V	30 V to 40V	275 to 600mV	275 to 600 mV	> 400 mv (-6 dB) (approx.) When other end field unit switched off"										
(Limit) for AM	Date	23-28.8 V	20.8 to 21.2 KHz	22.8 to 23.2 KHz	750 to 1200 mV	750 to 1200 mV		2.0 to 2.5 V	< 0.7 V	2.0 to 2.5 V	< 0.7 V	> 1.7 V DC	> 1.7 V DC	4.75 to 5.25 V	11.50 V to 12.50 V	23.50 to 24.50	14.50 to 15.50

Signature of CEL Rep.
Name, Designation & Date

Signature of Railway Rep.
with Name, Designation & Date

Multi Section Digital Axle Counter

For Servicing or any other information contact the following

- CEL service center located at

  Central Electronics Limited
  Systems Division
  4, Industrial Area
  Sahibabad -201010

  OR

- Contact **Customer care at 1800** Fax No. 0120-2895147/48

  OR

- E-mail: cel@celsolar .com celspd@hotmail.com

When you send / ship the product for service

- Carefully pack your module or unit preferably in the original carton.
- Attach a letter detailing the fault.

Turnkey

- CEL has been successfully manufacturing the Railway Signalling equipment for more than 20 years and providing turnkey solutions for track circuiting, Single line and Double line block working systems to Indian Railways. CEL is equipped for manufacturing, supply and installation of Digital Axle Counter on turnkey basis.

Note: - CEL reserves the right to alter the specification or other technical details / parameter with approval for RDSO for improvement of the system.

For further details, please contact
Systems Division (Marketing)

Central Electronics Limited

(A public sector enterprise)
4, Industrial Area, Sahibabad, U.P-201010,INDIA
Ph. No.0120-2895149, Fax No. 0120-2895147/48
Web:www.celindia.co.in, E-mail:cel@celsolar.com

Customer care -
Regional Sales Office

781, D.B Gupta Road
Karol Bagh,
New Delhi-110005
Ph :011- 23526836
23549336

51, C M H Road,
Indira Nagar,
Bangalore-560038
Ph : 080-25201550
Fax: 080-25251740

ISO 9001 : 2015

QMS

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