सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(For official use only)

डिजिटल एकसल काउण्टर (सिंगल सेक्शन) पर अनुरक्षण हस्तपुतिका

MAINTENANCE HAND BOOK ON

DIGITAL AXLE COUNTER (SINGLE SECTION)






कैमटैक / एसएण्डटी / एस / 2010 / एच बी / एसएसडीएसी / 1.0

अप्रैल 2010

CAMTECH/S&T/S/2010/HB/SSDAC/1. 0
April 2010

Transforming Railways

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MAHARAJPUR, GWALIOR - 474 005

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OUR OBJECTIVE

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

If you have any suggestion & any specific comments, please write to us:

Contact person :		**Director (Signal & Telecommunication)**
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प्राक्कथन

डिजिटल एक्सल काउण्टर अपनी उन्नत संरक्षा संबंधी विशेषताओं तथा विश्वस्तता के कारण भारतीय रेल्वे में प्रगती के साथ संस्थापित किये जा रहें हैं।

कैमटेक उच्च अनुरक्षण रीतियों से सम्बंधित सूचनाओं के प्रलेखन तथा उन्नयन की दिशा में निरन्तर प्रयत्नशील हैं। उपरोक्त विषय पर वर्तमान अनुरक्षण हस्तपुस्तिका इस दिशा में एक अगला कदम हैं।

इस हस्तपुस्तिका में दी गई सूचना निर्दिष्ट स्तर तक पहुंचना चाहिये तथा यह संकेत विभाग के कर्मिको को उपरोक्त पद्धति के संस्थापन व अनुरक्षण में सहायक होगी ।

कैमटेक, ग्वालियर
दिनांक : 22.4.2011

एस.सी.सिंघल
कार्यकारी निदेशक

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FOREWORD

Digital Axle Counters are progressively being installed on Indian Railways due to their enhanced safety features and reliability.

CAMTECH is continuously making efforts in documentation and up-gradation of information on advanced maintenance practices. The current maintenance handbook on the subject is a further step in this direction.

The information given in this handbook should reach to the appropriate levels and will help signal personnel in installing and maintaining the above system.

CAMTECH GWALIOR ***S.C.SINGHAL***
DATE: 22.04.2010 ***EXECUTIVE DIRECTOR***

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भूमिका

परम्परागत एक्सल काउण्टरों की उनकी कार्य के दायरें तथा विश्वस्तता के आधार पर अपनी सीमायें हैं तथा इन्हें समय समय पर अनुरक्षण की आवश्यकता होती है। माइक्रो कंट्रोलर तथा साफ्टवेयर आधारित डिजिटल एक्सल काउण्टरों के लिये बहुत कम अनुरक्षण की आवश्यकता होती है तथा इनमें खराबी के लक्षण की सूचना एल ई डी के द्वारा देने की अतिरिक्त विशेषतायें हैं। डिजिटल एक्सल काउण्टर के इस संस्करण के सीधें अनुभाग, स्टेशन क्षेत्र के पाईंट जोन तथा ब्लॉक सेक्शन को प्रमाणित करन में अनुप्रयोग है। वर्तमान हस्तपुस्तिका अनुरक्षण कर्मिकों का प्रणाली के संस्थापन, अनुरक्षण तथा त्रुटिविहीन कार्य संपादन में सहायता हेतु बनाई गयी हैं। यह हस्तपुस्तिका अ.अ.मा.सं. द्वारा निर्मित डिजिटल एक्सल काउण्टरों पर विक्रेता विशिष्ट सूचना भी सम्मिलित करती है।

यह स्पष्ट किया जाता है कि यह हस्तपुस्तिका सिग्नल इजि. मैनुअल, रेल्वे बोर्ड प्रकाशन व अ.अ.मा.सं. प्रकाशनो के किसी भी विद्यमान प्रबंधो को विस्थापित नही करती है। यह हस्तपुस्तिका वैधानिक नही है वरन् इसमें दिये हुये निर्देश केवल मार्गदर्शन हेतु दिये गये हैं।

हम श्री ए.के.यादव, निदेशक/संकेत अ.अ.मा.सं., मै. एल्डाईन इलैक्ट्रोसिस्टम्स प्रा.लि. कलकत्ता, मै. सी ई एल लि. साहिबाबाद, मै. जी जी ट्रॉनिक्स बैगलुरु व फील्ड कर्मचारियों के आभारी हैं जिन्होने इस हस्तपुस्तिका को तैयार करने में विशेष योगदान दिया।

चूंकि तकनीकी उन्नयन एवं शिक्षण एक क्रमिक प्रक्रिया है, अतः इस हस्तपुस्तिका में यदि कुछ जोडने या सुधारने की आवश्यकता महसूस कर सकते हैं। यदि ऐसा है तो कृपया अपने सुझाव हमें लिख भेजें। हम आपके सहयोग के अत्यन्त आभारी होंगें।

कैमटेक, ग्वालियर
दिनांक : 22.4.2011

जगमोहन राम
निदेशक (सं.एवं दू.सं.)

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PREFACE

Conventional Axle Counters have their own limitations in terms of its range of operation and reliability and require frequent maintenance. The Micro-controller and software based Digital Axle Counters require less maintenance and have added feature of diagnostics information through LEDs. The Single Section version of Digital Axle Counter has applications in straight sections and point zones of Station area as well as in proving of Block section.

The current maintenance handbook on the subject has been prepared to help the maintenance personnel in installation, maintenance and trouble-free performance of the system. The handbook also covers vendor specific information such on Digital Axle Counters manufactured by RDSO approved firms..

is clarified that this handbook does not supersede any existing provisions laid down in Signal Engineering Manual, Railway Board publications and RDSO publications. This handbook is not statutory and instructions given in it are for the purpose of guidance only.

We are sincerely thankful to Shri A.K.Yadav, Director (Signal)/ RDSO, M/s Eldyne Electrosystems Pvt. Ltd., Kolkata, M/s Central Electronics Ltd., Sahibabad and M/s G.G.Tronics, Bangalore and field personnel who helped us in the revision of this handbook.

Since technological upgradation and learning is a continuous process, you may feel the need for some addition/modification in this handbook. If so, please feel free to write us. We shall be highly appreciating your contribution.

CAMTECH GWALIOR ***JAGMOHAN RAM***
DATE:22.04.2010 ***DIRECTOR (S&T)***

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संशोधन पर्चियों का प्रकाशन

इस लघु पुस्तिका के लिये भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जायेगा।

कैमटैक / एसएण्डटी / एस / 2010 / एच बी / एसएसडीएसी / 1.0 सीएस #XX दिनांक--------

जहॉ "XX" सम्बन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)

प्रकाशित संशोधन पर्चियॉ

क्र.सं.	प्रकाशन की तारीख	संशोधित पृष्ठ संख्या तथा मद संख्या	टिप्पणी

ISSUE OF CORRECTION SLIPS

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

CAMTECH/S&T/S/2010/HB/SSDAC/1.0/CS# XX date .....

Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

CORRECTION SLIPS ISSUED

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अध्याय – 1

डिजिटल एक्सल काउण्टर (सिंगल सेक्शन)
DIGITAL AXLE COUNTER (SINGLE SECTION)

1.0 परिचय Introduction

Axle counter is a device for monitoring a specified section of track for the presence of vehicle. Conventional axle counters were designed with transistorized circuits and ICs. Now Axle Counters are designed using Micro-Controllers and Software program, and these are called as "Digital Axle Counters". The communication used in the system is by means of packets for exchange of information between units. This communication is in duplex mode and is fail safe. *(In duplex mode data is exchanged between two connected devices in both directions simultaneously. Data flow takes place independently in both directions)*

1.1 डिजिटल एक्सल काउन्टर का वर्गीकरण Classification of Digital Axle Counter

There are two types in use:

- Single Section Digital Axle Counter
- Multiple Section Digital Axle Counter

Single section axle counters are generally used to monitor a single track section i.e there is only one entry point and one exit point for a particular track section. Digital data is transmitted directly between two axle counter field equipments by means of modem communication. Whereas a Multi Section Digital Axle Counter is used to monitor a track Section confined by multiple Entry and Exit points.

1.2. सिंगल सेक्शन डिजिटल एक्सल काउन्टर Single Section Digital Axle Counter

1.2.1 सामान्य विवरण General Description

Single Section Digital Axle Counter consists of axle detectors and field units (1 or 2 or 3 or 4) confining a track section connected together by transmission medium which is in VF range. It is capable of counting axles, count comparison, finding direction of axle movement, supervision, relay drive and transmission of counts and health of axle detectors and field units.

Track clear indication shall only be given when IN count and OUT count are equal and equipment is functioning all right. Axle counter shows occupied when any of the its sub-assemblies belonging to the section is damaged , missing or has become faulty.

The Axle Counter detects change of both amplitude and phase of the axle detector receiver signal.

On Indian Railways Single Section Digital Axle Counters are designed as per RDSO Specification No. RDSO/SPN/177/2005. The interconnection block diagram for SSDAC is given on next page.

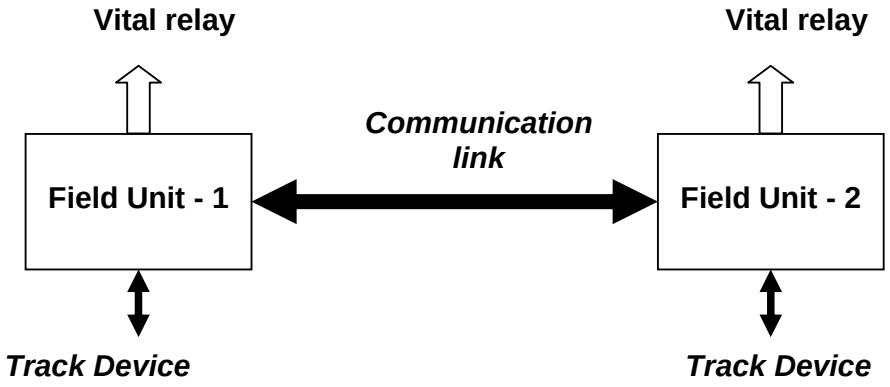


Fig.1.1: SSDAC interconnection Block diagram

1.2.2 संचार Communication

For transmission of data between field units, following communication links can be used:

a) Telecomm. Quad cable (0.9 mm. dia.) – ½ quad (As per IRS:TC:30/97).
b) PIJF cable (0.9 mm. dia.) – 1 pair (IRS:TC 41/97).
c) OFC – One 2 wire voice channel.

1.2.3 प्रमुख विशेषतायें Salient Features

- It can support upto 4 detection points and generate vital relay outputs for each detection point.
- Each track section can be reset independently from a reset box or with co-operation from other station depending upon the installation.
- The Event logger records all the events occurring in the single section digital axle counter.
- It has such an arrangement that wheels of push trolleys, dip lorries, rail dollies etc. are not counted by it. Trolley protection track circuit is not required with phase modulation.

1.2.4 संरचना Configuration

Single Section Digital Axle Counter works in following 5 configurations:

(i) One detection point single section : In terminal lines/siding.



Fig 1.2 (a)

(ii) Two detection points single section: In straight line.

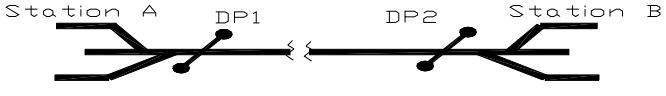


Fig 1.2 (b)

(iii) Three detection points single section: In point zone.

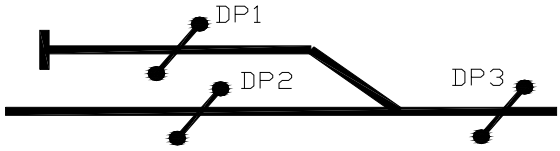


Fig 1.2 (c)

(iv) Four detection points single section: In point zone.

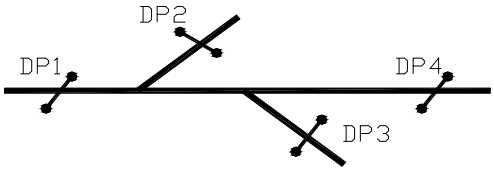


Fig 1.2 (d)

(v) Three detection points for two consecutive sections.

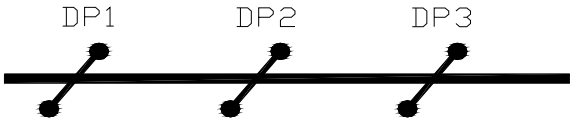


Fig.1.2(e)

1.2.5 मुख्य भाग Main Parts

The SSDAC broadly consists of following parts:
Axle detectors.
DAC field units.
Reset unit.
Vital Relay unit.
Event logger.
Diagnostic system

1.2.6 विभिन्न भागों के कार्य Functions of various parts

(i) एक्सल डिटेक्टर Axle detector

It comprises of two sets of Transmitter/Receiver coils/sensors. These operate at frequencies above 20 KHz. These are of web mounted type. One detection point comprises a set of two transmitter and two receiver coils fitted adjacent to each other.

(ii) डी ए सी फील्ड इकाई DAC Field unit

It has 2 out of 2 architecture. It detects and counts axles passing over the axle detector according to the principle of wheel detection, as well as determine the direction of passing axles. The field units transmit axle counts and health status to other end field unit and vice-versa at regular intervals. Provision is available for setting unique address of each field unit. The address shall be minimum 8 bits.

Principle of wheel detection

The following paragraphs explain the principle of wheel detection:

(a) The train wheel bridges the one set of two Transmitter/Receiver coils of different frequencies while passing over them and creates an overlapping pulse for Phase detector 1 and phase detector 2 which results in counting of

wheels. If phase of signal output of Rx is compared with Tx then under wheel condition Tx and Rx will be in phase <100mV

(b) A trolley wheel, because of its lesser diameter does not bridge the coils and hence a non-overlapping pulse is created for PD1 and PD2 by which the wheel is not counted. However solid trolley wheels create error condition sometimes. Under No wheel condition Tx and Rx signals will be 180° out-of-phase >10V.

(c) The four spoked trolley wheel, dip lorry wheel and rail dolly wheels do not generate any pulse due to which the movement of these wheels is ignored.

The above principle is explained in the diagrams given below:

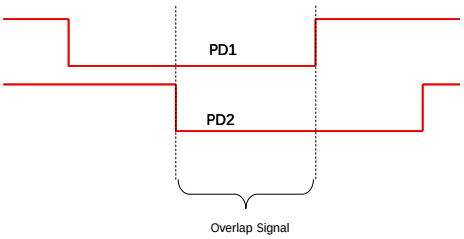


Fig 1.3 (a) Wheel Detection - Train Wheel - Count

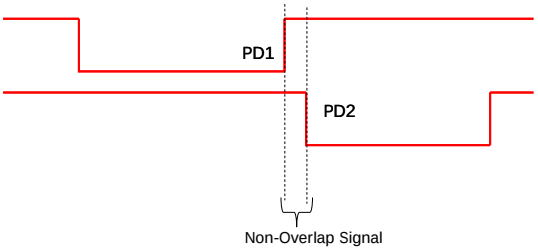


Fig 1.3 (b) Wheel Detection - Trolley Wheel - No Count

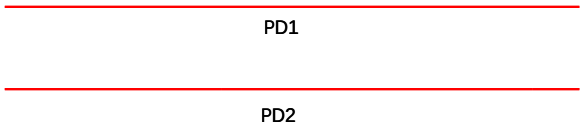


Fig 1.3 (c) Wheel Detection - Dip Lorry - No Count

(iii) रीसेट इकाई Reset unit

Reset boxes are provided in ASM room to reset respective track sections. These work from 24 V DC supply.

If all the field units of an axle counter section are placed in the same station, same/one reset box can be used to reset all the field units of one section in parallel.

If any field unit of an axle counter section is placed in separate station then separate reset box is used for resetting that field unit.

The following are provided in the Reset box:

1. A six digit (min.) non-resettable type counter.
2. Reset switch with key.
3. Reset push button – RED.
4. Axle counter section clear indication (LED 10 mm) – GREEN.
5. Axle counter section occupied indication (LED 10 mm) – RED.
6. Power OK indication (LED 3 mm) – YELLOW.
7. Preparatory reset indication (LED 3 mm) – GREEN.
8. Line verification indication (LED 3 mm) –YELLOW.

The possibility of reset will be as per table below:

Sr. No.	Condition	Whether Reset permitted (Yes/No)
1.	No in-count, No out-count, Section clear and healthy.	No
2.	No in-count, No out-count, Error has occurred.	Yes
3.	Only in-count, No out-count, System healthy.	No
4.	Only in-count, No out-count, Error has occurred.	Yes
5.	In-count and out-count started, System healthy.	Yes
6.	In-count and out-count started, Error has occurred.	Yes
7.	No in-count, but only out-count started, System goes to error.	Yes
8.	System in preparatory mode.	No

(iv) वाईटल रिले ड्राईव तथा रिले इकाई Vital relay drive and Relay unit

The vital relays are mounted in the space provided in the relay unit. These are 24 V DC, 1000 ohm plug-in type relays.

The pick up and drop contacts of vital relay are utilized for indicating the axle counter section clear and occupied respectively. The other contacts of vital relay can be used in interlocking circuits e.g. Signal clearance circuit.

For one detection point single section and two detection point single section configuration, each field unit drives its vital relay. The field unit of the common detection point mentioned in 3.4.5 drives two relays of adjacent sections.

For three detection point single section and four detection point single section configuration, vital relay may be provided in any one of the field units.

(v) इवेंट लॉगर Event Logger

The Event Logger is inbuilt in each field unit. It works automatically without any other input required to be given. It is possible to download logged events to a commercial computer through standard port.

The Event logger shall record following events at the minimum.

- Resetting of track section or field unit.
- Failures/errors in field units.
- Breakdown of communication link(s).
- Change in relay status for section occupied/clear.
- Change in 5 V output of DC-DC Converter beyond limits.
- Change in date/time.

(vi) डायगोनोस्टिक प्रणाली Diagnostic system

Diagnostic system of the axle counter provides:

- Local and remote diagnostics and testing of system through a serial connection.
- Self detection of error codes and brief description in reset box through alphanumeric LCD display.
- The same display normally shows in count/out count detection point-wise and section-wise and software version No. when the system is switched on initially.
- After running the diagnostic software, the system data (viz. Current data and Historical data) can be downloaded and analysed on the PC. The historical data may be used to reconstruct the sequential occurrence of events happened in the system.

1.3 सिंगल सेक्शन डिजिटल एक्सल काउन्टर की रीसेटिंग Resetting of Single Section Digital Axle Counter

There are three types of reset applied for a Digital Axle Counter, namely:

सीधा हार्ड रीसेट Direct Hard Reset

Direct hard reset shall not be provided normally, which resets the axle counter directly to clear the axle counter without any verification/co-operation/piloting or out count.

आरंभिक रीसेट Preparatory Reset

After doing preparatory reset, axle counter continues to show occupied until one train movement takes place in the section by piloting.

प्रतिबंधीय रीसेट Conditional Hard Reset

This reset is activated after physical verification of clearance of track section from site using line verification box. The axle counter will show clear after conditional hard reset.

Depending on the application of axle counter, different types of procedures are followed as given in the following table:

S. No.	Axle Counter Track Section	Type of reset
1.	Points zone	Conditional Hard Reset
2.	Loop line and Sidings	Conditional Hard Reset
3.	Main line	Preparatory Reset
4.	Section between Advance Starter and IBS	Preparatory Reset
5.	Automatic section	Preparatory Reset
6.	Block Proving by Axle Counter	Preparatory Reset

Resetting of SSDAC of different vendors is different, hence it is dealt separately vendor-wise.

(a) A reset operation is only possible when section is occupied or disturbed or there is an error in the system .

(b) Reset key operation (including line verification switch) should be performed by an authorized person only.

1.4 अ.अ.मां.सं द्वारा अनुमोदित फर्में RDSO approved firms

At present there are three RDSO approved firms for supply and installation of Single Section Digital Axle Counter on Indian Railways:

1. M/s Eldyne Electrosystems Pvt. Ltd., Kolkata.
2. M/s Central Electronics Ltd., Sahibabad
3. M/s G.G.Tronics, Bangalore

Part C,D & E of this handbook cover axle counters of above firms respectively.

■■■■■

अध्याय – 2 Chapter – 2

डिजिटल एक्सल काउन्टर (सिंगल सेक्शन) की संस्थापना
INSTALLATION OF DIGITAL AXLE COUNTER (SINGLE SECTION)

2.0 परिचय Introduction

The following installation guidelines are common to all types of SSDAC. If there is any variation for SSDAC manufactured by a particular firm, the same is given separately in the respective sections.

2.1 संस्थापन हेतु सामान्य अनुदेश General installation guidelines

The installation can be taken up with the following parallel activities:

- Laying foundation as per approved drawing for the location box, fixing the location box.
- Trenching for running the required cable.
- Laying of power, signalling cables and cables coming from TX/RX coils.
- Marking of location for drilling holes in the rail web for fixing of TX/RX coils.
- Drilling of correct size holes in rail web with the help of jig.
- Fixing of TX/RX coils on the rail.
- Fixing of required planks for shelves and termination boards.
- Fixing of fuse and terminal blocks.
- Terminating the cables on the fuse and terminal blocks as per drawings.
- Placing of the SSDAC unit with all the PCB modules and the Relay box on the plank provided in the location box.
- Fixing of the MS Coupler cable assemblies on to the designated mating couplers on the rear panel of the systems where provided or termination of designated cables on the terminal blocks provided on the rear of the unit as the case may be.
- Continuity, insulation resistance between cables should be checked.
- Also the insulation resistance between the chassis and the cables must be checked.
- Connecting earth terminal of the unit chassis to the main chassis through copper cables.
- All the shields and the screen wires shall also be connected to the earth.
- Fix the reset box in a convenient location in the station.
- Connect the wires coming from the system to the reset box as per drawing.
- Connect 24V DC power supply.
- Connect the power cables coming from the system to the source of power supply of 24V DC at the station.

2.1.1 एक्सल डिटेक्टरों का स्थापन Location of Axle Detectors

- Select location of Axle detectors as per approved signaling plan.
- Select another location if there is any embossment on the rail web.
- On double line section the axle detectors should be mounted preferably on the outer rail.
- The Axle detectors should be installed after Advance starter (LSS) signal post and Home signal (HS) post on UP and DN lines of Double line section for use in BPAC.
- The Axle detectors should be installed after Advance Starter Signal (LSS) Post for both directions of Single Line Section for use in BPACs.
- In main Lines, loop lines, yard area the Axle detectors can be fixed just after the Starter Signal post of each line under monitoring of SSDAC.
- The Axle detector separation between two sets of different SSDAC systems should be at least 2 meters away so as to avoid mutual interference.
- The detectors have to be fixed on the clear spacing between two sleepers**.**
- It should be ensured that the rail is not badly worn causing the wheel flanges to graze over the fittings.
- Transmitter and Receiver cables are to be laid in the 40mm HDPE pipe for safety and buried underground below ballast at the depth of approx. 0.3mts.
- Transmitter and Receiver cables should run separately at a minimum separation of 400mm in different HDPE pipes.
- The transmitter and Receiver coils are provided with 23/0.2mm, 2 core shielded PVC cable with gray sheath and have to be taken to location box directly without any loops

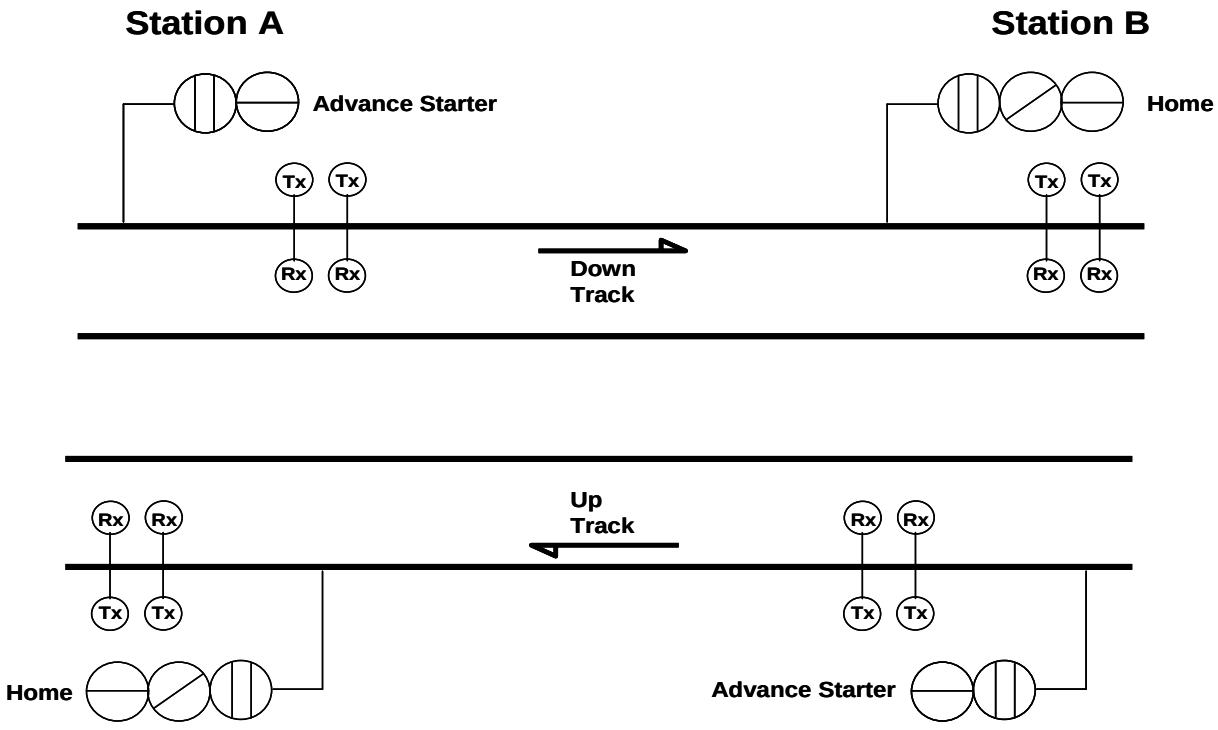


Fig. 2.1: Location of axle detectors in double line section for use in BPAC

2.1.2 रेल पर चिन्हित करना एवं छिद्र करना Marking and drilling holes on the Rail

- The marking jig is to be fixed from bottom of the rail and tightened to the rail with bolts.
- The marking for 3 holes with punch is to be made on the web of rail with equal spacing and at appropriate height from the bottom of the rail as specified in the instruction manual using marking jig.
- The 3 Holes of specified dimension are to be drilled on the web as per the markings at each location.
- The drilling is to be carried out on the web of rail at marked places with the help of drill machine by ratchet drill method.
- The burr is to be removed from the holes after drilling.

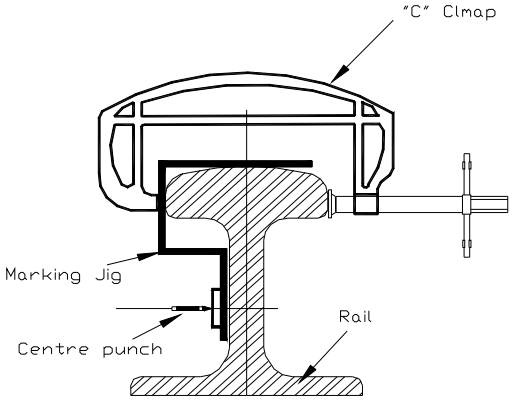


Fig.2.2 : Fixing of Marking Jig (CEL make) and marking using punching guide as per rail size

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

2.1.3 एक्सल डिटेक्टरों को लगाना (ट्रांसमीटर व रीसीवर क्वाईल) Fixing of Axle Detectors (Transmitter and Receiver Coil)

- These are fixed on the rail with the help of three M12 bolts which must be tightened by means of an adjustable torque wrench supplied only with the Tool Kit.
- Each Tx head is mounted on an Aluminium casting with two M8 bolts.
- ***The four M8 bolts must be tightened by means of an adjustable torque wrench supplied only with the Tool Kit.***
- Transmitter coil assembly should be fixed on the outer side of rail. The transmitter assembly should sit properly on the web of rail.
- Receiver coil assembly should be fixed on the inner side of rail. The receiver assembly should be placed properly on the web of rail.
- It should be ensured that transmitter coil assembly and receiver coil assembly of same frequency are facing opposite to each other and on either side of rail with centerline of coils matching with each other.
- The TX1 and TX2 coil cables are taken together in one HDPE pipe to the location Box. Similarly both RX1 and RX2 coil cables are taken together but separately from TX coil cables to the location box. TX and RX coil cables should be laid with a separation of 400 mm.
- Both at the Entry and Exit of the section, the axle detectors should be fixed on same rail i.e. either Left side rail or right side rail of the track as shown in Fig.2.1.

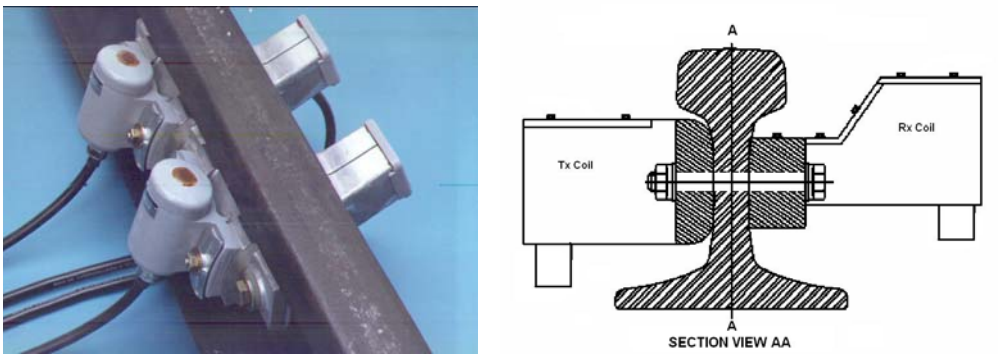


Fig. 2.3: (i) Fixing of axle detectors (ii) Sectional view

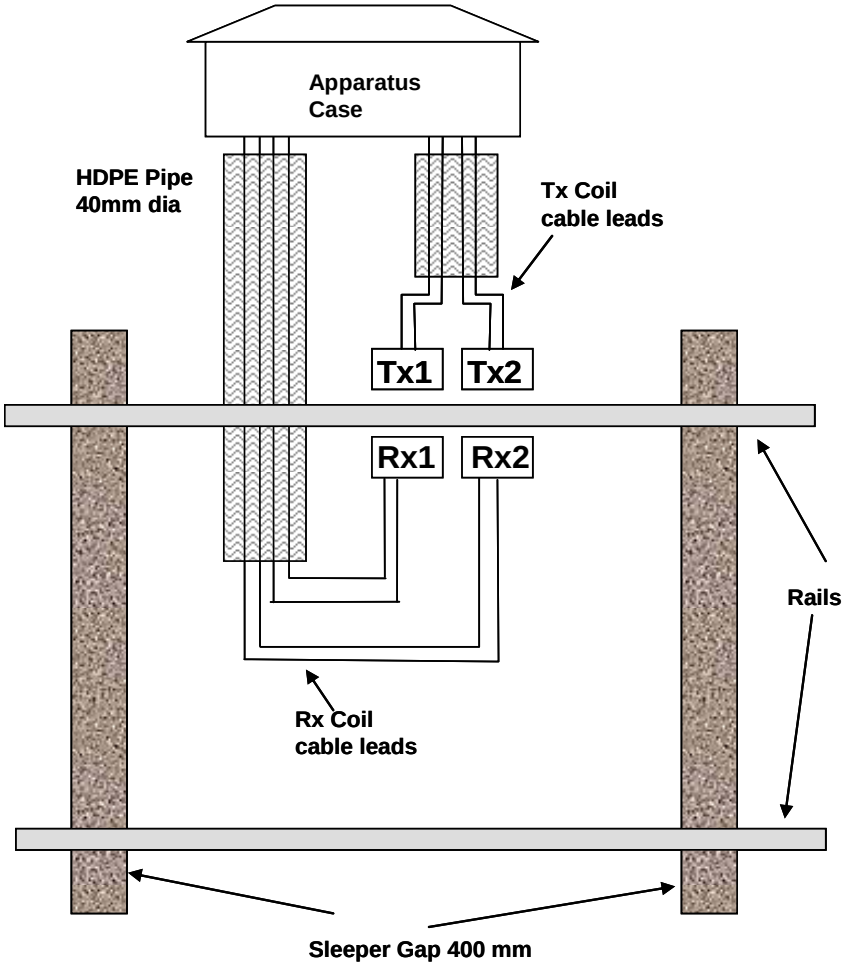


Fig. 2.4: Arrangement for laying of TX & RX cables

2.1.4 रेल डिफ्लेक्टरों को लगाना Fixing of Rail Deflector

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. While fixing deflector plate, it should be ensured that the deflector plates are positioned in front of transmitter and receiver coils.



Fig 2.5.: Fixing of deflector plates

2.1.5 लोकेशन बॉक्स की संस्थापना Installation of Location Box

- The location box should be installed as close as possible to detection point so that the length of Axle detector cable should not exceed 10 m or 15m depending on the type of SSDAC.
- The location box foundation should be cast at rail level and as per Standard practice in railways.
- One wooden/Hylam/NFTC shelf and a terminal board consisting of Wago/ Phoenix/ ARA terminals to be provided inside the location box.
- The incoming and outgoing cables from the Axle detectors, SSDAC unit, modem and cable going to the remote SSDAC unit are terminated on the Wago/Phoenix/ARA terminals provided on terminal board. (For Eldyne SSDAC there is no need of terminal board as the incoming and outgoing cables are directly terminated on the terminals provided on SSDAC unit).
- One Shelf made out of teak wood should be provided in the location box for keeping SSDAC Counting Unit and Relay Box.
- Location box and Cable earthing should be provided.

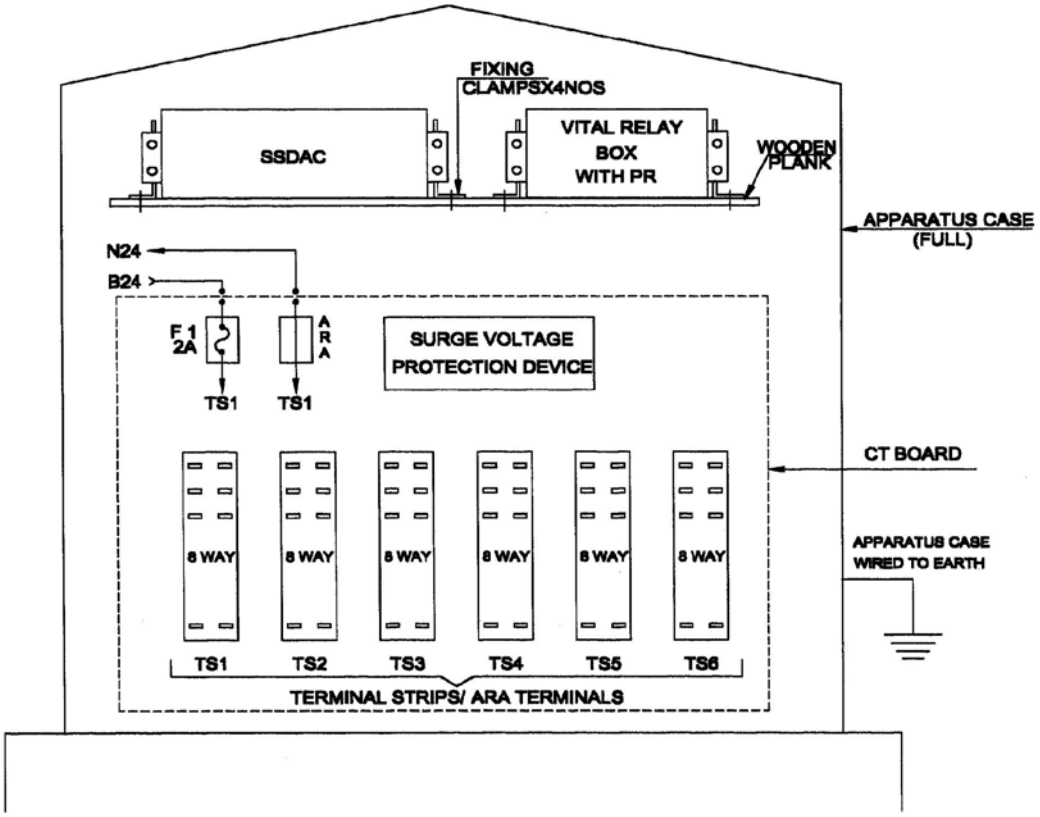


Fig 2.6.: Installation of location box

2.1.6 केबल हेतु योजना Cabling scheme

For communication between two SSDAC field units ½ quad of Telecomm. Quad cable (0.9 mm. dia.) is required. Similarly for communication with station reset separate ½ quad cable is required. For better reliability the right pair of star quad cable should be used with proper terminations.

Quad 1 - 1st pair: Blue-White & 2nd pair Red-Grey
Quad 2 - 1st pair: Brown-White & 2nd pair Red-Grey
Quad 3 - 1st pair: Green-White & 2nd pair Red-Grey
Quad 4 - 1st pair: Orange-White & 2nd pair Red-Grey

The station-reset and repeater relay signal is sent through 6-core signalling cable of 1.5 Sq mm.
Power supply to the unit is provided through 2-core aluminium power cable of 25 Sq mm.
Cabling scheme for a SSDAC installed for BPAC between two stations on single line is given in Fig. 2.7.

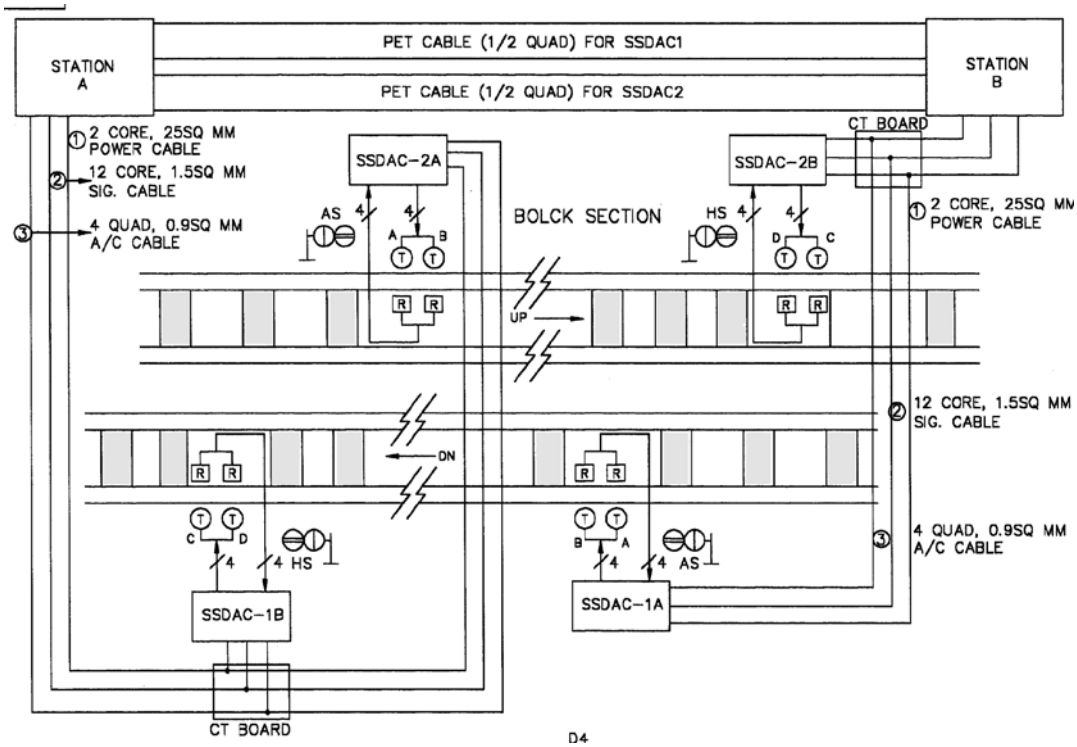


Fig. 2.7: Cabling scheme for BPAC between two stations on Double line using SSDAC.

2.1.7 एस.एस.डी.ए.सी. इकाई की संस्थापना Installation of SSDAC Unit

The SSDAC is installed on the wooden/ Hylam/NFTC plank inside the location box. This is firmly fixed using clamps, nuts and bolts. Similarly the relay box should also have to be fixed rigidly on the plank.

2.1.8 रीसेट बॉक्स की संस्थापना Installation of Reset box

The Reset box is to be installed on SM's/Cabin-man's table, firmly fixed by means of nuts and bolts. The body of the reset box is to be connected to the earth in SM's room. The earth available for other equipment can be used. 2 Nos. reset box (1 no. at each end) are wired in block section and one reset box is wired in station section.

2.1.9 पॉवर सप्लाई की व्यवस्था Power Supply Arrangement

The SSDAC system works on 24V DC supply. This has to be provided through battery and battery Charger or IPS module as per latest RDSO specification.

बैटरी Batteries

Low Maintenance Battery Bank may be used for powering of the SSDAC. The batteries are kept on teak wood/ hard wood shelf on MS angles or on prefabricated concrete platform with acid-proof tiles and are to be installed in the battery room. Insulators are to be provided below the batteries. The charging of batteries has to be done as per manufacturer's manual.

बैटरी चार्जर **Battery Charger**

24 V, 5A Axle Counter type Battery Charger/ 24 V, 5 A dedicated module of IPS are to be installed in the equipment room.
The battery chargers are usually kept on teak wood shelf fixed on MS Angles or prefabricated concrete platform.
The 24V, 5A battery charger has to be installed and connected to battery on auto mode.

2.2 सावधानियां **Precautions**

- ***The teeth and grooves of aluminium casting and the Tx head should be correctly lined-up.***
- After tightening the nuts, the bolts should protrude a minimum of 2mm.
- The transmitter head must not touch the rail-head.
- It should be ensured that the rail is not badly worn causing the wheel flanges to graze over the fittings.
- The brackets for the HDPE pipe must be insulated from the rail by inserting nylon bushes into the holes of the bracket.
- Mark the Axle detector coil integral cables, before putting them inside the HDPE pipe as TX1/TX2 and RX1/RX2 according to the reference count direction so that correct cables can be identified after taking out at the other end.
- The Axle detector separation between two sets of different SSDAC systems should be at least 2 meters away so as to avoid mutual interference.
- The HDPE pipe must be cut to the correct length before the cable is inserted. The pipe must be made watertight with a rubber seal on both the axle detector side and the location side.
- Exposed integral cables at the Tx and Rx side should have adequate radius of curvature to avoid stress and contact with the ballast.
- The integral cables of axle detectors must be laid directly from the track to the electronic unit avoiding loops/coils. The integral cables are available in different lengths depending upon the manufacturer. Right length of integral cable should be chosen before installation. The cable should not be shortened.

2.3. भूसंपर्कन (अर्थिंग) व विद्युत लहर (सर्ज) से बचाव **Earthing and Surge protection**

2.3.1 भूसंपर्कन **Earthing**

Earth Electrode - Galvanised iron pipe(s) of internal diameter $\geq$ 38 mm and length $\geq$ 2.5 mtr. in length with spike at one end and lug at the other end for connecting with earth lead. The lead wires used for connecting the installation and the earth electrode – 29 sq mm (19 strand wires of 1.4 mm diameter). 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. The maximum values of earth resistance specified for earthing of SSDAC and its accessories are as follows:

S.No.	Equipment to be earthed	Value of Earth resistance
1	Apparatus case connected to Earth (SSDAC and vital relay box if housed in apparatus case are connected to same earth). All cable armours connected to same earth.	≤ 1 Ohms
2.	Reset box connected to earth (indoor) near SM's Room.	≤ 1 Ohms

2.3.2 विद्युत लहर (सर्ज) विभव से बचाव **Protection from surge voltages**

In order to protect the equipments from surge voltages, all the input lines of SSDAC i.e. Power Supply (24 V), Reset and both the modem lines i.e. SSDAC to SSDAC and SSDAC to Reset box is to be routed through the Surge Voltage Protection devices for effectively protecting the system.

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

■■■

अध्याय – 3 Chapter – 3

ए.जेड़.एल.एस. एलडाईन सिंगल सेक्शन एक्सल काउन्टर
Az LS ELDYNE SINGLE SECTION DIGITAL AXLE COUNTER

3.0 परिचय Introduction

This part provides brief description and specific guidelines for installation, commissioning, adjustment and maintenance of Single Section Digital Axle Counter of AzLS system manufactured by M/s Eldyne Electro-systems Pvt. Ltd., in association with M/s Thales of Germany.

The AzLS system consists of at least two detection points Zp30CA-2, both installed on the same rail. A seperate evaluator is not required. The AzLS contains a 2 out of 2 vital microprocessor system to count the axles, establish the track occupancy and provide the information to the block or the interlocking equipment.

3.1 मुख्य भाग एवं उनके कार्य
Main Modules and their functions

AzLS system consists of following main modules:

- Outdoor Trackside system:
  - Rail contacts (SK30H)
  - Track-Side Electronic Unit (EAK)
- Communication Link
- Reset Relay
- Vital Relay

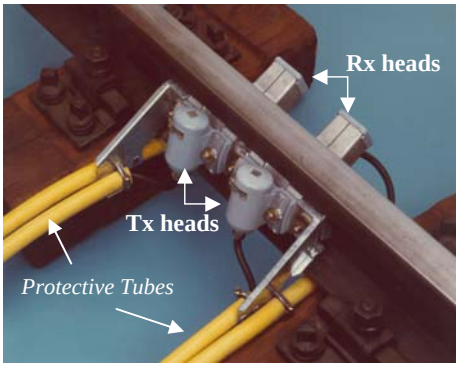


Fig ***3.1 :Rail contacts SK30H***

3.1.1 बाहरी ट्रेक प्रणाली
Outdoor Trackside system

रेल कॉण्टेक्ट (एस के ३० एच) *Rail Contact (SK30H)*

It consists of two coil sets Sk1 & Sk2 of Transmitter (Tx) & Receiver (Rx) installed on the same rail. (Refer Fig. 3.1).

The two Tx coils are fed with different frequencies (approx. 30.6 KHz and 28 KHz) which induce a voltage in Rx coils.

ट्रेक साईड इलैक्ट्रॉनिक इकाई(इएके) *Track-Side Electronic Unit (EAK)*

Track-Side Electronic Unit (EAK) is installed near Rail Contacts SK30H and connected to it via integral cables.

It consists of

- Analog Card
- Digital Card
- Motherboard and
- Spare slot for additional Digital Cards and housing.

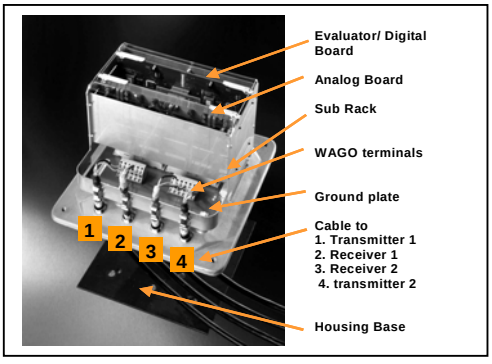


Fig. 3.2: Track-side Electronic Unit

EAK has following functions:

1. Feeds required frequency to the rail contacts SK30H.
2. Converts analog wheel pulse to digital.
3. Supervises rail contacts SK30H.
4. Performs self-test.
5. Transmits the counting and diagnostic data to the partner evaluator (other end EAK).

संचार Communication

For communication with other EAKs the system uses two wire CCITT V.23 semi duplex communication protocol at 1200 bits/second.

रीसेट रिले Reset Relay

Reset relay is to be connected either in the location box near the EAK or in the relay room for resetting the system. The normal power supply is provided to the EAK through the back contact of the relay. When the reset is commanded from the reset box, this relay picks up and the polarity of the power supply to the EAK is reversed thereby resetting the system. 1000 ohm AC immunized Q series relay to be used as reset relay. A free whelling diode (IN 4007) should be connected with this reset relay. Minimum 21.6 Volt DC should reach the reset relay coil after cable loss.

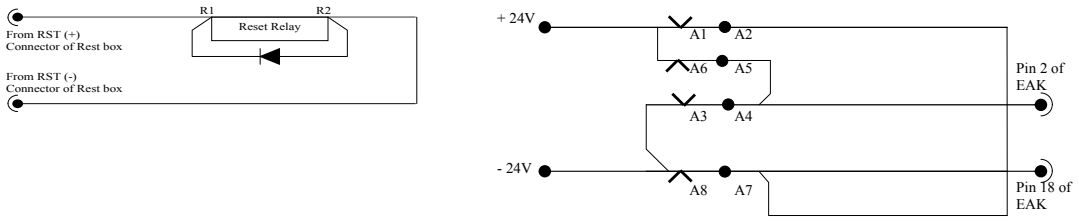


Fig. 3.3: Connection of Reset Relay

वाइटल रिले Vital Relay

The vital relay is to be connected either in the location box near the EAK or in the relay room.

Relay to be used as Vital relay - AC immunized Q series relay.

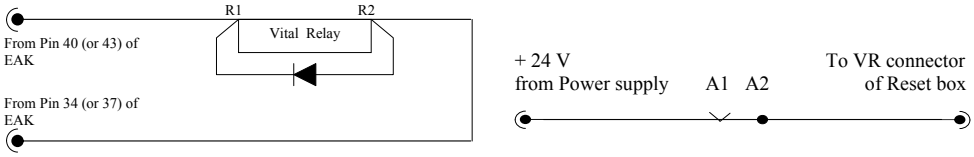


Fig. 3.4: Connection of Vital Relay

3.2 संस्थापना **Installation**

Apart from the general guidelines given in section, the specific guidelines which are to be followed for installation of AzLS are as given below:

3.2.1 रेल कॉंटैक्टो (एस के ३० एच)की संस्थापना *Installation of Rail Contacts (SK 30H)*

- Recommended distance from rail joint (fish-plated or welded or insulating joint)
  - not less than 1 metre, in normal conditions.
  - not less than 2 metre, if the condition of the track is poor.
- Mandatory distance from rail contact of same type (Sk30, Sk30H) of a neighbouring detection
  - not less than 2 metre.

3.2.2 छिद्र बनाना *Drilling of Mounting Holes*

Drill the mounting holes on the rail web in correct position as per following approximation formula:

a = (0.409 * h), where a = height of the mounting hole
h = height of the rail

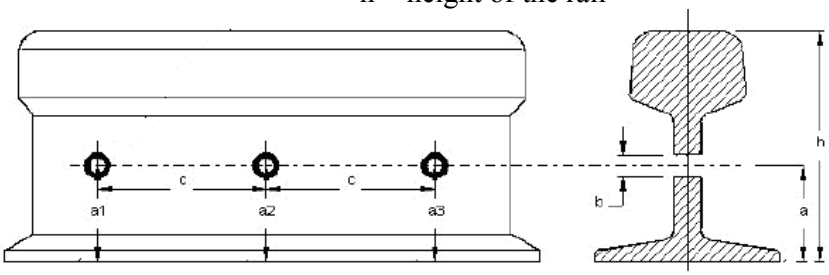


Fig. 3.5: Position of mounting holes for installation of Rail Contacts

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

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

Drill the final three holes of diameter 13mm on the rail web with the help of drilling jig. The procedure is illustrated in the figures 3.6 to 3.9.

3.2.3 ड्रिलिंग जिग *Drilling Jig*

The drilling jig consists of:
i) Drilling template
ii) Mounting device for the drilling machine
iii) Templates for the standard rail profiles
iv) Fastening device
v) The drilling machine

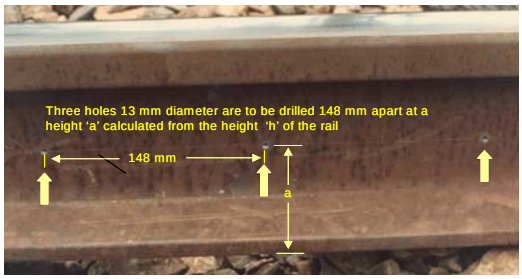


Fig 3.6: Select the detection point location where 3 holes are to be drilled. Identify location for mounting trackside electronic unit within 4 meters of the rail contact.

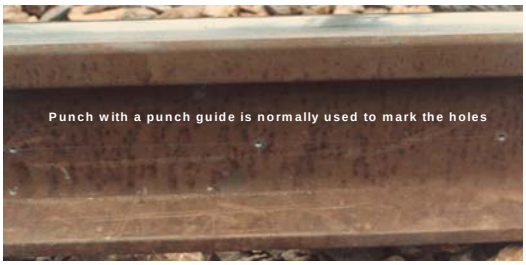


Fig ***3.7 Cleaning the area, marking , punching and running a pilot drill of 6 mm diameter if required.***



Fig ***3.8 Three 13 mm holes are drilled accurately.***



Fig 3.***9: Cleaning and deburring the drilled hole***

3.2.4 रेल कांटेक्टो को लगाना *Mounting of Rail Contacts*

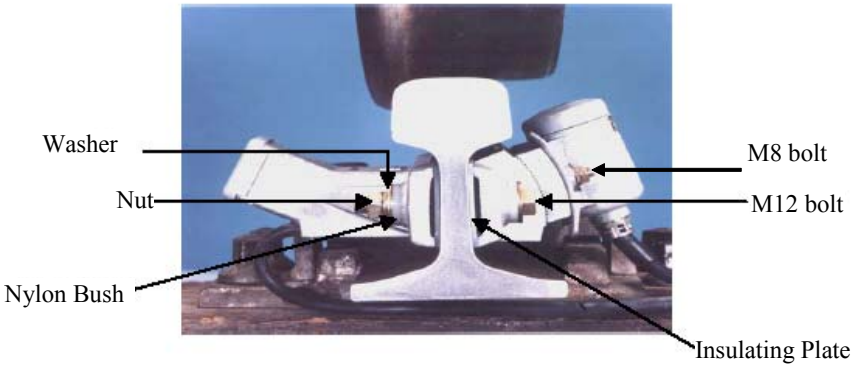


Figure 3.10 : Mounting of Rail Contacts

3.2.5 इएके उपकरण का स्थापन Housing of the EAK Equipment

EAK, if installed, out side the location box should be installed in the Lockable Mushroom Cover with SS stand (EPC 001–CI Eldyne make). If EAK is placed inside the location box it is recommended to house the EAK with a dust cover.





Fig. 3.11(a) Mushroom cover with pedestal b) EAK installation

3.3 जोड़ Connections

The connection of integral cables of rail contacts in EAK are as below:

Rail contact and wire colour	**Terminal on Zp30CA-2(AzLS)**
Rx 1(black)	Sk1 / E1
Rx 1 (transparent)	Sk1 / E2
Rx 1 (blue)	Sk1 / E3
Tx 1 (transparent)	Sk1 / S2
Tx 1 (black)	Sk1 / S1
Tx 2 (black)	Sk2 / S1
Tx 2 (transparent)	Sk2 / S2
Rx 2 (blue)	Sk2 / E3
Rx 2 (transparent)	Sk2 / E2
Rx 2 (black)	Sk2 / E1

The connections for Power Supply, Communication and vital relay in the EAK are as under:

Connections	**Terminals**
Data link 1 for Outer Slot (for connection to other end DP of AzLS)	5
Data link 2 for Outer Slot (for connection to other end DP of AzLS)	21
Data link 1 for Inner Slot (for connection to other end DP of AzLM)	6
Data link 2 for Inner Slot (for connection to other end DP of AzLM)	22
Power Supply (24 V+)	2
Power Supply (24 V-)	18
Relay Supply (24 V+ through a 500mA fast blow fuse for Evaluator card at outer slot)	39
Relay Supply (24 V- for Evaluator card at outer slot)	33
Relay Coil (For Evaluator card at outer slot)	40
Relay Coil (For Evaluator card at outer slot)	34
Relay Supply (24 V+ through a 500mA fast blow fuse for Evaluator card at inner slot)	42
Relay Supply (24 V- for Evaluator card at inner slot)	36
Relay Coil (For Evaluator card at inner slot)	43
Relay Coil (For Evaluator card at inner slot)	37

Provide a shorting link between
44 & 38 - if the evaluator card is used in middle slot.
41 & 35 - if the evaluator card is used in outer slot.

- Connect the screen of the rail contact cables to the earthing bar.
- Remove the cable insulation for a length of approximately 45 mm.
- Fasten the screen to the earthing bar by means of a cable tie and connect the screen to the earthing bar using the clip supplied.
- The pairs of wire have to be twisted properly as shown in Fig. 2.12.

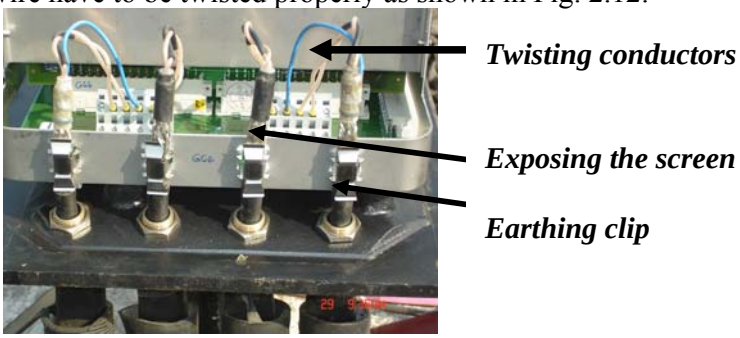


Fig. 3.12: Fixing of Rail Contact Integral Cable at EAK Side

3.4 पावर सप्लाई Power Supply

- Recommended power supply for track-side electronic unit of AzLS is 21.5 VDC to 28.8 VDC.
- Power consumption per EAK having two evaluator/digital cards- 20W (approx.)
- Recommended ripple content of the power supply <24mV peak to peak.

3.5 इएके का भूसंपर्कन Earthing of EAK

The EAK has to be connected to the earth with a copper cable of minimum 25 Sq.mm or an iron cable of minimum 50 sq.mm. The housing has to be earthed to a suitable low inductance (approximately L<40μH) and low resistance (approximately R<4 ohm) earth.

3.6. रेल कॉंटेक्ट टीएक्स हैड का डमी व्हील तथा टूल किट की सहायता से समायोजन Adjustment of Rail contact Tx head with Dummy wheel and Tool Kit

The Tx head is adjusted such that the received rectified voltage produced when a wheel is present has the same amplitude but the opposite polarity as the voltage produced with the wheel absent.

- A dummy wheel is required for the adjustment of the rail contact.
- On main lines the dummy wheel is normally set to 40mm.
- During adjustments the dummy wheel must be kept vertically at the centre of Rx heads.(Fig.3.13).

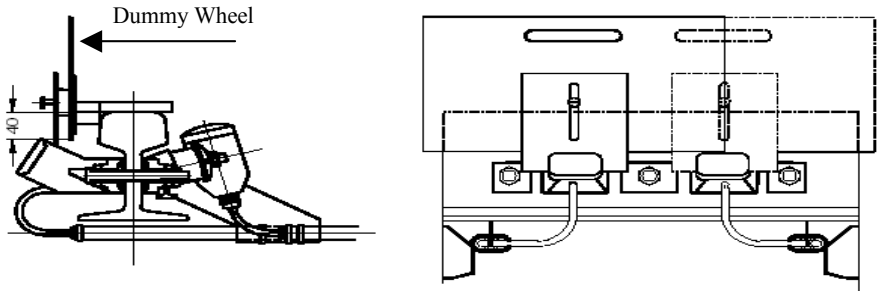


Fig 3.13 : Positioning of Dummy wheel

For adjustments, tool kit ETU001 has to be used only with its dummy wheel, true RMS multimeter and adjustable torque wrench (Fig.3.13).

3.6.1 परीक्षण उपकरण (टूलकिट) इटीयू ००१ *Test equipment (Tool Kit) ETU001*

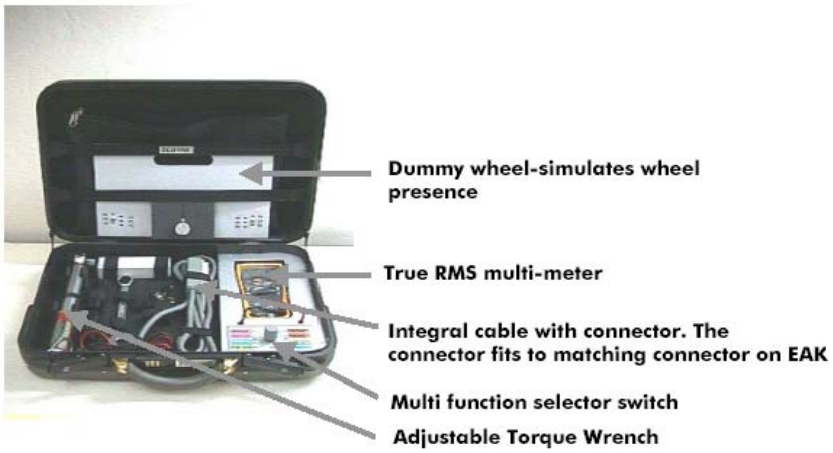


Fig. 3.14: Tool Kit ETU001

Test equipment ETU001 is utilized for

1) Signal voltage level and frequency measurement.
2) AC & DC Current /Voltage measurement.
   During Installation, Testing, Commissioning, Diagnosing and Calibrating the Outdoor Unit of AzLS & AzLM, Alcatel (now Thales) Axle Counter.

Contents of Test Equipment

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

3.6.2 सिलेक्टर स्विच के कार्य *Selector Switch functions*

- Selector switch position 1:Shows the value of the output of 1st internal DC-DC Converter (Channel1) in Analog card.
- The selector switch position 2: Shows the value of output voltage of 2nd internal DC-DC Converter (Channel2) in Analog card.
- Selector switch position 3: OFF
- Selector switch position 4: Shows the rectified Rx voltage (MESSAB1) for SK1. For fine adjustment the potentiometer R2 on the Analog board should be used.



Figure 3.15: Potentiometer for adjustment

- Selector switch position 5: Shows the value of reference voltage for SK1 (PEGUE1). This can be adjusted by the potentiometer R1 on the Analog board.
- Selector switch position 6: OFF
- Selector switch position 7: Shows the rectified Rx voltage (MESSAB2) for SK2. For fine adjustment the potentiometer R4 on the Analog board should be used.
- Selector switch position 8: Shows the reference voltage for SK2 (PEGUE2). This can be adjusted by the potentiometer R3 on the Analog board.
- Selector switch position 9: OFF

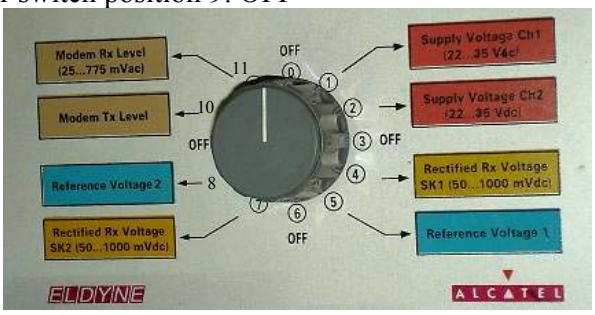


Fig.3.16: Selector Switch of Test Equipment

3.6.3 रेल कॉंटैक्टो के समायोजन हेतु जांच किये जाने वाले बिंदू *Parameters to be checked for adjustment of rail contact*

a) Output of 1st internal DC-DC Converter (Channel 1): Specified range 22VDC to 35VDC.

b) Output of 2nd internal DC-DC Converter (Channel 2): Specified range 22VDC to 35VDC.

c) Rx voltage (MESSAB1) for SK1: This should be positive without dummy wheel. After placing the dummy wheel on Rx1 vertically on the center, the MESSAB1 voltage should be negative. In ideal condition and for proper adjustment of rail contact, MESSAB1 voltage without dummy wheel should be equal to the MESSAB1 voltage with dummy wheel but having an opposite polarity. The value of MESSAB1 should be within 80mV to 1000mV depending upon the drill position and rail profile.

d) Rx voltage (MESSAB2) for SK2: Same as that for Rx voltage (MESSAB1) for SK1.

e) Reference voltage for SK1 (PEGUE1): This is made equal (or ±2%) to the value of MESSAB1 as measured without the dummy wheel.

f) Reference voltage for SK2 (PEGUE2): Same as that for Reference voltage for SK1 (PEGUE1).



Fig.3.17: Measurement of MESSAB1 and MESSAB2

3.6.4 टी.एक्स. हैड को वोल्टेज एवं आवृति *Voltage & Frequency of Tx heads*

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

3.6.5 पावर सप्लाई वोल्टेज Power supply voltage

Measure the power supply voltage fed to the track side electronic unit with the meter and the probe set directly to the power supply connector terminals 2 & 18.



3.6.6 समायोजन की प्रक्रिया *Adjustment procedure*

Connect the test equipment to the diagnostic port of EAK as shown in fig. 3.18 .

Fig.3.18: Connection to diagnostic port

रेक्टिफाईड वोल्टेज को समायोजित करने हेतु चरण Steps to adjust the rectified voltage

MESSAB1

- Put Selector Switch to position 4.
- Measure the rectified voltage with and without dummy wheel.
- Turn Potentiometer R2 on the Analog board to positive max.
- The rectified voltage without dummy wheel must be set to positive maximum.
- If there is a big difference between the positive value and the negative value, move the Tx heads upward or downward along the serration and adjust to

optimum position. Taking the transmitter head upwards increases the negative voltage and decreases the positive voltage and vice versa.

- Adjust using Pot. R2 such that rectified voltage with and without dummy wheel are absolute equal (equal but having opposite polarity). Tolerance <=30mV.
- After getting the positive and negative voltages within the above specified tolerance limit tighten the transmitter head properly with the torque wrench set at 25 Nm.

ट्रॉली सप्रेशन **Trolley suppression**

For Trolley suppression to be effective, the positive voltage (without dummy wheel) should be greater than the negative voltage (with dummy wheel) by a value not less than 30 mV so that the rectified Rx voltage does not go to negative (Figure 2.20) with the specified trolley wheel. It is recommended that the adjustment should be done using a spoke trolley wheel that is normally used in the section.

मेसाब 2 *MESSAB2*

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

पेग 1 *PEGUE1*

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

पेग 2 *PEGUE2*

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

3.7 एड्रेस निर्धारण *Address Setting*

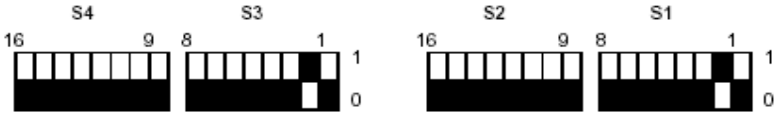
An EAK monitoring a section must have a unique address. This address setting can be done by setting the DIP switches provided on the mother board as shown in Figure 21.

The system will not work without proper pair of address.
Bit No. 16 has no usage, it may be either 0 or 1.
Bit No. 15 has to be set to 0 at entry end and 1 at exit end of the section.
Bit No. 14 has to be set to 0 for straight line section and 1 for point zone.
Bit No. 13 has to be set to 0 for preparatory reset and 1 for hard reset.
Bit No. 12 has to be set to 0 for single point reset and 1 for two-point reset.

An example of address setting for 2 DP – Single Section configuration with Single – point Preparatory Reset is given in fig.3.19 :



Address setting for EAK1(DP1)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 on both set of DIP switches.



Address setting for EAK2(DP2)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 on both set of DIP swithes.

Fig. 3.19 : Setting of Address

Ensure that the switches are firmly set to the correct position. Only insulated long needle like materials to be used to set the switches.

- To set a ´1´ press switch to the end that is marked "1".
- To set a ´0´ press switch to the other end.

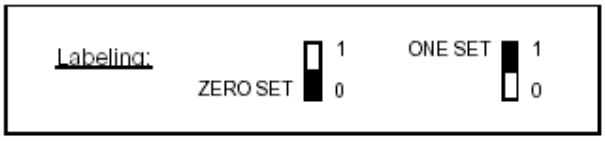


Fig. 3.20: DIP switch positions

Different sets of addresses should be used for each AzLS when more than one set of AzLS working on the same cable.

3.8. रीसेट बॉक्स Reset Box

ERBS-02 is the reset box for Alcatel's Single/Double Section Digital Axle Counters ZP30CA-2 (AzLS). It provides the basic resetting pulse (24VDC) for reset relay for 3 seconds (approximately). A buzzer is provided to give audio indication that the 3 second reset pulse is on.

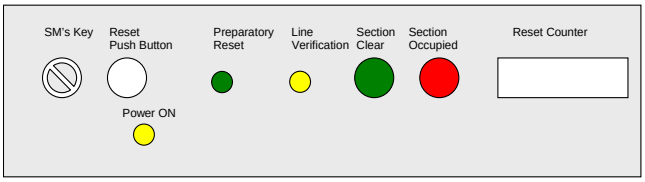


Fig.3.21: Front pane of Reset box (ERBS-02)

रीसेट आरंभ करने हेतु चरण *Steps to initiate a reset*

1. Insert the KEY, turn it clockwise and then push. Simultaneously, insert and turn the Cooperative SM's key if provided. (H & R are to be shorted at selection jumper J1 on PCB if the Cooperation / Line verification is required otherwise P & R are to be shorted).
2. While KEY is in turned position press the Reset Push Button for a specific section momentarily.
3. BUZZER sounds for 3 seconds and then stops.
4. Turn back the KEY anti-clockwise and take out.

Each reset is registered in the sealed reset COUNTER unit. The count increases by one after each reset commanded by the operator.

3.9 ए जेड एल एस को रीसेट करना Resetting of AzLS

AzLS V1.1 provides four types of reset:

1. एकल बिंदू प्रेपरेटरी रीसेट (बर्थिंग सेक्शन हेतु) **Single point preparatory reset (for berthing section)**
   The preparatory reset is initiated through an external relay circuit which reverses the polarity of the supply voltage to one of the detection points of the section. The preparatory reset does not clear the section immediately. It is sufficient that one of the detection points of the relevant section receives a preparatory reset. After carrying out the preparatory reset, a train must pass through the section on "caution running conditions". Only then the section will be cleared.

2. दो बिंदूओं को आपरेटिव प्रेपरेटरी रीसेट (ब्लॉक सेक्शन हेतु) **Two point co-operative preparatory reset (for block section).**
   The two point preparatory reset is initiated through individual external relay circuits which reverse the polarities of the supply voltages to each detection point of the section. The reset command is to be applied to both detection points within one hour. If this time elapses, the reset command is rejected. The other conditions are same as given in clause 1 above.

3. एकल बिंदू हार्ड रीसेट (प्वाईंट क्षेत्र हेतु) **Single point hard reset (for point zone).**
   The hard reset is initiated through an external relay circuit which reverses the polarity of the supply voltage to one of the detection points of the section. It is sufficient that one of the detection points of the relevant section receives a hard reset. The hard reset clears the section immediately.

4. दो बिंदूओं को आपरेटिव हार्ड रीसेट **Two point Co-operative hard reset.**
   The two point hard reset is initiated through individual external relay circuits which reverse the polarities of the supply voltages to at least two detection points of the section.

3.11.एलईडी संकेत LED indications

LEDs on the Analog and Evaluator/Digital cards are given to indicate the status of the system.

एनेलॉग कार्ड पर एल ई डी संकेत **LED indications on Analog card**

LED	Colour	Indication
H1 - 1	Red	On: Wheel on rail contact 1; Off: No wheel on rail contact 1
H1 - 2	Green	Off: Wheel approaching; Flashing: Sensor voltage (MESSAB1) within tolerance no wheel approaching.
H2 - 1	Red	On: Wheel on rail contact 2; Off: No wheel on rail contact 2
H2 - 2	Green	Off: Wheel approaching; Flashing: Sensor voltage (MESSAB2) within tolerance no wheel approaching.
H3 - 1	Red	On: Voltage H24V out of tolerance; Off: Voltage H24V within tolerance.
H3 - 2	Green	On: Voltage H5V O.K.; Off: Voltage H5V not O.K.

डिजिटल कार्ड पर एल ई डी संकेत **LED indications on Digital Card**

LED	Colour	Indication if permanently ON	Indication if permanently OFF	Flashing
H1/H5 - 1	Green	Preparatory reset is input	Preparatory reset is not input	
H1/H5 – 2	Green	Voltage on relay coil (Section Clear)	No voltage on relay coil (Section Occupied/Disturbed/Defect)	
H2/H6 – 1	Green	Telegrams from all other detection point received	Telegram missing/Communication loss	
H2/H6 – 2	Green		No transmission of telegram	Transmission of telegram is taking place.
H3/H7 – 1	Red	Negative axles in section	After accepting reset	After restart and after test phase.
H3/H7 – 2	Green	Single point reset: Reset command accepted . Co-operative reset: Reset command accepted at one detection point.	No reset active or rejected.	Sweeping in progress (only for preparatory reset)
H4/H8 – 1	Red	Disturbance^ of own detection point computer.	No disturbance	Disturbance of other detection point received.
H4/H8 – 2	Red	Defect* of own detection point computer	No defect	Defect of other detection point received.

^ Disturbance indicates an error in the system due to any problem in communication medium and/or power. System is re-settable after rectifying the problem and without putting the power off.

**** Defect indicates an error in the system due to any problem in analog card and/or digital card and/or motherboard. Power to be made off and then on for resetting the system after rectifying the problem.***

3.11 लॉग शीट LOG SHEET

This should be followed with Pre-commissioning Check list for AzLS V1.1 and regularly updated and kept as future reference.

Station Name :

Log item AzLS		**Tolerance range**	**DP:**	**DP:**	**DP:**
Rail Profile					
Switch S1 & S2 address for CPU1 Outer Slot		Bit 16…….1			
Switch S3 & S4 address for CPU2 Outer Slot		Bit 16 ……1			
Switch S1 & S2 address for CPU1 Middle Slot		Bit 16…….1			
Switch S3 & S4 address for CPU2 Middle Slot		Bit 16…….1			
Selector position in test unit ETU001	Input power supply (terminal 2 & 18 of EAK)	21.5 V to 28.8 VDC			
1.	a)Power supply Channel 1	22…35 VDC			
2.	b)Power supply Channel 2	22…35 VDC			
3.	c) MESSAB1 (Rx1 voltage w/o dummy wheel)	+80..+1000mVDC			
	d) With dummy wheel set on 40 mm	-80….-1000mVDC			
4.	e) Reference voltage PEGUE1	Adjust (as per 3c)			
5.	f) MESSAB2 (Rx2 voltage w/o dummy wheel)	+80..+1000mVDC			
	g) With dummy wheel set on 40 mm	-80…..-1000mVDC			
6.	h) Reference voltage PEGUE2	Adjust (as per 5f)			
Terminal SK1/S1 & SK1/S2	Transmitter frequency SK1	30.0….. 31.25KHz			
	Transmitter voltage SK1	40……85 VAC			
Terminal SK2/S1 & SK2/S2	Transmitter frequency SK1	27.4…..28.6KHz			
	Transmitter voltage SK1	40……85 VAC			

For more details Az LS Installation Guideline along with Pre-commissioning Check list for AzLS V1.1 may be referred.

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अध्याय – 4 बेंचजमत दृ 4

डीएसीएफ 710ए व डीएसीएफ 710पी सीईएल सिंगल सेक्शन डिजिटल एक्सल काउण्टर
DACF 710 A & DACF 710 P
CEL SINGLE SECTION DIGITAL AXLE COUNTER

4.0 परिचय Introduction

This part covers installation, commissioning, adjustment and maintenance of Single Section Digital Axle Counter DACF 710 P and DACF 710 A manufactured by M/s CEL as per RDSO guidelines.

4.1 प्रणाली का विवरण System description

The DACF system comprises of trackside counting units called SSDAC units, installed near the detection points on the track. The system performs counting of train wheels and its evaluation at both detection points. No separate evaluator is required. There are two versions available namely DACF 710P and DACF 710 A**.**

DACF 710 P consists of Phase reversal type Axle detectors. Trolley suppression track circuit is not required.

(i)The push trolleys by which the system is not affected are

(a) 4 spoke trolley; (b) 8 spoke trolley; and (c) rail dolly.

(ii)The system counts the following push trolleys

(a) Push trolley with perforated wheel; (b) Dip lorry and (c) Motor trolley.

DACF 710 A consists of Amplitude Modulation type Axle detectors. Trolley suppression track circuit is required. The SSDAC remains unaffected with all types of insulated push trolleys and the SSDAC goes into disturbed state (ERROR condition) for non insulated trolleys.

4.2 डीएसीएफ के अनुभाग Components of DACF

The CEL DACF system consists of following units

4.2.1 एक्सेल डिटेक्टर Axle detectors

- Transmitter (TX) coils – 2Nos.
- Receiver (RX) coils – 2 Nos.

The TX coils are fed with 21 kHz and 23 kHz carrier signals which are received in Receiver coils. The receiver signal is phase modulated with each train wheel passing over the detection point.



Fig.4.1: Axle detectors

4.2.2 ट्रैक साईड इलैक्ट्रॉनिक इकाई (एसएसडीएसई) Trackside electronic unit (SSDAC)

The trackside SSDAC supplies the two different frequencies to the transmitter coils. It operates in independent mode without central evaluator. In this mode, two numbers of SSDAC units are used. The 1st unit transmits its wheel count to 2nd unit and vice-

versa. The SSDAC computes the status of the corresponding track section and conveys the same to the vital relay. The two SSDACs communicate with each other through a 2 wire internal modem.



Fig. 4.2: Trackside Electronic Unit

The SSDAC Counting unit comprises total 8 cards. Card description and their functions are given below:

(i) Signal Conditioning Cards (Card 1 & 2)
- Carrier Signal Generation.
- Demodulation and Pulse generation

(ii) Micro controller logic blocks (2 Micro controllers) (Card 3 & 4)
- Pulse counting.
- 2 out of 2 decision.
- Vital relay Command Read back.
- Preparatory Relay Drive Command.

(iii) Event Logger Card (Card 5)
- For Storage of events in the system.
- For monitoring failures.

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

(v) Relay Driver Card (Card 7)
- Output drive for vital relay and PR relay.

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

4.2.3 वाईटल रिले बॉक्स Vital relay box

The VR box consists of dual relay i.e VR & PR relay of Q style, 24V and 1000 ohm. It is provided in the trackside location box along with SSDAC unit.



Fig. 4.3: Vital Relay Box

4.2.4 स्टेशन मास्टर का रीसेट बॉक्स SM's Reset Box

- 1 No. for common resetting (when used in station area/platform lines)
- 2 Nos. for independent resetting (when used in block sections)

The reset box consists of the following:

i. The LED indications
   - Section Clear - Green indication.
   - Section Occupied - Red indication.
   - Power ON - Yellow indication.
   - Preparatory Reset - Green indication.
   - Line Verification – Yellow indication.

ii. SM's key actuator.

iii. Reset Push button (Red colour).

iv. Counter for recording the number of reset operations.

v. 20 X 2 LCD display with backlit.

vi. 4 keys keypad for setting the date and time operation.

vii. 9 pin D-sub connector on the motherboard of reset box, used for downloading the data for analysis purpose.



Fig. 4.4: SM's Reset Box

4.2.5 सर्ज वोल्टेज से बचाव का साधन Surge Voltage Protection Device

This Surge Voltage Protection Device is provided to protect the equipments from surge voltages. This device is to be installed at each location along with every SSDAC unit.



Fig. 4.5: Surge Voltage Protection Device

4.3 संस्थापन Installation

For installation, apart from general guidelines given in section the following procedure is to be followed:

4.3.1 रेल के फलक पर चिन्हित करना व छिद्र करना Marking and drilling holes on web of rail

3 holes of 14 mm dia.on the rail web 0-170-340 mm at 86 mm from top for 90R rail and 88 mm. from the top for 52 Kg/60Kg. rail.



Fig. 4.6: Fixing of Marking Jig. Marking using punching guide as per rail size

4.3.2 विभिन्न प्रकार के संस्थापनो हेतु आवश्यक उपकरण व सहायक Equipments and accessories required for different type of installations

The minimum supportive equipment and accessories of SSDAC required for different type of installations are tabulated below:

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

4.4. एसएसडीएसी इकाईयों के एड्रेस का निर्धारण Address setting for SSDAC units

The outdoor SSDAC units are provided with unique address schemes for selection of 15 different pairs of units by means of 8-way DIP switch on motherboard.

SW1 is 8-way sliding type DIP switch setting on the motherboard. To access this switch, open 6 Nos. of screws on back cover). The switches can be slide to move to Right (ON) or LEFT (OFF) as required. For selecting a pair of units (e.g. pair 5) and its switch position is given in Fig.4.7:

Pair 5

Unit 1:0A (Entry)

Selection	8-way switch	Selection
---	1	ON
OFF	2	---
---	3	ON
OFF	4	---
---	5	ON
---	6	ON
---	7	ON
---	8	ON
To left side	Switch position	To Right side

Unit 2:0B (Exit)

Selection	8-way switch	Selection
OFF	1	---
OFF	2	---
---	3	ON
OFF	4	---
---	5	ON
---	6	ON
---	7	ON
---	8	ON
To left side	Switch position	To Right side

Fig. 4.7: 8 way switch selection for entry and exit units

For providing different pairs of units in station area/Block section, the address setting can be done from the available scheme for all the 15 pairs. Pair 1 address setting is factory selected.

4.5. एसएसडीएसी की कार्य संबसंधी स्थितियां Functional States of SSDAC

At any point of time, the SSDAC is internally in any one of the following four states:

4.5.1 प्रिपरेटरी रीसेट की स्थिति (रीसेट प्रयुक्त किया है। **Preparatory Reset State (Reset applied)**

This is the state of the system when the reset is applied in the units. The reset is to be applied in SSDAC after ensuring that there is no train in the block section. After which the system goes to preparatory reset state.

4.5.2 खाली स्थिति **Clear State (Section Clear)**

The SSDAC unit enters this state when the of local wheel count value is same as that of the counts received from remote Counting unit.

4.5.3 भरी स्थिति **Occupied State (Section Occupied)**

The SSDAC unit enters this state when the of local wheel count value is different from that of the counts received from remote Counting unit or due to any error in the system.

4.5.4 बाधित स्थिति(प्रणाली में त्रुटि) **Disturbed State (Error in the system)**

The SSDAC unit enters the error state when:

- The counted wheels in the section become negative.
- The count and health data of two MLB's in the SSDAC unit is different.
- Any card is removed from the unit.
- An internal error is detected during self-test.
- The Vital Relay pick up and drop detected is improper.
- The Vital Relay is not plugged in the Vital Relay box.
- Address setting of the unit is changed and disturbed during operation.
- The communication link between two units of SSDAC is disconnected (open).
- The axle detectors are giving low signals.
- The axle detectors are showing open condition.
- The watchdog timer gives time out.
- Reset has been applied in one of the SSDAC units.

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

4.6 प्रणाली के त्रुटि कूट (एरर कोड) **System Error Codes**

The two MLB cards continuously check and monitor the health of the system. During normal working condition of the system, all the LEDs are OFF. When the system detects error, it will be displayed on these cards by means of flashing/glowing one or more LEDs for the particular error.

The errors occurring in the system during the operation of the SSDAC are encoded and are indicated by means of the 8 - LED block present on the front panel of the MLB cards. A glowing LED implies a 1 while OFF LED indicates a 0. All the LEDs

are numbered as given below. DS1 to DS4 are designated for Least Significant Bits (LSB) and DS5 to DS8 are designated for High Significant Bits (HSB).

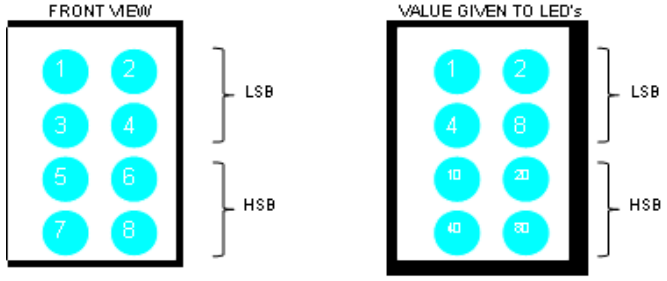


Fig.4.8: LED indications for errors

The Errors are given in Hexa decimal codes which can be referred from manufacturer's instruction manual.

4.7 एल ई डी संकेत LED indications

The LED indications are provided on the facial plate i.e. on front side of different modules of SSDAC viz. SCC cards, MLB Cards, Modem Card, Relay Driver, DC-DC Converter and Event Logger to indicate OK or Error condition. These are as follows:

SCC Cards			
1.	OSC OK	Green LED	ON when TX coil & Oscillator are working normally. OFF when these becomes faulty.
2.	LD OK	Green LED	ON when signal from RX coils are normal and above certain level, OFF when fault in RX coil or disconnection.
3.	PULSE OK	Green LED	ON when signal from RX coil normal and pulse level in Card OK. OFF when RX coil faulty, wrongly connected or disconnected
4.	TP CON	Green LED	Permanently OFF as trolley suppression track circuit is not required in phase reversal type system.
MLB Cards			
1.	8 LED BLOCK	All Red LED	Normally OFF, ON when error appears
2.	CLEAR	Green LED	ON for clear condition
3.	OCCUPIED	Red LED	ON for occupied condition
MODEM Card			
1.	TX	Green LED	Transmitting the signal when LED is flashing.
2.	RX	Green LED	Receiving the signal when LED is flashing
3.	MODE	Green LED	Normally OFF, Glows and again goes low when system is reset.
4.	CD	Green LED	Carrier is detected when LED is flashing

RELAY DRIVER			
1.	MLB 1 CLEAR	Green LED	ON when section clear, OFF when section occupied.
2.	MLB 1 CLOCK	Green LED	LED flashes when section is clear.
3.	MLB 2 CLEAR	Green LED	ON when section clear, OFF when section occupied.
4.	MLB 2 CLOCK	Green LED	LED flashes when section is clear
5.	RELAY DRIVE	Green LED	ON when section clear, OFF when section occupied.
DC-DC CONVERTER			
1.	+5V	Red LED	ON when +5V supply available
2.	+12V	Red LED	ON when +12V supply available
3.	+24V	Red LED	ON when +24V supply available
4.	+15V ISO	Red LED	ON when +15V ISO supply available
EVENT LOGGER			

1.	RUN	Green LED	Blinks continuously indicating normal working of Event Logger Card
2.	LOG	Green LED	Blinks whenever data is being logged into the flash memory (approx. after every 2 minutes)
3.	DNLD	Green LED	ON when data is being downloaded from the flash memory of the card, OFF when download is complete.

4.8 अनुरक्षण Maintenance

For maintenance of Single Section Digital Axle Counter various parameters are to be checked periodically. The various signal input and output levels and its limits which are to be recorded and adjusted to correct levels wherever necessary are given in following tables:

4.8.1 24 वोल्ट डीसी सप्लाई (बैटरी) 24 V DC Supply (Battery)

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

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

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

4.8.2 ऑसीलेटर आउटपुट (टीएक्स क्वाईल) Oscillator Output (TX Coils)

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

S.No.	Parameter	Limit	TX coil 1 (21 KHz)	TX coil 2(23 KHz)
1.	Oscillator output	30V to 40V rms		
2.	Oscillator frequency	(i) 20.80 to21.20 KHZ (ii) 22.80 to 23.20 KHz		

4.8.3 रिसीवर क्वाईल आउटपुट Receiver Coil Output

Measure the RX coil signal output

For Amplitude Modulation type Digital Axle Counter

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

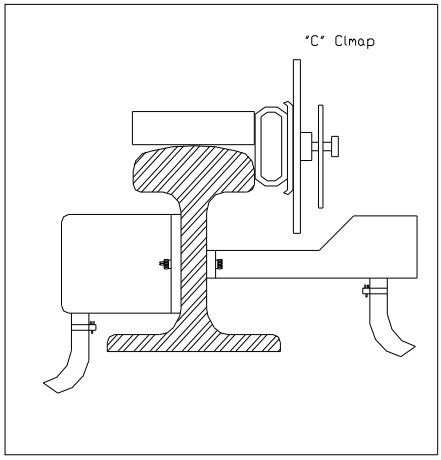


Fig 4.9: Adjustment of Receiver coil output with the help of dummy wheel

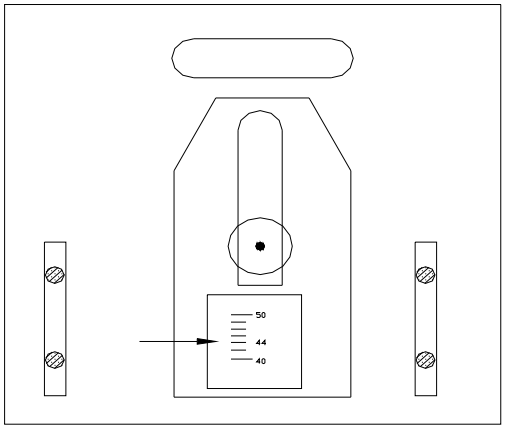


Fig 4.10: Dummy wheel setting = 44 mm for 90 R, 52 kg and 60- kg rails

For Phase Reversal type Digital Axle Counter

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

4.8.4 एस.सी.सी.कार्ड (कार्ड 1व 2) SCC Cards (Cards 1 & 2)

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

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

4.8.5 डीसीडीसी कनवर्टर कार्ड (कार्ड 8) DC –DC Converter Card (Card 8)

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

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

4.8.6 मोडेम आउअपुट कार्ड (कार्ड 6) Modem Output (Card 6)

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

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

4.8.7 रिले ड्राइव (कार्ड 7) Relay Drive (Card 7)

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

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

4.9 रीसेट प्रक्रिया Resetting Procedure

4.9.1 स्टेशन क्षेत्र में In station area

कॉमन रीसेटिंग **Common resetting**

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

रीसेटिंग करने की कार्यविधि **Resetting operation**

- Insert SM's key, turn right and keep pressed.
- Press Reset button for 2 seconds.
- Release SM's key and Reset Button.
- Turn left, remove SM's key and keep in safe custody.

With the above operation

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

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

4.9.2 ब्लॉक सेक्शन में In Block Section

इडिंपेंडेट रीसेटिंग Independent resetting

The independent resetting of SSDAC units at each station is to be carried out when used in Block Sections. Sometimes SM's key and button contacts are extended to a remote location for resetting purpose.

रीसेट करने की कार्यविधि Resetting operation

- Insert SM's key, turn right and keep pressed.
- Press Reset button for 2 seconds.
- Preparatory LED starts flashing.
- Release SM's key and Reset Button.
- Turn left, remove SM's key and keep in safe custody.

With the above operation

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

टिप्पणी Note:

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

4.10 इवेंट लॉगर Event Logger

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

4.11 औजार एवं अतिरिक्त Tools and Spares

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

4.11.1 टूल किट Tool Kit

1.	Portable data analyzer for downloading event logger data for analysis and report generation. (Specification ref: RDSO letter No. STS/E/AC/DIGITAL/CEL dated 19.12.2006. Celeron M Processor 1.5 GHz (or better), 20 GB HDD (or better), 256 MB RAM (or better) ,CD RW, 56 kbps modem (or better), 10/100 LAN, 2 X USB ports, VGA out.,14.1" wide screen (LCD/TFT) or 38.1 cm.(15" LCD/TFT), Windows XP Home or Professional/Windows 2000 – (OEM pack), Two hours battery backup minimum.	1 No.
2.	Pure sine wave Digital Multimeter make Fluke model 187/Rishabh model 285/ Kusum Meco model 859CF or equivalent.	1 No.
3.	Train simulator, Model TS 267P CEL make	1 No.

4.	Extender card (Card No.557)	1 No.
5.	Dummy wheel	1 No.
6.	Ring spanner 17-19, 24-26	1 No. each
7.	Open end spanner 17-19, 24-26	1 No. each
8.	Socket spanner with handle	1 No.
9.	Torque wrench (Jaicom JPR65 or equivalent, 88NM)	1 No.
10.	Screw driver No. 902	1 No.
11.	Screw driver No. 935	1 No.
12.	Marking jig for drilling	1 No.
13.	Dummy load to check power supply (resistive)	1 No.



Fig. 4.11: Marking Jig, Punch and fixing device



Fig.4.11 (b)

- **Socket spanner with handle**
- **Screw Driver No. 902**
- **Screw Driver No. 935**
- **Ring spanner 17-19,24-26**
- **Open end spanner 17-19, 24-26**



Fig.4.11: Torque wrench tool



Fig.3.12 (d): Dummy Wheel

4.11.2 संस्तुतिकृत अतिरिक्त **Recommended Spares**

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

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

4.12 दोष निवारण **Troubleshooting**

4.12.1 गणना संबंधी दोष **Count related errors**

- Error code 0x33, 0x34 & 0x35: the remote unit's error code is checked and diagnosed.
- Error code 0x36 & 0x37: the Tx/Rx coils and SCC card are to be checked.

4.12.2 पहिये की गलत गति की वजह से दोष **Error due to wrong wheel movement**

- Error 0x38 & 0x43: output of coil and SCC cards should be checked.
- Error 0x44, 0x45, 0x46, 0x47 & 0x48: comes due to formation of non-overlap pulse. Any movement of trolley in the section should be checked.

4.12.3 वाईटल रिले संबंधी दोष **Vital relay related errors**

- Error 0x15, 0x50, 0x51, 0x52 & 0x53: the VR should be checked for proper insertion.

4.12.4 पावर तथा संचार संबंधी दोष **Power & communication related errors**

- Error 0x30: link between the two SSDAC units should be checked.
- Error 0x40, 0x41, 0x42: the communication media between the local and remote units should be checked for noise or other interfering element.
- Surge Devices to be checked
- Error 0x3F, 0x7F: reset operation for the local and/or remote unit should be proper
- Error 0x80: remote unit should be checked and analyzed for error.

4.12.5 हार्डवेयर से तालमेल संबंधी दोष **Hardware synchronization related errors**

- Error 0x60, 0x62: Reset the system. If problem persists, MLB cards should be replaced
- In case of lightning, the SVPD devices should be checked for proper working.
- Power line & reset line surge modules are indicative type surge devices.
- Modem line devices are non indicative type.
- The damaged module(s), if found should be replaced with fresh module(s) of similar type. contact CEL for part nos.

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अध्याय – 5

एस.एस.डी.ए.सी.–जी 36
जीजी ट्रॉनिक्स सिंगल सेक्शन डिटिट्ल एक्सेल काउण्टर
SSDAC-G36
G.G.TRONICS SINGLE SECTION DIGITAL AXLE COUNTER

5.0 परिचय Introduction

This part covers configuration, installation guidelines, commissioning, adjustment and maintenance of SSDAC-G36 Single Section Digital Axle Counter system manufactured by M/s G.G.Tronics Pvt. Ltd. Bangalore. It is a microcontroller based system with 2 out of 2 architecture suited for proving station and block section.

संरचना Configurations

SSDAC-G36 units can be installed to work in the following configurations:

- Two detection points Single section: In straight line [2DP1S].
- Three detection points Single section: In point zone [3DP1S].
- Three-detection points for two consecutive sections in a straight line [3DP2S].

अनुभाग Modules

The hardware and software for all the configurations are same. The main modules for SSDAC-G36 are listed below:

- SSDAC unit
- Reset box
- Axle Detectors
- LCD display Module
- 7 Segment Display Module

5.1 एसएसडीएसी 2 डीपी 1एस प्रणाली SSDAC 2DP1S system

This system is provided with two detection points on straight lines in station or block section. It indicates the section as occupied or clear through a Vital Relay (VR) output. The system consists of Start Fed (SF) and End Fed (EF) units.
The SF and EF unit consists of the following modules:

- Phase detector Card 1 - 21 KHz – 1No.
- Phase detector Card 2 - 25 KHz – 1 No.
- Central Processing Unit 1(CPU1) – 1 No.
- Central Processing Unit 2(CPU2) – 1 No.
- Communication module – 1No.
- Relay Drive Module – 1 No.
- SM-CPU /Event logger module – 1 No.
- DC/DC Converter – 1 No.
- LCD display Module
- 7 Segment Display Module

Note:

1. CPU1 & CPU2 have unique addresses.
2. Communication and relay drive modules are equipped in different positions in SF/EF units for unique port addressing.

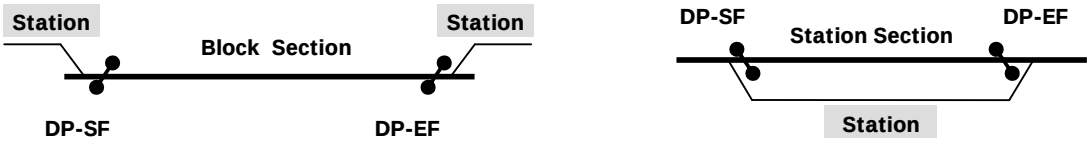


Fig.5.1:2DP1S system layout plans for block section and station section

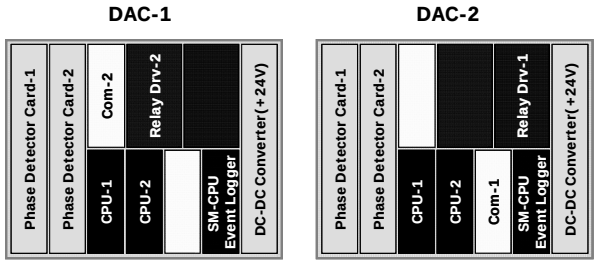


Fig.5.2: 2DP1S card configuration in SSDAC G36

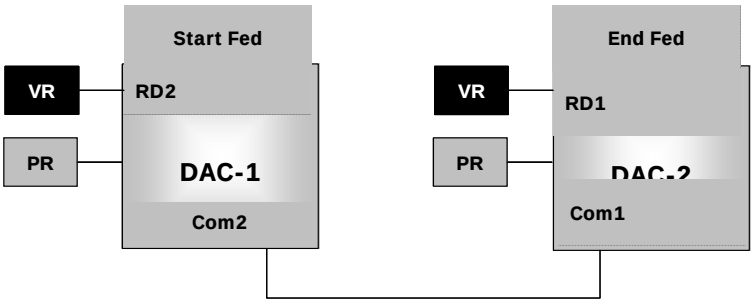


Fig.5.3: 2DP1S block schematic

5.1.1 प्रमुख विशेषतायें Salient features

- Both the units communicate with each other and with station reset box through FSK Modem communication using separate ½ quad cable.
- The station-reset and repeater relay signal is sent through 6-core signalling cable of 1.5 Sq mm.
- Power supply to the unit is provided through 2-core aluminium cable of 25 Sq mm.
- More than 14,000 events can be stored in SM-CPU / Event Logger module of the system which can be downloaded through RS232 communication port available on the module.
- The system is suitable to work on 52 Kg, 60 Kg & 90 R rails in both RE and Non-RE areas.
- Wheels above 550 mm dia. are only sensed and trolley wheels are ignored. Trolley protection circuit can be activated if necessary.

- A display module placed above the SF/EF units shows plain English messages on the status of the system and also wheel counts through a 4 line 40 character alphanumeric display. In addition to this Alphanumeric display unit on reset box and 7 segment displays and LEDs on the hardware modules of SF/EF units help in monitoring the working of the system.
- On single line section, train can enter at either end of the block section irrespective of SF/EF units. In double line section, SF is placed at the entry end and EF is placed at the exit end of the block section.
- The system is brought to normal by giving co-operative reset through reset boxes in stations by both the station masters of a block section within a gap of 5 min and after running of a pilot train. The reset potential is 36-52 V DC.
- Configuration of SF/EF units and unique addresses for the CPU modules can be set through links provided on the CPU modules.
- The system works on 24 V + 20% DC and is protected with fuses and LDUs.
- The SF and EF units have a common rear panel with water proof and dust proof MS couplers for terminating the external cables.
- A relay box houses the vital relay (VR) and the preparatory relay (PR) of Q type 24V, 1000Ω 6F, 6B
- The outputs of the above are connected to VPR and PPR relays in the relay room through the FTB for extending signals under different conditions of the system. Feedback from the contacts of these relays is also taken to the system for processing.

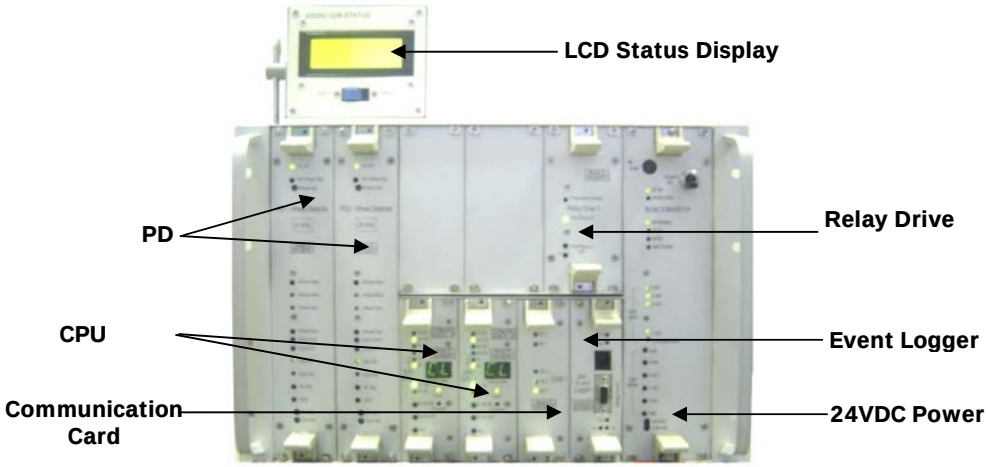


Fig.5.4: Front view of typical SSDAC-G36 unit



Fig.5.5 : SSDAC-G36 unit with PR and VR Relays in a box and Display Module

5.1.2 प्रणाली की कार्य पध्दतिSystem working

- Once the system is powered ON, it boots and enters the reset state.
- Initially the two relays preparatory and vital relays remain in the de-energized state.
- As soon as the SM Key and reset button in reset boxes of both the units of a particular section is actuated the system enters preparatory state, provided there are no trains in that section.
- Now a pilot train can be allowed to run in the section.
- After counting of minimum of two wheels as In-counts and Out-counts the respective preparatory relay A (EF) and preparatory relay B (SF) will get de-energized.
- The system enters clear mode after In-count and Out-count of the pilot train matches and vital relay A (EF) and vital relay B (SF) will get energized.
- Whenever any train enters the section, on counting the first wheel the system enters occupied mode and the In-counts will be incremented till the last wheel of the train.
- When the train that has already entered the station, exits the station, Out-count will start incrementing.
- When both In-counts and Out-counts match, the section will enter the clear mode and the vital relay A (EF) and vital relay B (SF) will get energized.
- Communication between two units will be through FSK communication.
- Axle counts as both In-counts and Out-counts will be displayed on the LCD panel.
- The System Status, Checksum and Version No, Counts and error code are displayed in the Reset Box LCD display.

5.1.3 एसएसडीएसी 2 डीपी 1एस संरचना निर्धारण SSDAC- 2DP1S Configuration Setting

The SSDAC system is configurable to different configurations based on the requirements. Jumper setting is done where the jumper "0" indicates no jumper to be done and "1" indicates jumper to be soldered.

SSDAC- 2DP1S SF (Start Fed Configuration Setting)

Table A:Jumper Settings

LK25	LK24	LK23	LK22	LK21	LK20	LK19	LK18
0	0	0	0	0	0	0	1

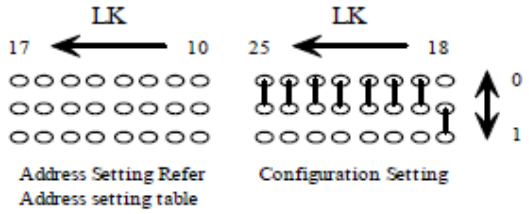


Fig.5.6 : SSDAC - 2D SF Start Fed Configuration (CPU Card Top View Component Side)

Next step is to set the address of the CPU in each of the units for proper communication between the units. In order to identify the CPUs in each of the units, 1 to 252 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17 as per table B below.

Table B: CPU addressing for SF of 2DP1S configuration

Jumper settings								Address assigned
LK10	LK11	LK12	LK13	LK14	LK15	LK16	LK17	
LSB							MSB	
1	0	0	0	0	0	0	0	1
0	1	0	0	0	0	0	0	2
▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼
0	0	1	1	1	1	1	1	252

SSDAC- 2DP1S EF (End Fed Configuration Setting)
The CPU Card Top View is similar to that o for SF unit

Table C: Jumper Settings

LK25	LK24	LK23	LK22	LK21	LK20	LK19	LK18
0	0	0	0	0	0	1	0

In order to identify the CPUs in each of the units, 3 to 254 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17 similar to that given in table B above.

Addressing Scheme for 2DP1S
The below table indicates possible addresses of different SSDAC –2DP1S configurations. The addressing method is same for Start Fed or End Fed system. Ensure that Group Local Addresses of individual SSDAC equipments are configured through CPU module as below.

Table D: Addressing scheme

SSDAC Unit	**SF-Start Fed**	**Group local address**	**EF-End Fed**	**Group local address**
SSDAC 1-2	CPU-1 CPU-2	001 002	CPU-1 CPU-2	003 004
SSDAC 3-4	CPU-1 CPU-2	005 006	CPU-1 CPU-2	007 008
SSDAC 5-6	CPU-1 CPU-2	009 010	CPU-1 CPU-2	011 012
▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼
SSDAC (n-1) - n	CPU-1 CPU-2	251 252	CPU-1 CPU-2	253 254

Note: Any deviation from the above configuration, the SSDAC – 2DP1S system does not boot and enters wrong configuration status with error message displayed.

5.1.4 आपसी संयोजन Interconnections

Interconnections are to be made between SSDAC units, TX / RX axle detectors, Modem, Power Supply, Train Simulator and reset box. MS Coupler connectors are provided on SSDAC units for external connections. Following is the brief description of MS couplers:

MS 2 -Vital Relay A
MS 3 - Vital Relay B
MS 4 -Transmitter Coil 2 Connection
MS 5 - Transmitter Coil 1 Connection
MS 6 - Modem-A Communication (FSK) Connection (Note: Modem A (COM1) is used in EF, CF and 3DP1S unit types of SSDAC)
MS 7 - Preparatory Relay A
MS 8 - Preparatory Relay B
MS 9 - Train Simulator
MS 10 -LCD Display
MS 11 - Modem-B (COM2) Communication (FSK) Connection {Note: Modem B (COM2) is used in SF, CF and 3DP1S unit types of SSDAC}.
MS 12 – Reset A (Note: Reset A is used in EF)
MS 13 – Reset B. (Note: Reset B is used in SF)
MS 14 - DC-DC Converter
MS 15 - SM/Event Logger Connection
MS 16 - Receiver Coil 2 Connection
MS 17 - Receiver Coil 1 Connection

5.2 एसएसडीएसी 3 डीपी 1एस प्रणाली SSDAC- 3DP1S System

In SSDAC 3DP1S configuration, there will be three SSDAC units i.e. Unit A, Unit B and Unit C can be interfaced using FSK Modem communication. All the other features are similar to that of 2DP1S system.

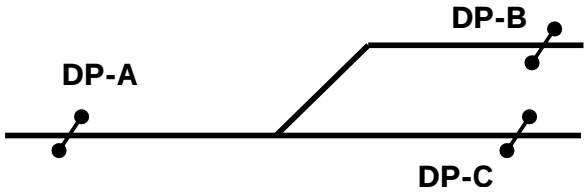


Fig.5.8: 3DP1S system layout plan for point zone

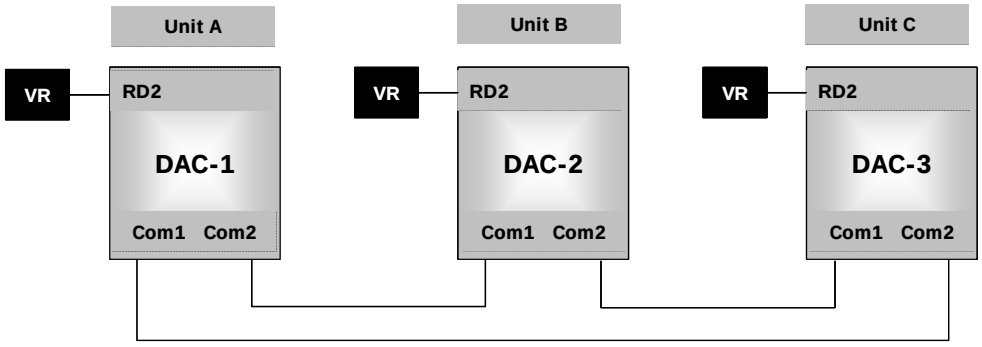


Fig.5.9: Block Schematic of SSDAC- 3DP1S System
(RD1, RD2- Relay Drive Card, Com1, Com2 - Communication Card, VR - Vital Relay)

5.2.1 प्रणाली की कार्य पध्दति System working

In this configuration one reset box will be used to reset three SSDAC units placed at station. The Vital relays remain in de-energized state.
The reset command from reset box is accepted only after ensuring that the line is clear through line verification box (LED ON) and the SM key and reset button being pressed. Now the vital relay will get energized and system shall enter clear mode.
If train enters from detection point A, it can exit from B OR C or B AND C.
If train enters from detection point B, it can exit from A OR C or A AND C.
If train enters from detection point C, it can exit from A OR B or A AND B.

5.2.2 एसएसडीएसी 3 डीपी 1एस संरचना निर्धारण SSDAC-3DP1S Configuration Setting

Table E: Jumper Settings Unit A

LK25	LK24	LK23	LK22	LK21	LK20	LK19	LK18
0	0	0	0	0	1	0	0

CPU address setting Unit A
In order to identify the CPUs in each of the units, 1 to 250 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17.

Table F:Jumper Settings Unit B

LK25	LK24	LK23	LK22	LK21	LK20	LK19	LK18
0	0	0	0	0	1	0	1

CPU address setting Unit B
In order to identify the CPUs in each of the units, 3 to 252 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17.

Table G:Jumper Settings Unit C

LK25	LK24	LK23	LK22	LK21	LK20	LK19	LK18
0	0	0	0	0	1	1	0

CPU address setting Unit C
5 to 254 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17.The below table indicates possible addresses of different SSDAC – 3DP1S configurations. The addressing method is same for Unit A, Unit B system or Unit C systems.

Table H: Addressing Scheme for 3DP1S

SSDAC Unit A – B - C	Unit A	Group local address	Unit B	Group local address	Unit A	Group local address
SSDAC 1-2-3	CPU-1 CPU-2	001 002	CPU-1 CPU-2	003 004	CPU-1 CPU-2	005 006
SSDAC 4-5-6	CPU-1 CPU-2	007 008	CPU-1 CPU-2	009 010	CPU-1 CPU-2	011 012
▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼	▼ ▼
SSDAC (n-2)–(n-1)-n	CPU-1 CPU-2	249 250	CPU-1 CPU-2	251 252	CPU-1 CPU-2	253 254

Note: Any deviation from the above configuration, the SSDAC 3DP1S system does not boot and enters wrong configuration status with error messages displayed.

5.3 एसएसडीएसी 3 डीपी 2एस प्रणाली SSDAC-3DP-2S System

In this configuration, there will be three SSDAC units i.e. Start Fed, Centre Fed and End Fed units which are interfaced using FSK Modem communication. There are two types of relay boxes. One contains two vital relays and two Preparatory relays used in centre fed unit named as four relay box and another contains one vital relay and one Preparatory relay used in start fed and end fed unit named as two relay box. All the other features are similar to that of 2DP1S system.

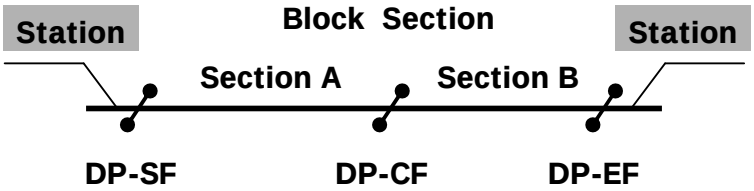


Fig. 5.10: 3DP2S system layout plan for two consecutive sections in a straight line

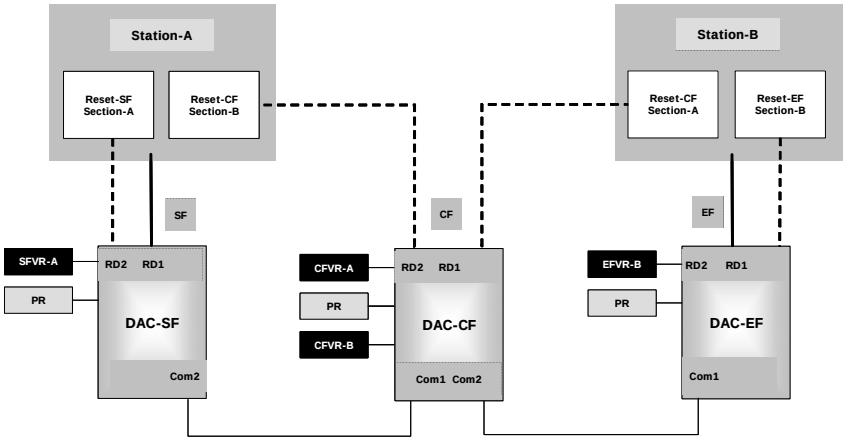


Fig.5.11: Block schematic of SSDAC-3DP-2S Configuration

SF: Start Fed, CF: Centre Fed, EF: End Fed EFVR - A : Vital Relay at Sec B for End Fed
CFVR - A : Vital Relay for Sec A at Centre Fed PR: Preparatory Relay
CFVR - B : Vital Relay for Sec B at Centre Fed SFVR - A : Vital Relay at Sec A for Start Fed)
Com1, Com2 : Communication Card

5.3.1 प्रणाली की कार्यपद्धति System working

In this configuration the as the train entered through SF (Section A), exits through CF, Out-counts of Section A decrements and In-counts of section B will start incrementing. Similarly if train that has entered through EF (Section B) exits through CF, Out-counts of Section B decrements and In-counts of section A will start incrementing. When both In-counts and Out-counts match, particular section will enter clear mode and the vital relays will get energized. In this configuration four reset boxes will reset three SSDAC placed at each station. One Reset box each for SF and EF Units, two reset boxes for CF Unit.

When reset buttons of all the units of the section are actuated; the preparatory relay get energized and the system enters preparatory state. Rest working and configuration setting is similar to that of 2DP1S system.

5.3.2 एसएसडीएसी 3 डीपी 2एस (3 डीपी 2एस संरचना निर्धारण) SSDAC – 3DP-2S (3DP-2S Configuration Setting)

The SSDAC – 3DP-2S systems consists of SF (Start Fed), EF (End Fed) and CF (Centre Fed) System.

SSDAC – 3DP-2S SF (Start Fed Configuration Setting)
Jumper Settings
Similar to that of 3DP1S SF configuration.(refer TableA)

CPU address setting
1 to 250 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17.

For EF configuration of 3DP-2S
Jumper Settings
Similar to that of 3DP1S EF configuration. (refer Table B).
CPU address setting
5 to 254 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17.

For CF configuration of 3DP-2S
Table I: Jumper Settings .

LK25	LK24	LK23	LK22	LK21	LK20	LK19	LK18
0	0	0	0	0	0	1	1

CPU address setting
3 to 252 unique addresses are provided which can be set with the help of jumpers from LK10 to LK17.The addressing scheme for 3DP-2S configuration is similar to that of 3DP-1S configuration as shown in table. (Use SSDAC units SF-CF-EF in place of SSDAC units A-B-C).

5.5 संस्थापन Installation

Apart from the installation guidelines given in Part B, the following points will be useful in installation of G-36 system:

5.4.1 रेल पर चिन्हित करना एवं छिद्र बनाना Marking & Drilling holes on the Rail

- The 3 Holes of 13 mm dia. are required to be marked and drilled for fixing web mounted TX/RX coils at each location with spacing of 183mm.
- From bottom of the rail drill the holes at 68 mm for 52 KG, 84 mm for 60 KG and 57 mm for 90 R.

5.4.2 रिले बॉक्स Relay Box

Following relay box are provided depending upon the configuration

Table J

Sr. No.	Configuration	Units	Vital relay	Preparatory Relay
1.	2DP1S version	SF	1	1
		EF	1	1
2.	3DP1S version	--	1	--
3.	3DP2S version	SF	1	1
		EF	1	1
		CF	2	2

5.4.3 रिसेट बॉक्स Reset Box

The Reset Box has the following controls and displays.

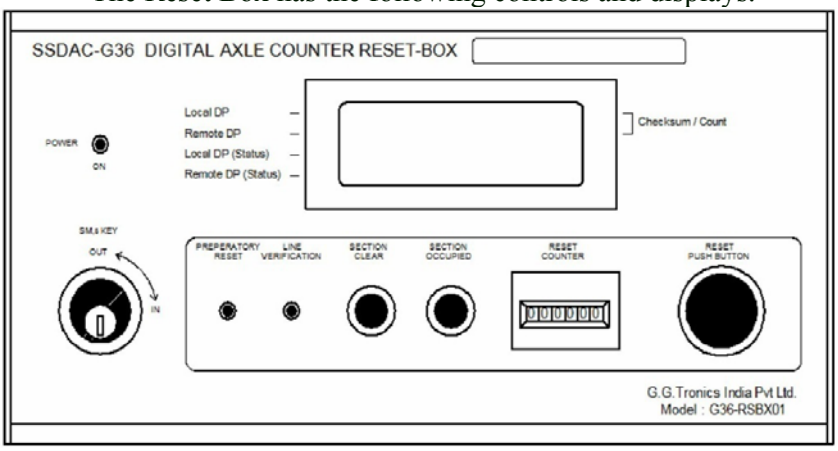


Fig.5.13:Reset box front view

एसएम चाबी **SM Key** – This has a facility of locking to prevent unauthorized operations. For executing a reset command, this key has to be kept pressed after unlocking it.

रिसेट पुश बटन **Reset Push Button** – This switch is meant for sending the reset command to the system. For sending the reset command, both the SM Key and the reset push button are to be held pressed simultaneously and momentarily.

लाईन वेरीफिकेशन बॉक्स **Line Verification Box**-Line verification Box is supplied only for case where hard reset has to be adopted instead of a preparatory reset.

संकेत **Indications**

Following indications are provided on the front panel – Power on, Preparatory reset, line verification, Section clear and Section occupied.

काउण्टर **Counter**

A counter is provided to record the resetting operation.

प्रदर्शन Display

The System Status, Checksum and Version No, Counts and error code are displayed in the LCD display provided on the reset box.

The reset box required may be one per unit or two per unit depending upon the configurations. Process of resetting required for a particular configuration also differs. For example a single stationmaster or two separate stationmasters can do reset

5.4.4 संस्थापन हेतु पूर्वाकांक्षित Pre- requisites for installation

तालिका –एल विभिन्न संचनाओं की संस्थापन हेतु पूर्वाकांक्षित

Table L: Pre-requisites for installation of different configurations

Sr. No.	Supportive equipment and accessories	2DP-1S Configuration			3DP-1S Configuration	3DP-2S Configuration		
		Station Area (1 set of SSDAC)	Block Section (S/L) (1 set of SSDAC)	Block Section (D/L) (2 sets of SSDAC)	Station Area - 3 No. SSDAC	Station Area- 1 set of SSDAC	Block Section (S/L) (1 set of SSDAC)	Block Section (D/L) (2 sets of SSDAC)
1.	24V, 40 AH low maintenance battery or 24V, 5 Amp output from one module of IPS	1 No.	2 Nos.	2 Nos.	1 No	1 No.	3 Nos.	3 Nos.
2.	24V, 5A Axle Counter type Battery Charger	1 No.	2 Nos.	2 Nos.	1 No.	1 No.	3 Nos.	3 Nos.
3.	4/6 Quad cable	0.9 mm (1 Pair)	0.9 mm (1 Pair)	0.9 mm (2 Pair)	0.9 mm (3 Pair)	0.9 mm (1 Pair)	0.9 mm (1 Pair)	0.9 mm (2 Pair)
4.	Apparatus case (Full) with termination board.	2 Nos.	2 Nos.	4 Nos.	3 Nos.	3 Nos.	3 Nos.	6 Nos.
5.	25 sq. mm AL Power cable, 2 Core	Length as required	Length as required	Length as required	Length as required	Length as required	Length as required	Length as required
6.	1.5 Sq. mm., Signalling cable (6 core + 4 spare for D/L)	Length as required	Length as required	Length as required	Length as required	Length as required	Length as required	Length as required
7.	Earthing of Apparatus case (Locations)	2 Nos.	2 Nos.	4 Nos.	3 Nos.	2 Nos.	3 Nos.	6 Nos.
8.	Deflectors for Axle detectors	4 Nos.	4 Nos.	8 Nos.	6 Nos.	4 Nos.	12 Nos.	24 Nos.

5.4.5 पावर सप्लाई व्यवस्था Power Supply Arrangement

The SSDAC system works on 24V DC supply. This has to be provided by the respective station through power cables. The continuous current drain, requirement of battery and battery charger are as indicated in Table K.

Table K

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

5.5 रीसेट की प्रक्रिया Resetting Procedure

The procedure for reset for the different configurations is described in the following paragraphs.

The reset box is wired to SSDAC system through a repeater relay named as VPR. The repeater relay in the relay room repeats the status of the vital relay of the SSDAC system. For all SSDAC system configurations the same reset circuit can be used.

5.5.1 2डीपी 1एस प्रणाली के रीसेट की प्रक्रिया Reset procedure for 2DP1S system

The SSDAC-2DP1S system allows reset from stationmaster whenever system is powered on or system/section enter error mode or unbalanced with occupied LED glowing, but no hardware failures. SSDAC-SF and SSDAC-EF need reset from station A and station B. Under this condition, reset is possible only if preparatory and vital relay are in de-energize/drop state. The following procedure is adopted for resetting a 2DP1S system:

- Stationmaster A inserts and turns the SM key and press the reset button simultaneously.
- Preparatory LED start blinking and LCD displays “Reset Applied“ in the position of remote DP status indicating that reset is pressed.
- Stationmaster B inserts and turns the SM key and presses the reset button simultaneously.
- After SSDAC-SF and SSDAC-EF communication is successful both the systems enter the preparatory mode with preparatory LED glowing in the reset box at station A and station B and the counter gets incremented by 1.
- The LCD display’s “Wait For Pilot Train” in both Local and remote DP status position.
- Now the pilot train is allowed in the section to balance the section. On successful piloting of train with minimum of two axles as Incounts and Out-counts, section gets balanced.
- The section goes through reset operation and vital relays of SSDAC-SF and SSDAC–EF energize/pickup. Occupied LEDs goes off and clear LEDs glow at both station A and station B.
- Reset procedure is now completed and SSDAC-2DP1S section is ready for train movements.

5.5.2 3डीपी 1एस के रीसेट की प्रक्रिया(हार्ड रीसेट) Reset Procedure for 3DP1S (Hard Reset)

SSDAC-3DA, SSDAC-3DB and SSDAC-3DC will need reset from station. The following procedure is adopted for resetting a 3DP1S system:

Stationmaster physically verifies that the section is clear and operates line verification switch and line verification LED glows in the reset box indicating that there is no train in the section.
Stationmaster inserts and turns the SM's key and presses the reset button simultaneously.
SSDAC-3DP1S Unit A, SSDAC-3DP1S Unit B and SSDAC-3DP1S Unit C system goes through the reset operation and vital relay picks-up/energizes.
Counter gets incremented by 1. Occupied LED switch off and clear LED glows.
Reset procedure is now completed and SSDAC-3DP1S section is in balanced mode ready for train movements.

5.5.3 3डीपी 2एस के रीसेट की प्रक्रिया(प्रेपरेटरी रीसेट) Reset Procedure for 3DP-2S (Preparatory Reset)

SSDAC-SF, SSDAC-CF and SSDAC-EF need reset from station A and station B. Under this condition, reset is possible only if preparatory and vital relay are de-energize/drop. The following procedure has to be followed:

सेक्शन ए हेतु रीसेट की प्रक्रिया Reset Procedure for Section A

- Station A stationmaster insert and turns the SM key and presses the reset button of reset box in station A simultaneously for section A.
- Now, Preparatory LED starts blinking indicating that reset is initiated at station A for section A.
- Station B stationmaster insert and turns the SM key and presses the reset button simultaneously of reset box in station B for section A.
- After, communication of reset status between SF and CF unit of section A is successful, Preparatory LED of section A at Station A and at station B glows steadily indicating that section A is in preparatory mode and ready for piloting.
- The pilot train is allowed in the section A to balance the section. On successful piloting of train with minimum of two axles and matching of In-counts and Out-counts of section A system gets balanced.
- Now, section A's vital relays are picked up/energize indicating balanced mode and ready for train movements.

सेक्शन बी हेतु रीसेट की प्रक्रिया Reset procedure for Section B

- Station A stationmaster insert and turns the SM key and presses the reset button simultaneously of reset box in station A for section B.
- Preparatory LED starts blinking indicating reset operation at station A for section B.
- Station B stationmaster insert and turns the SM key and presses the reset button simultaneously of reset box in station B for section B.
- After, communication of reset status between EF and CF unit of section B is successful. Preparatory LED of section B at Station A and at station B glows steadily

indicating that section B is in preparatory mode and ready for piloting. The rest procedure is same as for Section A.

5.6 अनुरक्षण Maintenance

SSDAC has various monitoring points. These different points are being tabulated below which should be checked monthly.

Table M: Monitoring points of SSDAC

Module	Monitoring item	Measured values range
Phase Detector (PD1 and PD2)	RX-SIG and GND	900 mV to 1.2 V AC
	SUP-OUT and GND	4V to 5V DC
	WHEEL-M-OUT and GND	4.5V to 5V DC
	WHEEL-S-OUT and GND	4.5V to 5V DC
	RX-PH-SIG and GND	10V to 12V DC
	SUP-ADJ and GND	4V to 5V DC
DC-DC Converter	+5V DC and GND	4.75V to 5.25 V
	+18V DC and GND	17.75V to 18.25 V
	+12V DC and GND	11.75V to 12.25 V
	-12V DC and GND	11.75V to 12.25 V
	+24V DC and GND	22V to 26V
CPU1	EN1B O/P and GND (For SF, CF, 3DP1S units)	11.5V to 12.5V DC
	EN1A O/P and GND (For EF, CF)	11.5V to 12.5V DC
CPU2	EN2B O/P and GND (For SF, CF, 3DP1S units)	11.5V to 12.5V DC
	EN2A O/P and GND (For EF, CF)	11.5V to 12.5V DC
RELAY DRIVE 1 (For EF,CF)	VITAL RELAY A O/P(+) VITAL RELAY A O/P(-)	>20V DC
RELAY DRIVE (For SF,CF,3D units)	VITAL RELAY B O/P(+) VITAL RELAY B O/P(-)	>20V DC

Table N:Maintenance log sheet for (i) SF & EF units of 2DP1S system and (ii) SF, CF & EF units of 3DP2S system

Description	Date	Battery (24V)	Tx1 Vrms / freq	Tx2 Vrms / freq	Rx1 Vrms	Rx2 Vrms	Phase Detector 1 DC Volts		Phase Detector 2 DC Volts		With Push Trolley on axle detectors (4 spokes / 8 spokes)		DC – DC Converter				
													DC Volts				
													5 V	12 V	-12 V	+18V	24 V
Test Points		FTB 1 & 2	FTB 27 & 28	FTB 31 & 32	FTB 29 & 30	FTB 33 & 34	RX PH-SIG & GND Socket		RX PH-SIG & GND Socket		RX PH-SIG & GND Socket		Monitoring Sockets on DC-DC converter card				
							Normal	Dummy wheel	Normal	Dummy wheel	PD1	PD2					
(Limit) for Phase		22-30 V	40 to 70 V 20.802 to 21.302 KHz	40 to 70 V 24.750 to 25.250 KHz	300mV to 1.2V (AC) RX SIG & GND Socket 750 to 1200 MV	300mV to 1.2V (AC) RX SIG & GND Socket 750 to 1200 MV	10 V to 12 V	< 1 V	10 V to 12 V	< 1 V	10 V to 12 V	10 V to 12 V	4.75 to 5.25 V	11.75 V to 12.25 V	-11.75 V to -12.25 V	17.75 V to 18.25 V	22V to 26V

Table O: Maintenance log sheet for Unit A, B, & C of 3DP1S system

Description	Date	Battery (24V)	Tx1 Vrms / freq	Tx2 Vrms / freq	Rx1 Vrms	Rx2 Vrms	Phase Detector 1 DC Volts		Phase Detector 2 DC Volts		With Push Trolley on axle detectors (4 spokes / 8 spokes)		DC – DC Converter DC Volts				
													5 V	12 V	-12 V	+18V	24 V
Test Points		FTB 1 & 2	FTB 27 & 28	FTB 31 & 32	FTB 29 & 30	FTB 33 & 34	RX PH-SIG & GND Socket		RX PH-SIG & GND Socket		RX PH-SIG & GND Socket		Monitoring Sockets on DC-DC converter card				
							Normal	Dummy wheel	Normal	Dummy wheel	PD1	PD2					
(Limit) for Phase		22-30 V	40 to 70 V 20.802 to 21.302 KHz	40 to 70 V 24.750 to 25.250 KHz	300mV to 1.2V (AC) RX SIG & GND Socket 750 to 1200 MV	300mV to 1.2V (AC) RX SIG & GND Socket 750 to 1200 MV	10 V to 12 V	< 1 V	10 V to 12 V	< 1 V	10 V to 12 V	10 V to 12 V	4.75 to 5.25 V	11.75 V to 12.25 V	-11.75 V to -12.25 V	17.75 V to 18.25 V	22V to 26V

5.7 टूल्स व स्पेयर Tools and Spares

The following toolkit and spares must be procured separately for installation and maintenance (1 set of tool kit for every 10 sets of SSDAC systems).

टूल किट Tool Kit

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

संस्तुतिकृत स्पेयर **Recommended Spares**

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

Sr. No.	Spares	Quantity
1.	Phase detector modules 1& 2 (PD1 & PD2)	2
2.	CPU1 & CPU2 modules	2
3.	Communication module	1
4.	Relay drive module	1
5.	Event logger/SM-CPU module	2
6.	DC-DC Converter module	1
7.	Axle detectors 21 kHz/25 kHZ (TX coil)	1
8.	Axle detectors 21 kHz/25 kHZ (RX coil)	1
9.	Hardware for mounting axle detectors	1
10.	MS circular connectors (6 No.)	1
11.	Reset box RB	1
12.	SSDAC unit (housing with motherboard, without modules)	1
13.	Relay box	1

5.8 दोष निवारण **Troubleshooting**

- For ease of maintenance in the field messages are provided in the Display Module both during healthy and Error conditions
- About 61 possible conditions have been identified which drives the system into Error mode.
- The errors are displayed in plain English on the Display Module
- Many Error Messages are displayed that suggest faulty module to take immediate corrective action by the service personnel. Detail report can be downloaded from Event Logger card for analysis and the corrective action to be taken

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अध्याय – 6

क्या करें व क्या न करें
DO's & DON'Ts

6.1 क्या करें Do's

- Follow specified interconnection drawings for connecting the TX and RX Coils.
- Ensure that RX and TX coil cables have been laid in different pipes.
- Ensure that both the TX coils and RX coils are having proper alignment on Rail.
- Ensure that packing of sleepers with ballast on both sides of Axle detector is proper. Check that metal sheaths of the outdoor cable are connected to earth at both ends.
- The recommended cables for wiring of the system at site should be used.
- The steady battery voltage 24 V should be maintained.
- The cable connections should not be connected loosely.
- The MS Coupler connectors of SSDAC System are checked and maintained firmly.
- Check that the SSDAC unit and Reset box are provided with sealing arrangement
- Resetting should be done only after ensuring that there is no train in the Section.
- It is recommended that heat resisting paint to be used on the apparatus case so that the temperature inside apparatus case is maintained lower in comparison to other normal paints.
- Caution Board has to be placed near the SSDAC Axle Detectors to avoid damaging of coils from packing machines.
- Deflector Plates must be mounted near the SSDAC Axle Detectors to avoid damaging of coils.
- Usage of Spoked Trolley wheel is desirable as it reduces the SSDAC system entering the Error mode. The straight movements or passing of Motor Trolley or Push Trolley with solid mass wheel may create error sometimes.

6.2 क्या न करें Don'ts

- Don't install the Axle detectors near the rail joint. (Not less than 6 sleepers away).
- Don't install the Axle detectors where the rail is badly worn out
- Don't cut or join the Transmitter / Receiver cables supplied along with the coil. It would result in change of input Receiver signal.
- Don't remove the modules from SSDAC System under Power ON condition.
- Always remove the modules if necessary after switching OFF the power to the SSDAC System.
- Address settings of the SSDAC System should not be changed at the field.
- When Section is in Occupied / Preparatory Mode, Motor Trolley wheel, Push Trolley with solid mass wheel and Material Trolley wheel must not be allowed to Enter / Exit the Section to avoid SSDAC System going to Error condition.

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अनुलग्नक I
ANNEXURE I

संक्षिप्त शब्दावली ABBREVIATIONS

अध्याय 1 Chapter 1

ASM	Assistant Station Master
DP	Detection Point
DAC	Digital Axle Counter
IC	Integrated Circuit
LED	Light Emitting Diode
LCD	Liquid Crystal Display
OFC	Optic Fibre Cable
PC	Personal Computer
PIJF	Polythene Insulated Jelly Filled
RDSO	Research Design & Standards Organisation
RX	Receiver
SSDAC	Single Section Digital Axle Counter
TX	Transmitter
VF	Voice Frequency

अध्याय 2 Chapter 2

BPAC	Block Proving by Axle Counter
DC	Direct Current
DN	Down
HDPE	High Density Poly Ethylene
LSS	Last Stop Signal
MS	Mild Steel
NFTC	Natural Fibre Thermoset Composite
PVC	Poly Vinyl Chloride
SM	Station Master
SSDAC	Single Section Digital Axle Counter

अध्याय 3 Chapter 3

AC	Alternating Current
AzLM	Thales Multi Section Digital Axle Counter
AzLS	Thales Single Section Digital Axle Counter
CCITT V 23	Consultative Committee for International Telephony & Telegraphy Version 23
DC	Direct Current
DIP	Dual In line Packaged
EAK	Trackside Electronic Unit
ETU001	AzLS Tool Kit
KHz	Kilo Hertz
LED	Light Emitting Diode
MESSAB1	Rx voltage for Sk1

MESSAB2	Rx voltage for Sk2
Nm	Newton meter
PCB	Printed Circuit Board
PEGUE1	Reference voltage for Sk1
PEGUE2	Reference voltage for Sk2
RMS	Root Mean Square
Sk1	Track Device No.1 (Tx1 & Rx1)
Sk2	Track Device No.2 (Tx2 & Rx2)
Sk 30 H	Rail Contact
Rx	Reciever
Tx	Transmitter
Zp30CA -2	Detection point of AzLS

अध्याय 4 Chapter 4

ACSR	Aluminium Conductor Steel Reinforced
AH	Ampere Hour
ARA	
BPAC	Block Proving by Axle Counter
CD	Carrier Detection
CEL	Central Electronics Limited
DACF 710 A	CEL Single Section Digital Axle Counter Amplitude Modulation type
DACF 710 P	CEL Single Section Digital Axle Counter Phase Modulation type
DIP	Dual In line Packaged
D/L	Double Line
DNLD	Download
GB	Giga Byte
HDD	Hard Disk Drive
HDPE	High Density Poly Ethylene
I/O	Input/Output
IPS	Integrated Power Supply
ISO	Isolated
KHz	Kilo Hertz
LAN	Local Area Network
LCD	Liquid Crystal Diode
LD	Level Detector
LED	Light Emitting Diode
MLB	Micro Controller Logic Block
MS	Mild Steel
NFTC	Natural Fibre Thermoset Composite
OSC	Oscillator
PR	Preparatory Relay
QNA1	Style Q AC immunized relay
RAM	Random Access Memory
RDSO	Research Design & Standards Organisation
Rx	Receiver
SCC	Signal Conditioning Card
S/L	Single Line
SM	Station master
SSDAC	Single Section Digital Axle Counter
TFT	Thin Film Transistor
TP	Trolley Protection
Tx	Transmitter
USB	Universal Serial Bus
VR	Vital Relay

अध्याय 5 Chapter 5

AH	Ampere Hour
ARA	
BPAC	Block Proving by Axle Counter
CF	Centre Fed
CPU	Central Processing Unit
DC	Direct Current
2DP1S	Two detection points Single section
3DP1S	Three detection points Single section
3DP2S	Three-detection points for two consecutive sections in a straight line
EF	End Fed
FSK	
FTB	Fused Terminal Blocks
HDD	Hard Disk Drive
HDPE	High Density Poly Ethylene
I/O	Input/Output
IPS	Integrated Power Supply
ISO	Isolated
KHz	Kilo Hertz
LCD	Liquid Crystal Diode
LDU	Lightning Detector Unit
LED	Light Emitting Diode
MLB	Micro Controller Logic Block
MS	Mild Steel
NFTC	Natural Fibre Thermoset Composite
OSC	Oscillator
PPR	Repeater relay for Preparatory Relay
PR	Preparatory Relay
QNA1	Style Q AC immunized relay
RAM	Random Access Memory
RDSO	Research Design & Standards Organisation
Rx	Receiver
SCC	Signal Conditioning Card
SF	Start Fed
S/L	Single Line
SM	Station master
SSDAC	Single Section Digital Axle Counter
TFT	Thin Film Transistor
TP	Trolley Protection
Tx	Transmitter
USB	Universal Serial Bus
VPR	Repeater relay for Vital Relay
VR	Vital Relay

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अनुलग्नक II
ANNEXURE II

संदर्भ
REFERENCES

- IRS specification No. RDSO/SPN/177/2003 Ver 1.0 with amendment 2.
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- Installation Manuals - Single section Digital Axle Counter DACF -710 A & DACF 710 P – M/s Central Electronics Ltd.
- SSDAC G-36 2DP1S Installation Manual (SSDAC-2DP1S-IM) – M/s G.G.Tronics India Pvt.Ltd.
- SSDAC G-36 3DP1S Installation Manual (SSDAC-3DP1S-IM) – M/s G.G.Tronics India Pvt.Ltd.
- SSDAC G-36 3DP2S Installation Manual (SSDAC-3DP2S-IM) – M/s G.G.Tronics India Pvt.Ltd.

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टिप्पणी / Notes

गुणवत्ता नीति

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

QUALITY POLICY

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