# स्थापन मैनुअल
# INSTALLATION MANUAL

## उच्च उपलब्धता एकल खण्डीय सांख्य धुरी गणक
डी ए सी एफ–720पी
(फेज रिवर्सल प्रकार)
आर.डी.एस.ओ/एस.पी.एन./177/2012 आवृति–3.0

## HIGH AVAILABILITY SINGLE SECTION DIGITAL AXLE COUNTER
**DACF - 720P**
**(PHASE REVERSAL TYPE)**
**RDSO/SPN/177/2012 Ver 3.0**





## सैन्ट्रल इलैक्ट्रॉनिक्स लिमिटेड
(आई एस ओ 9001:2015 प्रमाणित कम्पनी)
## CENTRAL ELECTRONICS LIMITED
**AN ISO 9001:2015 CERTIFIED COMPANY**

# DOCUMENT DATA SHEET

| | | |
|---|---|---|
| Title of Document | : | Installation Manual of HASSDAC |
| Document Number<br>Version Number<br>Date of issue | :<br>:<br>: | CEL/HASSDAC/<br>IM-01 Version 2.3<br>24.05.2025 |
| System designed as per RDSO Specification No. | : | RDSO / SPN / 177 / 2012 Ver. 3 |
| Prepared By | : | Railway Testing<br>System Production Division<br>Central Electronics Limited |
| Issued by | : | Production Engineering Department<br>Systems Division |
| Approved by | : | HOD, Systems Division<br>Central Electronics Limited |
| Approved by | : | Director Signal (Draft Copy, RDSO approval Awaited)<br>RDSO, Lucknow |

Abstract:

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

## *MESSAGE FROM OUR CMD*

Dear HASSDAC Customer,

We are privileged for your decision to choose HASSDAC for modernization of signalling in the Railways. The HASSDAC 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 HASSDAC. 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 HASSDAC

1. **HASSDAC:**

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



High Availability Single Section Digital Axle Counter

**2. Salient Features**

- Trackside electronic counting equipment
- Web type /Clamp type axle detectors to avoid drilling in railweb.
- Compatible with 90R, 52 Kg & 60 Kg rail profiles
- Redundancy provided in counting, processing, communication, output relay and supply section.
- Redudency in track devices and counting process is optional.
- Auto reset feature is available, if one of the output relay remained occupied after train clears the section, auto reset takes place.
- Circuit of two MLB cards is duplicated in card called Dual MLB Card.
- 2 Nos of Dual MLB cards are used in each entry / exit unit.
- 2 Nos of Modem cards are used in each entry /exit unit.
- Event Logger card is provided at the rear of the entry / exit unit.
- 2 Nos of DC –DC Converter cards used.
- Two separate relay driver cards are used.
- Separate vital relays are used for each set of processing unit.
- Final VPR relay provided in relay room picks up if any of the two Vital Relays is picked up.
- Spring type wago terminals provided at the back of Unit & Vital Relay box instead of couplers for higher contact reliability.
- SSDAC model DACF – 700/710 cannot be upgraded to HASSDAC.
- Track clear/occupied status at both stations.

## 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 (One quad for dual system)
- 2 Nos. of Dual Microcontroller cards used in each entry/exit unit
- 2 Nos. of Modem cards used in each entry/exit unit
- Compatible to work on voice channel of OFC & quad simultaneously
- Out of two processing units if one unit fails no train detentation.
- 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 Relays.
  ii) Dual 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 High Availability Single Section Digital Axle Counter (HASSDAC) is supplied with Phase Reversal type Axle detectors. The system model nos. is as follows:

| S. No. | Item | Model No. |
|---|---|---|
| 1. | HASSDAC | DACF – 720P |
| 2. | Axle Detectors | AD – 711/AD-711 FS |
| 3. | Vital Relay Box with PR & Reset Relay | VR – 722 |
| 4. | Reset Box | RB – 259A |
| 5. | Surge Voltage Protection device | Din Rail Mounted |

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) Tyre base < 100 mm.
   There shall be no Rim inside the tyre and orientation of spokes shall be in the plane to allow passage to flux.

   ii) The system counts the following trolleys:
      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 has been provided with additional protection module for modem line of reset box.

**ISSUE DETAILS:**

| SR. NO. | AMENDMENTS IN CHAPTER / ANNEXURE | ISSUE NO. | DATE |
|---|---|---|---|
| 1.0 | Initial release | 1.0 | - |
| 2.0 | Typing error removed in ordering information | 2.1 | 24.11.2017 |
| 3.0 | Dos and Don'ts modified | 2.2 | 21.02.2019 |
| 4.0 | i. Addition installation procedure of clamp based fail-safe track device (AD- 711FS.)<br>ii. Addition of Modified pre-commissioning check list.<br>iii. Addition of Drawing No. W009362 A4 for wiring for data logging of individual VR1 & VR2 of HASSDAC.<br>iv. Addition of Drawing. No. W009363A4 for HASSDAC Power supply wiring by using two independent power supplies.<br>v. Addition of Drawing No. W009364 A4 for SVPD wiring details with power Combiner module<br>vi. Addition of Drawing No.W009244A4 for wiring details for power supply combination card HASSDAC (DACF-720A/720P) | 2.3 | 24.05.2025 |

## 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 27 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 High Availability 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 HASSDAC |
| 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 auto reset feature. In case of failure of one unit, auto reset is to applied by auto reset module. The system comes to preparatory state. Train detentation do not take place. One train is to be piloted in the section for system to become clear if both systems fail. Procedure for piloting should be followed as per Station Working Rule in railways. |
| 4. | HASSDAC and Reset Box are provided with sealing arrangement. The HASSDAC 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. HASSDAC work on single power supply source. |
| 2. | Maintain battery to provide steady 24V to the system. Check that no interruption takes place on power supply. |
| 3. | Independent switch are provided to switch OFF processing unit 1 or 2. Make sure to Switch off 24 V Power Supply to HASSDAC 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 HASSDAC. |
| 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 High Availability Single Section Digital Axle Counter for line / section verification to control and drive signals in Railways.

We assure you that the HASSDAC 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 HASSDAC 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

# CONTENTS

**KNOW YOUR HASSDAC**

**ISSUE DETAILS**

**FOREWORD** ..... **3**
**CHAPTER 1** ..... **1**
**1.0 GENERAL INFORMATION** **1**
1.1 INTRODUCTION ..... 1
1.2 MODELS OF SYSTEM ..... 1
1.3 BRIEF OF SYSTEM ..... 1
1.4 SPECIFICATIONS ..... 2
1.5 SYSTEM DESIGN ..... 2
1.6 SYSTEM FEATURES ..... 3
1.7 PRINCIPLE OF OPERATION ..... 3
1.8 PHYSICAL DESCRIPTION ..... 4
1.9 CONSTRUCTION DETAILS ..... 5
1.10 TYPICAL APPLICATION ..... 5
1.11 ADVANTAGES OVER OTHER TRACK MONITORING SYSTEMS ..... 5
**CHAPTER 2** ..... **6**
**2.0 SYSTEM DETAILS** **6**
2.1 INTRODUCTION ..... 6
2.2 APPLICATION ..... 6
2.3 FUNCTIONS PERFORMED BY HASSDAC ..... 6
2.4 BRIEF DESCRIPTION OF CARDS ..... 8
**CHAPTER 3** ..... **12**
**3.0 SYSTEM DESCRIPTION** **12**
3.1 INTRODUCTION ..... 12
3.2 SIGNAL CONDITIONING CARD (Card 1,2 & 7,8) ..... 12
3.3 DUAL MICRO CONTROLLER LOGIC BLOCK CARD (Card 4 & 10) ..... 13
3.4 MODEM CARD: (Card 3&9) ..... 13
3.5 DUAL RELAY DRIVER CARD (Card 5 & 11) ..... 13
3.6 DC-DC CONVERTOR (Card 6&12) ..... 14
3.7 EVENT LOGGER CARD ..... 14
**CHAPTER 4** ..... **15**
**4.0 INSTALLATION PROCEDURE** **15**
4.1 COMPONENTS OF HASSDAC ..... 15
4.2 SUPPORTIVE COMPONENTS ..... 15
4.3 INSTALLATION OF LOCATION BOX ..... 18
4.5 VITAL RELAY ..... 19
4.6 POWER SUPPLY ARRANGEMENT ..... 19
4.7 BATTERIES ..... 19
4.8 BATTERY CHARGER ..... 20
4.9 INTEGRATED POWER SUPPLY ..... 20
4.10 CABLE ..... 20
**CHAPTER 5** ..... **21**
**5.0 INSTALLATION AND SETTING UP HASSDAC** **21**
5.1 INTRODUCTION ..... 21
5.2 ADDRESSING SCHEME ..... 21
1 23
5.3 TRAIN DIRECTION & COUNTING METHOD ..... 24
5.4 SWITCH SETTINGS IN MODEM CARD (card no. 699) ..... 24
5.5 SIGNAL CONDITIONER CARD (SCC Card) ..... 24
5.6 RELAY DRIVER ..... 25
5.7 DC-DC CONVERTER ..... 25
**CHAPTER 6** ..... **26**
**6.0 INTER CONNECTIONS** ..... **26**

**CHAPTER 7** ..... **28**
**7.0 MEASUREMENT OF SIGNAL LEVELS** **28**
**CHAPTER 8** ..... **30**
**8.0 COMMUNICATION PROTOCOL** **30**
8.1 INTRODUCTION ..... 30
8.2 POWER ON AND RESET PACKETS 'J' AND 'R' ..... 30
8.3 COUNT CHANGE PACKET 'C' ..... 30
8.4 COUNT UPDATE PACKET 'U' ..... 30
**CHAPTER 9** ..... **32**
**9.0 SYSTEM SOFTWARE** **32**
9.1 INTRODUCTION ..... 32
9.2 COUNTING OF WHEELS AND COMPUTATION OF DIRECTION ..... 33
9.3 FUNCTIONAL STATES OF HASSDAC ..... 33
**CHAPTER 10** ..... **35**
**10.0 LED INDICATIONS** **35**
10.1 INTRODUCTION ..... 35
10.2 SCC CARDS (Card 1 , 2 & 7,8) ..... 36
10.3 DUAL MLB CARDS (CARD 4 & 10) ..... 36
10.4 MODEM CARD (CARD 3&9) ..... 37
10.5 RELAY DRIVER CARD (CARD 5 & 11) ..... 37
10.6 DC-DC CONVERTER (CARD 6&12) ..... 37
10.8 SYSTEM ERROR CODES ..... 38
10.9 DIAGNOSTICS CHART ..... 48
**CHAPTER 11** ..... **52**
**11.0 EARTHING** **52**
11.1 EARTHING OF HASSDAC ..... 52
11.2 TREATMENT OF SOIL ..... 52
11.3 EARTH LEAD WIRES ..... 52
11.4 LIMITS OF EARTH RESISTANCE ..... 52
11.5 EQUIPMENT TO BE EARTHED ..... 53
11.6 PRECAUTIONS TO BE TAKEN DURING EARTHING ..... 53
11.7 MAINTENANCE AND TESTING OF EARTHS ..... 54
**CHAPTER 12** ..... **55**
**12.0 SURGE VOLTAGE AND LIGHTNING PROTECTION** **55**
12.1 INTRODCUTION ..... 55
12.2 CAUSES OF SURGE VOLTAGE IN POWER AND DATA LINES ..... 55
12.3 PROTECTION OF HASSDAC FROM SURGE VOLTAGES ..... 55
12.4 WIRING DETAILS OF SURGE VOLTAGE DEVICE ..... 56
**CHAPTER 13** ..... **57**
**13.0 SM's RESET BOX** **57**
13.1. FEATURES OF RESET BOX ..... 57
13.2. WORKING OF RESET BOX ..... 58
13.3. INSTALLATION OF RESET BOX ..... 61
13.4 RESETTING PROCEDURE ..... 61
**CHAPTER 14** ..... **64**
**14.0 COMMISSIONING OF SYSTEM** **64**
14.1 PRECOMMISSIONING CHECK OF THE SYSTEM ..... 64
14.2 RESET BOX RB – 259A ..... 64
14.3 SURGE VOLTAGE PROTECTION DEVICE ..... 64
14.4 COMMISSIONING INTO SIGNALLING CIRCUITS ..... 64
**CHAPTER 15** ..... **65**
**15.0 MAINTENANCE SCHEDULE (MONTHLY)** **65**
15.1 TX & RX COIL AXLE DETECTORS (At site) ..... 65
15.2 HASSDAC UNIT (At site) ..... 65
15.3 POWER SUPPLY (Battery Room & Site) ..... 65
15.4 INSPECTION OF RESET BOX (SM's room) ..... 66

15.5 GENERAL ..... 66
15.6 REPAIR OF FAULTY CARDS ..... 66
**CHAPTER 16 ..... 67**
**16.0 TOOLS AND SPARES 67**
16.1 TOOL KIT: ..... 67
16.2 RECOMMENDED SPARES: ..... 68
**CHAPTER 17 ..... 69**
**17.0 DO'S AND DON'TS FOR HA DIGITAL AXLE COUNTER 69**
17.1 DO'S ..... 69
17.2 Don'ts ..... 69
**CHAPTER 18 ..... 70**
**18.0 70**
**INTRODUCTION (EVENT LOGGER) 70**
18.1 SOFTWARE INSTALLATION ..... 70
18.3 DATA ANALYZER SOFTWARE: ..... 72
18.4 DOWNLOADING OF DATA: ..... 73
18.5 DATA ANALYSIS: ..... 77
**ORDERING INFORMATION ..... 78**
**FEED BACK FORM ..... 80**
**DRAWINGS ..... 81**
**PRE-COMMISSIONING CHECKLIST ..... 82**

# 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 has made an effort to design and develop a High Availability Single Section Digital Axle Counter (HASSDAC) 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. Aadvance version of SSDAC is designed known as High Availability Digital Axle Counter(HASSDAC) in which redundancy is given in all sections. Also optional redundancy in SCC cards and track devices is provided. Auto reset feature is given in which if out of two processing units in HASSDAC one unit fail then that unit will get resetted automatically .The High Availability Digital Axle Counter model received by you is DACF-720P for monitoring single section.

### 1.2 MODELS OF SYSTEM

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

i. HASSDAC for 2 Detection point DACF – 720P with single sensor
ii. HASSDAC for 2 Detection point DACF – 720P with dual sensor

System is easily upgradable at site from single sensor to dual sensor and vice versa.

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 HASSDAC units, TX/RX coil Axle detectors and vital relays. The HASSDAC 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. Two 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 in such a way that redundancy is given in counting process, processing unit, communication unit and supply section. Also auto reset feature is given in which out of two units in HASSDAC if one part fail then that part will get reset automatically. In case of failure of both the parts in HASSDAC the station master has to apply the reset and after that the system goes to preparatory state. One pilot train has to be moved (piloted) in the section for system (both units) 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 fail safe operation. The redundancy is built into the system design by means of 2 out of 2 Micro Controller decision. Also redundancy is provided in processor unit, communication, supply section, relay driver circuit and counting section (Optional) i.e now 2 Nos. of Dual Microcontroller Cards are available along with 2 Nos of Modem Cards. Two computing elements are built in each processor unit 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 HA Digital Axle Counter has two micro controllers in each Microcontroller card 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 separate channels).

e. Opto isolated Dual vital relay drive.

f. Fail safe operation.

## 1.6 SYSTEM FEATURES

i. Trackside electronic counting equipment

ii. Web mounted type/ Clamp 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).

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

v. Auto reset feature available.

vi. Easy to install, commission and maintain.

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

The HASSDAC model No – DACF-720 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 High Availability Digital Axle Counter System in full comprises of: -

i. Axle detectors AD 711/ AD 711 FS

   a. TX coils - 2 Nos. For single sensor type, 4 Nos for dual sensor type

   b. RX coils - 2 Nos. For single sensor type, 4 Nos for dual sensor type

ii. DACF 720P - 2 Nos. (Two Detection)

iii. Vital Relay Box VR-722 2 Nos

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

   - 2 Nos. for independent resetting

The HA Digital Axle Counter System works in combination of 2 units (1 pair) for one-track section. One HASSDAC Unit of the system is installed at each end of the track section along with two 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 HASSDAC 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 processing unit sends its count to the first processing unit located at the other end of the track section at regular intervals. Similarly the first processing unit receives the count status from the first processing unit of the system. Same process happens for second processing unit located at each location. 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 HASSDAC unit. Each HASSDAC 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 any one out of two or both the Vital Relay are 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 HASSDAC Unit of the Digital Axle Counter system is manufactured in a 3U height and 366mm width desktop enclosure. The system comprises of twelve 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. A008805 (Page D9) shows the front

view of the HASSDAC using Single set of track devices and Drawing no. A008806 shows the front layout of HASSDAC using Dual set of track devices.

The cards must be inserted in the order of card 1 to 12 from left to right in the sub rack. The various dimensions of the system are as follows.

- Width: 366.0 mm.
- Height: 133.0 mm (3 U)
- Depth: 310.0 mm

## 1.9 CONSTRUCTION DETAILS

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

## 1.10 TYPICAL APPLICATION

The HASSDAC system can be used for monitoring single track section with 2 detection points. **Refer Drawing no. B008799A4 (Page no. 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. (<2.5 A @ 24V DC for complete system)
iv. Cable requirement is 1 Quad.
v. Redundancy available in all sections.
vi. Can use Quad & OFC simultaneously for communication.
vii. Q type Vital Relay 24V, 1000 Ohm output at both locations.
viii. Trolley suppression track circuit is not required if standred trolley wheels are used.
ix. Two parallel outpus available. Failure in one donot lead to train detentation.
x. Auto reset for one failed output.

# CHAPTER 2

## 2.0 SYSTEM DETAILS

### 2.1 INTRODUCTION

The system comprises of trackside HASSDAC 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 HASSDAC.
vii. Output for Vital Relay.
viii. Read Back of Vital Relay

### 2.2 APPLICATION

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

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

### 2.3 FUNCTIONS PERFORMED BY HASSDAC

The various functions performed by HASSDAC units are described below.

#### 2.3.1 TX AND RX COIL AXLE DETECTORS

Each dual sensor detection point comprise of 2 no. of Transmitter coil and 2 no. of Receiver coil and single sensor detection point consists of one number of transmitter coil and one number of receiver coil. The HASSDAC 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 in or out of the section through that particular detection point.

### 2.3.5 Auto Resetting:

The system has auto resetting facility. If one processing unit has failed then the other normal processing unit will reset the failed unit. If in case one unit is failed then LR relay will pick and give reset voltage to failed unit through drop contact of VR of failed unit. After resetting, the failed unit attains preparatory state with one increment in respective counter in VR box at location and become clear after next train movement. High availability system uses proven electronic circuits of standard SSDAC, duplicated on same board/card. This system also facilitates use of redundant communication channels by using quad/OFC to overcome common mode failures. System provides two vital relay outputs from two channels that are used in `OR' mode to interface with interlocking/block circuits. System uses `Auto-reset Feature' to reset the failed channel or system by correctly working channel under steady state conditions. Complete electronics of high availability SSDAC system is integrated in a single channel unit. Interfaces for the operator still remains the same and he is required to manually reset the system only when both channels of the systems have failed. Single reset interface will send reset command to both the channels and the reset command is extended to electronic via drop contact of vital relay of concerned channel.

**Transmission and Reception of Counts between the two units of HASSDAC**

In Independent mode of operation, 1st unit of HASSDAC periodically sends its wheel counts to the second unit of HASSDAC i.e processing unit 1 in entry sends to processing unit 1 in Exit and Processing unit 2 in entry sends to Processing unit 2 in exitunit. Similarly, the 1st unit of HASSDAC receives wheel counts from 2nd unit of HASSDAC. 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 HASSDAC are matched and equal, then the vital relay is driven to Pick Up by the Relay Driver cards. Both vital relays are made parallel in VR box. Hence even if onr VR is pick up final VPR picks up in relay room.

### 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 HASSDAC is given in **Drawing no. B008804A4 (Page no. D6).** CEL HASSDAC is designed to accommodate two sets of identical circuit of single section digital axle counters into single chassis. Each set of SSDAC circuit consists of one number each of Signal Conditioner card 1 (SCC1), Signal Conditioner card 2(SCC 2), Dual MLB card, Modem card, Relay Driver card, DC DC converter card and Event logger card interconnected through Mother board.

Single Sensor HASSDAC and Dual Sensor HASSDAC units are configurable using different number of cards and use of jumpers. In the dual sensor variant of HASSDAC all the cards along with two sets of sensors are used for achieving 100% redundancy, whereas, in the single sensor variant, common sensor along with associated SCC card is used.

The HASSDAC comprises of following functional card modules. The HASSDAC system is based on 2-out-of-2 Micro Controller architecture. Both the Dual Micro Controller cards receive the wheel pulses from the signal conditioner cards. The wheel counts are counted independently. Each of the two Dual Micro Controllers receives the wheel count from the remote Axle Counter

system and computes the track status independently. Both the Dual Micro Controller cards give the command for relay driving the respective vital relay. If both the dual Micro Controller agrees on count status and health, the respective Vital Relay is driven to pick up otherwise it remains dropped. Each unit of HASSDAC consists of following modules. These modules implement the functions described in section 2.1.

i. Signal Conditioner Cards (Card1,2& 7,8)
   a Carrier Signal Generation
   b Demodulation and Pulse generation.

ii. Dual Micro controller logic blocks (2 micro controllers) (Card 4&10)
   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)
   a. For storage of events in the system.

iv. Modem Card (Card 3&9)
   a. Serial I/O Multiplexer
   b. Resetting Circuit

v. Relay Driver Card (Card 5 & 11)
   a. Output drive for vital relay & PR Relay

vi. Power Supply Module (DC-DC converter) (Card 6&12)
   a. All the supply voltages required in HASSDAC are generated
   b. Both DC-DC converter card are independent

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 12 starting from left within the sub rack.

### 2.4.1 SIGNAL CONDITIONER CARD (SCC) (Card 1,2 &7,8)

#### 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.

Card at position 7,8 are used if dual track devises are used otherwise dummy cards are used at position 7,8

#### 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 DUAL MICRO-CONTROLLER LOGIC BLOCK CARD (MLB) (Card 4&6)

The Dual 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 HASSDAC and decision making to give output. The input pulses are given to both the Dual Micro Controller Logic Blocks. Both the dual 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 controllers in each 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 3&9)

Two V.21 Modems are used for communication between two units of HASSDAC, hence provide redundancy for the communication part of unit. The digital packets generated by dual MLB cards are sent to remote unit on two pairs 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 HASSDAC reset circuit is included in the modem cards 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. The modem card at Entry Unit (Card 3 & 9) shall be at 1650 Hz and the cards in Exit Unit (Card 3 & 9) shall be at 980 Hz frequency. The modem cards in Entry units shall be at 1650 Hz irrespective of address setting of individual axle counters i.e even if second axle counter in Entry unit is made as Exit, to install track devices on right rail. **(Refer 5.2 on page 21 for address scheme)**

### 2.4.4 RELAY DRIVER CARD (Card 5 & 11)

The card module checks & generates the respective 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 6&12)

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. Both the cards are connected in parallel mode so that if one card stop functioning the another one will take care of it.

### 2.4.6 EVENT LOGGER CARD

Event Logger card is designed to capture and store important signals from the remote and local HASSDAC 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 HASSDAC. The data can be analyzed with the help of CEL Data analyzer software. 02 nos of such event logger cards are provided in Unit.

**CONFIGURATION TABLE FOR SINGLE SENSOR & DUAL SENSOR HASSDAC**

| Sr.No. | Slot Number | Single Sensor HASSDAC | Dual Sensor HASSDAC |
|---|---|---|---|
| 1. | 1 | SCC Card (21 KHz Freq.) | SCC Card (21 KHz Freq.) |
| 2. | 2 | SCC Card (23 KHz Freq.) | SCC Card (23 KHz Freq.) |
| 3. | 3 | Modem Card | Modem Card |
| 4. | 4 | Dual MLB Card | Dual MLB Card |
| 5. | 5 | Dual Relay Driver Card | Dual Relay Driver Card |
| 6. | 6 | DC DC Converter Card | DC DC Converter Card |
| 7. | - | Event Logger Card (At back Plate) | Event Logger Card (At back Plate) |
| 8. | - | Mother Board | Mother Board |
| 9. | 7 | Dummy Card | SCC Card (21 KHz Freq.) |
| 10. | 8 | Dummy Card | SCC Card (23 KHz Freq.) |
| 11. | 9 | Modem Card | Modem Card |
| 12. | 10 | Dual MLB Card | Dual MLB Card |
| 13. | 11 | Dual Relay Driver Card | Dual Relay Driver Card |
| 14. | 12 | DC DC Converter Card | DC DC Converter Card |
| 15. | - | Event Logger Card (At back Plate) | Event Logger Card (At back Plate) |
| 16. | - | Mother Board | Mother Board |
| 17. | - | One to one connector at P7 and P10 connected at back. | One to one connector at P7 and P10 is removed. |
| 18. | - | Current drawn from 24 V DC supply is around 750 mA. | Current drawn from 24 V DC supply is around 1.0 Amp |

# CHAPTER 3

## 3.0 SYSTEM DESCRIPTION

### 3.1 INTRODUCTION

The HASSDAC Counting Unit comprises of the following cards.

| | | | |
|---|---|---|---|
| i. | Signal Conditioning Card | Card 1 & 2 | 2 Nos. |
| ii. | Signal Conditioning Card(Optional) | Card 7 & 8 | 2 Nos. |
| iii. | Dual Micro Controller Logic | Card 4 & 10 | 2 Nos. |
| iv. | Event Logger | At the back plate | 2 Nos |
| v. | Modem | Card 3&9 | 2 No. |
| vi. | Dual Relay Driver | Card 5 & 11 | 2 No |
| vii. | DC-DC converter | Card 6&12 | 2 Nos |
| | | | --- |
| | | Total: | 14 Nos. |
| | | | --- |

The card details are described in following sections.

### 3.2 SIGNAL CONDITIONING CARD (Card 1,2 & 7,8)

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 HASSDAC 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 coil from rail web. No metal parts / metal sheets / metal foils shall be placed near Tx/Rx coils.

## 3.3 DUAL MICRO CONTROLLER LOGIC BLOCK CARD (Card 4 & 10)

The Dual 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 – Two blocks of 8 LED indicators for count progress / error display, 2 independent LED indicators for section status.

## 3.4 MODEM CARD: (Card 3&9)

The Modem card being used is of V.21 type (2 wires) in High Availability Single Section Digital Axle Counter (HASSDAC). The card interfaces with serial RS232C port of dual Micro controller Logic Block card. 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. HASSDAC reset circuit including the reset voltage window and reset timing window function.

## 3.5 DUAL RELAY DRIVER CARD (Card 5 & 11)

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

plugs into the motherboard of HASSDAC. One dual RD card is used in each HASSDAC counting unit. The dual Relay Driver card receives the command of clear and clock signals from two dual MLB cards and drives the respective vital relay to energized condition (Pick up) when section is clear. If a train occupies the section,both the vital relays are 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 6&12)

The DC-DC Converter card converts 24Vdc input to different DC Power supply required by the HASSDAC in an extended Euro size board that is plugged directly in to the HASSDAC motherboard. Both the DC-DC converter cards are connected independent to each other i.e if one card fails corresponding processing unit will fail. All the output voltages are monitored, if any output voltage goes beyond predefined level the complete DC DC card gets switched OFF and system is driven to safe state. To switch ON the same card again switch OFF the corresponding 24 V input supply switch provided at the back of system for 12 seconds or more and then switch ON. The DC DC Card may again trip if problem persists.

The main features of both the boards 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.
vi. All the outputs are monitored

## 3.7 EVENT LOGGER CARD

Please refer chapter 18 for details.

# CHAPTER 4

## 4.0 INSTALLATION PROCEDURE

### 4.1 COMPONENTS OF HASSDAC

The HASSDAC consists of the following equipments: -

i. TX & Rx Coil Axle Detectors - 4 Nos.dual sensor (2 Nos for single sensor)

ii. HASSDAC Counting Unit - 2 Nos.

iii. Vital Relay Box - 2 Nos.

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

v. Din Rail Mounted Surge Voltage Protection Device - 2 Nos.

### 4.2 SUPPORTIVE COMPONENTS

| S.No. | Supportive equipment and accessories | Quantity | | |
|---|---|---|---|---|
| | | Station Area(1 No. HASSDAC) | Block Section (S/L) 1 No. of HASSDAC | Block Section (D/L) (2 No. of HASSDAC) |
| 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<br>For HASSDAC (Station to Station)<br>For reset box (From Location to SM's Room) | 0.9 mm<br>(2 Pairs)<br>(2 Pair) | 0.9 mm<br>(2 Pairs)<br>(2 Pair) | 0.9 mm<br>(4 Pairs)<br>(4 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 | 4/8 Nos. | 4 /8 Nos. | 8/16 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 /Clamp type Transmitter Coils (TX coil)

ii. Web Type/ Clamp 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 HASSDAC.

iv. The Axle detectors separation between two sets of different HASSDAC 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.

x. If dual sensor HASSDAC is being installed it is advised to install one sensor on left rail and one sensor on right rail with minimum diagonal distance of 2 meters to avoid cross interference. Also the gap shall not be much more as it is desirable that both processing units go in occupied state almost simultaneously.

### 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 the drilling shall be carried at 86 mm from top of Rail.

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 for corresponding processing unit i.e. sensor mounted on left rail

and processing unit 1 shall be connected to remote unit having sensor on left side rail of the track. ***The drawing no. I008072A4 page no. D28 and Drawing no. F008811 Page no. D28a.***

ix. **Note**: If it is connected 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 HASSDAC Counting Unit & Vital Relay Box.

iv. The VR box consists of 4 relays i.e. 2 numbers of VR & one Reset Relay Q Type, 24V and 1000Ω type and one dual PR relay. 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. S008809A3. (Page no. D18, D19 & D19a)***

### 4.3.2 TERMINAL BOARD

i. The incoming and outgoing cables are terminated on spring cage type connectors from M/s WAGO or M/s Phoenix fitted at the back of the unit.

ii. HASSDAC COUNTING UNIT

The HASSDAC is installed on the wooden/ Hylam /NFTC plank inside the location box. This is firmly fixed using clamps, nuts & bolts.

## 4.4 VITAL RELAY

The VR Box is to be installed on the same wooden/Hylam/NFTC plank inside the location box where HASSDAC unit has been installed. The VR Box is also firmly fixed using clamps, nuts & bolts. The dual PR relay contacts can be extended to relay room for proving PPR relay. VR Box consists of two Vital relays , one Preparatory relay and one Logic relay . VR Box now has two red and two green LED for respective VR, two yellow colour LED and it will glow when particular section is in Preparatory mode and one yellow colour LED for RR relay which will glow when Reset Relay get picked up i.e in case of auto resetting. Both the VR relay outputs are **'OR'** to pick up the Final VPR relay in relay room. Separate counters are provided in Vital Relay Box for each processing unit which is incremented only on auto reset. This helps in maintaining data related to failure of individual processor units.

## 4.5 POWER SUPPLY ARRANGEMENT

The power supply to HASSDAC 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 HASSDAC unit .

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 HASSDAC units of double line block section.

This power supply should not be used for any other signaling gear/systems. ***Refer drawing no. S008809A3 Page 18.***

## 4.6 BATTERIES

The 24V, 40 AH low Maintenance Battery (12V X 2Nos.) or 24V; 40AH Battery Bank may be used for powering the two units of HASSDAC. 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.

## 4.7 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 HASSDAC unit is <1.25A @ 24V. For complete system (2 HASSDAC units) it is <2.5A @ 24V.

## 4.8 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 HASSDAC units instead of Battery.

## 4.9 CABLE REQUIRMENT

- 2 core x 25 Sq. mm Aluminum cable / 12 core signal cable for 24V supply from relay room to Location box, for Single and Double Line (Same as SSDAC)
- 6 core signal cable for VPR, PPR & Reset voltage from relay room to location box for single line
- Communication Media: 2 pairs of quad cable / one pair of quad cable & one OFC channel / Two OFC channels between station to station.
- Quad cable – 2 pairs (1 quad) from location to relay room for display in reset box

## 4.10 CABLE REQUIRMENT EXTRA FROM SSDAC

- The HASSDAC System is designed in such a way to reduce the cable requirement and can work with same cables that are used in SSDAC with following addition:
- One extra quad pair ( 2 Conductors) from Location to SM Panel for data display of second processing unit.
- One extra quad pair / OFC channel from station to station.
- If some railway do not want to cut cable cost and want to repeat both VR and both PR at Relay Room, then two numbers of SSDAC model DACF-710 P/A may be used in parallel with CEL auto reset box at Relay Room.

# CHAPTER 5

## 5.0 INSTALLATION AND SETTING UP HASSDAC

### 5.1 INTRODUCTION

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

**Note : Address setting scheme is slightly different in HASSDAC as compared to SSDAC.**

### 5.2 ADDRESSING SCHEME

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

The Counting Units of HASSDAC 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 relays to pickup is also built in the HASSDAC units. The HASSDAC system for 2D, therefore, monitors and provides the track clear/occupancy status of the section.

#### 2D system for Single Section (Refer Drawing no. B008799A4, page no. D1)

The 2D system is designed by means of one pair i.e. 2 HASSDAC 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 HASSDAC units are provided with unique address schemes for selection of 15 different pairs of units by means of 8-way dip switch SW1 on each motherboard. There are two motherboards and hence two SW1 switches in each mother board. We have selected the first and second pair in factory and units are supplied.

**For single sensor HASSDAC** address setting in Entry unit for first processing unit is set 02, and for second processing unit it is set as 04. Correspondingly in Exit unit address for first processing unit is set as 03 and for second processing unit it is set as 05. Hence first processing unit at Entry with address setting 02 shall be connected to first processing unit at Exit with address setting 03. Similarly second processing unit with address setting 04 shall be connected to processing unit with address setting 05. First 06 cards combined together with corresponding Mother Board are called first processing unit and 7 to 12 card with corresponding Mother board are called second processing unit in Entry unit or Exit unit.

In single sensor configuration if track devices are connected on left rail entry unit shall be placed in location where train enters and exit unit where train exit. If however track devices are mounted on right rail, Exit unit shall be placed at the location where train enters and entry unit at location where train exit. **Refer drawing no. I008072, Page no. D28.**

**For dual sensor HASSDAC** address setting in Entry unit for first processing unit is set 02, and for second processing unit it is set as 04. Correspondingly in Exit unit address for first processing unit is set as 03 and for second processing unit it is set as 05. It shall be noted that it is recomanded to use one track device on left rail and one on right rail in case of dual sensor HASSDAC. **(Refer drawing no. F008811, Page D28a)** When the right rail is selected for second processing unit address of second processing unit shall be made 05 in Entry unit and address for second processing unit in Exit shall be made 04. Second processing units of Entry & Exit unit shall be connected to track devices mounted on right rails. Otherwise system will generate Error code 35 after pilot train movement in preparatory state.

***Caution: The HASSDAC 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 DIP switch on mother board of processing unit 'A' and processing unit 'B' (to access this switch, open 6 no's of screws on back cover).

The factory setting address provided by selecting the following switch position in the units.

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

| SW1 | Selection |
|---|---|
| 1 | OFF |
| 2 | ON |
| 3 | OFF |
| 4 | ON |
| 5 | ON |
| 6 | ON |
| 7 | ON |
| 8 | ON |
| 0Ω Resistance | Connected |

**Processing Unit 1: 03 (Exit)**

| SW1 | Selection |
|---|---|
| 1 | OFF |
| 2 | OFF |
| 3 | OFF |
| 4 | ON |
| 5 | ON |
| 6 | ON |
| 7 | ON |
| 8 | ON |
| 0Ω Resistance | Connected |

**Pair 2: Processing Unit 2: 04 (Entry) Processing Unit 2: 05 (Exit)**

| SW2 | Selection |
|---|---|
| 1 | OFF |
| 2 | ON |
| 3 | ON |
| 4 | OFF |
| 5 | ON |
| 6 | ON |
| 7 | ON |
| 8 | ON |
| 0ΩResistance | Connected |

| SW2 | Selection |
|---|---|
| 1 | OFF |
| 2 | OFF |
| 3 | ON |
| 4 | OFF |
| 5 | ON |
| 6 | ON |
| 7 | ON |
| 8 | ON |
| 0Ω Resistance | Connected |

The 8 way switch SW1 can be viewed on to the mother board after opening back cover.

In HASSDAC system there are two DIP switches in each Unit corresponding to processing unit A and Processing unit B. Both DIP switches in Entry Unit shall have entry setting and both settings shall be different from each other. For example processing unit A and B shall have address 02 & 04 in Entry Unit where as in Exit Unit Processing Unit A & B shall have address setting 03 & 05 respectively. Mother board with address setting 02 will communicate with mother board having address setting 03.

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

## 5.3 TRAIN DIRECTION & COUNTING METHOD

In case of block section, the HASSDAC units are to be installed at each end of the block section. One of the HASSDAC 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 (card no. 699)

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 SW1 is given below in table 5.3. The dip switch can be accessed by removing the card shield of modem card.

**Table 5.3A: Dipswitch (2-way) selection in Modem Card**

| SNO | HASSDAC Units (Card no. 3) | Dipswitch Settings SW1 | |
|---|---|---|---|
| | | 1st Way | 2nd way |
| 1 | Exit Unit | OFF | OFF |
| 2 | Entry Unit | ON | ON |
| SNO | HASSDAC Units (Card no. 9) | 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 and 7&8 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 2.2 Volts. 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 respective Vital Relay to Pick Up condition. There is no adjustment required in this card. The vital Relay is also checked (read back) in the system as per the driving output. 02 nos of such cards are provided in entry unit and 02 nos in exit unit.

## 5.7 DC-DC CONVERTER

The DC-DC converter card provides all DC supply voltages required for powering ON the circuits of HASSDAC. 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. In HASSDAC two DC-DC converter cards are used as both are connected independent to each other.

# CHAPTER 6

## 6.0 INTER CONNECTIONS:

Wiring details for SSDAC (HA) and VR box with wago terminals

| HASSDAC | VR Box | OTHERS |
|---|---|---|
| **1** | 6 | - |
| **2** | 7 | - |
| **3** | 8 | - |
| **4** | 9 | - |
| **5** | 10 | - |
| **6** | - | Card 636-4 WG2-3 ($2^{nd}$ Card) (Modem 2) |
| **7** | - | Card 636-4 WG2-4 ($2^{nd}$ Card) (Modem 2) |
| **8** | - | Card 636-4 WG2-5 ($2^{nd}$ Card) (Display 2) |
| **9** | - | Card 636-4 WG2-6 ($2^{nd}$ Card) (Display 2) |
| **10** | 5 | - |
| **11** | - | RX 21 |
| **12** | - | RX21 |
| **13** | - | RX23 |
| **14** | - | RX23 |
| **15** | - | TX21 |
| **16** | - | TX21 |
| **17** | - | TX23 |
| **18** | - | TX23 |
| **19** | - | TP2 OUT |
| **20** | - | TP2 IN |
| **21** | - | - |
| **22** | 13 | - |
| **23** | 14 | |
| **24** | - | - |
| **25** | - | - |
| **26** | - | - |
| **27** | - | - |
| **28** | - | - |
| **29** | 25 | - |
| **30** | 26 | - |
| **31** | 18 | - |
| **32** | 19 | - |
| **33** | 20 | - |

| | | |
|---|---|---|
| **34** | 21 | - |
| **35** | 22 | - |
| **36** | - | Card 636-4 WG2-3 (1st Card) (Modem 1) |
| **37** | - | Card 636-4 WG2-4 (1st Card) (Modem 1) |
| **38** | - | Card 636-4 WG2-5 (1st Card) (Display 1) |
| **39** | - | Card 636-4 WG2-6 (1st Card) (Display1) |
| **40** | 17 | - |
| **41** | - | RX 21 |
| **42** | - | RX21 |
| **43** | - | RX23 |
| **44** | - | RX23 |
| **45** | - | TX21 |
| **46** | - | TX21 |
| **47** | - | TX23 |
| **48** | - | TX23 |
| **49** | - | TP1 OUT |
| **50** | - | TP1 IN |
| **51** | - | Card 636-4. WG2-2 (1st Card) (+24V) |
| **52** | - | Card 636-4. WG2-1 (1st Card) (-24V) |
| **53** | - | |
| **54** | - | |
| **55** | - | |
| **56** | - | |
| **57** | - | |
| **58** | - | |
| **59** | - | Card 636-4. WG2-2 ( 2nd Card) (+24V) |
| **60** | - | Card 636-4. WG2-1 ( 2nd Card) (-24V) |
| **-** | 23 | R1-PPR |
| **-** | 24 | R2-PPR |
| **-** | 27 | R1-VPR |
| **-** | 28 | R2-VPR |
| **-** | 1 | (+) 24V DC |
| **-** | 2 | (-) 24 V DC |
| - | 3,4 | Refer drawing D31 and D32 |

Note: Logic Relay (LR) or Reset Relay (RR) is same Relay with two designators.

# 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 HASSDAC 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) Card 1 | TX Coil 2 (23KHz) Card 2 | TX Coil 1 (21KHz) Card 7 Optional | TX Coil 2 (23KHz) Card 8 Optional |
|---|---|---|---|---|---|---|
| 1. | Oscillator output | 30V to 40Vrms | | | | |
| 2. | Oscillator Freq. | I) 20.80 to 21.20 KHz<br>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 (Card 1&2) | Measured Value (Card 7&8) optional |
|---|---|---|---|---|
| 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 6&12)

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

| S.No. | Parameter | Limit (DC Volts) | Measured output for card 6 (DC Volts) | Measured output for card 12 (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 3&9)

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

| S.No. | Measuring Limit (mV rms) | Measured Output for card 3 (mV rms) | Measured Output for card 9 (mV rms) |
|---|---|---|---|
| 1 | >300 mV (-6 dB) | | |

## 7.7 RELAY DRIVE (CARD 5 &11)

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

| S.No. | Parameter | Measuring Limit (DC volts) | Measured Output for VR1 (DC Volts) | Measured Output for VR2(DC Volts) |
|---|---|---|---|---|
| 1 | Clear mode | >20V | | |
| 2. | Occupied mode | < 2V | | |

# CHAPTER 8

# 8.0 COMMUNICATION PROTOCOL

## 8.1 INTRODUCTION

The HASSDAC 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 HASSDAC units are energized and are holding in stuck condition. The HASSDAC 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 HASSDAC 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 HASSDAC keeps sending the J Packet at regular intervals till R Packet is received from the other HASSDAC.

## 8.3 COUNT CHANGE PACKET 'C'

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

## 8.4 COUNT UPDATE PACKET 'U'

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

The details of the packet are as explained below:

**XX : U42 0005 FFFB 2**

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 dual micro controller logic block card (MLB) in the HASSDAC. Both the dual MLB's are performing exactly the same functions. Both the dual MLB's are receiving the pulse and supervisory signals from the Signal Conditioning cards. The dual MLB's are continuously monitoring and evaluating the pulse and supervisory signals coming from the Signal Conditioning cards. The dual 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.

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

i. Monitor and Receive Pulse signals
ii. Output Pulse signals to other microcontroller
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 HASSDAC
vii. Decode message packets received from the remote HASSDAC
viii. Determine the number of axles in the section
ix. Control and supervise the status of Vital Relay

Each Dual MLB keeps track of three different counts -

i. Primary Count — Its own wheel count
ii. Secondary Count — wheel count of 2$^{nd}$ micro controller and
iii. Remote Count — Count values of remote HASSDAC unit.

Each dual 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 microcontroller.

Therefore, the other microcontroller 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 microcontrollers in dual MLB checks the original pulse input signals and filtered pulse signals received from other microcontroller 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 microcontroller.

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

## 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 HASSDAC

The HASSDAC functional states are implemented as a set of four states. At any point of time, the individual processing units in HASSDAC are 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 HASSDAC after ensuring that there is no train in the block section. After which the HASSDAC units performs Self Test and the units are normal the system goes to preparatory state. The HASSDAC comes to clear state after movement of a pilot train in the section.

### 9.3.2 CLEAR STATE (SECTION CLEAR)

The HASSDAC unit enters this state when the net counts value of the section matches (wheel count are same in both the Counting Units of HASSDAC 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 HASSDAC. The health status of both the HASSDAC units is also OK.

### 9.3.3 OCCUPIED STATE (SECTION OCCUPIED)

The HASSDAC unit enters this state when the count value of the section is different between the two units of HASSDAC 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 HASSDAC, both 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 HASSDAC 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 HASSDAC 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 HASSDAC 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 HASSDAC 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 HASSDAC 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. DUAL MLB CARD**

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

ii. Clear/Occupied (Bi colour LED) - (Green)Glows for clear condition/ (Red)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 CARD**

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

**5. DC-DC CONVERTER**

i. + 5V (Green LED)

ii. +12V (Green LED)

iii. +24V (Green LED)

iv. +15V ISO (Green LED)

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

## 10.2 SCC CARDS (Card 1 , 2 & 7,8)

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.

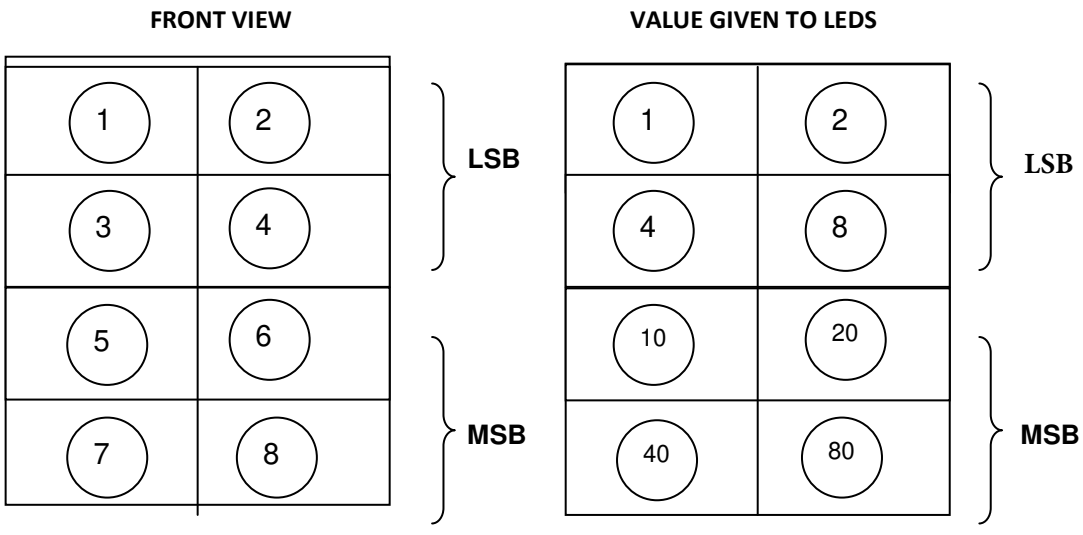
During train movement, this LED changes between OFF and ON. It is visible during slow movement of train

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

## 10.3 DUAL MLB CARDS (CARD 4 & 10)

**10.3.1** The errors occurring in the system during the operation of the HASSDAC are encoded and are indicated by means of the Two 8-LED block present on the front panel of the Dual 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 DUAL 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 3&9)

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 5 & 11)

I. RELAY DRV. OK 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 6&12)

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.

## 10.8 SYSTEM ERROR CODES

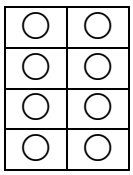
The two MLB cards continuously check and monitor the health of the system. During Normal working condition of the system, there won't be any error and all the LED's are OFF. When the system detects error, it will be displayed on these cards by means of flashing / glowing one or more LED's for the particular 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

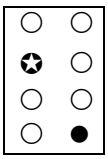
During normal condition of the system all the 8 LEDs are OFF in both MLB cards.



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

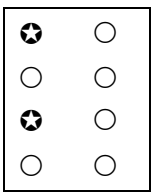
● Indicates LED is ON

## 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

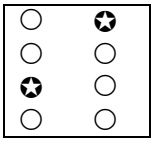
The ROM of the microcontroller is checked during the Power on Self test (POST). If the memory test is passed, this error will not appear. If any location of ROM is corrupted, the error No. 11 is displayed.



| 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

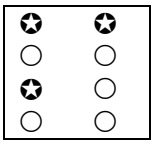
The RAM of the microcontroller is checked during the Power on Self test (POST). If the memory test is passed, this error will not appear. If any location of RAM is corrupted, the error No. 12 is displayed.



| 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

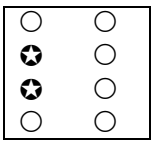
The Serial port of the microcontroller is checked during the Power on Self test (POST). If the serial port test is passed, this error will not appear. If any serial port test is failed, the error No. 13 is displayed.



| 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

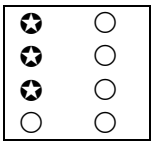
The presence of each card is checked in the system. If all the cards are intact and present in the system, this error will not appear. If any card is removed or not inserted properly in the unit, the error No. 14 is displayed.



| 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

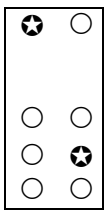
During Self Test (POST) the vital relay connected to the system is also checked. If the relay is present, this error will not appear. If relay is not connected, the error No. 15 is displayed.



| 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

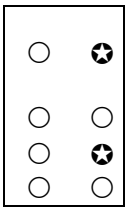
The ROM of the microcontroller is checked during the normal working of the system. At all times, ROM is checked. If any location of ROM is corrupted during system working, the error No. 21 is displayed.



| 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

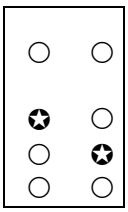
The RAM of the microcontroller is checked during the normal working of the system. If the RAM is found faulty at any time of operation, the error No. 22 is displayed.



| 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

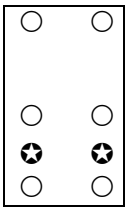
This error is displayed when any of the cards are taken out from the unit in power ON condition



| 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

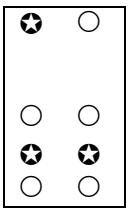
The link error is detected when the link between the two HASSDAC units is open or loss of carrier detector CD. This is displayed as error No. 30.



| 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

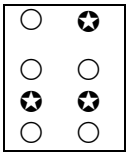
Software checks the pulse sequence when axle is detected on the sensor.



| 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

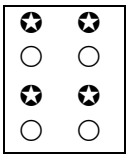
Software checks matching of counts in MLB cards after detection of all the axles passed over the axle detectors. If difference of counts is noticed, then the error 32 is displayed.



| 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

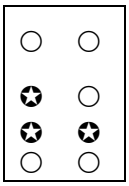
This error will be displayed if the system is in error state and after that there is train movement in the section. Error 33 will be displayed in the unit having error 80. Secondly, error 33 will be displayed after reset is applied in the system and while the system is trying to synchronize, there is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

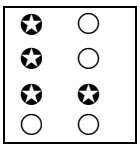
This error will be displayed when the system is in preparatory state and there is train movement out of the section without entering the section.



| 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

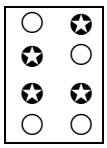
This error will be displayed if counts registered in the system are less at the Entry end while train entering the section than the counts registered at the Exit end while train is leaving out of section i.e. counts into the section are less than the counts out of the section.



| 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

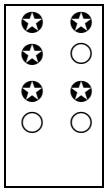
This error will be displayed when train moving forward & backwards (shunting) on axle detectors without proper direction influencing only external detector twice without affecting internal detector. The system checks and locks this as an error.



| 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

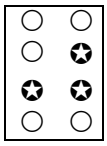
Supervisory error is displayed if any of the axle detectors signal level becomes low. Immediately MLB cards detect this and error 37 flashes on the MLB.



| 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.<br>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

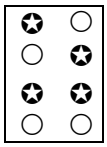
This error will be displayed when train is moving forward & backwards (shunting) on axle detectors without proper direction in such a way that both detectors are influenced & internal detector is influenced twice. The system checks and locks this as an error.



| 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

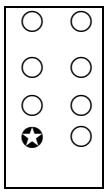
This error will be displayed when counts counted by the MLB card does not matches. Count Unequal Error is displayed. The system checks and locks this as an error.



| 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

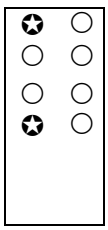
The communication error is displayed when communication between the two units is not proper i.e. packet information is corrupted due to noise in the Quad Pair used.



| 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

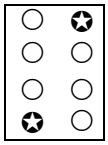
The CRC Error is displayed when data of the packets gets corrupted. Due to this the CRC of the packet does not matches.



| 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

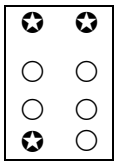
The EOB error is displayed when data of the packets gets corrupted. Due to this the End of packet is not detected.



| 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

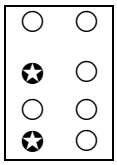
This is the Error related to the sequence of pulses from the axle detectors and SCC cards.



| 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)

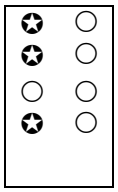
The Error occurs if the wheel is moved in such a way that independent pulses are generated by system in forward direction. This happens only if motor trolley wheel that are similar in diameter is moved beyond the permissible limit.



| 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)

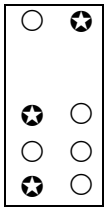
The Error occurs if the wheel is moved in such a way that independent pulses are generated by system in reverse direction. This happens only if motor trolley wheel that are similar in diameter is moved beyond the permissible limit.



| 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

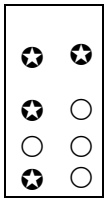
This error is displayed if the section occupancy and section clearance by different type of wheel i.e. section is occupied by train but clears by motor trolley wheel and vice versa.



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

## 26. ERROR NO 47 – TRAIN TROLLEY MISMATCH ERROR

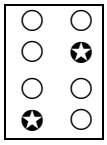
This error is displayed if following Motor trolley shunts back or if only train entered the section and crossed exit and leaving two counts, now motor trolley leaves section balancing counts.



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

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

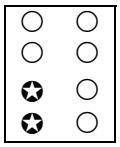
This error is displayed if motor trolley enters the section and after that train enters the section.



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

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

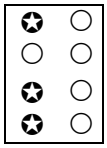
During power on self test (POST) of the system the presence of relay is checked. If relay is not present then, the error No. 50 is displayed.



| 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

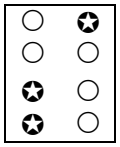
During section occupied of the system, the making of back contact (Dropped) of the vital relay is checked. If it is found open when section is occupied, the error no. 51 is displayed



| 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)

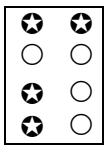
After counts are equal from the train passed in the section, the system goes to clear state (clear). The relay driver card drives the vital relay to pick up, but relay fails to pick up then the error No. 52 is displayed.



| 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

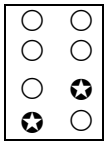
The system after detection of train in the section goes to OCCUPIED state but vital relay fails to drop then the error No. 53 is displayed.



| 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

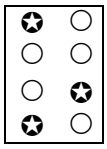
Both MLB's will be working in tandem and software shall follow a particular sequence. If any sequence is missed, then Tracing Error is generated.



| 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

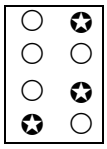
Both MLB's will be working in tandem and should be in agreement for any decision. Suppose MLB1 card is in different state from that of MLB2 card or vice versa, the system will generate the error 61.



| 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

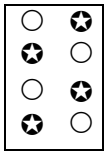
The error is generated if any of the CPU fails to respond with its adjacent CPU due to failure of any components.



| 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

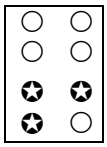
This error is generated if the power supply interruptions are taking place in the system.



| 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

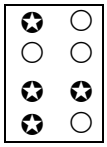
The error is generated if address of the units is found to be different as per the factory settings or both Entry and both Exit Units have been used in the section.



| 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

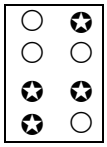
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



| 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

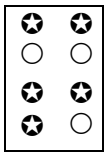
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



| 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

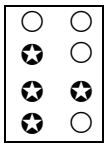
The error is detected when the address of unit is changed while the system is running.



| 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

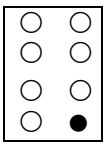
The error is generated if address of the units is found to be different as per the factory setting or both Entry and both Exit units have been used in the section.



| 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

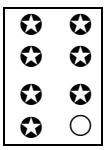
This error code is displayed if any error is detected in the remote unit.



| 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

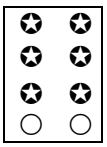
The error is generated in the local unit when remote unit is resetted.



| 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 HASSDAC units. |

## 43. ERROR NO 3F – SELF RESET ERROR

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



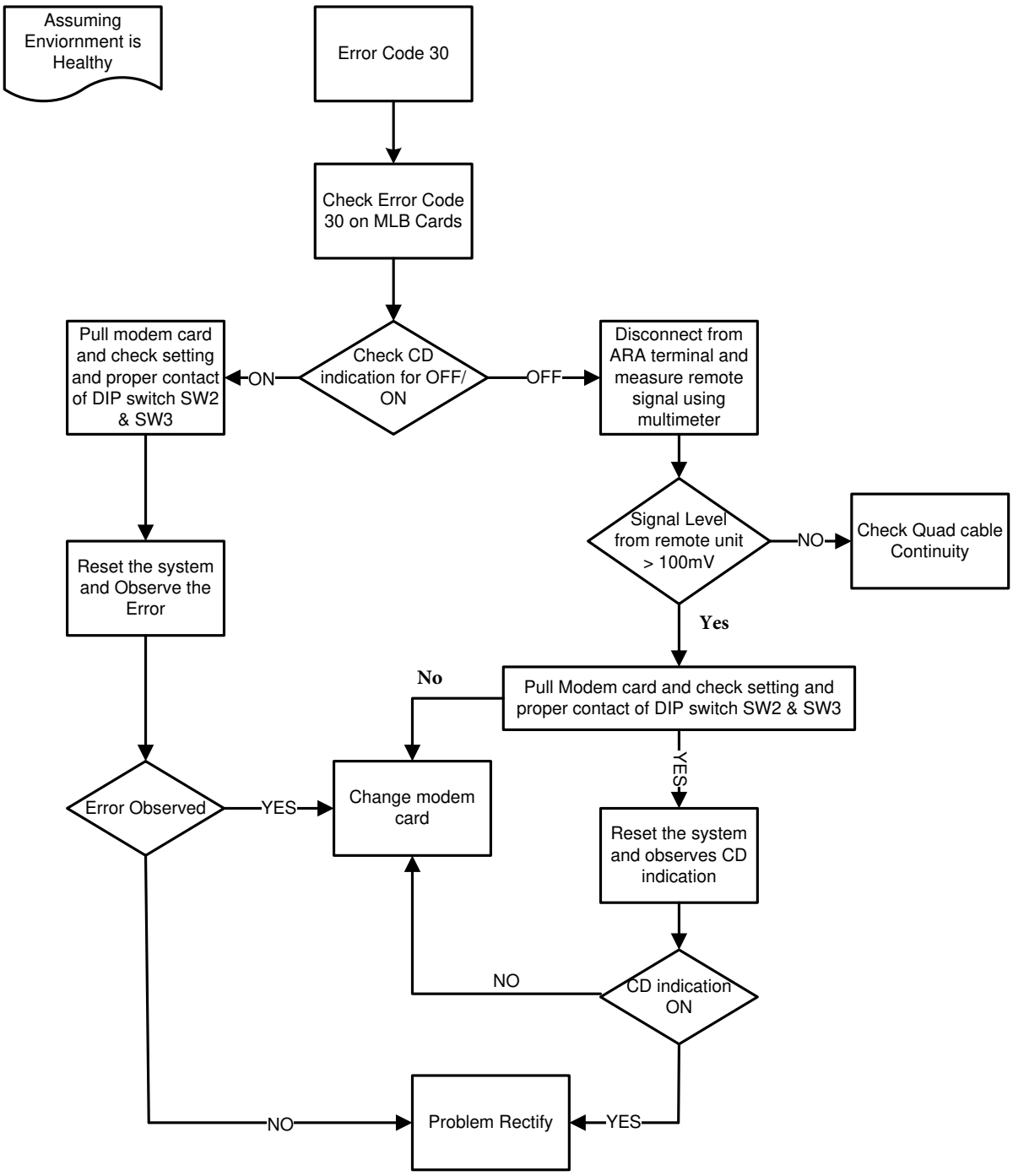
| Error No. | Action required |
|---|---|
| Error 3F is generated in the local unit when it is resetted and it is waiting for remote unit to be resetted | Remote unit is to be resetted or else both HASSDAC units are to be resetted |

## OTHER TYPE OF ERRORS:

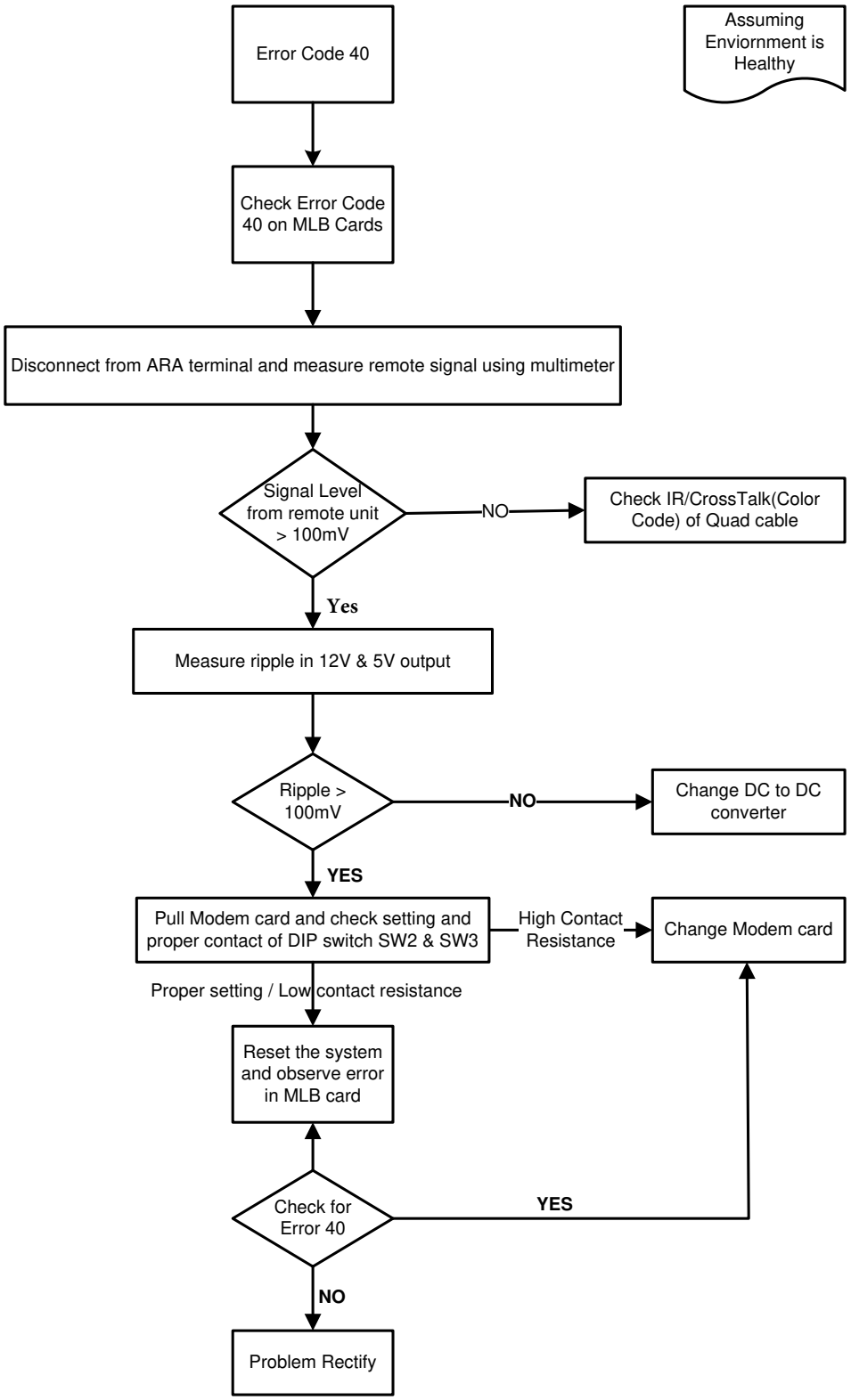
| S. NO | CONDITION | ERROR NO. | SYSTEM STATUS | ACTION REQUIRED |
|---|---|---|---|---|
| 1. | Entry counts are more than Exit counts | No Error | Vital relays are dropped. System may fail for each train movement. | 1. Check Exit end axle detectors and align them properly.<br>2. Check SCC1 & 2 cards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

## 10.9 DIAGNOSTICS CHART

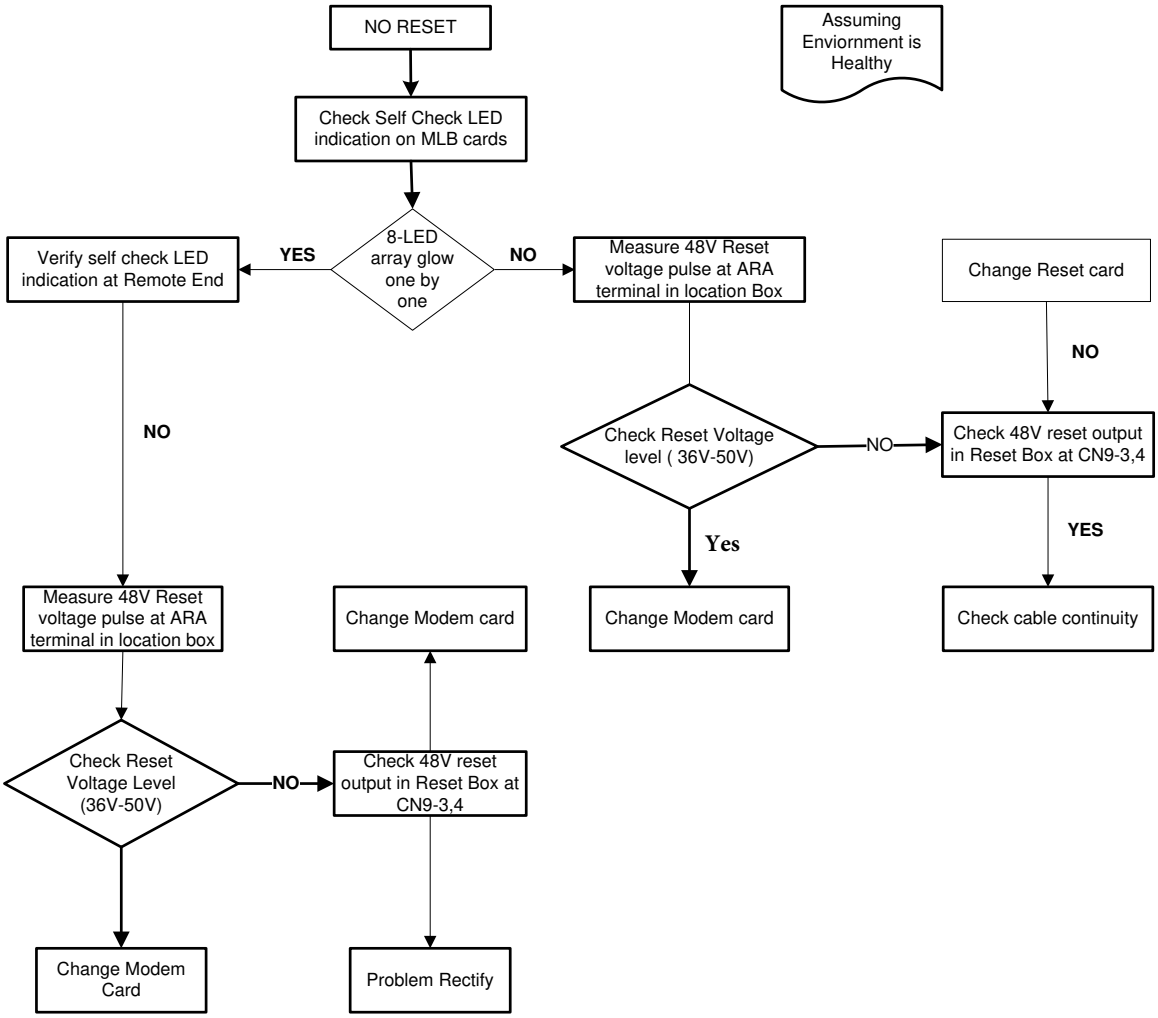
### FAULT DIAGNOSTIC CHART FOR LINK ERROR(30)



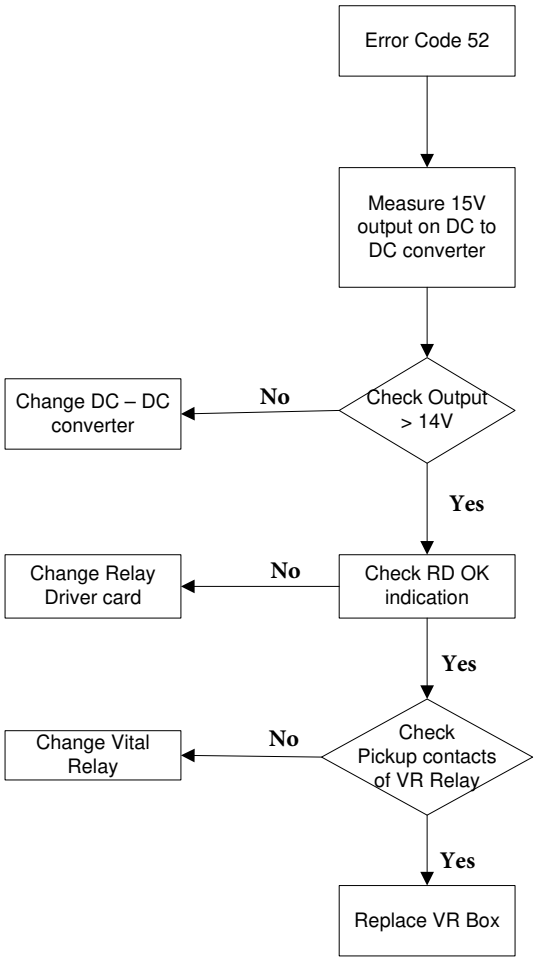
**FAULT DIAGNOSTIC CHART FOR COMMUNICATION ERROR(40)**



**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 HASSDAC

The Earth Electrode and its details of installation are shown in ***Drg. No. I007755A4*** 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 HASSDAC and its accessories are as follows

| S.No | | Value |
|---|---|---|
| 1 | i. Apparatus case connected to Earth (HASSDAC and vital Relay Box is housed in Apparatus case and Connected to earth at outdoor.)<br>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 HASSDAC for items 1 (i & ii) of the above at the outdoor

i. The Apparatus Case is to be connected to earth (the chassis of HASSDAC & 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 HASSDAC 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 HASSDAC FROM SURGE VOLTAGES

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

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.

These devices (10 numbers) are mounted on DIN Rail and supplied along with the system ***(as per drawing no W008810 A4, page no D31 or D32)***. One number of SVPD assembly is to be installed at each location and wired to the ***HASSDAC (as per drawing no. W008810, page no D31 & D32).***

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 change overs 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.

The three type of SVPD are as follow.

**CEL make**

For these devices, kindly refer to the drawing No. ***W009364A4 on page D35***

**OBO make**

For these devices, kindly refer to the drawing no ***W008810 A4 on page D31.***

**Phoenix make**

For these devices, kindly refer to the drawing no ***W008810 A4 on page D32.***

***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

***(Drawing no. F008807A4 on page no. D16 & W008808 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.
    f. One unit fail Red indication of 3 mm.
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 at the back 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.
9. Toggle Switch for displaying data of processing unit 1 or 2.

## 13.1. FEATURES OF RESET BOX

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

i. The Interface card is used to provide interface with the HASSDAC unit on a pair of cable. This communication from reset box and HASSDAC unit is used for transmission of packets from HASSDAC 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 HASSDAC 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.

Reset Card of reset box is plugged in connector of the first card 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 HASSDAC unit.

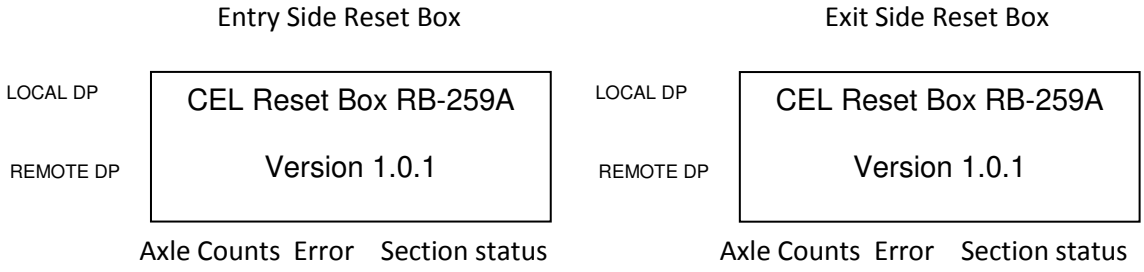
The following functions are controlled in the reset box

i. Line Verification proving circuit is provided. Refer drawing D18 & D19a for jumper setting for using LV.
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.

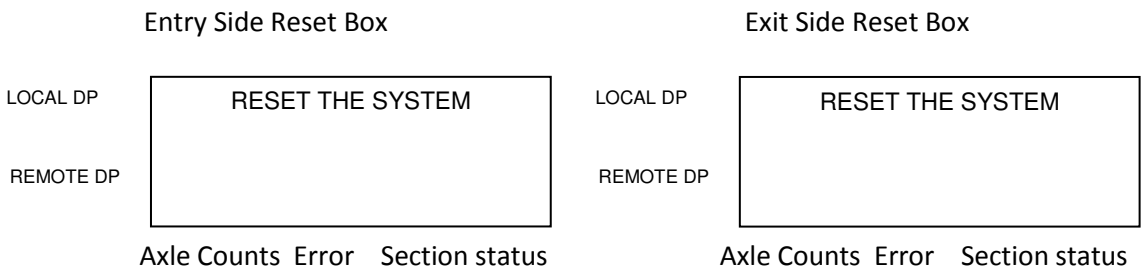
## 13.2. WORKING OF RESET BOX

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 HASSDAC software used and its checksum.




2. After the checksum, the reset box will wait for the user to apply the reset to HASSDAC 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 HASSDAC 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.

Entry Side Reset Box

LOCAL DP 00000 00 Preparatory state

REMOTE DP 00000 00 Preparatory state

Axle Counts Error Section status

Exit Side Reset Box

LOCAL DP 00000 00 Preparatory state

REMOTE DP 00000 00 Preparatory state

Axle Counts Error Section status

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.

Entry Side Reset Box

LOCAL DP 00002 00 Preparatory state

REMOTE DP 00000 00 Preparatory state

Axle Counts Error Section status

Exit Side Reset Box

LOCAL DP 00000 00 Preparatory state

REMOTE DP 00002 00 Preparatory state

Axle Counts Error Section status

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

LOCAL DP 00002 00 Clear

REMOTE DP 00002 00 Clear

Axle Counts Error Section status

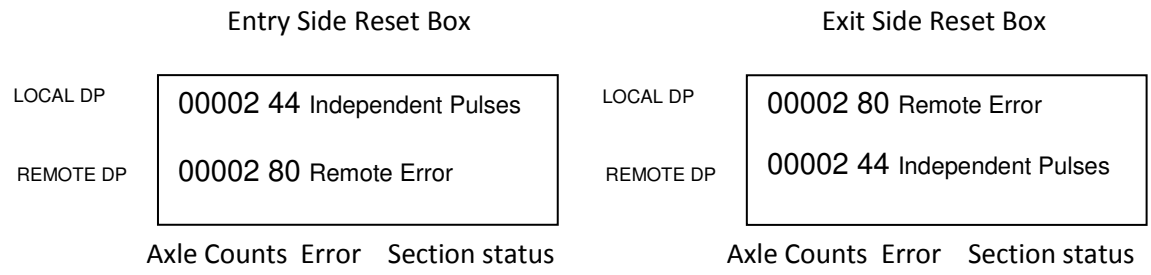
Exit Side Reset Box

LOCAL DP 00002 00 Clear

REMOTE DP 00002 00 Clear

Axle Counts Error Section status

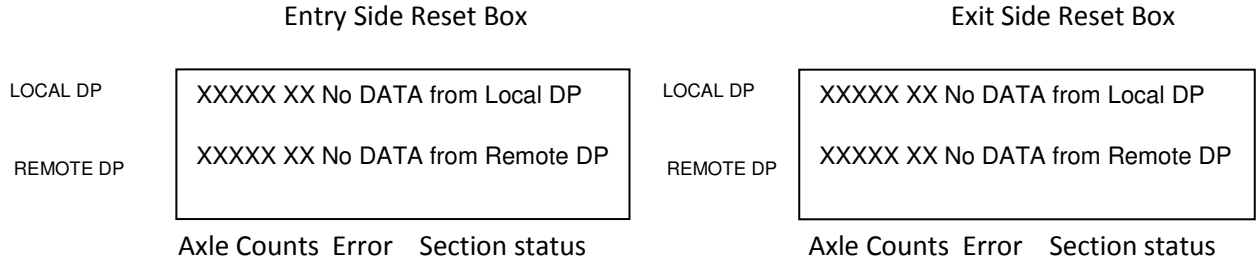
7. The axle counts are incremented or decremented according to the direction of train movements.
8. In case of failure, Error code is displayed at both the ends. The Error code along with its description is displayed. This Error code is required to be recorded by SM's before applying Reset.




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

iv. 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.

v. B24 used for HASSDAC is to be connected / extended to reset box for power ON and other indications.

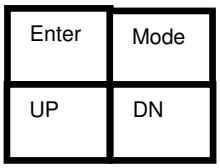
vi. 2Nos. of Reset Box (1 No. at each end) are wired in block section & one Reset Box is wired in station section. In case the quad pair from location box to SM's room is not provided, only the LCD display on the reset box will not work. All the other functions of the reset box will continue to work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

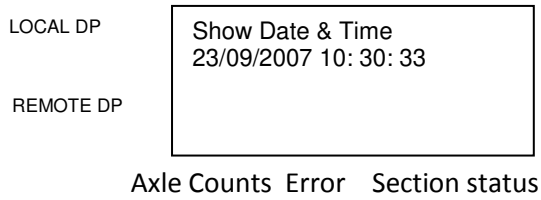
vii. It is recommend to set the date and time of RTC clock by use of keypad before commissioning so that Error log is displayed properly.

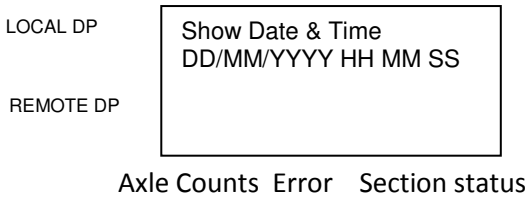
a. Press Mode Key and press Enter when Show Current date & time is displayed. It will display the current date and time

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 HASSDAC WHEN USED FOR TRACK CIRCUITING AT STATIONS

**COMMON RESETTING**

The common resetting of both HASSDAC 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. S008809 A3 on page no. D18 for wiring details.***

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

- **RESETTING OPERATION AND FEATURES**

1. When both processing units fail simultaneously and successful resetting for both processing units is carried out by SM Reset, both PR Relays in VR box pick which in turn pick PPR Relay in Relay Room. Corresponding to PPR Prep. Rest indication glow steady high and Reset Counter increment by One in Reset Box.
2. After auto reset operation when only one PR relay pick up, PPR relay is not picked up and Prep Reset indication do not glow and Reset counter do not increment in Reset box.
3. One Unit fail indication however glow in Reset box and corresponding auto reset counter increments in Vital Relay Box.
4. For proper working of 'One Unit fail' indication both quad pairs for display(4 Conductors) shall be connected to reset box. If only one pair is connected indication may always glow.
5. Reset Box logs last 10 errors codes of both processing unit with date and time, irrespective of the display selected on LCD through toggle switch.
6. Auto reset circuit is provided in the vital relay box. One Processing unit is working normal and another one is in error, Reset Relay and auto reset circuit reset the processing unit in error after 12 seconds. Processing unit in error achieve preparatory state and clears after movement of one train into the section.

## 13.4.2 HASSDAC WHEN USED IN BLOCK SECTIONS

### INDEPENDENT RESETTING

The independent resetting of HASSDAC 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.

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

Auto reset circuit is provided in the vital relay box. One Processing unit is working normal and another one is in error, Logic Relay and auto reset circuit reset the processing unit in error after 12 seconds. Processing unit in error achieve preparatory state and clears after movement of one train into the section.

### 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 HASSDAC, this 48V DC activates the reset circuit in modem card (card 6) of HASSDAC unit and generates reset command to the Micro Controllers in Dual MLB cards (Card 4&10).
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 HASSDAC units are reset and counts become zero. The self-test is carried out in both the units. The HASSDAC 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 – 259A

The reset box controls the Resetting of HASSDAC 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.

### 14.3 SURGE VOLTAGE PROTECTION DEVICE

The Surge Voltage protection device is to be installed at each location along with every HASSDAC unit. Each device is to be wired as per wiring details as given in drawing no.W008810 A4 on page no. D31 & D32.

### 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 HASSDAC UNIT (At site)

i. The 2.2V DC signal levels of card 1&2 of the HASSDAC 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 HASSDAC 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 WITH WEB TYPE (AD-711)

| | | |
|---|---|---|
| 1. | Pure sine wave Digital multimeter make 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. | Extender card ( card No.557 or latest ) | 1 No. |

### TOOL KIT WITH CLAMP TYPE (AD-711FS)

| | | |
|---|---|---|
| 1. | Pure sine wave Digital multimeter Make 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 for Hex M10 Nut & Bolt: Part No. L17H, Make -Taparia or equivalent | 1 No. |
| 6. | Socket for Hex M20 Nut & Bolt as per attached Drg. No R&D(SPD)SOCKET A/F30/F00240 | 1 No. |
| 7. | Torque wrench : Part No.TWR160 (50Nm- 220Nm) or equivalent | 1 No. |
| 8. | Screw driver No. 902 | 1 No. |
| 9. | Screw driver No. 935 | 1 No. |
| 10. | Extender card ( card No.557 or latest ) | 1 No. |

## Optical item

| | | |
|---|---|---|
| 1. | Portable data analyzer for downloading event logger data for analysis and report generation (LAPTOP) | 1 No. |
| 2. | Serial to USB Convertor 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 & 7,8) | 2 Nos. |
| 2. | Dual MLB cards (Card 4 & 10) | 2 Nos. |
| 3. | Modem card (Card 3&9) | 2 Nos. |
| 4. | Relay driver (Card 5 & 11) | 2 No. |
| 5. | Event Logger Card | 2 Nos. |
| 6. | DC-DC converter (Card 6&12) | 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. | Reset box RB-259A | 1 No. |
| 11. | HASSDAC unit (housing with mother board, without cards) | 1 No. |
| 12. | Vital Relay Box with Relay 24V, 1000 ohm, Q type | 1 No. |
| 13. | Surge voltage protection device box | 1 No. |

# CHAPTER 17

## 17.0 DO'S AND DON'TS FOR HA 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 WAGO connections of HASSDAC are checked and maintained firmly.
x. The WAGO connections of HASSDAC Vital Relay Box are checked and maintained firmly.
xi. The HASSDAC & Reset box is provided with sealing arrangement. They should be sealed at site.
xii. 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 HASSDAC units under power ON condition of system.
viii. Remove card if necessary after Switching OFF the power to the unit.
ix. Do not 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 coil if required metal parts shall be placed at least half meter away from energised Tx/Rx coils.

# CHAPTER 18

## INTRODUCTION EVENT LOGGER

**After installing the front end software in laptop from the CD supplied along with system, connect the event logger port at the back of HASSDAC system to laptop using serial to USB converter cable supplied. Follow the following procedure to download the data.**

1) Open the application by double clicking on SSDAC data analyzer.
2) Click on Settings Icon.
3) Then Click on Port Open, serial port settings window appear .
4) In window, click on icon in front of Serial Port.
5) In the icon click on COM as shown .
6) Then click on Detect Baud Rate Icon.
7) System will automatically set the port according to the Baud Rate of Event Logger.
8) Port connected and baud rate Detected window appear, Click on OK.
9) Then Click on Operations Icon.
10) In operations Icon further four links will be shown such as Download Data, get RTC, Set RTC, Erase Flash.
11) Firstly Click on Get RTC Link.
12) Separate Get RTC window will appear which shows the current Date and time of Event logger card. Then click on OK.
13) If Date and time is not proper , then again click on operations icon and then click on Set RTC link.
14) Separate window of select Date and Time will appear in which computer's date and time will be shown.
15) If date and time of computer is updated then click on OK , otherwise firstly correct the computer's date and time and then repeat this step.
16) Separate window namely RTC of EL Card updated appears, Click on OK.
17) Then Click on Operations and then on Download data Link.
18) Download Data window appears, then click on Start Download.
19) Another Save as window appears in which file name and location where file to be saved will be given.
20) Then Click on Save, Data Downloading will starts.
21) After certain time when download completes, Separate Download Complete window appears. Then Click on OK.
22) Then Click on Analysis Icon in the application.
23) After clicking the analysis icon , click on Open data File Link.
24) Separate Open link window will appear, then select the file saved and click on Open.
25) Analysis Done successfully window will appear, then click on OK.
26) Now Click on Reports Icon in the application.
27) Separate window containing report will be shown.
28) Now Click on Next or Previous Icon to select the Date of which analysis is to be done.
29) Desired date report can be seen on the screen.
30) Then Click on Export to CSV Icon, CSV file is created window will appear.
31) Then Click on OK. CSV file got saved in SSDAC EL Analyzer folder in C: Drive of Computer.
32) This CSV file can be open in Excel sheet format.

**Annexure I** **(Page 1 of 6)**

**HASSDAC 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_____**

## STATUS CHART OF HASSDAC FOR VARIOUS CONDITIONS

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↓ | PR1↓ VR1↓ PR2↓ VR2↓ RR↓ | 24V dc is available to system. System is ON & waiting for Reset | No indication | PPR↓ VPR↓ | PR1↓ VR1↓ PR2↓ VR2↓ RR↓ | 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(After 3-8 seconds) vi) Occupied (Red Indication remains. | PPR↓ VPR↓ | PR1↓ VR1↓ PR2↓ VR2↓ RR↓ | i) Reset is applied to dual system. ii) The self test starts in the dual system and both goes to Error due to far end unit is not reset. | -do- | -do- | -do- | -do- |

**Annexure I** **(Page 2 of 6)**

**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↓<br>VPR↓ | PR1↓ VR1↓<br>PR2↓ VR2↓<br>RR↓ | Error due to far end unit is not synchronized. | i) Insert SM's key, turned & keep pressed<br>ii) Reset button pressed.<br>iii) Both released(After 3-8 seconds)<br>iv) Occupied indication remains. | PPR↓<br>VPR↓ | PR1↓ VR1↓<br>PR2↓ VR2↓<br>RR↓ | i) Reset is applied to system.<br>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↑<br>VPR↓ | PR1↑ VR1↓<br>PR2↑ VR2↓<br>RR↓ | 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. Reset counter increments by 1 count. | PPR ↑<br>VPR↓ | PR1↑ VR1↓<br>PR2↑ VR2↓<br>RR↓ | Both Units Communicates with each other by means of packets and enters into preparatory state mode. Reset counter in Reset Box 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 6)

**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↑<br>VPR↓ | PR1↑<br>VR1↓<br>PR2↑<br>VR2↓<br>RR↓ | System registers wheel counts & PR relays remains pickup. | Power On LED glows. Prep. Reset LED remains ON. | PPR↑<br>VPR↓ | PR1↑<br>VR1↓<br>PR2↑<br>VR2↓<br>RR↓ | 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↓<br>VPR↑ | PR1↓<br>VR1↑<br>PR2↓<br>VR2↑<br>RR↓ | 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↓<br>VPR↑ | PR1↓<br>VR1↑<br>PR2↓<br>VR2↑<br>RR↓ | 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↓<br>VPR↓ | PR1↓<br>VR1↓<br>PR2↓<br>VR2↓<br>RR↓ | 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↓<br>VPR↓ | PR1↓<br>VR1↓<br>PR2↓<br>VR2↓<br>RR↓ | 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↓<br>VPR↑ | PR1↓<br>VR1↑<br>PR2↓<br>VR2↑<br>RR↓ | 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↓<br>VPR↑ | PR1↓<br>VR1↑<br>PR2↓<br>VR2↑<br>RR↓ | 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.

**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 |
| 10 | Resettable Error is generated in first processing unit | Power On LED (Yellow) remains. Occupied (Red) LED remains OFF. Prep Reset LED remains OFF. Clear (green) LED Glows | PPR↓ VPR↑ | PR1↓ VR1↓ PR2↓ VR2↑ RR ↑ | Resettable Error is generated in first processing unit | Power On LED (Yellow) remains. Occupied (Red) LED remains OFF. Prep Reset LED remains OFF. Clear (green) LED Glows | PPR↓ VPR↑ | PR1↓ VR1↓ PR2↓ VR2↑ RR ↑ | One system is fail with VR1 drop and one system is ok with VR2 pick up. |
| 11. | Auto Reset Command generated by 2nd processing unit to reset 1st processing unit after 12 seconds of failure. | Power On LED glows. Prep. Reset LED OFF. Occupied LED OFF & clear LED glows. | PPR↓ VPR↑ | PR1↓ VR1↓ PR2↓ VR2↑ RR ↑ | Reset is applied in fail system. System enters in self check mode. | Power On LED glows. Prep. Reset LED OFF. Occupied LED OFF & clear LED glows. | PPR↓ VPR↑ | PR1↓ VR1↓ PR2↓ VR2↑ RR ↑ | Reset is applied in first processing unit. System enters in self check mode. After hand shake mode 1st processing unit enters prep. State. |
| 12. | 1st processing unit enters prep. Reset state while 2nd is clear | Power on LED glows. Prep. Reset LED is OFF. Occupied LED OFF. Clear LED ON. | PPR↓ VPR↑ | PR1↑ VR1↓ PR2↓ VR2↑ RR ↑ | First processing unit in prep. State. Reset counter in VR box for 1st processing unit increments. | Power on LED glows. Prep. Reset LED is OFF. Occupied LED OFF. Clear LED ON. | PPR↓ VPR↑ | PR1 ↑ VR1↓ PR2↓ VR2↑ RR ↑ | First processing unit in prep. State. Reset counter in VR box for 1st processing unit increments. |
| 13 | 1st train enters the block section from stn A | Power On LED (Yellow) remains. Occupied (Red) LED ON. Prep Reset LED remains OFF. Clear LED OFF. | PPR↓ VPR↓ | PR1↑ VR1↓ PR2 ↓ VR2 ↓ RR ↓ | System registers in counts at station A. System goes to OCC state. VR2 is driven OFF | Power On LED (Yellow) remains. Occupied (Red) LED ON. Prep Reset LED remains OFF. Clear LED OFF. | PPR ↓ VPR↓ | PR1↑ VR1↓ PR2↑ VR2↓ RR↓ | System registers in counts at station A. System goes to OCC state. VR2 is driven OFF. |

**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 |
| 14. | 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↑ | PR1↓ VR1↑ PR2↓ VR2↑ RR↓ | 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↑ | PR1↓ VR1↑ PR2↓ VR2↑ RR↓ | System registers out counts at stn B. After count balancing the system goes to clear state. |
| 15 | Resettable Error is generated in 2nd processing unit | Power On LED (Yellow) remains. Occupied (Red) LED remains OFF. Prep Reset LED remains OFF. Clear (green) LED Glows | PPR↓ VPR↑ | PR1↓ VR1↑ PR2↓ VR2↓ RR ↑ | Resettable Error is generated in 2nd processing unit | Power On LED (Yellow) remains. Occupied (Red) LED remains OFF. Prep Reset LED remains OFF. Clear (green) LED Glows | PPR↓ VPR↑ | PR1↓ VR1↑ PR2↓ VR2↓ RR ↑ | One system is fail with VR2 drop and one system is ok with VR1 pick up. |

**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**_____

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Auto Reset Command generated by 1st processing unit to reset 2nd processing unit | Power On LED glows. Prep. Reset LED OFF. Occupied LED OFF & clear LED glows. | PPR↓ VPR↑ | PR1↓ VR1↑ PR2↓ VR2↓ RR ↑ | Reset is applied in fail system. System enters in self check mode. | Power On LED glows. Prep. Reset LED OFF. Occupied LED OFF & clear LED glows. | PPR↓ VPR↑ | PR1↓ VR1↑ PR2↓ VR2↓ RR ↑ | Reset is applied in 2nd processing unit. System enters in self check mode. After hand shake mode 2nd processing unit enters prep. State. |
| 17 | 2nd processing unit enters prep. Reset state while first is clear. | Power on LED glows. Prep. Reset LED is OFF. Occupied LED OFF. Clear LED ON. | PPR↓ VPR↑ | PR1↓ VR1↑ PR2↑ VR2↓ RR ↑ | First processing unit in prep. State. Reset counter in VR box for 2nd processing unit increments. | Power on LED glows. Prep. Reset LED is OFF. Occupied LED OFF. Clear LED ON. | PPR↓ VPR↑ | PR1↓ VR1↑ PR2↑ VR2↓ RR ↑ | 2nd processing unit in prep. State. Reset counter in VR box for 2nd processing unit increments. |
| 18 | 1st train enters the block section from stn A | Power On LED (Yellow) remains. Occupied (Red) LED ON. Prep Reset LED remains OFF. Clear LED OFF. | PPR↓ VPR↓ | PR1 ↓ VR1↓ PR2 ↑ VR2 ↓ RR ↓ | System registers in counts at station A. System goes to OCC state. VR1 is driven OFF | Power On LED (Yellow) remains. Occupied (Red) LED ON. Prep Reset LED remains OFF. Clear LED OFF. | PPR ↓ VPR↓ | PR1 ↓ VR1↓ PR2 ↑ VR2 ↓ RR ↓ | System registers in counts at station A. System goes to OCC state. VR1 is driven OFF. |
| 19 | 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↑ | PR1↓ VR1↑ PR2↓ VR2↑ RR↓ | 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↑ | PR1↓ VR1↑ PR2↓ VR2↑ RR↓ | System registers out counts at stn B. After count balancing the system goes to clear state. |

**Annexure II**

**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_____**

## RELAY STATUS CHART FOR SSDAC

| S. No. | CONDITION | STATION-A | | | | STATION-B | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Relay Room | | Location | | Relay Room | | Location | |
| 1 | 24 V connected | VPR↓ | PPR↓ | VR1&2 ↓ | PR1&2 ↓ | VPR↓ | PPR↓ | VR1&2 ↓ | PR1&2 ↓ |
| 2 | Reset applied (SM's key inserted, reset button operation, etc) | VPR↓ | PPR↓ | VR1&2 ↓ | PR1&2 ↓ | VPR↓ | PPR↓ | VR1&2 ↓ | PR1&2 ↓ |
| 3 | System enters preparatory reset mode | VPR↓ | PPR↑ | VR1&2 ↓ | PR1&2 ↑ | VPR↓ | PPR↑ | VR1&2 ↓ | PR1&2 ↑ |
| 4(a) | First train enters the section (Pilot train) | VPR↓ | PPR↑ | VR1&2 ↓ | PR1&2 ↑ | VPR↓ | PPR↑ | VR1&2 ↓ | PR1&2 ↑ |
| 4(b) | First train clears the section (after counts equal in both units | VPR↑ | PPR↓ | VR1&2 ↑ | PR1&2 ↓ | VPR↑ | PPR↓ | VR1&2 ↑ | PR1&2 ↓ |
| 5(a) | Subsequent trains when occupy the section | VPR↓ | PPR↓ | VR1&2 ↓ | PR1&2 ↓ | VPR↓ | PPR↓ | VR1&2 ↓ | PR1&2 ↓ |
| 5(b) | Subsequent trains when clears the section | VPR↑ | PPR↓ | VR1&2 ↑ | PR1&2 ↓ | VPR↑ | PPR↓ | VR1&2 ↑ | PR1&2 ↓ |

# ORDERING INFORMATION

## INSTALLATION MANUAL (DACF-720P)

| S. No. | Description OF Item | | Qty. | |
|---|---|---|---|---|
| 1. | **High Availability Single Section Digital Axle Counter System complete with <u>Dual sensor</u> as per RDSO specification 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)/(AD-711FS) consisting of web Mounting/Clamp Mounting Type Tx =02 Nos. & Rx=02 Nos. | **02 set** | |
| | **b.** | Track side High Availability Digital Axle Counter Unit (DACF-720P) | **02 Nos.** | |
| | **c.** | Vital Relay box. model VR-722 duly wired with following relays:<br>(a.) Vital Relay QN1k, 24V, 6F-6B - 2 Nos.<br>(b.) Reset Relay QN1k, 24V, 6F-6B - 1 No.<br>(c.) PR Relay QN1k, 24V, 6F-2B (Dual) - 1 No. | **02 Nos.** | |
| | **d.** | Clamp with defector plates and hardware | **08 Nos.** | |
| | **e.** | Reset Box Model No. RB 259A | **02 Nos.** | |
| | **f.** | Surge voltage Protection device Mounted on DIN Rail | **02 Nos.** | |

| S. No. | Description OF Item | | Qty. | |
|---|---|---|---|---|
| 1. | **High Availability Single Section Digital Axle Counter System complete with <u>Dual sensor</u> as per RDSO specification 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)/(AD-711FS) consisting of web Mounting / Clamp Mounting Type Tx =02 Nos. & Rx=02 Nos. | **02 set** | |
| | **b.** | Track side High Availability Digital Axle Counter Unit (DACF-720P) | **02 Nos.** | |
| | **c.** | Vital Relay box. model VR-722 duly wired with following relays:<br>(a.) Vital Relay QN1k, 24V, 6F-6B - 2 Nos.<br>(b.) Reset Relay QN1k, 24V, 6F-6B - 1 No.<br>(c.) PR Relay QN1k, 24V, 6F-2B (Dual) - 1 No. | **02 Nos.** | |
| | **d.** | Clamp with defector plates and hardware | **08 Nos.** | |
| | **e.** | Reset Box Model No. RB 259A | **02 Nos.** | |
| | **f.** | Surge voltage Protection device Mounted on DIN Rail | **02 Nos.** | |

**FOR ORDERING FOLLOWING SPARE CARDS FACIA PLATE NUMBERS ALONG WITH CARD NO. SHALL BE MENTIONED AS BELOW.**

1. SCC CARD 1 WITH FACIA PLATE NO. 1 / 7..... CARD NO. 672-1
2. SCC CARD 2 WITH FACIA PLATE NO. 2 / 8 .....CARD NO. 672-1
3. MODEM CARD WITH FACIA PLATE NO. 3 /9 .....CARD NO. 699
4. DUAL MLB CARD WITH FACIA PLATE NO. 4 / 10 .....CARD NO. 694
5. RELAY DRIVER CARD WITH FACIA PLATE NO. 5 / 11.....CARD NO. 674
6. DC DC CONVETER CARD WITH FACIA PLATE NO. 6 /12 .....CARD NO. 697
7. DUMMY CARD WITH FACIA PLATE NO. 7 / 8 .....CARD NO. 712

**FOR ORDERING FOLLOWING SPARE CARDS CARD NO. SHALL BE MENTIONED AS BELOW.**

1. EVENT LOGGER CARD .....CARD NO. 695
2. AUTO RESET CARD.....CARD NO. 701
3. RESET CARD .....CARD NO. 652
4. RESET INTERFACE CARD .....CARD NO. 696
5. MOTHER BOARD ..... .CARD NO. 693
6. POWER SUPPLY AND LINE FILTER CARD ..... CARD NO. 636-4

Following nomenclature shall be followed while ordering CEL make spare cards for the following projects. It will be additional advantage to decode the card required.

| | Project | Code |
|---|---|---|
| A. | Universal Axle counter product code ..... | 1 |
| B. | BPAC using Mux ..... | 2 |
| C. | Single Section Digital Axle Counter ..... | 3 |
| D. | BPAC using UFSBI ..... | 4 |
| E. | Multi Section Digital Axle Counter ..... | 5 |
| F. | High Availability Single Section Digital Axle Counter..... | 6 |

Bar Code for Spare Cards.

1 2 3 4 5 6 7

1. Project Code (Example- write 3 if card belongs to SSDAC system or accessories)
2. Card position (write the number of slot in which card is inserted. Ex – write 7 if Relay Driver card of SSDAC is required. Write 0 if card do not have any slot number i.e if Reset card of Reset Box of SSDAC is Required.)

3. 4. 5. 6. 7. (Write card number at position 3,4,5,6,7. First two digit may be written 0 if card number is of three digits.)

Example: If SSC2 card at slot 8 of HASSDAC is required, following shall be written 68672-1.

**Annexure VI**

# FEED BACK 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:**

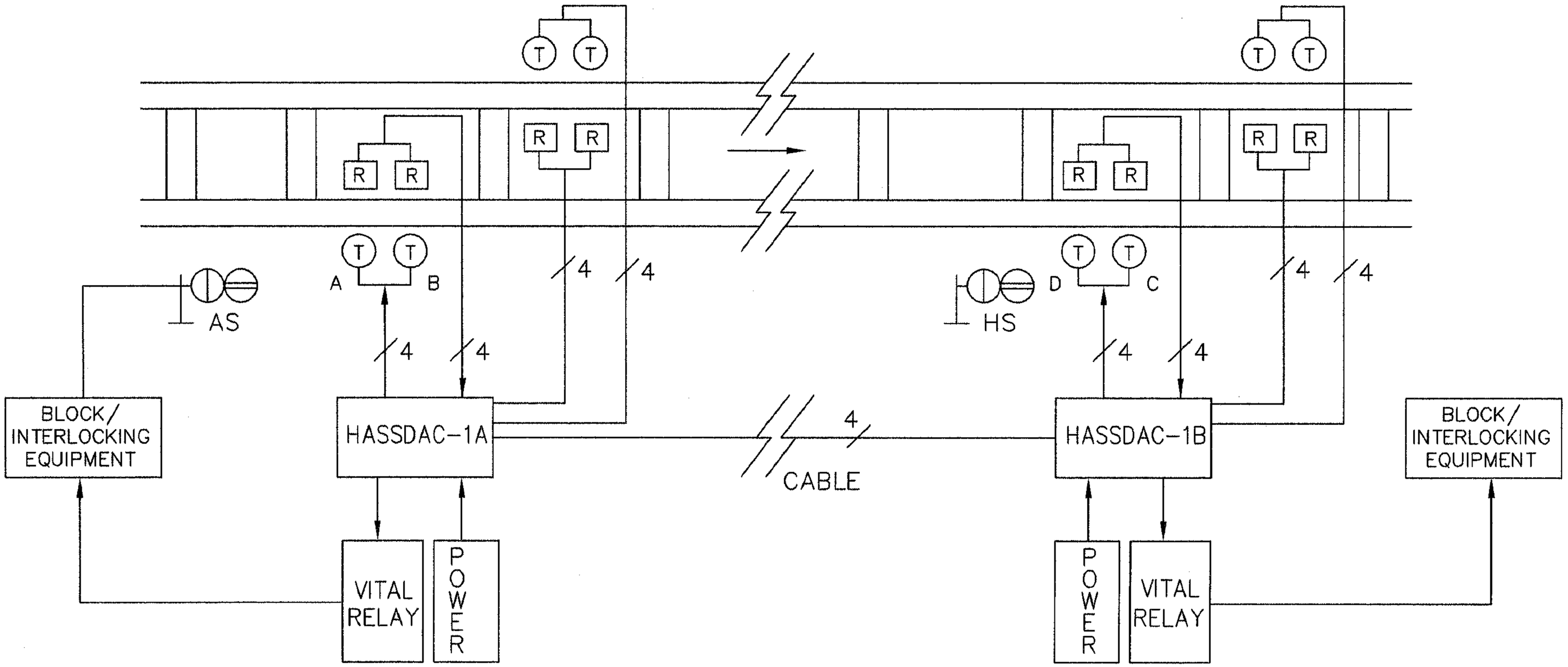
**Signature and Designation**
**(Customer Railway)**

# DRAWINGS

STATION A

STATION B

BLOCK SECTION




FOR SINGLE SENSOR HASSDAC, ONLY TWO SET SENSORS ARE USED

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26-03-13 |

HASSDAC (DACF – 720P)
USE IN BLOCK SECTION

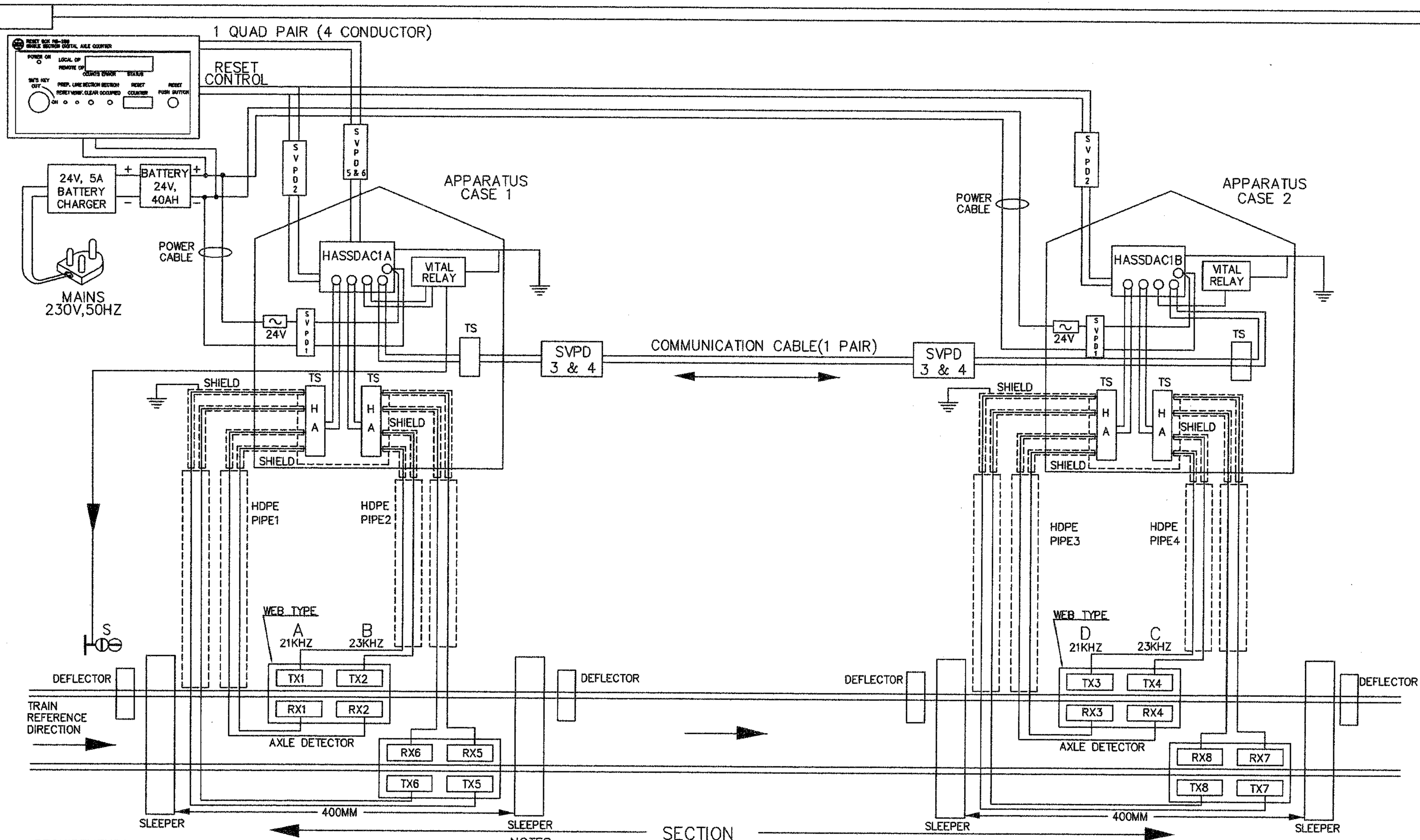
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. B008799A4

SHEET 1 OF 1

D1

SYSTEM4/ADITYA/HASSDAC/8799A4




SECTION

REQUIREMENTS:–

1) APPARATUS CASE(FULL) – 2 NOS
2) TERMINAL BOARD – 2 NOS
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 – 2 PAIR
7) SIGNALING CABLE,1.5 SQ. MM – 6 CON (1ST. LOC),2 CON (2ND LOC)
8) EARTHING – 2 LOCATIONS

NOTES:–

1) TX1 TO TX8 AXLE DETECTOR TRANSMITTER
2) RX1 TO RX8 AXLE DETECTOR RECEIVER
3) HASSDAC1 & HASSDAC2 HASS DIGITAL AXLE COUNTER
4) TS TERMINAL STRIPS
5) SVPD SURGE VOLTAGE PROTECTION DEVICE.
6) ONE QUAD REQUIRED BETWEEN LOCATION TO SM ROOM

FOR SINGLE SENSOR HASSDAC, ONLY TWO SET SENSORS ARE REQUIRED.

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26–03–13 |

HASSDAC (DACF–720P)
INSTALLATION DETAILS FOR TRACK CIRCUITING AT STN.

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

DRG.NO. L008800A4

SHEET 1 OF 1

D2

SYSTEM4/ADITYA/HASSDAC/8800A4

STATION A

1 QUAD PAIR (4 CONDUCTOR)

RESET CONTROL

SVPD 5 & 6

SVPD 2

24V, 5A BATTERY CHARGER

BATTERY 24V, 40AH

APPARATUS CASE 1

POWER CABLE

HASSDAC1A

VITAL RELAY

MAINS 230V,50HZ

24V

SVPD 1

TS

SVPD 3 & 4

COMMUNICATION CABLE(1 PAIR)

SHIELD

HA

HDPE PIPE1

HDPE PIPE2

WEB TYPE

A 21KHZ

B 23KHZ

AS

DEFLECTOR

TRAIN REFERENCE DIRECTION

TX1 TX2 RX1 RX2

AXLE DETECTOR

RX6 RX5 TX6 TX5

SLEEPER

400MM

STATION B

RESET CONTROL

SVPD 2

1 PAIR

SVPD 5 & 6

BATTERY 24V, 40AH

24V, 5A BATTERY CHARGER

POWER CABLE

HASSDAC1B

VITAL RELAY

MAINS 230V,50HZ

APPARATUS CASE 2

HDPE PIPE3

HDPE PIPE4

HS

D 21KHZ

C 23KHZ

TX3 TX4 RX3 RX4

RX8 RX7 TX8 TX7

BLOCK SECTION

REQUIREMENTS:-

| | |
|---|---|
| 1) APPARATUS CASE(FULL) | – 4 NOS |
| 2) TERMINAL BOARD | – 4 NOS |
| 3) POWER CABLE 25 SQ.MM, 2 CORE AL | – 2 LOCATIONS |
| 4) BATTERY CHARGER 24V, 5A | – 2 NOS. |
| 5) BATTERY 24V,40AH | – 2 NOS. |
| 6) CABLE PAIR 0.9 MM(4 QUAD) | – 4 PAIR(D/L), 2PAIR(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 TX8 | AXLE DETECTOR TRANSMITTER |
| 2) RX1 TO RX8 | AXLE DETECTOR RECEIVER |
| 3) HASSDAC1 & HASSDAC2 | HASS DIGITAL AXLE COUNTER |
| 4) TS | TERMINAL STRIPS |
| 5) SVPD | SURGE VOLTAGE PROTECTION DEVICE. |
| 6) ONE/TWO QUAD BETWEEN LOCATION TO SM ROOM FOR SL/DL | |

FOR SINGLE SENSOR HASSDAC, ONLY TWO SET SENSORS ARE REQUIRED.

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26-03-13 |

HASSDAC(DACF-720P)
INSTALLATION DETAILS FOR BLOCK WORKING

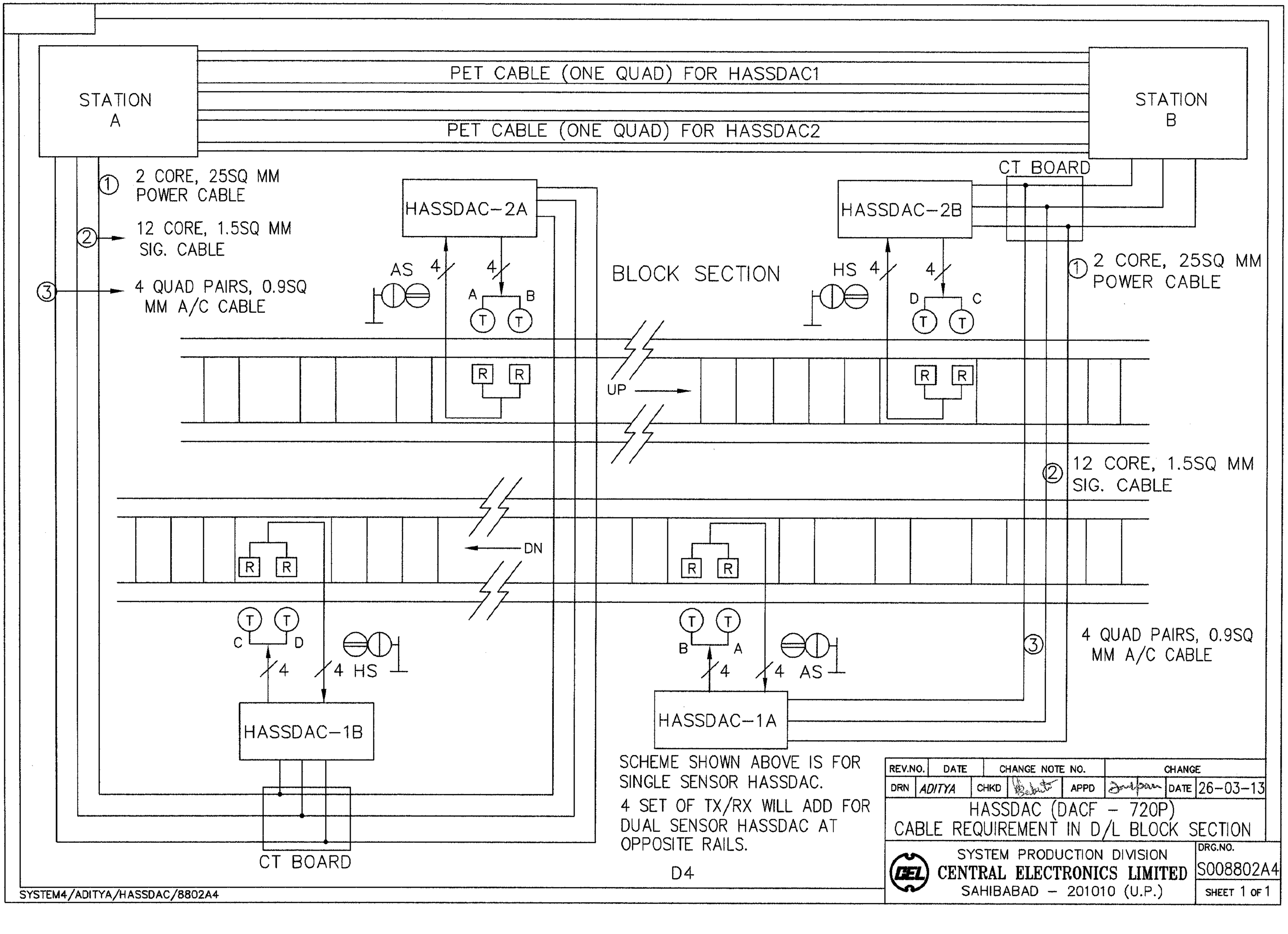
SYSTEM PRODUCTION DIVISION
CEL CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. L008801A4

SHEET 1 OF 1

D3

SYSTEM4\ADITYA\HASSDAC/8801A4




SCHEME SHOWN ABOVE IS FOR SINGLE SENSOR HASSDAC.

4 SET OF TX/RX WILL ADD FOR DUAL SENSOR HASSDAC AT OPPOSITE RAILS.

D4

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26-03-13 |

HASSDAC (DACF – 720P)
CABLE REQUIREMENT IN D/L BLOCK SECTION

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

DRG.NO. S008802A4

SHEET 1 OF 1

SYSTEM4/ADITYA/HASSDAC/8802A4

STATION A

V.CH–1 TO 4

MUX. (OFC)

OLTE

OFC

OLTE

MUX. (OFC)

V.CH–1 TO 4

STATION B

① 2 CORE, 25SQ MM POWER CABLE

② 12 CORE, 1.5SQ MM SIG. CABLE

③ 4 QUAD PAIR, 0.9SQ MM A/C CABLE

HASSDAC–2A

HASSDAC–2B

CT BOARD

AS 4 4

A B

T T

R R

BLOCK SECTION

HS 4 4

D C

T T

R R

UP

DN

① 2 CORE, 25SQ MM POWER CABLE

② 12 CORE, 1.5SQ MM SIG. CABLE

③ 4 QUAD PAIR, 0.9SQ MM A/C CABLE

R R

T T

C D

4 4 HS

HASSDAC–1B

CT BOARD

R R

T T

B A

4 4 AS

HASSDAC–1A

SCHEME SHOWN ABOVE IS FOR SINGLE SENSOR HASSDAC.

4 SET OF TX/RX WILL ADD FOR DUAL SENSOR HASSDAC AT OPPOSITE RAILS.

D5

| SR.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | ADITYA | CHKD | APPD | DATE | 26–03–13 |

# HASSDAC (DACF – 720P)
## CABLE REQUIREMENT IN D/L BLOCK ON OFC

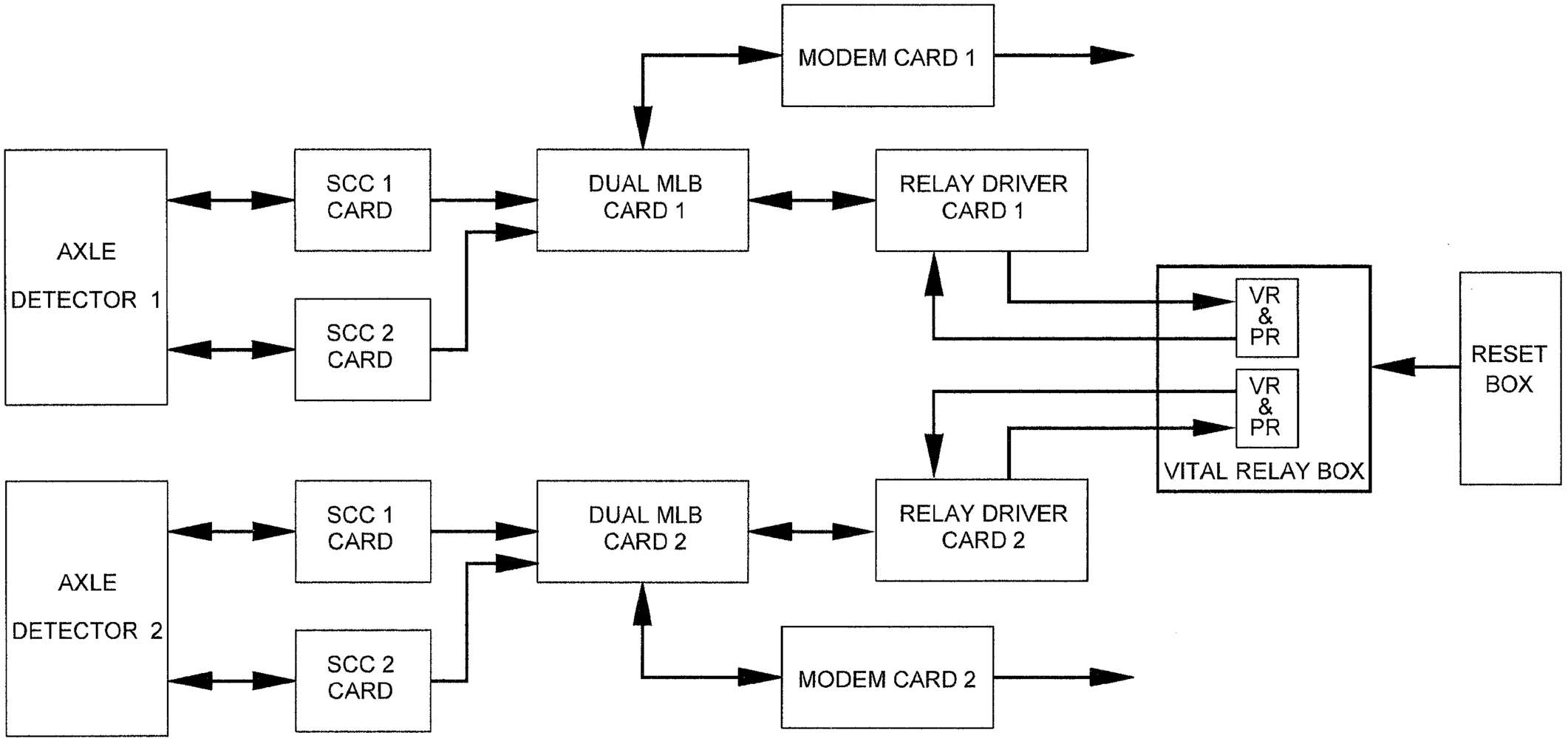
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. S008803A4

SHEET 1 OF 1

SYSTEM4/ADITYA/HASSDAC/8803A4

# BLOCK DIAGRAM OF HASSDAC




FOR SINGLE SENSOR HASSDAC ONLY ONE SET
AXLE DETECTORS AND SCC CARD REQUIRED

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26-03-13 |

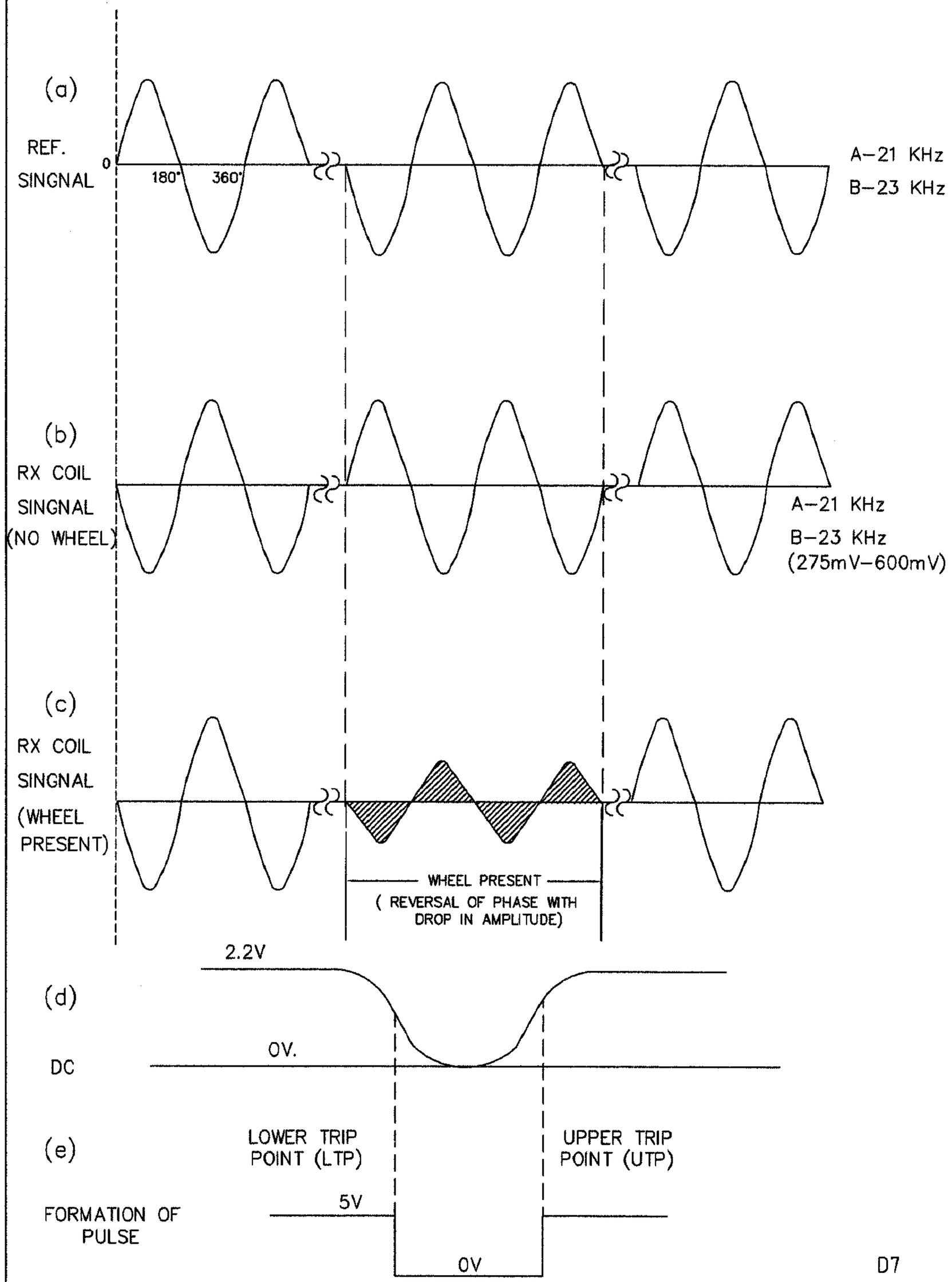
HASSDAC (DACF- 720P)
BLOCK DIAGRAM

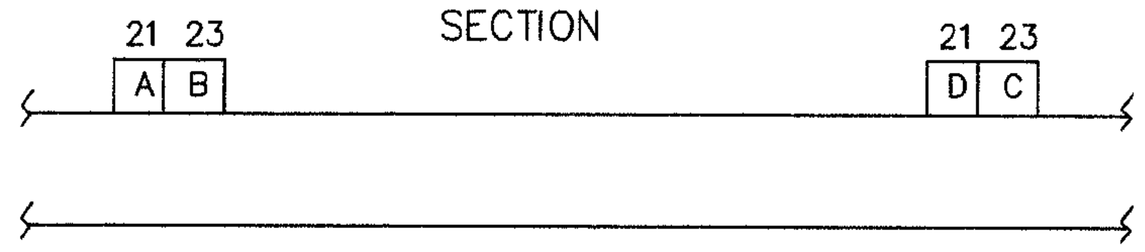
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

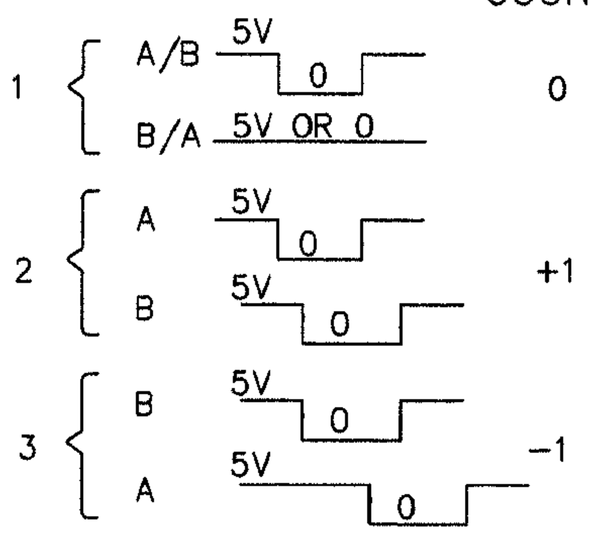
DRG.NO. B008804A4
SHEET 1 OF 1

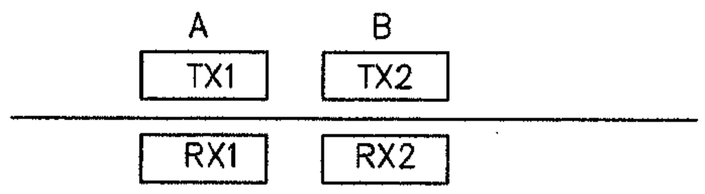
D6

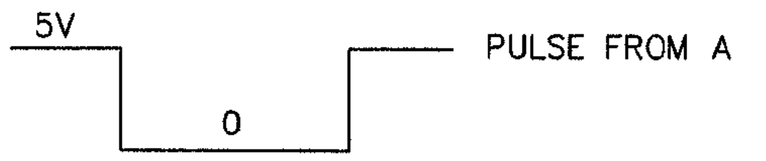
SYSTEM4/ADITYA/HASSDAC/8804A4

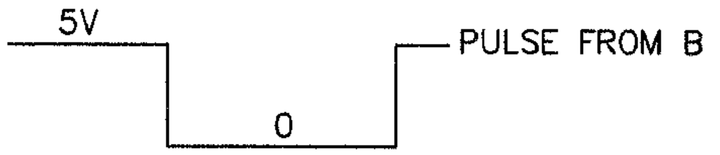



"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

| SR.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | Bhandari | CHKD | APPD Darpan DATE 28-10-04 |

HASSDAC (DACF-720P)
SIGNAL, DIP,PULSE & COUNT DETAILS

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

DRG.NO. L008077A3

SHEET 1 OF 1



SYSTEM4\ADITYA\HASSDAC\8077A3

# PULSE FORMATION IN SSDAC

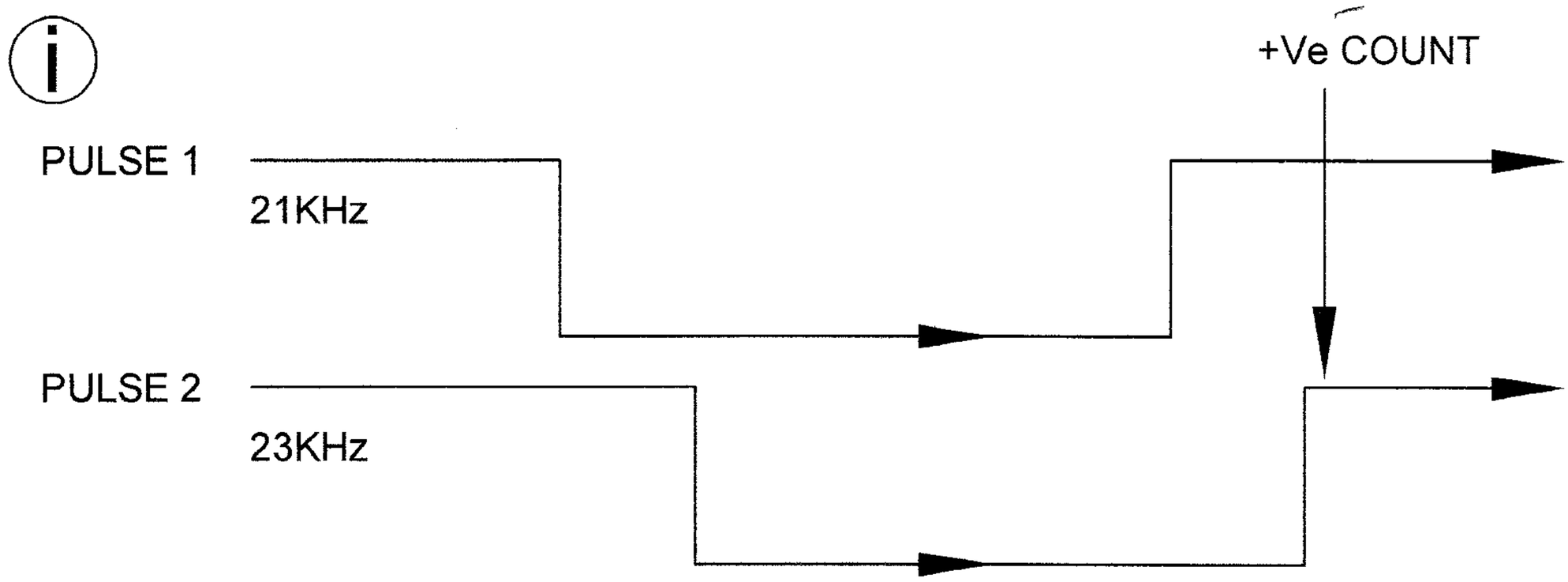



FIG. 11a: Wheel moving from 21KHz coil to 23KHz coil
counted as 1No. of +ve count in ssdac

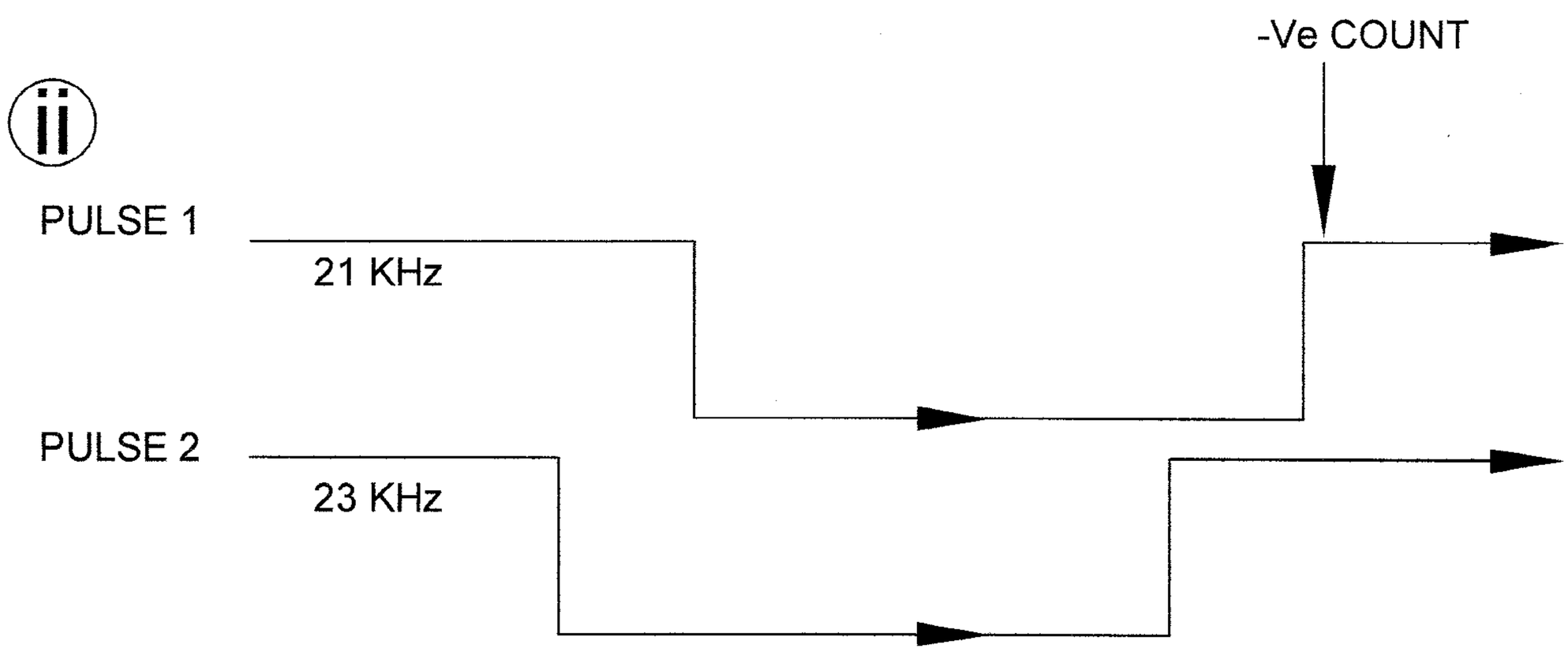



FIG. 11a: Wheel moving from 23KHz coil to 21KHz coil
counted as 1No. of -ve count in ssdac

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

HASSDAC (DACF- 720P)
PULSE FORMATION

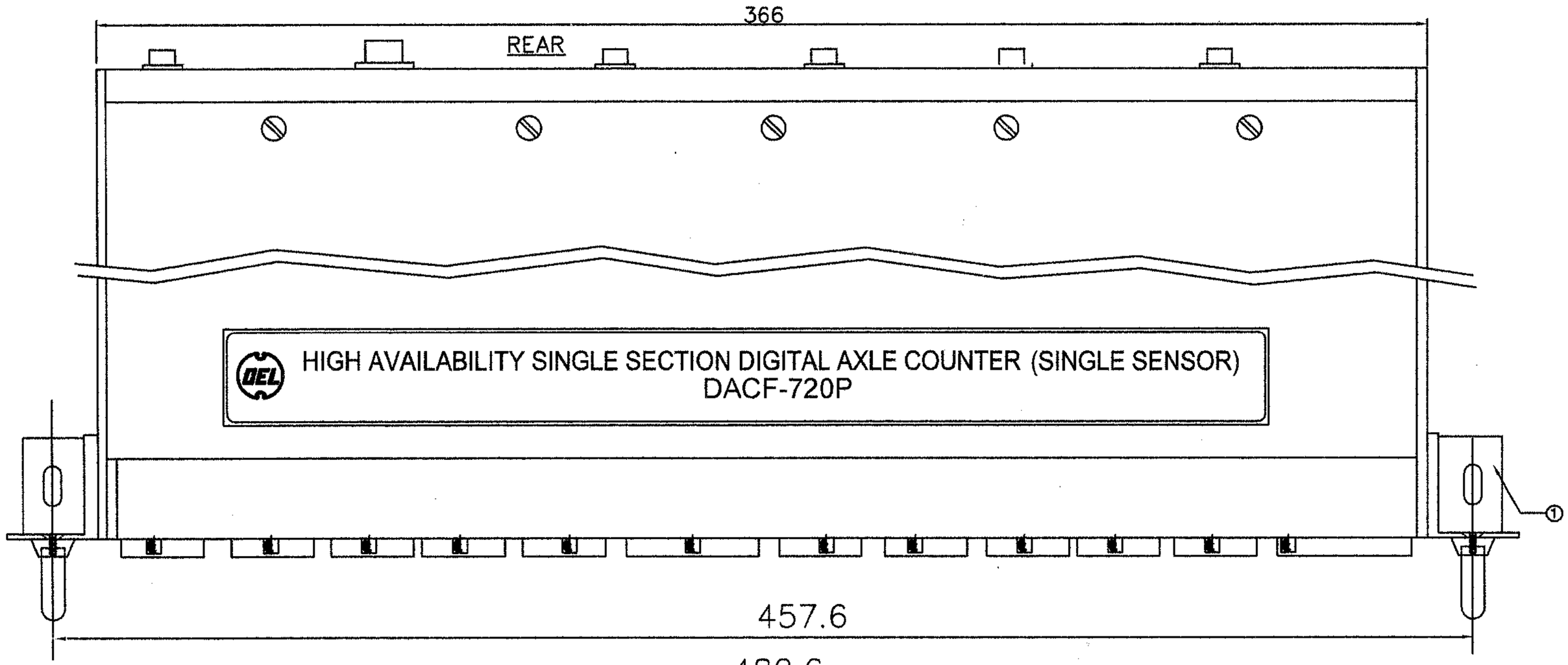
SYSTEM PRODUCTION DIVISION
CEL CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

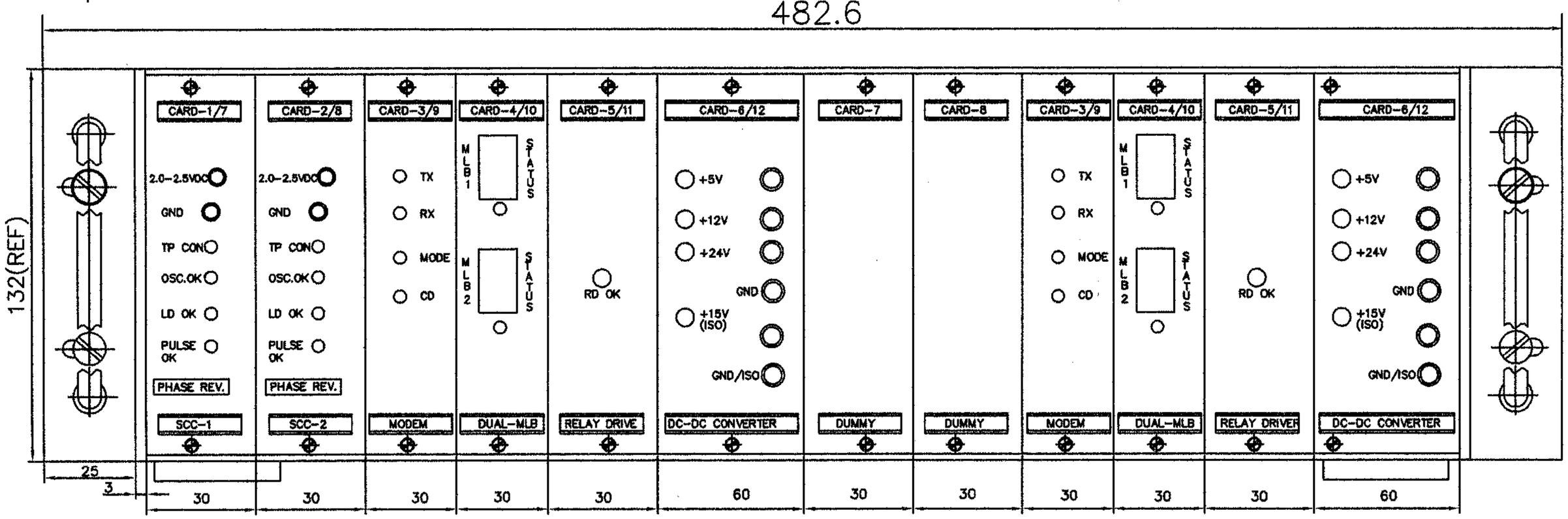
DRG.NO. 1007765A4

SHEET 1 OF 1

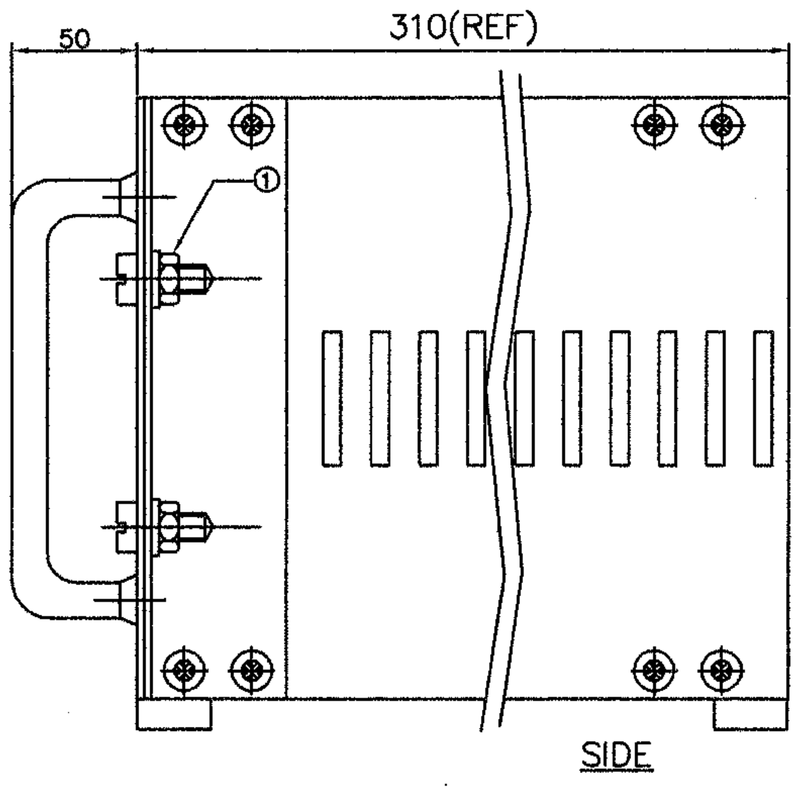
D8

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




FRONT




| REV.NO | CHANGE NOTE | AMMENDMENT DETAILS | DATE | APPD. |
|---|---|---|---|---|
| | | | | |

GEN TOL.
FULL FIG = ±1
DEC 0.X =
DEC 0.XX
PARALLELISM =
ANGLE =
UNSPECIFIED TOL.
AS PER IS :2102
CLASS =

SIZE A3

| | | | | | |
|---|---|---|---|---|---|
| DESIGNED | SIG. | DT. | MATL --- | DIM MM | NO.OF 1 |
| DRAWN | ADITYA | 26-03-13 | FINISH --- | SCALE NTS | |
| CHECKED | [signature] | 25.4.2015 | | | |
| APPROVED | [signature] | 25.4.2015 | | | |

PROJECT: HA SINGLE SECTION DIGITAL AXLE COUNTER DACF-720P (SINGLE SENSOR)

TITLE: CHASSIS ASSEMBLY

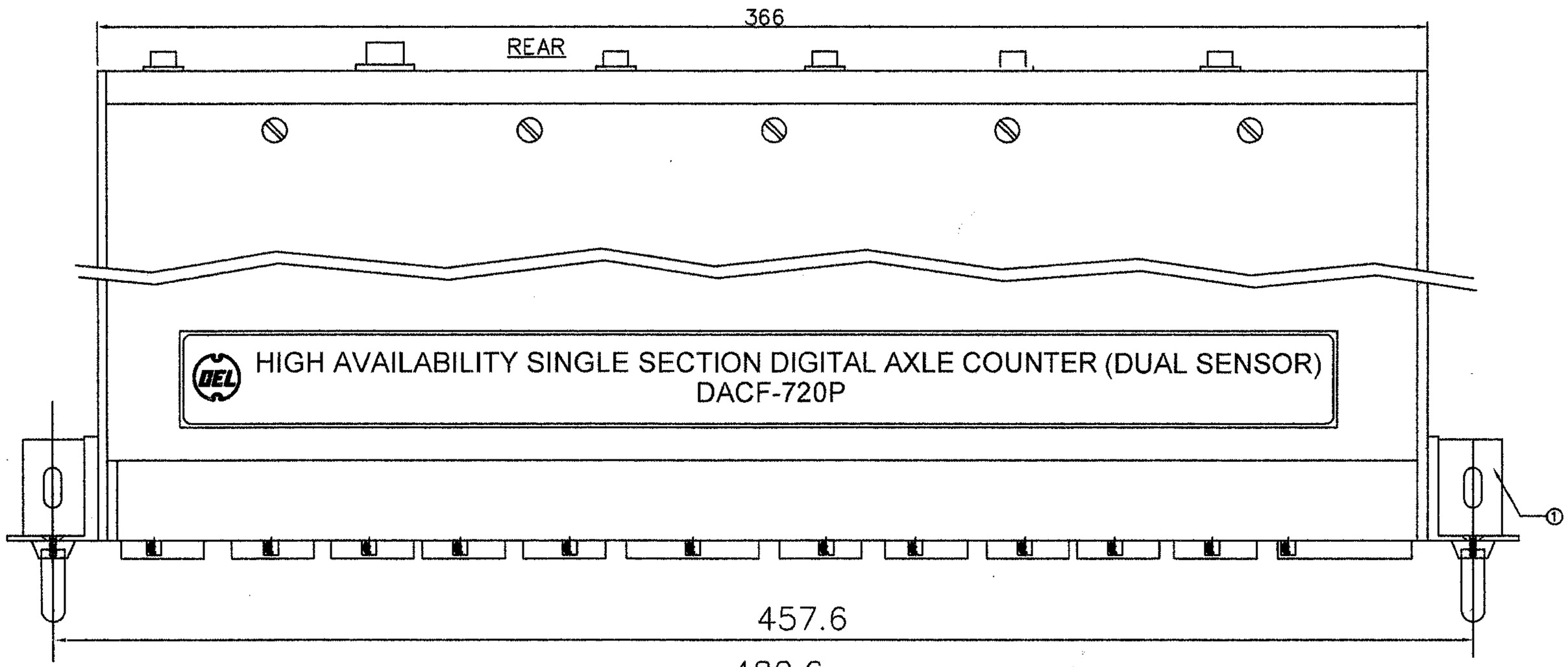
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

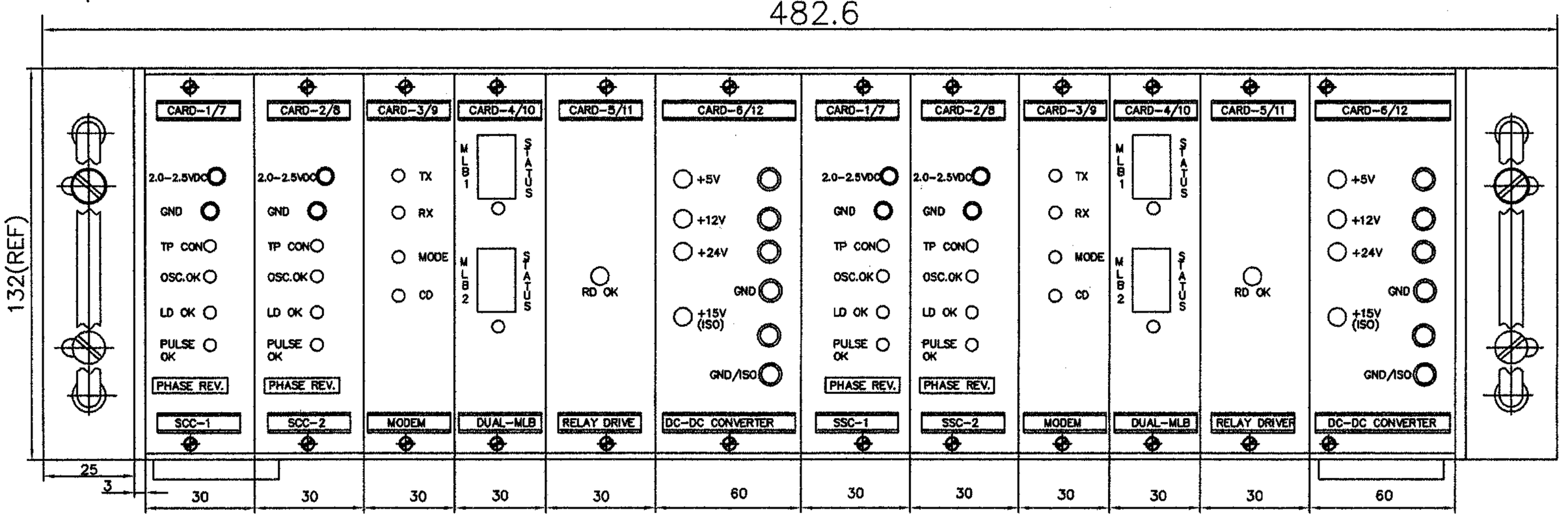
DRG.NO. A008805 | REV.NO. --- | SHEET NO. 1 OF 1

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROTRIETORS"

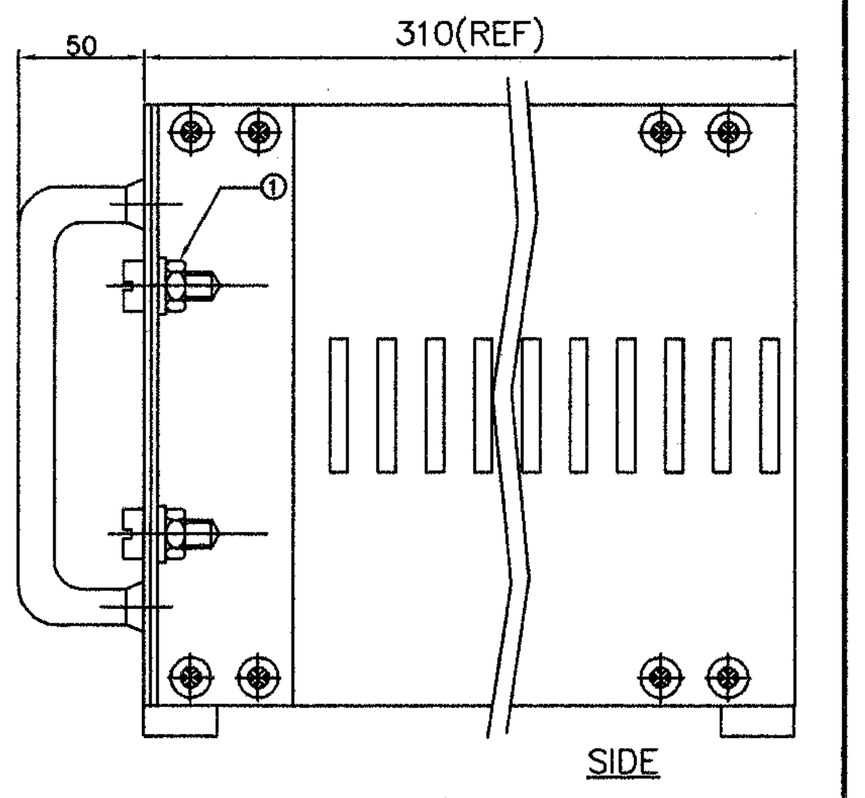
D9

SYSTEM4\ADITYA/HASSDAC\8805A2




FRONT




SIDE

| | | | | | | |
|---|---|---|---|---|---|---|
| REV.NO | CHANGE NOTE | AMMENDMENT DETAILS | | DATE | APPD. | GEN TOL. FULL RG = ±1, DEC 0.X =, DEC 0.XX, PARALLELISM =, ANGLE =, UNSPECIFIED TOL. AS PER IS :2102, CLASS = |

SIZE A3

| | | | | |
|---|---|---|---|---|
| DESIGNED | SIG. | DT. | MATL --- | DIM MM, NO.OF 1 |
| DRAWN | ADITYA | 26-03-13 | FINISH --- | SCALE NTS |
| CHECKED | | 25.4.15 | PROJECT: HA SINGLE SECTION DIGITAL AXLE COUNTER DACF-720P (DUAL SENSOR) | |
| APPROVED | | 25.4.15 | TITLE: CHASSIS ASSEMBLY | |

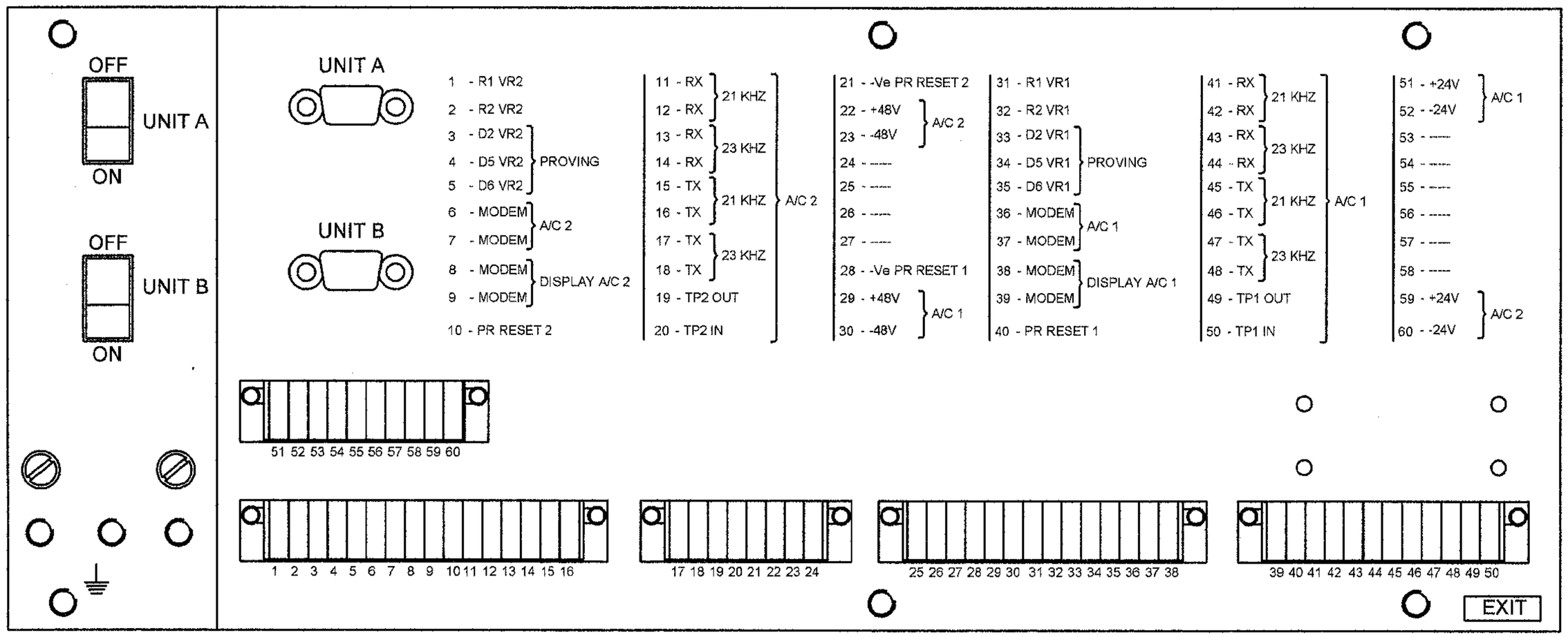
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. A008806 | REV.NO. --- | SHEET NO. 1 OF 1

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROTRIETORS"

D10

SYSTEM4\ADITYA/HASSDAC\8806A2




NOTE:-

SPRING TYPE PLUGABLE CONNECTORS ARE PROVIDED AFTER SUPPLY OF FIRST 200 SYSTEMS AS SHOWN IN DRAWING.

| REV.NO. | CHANGE NOTE | AMMENDMENT DETAILS | DATE | APPD. |
|---|---|---|---|---|
| 1 | 3011 | AS PER C' NOTE | 20.07.13 | |

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. | MATL | DIM MM | NO.OFF |
| DRAWN | ADITYA | 19.02.13 | FINISH | SCALE NTS | |
| CHECKED | | 09.9.13 | PROJECT: HIGH AVAILBILITY SINGLE SECTION DIGITAL AXLE COUNTEF HASSDAC | | |
| APPROVED | | 09.9.13 | TITLE: REAR PRINTING | | |

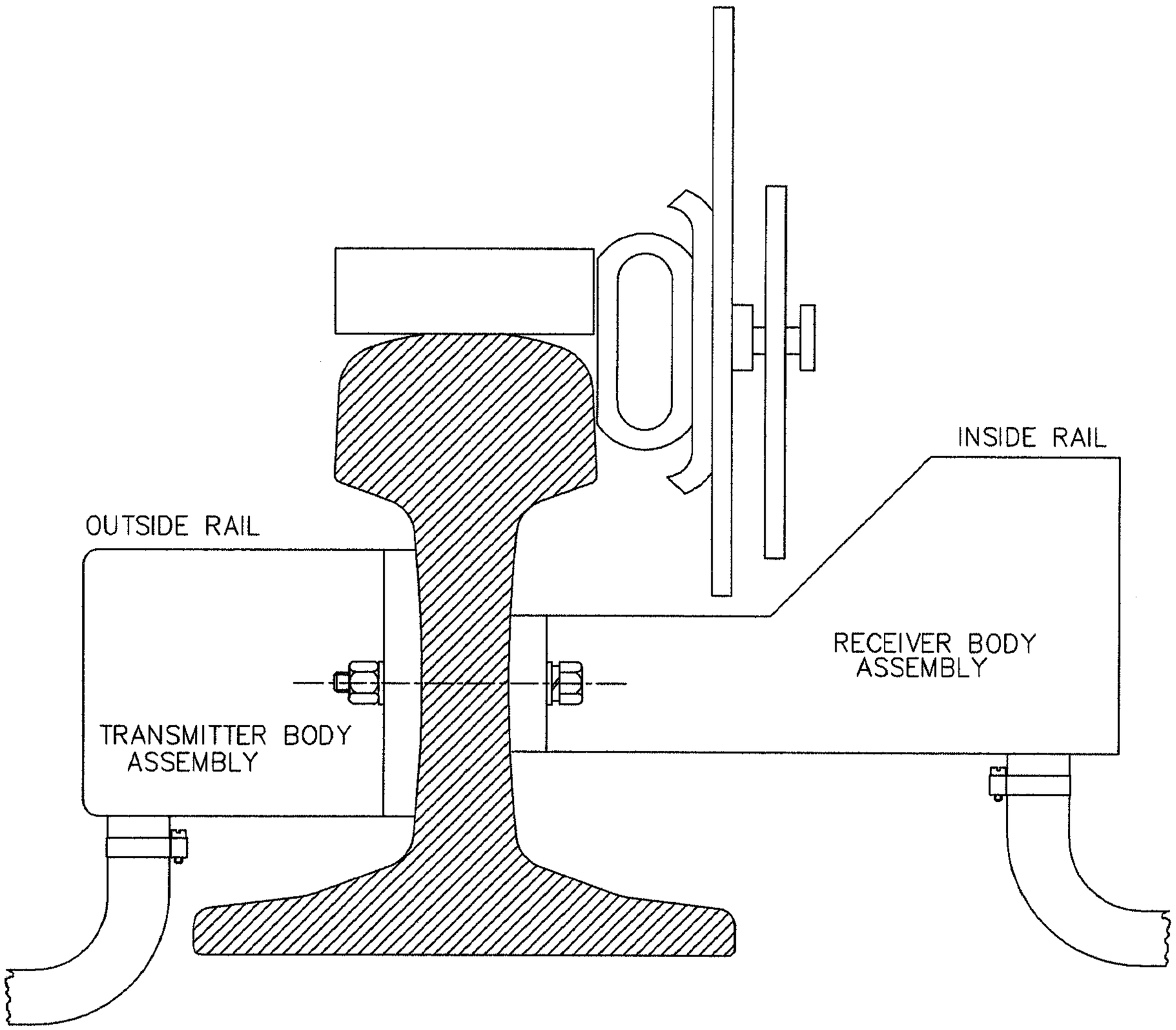
SYSTEMS PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

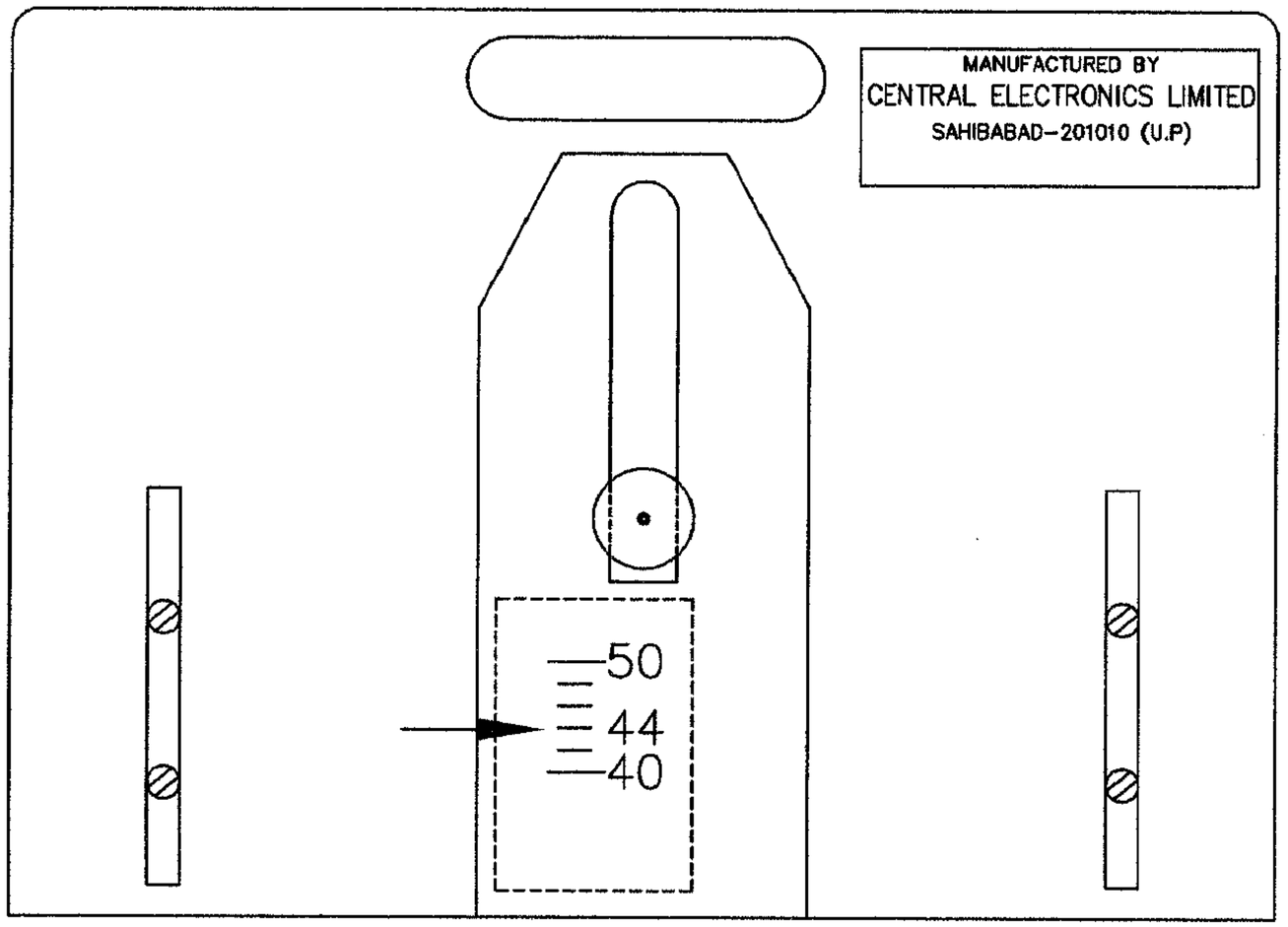
DRG.NO. P008780 | REV.NO. 01 | SHEET NO. 1

D11 A

SYS-4/ADITYA/MECH/8780A4

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"




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

DRAWING NUMBER D12,D13 ARE NOT USED.



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

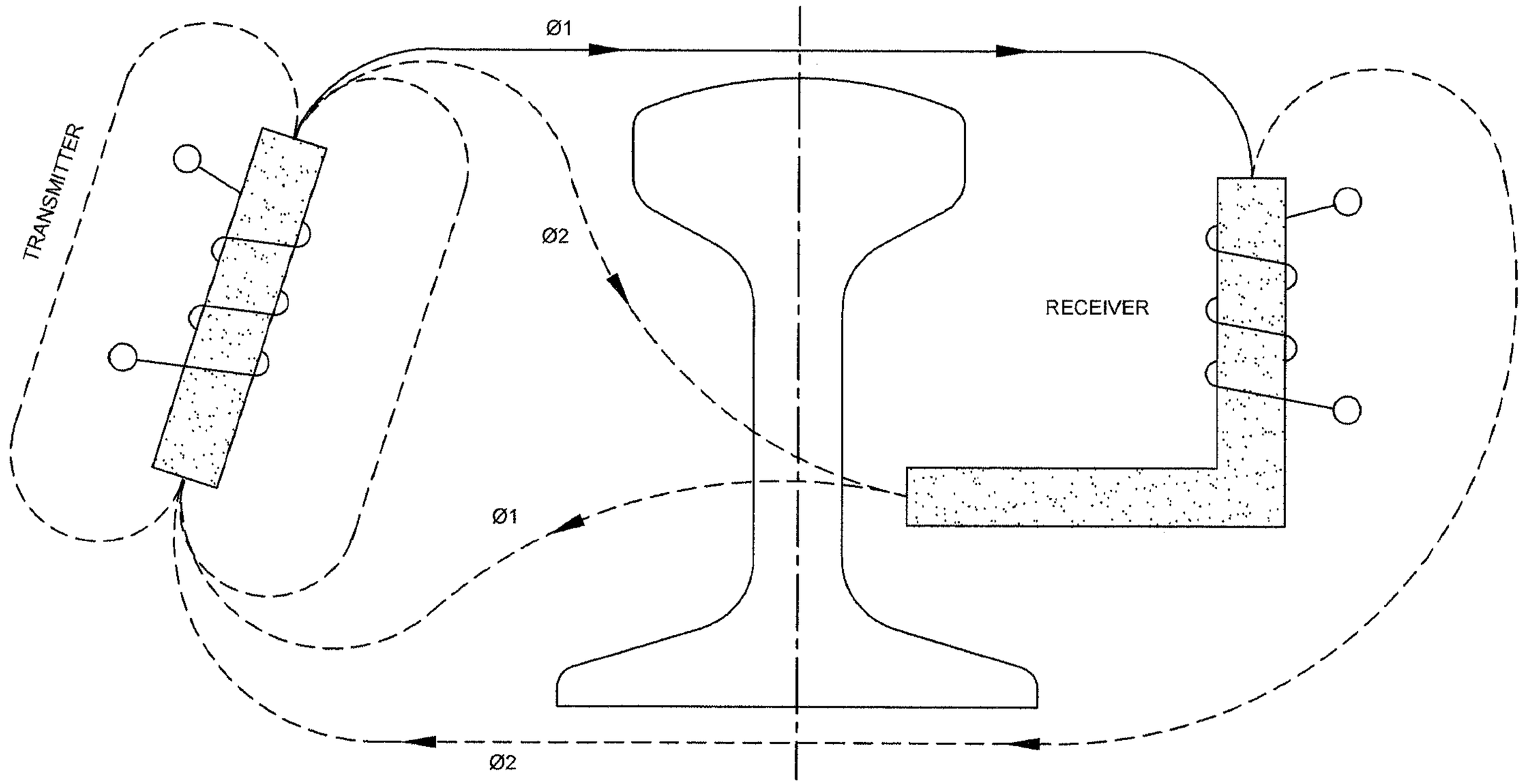
HASSDAC (DACF- 720P)
DUMMY WHEEL SETTING FOR DIP

SYSTEM PRODUCTION DIVISION
CEL 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 |

HASSDAC (DACF- 720P)
MAGNETIC FLUX PATHS IN THE AXLE DETECTOR

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

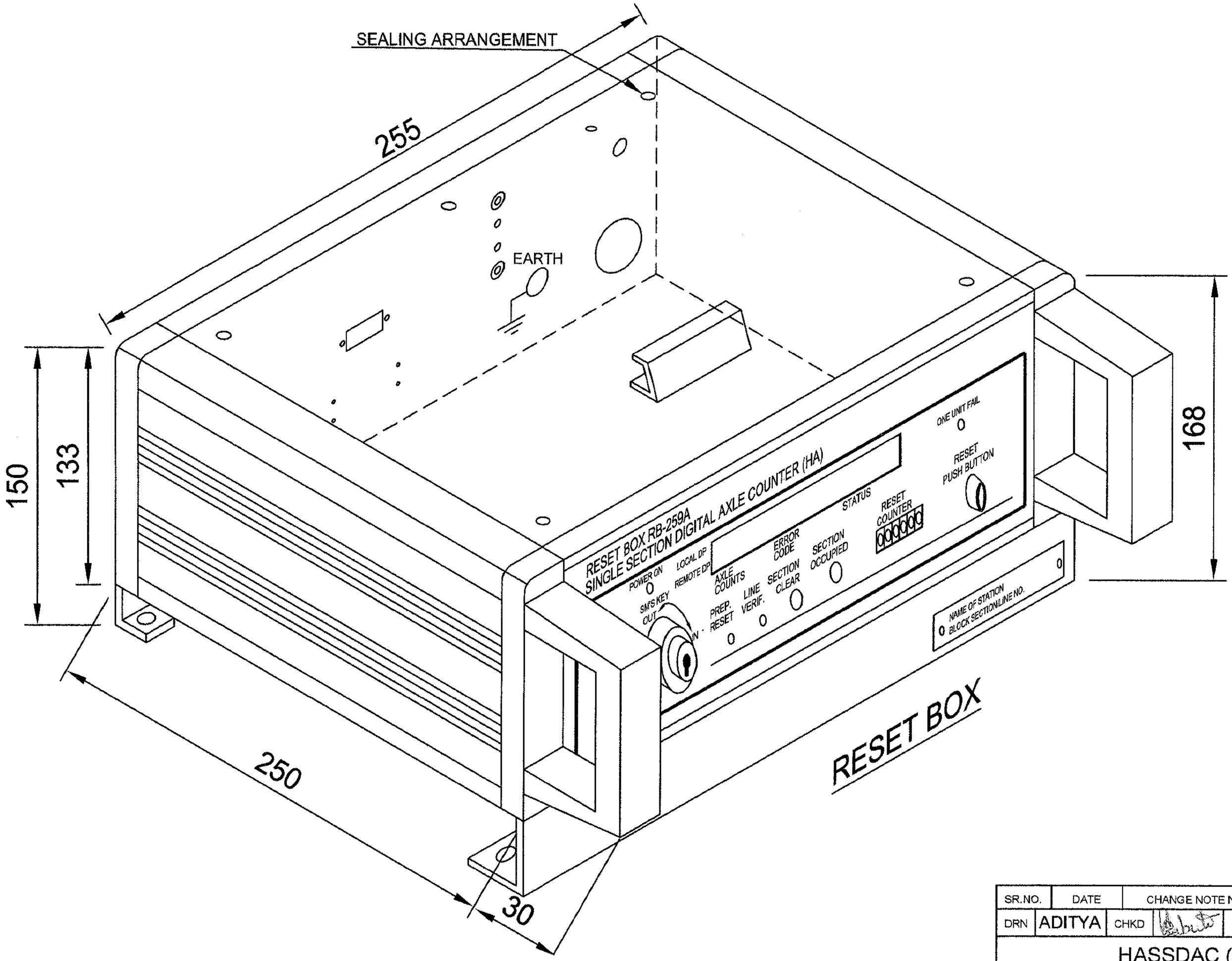
DRG.NO. L005993A3

SHEET 1 OF 1

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"



SYSTEM2\Bhandari\DACF-AP\5993A3




| SR.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | ADITYA | CHKD | APPD | DATE | 26-03-13 |

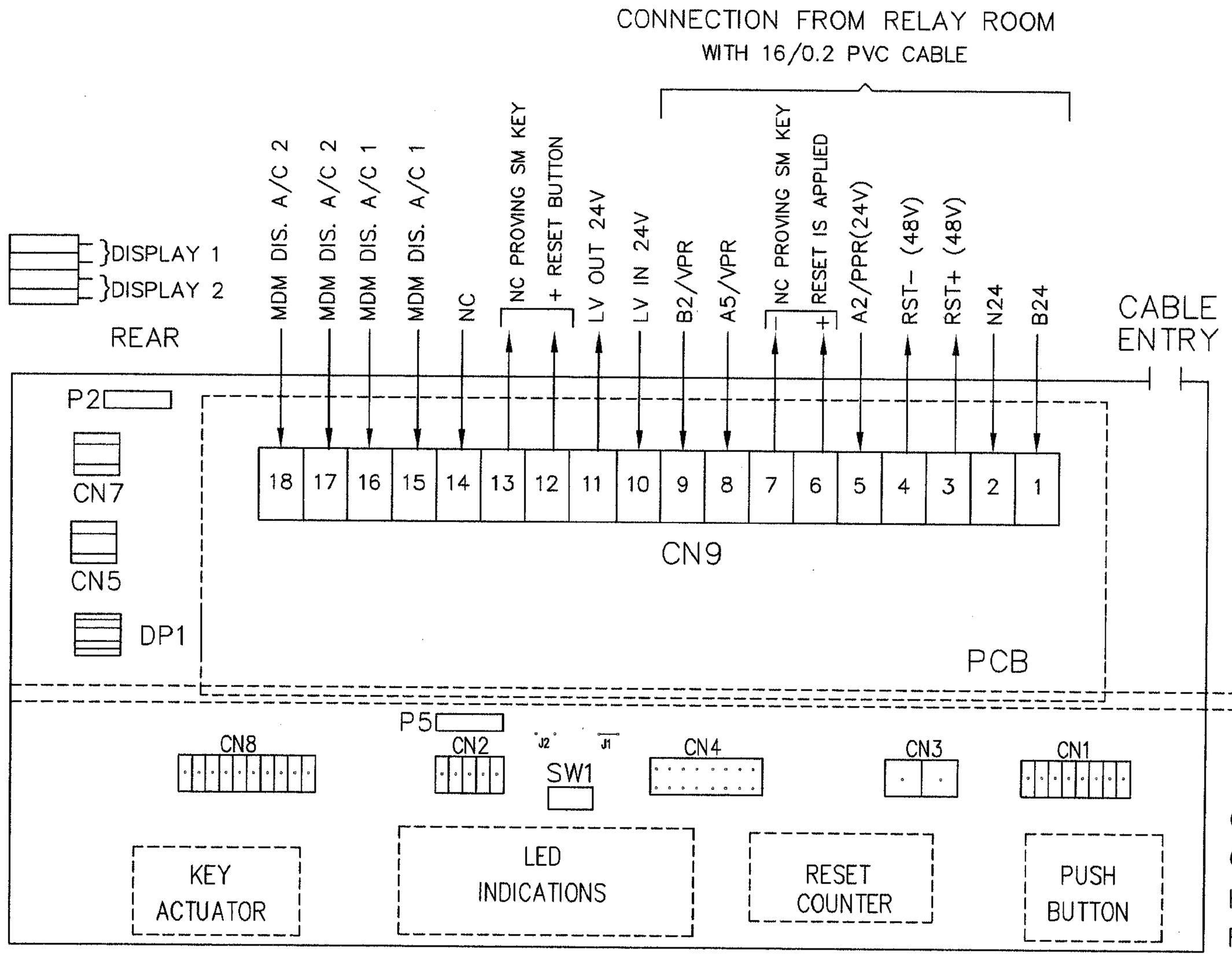
HASSDAC (DACF - 720P)
RESET BOX RB-259 (ISOMETRIC VIEW)

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

DRG.NO. F008807A4
SHEET 1 OF 1

D16

SYSTEM4\ADITYA/HASSDAC /8807A4




CN9–6,7,12,13 ARE TO BE CONNECTED TO EXTERNAL HARDWARE IF REQUIRED BY RAILWAY.

CN4–LCD DESPLY CABLE ENTRY.

CN7–9 PIN DSUB FOR DOWN LOADING DATA.
SW1–RESET SWITCH FOR LCD REFRESH.
CN5–FOR KEY PAD CABLE ENTRY.

JUMPER J1 SHALL BE REMOVED AND J2 CONNECTED FOR LV PROVING.

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26-03-13 |

HASSDAC (DACF – 720P)
WIRING DETAILS OF RESET BOX AT SITE

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

DRG.NO. W008808A4
SHEET 1 OF 1



SYSTEM4/ADITYA/HASSDAC/8808A4

## SM'S ROOM / CABIN

RESET BOX (FRONT VIEW)

RESET BOX RB-259A
SINGLE SECTION DIGITAL AXLE COUNTER

POWER ON
LOCAL DP
REMOTE DP
COUNTS ERROR STATUS
ONE UNIT FAIL
SM'S KEY OUT
PREP. LINE SECTION SECTION RESET VERIF. CLEAR OCCUPIED
RESET COUNTER
RESET PUSH BUTTON
ON

+24V
DC
DC-DC (24 TO 48)
48V OUTPUT
REGULATOR (24 TO 12)
+12V
TO SH-2
24V
N24+ B24

RR
4 6

NO 1 NO 2 NO 1 NO 2
24V DC CONTINUOUSLY AVAILABLE
SM'S KEY
RESET BUTTON

NO 3 NO 4 NO 3 NO 4
SM'S KEY
RESET BUTTON

## RELAY ROOM

230V, 50HZ
BATT.CHARGER 230V,24V/5A
24V
BATTERY 24V, 40AH
BATTERY
110V
IPS (24V,5A MODULE)
F1,2A
B24
A1 PPR
B1 VPR
SPARE
N24

TERMINALS IN RESET BOX
1CN9 1 B24
2CN9 2 N24

FROM SH.2
3CN9 3
48V DC (WHEN RESET APPLIED)
4CN9 4

DISPLAY 1
DISPLAY 2

12CN9 12 NC
13CN9 13 NC

TO SH.2

LV PROVING AT SITE
LV IN (24V) 10CN9 10
J1
24V LV OUT (24V) 11CN9 11

## HIGH AVAILABILITY SINGLE SECTION DIGITAL AXLE COUNTER LOCATION (SITE)

POWER CABLE,2CORE (25 Sq. mm 'Al')

N24: B2 VR, B2 PR, R2 PR, SVPD1, SPARE
B24: C1 VR, A1 PR, SVPD1, SPARE

RESET 48V FOR 2nd UNIT OF SSDAC IN STATION SECTION
1
2

48V DC AVAILABLE TO BOTH MODULES WHEN RESET APPLIED
SVPD 2
VR 722

N24 B24
SVPD-1

**DIGITAL AXLE COUNTER (HASSDAC)**

QUAD 1
(MODEM LINK)
SVPD 5,6 & 9,10

VR
VR
D4 D3
PR
N24

TO 2nd UNIT OF SSDAC
1/2 QUAD CABLE/OFC (MODEM LINK FOR MODULE1)
SVPD 3&4
1/2 QUAD CABLE/OFC (MODEM LINK FOR MODULE2)
SVPD 7&8

D18

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26-03-13 |

HASSDAC POWER SUPPLY,RESET CIRCUIT WITH RESET INTERLOCKING & LCD DISPLAY WIRING DIAGRAM

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

DRG.NO. S008809A3
SHEET 1 OF 3

SYSTEM4/ADITYA/HASSDAC/8809A3-1

SM'S ROOM / CABIN

RELAY ROOM

HIGH AVAILABILITY SINGLE SECTION
DIGITAL AXLE COUNTER LOCATION (SITE)

D1
R2 R1
− VPR +
3
VR1 C2 C1
VR2 C2 C1
B24
SIGNALLING
CABLE(1.5sq.mm)
4
B1 B2 C3 C4 VR1
B1 B2 C3 C4 VR2
N24

N24
2N5416
TERMINALS IN RESET BOX
3 TO 5 SEC. TIMER CKT
5CN9
5
PPR A2 A1
B24

D2
R2 R1
− PPR +
5
PR1 C2 C1
PR2 A2 A1
B24
SIGNALLING
CABLE(1.5sq.mm)
6
PR1 C3 C4 D3 D4
PR2 A3 A4 B3 B4
N24

R1 1 4 6 8
Prep. Reset Relay
PPR1
R2 16 13 11 9
+12V
CIRCUIT
FROM SH.1 ③
0 0 0 0 0 0
RESET COUNTER
N24

FROM SH.1 ⑥
J2
B24
POWER
PREP. RESET
LINE VER.
OCC.
CLEAR
N24

8CN9 8 VPR D4 D3
9CN9 9 VPR B2 B1 B24
6CN9 6 NC(+) 24V OUT WHEN RESET IS APPLIED. CAN BE CONNECTED TO EXTERNAL HARDWARE IF REQUIRED BY RAILWAY.
7CN9 7 NC (−)
14CN9 14 NC

D1,D2 – IN5408 DIODE.

D19

| REV.NO. | DATE | CHANGE NOTE NO. | | CHANGE | |
|---|---|---|---|---|---|
| DRN ADITYA | CHKD | APPD | | DATE | 26-03-13 |

HASSDAC POWER SUPPLY,RESET CIRCUIT WITH RESET INTERLOCKING & LCD DISPLAY WIRING DIAGRAM

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

DRG.NO. S008809A3

SHEET 2 OF 3

SYSTEM4/ADITYA/HASSDAC/8809A3-2

NOTE: –

1) 2nd RESET BOX IS TO BE WIRED FOR THE 2nd UNIT OF HASSDAC 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 IN STATION SECTION.
3) VR–02 NOS, RR–01NO. ARE 24V,1000 Ohms,6F/6B QN1K TYPE RELAY PR IS DUAL RELAY,24V,QNN1 TYPE 6F/2B, LH & RH RELAY
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 SECONDS.
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. 696 FOR LV PROVING. ALSO REMOVE DIODE D11 ON CARD NO. 652

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN Aditya | CHKD | APPD | DATE 26.03.13 |

HASSDAC POWER SUPPLY RESET CIRCUIT WITH RESET INTERLOCKING & LCD DISPLAY WIRING DIGRAM

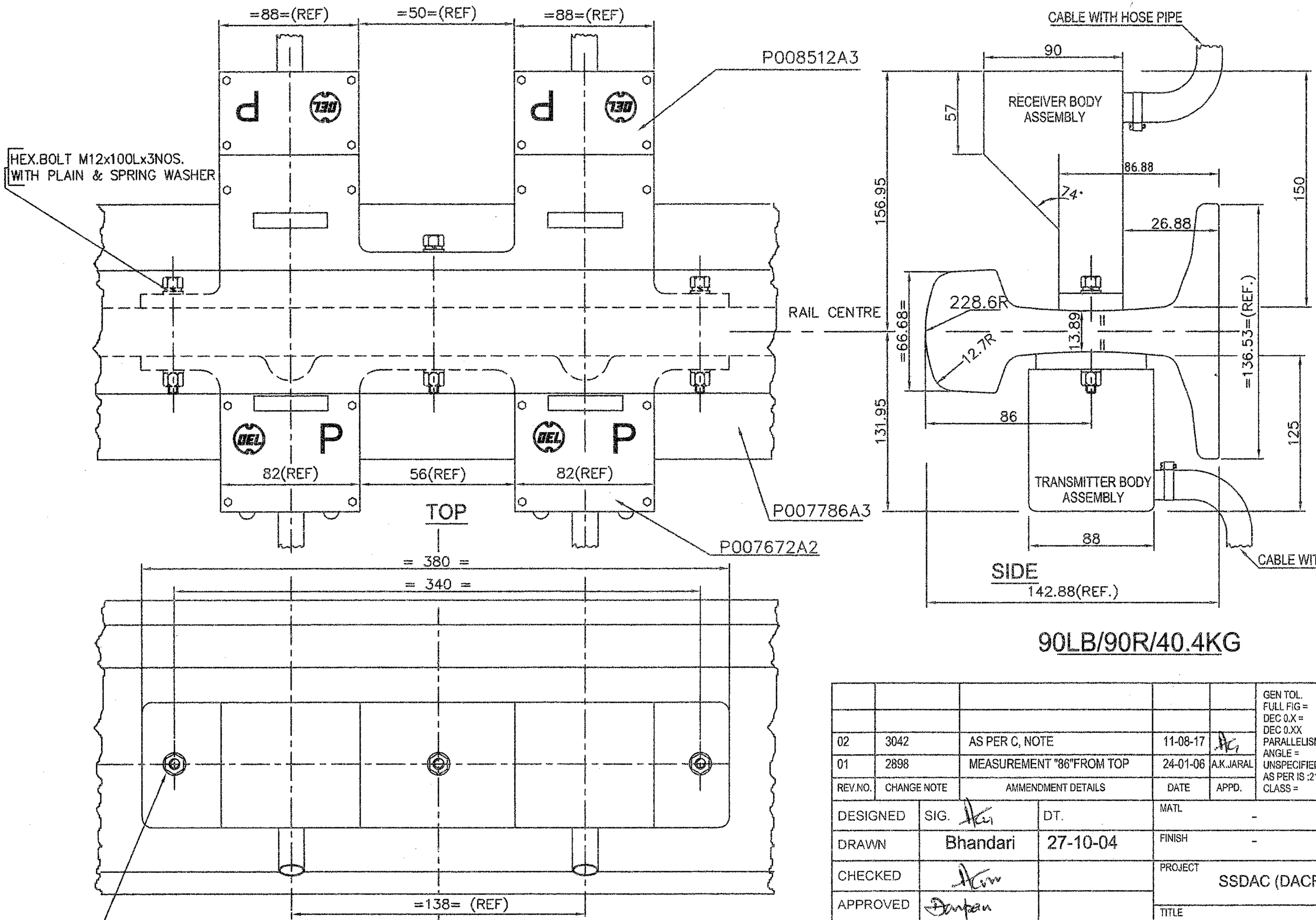
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. S008809A3

SHEET 3 OF 3



SYSTEM4/ADITYA/HASSDAC/8809A3–3




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)

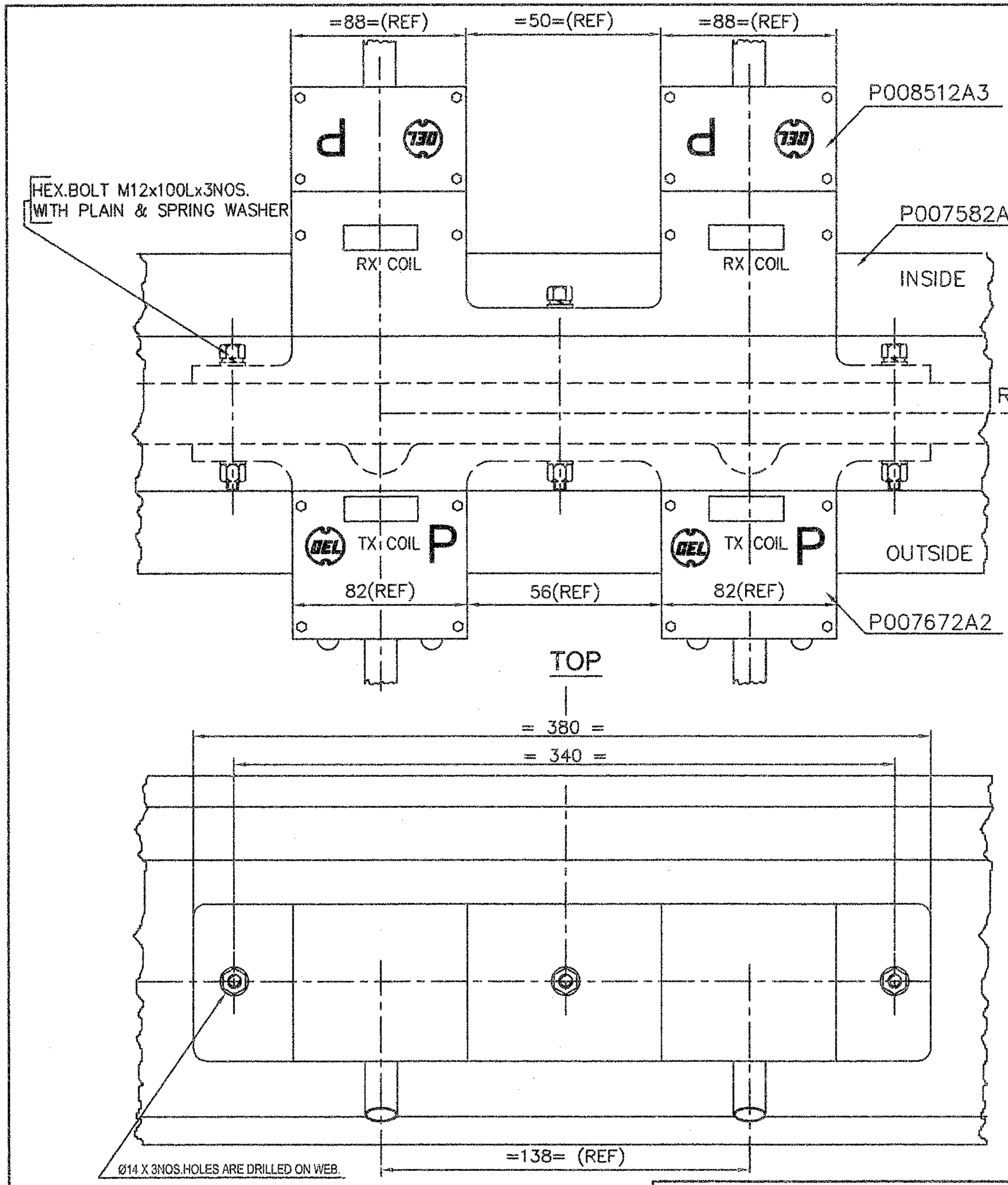
TITLE: WEB MOUNTED TX/ RX AXLE DETECTOR
PHASE MOUDLATION ASSEMBLY FOR 90LB RAIL

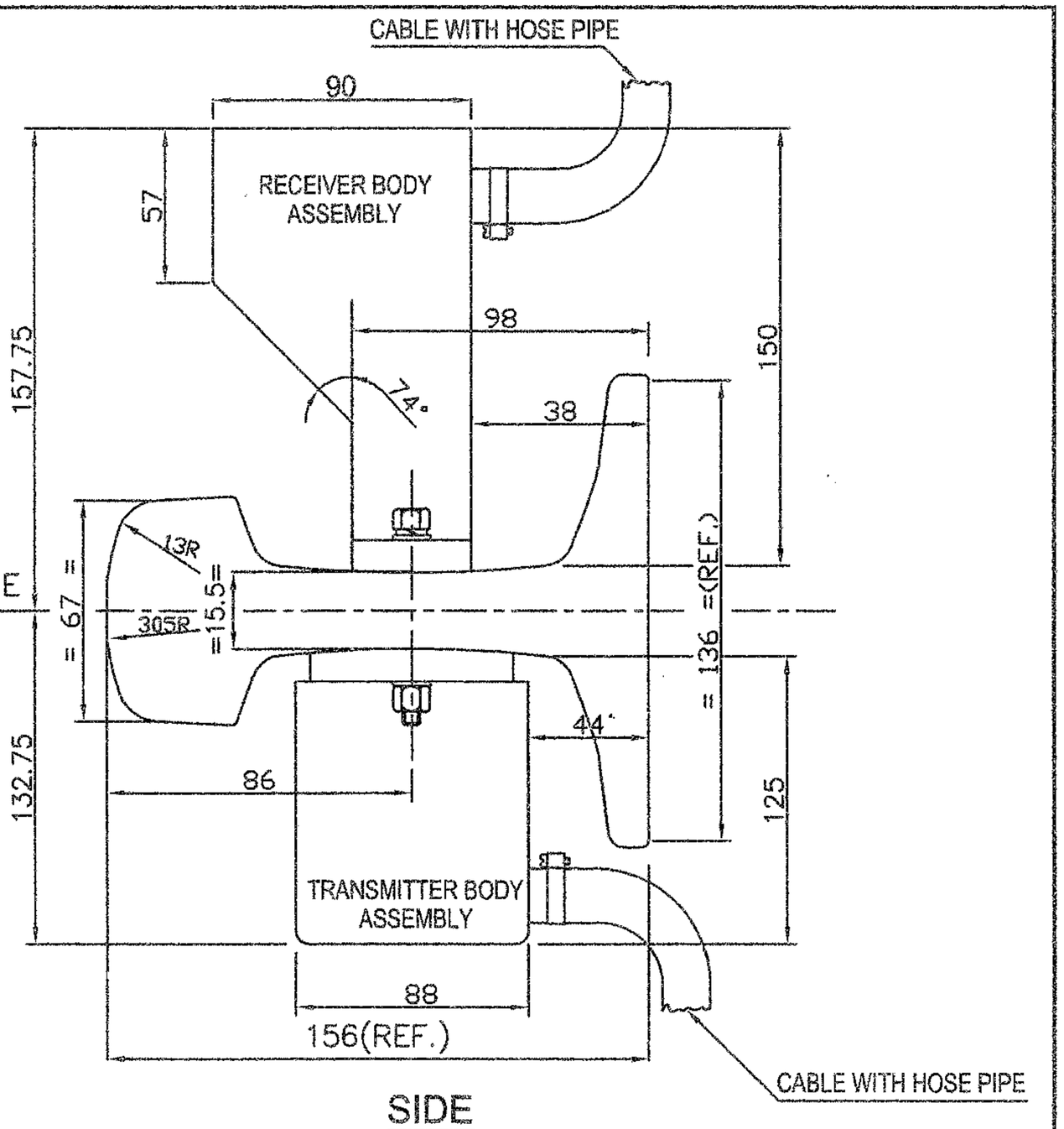
DRG.NO. A008446 | REV.NO. 01 | SHEET NO. 1 OF 1

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

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)

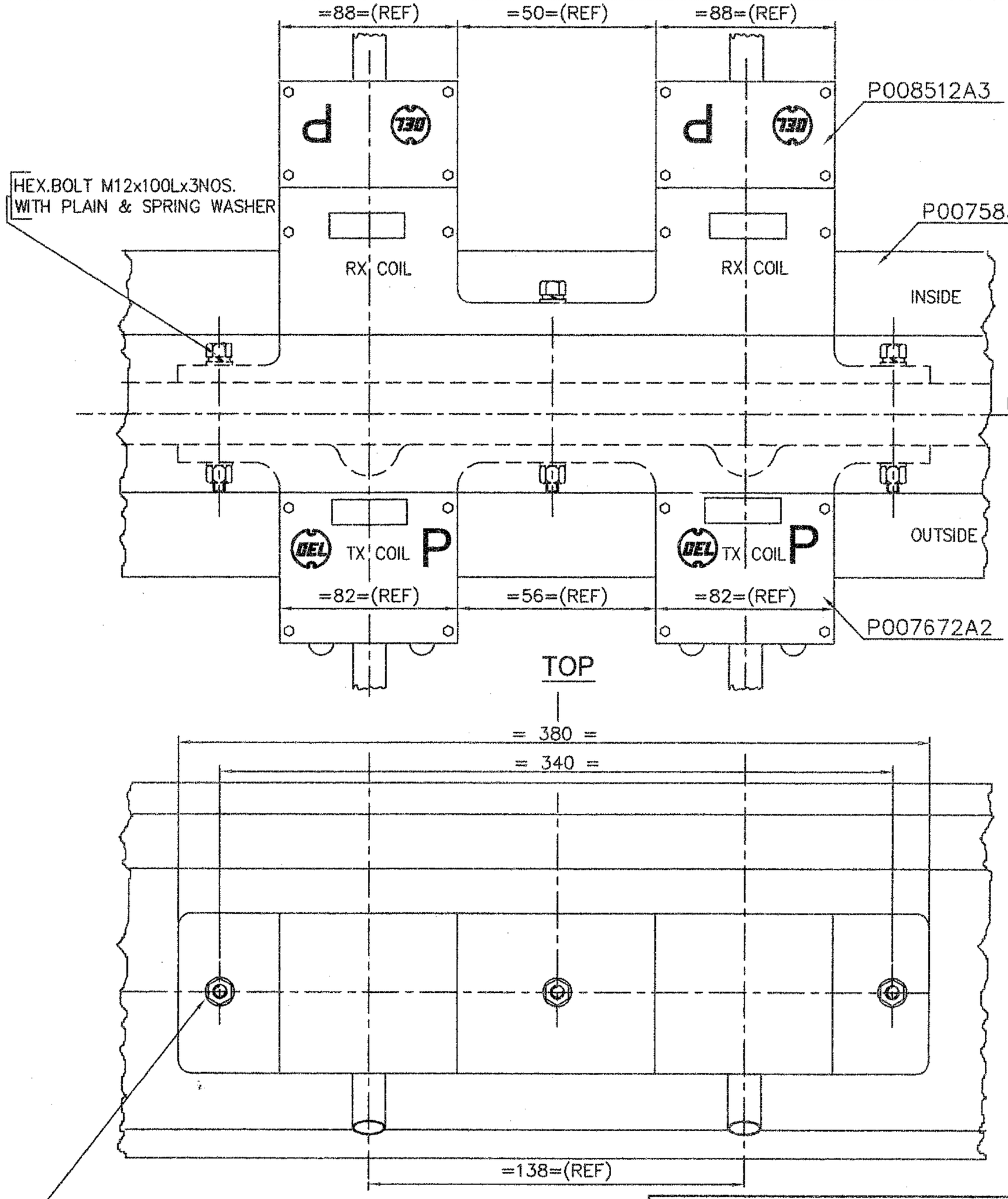
TITLE: WEB MOUNTED TX/RX AXLE DETECTOR
PHASE MOUDLATION ASSEMBLY FOR 52 KG

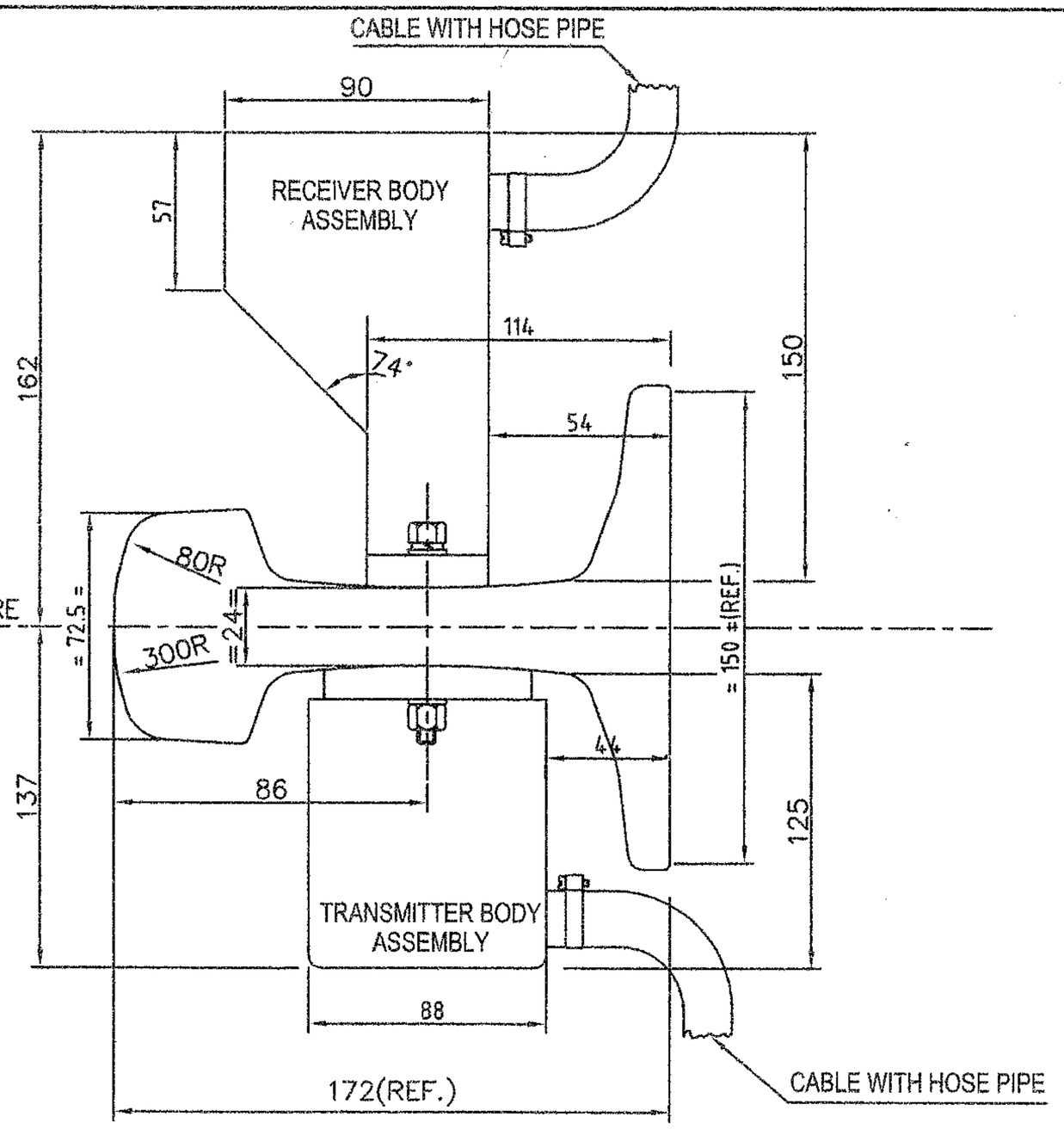
"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROTRIETORS"

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

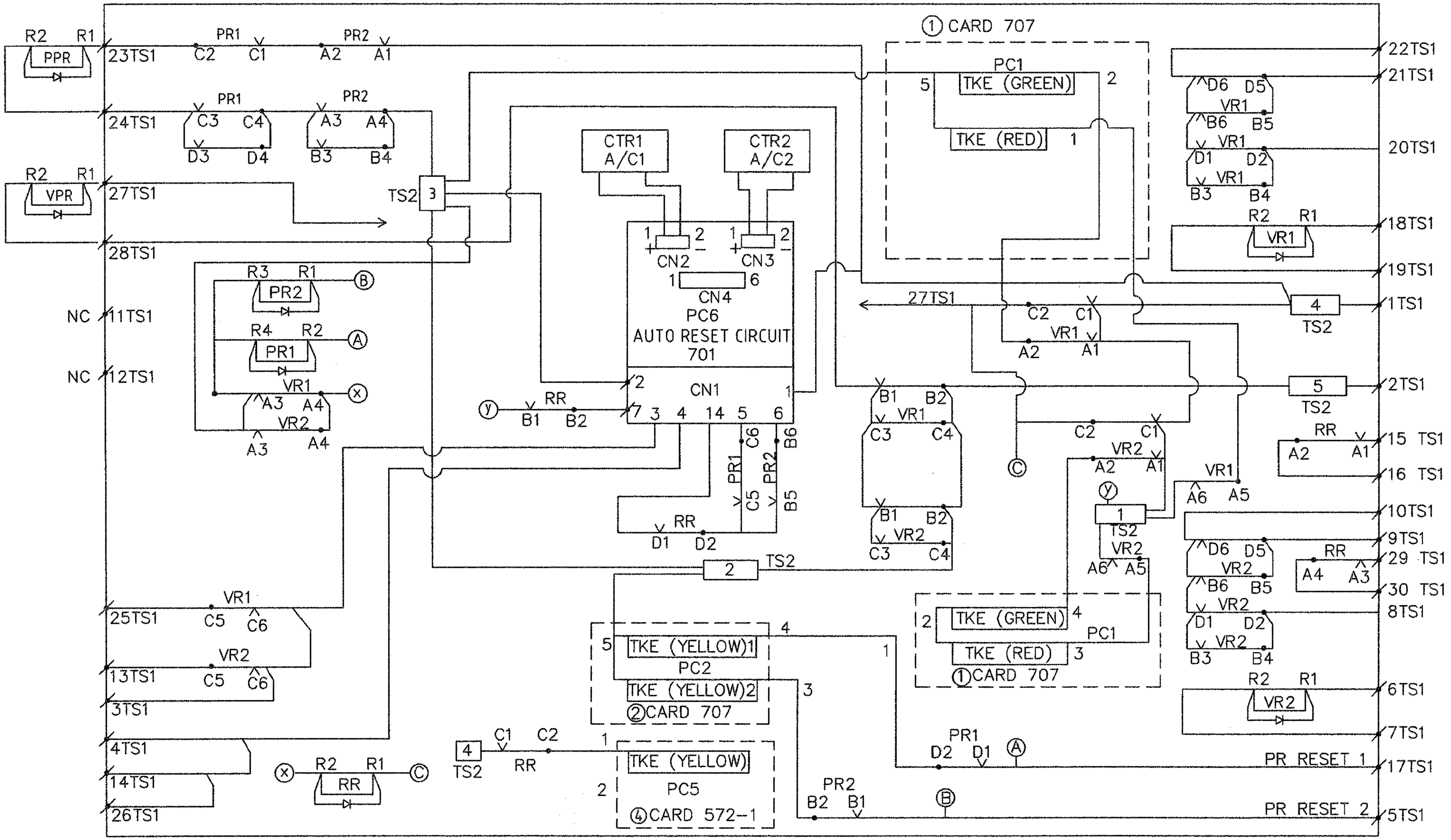
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

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

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROTRIETORS"

SYSTEM2\Bhandari\DACF-700AP\8448A3

D22




| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | BHUSHAN | CHKD | APPD |

DATE 25-01-2012

VITAL RELAY BOX VR-722 (HASSDAC)
LOGIC SCHEMATIC

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

DRG.NO. S008663A3

SHEET 1 OF 1

D23,24 NOT USED.

D25

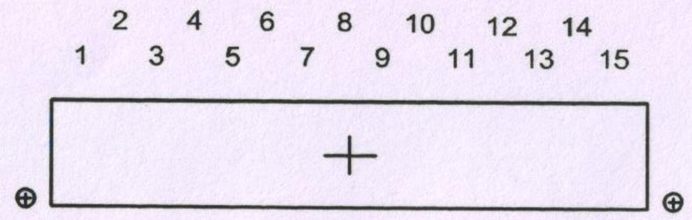
03/04/13

SYS-4/ADITYA/HASSDAC/8663A3

# VITAL RELAY BOX (HA)
# VR-722

TS1

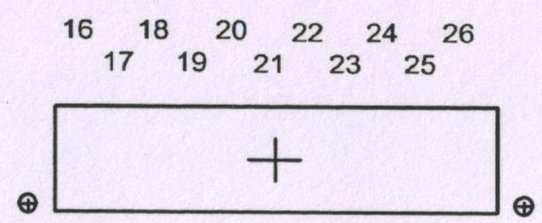
| | |
|---|---|
| 1 | + BATT. (24V) |
| 2 | - BATT. (24V) |
| 3 | + 48V RESET BOX |
| 4 | - 48V RESET BOX |
| 5 | PR RESET 2 |
| 6 | R1 VR2 |
| 7 | R2 VR2 |
| 8 | D2 VR2 |
| 9 | D5 VR2 |
| 10 | D6 VR2 |
| 11 | NC |
| 12 | NC |
| 13 | + 48V A/C 2 |
| 14 | - 48V A/C 2 |
| 15 | A1 RR PICK |




TS1

TS1

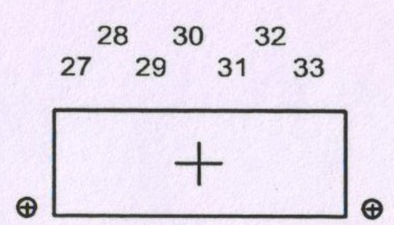
| | |
|---|---|
| 16 | A2 RR PICK |
| 17 | PR RESET 1 |
| 18 | R1 VR1 |
| 19 | R2 VR1 |
| 20 | D2 VR1 |
| 21 | D5 VR1 |
| 22 | D6 VR1 |
| 23 | R1 PPR |
| 24 | R2 PPR |
| 25 | + 48V A/C 1 |
| 26 | - 48V A/C 1 |




TS1

TS1

| | |
|---|---|
| 27 | R1 VPR |
| 28 | R2 VPR |
| 29 | A3 RR DROP |
| 30 | A4 RR DROP |
| 31 | NC |
| 32 | NC |
| 33 | NC |




TS1

NOTE:-

Spring type plugable connectors are provided after supply of first 200 System as shown in drawing.

If Railway want to observe number of Auto Resetting cases in Data Logger,Reset/Logic relay may be repeated in relay room. Potential free Pick up and Drop contact od RR are provided at TS1-15,16 and 29,30 of VR box. Contacts of RPR (Reset Proving Realy may be connected in Data Logger with exception of 10 Seconds as Reset Realy may pick up after each train movement for few Milliseconds.

If dual Power supply is to be used i.e two different Power supply source are provided, module provided on DIN rail with power supply combination card (card No-768) shall be wired as per Printing details on card and its 24V DC output shall be connected to connector 1,2 of vital relay box VR-722.

D26A

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

| REV.NO. | CHANGE NOTE | AMMENDMENT DETAILS | DATE | APPD. |
|---|---|---|---|---|
| 01 | 3010 | AS PER CHANGE NOTE | 20/07/13 | |

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

SIZE A3

| | | |
|---|---|---|
| DESIGNED | SIG. | DT. |
| DRAWN | AMIT KUMAR | 22.08.2018 |
| CHECKED | | — |
| APPROVED | | — |

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

PROJECT: VITAL RELAY VR-722 (HA)

TITLE: PRINTING TOP / REAR

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

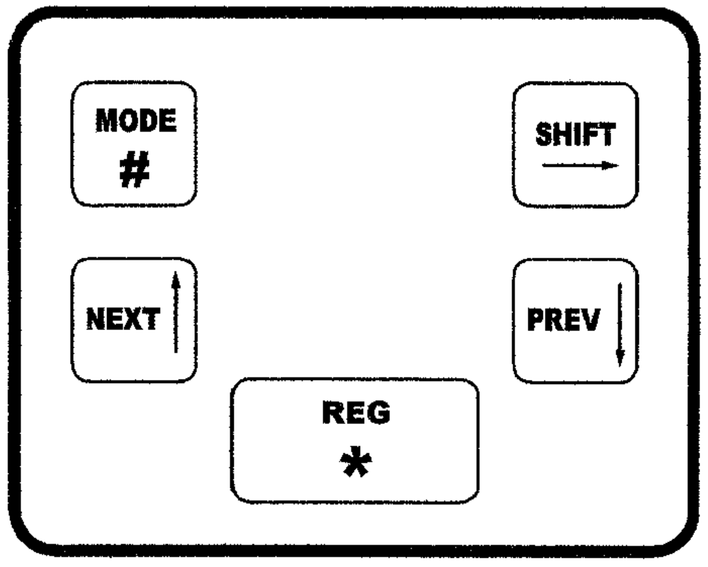
DRG.NO. E008627 | REV.NO. 02 | SHEET NO. 1 OF 2

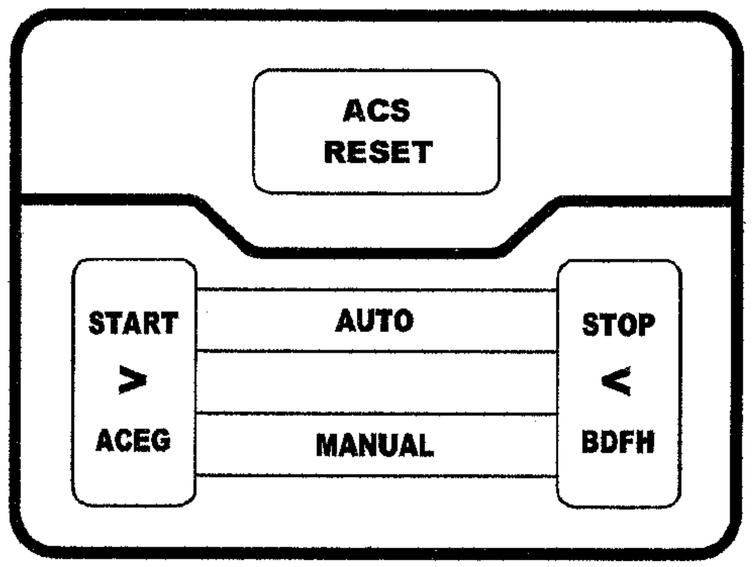
SYS4/ADITYA/MECH/8627A3-1

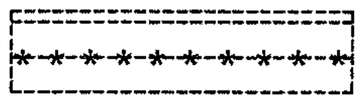
CENTRAL ELECTRONICS LIMITED

# TRAIN SIMULATOR TS-267P



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

HASSDAC DACF-720P
TRAIN SIMULATOR

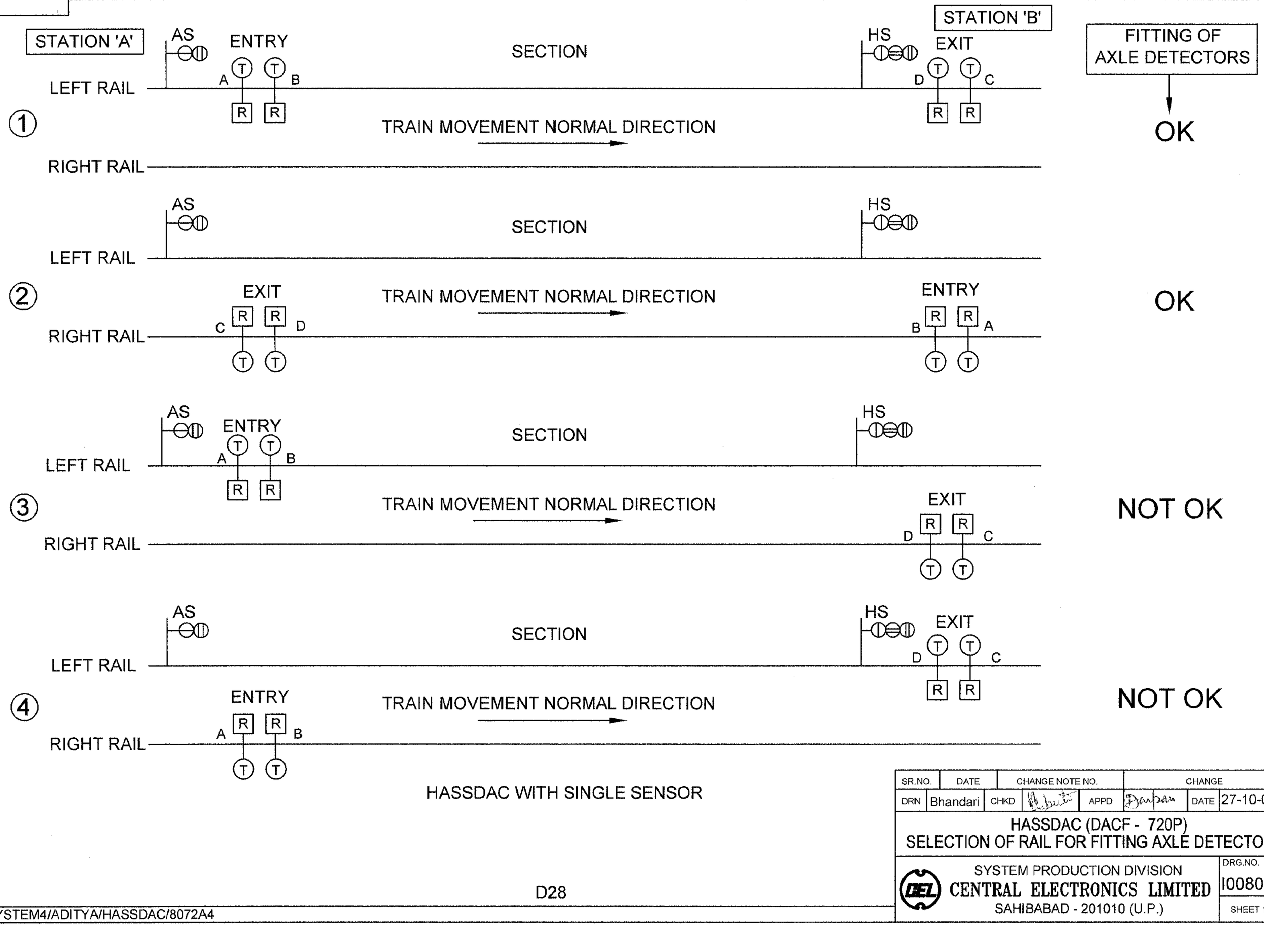
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. K008071A4

SHEET 1 OF 1



SYS4/ADITYA/HASSDAC/8071A4




HASSDAC WITH SINGLE SENSOR

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

HASSDAC (DACF - 720P)
SELECTION OF RAIL FOR FITTING AXLE DETECTORS

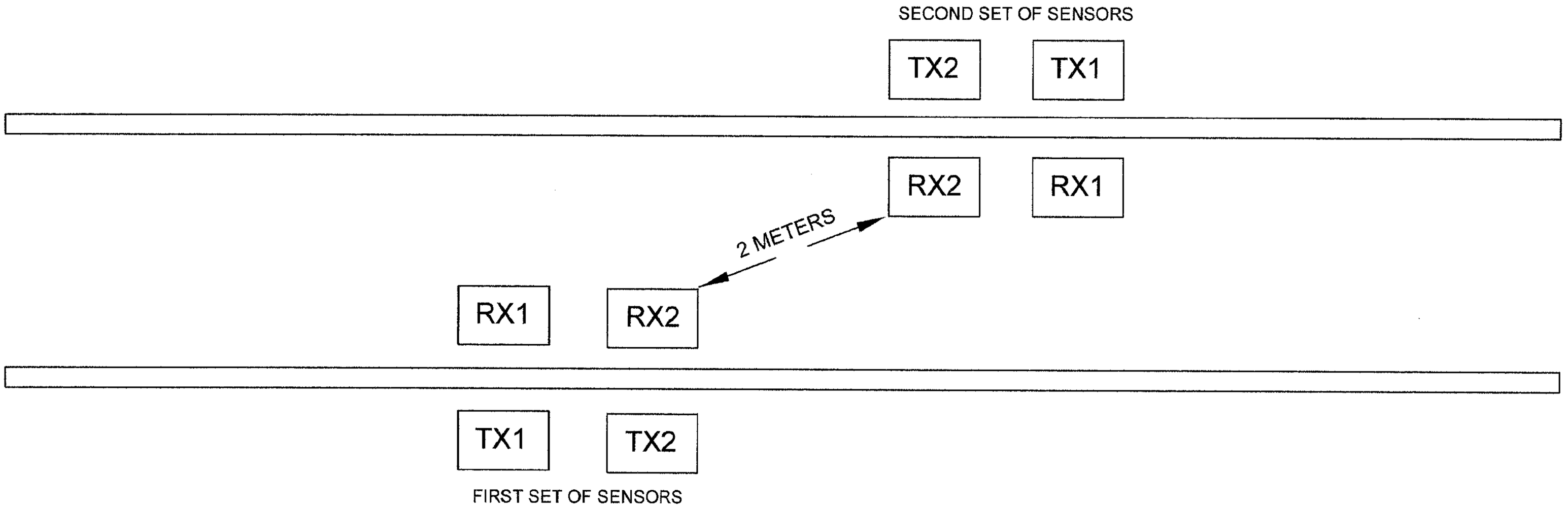
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

DRG.NO. I008072A4

SHEET 1 OF 1



SYSTEM4/ADITYA/HASSDAC/8072A4




NOTE:-

(I) SENSORS SHALL BE INSTALLED AT LEFT & RIGHT RAIL

(II) DIAGONAL DISTANCE BETWEEN TWO SENSORS SHALL NOT BE LESS THAN 2 METERS.

(III) ALL THOUGH THERE IS NO UPPER LIMIT FOR GAP IN BOTH SENSORS IT SHALL BE CONFINED TO 2-3 METERS FOR SIMULTANEOUS DROP OF VR1 AND VR2 RELAYS.

| 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. | MATL | DIM M.M | NO.OFF 1 |
| DRAWN | ADITYA | 03-04-2013 | FINISH - | SCALE N.T.S | |
| CHECKED | Babita | 05.04.13 | PROJECT HASSDAC DACF- 720P | | |
| APPROVED | Darpan | 05.4.2013 | | | |

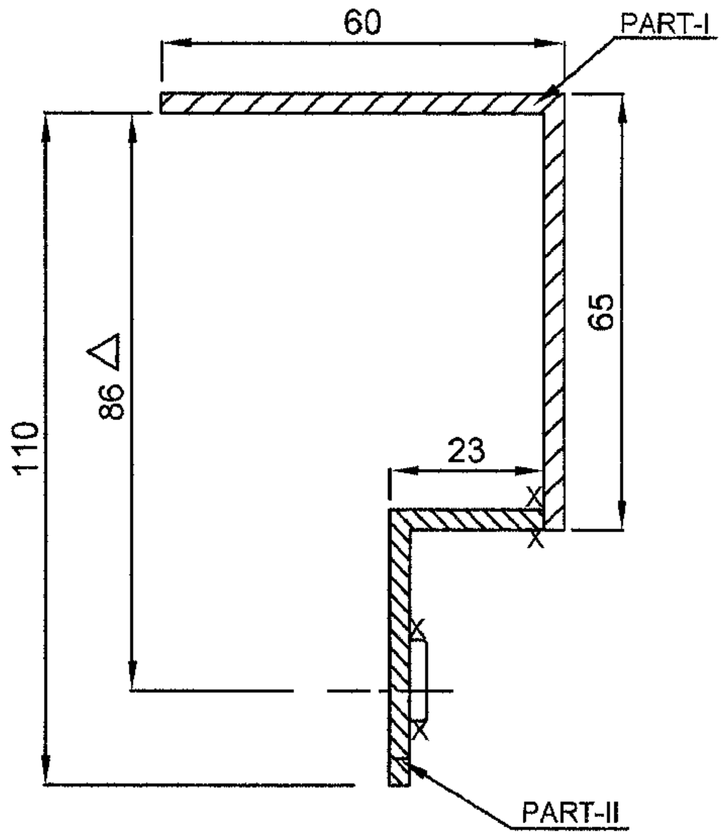
SYSTEM PRODUCTION DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD - 201010 (U.P.)

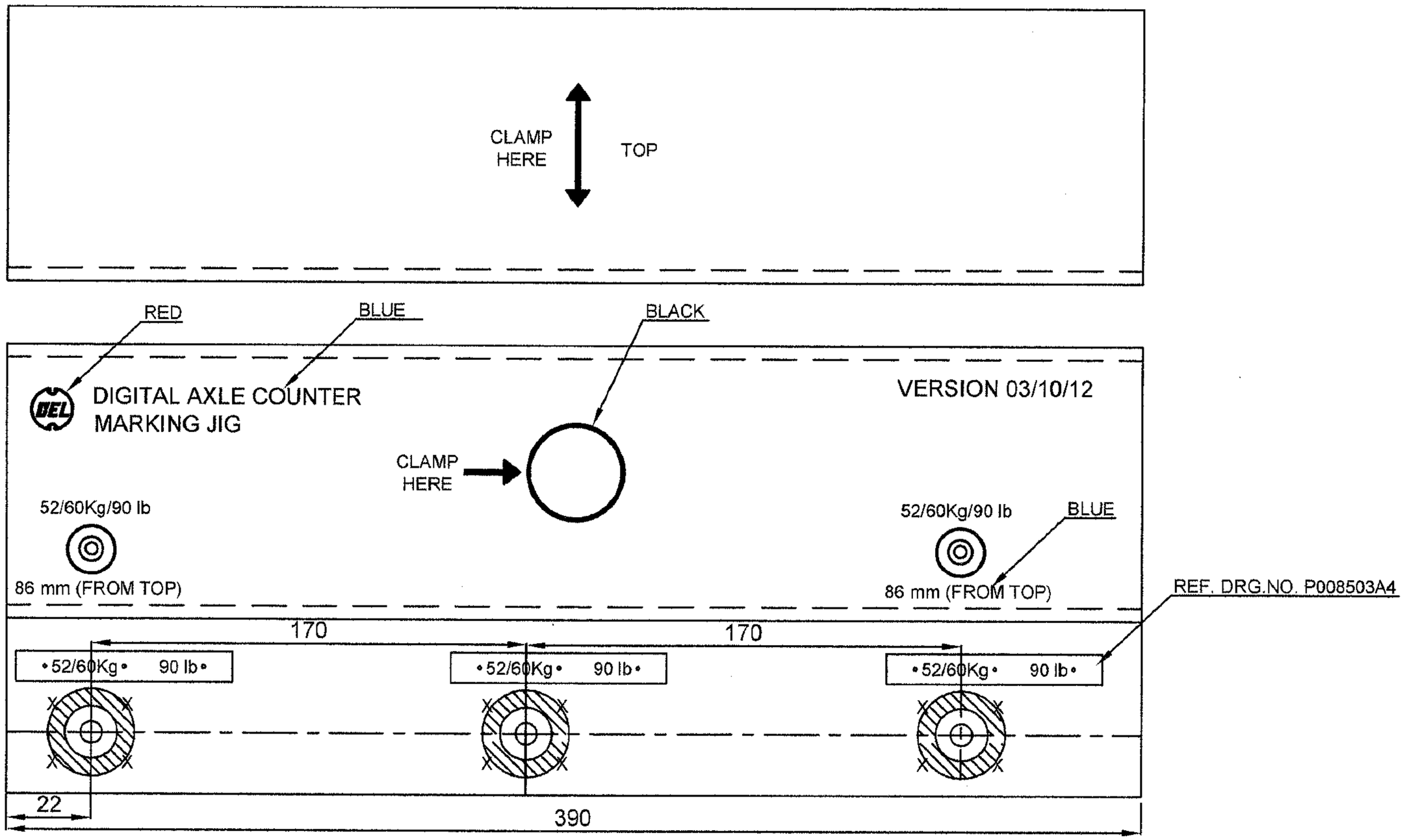
TITLE FIXING DETAILS OF SENSORS IN DUAL SENSOR HASSDAC

| DRG.NO. | REV.NO. | SHEET NO. |
|---|---|---|
| F008811 | 00 | 1 |

D 28a

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"




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

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

| 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 = $\pm 0.5$
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 | Bebuti | 02-04-13 |
| APPROVED | Dabas | 02.4.13 |

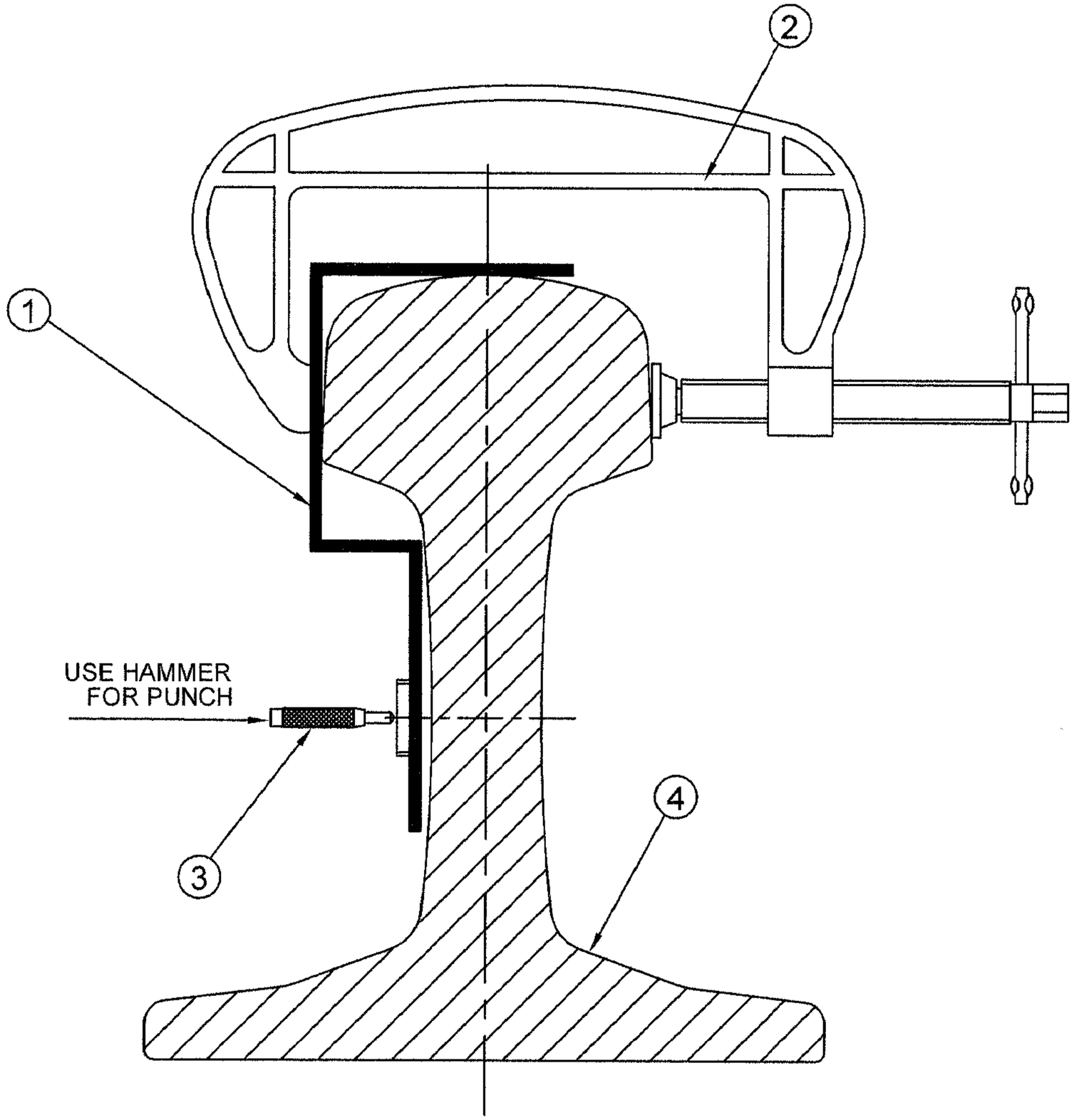
MATL M.S.SHEET 3TH. | DIM M.M | NO.OFF 1
FINISH - | SCALE N.T.S

PROJECT: HASSDAC DACF- 720P

TITLE: WEB MOUNTING MARKING JIG

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

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




| 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: HASSDAC DACF- 720P

TITLE: MARKING JIG ASSEMBLY ON RAIL

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

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

"THIS DOCUMENT IS THE PROPERTY OF THE CENTRAL ELECTRONICS LIMITED.REPRODUCTION,UTILISATION OR DISCLOSURE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF THE PROPRIETORS"

# CENTRAL ELECTRONICS LIMITED

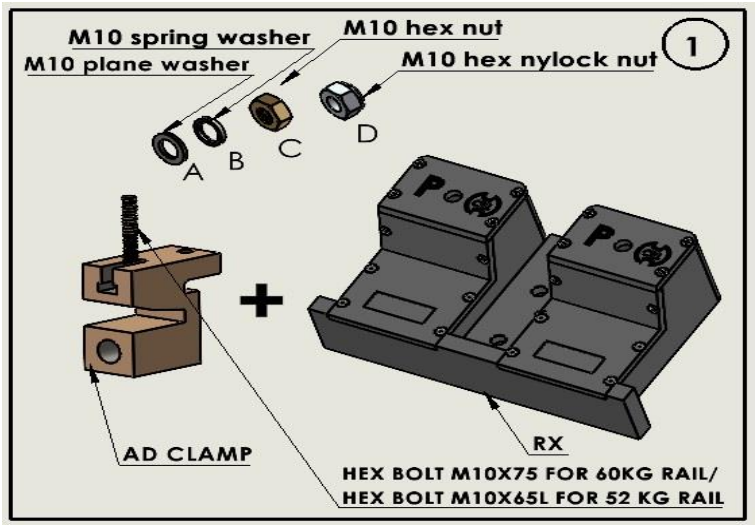
Date- 19/09/2024

## Step by Step Installation Procedure of Fail – Safe Track Device (REV-01)

**1st STEP**

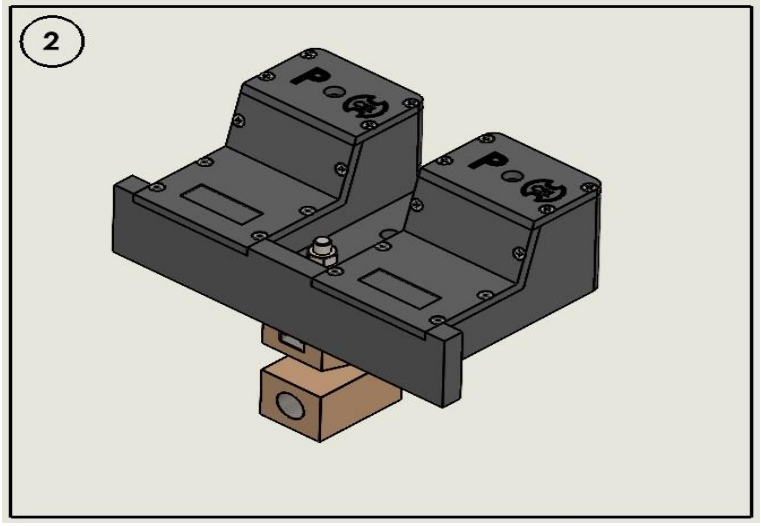
1.) Insert M10 hex bolt into sliding grove of AD CLAMP (75 mm bolt length for 60kg rail and 65mm bolt length for 52kg RAIL) as shown in figure - 1.
2.) Place RX/TX Axle Detector on the clamp such that bolt get inserted.
3.) Place axle detector cover firmly.
4.) Insert hardware in given sequence and tighten the M10 Hex Nut.

M10 plane washer -> M10 spring washer -> M10 Hex nut -> M10 Nylock Nut



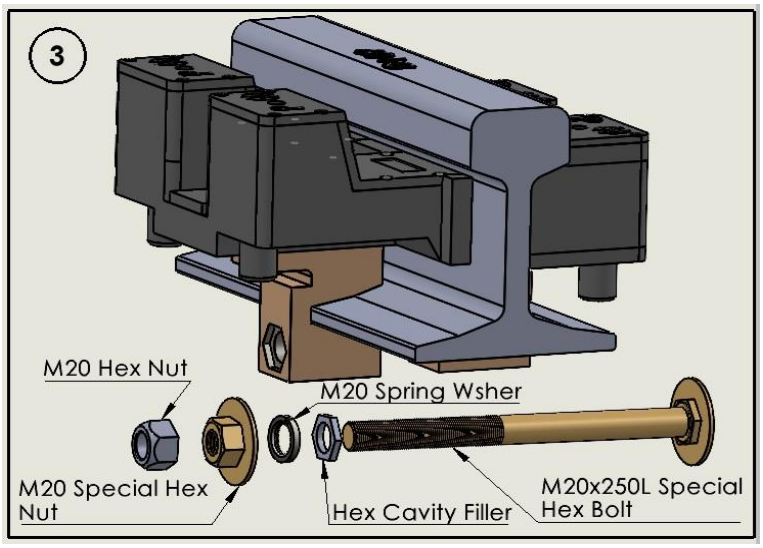

**2nd STEP**

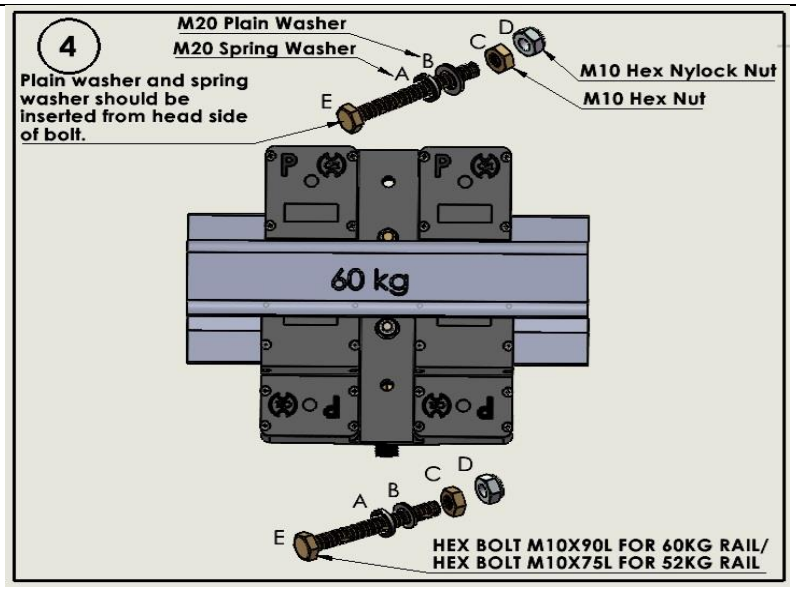
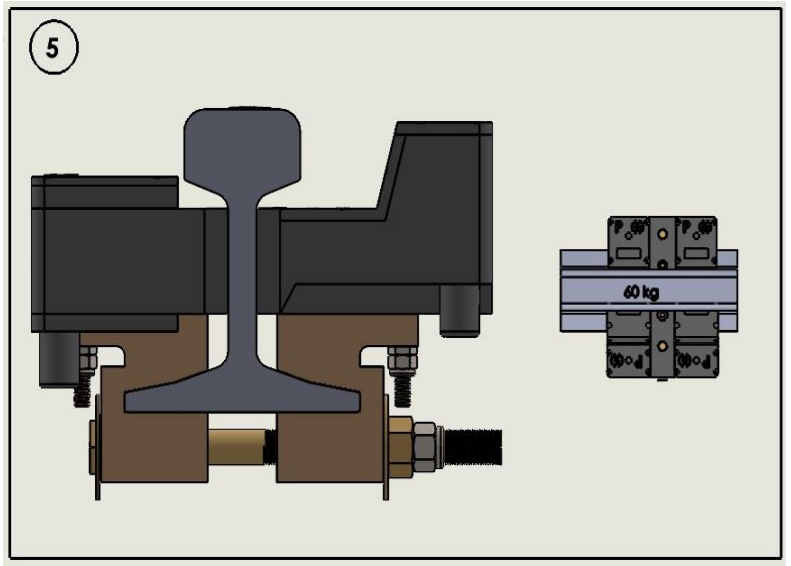
1.) After the completion of 1st step we got the desired assembly of AD Clamp and Axle Detector as shown in figure - 2. Follow step 1st again to prepare TX assembly with AD Clamp.




**3rd STEP**

1.) Insert RX assembly from inner side and TX assembly from outer side of the rail track to the rail base.
2.) Align 20 mm hole of AD CLAMP from both side such that M20X250 mm long hex bolt get inserted properly then insert M20X250L Hex Bolt from TX side towards RX side as shown in figure - 3.
3.) Firstly, insert Hex Cavity Filler Washer into hex cavity of clamp and then spring washer. After that, tighten M20 special hex nut and then M20 hex Nut.



| | |
|---|---|
| **4th STEP**<br>1.) Insert M10 hex bolt (90mm long for 60kg rail and 75 mm long for 52 kg rail) from top of the sensors along with M10 spring and plane washer from head side into outer hole of axle detectors as shown in figure - 4.<br>2.) Tighten the M10 hex nut in such way that it should be stuck in bottom side cavity in flange of AD CLAMP.<br>3.) At the end, tighten M10 Nylock nut at their respective location. |  |
| **5th STEP**<br>1.) Ensure that all nut should be properly tighten.<br>2.) Ensure that outer M10 hex bolt must cross upper periphery of the collar of M20 special nut on RX side and periphery of collar of M20 special bolt on TX side as shown in figure - 5.<br>3.) After following all given steps, the installation of Fail- Safe Track Device has completed. |  |

## Suggested Tools and rated torque for installation of AD-711FS:

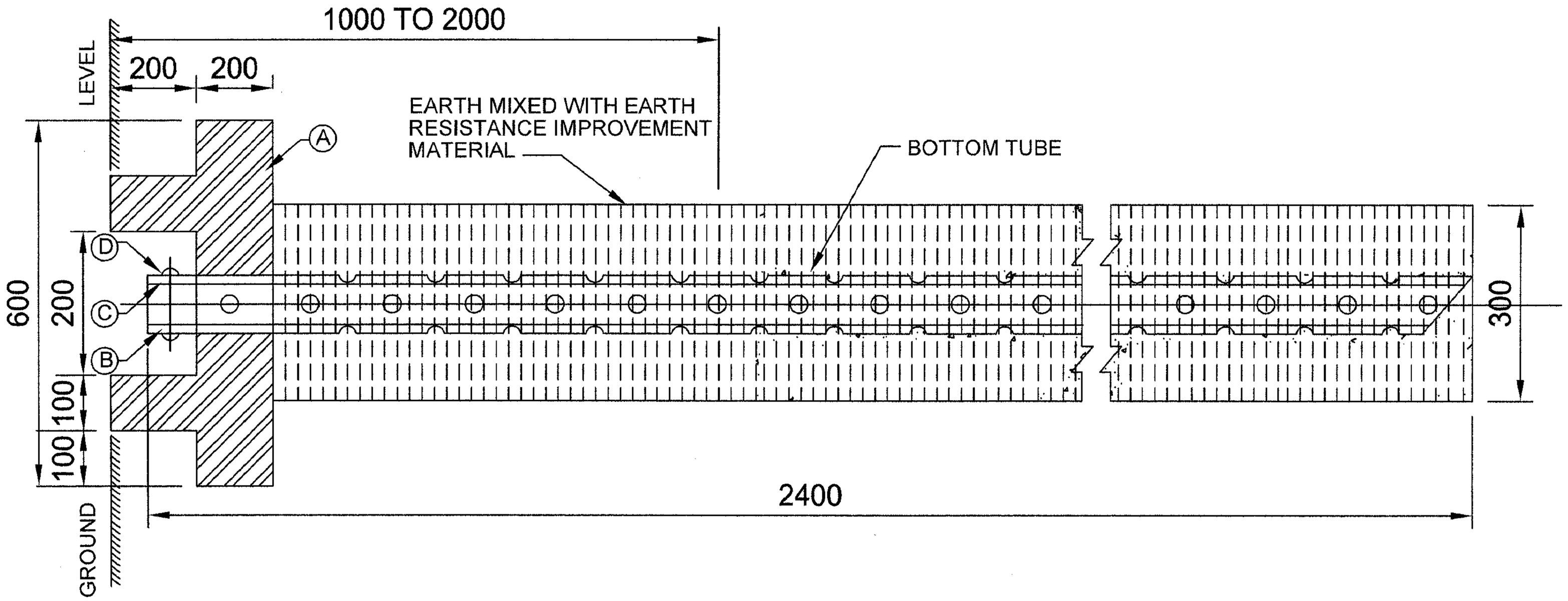
1.) For M10 Bolt: -
- i.) Tool - Torque wrench
- ii.) Rated Torque – 50 Nm

2.) For M20 Bolt: -
- i.) Tool - Torque wrench
- ii.) Rated Torque – 140 Nm

**Note –**

1.) Before tightening nuts and bolts of the track device with clamp, kindly ensure that a spring should be present at their place. If it is displaced, put spring at their respective place and then start tightening nuts and bolts.

2.) AD clamp assembly, especially M20 nuts should be checked every 20 days and if found loose shall be tightened with proper tools as defined above.




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 | APPD | DATE | 8-5-03 |

HASSDAC (DACF- 720P)
EARTHING ARRANGEMENT

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

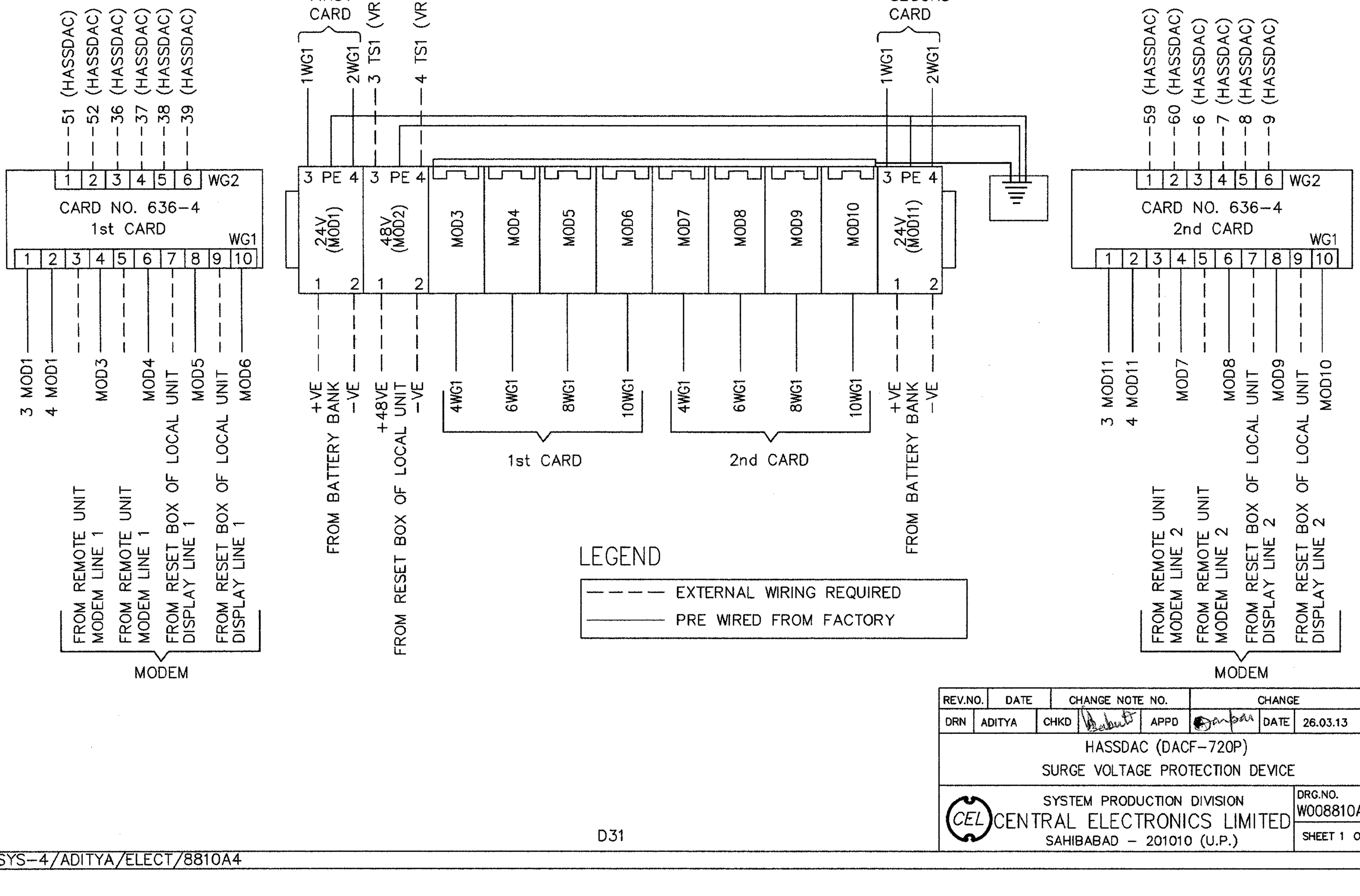
DRG.NO. I007755A4

SHEET 1 OF 1



SYSTEM4/ADITYA/HASSDAC/7755A4

# WIRING DETAILS OF SVPD (OBO MAKE)




## LEGEND

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

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | ADITYA | CHKD | APPD | DATE | 26.03.13 |

HASSDAC (DACF-720P)
SURGE VOLTAGE PROTECTION DEVICE

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

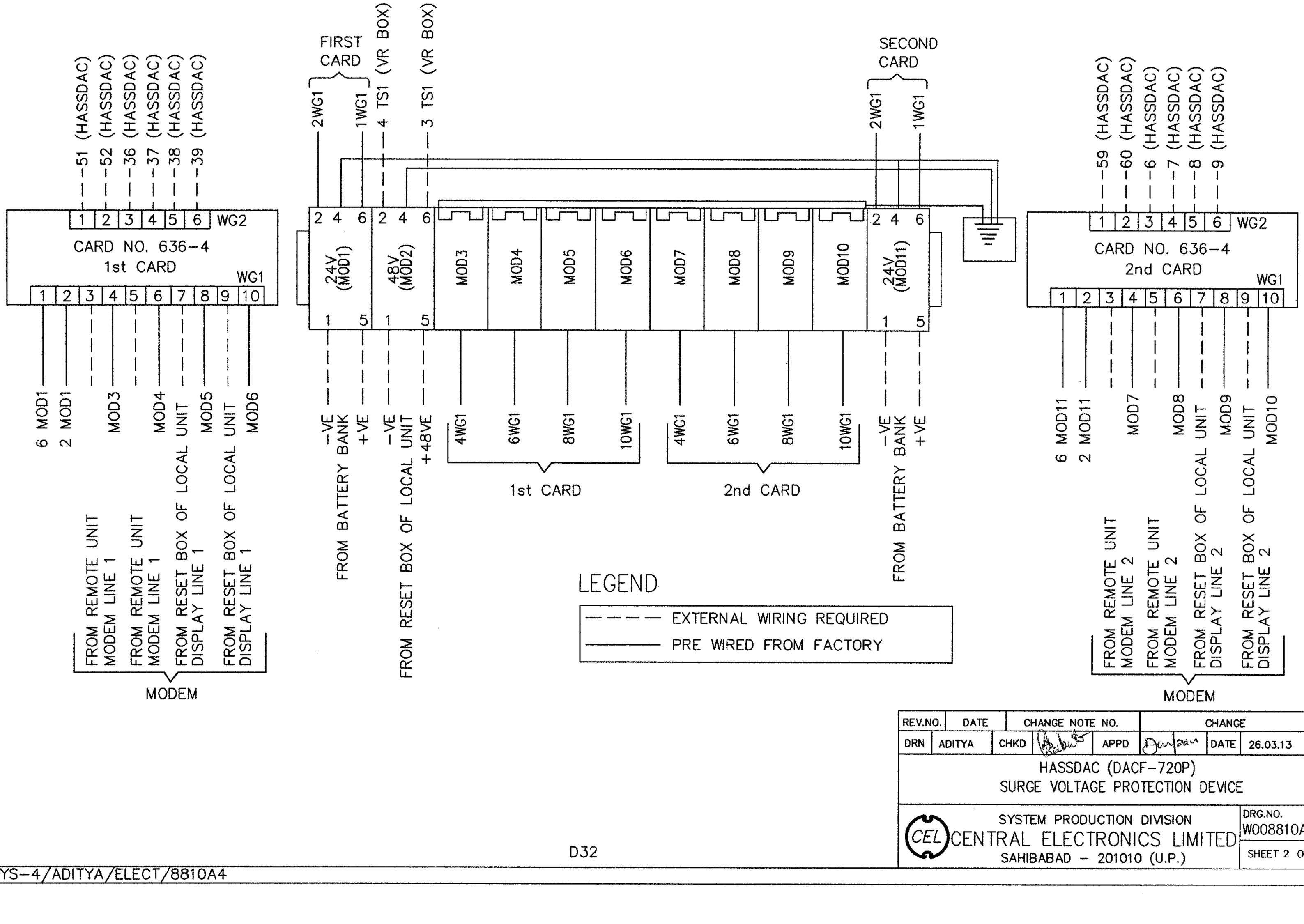
DRG.NO. W008810A4

SHEET 1 OF 2



SYS-4/ADITYA/ELECT/8810A4

# WIRING DETAILS OF SVPD (PHOENIX MAKE)




## LEGEND

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

| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN ADITYA | CHKD | APPD | DATE 26.03.13 |

HASSDAC (DACF-720P)
SURGE VOLTAGE PROTECTION DEVICE

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

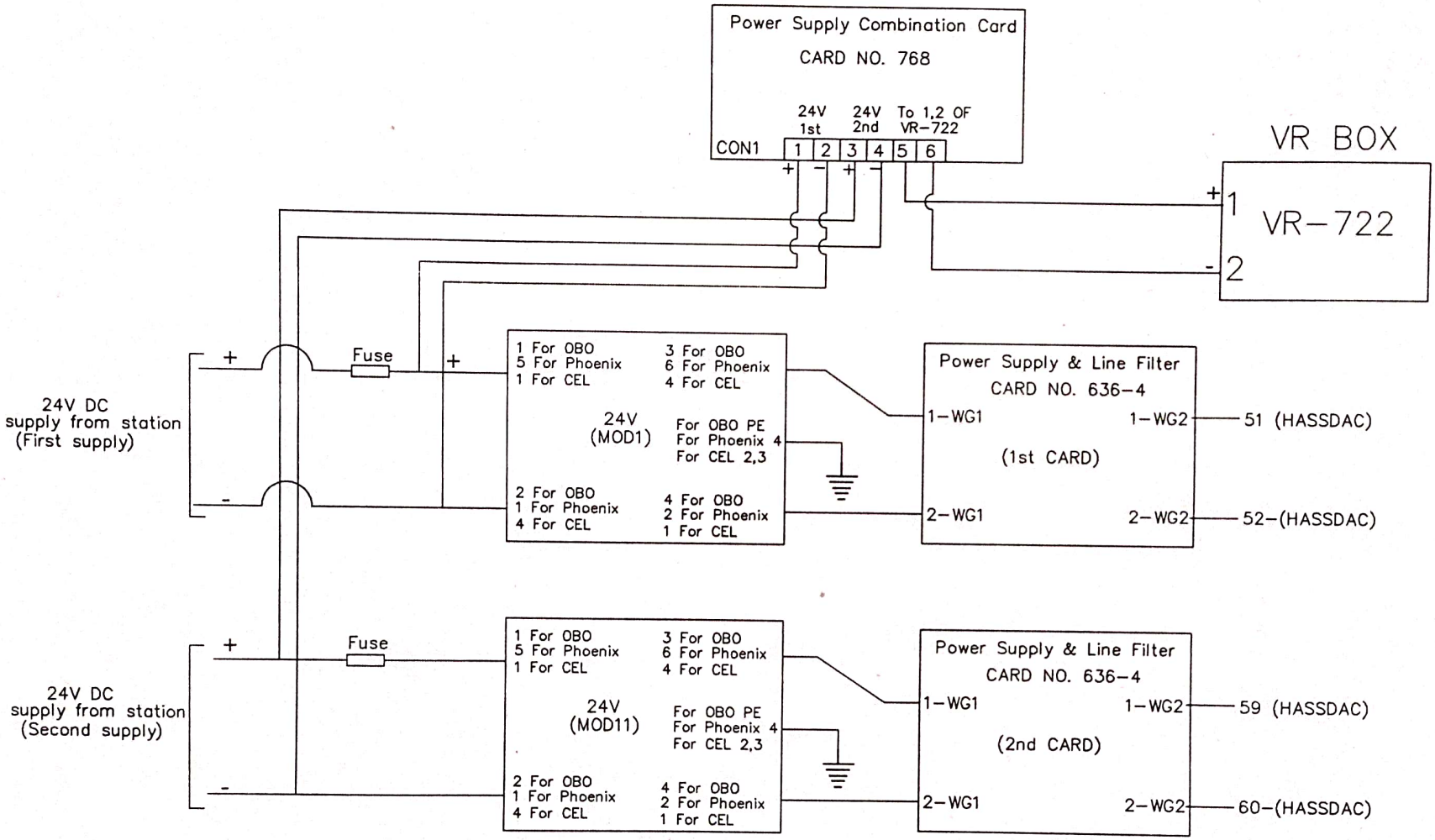
DRG.NO. W008810A4

SHEET 2 OF 2



SYS-4/ADITYA/ELECT/8810A4

# 24V DC WIRING IN LOCATION BOX FOR CEL HASSDAC WITH TWO INDEPENDENT POWER SUPPLY SOURCE




| REV.NO | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN AMIT KR. | CHKD | APPD | DATE 21.05.2025 |

HASSDAC power supply wiring by using two indepanedent power supplies

RAILWAY BUSINESS DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

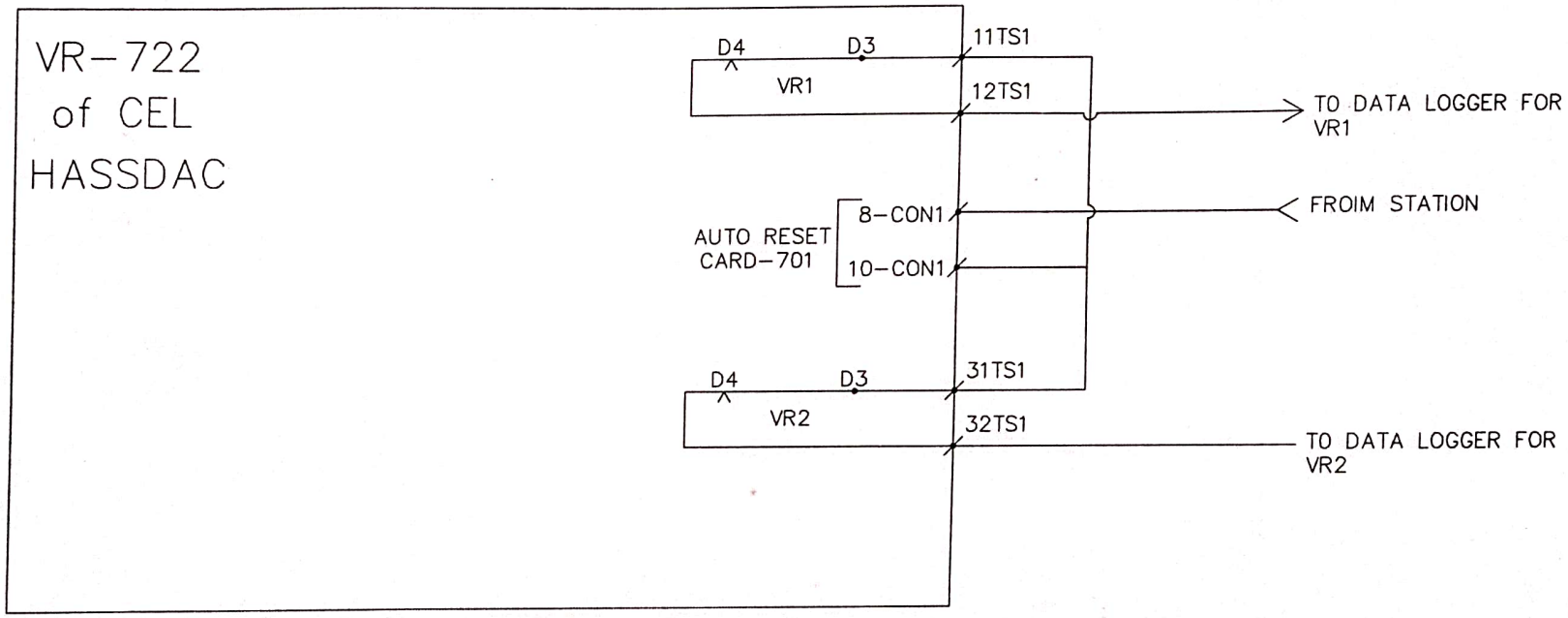
DRG.NO. W009363A4

SHEET 1 OF 1



SYSTEM-5/ELECT/W009363A4

For DATA Logging of Individual VR1 & VR2 of HASSDAC
An Exception of 10 Seconds to be Provided in Data logger.




* Wiring at D3,D4 of VR1,VR2 Up to 11TS1,12TS1,31TS1,32TS1 To be done at railway site with competent authority approval.

| REV.NO | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN AMIT KR. | CHKD | APPD | DATE 21.05.2025 |

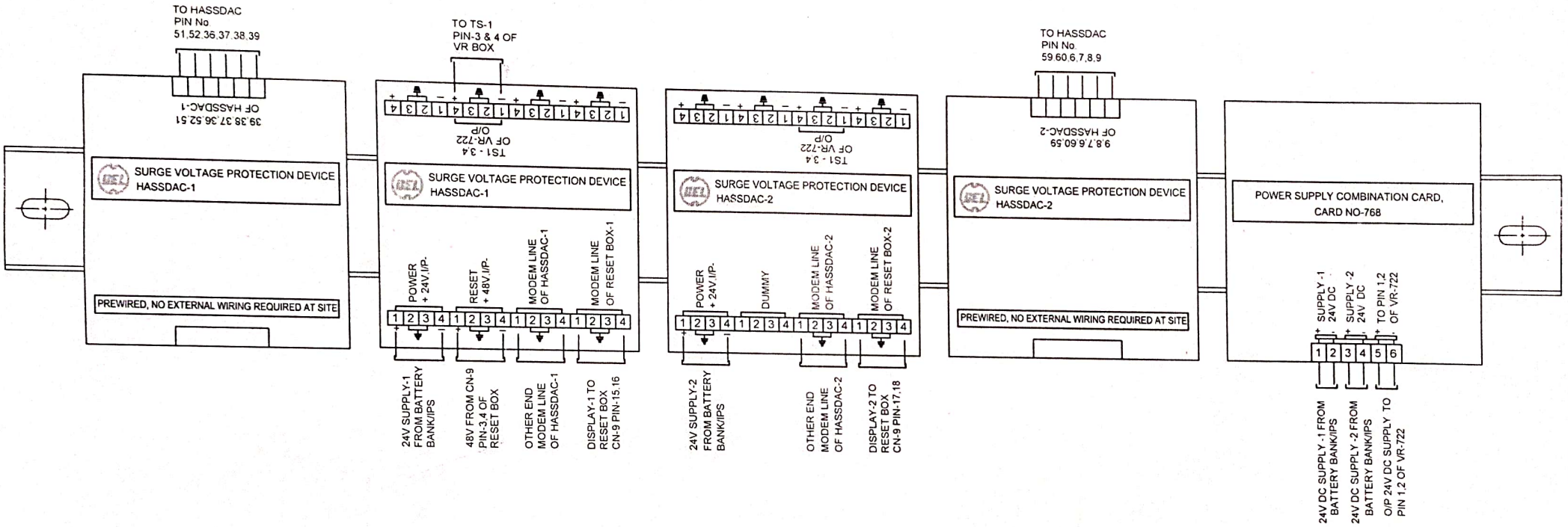
Wiring for DATA Logging of Individual VR1 & VR2 of HASSDAC

RAILWAY BUSINESS DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO. W009362A4

SHEET 1 OF 1

# WIRING DETAILS OF SVPD (CEL MAKE)



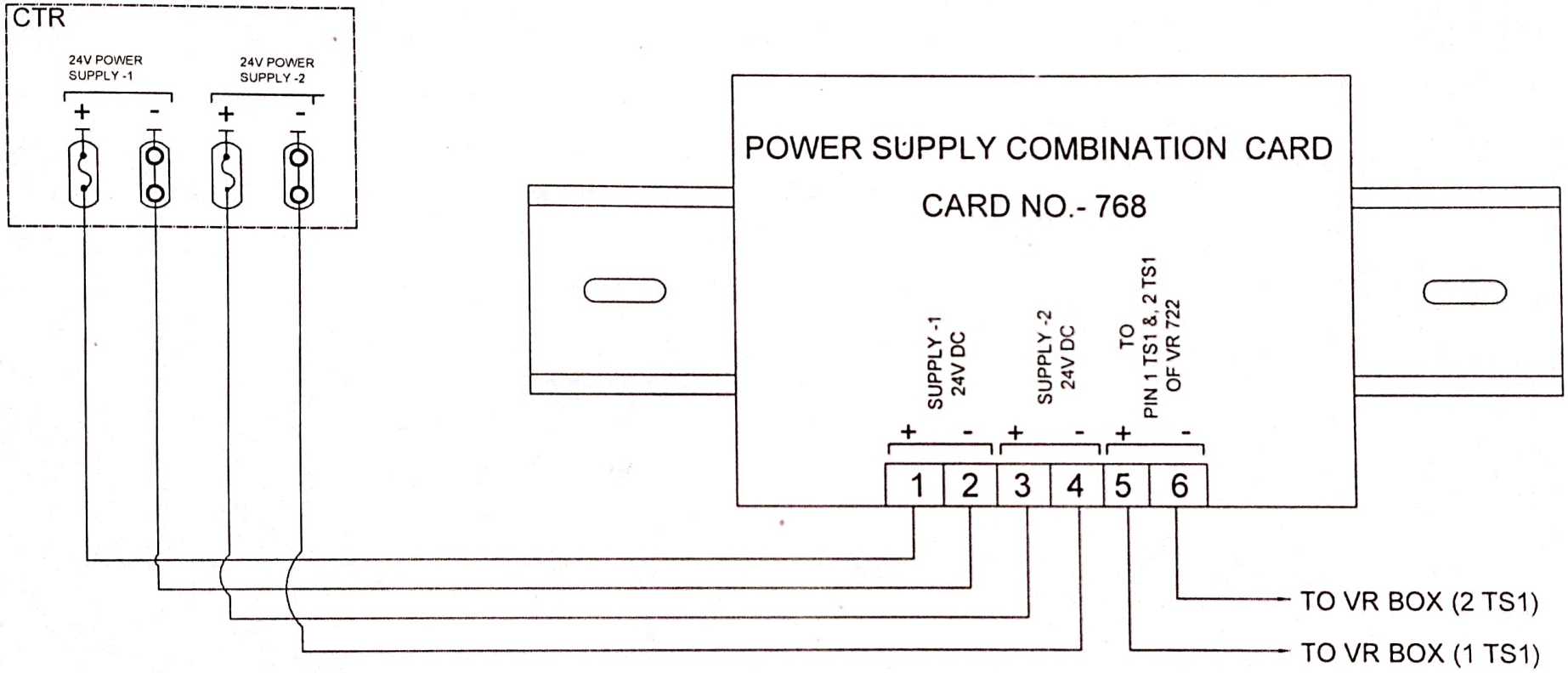

| REV.NO | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | AMIT KR. | CHKD | APPD / DATE 21.05.2025 |

SVPD WIRING DETAILS WITH
POWER COMBINER MODULE

RAILWAY BUSINESS DIVISION
CENTRAL ELECTRONICS LIMITED
SAHIBABAD – 201010 (U.P.)

DRG.NO.
W009364A4

SHEET 1 OF 1




| REV.NO. | DATE | CHANGE NOTE NO. | CHANGE |
|---|---|---|---|
| DRN | AMIT KR. | CHKD Amit Kr | APPD DATE 22.05.2023 |

WIRING DETAIL FOR POWER SUPPLY COMBINATION CARD
HASSDAC (DACF-720A/720P)

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

DRG.NO. W009244A4

SHEET 1 OF 1



SYS-5/AMIT/ELECT/W009244A4

# PRECOMMISSIONING CHECKLIST

Fax: +91-522-2452332
E-mail: triambak.tiwari@gov.in
Mob: 9794863310

सत्यमेव जयते

भारत सरकार, रेलमंत्रालय,
अनुसंधान अभिकल्प और मानक संगठन,
लखनऊ–226011

Government of India - Ministry of Railways
Research Designs & Standards Organisation
LUCKNOW – 226011

No.: RDSO-SIG0SDAC(CEL)/1/2020

Date: As signed
**By E-mail**

M/s CENTRAL ELECTRONICS LIMITED-GHAZIABAD
781, Desh Bandhu Gupta Road, Karol Bagh,
Delhi - 110005, India

(E-mail: piyushsinghal@celindia.co.in, darpan@celindia.co.in & spdmktg@celindia.co.in)

| | |
|---|---|
| **Sub/**विषय: | Pre-commissioning Check List for Single-Section Digital Axle Counter and Single/Dual Sensor HASSDAC (Ver.: D01S007H04 for AM, & D01S007H05 for Phase of SSDAC and D01S007H06 for HASSDAC) of M/s Central Electronics Limited, Sahibabad as per RSDO specification No. RDSO/SPN/177/2012 Ver. 3.0. |
| **Ref/** संदर्भ: | 1. This office letter no. RDSO-SIG0MDAC(CEL)/1/2020 dtd. 12.02.2025.<br>2. Firm's letter No. CEL/SPD/R&D/RDSO dtd. 11.03.2025 & 18.03.2025. |

With reference to above referred letters, Pre-Commissioning Check List (SIG 0605 Ver. 5) for Single-Section Digital Axle Counter (SSDAC) and Single/Dual Sensor High Availability Single-Section Digital Axle Counter (HASSDAC) (Ver.: D01S007H04 for AM, & D01S007H05 for Phase of SSDAC and D01S007H06 for HASSDAC) of M/s Central Electronics Limited, Sahibabad as per RSDO specification No. RDSO/SPN/177/2012 Ver. 3.0 is revised to include the SPD scheme for SSDAC and HASSDAC system and Technical Advisory Note No.-STS/E/TAN/7010 dated: 20.11.2024 (Annexure-III) with minor corrections/additions/deletions. The revised PCCL No. SIG 0605 Ver. 6 is being issued herewith for your kind information & further necessary action please.

DA: As above

20/3/25

(Triambak Tiwari)
Director/signal –II
For Director General/S&T

**Copy to:** All PCSTEs, Indian Railways.
(Through E-mail)

सत्यमेव जयते

# RESEARCH DESIGNS AND STANDARDS ORGANISATION
# MANAK NAGAR, LUCKNOW

## SIGNAL DIRECTORATE

**Pre-commissioning Check List for Single-Section Digital Axle Counter and Single/Dual Sensor HASSDAC (Ver.: D01S007H04 for AM, & D01S007H05 for Phase of SSDAC and D01S007H06 for HASSDAC) 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 6001 and suitable for redundant system |
| 3. | 00.03.2013 | S006 | 29 pages | 3 | Inclusion of Functionality of HASSDAC (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 |
| 5. | 15.01.2024 | S007 | 32 pages | 5 | Due to inclusion of axle detector model No.AD-711 FS |
| 6. | DD.MM.2025 | S007 | 26 pages | 6 | Addition of SPD in page no. 3, 12 & 13, minor corrections/additions/deletions at page no. 1, 3, 4, 5, 6, 7, 11 & 20 – 26 according to firm's request and release of compendium TAN No. STS/E/TAN/7010 Ver. 1.0 dated 20.11.2024. |

Authors

| Name & Signature | Function | Level | Signature |
|---|---|---|---|
| Ranjeet Singh (SSE (D)/S&T) | Member | Prepared | |
| A.K. Srivastava(ADE/Sig/VI) | Member | Checked | 20/03/2025 |
| Triambak Tiwari (Director/Sig-II) | Member | Issued | 20/3/25 |

**Approved by: Shri Suresh Kumar (PED/S&T)**

| Inspected by: Name & Signature of Railway Representative | Tested by: Name & Signature of firm's Representative |
|---|---|

Pre-commissioning check list for Single Section Digital Axle Counter

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

**(**AS PER RADSO/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: Unit. A(Quad/OFC)<br>OFC / Microwave / Quad Cable Unit. B(Quad/OFC) | |
| 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.

a) 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.

b) 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.

2. 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 21.06.2011)

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

**A- CATEGORY**

**(This part of work to be done before commissioning)**

**1. Outdoor (Location Box)**

| SI. 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 7010 dated 20.11.2024 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 | (1) Earthing of Location Box. (ii) Earth value | Should be properly connected with earth. ≤1Ω | | | |

**1.7 SPD used in outdoor equipment**

| SN | Type | Description | Make | Quantity | Remark (OK/Not OK) |
|---|---|---|---|---|---|
| a) | SSDAC | SPD | CEL or Phoenix or OBO or CITEL or any other reputed make | 8 numbers / set | |
| b) | HASSDAC | SPD | CEL or Phoenix or OBO or CITEL or any other reputed make | 14 numbers / set | |

**2. Outdoor (track device)**

| SI. No. | Item | Required | Observed | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Entry end | | Exit end | | OK /Not OK |
| 2.1 | Wiring of Tx/Rx coil & M S coupler cables | Wired on approved Spring Cage Type terminals | Unit A | Unit B | Unit A | Unit B | |
| 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) (for web type track device) | 60 Kg 86 mm 52 Kg 86 mm 90 R 86 mm | | | | | |
| 2.4 | Drilling of holes in the web of rail | Should be of 14mmdia as per drawings on page no. D20— D22 of installation's manual Version 1.1(Document No. — | Unit A | Unit B | Unit A | Unit B | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | CEL/DAC/IM-04) for Phase Modulation and Version1.1 (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 (for web type track device) | 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 ofaxle detectors at entry & exit end | On the same rail as per drawing no.-I008072A4,page no.D28 of Installation's manual Version1.1 (Document No.—CEL/DAC/IM-04) for phase Modulation and Version1.1 (Document No.—CEL/DAC/IM-03) Amplitude Modulation. | | | | | |
| 2.9 | (a)Measure Length of the track device (axle detector) cable | 10m ± 0.3m & 15M±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 PM & Ver.1.1 (Document No.—CEL/DAC/1M-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 Version1.1 (Document No.—CEL/DAC/IM04) for Phase Modulation and Version 1.1(Document No. —CEL/DAC/IM03) for Amplitude Modulation. | | | | | |
| 2.13 | Type of push trolley used in the section | As per RDSO's drawing no. RDSO/TM/05/10 dated 05.09.2011 | | | | | |
| 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** | | | | | | | |
| 2.16 | Clamp type track device (Installed as per CEL's installation manual) | Torque required:<br>M10 Bolt Torque – 50 Nm<br>M20 Bolt Torque – 140 Nm | | | | | |
| 2.17 | Height of deflector | Should not be higher than the rail | | | | | |

| | |
|---|---|
| Inspected by: Name & Signature of Railway Representative | Tested by: Name & Signature of firm's Representative |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.18 | Clearance between sleepers | 400 mm between sleepers (Refer DrgNo.L008453A4 at Page. D2/D3 ofManualVersion1.1 (Document No.-CEL/DAC/IM-04) for Phase Modulation and Version1.1 (Document No.-CEL/DAC/IM-03) for Amplitude Modulation | | | | | |
| 2.19 | Embossing on rail | Should not be covered by Track device | | | | | |
| 2.20 | Length of Trolley Protection circuit | (a) In Single line 5RL<br>(b) In Double line 3RL | | | | | |
| 2.21 | Position of deflector | (a)30 cm away from Tx/Rx coils in the next sleeper | | | | | |
| 2.22 | Fixing ofAxle Detectors | (a) In Single line should be fixed in center of 5RL.<br>(b) In Double line Should be fixed at 33 meters from block joint in the direction of movement | | | | | |

**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/HASSDAC **in Station** area.

| SL.NO. | ITEM | EXPECTED | MEASURED/ OBSERVED Entry | Exit | 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-C for Quad cable may be referred. Wiring practices should be adopted in accordance to TAN 7010 dated 20.11.2024 See Annexure –III** | | | |
| 3.1.2 | Use of pair | Proper pairOf wires to be used for connectivity. Annexure — © for quad cable may be referred. Wiring practices should be adopted in accordance to TAN 6001 at 04.10.2011See annexure –iii | | | |
| 3.1.3 | Duplication of Wires | No wire 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° 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) | Shad 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 7010 dated 20.11.2024 See Annexure –III | | | |
| 3.1.10 | Separate Earth. Of Quad/PIJF telecom | 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 | | | |

3.2 Test format for testing of QUAD cable before commissioning of SSDAC©/ SSBPAC (D) Used in **between Station to station.**

| SI. 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.<br>Signaling Cable shall not be used at all. **Wiring practices** should be adopted in accordance **to TAN 7010 dated 20.11.2024 See Annexure – III** | | |
| 3.2.1.2 | Use of pair | Proper Pair of wires to be used for Connectivity.<br>Annex-© for quad cable may be referred Wiring practices should be adopted in accordance **to TAN 7010 dated 20.11.2024 See Annexure –III** | | |
| 3.2.1.3 | Duplication of Wires | No wire 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 20ºC for Quad cable &_____* ohm / Kms for PIJF telecom cable.<br>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 | | |

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.**

| SI. No. | Item | Expected | Measured/ Observed | Remarks (OK/Not OK ) |
|---|---|---|---|---|
| 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.<br>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.<br>Annexure –© for Quad cable may be referred Wiring practices should be adopted in accordance **to TAN 7010 dated 20.11.2024 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 or equal to 10 M ohm. | | |
| 3.3.1.5 | Loop Resistance of designated pair | Not to exceed 56 ohm/Kms at 20°C for Quad cable * Ohm/Kms for PIJF telecom cable.<br>See Annexure -2 for correction factor. | | |
| 3.3.1.6 | Earth of Quad Cable(Armor) | 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 | | |
| 3.3.2.0 | OFC | | | |
| 3.3.2.1 | Channel line up | For 0dBTrans 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-**

| SI. No | Condr Dia used in PIJF cable | Resistance at $20^0$ C | Loop Resistance /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 |

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.

## 4. Outdoor electronics

| SI. No. | Item | Required | Observed | | Remarks OK /Not OK |
|---|---|---|---|---|---|
| | | | Entry end | Exit end | |
| 4.1 | a) SI. No. of SSDAC/ HASSDAC units<br>b) Details of Track circuit | Same serial no pairs.<br>Example – 015A (entry),<br>015B (exit),<br>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/HASSCAC 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 for Unit A:2 Amp, Unit B:2Amp<br>For VR Box:2Amp | | | |
| 4.14 | Software version no. | S007 | | | |
| 4.15 | Specified value of checksum | 9664 7ED6 12C1 35DE 9D81 D9A9<br>2F83 CD4A AC24 369F 0000 5A51 | | | |
| 4.16 | Input voltage with IPS ON | should not be more than 28.8 V DC | | | |

| SI. No. | Item | Required | Entry end | Exit end | Remarks |
|---|---|---|---|---|---|
| 4.17 | Input voltage with Charger OFF.(Keep Charger FF for 15 Minutes before taking reading ) /IPS Module | Should not be less than 23 V DC | | | |
| 4.18 | Ripple. Of Input Power Supply | Less than 10 mV rms / 50 mV peak to peak. | | | |
| 4.19 | Level of reset signal at SSDAC unit input. | 42 V to 50 V DC | | | |
| 4.20 | 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) | | | | |

| | | | Unit A | Unit B | Unit A | Unit B | |
|---|---|---|---|---|---|---|---|
| 4.21 a | Section is Clear | > 22V | | | | | |
| 4.21 b | Section Occupied | < 2V | | | | | |

| | | | Unit A | Unit B | Unit A | Unit B | |
|---|---|---|---|---|---|---|---|
| 4.22 | Relay drive output to the **Preparatory** Relay. (This may be checked across **R1 &** R2 of coil of relay/relays) | | | | | | |
| 4.23 a | When preparatory relay is picked up. | > 22V | | | | | |
| 4.23 b | When preparatory relay is dropped | < 2V | | | | | |
| 4.24 | Drive voltage of repeater relays in picked up condition, When charger is OFF for 15 minutes. | | | | | | |
| 4.25 | VPR | > 22V | | | | | |
| 4.26 | PPR | >22V | | | | | |

## 5.0 INDOOR (Reset Box Location)

| SI .No. | Item | Required | Observed | | Remarks |
|---|---|---|---|---|---|
| | | | Entry end | Exit end | OK /Not OK |
| 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. | | | |

## 6.0 COMMISSIONING

| SI. 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.<br><br>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:**

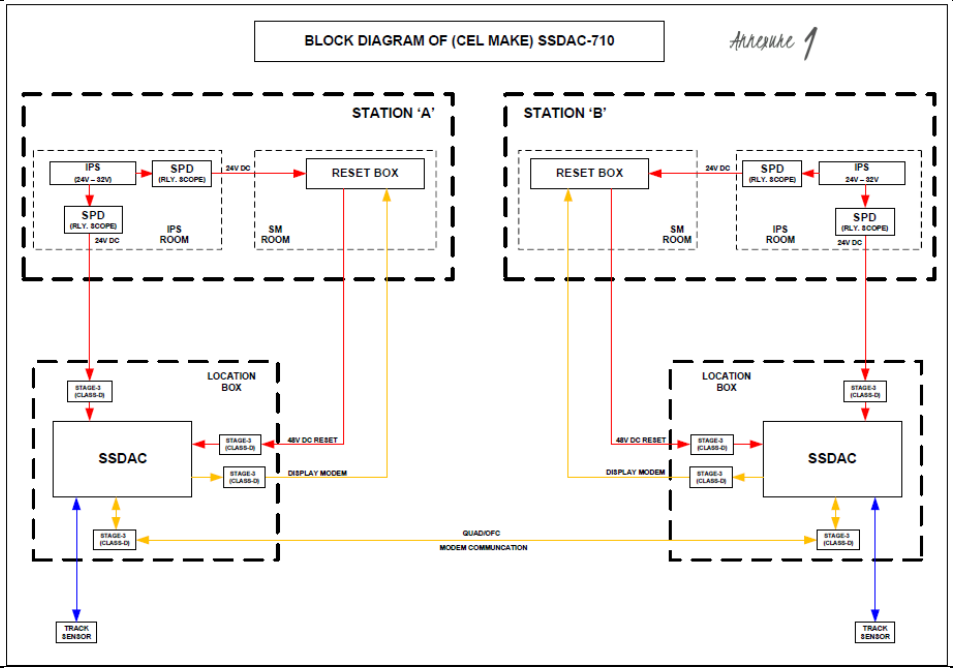
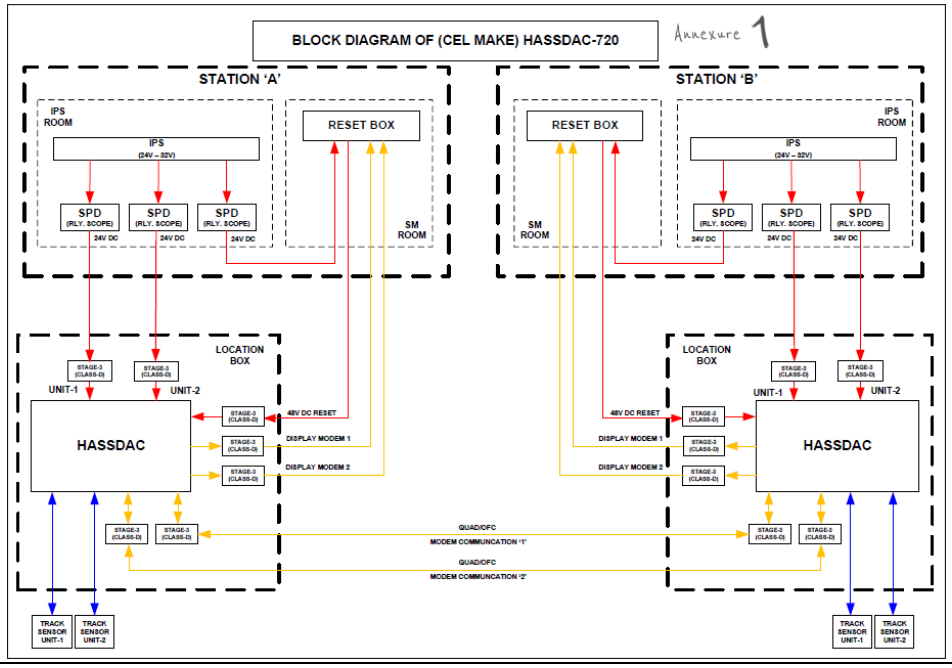
**(PENDING ISSUES TO BE ATTENDED WITHIN 15 DAYS FROM THE DATE COMMISSIONING)**

**7.0 INDOOR POWER SUPPLY/CT RACK**

| SI. No. | 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/ 4.0 Amps. | | | |
| 7.3 | (a) Power supply for axle counter.<br><br>(b) Out voltage for SSDAC, With charger ON in Float mode.<br><br>7. Out voltage for SSDAC Charger OFF.<br>7. IPS | 7. (i) Charger should be fit for axle counter use.<br>(ii)There should not be any other load on the power supply except axle counter.<br>(iii)Class B&C types surge protection must be provided on 230 V mains line.<br>(b)Should not be more than32 V DC.<br>(c) Should be in between28V — 30V DC.<br>(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. | | | |
| 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.<br>(This may be checked across R1& F | >22V | | | |
| 7.7 | Drive voltage of the PPR.<br>( This may be checked across | >22V | | | |
| 7.8 | Diode across VPR and PPR relay. | Should be provided with BY127/1N4007/1N5408 | | | |

8.0 Provision of SPD:

A. Provision of SPD has been done as per the following schematic diagram:-

| SN | Type | Diagram | Remarks (OK/Not OK) |
|---|---|---|---|
| a) | SSDAC |   | |
| b) | HASSDAC |   | |

| Inspected by: Name & Signature of Railway Representative | Tested by: Name & Signature of firm's Representative |
|---|---|

B. Details of SPDs used in SSDAC:-

B.1. Details of SPDs used with SSDAC Entry/Exit Unit

| SN | Make and model of SPD | Type of SPD | No. of used SPD | Remarks |
|---|---|---|---|---|
| 1. | CEL | Class D | 4 | |
| 2. | | | | |

B.2. Details of SPDs used in communication line, power line, reset line, display modem line

| SN | Make and model of SPD | Type of SPD | No. of used SPD | Remarks |
|---|---|---|---|---|
| 1. | CEL | Class D | 8 number / set | |
| 2. | | | | |

C. Details of SPDs used in HASSDAC:-

C.1. Details of SPDs used with HASSDAC Entry/Exit Unit

| SN | Make and model of SPD | Type of SPD | No. of used SPD | Remarks |
|---|---|---|---|---|
| 1. | CEL | Class D | 7 | |
| 2. | | | | |

C.2. Details of SPDs used in communication line, power line, reset line and display modem line

| SN | Make and model of SPD | Type of SPD | No. of used SPD | Remarks |
|---|---|---|---|---|
| 1. | CEL | Class D | 14 numbers / set | |
| 2. | | | | |

**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 influence / Goes to error / Counted / other) | Remarks |
|---|---|---|---|
| 1 | 4 spoke wheel<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth -<br>Spoke width - | | |
| 2 | 6 spoke wheel<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth -<br>Spoke width- | | |
| 3 | Solid Wheel with 6 holes<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 4 | 8 spoke wheel<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth -<br>Spoke width - | | |
| 5 | 8 spoke with slots<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth -<br>Spoke width - | | |

| S. No. | Type of Trolley wheel | Observed Result( No influence/ Goes to error / Counted / other) | Remarks |
|---|---|---|---|
| 6 | Perforated<br>No. of perforation with dia.<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth -<br>Spoke width - | | |
| 7 | Solid wheel<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 8 | Motor trolley wheel,solid<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 9 | Rail Dolly wheel solid<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 10 | Motor Trolley solid wheel<br>Wheel Dia with flange-<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 11 | Motor trolley wheel with 6 holes,<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 12 | Tower wagon<br>Wheel Dia with flange -<br>Wheel Width -<br>Flange width -<br>Flange depth - | | |
| 13 | Motor trolley following a train | | |
| 14 | Effect of Tower wagon | | |

## 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 (Card6) AC Vrms | SCC1 (Card 1) DC Volts | | SCC2 (Card 2) DC Volts | | With Push Trolley on axle detectors (4spokes/8 spokes) | | DC-DC Converter DC Volts | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | 5V | 12V | 24 V | 15V ISO |
| **Test Point** | | **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** | | 23-28.8V | 30 to 40 V<br>20.8 to 21.2 KHz | 30 to 40 V<br>22.8 to 23.2 KHz | 275 to 600 mV | 275 to 600 mV | >400 mv (-6dB) (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 VDC | >1.7 VDC | 4.75 to 5.25V | 11.50 to 12.5V | 23.50 to 24.5V | 14.50 to 15.50V |
| **(Limit) for AM** | | | | | 750 to 1200 mV | 750 to 1200 mV | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

| Inspected by: Name & Signature of Railway Representative | Tested by: Name & Signature of firm's Representative |
|---|---|

## 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 (Card6) AC Vrms | SCC1 (Card 1) DC Volts | | SCC2 (Card 2) DC Volts | | With Push Trolley on axle detectors (4spokes/ 8 spokes) | | DC-DC Converter DC Volts | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | 5V | 12V | 24 V | 15V ISO |
| Test Point | | 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 Phas | | 23-28.8V | 30 to 40 V 20.8 to 21.2 KHz | 30 to 40 V 22.8 to 23.2 KHz | 275 to 600 mV | 275 to 600 mV | >400 mv (-6dB) (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 VDC | >1.7 VDC | 4.75 to 5.25V | 11.50 to 12.5V | 23.50 to 24.5V | 14.50 to 15.50V |
| (Limit) for AM | | | | | 750 to 1200 mV | 750 to 1200 mV | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

| Inspected by: Name & Signature of Railway Representative | Tested by: Name & Signature of firm's Representative |
|---|---|

## Annexure-1

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.

**Annexure-II**

## TEMPERATURE CORRECTION FACTOR FOR CONDUCTOR RESISTANCE FORANNEALED HIGH CONDUCTIVITY COPPER

| Temp. Deg C | Corre. Factor | Temp. deg C | Corre. Factor | Temp deg C | Corre. factor | Temp. deg C | Corre. factor | Temp. deg C | Corre. Factor |
|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.8751 |
| 8 | 1.0504 | 20 | 1.0000 | 32 | 0.9542 | 44 | 0.9124 | 56 | 0.8741 |
| 8.5 | 1.0482 | 20.5 | 1.9980 | 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 | 0.8581 |
| 10.5 | 1.0395 | 22.5 | 0.9900 | 34.5 | 0.9452 | 46.5 | 0.9048 | 53.5 | 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 | 50.5 | 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 | 0.896 1 | 61 | 0.8591 |
| 13.5 | 1.0267 | 25.5 | 0.9765 | 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 | 1.9223 | 26.5 | 0.974 | 38.5 | 0.9311 | 50.5 | 0.8913 | 62.5 | 0.8547 |
| 15 | 1.0204 | 27 | 0.9728 | 39 | 0.9294 | 51 | 0.8897 | 63 | 0.8532 |
| 15.5 | 1.0183 | 27.5 | 0.9709 | 39.5 | 0.9276 | 51.5 | 0.8881 | 63.5 | 0.8518 |
| 16 | 1.0163 | 28 | 0.9690 | 40 | 0.9259 | 52 | 0.8863 | 64 | 0.8503 |
| 16.5 | 1.0142 | 28.5 | 0.9671 | 40.5 | 0.9242 | 52.5 | 0.8850 | 64.5 | 0.8489 |

**Annexure-III**

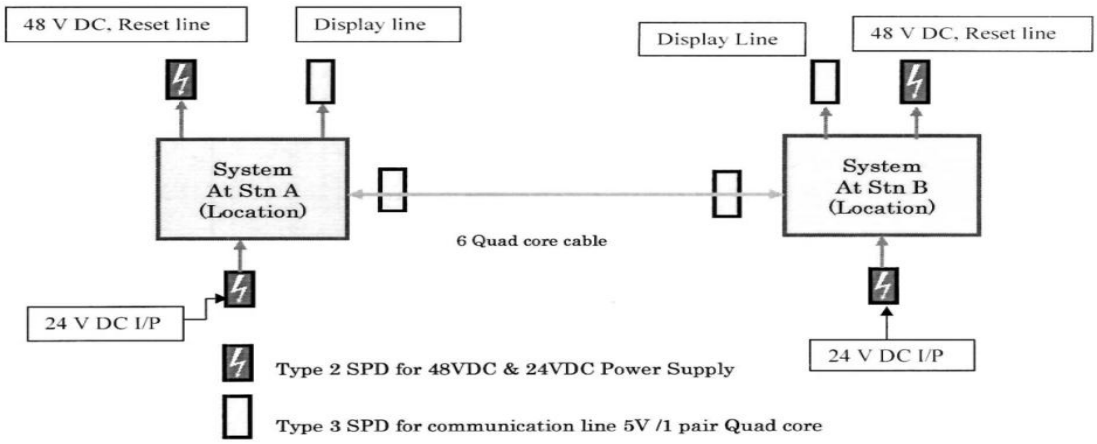
Compliance of Technical advisory Note no.STS/E/TAN/7010 Ver. 1.0 or latest which is reproduced below has been ensured during installation and commissioning of SSDAC/HASSDAC**:**

| Technical Advisory Note- Compendium of Axle counter TANs | | | |
|---|---|---|---|
| Subject | Guidelines and precautions of installation of Digital Axle Counter | | |
| Document Number | STS/E/TAN/7010 | Version | 1.0 |
| Dated | 20.11.2024 | | |

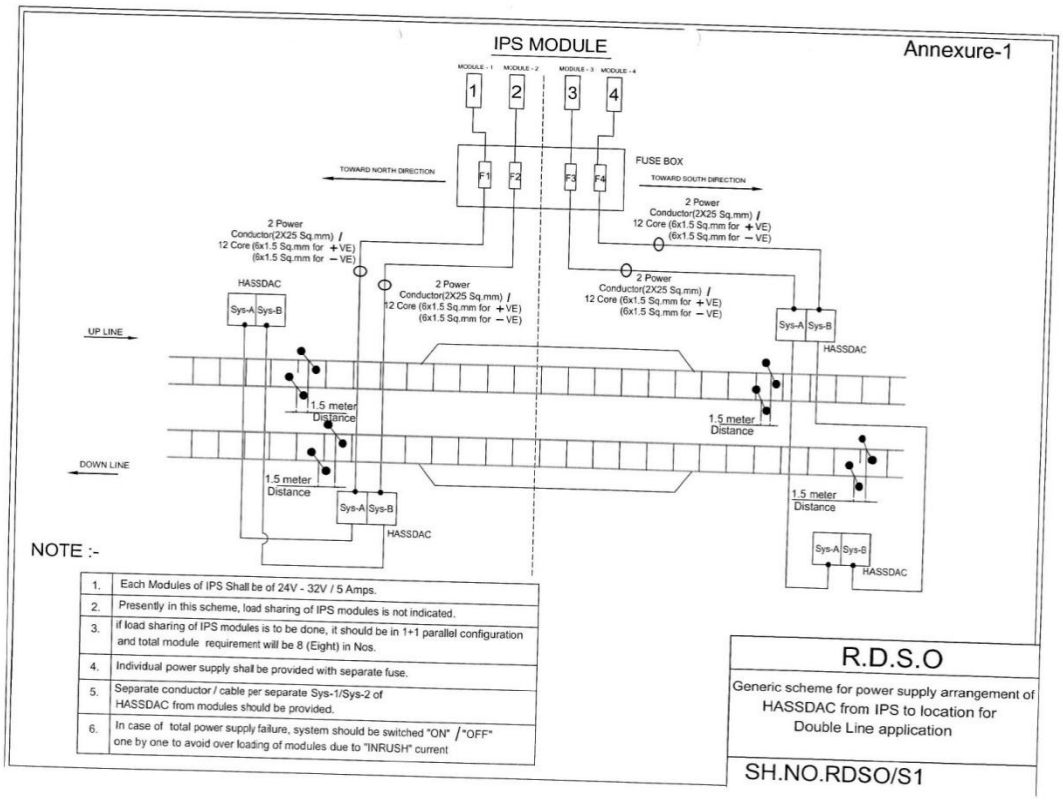
A compilation of instructions given in different advisories for digital axle counter systems is being published.

| Sr. No. | Description |
|---|---|
| **A.** | **Indoor Installations** |
| 1. | For MSDAC, Evaluators should be kept in dust free and ventilated rooms. |
| 2. | For IBS/ABS installation using MSDAC, line wise electronics should be planned. In which, the requirement is that there shall be no single point of failure that can affect both the lines at the same time. MSDAC can provide multiple track section monitoring by single evaluator but it shall be ensured that one evaluator failure does not affect signals on both UP & Down lines. This primarily leads to provision of line wise evaluators with separate power supply modules. |
| 3. | Line side portable cabins/relay huts etc. shall have sufficient space for keeping circuit books, manuals, and diagnostic PC on a table of adequate size and also for movement of staff during routine maintenance and fault finding. |
| 4. | Battery shall not be installed in the same space where electronic systems are installed. Battery room shall be separate and sufficiently ventilated. |
| 5. | These line side portable cabins/relay huts etc. shall be preferably located near Level crossings for quick access otherwise a suitable access route shall be identified and approved by open line. |
| **B** | **Outdoor Installations** |
| 6. | Continuity of Traction bonds in the vicinity of the sensors (50m) should be ensured to keep earth potential rise near DP minimum. |
| 7. | DP should be away from neutral section by 30m. Distance separation between 2 adjacent DPs should be min. 2m. |
| 8. | Sensors should be sufficiently far away from rail joints |
| 9. | As far as possible, TX/ RX coils need to be installed on non-cess rails. This will prevent failures due to movement of rail dolly etc. |
| **C** | **Wiring and Cabling Practices** |
| 10. | Avoid bunching of power and DAC cables in relay room.DAC circuits in location shall also 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. |
| 11. | Only Shielded cable should be used in indoor wiring of DAC. |
| 12. | 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.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.Wiring and cabling shall not be supported at any sharp-edged object to ensure that conductors are not damaged during their installation/ maintenance. |
| 13. | 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. |

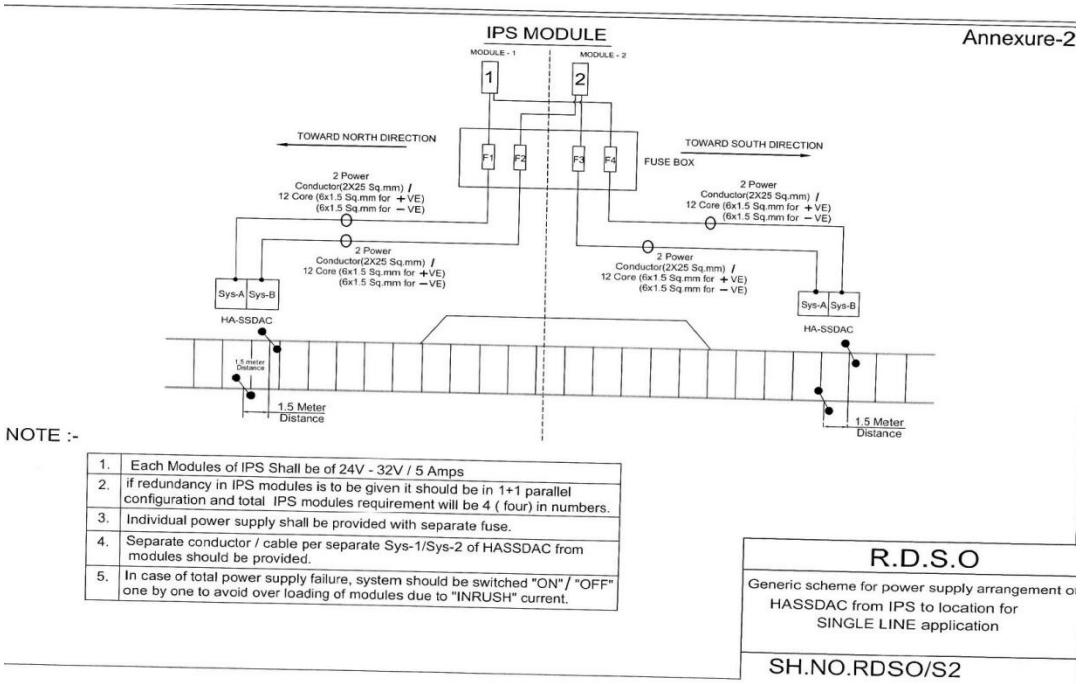
| | |
|---|---|
| 14. | Preferably, quad cable shall be terminated in cage clamp type terminals that provide solid 360 degree surface connection and sufficient pressure on the wire to make a good electrical contact. Any unused/spare conductor of the quad cable shall be terminated and tightened properly at CTR, Locations and in between junction boxes. |
| 15. | 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. |
| 16. | 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. |
| 17. | Quad cable twisting shall be ensured during termination so that minimum one twist per inch is maintained till the last inch into terminations. |
| 18. | 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. |
| 19. | Signalling cable or any other untwisted cable pair shall never be used in DAC communication circuits to avoid intermittent type of failure. |
| 20. | 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. |
| 21. | 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. |
| 22. | 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. |
| 23. | Cabling, as far possible, shall be planned line wise in such a way that single cable failure does not affect the signalling on other line and there are sufficient spares for concerned line. |
| 24. | Periodic checking of Quad cable parameters including IR, Loop Resistance, attenuation and cross talk. Parameters are mentioned in PCCL also. IR should preferably be equal to or better than 10M ohms, Loop resistance should generally not exceed 56 ohms/km, attenuation loss should not be greater than 30dB, FEXT /NEXT should be better than 55dB. It should be ensured that line loss is not more than specified by OEM. |
| **D** | **Power Supply Installations** |
| 25. | Power supply ripples shall be ensured to be less than 50 mv peak to peak as per IPS specifications. This should be part of routine maintenance measurements and records. |
| 26. | Separate power supply/module for DAC to be used. |
| 27. | To realise full advantage of line wise electronics provision, evaluator for each line shall be supplied from independent power supply module. |
| 28. | Power supply for evaluator shall not be shared for anything else like cabinet fan or track section relays etc. |
| 29. | Power supply module feeding external circuits shall never be used for feeding indoor electronic systems like evaluators that require separate isolated supply |
| 30. | For taking full advantage of dual system and HASSDACs two pair of separate power conductors (2X25 Sq. mm Aluminium power cable/equivalent signalling cable) shall be provided for power. Each pair of such power conductor shall be connected to individual DC-DC converters in the IPS and power supply cards of dual system/HASSDAC. |
| **E** | **Earthing and Surge Protection Devices** |
| 31. | Availability and intactness of Class B & C SPDs which are being supplied along with IPS in a separate wall mountable box should be checked and provided wherever not available. |
| 32. | The equi-potential bonding of indoor signalling equipment including, IPS racks should be provided in the power room and connected to low resistance earth of less than 1 Ohm |
| 33. | 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. The length of cables from SPDs to earth bus bar and from equipment to earth bus bar should be shortest possible without any bends Loops should not be present. |
| 34. | The size of cable from SPD to earth bus bar should be minimum 16 sq. mm copper cable and the |

| | |
|---|---|
| | size of cable from equipment to earth bus bar should be minimum 10 sq. mm copper cable |
| 35. | All connections from equipment or SPD to earth bus bar shall be exothermic welded or soldered. |
| 36. | Suitable Class-C SPDs should be provided in the power line, communication line and reset line for surge protection in DAC's. In this way, it has to be ensured that wherever power cables/data lines go out of location/relay room, proper SPDs need to be provided at both ends. |
| 37. | In quad cable, the armour, screen and sheath continuity should be maintained while jointing it.<br>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 & armour.<br>Combined earth for armour and screen at intermediate locations shall have earth value as low as possible, but shall never be more than 5 Ω (Ohms). |
| 38. | Low resistance earth of value less than 5 Ohms needs to be provided in the location boxes where field unit of Digital Axle Counter is provided. |
| 39. | All equipments, cables in the location box need to be connected firmly to the earth bar inside location. Periodical checking of earth bus bar continuity and earth values should be undertaken and recorded. |
| 40. | Screen of Sensor cables should be properly earthed at location end. |
| 41. | High quality, high speed & self-diagnosing/indicative type SPDs should be used.SPD& their wiring — short and straight wire with low inductance away from other wiring of electronics, SPD of proper quality needs to be ensured. OEM shall select appropriate rating of SPD for use in quad cable considering effect of induced voltage |
| 42. | OEM shall select appropriate rating of SPDs for use in quad cable considering effect of induced voltage.<br>Intactness and availability of SPDs in DAC should be checked periodically and recorded in maintenance logbooks. To ensure their availability in the system, their health should be monitored /checked periodically, specially before monsoon, after every heavy rain/lightning, storm, and during maintenance/inspection. In case of failure or deterioration in performance, same should be replaced. |
| 43. | Record of provision of SPDs with make and model details should be made in PCCL by OEM & Railways. |
| 44. | For surge protection arrangement in HASSDAC a generic scheme is shown below:<br><br><br>The SPDs as indicated above shall be indicative type and provided by OEM of HASSDAC as stipulated in their user/installation manual. |
| 45. | Earthing & Bonding arrangement to be ensured as per RDSO/SPN/197 Ver. 1.0 or latest. |
| 46. | Generic scheme for power supply arrangement- |

Use of HASSDAC for double line application:–




Use of HASSDAC for single line application-




| F | **Precautions during maintenance of DACs** |
|---|---|

| Inspected by: Name & Signature of Railway Representative | Tested by: Name & Signature of firm's Representative |
|---|---|

| | |
|---|---|
| 47. | Maintenance activity shall be done with utmost care and as per technical manuals of OEMs related to this subject. As a general rule, any maintenance activities in track device area, like, ballast packing & rail changing etc., that require disconnection of track devices and adjustments of axle counter parameters shall not be done in working system. If so required, maintenance staff shall take proper disconnection, duly de-energizing the related sections of SSDAC/HASSDAC/MSDAC from CT rack/disconnection terminals before starting indoor/outdoor maintenance activities. |
| 48. | Once work is completed the section should be connected/ energized following all precautions related to resetting, checking of parameters as stipulated and physical clearance of track section before reconnection. |
| 49. | **Routine Maintenance**<br><br>Activities like measurement of parameters, cleaning etc. which does not interfere with working of system, may be carried without disconnection<br><br>**Specific Checks on Track Device**<br><br>Periodic preventive checks by maintenance staff to ensure that track device is properly fitted at site and fixing nuts/bolts are properly tight and intact_ Connections of track device cables are also proper. Any damage/irregularity noticed in nuts/bolts/cables near the trackside shall be immediately attended to duly disconnecting the associated track section while attending the same for damages/ irregularities. Fixing Nuts/Bolts shall be used as recommended by OEM |
| 50. | Handling of Track Devices: 1<br><br>Wheel sensors / Track devices are the most sensitive element in DAC technology and these needs to be handled with utmost care. OEM instructions for removing, installing and adjusting shall always be adhered to. Any attempt to experiment with wheel sensors on an operational system can lead to unforeseen hazards. If there are any doubts, railways can always raise those to RDSO, in turn required testing and checks will be done and a mitigation for those doubts will be undertaken in RDSO without jeopardizing the working system on operational railway. |
| 51. | Handling of Track Devices: 2<br><br>All Wheel sensor / Track devices installed so far on IR, work on principal of electromagnetic flux linking between transmitter and receiver coils. Electronics connected to these track devices keeps monitoring the track devices continuously for the changes in current/voltage induced in receiver coils due to change in flux linkage between transmitter and receiver coils. When a ferromagnetic metallic item is brought near to the track device, it influences the flux linking between the transmitter and receiver coils to a certain level and if this change is less than the set threshold level, then electronics ignores that change. This is how a trolley is, generally, suppressed, as the change in induced receiver voltage is less than set threshold for electronics to process that signal for wheel detection. |
| 52. | Handling of Track Devices: 3<br><br>If the change in receiver voltage is beyond the set threshold level then associated electronics starts processing that signal for detecting and counting train wheels. Track devices detect the train wheel based on a specific pattern of flux changes in receiver coil. Any Receiver voltage change beyond the set threshold but not followed by specific wheel detection pattern will lead to the section going into occupancy as a failsafe response. |
| 53. | Handling of Track Devices: 4<br><br>If any attempt is made to displace the track device components in a manner that flux linkage between transmitter and receiver coils does not result in threshold being crossed then it may lead to a situation where track device is no more installed in the manner specified by OEM. Such attempt may then create unwanted scenario of track section neither going to occupied condition nor the track device being able to count a train wheel.<br><br>It is again reiterated that any such concern related to track device displacement shall be discussed and analyzed in lab environment and not in operational field conditions where it can impact signaling system in an undesirable manner. |

| | |
|---|---|
| 54. | Intactness and availability of SPDs in DAC should be checked periodically and recorded in maintenance logbooks. To ensure their availability in the system, their health should be monitored /checked during maintenance/ inspections and after the events of heavy lightning. |
| **G** | **Dual Detection using DACs and HASSDACs** |
| 55. | Track devices for both the DAC systems shall be provided on separate rails with specified staggering of minimum 1.5 meters. |
| 56. | In dual system and HASSDAC, two DAC systems works in parallel. Health of individual systems to be monitored through Data logger and exception reports/ alarms to be generated for predictive maintenance |
| 57. | For HASSDAC, the status of LR (logic relay)/RR relay (Reset relay) shall be connected in relay room using 2 cores of Signalling cable from location to relay room |
| 58. | For M/s CEL HASSDAC, the information of LR/RR relay is available at pin 15, 16 of VR-Box. Normally there is no continuity between these two pins. When there is a failure in any of the system, pin 15 and 16 shorts. This information shall be provided to data logger and exception report/alarm needs to be generated when shorting continues for more than 10 seconds (10 second exception is compulsory to avoid false alarm) |
| 59. | For M/s GG Tronics HASSDAC, repeater relays of the vital relays of each individual system are available in relay room also. Pick UP contacts may be used in data logger to monitor the status of individual systems and to generate exception report/alarm |
| 60. | Two set of independent cables shall be provided between locations to station for individual systems. |
| 61. | Diversity has to be built right from the stage of power supply and the connecting cables and the method of train sensing and train detection. |
| 62. | Wherever Axle Counters have been used as one of the Train Detection Systems, the resetting shall invariably be activated automatically by the other train Detection Device. Resetting of Axle Counters shall always be in the preparatory mode. |
| 63. | Each of these Train Detection Devices shall be separately monitored by the Data Loggers and Exception Reports/alarms be transmitted to Maintenance Team & Signal Control, in case of mismatch/failure of devices, Messages received about mismatch/failure of the devices should be promptly attended. |
| 64. | During failure of any one device of Dual Detection, train shall be dealt on proper signal. Failed device shall be attended & rectified, where required, only under proper disconnection taken dung lean period of traffic |
| 65. | In case of failure of both the devices, trains shall be dealt on written authority at restricted speed. Rectification and restoration work should be done after receipt of failure memo/under proper disconnection as required as per extant practice. |
| 66. | Dual Train Detection Devices should be checked and inspected regularly as per the stipulated periodicity of maintenance and inspection. |
| **H** | **Communication** |
| 67. | Redundancy in media can be planned where communication failures are high. Media changeover arrangement/ switch should be provided for this |
| 68. | Use of High availability SSDAC in high density traffic areas can give more availability and reliability of system (BPAC applications). |
| 69. | Communication<br><br>Both the systems of HASSDAC systems shall be provided with media diversity for reliability i.e. one system on dark optical fiber or dedicated El channel (point to point) and the other system on 6 quad cable |
| **I** | **General Items** |
| 70. | OEMs have been advised to give on-site training to staff as per requirement of Railway |
| 71. | Implement effective Installation and Commissioning procedures as per PCCL. All columns of the PCCL should be filled in and only then signed. |
| 72. | Person signing the PCCL should be different from installer so that additional check is enforced. |
| 73. | Association of OEM during pre-commissioning check to be ensured. |
| 74. | Monitoring of VRs of DACs shall be done through Data Logger. |
| 75. | Methodology for calculation of FRPCPY of different types of DACs(MSDAC, HASSDAC and SSDAC) is prescribed vide the Railway Board letter no. 2022/Sig/19-FRPCPY/12 dated- 15.07.2022, same |

| | |
|---|---|
| | should be followed. |

The sources of all these points are following-

1. TAN- STS/E/TAN/6001 for Digital Axle Counter- Wiring Discipline*
2. TAN- STS/E/TAN/6002 for ABS & IBS Scheme using MSDAC*
3. TAN- STS/E/TAN/7005 for Lightning protection for DAC in lightning prone area.*
4. TAN- STS/E/TAN/7006 for Technical Advisory for Digital axle counters*
5. TAN- STS/E/TAN/7008 for Installation of HASSDAC*
6. TAN- STS/E/TAN/7009for Axle counter*
7. RB letter no. 2012/Sig/M/DAC/DC dated: 31.12.2013
8. RB letter no. 2022/Sig/19-FRPCPY/12 dated- 15.07.2022

*Note- TANs mentioned vide sl. No. 1 to 6 are henceforth being withdrawn as all their points are covered in this documents number STS/E/TAN/7010.

*For any issues related to this TAN (technical advisory note) please contact Director/Signal-II at RDSO, Lucknow (Rly phone- 032-42659, DOT-0522-2452332, Email: Triambak.tiwari@gov.in.*

**********

## High Availability Single Section Digital Axle Counter DACF 720 P

**For Servicing or any other information contact the following**

- CEL service center located at

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

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

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

When you send / ship the product for service

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

**Turnkey**

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

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


For further details, please contact
**Systems Division (Marketing)**

**Central Electronics Limited**

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

Customer care -
Regional Sales Office

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

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


**ISO 9001 : 2015**

QMS

Accredited by the Dutch Council for Accreditation Accreditation No. C 286