स्थापन मैनुअल
INSTALLATION MANUAL

एकल खण्डीय सांख्य धुरी गणक
डी ए सी एफ-710पी
(फेज रिवर्सल प्रकार)
आर.डी.एस.ओ/एस.पी.एन./177/2012 आवृति-3.0

SINGLE SECTION DIGITAL AXLE COUNTER DACF 710P™
(PHASE REVERSAL TYPE)
RDSO/SPN/177/2012 Ver 3.0



सैन्ट्रल इलैक्ट्रॉनिक्स लिमिटेड
(आई एस ओ 9001:2015 प्रमाणित कम्पनी)
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Abstract:

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

MESSAGE FROM OUR CMD

Dear SSDAC Customer,

We are privileged for your decision to choose SSDAC for modernization of signalling in the Railways. The SSDAC comes to you backed by the trusted CEL brand and is part of the Microprocessor and Software based Signalling Systems for Track Circuiting and Block Working application.

We would want you to get acquainted with the details in the installation manual, which will enable you to derive the best performance from your SSDAC. We look forward to having you as a satisfied customer and hope to have you retain us, as your first choice for any of your signalling needs.

Yours Sincerely

Chairman & Managing Director,
Central Electronics Limited.

KNOW YOUR SSDAC

1. **SSDAC:**

The SSDAC is supplied as one pair (two units) named as Entry and Exit units for monitoring single section. SSDAC with vital relay box and SM's reset Box is shown below



Single Section Digital Axle Counter

2. **Salient Features**

- Trackside electronic counting equipment
- Web type axle detectors
- Compatible with 90R, 52 Kg & 60 Kg rail profiles
- Track clear/occupied at both stations
- Normal operation during water logging condition on rails

Contd

3. System Design

- Designed as per CENELEC, SIL-4 (European standard)
- 21 KHz & 23 KHz high frequency 'Phase Reversal' type axle detectors
- Micro controller based design with 2 out of 2 decision
- V 21 modem communication on ½ quad cable
- Compatible to work on voice channel of OFC & Radio
- Opto isolated relay drive for Q type 24V, 1000 ohm.
- MTBF is greater than 20 years.

4. Application:

The system can be widely used in Railways for

- Block Working
- Intermediate block signaling
- Auto signalling
- Track circuiting for

  i) Loop line ii) Main line iii) yard lines

5. Input, Output & Power Supply:

- Input: i) High Frequency axle detectors
  ii) V 21 Modem
  iii) Reset command of 48V dc.

- Output: i) Q type 24V, 1000 ohm Vital Relay.
  ii) Q type 24V, 1000 ohm Prep. Relay.
  iii) Monitor port RS232.
  iv) Event logger card (Flash Memory).

- Power Supply: 24 V DC battery or 24 V DC from IPS

For your kind attention

The Single Section Digital Axle Counter (SSDAC) is supplied with Phase reversal type Axle detectors. The system model nos. is as follows:

S. No.	Item	Model No.
1.	SSDAC	DACF – 710P
2.	Axle Detectors	AD - 711
3.	Vital Relay Box with PR Relay	VR – 721
4.	Reset Box	RB – 259
5.	Surge Voltage Protection device	SV - 121

The technical features of the above model are:

1. Phase reversal type Axle detectors. Track circuit connection into the system is not required for trolley suppression.
   i) The push trolleys by which the system is not affected are
   a) 4 spoke trolley; b) 8 spoke trolley; and c) rail dolly.
   4/8 spokes push trollies shall have the following parameters for not affecting the system.
   A) Flange Height < 22mm+/- 2mm, B) Flange width< 10mm, C) wheel base < 100 mm.
   There shall be no Rim inside the wheel and orientation of spokes shall be in the plane to allow passage to flux.

   ii) The system counts the followingtrolleys:
   a) Push trolley with perforated wheel; b) Dip lorry and c) Motor trolley.
   b) Trolly with following parameters will be counted
   A) Flange Height >28mm, B) Flange width> 15mm, C) Tyre base >110 mm.
   Any variation in even one parameter of Push/Motor Trolley may lead the system to error.


Undetected


Detected

2. Power Supply voltage required at input of system is 24V DC.

3. Resetting of axle counter only after registration of 1st out count.

4. Surge Voltage Protection device SV-121 has been provided with additional protection module for modem line for reset box.

Please Note : -

Kindly verify the version number of each card before its use and while ordering for spares in existing system. Based on the version number , feature may vary so you are requested to contact CEL for suitable guidance.

For Modifying SSDAC version DACF-700A or DAC700AP to current model DACF-710A/P the following are required.

1. Replacement of Motherboard, MLB cards, Modem Card (AGC and above only).
2. Replacement of reset Box model - RB258 to model – RB259
3. Replacement of Surge Voltage Protection Device model from SV120 to SV121.
4. Additional pair of quad for displaying of packets information from location box to SM's Room.

If all of the above modifications are carried out in each system, the features specified as per RDSO/SPN/177/2005 of DACF-710A/P will be available.

For Modifying Amplitude Model SSDAC to Phase Reversal Type SSDAC, the following are required

1. Replacement of Axle Detectors model AD-710 with AD-711.
2. Modification of Signal Conditioner Cards 1 & 2

ISSUE DETAILS

SR. NO.	AMENDMENTS IN CHAPTER ANNEXURE	ISSUE NO.	DATE
1.0	Initial release	1.0	29.06.2007
2.0	First issue	1.1	31.08.2007
3.0	Second issue: Updation of Drawings	1.2	31.08.2009
4.0	Third issue: Addition of push trolley details and its dimensions, Additon of Diagnostic charts, modification of specifications of portable Data Analyzer	1.3	31.03.2012
5.0	Fourth issue: Typographic errors in ordering information removed	2.0	Fourth issue: Typographic errors in ordering information removed
6.0	Fifth issue: Do's & Don'ts modified	2.1	19.02.2019

WARRANTY

At CEL, we understand the needs of Railways to provide reliable Signalling systems. We have always strived to provide quality products to Railways.

CEL gives warranty for this product for 12 months from date of purchase by the user against defects in material and workmanship. After expiry of this period, you can still avail of the repair facility by paying for the same. The warranty is subject to the following conditions

1. To provide the details of purchase date from CEL.
2. The defective card / unit must be delivered at the user's cost to service centre in CEL.
3. The guarantee is not valid for the damages resulting from accidents, mishandling, negligence, unauthorised repairs, tampering, loss of components / accessories, exposure to extensive heat and temperature, damped due to rain or any other chemical such as acid etc.
4. CEL's liability for damages is restricted to repair/ replacement of the defective parts.

OUR COMMITMENT

For more than 22 years CEL has harnessed the power of intellectual signalling professionals to design and produce highly reliable products for Railway Signalling Application. These include Universal Axle Counter, Block proving by Axle Counter for Single and Double lines etc.

From the year 2000 CEL started working on innovative products based on software and Micro controller technologies. We came up with Single Section Digital Axle Counter conforming to CENELEC SIL-4 standard for track circuiting and block proving application in Railways.

CEL has highly motivated professionals and specialists trained on the above technologies. We reiterate and extend our commitment for modernisation of signalling systems in railways. We are now manufacturing & supplying Single Section Digital Axle Counters to Railways.

	IMPORTANT
	Before Use
1.	Please read all the instructions described in this manual carefully for proper installation of SSDAC
2.	After making connections to TX & Rx coils, check the presence of Rx coil signals, which gives pulse output by means of LED glow on SCC1 & SCC2 cards. If not reverse the connection of Rx coil cable.
3.	The system has been provided with preparatory reset feature. In case of failure the reset is to be applied by SM and the system comes to preparatory state. One train is to be piloted in the section for system to become clear. Procedure for piloting should be followed as per Station Working Rule in railways.
4.	SSDAC and Reset Box are provided with sealing arrangement. The SSDAC top and back covers are to be sealed. Reset Box in SM's Room is also to be sealed with metal seal. This is to be done before commissioning at site.
	For Best Performance
1.	Provide battery and battery charger exclusively for this system. Do not add any other load on this battery.
2.	Maintain battery to provide steady 24V to the system. Check that no interruption takes place on power supply.
3.	Make sure to Switch off 24 V Power Supply to SSDAC before removing or reinserting the card (spare) into the system.
4.	Make sure that the system is connected to earth (1 Ohms) for protecting from lightning at all locations of SSDAC.
5.	Only twisted quad pair shall be used between two units for modem connection.
6.	While resetting, Reset key and button shall not be pressed for more than 10 seconds. Ideal time is 3 to 8 seconds

FOREWORD

Congratulations for your decision to purchase single section digital axle counter for line / section verification to control and drive signals in Railways.

We assure you that the SSDAC opens new era of signalling system for providing track circuiting and block working in Railways.

The contents of this manual have been divided into 18 chapters. The Installation procedure, interconnections, measurements, commissioning, maintenance and monitoring of system are described. The functions of SSDAC have been clearly defined for better understanding and correct installation of system.

Chapter 1 to 3 System information
Chapter 4 & 5 specifies the System Installation procedure.
Chapter 6 gives Inter connection details
Chapter 7 is Measurement of signals.
Chapter 8 & 9 describes Communication & System software.
Chapter 10 describes LED indications and Error codes.
Chapter 11 is Earthing Instructions
Chapter 12 Surge Voltage & Lightning protection
Chapter 13 Resetting the system
Chapter 14 Commissioning of the system.
Chapter 15 is about Maintenance of system
Chapter 16 Tools & Spares
Chapter 17 Do's & Don'ts
Chapter 18 Event logger recording & analysis

Author

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KNOW YOUR SSDAC

ISSUE DETAILS

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CHAPTER 1

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

Axle Counter is train detection equipment for use in Railways for monitoring a defined track section to provide occupancy / clear status. The System detects the presence of a train in any specified track section. The track section can be platform lines, yard lines, block section between two stations.

The axle counters have been designed first with transistorized circuits and after that the systems were made using ICs. Now CEL and RDSO have made an effort to design and develop a Single Section Digital Axle Counter (SSDAC) using Micro Controller and software program. The communication used in the system is by means of packets for exchange of information between units. The communication is in duplex mode and is fail-safe. The Digital Axle Counter model received by you is DACF-710P for monitoring single section.

1.2 MODELS OF SYSTEM

The Single Section Digital Axle Counter is manufactured and supplied in following model.

i. SSDAC for 2 Detection point DACF – 710P
ii. SSDAC for 2 Detection point DACF – 710A

The application of 2-Detection point system is for block section, platform lines, yard lines and auto section.

1.3 BRIEF OF SYSTEM

The System consists of SSDAC units, TX/Rx coil Axle detectors and vital relays. The SSDAC Unit is designed with High Frequency tuned circuits; pulse shaping circuits and Micro Controllers. The system has been designed for installing on trackside at Outdoor. 2 units (one pair) constitute one system for monitoring single-track section. The units are to be installed near the trackside at the beginning and end of the track section i.e. outer limits of section. The system is easy to install, Commission and maintain. The system is designed using Micro controller along with other electronic circuits and programmed using dedicated software. When any of these circuits fail, the system goes to fail-safe-condition. In case of failure in the Single Section Digital Axle Counter the station master has to apply the reset and after that the system goes to preparatory state. After which one pilot train has to be moved (piloted) in the

section for system to become clear. This removes the dangers associated with system becoming clear on direct traditional reset.

1.4 SPECIFICATIONS

The System has been designed to the RDSO Specification No: RDSO/SPN/177/2012.

1.5 SYSTEM DESIGN

The basic design of the system is based on counting the number of axles passing at each detection point. These stored counts are transmitted to the second unit of the system and vice versa by means of modem communication. The communication consists of digital packets having details of counts, health and no error condition to arrive at the decision of clearance. If counts registered at both detection points are equal, the section is cleared. Otherwise the section is shown as occupied.

The design of the system is aimed at providing failsafe operation. The redundancy is built into the system design by means of 2 out of 2 Micro Controller decision. This means two computing elements are built in each system to check arrival and clearance of train from the track section. The cards should be always in agreement for clearance of the section thereby providing an authentic decision, otherwise goes to a fail-safe operation.

The Digital Axle Counter has two micro controllers and two separate data collection paths. Both the micro controllers continuously communicate with each other to share respective count information and to monitor each other's health. The count information from both the micro controllers is used to compute the final output.

The design of System consists of: -

a. 21 KHz & 23 KHz High frequency Axle detectors.
b. Micro controller based design with 2 out of 2 decision.
c. Counting through software.
d. Modem communication (2 wire).
e. Opto isolated vital relay drive.
f. Fail safe operation.

1.6 SYSTEM FEATURES

i. Trackside electronic counting equipment
ii. Web mounted type Axle Detectors

iii. 4-spokes / 8-spokes push trolley wheel with wheel flange less than 22 mm and wheel base less than 100 mm has no effect on the system (system remains NORMAL).The push trolleys recommended for use with SSDAC is given in Drawing No – P008697 Page D34

iv. Compatible with 90R, 52 Kg & 60 Kg rail profiles

v. Easy to install, commission and maintain.

vi. Vital Relay output at both ends of the system.

The SSDAC model No – DACF-710 A/P supports the resetting of axle counter only on one outcount. In this case the system will not accepts any resetting operation till outcount is registered. The current model also supports the display of Error and Counts on the Reset Box. For displaying the information one additional pair of quad cable is required from location to station master's reset panel.

1.7 PRINCIPLE OF OPERATION

The Digital Axle Counter System comprises of: -

i. Axle detectors AD 711
   a. TX coils - 2 Nos.
   b. RX coils - 2 Nos.

ii. SSDAC DACF 710P - 2 Nos.

iii. Vital Relay Box VR721- 2 Nos

iv. Reset Box RB 259 - 1 No. for common resetting (station area / platform)
   - 2 Nos. for independent resetting

The Digital Axle Counter System works in combination of 2 units (1 pair) for one-track section. One SSDAC Unit of the system is installed at each end of the track section along with one set of TX and RX coil Axle detectors. The TX and RX coils are mounted on web of the rail at each location. The system front end generates carrier signals that are fed to the rail mounted TX coil Axle Detectors and receives these signals in Rx Coils at the respective location. When wheels of the train pass over the detection point, the carrier signal is modulated by means of phase reversal upto 180^{o} in the Rx coils. The phase-modulated signal is compared with standard reference signal and processed in the counting unit. The resultant signal is converted into a wheel pulse. Each passing wheel generates a set of two pulses in quick succession i.e. one after the other with some delay. This is shown in ***Drg. No L008077A3 (Page No D7) and Drg. No.I007765A4 (Page No. D8).***

The SSDAC Unit monitors these wheel pulses A & B to detect the direction of movement of train. It registers the counts of the number of wheels passing over the location and keeps the total count. The first unit sends its count to the second unit located at the other end of the track section at regular intervals. Similarly the first unit receives the count status from the second unit of the system. Each unit of the system compares the self-count with the remote count received from the other unit and evaluates the section status. The various supervisory signals are also monitored and checked in the SSDAC unit. Each SSDAC unit of the system drives its Vital Relay to energized condition (Pick up) at their location after verification of the following:

i. The self-count and remote counts are matched and equal.
ii. The supervisory signals are normal at both locations.

The track section is shown as CLEAR when the Vital Relay is picked up. Otherwise the track section is shown as OCCUPIED. The Vital Relay contacts can be used by the Railways at both ends or at any one end as per requirement.

1.8 PHYSICAL DESCRIPTION

The SSDAC Unit of the Digital Axle Counter system is manufactured in a 3U height and 42T width desktop enclosure. The system comprises of eight plug-in modules. All the cards are of extended single Euro size (220mm x 100mm) that plugs into a motherboard in the sub rack. ***Drawing no A007745A4 (Page No. D9)*** shows the front view of the system and the position of PCBs. ***Drawing no I008442A4 (Page No. D10)*** shows the rear view of the system.

The cards must be inserted in the order of card 1 to 8 from left to right in the sub rack. The various dimensions of the system are as follows.

- Width: 300.0 mm. (42 T)
- Height: 133.0 mm (3 U)
- Depth: 300.0 mm

1.9 CONSTRUCTION DETAILS

i. Web mounted axle detectors.
ii. Sub rack for SSDAC.
iii. Modular design of cards.
iv. Inter card shielding.
v. Motherboard for Inter Card Connections.

1.10 TYPICAL APPLICATION

The SSDAC system can be used for monitoring single track section with 2 detection points. ***Refer Drawing no B007743A4 (Page D1)***

1.11 ADVANTAGES OVER OTHER TRACK MONITORING SYSTEMS

i. Eliminates the need for wooden sleepers.

ii. Monitors section length up to 18 KMs.

iii. Low power consumption. (2.0 A @ 24V DC for complete system)

iv. Cable requirement is ½ Quad.

v. Can also be used on OFC.

vi. Q type Vital Relay 24V, 1000 Ohm output at both locations.

vii. Trolley suppression track circuit is not required.

CHAPTER 2

2.0 SYSTEM DETAILS

2.1 INTRODUCTION

The system comprises of trackside SSDAC units, which are installed near the detection points of the railway track. The system implements the total function of Counting of train wheels and its evaluation at both detection points. This includes

i. Phase reversal type TX and Rx coil Axle detectors.
ii. Generation of carrier signal.
iii. Demodulation of received signal.
iv. Pulse Shaping and Validation.
v. Pulse Counting.
vi. Transmission and Reception of Counts between two units of SSDAC.
vii. Output for Vital Relay.
viii. Read Back of Vital Relay

2.2 APPLICATION

The SSDAC - 2D can be used for track circuiting in loop lines, block sections etc.

The SSDAC operates in Independent Mode without central evaluator. In this mode 2 numbers of SSDAC Units are used. The 1st unit of SSDAC transmits its wheel count to 2nd unit of SSDAC and also receives the wheel count from 2nd unit of SSDAC. Based on its internally counted wheel and the wheel count received from second unit of SSDAC, the SSDAC computes the status of the corresponding track section and outputs the same to the relay port. The communication between SSDAC's is through a 2 Wire internal modem.

2.3 FUNCTIONS PERFORMED BY SSDAC

The various functions performed by SSDAC Counting unit are described below.

2.3.1 TX AND RX COIL AXLE DETECTORS

Each detection point comprise of 1 no. of Transmitter coil and 1 no. of Receiver coil. The SSDAC generates 21 KHz & 23 KHz carrier signals to the Transmitter coils respectively. These signals are received in Receiver coils. The receiver signal is phase modulated with each train wheel passing over the detection point.

2.3.2 Demodulation of Received Signal

When the train wheels passes over the detection point, the receive signal gets modulated. The modulated receive signal is demodulated in the signal conditioner card to generate pulses corresponding to wheels passing over the detection point.

2.3.3 Pulse Shaping and Validation

The generated set of A & B pulses corresponding to the wheels passing over the detection points are passed through time filters and validated for acceptance.

2.3.4 Pulse Counting

The set of A & B pulses validated are used to identify the direction of movement of train thereby to increment or decrement pulse counts. These counts identify the number of wheels moving into or out of the section through that particular detection point.

2.3.5 Transmission and Reception of Counts between the two units of SSDAC

In Independent mode of operation, 1st unit of SSDAC periodically sends its wheel counts to the second unit of SSDAC. Similarly, the 1st unit of SSDAC receives wheel counts from 2nd unit of SSDAC. The counts from both units are compared to compute the Clear/Occupied condition of the respective track section.

2.3.6 Vital Relay Drive:

If the counts compared between SSDAC are matched and equal, then the vital relay is driven to Pick Up by the Relay Driver card.

2.3.7 Vital Relay Read Back:

The Vital Relay potential free contacts are fed with voltages and these are read back in the system to check the vital relay is driven to pick up or drop as per the command given from the system.

2.4 BRIEF DESCRIPTION OF CARDS

The block diagram of the SSDAC is given in ***Drawing no B007744A4 (Page No. D6)***. The SSDAC comprises of following functional card modules. The SSDAC system is based on 2-out-of-2 Micro Controller architecture. Both the Micro Controller cards receive the wheel pulses from the signal conditioner cards. The wheel counts are counted independently. Each of the two Micro Controllers receives the wheel count from the remote Axle Counter system and computes the track status independently. Both the Micro Controller cards give the command for relay driving the vital relay. If both the

Micro Controller agrees on count status and health, the Vital Relay is driven to pick up otherwise it remains dropped. Each unit of SSDAC consists of following modules. These modules implement the functions described in section 2.1.

i. Signal Conditioner Cards (Card 1 & 2)
   a Carrier Signal Generation
   b Demodulation and Pulse generation.

ii. Micro controller logic blocks (2 micro controllers) (Card 3&4)
   a. Pulse counting.
   b. 2 out of 2 decision
   c. Vital Relay Command Read back
   d. Preparatory Relay Drive Command

iii. Event Logger Card (for monitoring failures, etc) (Card 5)
   a. For storage of events in the system.

iv. Modem Card (Card 6)
   a. Serial I/O Multiplexer
   b. Resetting Circuit

v. Relay Driver Card (Card 7)
   a. Output drive for vital relay & PR Relay

vi. Power Supply Module (DC-DC converter) (Card 8)
   a. All the supply voltages required in SSDAC are generated

All the above cards are of extended single Euro size (220mm x 100mm), which plugs into a motherboard in the sub rack. The cards must be inserted from card 1 to 8 starting from left within the sub rack.

2.4.1 SIGNAL CONDITIONER CARD (SCC) (Card 1 & 2)

2.4.1.1 Carrier Signal Generation

Each card generates the carrier signals, which is transmitted, to its transmitter coil mounted on each detection point.

SCC1 (21 KHz) to TX Coil A.

SCC2 (23 KHz) to TX Coil B.

2.4.1.2 Demodulation and Pulse generation

Each card demodulates its receiver signal from Rx coil A & B to generate pulses corresponding to wheels passing over the detection point. These pulses are then validated and fed to Micro Controller Logic Cards.

Rx Coil A to SCC1 (21 KHz).

Rx Coil B to SCC2 (23 KHz).

2.4.2 MICRO-CONTROLLER LOGIC BLOCK CARD (MLB) (Card 3&4)

The Micro Controller logic block cards are the heart of the unit. Two identical cards have been implemented to give 2-out-of-2 decision. These cards perform the functions related to counting of pulses, count validation, communication through Modem with 2nd Unit of SSDAC and decision making to give output. The input pulses are given to both the Micro Controller Logic Blocks. Both the micro-controller cards continuously monitor each other's health and wheel counts. If the results are not matching then the system goes into Error state.

The results of count check and health between 2 micro controller cards are always match to arrive at a clear decision by the system.

Vital relay read back feature is included in the Micro controller card to read back the vital relay in occupied as well as in the clear state and checks as per the decision given from the card.

2.4.3 MODEM CARD (Card 6)

V.21 Modem is used for communication between two units of SSDAC. The digital packets generated by MLB cards are sent to remote unit on a pair of cable. Serial I/O Multiplexer is used to select the micro controller card that will communicate with the modem on the remote unit.

The SSDAC reset circuit is included in the modem card wherein the reset voltage window (36V to 52V) and reset timing window (between 2 secs to 10 secs) functions has been provided. The reset command will not respond for the cases outside these windows.

2.4.4 RELAY DRIVER CARD (Card 7)

The card module checks & generates the vital relay drive output to finally clear/occupied status of the corresponding track section. The output is used to drive fail-safe vital relay.

2.4.5 DC-DC CONVERTER CARD (Card 8)

The Card receives 24V battery input and generates 5V, 12V, and 24V output with common ground for all circuit requirements. A separate 15V with ISO ground is also provided for vital Relay drive output.

2.4.6 EVENT LOGGER CARD (Card 5)

Event Logger card is designed to capture and store important signals from the remote and local SSDAC units. The stored data can be downloaded from the event logger card for the

purpose of analyzing the events occurring during the operations of the SSDAC. The data can be analyzed with the help of CEL Data analyzer software.

CHAPTER 3

3.0 SYSTEM DESCRIPTION

3.1 INTRODUCTION

The SSDAC Counting Unit comprises of the following cards.

i.	Signal Conditioning Card	Card 1 & 2	2 Nos.
ii.	Micro Controller Logic	Card 3 & 4	2 Nos.
iii.	Event Logger	Card 5	1 No.
iv.	Modem	Card 6	1 No.
v.	Relay Driver	Card 7	1 No
vi.	DC-DC converter	Card 8	1 No.

		Total:	8 Nos.

The card details are described in following sections.

3.2 SIGNAL CONDITIONING CARD (Card 1&2)

The Signal Conditioning Cards (SCC) generates high frequency (SCC1-21 KHz, SCC2-23 KHz) carrier signals, which are transmitted to the two independent TX coils of axle detectors. The two independent Rx coils receive these signals, which are at a phase difference upto 180^{o} with respect to reference signal of TX coils. The TX and Rx coils are mounted to the web of rails. When the train wheels passes over the axle detectors, the Rx signal phase difference becomes nearly to zero with respect to reference signal of TX coils. The SCC card processes the change of phase difference from 180^{o} to 0^{o} between the reference & Rx coil signals and converts it into valid train pulses. The supervisory levels are also generated. The board generates TTL compatible pulse and supervisory signals. The Oscillator, Pulse & Supervisory OK signal indications are provided on the card. The SSDAC system with phase reversal type track devices does not require short length DC track circuits (3 Rail Length.) and its TPR relay connections for trolley suppression.

Power Supply to unit shall be switched OFF before removing Tx/Rx coils from Rail web. No metal parts / metal sheets / metal foils shall be placed near Tx/Rx coils.

3.3 MICRO CONTROLLER LOGIC BLOCK CARD (Card 3 & 4)

The Micro controller Logic Block Card (MLB) is the heart of the system. These cards implement the wheel detection, train direction checking and wheel counting functions. In addition it receives the remote wheel count and computes the status of the section for clear or occupied. It also Checks various supervisory signal levels like supervisory of TX/Rx coils, presence of various cards, LED check, communication link failure etc.

The card design is based on 8051 compatible micro controllers. The salient features of the card are as follows: -

i. Micro controller is based on industry standard 89C51
ii. RS232C compatible serial port for modem connectivity
iii. 10K byte on chip Flash ROM for program storage
iv. 256 byte on chip RAM
v. Parallel ports for address/mode input, pulse inputs and Vital Relay output and relay read back.
vi. Extensive LED display – A block of 8 LED indicators for count progress / error display, 2 independent LED indicators for section status.

3.4 MODEM CARD: (Card 6)

The Modem card being used is of V.21 type (2 wires) in Single Section Digital Axle Counter (SSDAC). The card interfaces with serial RS232C port of both Micro controller Logic Block cards. It multiplexes the two RS232 inputs and selects one of the two channels and provides signal conversion from digital to analog and vice-versa as per CCITT V.21 standard. The board uses OKI FSK modem IC.

i. The Salient features of the card include: -FSK Full Duplex modem chip
ii. V.21 mode of operation (2 wire)
iii. 300 Baud rate
iv. Multiplexes the two serial ports
v. Originator (Entry unit) and Answerer (Exit unit) for V21 selected.
vi. Automatic gain controls provided in receive path.
vii. SSDAC reset circuit including the reset voltage window and reset timing window function.

3.5 RELAY DRIVER CARD (Card 7)

The Relay Driver card (RD) is the output card for driving Vital Relay for Single Section Digital Axle Counter (SSDAC). The card is of extended Euro size card terminated with 64 pin standard

Euro Connector. The card directly plugs into the motherboard of SSDAC. One RD card is used in each SSDAC counting unit. The Relay Driver card receives the command of clear and clock signals from MLB1 & MLB2 cards and drives the vital relay to energized condition (Pick up) when section is clear. If a train occupies the section, the vital relay is dropped. The command signals and vital relay Pick up is indicated on the card. The preparatory reset output after system becomes normal after reset is driven from this card.

The main functions of the card are:

i. Dual Clock Checking circuits
ii. Opto isolator Circuit.
iii. Vital Relay Drive Output.
iv. Preparatory Reset (PR) Relay drive output.

3.6 DC-DC CONVERTOR (Card 8)

The DC-DC Converter card converts 24Vdc input to different DC Power supply required by the SSDAC in an extended Euro size board that is plugged directly in to the SSDAC motherboard.

The main features of the board are: -

i. Low Ripple
ii. Wide input line regulation
iii. Very good load regulation
iv. Input/output protected for short circuit.
v. Immune to EMI/RFI Interference.

3.7 EVENT LOGGER CARD (CARD 5)

Please refer chapter 18 for details.

CHAPTER 4

4.0 INSTALLATION PROCEDURE

4.1 COMPONENTS OF SSDAC

The SSDAC consists of the following equipments: -

i. TX & Rx Coil Axle Detectors - 2 Nos.

ii. SSDAC Counting Unit - 2 Nos.

iii. Vital Relay Box - 2 Nos.

iv. Reset Box - 1 No. (Common resetting) or 2 Nos. (Independent resetting)

v. Surge Voltage Protection Device 2 Nos.

4.2 SUPPORTIVE COMPONENTS

The supportive equipment and accessories required for SSDAC are: -

S.No.	Supportive equipment and accessories	Quantity		
		Station Area(1 No. SSDAC)	Block Section (S/L) 1 No. of SSDAC	Block Section (D/L) (2 No. of SSDAC)
1.	24V, 40 AH low maintenance battery or 24V, 5 Amp output from one module of IPS	1 No.	2 Nos.	2 Nos.
2.	24V, 5A Axle counter type Battery Charger	1 No.	2 Nos.	2 Nos.
3.	4/6 Quad cable For SSDAC (Station to Station) For reset box (From Location to SM's Room)	0.9 mm (1 Pair) (1 Pair)	0.9 mm (1 Pair) (1 Pair)	2 Nos. (2 Pair) (2 Pair)
4.	Apparatus case (Full) with termination board	2 Nos.	2 Nos.	4 Nos.
5.	25 sq mm 'AL' Power Cable, 2 core.	Length as required	Length as required	Length as required
6.	1.5 Sq.mm, Signalling cable (6 Core required + 4 spare for S/L) (12 Core required + 4 spare for D/L)	Length as required	Length as required	Length as required
7.	Earthing of Apparatus case (Locations)	2 Nos.	2 Nos.	4 Nos.
8.	Deflectors for Axle detectors supplied	4 Nos.	4 Nos.	8 Nos.
9.	QNA1 type Relay, 24 V, 1000 Ω, 6F/6B	2 Nos.	4 Nos.	8 Nos.

The axle detector unit consists of:

i. Web Type Transmitter Coils (TX coil)

ii. Web Type Receiver Coils (Rx coil)

iii. Rail Deflector Bracket Assembly

4.2.1 DETAILS FOR FIXING OF AXLE DETECTORS

i. The Axle detectors should be installed after Advance starter (LSS) signal post and Home (HS) signal post on UP and DN lines of Double line section for use in BPAC.

ii. The Axle detectors should be installed after Advance Starter Signal (LSS) Post for UP & DN Lines of Single Line Section for use in BPACs.

iii. In main Lines, loop lines, yard area the Axle detectors can be fixed just after the starter signal post of each line under monitoring of SSDAC.

iv. The Axle detectors separation between two sets of different SSDAC systems should be at least 2 meters away so as to avoid mutual interference.

v. The detectors have to be fixed on the clear spacing between two sleepers.

vi. It should be ensured that the rail is not badly worn out causing the wheel flanges to graze over the fittings.

vii. The design of the detector is suitable for 90R, 52Kg and 60Kg rails.

viii. The transmitter and Receiver coils are provided with 24/0.2 shielded cables of 10m lengths and have to be taken to location box directly without any loops.

ix. Transmitter and Receiver cables should run separately at a minimum separation of 400mm in different HDPE pipes. The cables have to be laid in the 40mm HDPE pipe for safety and buried underground below ballast at the depth of approx. 0.3mts.

4.2.2 PROCEDURE FOR FIXING OF AXLE DETECTORS

4.2.2.1 MARKING & DRILLING HOLES ON WEB OF RAIL

i. The marking jig is to be fixed from top of the rail and tightened to the rail with clamp.

ii. The marking for 3 holes with punch is to be made on the Web of rail using marking jig ***(Drg No. F008300 on page D29 & D29a).***

iii. The marking for 3 holes is given at a distance of 0 - 170 - 340mm.

iv. For 90 R or 90Lb, 52 Kg & 60Kg mark is 86mm from top.

v. 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.

vi. 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.

4.2.2.2 FIXING OF AXLE DETECTORS (TRANSMITTER AND RECEIVER COIL)

(Drg No. A008446A3 on page D20, A008447A3 on page D21, A008448A3 on page D22)

i. 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.)

ii. 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.

iii. 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.

iv. 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.

v. 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.

vi. 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.

vii. 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

viii. 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. The ***Drawing no I008072A4 (Page No. D28)*** is to be followed for correct installation of axle detector.

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.

4.2.3 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.

4.3 INSTALLATION OF LOCATION BOX

4.3.1 LOCATION BOX (Full size)

i. The location box should be installed as close as possible to detection point so that the length of Axle detector cable should not exceed 10m.

ii. The location box foundation should be cast at rail level and as per scheduled dimensions of Railways. (Standard practice in railways).

iii. One Shelf should be provided in the location box for keeping SSDAC Counting Unit & Vital Relay Box.

iv. The VR box consists of Dual relay i.e. VR & PR relay of Q Type, 24V and 1000Ω type hence no external relay is required in the location box. The available contacts from the relay can be extended to the station for the external circuits for PR & VR. ***Refer Drawing no S008429A3 (page no D18 & D19)***

4.3.2 TERMINAL BOARD

i. The incoming and outgoing cables from the Axle detectors, SSDAC unit, modem and cable going to the remote SSDAC is terminated on a cable termination board inside the location box. It should also have the facility for measuring various parameters.

ii. The incoming and outgoing cables are terminated on spring cage type connectors from M/s WAGO or M/s Phoenix fitted on DIN rail fitted on Bakelite sheet of location box. The cables from SSDAC, power supply; TX and RX coils are to be terminated as per detail shown in ***Drawing no W008474A3 (page no D13) & I008477A3 (page no D11)***. Fuse with rating of 2A is to be provided on 24V Power Supply to the system.

4.4 SSDAC COUNTING UNIT

The SSDAC is installed on the wooden/ Hylam /NFTC plank inside the location box. This is firmly fixed using clamps, nuts & bolts. ***Refer Drawing no I008477A3 (Page no. D11)***

4.5 VITAL RELAY

The VR Box is to be installed on the same wooden/Hylam/NFTC plank inside the location box where SSDAC unit has been installed. The VR Box is also firmly fixed using clamps, nuts & bolts. ***Refer Drawing no I008477A3 (Page no. D11).*** VR Box also has yellow colour LED and it will glow when PR relay is picked up. The PR relay contacts can be extended to relay room for proving PPR relay.

4.6 POWER SUPPLY ARRANGEMENT

The power supply to SSDAC consists of

i) 24V, 40 AH Battery and 24V, 5A Battery charger or 24V, 5A dedicated module of IPS.

ii) Power cable for connection from battery to SSDAC unit

The power supply and its equipments for digital axle counter are shown in ***Drawing no S008429A3 (Page No. D18)***. Only Axle counter type battery charger should be used. When integrated Power Supply (IPS) of 24V, 5 A is used, its ripple content should be within limits. The same 24V Battery can be used for advance and home location of UP & DN SSDAC units of double line block section.

This power supply should not be used for any other signaling gear/systems.

4.7 BATTERIES

The 24V, 40 AH low Maintenance Battery (12 VX 2Nos.) or 24V; 40AH Battery Bank may be used for powering the two units of SSDAC. The batteries are to be procured as per latest RDSO specifications.

i. The batteries are kept on teak wood/ hard wood shelf on MS angles and are to be installed in the battery room.
ii. Insulators are to be provided below the batteries.
iii. The charging of batteries has to be done as per manufacturer's manual.

4.8 BATTERY CHARGER

i. The Axle counter type Battery Charger as per latest specification is to be procured and installed in the equipment room. The battery chargers are usually kept on teak wood shelf fixed on MS Angles.

ii. The 24V, 5A battery charger has to be installed and connected to battery on auto mode. The current consumption of each SSDAC unit is 1.0A @ 24V. For complete system (2 SSDAC units) it is 2.0A @ 24V.

4.9 INTEGRATED POWER SUPPLY

The 24V, 5A output from one of the modules of Integrated Power Supply (IPS) of approved manufactures may be used to power SSDAC units instead of Battery.

4.10 CABLE

The connecting cable from Battery / IPS to SSDAC units at the site should be as given below:

i. 2 core, 25 sq. mm aluminium power cable.

ii. 12+4 spare conductors (double line) or 6+4 spare conductors (single line) of 1.5 sq. mm signalling cable

iii. 4/6 Quad cable (1 Quad for double line or ½ quad for single line for station to station communication and 1 Quad for location to SM's Room for reset display)

CHAPTER 5

5.0 INSTALLATION AND SETTING UP SSDAC

5.1 INTRODUCTION

This chapter provides necessary information for installation of SSDAC. This includes addressing scheme, and it's setting through 8-way dip switch, modem setting, etc.

5.2 ADDRESSING SCHEME

The SSDAC can be used in single sections of all type with 2 detection points (2D)

The Counting Units of SSDAC communicate with each other on regular basis and provides the status and wheel count to each other. The Evaluation and final decision for driving the vital relay to pickup is also built in the SSDAC units. The SSDAC system for 2D, therefore, monitors and provides the track clear/occupancy status of the section.

2D system for Single Section ***(Refer Drawing no B007743A4, Page No. D1)***

The 2D system is designed by means of one pair i.e. 2 SSDAC units. The units are manufactured as Entry and Exit end units for single section. The Entry unit is to be installed at the beginning of a section i.e. Adv. starter and the Exit unit is to be installed at the end of a section i.e. Home of a block section. The units are connected to Axle detectors, vital relay, Reset Box and other wiring as per the wiring diagram ***Drawing no L008453A4, Page No. D2 & D3***

The SSDAC units are provided with unique address schemes for selection of 15 different pairs of units by means of 8-way dip switch on motherboard. We have selected the first pair in factory and units are supplied. However, for providing different pairs of units in station area/ Block section, the address scheme is given in Table 5.1. The user can also monitor the address of SSDAC units using monitor port (as explained in Chapter 17)

Caution: The SSDAC units installed for a single section should not be either both Entry type or units installed should not be both Exit type for 2 D section. This may result in continuous configuration Error in the system. The Entry and Exit unit markings have been printed on the units for easy identification of the system. For avoiding wrong installation it is advised that the same serial no units should be installed for one section.

Address setting of Units:

SW1 is 8-way sliding type dip switch setting on mother board (to access this switch, open 6 no's of screws on back cover). The switches can be slide to move to Right (ON) or Left (OFF) as required.

The factory setting address provided (pair 1) by selecting the following switch position in the units:

Pair 1: **Unit 1: 02 (Entry)**

Selection	8-way switch	Selection
--	1	ON
OFF	2	--
--	3	ON
--	4	ON
--	5	ON
--	6	ON
--	7	ON
--	8	ON
To Left Side	Switch Position	To Right Side

Unit 2: 03 (Exit)

Selection	8-way switch	Selection
OFF	1	--
OFF	2	--
--	3	ON
--	4	ON
--	5	ON
--	6	ON
--	7	ON
--	8	ON
To Left Side	Switch Position	To Right Side

The 8 way switch can be viewed on to the mother board after opening back cover.

Example for selecting a different pair of units (pair no 5) and its switch position is given in the table below:

Pair 5: **Unit 1: 0A (Entry)**

Selection	8-way switch	Selection
--	1	ON
OFF	2	--
--	3	ON
OFF	4	--
--	5	ON
--	6	ON
--	7	ON
--	8	ON
To Left Side	Switch Position	To Right Side

Unit 2: 0B (Exit)

Selection	8-way switch	Selection
OFF	1	--
OFF	2	--
--	3	ON
OFF	4	--
--	5	ON
--	6	ON
--	7	ON
--	8	ON
To Left Side	Switch Position	To Right Side

The address setting for all the 15 pairs is shown in the table below

Table 5.1

8-way Switch Position								Mode	Address Setting	
8	**7**	**6**	**5**	**4**	**3**	**2**	**1**			
ON	ON	ON	ON	ON	ON	OFF	ON	ENTRY	02	PAIR 1
ON	ON	ON	ON	ON	ON	OFF	OFF	EXIT	03	**(factory selected)**
ON	ON	ON	ON	ON	OFF	ON	ON	ENTRY	04	PAIR 2
ON	ON	ON	ON	ON	OFF	ON	OFF	EXIT	05	
ON	ON	ON	ON	ON	OFF	OFF	ON	ENTRY	06	PAIR 3
ON	ON	ON	ON	ON	OFF	OFF	OFF	EXIT	07	
ON	ON	ON	ON	OFF	ON	ON	ON	ENTRY	08	PAIR 4
ON	ON	ON	ON	OFF	ON	ON	OFF	EXIT	09	
ON	ON	ON	ON	OFF	ON	OFF	ON	ENTRY	0A	PAIR 5
ON	ON	ON	ON	OFF	ON	OFF	OFF	EXIT	0B	**(example shown above)**
ON	ON	ON	ON	OFF	OFF	ON	ON	ENTRY	0C	PAIR 6
ON	ON	ON	ON	OFF	OFF	ON	OFF	EXIT	0D	
ON	ON	ON	ON	OFF	OFF	OFF	ON	ENTRY	0E	PAIR 7
ON	ON	ON	ON	OFF	OFF	OFF	OFF	EXIT	0F	
ON	ON	ON	OFF	ON	ON	ON	ON	ENTRY	10	PAIR 8
ON	ON	ON	OFF	ON	ON	ON	OFF	EXIT	11	
ON	ON	ON	OFF	ON	ON	OFF	ON	ENTRY	12	PAIR 9
ON	ON	ON	OFF	ON	ON	OFF	OFF	EXIT	13	
ON	ON	ON	OFF	ON	OFF	ON	ON	ENTRY	14	PAIR 10
ON	ON	ON	OFF	ON	OFF	ON	OFF	EXIT	15	
ON	ON	ON	OFF	ON	OFF	OFF	ON	ENTRY	16	PAIR 11
ON	ON	ON	OFF	ON	OFF	OFF	OFF	EXIT	17	
ON	ON	ON	OFF	OFF	ON	ON	ON	ENTRY	18	PAIR 12
ON	ON	ON	OFF	OFF	ON	ON	OFF	EXIT	19	
ON	ON	ON	OFF	OFF	ON	OFF	ON	ENTRY	1A	PAIR 13
ON	ON	ON	OFF	OFF	ON	OFF	OFF	EXIT	1B	
ON	ON	ON	OFF	OFF	OFF	ON	ON	ENTRY	1C	PAIR 14
ON	ON	ON	OFF	OFF	OFF	ON	OFF	EXIT	1D	
ON	ON	ON	OFF	OFF	OFF	OFF	ON	ENTRY	1E	PAIR 15
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	EXIT	1F	

5.3 TRAIN DIRECTION & COUNTING METHOD

In case of block section, the SSDAC units are to be installed at each end of the block section. One of the SSDAC units is configured as Entry unit and the other is configured as Exit unit. The counting procedure is given below:

i) At the Entry unit, when the train is entering into section (1st detection) the wheel count is incremented. At the Exit end, when the train is leaving out of the section (2nd detection) the wheel counts are also incremented.

ii) In contrast, if the train is entering into the section from Exit end (2nd detection) i.e. the train movement is in reverse direction, the wheel counts are decremented and when the train is coming out of the section from Entry end (1st detection) the wheel counts are also decremented.

iii) At Entry end if train enters into section (1st detection), the counts are incremented and when train shunts back from the same detection, the counts are decremented.

iii) At Exit end if train enters into section (2nd detection), the counts are decremented and when train shunts back from the same detection, the counts are incremented.

5.4 SWITCH SETTINGS IN MODEM CARD

The modem card transmits and receives the digital packet information from one counting unit to the other. The modem has been set in "ORIGINATOR" mode for Entry Unit and in "ANSWERER" mode for Exit Unit as default. The selection of dip switch SW2 and SW3 is given below in table 5.3. The dip switch can be accessed by removing the card shield of modem card.

Table 5.3: Dipswitch (4-way) selection in old Modem Card Rev G

SNO	SSDAC Units	Dipswitch Settings SW2		Dipswitch Settings SW3	
		1st Way	2nd way	1st Way	2nd way
1	Exit Unit	OFF	ON	OFF	ON
2	Entry Unit	ON	ON	ON	OFF

Table 5.3A gives the details of the DIP switch selection for new modem card No 699.

Table 5.3A: Dipswitch (2-way) selection in Modem Card No 699

SNO	SSDAC Units	Dipswitch Settings SW1	
		1st Way	2nd way
1	Exit Unit	OFF	OFF
2	Entry Unit	ON	ON

5.5 SIGNAL CONDITIONER CARD (SCC Card)

The signal conditioner cards 1&2 are provided with monitoring sockets. The initial phase shift in Rx coil signal is monitored by means of measuring 2.2V DC on cards with DMM. The range of above voltage is 2.0 to 2.5 volts. The Rx coil signal connected to the SCC card and with normal phase shift of 180^{o} available, the DC Voltage measured should be 2.2Volts. Otherwise the Rx coil cable polarity connected to the card is to be interchanged for getting the same voltage.

5.6 RELAY DRIVER

The relay driver card provides the 24V DC output required for driving Vital Relay to Pick Up condition. The output from the SSDAC Unit has to be connected to the relay. There is no

adjustment required in this card. The vital Relay is also checked (read back) in the system as per the driving output.

5.7 DC-DC CONVERTER

The DC-DC converter card provides all DC supply voltages required for powering ON the circuits of SSDAC. It takes 24V DC input from battery. The input range of DC-DC converter is 19.2V to 28.8V for normal working and provides specified constant output voltages in the system.

CHAPTER 6

6.0 SYSTEM INTER CONNECTION DETAILS

6.1 INTRODUCTION

This chapter provides the details for interconnection to be made between SSDAC counting unit, TX / Rx axle detector, modem, Power Supply and other details. This includes the details of MS Coupler connectors provided on SSDAC counting unit for external connections.

6.2 TX COIL AXLE DETECTOR (MS-1)

The TX coil1 (21 KHz) and TX coil2 (23 KHz) axle detectors are connected to SCC card 1 and 2 respectively through MS Connector1 (7 pin). From the MS connector pins the signals are connected to a 7-pin Jalex connector P9 on the Motherboard. These are finally connected to SCC cards 1 & 2. The pin configuration of 7-pin connector is given below in table 6.1.

Table 6.1: TX Coupler (MS-1)

S.No	MS coupler (MS-1)		Description of Signal	WAGO/ PHOENIX	Wire Details Of TX Coil Axle Detectors	
	Pin	Cable				
1	A	BLUE	Tx21	Connection to be made	RED	24/0.2, 2 core shielded PVC sheathed cable (1^{st})
2	B	ORANGE	Tx21	--do--	BLACK	----do---- (2^{nd})
3	C	GREEN	Tx23	--do--	RED	24/0.2, 2 core shielded PVC sheathed cable (1^{st})
4	D	BROWN	Tx23	--do--	BLACK	----do---- (2^{nd})
5	E	GREY	TP_OUT	--do--	RED	Optional can be used if TP circuit is already provided
6	F	BLACK-WHITE	TP_IN	--do--	BLACK	
7	G	NC	NIL	----	---	----

6.3 Rx COIL AXLE DETECTORS (MS-2)

The Rx coil1 (21 KHz) and Rx coil2 (23 KHz) Axle detectors receives the induced signals and these are fed to SCC card 1&2 for processing the information through MS Connector2 (5 pin). From the MS connector pins, the signals are connected to a 5-pin Jalex connector on the Motherboard. These are finally connected to SCC cards 1 & 2. The pin configuration of 5-pin connector is given below in table 6.2.

Table 6.2: RX Coupler (MS-2)

S No	MS Coupler (MS-2)		Description Of Signal	WAGO/ PHOENIX	Wire Details Of Rx Coil Axle Detectors	
	Pin	Cable				
1	A	VIOLET	Rx21 (21KHz)	Connection to be made	RED	24/0.2, 2 core Shielded PVC Sheathed cable
2	B	VIOLET	Rx21 (21KHz)	--do--	BLACK	
3	C	WHITE	Rx23 (23KHz)	--do--	RED	24/0.2, 2 core Shielded PVC Sheathed cable
4	D	WHITE	Rx23 (23KHz)	--do--	BLACK	
5	E	NC	Nil	--	--	--

6.4. MODEM COUPLER (MS-4)

The two MLB cards send the digital packet information to the modem card through the Axle Counter motherboard. The modem card converts the digital packets to analog signals for transmission. The analog signal from modem card through Euro Connector is available at 4-Pin connector P5 on motherboard and then connected to 4 Pin MS circular connector on the back plate. The modem is connected with remote SSDAC unit via station by means of 2Wire, 0.9mm dia Quad cable in Block section for track circuiting applications. ***Refer Drawing No. S007855A4 Sheet 1 (Page No. D4).*** The voice channel on OFC cable can also be used for connecting SSDAC units between two stations for block working. R***efer Drawing No.S007855A4 Sheet 2 (Page No D5)***. The resetting of unit is provided through C and D Pins of MS Coupler 4. The 48V DC is available at these pins when reset is applied by SM from SM's Reset box. The pin configuration of 4-pin MS connector4 is given in Table No. 6.3

Table 6.3: Modem Coupler (MS-4)

S.No	MS Connector Pin (MS - 4)		Description of Signal	WAGO/ PHOENIX	Cable to be used
	Pin	Cable			
1.	A	WHITE	TX	Modem signal for connection to 2nd counting unit at next station	½ Quad 0.9 mm up to station and PET cable / voice channel on OFC to next station
2.	B	WHITE	Rx		
3.	C	RED	Reset + (48V)	Reset connections are wired from SM's Reset Box from station	1.5 sq mm sig / 0.9 mm Quad cable from station.
4.	D	BLACK	Reset (0V)		

6.5 RELAY DRIVE (MS-3)

The SSDAC is connected by means of 6-pin MS coupler (MS-3) to Vital Relay in VR Box. The 6-pin MS coupler is connected to relay driver card through the motherboard. The input / output pin detail of 6-pin circular connector is given below in table 6.4.

Table 6.4: Relay Drive Coupler (MS-3)

S.No	MS COUPLER (MS-3)		Description of SIGNAL	Connections made through	MS COUPLER (MS-7) on VR Box	
	Pin	Cable			Pin	Cable
1.	A	BLUE	Prep Reset (24V)	Directly connected to VR Box (Coupler to coupler)	A	BLUE
2.	B	ORANGE	To R2 of vital relay		B	ORANGE
3.	C	GREEN	To R1 of vital relay		C	GREEN
4.	D	BROWN	D1 (pick up contact)		D	BROWN
5.	E	GREY	D5 (drop contact)		E	GREY
6.	F	BLUE-WHITE	ISO (Gnd) t0 D2 and D6		F	BLUE-WHITE
					G	-NC-

6.6 MONITOR PORT (MS - 5)

The Monitor port is being used to carry data from the field unit to the corresponding reset box (New Model No.: RB-259). This is being used to display the status of the SSDAC field unit on the reset box. It is recommended to use 1 pair of 0.9 mm Quad cable from location box to SM's room for display of Count and other important information on reset box.The details of 9 pins MS Coupler are given below in table 6.5.

Table 6.5: Monitor port

S.No	MS Coupler (MS-5)		Description of SIGNAL	Terminated on CT Board
	Pin	Cable		
1.	A	--- NC ---	--- NC ---	Connected on CT Board for display of status of data on new reset box (Model No.: RB-259).
2.	B	--- NC ---	--- NC ---	
3.	C	--- NC ---	--- NC ---	
4.	D	--- NC ---	--- NC ---	
5.	E	--- NC ---	--- NC ---	
6.	F	--- NC ---	--- NC ---	
7.	G	--- NC ---	--- NC ---	
8.	H	RED	MDM RB +	
9.	J	BLACK	MDM RB –	

6.7 POWER SUPPLY 24V (MS - 6)

The power supply 24V connection is made to the system through 2-pin MS Connector (MS-6). This is extended to the DC-DC converter card through motherboard and is given below in table 6.6.

Table 6.6: Power Supply

S.No.	MS Coupler (MS-6)		Power Supply	Connection made on CT Board	Connection from battery / IPS
	Pin	Cable			
1.	A	BLACK	N24		N 24

2.	B	RED	B24		B 24

6.8 VITAL RELAY BOX (MS - 7)

The Vital relay is housed in the VR box. The relay coil and its contacts are terminated on to the 7-pin MS coupler (MS-7) fixed at the back of the relay box. The wiring is as shown below in table 6.7. The Relay Drive output from SSDAC is connected to Vital Relay through this coupler MS-7.

Table No. 6.7: Vital Relay Box

S.No.	MS coupler (MS-7)		Description of signal to vital relay	Connection to be made
	Pin	Cable		
1.	A	BLUE	Prep. Reset (24V) In	Direct coupler to coupler cable to be connected between VR Box (MS-7) to SSDAC to (MS-3)
2.	B	ORANGE	Coil R2	
3.	C	GREEN	Coil R1	
4.	D	BROWN	D1	
5.	E	GREEN	D5	
6.	F	BLUE-WHITE	D2 & D6	
7.	G	GREEN	NC	

6.9 RELAY CONTACT DETAILS (MS-8)

The vital relay contacts are wired and given on this MS-8 coupler for use in signalling circuits. Railways may use these contacts as per requirement at site.

Table 6.8: Relay Contacts wired on MS-8 Coupler

S.No	MS Coupler (MS-8)		Description of Signal from VITAL RELAY	To be used in Signalling circuits
	Pin	Cable		
1.	A	BLUE-WHITE	B2 Pick Up	Potential free contact (1st pair)
2.	B	BLUE-ORANGE	B1 Pick Up	Potential free contact (1st pair)
3.	C	BLUE-GREEN	C1 Pick Up	Potential free contact (2nd pair)
4.	D	BLUE-BROWN	C2 Pick Up	Potential free contact (2nd pair)
5.	E	BLUE-GREY	NU	NA
6.	F	ORANGE-WHITE	NU	NA
7.	G	BLUE	C5 Back	Potential free contact (2nd pair)
8.	H	ORANGE	C6 Back	Potential free contact (2nd pair)
9.	J	BLACK	A2 PR	To R1 of PPR
10.	K	RED	A6 VR	+24V
11.	L	GREEN	A3 Back	Potential free contact (1st pair)
12.	P	GREY	A4 Back	Potential free contact (1st pair)
13.	M	BROWN	B1 PR	To R2 of PPR relay
14.	N	-NC-	-NC-	-NC-

Note:
NU – Not Used
NA – Not Applicable
NC – Not Connected

CHAPTER 7

7.0 MEASUREMENT OF SIGNAL LEVELS

The various signal input & output levels and its limits are given in the following tables. This should be recorded and adjusted to correct levels wherever necessary.

7.1 24V DC SUPPLY (BATTERY)

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

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

Note : Keep Charger OFF for 15 mins before taking measurements

7.2 OSCILLATOR OUTPUT (TX Coils)

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

S.No	Parameter	Limit	TX Coil 1 (21KHz)	TX Coil 2 (23KHz)
1.	Oscillator output	30V to 40Vrms		
2.	Oscillator Freq.	I) 20.80 to 21.20 KHz II) 22.80 to 23.20 KHz		

7.3 RECEIVER COIL OUTPUT

Measure the Rx coil signal output

S.No.	Parameter	Limit mV rms	Measured Value
1.	Rx Coil 1 (21KHz)	275 to 600	
2.	Rx Coil 2 (23KHz)	275 to 600	

7.4 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)					
		Without dummy wheel		With dummy wheel		With push trolley (4/8 spokes) on axle detectors	
		Limit	Measured Value	Limit	Measured Value	Limit	Measured Value
1	SCC 1	2.0 to 2.5V		< 0.7V		> 1.7 V	
2	SCC 2	2.0 to 2.5V		< 0.7V		> 1.7 V	

7.5 DC-DC CONVERTER CARD (CARD 8)

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

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

7.6 MODEM OUTPUT (Card 6)

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

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

7.7 RELAY DRIVE (CARD 7)

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

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

CHAPTER 8

8.0 COMMUNICATION PROTOCOL

8.1 INTRODUCTION

The SSDAC counting units communicate with each other to share information regarding status of wheel counts and health information. The communication protocol comprises of following packets.

i Power On & Reset Packets 'J' and 'R'

Ii Count Change Packet 'C'

Iii Count Update Packet 'U'

These packets are described in detail below.

8.2 POWER ON AND RESET PACKETS 'J' AND 'R'

The Reset Packets are of two types - J Packet and R Packet. After Power ON to the system, the SSDAC units are energized and are holding in stuck condition. The SSDAC Units are waiting for Reset command from SM's Reset box. After applying the Reset from SM's reset box, the resetting takes place in the units and SSDAC performs the self-test. After successfully completing the self-test the local unit generates the J Packet and sends to the remote unit and vice versa. This reset packet includes the system status. The R Packet is received from the remote unit against the transmitted J Packet from local unit. Then both units go into hand shaking mode and come to preparatory reset condition. The SSDAC keeps sending the J Packet at regular intervals till R Packet is received from the other SSDAC.

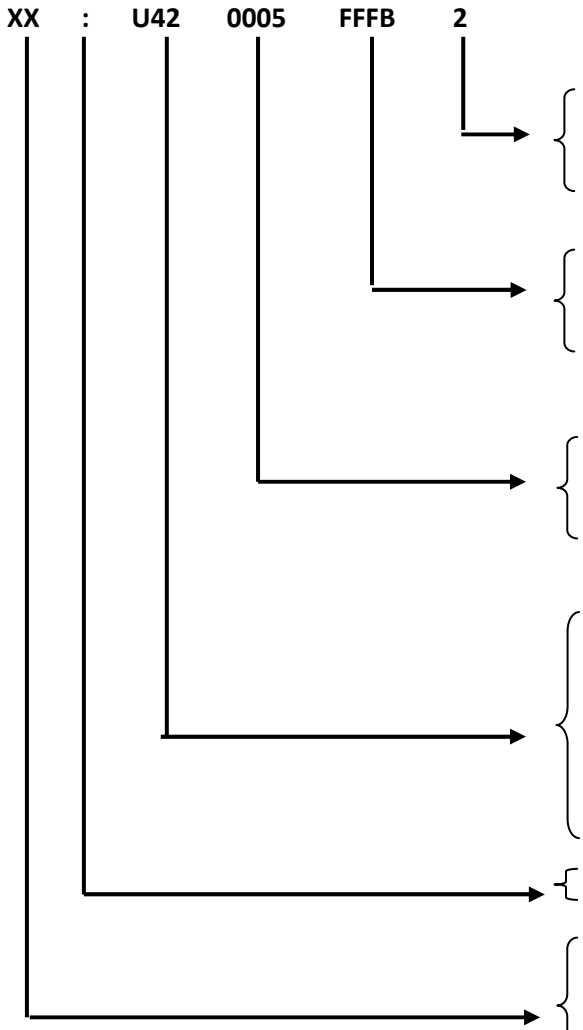
8.3 COUNT CHANGE PACKET 'C'

This packet is sent by the SSDAC if the count status changes from **Matching** to **Mismatching**. This normally happens after the wheel count from 1st wheel of train is detected in clear state. This packet is basically used to warn the remote SSDAC that a train is entering the section from this end and that the remote SSDAC to change the Status to OCCUPIED.

8.4 COUNT UPDATE PACKET 'U'

The Count Update Packet is sent by an SSDAC to Remote SSDAC every 800 milliseconds. This packet carries the Status of wheel count and health to the remote SSDAC and Vice Versa.

The details of the packet are as explained below:



Gives the type of wheel information:
'0' in preparatory and clear state.
'1' if non-overlap pulse i.e. motor trolley.
'2' if overlap pulse i.e. train.

FFFB – The second MLB card counts in decrement mode from FFFF counts. With every count this gets decremented by 1. (Here, 5 counts are decremented)

0005 – First MLB card count status in incremented mode from 0000 counts. With every count this gets incremented by 1. (Here, 5 counts are incremented)

U – Update packet.
42 – Address marked in the system is given below

Entry	Exit	System State
02	03	Preparatory / Occupied
42	43	Clear
82	83	Error

':' – Start of Block

'XX' – Error code is displayed (Refer system error code chard for all types of errors).
00 – No Error
80 – Remote Error

CHAPTER 9

9.0 SYSTEM SOFTWARE

9.1 INTRODUCTION

As described in earlier chapters, the system is designed with two micro controller logic block card (MLB) in the SSDAC. Both the MLB's are performing exactly the same functions. Both the MLB's are receiving the pulse and supervisory signals from the Signal Conditioning cards. The MLB's are continuously monitoring and evaluating the pulse and supervisory signals coming from the Signal Conditioning cards. The MLB's validate the pulse signals from wheels and the direction of train movement. Accordingly, the number of wheels is counted from passing wheels over the detection points. Each MLB, after detecting pulses, keeps sending a copy of it to the other MLB.

The MLB's are programmed to perform the following functions.

i. Monitor and Receive Pulse signals
ii. Output Pulse signals to other MLB
iii. Detect the passing wheels and its direction.
iv. Count the wheels passing at the Axle detectors
v. Supervise the Axle detectors
vi. Code message packets for transmission to remote SSDAC
vii. Decode message packets received from the remote SSDAC
viii. Determine the number of axles in the section
ix. Control and supervise the status of Vital Relay

Each MLB keeps track of three different counts -

i. Primary Count — Its own wheel count
ii. Secondary Count — wheel count of 2nd micro controller and
iii. Remote Count — Count values of remote SSDAC unit.

Each MLB continuously monitors the Pulse input signals and filters them through software filter. It then regenerates equivalent pulse output levels for transmission to the other MLB.

Therefore, the other MLB gets filtered pulse equivalent signals of the original pulse input signals after a short delay of up to a maximum of 50 microseconds. Hence, each of the two MLB's checks the original pulse input signals and filtered pulse signals received from other MLB and keeps two sets of wheel counts; Primary count for the original pulse inputs and Secondary counts for the filtered pulse inputs received from the other MLB.

In SSDAC unit, the first MLB card sends the primary count as well as the secondary count to the remote SSDAC on regular basis of every 800 milliseconds using Update Count Packet. When the SSDAC detects the first train wheel entering the Track Section, it sends a Count Change Packet to the remote SSDAC.

9.2 COUNTING OF WHEELS AND COMPUTATION OF DIRECTION

There are two pulse inputs, PULSE1 (21 KHz) and PULSE2 (23 KHz), from the Signal Conditioning cards. PULSE1 (21 KHz) is generated from the phase-modulated signal received from Rx1 coil. Similarly, PULSE2 (23 KHz) is generated from the phase-modulated signal received from Rx2 coil. PULSE1 (21 KHz) and PULSE2 (23 KHz) signals are normally 'high' and go 'low' when a wheel passes over the respective Rx coil. Sequence of PULSE1 (21 KHz)/PULSE2 (23 KHz) signals gives the direction of movement of train. If PULSE1 (21 KHz) goes low before PULSE2 (23 KHz) then wheel is moving from Rx1 coil to Rx2 coil. If PULSE2 (23 KHz) goes low before PULSE1 (21 KHz) then wheel is moving from Rx2 coil to Rx1 coil.

Drawing no L008077A3 (Page No D7) & Drawing no I007765A4 (Page No D8) give the typical types of PULSE1 (21 KHz) / PULSE2 (23 KHz) signals. (i) Shows a wheel crossing the detection point and moving from Rx1 coil towards Rx2 coil. (ii) Shows a wheel crossing the detection point and moving from Rx2 coil towards Rx1 coil.

This scheme of wheel counting is implemented in software using a State machine approach. Change in pulse inputs result in change of state. Wheel direction from Rx1 coil to Rx2 coil is taken as positive and wheel count is incremented. Similarly, wheel direction from Rx2 coil to Rx1 coil is taken as negative and wheel count is decremented. It may be noted that wheel count is incremented or decremented only when the wheel completely crosses the detection point.

9.3 FUNCTIONAL STATES OF SSDAC

The SSDAC functional states are implemented as a set of four states. This is shown in ***Drawing no L007758A3 (Page No. D26)***. At any point of time, the SSDAC is internally in any one of the following four states.

i.	Preparatory Reset	Reset applied
ii.	Clear	Section clear
iii.	Occupied	Section occupied
iv.	Disturbed	Error in the system

These states are described below.

9.3.1 PREPARATORY RESET STATE (RESET APPLIED)

This is the state of the system when the Reset is applied in the units. The Reset is to be applied in SSDAC after ensuring that there is no train in the block section. After which the SSDAC units performs Self Test and the units are normal the system goes to preparatory state. The SSDAC comes to clear state after movement of a pilot train in the section.

9.3.2 CLEAR STATE (SECTION CLEAR)

The SSDAC unit enters this state when the net counts value of the section matches (wheel count are same in both the Counting Units of SSDAC in the section). The local count value of both the MLB's is identical and is same as that of the counts received from the remote SSDAC. The health status of both the SSDAC units is also OK.

9.3.3 OCCUPIED STATE (SECTION OCCUPIED)

The SSDAC unit enters this state when the count value of the section is different between the two units of SSDAC or when a wheel is occupying over a single Axle detector or due to any error in the system it is shown as occupied.In SSDAC, VR drops in case any single channel is influenced by train wheel and continues to be dropped till the channel is restored. Such influence is allowed only twice and system goes to Error State.

9.3.4 DISTURBED STATE (ERROR IN THE SYSTEM)

The SSDAC unit enters the error state when: -

i. The counted wheels in the section becomes negative
ii. The count & health data of two MLB's in the SSDAC unit is different
iii. Any card is removed from the unit
iv. An internal error is detected during self-test
v. The Vital Relay pick up and drop detected is improper
vi. The vital Relay is not plugged in vital relay box.
vii. Address setting of the unit is changed and disturbed during operation
viii. The communication link between two units of SSDAC is disconnected (open).
ix. The Axle detectors are giving low signals
x. The Axle detectors are showing open condition
xi. The watchdog timer gives time out
xii. Reset has been applied in one of the SSDAC units.

All the above errors are displayed in MLB cards by means of error code.

CHAPTER 10

10.0 LED INDICATIONS

10.1 INTRODUCTION

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

1. SCC CARDS

i. OSC OK (Green LED)

ii. LD OK (Green LED)

iii. PULSE OK (Green LED)

iv. TP CON (Green LED)

The above LED's (i) to (iii) will be glowing for OK condition. The LED (iv) TP circuit is not operational and LED will be in OFF condition.

2. MLB CARDS

i. 8 LED BLOCK (All Red LED's) - Normally OFF. Glows when error appears.

ii. Clear (Green LED) - Glows for clear condition

iii. Occupied (Red LED) - Glows for occupied condition

3. MODEM CARD

i. TX (Green LED) - Transmitting the signal when LED is flashing.

ii. Rx (Green LED) - Receiving the signal when LED is flashing.

iii. MODE (Green LED) - Normally remains OFF. When system is made OFF and ON, LED glows and again goes low when system enters self test after successful reset.

iv. CD (Green LED) - Carrier is detected when LED is glowing.

4. RELAY DRIVER

i. MLB1 CLEAR (Green LED)

ii. MLB1 CLOCK (Green LED) - LED flashes when section is clear

iii. MLB2 CLEAR (Green LED)

iv. MLB2 CLOCK (Green LED)- LED flashes when section is clear

v. RELAY DRIVE (Green LED) - Remains OFF for section occupied and glows when section is Clear.

All the above LED's are lit for section clear condition

5. DC-DC CONVERTER

i. + 5V (Red LED)

ii. +12V (Red LED)

iii. +24V (Red LED)

iv. +15V ISO (Red LED)

All the above LED's are lit for power supply OK condition.

6. **EVENT LOGGER**

i. Run (Green LED)

ii. LOG (Green LED)

iii. Dnld (Green LED)

10.2 SCC CARDS (Card 1 & 2)

i. **OSC OK** – This LED indication will indicate the normal working of the TX coil and the oscillator. In case TX coil is short, the OSC OK indication will not glow. During train movement, this LED continues to glow.

ii. **LD OK** – This LED indication will indicate the health of the Rx coil. The LEVEL DETECTOR (LD) indication will indicate that the signal from Rx coils are normal and above a certain level. The LD OK LED indication will be OFF in case of

   a. Fault in Rx coil

   b. Rx coil cable is disconnected

iii. **PULSE OK** – This LED indicates the normal signal from Rx coil and Pulse level in Card is OK. This indication will not glow in case of

   a. Fault in Rx coil.

   b. Rx cables are connected in reverse polarity.

   c. Rx coil cable is disconnected.

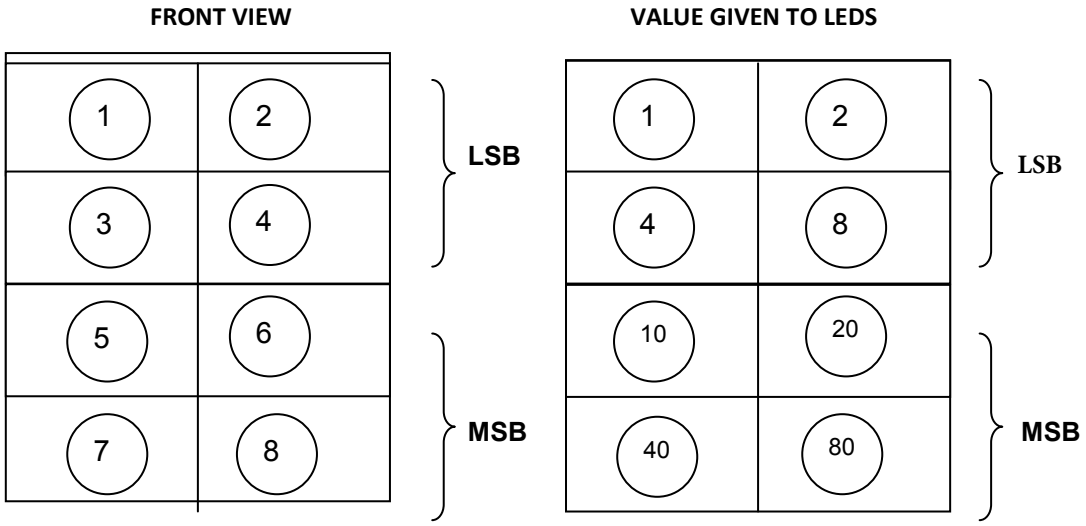
During train movement, this LED changes between OFF and ON. It is visible during slow movement of train

iv. **TP Con -** This LED remains OFF permanently as trolley suppression circuit is not required in phase reversal type system

10.3 MLB CARDS (CARD 3 & 4)

10.3.1 The errors occurring in the system during the operation of the SSDAC are encoded and are indicated by means of the 8-LED block present on the front panel of the MLB cards. A glowing LED implies a '1' while OFF LED indicates a '0'. All the LED's are numbered as given below. DS 1 to DS4 are designated for Least Significant Bits (LSB) and DS5 to DS8 are designated for High Significant Bits (HSB). The Error is given in Hexa decimal code

10.3.2 LED BLOCK



The example for reading an error from the above LED's is as follows: -

LED's 1 & 3 of LSB glow and LED's 5 & 6 of MSB glow and all other LED's are OFF. By adding LSB + MSB LED's values, the error no. is 35 i.e. negative count error.

10.3.2 LED STATUS FOR ERROR CONDITIONS

Different error conditions are displayed through LED's to show the status of the system. The detail system error codes are described in section 10.7.

10.3.3 Clear & occupied LED's

Clear - Clear LED glows when section is clear

Occupied - Occupied LED glows when section is occupied.

10.4 MODEM CARD (CARD 6)

i. TX indication will continuously flash and indicate the signal transmission information from local unit. The packet information is continuously sent to the remote unit. In case TX indication is OFF, it means the modem card is not transmitting any information to remote unit. Rx indication will complement the TX. This will continue to flash suggesting that the packets are continuously being received from the remote unit. If Rx indication is not present, it means the transmission signal is not OK or cable link is not OK.

ii. CD indication indicates Carrier Detect. This will glow only if the link is present and it also suggests that the carrier is present between the local and remote unit.

iii. MODE indication will be normally OFF. Whenever power ON after OFF, LED glows and when system goes to self check after successful reset from SM's reset box the

LED goes OFF. In error condition if reset is applied, MODE LED glows and immediately goes OFF.

10.5 RELAY DRIVER CARD (CARD 7)

I. After counts are balanced in the section, the clear signal will be generated by MLB1 card and MLB1 CLEAR LED indication will glow in this card. When the section is occupied MLB 1 detects occupied and this LED indication becomes OFF.

II. MLB1 CLOCK LED indicates the presence of Clock from MLB1 card after the counts are balanced. The flashing of this LED indicates the presence of Clock to relay driver card. This indication is OFF / ON depending on the interruption of clock from MLB1 when the section is occupied by a train.

III. After counts are balanced in the section, the clear signal will be generated by MLB1 card and MLB2 CLEAR LED indication in this card will glow. When the section is occupied MLB2 detects occupied and this LED indication becomes OFF.

IV. MLB2 CLOCK LED indicates the presence of Clock from MLB2 card after the counts are balanced in the section. The flashing of this LED indicates the presence of Clock to relay driver card. This indication is OFF / ON depending on the interruption of clock from MLB2 when a train occupies the section.

V. RELAY DRIVE LED indicates the presence of Relay Drive output (24V DC) to Q type relay from Relay Driver card. The LED glows when the relay drive output is present. When Relay Drive output is not present this LED is OFF.

10.6 DC-DC CONVERTER (CARD 8)

I. + 5V LED OK indication suggests the presence of +5V in the DC-DC converter card. This indication is OFF during the failure of 5V in DC-DC converter card.

II. +12V LED OK indication suggests the presence of +12V in the DC-DC converter card. This indication is OFF during the failure of 12V in DC-DC converter card.

III. +24V LED OK indication suggests the presence of +24V in the DC-DC converter card. This indication is OFF during the failure of 24V in DC-DC converter card.

IV. +15V ISO LED OK indication suggests the presence of +15V ISO in the DC-DC converter card. This indication is OFF during the failure of 15V ISO in DC-DC converter card.

10.7 EVENT LOGGER CARD (Card 5)

i. Run This LED blinks continuously indicating the normal working of the event logger card.

ii. Log This LED blinks whenever data is being logged into the flash memory (approx, after every 2 minutes)

iii. Dnld This LED is ON when data is being downloaded from the flash memory of the card and becomes OFF when download is complete.

10.8 SYSTEM ERROR CODES

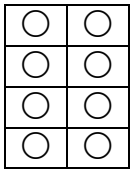
The two MLB cards continuously check and monitor the health of the system. During Normal working condition of the system, there won't be any error and all the LED's are OFF. When the system detects error, it will be displayed on these cards by means of flashing / glowing one or more LED's for the particular error. The list of error codes and their respective glow of LED's are given below. The corrective action may be taken accordingly.

S. NO	ERROR	ERROR NUMBER (Hex decimal)	ERROR DUE TO
1.	SYSTEM NORMAL (NO ERROR)	00	NORMAL
2.	ROM_TEST_DURING POST	11	ROM TEST DURING POST
3.	RAM_TEST_DURING POST	12	RAM TEST DURING POST
4.	SERIAL_TEST_DURING POST	13	SERIAL PORT TEST DURING POST
5.	CARD_TEST_DURING POST	14	CARD PRESENCE TEST DURING POST
6.	RELAY_TEST_DURIN POST	15	RELAY TEST FAIL DURING POST
7.	ROM_TEST_DURING SYS WORKING	21	ROM TEST FAIL DURING SYSTEM WORKING
8.	RAM_TEST_DURING SYS WORKING	22	RAM TEST FAIL DURING SYSTEM WORKING
9.	CARD_TEST_DURING SYS WORKING	24	CARD PRESENCE FAIL DURING SYSTEM WORKING
10.	LINK ERROR	30	LOSS OF CARRIER OR LINK
11.	SEQUENCE ERROR	31	SEQUENCE OF INPUTS MISMATCH
12.	SELF_COUNT_MISMATCH	32	SELF COUNT MISMATCH ERROR
13.	INOUT_ERROR	33	MOVEMENT OF TRAIN BEFORE PREPARATORY RESET
14.	OUT_B4_IN_ERROR	34	REGISTRATION OF OUTCOUNT BEFORE INCOUNT
15.	NEGATIVE_COUNT_ERROR	35	NEGATIVE COUNT ERROR
16.	SHUNT_ERROR	36	SHUNT ERROR
17.	SUPERVISORY_ERROR	37	SUPERVISORY ERROR
18.	INTERNAL_SHUNT_ERROR	38	INTERNAL SHUNT ERROR
19.	COUNT UNEQUAL ERROR	39	COUNTS MISMATCH IN MLB OF SAME UNIT
20	COMMUNICATION_ERROR	40	CORRUPTION OF PACKETS
21	CRC_ERROR_CONST	41	CORRUPTION OF DATA
22.	EOB_ERROR_CONST	42	CORRUPTION OF DATA
23.	WHEEL_SHUNT_ERROR	43	WHEEL SHUNT ERROR
24.	INDEPENDENT PULSE ERROR(FORWARD)	44	OCCURRENCE OF NON OVERLAPPING PULSE IN FORWARD DIRECTION
25.	INDEPENDENT PULSE ERROR(REVERSE)	45	OCCURRENCE OF NON OVERLAPPNG PULSE IN REVERSE DIRECTION
26.	EXIT MISMATCH ERROR	46	TRAIN / TROLLEY IN AND TROLLEY / TRAIN OUT.
27.	TRAIN TROLLEY ERROR	47	FOLLOWING TROLLEY SHUNTS BACK.
28.	NON OVERLAP B4 OVERLAP ERROR	48	TRAIN ENTERS AFTER MOTOR TROLLEY.
29.	RELAY ERROR DURING POST (CLR)	50	RELAY ERROR DURING POST IN CLR STATE
30.	RELAY ERROR DURING POST (OCC)	51	RELAY ERROR DURING POST IN OCC STATE.
31.	RELAY ERROR DURING CLR STATE.	52	RELAY CONTACT NOT READ BACK IN CLR STATE
32.	RELAY ERROR DURING OCC STATE	53	RELAY CONTACT NOT READ BACK IN OCC STATE

33.	TRACING ERROR	60	CORRUPTION OF SOFTWARE IN MICRO CONTROLLERS.
34.	SECONDRY CPU DECISION ERROR	61	DECISION OF BOTH MLB'S MISMATCHES
35.	SECONDRY CPU FAIL	62	SECONDRY CPU FAILS
36.	WATCHDOG RESET ERROR	66	MICRO CONTROLLER'S WATCHDOG TIMER RESETS
37	CONFIGURATION ERROR	70	CHANGE IN CONFIGURATION DURING POST
38.	J PKT CONFIGURATION ERROR	71	J PACKET CONFIGURATION ERROR
39.	R PKT CONFIGURATION ERROR	72	R PACKET CONFIGURATION ERROR
40.	CONFIGURATION ERROR	73	ADDRESS CHANGE DURING SYSTEM RUNNING
41.	U PKT CONFIGURATION ERROR	74	U PACKET CONFIGURATION ERROR
42.	REMOTE ERROR	80	ERROR IN REMOTE SYSTEM
43.	REMOTE RESET ERROR	7F	REMOTE UNIT IS RESETTED, LOCAL IS NOT
44.	SELF RESET ERROR	3F	LOCAL UNIT IS RESETTED, REMOTE IS NOT

NORMAL CONDITION OF SYSTEM

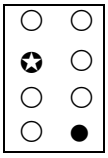
During normal condition of the system all the 8 LEDs are OFF in both MLB cards.



O Indicates the LED is OFF

ERROR CONDITION OF SYSTEM

During error condition either one or several LEDs are ON/flashing in MLB cards. The error conditions are described below.



✪ Indicates LED is flashing

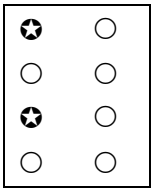
● Indicates LED is ON

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

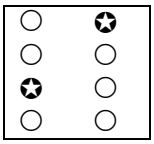
The ROM of the microcontroller is checked during the Power on Self test (POST). If the memory test is passed, this error will not appear. If any location of ROM is corrupted, the error No. 11 is displayed.



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

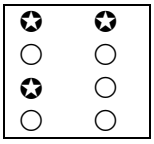
The RAM of the microcontroller is checked during the Power on Self test (POST). If the memory test is passed, this error will not appear. If any location of RAM is corrupted, the error No. 12 is displayed.



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

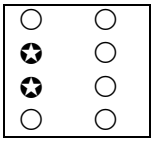
The Serial port of the microcontroller is checked during the Power on Self test (POST). If the serial port test is passed, this error will not appear. If any serial port test is failed, the error No. 13 is displayed.



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

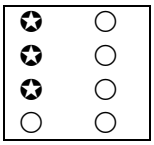
The presence of each card is checked in the system. If all the cards are intact and present in the system, this error will not appear. If any card is removed or not inserted properly in the unit, the error No. 14 is displayed.



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

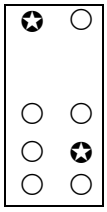
During Self Test (POST) the vital relay connected to the system is also checked. If the relay is present, this error will not appear. If relay is not connected, the error No. 15 is displayed.



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

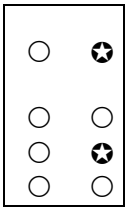
The ROM of the microcontroller is checked during the normal working of the system. At all times, ROM is checked. If any location of ROM is corrupted during system working, the error No. 21 is displayed.



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

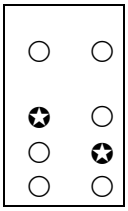
The RAM of the microcontroller is checked during the normal working of the system. If the RAM is found faulty at any time of operation, the error No. 22 is displayed.



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

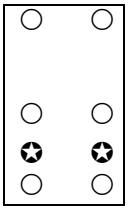
This error is displayed when any of the cards are taken out from the unit in power ON condition



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

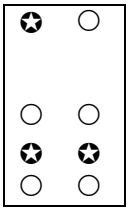
The link error is detected when the link between the two SSDAC units is open or loss of carrier detector CD. This is displayed as error No. 30.



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

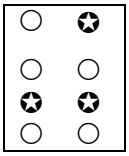
Software checks the pulse sequence when axle is detected on the sensor.



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

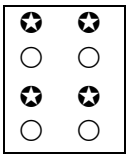
Software checks matching of counts in MLB cards after detection of all the axles passed over the axle detectors. If difference of counts is noticed, then the error 32 is displayed.



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

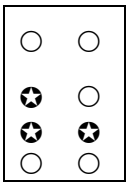
This error will be displayed if the system is in error state and after that there is train movement in the section. Error 33 will be displayed in the unit having error 80. Secondly, error 33 will be displayed after reset is applied in the system and while the system is trying to synchronize, there is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

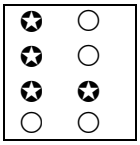
This error will be displayed when the system is in preparatory state and there is train movement out of the section without entering the section.



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

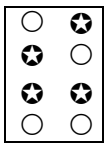
This error will be displayed if counts registered in the system are less at the Entry end while train entering the section than the counts registered at the Exit end while train is leaving out of section i.e. counts into the section are less than the counts out of the section.



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

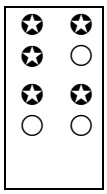
This error will be displayed when train moving forward & backwards (shunting) on axle detectors without proper direction influencing only external detector twice without affecting internal detector. The system checks and locks this as an error.



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

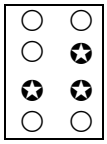
Supervisory error is displayed if any of the axle detectors signal level becomes low. Immediately MLB cards detect this and error 37 flashes on the MLB.



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

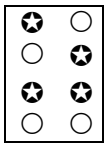
This error will be displayed when train is moving forward & backwards (shunting) on axle detectors without proper direction in such a way that both detectors are influenced & internal detector is influenced twice. The system checks and locks this as an error.



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

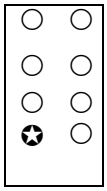
This error will be displayed when counts counted by the MLB card does not matches. Count Unequal Error is displayed. The system checks and locks this as an error.



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

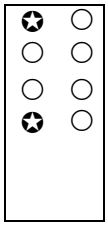
The communication error is displayed when communication between the two units is not proper i.e. packet information is corrupted due to noise in the Quad Pair used.



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

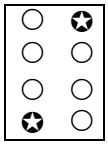
The CRC Error is displayed when data of the packets gets corrupted. Due to this the CRC of the packet does not matches.



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

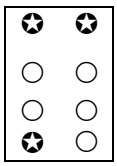
The EOB error is displayed when data of the packets gets corrupted. Due to this the End of packet is not detected.



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

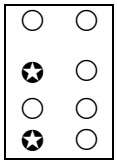
This is the Error related to the sequence of pulses from the axle detectors and SCC cards.



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.

23. ERROR NO 44 – INDEPENDENT PULSES ERROR(FORWARD)

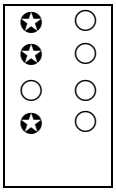
The Error occurs if the wheel is moved in such a way that independent pulses are generated by system in forward direction. This happens only if motor trolley wheel that are similar in diameter is moved beyond the permissible limit.



Error No.	Action required
Error No. 44 is displayed when both the channels are giving independent pulses in forward 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.

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

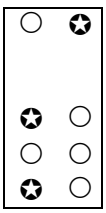
The Error occurs if the wheel is moved in such a way that independent pulses are generated by system in reverse direction. This happens only if motor trolley wheel that are similar in diameter is moved beyond the permissible limit.



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.

25. ERROR NO 46 – EXIT MISMATCH ERROR

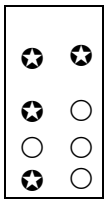
This error is displayed if the section occupancy and section clearance by different type of wheel i.e. section is occupied by train but clears by motor trolley wheel and vice versa.



Error No.	Action required
Error No. 46 is displayed	Reset the system.

26. ERROR NO 47 – TRAIN TROLLEY MISMATCH ERROR

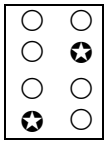
This error is displayed if following Motor trolley shunts back or if only train entered the section and crossed exit and leaving two counts, now motor trolley leaves section balancing counts.



Error No.	Action required
Error No. 47 is displayed	Reset the system.

27. ERROR NO 48 – NON OVERLAP PULSES BEFORE OVERLAP PULSES ERROR

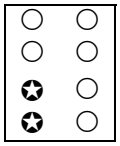
This error is displayed if motor trolley enters the section and after that train enters the section.



Error No.	Action required
Error No. 48 is displayed	Reset the system.

28. ERROR NO 50 – RELAY REMOVED (PHYSICALLY FROM PLUG BOARD)

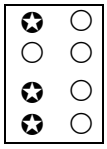
During power on self test (POST) of the system the presence of relay is checked. If relay is not present then, the error No. 50 is displayed.



Error No.	Action required
Error No. 50 is displayed when the relay is not present during diagnostic test.	Check the presence of Vital relay in the relay box of the system & insert in the plug board.

29. ERROR NO 51 – RELAY DROP FAILURE IN OCCUPIED STATE

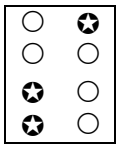
During section occupied of the system, the making of back contact (Dropped) of the vital relay is checked. If it is found open when section is occupied, the error no. 51 is displayed



Error No.	Action required
Error No. 51 is displayed if back contacts of the relay are open when the section is occupied.	Check the back contacts (D5 & D6) of the vital relay used for read back in the system & rectify.

30. ERROR NO 52 – RELAY PICKUP FAILURE IN UNOCCUPIED STATE (Clear)

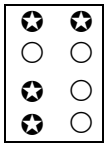
After counts are equal from the train passed in the section, the system goes to clear state (clear). The relay driver card drives the vital relay to pick up, but relay fails to pick up then the error No. 52 is displayed.



Error No.	Action required
Error No. 52 is displayed if pick up contacts of the relay are not made when the system is cle (clear) condition.	Check the pick up contacts of the vital relay and rectify or replace the relay.

31. ERROR NO 53 – RELAY DROP FAILURE IN OCCUPIED STATE

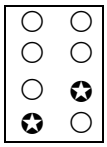
The system after detection of train in the section goes to OCCUPIED state but vital relay fails to drop then the error No. 53 is displayed.



Error No.	Action required
Error No. 53 is displayed if back contacts of the relay are open (not made) when the system is occupied.	Check the back contacts of the relay and rectify or replace the relay.

32. ERROR NO 60 – TRACING ERROR

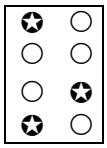
Both MLB's will be working in tandem and software shall follow a particular sequence. If any sequence is missed, then Tracing Error is generated.



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

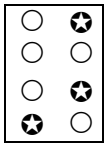
Both MLB's will be working in tandem and should be in agreement for any decision. Suppose MLB1 card is in different state from that of MLB2 card or vice versa, the system will generate the error 61.



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

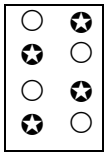
The error is generated if any of the CPU fails to respond with its adjacent CPU due to failure of any components.



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

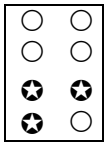
This error is generated if the power supply interruptions are taking place in the system.



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

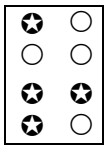
The error is generated if address of the units is found to be different as per the factory settings or both Entry and both Exit Units have been used in the section.



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

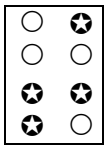
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



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

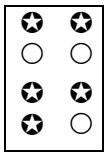
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



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

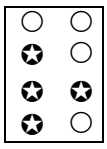
The error is detected when the address of unit is changed while the system is running.



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

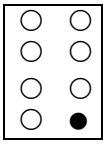
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



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.

41. ERROR NO 80 – REMOTE ERROR

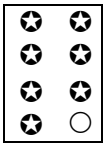
This error code is displayed if any error is detected in the remote unit.



Error No.	Action required
Error 80 is displayed locally if the remote unit is in error state.	The local unit is OK. Check the errors in remote unit and rectify.

42. ERROR NO 7F – REMOTE RESET ERROR

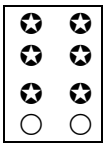
The error is generated in the local unit when remote unit is resetted.



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.



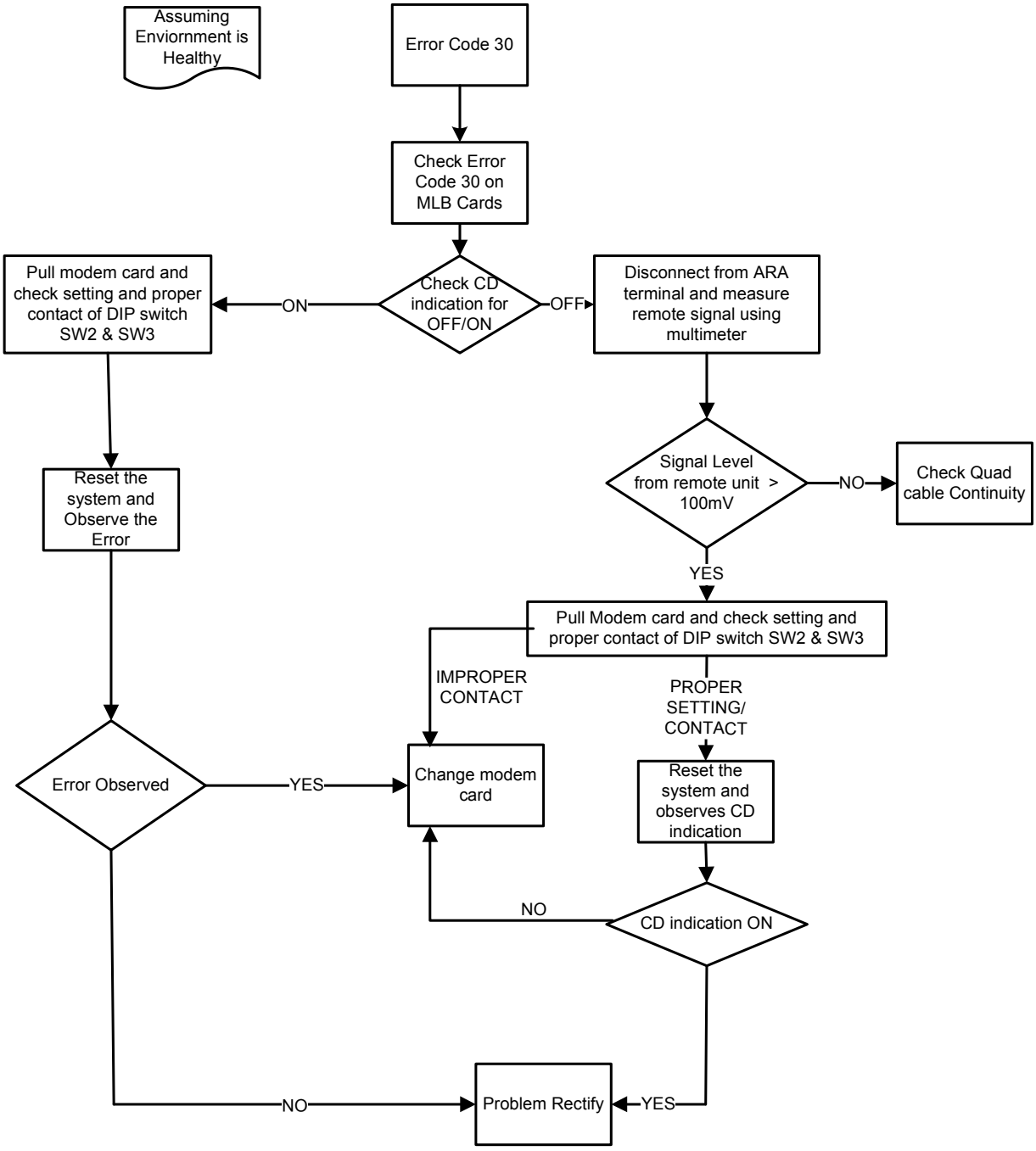
Error No.	Action required
Error 3F is generated in the local unit when it is resetted and it is waiting for remote unit to be resetted	Remote unit is to be resetted or else both SSDAC units are to be resetted

OTHER TYPE OF ERRORS:

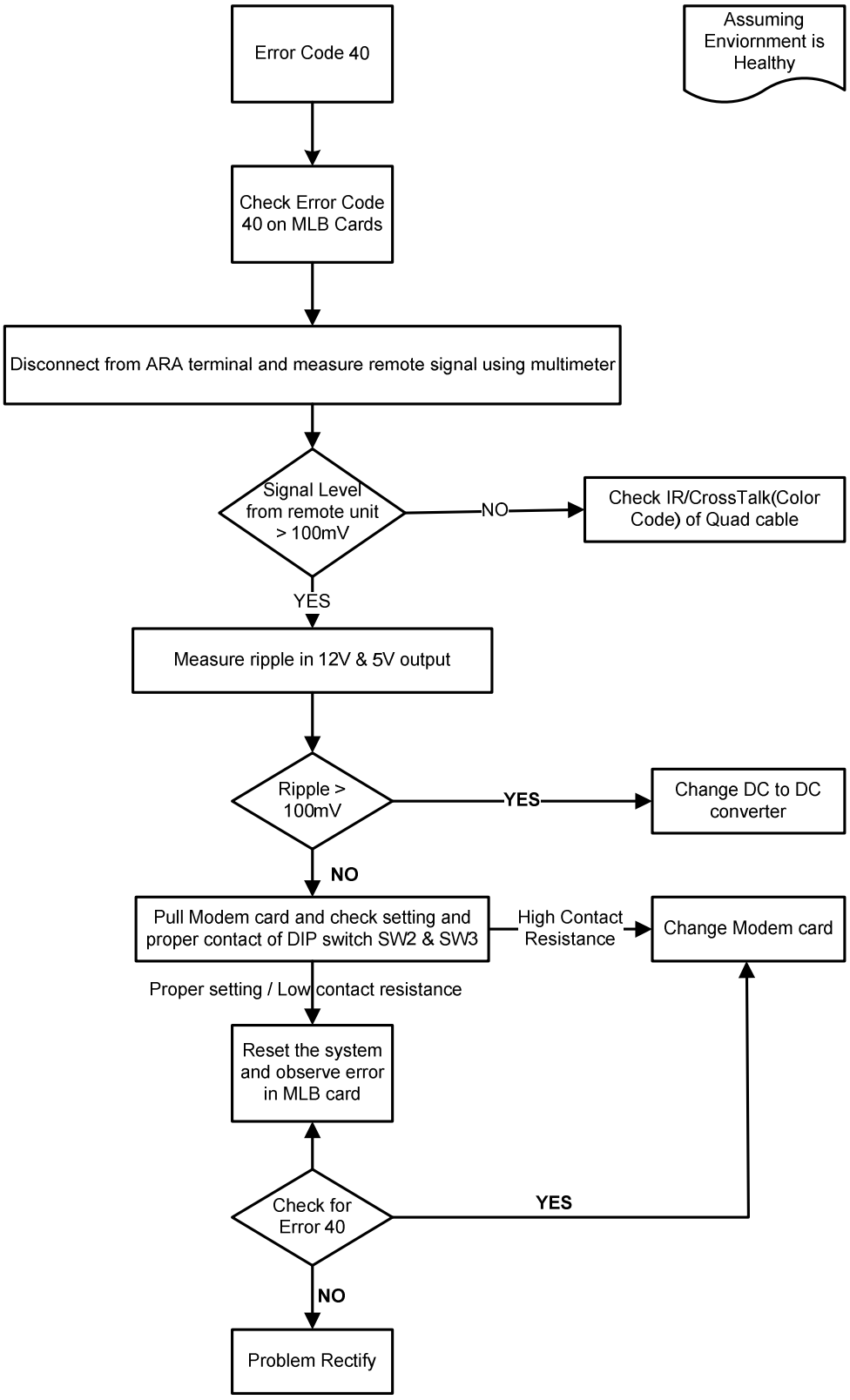
S. NO	CONDITION	ERROR NO.	SYSTEM STATUS	ACTION REQUIRED
1.	Entry counts are more than Exit counts	No Error	Vital relays are dropped. System may fail for each train movement.	1. Check Exit end axle detectors and align them properly. 2. Check SCC1 & 2 cards and its output.

10.9 DIAGNOSTICS CHART

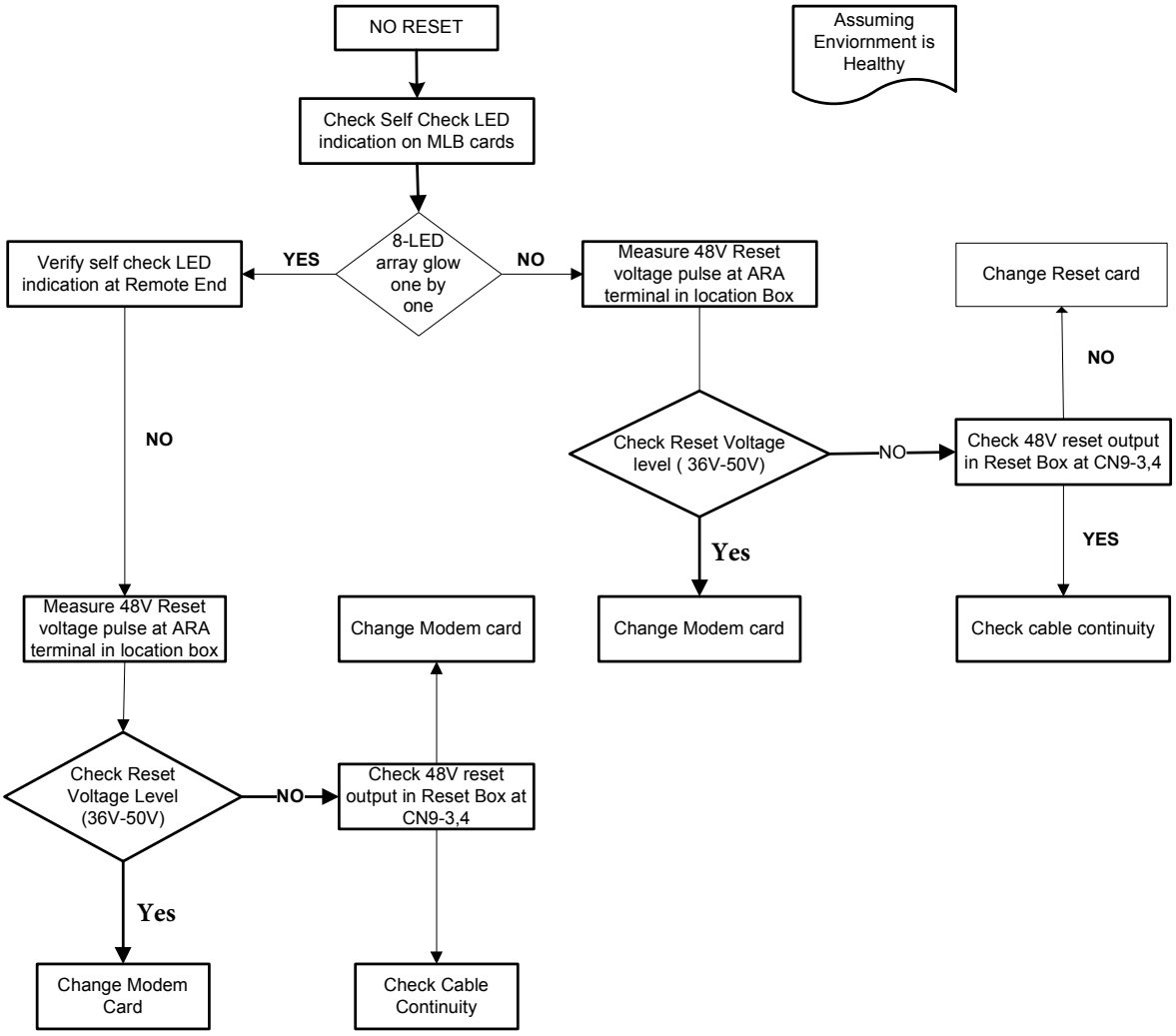
FAULT DIAGNOSTIC CHART FOR LINK ERROR (ERROR 30)



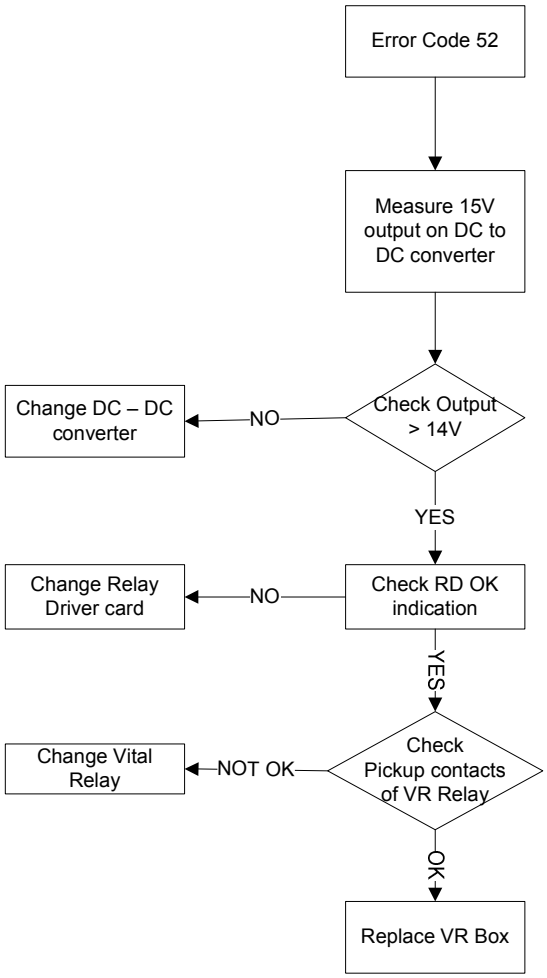
FAULT DIAGNOSTIC CHART FOR COMMUNICATION ERROR(ERROR 40)



FAULT DIAGNOSTIC CHART FOR SYSTEM NOT GETTING RESETTED ERROR (3F/7F)



FAULT DIAGNOSTIC CHART FOR RELAY ERROR (52)



CHAPTER 11

11.0 EARTHING

11.1 EARTHING OF SSDAC

The Earth Electrode and its details of installation are shown in ***Drg. No. I007755A4 (Page No. D30)*** and shall normally consist of one or more galvanized iron pipes of not less than 38 mm internal diameter and not less than 2.5 mtr. in length with spike at one end and a lug at the other end for connecting with earth lead. The pipe is embedded vertically, leaving the portion above the ground.

11.2 TREATMENT OF SOIL

i. To reduce the resistivity of the soil, it is necessary to absorb and retain the moisture normally contained in the soil. For this purpose, "Earth resistance improvement material" procured from RDSO recommended firms should be used. Instructions given by manufacturer/supplier of this item should be followed to get its full advantage and maintenance free earth.

ii. The Earthing arrangement should be located in the natural soil, as far as possible. The made up soil is likely to result in poor earthing and may be eroded by weather and is not suitable.

11.3 EARTH LEAD WIRES

The lead wires connecting the installation and the earth electrode shall ordinarily be of stranded copper wire of 29 sq. mm (19 strand wires of 1.4 mm diameter). Copper wire has been specified because GI wires usually are having greater corrosion. However, in areas where copper wire may be frequently stolen due to theft, ACSR of size 64 sq. mm (19 strands of 2.11 mm diameter) may be used.

11.4 LIMITS OF EARTH RESISTANCE

The maximum values of earth resistance specified for Earthing of SSDAC and its accessories are as follows

S.No		Value
1	i. Apparatus case connected to Earth (SSDAC and vital Relay Box is housed in Apparatus case and Connected to earth at outdoor.) ii. All cable connected to same earth	$\leq$ 1 ohms
2	Reset box connected to earth (Indoor) near SM's Room.	$\leq$ 1 ohms

11.5 EQUIPMENT TO BE EARTHED

A Common Earth should be provided for SSDAC for items 1 (i & ii) of the above at the outdoor

i. The Apparatus Case is to be connected to earth (the chassis of SSDAC & Vital Relay Box should be properly connected to apparatus case).

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

   a. In R.E area, the metallic sheath and armouring of main telecom cables are earthed at both ends.

   b. In R.E area, 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.

iv. Earth already available for other equipment may be used for earthing of Reset Box near SM's Room / Cabin etc.

11.6 PRECAUTIONS TO BE TAKEN DURING EARTHING

i. The earth electrodes shall be free from paint, enamel or grease.

ii. Under ordinary condition of soil, G.I or M.S electrode is used.

iii. In areas where corrosion is likely to be excessive, it is preferable to use either copper or copper clad electrode.

iv. The length of electrode should be of minimum 2.5m length.

v. When a rocky area is encountered at a depth of less than 2m, the electrode may be buried inclined with the inclination being limited to 30° from vertical.

vi. The diameter of earth electrode is such that it can easily withstand the strain of driving in rocky areas.

vii. The earth lead should be of adequate size to offer negligible resistance.

viii. In case, the earth lead wire is buried underground, it should be protected from corrosion by an application of suitable anti-corrosive paint or bitumen or varnish.

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

x. 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.

xi. 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.

xii. In places where the soil is extensively corrosive, the soil may be chemically examined before deciding the material of the earth electrode.

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

11.7 MAINTENANCE AND TESTING OF 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.

CHAPTER 12

12.0 SURGE VOLTAGE AND LIGHTNING PROTECTION

12.1 INTRODCUTION

Transient surge voltages arise as a result of Lightning discharge, switching operations in electrical systems and electrostatic discharge. These surge voltages often destroy the electronic equipment to a large extent.

12.2 CAUSES OF SURGE VOLTAGE IN POWER AND DATA LINES

The coupling of surge voltages from one system to another system can be Galvanic, inductive or capacitive. The three types of coupling are explained here using the example of lightning discharge.

Galvanic Discharge

High Lightning current amplitudes cause a surge voltage at the grounding resistance, which in turn couples into the connected lines via equipotential bus bar.

Inductive Coupling

Inductive coupling into a conductor occurs through the magnetic field of another current carrying conductor, following transformer principle.

Capacitive Coupling

Capacitive coupling always occurs via the electric field between two points with a high potential difference.

12.3 PROTECTION OF SSDAC FROM SURGE VOLTAGES

In order to prevent surge voltages from destroying the equipment, all the input lines of SSDAC i.e. Power Supply (24V), Reset (48V) & both the Modem lines i.e. SSDAC to SSDAC & SSDAC to reset box is to be routed through surge voltage protection devices for effectively protecting the system.

These devices (6 numbers) are mounted in a box and supplied along with the system ***(as per drawing no A008427A4, page no D31)***. One number of SVPD box is to be installed at each location and wired to the ***SSDAC (as per drawing no. W008556A4, page no D32 & D33).***

In addition to these surge modules, added protection is given for input 24V line that acts as a filter for 24V DC. It helps in filtering out the surge entering in the system during changeovers etc.

12.4 WIRING DETAILS OF SURGE VOLTAGE DEVICE

SVPD unit is supplied by two types of protection devices. The wiring details of each type are to be done as per supplied item.

Currently CEL supplies two types of Surge devices. OBO make & Phoenix make. The wiring details of each of these devices are required to be done as per drawing enclosed.

OBO make

For these devices, kindly refer to the drawing no ***W008556A on page D32.***

Phoenix make

For these devices, kindly refer to the drawing no ***W008556A on page D33.***

Note ***It is recommended to use as shorter wire as possible for connections and earthing to these devices for better protection. In case of lightening, Do replace these modules in case of its damage due to lightening with fresh modules***

CHAPTER 13

13.0 SM's RESET BOX

*(D**rawing no F008443A**4, Page No. D16 & W00**8444**A4, Page No. D17)*

The reset box is a tabletop model has been designed as per RDSO Drawing No S/2000/3. It has the following components

1. The LED indications displaying the section status
    a. Section Clear green indication LED of 10mm.
    b. Section Occupied Red indication LED of 10mm.
    c. Power ON Yellow indication of 3mm.
    d. Prep. Reset Green indication of 3mm.
    e. Line Verif. Yellow indication of 3mm.
2. SM's Key actuator
3. Push Button Red colour
4. Counter for recording the number of reset operations.
5. 20 X 2 LCD display with Backlit
6. 4 Keys Keypad for setting the date and time operation.
7. 9 pin D-sub connector is given on the back panel of reset box which can be used for downloading the data from flash for analysis purpose.
8. Miniature reset switch for refreshing the LCD display.

13.1. FEATURES OF RESET BOX

The new reset box (RB-259) supplied by SSDAC consists of two cards.

Card 1 of reset box is Interface card or controller block which is plugged in ECN2 connector of motherboard.

i. This interface card is used to provide interface with the SSDAC unit on a pair of cable (2 wire of Quad is preferred).This communication from reset box and SSDAC unit is used for transmission of packets from SSDAC to the reset box. These packets are then processed in the reset box to display the information in the form of Axle Counts and Error Code of both local unit and remote unit.

ii. It has onboard flash memory which stores the serial packets of the local unit. In order to analyse the local SSDAC packets, this data can be downloaded from the flash by using any windows compatible PC.

iii. It has support for Keypad consisting of 4 keys. The keypad is used for setting up time and date of the reset box.

Card 2 of reset box is Reset Card is plugged in ECN1 connector of the motherboard which controls the following activities.

i. SM's Key actuator & Reset button for resetting.
ii. Flashing of the Prep Reset. LED is controlled by this card. When preparatory reset state is achieved then signal is given by Interface card for making the LED steady.
iii. Counter for recording no. of resets.
iv. 24V to 48V DC-DC converter which generates 48V DC required for resetting of SSDAC unit.

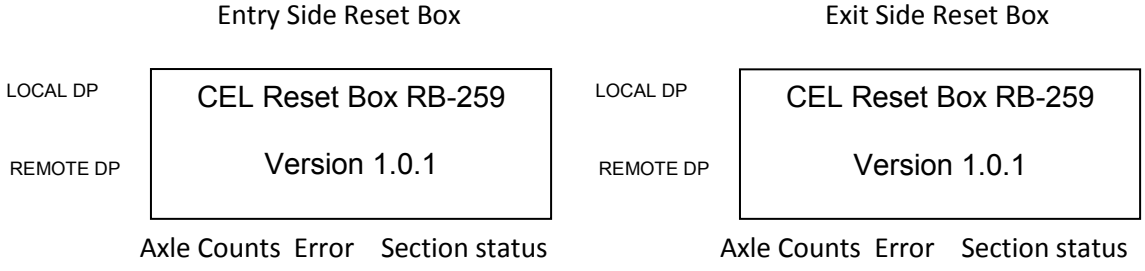
The following functions are controlled in the motherboard of reset box

i. Line Verification proving circuit is provided.
ii. This card has the provision for extending the 24V when reset button and SM's Key is pressed. NC proving of SM's key & reset Button is also provided. It can be used for extending the reset command to remote location in case it is required.

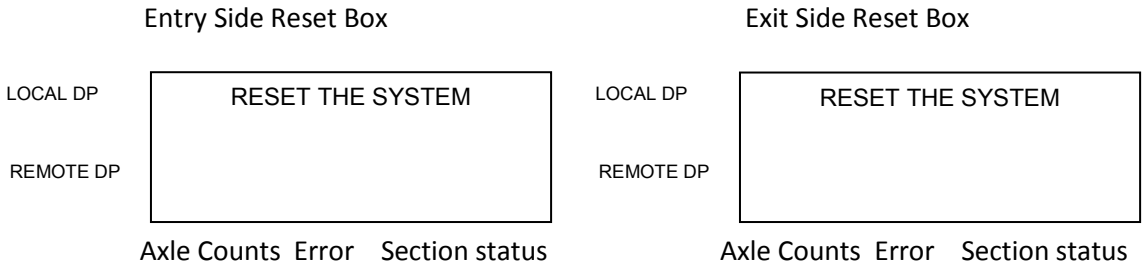
13.2. WORKING OF RESET BOX

The reset box is connected in the Station master's room and is used for applying the reset by station master.

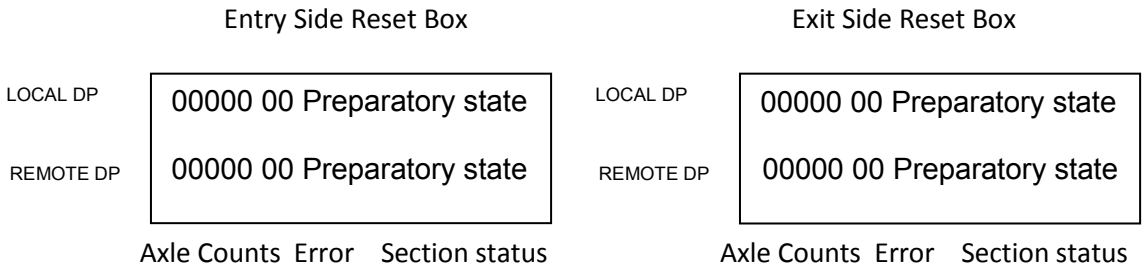
1. During POWER ON of reset box, the reset box will display the Software version of the SSDAC software used and its checksum.



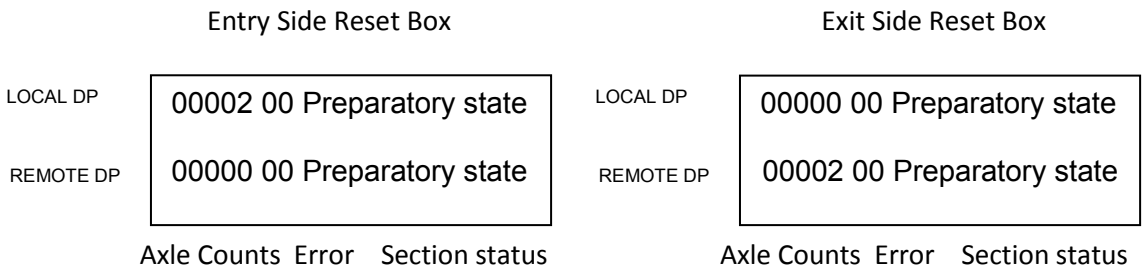
2. After the checksum, the reset box will wait for the user to apply the reset to SSDAC system. The screen will display "RESET THE SYSTEM".



3. The reset shall be applied as defined in the resetting procedure given below. On pressing of Reset button and SM's Key, the PREP RESET indication will start flashing. The remote unit also required to be reset.
4. When reset is applied to both the local and remote SSDAC units, the flashing PREP reset indication will become Steady when the system attains the "Preparatory state". At this point the LCD will display the following message.

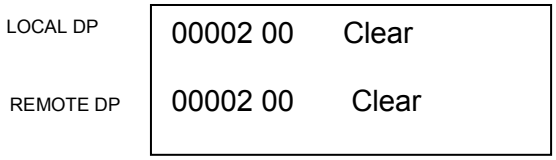


5. When Pilot train is moved in the section, the LCD will display the axle counts in local DP on the Entry side Reset Box and in Remote DP on the Exit side Reset Box as shown below. The section status is displayed as Preparatory state.



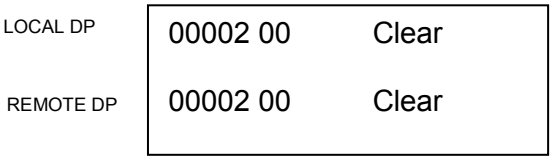
6. When Pilot train is moved out of the section, The LCD displays the axle counts in Remote DP on the Entry side reset Box and in Local DP on the exit side reset Box. When the axle counts are matched, the section status is displayed as Clear and Section CLEAR indication glows.

Entry Side Reset Box



Axle Counts Error Section status

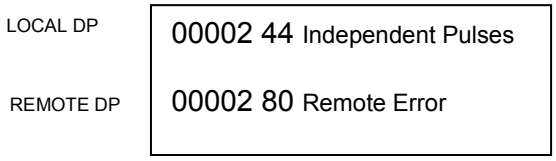
Exit Side Reset Box



Axle Counts Error Section status

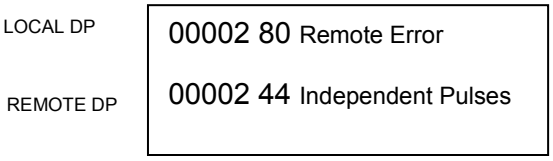
7. The axle counts are incremented or decremented according to the direction of train movements.
8. In case of failure, Error code is displayed at both the ends. The Error code along with its description is displayed. This Error code is required to be recorded by SM's before applying Reset.

Entry Side Reset Box



Axle Counts Error Section status

Exit Side Reset Box

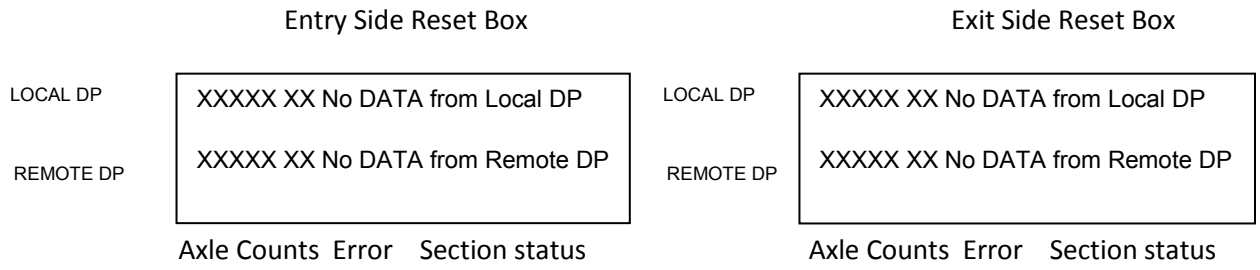


Axle Counts Error Section status

9. On applying the reset, this Error code will get refreshed and is stored in flash. List of 10 recent error codes are stored in Error log entry. This Error Log can be viewed by maintainer at all times without the use of PC. By pressing reset button for 10 secs, last 10 Errors will be displayed with Date and time one by one. After the complete Error log, the LCD display will come back to its original state. This Error log can be activated at any time but is recommended not to done during the reset procedure.

10. One reset switch is provided on the interface card or motherboard which can be used for resetting the display of LCD. This switch can be accessed by removing the top cover of the reset box. This reset will not affect the status of the section and be applied at any time but it is recommended to not to use it during the reset operation.

11. In case the cable pair from location box to SSDAC unit is not provided, the display information on the reset box will not appear.



13.3. INSTALLATION OF RESET BOX

i. The Reset box is to be installed on SM's /Cabin man table.

ii. The Reset Box is to be firmly fixed to the table by means of bolt & nut.

iii. The Reset Box is to be wired as d***rawing no F008443A4, Page No. D16 & W008444A4, Page No. D17***

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

v. The Reset Box top cover 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 SSDAC is to be connected / extended to reset box for power ON and other indications.

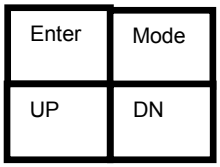
vii. 2Nos. of Reset Box (1 No. at each end) are wired in block section & one Reset Box is wired in station section. In case the quad pair from location box to SM's room is not provided, only the LCD display on the reset box will not work. All the other functions of the reset box will continue to work normally.

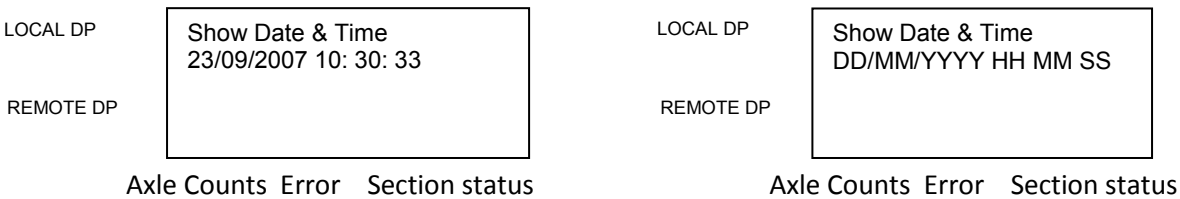
viii. It is recommend to set the date and time of RTC clock by use of keypad before commissioning so that Error log is displayed properly.

a. Press Mode Key and press Enter when Show Current date & time is displayed. It will display the current date and time

b. Press Mode Key and press Enter when option "Set Date & Time is displayed.

c. Follow the instructions as displayed on the LCD.





13.4 RESETTING PROCEDURE

13.4.1 SSDAC WHEN USED FOR TRACK CIRCUITING AT STATIONS

- **COMMON RESETTING**

The common resetting of both SSDAC units is to be carried out when used for track circuiting such as platform lines, yard lines etc. The provision for LV proving is also provided for its use if required. ***Kindly refer drawing no S008429A3 on Page no. D18 for wiring details***

The design of reset box of modified SSDAC is such that the SM's Reset operation is essential & absolutely necessary for carrying out the resetting in SSDAC. The Reset operation is positive type & built in to the design of reset box & SSDAC using additional hardware. The external Relays for resetting are not required. The danger of accidental resetting in SSDAC due to power disconnection and reconnection is avoided with this type of reset circuit.

- **RESETTING OPERATION**

1. i. Insert SM's key, turn right and keep pressed.
   ii. Press Reset button for 3 to 5 seconds.
   iii. Release SM's Key and Reset Button
   iv. Turn left, remove SM's key and keep in safe custody.
2. With the above operation from step 1 (i) & (ii) the 48V DC from the reset box is extended and connected to the SSDAC, the 48V DC activates the reset circuit in modem card (card 6) of SSDAC unit and generates reset command to the Micro Controllers in MLB1 and MLB2 cards (Card 3 & 4)
3. Reset command to Microcontrollers will not be generated if system is in clear / preparatory / occupied state. System can be resetted if it is in error state or out counts were registered after occupied state.
4. The SSDAC units are reset and counts become zero. The self test is carried out in both the units. The SSDAC unit attains the preparatory reset state. The PR & PPR Relays pick up and preparatory reset LED indication glows on the reset box in SM's room. Resetting operation by both stations is required and is necessary in BPAC use.
5. The counter reading also increments by 1 count through the Prep. Reset command after a gap of 5 sec. approximately. The counter reading should be recorded.
6. One pilot train is to be passed in the section to make the system normal. Thereafter, the vital relay picks up.

13.4.2 SSDAC WHEN USED IN BLOCK SECTIONS

- **INDEPENDENT RESETTING**

The independent resetting of SSDAC units at each station is to be carried out when used in block sections. Sometime it may be required to prove the SM's Key and Button and extend 24V for remote location for its use in railways circuit. ***Kindly refer drawing no S008429A3 on Page no. D18 for wiring detail***

The design of reset box of modified SSDAC is such that the SM's resetting operation from both stations is essential and absolutely necessary for carrying out the resetting in SSDAC. The Reset operation is positive type and built in to the design of reset box and SSDAC using additional hardware. The external Relays for resetting are not required. The danger of accidental resetting in SSDAC due to power disconnection and reconnection is avoided with this type of resetting circuit.

- **RESETTING OPERATION**

Both sides resetting operation is required with or without time gap in BPAC use. The procedure for resetting is as follows: -

1. **i. Insert SM's key, turn right and keep pressed.**
   ii. Press Reset button for 3 to 5 secs
   iii. Preparatory LED starts flashing.
   iv. Release SM's Key and Reset Button
   v. Turn left, remove SM's key and keep in safe custody.
2. With the above operation from step 1(I) & (ii) the 48V dc from the reset box is extended and connected to the SSDAC, this 48V DC activates the reset circuit in modem card (card 6) of SSDAC unit and generates reset command to the Micro Controllers in MLB 1 and MLB2 cards (Card 3 & 4).
3. Reset command to Microcontrollers will not be generated if system is in clear / preparatory / occupied state. System can be resetted if it is in error state or out counts were registered after occupied state.
4. The SSDAC units are reset and counts become zero. The self-test is carried out in both the units. The SSDAC units attain the preparatory reset state. The PR & PPR relays pick up and preparatory reset LED indication glows on the reset box in SM's room. Resetting operation by both stations is required and is necessary in BPAC use.
5. The counter reading also increments by 1 count through the Prep. Reset command after a gap of 5 sec approx. The counter reading should be recorded.
6. One pilot train is to be passed in the section to make the system normal. Thereafter, the vital relay picks up at both stations.

CHAPTER 14

14.0 COMMISSIONING OF SYSTEM

14.1 PRECOMMISSIONING CHECK OF THE SYSTEM

After installation of the system, the measurements as per pre-commissioning check list given in Annexure III are taken and recorded. The readings should be within limits.

14.2 RESET BOX RB – 259

The reset box controls the Resetting of SSDAC units at site. The reset box also consists of line (section) status i.e. clear/occupied indications. The wiring of reset box installed at Station Master's room cabin is to be checked and verified as per the wiring details of the reset box given in ***Drawing no W007742A4 (Page No. D17) & S008433A3 (Page No D18 & D19)***

14.3 SURGE VOLTAGE PROTECTION DEVICE SV-121

The Surge Voltage protection device is to be installed at each location along with every SSDAC unit. Each device is to be wired as per wiring details given in Chapter 12.

14.4 COMMISSIONING INTO SIGNALLING CIRCUITS

Parallel working of the system should be done first. The system is to be commissioned in the signalling circuits after watching its performance during the parallel operation for 3 to 4 days for train movements in the section. It is to be ensured that the system is working satisfactorily before commissioning. After commissioning, it is to be further observed that system is working satisfactorily for a few more days. The failure register may be opened with the Station Master for record of resets in the system.

CHAPTER 15

15.0 MAINTENANCE SCHEDULE (MONTHLY)

15.1 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.

15.2 SSDAC 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.

15.3 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.

15.4 INSPECTION OF RESET BOX (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.

15.5 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.

15.6 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.

CHAPTER 16

16.0 TOOLS AND SPARES

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

16.1 **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)	1 No.
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 , 88 NM	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.
10.	Dummy load to check power supply(resistive)	1 No.
11.	Train simulator, model TS267P CEL make	1 No.
12.	Extender card (Card No. 557 or latest)	1 No.

Optional items:

1.	Portable data analyzer for downloading event logger data for analysis and report generation	1 No.
2.	Serial to USB converter with driver CD make MOXA	1 No.

16.2 RECOMMENDED SPARES:

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

1.	SCC 1&2 cards (Card 1 & 2)	2 Nos.
2.	MLB 1&2 cards (Card 3 & 4)	2 Nos.
3.	Modem card (Card 6)	1 No.
4.	Relay driver (Card 7)	1 No.
5.	Event Logger Card (Card 5)	2 Nos.
6.	DC-DC converter (Card 8)	1 No.
7.	Axle detectors (AD711) 21 KHz/23KHz (TX coil)	1 No.
8.	Axle detectors (AD711) 21 KHz/ 23 KHz (Rx coil)	1 No.
9.	Hardware for mounting axle detectors	1 Set
10.	MS circular connectors (6 No.)consisting of a. MS1 – 7 pin – TX Coil – 1 each b. MS2 – 5 pin – RX coil – 1 each c. MS3 – 6 pin - Vital Relay – 1 each d. MS4 – 4 pin – Modem – 1 each e. MS5 – 9 pin – Monitor – 1 each f. MS6 – 2 pin – DC Power – 1 each	1 Set
11.	Reset box RB-259	1 No.
12.	SSDAC unit (housing with mother board, without cards)	1 No.
13.	Vital Relay Box with Relay 24V, 1000 ohm, Q type	1 No.
14.	Surge voltage protection device box (SV-121)	1 No.

CHAPTER 17

17.0 DO'S AND DON'TS FOR DIGITAL AXLE COUNTER

17.1 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

17.2 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 unit.
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 18

18.0 INTRODUCTION (EVENT LOGGER)

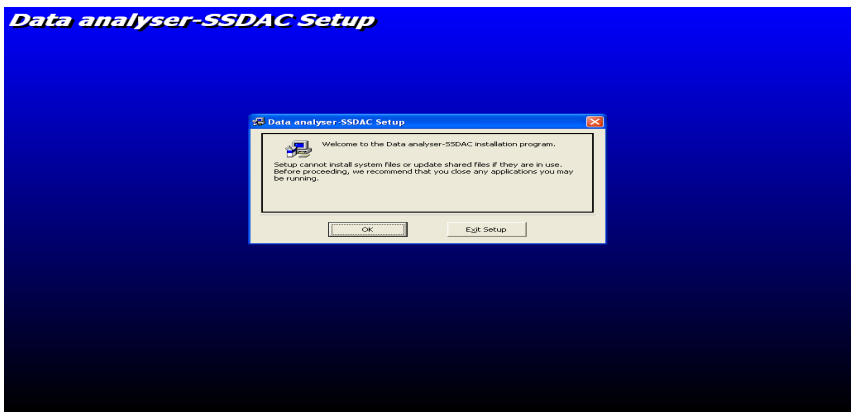
Event logger card is designed to capture and store important signals from the remote and local SSDAC units. The stored data can be downloaded from the event logger card for the purpose of analyzing the events occurring during the operations of the SSDAC. The data can be analyzed with the help of CEL data analyzer software. Following signals are captured by the event logger card.

- Card removal information
- Serial packets from
  - MLB1 (Local unit)
  - MLB2 (local unit)
  - Remote unit (communication failure and composite information from MLB1 & MLB2.

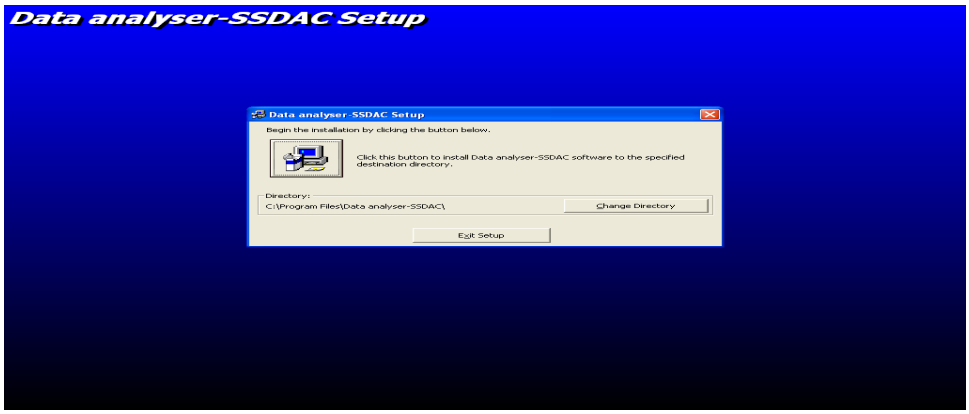
For capturing the signals of SSDAC unit, Event Logger card is required to be plugged in the SSDAC unit in the appropriate slot. Event Logger card has a Rabbit processor and 2 MB FLASH MEMORY to store packets. The data is initially stored in the buffer and subsequently transferred to FLASH memory every two minutes. Normally 4096 pages of the data can be stored in flash memory. The overflow of the data is stored by overwriting existing pages of the flash memory starting from “0” page onwards. This activity of the overwriting memory is known as CIRCULATION OF FLASH MEMORY.

18.1 SOFTWARE INSTALLATION

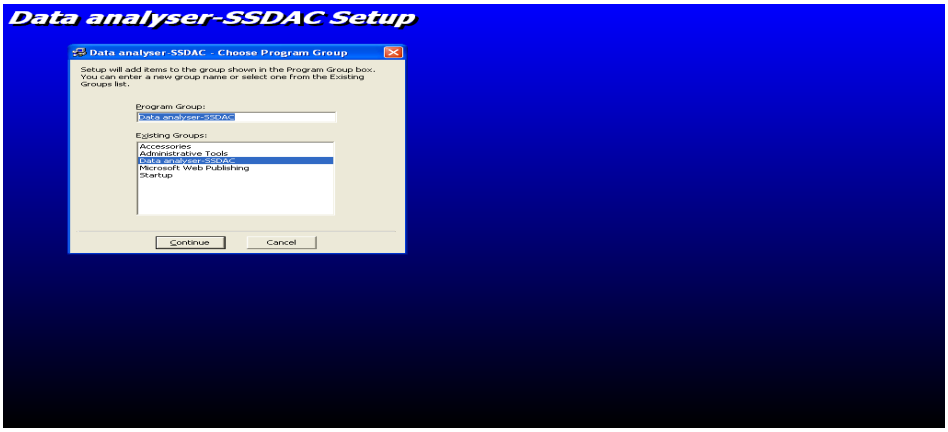
1. The data analyzer software CD has auto run feature. When CD is inserted into the CD ROM drive, software installation automatically gets initiated. If CD doesn’t run automatically then run “setup.exe” command from the root of the CD.



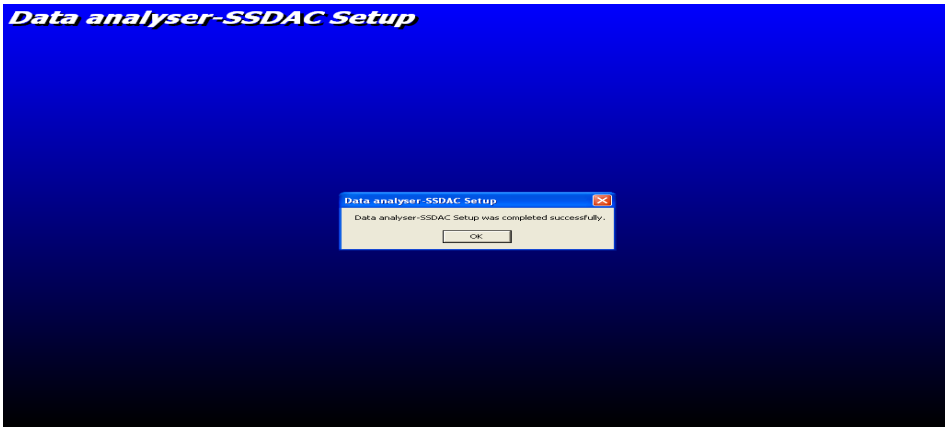
1. Data analyzer setup window shows the default installation path of the data analyzer software (c:\program files\Data analyzer-SSDAC). This path can be changed by selecting “change directory” button.



2. Select installation button to proceed for installation procedure. When choose program window appears. A program group can be selected. The default program group is data analyzer-SSDAC.
3. When user presses the “continue” button data analyzer installation procedure starts.



4. After successful completion of data analyzer software, “data analyzer-SSDAC setup was completed successfully” message appears. This indicates successful completion of installation.



5. It is recommended to uninstall previously installed version of data analyzer if any and restart the computer before installation of software.

18.2 INSTALLATION INSTRUCTIONS:

18.2.1 Plug in the Event Logger card in the SSDAC system, it gets powered on and download LED remains “ON” continuously. It takes a maximum of 3 minutes to get download LED turned off. After this the card is ready for following operations.

- ❖ Check CRC
- ❖ Reset flash.
- ❖ Erase flash.
- ❖ Time stamping.
- ❖ Show current time stamp.
- ❖ Download data.

18.2.2 While recording the data, time is getting stamped every 2 minutes.

18.2.3 To ensure storage of the data for the current activity, at least 2 minutes gap is required before any other activity involving communication failure or power reset is carried out.

18.2.4 During the train movement **no** time stamping activity is carried out in flash, hence time stamps may not have a regular 2 minutes gap during train movement.

18.3 DATA ANALYZER SOFTWARE:

18.3.1 For analyzing the data stored in flash of the event logger card, EL card is connected to a PC (or laptop) through a COM PORT (or USB port) using a standard cross connected RS-232 cable (or USB to RS232 converter cable).

18.3.2 Data download procedure

- ❖ Data analyzer software is installed in a PC using Auto run facility in the software CD or running setup.exe command. After the software is installed, run the software for carrying out various EL related activities.
- ❖ From main menu, “Card function” option is selected.

a) Comport setting**:** select “Com Port Settings” from the drop down menu of “card function” (use default setting for the selected Com Port as 19200, n, 8, 1).

b) Select desired Com Port, click OK.

18.3.3 Other card functions:

❖ Check CRC: for checking the checksum stored in the micro-controllers of MLB cards. To check the CRC, data must be downloaded first from the event logger card.

❖ Reset flash: for resetting the flash, click on reset flash.

❖ Erase flash: to erase all 4096 pages of the flash memory, click on to erase flash and then click on to erase button. “Flash erased” message will be displayed on the host computer screen. Further writing of the flash memory will start from page number “0”. Before erasing the flash, time stamping is recommended.

18.3.4 Time stamping:

❖ Click on to the “Time stamping” option.

- ❖ Click on the “Select the current time”.
- ❖ Click on “Form packet”.
- ❖ Click on “Send packet”, time packets are sent to the event logger card.
- ❖ Show current time stamping: Once clicked on this option the system shows the current time stamping. The date time will appear in the following format:

{15:03:2005|12:27:00}

18.4 DOWNLOADING OF DATA:

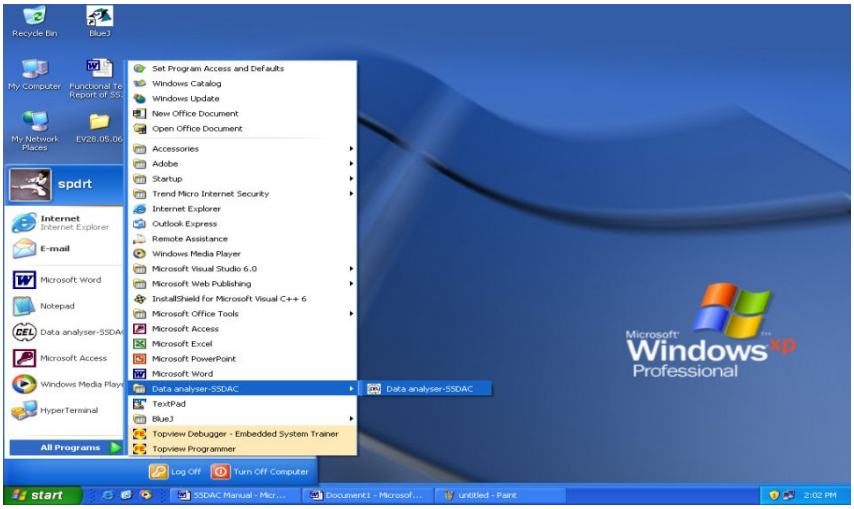
Data from the Event Logger card is downloaded from flash memory of event logger.

18.4.1 Case 1: When flash page number is >0 and flash is not circulated, the controller generates a message “downloading buffer” followed by page number of current page. Once the command is executed, data is downloaded from the flash memory from page number 0 to the current page number.

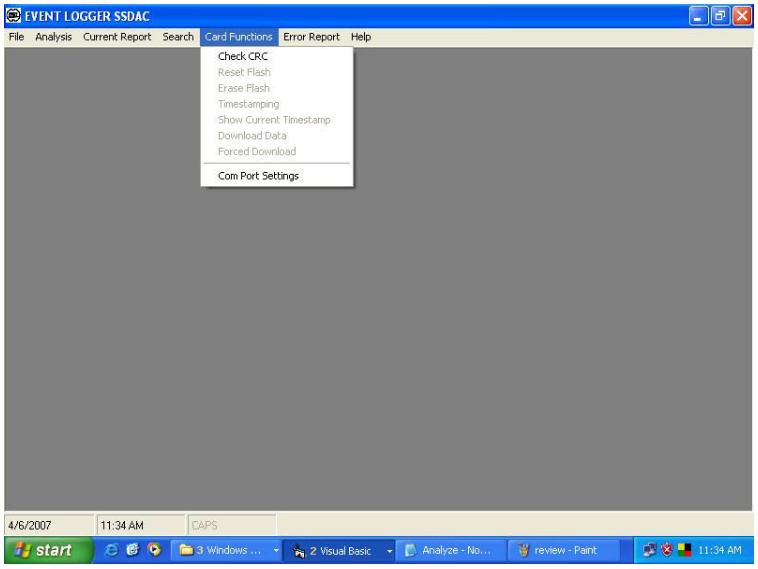
18.4.2 Case 2: When flash is circulated, the controller generates a message “downloading buffer” followed by page number of current page. Here in this case data is downloaded from current page to last page (4096) of the flash and then page number 0 to the current page number.

18.4.3 Steps for downloading the data.

- ❖ Open the CEL data analyzer application. Go to Start > All Programs > Data Analyser-SSDAC > Data analyser-SSDAC

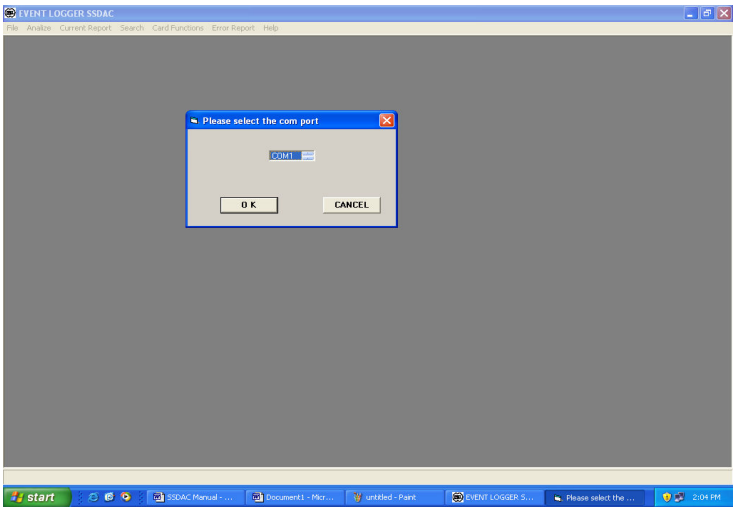


❖ Go to card function.

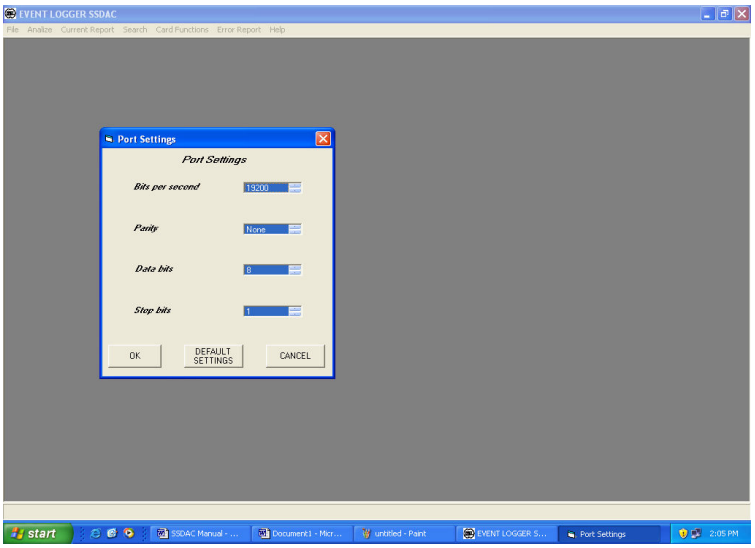


❖ Click on the com port setting

❖ Click on com1/com2/com3/com4 as per the comport availability.

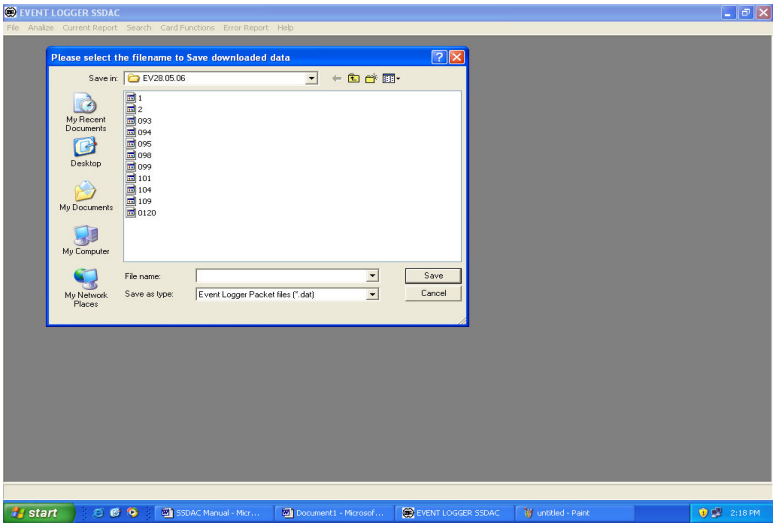


❖ Check the setting for 19200 bauds, parity none, data bits 8 and stop bit 1.

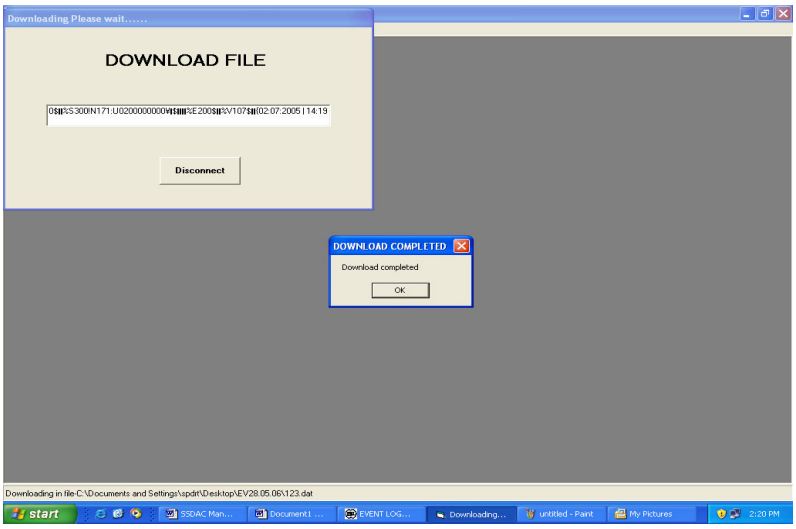


Now click on to download data.

❖ Give file name and save. Data starts getting downloaded.

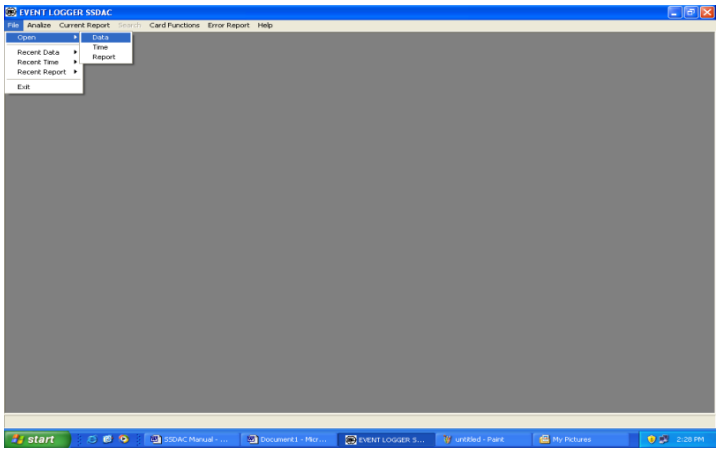


❖ On completion of downloading the message “downloading completed” appears.

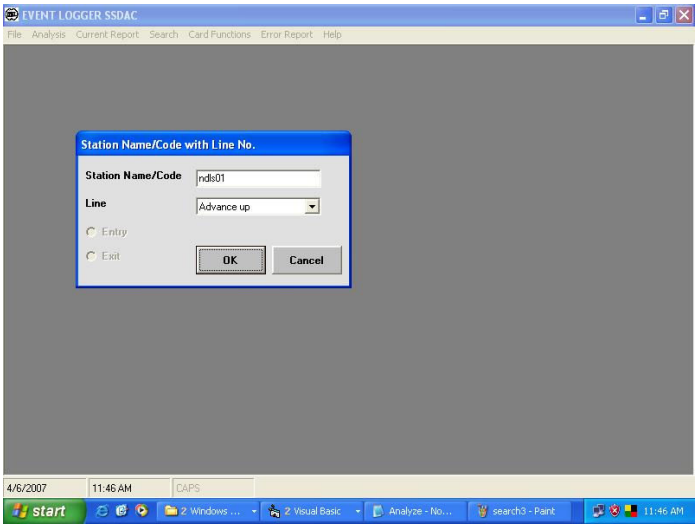


18.5 DATA ANALYSIS:

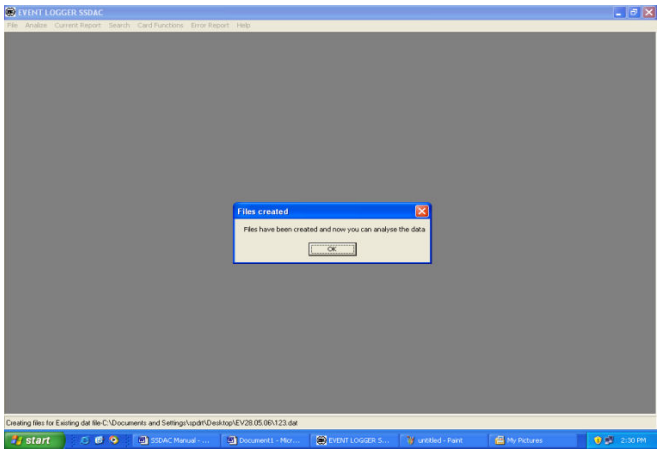
- Run the Data Analyzer Application.
- Click on select data, then select file form the list or from the path where the files are saved.



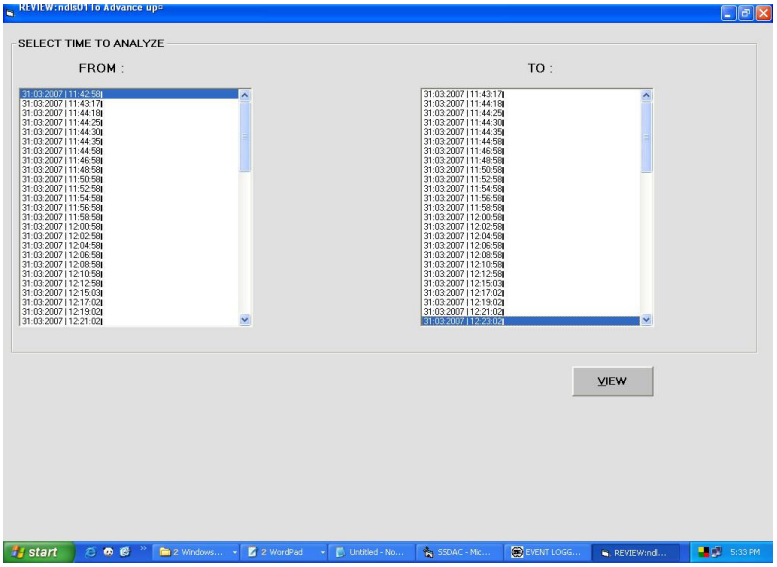
- Give the name of station or station code. Station name / code should be atleast 3 characters long.



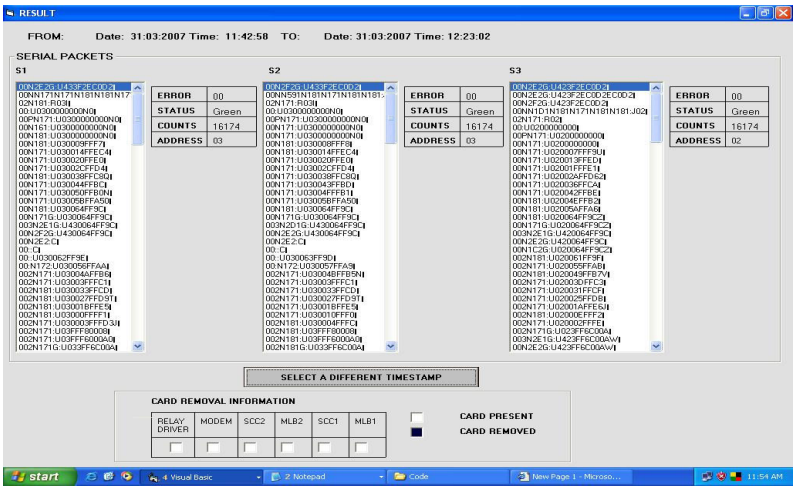
- Click on OK button. Then files will start getting created.
- After creating the files message will appear “Files are created and now you can analyze the data”.



❖ The required time slots in “From” and “To” windows for which the analyzing is to be done should be selected. After time zone selection, click on “VIEW”.

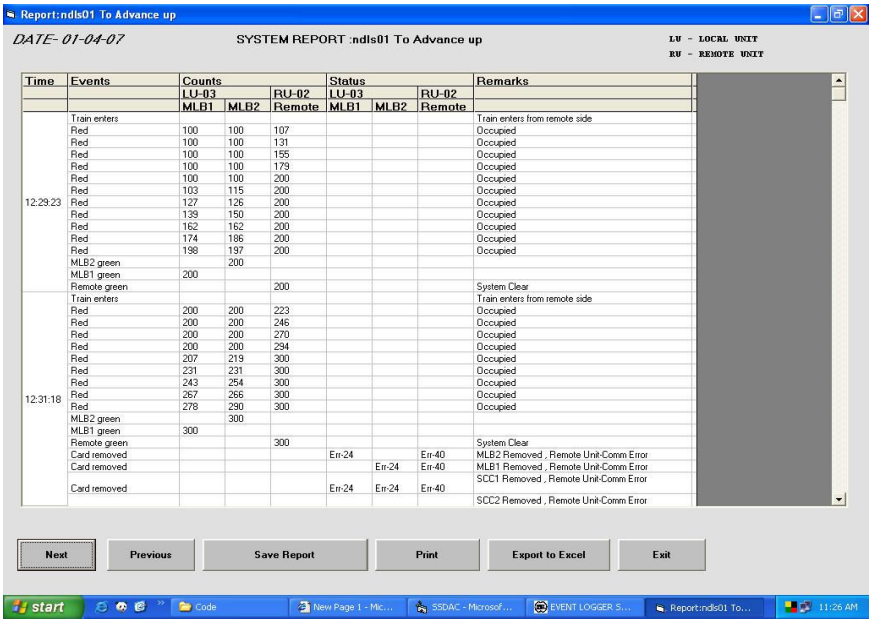


❖ The result menu comes on having information regarding serial packets and Card removal information.

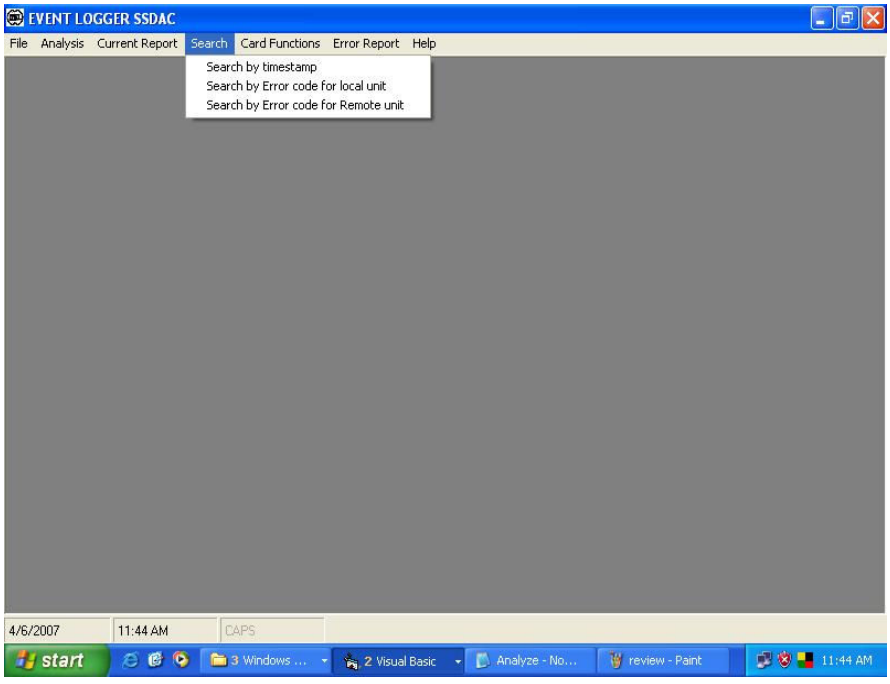


18.6 Current Report and Error Report for the selected “*.dat” file are ready to be viewed. The current report can be exported in the Excel format by clicking on “Export to Excel”

button. If Microsoft Excel is not installed in the PC or Laptop, then the user can use the "Print" button to print the report directly or the "Save Report" button to save the report in a text file.



18.7 Search feature is provided in data analyzer software to search and analyze the data on the basis of time stamps or error codes.



18.8 Detailed help instructions are provided in the help menu of the software.

Annexure I- STATUS CHART OF SSDAC FOR VARIOUS CONDITIONS (3 SHEETS)

SSDAC Unit Sl. No. (Entry end) _____ (Exit end) _____
Rail section. (Entry end) 90R / 52 Kg / 60 Kg (Exit end) 90R / 52 Kg / 60 Kg
Line used for _____ Section / Station_____

The status includes when power connected, Reset applied, Preparatory, Occupied (Train Entry in Section), Clear (Train Exit from Section)

S. No.	Condition	Station A				Station B			
			Relay Room	Location			Relay Room	Location	
		SMs Room (Reset Box)	Q-Relay Status	Q-Relay Status	System Status	SM's Room (Reset Box)	Q-Relay Status	Q-Relay Status	System Status
1.	24Vdc is connected at Station A (Fuse connected)	Occupied (Red) LED indication glows	PPR↓VPR↓	PR↓ VR↓	24V dc is available to system. System is ON & waiting for Reset	No indication	PPR↓ VPR↓	PR↓ VR↓	System is OFF
2.	24V dc is connected at Station B (Fuse connected)	-do-	-do-	-do-	-do-	Occupied (Red) LED indication glows	-do-	-do-	24Vdc is available to system. System is ON. Waiting for Reset
3.	Reset applied at Station A.	i) Insert SM's Key, turned & keep pressed ii) Reset Button pressed iii) Both released vi) Occupied (Red Indication remains.	PPR↓ VPR↓	PR↓ VR↓	i) Reset is applied to system. ii) The self test starts in the system and goes to Error due to far end unit is not resetted	-do-	-do-	-do-	-do-

Annexure I **(Page 2 of 3)**

SSDAC Unit Sl. No. (Entry end) _____ (Exit end) _____
Rail section. (Entry end) 90R / 52 Kg / 60 Kg (Exit end) 90R / 52 Kg / 60 Kg
Line used for _____ Section / Station_____

S. No.	Condition	Station A				Station B			
		SM's Room (Reset Box)	Relay Room	Location		SM's Room (Reset Box)	Relay Room	Location	
			Q Relay Status	Q Relay Status	System Status		Q Relay Status	Q Relay Status	System Status
4.	Reset applied at Station B	Occupied (Red) LED indication glows.	PPR↓ VPR↓	PR↓ VR↓	Error due to far end unit is not synchronized.	i) Insert SM's key, turned & keep pressed ii) Reset button pressed. iii) Occupied indication remains.	PPR↓ VPR↓	PR↓ VR↓	i) Reset is applied to system. ii) The self test starts in the system and hand shakes with the other end unit.
5.	System enters Preparatory reset mode	Power On remains. OCC indication remains. Preparatory Reset indication glows. Reset counter increments by 1 count.	PPR ↑ VPR↓	PR↑ VR↓	Both Units communicate each other by means of packets and enters into preparatory reset mode	Power ON remains. OCC Indication remains. Preparatory Reset Indication glows	PPR ↑ VPR↓	PR↑ VR↓	Both Units Communicates with each other by means of packets and enters into preparatory state mode. Reset counter increments by 1 count.
After PR & PPR relays are picked up, the system is in No. Error Condition, But, the VR & VPR Relays of both stations are forced to remain in dropped condition by the system. Therefore LSS cannot be lowered. The 1st train is to be piloted in the section to register balance of counts and thereby to drive VR relays ON at both stations.									

Annexure I (Page 3 of 3)

SSDAC Unit Sl. No. (Entry end) _____ (Exit end) _____
Rail section. (Entry end) 90R / 52 Kg / 60 Kg (Exit end) 90R / 52 Kg / 60 Kg
Line used for _____ Section / Station_____

S. No.	Condition	Station A				Station B			
		SMs Room (Reset Box)	Relay Room	Location		SM's Room (Reset Box)	Relay Room	Location	
			Q-Relay status	Q-Relay status	System status		Q-Relay status	Q-Relay status	System status
6.	1st train enters the block section from stn A	Power On LED (Yellow) remains. Occupied (Red) LED remains. Prep Reset LED remains ON.	PPR↑ VPR↓	PR↑ VR↓	System registers wheel counts & PR relays remains pickup.	Power On LED glows. Prep. Reset LED remains ON.	PPR↑ VPR↓	PR↑ VR↓	System registers wheel counts at station A. PR & PPR relays remains picked up.
7.	1st train clears the section from Stn B.	Power On LED glows. Prep. Reset LED becomes OFF. Occupied LED becomes OFF & clear LED glows	PPR↓ VPR↑	PR↓ VR↑	Counts in both units of the system become equal. The decision to drive VR relay ON is given. VR relay picks up.	Power on LED glows. Prep. Reset LED becomes OFF. Occupied LED becomes OFF & clear LED becomes ON	PPR↓ VPR↑	PR↓ VR↑	Counts in both units of the system become equal. The decision to drive VR relay ON is given. VR relay picks up.
8.	On subsequent trains entry in the block section from stn A	Power on LED glows. Prep. Reset LED is OFF. Occupied LED becomes ON. Clear LED becomes OFF.	PPR↓ VPR↓	PR↓ VR↓	System registers in counts at station A. System goes to OCC state. VR is driven OFF.	Power on LED glows. Prep. Reset LED is OFF. Occupied LED becomes ON. Clear LED becomes OFF.	PPR↓ VPR↓	PR↓ VR↓	System registers in counts at stn A. System goes to OCC state. VR is driven OFF.
9.	Trains clears the block section and enters stn B	Power on LED glows. Prep. Reset LED is OFF. Occupied LED becomes OFF. Clear LED becomes ON.	PPR↓ VPR↑	PR↓ VR↑	System registers out counts at station B. After count balancing the system goes to clear state	Power on LED glows. Prep. Reset LED is OFF. Occupied LED becomes OFF. Clear LED becomes ON.	PPR↓ VPR↑	PR↓ VR↑	System registers out counts at stn B. After count balancing the system goes to clear state.

Note: In the wiring circuit of Reset Box contacts of PPR & VPR are not proved. Hence reset voltage is extended to system in PPR or VPR pick up condition. Reset is however possible only in error or occupied state after registration of at least one out count.

Annexure II - RELAY STATUS CHART FOR SSDAC

SSDAC Unit Sl. No. (Entry end) _____ (Exit end) _____
Rail section. (Entry end) 90R / 52 Kg / 60 Kg (Exit end) 90R / 52 Kg / 60 Kg
Line used for _____ Section / Station_____

S. No.	CONDITION	STATION-A				STATION-B			
		Relay Room		Location		Relay Room		Location	
1	24 V connected	VPR ↓	PPR↓	VR↓	PR↓	VPR↓	PPR↓	VR↓	PR↓
2	Reset applied (SM's key inserted, reset button operation, etc)	VPR↓	PPR↓	VR↓	PR↓	VPR↓	PPR↓	VR↓	PR↓
3	System enters preparatory reset mode	VPR↓	PPR ↑	VR↓	PR↑	VPR↓	PPR↑	VR↓	PR↓
4(a)	First train enters the section (Pilot train)	VPR↓	PPR↑	VR↓	PR↑	VPR↓	PPR↑	VR↓	PR↑
4(b)	First train clears the section (after counts equal in both units	VPR↑	PPR↓	VR↑	PR↓	VPR↑	PPR↓	VR↑	PR↓
5(a)	Subsequent trains when occupy the section	VPR↓	PPR↓	VR↓	PR↓	VPR↓	PPR↓	VR↓	PR↓
5(b)	Subsequent trains when clears the section	VPR↑	PPR↓	VR↑	PR↓	VPR↑	PPR↓	VR↑	PR↓

ORDERING INFORMATION

INSTALLATION MANUAL DACF- 710P

Sr. No		Description Of Item	Qty.	
1.	**Single section Digital Axle counter system complete as per RDSOspecification no. RDSO/SPN/177/2012 Version 3.0 or latest. Each set consisting of the following:-**			**01 Set**
	a.	High frequency Tx coil and Rx coil (AD-711) consisting of web mounting typeTx = 02 Nos. & Rx = 02 Nos.	**01 Set**	
	b.	Track side Digital Axle Counter Unit (DACF- 710P)	**02 Nos**	
	c.	24 Volt, 1000 ohm 'Q' type relay = 2 Nos. along with relay box duly wired for vital relay & PR relay	**02 Nos**	
	d.	Clamp with deflector plates and hardware .	**04 Nos.**	
	e.	Reset Box	**02 Nos.**	
	f.	Surge Voltage Protection Device (SV- 121)	**02 Nos.**	

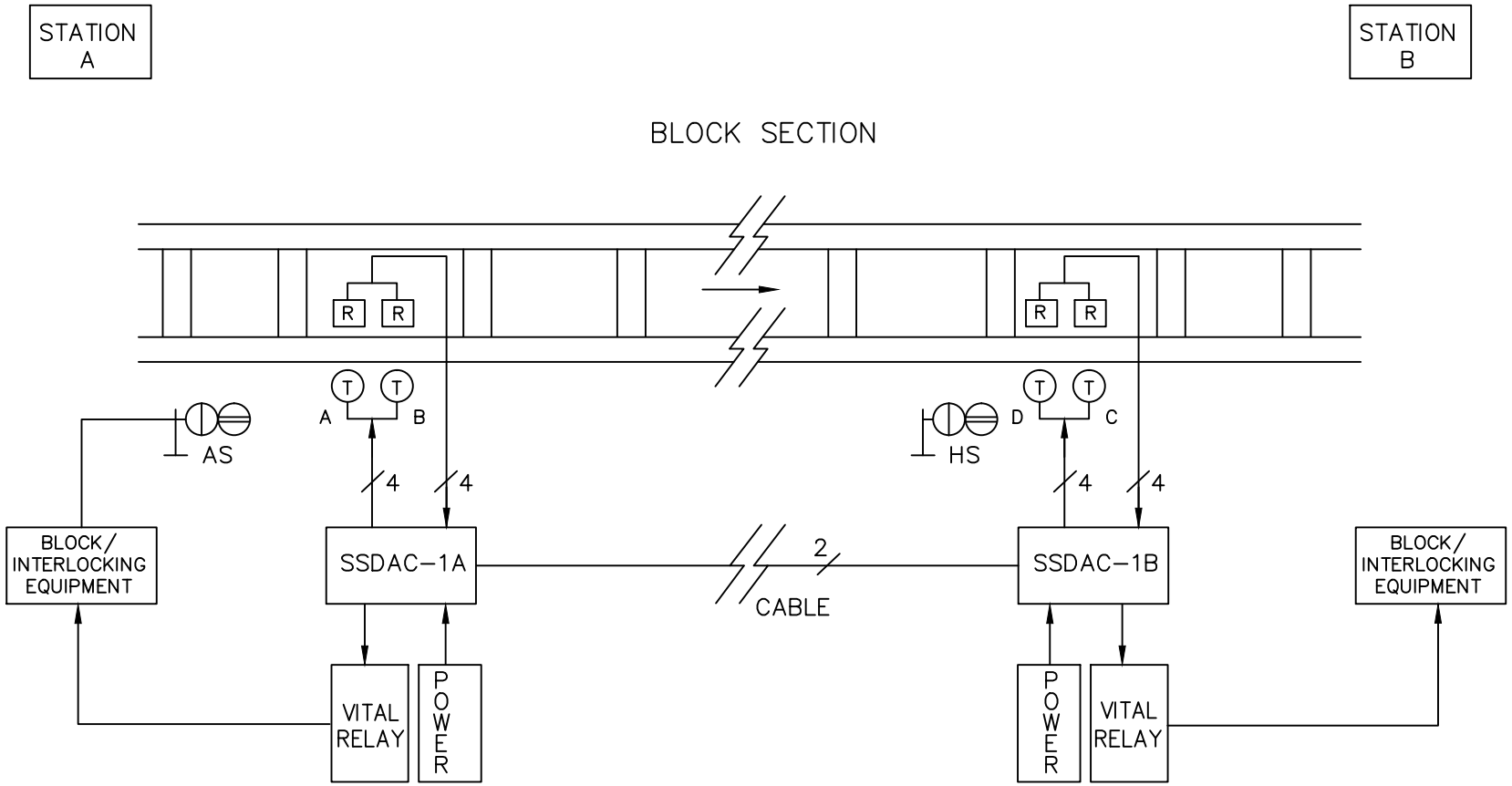
Annexure IV- FEEDBACK FORM

1. **Purchase Order (P.O.) No.** :
2. **Consignee details** :
3. **Systems purchased directly from CEL or through contractor** :
4. **Sr. No. of the Systems** :
5. **Date of Receipt of System** :
6. **Date of Installation** :
7. **Type of Track Circuiting For ex. Platform line, Block Working** :
8. **Systems received in good condition (any damage noticed during transit)** :
9. **System has been installed by Railways or Contractor** :
10. **System Installation Manual received. System has been installed as per instructions given in the manual** :
11. **Fault observed during system working** :
12. **The overall performance of the system** :
13. **Any suggestion for making improvement of the system. Please specify** :

Dated:

Signature and Designation
(Customer Railway)

ANNEXURE V – DRAWINGS (38 SHEETS)



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN *Bhandari*	CHKD *DARPAN*	APPD *PRAVEEN*	DATE 30–04–12

SSDAC (DACF – 710A/P)
USE IN BLOCK SECTION

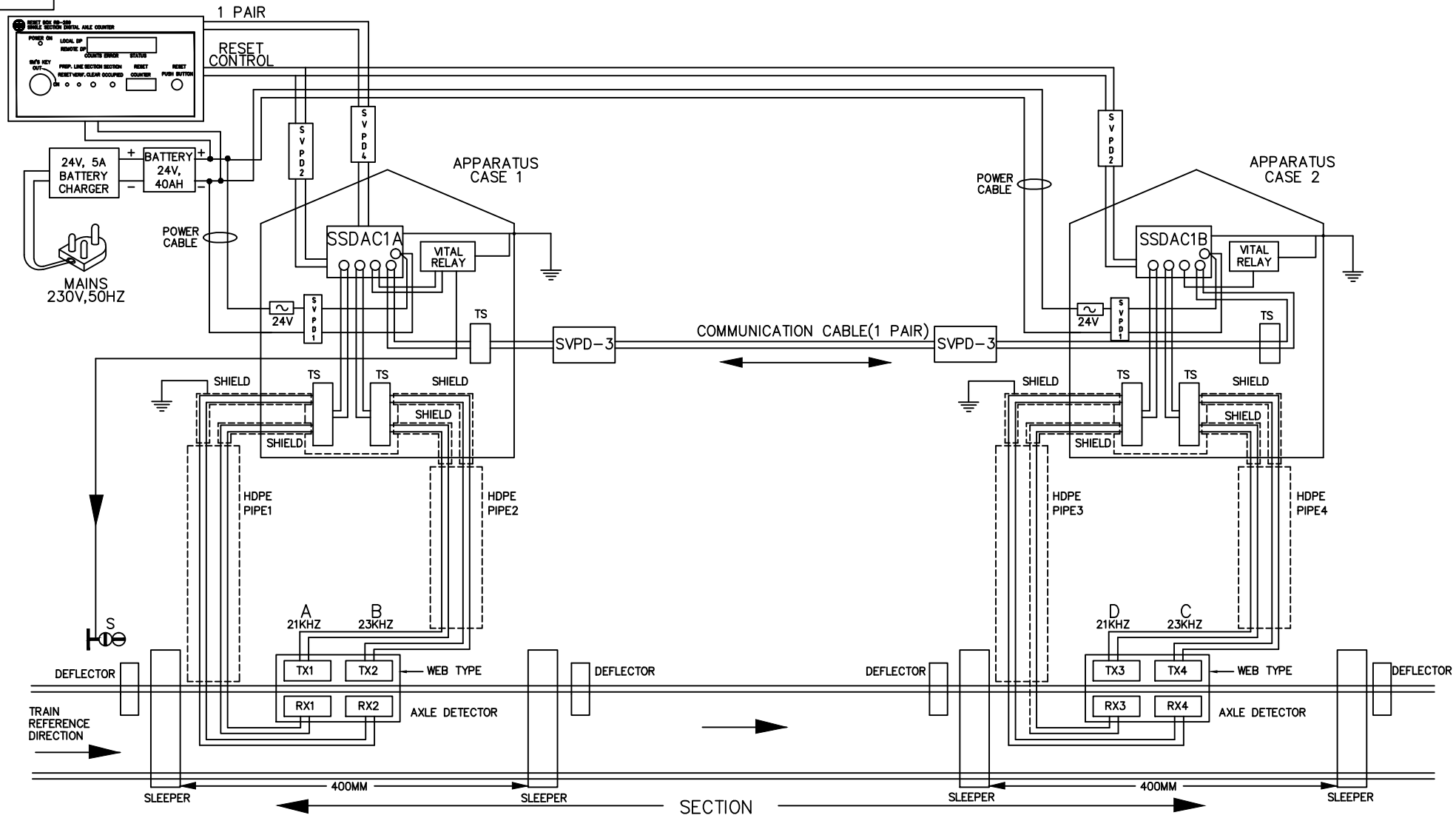
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. B007743A4

SHEET 1 OF 1

D1

SYSTEM2/Bhandari/DACF–AP/7743A4



REQUIREMENTS: –

1) APPARATUS CASE(FULL) – 2NOS
2) TERMINAL BOARD – 2NOS
3) POWER CABLE 25 SQ.MM, 2 CORE AL – 2 LOCATIONS
4) BATTERY CHARGER 24V, 5A – 1NO
5) BATTERY 24V,40AH – 1NO
6) CABLE PAIR 0.9 MM – 1PAIR
7) SIGNALING CABLE,1.5 SQ. MM – 6 CON (1ST. LOC),2 CON (2ND LOC)
8) EARTHING – 2 LOCATIONS

NOTES: –

1) TX1 TO TX4 AXLE DETECTOR TRANSMITTER
2) RX1 TO RX4 AXLE DETECTOR RECEIVER
3) SSDAC1 & SSDAC2 DIGITAL AXLE COUNTER
4) TS TERMINAL STRIPS
5) SVPD SURGE VOLTAGE PROTECTION DEVICE.
6) HALF QUAD REQUIRED BETWEEN LOCATION TO SM ROOM

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D2

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD DARPAN	APPD PRAVEEN	DATE 26-06-07

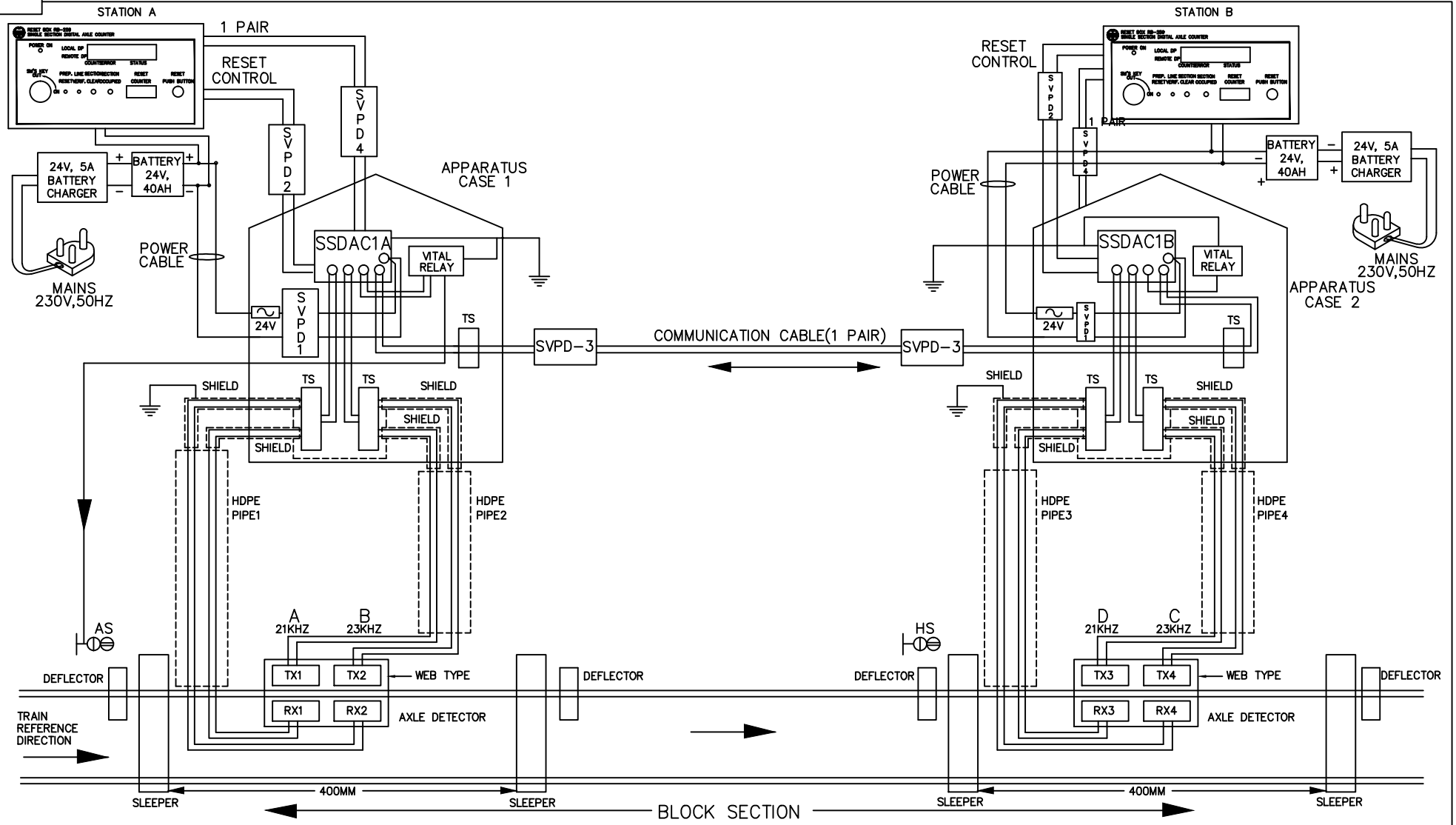
SSDAC(DACF-710A/P)
INSTALLATION DETAILS FOR TRACK CIRCUITING AT STN.

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

DRG.NO. L008453A4

SHEET 1 OF 2

SYSTEM2\Bhandari\DACF-710A/P/8453A4



REQUIREMENTS: –

1) APPARATUS CASE(FULL)	– 4NOS
2) TERMINAL BOARD	– 4NOS
3) POWER CABLE 25 SQ.MM, 2 CORE AL	– 2 LOCATIONS
4) BATTERY CHARGER 24V, 5A	– 1 NO
5) BATTERY 24V,40AH	– 1 NO.
6) CABLE PAIR 0.9 MM(4 QUAD)	– 2PAIR(D/L), 1PAIR(S/L)
7) SIGNALLING CABLE (1.5 SQ.MM)	– 12 CON. (D/L), 6 CON.(S/L)
8) EARTHING	– 4 LOCATIONS

NOTES: –

1) TX1 TO TX4	AXLE DETECTOR TRANSMITTER
2) RX1 TO RX4	AXLE DETECTOR RECEIVER
3) SSDAC1 & SSDAC2	DIGITAL AXLE COUNTER
4) TS	TERMINAL STRIPS
5) SVPD	SURGE VOLTAGE PROTECTION DEVICE.

6) HALF QUAD REQUIRED BETWEEN LOCATION TO SM ROOM

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REV.NO.	DATE	CHANGE NOTE NO.		CHANGE	
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	26–06–07

SSDAC(DACF–710A/P)
INSTALLATION DETAILS FOR BLOCK WORKING

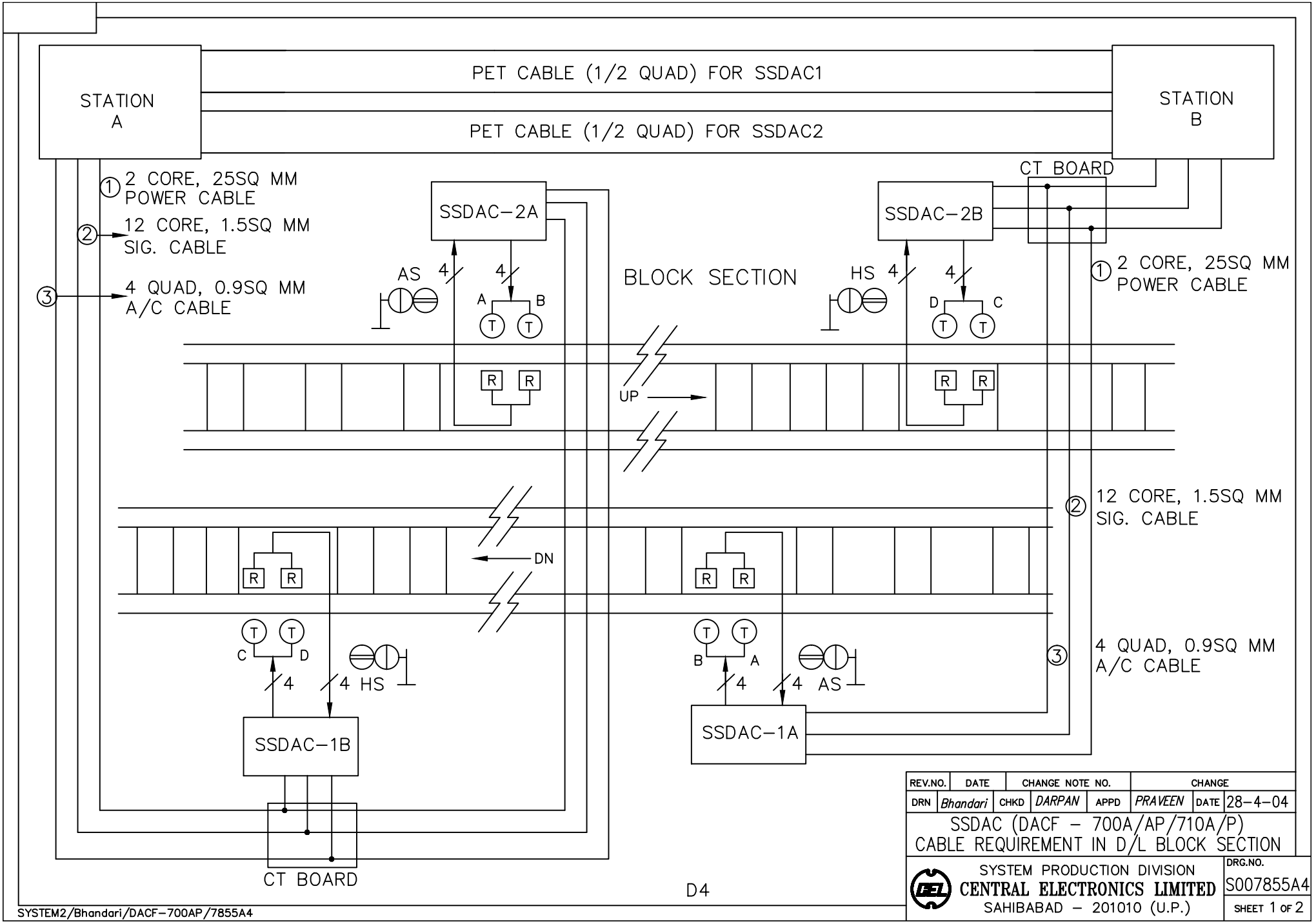
SYSTEM PRODUCTION DIVISION
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DRG.NO. LO08453A4

SHEET 2 OF 2

D3

SYSTEM2\Bhandari\DACF–710A/P/8453A4



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN *Bhandari*	CHKD *DARPAN*	APPD *PRAVEEN*	DATE 28-4-04

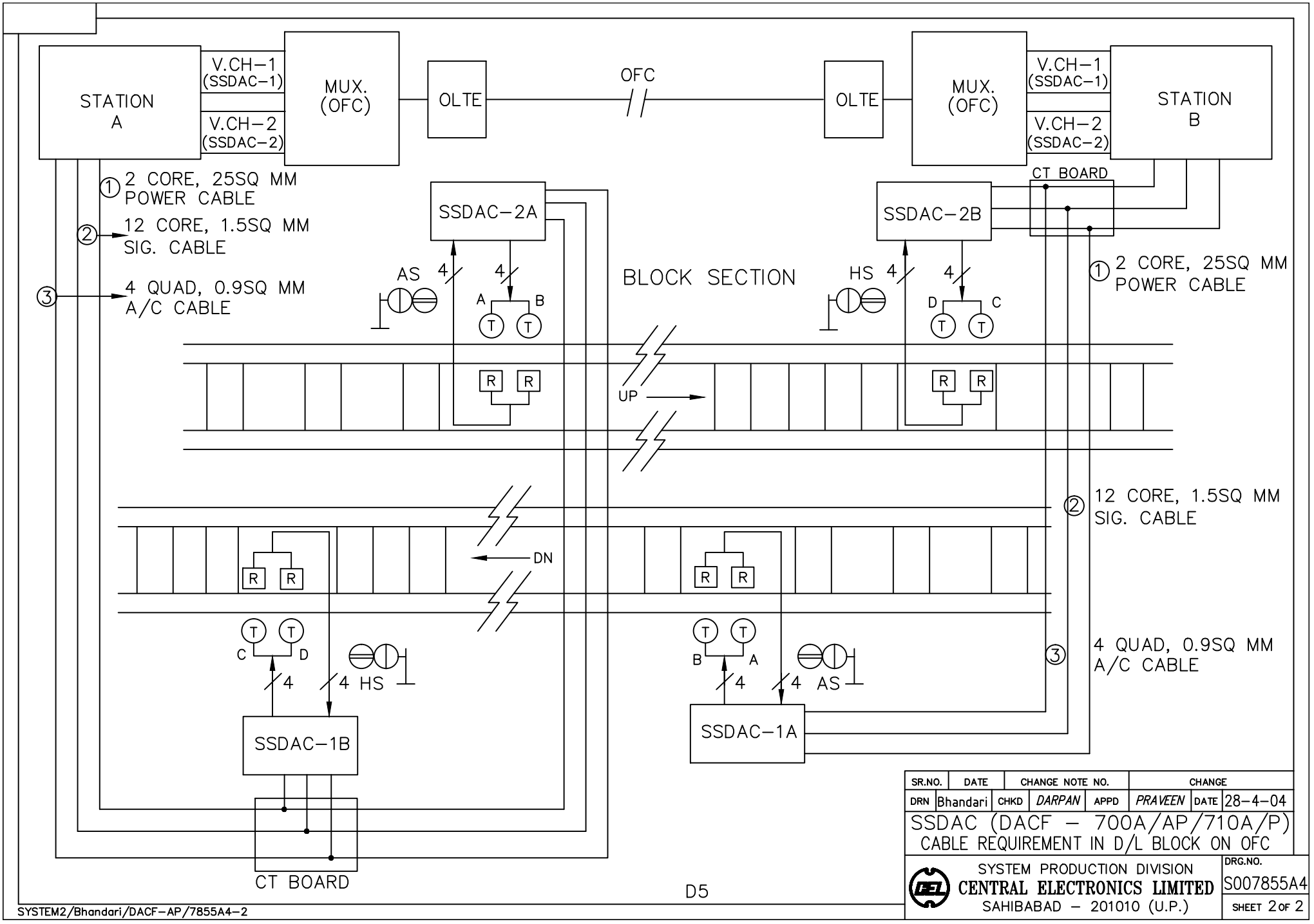
SSDAC (DACF – 700A/AP/710A/P)
CABLE REQUIREMENT IN D/L BLOCK SECTION

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

DRG.NO. S007855A4

SHEET 1 OF 2

SYSTEM2/Bhandari/DACF-700AP/7855A4



SR.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD *DARPAN*	APPD *PRAVEEN*	DATE 28–4–04

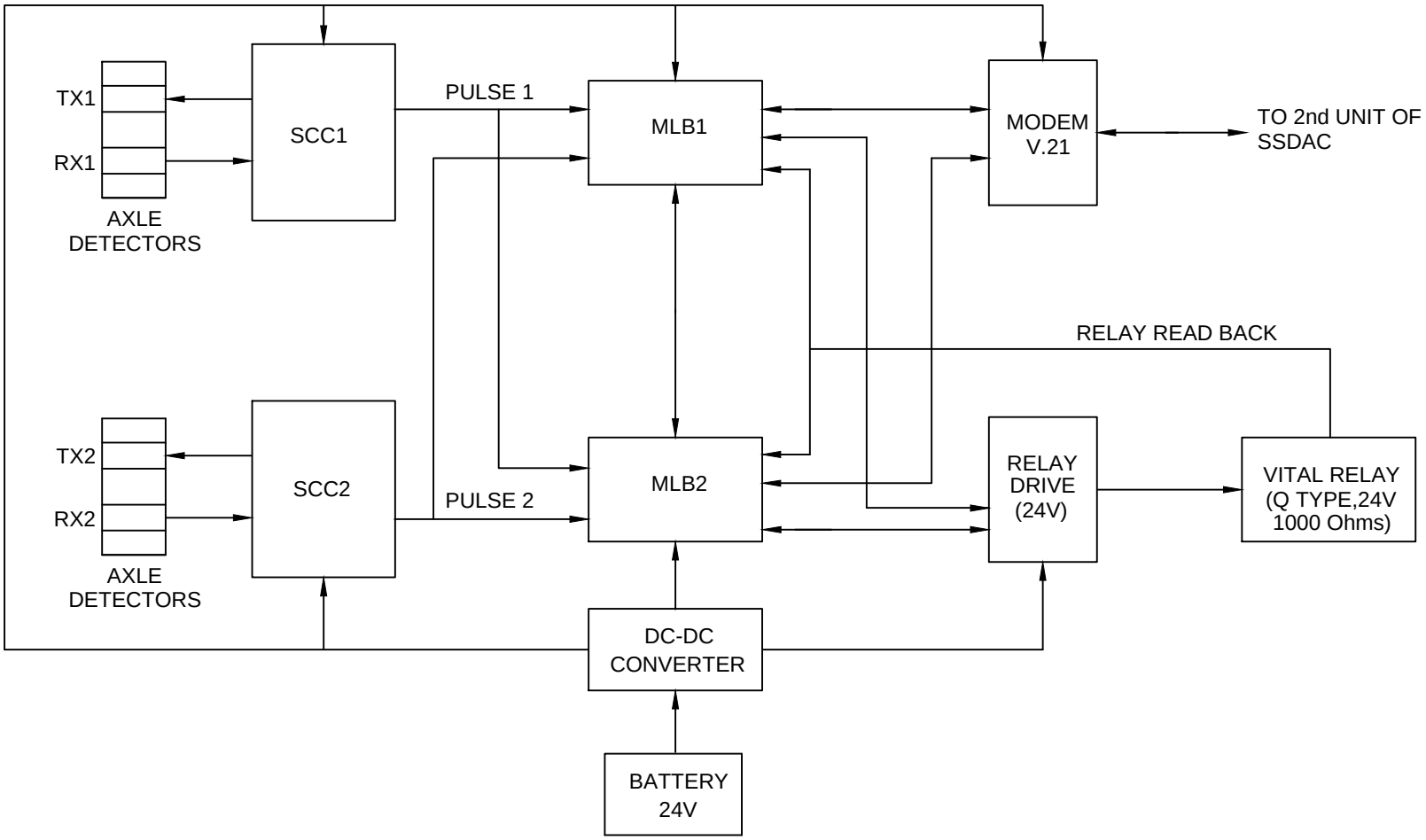
SSDAC (DACF – 700A/AP/710A/P)
CABLE REQUIREMENT IN D/L BLOCK ON OFC

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

DRG.NO. S007855A4
SHEET 2 OF 2

SYSTEM2/Bhandari/DACF–AP/7855A4–2

BLOCK DIAGRAM OF SSDAC



LEGEND :
SCC1 & 2: SIGNAL CONDITIONER CARD
MLB1 & 2: MICRO CONTROLLER LOGIC BLOCK CARD

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Bhandari	CHKD DARPAN APPD PRAVEEN	DATE 05-05-03

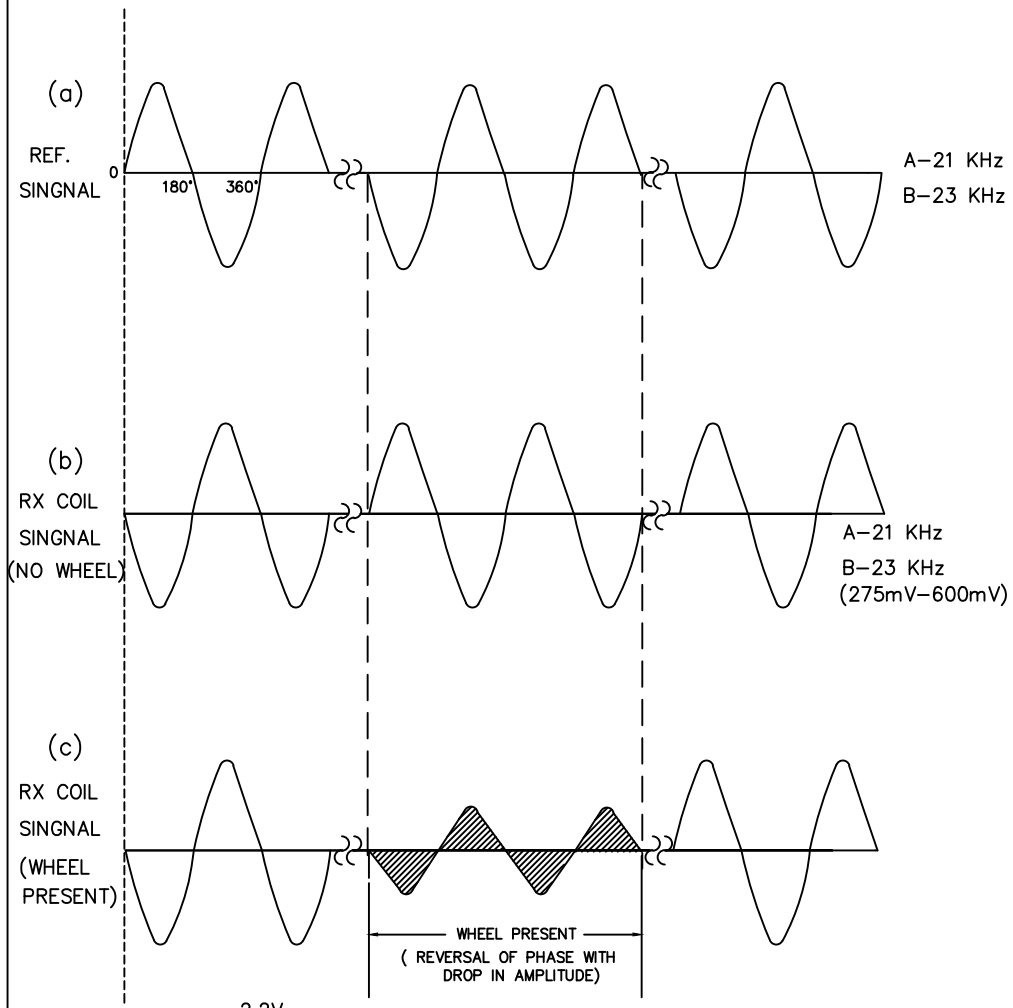
SSDAC (DACF-700A/AP/710A/P)
BLOCK DIAGRAM

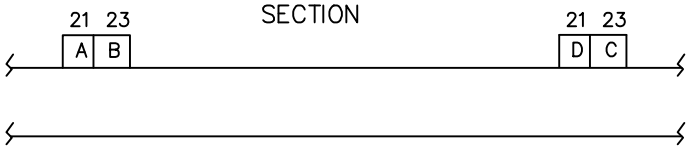
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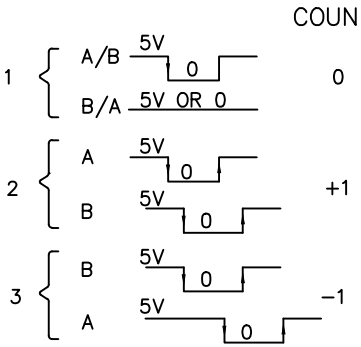
DRG.NO. B007744A4
SHEET 1 OF 1

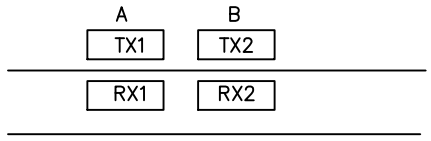
D6

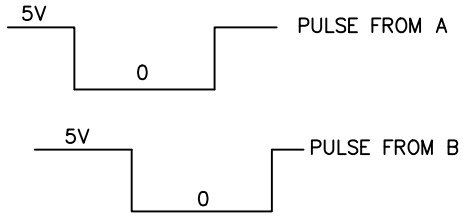
SYSTEM2/Bhandari/DACF-AP/7744A4











D7

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SR.NO.	DATE	CHANGE NOTE NO.		CHANGE			
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	28–10–04

SSDAC (DACF–700AP/710P)
SIGNAL, DIP,PULSE & COUNT DETAILS

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

DRG.NO. L008077A3

SHEET 1 OF 1

SYSTEM2\Bhandari\DACF–AP\8077A3

PULSE FORMATION IN SSDAC

(i)

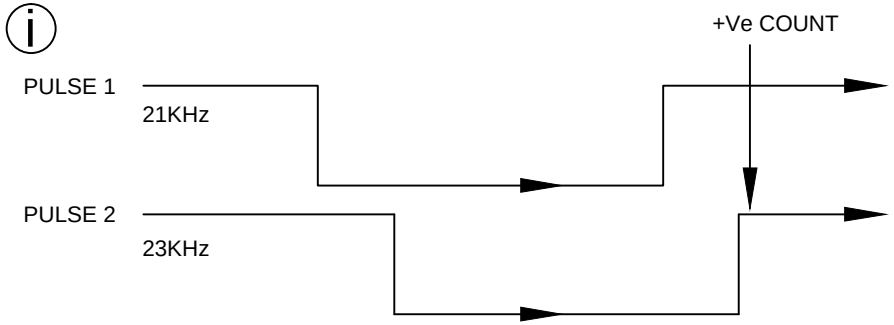


FIG. 11a: Wheel moving from 21KHz coil to 23KHz coil counted as 1No. of +ve count in ssdac

(ii)

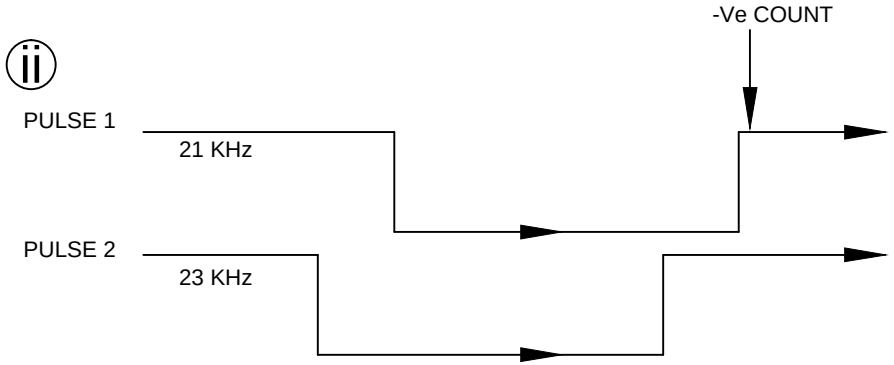


FIG. 11a: Wheel moving from 23KHz coil to 21KHz coil counted as 1No. of -ve count in ssdac

SR.NO.	DATE	CHANGE NOTE NO.	CHANGE				
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	20-05-03

SSDAC (DACF-700A/AP/710A/P)
PULSE FORMATION

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

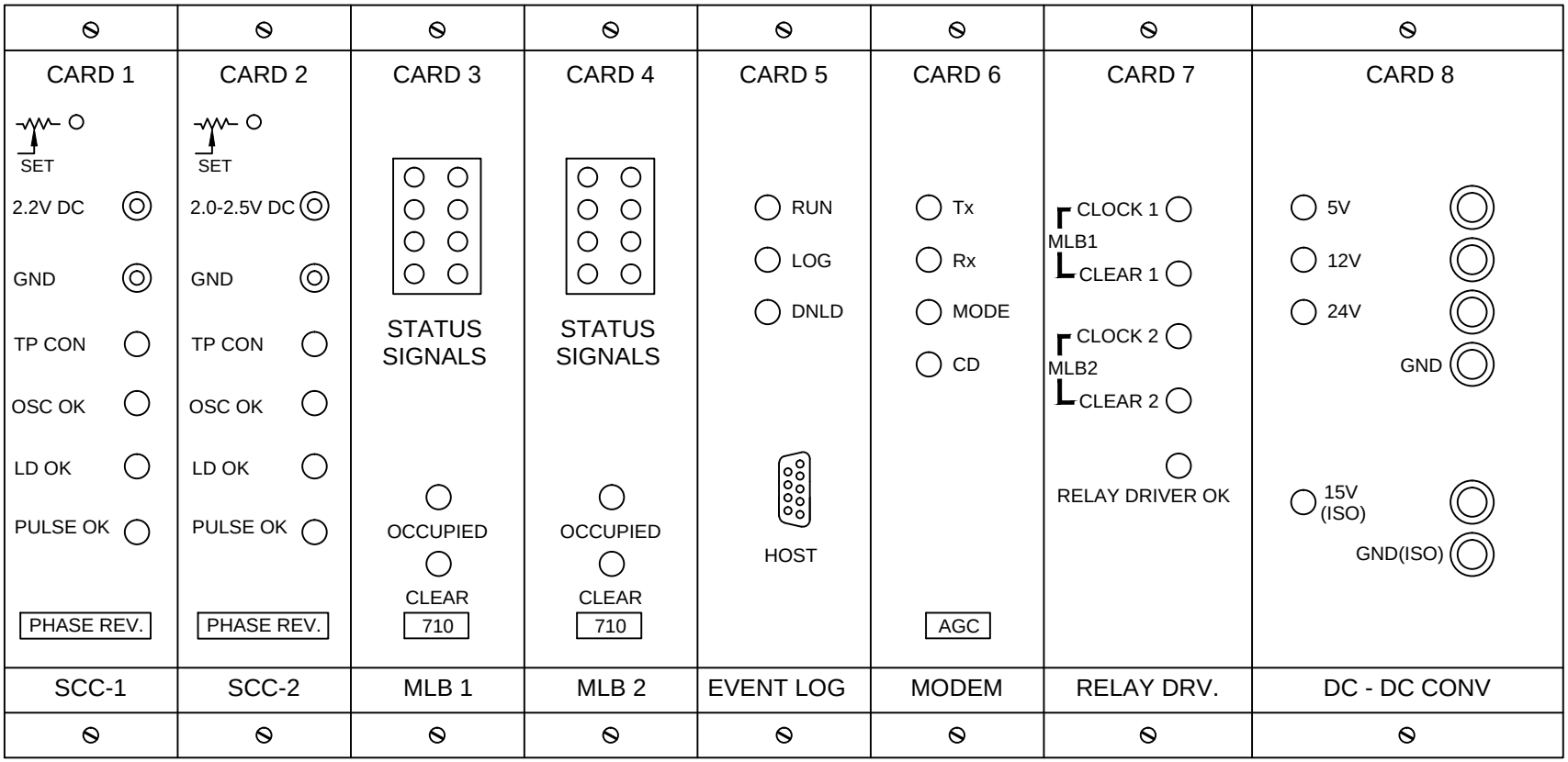
DRG.NO. I007765A4

SHEET 1 OF 1

D8

SYSTEM-2/Bhandari/DACF-AP/7765A4

FRONT VIEW



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE

DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	30-09-05

SSDAC (DACF - 700AP/710P) PHASE REVERSAL
FRONT VIEW

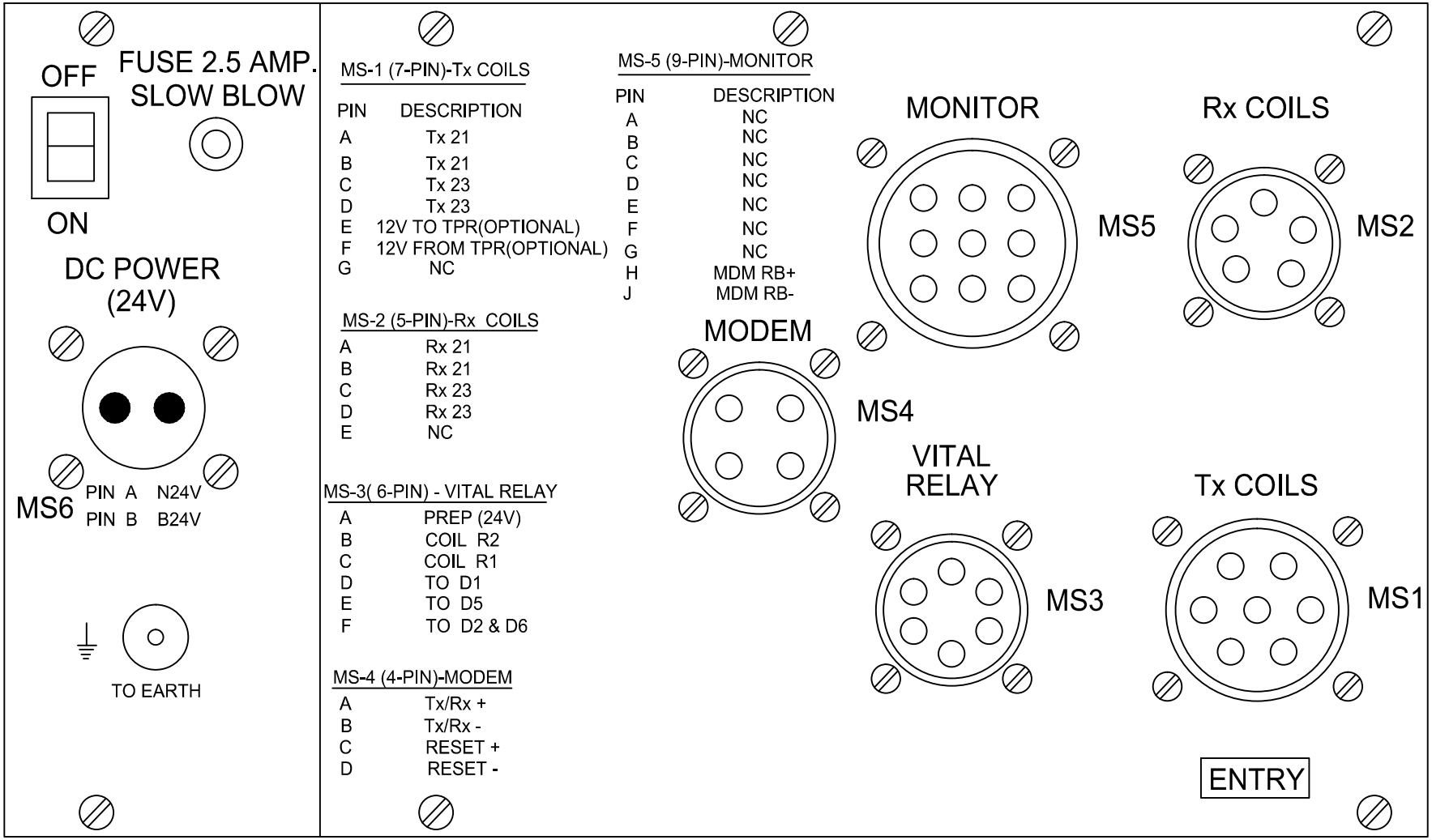
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. A007745A4

SHEET 1 OF 1

SYSTEM2/Bhandari/DACF-AP/7745A4

REAR VIEW OF SSDAC



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD *DARPAN*	APPD *PRAVEEN*	DATE 08-06-07

SSDAC (DACF-710A/P)
REAR VIEW

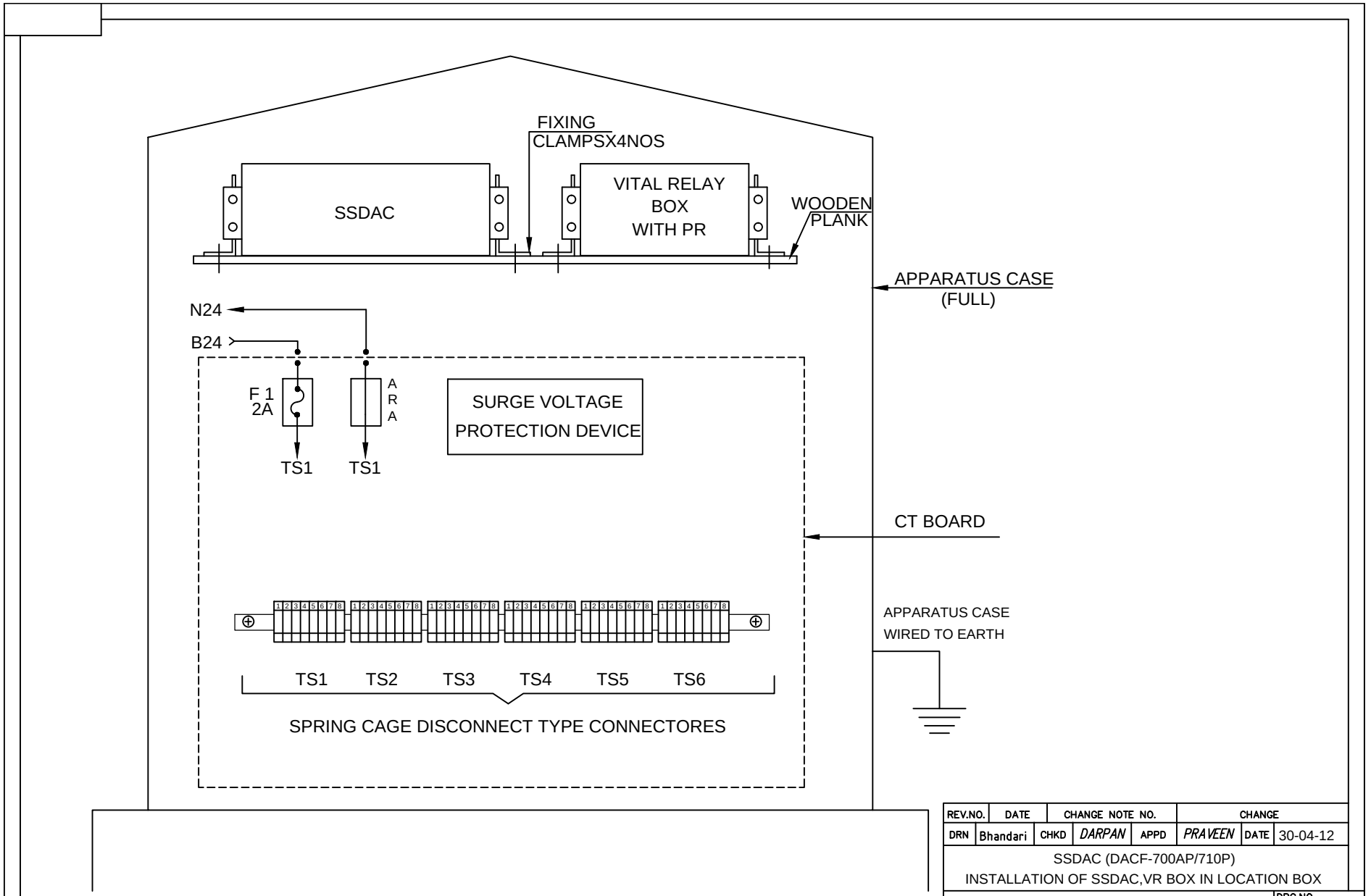
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. I008442A4

SHEET 1 OF 1

D10

SYSTEM2/Bhandari/DACF-700A/AP/710A/P/8245A4



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD *DARPAN*	APPD *PRAVEEN*	DATE 30-04-12

SSDAC (DACF-700AP/710P)
INSTALLATION OF SSDAC,VR BOX IN LOCATION BOX

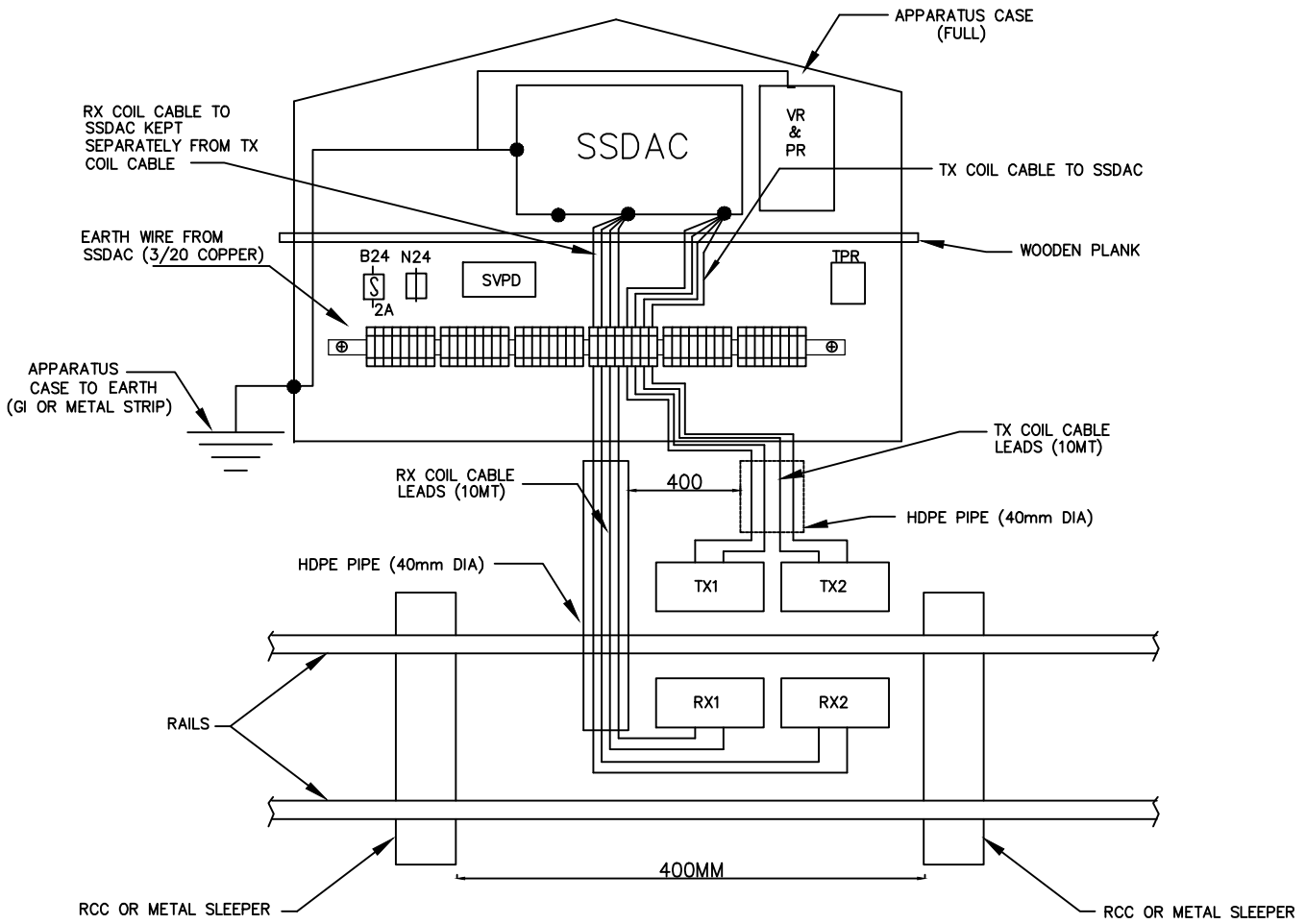
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. I008477A3

SHEET 1 OF 1

D11

SYSTEM2/Bhandari/DACF-700A/710A/8477A3



NOTES:–
1, THE LENGTH BETWEEN APPARATUS CASE AND AXLE DETECTOR SHOULD NOT EXCEED 10M.
2, SSDAC AND APPARATUS CASE TO BE EARTHED.
3, TX AND RX COIL CABLES SHOULD BE SEPARATELY LAID BY 400 MM

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE				
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	01–05–12

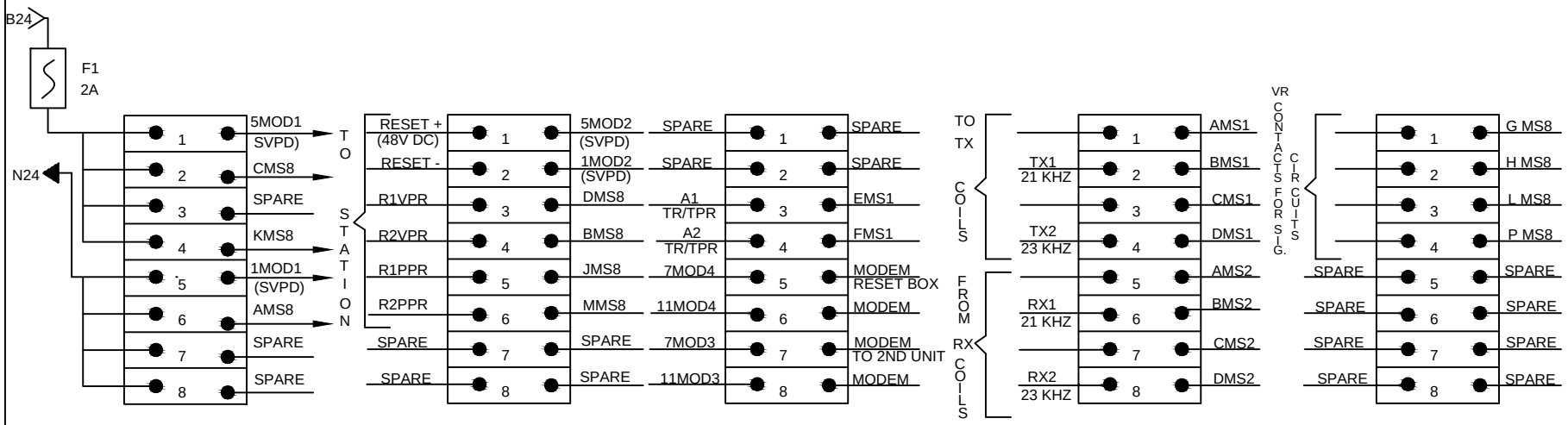
SSDAC (DACF–700AP/710P)
INSTALATION DETAILS

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

DRG.NO. L008478A3

SHEET 1 OF 1

SYSTEM2\Bhandari\DACF–700AP\710P\8478A3



TS1
(24V BATTERY)

TS2
VPR,PPR
& RESET

TS3
TPR & MODEM

TS4
Tx & Rx COILS

TS5
VR RELAY
CONTACTS

NOTE :-

1-THE SVPD CONNECTION SHOWN IS FOR PHOENIX MAKE.FOR OBO MAKE REF.DRG. D33

2- MOD1,MOD2,MOD3,MOD4 ARE OF SVPDS.

3- TS3-3,4 SHALL BE CONNECTED FOR AMPLITUDE TYPE SSDAC ONLY.

4- WAGO OR PHOENIX MAKE CONNECTORS SHALL BE USED FOR TERMINATION.

D13

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Bhandari	CHKD DARPAN	APPD PRAVEEN DATE 30-04-12

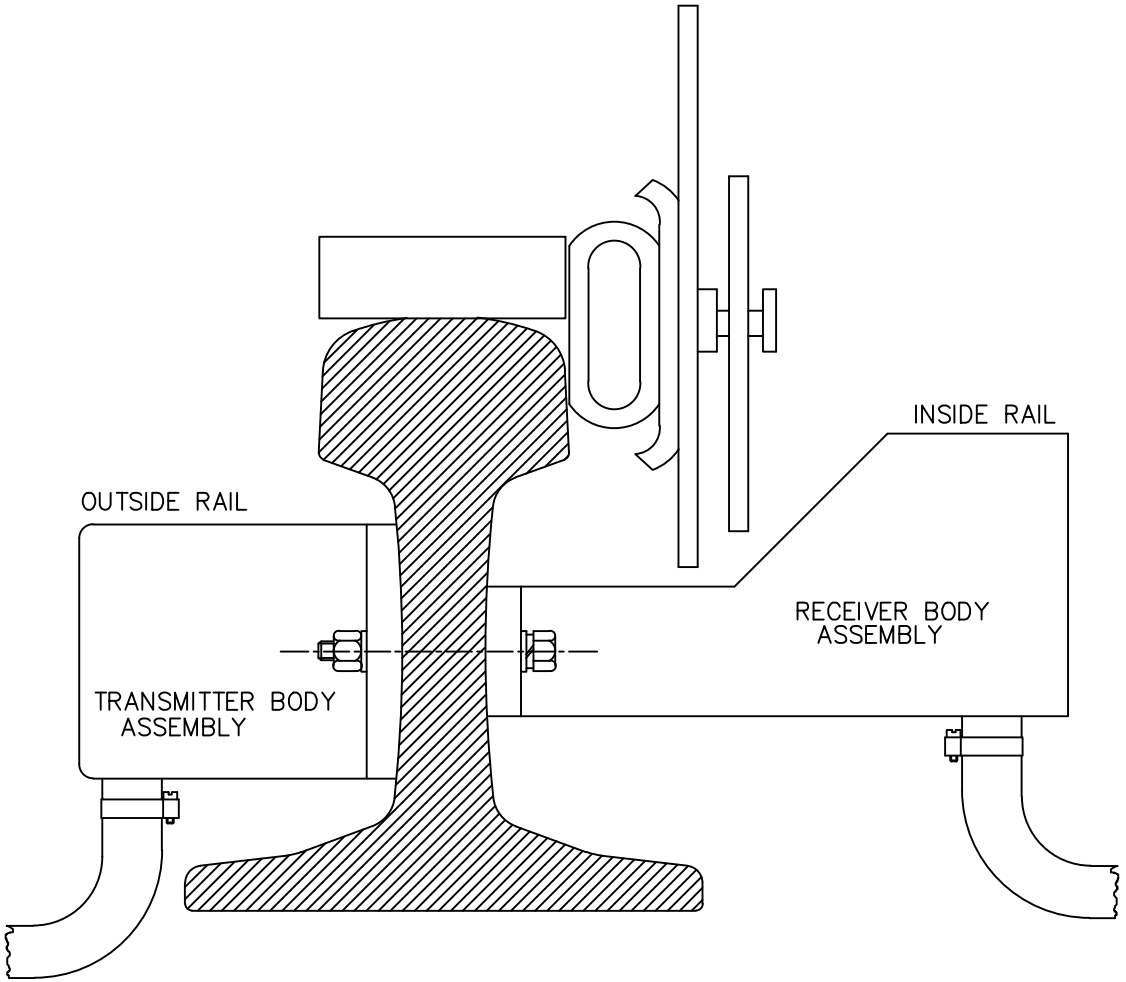
SSDAC (DACF-710A/P)
WIRING DETAILS IN LOCATION BOX

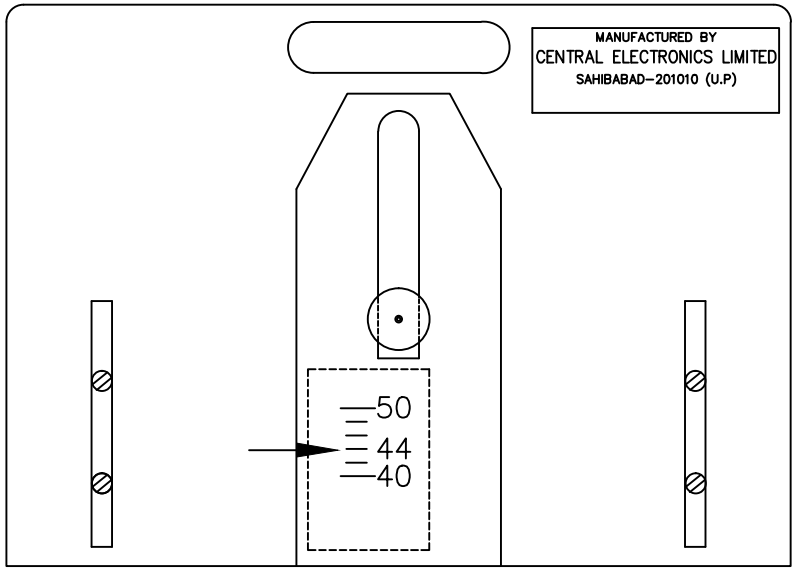
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. W008474A3

SHEET 1 OF 1

SYSTEM2/DACF-710P/8474A3





DUMMY WHEEL SETTING = 44MM FOR 90R,52 Kg. & 60 Kg. RAILS

REV.NO.	DATE	CHANGE NOTE NO.		CHANGE			
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	12-5-03

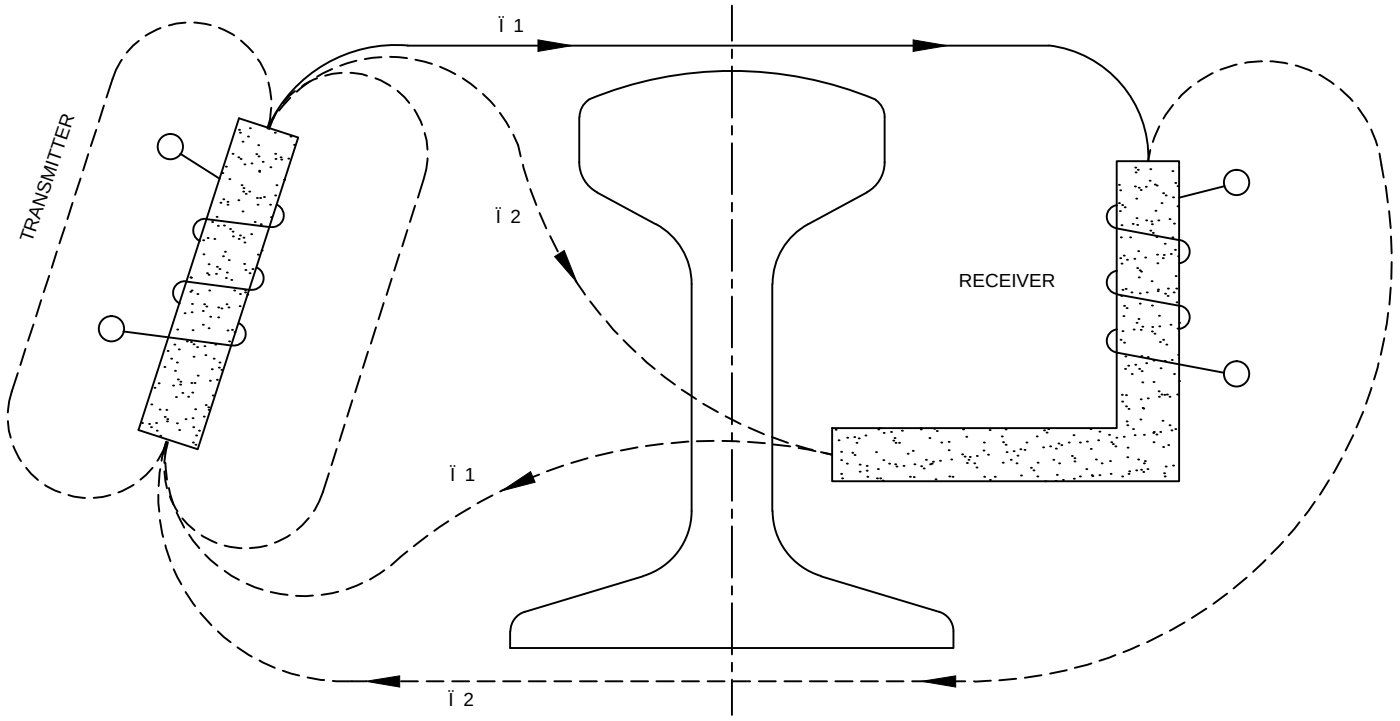
SSDAC (DACF-700A/AP/710A/P)
DUMMY WHEEL SETTING FOR DIP

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

DRG.NO. L007750A3

SHEET 1 OF 1

SYSTEM2\Bhandari\DACF-AP\7750A3



(FITTED OUTSIDE THE RAIL)

(FITTED INSIDE THE RAIL)

REV.NO.	DATE	CHANGE NOTE NO.			CHANGE		
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	02-05-03

SSDAC (DACF-700A/AP/710A/P)
MAGNETIC FLUX PATHS IN THE AXLE DETECTOR

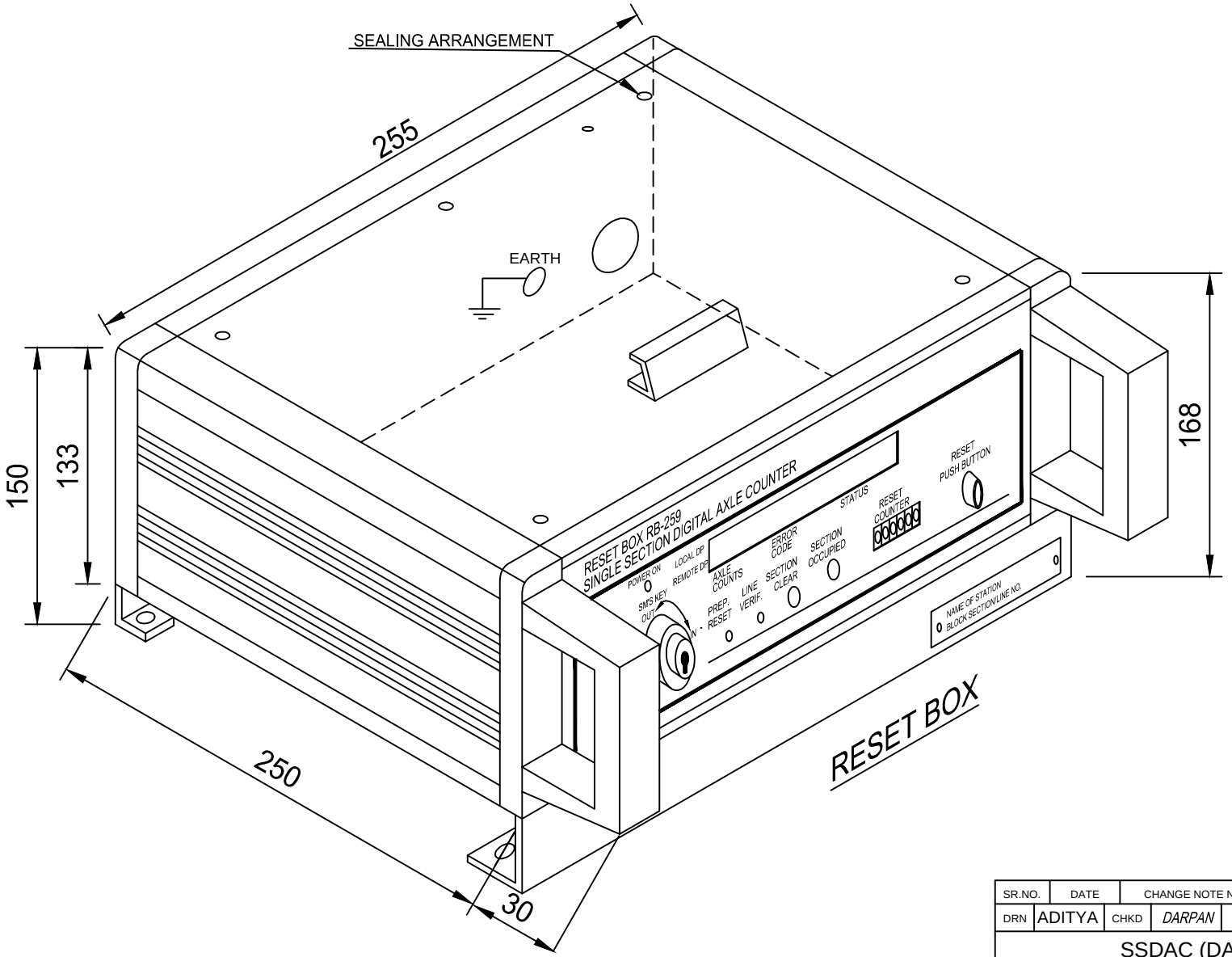
SYSTEM PRODUCTION DIVISION
CEL CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. L005993A3

SHEET 1 OF 1

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SYSTEM2\Bhandari\DACF-AP\5993A3



SR.NO.	DATE	CHANGE NOTE NO.		CHANGE			
DRN	ADITYA	CHKD	*DARPAN*	APPD	*PRAVEEN*	DATE	08-06-07

SSDAC (DACF - 710A/P)
RESET BOX RB-259 (ISOMETRIC VIEW)

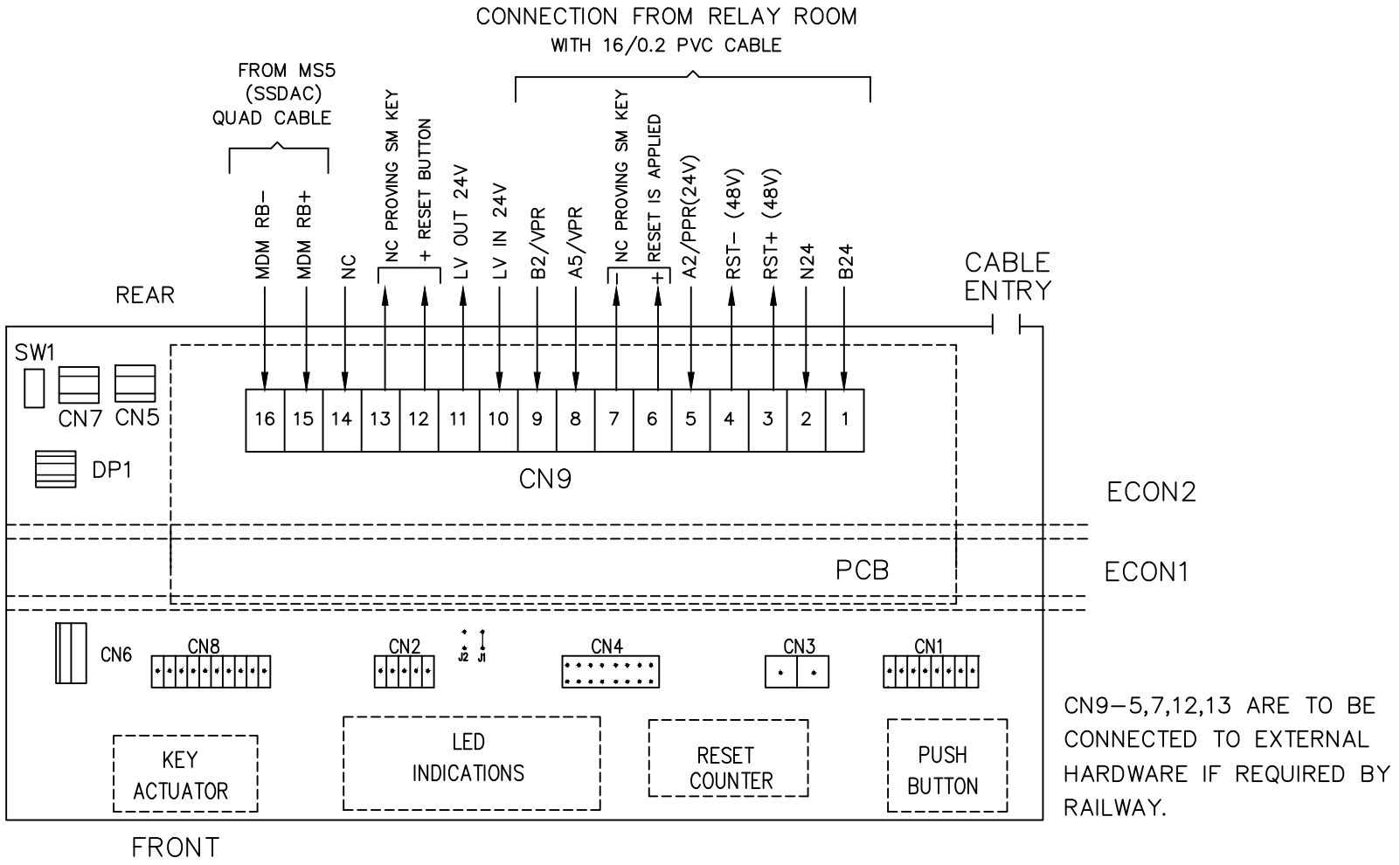
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. F008443A4

SHEET 1 OF 1

D16

SYSTEM2\DACF-710A/P/8443A4



CN9–5,7,12,13 ARE TO BE CONNECTED TO EXTERNAL HARDWARE IF REQUIRED BY RAILWAY.

DP1–1,2,3,4, ALL OFF FOR ENTRY SIDE.
1–ON, 2,3,4,–OFF FOR EXIT SIDE.
CN7–9 PIN DSUB FOR DOWN LOADING DATA.
SW1–RESET SWITCH FOR LCD REFRESH.
CN5–FOR KEY PAD CABLE ENTRY.
CN4–LCD DESPLY CABLE ENTRY.
CN6–TEST POINTS.
JUMPER J1 SHALL BE REMOVED AND J2 CONNECTED FOR LV PROVING.

REV.NO.	DATE	CHANGE NOTE NO.		CHANGE		
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE 08–06–07

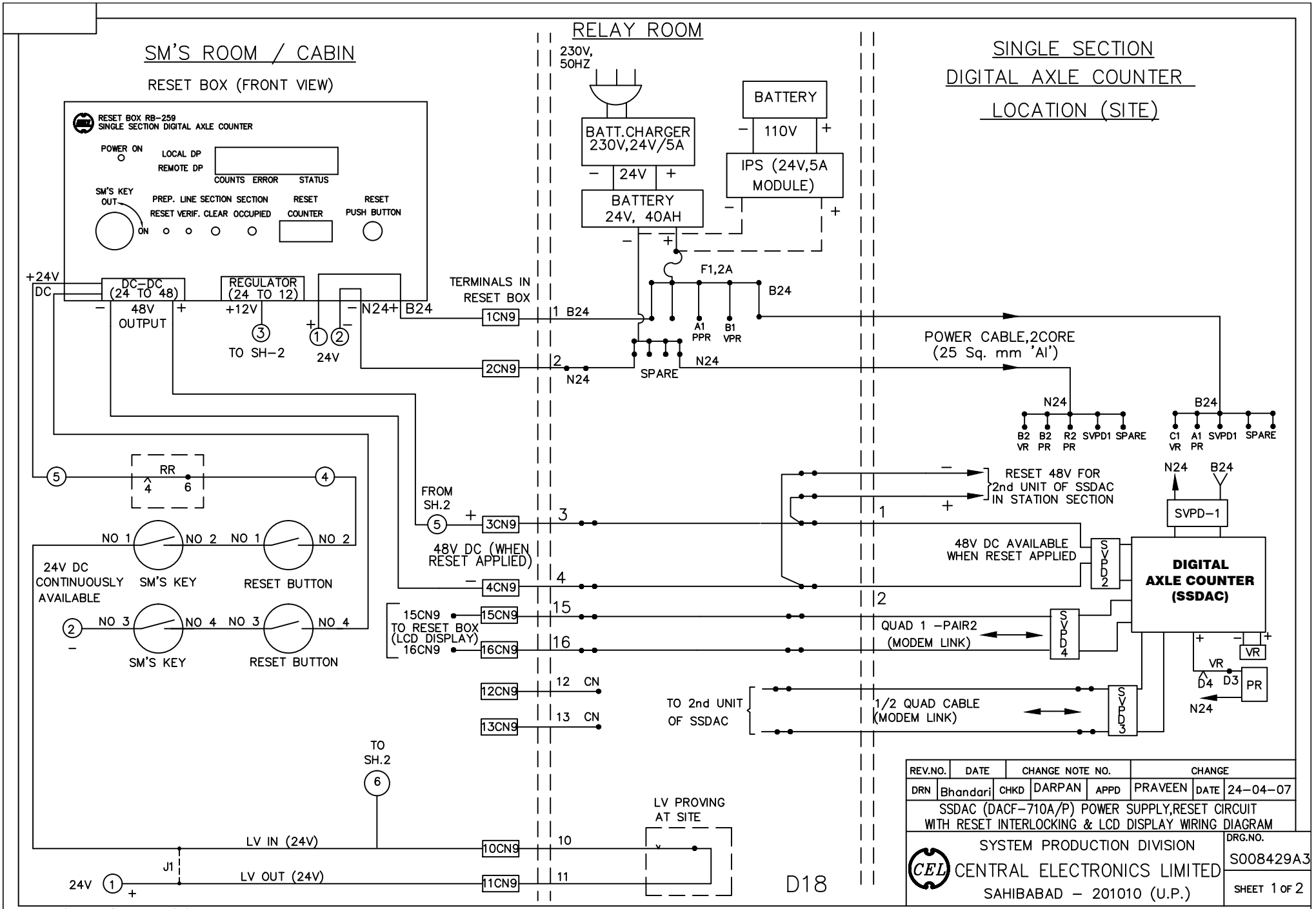
SSDAC (DACF – 710A/P)
WIRING DETAILS OF RESET BOX AT SITE

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

DRG.NO. W008444A4
SHEET 1 OF 1

D17

SYSTEM2/Bhandari/DACF–710A/P/8444A4



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD DARPAN	APPD PRAVEEN	DATE 24-04-07

SSDAC (DACF-710A/P) POWER SUPPLY,RESET CIRCUIT WITH RESET INTERLOCKING & LCD DISPLAY WIRING DIAGRAM

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

DRG.NO. S008429A3

SHEET 1 OF 2

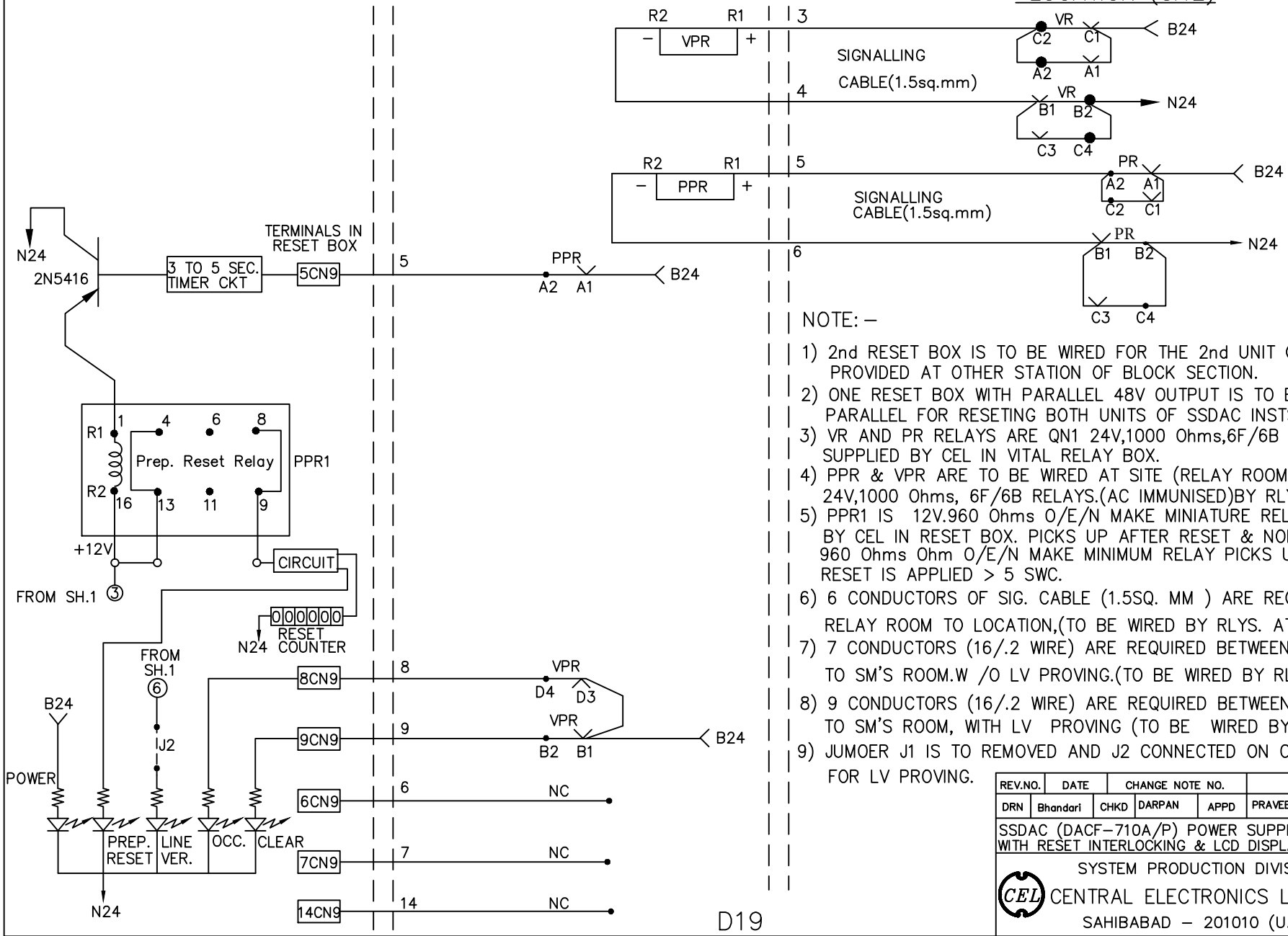
SYSTEM2/Bhandari/DACF-710A/P/8429A3-1

SINGLE SECTION DIGITAL AXLE COUNTER

SM'S ROOM / CABIN

RELAY ROOM

LOCATION (SITE)



NOTE: –

1) 2nd RESET BOX IS TO BE WIRED FOR THE 2nd UNIT OF SSDAC PROVIDED AT OTHER STATION OF BLOCK SECTION.
2) ONE RESET BOX WITH PARALLEL 48V OUTPUT IS TO BE WIRED IN PARALLEL FOR RESETING BOTH UNITS OF SSDAC INSTSTION SECTION.
3) VR AND PR RELAYS ARE QN1 24V,1000 Ohms,6F/6B OR EQUIVALENT SUPPLIED BY CEL IN VITAL RELAY BOX.
4) PPR & VPR ARE TO BE WIRED AT SITE (RELAY ROOM) WITH QNA1, 24V,1000 Ohms, 6F/6B RELAYS.(AC IMMUNISED)BY RLYS.
5) PPR1 IS 12V.960 Ohms O/E/N MAKE MINIATURE RELAY SUPPLIED BY CEL IN RESET BOX. PICKS UP AFTER RESET & NORMAL RR IS 12V, 960 Ohms Ohm O/E/N MAKE MINIMUM RELAY PICKS UP IF RESET IS APPLIED > 5 SWC.
6) 6 CONDUCTORS OF SIG. CABLE (1.5SQ. MM) ARE REQUIRED BETWEEN RELAY ROOM TO LOCATION,(TO BE WIRED BY RLYS. AT SITE)
7) 7 CONDUCTORS (16/.2 WIRE) ARE REQUIRED BETWEEN RELAY ROOM TO SM'S ROOM.W /O LV PROVING.(TO BE WIRED BY RLYS, AT SITE).
8) 9 CONDUCTORS (16/.2 WIRE) ARE REQUIRED BETWEEN RELAY ROOM . TO SM'S ROOM, WITH LV PROVING (TO BE WIRED BY RLYS. AT SITE).
9) JUMOER J1 IS TO REMOVED AND J2 CONNECTED ON CARD NO 653 FOR LV PROVING.

REV.NO.	DATE	CHANGE NOTE NO.		CHANGE	
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	24–04–07

SSDAC (DACF–710A/P) POWER SUPPLY,RESET CIRCUIT WITH RESET INTERLOCKING & LCD DISPLAY WIRING DIAGRAM

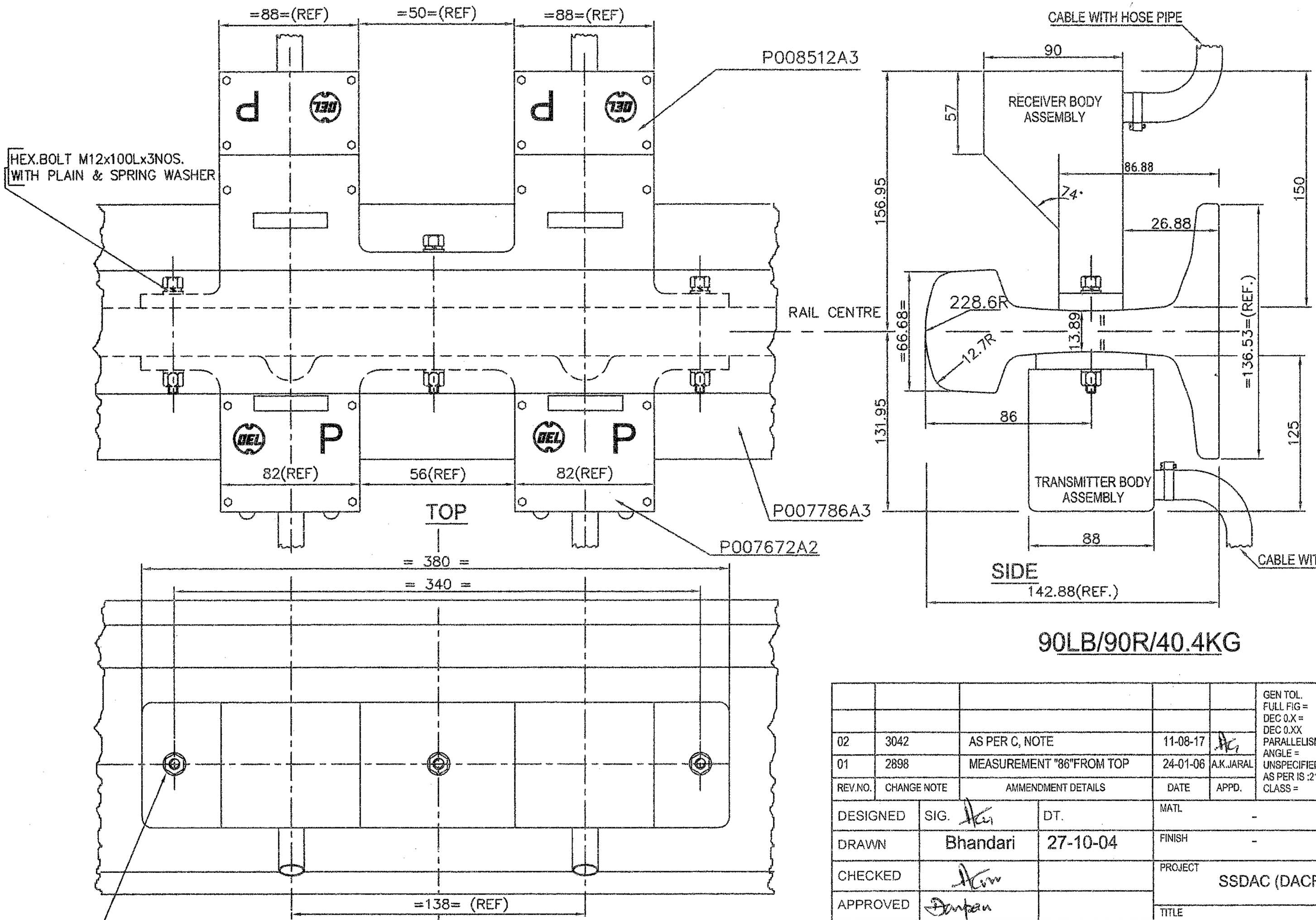
SYSTEM PRODUCTION DIVISION
CEL CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. S008429A3

SHEET 2 OF 2

D19

SYSTEM2/Bhandari/DACF–710A/P/8429A3



90LB/90R/40.4KG

D20

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.
02	3042	AS PER C, NOTE	11-08-17	
01	2898	MEASUREMENT "86"FROM TOP	24-01-06	A.K.JARAL

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

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	Bhandari	27-10-04
CHECKED		
APPROVED		

MATL -
FINISH -
DIM MM
SCALE N.T.S
NO.OFF 1

PROJECT: SSDAC (DACF-710P/720P)

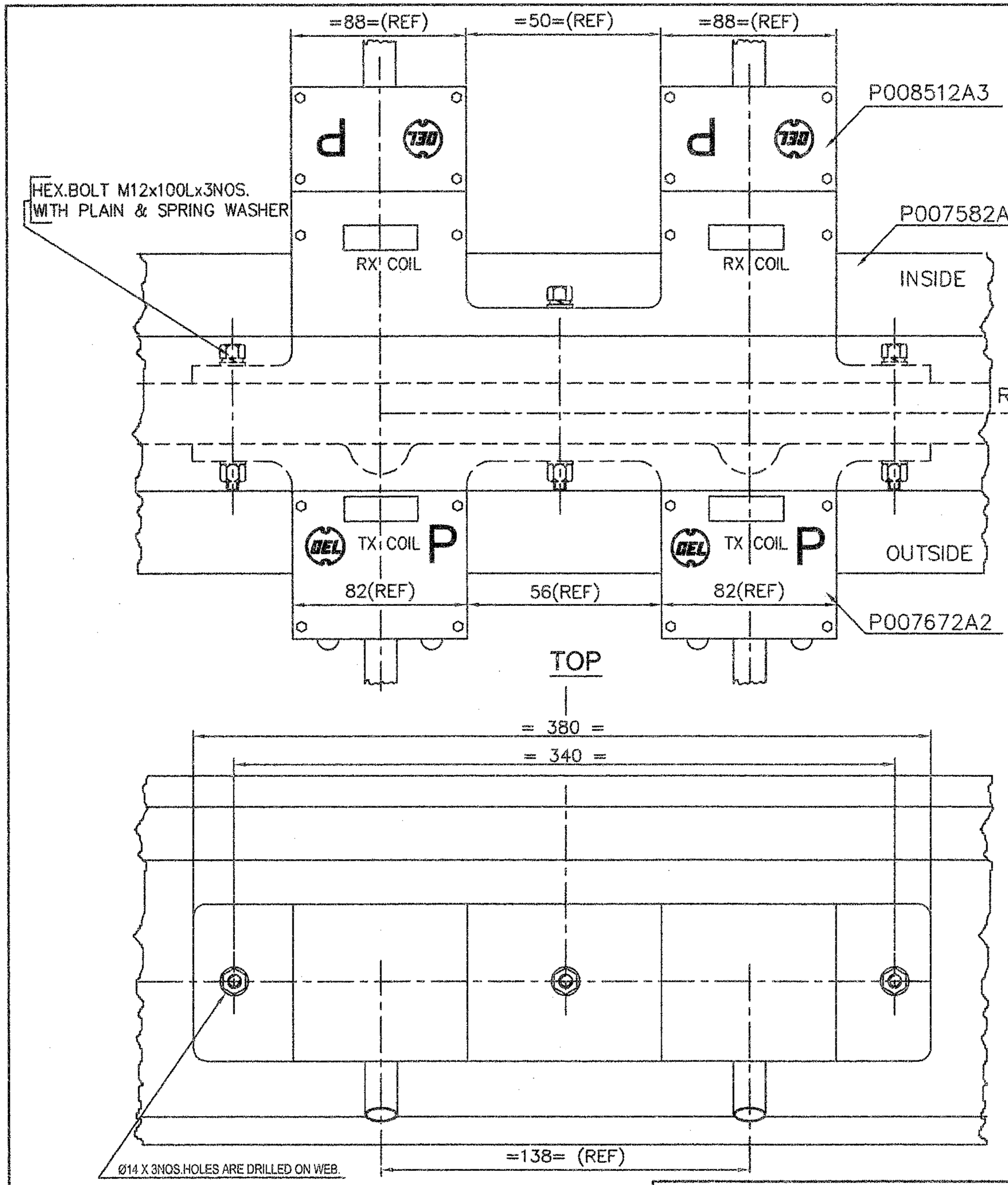
TITLE: WEB MOUNTED TX/ RX AXLE DETECTOR
PHASE MOUDLATION ASSEMBLY FOR 90LB RAIL

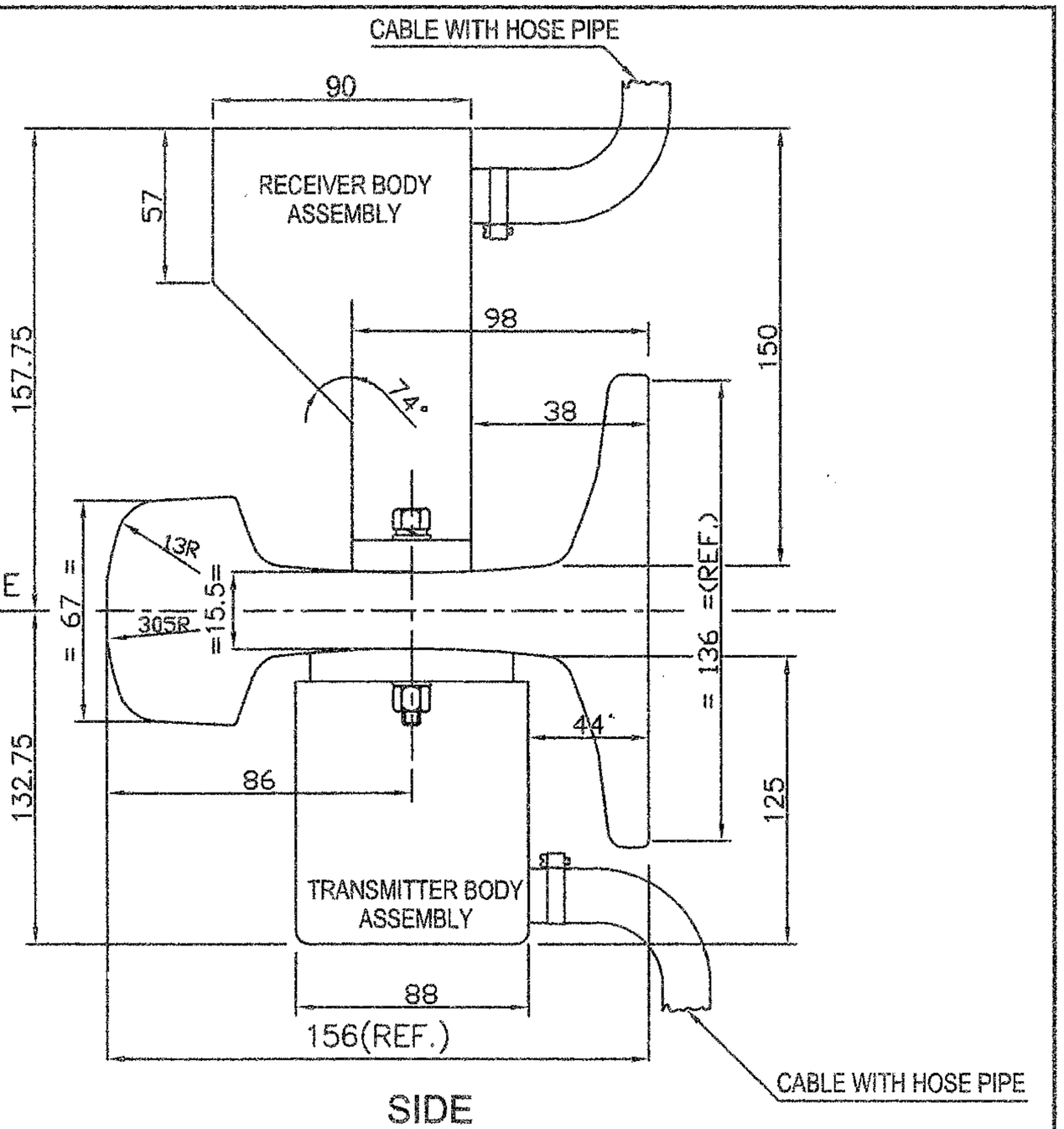
DRG.NO. A008446 | REV.NO. 01 | SHEET NO. 1 OF 1

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

SYS-2/Bhandari/DACF-700AP/8446A3





52 KG RAIL

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.
03	3042	AS PER C' NOTE	11-08-17	
02	3007	MEASUREMENT 86"FROM TOP	20-10-12	A.K.JARAL
01	2899	MEASUREMENT '88"FROM TOP	24-01-06	A.K.JARAL

GEN TOL.
FULL FIG = ±1.0
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	Bhandari	27-10-04
CHECKED		
APPROVED		

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

PROJECT: SSDAC (DACF-710P/720P)

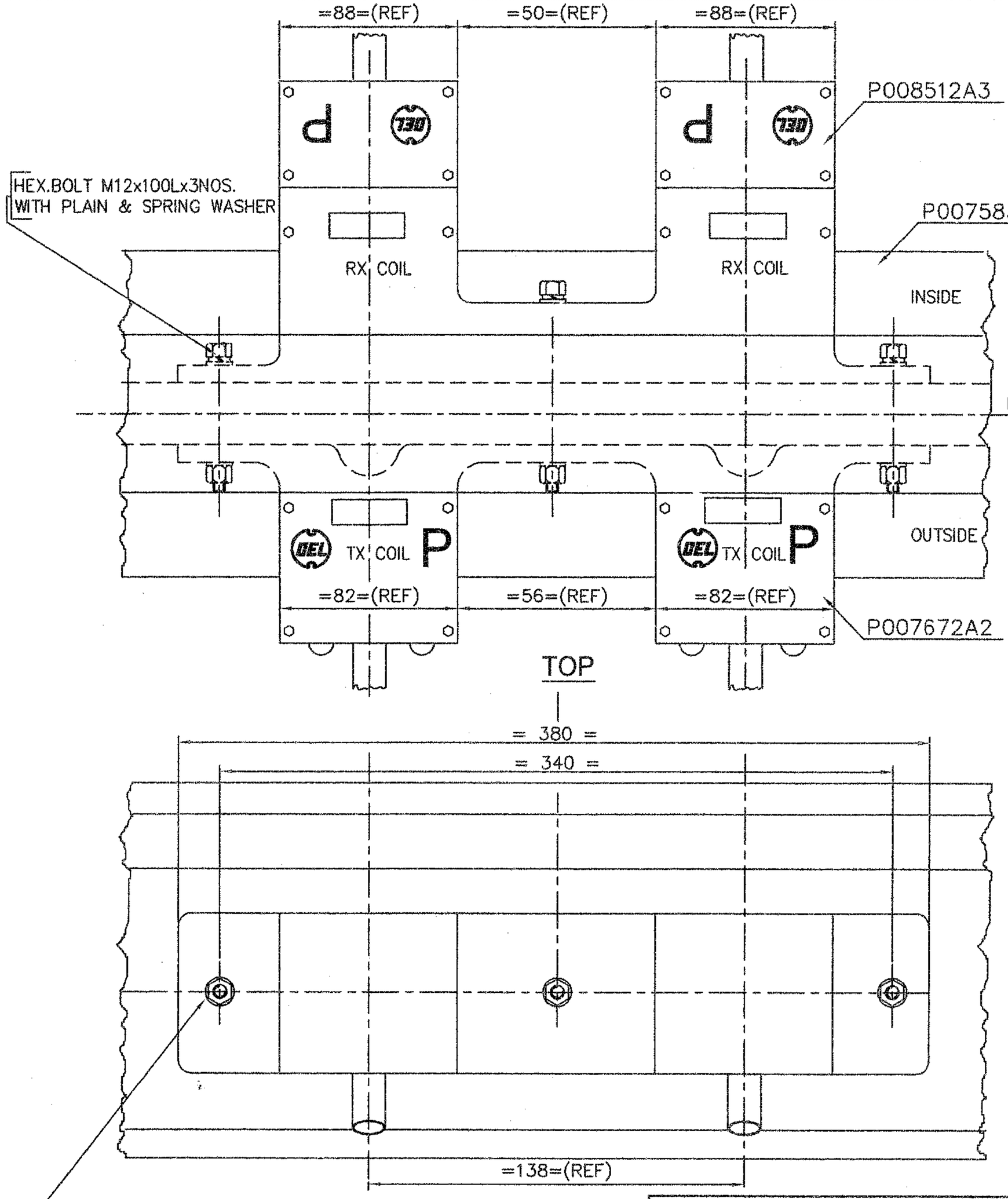
TITLE: WEB MOUNTED TX/RX AXLE DETECTOR
PHASE MOUDLATION ASSEMBLY FOR 52 KG

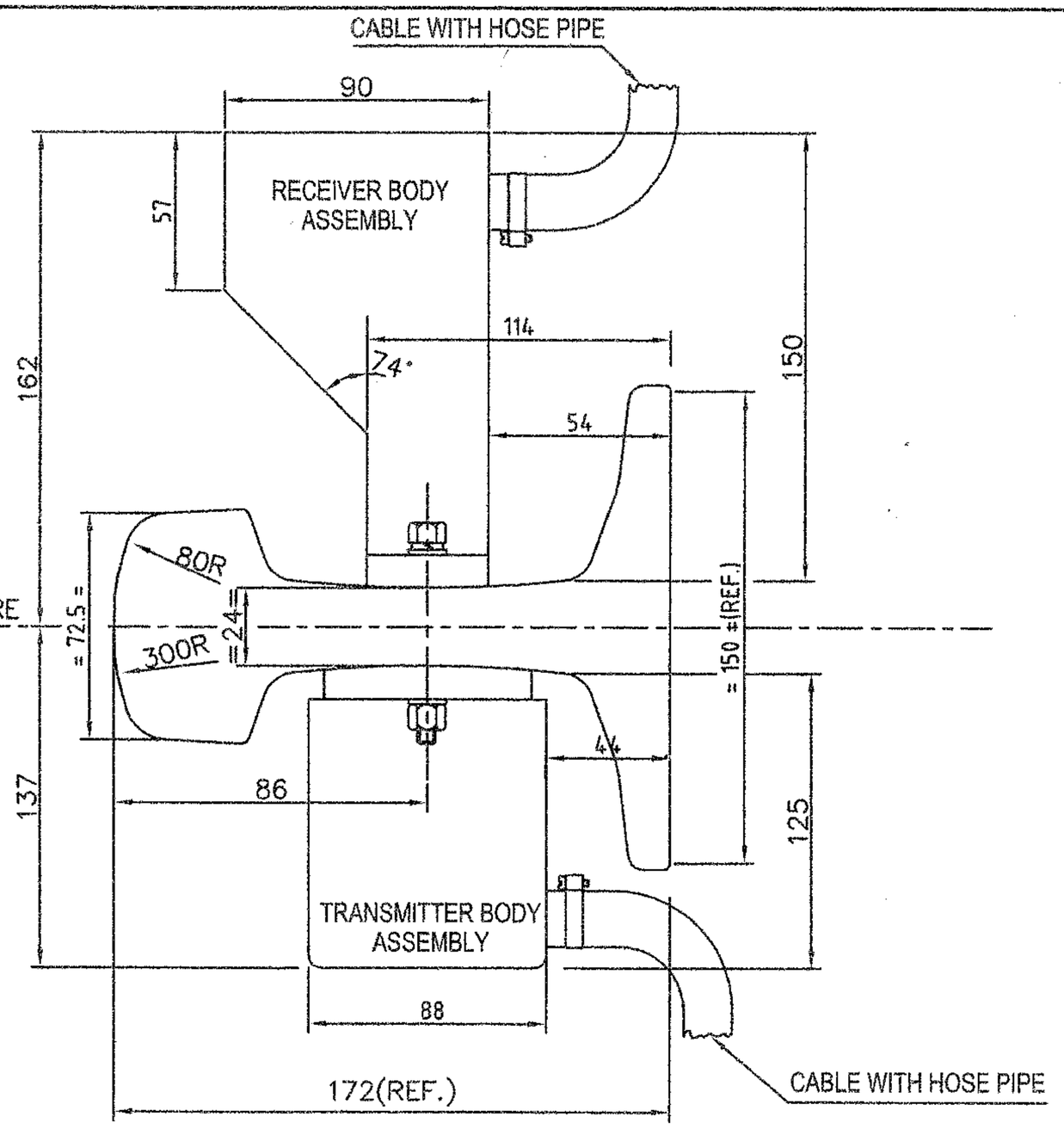
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SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. A008447 | REV.NO. 01 | SHEET NO. 1 OF 1

SYSTEM2\Bhandari\DACF-700AP\8447A3





SIDE

60 Kg RAIL

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.
03	3042	AS PER C, NOTE	11-08-17	
02	3007	MEASUREMENT"86"FROM TOP	20-10-12	A.K.JARAL
01	2900	MEASUREMENT"88"FROM TOP	24-01-06	A.K.JARAL

GEN TOL.
FULL FIG = ±1.0
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	Bhandari	27-10-04
CHECKED		
APPROVED		

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

PROJECT: SSDAC (DACF-710P/720P)

TITLE: WEB MOUNTED TX/RX AXLE DETECTOR
PHASE MOUDLATION ASSEMBLY FOR 60 KG

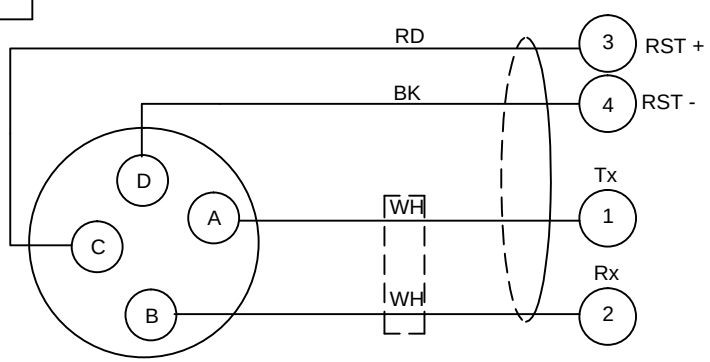
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. A008448 | REV.NO. 01 | SHEET NO. 1 OF 1

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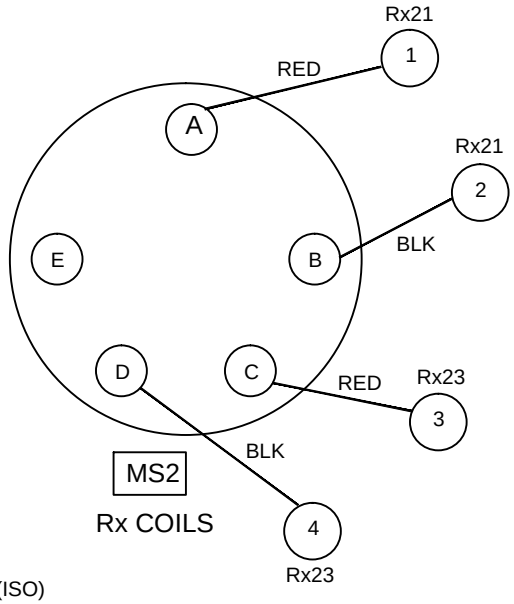
SYSTEM2\Bhandari\DACF-700AP\8448A3

D22



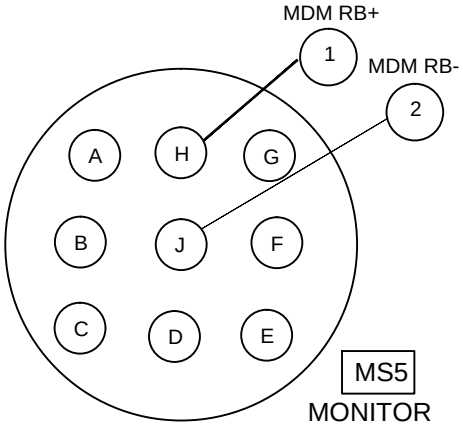
MS4

MODEM



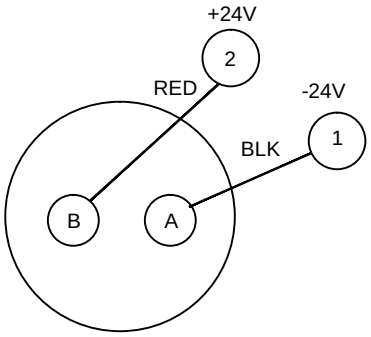
MS2

Rx COILS



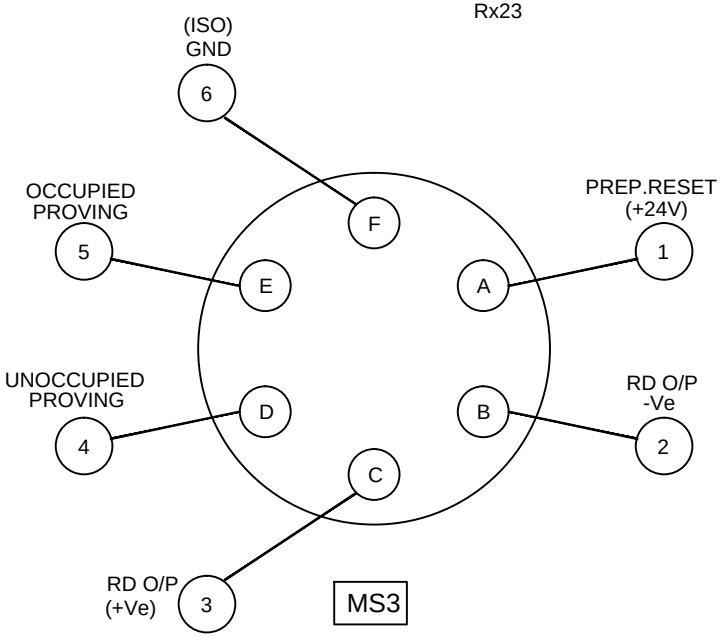
MS5

MONITOR



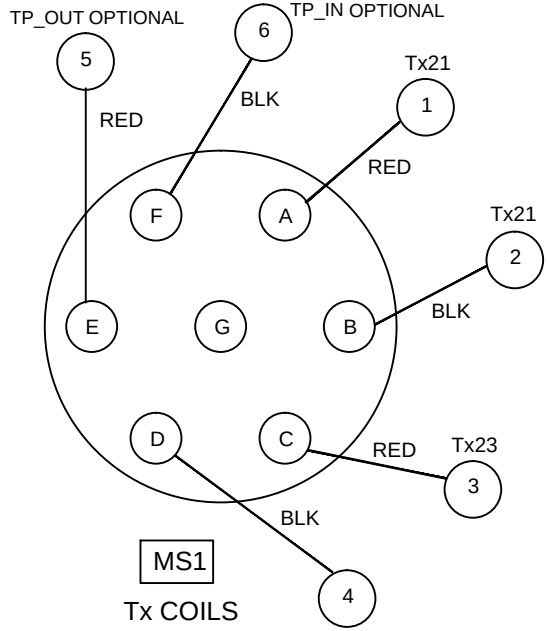
MS6

DC POWER



MS3

VITAL RELAY



MS1

Tx COILS

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD *DARPAN*	APPD *PRAVEEN*	DATE 12-06-07

SSDAC (DACF - 710A/P)
M.S.COUPLER (PLUG) WIRING DETAILS

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

DRG.NO. W008451A4

SHEET 1 OF 1

D23

SYSTEM2/Bhandari/DACF700-A/8451A4

VR

		A	B	C	D
FRONT CONTACTS	1	18 C1VR 19 A1PR	14 BMS8 15 C3VR	17 CMS8 18 A1VR	28 B3VR 27 B6VR
	2	8 C2VR 9 3PC1	20 AMS8 16 C4VR	7 DMS8 8 A2VR	44 DMS7 29 B4VR
BACK CONTACTS	3	11 LMS8	28 D1VR	15 B1VR	41 AMS7
	4	10 PMS8	29 D2VR	16 B2VR 21 1TS1	38 R1PR
BACK CONTACTS	5	35 2PC1	25 D5VR	12 GMS8	24 EMS7 25 B5VR
	6	34 KMS8	27 D1VR 26 D6VR	13 HMS8	26 B6VR 23 FMS7
	7				
	8				

R1 31 CMS7 — R2 30 B MS7

R3 — 1N5408/DIODE — R4

VITAL RELAY 6F/6B,24V,HN1K

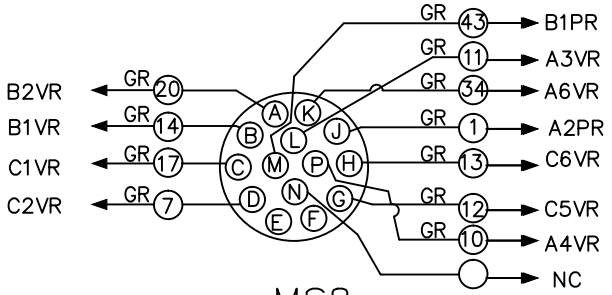
PR

	A	B	C	D
1	19 A1VR 37 C1PR	43 MMS8 42 C3PR	37 A1PR	
2	1 JMS8 2 C2PR	42 PC2 5 C4PR	2 A2PR 3 1PC2	
3			42 B1PR	
4			5 B2PR	
5				
6				
7				
8				

R1 38 D4VR — R2 36 1PC1

R3 — 1N5408/DIODE — R4

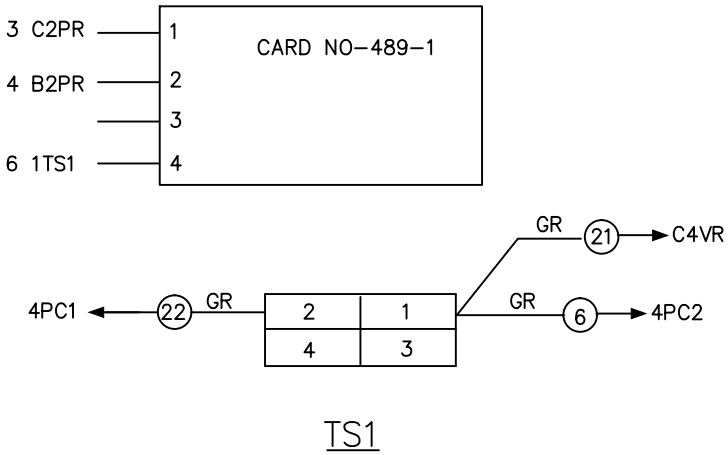
VITAL RELAY 6F/6B,24V,HN1K



MS8

14 PIN MS COUPLER(RECEPTACLE)

TYPE MS3102R-22-19P



TS1

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN Bhandari	CHKD DARPAN	APPD PRAVEEN	DATE 31-07-07

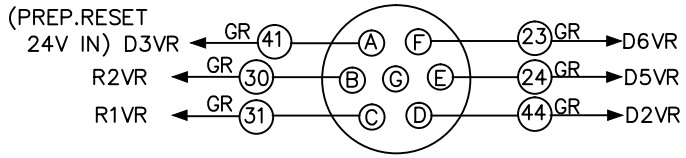
SSDAC (DACF-710A/P)
WIRING DIAGRAM OF VITAL RELAY BOX,VR-721

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

DRG.NO. W008459A3

SHEET 1 OF 3

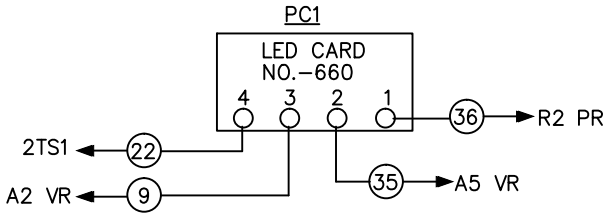
SYS-2/Bhandari/8459A3



MS7

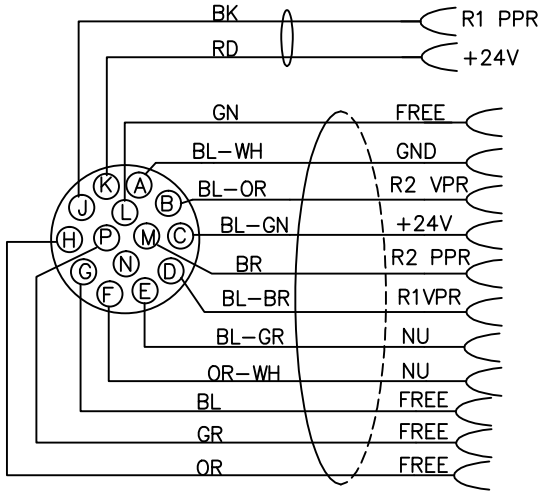
7 PIN MS COUPLER(RECEPTCLE)

TYPE MS 3102R–16S–1P



COMPONENT LIST

1. MS7–7PIN MS COUPLER RECEPTACLE,
   TYPE:–MS–3102R–16S–1P– 1 NO.
2. MS8–14PIN MS COUPLER RECEPTACLE,
   TYPE:–MS–3102R–22–19P– 1 NO.
3. VR–VITAL RELAY PLUG BOARD ,TYPE:–6F/6B –2 NO.
4. TS1–4 CONDUCTOR TERMINAL STRIP 2 POLE,
   TYPE–261–202 –1NO. (ASSEMBLED)
5. PC1–LED CARD NO–660 WIRED – 1 NO.
6. DIODE ,TYPE G–2M– 1NO.
7. MARKERS–0.65 SQ. MM–1) 0,8,9– 2 EACH
   2) 1– 12 NOS.
   3) 2– 9 NOS.
   4) 3 TO 7 – 3 EACH.
8. VITAL RELAY LUGS –26 NOS.
9. 16/0.2 ATC PVC INSULATED GREY COLOUR,
   630V GRADE–20 MTRS.
10. PC2 LED CARD NO. 489–1–ASSEMLED) –1NO.



MS8 (PLUG) 14 PIN

COMPONENT LIST

1) MS8–14 PIN MS COUPLER PLUG,
   TYPE: MS3106F–22–19S– 1NO.
2) 16/0.2 14CORE SHIELDED CABLE (BL–WH,BL–OR,
   BL–GN,BL–BR,BL–GR,OR–WH,BL,OR,GN,BR,GR,
   RD,BK,YL) – 2 MTS
3) LUGS TYPE –7257 (DOWELLS)–13NOS.
4) PVC SLEEVES 4MM DIA BLACK COLOUR – 1mtrs.
5) MARKERS :– 0.65 SQ. MM
   A,D,N – 2EACH
   C,B – 5EACH
   1,6 – 2EACH
   2,3,4,5 – 4EACH

EXTERNAL COUPLER PLUG WIRING

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Bhandari	CHKD DARPAN	APPD PRAVEEN DATE 31–07–07

SSDAC (DACF–710A/P)
WIRING DIAGRAM OF VITAL RELAY BOX,VR–721

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

DRG.NO. W008459A3

SHEET 2 OF 3

SYS–2/Bhandari/8459A3–1

NOTES: –

1) FOR MS1 & MS5 — 16/0.2 8 CORE SHIELDED CABLE (BL,OR,GN,BR,GR, BL–WH,BL–OR,BL–GN) 2 MTRS EACH.

2–FOR MS 2 — 16/0.2 4 CORE SHIELDED CABLE (VI–VI,WH–WH) –2MTRS

3–FORMS3 & MS7– 16/0.2 8 CORE SHIELDED CABLE (BL,OR,GN,BR,GR, BL–WH,BL–OR,BL–GN) 0.75 MTRS.

4–FOR MS4– 16/0.2 ,4 CORE SHIELDED CABLE (RD,BK,WH,WH)–2MTRS

5–FOR MS6– 16/0.2 2 CORE SHIELDED CABLE (RD,BK) –2MTRS

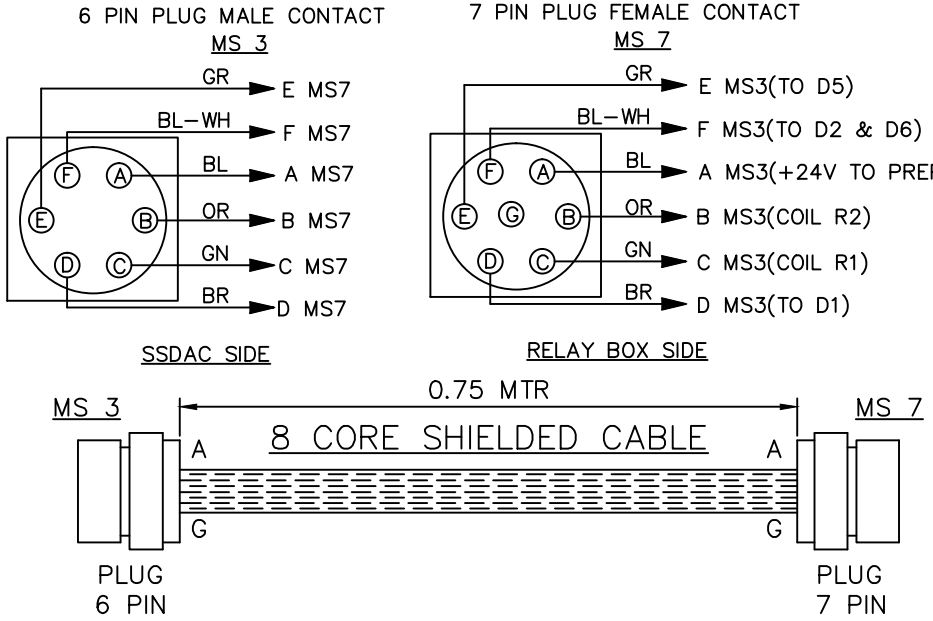
6–MS COUPLER–PLUGS–

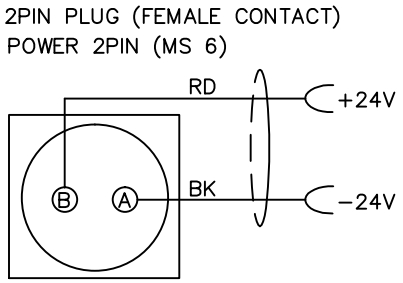
a) 7 PIN–MS3106F–16S–1P –MS1
b) 5 PIN–MS3106F–14S–5PX –MS2
c) 6 PIN–MS3106F–14S–6P –MS3
d) 4 PIN–MS3106F–14S–2P –MS4
e) 9 PIN–MS3106F–22–20P –MS5
f) 2 PIN–MS3106F–10SL–4S –MS6
g) 7 PIN–MS3106F–16S–1S –MS7

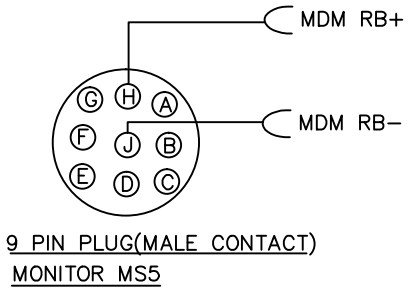
7) CABLE MARKERS 0.65sq.mm

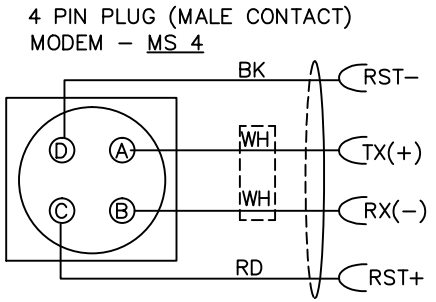
a) T,R – 10each b) X – 13nos. c) G,N,D,F,O,M – 1each
d) P – 6nos e) U,V – 4each f) L,S,E – 4each
g) '+' , '–' – 3each h) 1 – 9nos. i) 2 – 16nos.
j) 3,4 – 4each

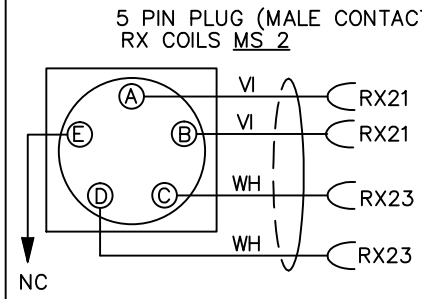
8) PVC SLEEVES –3 MM DIA BLACK COLOUR–0.5MTRS.

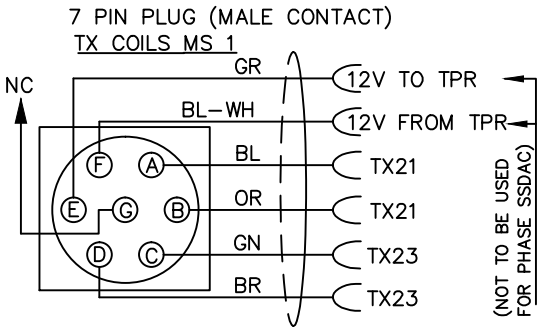












EXTERNAL COUPLER PLUG WIRING.

SR.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	Bhandari	CHKD DARPAN	APPD PRAVEEN DATE 30–04–12

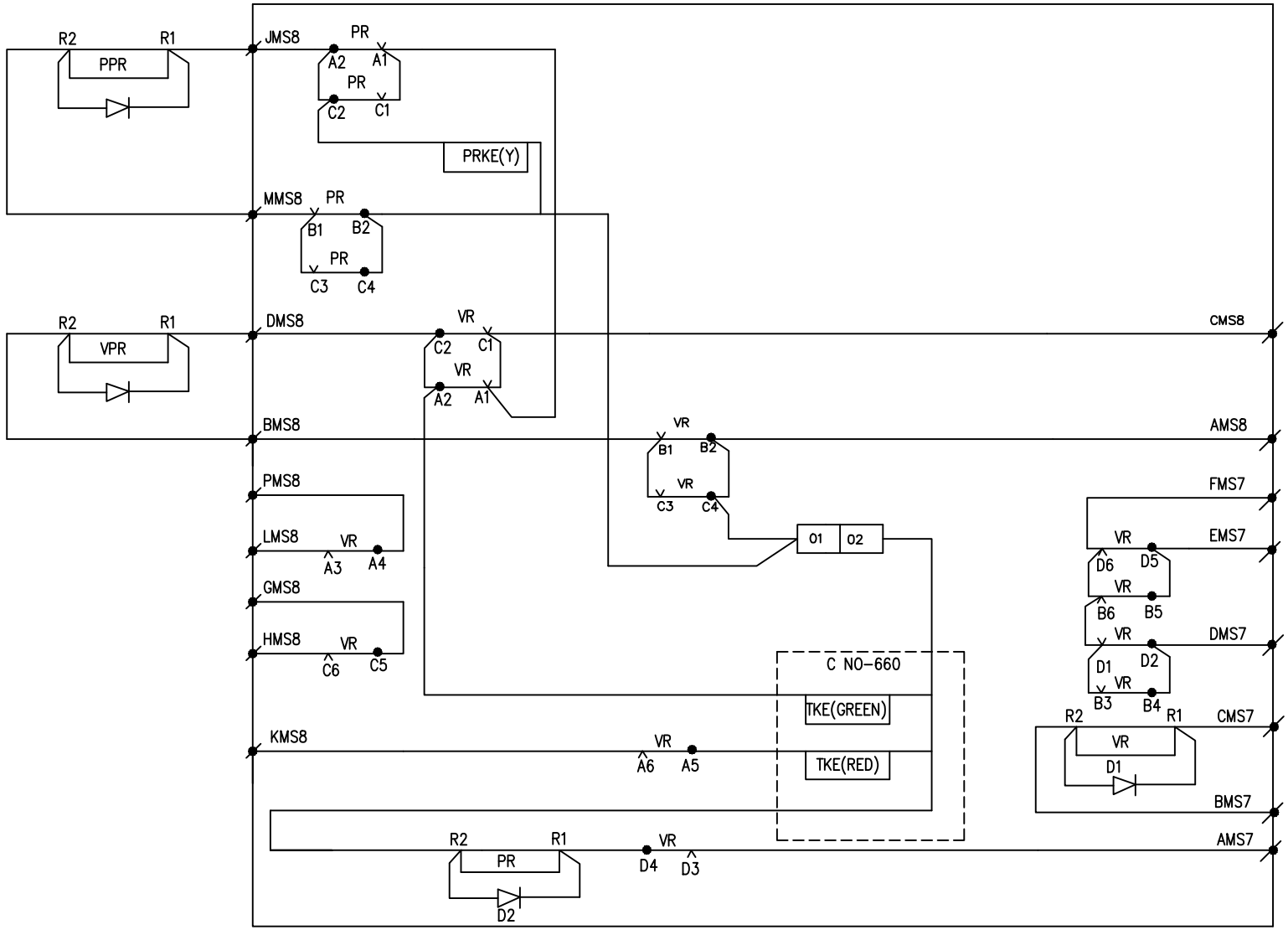
SSDAC (DACF–710A/P)
WIRING DIAGRAM OF MS COUPLERS

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

DRG.NO. W008459A3
SHEET 3 OF 3

D25A

SYSTEM2/Bhandari/DACF/8459A3-2



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN. Bhandari	CHKD DARPAN	APPD PRAVEEN	DATE 17-07-07

VITAL RELAY BOX VR-721 (DACF-710A/P)
LOGIC SCHEMATIC VITAL RELAY BOX

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

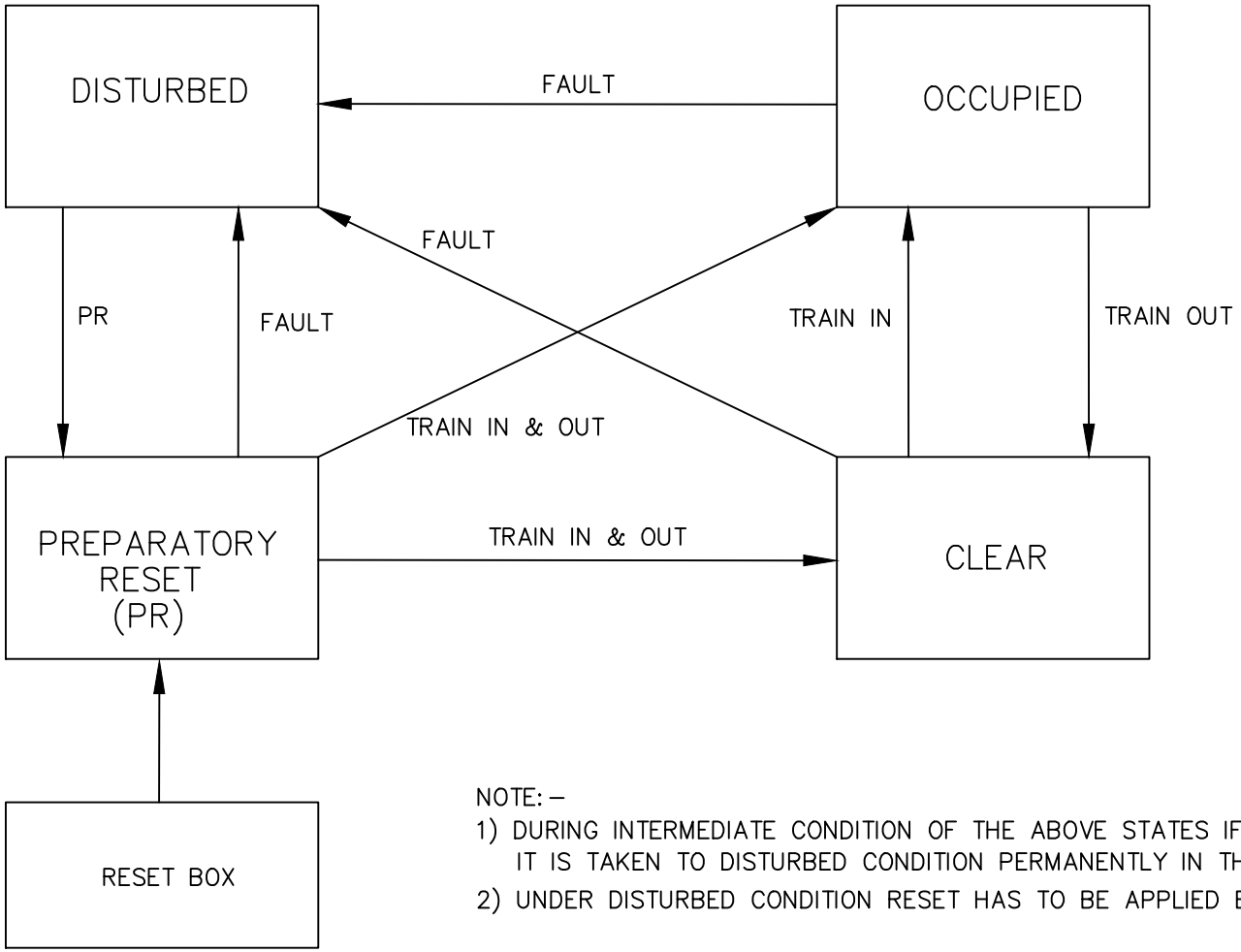
DRG.NO. S008460A3

SHEET 1 OF 1

D25B

SYS2/Bhandari/8460A3

STATES OF SSDAC



NOTE: –

1) DURING INTERMEDIATE CONDITION OF THE ABOVE STATES IF ANY ERROR APPEARS IT IS TAKEN TO DISTURBED CONDITION PERMANENTLY IN THE SYSTEM

2) UNDER DISTURBED CONDITION RESET HAS TO BE APPLIED BY STATION MASTER

REV.NO.	DATE	CHANGE NOTE NO.		CHANGE	
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	02-05-03

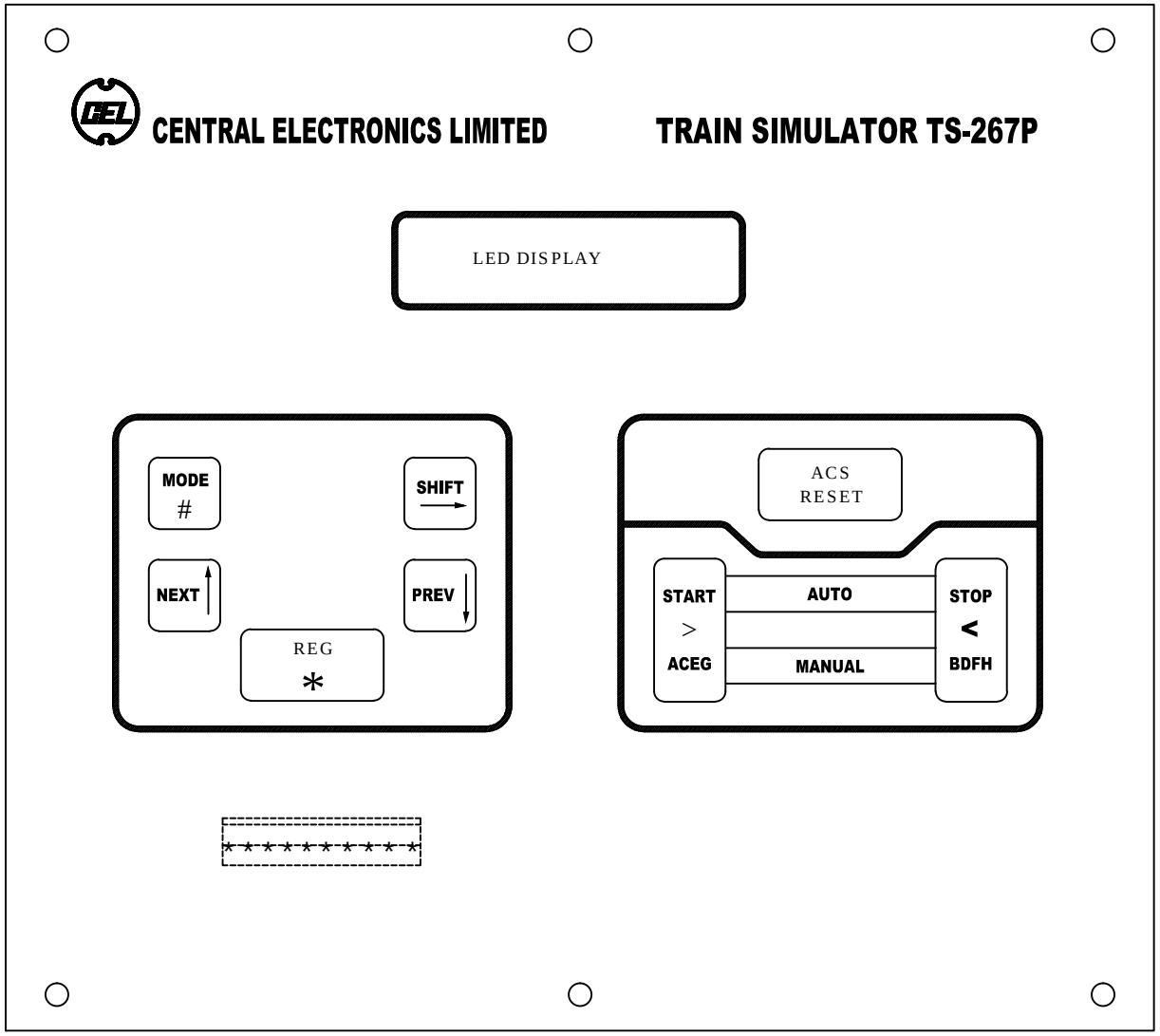
SSDAC (DACF-700A/AP/710A/P)
DIFFERENT STATES

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

DRG.NO. L007758A3

SHEET 1 OF 1

SYSTEM2\Bhandari\DACF-700AP\7758A3



REV.NO.	DATE	CHANGE NOTE NO.	CHANGE				
DRN	ADITYA	CHKD	DARPAN	APPD	PRAVEEN	DATE	25-10-04

SSDAC DACF-700AP/710P
TRAIN SIMULATOR

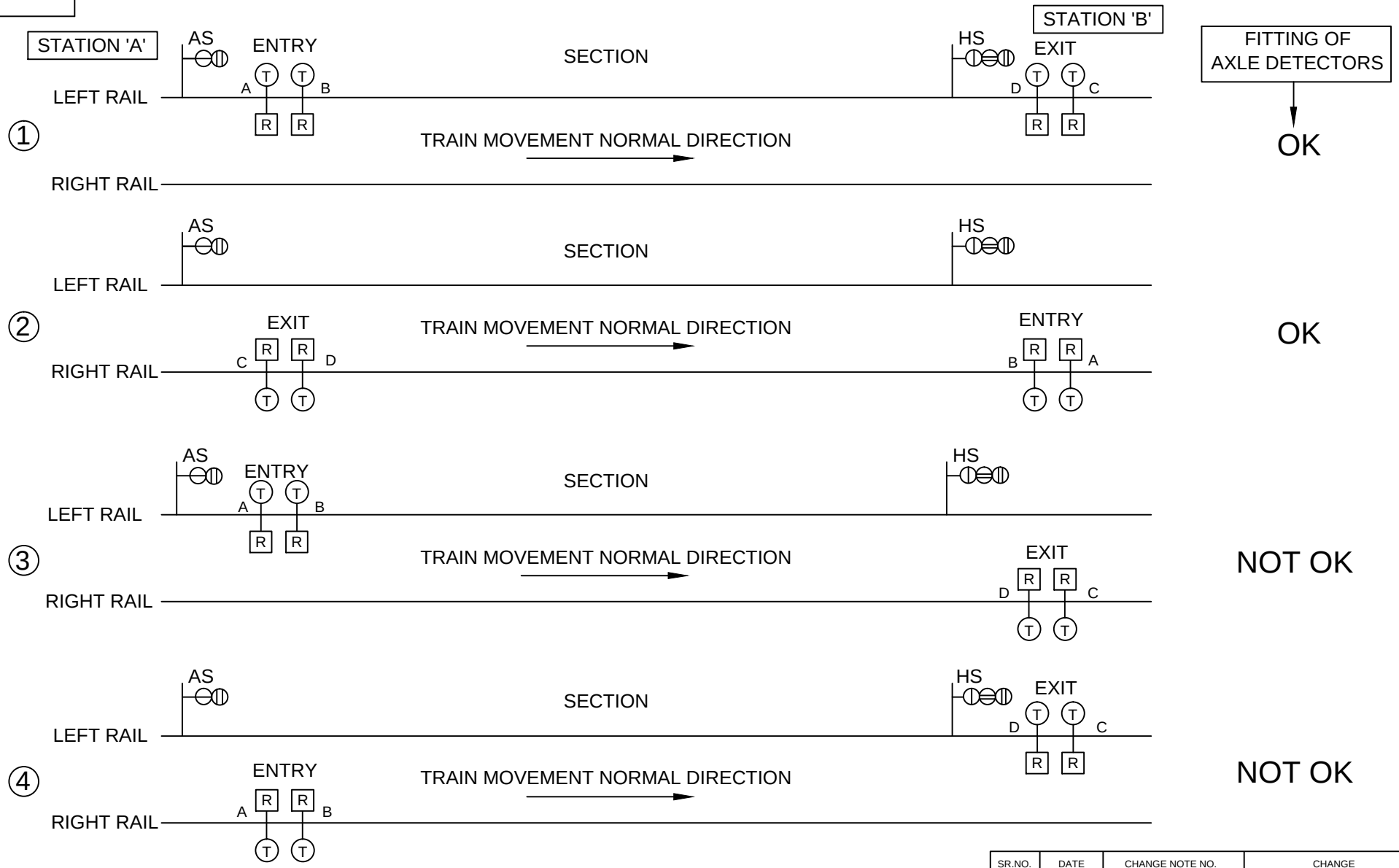
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. K008071A4

SHEET 1 OF 1

D27

SYS2/Bhandari/DACF-700AP/8071A4



SR.NO.	DATE	CHANGE NOTE NO.	CHANGE				
DRN	Bhandari	CHKD	DARPAN	APPD	PRAVEEN	DATE	27-10-04

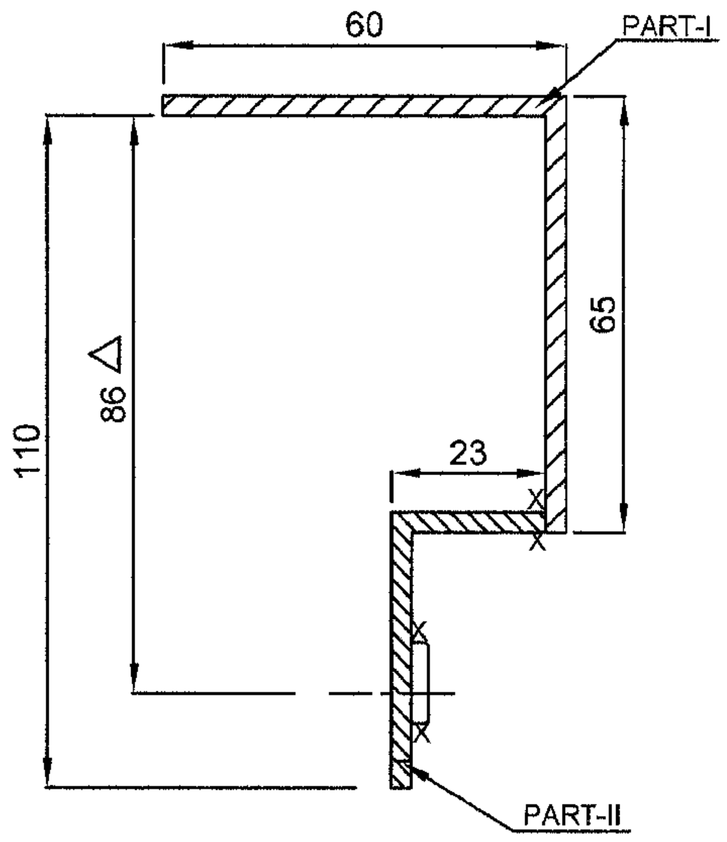
SSDAC (DACF - 700A/AP/710A/P)
SELECTION OF RAIL FOR FITTING AXLE DETECTORS

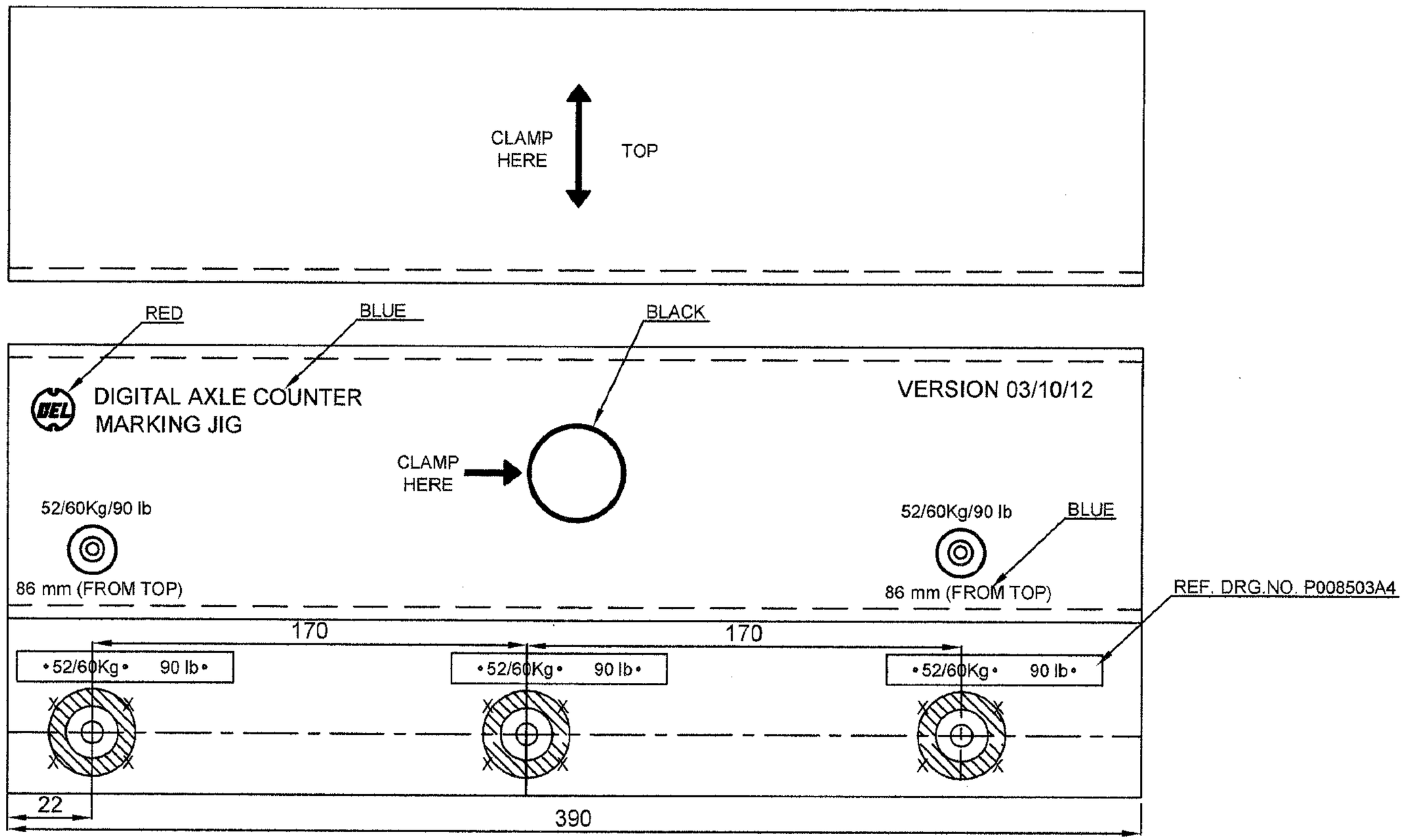
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. I008072A4

SHEET 1 OF 1

SYSTEM2/Bhandari/DACF-AP/8072A4





NOTE:-
* (I) PAINT-PEARL GREY (ALL OVER)
(II) JIG ARE IN PART I, II.
(III) PART SHOULD TO BE STRAIGHT
(IV) XX = WELDING
(V) AVOID WELDING INSIDE
△ (VI) 86 DIM SHOULD BE MAINTAIN.

D 29

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REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.
1	3004	AS PER RLY TESTING REPORT	01.10.12	

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

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	D.S.Bhandari	28-12-05
CHECKED		02-04-13
APPROVED		02.4.13

MATL M.S.SHEET 3TH. | DIM M.M | NO.OFF 1
FINISH - | SCALE N.T.S

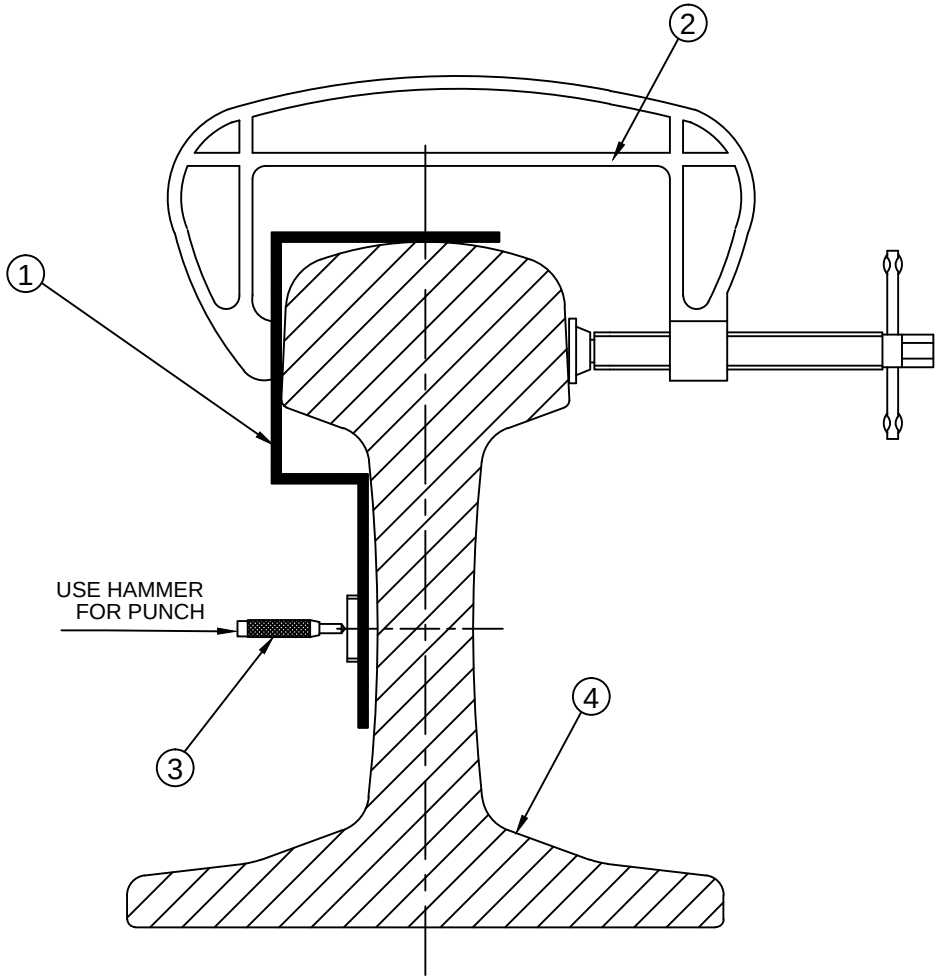
PROJECT
SSDAC / HASSDAC DACF- 720P
-710 P

TITLE
WEB MOUNTING MARKING JIG

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

DRG.NO. F008300 | REV.NO. 00 | SHEET NO. 1OF2

SYS-4/ADITYA/HASSDAC/8300A3-1



S.NO.	DESCRIPTION
1	MARKING JIG (F008300A3 SH.1OF2)
2	`C` CLAMP
3	CENTER PUNCH
4	RAIL

REV.NO.	CHANGE NOTE	AMMENDMENT DETAILS	DATE	APPD.

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

SIZE A3

DESIGNED	SIG.	DT.
DRAWN	ADITYA	20.02.06
CHECKED	DARPAN	
APPROVED	PRAVEEN	

MATL | DIM M.M | NO.OFF 1
FINISH - | SCALE N.T.S

PROJECT: SSDAC DACF-700A/AP/710A/P

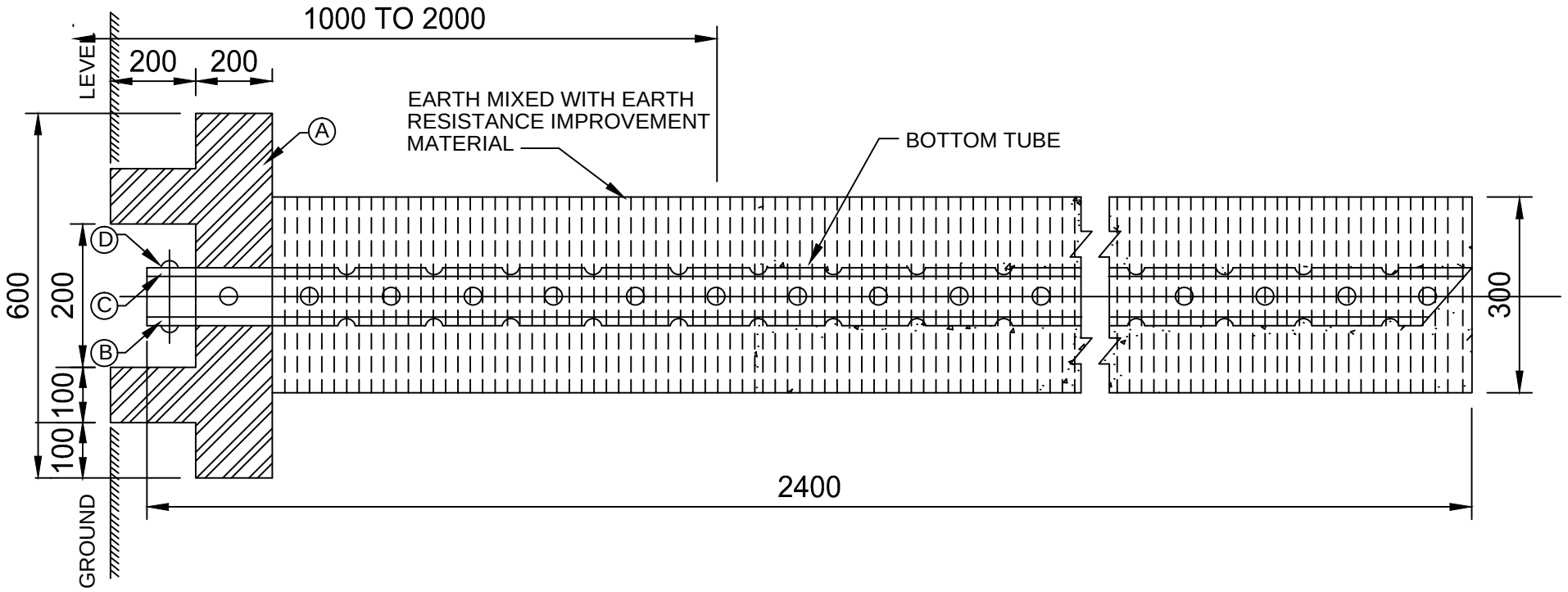
TITLE: MARKING JIG ASSEMBLY ON RAIL

DRG.NO. F008300 | REV.NO. 00 | SHEET NO. 2 OF 2

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

SYS-2/BHANDARI/TOOL/700A/AP/710A/P/8300A3-2



NOTES:-

1. ALL DIMENSIONS ARE IN MM
2. BOLT C & ONE WASHER D SHALL BE WELDED TO THE GI PIPE B IN THE MANNER SHOWN.
3. THE EARTH ELECTRODE SHOULD BE BURIED AT A DEPTH OF 1000 MM TO 2000 MM DEPENDING UPON THE POSITION OF CONDUCTING LAYERS OF SOIL.
4. WHERE MORE THAN ONE EARTH IS TO BE INSTALLED, THEY SHOULD BE SEPARATED BY A DISTANCE OF NOT LESS THAN 2000 MM FROM EACH OTHER.
5. THE WALLS OF THE PIT SURROUNDING THE PIPE OPENING SHALL BE PLASTERED & THEN FILLED WITH SAND.
6. THE EARTH WIRE SHALL BE FASTENED TO THE BOLT C BY MEANS OF NUT E & WASHER D & SHALL THEN BE SOLDERED.
7. DETAILED INSTRUCTIONS OF SUPPLIER OF EARTH RESISTANCE IMPROVEMENT MATERIAL TO BE FOLLOWED.

REV.NO.	DATE	CHANGE NOTE NO.		CHANGE			
DRN	Bhandari	CHKD	*DARPAN*	APPD	*PRAVEEN*	DATE	8-5-03

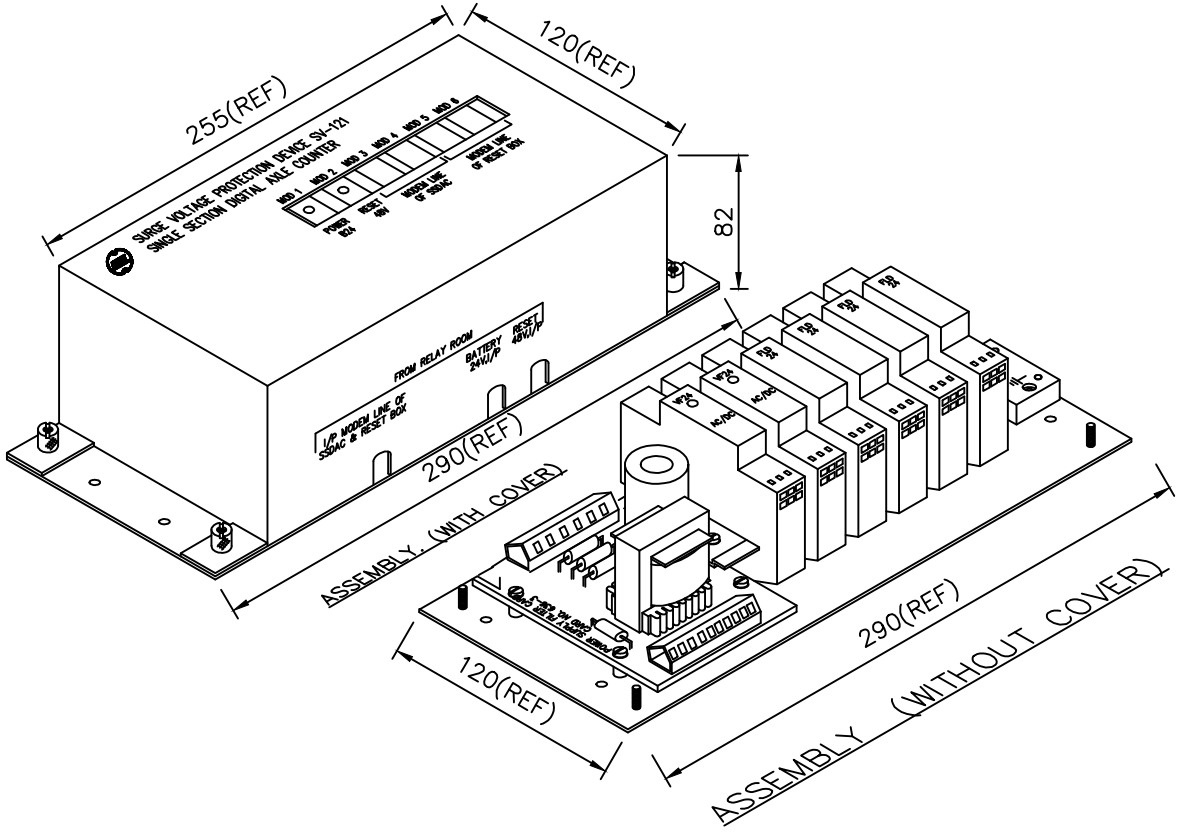
SSDAC (DACF-700A/AP/710A/P)
EARTHING ARRANGEMENT

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

DRG.NO. I007755A4

SHEET 1 OF 1

SYSTEM2/Bhandari/DACF-AP/7755A4



REV.NO.	DATE	CHANGE NOTE NO.			CHANGE		
DRN	BHANDARI	CHKD	DARPAN	APPD	PRAVEEN	DATE	22-09-08

SSDAC (DACF-700A/AP)

SURGE VOLTAGE PROTECTION DEVICE ASSEMBALY SV-121

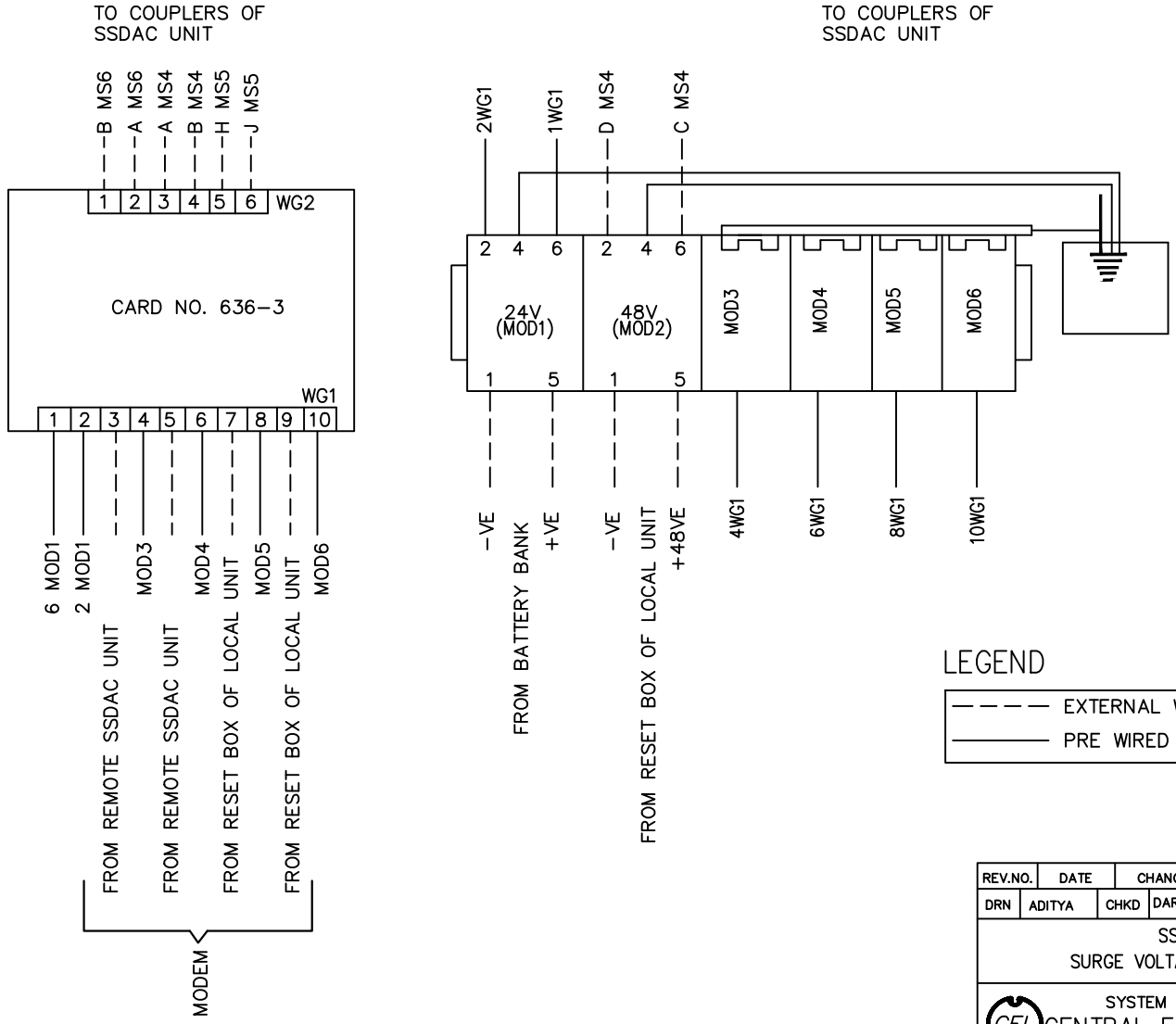
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. A008527A3

SHEET 2 OF 2

SYS-2/ADITYA/

WIRING DETAILS OF SVPD (PHOENIX MAKE)



LEGEND

- - - -	EXTERNAL WIRING REQUIRED
————	PRE WIRED FROM FACTORY

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE
DRN	ADITYA	CHKD DARPAN APPD PRAVEEN	DATE 30.04.12

SSDAC (DACF-710A/P)
SURGE VOLTAGE PROTECTION DEVICE SV-121

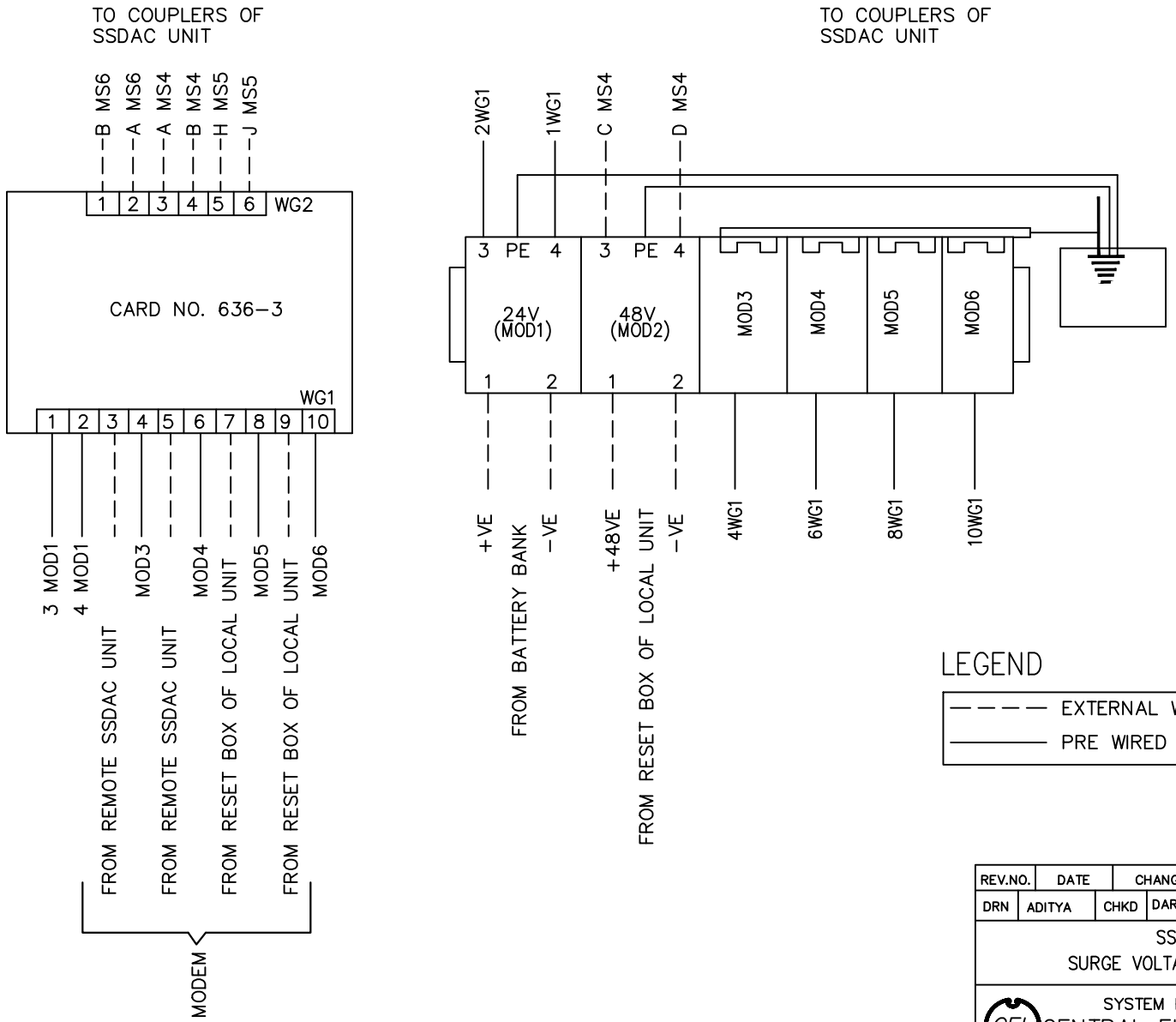
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. W008556A4

SHEET 1 OF 2

SYS-2/ADITYA/W008556A4

WIRING DETAILS OF SVPD (OBO MAKE)



LEGEND

- EXTERNAL WIRING REQUIRED
- PRE WIRED FROM FACTORY

REV.NO.	DATE	CHANGE NOTE NO.	CHANGE				
DRN	ADITYA	CHKD	DARPAN	APPD	PRAVEEN	DATE	30.04.12

SSDAC (DACF-710A/P)
SURGE VOLTAGE PROTECTION DEVICE SV-121

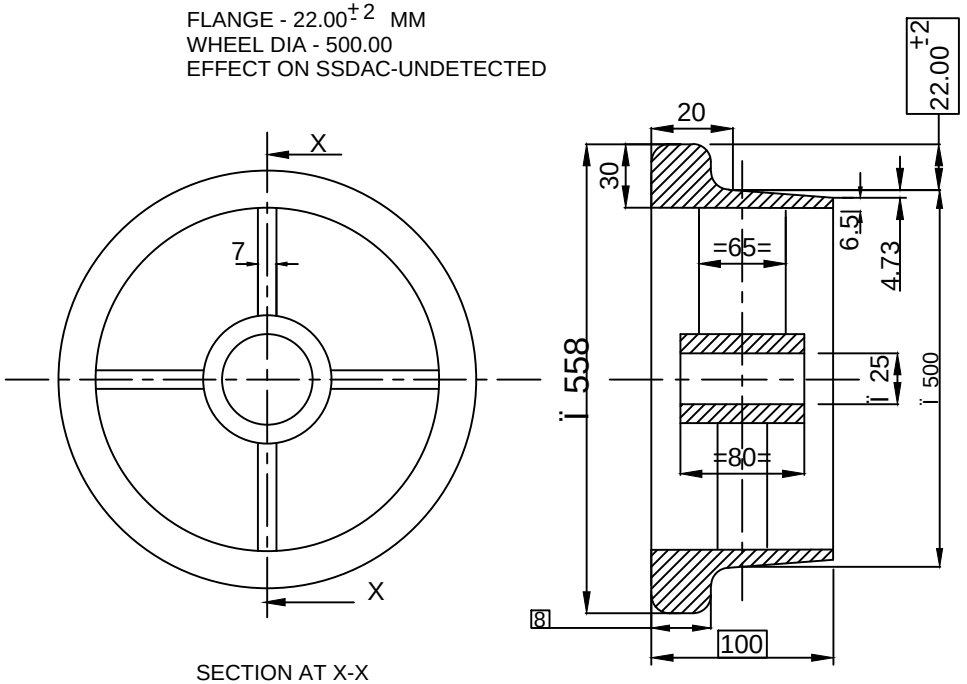
SYSTEM PRODUCTION DIVISION
CEL CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. W008556A4

SHEET 2 OF 2

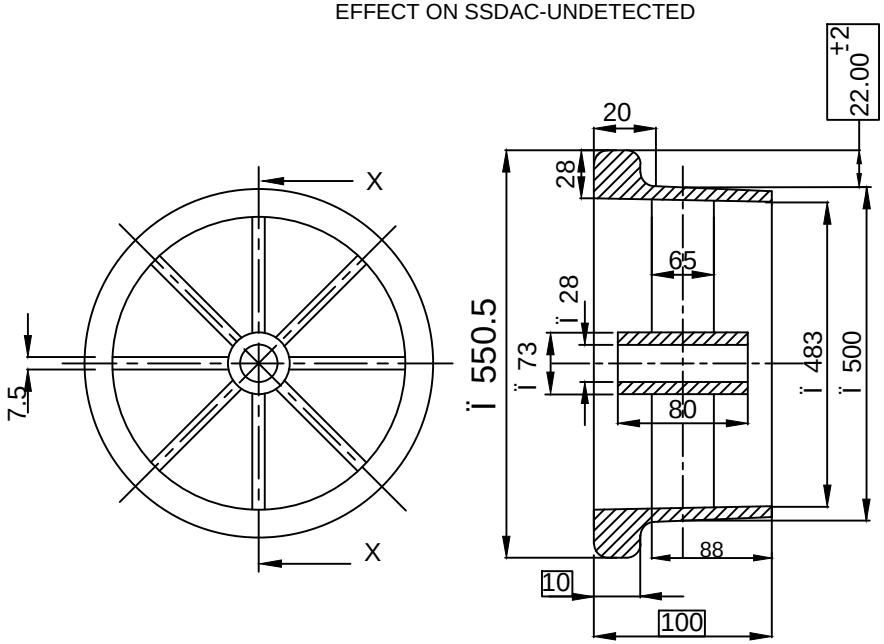
SYS-2/ADITYA/W008556A4-1

1. PUSH TROLLEY (4 SPOKE)
FLANGE - 22.00 ±2 MM
WHEEL DIA - 500.00
EFFECT ON SSDAC-UNDETECTED

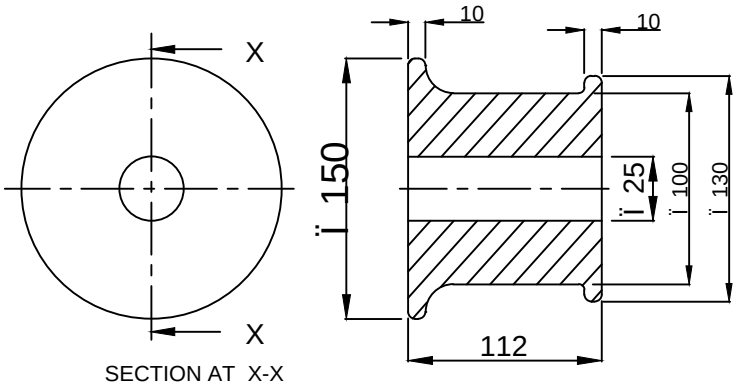


SECTION AT X-X

3. PUSH TROLLEY (8 SPOKE WHEEL)
FLANGE - 22.00 ±2 MM
WHEEL DIA - 500.00
EFFECT ON SSDAC-UNDETECTED



SECTION AT X-X



SECTION AT X-X

2. RAIL DOLLY SOLID WHEEL
FLANGE - 25mm
WHEEL DIA - 100.00
EFFECT ON SSDAC-UNDETECTED

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	*DARPAN*	
APPROVED	*PRAVEEN*	

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

PROJECT: SSDAC

TITLE: PUSH TROLLEY RECOMMENDED FOR SSDAC

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

D34

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

SYSTEM4/ADITYA/MECH/8697A3

ANNEXURE – VI – PRECOMMISSIONING CHECKLIST



सत्यमेव जयते

RESEARCH DESIGNS AND STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW

SIGNAL DIRECTORATE

Pre-commissioning check list for Single Section Digital Axle Counter of M/s Central Electronics Limited, Sahibabad

S.N.	Date of amendment	SSDAC Version	Page No.	Version	Reasons for amendment
1.	21.05.2007	S006	21 pages	1	First Issue
2.	03.03.2012	S006	26 pages	2	inclusion of TAN 600i and suitable for redundant system
3.	00.00.2013	S006	29 pages	3	Inclusion of Fuctionality of HA SSDAC (Resetting & Relay logic) due to review of specification
4.	**22.09.2017**	**S007**	**21 pages**	**4**	**Due to implementation of S007 ver. of software cl 4.14 changed for software ver. & cl. 4.15 add for software checksum at pg. 10 Due to battery fitted problem cl.5.7 add at pg.11 & cl.6.4 add for OEM's certificate at pg.12**

Prepared by:
Director / Signal
Name: H. O. Kushwaha

Signature:

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

Signature:

Signature of CEL Rep
With Name, Designation & Date

Signature of Railway Rep.
With Name, Designation & Date

Pre-commissioning check list for Single Section Digital Axle Counter

SSDAC (MODEL: DACF-710A/710P/DACF-720P)

(AS PER RDSO/SPN/177/2012 Version 3)

0. General Information

1.	Station /Yard Name:	
2.	Section:	
3.	Division/Zonal Railway:	
4.	Contact Details of Railways at site:	
5.	Contact Details of Railways at HQ/Division	
6.	Contract No./P.O. No.	
7.	Application [Yard/ABS/IBS/BPAC]	
8.	Total Nos. Of Detections & Section:	
9.	Name and Address of manufacturer/supplier: (RDSO Approved vendor)	
10	Serial number of the equipment:	
11	SSDAC working on: OFC / Microwave / Quad Cable	
12	Date of installation:	
13	Date of pre-commissioning inspection:	

Note :

1. System should be installed and commissioned by authorized technical staff of manufacturer only.
2a. Installation practices of SSDAC model DACF 710P for Phase Reversal/ DACF-710A for AM should be strictly adhered to and checked before commissioning covering all points in the following document.
2b. Installation practices of HASSDAC model DACF - 720P for Phase Reversal should be strictly adhered to and checked before commissioning covering all points in the following document.
3. OEM shall certify that verification of system installation has been completed by OEM and all necessary arrangements meet the required standards of engineering for trouble free working of installed system.
(Ref: This office letter no.: STS.E.AC.Dig.Genl dt 21.06.201

Signature of CEL Rep
With Name, Designation & Date

Signature of Railway Rep.
With Name, Designation & Date

SSDAC Unit Sl. No (Entry end) ---------- **(Exit end) ----------**

A- **CATEGORY:**
(This part of work to be done before commissioning)

1 **Outdoor** (Location Box)

Sl. No.	Item	Required	Observed		Remarks
			Entry end	Exit end	OK /Not OK
1.1	Relay used for VR & PR.	Q type, 24V, 1000 Ohm (SSDAC)			
1.2	Diode across each relay coil in reverse bias.	Should be provided with BY127/IN4007/IN5408			
1.3	Unused Quad pair	To be terminated on terminals. **Annex- i for Quad cable may be referred.** Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 **See annexure -iii**			
1.4	Dressing of Quad pair	To be properly dressed with insulated tape.			
1.5	Spiral before termination.	No individual conductor to be made spiral			
1.6	(i) Earthing of Location Box. (ii) Earth value	(i) Should be properly connected with earth. (ii) ≤ 1 Ω			

2 **Outdoor (track device)**

Sl. No.	Item	Required	Observed		Remarks
			Entry end	Exit end	OK /Not OK
2.1	Wiring of Tx/Rx coils & MS coupler cables	Wired on approved Spring Cage Type terminals			
2.2	Condition of worn out of Rail 60 Kg - 13 mm 52 Kg - 8 mm 90 R - 5 mm	Should be within vertical limit of worn out 159-172 mm 148-156 mm 138-143 mm			
2.3	Marking of holes on rail (From top of the rail)	60 Kg 86 mm 52 Kg 86 mm 90 R 86 mm			

Signature of CEL Rep
With Name, Designation & Date

Signature of Railway Rep.
With Name, Designation & Date

2.4	Drilling of holes in the web of rail	Should be of 14mm dia as per drawings on page no. D20– D22 of installation's manual Version 1.1(Document No. – CEL/DAC/IM-04) for Phase Modulation and Version 1.1(Document No. – CEL/DAC/IM-03) Amplitude Modulation, Should be square (perpendicular), should not be oblong.			
2.5	Torque applied to fix track device using Torque wrench	Jaicom make JPR65 or equivalent - 88 Nm.			
2.6	Fixing of Tx	Outside the rail			
2.7	Fixing of Rx	Inside the rail			
2.8	Fixing of axle detectors at entry & exit end	On the same rail as per drawing no.-I008072A4, page no.D28 of installation's manual Version 1.1(Document No. – CEL/DAC/IM-04) for Phase Modulation and Version 1.1(Document No. – CEL/DAC/IM-03) Amplitude Modulation.			
2.9	(a) Measure length of the track device (axle detector) cable	10m ± 0.3m			
2.10	(b) Laying of axle detector cable	In corrugated/HDPE pipe as per drawing no. L008453A4 at page D2/D3 of installation's manual Ver. 1.1(Document No. – CEL/DAC/IM-04) for Phase & Ver.1.1 (Document No. – CEL/DAC/IM-03) for AM.			
2.11	Screen of axle detector cable	Should be earthed			
2.12	Fixing of deflector plates	As per drawing no. L008453A4 at page D2/D3 of manual Version 1.1(Document No. – CEL/DAC/IM04) for Phase Modulation and Version 1.1(Document No. – CEL/DAC/IM-03) for Amplitude Modulation.			
2.13	Type of push trolley used in the section.	4 spoke/ 6 spoke			
2.14	Rail section	60 Kg/ 52 Kg /90 R			
2.15	Nuts, bolts & washers for fixing rail contacts	Insertion of bolt from Rx coil side i.e. inside of the rail			
For amplitude detection only					
2.17	Height of deflector	Should not be higher than the rail top			

Signature of CEL Rep
With Name, Designation & Date

Signature of Railway Rep.
With Name, Designation & Date

2.18	Clearance between sleepers	400 mm between sleepers (Refer Drg No. L008453A4 at page D2/D3 of Manual Version 1.1 (Document No. – CEL/DAC/IM-04) for Phase Modulation and Version 1.1(Document No. – CEL/DAC/IM-03) for Amplitude Modulation			
2.19	Embossing on rail	Should not be covered by Track device			
2.16	Length of Trolley Protection circuit	(a) In Single line 5RL (b) In Double line 3RL			
2.17	Position of deflector	(a) 30 cm away from Tx/Rx coils in the next sleeper			
2.18	Fixing of Axle Detectors	(a) In Single line Should be fixed in centre of 5RL (b) In Double line Should be fixed at 33 mtrs from block joint in the direction of movement.			

Signature of CEL Rep
With Name, Designation & Date

Signature of Railway Rep.
With Name, Designation & Date

3 Outdoor Quad Cable

3. Outdoor (Quad Cable/PIJF twisted pairs telecom cable for Axle counter system working in station area, As per RDSO letter no. STS/E/SSDAC/SPN/177 dated-28/30.08.2006)

3.1 Test format for testing of QUAD cable/PIJF twisted pair telecom cable before commissioning of SSDAC **in Station area**

SL NO.	ITEM	EXPECTED	MEASURED/ OBSERVED	REMARKS (OK/NOT OK)
3.1.1	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. **Annex-i for Quad cable may be referred. Wiring practices should be adopted in accordance to TAN 6001 dt 04.10.2011 See annexure -iii**		
3.1.2	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**		
3.1.3	Duplication of Wires	No wires to be paralleled for reducing conductor resistance.		
3.1.4	Insulation Resistance of Quad cable	Shall be greater than /equal to 10 M ohm.		
3.1.5	Loop Resistance of designated pair	Not to exceed 56 ohm/Kms at 20^0 C. See Annexure – ii for correction factor.		
3.1.6	Attenuation loss of cable between one SSDAC to other, measured at 2 KHz	Shall not be greater than 30.0 dB for full length of the cable (including tail cables) used.		
3.1.7	Near End Cross Talk (NEXT)	Shall be better than 55 dB for Quad cable.		
3.1.8	Far End Cross Talk (FEXT)	Shall be better than 55 dB for Quad cable.		
3.1.9	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**		
3.1.10	Separate Earth of Quad/PIJF telecom cable	**Shall be ≤ One ohm**		
3.1.11	Cable allocation table	Shall be filled up & attached		
3.1.12	Unused Quad pair	To be terminated on terminals.		
3.1.13	Dressing of Quad pair	To be properly dressed with insulated tape.		
3.1.14	Spiral before termination.	No individual conductor to be made spiral		

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3.2 Test format for testing of QUAD cable before commissioning of SSDACC/ SSBPAC (D) used in **between Station to station**

Sl. No.	Item	Expected	Measured / Observed	Remarks (OK / Not OK)
3.2.1	QUAD / PIJF			
3.2.1.1	Communication Media Type of Cable	Jelly filled telecom cable / Only **Proper pair of wires of** Quad cable is to be used **for connectivity** between field units & OFC Equipment room. Signaling Cable shall not be used at all. Wiring practices should be adopted in accordance to **TAN 6001 dt 04.10.2011 See annexure -iii**		
3.2.1.2	Use of pair	Proper pair of wires to be used for connectivity. Annex-i for quad cable may be referred Wiring practices should be adopted in accordance to **TAN 6001 dt 04.10.2011 See annexure -iii**		
3.2.1.3	Duplication of Wires	No wires to be paralleled for reducing conductor resistance.		
3 2.1.4	Insulation resistance of Quad cable	Shall be greater than /equal to 10 M ohm.		
3.2.1.5	Loop resistance of designated pair	Not to exceed 56 ohm/Kms at 20^0 C for Quad cable & _____* ohm / Kms for PIJF telecom cable. See annexure – ii for correction factor.		
3.2.1.6	Earth of quad cable	Shall be less than One ohm		
3.2.1.7	Cable allocation table	Shall be filled up & attached		
3.2.1.8	Unused Quad pair	To be terminated on terminals.		
3.2.1.9	Dressing of Quad pair	To be properly dressed with insulated tape.		
3.2.1.10	Spiral before termination.	No individual conductor to be made spiral		

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3.3 Test format for testing of local QUAD / PIJF twisted pair telecom cable & OFC before commissioning of SSDAC/BPAC/SSBPAC (D) **on OFC in between station to station.**

Sl No.	Item	Expected	Measured/ Observed	Remarks (OK/Not OK)
3.3.1	**QUAD/PIJF**			
3.3.1.1	Communication Media Type of Cable	Only **Proper pair of wires of** Quad cable is to be used **for connectivity** between field units & Station room. Quad cable / PIJF twisted pair telecom cable is to be used between field unit to Reset Box.		
3.3.1.2	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**		
3.3.1.3	Duplication of Wires	No wires to be paralleled for reducing conductor resistance.		
3.3.1.4	Insulation resistance of Quad cable	Shall be greater than /equal to 10 M ohm.		
3.3.1.5	Loop Resistance of designated pair	Not to exceed 56 ohm/Kms at 20^0C for Quad cable & * ohm/Kms for PIJF telecom cable. See Annexure -2 for correction factor.		
3.3.1.6	Earth of Quad cable	Shall be less than One ohm		
3.3.1.7	Cable allocation table	Shall be filled up & attached		
3.3.1.8	Unused Quad pair	To be terminated on terminals.		
3.3.1.9	Dressing of Quad pair	To be properly dressed with insulated tape.		
3.3.1.10	Spiral before termination.	No individual conductor to be made spiral		
3.3.2	OFC			
3.3.2.1	Channel line up	For 0 dB Trans signal level, the received signal level at other end shall not be more than -15dB.		

***PIJF telecom cable is available with three types of Conductor dia-**

Sl. No	Condr Dia used in PIJF cable	Resce at 20^0 C	Loop Resce /KM
1	0.50 mm	86 ohm +/- 6	172 ohm / Kms
2	0.63 mm	58 ohm +/- 4	116 ohm / Kms
3	0.90 mm	28 ohm +/- 2	56 ohm / Kms

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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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4 Outdoor electronics

Sl. Nos	Item	Required	Observed		Remarks OK /Not OK
			Entry end	Exit end	
4.1	a. Sl. No. of SSDAC/ HASSDAC units b. Details of Track circuit	Same serial no pairs. Example – 015A (entry), 015B (exit) Track circuit no.			
4.2	Placement of Cards/modules	Should be in proper position			
4.3	Firmness of card/Modules	Should be tightened with screw / clip provided			
4.4	MS Couplers/Spring Cage Terminals	Should be tightened properly			
4.5	MS coupler/Spring Cage cables	Wired properly as per colour code			
4.6	Earthing of SSDAC/HASSDAC units	Should be provided firmly through copper strips or standard copper cable to the Location Box earth.			
4.7	Earthing of Vital Relay Box	Should be provided firmly through copper strips or standard copper cable to the Location Box earth.			
4.8	Fixing of SSDAC /HASSDAC unit	Should be firmly fixed using clamp			
4.9	Fixing of Vital Relay Box	Should be firmly fixed using clamp			
4.10	Cable for taking 24V D.C. from central location to SSDAC /HASSDAC unit.	2 X 25 sq. mm Al.			
4.11	External Surge Protection Devices on input, output and power supply lines	Indicative type, plug able or easy to install on a DIN rail. Non plug able shall be connected in parallel.			
4.12	Address of SSDAC/HASSDAC	Address pair should be different from any SSDAC/ HASSDAC system working on the same station / section.			
4.13	Fuse	2A			
4.14	Software version no.	S007			
4.15	Specified value of checksum	9664 7ED6 12C1 35DE 9D81 D9A9 2F83 CD4A AC24 369F 0000 5A51			
4.16	Input voltage with Charger ON	should not be more than 28.8 V DC			

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Sl. Nos	Item	Required	Observed		Remarks OK /Not OK
			Entry end	Exit end	
4.16	Input voltage with Charger OFF.(Keep charger OFF for 15 minutes before taking reading) /IPS Module	Should not be less than 23 V DC			
4.17	Ripple of Input Power Supply	Less than 10 mV rms / 50 mV peak to peak.			
4.18	Level of reset signal at SSDAC unit input.	42 V to 50 V DC			
4.19	Relay drive output to the **Vital Relay**. (This may be checked across R1 & R2 of coil of relay/both vital relays in vital relay box).				
4.19 a	Section is Clear	> 22V			
4.19 b	Section Occupied	< 2V			
4.20	Relay drive output to the **Preparatory** Relay. (This may be checked across R1 & R2 of coil of relay/relays).				
4.20 a	When preparatory relay is picked up.	> 22V			
4.20 b	When preparatory relay is dropped	< 2V			
4.21	Drive voltage of repeater relays in picked up condition, when charger is OFF for 15 minutes.				
4.22	VPR	>22V			
4.23	PPR	>22V			

5.0 INDOOR (Reset Box Location)

Sl. No.	Item	Required	Observed		Remarks OK /Not OK
			Entry end	Exit end	
5.1	Reset Box	Wired as per Drg no. S007764A3 (Page No. D18 & D19) – 2 sheets & W007742A4 (Page No. D17) & fixed firmly.			
5.2	Reset Box Earthing.	Connected to earth properly.			
5.3	Reset Function	a) Reset not possible when Axle Counter section is clear and healthy.			
		b) Reset not possible when Axle counter section is in Preparatory reset mode.			
5.4	24 V D. C. level at Reset box input.	22V DC to 30 V DC			
5.5	Level of reset signal at reset box O/P.	44 V to 52 V DC			
5.6	Level of reset signal at SSDAC unit input.	38 V to 50V DC ± 2V DC			
5.7	Reset Box	Battery of the reset box is dully fitted in battery compartment & display shows the RTC stamping			

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6.0 COMMISSIONING

Sl. No.	Item	Required	Measured / Observed	Remarks (OK / Not OK)
6.1	Commissioning	System should be installed & commissioned by personal trained by the manufacturer.		
6.2	Training	Railway personnel should be trained before commissioning.		
6.3	Verification of working	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 para 7.0		
6.4	OEM's Certificate	Should be filled up & It should be available at site		

B- CATEGORY:
(PENDING ISSUES TO BE ATTENDED WITHIN 15 DAYS FROM THE DATE COMMISSIONING)

7.0 INDOOR POWER SUPPLY/CT RACK

Sl. Nos	Item	Required	Observed		Remarks OK /Not OK
			Entry end	Exit end	
7.1	PPR & VPR Relays	Shall be of Q type 24 V, 1000 ohms			
7.2	Fuse ratings	2.0 Amps			
7.3	(a) Power supply for axle counter.	(a)(i) Charger should be fit for axle counter use. (ii) There should not be any other load on the power supply except axle counter. (iii) Class B & C types surge protection must be provided on 230 V mains line.			
	(b) Out voltage for SSDAC with charger ON in Float mode.	(b) Should not be more than 32 V DC.			
	(c) Out voltage for SSDAC charger OFF.	(c) Should be in between 28V – 30V DC.			
	(d) IPS	(d) should be adjusted in between 28 V- 30 V DC			
7.4	Ripple of Input Power Supply	Less than 10 mV rms / 50 mV peak to peak.			

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7.5	Glitch in Input Power Supply by putting ON/OFF the charger	No glitch should be there			
7.6	Drive voltage of the **VPR**. (This may be checked across R1 & R2 of coil of relay).	>22V			
7.7	Drive voltage of the **PPR**. (This may be checked across R1 & R2 of coil of relay).	>22V			

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8.0 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 influence / 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 trolley 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 –		
13	Motor trolley following a train		
14	Effect of Tower wagon		

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Maintenance log sheet for SSDAC/HASSDAC (Entry end)

Sr. no.	Date	Battery (24V)	Tx1 Vrms / freq	Tx2 Vrms / freq	Rx1 Vrms	Rx2 Vrms	Modem Tx Level (Card 6) 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 1 & 5	TS4 1 & 2	TS4 3 & 4	TS4 5 & 6	TS4 7 & 8	TS2 7 & 8	Red & Black Socket		Red & Black Socket		Red & Black Socket		Monitoring Sockets on card 8			
								Normal	Dummy wheel	Normal	Dummy wheel	SCC1	SCC2				
(Limit) for Phase		23-28.8 V	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	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
(Limit) for AM			20.8 to 21.2 KHz	22.8 to 23.2 KHz	750 to 1200 mV	750 to 1200 mV											

Note: Refer CEL/DAC/IM-04 for Phase Modulation and Document No. – CEL/DAC/IM-03 for Amplitude Modulation for test point. Refer Drawing D11 of document no. CEL/HASSDAC/IM-01 to record readings of Tx and Rx in HASSDAC. For DACF-720P model fill one more duplicate sheet.

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Maintenance log sheet for SSDAC/HASSDAC

(Exit end)

Sr. no.	Date	Battery (24V)	Tx1 Vrms / freq	Tx2 Vrms / freq	Rx1 Vrms	Rx2 Vrms	Modem Tx Level (Card 6) 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 1 & 5	TS4 1 & 2	TS4 3 & 4	TS4 5 & 6	TS4 7 & 8	TS2 7 & 3	Red & Black Socket		Red & Black Socket		Red & Black Socket		Monitoring Sockets on card 8			
								Normal	Dummy wheel	Normal	Dummy wheel	SCC1	SCC2				
(Limit) for Phase			30 to 40 V	30 V to 40V	275 to 600mV	275 to 600m V	> 400 mv (-6 dB) (approx.) When other end field unit switched off										
(Limit) for AM		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

Note: Refer CEL/DAC/IM-04 for Phase Modulation and Document No. – CEL/DAC/IM-03 for Amplitude Modulation for test point. Refer Drawing D11 of document no. CEL/HASSDAC/IM-01 to record readings of Tx and Rx in HASSDAC. For DACF-720P model fill one more duplicate sheet.

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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/BPAC/SSBPAC (D)

Position of One Quad in Quad cable:

White
(A)
X

Red (C) X X (D) Grey

X
(B)
Quad colour

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.

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Annexure-II

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.	0.3863	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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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.

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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