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ADVANCED TRANSPORTATION CONTROLLER

TESTING and VALIDATION

The right tool always makes the job easier!

Traffic Signal Engineers and Signal Technicians are faced with the challenge of testing traffic controllers to ensure that they are configured correctly and operate according to the intersection plans. This testing and validation process may be part of a new intersection or cabinet deployment, or just an update to the currently installed controller database. As controller operation gets more sophisticated and complex operations such as critical railroad and emergency vehicle preemption sequences are added, the challenge grows in complexity and importance.

Among the challenges faced are the following:

- Configuring a physical test cabinet to match the on-street configuration under test,
- Generating detector & preemption inputs to force controller outcomes,
- Visualizing the controller signal outputs in an easily recognized format, and
- Validating compatibility with the CMU configuration.

In many cases today, the testing process may be done manually using a "suitcase tester". These manual tests can be tedious and fail to offer any flexibility in the testing configuration or in graphically displaying the signal states of the controller under test. These suitcase testers are also not able to be configured or expanded beyond the original configuration of the tester. Most traffic cabinets today such as the ATC Cabinet are modular and easily expanded to capacities far beyond the capabilitity of any suitcase testers.

Another important aspect of validating the operation of a new controller database is ensuring compatibility with the Cabinet Monitor Unit (CMU / MMU). A suitcase tester environment does not offer any method to operate the controller with a CMU or MMU in the mix.

Another option for testing an ATC Controller is to bring the actual cabinet to the signal shop or lab. An Input Assembly can be loaded with test switches for exercising the detector inputs, but seeing signal displays in a suitable format is not easily done and is vitally important to observe the controller signal outputs. Often during the development phase the physical cabinet is not available, or just not convenient to use. With intersection complexities growing, the problem will only get worse over time.

The ATC CyberCabinet® product is a revolutionary update to the tools available for Advanced Transportation Controller (ATC)

If there was an easier and better way to exercise and validate a new or modified controller database, then Engineers and Technicians could spend more time designing and testing. The ***ATC CyberCabinet®*** product is a revolutionary update to the tools available for Advanced Transportation Controller (ATC) testing and validation. Adding this tool to a traffic professional's kit will produce higher quality results in less time, while reducing or eliminating the need for call-backs once the intersection is operating. Being software based it also future-proofs the agency ATC development and test program.

The ATC CyberCabinet provides a traffic signal expert with a software based solution to test and validate the functionality of a Controller database while operating with the actual CMU or MMU configuration, but without needing a full cabinet assembly in hardware. Instead, the CyberCabinet software emulates the functionality of the cabinet components; Serial Interface Units (SIU / BIU) and Cabinet Monitor Unit (CMU / MMU). The PC is linked to the serial bus (SB#1 / Port1) port of the physical controller under test via the included ***HDLC Interface Module***. This module converts the EIA-485 message format into USB communications to the PC. So the physical controller, the HDLC Interface Module and a PC are all that is needed to complete the job.

In the ATC Cabinet mode, the CyberCabinet software supports the full complement of ATC5301 defined assignments of five Input SIUs (120 channels of detection), two Output SIUs (32 channels of signals), and a 32 channel CMU2212 function. In the Caltrans 33X mode, the software emulates the functionality of the Field IO Module (FIO) and a 2018KCL Cabinet Monitor Unit (CMU). In the NEMA TS-2 mode, the software emulates the functionality of four Input BIUs, four Output BIUs, and the Malfunction Management Unit (MMU2).

The CyberCabinet software is intersection project based and provides two operating modes; Device View and Map View. The Device View is a more hardware centric view of the cabinet devices, and provides a direct access to the individual SIU / BIU inputs and outputs.

The Map View elevates the functionality beyond the device level into an overhead view of the intersection and uses active icons for detection and preempt inputs and signal outputs. A built-in Editor is used to develop an icon based bird's eye view of the target intersection.

This Map view eliminates the need to mentally translate the device level inputs and outputs into the phase assignments that they represent in the actual intersection. Active button control icons represent detector or preempt inputs, and active signal icons display signal states. Close to twenty different signal icon faces are currently offered for thru movements, protected turns, FYA signals, bike and transit, and beacons or blank-out signs.

The CMU / MMU functionality provides a full complement of signal monitoring functions to help ensure that the controller operation is both safe and proper; Conflict, Lack of Signal (LOS), Multiple, Clearance, FYA, Virtual Channels, SB#1 Timeout, and Local Flash. The CMU2212 functionality is configured directly from the actual cabinet CMU Datakey. This level of CMU testing during the development phase also provides an opportunity to validate that the CMU or MMU configuration is correct, accurate, and complete. This can easily prevent the need for last minute CMU configuration changes at the cabinet turn-on event.

During the validation phase, if a signal sequence is observed to be incorrect, such as a complex preemption sequence, closer

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scrutiny of the signal operation is usually needed to identify the root of the problem and correct it. To facilitate a review of the signal operations, an internal trace record is recorded as the controller cycles the intersection. When the Replay function is triggered either manually, or as a result of the CMU detecting a fault condition, the Replay control provides a means to scroll through the recorded sequence and review the operation step by step. The captured trace record can be stored to a disk file as well for future review or consultation.

With the advent of the serial bus structure of modern traffic cabinets, tools such as the ATC CyberCabinet software can be effectively used to test and validate the operation of an ATC database without the need for a populated hardware traffic cabinet. This method has become even more important in the last two years with the pandemic forcing many staff members to work from their home office. Most importantly, by using software to control and display the test and validation process, an agency Controller Development and Test program or QA program can be streamlined and future-proofed against changing or new functional requirements.

Most would agree that if testing were made easier and more efficient, the quality of that testing process will produce better results. The right tool always makes the job easier!

Scott Evans is President of SRE Services LLC, a technical consulting company. Scott was VP of Engineering and Chief Technology Officer for Eberle Design Inc. (EDI) for 30 years prior to his current position. He was instrumental in developing the NEMA TS-2 Standard, and was a principle author of the new (AASHTO, ITE, NEMA) ATC5301 Advanced Transportation Controller Cabinet Standard.

Scott Evans
President of SRE Services LLC