

VDU Based SM's Panel for CEL's MSDAC

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Abstract

CEL's MSDAC is capable of handling 40 track sections with one chassis. It has a SM's reset panel that is a fixed configuration hardware and is capable of 15 track sections. When the equipment is upgraded in field, the reset panel will have to be changed to suit the number of track sections to be controlled by the reset panel. This design of the reset panel is not conducive to field-upgrade principle of CEL's MSDAC.

Hence a mechanism was required which will truly give the power in the hands of Railways to field-upgrade the equipment and have the flexibility with them to reuse the existing equipment with the OEM's intervention. The VDU based panel was planned to achieve these requirement. This article introduces the VDU based panel in some details.

1 Introduction

CEL's¹ multi section digital axle counter system, MSDAC-730P, is designed using the principles of fail-safety and has a two-out-of-three voting based decision making architecture. It is micro-controller based and has redundant power supply arrangement. Its modular nature allows planning upgrade and extensions without any problem. It can be extended with 8 detections points in a module set. It provides an easy to use GUI for configuration.

MSDAC-730P allows 40 detection points per chassis. Each detection point has a track sensor that identifies a track section boundary. A track section can be defined with 2/3/4 detection points. There can be a detection point common to more than one track section.

1.1 Station Master's (SM's) Reset Panel

Reset Panel is used by Station Master for applying the reset when required. The salient features of SMs panel are as follows

- Power OK indication

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- Reset Button & SMs Key
- Indications for giving track section in CLEAR, track section OCCUPIED, track section in PREPARATORY & LINE VERIFICATION
- 6 digit reset counter provided for recording the resets

The SMs Panel is hardware based equipment that operates on 24V DC supplied from DC to DC converter card. It consists of 8 channel reset card that generates the Reset packet for resetting. This packet is then processed by Central Evaluator. Central Evaluator resets the track section after verifying the reset conditions. On successful resetting, reset card receives the updated packets and the current track section status is displayed on various LEDs.

The software verifies the SMs key and generates the packet in the form of reset command that is sent on 4-wire interface with SMs panel and central evaluator. Now, CEL has designed and developed VDU based SMs reset panel that will replace our existing SMs reset panel.

1.2 What is VDU based SM's Panel?

It is Graphical User Interface (GUI) installed on single board computer and displays the track section status on Visual Display Unit or Monitor. The GUI generates the Reset packet for resetting. This packet is then processed by Central Evaluator. Central Evaluator resets the track section after verifying the reset conditions. On successful resetting, GUI receives the updated packets and the current track section status is displayed on VDU.

Figure 1 shows the SM's reset panel as it exists today. Figure 2 shows the VDU based SM's rest panel.

1.3 Why is VDU based SM's Panel Required?

MSDAC has been designed to monitor 40 Detection points and to display of 40 track sections on the SMs panel. Currently it is supplied with SMs Panel having capability to display maximum 15 track sections in single enclosure. In case there is requirement to



Figure 1: Existing SM's Reset Panel



Figure 2: VDU based SM's Reset Panel

display more track sections, new SMs panel enclosure is required or multiple equipment of SMs panel is required to cater to track sections above 15 sections. To install multiple SMs panel, Additional space and wiring will be required in the SMs Room which are already very crowded and restrict movement. MSDAC has been designed to be upgraded at the site. If Railways decides to add more vital relay outputs i.e. for supervisory track circuit etc then present SMs panel needs to be replaced with bigger SMs Panel or multiple SMs Panel Enclosure. VDU based SM's reset panel is already suited for 40 track sections.

2 VDU Based SM's Panel

VDU based SMs panel with graphical user interface has been developed to cater to these limitations. Upgraded SMs Reset panel performs all the functions performed by current SMs Panel without any of the above mentioned limitations. The updated SMs Panel has been designed to cater to overcome limitation of 15 track sections.

The new SMs panel is completely user configurable. The new SMs Panel is compact and can display 40 track sections output without any wiring change. The GUI has in-built to feature to extend desired voltage to site for verification of Line manually. This takes place through line verification Interface card that performs all the functions of line verification and it then sends the output to GUI and ensures that section is verified manually.

3 Salient Features

- Displays the track section status on VDU.
- Password Protection for use by Authorised Users.
- Line Verification through Line Verification Box and is configurable.
- Similar in layout as of existing reset panel for easy adaptability.
- User Configuration to use the same naming convention of track circuits as per yard layout.
- Various track section status are available. Information like
 - Track Clear
 - Track Occupied
 - Line Verification
 - Preparatory Reset
 - Reset Count
- Line Verification Interface card: - The Line verification (LV) Interface Card will be used along with VDU based Reset panel for MSDAC for verifying the Line Manually
- Interfaces directly with Central Evaluator (CE) on industry standard RS-422 protocol.
- Operates using normal keyboard and mouse.

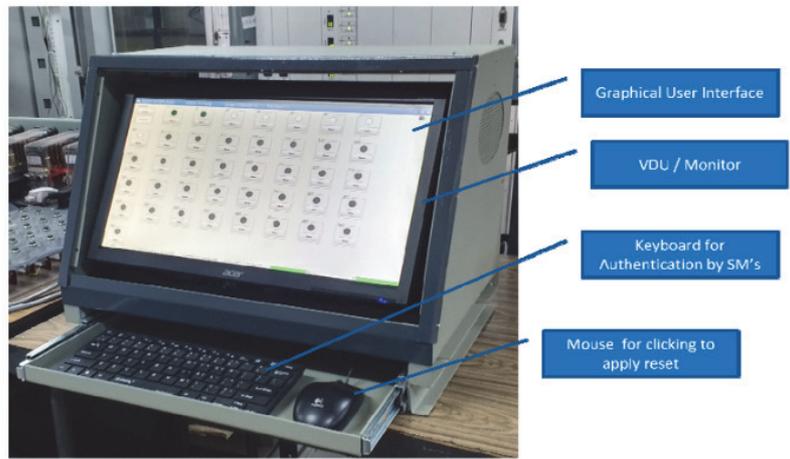


Figure 3: Updated SM's Reset Panel

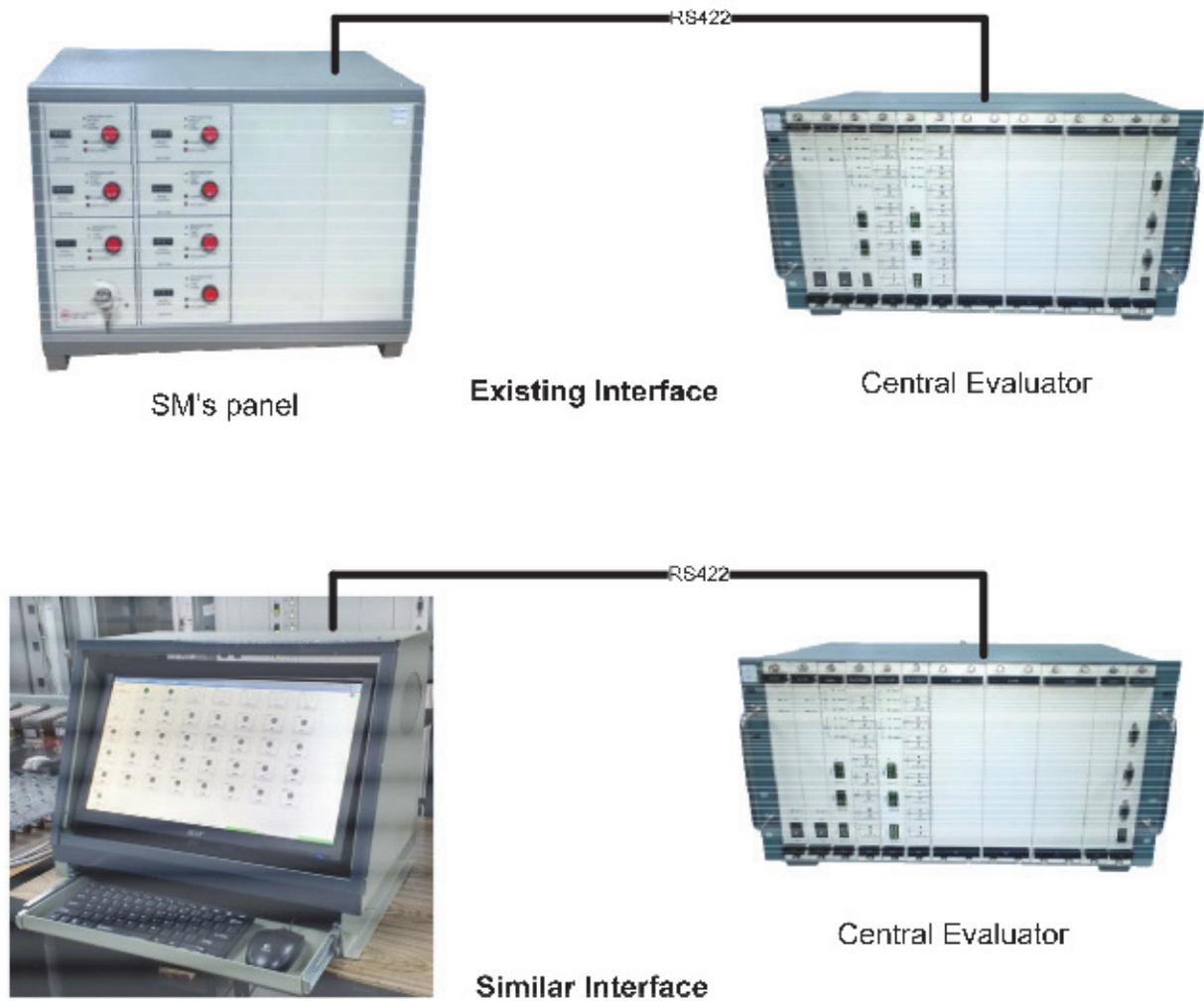


Figure 4: Connectivity of Reset panel with CE

4 Impact Analysis

The interface for connecting the updated SMs panel has been kept same as per current SMs Reset Panel. In Existing SMs Reset panel, 8 channel reset card is used to generate reset command where as in VDU based SMs reset panel, GUI is used to generate the reset command.

Figure 4 shows the connectivity of CE and SM's reset panel for both the existing and VDU based panels. Virtually, there is no impact on the interface of the central evaluator and SM's reset panel. This means that the VDU based reset panel can be retro-fit in the existing installations of CEL's MSDAC.

5 Advantages

- The GUI is user configurable. Hence, the same equipment can be used up to 40 track sections.
- The new SMs reset Panel is compact.
- The VDU Based reset panel is can display maximum of 40 track sections as compared to 15 track section only without modifying the enclosure.
- The VDU based is operated through the GUI software and PC therefore more reliable as compared to hardware based SMs reset panel.
- The Reset Panel can be operated from Stations in case Central Evaluator is installed in the mid section or relay hut or Goomty by using special purpose modem.

6 Conclusion

The VDU based reset panel provides better flexibility and adaptability for various field configuration for CEL's MSDAC. It shall help Railways in planning field upgrades of CEL's MSDAC to derive maximum benefits out of the products capabilities.

VDU based Reset panel has been offered to RDSO for granting approval for use in Indian Railways.

Praveen Chand Awasthi is Bachelor of Engineering in Electronics & Communication from Roorkee University. He joined CEL in 1983 and was involved in the manufacturing of Universal Axle Counter, Digital Axle Counter, Multisection Digital Axle Counter and manufacturing of VSAT with TOT for C-DOT. He had crucial role in the development of Level Crossing Radio Warning System and Transmitter-Receiver of the system. He has multidimensional experience in CEL for the last 34 years. He is currently working as General Manager in CEL and heading the Systems Groups that manufactures Railway signaling products. He is also leading the development of next generation signalling products in CEL.



Sandeep Aggarwal has 18 years of experience in the design and development of safety critical systems for Railways signalling. He holds an MBA and BE (CSE) degree. He is currently working as Chief Manager in Central Electronics Limited in R&D Department. He was the core member of Design & Development of Single Section Digital Axle Counter and Multi Section Digital Axle Counter. He was responsible for carrying out Independent Software Verification and Validation (V&V) for SSDAC & MSDAC at CEL. These SSDAC and MSDAC became the first indigenous axle counters to achieve the CENELEC-SIL4 certification. He is currently involved in developing the next generation axle counter products for Railway signalling.



The information / views expressed in this paper is of the author and are based on his experience working in CEL and axle counters. He may be reached at sandeep@celindia.co.in.