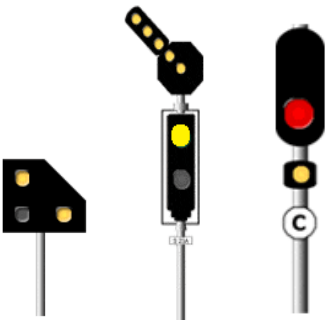
सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

Maintenance Instructions for
LED Signals



CAMTECH/S/PROJ/2019-20/SP5A
March 2020

अअमा सं RDSO
रेल अग्रदूत Transforming Railways
An ISO 9001:2008 Certified Organisation
उत्कृष्ट रखरखाव प्रौद्योगिकी केन्द्र
EXCELLENCE IN MAINTENANCE
Indian Railways
Centre for Advanced Maintenance Technology
Maharajpur, Gwalior (M.P.) - 474005

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Maintenance Instructions for LED SIGNAL

1. Introduction

This is surface mounted Light Emitting Diode (LED) based signal lighting unit with transparent cover of UV painted in matte (dull) finish, to prevent reflection of sunlight or headlight of loco. LED based signal lighting unit is the replacement of the hitherto used signal lamp.

LED signal has two components - LED aspect and current regulator. LED aspects suitably fits into light unit frame in the existing CLS housing and the current regulator replaces the CLS transformer. LED based signal units work at 110 Volt ± 20% on both AC and DC supply.

2. Advantages

LED signal unit offers the following advantages.

- Life of LED signal is about 1,00,000 hours.
- Provides comprehensive protection against lightening and/or surge voltages.
- Provides higher noise immunity and failure free operation.
- Focusing is not required.
- Power consumption is reduced to about 50%.
- Requires very low maintenance.

Maint. Instructions for LED Signals March '20

3. Specifications

Old Specifications

RDSO/SPN/153/2011 Revision: 4.1 (Draft) - For Main and Secondary Signal Lighting Units.

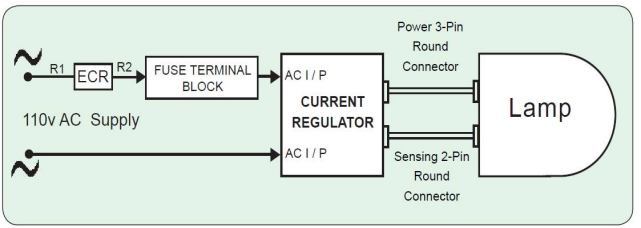
RDSO/SPN/199/2010 Revision: 1.0 - For Integrated Signal Lighting Units.

New Specifications

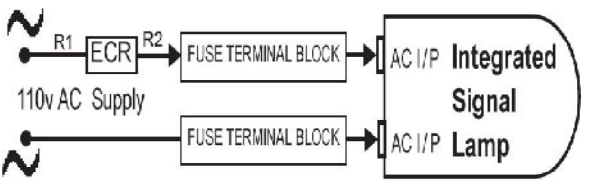
RDSO Spec. No. RDSO/SPN/199/2010 Rev. 1.0 - For Main colour light signals (Integrated Signal Lighting Units)

RDSO Spec. No. RDSO/SPN/153/2018 Rev. 5.0 (Draft) - For Subsidiary colour light signals (Shunt, Route Calling-On)

(i) Main Signal Wiring Diagram as per RDSO/SPN/153/2011 Revision: 4.1



(ii) Main Signal Wiring Diagram as per RDSO/SPN/199/2010 Revision: 1.0



4. Important parameters

- The minimum visibility distance of Main signal LED signal lighting Units shall be 600 m. in clear daylight with peak sunrays at rated voltage.

- The minimum visibility distance of Direction type Route Indicator with three lit LED signal lighting units shall be 400 m. in clear daylight with peak sun rays at rated voltage

- The minimum visibility distance of LED signal lighting units, other than Main and Route signal lighting units, shall be 200 m in clear daylight with peak sunrays at rated voltage.

Operating parameters

Parameter	Main Signal	Calling-on Signal	Route Lighting unit	Shunt Lighting unit
Rated voltage at Input terminals of Current Regulator	110V AC +25 %	110V AC ± 20%	110V AC ± 20%	110V AC ± 20%
Current at rated voltage per unit at Input terminals of Current Regulator	140 mA +10%, -20% (rms) *	150 mA +10%, -20% (rms)	25 mA ± 5%(rms)	55 mA ± 5%(rms)
Colour	Red ,Yellow Green	Yellow	Lunar White	Lunar White

In **blanking mode**, a Main Signal Lighting Unit shall extinguish when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is not less than 40% of nominal illumination due to a failure or any other reason. In such case, current regulator should not draw input current more than 30 mA at maximum rated voltage.

In **non-blanking mode**, a Main Signal Lighting Unit shall remain lit when input current drawn by the current regulator falls outside specified limits of rated input current or illumination falls to a value which is less than 40% of nominal illumination due to a failure or any other reason. In such case, input

current drawn by current regulator shall be limited to less than 40 mA to ensure dropping of ECR. Limit on input current shall apply when illumination has deteriorated to a value, which is not less than 40% of nominal illumination.

As per RDSO guidelines, for RED aspect, Non – Blanking mode should be selected in Current Regulator & for Green Aspect, the Blanking mode should be selected. For Yellow aspect, it should be selected based on installation.

5. Measurement of voltage

Measure the rated voltage at Input Terminals of Main LED Signal Lighting unit or in location box.

(i) Main Signals

Specified range in rms @ 50 Hz –
82.5 V to 137.5 V AC
For use in tunnels in Metro Railway Kolkata
Specified range in rms @ 50 Hz –
88 V to132 V AC

(ii) Subsidiary Signals
(Route, Calling –on & Shunt)
Specified range in rms @ 50 Hz –
88 V to 132 V AC

6. Measurement of Current

Measure the current at rated voltage per unit at CT Rack or LED Lamp Proving Relay coil terminal.

(i) Main Signals

Specified range in RMS @ 50 Hz –
110 to 150 mA

For Main Signals of High Speed lines (165 Kmph)
Specified range in RMS @ 50 Hz –
60 to 100 mA

For Main Signals in tunnels in Metro Railway Kolkata
Specified range in RMS @ 50 Hz –
112 to 154 mA

(ii) Shunt Signals
Specified range in RMS @ 50 Hz –
52.25 to 57.75 mA

(iii) Route Signals
Specified range in RMS @ 50 Hz –
23.75 to 26.25 mA

(iv) Calling-On Signals
Specified range in RMS @ 50 Hz –
120 – 165 mA

7. Earthing, Fuse & MOV

Sr. No.	Item	Specified value/range
1	Signal unit earthing	<10 Ohms
2	MOV connected to MOV I/P terminals of aspect.	
	(i) Integrated type LED Signal units as per RDSO Spec. 199/2010 Rev. 1.0	175 Volts
	(ii) Subsidiary LED Signal units as per RDSO Spec. 153/2018 Rev.5 (Draft),	200 Volts
3	Fuse provided in fuse terminal block.	

Sr. No.	Item	Specified value/range
	(i) Integrated type LED Signal units as per RDSO Spec. 199/2010 Rev. 1.0,	400 mA
	(ii) Subsidiary LED Signal units as per RDSO Spec. 153/2018 Rev. 5 (Draft),	630 mA
4	Glass fuse inside the LED Signal Lamp is of the rating	
	(i) Main Signal	NIL
	(ii) Shunt Signal	250 mA
	(iii) Route signal	250 mA
	(iv) Calling-On Signal	630 mA

8. Maintenance

(a) Clean the LED signal lighting units, all terminals and current regulator periodically with soft cloth.

(b) Check that all terminals in CT racks, junction box, LED signal lighting unit, CR and fuse terminal block are tight and clean.

(c) Check fixing of protective caps on the input supply terminals of CR and protective covers on the jumpers selection where applicable. Otherwise it may be the cause of false operation.

(d) Ensure that interconnecting cable between CR and LED/Signal lighting Unit is properly connected and tight.

(Not applicable for Integrated type LED lighting units).

(e) Ensure that mounting screws of LED Signal Lighting Unit, CR and fuse terminal block are properly fixed.

Note:

LED Signal Unit should be mounted on 4 holes provided in existing signal unit. (In case of replacement in existing signal unit, Outer lens, Inner lens, CLS transformer, MECR, Bulb holder & Bulb should be removed.)

(f) Tighten all terminals in CT rack, junction Box, LED Signal Lighting Unit, Current Regulator, Route Signals, Shunt Signals and Calling-On Signal periodically or as per instructions given by the railways.

(g) Ensure that mounting bolts/screws have been tightened for LED signal lighting unit and current regulator unit once in a six month or as instructed by railways.

(h) Ensure that LED signal does not vibrate during the running of trains.

(i) Ensure that the all LEDs of LED signal lighting unit are properly lit.

(j) The connections in the location boxes should be cleaned for removing oxidation, rusting etc. regularly.

(k) After any check opening/refitting CRC spray should be provided.

(l) The LED signal lighting unit clear lens should be cleaned once in a six month to remove the dust with anti-static soft cloth or as per instruction given by the railways.

(m) Ensure that the AC supply used for lightening the LED Signal Lighting units is pure sine wave (i.e.50Hz±2 Hz).

(n) Check periodically and ensure that signal housing door is kept shut and locked properly.

(o) Safety validation test as per the pre-commissioning check list may be conducted once in a year.

9. Testing

The following testing should be carried out as per schedule of maintenance (Monthly) or as per the instructions issued by the Railways:

9.1 Route Signal

The signal is cleared for diversion and all the five route LED lighting units are lit in parallel. Ensure that ECR is pick up with five route LED signal lighting units lit. (UECR PU - 90 mA, DA- 60 mA)

On removal of one route LED unit

– UECR should remain pick up.

(As current = 4X 25mA =100mA)

On removal of 2nd route LED unit

– UECR should remain pick up.

(As current = 3X 25mA =75mA)

On removal of 3rd route LED unit

– UECR should drop.

(As current = 2X 25mA =50mA

which is less than DA value =60 mA)

Note:

As per RDSO Spec. No. STS/E/Relays/AC lit LED Signal/09-2002 Amdt. 1. The pick up current of AC LED UECR is 90 mA when connected in LED lamp circuit.

If on clearing the signal for diversion, only three route LED lighting units are lit then the UECR shall not pick up as the three lamps will draw a current of 25mA X 3 = 75 mA only.

UECR shall pick up only when minimum 4 route LED lighting units are lit on clearing the signal for diversion. In this

case the current drawn shall be 25 mA X 4 = 100 mA which is more than the PU value.

9.2 Main Signal

(a) Ensure that cascading of the signals is working properly.

(b) Ensure that current regulator draw proper current while LED signal lighting unit is lit and the concerned ECR is picked up.

(c) Ensure that most respective aspect is in non-blanking mode and other aspects are in blanking mode.

(d) Check correspondence of ECR for main signals by disconnecting the interconnecting cable.

9.3 Insulation resistance test

Check the insulation resistance as given below after every six months or as per instructions issued by the Railways:

- Check that insulation resistance for LED signal lighting unit, current regulator and health monitor unit with 500 Volt megger between the body and the current carrying terminals shall not be less than 100 M Ohms.

- Check that the insulation resistance of cable conductor connected for lighting

the LED signal lighting unit shall not be less than 100 M Ohms.

9.4 Check for lamp, CR and Correspondence of ECR & Fuse terminal block.

(a)	After taking off signal remove the fuse in the Fuse terminal block.	(i) Aspect at site extinguishes and more restrictive aspect lights (In case of RED aspect signal in rear goes to danger) (ii) Fuse blown indication appears on terminal block. (iii) ECR of the aspect drops
(b)	Restore the fuse in fuse terminal block	(i) Aspect at site lights normal (ii) ECR of the aspect picks up

9.5 Check for Lamp, CR and correspondence of ECR

(a)	After taking OFF an aspect disconnect interconnecting cable between CR and LED Signal Lighting Unit from LED Signal lighting Unit (In case there are two Inter connecting cables between CR and LED Signal Lighting Unit– Disconnect the Cable other than optical sensing cable. The cable with 2 pin connector is optical sensing cable.)	(i) Aspect at the site extinguishes and more restrictive aspect lights (In case of Red aspect, signal in rear goes to danger.) (ii) ECR of aspect drops.
(b)	Reconnect disconnected cable and take off the aspect again	(i) Aspect at site lights normal (ii) ECR of the aspect Picks up

(c)	Disconnect the optical sensing cable (i.e. 2 pin round cell connector) from LED signal lighting unit.	(i) In case CR is configured for Non-blanking mode. Aspect at site lights with deteriorated illumination with input current of CR restricted to < 40 mA. (ii) In blanking mode Aspect at site Extinguishes with input current restricted to < 30 mA. (iii) More restrictive

		aspect lights (In case of Red aspect, signal in rear goes to danger. (iv) ECR of the aspect drops
(d)	Reconnect disconnected cable	(i) Aspect at site lights normal. (ii) ECR of the aspect picks up

10. General Precautions

1. LED signal lighting units shall only be used with LED ECRs as per RDSO specification STS/E/Relays/AC Lit LED Signal/09-2002 as applicable.

2. LED signal lighting unit should be stored in suitable cover provided with thermocol packing on the inner side surface.

3. True RMS Meter must be used for measurement of current and voltage in the input supply.

4. As per Pre-commisioning Check List, LED Signal Lighting unit should be kept in Burn in test for 168 hours before putting in to use.

5. Individual ECR is provided for every signal aspect

6. Every Aspect has Individual return path.

7. Ensure that all connections are proper and tight.

8. Ensure MOV is connected to MOV I/P terminals of aspect

9. 400mA fuse should be used in fuse terminal block. Don't use fuse rating more than 400ma for integrated signals.

10. 630mA fuse should be used in fuse terminal block. Don't use fuse rating more than 630ma for Main signals.

11. Monsoon precautions

Ref.: Annexure to letter no. 2015/SIG/SF/Monsoon Precautions dtd. 12.05.2016.

(a). All signal units shall be examined to check the possibility of water seepage/leakage inside the Signal Units.

(b). Signal units have to be sealed with proper gasket to prevent seepage of moisture/water. All signal unit lamps should be completely sealed including any holes to prevent moisture ingress.

(c). Additionally a plastic cover wherever required shall be provided and on the back of the Signal units, in case, leakage/seepage persists.

(d). After the first showers, the signal units have to be re-examined and action to be taken to avoid water seepage/leakage.

(e). Any mechanical discrepancies/damages in the signal units should be attended to ensure that the unit cover fits properly on the body and the locking arrangement is proper and watertight.

(f). Strengthening of foundations of signal posts/location boxes should be done wherever required.

12. Do's & Don'ts

Do's

- Select Blanking / Non-blanking mode in Current Regulator as desired. (ONLY for YELLOW aspects)

- All terminals in CT racks, junction box, LED signal lighting unit, are tight and clean.

- Connect only110V AC supply to the units, as these are AC lit units.

- Polycarbonate cover of LED signal lighting unit may be cleaned with soft cloth periodically.

- Ensure that protective caps are replaced once terminations and selections are made.

- Ensure MOV is connected between input terminals of MOV connector
- Ensure of fixing of protective caps on the input supply terminals of Aspect
- Ensure fixing of protective covers on the jumpers selection where applicable
- Before Commissioning, follow the steps provided in Pre-commissioning checklist

Don'ts

- Don’t leave loose connectors or wires at LED Signal lighting units. This may cause false operations.
- Don’t use fuse more than the specified ratting, always use rated fuse.
- Don’t carry units by its cables.

- Do not give 110 V DC supply to the units.

- Do not wipe LED signals with moist OR dusty cloth.

- Do not try to open the unit as it is sealed for environmental protection.

- Do not use fuse other than 400 mA in the circuit

- Do not ignore selection of protection mode. (Blanking / Non-blanking), in case of YELLOW aspects.

■■■

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 ।“

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“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.”

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