सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

अर्थ लीकेज डिटेक्टर
की सहायता से केबल इन्सुलेशन की ऑन लाइन मॉनीटरिंग
Online monitoring of Cable Insulation through
EARTH LEAKAGE DETECTOR



कैमटेक/एस /प्रोज/2019-20/एसपी 9/2.0
फरवरी 2020
CAMTECH/S/PROJ/2019-20/SP9/2.0
February 2020
Target group:
SSEs/JEs(Signal) & Signal Maintainers

अआमा गंRDS
रेल अग्रदूत Transforming Railways

An ISO 9001-2015 Certified Organization
उत्तम अनुरक्षण प्रौद्योगिकी केन्द्र
EXCELLENCE IN MAINTENANCE

Indian Railways
Centre for Advanced Maintenance Technology

Contact person: **Director (S & T)**
Indian Railways Centre for Advanced Maintenance Technology
Maharajpur, GWALIOR (M.P.) 474 005
✆ : 0751-2470185, FAX: 0751-2470841 e-mail: dirsntcamtech@gmail.com

अर्थ लीकेज डिटेक्टर

की सहायता से केबल इन्सुलेशन की ऑन लाइन मॉनीटरिंग

Online monitoring of Cable Insulation through

EARTH LEAKAGE DETECTOR

कैमटेक/एस /प्रोज/2019-20/एसपी 9/2.0
फरवरी 2020
CAMTECH/S/PROJ/2019-20/SP9/2.0
February 2020

भूमिका

रेल्वे सिग्नलिंग प्रणाली की कार्य प्रणाली हेतु सिग्नलिंग केबल की विश्वसनीयता महत्त्वपूर्ण है । अर्थ लीकेज डिटेक्टर जो कि सिग्नलिंग केबल के अर्थ फॉल्ट की निगरानी करने का एक साधन है, सिग्नलिंग प्रणाली की दक्षता एवं विश्वसनीयता को बढ़ाता है ।

यह पॉकेट बुक अर्थ फॉल्ट से कोई बड़ी खराबी होने से पूर्व सिग्नल अनुरक्षण कार्मिकों को निवारक कार्रवाई करने में सहायता करने उद्देश्य से अर्थ लीकेज डिटेक्टर के संस्थापन एवं कार्यप्रणाली से संबन्धित निर्देशों को सम्मिलित करती है ।

मुझे आशा है कि यह पॉकेट बुक अनुरक्षण स्टाफ को सिग्नल उपकरणों के अनुरक्षण में निश्चित रूप से सहायक होगी ।

कैमटेक ग्वालियर
दिनांक:

जितेन्द्र सिंह
प्रधान कार्यकारी निदेशक

FOREWORD

The reliability of Signalling cables is important for working of the railway signalling system. Earth Leakage Detector being an aid for monitoring the earth faults in signalling cables increases the efficiency and reliability of Signalling system.

This pocket book covers the installation and operating instructions of Earth Leakage Detector to help the signal maintenance personnel in taking the preventive action before any major failure occurs due to earth fault.

I hope that this handbook will definitely help maintenance staff in maintaining signalling equipments.

CAMTECH Gwalior ***JITENDRA SINGH***
Date: 24.02.2020 ***Principal Executive Director***

प्राक्कथन

यह पॉकेट बुक सिग्नल अनुरक्षण कार्मिकों को सिग्नलिंग परिपथों में अर्थ फॉल्ट की निगरानी करने में सहायता हेतु तैयार की गयी है जिससे प्रणाली की कार्यक्षमता में वृद्धि होती है । यह पॉकेट बुक अर्थ लीकेज डिटेक्टर का संक्षिप्त विवरण, कार्य का सिद्धान्त एवं निर्देश तथा त्रुटि निवारण हेतु उपकरण के इंडिकेशन व कंट्रोल की व्याख्या को सम्मिलित करती है ।

हम सिग्नल निदेशालय, आरडीएसओ, लखनऊ, मै. अणु विद्युत, रुड़की एवं भारतीय रेलवे के सभी संकेत एवं दूरसंचार कार्मिकों के अत्यधिक आभारी हैं जिन्होने इस हस्तपुस्तिका को बनाने में हमारी सहायता की है |

चूंकि तकनीकी उन्नयन एवं शिक्षण एक क्रमिक प्रक्रिया है, अतः इस हस्तपुस्तिका में आप कुछ जोड़ने या सुधारने की आवश्यकता महसूस कर सकते हैं | यदि ऐसा है तो कृपया अपने सुझाव हमें ईमेल dirsntcamtech@gmail.com पर भेजें अथवा इस पते पर लिख भेजें : भारतीय रेल, उच्च अनुरक्षण प्रोद्योगिकी केंद्र, होटल आदित्याज़ के सामने, एयरपोर्ट मार्ग, महाराजपुर, ग्वालियर (म. प्र.) 474005

कैमटेक, ग्वालियर **दिनेश कुमार कलामे**
दिनांक: **संयुक्त निदेशक (संकेत एवं दूरसंचार)**

PREFACE

This pocketbook has been prepared to help the signal maintenance personnel in monitoring of earth faults in signalling circuits thereby enhancing the performance of the system. The pocket book covers brief overview, principle of operation, operating instructions and interpretation of indications and controls of Earth Leakage Detector for fault detection.

We are sincerely thankful to Signal Directorate RDSO, M/s Anu Vidyut, Roorkee and S&T personnel of Indian Railways who helped us in preparation of this pocketbook.

Since technological up-gradation and learning is a continuous process, you may feel the need for some addition/modification in this pocketbook. If so, please feel free to write us at Indian Railways, Centre for Advanced Maintenance Technology, In front of Hotel Adityaz, Maharajpur, Gwalior 474005 or mail us at *dirsntcamtech@gmail.com*. We shall be highly appreciating your contribution.

CAMTECH GWALIOR
DATE: 24.02.2020

DINESH KUMAR KALAME
JT.DIRECTOR (S&T)

विषय सूची
Contents

अनुभाग Section	विवरण Description	पृष्ठ Pages
	प्राक्कथन Foreword	iii/iv
	भूमिका Preface	v/vi
	विषय सूची Contents	vii
	सुधार पर्ची Correction Slip	viii
	डिस्क्लेमर Disclaimer	ix
	हमारा उद्देश्य Our objective	x
	कैमटेक प्रकाशन CAMTECH Publications	xi
	अर्थ लीकेज डिटेक्टर की सहायता से केबल इन्सुलेशन की ऑन लाइन मॉनिटरिंग **Online monitoring of Cable Insulation through Earth Leakage Detector**	
1.0	परिचय Introduction	1
2.0	अर्थ लीकेज डिटेक्टर मल्टी-चैनल टाईप 905 – बी2 (मै. अणु विद्युत) Earth Leakage Detector Multi-Channel type 905- B2 (M/s Anu Vidyut)	3
2.1	डिजाइन Design	3
2.2	कार्य का सिद्धान्त Principle of operation	5
2.3	त्रुटि के संकेत Fault Indications	5
2.4	मेन टर्मिनल स्ट्रिप का विवरण (पिछला भाग) Main terminal strip details (Rear side)	8
2.5	चैनल टर्मिनल स्ट्रिप का विवरण (पिछला भाग) Channel terminal strip details (Rear Side)	9
2.6	संस्थापन Installation	10
2.7	संचालन के निर्देश Operating instructions	11
2.8	केबल इंसुलेशन टेस्टर से परीक्षणTesting of insulation with Cable Insulation Tester	13
2.9	निदान हेतु कुछ सामान्य त्रुटि के संकेत Some common fault indications of ELD for diagnostics	14
2.10	आरडीएसओ एसपीएन/256/2002 के अनुसार प्री कमीशनिंग चेक लिस्ट Pre-commissioning check list for Earth Leakage Detector as per RDSO SPN/256/2002	15
2.11	ईएलडी हेतु बस बार से ली जाने वाली सिग्नलिंग पावर सप्लाई Signalling Power supplies to be taken from bus bar for ELD	18

सुधार पर्चियों को जारी करना
ISSUE OF CORRECTION SLIPS

इस पॉकेटबुक के लिए भविष्य में जारी की जाने वाली सुधार पर्चियों के क्रमांक इस प्रकार से रहेंगे:

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

केमटेक/एस/प्रोज/2019 – 20/एसपी 9/2.0 # XX दि .....

CAMTECH/S/PROJ/2019-20/SP9/ 2.0 # XX date .....

जहां "XX" सम्बंधित सुधार पर्ची की क्रम संख्या है (01 से शुरू होकर)

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

सुधार पर्चीयाँ जारी की गयीं
CORRECTION SLIPS ISSUED

सुधार पर्ची की क्रम संख्या Sr. No.of Correction Slip	जारी करने की तारीखDate of issue	संशोधित पृष्ठ क्रमांक एवं मद संख्या Page No. and Item no. modified	टिप्पणियाँ Remarks

डिसक्लेमर

यह स्पष्ट किया जाता है कि इस पॉकेटबुक में दी गयी जानकारी सिग्नल इंजीनियरिंग मैन्युअल, रेलवे बोर्ड प्रकाशनों तथा आर डी एस ओ प्रकाशनों के किसी भी वर्तमान आलेखों को विस्थापित नहीं करतीं है | यह दस्तावेज वैधानिक नहीं है वरन इसमें दिए गए निर्देश केवल मार्ग दर्शन हेतु हैं | यदि किसी बिन्दु पर विरोधाभास दृष्टीगोचर होता है, तब सिग्नल इंजीनियरिंग मैन्युअल, रेलवे बोर्ड प्रकाशनों, आर डी एस ओ मार्गदर्शन अथवा जोनल रेलवे के निर्देशों का पालन करें |

DISCLAIMER

It is clarified that the information given in this pocketbook does not supersede any existing provisions laid down in the Signal Engineering Manual, Railway Board and RDSO publications. This document is not statuary and instructions given are for the purpose of guidance only. If at any point contradiction is observed, then Signal Engineering Manual, Railway Board/RDSO guidelines may be referred or prevalent Zonal Railways instructions may be followed.

हमारा उद्देश्य

अनुरक्षण प्रौद्योगिकी और कार्यप्रणाली का उन्नयन करना तथा उत्पादकता और रेलवे की परिसम्पत्ति एवं जनशक्ति के निष्पादन में सुधार करना जिससे अंतर्विषयों में विश्वसनीयता, उपयोगिता और दक्षता प्राप्त की जा सके |

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.

यदि आप इस सन्दर्भ में कोई विचार और सुझाव देना चाहते हैं तो कृपया हमें इस पते पर लिखें :

संपर्क सूत्र : निदेशक (संकेत एवं दूरसंचार)
पत्राचार का पता : भारतीय रेल उच्च अनुरक्षण प्रौद्योगिकी केंद्र, महाराजपुर, ग्वालियर (म. प्र.) पिन कोड 474005
टेलीफोन : 0751-2470185
फैक्स : 0751-2470841
ई-मेल : dirsntcamtech@gmail.com

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

Contact person : Director (Signal & Telecommunication)
Postal Address : Centre for Advanced Maintenance Technology, Maharajpur, Gwalior (M.P.) Pin Code – 474 005
Phone : 0751 - 2470185
Fax : 0751 – 2470841
Email : dirsntcamtech@gmail.com

कैमटेक प्रकाशन CAMTECH Publications

CAMTECH is continuing its efforts in the documentation and up-gradation of information on maintenance practices of Signalling & Telecom assets. Over the years a large number of publications on Signalling & Telecom subjects have been prepared in the form of handbooks, pocket books, pamphlets and video films. These publications have been uploaded on the internet as well as railnet.

For downloading these publications

On Internet:

Visit www.rdso.indianrailways.gov.in

Go to *Directorates → CAMTECH Gwalior → Other Important links → Publications for download - S&T Engineering*

On Railnet:

Visit RDSO website at 10.100.2.19

Go to *Directorates → CAMTECH → Publications → S&T Engineering*

A limited number of publications in hard copy are also available in CAMTECH library which can be got issued by deputing staff with official letter from controllong officer. The letter should be addressed to Director (S&T), CAMTECH, Gwalior.

For any further information regarding publications please contact:

Director (S&T) – 0751-2470185 (O)(BSNL)

SSE/Signal - 7024141046 (CUG)

Or

Email at dirsntcamtech@gmail.com

Or

FAX to 0751-2470841 (BSNL)

Or

Write at

Director (S&T)
Indian Railways Centre for Advanced Maintenance Technology,
In front of Hotel Adityaz, Airport Road, Maharajpur,
Gwalior (M.P.) 474005

1.0 परिचय Introduction

The reliability of Signalling cables is important for working of the railway signalling system. Earth Leakage Detector (ELD) is a device which continuously monitors the earth leakage in signalling cables, loads (as point machine,signals etc.), circuits & power supply and gives alarm before earth fault, thereby increasing the efficiency and reliability of the Signalling system. The ELD conforms to RDSO specification no. RDSO/SPN/256 /2002. To understand the concept of ELD, one should have basic knowledge of Insulation resistance and Leakage resistance.

Insulation resistance

Insulation is the property of insulated material and can be measured in off line condition.

Leakage resistance

Leakage is also property of insulated material and can be measured on line condition.

On line System Insulation of Signaling system with respect to Earth

= Insulation of Power Supply + Insulation of Control circuits + Insulation of Cables+ Insulation of loads (all in parallel) = Leakage Resistance

For example if

Insulation of power supply (w.r.t Earth) =Rp
Insulation of one cable pair (w.r.t Earth) =Rc
Insulation of one load (any) (w.r.t Earth) =Rs

Then total insulation of (pair + load) $R1=1/Rc+1/Rs$

If we have n such circuits in our system and when all such circuits are working on common power supply (called bus bar), they all are in parallel. And equivalent parallel Insulation Resistance, will be given by the formula.

$$1/R=1/Rp+1/R1+1/R2+\ldots\ldots\ldots.1/Rn.$$

Where R is equivalent parallel Insulation Resistance.

This value of Insulation Resistance in parallel is called as On line System Insulation or Leakage Resistance.

A block diagram showing basic wiring connections of ELD is given below:

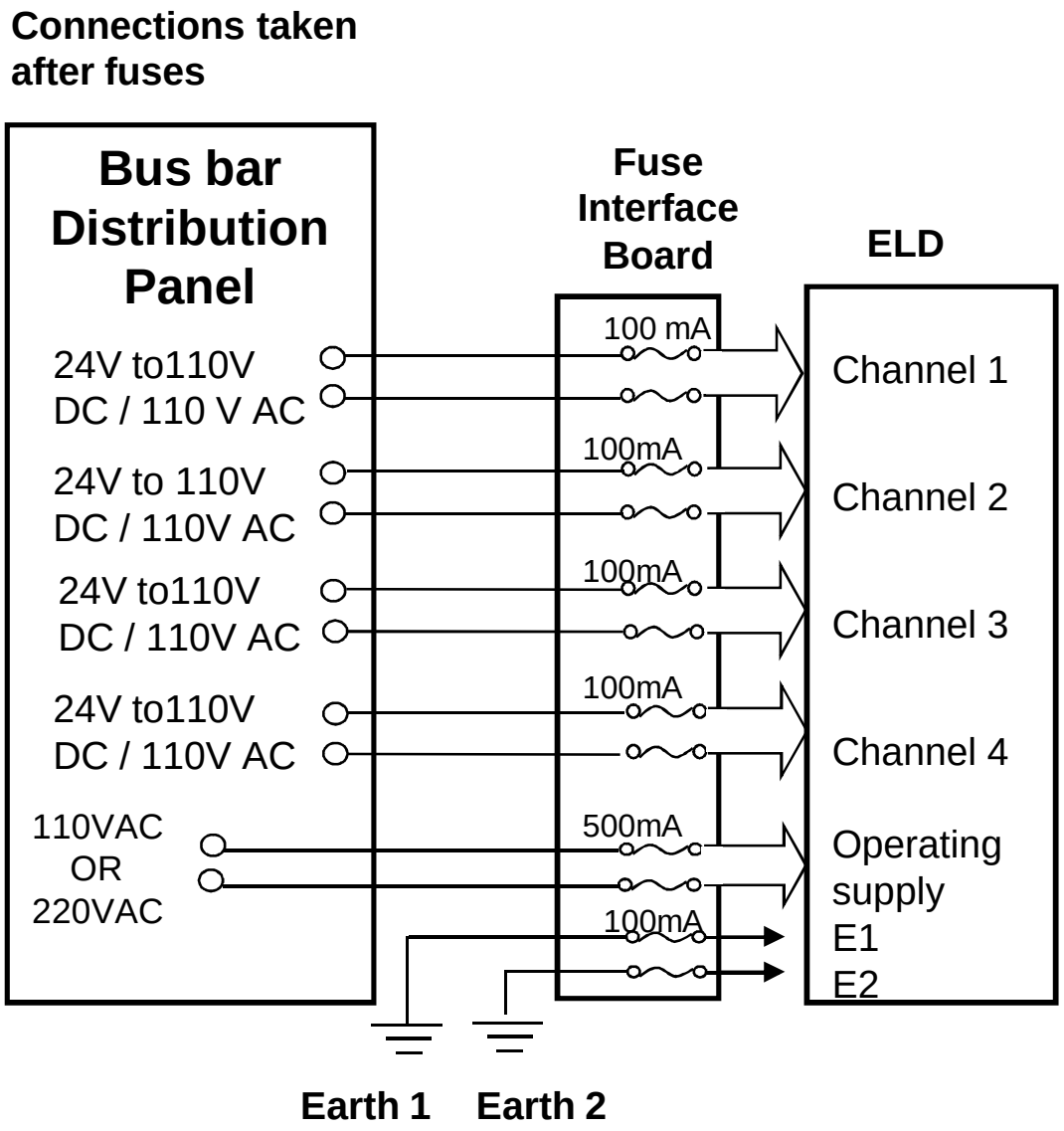


Fig. 1: Block diagram of wiring connections of ELD

How an ELD indicates leakage?

ELD constantly monitors & measures Leakage Resistance of Bus Bar with respect to Earth in on-line condition.
Leakage Resistance can be read on meter
When Leakage Resistance value drops below reference value, fault is detected; which is either announced as audio and/or visual alarm
Fault can be recorded by counter / Data logger
Reference value can be set anywhere between 1M to 2K (Factory setting on 2K)

If leakage shown by meter for a particular channel is permanent low leakage - <2K then fault may be -
a) External
b) Internal (In most cases in power supply)

If leakage shown by meter for a particular channel is intermittent low leakage - <2K then fault may be
a) External (In most cases cables or loads)
b) Internal (very rare)

For our study, we shall take the example of ELD of RDSO approved firm M/s Anu Vidyut, Roorkee.

2.0 अर्थ लीकेज डिटेक्टर मल्टी-चैनल टाईप 905 – बी2 (मै. अणु विद्युत) Earth Leakage Detector Multi-Channel type 905- B2 (M/s Anu Vidyut)

Brief description

This ELD has been designed for preventive maintenance of system insulation by monitoring its 'On-line' condition. It monitors and reads the insulation of all the cables and loads connected with power supply AC or DC (bus bar) in the form of leakage resistance. It measures 'On line insulation' (Leakage Resistance) directly on meter. Measurement Principle is based on superimposition of a DC measuring voltage. When Leakage Resistance value drops below reference value, fault is detected; which is either announced as audio and/or visual alarm. Fault can be recorded by counter / Data logger. Reference value can be set anywhere between 1M to 2K (Factory setting on 2K). ELD constantly monitors and measures Leakage Resistance of Bus Bar with respect to Earth in online condition.

It can also measure actual value of the insulation resistance of the signalling circuit during un-energised (OFF Line) condition through a built-in Cable Insulation Tester (CIT).

2.1डिजाइन Design

Basic unit comprises of two instruments in 19 inch sub rack:

- 4-Channel ELD for use on signaling circuits of 110V/60V/24V/12V in AC or DC –Online (Also available in 8 & 12 channel types)
- Cable Insulation Tester (CIT) - Off line

All channels of ELD and Cable Insulation Tester have a common Meter. If all the 4 channels are not in use then extra channels are covered with dummy plates. The Channel modules for AC and DC are different, hence their requirement has to be decided before ordering.

For More than 4-channels, say 8, 12 or 16- channels, add-on units of 4-channels are attached to the Basic unit. Various controls and indications are provided on the front plates of the 'Channel module' and 'Main module' (Cable Insulation Tester), the details of which are under 'Controls and Indications'.



Fig. 2: ELD equipment front view

On opening the rear panel of ELD, two types of terminal strips are seen as shown below. The first is MAIN STRIP which is common for all channels. It has tappings for connecting 110 V or 230 V AC supply. The second terminal strip or the CHANNEL STRIP is separate for each channel. It has various connections which are shown in fig.3 below.

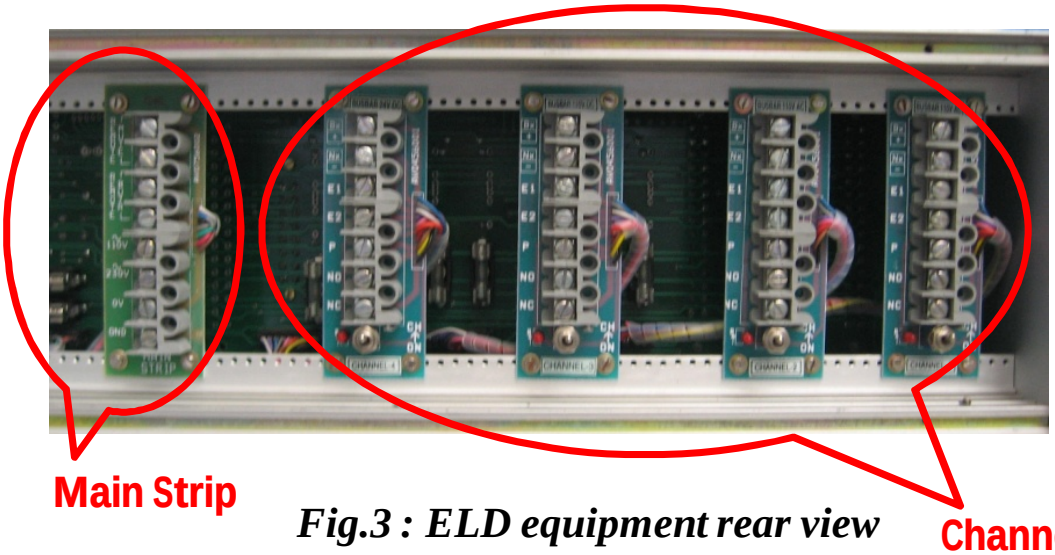


Fig.3 : ELD equipment rear view

2.2 कार्य का सिद्धान्त Principle of operation

Earth Leakage Detector measures on line insulation (Leakage Resistance) directly on meter.

Measurement Principle is based on superimposition of a DC measuring voltage.

ELD constantly monitors and measures Leakage Resistance of Bus Bar with respect to Earth in online condition.

Leakage Resistance can be read on meter.

When Leakage Resistance value drops below reference value, fault is detected; which is either announced as audio and/or visual alarm.

Fault can be recorded by counter / Data logger.

Reference value can be set anywhere between 1M to 2K (Factory setting on 2K).

2.3 त्रुटि के संकेत Fault Indications

Earth Leakage Detector has twin indicating arrangements:

(i) Through direct display of leakage Resistance on a D.C. analogue meter from infinity to nearly dead short (about 500 Ohm or zero) resistance (Black scale). The meter is common for all channels and Cable Insulation Tester (Red scale). For multi-channel equipment it can be selected through a Rotary Switch labeled SELECTOR.

(ii) (By way of lighting a RED LED on Channel Module front plate, labeled FAULT and initiation of an audible alarm which operates as per pre adjusted leakage limit. This arrangement is provided for alerting the maintenance staff to take suitable measures well in advance.

2.3.1 Controls and indications of Main Module

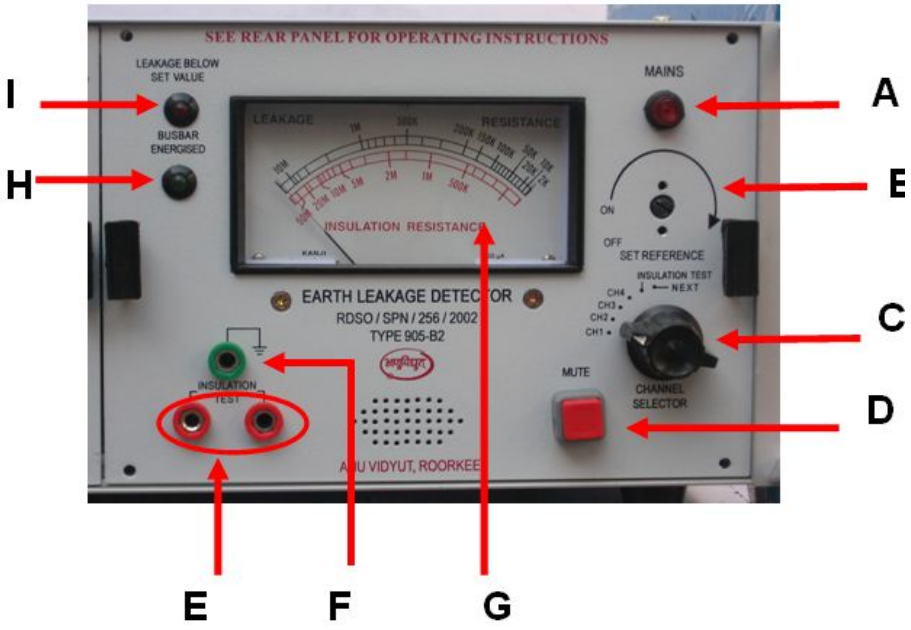


Fig.4: Controls & indications of Main module

Label	Description	Function
A	MAINS (RED neon lamp)	Glows when the mains is connected to the instrument.
B	SET REFERENCE	Normally OFF, Switched ON to set reference leakage at which ELD will announce fault of the selected channel (selected through SELECTOR switch).
C	CHANNEL SELECTOR	Selects (i) Any one channel from 1 to 4 (ii) 5th Insulation resistance meter (iii) 6th Next channel from additional unit if provided.
D	MUTE BUZZER	To stop the buzzer sound.
E	TEST	To connect the cable pair under measurement.
F	EARTH	To connect cable sheath (If earth) or earth.
G	METER	Reads bus bar to earth leakage or insulation resistance as per the position of switch.
H	PAIR ENERGISED (GREEN LED)	ON when cable pair connected to circuit (Measurement not possible**).**
I	LOW INSULATION (RED LED)	ON when insulation resistance is lower than or equal to the set value, otherwise OFF.

2.3.2 Controls and indications of Channel Module

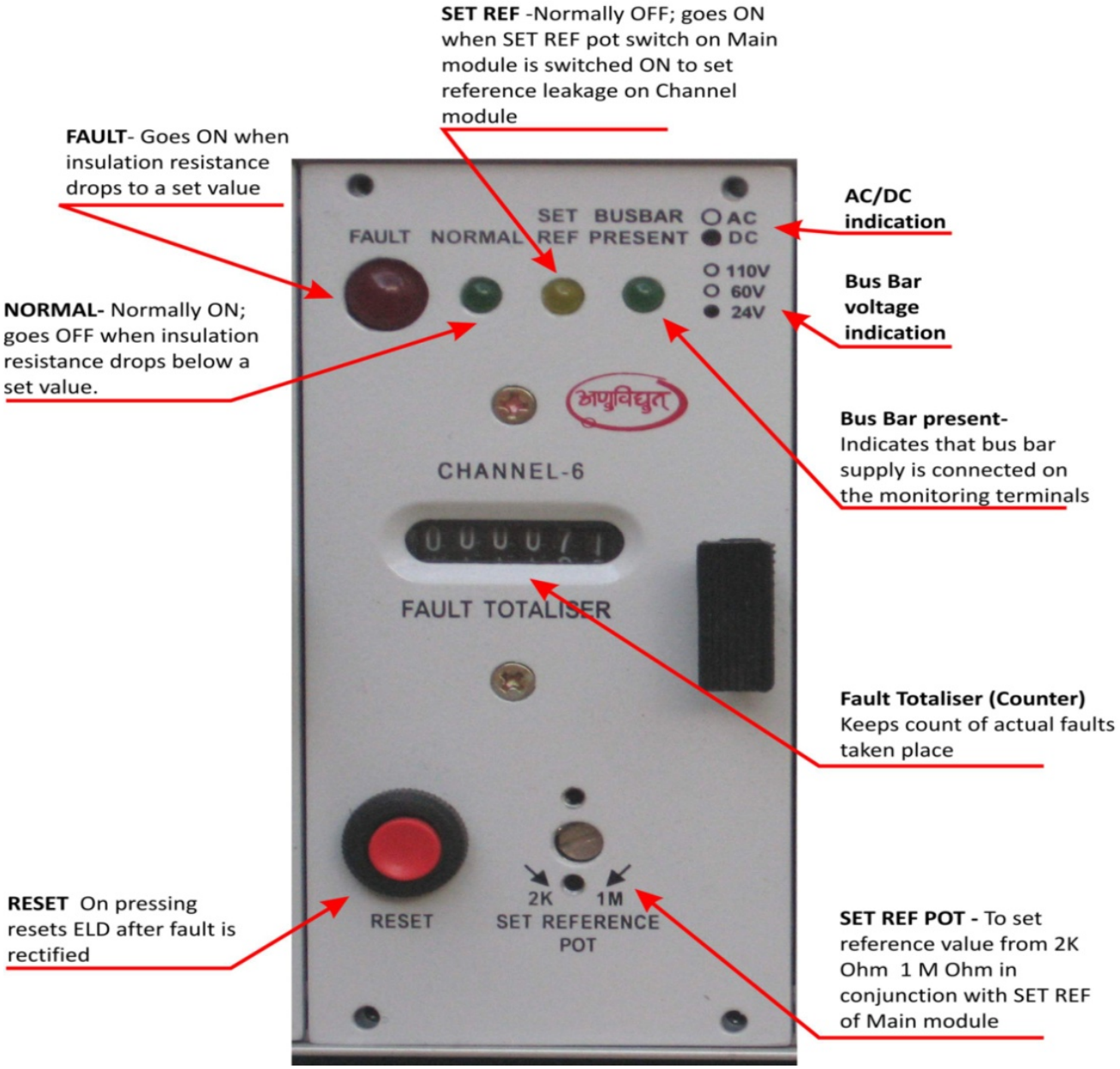


Fig.5: Controls & indications of Channel module

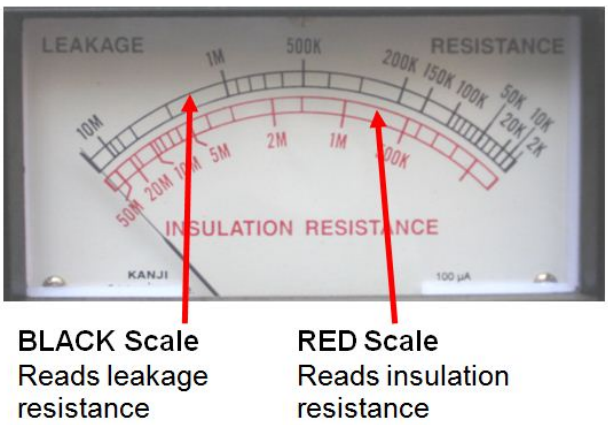
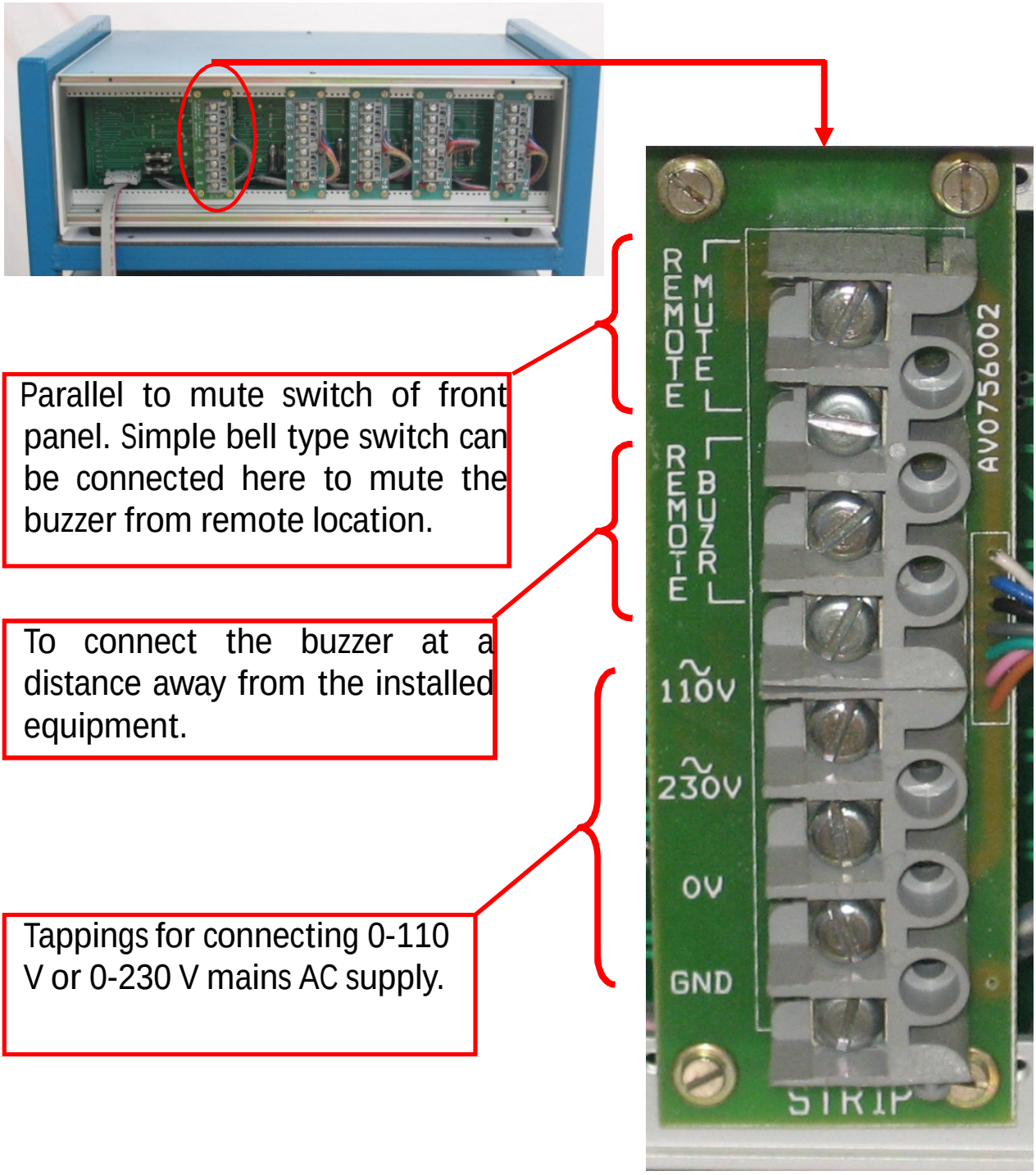


Fig.6: Meter for display of leakage and insulation resistance

2.4 मेन टर्मिनल स्ट्रिप का विवरण (पिछला भाग)
Main terminal strip details (Rear side)



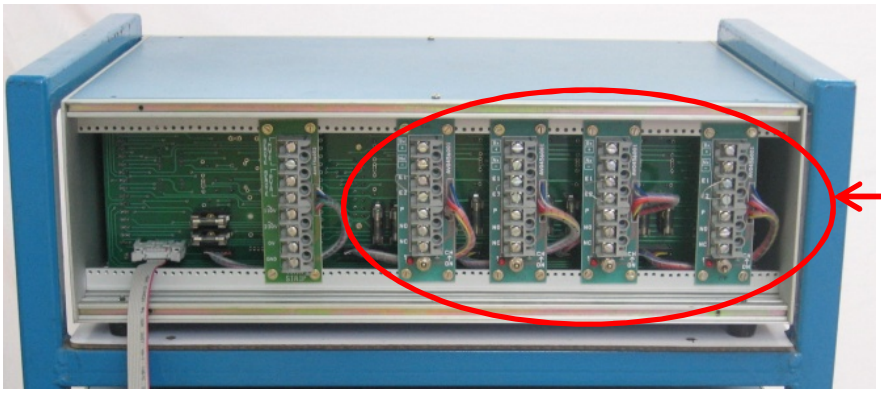
Parallel to mute switch of front panel. Simple bell type switch can be connected here to mute the buzzer from remote location.

To connect the buzzer at a distance away from the installed equipment.

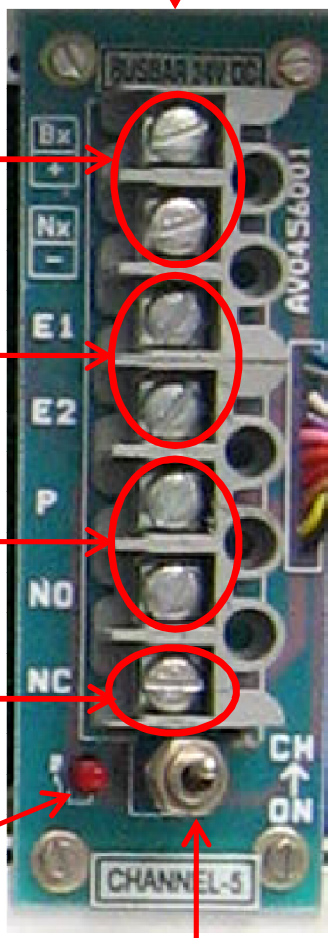
Tappings for connecting 0-110 V or 0-230 V mains AC supply.

Fig.7 : Details of Main Terminal strip (Rear side of ELD)

2.5 चैनल टर्मिनल स्ट्रिप का विवरण (पिछला भाग)
Channel terminal strip details (Rear Side)



Channel strip for AC/DC bus bar



Bx(+) & Nx(-)
Bus bar connections

E1 & E2
Two separate earth connections

P & NO
Digital input connection for data logger

NC
Not in use

Channel ON/OFF LED Indication

Channel ON/OFF Switch

Fig.8: Details of Channel strip (Rear side of ELD)

2.6 संस्थापन Installation

- Open the rear panel.
- Loop together all the terminals marked E1 on channel strips with a suitable wire.
- Loop together all terminals marked E2 of channel strips.
- Mount the ELD on the provided stand in the Relay Room near CT Rack.
- Connect AC/DC bus bar to Bx/+ and Nx/- terminals of relevant channel strip.
- Connect E1 & E2 to separate earths. In case of ring earth connect E1 & E2, with two separate wires. DO NOT SHORT CIRCUIT E1 & E2 on terminals side.
- Connect one conductor from instrument ground on main terminal strip to relay rack.
- Connect buzzer to REMOTE BUZZER terminals of Main terminal strip with extended buzzer wires.
- Connect a simple push switch (door bell type) to REMOTE MUTE terminals on extended wires.
- Connect P of each channel to the Data Logger digital common.
- Connect N O of each channel to the empty points at Tag Block. (In normal condition of ELD P & N O remain short and in Fault condition P & N O remain open).
- Finally connect the instrument with available power of 230V AC or 110V AC to the terminals marked '230V~' and '110V~' on main terminal strip. '0' is marked for neutral.

2.7 संचालन के निर्देश Operating instructions

- After the instrument is given Power, switch ON the connected channels from the rear terminal strip.
- The buzzer will sound and red light will glow on each channel. Mute the buzzer from the mute switch.
- Check the Leakage resistance on the Meter panel, one by one for each channel after selecting through the Channel selector.
- In case the meter reading of a channel is > 2K (say for example 10K or 100K Ohms) push the reset switch of the respective channel (for about 3 secs). Channel will reset with Red light (Fault) getting off and Green light (Normal) appearing.

If leakage shown by meter is below 2K continuously then take action as follows:

2.7.1 For non-IPS type power supply

- Check earth connections. The resistance between two Earths should be < 10 Ohms.
- If this is an AC Channel it should be connected to the Bus-bar.
- The above two conditions also cause FAULT indication even if the Leakage conditions are alright.
- If it is observed that on the panel meter the reading comes down to less than 2K, improves for some time and again falls down to 2K after sometime.
- In such cases investigate during operation, for which particular circuit (bus-bar) the Leakage resistance reading becomes < 2K.

By ascertaining this we can locate low insulation pair/pairs with the help of Insulation Tester (part of ELD).

In case the reading remains continuously <2K or 2K, investigate as follows –

- For AC Bus bar remove transformer Earth connection and check ELD meter reading for improvement in Leakage resistance**.**
- For DC BUS BAR remove charger's Earth connection and check ELD meter reading for improvement in Leakage resistance**.**
- If reading remains <2K then remove Battery Bank (Both connections) and check ELD meter reading for improvement in Leakage resistance**.**
- If meter reading remains <2K, (AC or DC bus bar) perform all the operations of the associated BUS BAR.
- During any operation if leakage reading becomes >2K, note that operation.
- Now with the help of insulation tester find out low insulation pair/pairs.

2.7.2 For IPS type power supply

- In case the bus-bar supplies are taken directly from the IPS and the leakage is below 2K continuously then change that module of the IPS and check leakage reading on ELD.

- If it is not possible to change the module, check the current to the load (On IPS Amp meter) and compare it with similar load condition in another or same station.

- If there is a large difference (about 2 times), then be sure that the leakage condition is caused by the IPS system. To ensure this, check all conductor pairs associated with this IPS module with the help of Insulation Tester.

2.8 केबल इंसुलेशन टेस्टर से परीक्षण
Testing of insulation with Cable Insulation Tester

- Connect earth lead (GREEN) on EARTH terminal.
- Connect measuring leads (RED) to TEST.
- Keep Channel Selector switch in INSULATION TEST position.
- Touch RED leads to GREEN lead, meter needle will move fully towards right side and Green LED (BUS BAR ENEGISED) glow momentarily and red LED (Leakage below set value) start glowing. It shows that instrument is working properly.
- Now connect earth lead probe (GREEN) to cable sheath or earth.
- Touch measuring lead probes (RED) to outgoing cable pair on CT rack whose insulation is to be tested.

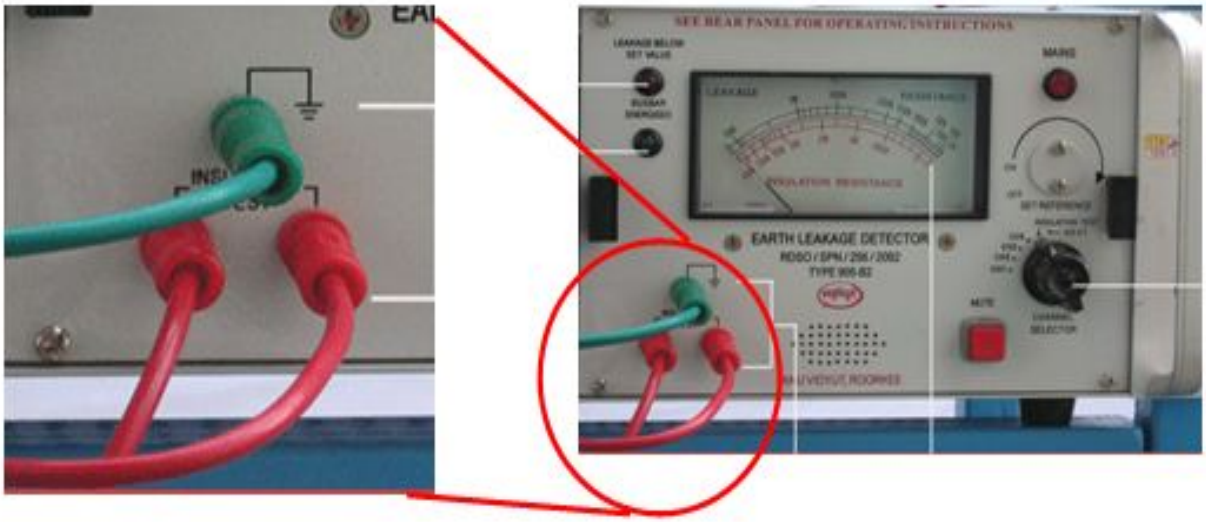


Fig.9 : Connections for testing of insulation

- If the pair is energized, Green LED (PAIR ENERGISED) will start glowing and meter will not show any reading. Connect to another pair, if Green LED does not glow and meter shows a reading (RED SCALE), then this is the insulation resistance of the pair with respect to earth.

By repeating this procedure we can find insulation of all pairs.

In case any energized pair is to be measured, follow proper procedure for disconnection.

Remove both links and measure the insulation.

After detecting low insulation pair/pairs, Meggering* of that pair can be done.

(*For instructions on meggering refer pamphlet on "Testing & Meggering of Signalling Cable" prepared by CAMTECH)

2.9 निदान हेतु कुछ सामान्य त्रुटि के संकेत
Some common fault indications of ELD for diagnostics

Indication	Fault
Bus Bar LED on and meter showing actual reading FAULT & NORMAL LED off	The switch on the rear terminal strip in off position
FAULT & NORMAL both LED on	Channel faulty
Meter showing above 10M ohm Fault light and Buzzer ON, ELD not being reset.	E1 & E2 are not properly connected or high resistance between them.

2.10 आरडीएसओ एसपीएन/256/2002 के अनुसार प्री कमीशनिंग चेक लिस्ट
Pre-commissioning check list for Earth Leakage Detector as per RDSO SPN/256/2002

Station..... Division.....
Date of commissioning..... Serial No.....
ELD procured through Manufacturer...../ Contractor...../Railway (COS)
ELD wired by : Manufacturer ...../ Contractor...../Railway.....
Note: These are the technical guidelines only. The hardware, wiring material, earth etc. required to implement these guidelines shall be covered in the commercial agreement with the executing agency.

Sr. No.	Description	Requirement	Result
1.	Availability of space	½ m from side 1 m from back 1 m from front	
2.	ELD mounting stand size (Provided with equipment)	½ m X ½ m	
3.	Input power supply	220 V AC/110 V AC	
4.	Type of wire to be used for various connections	1.0 mm diameter indoor cable	
5.	No. of wires required		
	(i) Operating supply	2 wires	
	(ii)Bus bar connection for 4 Ch 8 Ch 12 Ch	 8 wires 16 wires 24 wires	
	(iii) Measurement Earth (E1,E2)	2 wires	
	(iv) Data logger connection for 4 Ch 8 Ch 12 Ch	 5 wires 9 wires 13 wires	

Sr. No.	Description	Requirement	Result
	(v) Remote buzzer optional for 4 Ch 8 Ch 12 Ch	 2 wires 4 wires 6 wires	
	(vi) Remote buzzer optional for 4 Ch 8 Ch 12 Ch	 2 wires 4 wires 6 wires	
6.	Provision of different earths (i) Supply 220 AC (ii)measurement earths (E1,E2) long life type	1. Electric earth 2. Two separate earth one should be cable/ armoured sheath and second should be another unused earth, NO SEPARATE EARTH PIT REQUIRED FOR ELD. Or 2. Wires from ring earth (having more than 3 earths)	
6.1	Resistance between two earth	Less than 10 ohms.	
7.	Wiring board with fuses	Yes	
7.1	Wiring board fuse rating i) Bus bar ii)Measurement earth iii) Power supply	 100 mA 200 mA 2 A	

Sr. No.	Description	Requirement	Result
8.	Insulation resistance of various items (as per RDSO requirements) i) Cables ii) Signals iii) Charges iv) Bus bar transformer v) IPS output vi) Insulation of battery bank in between earth and battery body only	 More 10M ohms More 50M ohms More 50M ohms More 50M ohms More 50M ohms More 50M ohms	
9.	Measure earth to bus bar (DC detecting) voltage: After installation of ELD	Measured DC voltage should be: In AC channel	
	When leakage resistance is:		
	1M ohm to 10M ohms or above	About 100 V to 150 V	
	100K ohm to 1 M ohm	About 25 V to 100 V	
	2K ohm to 100K ohm	About 0.5 V to 25 V	
	When leakage resistance is:		
	1M ohm to 10M ohm or above: -ve Bus bar +ve Bus bar	 About 100 V to 150 V About 100 V to 150 V ± bus bar voltage	
	When leakage resistance is:		
	100K ohm to 1M ohm or above -ve Bus bar +ve Bus bar	 About 25 V to 100 V About 25 V to 100 V ± bus bar voltage	

Sr. No.	Description	Requirement	Result
	When leakage resistance is:		
	2K ohm to 10K ohm -ve Bus bar +ve Bus bar	 About 0.5 V to 25 V About 0.5 V to 25 V ± bus bar voltage	
10.	Ensure before putting wiring fuses that AC bus bar connected to AC channel and DC bus bar connected to DC channel as per channel voltages	Yes	
11.	Ensure bus bar name sticker on ELD channel for identification	Yes	
12.	Ensure earth connection soldered on earth side for corrosion free connection.	Yes	

2.11 ईएलडी हेतु बस बार से ली जाने वाली सिग्नलिंग पावर सप्लाई
Signalling Power supplies to be taken from bus bar for ELD

i. 110 V DC for points
ii. 110 V AC for Signals (each zone)
iii. 110 V AC for Track circuits (each zone)
iv. 24 V DC for Axle Counter (each zone)
v. 24 V/60 V DC for Relays Internal
vi. 24 V DC for Relays External

गुणवत्ता नीति

"आर. डी. एस. ओ." लखनऊ में हम सतत सुधार और ग्राहक मूल्यांकन प्राप्त करने हेतु गुणवत्ता प्रबंध प्रणालियों को आवधिक समीक्षा के माध्यम से रेलों में यात्री एवं माल यातायात की बढ़ती आवश्यकताओं, मांग और अपेक्षाओं को पूरा करने के लिए गुणवत्ता प्रबंध प्रणाली की व्यावहारिक आवश्यकताओं और अनवरत सुधारों को पूरा करने के समर्पण, गुणवत्ता उद्देश्यों को निर्धारित करके अनुसंधान, अभिकल्पों और मानकों में उत्कृष्टता के माध्यम से वैधानिक और नियामक अपेक्षाओं का अनुपालन करते हुए सुरक्षित, आधुनिक और किफ़ायती रेल प्रौधोगिकी विकसित करने हेतु सेवाओं को बनाए रखने और अद्यतन पारदर्शी मानकों हेतु प्रतिबद्ध हैं । इसे संगठन के अंदर संसूचित एवं लागू किया गया हैं तथा सभी संबन्धित इच्छुक पक्षकारों को भी उपलब्ध कराया गया हैं ।"

Quality Policy

"We at RDSO Lucknow are committed to maintain and update transparent standards of services to develop safe, modern and cost effective railway technology complying with statutory and regulatory requirements, through excellence in research, designs and standards by setting quality objectives, commitment to satisfy applicable requirements and continual improvements of the quality management system to cater to growing needs, demand and expectations of passenger and freight traffic on the railways through periodic review of quality management systems to achieve continual improvement and customer appreciation. It is communicated and applied within the organization and making it available to all the relevant interested parties."



INDIAN RAILWAYS

Centre for Advanced Maintenance Technology

Maharajpur, Gwalior (M.P.) Pin Code – 474 005