



इरिसेट

गाड़ी डिटेक्शन प्रयोगशाला
प्रयोग सं : टी डी एल - 11

IRISET

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TRAIN DETECTION LABORATORY
EXPERIMENT NO: TDL – 11

नाम

Name : _____

अनुक्रमांक

Roll No : _____

पाठ्यक्रम

Course : _____

दिनांक

Date : _____

प्राप्तांक

Marks Awarded : _____

अनुदेशक के आद्यक्षर

Instructor Initial : _____

UNIVERSAL AXLE COUNTER - 3D

(IRS specification S 42)

INTRODUCTION:

axle counter field unit / counting device is the track side electronic assembly that energize the axle detectors for 'Detecting the Passing of Wheels', 'Determining the Direction of Movement' and 'Keeping the Counting of Wheels'. It transmits the 'count' and 'health' information to the central 'Evaluator'. Based on the information detected, central 'Evaluator' determines 'status' of track section whether 'clear' or 'occupied'.

It is manufactured by

- CEL – Central Electronics Limited
- CGL – Crompton Greaves Limited
- BYCULLA- Central .Rly
- PODUNUR-Southern .Rly

3D configuration Installed in TD LAB is 'PODUNUR-Southern Rly' make.

EQUIPMENTS:

Indoor Equipment:

1. Central evaluator
2. Reset Box
3. Line verification box (LV)
4. SUPR, EVR relays
5. Power supply

Outdoor Equipment:

1. Electronic junction box (EJB)
2. Axle detectors mounted on flange of rail. (TX/RX coils)
3. Trolley suppression track circuit at each end of track section.
4. Power supply

WORKING PRINCIPLE

- a) This system consists of Electronic junction box (EJB) housed in location boxes adjacent to the track with associated axle detectors (TX/RX coils)
- b) The axle detectors 'TX coils' of each channel at each end of track section are fed with 5 KHz. AC voltages. This feeding of frequency is by concerned EJB.
- c) A transmitter coil is fed with alternating current which generates alternating electro-magnetic flux and associated receiver coil gets induced EMF through flux linkages.
- d) TX coils are connected outside of the rail and RX coils are connected inside of the rail.
- e) However these flux lines get interrupted when a wheel passes between transmitter and receiver coils which results in reduction in amplitude in receiver coils induced voltage.
- f) These changes in amplitude in receiver voltages are used for wheel sensing and are processed by EJB to central evaluator for tallying and deciding the status of section.
- g) Thus axle counter is counting the axles coming into the section as 'IN COUNT' and counting the axles going out of the section as 'OUT COUNT'.
- h) For counting purpose, occupation of trolley suppression track circuit is compulsory.
- i) If 'IN COUNT' and 'OUT COUNT' are equal then the section is decided as 'CLEAR' else 'OCCUPIED'.

SYSTEM DESCRIPTION:

- Now a day's use of this axle counter is minimized for future installation.
- This axle counter uses electronic hardware for logics and counting.
- With the help of this axle counter make we can monitor track section max up to 15 km only.
- It is in use for monitoring of track sections in yard – berthing portions of loop lines & main lines, point zone area, siding, block sections in IBS.
- The system is designed to work in Non RE/RE areas.
- Disturbance in staggering of channels is eliminated by installing inductors on same base plate on same rail.
- This system is compatible for 2D, 3D, 4D.
- Co-operative Reset and Preparatory Reset introduced.
- 24 VDC supply from battery charger suitable for 'Axle Counter' which is backed up by 120 AH capacity batteries is fed to the system through 2 - core aluminum cable of 25 Sq mm.
- Where IPS is available, 24 V power supply is taken from IPS.

EQUIPMENT DESCRIPTION

- Equipment consists of evaluator unit with inbuilt DC-DC converter.
- Evaluator unit consists different 10 boards as below

Sr no	Names of cards
Card no. 1	Filter, attenuator, Amplification and rectifier card for A,B,C & D channels
Card no. 2	Filter, attenuator, Amplification and rectifier card for E,F,G & H channels
Card no. 3	Pulse shaper card for A,B,C & D channels
Card no. 4	Pulse shaper card for E,F,G & H channels
Card no. 5	Logic card for E,F,G & H channels
Card no. 6	Logic card for A,B,C & D channels
Card no. 7	Counter comparator card with display unit
Card no. 8	General supervisory card
Card no. 9	Relay driver card
Card no. 10	DC-DC converter

1) Filter, attenuator, Amplification and rectifier card for A, B, C & D channels -

Card no 1

This card contains the following circuits.

- High pass filter
- Line matching transformer
- Attenuator pads
- Lockable shaft potentiometer
- Single stage transformer coupled tuned amplifier
- Full wave rectifier

(These circuits are identical for all four channels).

The output of each channel can be adjusted from this card by means of potentiometer. It is adjusted to 105 mV RMS

2) Filter, attenuator, Amplification and rectifier card for E, F, G & H channels -

Card no 2

- This card contains the circuits same as in card no 1 but only for E, F, G & H channels
- This card is used in only 3D, 4D installation.
- For 1D, 2D installation this card place is occupied by dummy card.

3) Pulse shaper card for A, B, C & D channels - Card no 3

This card contains the following circuits.

- a) Low pass filter
- b) Schmitt trigger
- c) Impulse time filter
- d) Level converter
- e) Trolley suppression circuit

(These circuits are identical for all four channels).

Output of each channel is TTL compatible

4) Pulse shaper card for E, F, G & H channels - Card no 4

- a) This card contains the circuits same as in card no 3 but only for E, F, G & H channels
- b) This card is used in only 3D, 4D installation.
- c) For 1D, 2D installation this card place is occupied by dummy card.

5) Logic card for E, F, G & H channels - Card no 5

- a) This card contains logic circuits for channels E, F, G, and H.
- b) This card is used in 3D, 4D installations only.
- c) For 1D, 2D this card place is occupied by dummy card.

6) Logic card for A, B, C & D channels - Card no 6

The Salient features of the logic card include: -

- a) Logic circuits for A, B, C & D channel
- b) The combiner Nand gates
- c) The IN-OUT supervision circuit
- d) Clock generator
- e) Channel failure proving circuit
- f) Minimum one outcount Reset circuit
- g) Power on reset circuit
- h) Preparatory reset circuit
- i) Indication circuit

7) Counter comparator card- Card no 5

This card contains the following circuits

- a) Count supervision logic
- b) Count comparator logic
- c) Numeric display is connected to this card to display counts status

8) General supervisory card- Card no 6

This card contains the following circuits

- a) LDO mono shot chain
- b) Pulse supervision circuit
- c) Fault supervision circuit
- d) EV supervision circuit

9) Relay driver card - Card no 7

This card contains the following circuits

- a) Channel level detector
- b) Voltage monitoring circuit
- c) DC output generation to drive SUPR and EVR relay.

10) Separate DC-DC converter is provided for this make

- a) Input 24 V DC
- b) Input power on switch
- c) Input fuse of capacity 3.5 A
- d) UV,N,OV LED indications are given
- e) Indications for Outputs +5 V , +10 V and ISO +10 V
- f) Adjustment facility for 5 V , +10 V
- g) The same GND monitoring point to measure +5 V, +10 V voltages.
- h) The separate GND monitoring point to measure ISO +10 V voltages
- i) The separate fuse for ISO +10 V of capacity 0.75 A

- **EVR,SUPR Relays**

- a) 1000 Ω shelf type or plug in type Q series (12 V DC) relays
- b) EVR shelf type relay energizes only when outcount and incout are equal.
- c) SUPR shelf type relay energizes only when EVR is in pickup condition.
- d) SUPR energisation also proves voltage level of all channels, voltage outputs of DC-DC converter, availability of all cards, reset relay position

- **Resetting**

Whenever the system enters into error mode due to internal or external reasons, the system has to be reset.

- a) For resetting the system under different conditions, reset box is provided in the station.
- b) Evaluator is connected with the station-reset box through signalling cable.
- c) Only hard resetting is available with this reset box.

- **Electronic junction Box** (EJB) is provided at each end of track section.

The Salient features of the EJB include: -

- a) Three cards – oscillator card, receiver card-1, receiver card-2
- b) Input 24 V DC
- c) Output is generated by oscillator card ----- 60 V AC with 5 KHz
- d) This output 60 V AC with 5 KHz is fed to transmitter coils which are connected in series.
- e) Concerned Receiver card receives the voltage from concerned RX coils, and then it is amplified and sent to evaluator through quad cable.

- **Staggering of channels**

- a) Staggering is the distance between center of inductors, it is maintained by installing inductors on same base plate
- b) This distance is required to fulfill the logic of 'IN COUNT' & 'OUT COUNT'
- c) Due to rail movement and one side traffic staggering is not getting disturbed.

- **The trolley suppression track circuit**

- a) This track circuit is provided at each end of axle counter track section.
- b) This arrangement is provided to suppress the counting of 'wheel of push trolley'.
- c) Counting is effective in logic card only through back contact of concerned end track circuit relay and since trolley axles are insulated, concerned track circuit will not drop.
- d) Length of this track circuit shall be five rail lengths for single line and three rail lengths for double line.

- **Surge protection:**

- a) External Surge Protection Devices on input, output and power supply lines.(GD)

- **Earthing:**

- a) Metal sheaths of the outdoor cable are connected to earth at both ends.
- b) Screen of axle detector cable should be earthed.
- c) Separate Earth of quad/PIJF telecom cable shall be less than one ohm (1Ω).
- d) Earthing of EJB and reset box should be provided firmly through copper strips or other standard copper cable. (Value $< 1 \Omega$)

• Readings:

	S. No	Description	Terminals	Tolerance Range	Actual Readings			
					Channel "A"	Channel "B"	Channel "C"	Channel "D"
EJB	1	Battery (24V DC) < 250 mA	● B 24 ● N 24	21.6 to 28.8 V DC				
	2	Oscillator Output 60 V AC @ 5 KHz	● Tx1/Tx2	30 V AC @ 5 KHz				
	4	Rx output from coil	● Rx1/Rx2	0.7 to 1.2 V AC				
	5	Rx output from EJB/RAC	● RAC1/RAC2	0.7 to 1.5 V AC				
Evaluator	6	Rx Input to evaluator (MS Coupler/Card1)	● TB4-1/3/5/7 ● TB4-2/4/6/8	0.2 to 1.5 V AC				
	7	Voltage on card 1 of evaluator	● A/B/C/D ● GND	105 ± 10 mV AC				
	Power supply Card	Input 24 V DC (Rear side) 1.5 Amps (2D) 2 Amps (3D / 4D)	● TB1-1 ● TB1-2	21.6 to 28.8 V DC				
		5 V DC @ 5 Amp	● + 5 V DC ● GND					
		10 V DC @ 1 Amp	● +10 V DC ● GND					
		10 V DC (ISO) @ 0.5 Amp	● +10 V (ISO) ● GND (ISO)					
Relays	SUPR	Pick up	● R1 ● R2	>10 V DC				
		Drop						
	EVR	Pick up	● R1 ● R2	>10 V DC				
		Drop						

