ATC CyberCabinet® Operation Manual

SOFTWARE VERSION 2.4.0

June 2023

SRE Services, LLC

www.SreServicesLLC.com

INFORMATION CONTAINED HEREIN IS PROPRIETARY TECHNICAL INFORMATION OF SRE SERVICES LLC. PUBLICATION, REPRODUCTION OR USE IN WHOLE OR PART IS NOT PERMITTED EXCEPT UNDER TERMS AGREED UPON IN WRITING.

CYBERCABINET® IS A TRADEMARK OF SRE SERVICES LLC.
MonitorKey® IS A TRADEMARK OF EBERLE DESIGN INC.
DATAKEY® IS A TRADEMARK OF ATEK ACCESS TECHNOLOGIES

© COPYRIGHT 2023 SRE SERVICES LLC

Please register your copy of the ATC CyberCabinet software on-line at www.SreServicesLLC.com/registration.

This will allow us to notify you of any software update releases.

WARNING

The *ATC CyberCabinet* emulation of the CMU is a tool to help ensure that the CMU Datakey Configuration is **compatible** with the Controller database operation. It is up to the User to determine that the CMU Datakey parameters are correct, complete, and suitable for the target intersection.

Table of Contents

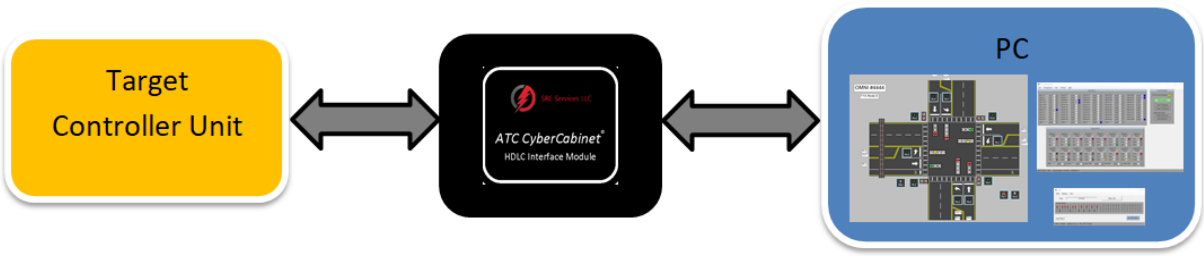
Section 1
General

1.1 INTRODUCTION

This manual covers the installation and operation of the *ATC CyberCabinet*® Software package running on a Microsoft Windows 10+ based Personal Computer (PC). It provides the user with a general understanding of the operating principles necessary to install and operate the *ATC CyberCabinet* software. The manual is written with the ATC5301 cabinet as the focus. Most operations for the NEMA TS-2, ITS Cabinet, and TEES 332 cabinet operate the same way.

1.2 ATC CYBERCABINET OVERVIEW

The *ATC CyberCabinet* program provides a traffic signal Engineer with a software based solution to emulate the functionality of an ATC5301 Standard ATC Cabinet, NEMA TS-2 Cabinet, ITS Cabinet, or TEES 332 Cabinet without needing a full cabinet assembly in hardware. The Advanced Transportation Controller Unit (CU) being tested will interface to the *ATC CyberCabinet* software via the *ATC CyberCabinet* HDLC Interface Module hardware.



The *ATC CyberCabinet* software emulates the functionality of the ATCC Cabinet Monitor Unit (CMU) and input/output Serial Interface Units (SIU). Up to seven SIUs are supported, two Output SIUs and five Input SIUs. Several different configurations of ATC cabinets are supported (See Section 5.2.1):

- Standard Input Assembly (24 or 48 channel)
  - Up to five SIUs for 120 Input channels
- Standard 16 Channel Output Assembly
- Standard 32 Channel Output Assembly
- Combo IO Assembly (future)
- NYCDOT LPLVC

In the NEMA TS-2 mode The *ATC CyberCabinet* software emulates the functionality of the MMU2 Malfunction Management Unit (MMU) and input/output Bus Interface Units (BIU). Up to eight BIUs are supported, four Output BIUs and four Input BIUs.

1.3 ATC CYBERCABINET FUNCTIONALITY

The *ATC CyberCabinet* software is intersection project based and operates in two basic modes,

the CU Direct mode and the SIU Direct mode. Once a project has been created with the relevant program configuration, it can be stored to a PC disk file and retrieved again, eliminating repetitive software setup steps.

1.3.1 CU DIRECT MODE

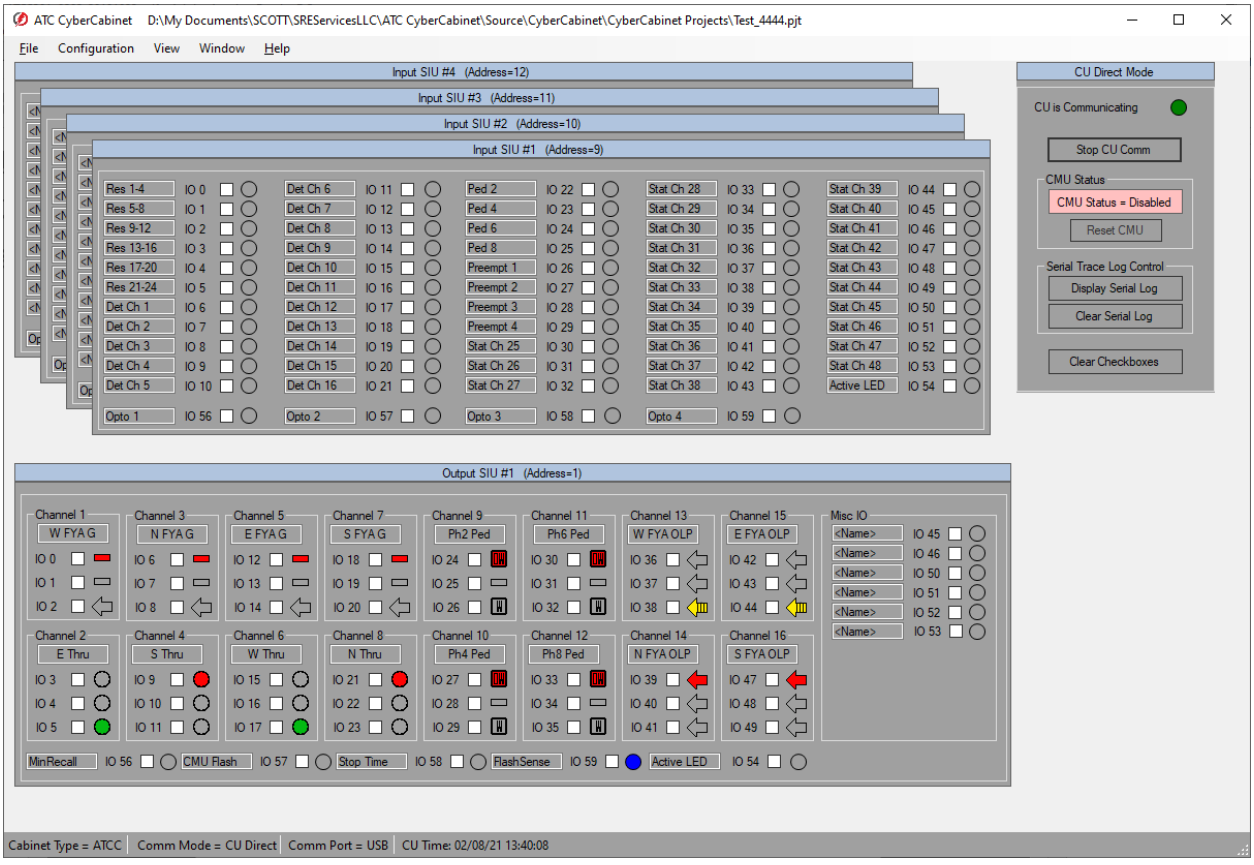
In the CU Direct mode, the *ATC CyberCabinet* software responds to HDLC commands from the target Controller Unit via SB#1 using the *ATC CyberCabinet* HDLC Interface Module (HIM) and adaptor cable. Only the target CU is a physical device and the cabinet CMU and SIUs are all virtualized in the *ATC CyberCabinet* software.

In the CU Direct mode two different operating view options are provided; the SIU/BIU Device view, and the Intersection Map view. Both can be viewed simultaneously depending on the operator preference.

1.3.1.1 SIU/BIU DEVICE VIEW

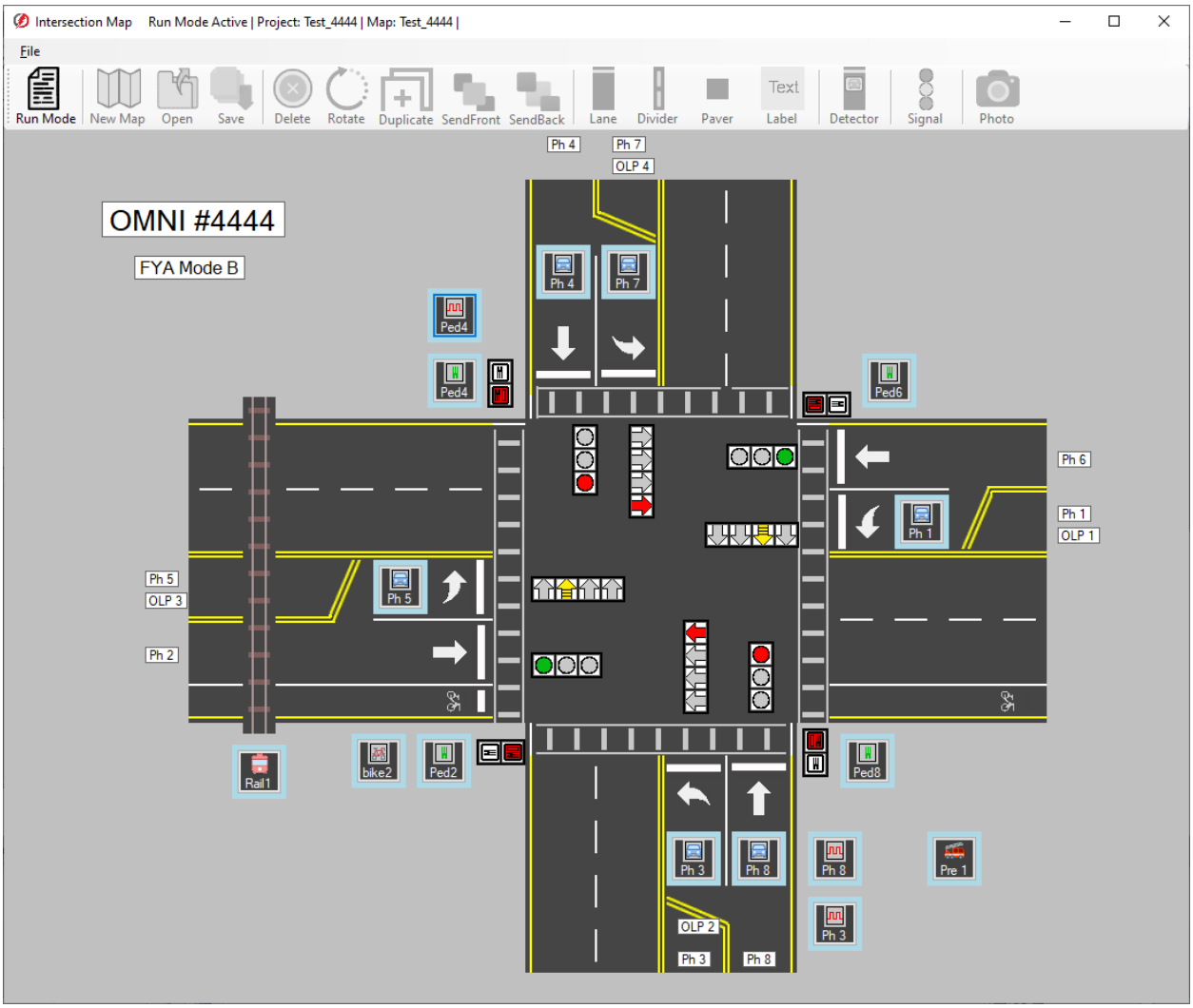
In the SIU/BIU Device view mode, the input and output states of the CU as transmitted to the virtualized Input and Output SIU devices are displayed on the Dashboard form showing the active IO's of each enabled SIU.

The Output SIU form provides channel icons that can each be configured to use different signal faces such as Protected Arrow, Thru Balls, Peds, FYA, and PPLT configurations.



1.3.1.2 INTERSECTION MAP VIEW

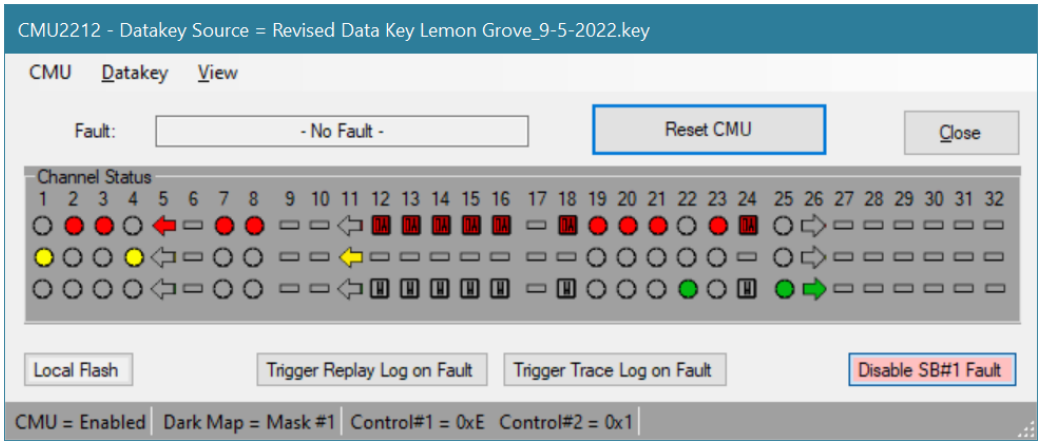
The Intersection Map view presents the SIU inputs and outputs to an overhead graphic map of the intersection being exercised. The graphic map is developed using the Map Editor function of the software, see Section 7. Configurable control icons representing lanes, signal heads, pedestrian crossings, detector zones, and other road furniture are used to model the actual intersection configuration.



1.3.1.3 CMU EMULATION

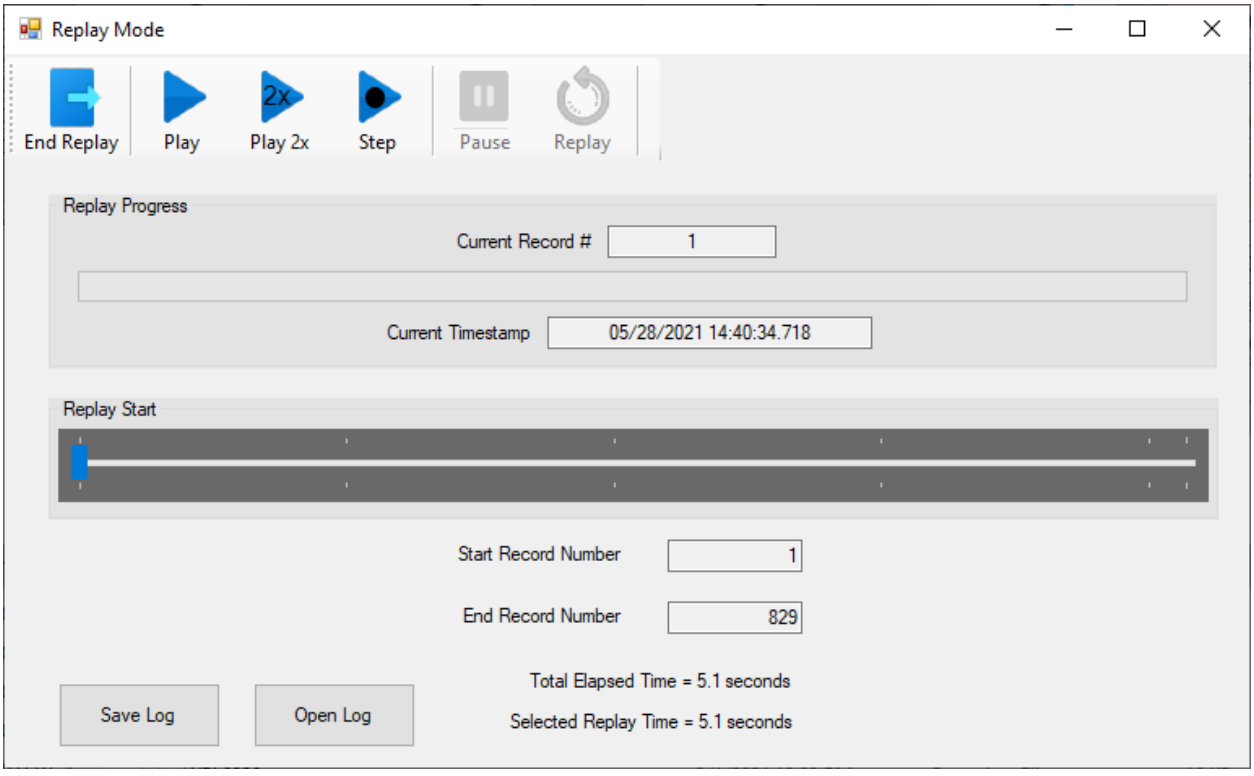
In both display modes of the CU Direct Mode, a software emulation of the Cabinet Monitor Unit (CMU-2212, CMU-212, MMU2, 2018KCL) is provided to ensure that the CU database provides proper signal sequencing. This monitoring function will help ensure that when the CU and physical cabinet are deployed to the street, the CU database will operate in the cabinet without generating CMU faults. This CMU emulation provides a secondary benefit of validating the programming of the target intersection CMU Datakey configuration. The CMU configuration parameters can be read from an EDI *MonitorKey*® disk file, or directly from a key using the EDI

MonitorKey® Programmer device. In NEMA TS-2 mode, the MMU2 parameters can be entered manually or from an EDI MMU2LE configuration file.



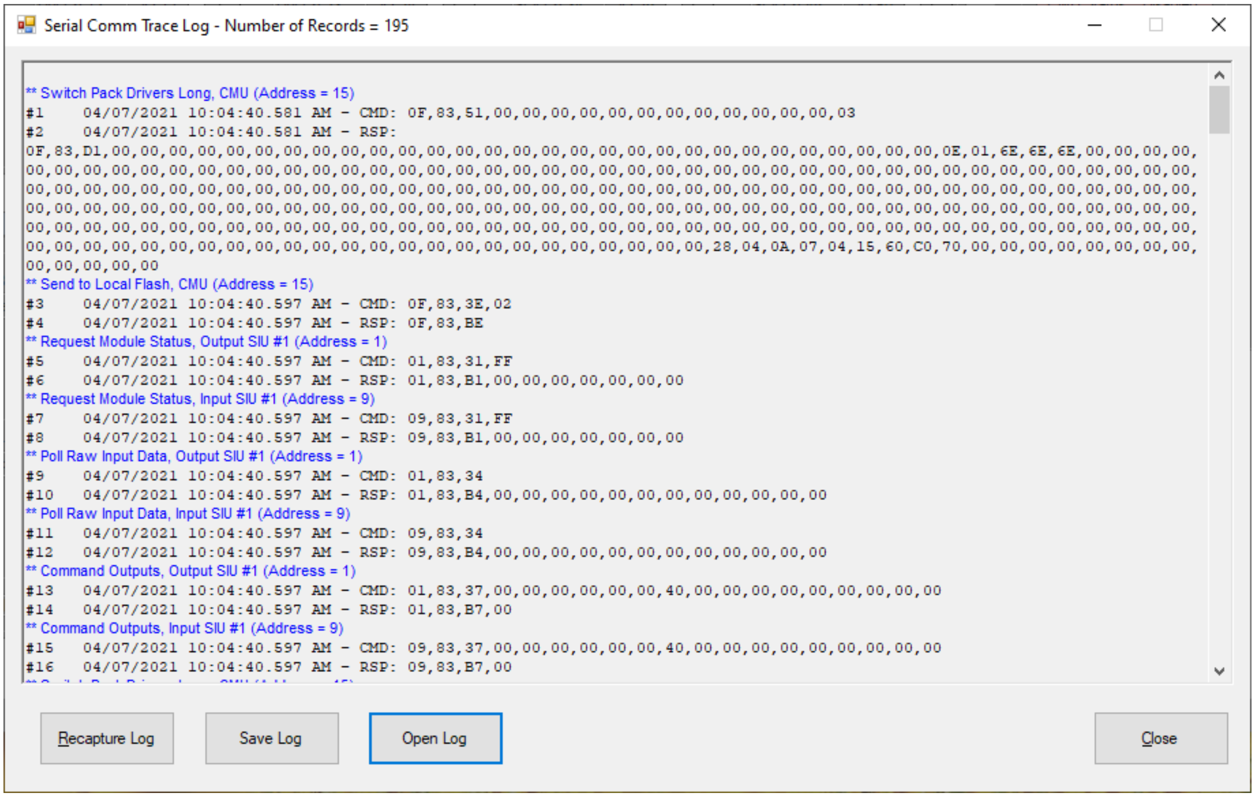
1.3.1.4 REPLAY TRACE LOG

A timestamped sequential log is collected that can be used to temporarily halt the real-time display and replay approximately five minutes of the controller sequence. See Section 8.



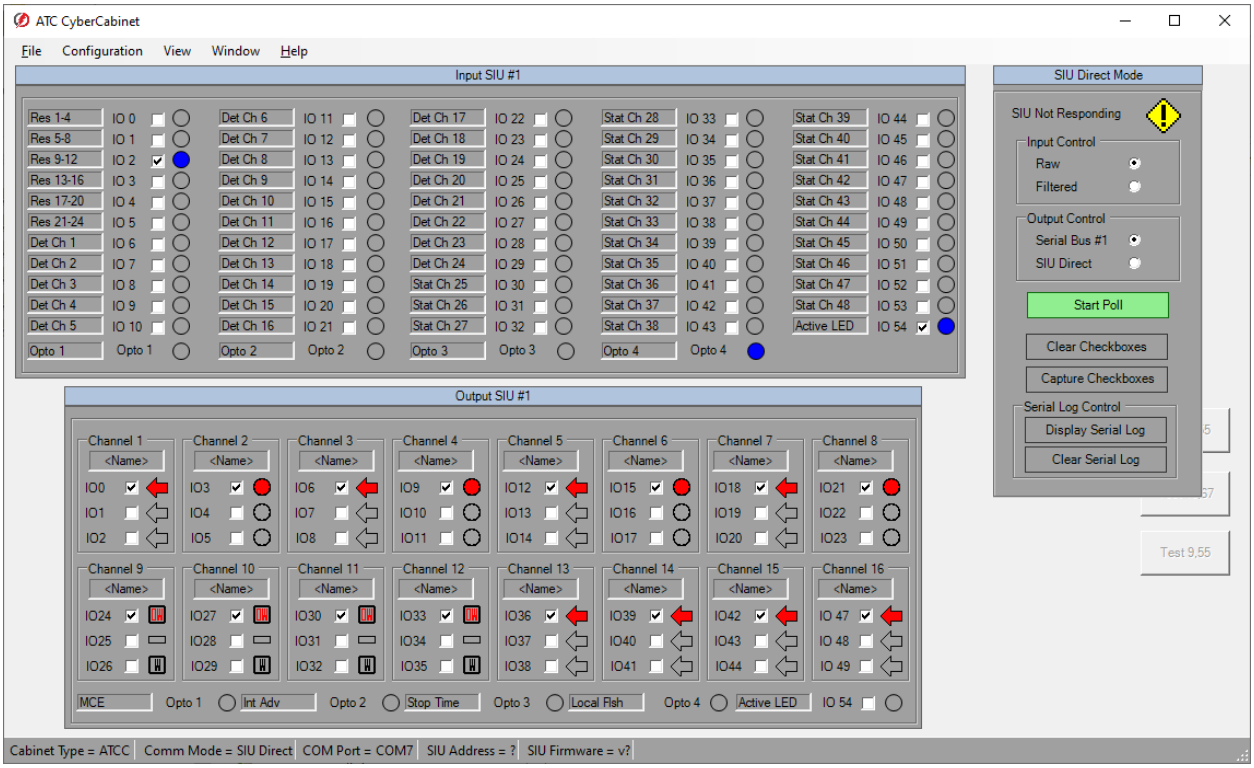
1.3.1.5 SERIAL BUS #1 COMM TRACE LOG

A timestamped sequential log is collected that acts as an SB#1 bus sniffer, presenting a complete record of SB#1 HDLC activity. Each Command frame issued by the CU and each corresponding Response frame from the addressed device is recorded and timestamped in a log format for review along with the frame contents. See Section 5.3.3 and Section 9.



1.3.2 SIU DIRECT MODE

The SIU Direct mode is intended to help trouble shoot issues with SIUs or Input / Output Assemblies in an actual hardware ATC cabinet. The software interfaces to the front panel serial port of a target SIU-2218 device. The *ATC CyberCabinet* software provides a view of the target SIU inputs and outputs of an operating control cabinet, and new input and output test states can be applied to supplement or override the CU commands.



1.4 ATC CYBERCABINET PACKAGE

The *ATC CyberCabinet package* includes:

- *ATC CyberCabinet* software for Microsoft Windows 10+
- *ATC CyberCabinet* HDLC Interface Module (HIM)
- *ATC CyberCabinet* SB#1 Adaptor
- *ATC CyberCabinet* Port1 Adaptor
- *ATC CyberCabinet* USB Cable
- *ATC CyberCabinet* HDLC Interface Module Loopback Plug

Section 2
Installation

2.1 COMPUTER (PC) REQUIREMENTS

To run the *ATC CyberCabinet* software, the following equipment is required:

- Personal Computer running Microsoft Windows 10+ (32 or 64 bit).
- Available USB port
- *ATC CyberCabinet HDLC Interface Module (HIM)*
- If the optional SIU Direct Mode is used:
  - PC Serial Port or Serial Port to USB Null Modem adaptor.
  - The SIU-2218 requires a Null Modem connection to the front panel serial port.

2.2 *ATC CYBERCABINET* SOFTWARE DOWNLOADS

Download the ATC CyberCabinet Installation packages from the SRE Services web site at: www.SreServicesLLC.com/Downloads. Extract both ZIP files to a temporary directory.

- *ATC_CyberCabinet_Install.ZIP*
  - ***Setup.exe***
  - *SetupCyberCabinet.msi*
- ATC_CyberCabinet_Driver.ZIP
  - ***Windows Driver Folder***

Optional:

- Loopback-Test.ZIP (optional)
  - *Loopback-Test.exe*
- *ATC CyberCabinet Operation Manual* (PDF)
- *ATC CyberCabinet Map Examples* (PDF)

2.3 *ATC CYBERCABINET* SOFTWARE INSTALLATION

The installation process is two steps; software install and USB driver install. To begin the software install, RIGHT click the *Setup*.exe file and select *Run as Administrator*. Follow the steps of the installation wizard. Once the installation is complete there will be a shortcut added to the Windows Start menu: *ATC CyberCabinet*.

2.4 *ATC CYBERCABINET* HDLC INTERFACE MODULE DRIVER INSTALLATION

To begin the USB driver install, follow the steps below:

1. Close all programs before installing this hardware.
2. Plug the USB cable into an open USB port on the PC.
3. The Windows Device Manager should pop up. If it doesn't, open the Device Manager manually. (Type DEVICE MANAGER in the Ask me anything bar at the bottom left of the screen).
4. On the Device Manager, look for ***Serial/USB*** in "*Other devices*". RIGHT click on ***Serial/USB***.

5. Click on *Update Driver Software*. Next, click on "*Browse my computer for driver software".*
6. Select the ***Windows Driver* folder** that was extracted in Section 2.2 above.
7. In the *Windows Driver* folder, select "*64_win10"* for Windows 10, 64 bit.
8. Click on *OK* then click on *NEXT*. The HDLC Interface Module Drive driver is now installed. You can close the Update Driver Software window.
9. See Section 11 for trouble-shooting information if needed.

2.5 HDLC INTERFACE MODULE (HIM)

The HDLC Interface Module provides four LED indictors for operational status.

- Power OK: indicates USB power is being provided.
- Operation OK: indicates that the internal circuits are ready.
- Rx Activity: indicates that HDLC data is being received.
- Tx Activity: indicates that HDLC data is being transmitted

.

2.6 HDLC INTERFACE MODULE (HIM) HARNESS ASSEMBLY

Be sure to tighten the jack screws of the harness assembly to the HDLC Interface Module. A loose connection can result in serial bus communication reliability issues.

DB25 Pin # Female	HIM	Controller	DB25 Pin# Male	DB15 Pin# Male
1	Ground	Ground	**13**	**2,4,6,8**
2	TxC- Out	RxC- In	**17**	**15**
3	TxD- Out	RxD- In	**15**	**13**
12	RxD- In	TxD- Out	**14**	**9**
13	RxC- In	TxC- Out	**16**	**11**
14	TxC+ Out	RxC+ In	**4**	**7**
15	TxD+ Out	RxD+ In	**2**	**5**
24	RxD+ In	TxD+ Out	**1**	**1**
25	RxC+ In	TxC+ Out	**3**	**3**

2.7 SOFTWARE REGISTRATION AND UPDATES

Please register your copy of the ATC CyberCabinet software on-line at www.SreServicesLLC.com/registration.

This will allow us to notify you of future software update releases.

Registration is only needed once. If the *ATC CyberCabinet* software is reinstalled, registration is not needed

The most current version of the *ATC CyberCabinet* software can be downloaded from the SRE Services web site at *www.SREservicesLLC.com/Downloads*.

Before installing a new update, the currently installed version of the *ATC CyberCabinet* program should first be uninstalled from the computer.

Section 3
CU Direct Mode Functions

3.1 GENERAL

The primary operating mode of the *ATC CyberCabinet* software is the CU Direct Mode. This mode emulates the CMU and SIU/BIU devices found in the ATC traffic cabinet, and the CMU and FIO found in a 33x cabinet. All input and output functions of the Controller Unit (CU) can be displayed and modified to exercise the CU program.

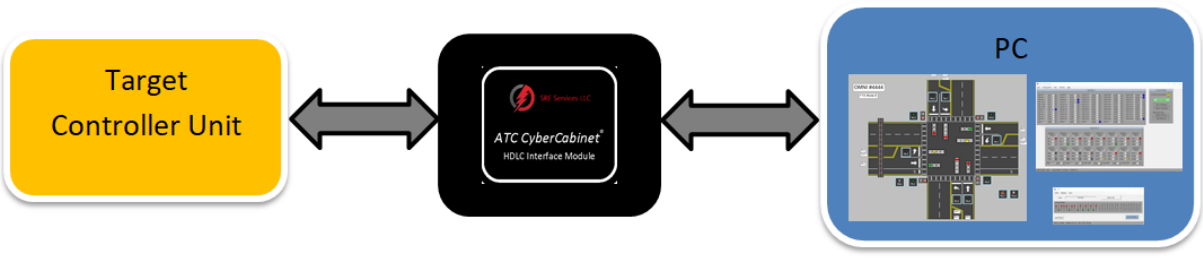
The CU Direct Mode is selected using the Main *Menu: Configuration / Operating Mode* (see Section 5.2.2)

A typical procedure to create a new project or session is to:

- Configure the Cabinet Type (Section 5.2.1)
- Select the Operating Mode (Section 5.2.2)
- Configure the SIU/BIUs installed in the cabinet5.2.4
  - SIU/BIU Enables (Section 5.2.4)
  - SIU/BIU IO Text Fields (optional) (Section 3.3.1.1)
  - Signal Face Types (optional) (Section 3.3.1.4)
- Use the Map Editor to build a map (optional) (Section 7)
- Connect the HDLC Interface Module to the CU (Section 5.2.3.1)
- Configure/enable the CMU/MMU2 (optional) (Section 5.3.1)
- Select the desired View (Section 5.35.3.2)
- Click the *Start CU Comm* button (CU Direct Control panel) (Section 3.5.1)
- When done, save the project file (Section 5.1.1.2)

3.2 SERIAL BUS #1 CONNECTION TO THE CU

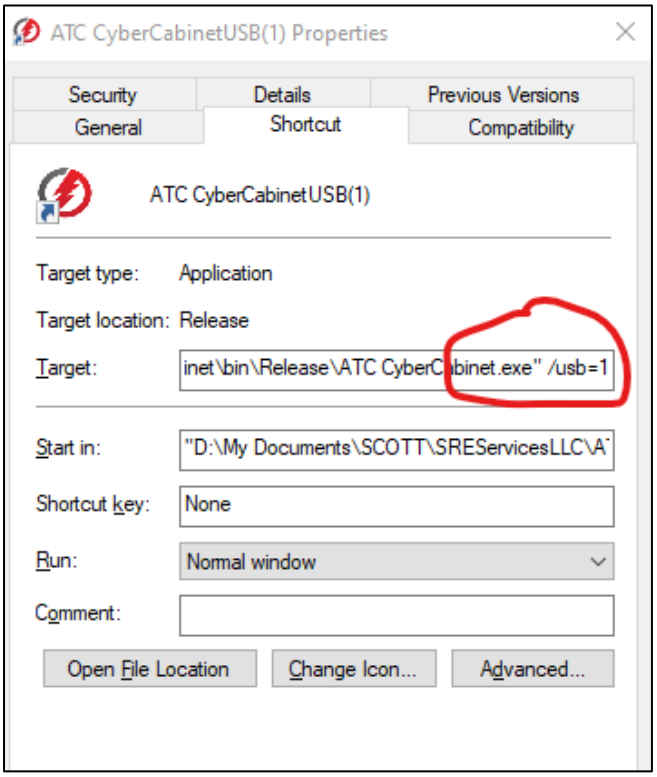
The *ATC CyberCabinet* connects to the target Controller Unit via the *ATC CyberCabinet* HDLC Interface Module (HIM). This module provides an HDLC to USB translation and requires one available USB port on the PC. A provided adaptor module is used to connect the *ATC CyberCabinet* HDLC Interface Module to the Serial Bus #1 port or Port1 of the Controller Unit.



3.2.1 MULTIPLE HDLC INTERFACE MODULES ON THE SAME PC

The *ATC CyberCabinet* software can run as separate instances on the same PC as long as the PC can support the USB load and display loading. One additional HDLC Interface Module is needed

for each instance (controller). As each additional HDLC Interface Module is added, Windows will assign it an incrementing USB address, starting from 0. The USB address used by each instance of the *ATC CyberCabinet* software is assigned with a command line option when launching the program. Create a shortcut to the installed version of the *ATC CyberCabinet* software. Edit the properties of this shortcut, adding the option ***/usb=X*** to the end of the Target field, where X is the number of the USB port of the added HDLC Interface Module. Be sure that this option text is outside of any quotes within the Target field. For example, this is the shortcut to launch the software for the second (X=1) HDLC Interface Module:



This shortcut process is only needed if additional HDLC Interface Modules are added. For a single instance, the program defaults to USB address 0.

3.2.2 SERIAL BUS #1 CONNECTION IN A 33X CABINET

To operate the *ATC CyberCabinet* software in a Caltrans 33x cabinet mode requires a 2070 controller with two options for the FIO configuration, a 2017-2A (-2E) card or a 2070-2B card. The controller must have a 2070 FIO card installed that either does not provide the FCU function (-2C) or an FIO card that can be configured to disable the hardware Field-IO Controller Unit (FCU) function.

3.2.2.1 2070-2B

The 2070-2B FIO card provides the SB#1 interface to the C12S connector without an internal FCU function. This card can be used with the *ATC CyberCabinet* directly.

3.2.2.2 2070-2A (-2E)

The 2070-2A (-2E) cards have a built-in FCU. This hardware FCU must be disabled in order to work with the *ATC CyberCabinet*. In this case the C12S connector provides the SB#1 communications to the HDLC Interface Module, and the *ATC CyberCabinet* will be emulating the disabled hardware FCU.

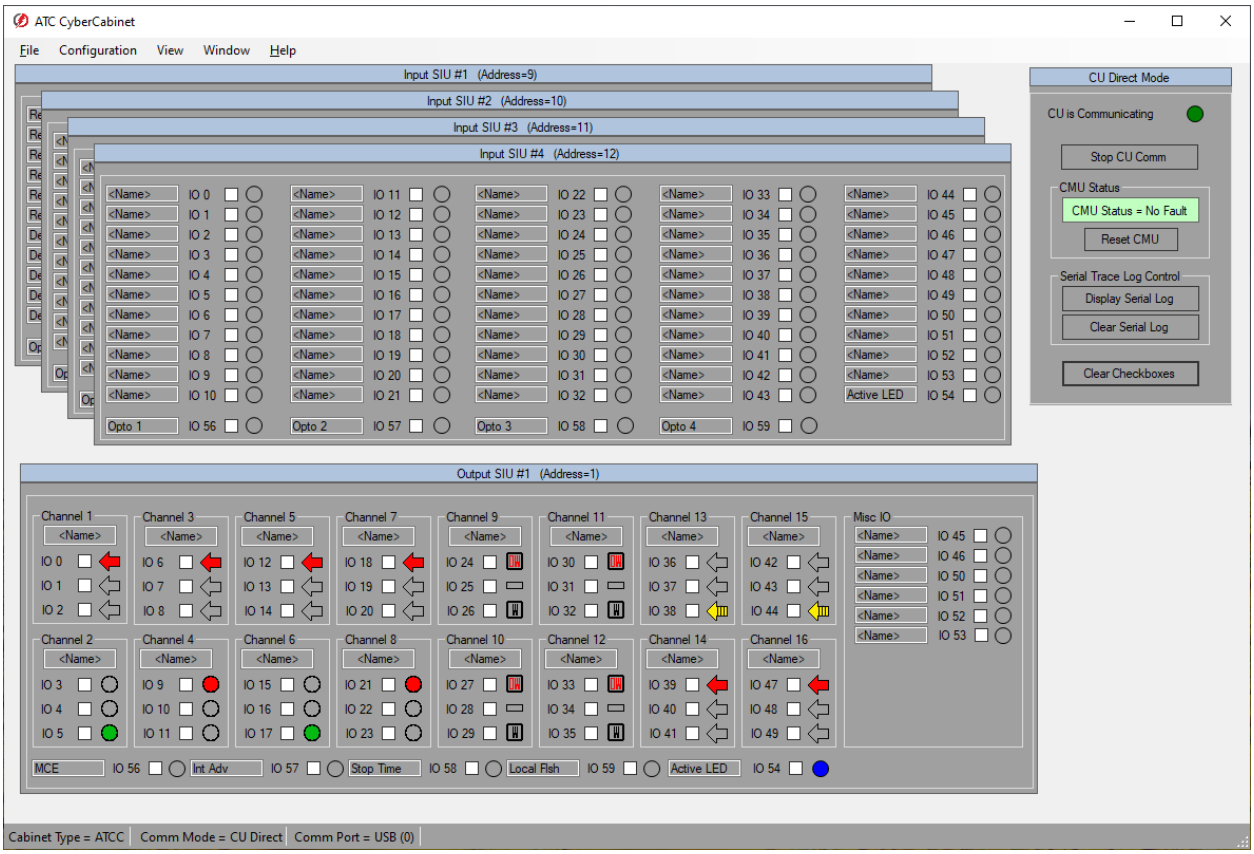
Note that not all 2070-2A (-2E) cards have an option to disable the FCU function.

For example, the McCain 2070-2A card has an option to remove the two socketed Eprom chips of the FCU processor. This disables the FCU.

3.3 VIEWS

3.3.1 SIU/BIU DEVICE VIEW

The main dashboard view provides a view of the input and output SIUs that are enabled (see Section 5.2.4). These SIUs are always visible. The Main *Menu: Windows / Tile (or Cascade)* (see Section 5.4) can be used to optimize the dashboard view once the appropriate SIUs are enabled.



3.3.1.1 DETECTOR DEVICE VIEW

In the ATCC mode, the Input SIUs can be displayed as SIU devices or 4-channel Detector devices if desired. See Section 5.2.5.

3.3.1.2 SIU OUTPUT MISC IO VIEW

In the ATCC mode, the Misc IO icons of the Output SIUs can be displayed or hidden. Misc IOs are those IO pins of the Output SIUs that are not defined by ATC5301. See Section 5.2.5.

3.3.1.3 SIU DEVICE VIEW TEXT FIELDS

The text fields of the Input and Output SIU panels of a project should be populated to help with identifying the function of each input or output. These fields will also assist when developing a Map view, see Section 7.5.1.1 and 7.5.1.2.

3.3.1.4 SIU DEVICE VIEW SIGNAL TYPES

The signal face icon of an Output SIU panel can be changed to match the function of the channel. The text fields and signal face types will be used when adding signals to a Map view, see Section 7.5.1.2, and on the CMU view. To modify the signal face type, *right click* on a signal face of the channel group, and select the proper signal type (*View* or *Modify*).

3.3.1.5 SIU DEVICE VIEW STATUS PANEL

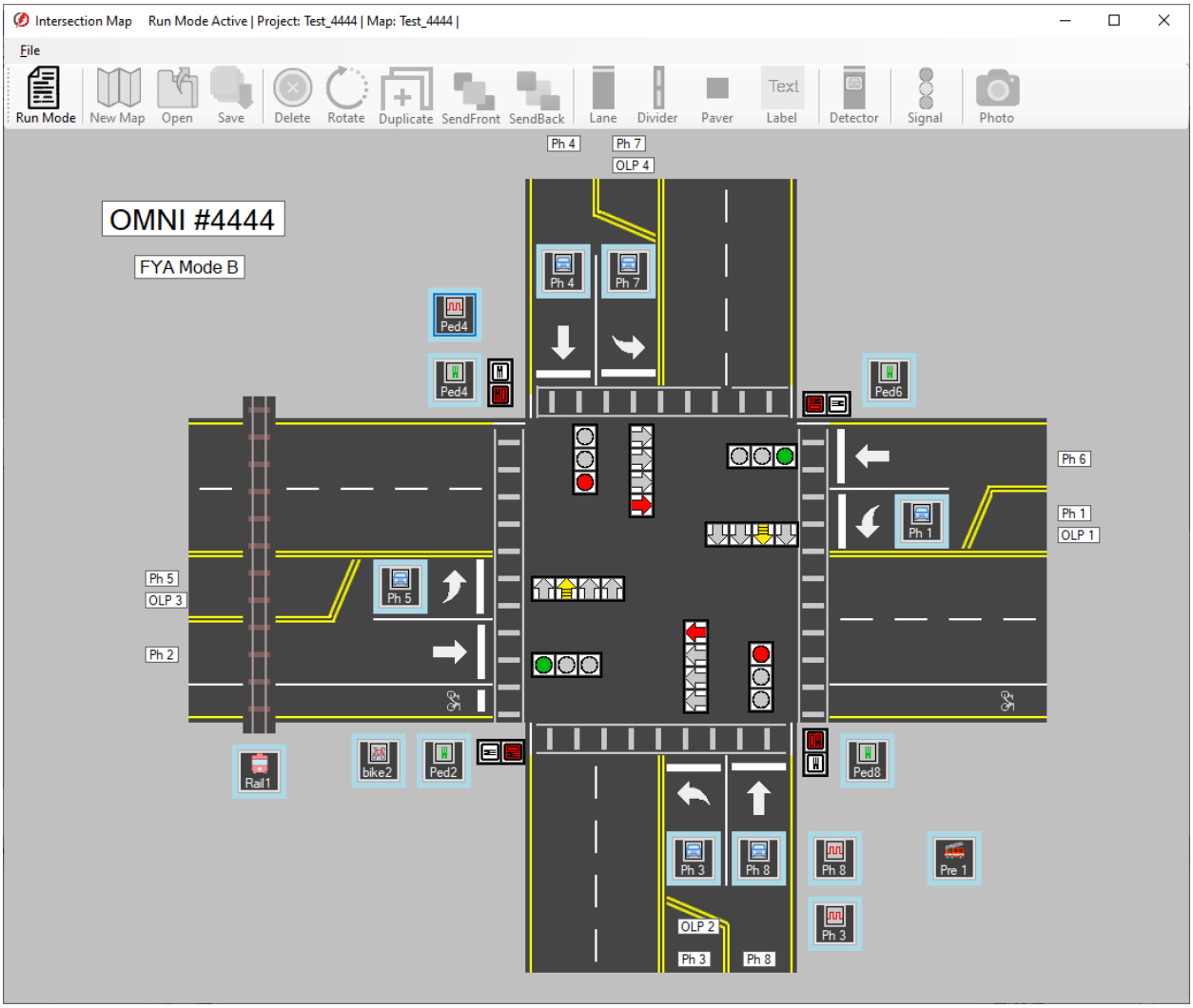
At the bottom of the Siu Device View form is a status panel that displays the Cabinet Type, Comm Mode, Comm Port and Controller Date and Time.

3.3.1.5.1 CONTROLLER DATE AND TIME

The status bar at the bottom of the SIU Device view form displays the Date and Time reported by the Controller via SB#1. If the time reported is offset from the PC time by greater than the *Controller Time Offset Threshold* parameter (see Section 5.2.5), then the panel is shaded pink, and displays the offset value in seconds.

3.3.2 INTERSECTION MAP VIEW

The intersection Map view is a separate form and once configured, displays the overhead intersection layout with active icons mapped to the SIU inputs and outputs. To create or modify an intersection map, use the Intersection Map Editor (see Section 7). Once configured, the Detector control icons can be used to drive CU inputs and the Signal control icons will display the CU signal outputs.



3.4 CABINET MONITOR UNIT (CMU)

The Cabinet Monitor Unit (CMU) emulates a 32 channel CMU-2212 device found in the ATC cabinet, a 32 channel CMU-212 device found in the ITS cabinet, a NEMA TS-2 16 channel MMU2 or a 2018KCL device found in a 33x cabinet.

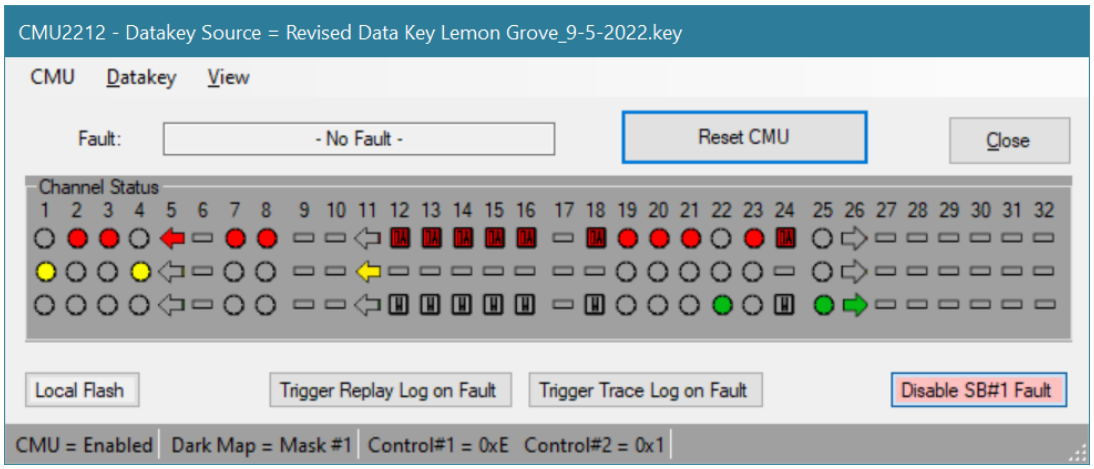
CAUTION

While the functionality of the *ATC CyberCabinet* CMU is designed to accurately emulate an actual hardware CMU, under some conditions there may be timing differences between this virtual CMU and a real CMU device that results in a different fault detection outcome.

The use of this CMU function is optional. However most Controller Units will require that the Datakey parameters be provided to the CU via SB#1 in order to exit flash. Even if the CMU function is not enabled, the Datakey parameters should be loaded (Section 6.7.1.2).

If the CMU is not Enabled (Section 6.7.1.1) then no cabinet flash will be generated if a signal fault occurs. This can be a useful technique to trouble shoot signal sequences such a preemption event, without interruption from the CMU.

3.4.1 CMU-2212



The *ATC CyberCabinet* CMU-2212 (CMU-212) monitoring functions include the following:

- Open / Read a Datakey configuration
- Conflict
- Lack of Signal
  - Dark Maps
- Multiple Signal
- Clearance
  - Minimum Yellow Clearance
  - Minimum Yellow + Red Clearance
- Flashing Yellow Arrow
  - FYA Yellow Trap
  - FYA Flash Rate
  - R & Y Input Enable
- Virtual Channels
- Serial Bus #1 Timeout
- Local Flash Input
- Exit Flash Call Start-up Function

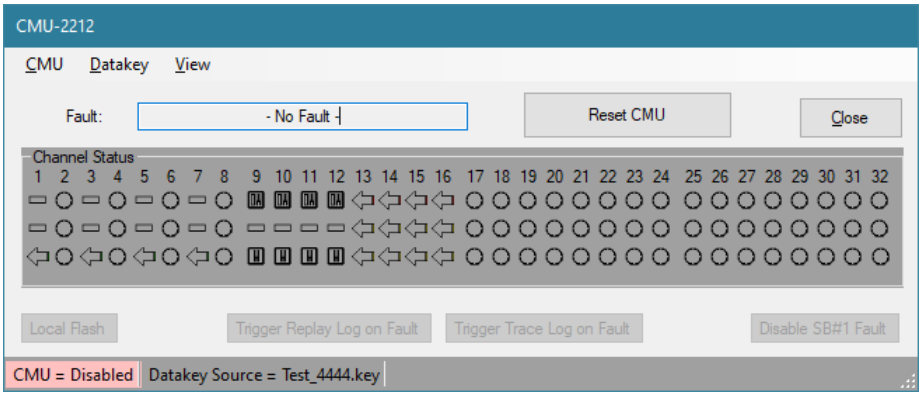
3.4.2 MMU2

The *ATC CyberCabinet* MMU2 monitoring functions include the following:

- Open / Read an EDI .CFG configuration file
- Conflict

- Red Fail
- Dual Indication Signal
- Clearance
    - Minimum Yellow Clearance
    - Minimum Yellow + Red Clearance
- Flashing Yellow Arrow
    - FYA Yellow Trap
    - FYA Flash Rate
    - R & Y Input Enable
- Port1 Timeout
- Local Flash Input
- Exit Flash Call Start-up Function

3.4.3 2018KCL



The *ATC CyberCabinet* CMU 2018KCL monitoring functions include the following:

- Open / Read a Datakey configuration
- Conflict
- Red Fail
- Multiple Signal
- Clearance
    - Minimum Yellow Clearance
    - Minimum Yellow + Red Clearance
- Flashing Yellow Arrow
    - FYA mode
    - FYAC mode
    - H mode
    - FYAC Flash Rate
- Watchdog Timeout
- Local Flash Input

3.4.4 OPERATING THE CMU

Before the CMU function can be enabled, a Datakey database must be loaded. See Section 3.4.5 for details. Once the Datakey has been successfully loaded, the CMU function is enabled using the CMU *Menu: CMU / Enable CMU*.

The CU Direct Mode can be operated with or without the CMU function enabled.

3.4.4.1 VIEW CMU CONFIGURATION

The CMU configuration parameters used from the loaded Datakey configuration can be reviewed using the CMU *Menu: View / CMU Configuration*.

3.4.4.2 RESET THE CMU

If the CMU has detected a fault condition, it will latch the state of the signal channels and display the type of fault detected along with channel fault status. The CMU can be reset to the No-Fault state by clicking the CMU *Reset CMU* button.

3.4.4.3 LOCAL FLASH CONTROL

To place the CMU into the non-latched Local Flash state, click on the CMU *Local Flash* button. During a Local Flash condition the CMU Fault display will show "Local Flash" and the *Local Flash* button will change to a light red color. To clear the Local Flash state, click on the *Local Flash* button again. The SB#1 Control Status parameters from the CMU will reflect the fault state and cabinet relay status associated with a cabinet flash mode state.

3.4.5 CONFIGURING THE CMU

The CMU is configured by either reading a Datakey device directly using the EDI *MonitorKey® Programmer* unit, or reading a stored EDI *MonitorKey®* file from disk. Before the CMU function can be enabled, a Datakey configuration must be loaded into the program. See Section 3.4.5.1 and 3.4.5.2 below.

The CMU function is invoked using the Main *Menu: View / View CMU*.

3.4.5.1 LOAD DATAKEY FILE

To load a Datakey file (.key) from the PC use the CMU *Menu: Datakey / Open Datakey File*. An Open File dialog will display and the file can be selected.

3.4.5.2 READ DATAKEY DIRECT

To read a Datakey device directly requires an EDI *MonitorKey®* Programmer device to be connected to a USB port of the PC. The *ATC CyberCabinet* software will make the necessary connection to the Programmer device automatically.

Use the CMU *Menu: Datakey / Read Datakey*.

3.4.6 OPERATING THE MMU2

Before the CMU function can be enabled, the configuration parameters must be loaded (manually or from the Project file load). Once the configuration has been successfully loaded, the MMU2 function is enabled using the MMU2 *Menu: MMU2 / Enable MMU2*.

The CU Direct Mode can be operated with or without the MMU2 function enabled.

3.4.6.1 SET MMU2 CONFIGURATION

The MMU2 configuration parameters used can be set manually using the MMU2 *Menu: Configure MMU2*.

3.4.6.2 LOAD CFG FILE

The MMU2 configuration parameters used can be set by reading an EDI MMU2-16LE Configuration file (.CFG), *Menu: MMU2 Config / Open CFG File* menu item.

3.4.6.3 VIEW MMU2 CONFIGURATION

The MMU2 configuration parameters can be reviewed using the MMU2 *Menu: View / MMU2 Configuration*.

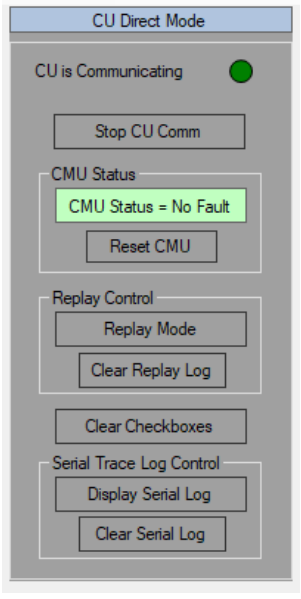
3.4.6.4 RESET THE MMU2

If the MMU2 has detected a fault condition, it will latch the state of the signal channels and display the type of fault detected along with channel fault status. The MMU2 can be reset to the No-Fault state by clicking the MMU2 *Reset MMU2* button.

3.4.6.5 LOCAL FLASH CONTROL

To place the CMU into the non-latched Local Flash state, click on the MMU2 *Local Flash* button. During a Local Flash condition the MMU2 Fault display will show "Local Flash" and the *Local Flash* button will change to a light red color. To clear the Local Flash state, click on the *Local Flash* button again. The SB#1 Control Status parameters from the MMU2 will reflect the fault state and cabinet relay status associated with a cabinet flash mode state.

3.5 CU DIRECT CONTROLS



The CU Direct Control panel on the Device View form is used to control the operation of the CU Direct Mode.

3.5.1 START / STOP CU COMM

Once the USB port connection to the HDLC Interface Module has been made (Section 5.2.3.1), then the *Start CU Comm* button will initiate the Controller SB#1 communication process. The button toggles from the *Start CU Comm* mode to the *Stop CU Comm* mode.

3.5.1.1 CU COMMUNICATING ICON

This icon reflects the status of the communications between the *ATC CyberCabinet* program and the connected Controller Unit once polling has started.

An indication of "CU Not Responding" may be caused by the following:

- HDLC Interface Module is not connected (see Section 5.2.3.1)
- No power to the Controller Unit
- The *Start CU Comm* button needs to be clicked to start the Comm process

3.5.2 CMU STATUS

This text box reports the fault status of the ATC CyberCabinet CMU (Section 6). If the CMU form is hidden from the main window, clicking this text box brings the CMU form to the front view.

3.5.3 RESET THE CMU

If the CMU has detected a fault condition, it can be reset to the No-Fault state by clicking the *Reset CMU* button.

3.5.4 REPLAY MODE

The *Replay Mode* button will load the Replay Mode control form (see Section 8). This temporarily suspends real-time operation and allows a replay of the past controller sequence.

3.5.5 CLEAR REPLAY LOG

The *Clear Replay Log* button will clear all records of the Replay Log (see Section 8). The Replay Log function will then start collecting records from that point.

3.5.6 DISPLAY SERIAL TRACE LOG

The *Display Serial Log* button will load the Serial Comm Trace Log form (see Section 9) and display the Command and Response frame records captured from the last SB#1 activity. The *Max Serial Log Count* parameter on the Settings form (Section 5.2.5) can be used to limit the length of the captured records.

3.5.7 CLEAR SERIAL TRACE LOG

The *Clear Serial Log* button will clear all records of the Serial Comm Trace Log (see Section 9). The Serial Comm Trace Log function will then start collecting records from that point.

3.5.8 CLEAR CHECKBOXES

If checkboxes have been manually set on the SIU Input form or SIU Output form, the *Clear Checkboxes* button will clear them all.

Section 4
SIU Direct Mode Functions

4.1 GENERAL

The SIU Direct mode is used to communicate directly to a hardware SIU-2218 installed in a physical ATC cabinet. Using the *ATC CyberCabinet* SIU input and output forms of this mode, a user can monitor the SIU IO responses to CU commands. The SIU Direct mode also allows the user to bypass the CU Serial Bus #1 commands and set inputs and outputs of the target SIU directly from the form. This mode can be helpful to trouble shoot problems with a suspect SIU-2218, or to exercise an Input or Output Assembly directly without a CU installed.

WARNING

The SIU Direct mode of Output Control (Section 4.3.3.3) should not be used in a traffic cabinet controlling traffic on the street. This function can cause traffic signals to change to improper or unsafe states which may cause the Cabinet Monitor Unit (CMU) to respond with Flash Mode.

4.2 SERIAL CONNECTION TO THE TARGET SIU-2218

The front panel serial port of the SIU-2218 is a 9 pin metal shell "DB9S" female subminiature type connector. Because the port is configured as a DTE device, it requires a Null Modem connection to a PC serial port. If the PC does not provide a serial port, many Serial to USB adaptors are available. The USB adaptor must be a either a Null Modem configuration or a Null Modem adaptor must be used.

4.2.1 SIU-2218 FRONT PANEL PORT

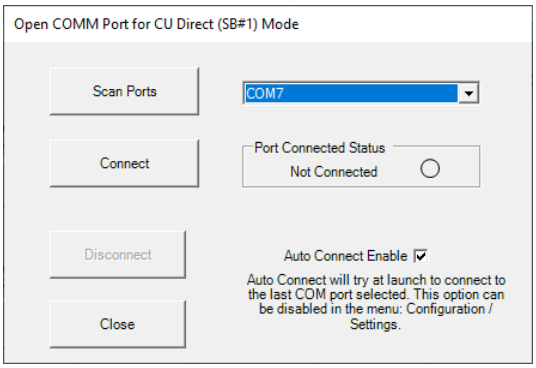
Pin #	Function	IO
1	Not Used	-
2	Receive Data	I
3	Transmit Data	O
4	Not Used	-
5	Signal Ground	X
6	Not Used	-
7	Not Used	-
	Not Used	-
9	Not Used	-

4.3 SIU DIRECT MODE FUNCTIONALITY

The SIU Direct Mode of the *ATC CyberCabinet* program is selected with the Main *Menu: Configuration / Operating mode / SIU Direct*. The IO mapping will be set according to the cabinet type selected in the Main *Menu: Configuration*. See Section 10 for details on Cabinet Type Maps.

4.3.1 CONNECTING THE SERIAL PORT

Once the physical cable connection between the PC and SIU2218 is made, the PC Comm Port must be selected and opened. Use the Main *Menu: Open Comm Port* to open the Connection dialog form.



4.3.1.1 SCAN PORTS BUTTON

Click on the *Scan Ports* button to populate the pull-down menu with all available serial Comm ports of the PC. Select the Comm port entry of the pull-down menu item that corresponds to the serial port or USB adaptor port to the SIU. If the correct port is not known, the PC Device Manager may be helpful to identify the connection to a USB adaptor or direct cable.

4.3.1.2 CONNECT BUTTON

Once the Comm port has been selected in the pull-down menu item, this button will open the port and allow *ATC CyberCabinet* communications to the SIU-2218 device. The Port Connected Status will update if the connection is successful.

4.3.1.3 DISCONNECT BUTTON

To close the Comm port, click on the *Disconnect* button. This will release the selected Comm port back to Windows for other applications to use.

4.3.1.4 AUTOCONNECT ENABLE

If this box is checked then when launched, the *ATC CyberCabinet* program will try to open the same Comm port used in the previous session without having to invoke the *Open Comm Port* form. This setting can also be enabled or disabled in the Settings form, see Section 5.2.5.

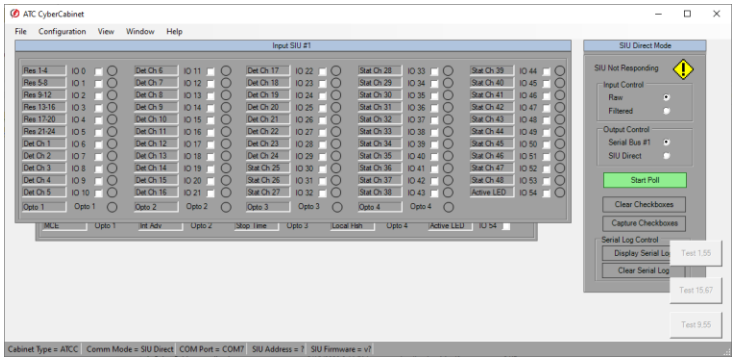
4.3.1.5 CLOSE

The *Close* button will close the Connection dialog form.

4.3.2 SIU IO VIEWS

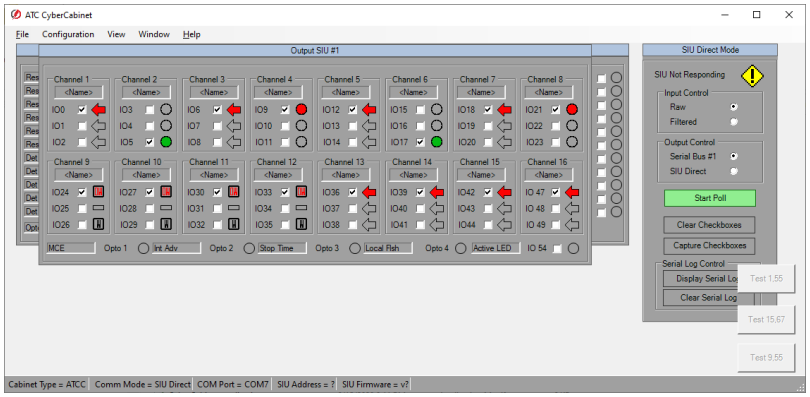
The SIU view will change between an Input SIU and Output SIU depending on the mode of the physical SIU-2218.

4.3.2.1 INPUT SIU



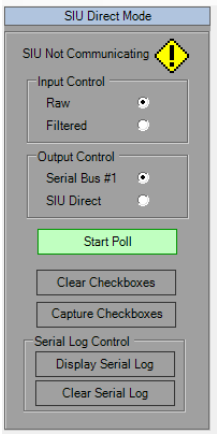
When linked to an Input SIU-2218, the blue circular indicators display that an input to the SIU is active. The associated checkbox can be checked to manually force the input to the active state when the *Output Control* radio button labeled *SIU Direct* is selected. See Section 4.3.3.3.

4.3.2.2 OUTPUT SIU



When linked to an Output SIU-2218, the colored signal indicators display that an output to the SIU is active. The associated checkbox can be checked to manually force the output to the active state when the Output Control radio button labeled *SIU Direct* is selected. See Section 4.3.3.3.

4.3.3 SIU DIRECT CONTROLS



The SIU Direct Control panel is used to control the operation of the SIU Direct Mode functions.

4.3.3.1 START POLL

Once the Comm port connection has been made, the *Start Poll* button will initiate the SIU-2218 polling process. The button toggles from the *Start Poll* mode to the *Stop Poll* mode.

4.3.3.1.1 SIU COMMUNICATING ICON

This icon reflects the status of the communications between the *ATC CyberCabinet* program and the connected SIU-2218 once polling has started.

An indication of "SIU Not Responding" can be caused by the following:

- Wrong Comm Port selected during Connect procedure
- Defective SIU-2218 or no power to the SIU-2218
- Cable is not a Null Modem type

4.3.3.2 INPUT CONTROL

This selection will determine if the SIU Device view displays the raw input data or filtered data from the SIU-2218 device.

4.3.3.3 OUTPUT CONTROL

When *Serial Bus #1* is selected, the SIU Device view displays data that the SIU-2218 has received from the Controller Unit via SB#1.

When *SIU Direct* is selected, the SIU Device view displays data that the SIU-2218 has received from the checkboxes on the SIU Device view panel via the serial communications port.

WARNING

The SIU Direct mode of Output Control (Section 4.3.3.3) should not be used in a traffic cabinet controlling traffic on the street. This function can cause traffic signals to change to improper or unsafe states which may cause the Cabinet Monitor Unit (CMU) to respond with Flash Mode.

4.3.4 CLEAR CHECKBOXES

If checkboxes have been manually set on the SIU Input form or SIU Output form, this button will clear them all.

4.3.4.1 CAPTURE CHECKBOXES

When this button is clicked the checkboxes on the SIU Device view will be selected to match the last command received from the Controller via SB#1. This can be helpful to freeze the SIU-2218 states when making a transition to the *SIU Direct* mode (Section 4.3.3.3).

4.3.5 DISPLAY SERIAL LOG

The *Display Serial Log* button will load the Serial Comm Trace Log form (see Section 9) and display the Command and Response frame records captured from the last SIU Direct activity.

4.3.6 CLEAR SERIAL LOG

The *Clear Serial Log* button will clear all records of the Serial Comm Trace Log (see Section 9). The Serial Comm Trace Log function will then start collecting records from that point.

Section 5
Main Menus

5.1 MENU: FILE

5.1.1 PROJECT FILE

Project files contain all of the configuration information for an *ATC CyberCabinet* session, and have a filename extension of "PJT". Before quitting a session, the Project file should be saved so that revisiting the session later does not require any repeated setup work.

5.1.1.1 OPEN PROJECT FILE

Use the Main *Menu: File / Open Project File* to bring up an Open File dialog. Select the Project file for the session. The *Default Directory* setting is used to browse directly to a directory of *ATC CyberCabinet* projects. See Section 5.2.5.

The most recent five Project File entries are listed on the File menu for quick Open access.

5.1.1.2 SAVE PROJECT FILE

Use the Main *Menu: File / Save Project File* to bring up a Save File dialog. Select the Project file name for the session. A backup copy is made of the previous project file (if it exists) and named with a "Backup of <filename>.pjt" filename prefix. The Default Directory setting is used to browse directly to a directory of *ATC CyberCabinet* projects. See Section 5.2.5.

5.1.2 EXIT

This menu option ends the *ATC CyberCabinet* program. If changes to the program setup or configuration have been made, the Project should be saved before exiting the program. See Section 5.1.1.2

5.2 MENU: CONFIGURATION

Main *Menu: Configuration*

5.2.1 CABINET TYPE

This menu option selects the type of ATC or 33x cabinet to be emulated. This defines the IO mapping used for the SIUs and FIO. Main *Menu: Configuration / Cabinet Type*

- *ATC Cabinet*: Uses standard IO mapping as defined by the ATC5301 Standard v02.02. See Section 10.2 for mapping assignments.
- *ATCC IO Combo*: Uses custom IO mapping to combine the functionality of Input and Output with one SIU. See Section 10.3 for mapping assignments.
- *ATCC NYCDOT*: Uses custom IO mapping as defined by the NYCDOT LPLVC Specification. See Section 10.4 for mapping assignments.
- *LADOT 33x*: Uses custom IO mapping as defined by the LADOT Specification.
- *TEES 33x*: Uses standard IO mapping as defined by the CalTrans TEES Specification.
- *NEMA TS*-2: Uses standard IO mapping as defined by the NEMA TS-2 Standard.
- *ITS Cabinet*: Uses standard IO mapping as defined by the ITS Cabinet Standard v01.02.17b

- 14 Pack
- 14 Pack + 6 Pack
- 14 Pack + 14 Pack
- 6 Pack
- 6 Pack + 6 Pack

5.2.2 OPERATING MODE

This menu item selects the operating mode, *CU Direct* or *SIU Direct*. Main *Menu: Configuration / Operating Mode*

- The *CU Direct* Mode is the primary mode of the *ATC CyberCabinet* software. It uses the *HDLC Interface Module* to communicate with an ATC Controller Unit.
- The *SIU Direct* Mode is provided as an additional tool to communicate directly with hardware SIU-2218 devices installed in an operating cabinet.

5.2.3 OPEN COMM PORT

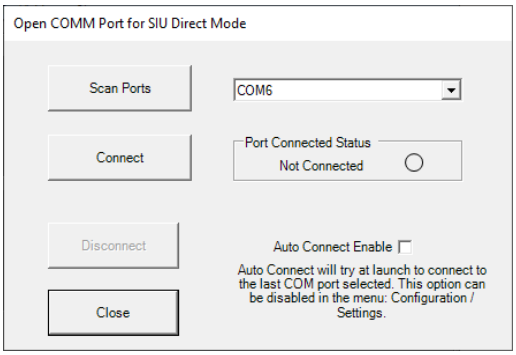
This menu option facilitates connecting to the COMM port associated with the Operating mode selected in Section 5.2.2

5.2.3.1 CONNECT USB (CU DIRECT MODE)

In the *CU Direct* mode, the software will automatically connect with the *HDLC Interface Module* if it is connected to a valid USB port. If not, then the connection can be reestablished with this menu item once the USB port is connected. Main *Menu: Configuration / Connect USB*

5.2.3.2 CONNECT COMM (SIU DIRECT MODE)

In the *SIU Direct* mode, the software will automatically connect with the last PC COMM port used to communicate with an SIU-2218 if the Auto Connect option is checked in the Settings form (see Section 5.2.5). If not, then the connection can be reestablished with this menu item. Main *Menu: Configuration / Connect COMM*



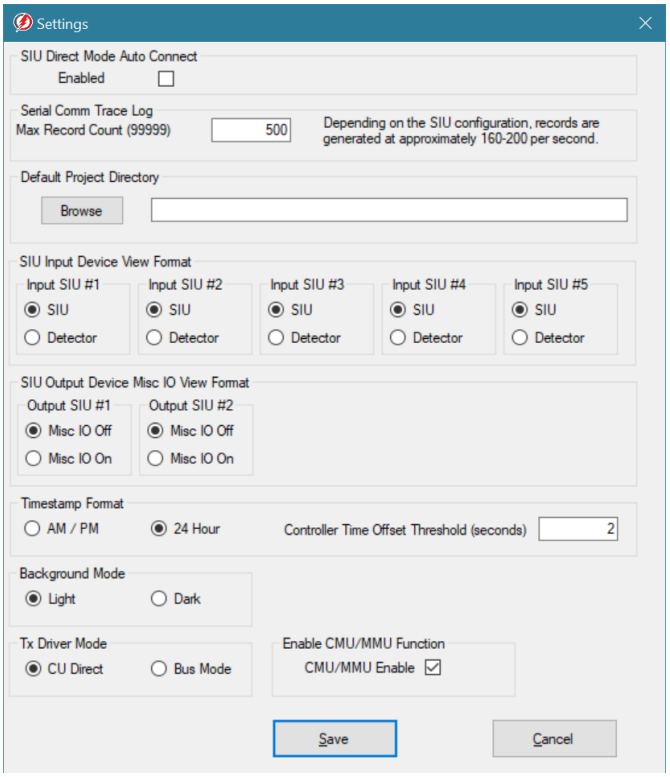
See Section 4.3.1 for details.

5.2.4 SIU ENABLES

This menu option is used to configure the SIUs being emulated in the CU Direct Mode. Only SIUs that are enabled will provide a response frame to be transmitted back to the CU. Main *Menu: Configuration / SIU Enables*

5.2.5 SETTINGS

The Settings form provides parameters to customize the program operation. Main *Menu: Configuration / Settings*



- *SIU Direct Mode Auto Connect*
  - When operating in the SIU Direct mode (Section 1.3.2), a check will cause the program to try and reconnect with the PC COMM port that was last used to communicate with the SIU.
- *Max Serial Log Count*
  - This value limits the size of the Serial Log. Keeping the number of records low makes accessing the log quicker. The parameter is limited to 9999 records.
- *Default Project Directory*
  - This directory is used as the default path when opening or saving Project files, Datakey files, and Map files.
- *SIU Input & Output Device View Format* (ATCC Mode Only)
  - The SIU Device view can display each Input SIU in two formats; *SIU Device* or *Detector Device*.
  - The SIU Device view can display each Output SIU with or without the Misc IO icons.
- *Timestamp Format*
  - Display the Time as 12 Hour AM/PM or 24 Hour format.
- *Controller Time Offset Threshold*
  - If the Controller date and time is offset from the PC time greater than the *Controller Time Offset Threshold* value, then the CU Time status panel on the main form is shaded pink, and the offset in seconds is displayed.

- *Background Mode*
  - A Light or Dark setting is provide to adjust the brightness of the Device View and Map View forms.
- *Tx Driver Mode*
  - The tri-state control for the HDLC Interface Module can be configured:
    - CU Direct: Direct connection between the Controller and the HDLC Interface Module, Tx Drivers always enabled.
    - Bus Mode: HDLC Interface Module is connected to the cabinet serial bus in parallel to hardware devices, Tx Drivers Tri-state.
- *CMU/MMU Function Enable*
  - When checked the CMU/MMU function is disabled on the serial bus. This may be useful when the HDLC Interface Module is connected to the cabinet serial bus in parallel to hardware devices.

5.3 MENU: VIEW

5.3.1 VIEW CMU

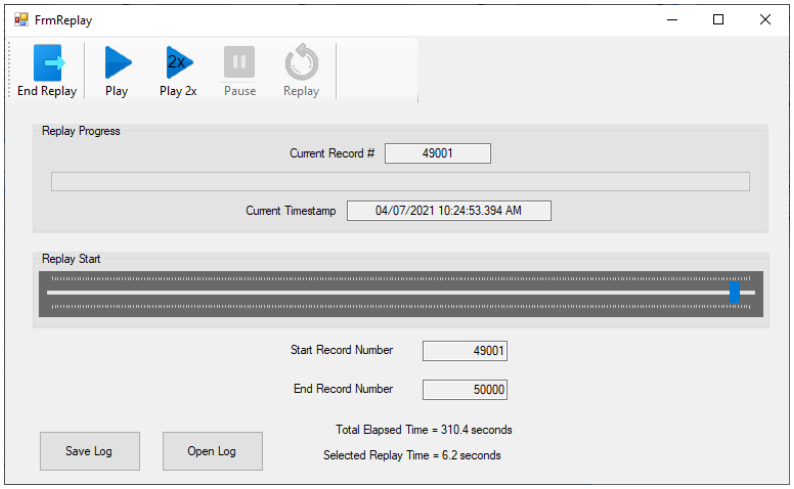
This menu option will launch the *CMU* function. The CMU form has its own menu structure, see Section 6.7. Main *Menu: View / CMU*. The proper CMU device type will be automatically selected based on the Cabinet Model.

5.3.2 INTERSECTION MAP VIEW

This menu option will launch the *Map* View function. The Map Editor form has its own menu structure, see Section 7.5. Main *Menu: View / Map View*

5.3.3 VIEW REPLAY LOG

The Replay Log form provides controls for replaying a controller sequence. See Section 8 for operational details.



5.3.3.1 CAPTURE NEW REPLAY LOG

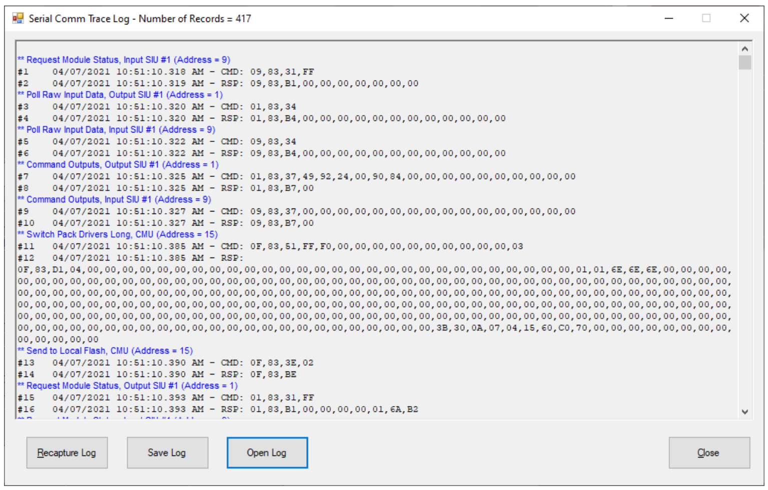
This menu item opens the Replay Log form and loads a new trace of the controller SB#1 activity. Main *Menu: View / View Replay Log/ Capture New Replay Log.*

5.3.3.2 OPEN SAVED REPLAY LOG

This menu item opens the Replay Log form and loads a log of the controller SB#1 activity that has been previously saved to a disk file (*.TRC). Main *Menu: View / View Replay Log / Open Saved Replay Log.*

5.3.4 VIEW SERIAL COMM TRACE LOG

The Serial Comm Trace Log displays a timestamped buffer of SB#1 command and response frames in the CU Direct mode, and a buffer of COMM command and response frames in the SIU Direct mode. All data values are displayed in hexadecimal format. See Section 9 for operational details.



5.3.4.1 CAPTURE NEW TRACE LOG

This menu item opens the Serial Comm Trace Log form and loads a new trace of the SB#1 activity. Main *Menu: View / View Serial Comm Trace Log/ Capture New Trace Log*

5.3.4.2 OPEN SAVED TRACE LOG

This menu item opens the Serial Comm Trace Log form and loads a log of the SB#1 activity that has been previously saved to a disk file (*.TRC). Main *Menu: View / View Serial Comm Trace Log / Open Saved Trace Log*

5.4 MENU: WINDOW

5.4.1 TILE

Once the SIU Enable settings are complete, the *Tile* function can order and display all of the SIU forms to be visible with some vertical scrolling required. Main *Menu: Window / Tile.*

5.4.2 CASCADE

Once the SIU Enable settings are complete, the *Cascade* function will order and display all of the SIU forms to be overlapped for a more condensed desktop view. Main *Menu: Window / Cascade.*

5.4.3 CENTER ALL WINDOWS

When loading a Project or Map file into a PC that has a different monitor screen setup, a form may load to a location not visible on the screen(s). For example, a project that uses two screens (left and right) is loaded into a PC with only one screen. Most cases are dealt with automatically, but the vast collection of screen configurations cannot always be anticipated.

If the main form is hidden, try the keystroke sequence while holding the <Alt> key with W then A. Main *Menu: Window / Center All Windows.*

5.5 MENU: HELP

5.5.1 IO MAPS

This menu item displays a series of tables describing the mapping of SIU IO pins to ATC CyberCabinet functions. A table is presented for each of the four cabinet architectures currently supported. Main *Menu: Help / IO Maps.*

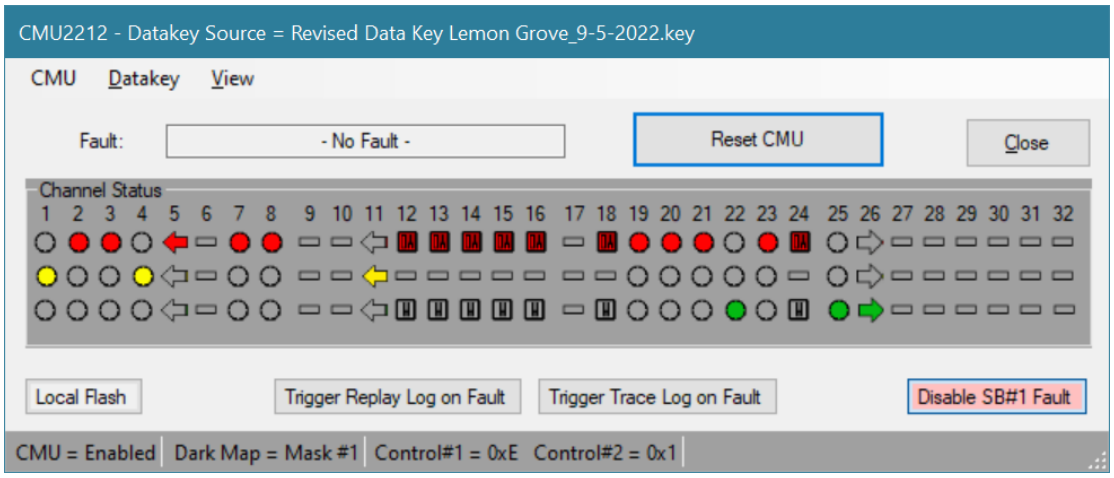
5.5.2 ABOUT

This menu item displays the *ATC CyberCabinet* software version information and the *ATC CyberCabinet* HDLC Interface Module version information. Main *Menu: Help / About.*

Section 6
Cabinet Monitor Unit (CMU)

6.1 GENERAL

In the CU Direct Mode a software emulation of the CMU-2212, CMU-212, MMU2 or 2018KCL is provided to help ensure that the CU database provides proper signal sequencing. This monitoring function will help test that when the CU and physical cabinet is deployed to the street, the CU database will operate in the cabinet without generating CMU faults.



This CMU emulation provides a secondary benefit of validating the programming of the target intersection CMU Datakey configuration. The CMU configuration parameters can be read from an EDI *MonitorKey*® formatted disk file, or directly using the EDI *MonitorKey*® Programmer device.

WARNING

This emulation of the CMU/MMU2 is a tool to help ensure that the CMU Configuration is **compatible** with the Controller database operation. It is up to the User to determine that the CMU/MMU2 parameters are correct, complete, and suitable for the target intersection.

6.2 CMU FUNCTIONALITY

The CMU emulation is intended to reflect the operation of a hardware CMU-2212, CMU-212, MMU2 or 2018KCL.

6.2.1 CMU CHANNEL DISPLAY

The CMU form will display the active channel colors reflecting the signal faces shown on the SIU Device view panel (see section 3.3.1.4). The CMU channel icons will be set to the same signal face type that has been assigned to the SIU Device view panel (see Section 3.3.1.4).

6.2.2 FAULT COVERAGE

The *ATC CyberCabinet* CMU monitoring functions include the following:

6.2.2.1 CONFLICT

Using the Permissive programming of the Datakey, the CMU will detect a *Conflict* fault when two or more non-compatible channels are active (Green or Yellow) for greater than 300 ms.

6.2.2.2 LACK OF SIGNAL (LOS) OR RED FAIL

The CMU will detect a *Lack of Signal* or *Red Fail* fault when all inputs of an enabled channel are not active for greater than 1250 ms.

6.2.2.2.1 DARK MAPS

The Lack of Signal monitoring function will be modified according to the current Dark Map selection provided by the CU in frame types 67, 81, or 83.

6.2.2.3 MULTIPLE SIGNAL

The CMU will detect a *Multiple* fault when two or more colors (G-Y, G-R, Y-R) of an enabled channel are active for more than 400 ms.

6.2.2.4 CLEARANCE

6.2.2.4.1 MINIMUM YELLOW CLEARANCE

The CMU will detect a *Minimum Yellow Clearance* fault when an enabled channel terminates the Green signal and activates the Red signal without displaying at least 2700 ms of Yellow.

6.2.2.4.2 MINIMUM YELLOW + RED CLEARANCE

The CMU will detect a *Minimum Yellow+Red Clearance* fault when an enabled channel terminates the Green signal and a *conflicting* Green signal is set active in less than 2700 ms.

6.2.2.5 FLASHING YELLOW ARROW

The CMU-2212 supports eight Flashing Yellow Arrow (FYA) 4-section signals. The 2018KCL supports four Flashing Yellow Arrow (FYA) 4-section signals.

6.2.2.5.1 FYA FLASH RATE

If enabled, the CMU will detect an *FYA Flash Rate* fault when the Overlap channel (Ra, sYa, fYa) flashing Yellow is active for more than 1500 ms.

6.2.2.5.2 FYA R&Y ENABLE

If enabled, the CMU will process the Red and Yellow inputs for Lack of Signal, Conflict, Multiple, and Clearance on an FYA Green Arrow channel. This applies only to the CMU-2212.

6.2.2.5.3 FYA YELLOW TRAP

If enabled, the CMU will detect an *FYA Yellow Trap* when the Overlap channel (Ra, sYa, fYa) solid Yellow is active and the Opposing thru phase Green is active. This applies only to the CMU-2212.

6.2.2.6 VIRTUAL CHANNELS

Four *Virtual Channels* (Ch: 29, 30, 31, and 32) are supported. This applies only to the CMU-2212.

6.2.2.7 SERIAL BUS #1 TIMEOUT

If the SB#1 communication from the CU stops for more than 300 ms, the CMU will detect a *SB#1 Timeout* fault. This fault is non-latching for the first two times in a 24 hour period. The third event is latched and requires a Reset of the CMU. This applies only to the CMU-2212.

6.2.2.8 WDT TIMEOUT

If the SB#1 communication from the CU stops for more than 300 ms, the CMU will detect a *SB#1 Timeout* fault. This fault is non-latching for the first two times in a 24 hour period. The third event is latched and requires a Reset of the CMU. This applies only to the 2018KCL.

6.2.2.9 LOCAL FLASH INPUT

The *Local Flash* button provides a way to emulate the Local Flash (AUTO / FLASH) switch in a cabinet. This is a non-latched fault state.

6.3 OPERATING THE CMU

From the Main menu select *Menu: View / CMU* to open the CMU function. The CMU status (enabled and fault) is also shown on the CU Direct Mode Control panel. Clicking this status window will bring the CMU form to the front to see more detail if the CMU form is hidden behind other windows.

The CMU must have a Datakey configuration loaded before it can be enabled. See Section 6.7.1.1 and 6.7.1.2.

6.3.1 RESET CMU

The *Reset CMU* button is used to clear the fault state of the CMU once a fault has been detected.

6.3.2 LOCAL FLASH

The *Local Flash* button can be toggled On and Off to emulate the AUTO / FLASH switch found in a real cabinet. Local Flash is a non-latched fault.

6.3.3 DISABLE SB#1 FAULT

The *SB#1 Timeout* fault can be disabled if stopping the Controller communications to the HDLC Interface Module will occur as part of the testing process. This allows the Controller sequence to continue without the “Exit From Flash” process.

6.3.4 TRIGGER REPLAY LOG ON FAULT

When this mode is enabled by clicking the *Trigger Replay Log on Fault* button, the Replay Trace Log (Section 8) will be captured when the CMU detects a fault condition.

6.3.5 TRIGGER TRACE LOG ON FAULT

When this mode is enabled by clicking the *Trigger Trace Log on Fault* button, the Serial Comm Trace Log (Section 9) will be captured when the CMU detects a fault condition.

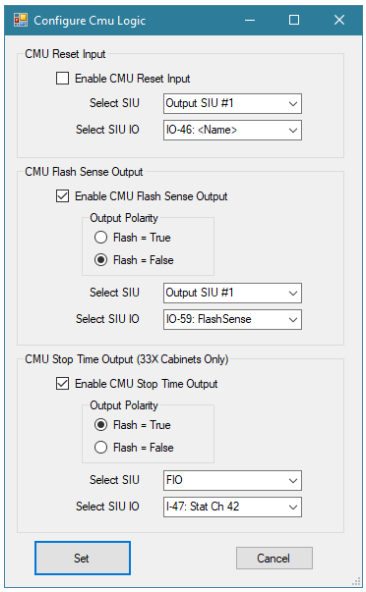
6.4 CMU MENU ITEMS

6.4.1 CMU MENU

6.4.1.1 ENABLE / DISABLE CMU

Once a Datakey configuration has been loaded, the CMU can be enabled for fault detection. If the CMU is not enabled, the CMU channel display will continue to display signal status, but no faults will be detected. CMU *Menu: CMU / Enable (Disable) CMU*.

6.4.1.2 CONFIGURE CMU LOGIC OUTPUTS



The CMU can be configured to interact with certain SIU/FIO inputs or outputs. CMU *Menu: CMU / Configure Logic*.

6.4.1.2.1 CMU RESET INPUT

Some ATC Cabinets may be wired to connect an SIU output pin to the CMU External Test Reset. This provides a method for the Controller to reset a fault condition in the CMU. To emulate this functionality, the *CMU Reset Input* function is configured with an Enable control and which IO pin of which SIU will be used for the connection.

6.4.1.2.2 CMU FLASH SENSE OUTPUT

The CMU can drive a configured SIU IO pin reflecting the cabinet flash state. To emulate this functionality, the *CMU Flash Sense* output function is configured with an Enable control and which IO pin of which SIU will be used for the CMU output. The polarity of the output can be set True or False for Flash Mode.

- MMU/CMU Flash Sense input .....select Flash = True
- Local Flash Sense input .....select Flash = False

6.4.1.2.3 CMU STOP TIME OUTPUT

The CMU can drive a configured SIU IO pin reflecting the cabinet flash state. To emulate this functionality, the *CMU Stop Time* output function is configured with an Enable control and which IO pin of which SIU will be used for the CMU output. The polarity of the output can be set True or False for Flash Mode. This output is only for the 2018KCL CMU.

- CMU Stop Time input .....select Flash = True

6.4.2 DATAKEY MENU

If a Datakey filename was saved in a previous session of the project, the Datakey file will be loaded into the CMU when the project file is opened. See section 5.1.1.1.

6.4.2.1 OPEN DATAKEY FILE

This function will load a MonitorKey® formatted file from the PC disk containing the CMU Datakey parameters. The last five file names are displayed for easy access. CMU *Menu: Datakey / Open Datakey File.*

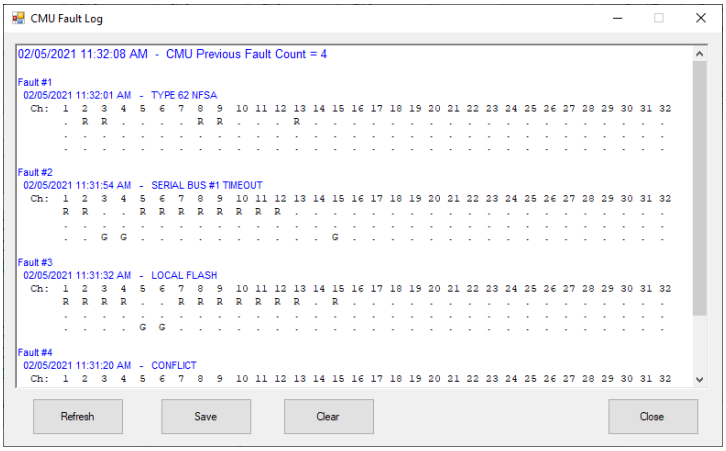
6.4.2.2 READ DATAKEY

This function will load a MonitorKey® configuration directly from the EDI MonitorKey® Programmer with a Datakey inserted. The MonitorKey® Programmer is connected via a USB port on the PC. CMU *Menu: Datakey / Read Datakey.*

6.4.3 VIEW MENU

6.4.3.1 CMU FAULT LOG

This menu item displays a form containing a log of time-stamped Previous CMU Faults. Fault #1 (top) is the most recent fault event, and fault #n (bottom) is the oldest fault. CMU *Menu: View / CMU Fault Log / View Log.* **Note that the timestamp values are generated from the PC computer time and not the time reported by the Controller.**



6.4.3.1.1 REFRESH LOG

This button will refresh the CMU Fault Log list if fault events have occurred since the Log was first opened. CMU *Menu: View / CMU Fault Log / Refresh Log*

6.4.3.1.2 SAVE LOG

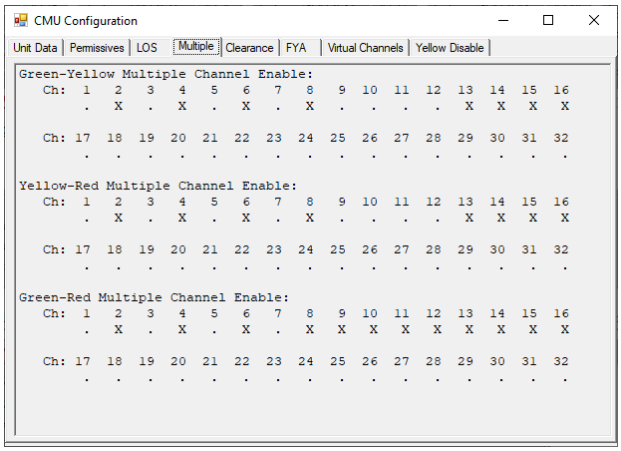
This button will save the CMU Fault Log list to a text file. This text file can then be easily edited or printed. CMU *Menu: View / CMU Fault Log / Save Log*

6.4.3.1.3 CLEAR LOG

This button will clear all previous events from the CMU Fault Log list. CMU *Menu: View / CMU Fault Log / Clear Log*

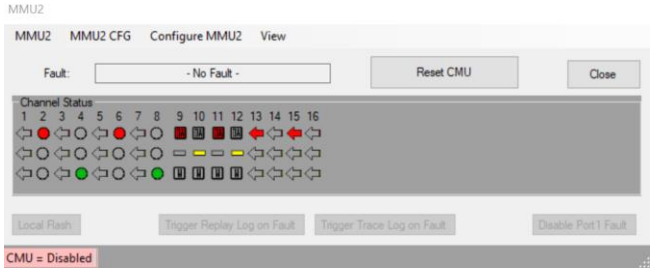
6.4.3.2 CMU CONFIGURATION

The Datakey parameters used by the CMU are displayed. Each tab presents the relevant parameters for the selected function. CMU *Menu: View / CMU Configuration.*



6.5 MMU2 FUNCTIONALITY

The MMU2 emulation is intended to reflect the operation of a hardware MMU2.



6.5.1 MMU2 CHANNEL DISPLAY

The MMU2 form will display the active channel colors reflecting the signal faces shown on the BIU Device view panel (see section 3.3.1.4). The MMU2 channel icons will be set to the same signal face type that has been assigned to the BIU Device view panel (see Section 3.3.1.4).

6.5.2 FAULT COVERAGE

The *ATC CyberCabinet* MMU2 monitoring functions include the following:

6.5.2.1 CONFLICT

Using the Permissive programming of the Datakey, the MMU2 will detect a *Conflict* fault when two or more non-compatible channels are active (Green or Yellow) for greater than 300 ms.

6.5.2.2 RED FAIL

The MMU2 will detect a *Red Fail* fault when all inputs of an enabled channel are not active for greater than 1250 ms.

6.5.2.3 MULTIPLE SIGNAL

The MMU2 will detect a *Dual Indication* fault when two or more colors (G-Y, G-R, Y-R) of an enabled channel are active for more than 400 ms.

6.5.2.4 CLEARANCE

6.5.2.4.1 MINIMUM YELLOW CLEARANCE

The MMU2 will detect a *Minimum Yellow Clearance* fault when an enabled channel terminates the Green signal and activates the Red signal without displaying at least 2700 ms of Yellow.

6.5.2.4.2 MINIMUM YELLOW + RED CLEARANCE

The MMU2 will detect a *Minimum Yellow+Red Clearance* fault when an enabled channel terminates the Green signal and a *conflicting* Green signal is set active in less than 2700 ms.

6.5.2.5 FLASHING YELLOW ARROW

The MMU2 supports four Flashing Yellow Arrow (FYA) 4-section signals.

6.5.2.5.1 FYA FLASH RATE

If enabled, the MMU2 will detect an *FYA Flash Rate* fault when the Overlap channel (Ra, sYa, fYa) flashing Yellow is active for more than 1500 ms.

6.5.2.5.2 FYA R&Y ENABLE

If enabled, the MMU2 will process the Red and Yellow inputs for Lack of Signal, Conflict, Multiple, and Clearance on an FYA Green Arrow channel.

6.5.2.6 PORT1 TIMEOUT

If the Port1 communication from the CU stops for more than 300 ms, the MMU2 will detect a *Port1 Timeout* fault. This fault is non-latching for the first two times in a 24 hour period. The third event is latched and requires a Reset of the CMU.

6.5.2.7 LOCAL FLASH INPUT

The *Local Flash* button provides a way to emulate the Local Flash (AUTO / FLASH) switch in a cabinet. This is a non-latched fault state.

6.6 OPERATING THE MMU2

From the Main menu select *Menu: View /* MMU2 to open the MMU2 function. The MMU2 status (enabled and fault) is also shown on the CU Direct Mode Control panel.

Clicking this status window will bring the MMU2 form to the front to see more detail if the CMU form is hidden behind other windows.

6.6.1 RESET MMU2

The *Reset MMU2* button is used to clear the fault state of the MMU2 once a fault has been detected.

6.6.2 LOCAL FLASH

The *Local Flash* button can be toggled On and Off to emulate the AUTO / FLASH switch found in a real cabinet. Local Flash is a non-latched fault.

6.6.3 DISABLE PORT1 FAULT

The *Port1 Timeout* fault can be disabled if stopping the Controller communications to the HDLC Interface Module will occur as part of the testing process. This allows the Controller sequence to continue without the "Exit From Flash" process.

6.6.4 TRIGGER REPLAY LOG ON FAULT

When this mode is enabled by clicking the *Trigger Replay Log on Fault* button, the Replay Trace Log (Section 8) will be captured when the MMU2 detects a fault condition.

6.6.5 TRIGGER TRACE LOG ON FAULT

When this mode is enabled by clicking the *Trigger Trace Log on Fault* button, the Serial Comm Trace Log (Section 9) will be captured when the MMU2 detects a fault condition.

6.7 MMU2 MENU ITEMS

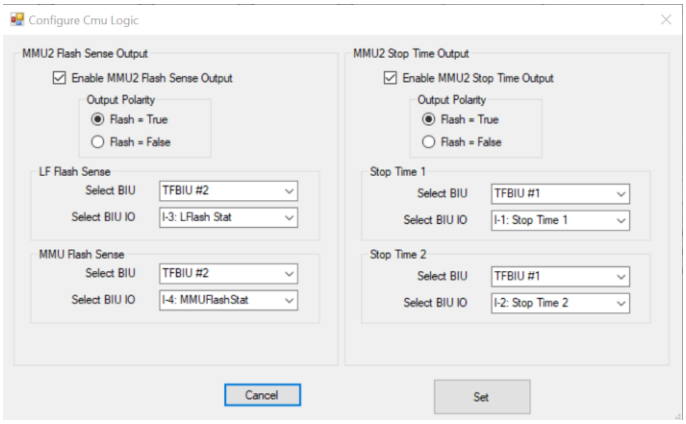
6.7.1 MMU2 MENU

6.7.1.1 ENABLE / DISABLE MMU2

Once an MMU2 configuration has been loaded, the MMU2 can be enabled for fault detection. If the MMU2 is not enabled, the MMU2 channel display will continue to display signal status, but no faults will be detected. MMU2 *Menu: MMU2 / Enable (Disable) MMU2*.

6.7.1.2 CONFIGURE MMU2 LOGIC OUTPUTS

The MMU2 can be configured to interact with certain BIU inputs or outputs. MMU2 *Menu: MMU2 / Configure Logic*.



6.7.1.2.1 MMU2 FLASH SENSE OUTPUT

The MMU2 can drive a configured BIU IO pin reflecting the cabinet flash state. To emulate this functionality, the *MMU2 Flash Sense* output function is configured with an Enable control and which IO pin of which BIU will be used for the MMU2 output. The polarity of the output can be set True or False for Flash Mode.

- MMU2 Flash Sense input .....select Flash = True

6.7.1.2.2 MMU2 STOP TIME OUTPUT

The MMU2 can drive two configured BIU IO pins reflecting the cabinet flash state. To emulate this functionality, the *MMU2 Stop Time* output function is configured with an Enable control and which IO pin of which BIU will be used for the MMU2 output. The polarity of the output can be set True or False for Flash Mode.

- MMU2 Stop Time input .....select Flash = True

6.7.2 MMU2 CONFIG MENU

6.7.2.1 OPEN CFG FILE

This function will load an EDI MMU216LE formatted file from the PC disk containing the MMU2 parameters. The last five file names are displayed for easy access. MMU2 *Menu: MMU2 CFG / Open CFG File.*

6.7.3 MMU2 MANUAL CONFIGURATION

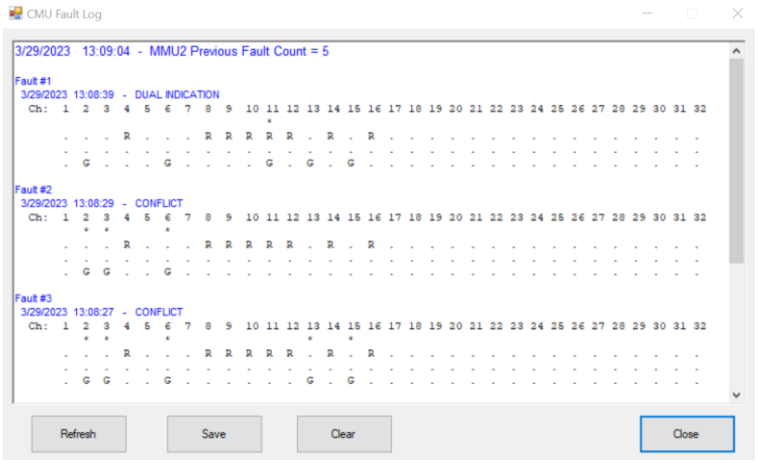
These menu items can be used to manually enter or change MMU2 configuration parameters.

- Unit Data
- Permissives
- Red Fail
- Dual Indication
- Clearance
- Channel Disable
    - Channel Disable is not a standard MMU2 configuration parameter. It is provided to simulate a physical channel that does not have a load switch installed.

6.7.4 VIEW MENU

6.7.4.1 MMU2 FAULT LOG

This menu item displays a form containing a log of time-stamped Previous MMU2 Faults. Fault #1 (top) is the most recent fault event, and fault #n (bottom) is the oldest fault. CMU *Menu: View / MMU2 Fault Log / View Log.* **Note that the timestamp values are generated from the PC computer time and not the time reported by the Controller.**



6.7.4.1.1 REFRESH LOG

This button will refresh the CMU Fault Log list if fault events have occurred since the Log was first opened. MMU2 *Menu: View / MMU2 Fault Log / Refresh Log*

6.7.4.1.2 SAVE LOG

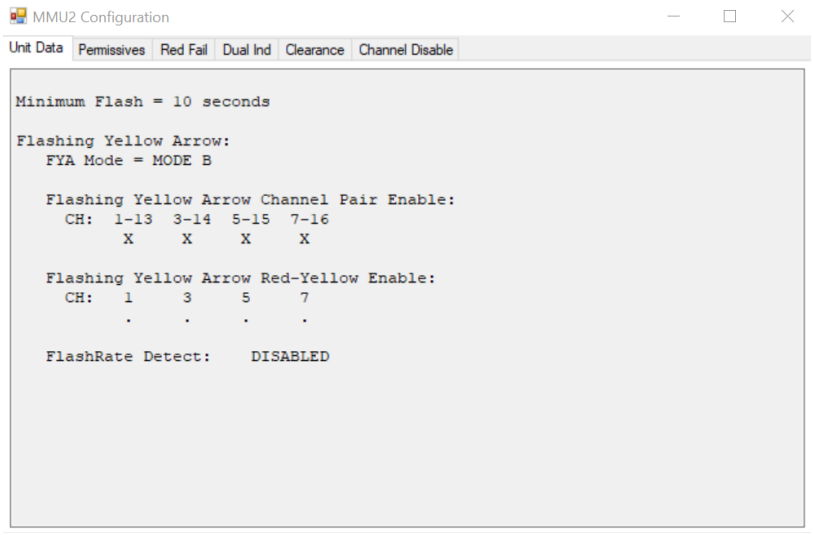
This button will save the MMU2 Fault Log list to a text file. This text file can then be easily edited or printed. MMU2 *Menu: View / MMU2 Fault Log / Save Log*

6.7.4.1.3 CLEAR LOG

This button will clear all previous events from the MMU2 Fault Log list. CMU *Menu: View / MMU2 Fault Log / Clear Log*

6.7.4.2 MMU2 CONFIGURATION

The Datakey parameters used by the MMU2 are displayed. Each tab presents the relevant parameters for the selected function. MMU2 *Menu: View / MMU2 Configuration.*



Section 7
Map Editor

7.1 GENERAL

The Map View is a higher level view of the Device View operation and best visualizes the actual operation of the intersection. Using this view is optional, but it provides a much easier interface to the CU Detector inputs and Signal outputs. Using the Map Editor, a bird's eye view of the actual intersection is created using individual road furniture icons such as lanes, dividers, cross-walks, etc. Active Detector control icons are used to input calls to the CU and active Signal icons are used to display the CU signal outputs.

7.2 MAP FILES

The Map Editor results are stored in a MAP file for each project. MAP files can be created for common intersection configurations and loaded as templates when a new project is started. Once a MAP is created, it should be saved to a file on the PC. See Section 7.2.2.

7.2.1 OPEN MAP FILE

Use *Menu: File / Open Map File* to open a Map file. A list of the last recent five MAP files is provided for the Open function. Opening a Map file will replace all of the current icons in the Map view.

7.2.1.1 OPEN MAP AS OVERLAY

A Map file can be loaded without clearing the current icons in the Map view using this menu option. This is helpful if the Map file is part of a template collection of Map approaches or other icon collections. *Menu: File / Open Map As Overlay*.

7.2.2 SAVE MAP FILE

Use MAP *Menu: File / Save Map File* to save a Map file. A backup copy is made of the previous Map file (if it exists) and named with a "Backup of <filename>.map" filename.

7.3 MAP ICONS

The following icons are provided in the icon library:

Active Detector Icons

- Lane Detector
- Pedestrian Push Button
- Bicycle Detector
- Preempt Input
- Train Input
- Volume / Occupancy Detector
    - Deterministic
    - Randomized

Active Signal Icons

- Thru Ball
- Protected Left Turn
- Pedestrian Walk / Don't Walk
- Protected Right Turn
- FYA Left Turn (4-section)
- FYA Right Turn (4-section)
- Permissive FYA Left Turn (3-section)
- Permissive FYA Right Turn (3-section)
- Protected-Permissive Left Turn (2-section)
- Protected-Permissive Right Turn (2-section)
- Transit (2-section)
- Transit (3-section)
- Bike (3-section)
- Not Used (3-section)
- Beacon (driven from Red output)
- Beacon (driven from Yellow output)
- Beacon (driven from Green output)

Lane Icons

- Unmarked Lane with no Stop Bar
- Left Arrow Lane with Stop Bar
- Right Arrow Lane with Stop Bar
- Straight Arrow Lane with Stop Bar
- Left Jog Lane
- Bike Lane with Stop Bar
- Bike Lane with no Stop Bar

Divider Icons

- Solid White
- Dashed White
- Single Yellow
- Double Yellow
- Ped Cross Walk
- Rail Crossing

Paver Icons

- Rectangular Pavement

Label Icons

- 8 Point
- 12 Point
- 20 Point

Photo Icons

- Background Photo

7.4 EDIT MODE AND RUN MODE

Map icons can only be created or modified when the Map View is in the Edit Mode. Once the map has been created and saved, toggle the Edit Mode to Run mode to allow the icons to be activated. If the map needs to be modified, then the Edit Mode needs to be selected again. Use the MAP *Menu: File / Toggle Edit Mode*, or the *Edit/Run Mode* button  .

7.5 EDITOR FUNCTIONS

The Map Editor provides the following functions to select, move, resize, rotate, delete, and duplicate. These functions are only active in the Edit Mode.

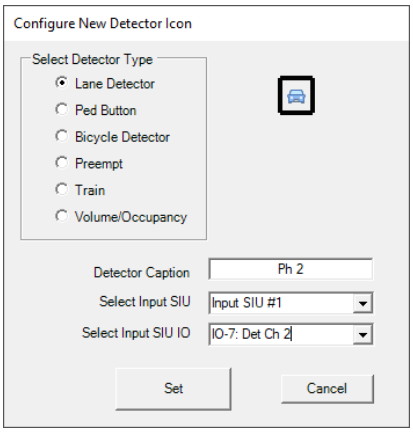
7.5.1 NEW ICON

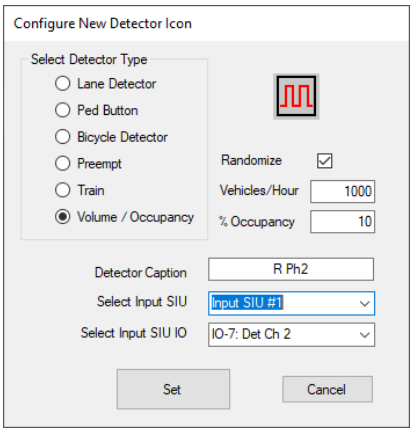
To create a new Lane, Divider, Paver, Label, Detector, Signal, or Photo icon, click on the appropriate button on the Toolbar. The new icon will appear in the upper left corner of the Map form.

Some icons require further detail to either select the graphic or assign the SIU and SIU IO. A separate form will appear to select this detail. It is recommended that the SIU Device view panels be populated with text fields for each IO pin and Output Channel and saved to a Project file before creating a new Map. This will assist in assigning the Detector and Signal icons.

7.5.1.1 DETECTOR DETAILS

A new Detector icon requires a selection for the Detector Type, an optional four character caption, and assignment to an SIU and SIU IO number. The pull-down box for the Input SIU IO assignment will be pre-populated with the labels from the SIU Device View panel.





7.5.1.1.1 VOLUME / OCCUPANCY DETECTOR

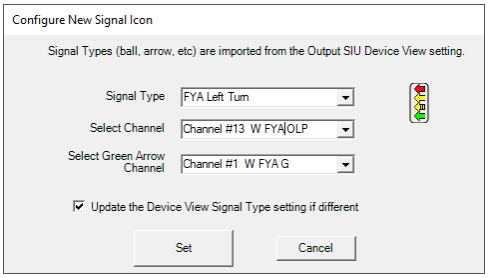
The Volume / Occupancy detector style is designed to output a stream of detector pulses when activated based on the Volume and Occupancy parameters specified when the detector is

created. The Volume parameter is specified as Vehicles per Hour (1-18000), and the Occupancy parameter is specified as a percentage (1-99).

If the *Randomize* checkbox is selected then calls will be generated randomly based on the Volume parameter (Vehicles per hour) as a 200 millisecond pulse.

7.5.1.2 SIGNAL DETAILS

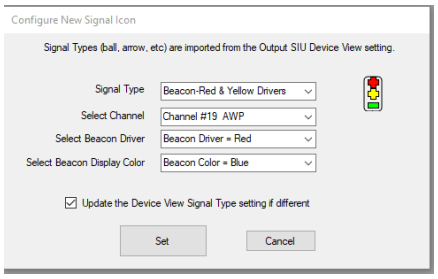
A new Signal icon requires a selection for the Signal Type, and an assignment to a Channel from the Device View Output SIU(s). Selecting a channel in the Select Channel pull-down box will cause the Signal Type pull-down box to be populated with the signal face type assigned to the channel on the Device View SIU panel.



The Signal Type can be modified from the default selection provided by the Device View SIU channel panel if desired. Use the Signal Type pull-down box to select a different signal face. If the Device View SIU panel signal type should be updated to match this new selection ensure that the *Update the Device View Signal Type setting if different* checkbox is checked before clicking the *Set* button.

7.5.1.2.1 BEACON SIGNAL TYPE

The Beacon signal type is a one-section signal face driven from one of the three signal outputs, Red, Yellow, or Green. The Map View displays this Beacon signal as a one-section face. The SIU Device view is channel based, and a channel can be set to drive a separate Beacon from each output. The *Signal Type* parameter of the *Configure New Signal Icon* form is used to set the SIU Device view channel display faces. The *Beacon Display Color* parameter of the *Configure New Signal Icon* form is used to set the Map Device view Beacon display color.



In the example shown above, the Beacon is driven from the Red output of channel 19. The Beacon display color is blue on the Map view, and the SIU Device view displays channel 19 driving Beacons from the Red and Yellow outputs.

7.5.1.3 INSPECTING DETECTOR AND SIGNAL ASSIGNMENTS

In either the Edit mode or Run mode, the Detector and Signal assignment parameters can be inspected by right clicking on the icon. This invokes a context menu that shows the details for each type of icon. Right-click *View Detector Parameters* or *View Signal Parameter*.

7.5.1.4 MODIFYING DETECTOR AND SIGNAL ASSIGNMENTS

In the Edit Mode, the Detector and Signal assignment parameters can be modified by right clicking on the icon. This invokes a context menu that shows the details for each type of icon. Right-click *Modify Detector Parameters* or *Modify Signal Parameter*

7.5.2 SELECT

When an icon is created or clicked with the mouse, it will be selected and display a red border around the icon. This selects the icon for other operations below. To de-select an icon, click on the selected icon again, click on the map background, or click on another icon. Multiple icons can be selected by holding the keyboard Ctrl key and clicking a series of icons. All icons can be selected by pressing the Ctrl key and the A key simultaneously.

7.5.2.1 PINNED ICONS

The Photo and Paver icons can be "Pinned" such that they cannot be selected. This prevents them from being accidentally selected and moved. To *Pin* or *Unpin* a Photo or Paver icon, right click the icon and click the Pinned menu item.

7.5.3 MOVE

To move an icon, it can be either selected or not selected. Press and hold the left mouse key over the icon and drag it to a new position, then release the left button. Icons will snap to a grid to assist in alignment. To move multiple icons they all need to be selected.

7.5.4 RESIZE

The Lane, Divider, Paver, and Photo icons are allowed to be resized. Select the icon by clicking on it to display the red border. When the mouse is approaching the icon red border edge that can be resized, the mouse will change to a double arrow (⟷) to indicate the direction of the resize. Press the left mouse button and drag the red border to the new width or height, then release the left button.

Resizing a Photo icon will maintain the original aspect ratio.

7.5.5 ROTATE

To rotate an icon it must be selected. If multiple icons are selected they will all be rotated. Click on the *Rotate* button  to rotate the icon 90 degrees. If multiple icons have been selected to rotate, they are rotated around the index point (left, top) of the first icon selected. If Ctl-A is used to select all icons, then the index point is the center of the MAP form.

7.5.6 DELETE

To delete an icon it must be selected. If multiple icons are selected they will all be deleted. Click on the *Delete* button  , or the keyboard Del key to delete the selected icon(s).

7.5.7 DUPLICATE

To duplicate an icon it must be selected. If multiple icons are selected they will all be duplicated. Click on the *Duplicate* button  to duplicate the selected icon(s).

7.5.8 SEND TO FRONT

Detector, Signal, and Label icons should be displayed on a layer above the road furniture. Select the icon and click on the *Send Front* button  to move an icon to the upper layer.

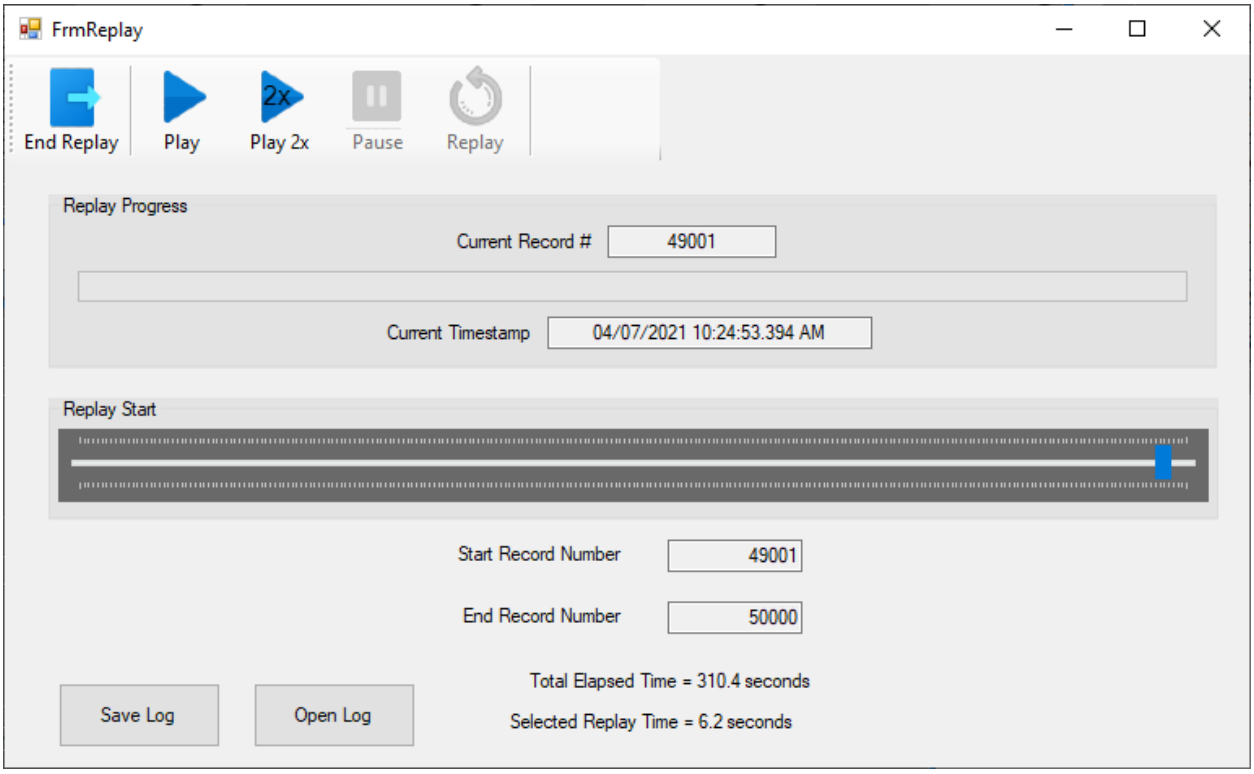
7.5.9 SEND TO BACK

Most road furniture icons should be displayed in a layer below the active icons such as detectors or signals. Select the icon and click on the *Send Back* button  to move an icon to the lower layer.

Section 8
Replay Mode

8.1 GENERAL

The Replay Log function can be used to replay and review the past sequence of controller movements. The Replay log is limited to 100,000 records which ranges from five to ten minutes of operation depending on SIU configurations. **Note that the timestamp values are generated from the PC computer time and not the time reported by the Controller.**



8.2 CAPTURING THE REPLAY TRACE LOG

The Replay Trace Log can be captured by clicking the *Replay Mode* button on the Device View Control panel (Section 3.5.4) or using the CMU *Trigger Replay Log on Fault* function (Section 6.6.4).

8.2.1 SAVE LOG

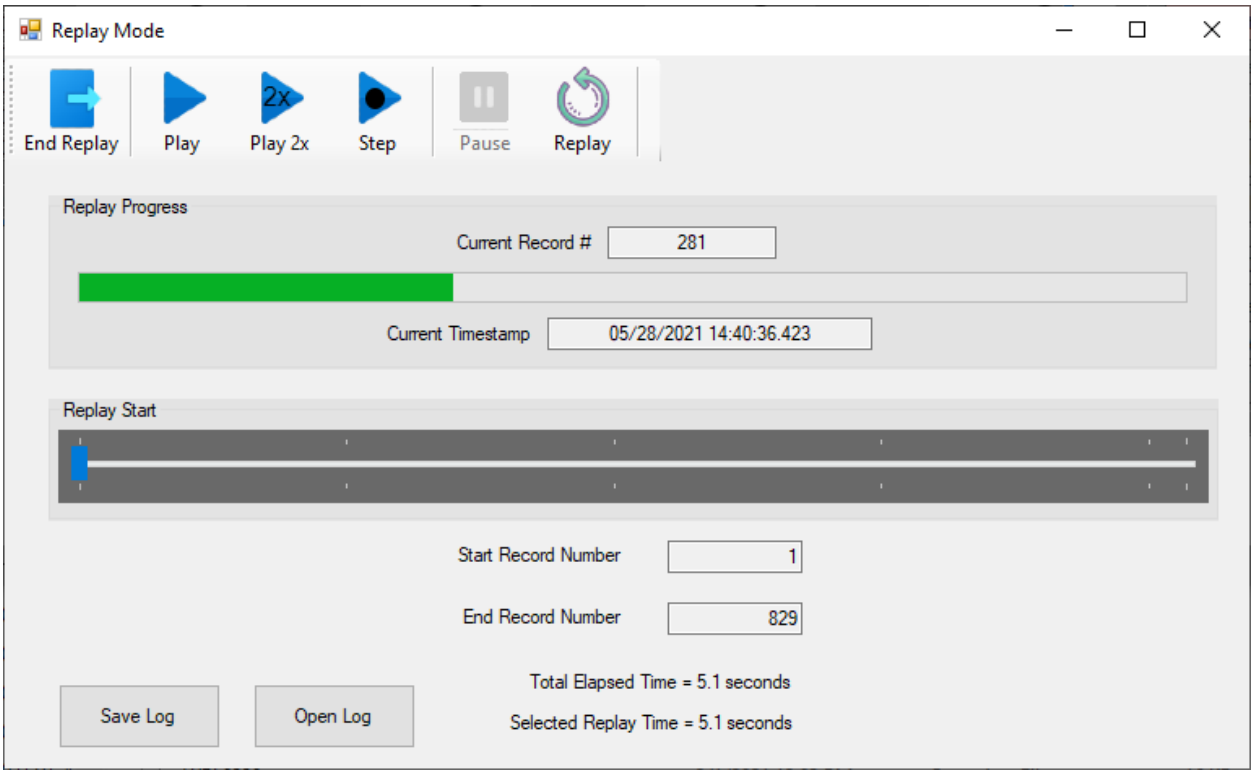
The *Save Log* button will save a text version of the log to disk.

8.2.2 OPEN LOG

The *Open Log* button will load a previously saved Replay Trace Log into the form.

8.3 REPLAY MODE

Once a Replay log has been loaded to the Replay form, it can be replayed to review the operation as it was recorded. This can be useful to review a sequence of signal changes that results in an improper or unexpected result.



During the Replay Mode, the SIU Device View and Map View are not updated from the real time Controller SB#1 activity, but rather the replay of the records selected (Section 8.3.7). The SIU Device View panels are displayed with a blue border to indicate the Replay Mode is active.

The CMU function may be *Enabled* during Replay if desired (Section 6.7.1.1). Note that if the CMU is enabled, then any signal faults during the replay will be processed and responded to by the CMU. This action only affects the CMU display and does not change the replayed signal sequence. During the Replay Mode, the SB#1 TIMEOUT fault detection of the CMU is automatically disabled.

8.3.1 END REPLAY

The *End Replay* toolbar button  is clicked to exit the Replay Mode. The current Replay log is cleared on exit, be sure to Save the log if necessary.

8.3.2 PLAY

The *Play* button  is clicked to start the replay of the selected records.

8.3.3 PLAY 2X

The *Play2x* button  is clicked to start the replay of the selected records at 2x speed.

8.3.4 STEP

The *Step* button  is clicked to move forward to the next SIU frame update and then pause.

8.3.5 PAUSE

The *Pause* button  can be clicked to temporarily stop the replay sequence. Clicking the *Play* or *Play2x* button resumes from that point, or clicking the *Replay* button will restart at the first selected record.

8.3.6 REPLAY

Following the completion of the replay sequence, the *Replay* button  can be used to reposition the current record to the original Start Record number. Clicking the *Play* button will start the sequence again.

8.3.7 REPLAY START

The Replay Start slider is used to select where the replay sequence will begin in the captured log. The slider can be reset to any point within the log and is positioned with the following methods:

- Manually slide the blue knob to a position in the log.
- A mouse click on the slider bar will move the knob left or right by approximately 12 seconds.
- The left or right keyboard arrow keys will move the knob approximately 1.5 seconds.

The *Start Record Number, Current Record Number,* and *Current Timestamp* parameters are updated with the new position.

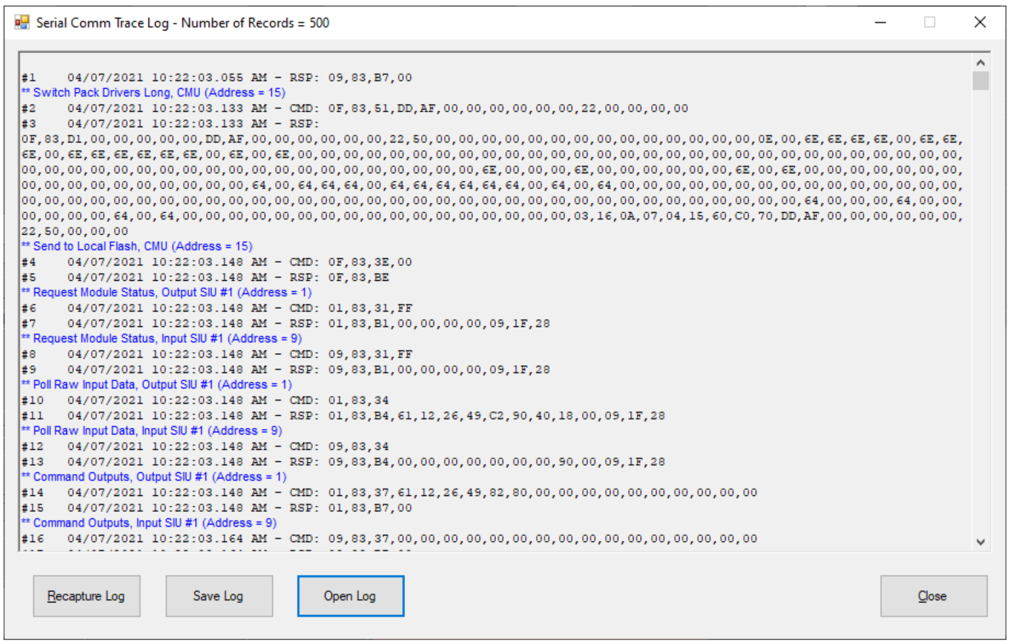
8.3.8 REPLAY PROGRESS

The Replay Progress bar indicates the progress of the Repay operation once the Play button is activated. The Progress Bar is scaled to the selected replay time.

Section 9
Serial Comm Trace Log

9.1 GENERAL

The Serial Comm Trace Log function can be used to display the past raw data records of the SB#1 frame activity of the Controller (CMD) and the SIUs (RSP) and CMU (RSP). This raw data provides a time stamp, a CMD or RSP notation, and the raw data of the frame in hexadecimal format. **Note that the timestamp values are generated from the PC computer time and not the time reported by the Controller.**



9.2 CAPTURING THE SERIAL COMM TRACE LOG

The Serial Comm Trace Log can be captured by clicking the *Display Serial Log* button on the Device View Control panel (Section 3.5.4) or using the CMU *Trigger Trace Log on Fault* function (Section 6.6.4).

9.3 DISPLAY MODE

The maximum number of records stored in the log is set by the *Max Serial Log Count* parameter in the Settings form (see Section 5.2.5). Long spans can take considerable time to process to the raw data display format of the form.

9.3.1 SAVE LOG

The *Save Log* button will save a text version of the log to disk. Records can also be copied using the Windows <ctl>A and <ctl>C keyboard short cuts.

9.3.2 OPEN LOG

The *Open Log* button will load a previously saved Serial Comm Trace Log into the form.

Section 10
SIU IO Maps

10.1 GENERAL

This section details the IO mapping of the input and output SIUs for each cabinet type.

10.2 ATC CABINET

10.2.1 INPUT SIU

Row A	Name	Function	Row B	Name	Function	Row C	Name	Function
1	+24v IN		1	+24V IN		1	IO 47	DET CH 18 STAT
2	IO 0	DET RES 1-4	2	IO 1	DET RES 5-8	2	IO 48	DET CH 19 STAT
3	IO 2	DET RES 9-12	3	IO 3	DET RES 13-16	3	IO 49	DET CH 20 STAT
4	IO 4	DET RES 17-20	4	IO 5	DET RES 21-24	4	IO 50	DET CH 21 STAT
5	IO 6	DET CH 1	5	IO 7	DET CH 2	5	IO 51	DET CH 22 STAT
6	IO 8	DET CH 3	6	IO 9	DET CH 4	6	IO 52	DET CH 23 STAT
7	IO 10	DET CH 5	7	IO 11	DET CH 6	7	IO 53	DET CH 24 STAT
8	IO 12	DET CH 7	8	IO 13	DET CH 8	8	SB1 TxD+	
9	IO 14	DET CH 9	9	IO 15	DET CH 10	9	SB1 TxD-	
10	IO 16	DET CH 11	10	IO 17	DET CH 12	10	SB1 RxD+	
11	IO 18	DET CH 13	11	IO 19	DET CH 14	11	SB1 RxD-	
12	IO 20	DET CH 15	12	IO 21	DET CH 16	12	SB1 TxC+	
13	IO 22	DET CH 17	13	IO 23	DET CH 18	13	SB1 TxC-	
14	IO 24	DET CH 19	14	IO 25	DET CH 20	14	SB1 RxC+	
15	IO 26	DET CH 21	15	IO 27	DET CH 22	15	SB1 RxC-	
16	IO 28	DET CH 23	16	IO 29	DET CH 24	16	Line Sync+	
17	IO 30	DET CH 1 STAT	17	IO 31	DET CH 2 STAT	17	Line Sync-	
18	IO 32	DET CH 3 STAT	18	IO 33	DET CH 4 STAT	18	NReset+	
19	IO 34	DET CH 5 STAT	19	IO 35	DET CH 6 STAT	19	NReset-	
20	IO 36	DET CH 7 STAT	20	IO 37	DET CH 8 STAT	20	Assy Addr	
21	IO 38	DET CH 9 STAT	21	IO 39	DET CH 10 STAT	21	InBus RTS	
22	IO 40	DET CH 11 STAT	22	IO 41	DET CH 12 STAT	22	SB2 TxD+	
23	IO 42	DET CH 13 STAT	23	IO 43	DET CH 14 STAT	23	SB2 TxD-	
24	IO 44	DET CH 15 STAT	24	IO 45	DET CH 16 STAT	24	SB2 RxD+	
25	IO 46	DET CH 17 STAT	25	Opto 1	PED1	25	SB2 RxD-	
26	Opto 2	PED2	26	Opto 3	PED3	26	SB2 TxC+	
27	Opto 4	PED4	27	Opto Common	PED GND	27	SB2 TxC-	
28	Addr 0		28	Addr 1		28	SB2 RxC+	
29	Addr 2		29	Addr 3		29	SB2 RxC-	
30	InBus TxD		30	InBus RxD		30	SB2 InBus TxC	
31	EQ GND		31	AC Line Ref		31	SB2 InBus RxC	
32	DC GND		32	DC GND		32	SIU Enable	

10.2.2 OUTPUT SIU

Row A	Name	Function	Row B	Name	Function	Row C	Name	Function
1	+24v IN		1	+24V IN		1	IO 47	HDSP8 CH2R
2	IO 0	HDSP1 CH1R	2	IO 1	HDSP1 CH1Y	2	IO 48	HDSP8 CH2Y
3	IO 2	HDSP1 CH1G	3	IO 3	HDSP1 CH2R	3	IO 49	HDSP8 CH2G
4	IO 4	HDSP1 CH2Y	4	IO 5	HDSP1 CH2G	4	IO 50	
5	IO 6	HDSP2 CH1R	5	IO 7	HDSP2 CH1Y	5	IO 51	
6	IO 8	HDSP2 CH1G	6	IO 9	HDSP2 CH2R	6	IO 52	
7	IO 10	HDSP2 CH2Y	7	IO 11	HDSP2 CH2G	7	IO 53	
8	IO 12	HDSP3 CH1R	8	IO 13	HDSP3 CH1Y	8	SB1 TxD+	
9	IO 14	HDSP3 CH1G	9	IO 15	HDSP3 CH2R	9	SB1 TxD-	
10	IO 16	HDSP3 CH2Y	10	IO 17	HDSP3 CH2G	10	SB1 RxD+	
11	IO 18	HDSP4 CH1R	11	IO 19	HDSP4 CH1Y	11	SB1 RxD-	
12	IO 20	HDSP4 CH1G	12	IO 21	HDSP4 CH2R	12	SB1 TxC+	
13	IO 22	HDSP4 CH2Y	13	IO 23	HDSP4 CH2G	13	SB1 TxC-	
14	IO 24	HDSP5 CH1R	14	IO 25	HDSP5 CH1Y	14	SB1 RxC+	
15	IO 26	HDSP5 CH1G	15	IO 27	HDSP5 CH2R	15	SB1 RxC-	
16	IO 28	HDSP5 CH2Y	16	IO 29	HDSP5 CH2G	16	Line Sync+	
17	IO 30	HDSP6 CH1R	17	IO 31	HDSP6 CH1Y	17	Line Sync-	
18	IO 32	HDSP6 CH1G	18	IO 33	HDSP6 CH2R	18	NReset+	
19	IO 34	HDSP6 CH2Y	19	IO 35	HDSP6 CH2G	19	NReset-	
20	IO 36	HDSP7 CH1R	20	IO 37	HDSP7 CH1Y	20	Assy Addr	
21	IO 38	HDSP7 CH1G	21	IO 39	HDSP7 CH2R	21	InBus RTS	
22	IO 40	HDSP7 CH2Y	22	IO 41	HDSP7 CH2G	22	SB2 TxD+	
23	IO 42	HDSP8 CH1R	23	IO 43	HDSP8 CH1Y	23	SB2 TxD-	
24	IO 44	HDSP8 CH1G	24	IO 45	--	24	SB2 RxD+	
25	IO 46	--	25	Opto 1	MCE	25	SB2 RxD-	
26	Opto 2	INTER ADV	26	Opto 3	STOP TIME	26	SB2 TxC+	
27	Opto 4	LOC FLASH	27	Opto Common	FACIL GND	27	SB2 TxC-	
28	Addr 0		28	Addr 1		28	SB2 RxC+	
29	Addr 2		29	Addr 3		29	SB2 RxC-	
30	InBus TxD		30	InBus RxD		30	SB2 InBus TxC	
31	EQ GND		31	AC Line Ref		31	SB2 InBus RxC	
32	DC GND		32	DC GND		32	SIU Enable	

10.3 IO COMBO (BACKPACK)

<Future>

Row A	Name	Function	Row B	Name	Function	Row C	Name	Function
1	+24v IN		1	+24V IN		1	IO 47	
2	IO 0	HDSP1 CH1R	2	IO 1	HDSP1 CH1Y	2	IO 48	
3	IO 2	HDSP1 CH1G	3	IO 3	HDSP1 CH2R	3	IO 49	
4	IO 4	HDSP1 CH2Y	4	IO 5	HDSP1 CH2G	4	IO 50	
5	IO 6	HDSP2 CH1R	5	IO 7	HDSP2 CH1Y	5	IO 51	
6	IO 8	HDSP2 CH1G	6	IO 9	HDSP2 CH2R	6	IO 52	
7	IO 10	HDSP2 CH2Y	7	IO 11	HDSP2 CH2G	7	IO 53	
8	IO 12	HDSP3 CH1R	8	IO 13	HDSP3 CH1Y	8	SB1 TxD+	
9	IO 14	HDSP3 CH1G	9	IO 15	HDSP3 CH2R	9	SB1 TxD-	
10	IO 16	HDSP3 CH2Y	10	IO 17	HDSP3 CH2G	10	SB1 RxD+	
11	IO 18	HDSP4 CH1R	11	IO 19	HDSP4 CH1Y	11	SB1 RxD-	
12	IO 20	HDSP4 CH1G	12	IO 21	HDSP4 CH2R	12	SB1 TxC+	
13	IO 22	HDSP4 CH2Y	13	IO 23	HDSP4 CH2G	13	SB1 TxC-	
14	IO 24		14	IO 25		14	SB1 RxC+	
15	IO 26		15	IO 27		15	SB1 RxC-	
16	IO 28		16	IO 29	Det Ch 1	16	Line Sync+	
17	IO 30	Det Ch 2	17	IO 31	Det Ch 3	17	Line Sync-	
18	IO 32	Det Ch 4	18	IO 33	Det Ch 5	18	NReset+	
19	IO 34	Det Ch 6	19	IO 35	Det Ch 7	19	NReset-	
20	IO 36	Det Ch 8	20	IO 37	Det Ch 9	20	Assy Addr	
21	IO 38	Det Ch 10	21	IO 39	Det Ch 11	21	InBus RTS	
22	IO 40	Det Ch 12	22	IO 41	Det Ch 13	22	SB2 TxD+	
23	IO 42	Det Ch 14	23	IO 43	Det Ch 15	23	SB2 TxD-	
24	IO 44	Det Ch 16	24	IO 45		24	SB2 RxD+	
25	IO 46		25	Opto 1		25	SB2 RxD-	
26	Opto 2		26	Opto 3		26	SB2 TxC+	
27	Opto 4		27	Opto Common		27	SB2 TxC-	
28	Addr 0		28	Addr 1		28	SB2 RxC+	
29	Addr 2		29	Addr 3		29	SB2 RxC-	
30	InBus TxD		30	InBus RxD		30	SB2 InBus TxC	
31	EQ GND		31	AC Line Ref		31	SB2 InBus RxC	
32	DC GND		32	DC GND		32	SIU Enable	

10.4 NYCDOT LPLVC CABINET

Row A	Name	Function	Row B	Name	Function	Row C	Name	Function
1	+24v IN	+24VDC	1	+24V IN	+24VDC	1	IO 47	HDSP4 CH1R
2	IO 0	Cab ADR SEL1	2	IO 1	Cab ADR SEL2	2	IO 48	HDSP4 CH1R
3	IO 2	Cab ADR SEL3	3	IO 3	Cab ADR SEL4	3	IO 49	HDSP4 CH1R
4	IO 4	DET RES 1-2	4	IO 5	DET RES 3-4	4	IO 50	HDSP4 CH2R
5	IO 6	HDSP1 CH1R	5	IO 7	HDSP1 CH1Y	5	IO 51	HDSP4 CH2R
6	IO 8	HDSP1 CH1G	6	IO 9	HDSP1 CH2R	6	IO 52	HDSP4 CH2R
7	IO 10	HDSP1 CH2Y	7	IO 11	HDSP1 CH2G	7	IO 53	CMU Reset
8	IO 12	HDSP2 CH1R	8	IO 13	HDSP2 CH1Y	8	SB1 TxD+	COM2
9	IO 14	HDSP2 CH1G	9	IO 15	HDSP2 CH2R	9	SB1 TxD-	COM 15
10	IO 16	HDSP2 CH2Y	10	IO 17	HDSP2 CH2G	10	SB1 RxD+	COM 1
11	IO 18	HDSP3 CH1R	11	IO 19	HDSP3 CH1Y	11	SB1 RxD-	COM 14
12	IO 20	HDSP3 CH1G	12	IO 21	HDSP3 CH2R	12	SB1 TxC+	COM 4
13	IO 22	HDSP3 CH2Y	13	IO 23	HDSP3 CH2G	13	SB1 TxC-	COM 17
14	IO 24	DET CH1	14	IO 25	DET CH2	14	SB1 RxC+	COM 3
15	IO 26	DET CH3	15	IO 27	DET CH4	15	SB1 RxC-	COM 16
16	IO 28	DET CH5	16	IO 29	DET CH6	16	Line Sync+	COM 9
17	IO 30	DET CH7	17	IO 31	DET CH8	17	Line Sync-	COM 22
18	IO 32	DET CH9	18	IO 33	DET CH10	18	NReset+	COM 10
19	IO 34	DET CH11	19	IO 35	DET CH12	19	NReset-	COM 23
20	IO 36	Cab ADDR 1	20	IO 37	Cab ADDR 2	20	Assy Addr	Slot 2-7 (1)
21	IO 38	Cab ADDR 3	21	IO 39	Cab ADDR 4	21	InBus RTS	Slot 2-7 (2)
22	IO 40	Stop Time	22	IO 41	Cab ADDR Parity	22	SB2 TxD+	COM 6
23	IO 42	MCE	23	IO 43	Inter Adv	23	SB2 TxD-	COM 19
24	IO 44	Ext Min Recall	24	IO 45	Cab Flash Mon	24	SB2 RxD+	COM 5
25	IO 46	Cab Alarm	25	Opto 1		25	SB2 RxD-	COM 18
26	Opto 2		26	Opto 3		26	SB2 TxC+	COM 8
27	Opto 4		27	Opto Common	+24VDC	27	SB2 TxC-	COM 21
28	Addr 0	DC GND	28	Addr 1		28	SB2 RxC+	COM 7
29	Addr 2		29	Addr 3		29	SB2 RxC-	COM 20
30	InBus TxD	Slots2-7(21)	30	InBus RxD	Slots2-7(19)	30	SB2 InBus TxC	NA
31	EQ GND		31	AC Line Ref		31	SB2 InBus RxC	NA
32	DC GND	DCP-5	32	DC GND	DCP-5	32	SIU Enable	DCP-5

10.5 LADOT 332 CABINET

10.5.1 INPUT

Pin #	Name	Function	Pin #	Name	Function	Pin #	Name	Function
2	O 0	4P DW	3	O 1	4P W	91	O 48	SF1 R
4	O 2	4R	5	O 3	4Y	93	O 49	SF1 G
6	O 4	4G	7	O 5	3R	94	O 50	OLB R
8	O 6	3Y	9	O 7	3G	95	O 51	OLB Y
10	O 8	2P DW	11	O 9	2P W	96	O 52	OLB G
12	O 10	2R	13	O 11	2Y	97	O 53	OLA R
15	O 12	2G	16	O 13	1R	98	O 54	OLA Y
17	O 14	1Y	18	O 15	1G	99	O 55	OLA G
19	O 16	8P DW	20	O 17	8P W	C11-1	O 56	CMU RESET
21	O 18	8R	22	O 19	8Y	C11-2	O 57	--
23	O 20	8G	24	O 21	7R	C11-3	O 58	--
25	O 22	7Y	26	O 23	YG	C11-4	O 59	--
27	O 24	6P DW	28	O 25	6P W	C11-5	O 60	--
29	O 26	6R	30	O 27	6Y	C11-6	O 61	--
31	O 28	6G	32	O 29	5R	C11-7	O 62	--
33	O 30	5Y	34	O 31	5G	C11-8	O 63	--
35	O 32	OLA G	36	O 33	OLB G			
37	O 34	OLA Y	38	O 35	OLB Y			
100	O 36	SF2 G	101	O 37	SF1 Y			
102	O 38	DET RESET	103	O 39	WDT			
83	O 40	SF2 R	84	O 41	SF2 Y			
85	O 42	OLD R	86	O 43	OLD Y			
87	O 44	OLD G	88	O 45	OLC R			
89	O 46	OLC Y	90	O 47	OLC G			

10.5.2 OUTPUT

Pin #	Name	Function	Pin #	Name	Function	Pin #	Name	Function
2	O 0	4P DW	3	O 1	4P W	91	O 48	SF1 R
4	O 2	4R	5	O 3	4Y	93	O 49	SF1 G
6	O 4	4G	7	O 5	3R	94	O 50	OLB R
8	O 6	3Y	9	O 7	3G	95	O 51	OLB Y
10	O 8	2P DW	11	O 9	2P W	96	O 52	OLB G
12	O 10	2R	13	O 11	2Y	97	O 53	OLA R
15	O 12	2G	16	O 13	1R	98	O 54	OLA Y
17	O 14	1Y	18	O 15	1G	99	O 55	OLA G
19	O 16	8P DW	20	O 17	8P W	C11-1	O 56	CMU RESET
21	O 18	8R	22	O 19	8Y	C11-2	O 57	--
23	O 20	8G	24	O 21	7R	C11-3	O 58	--
25	O 22	7Y	26	O 23	YG	C11-4	O 59	--
27	O 24	6P DW	28	O 25	6P W	C11-5	O 60	--
29	O 26	6R	30	O 27	6Y	C11-6	O 61	--
31	O 28	6G	32	O 29	5R	C11-7	O 62	--
33	O 30	5Y	34	O 31	5G	C11-8	O 63	--
35	O 32	OLA G	36	O 33	OLB G			
37	O 34	OLA Y	38	O 35	OLB Y			
100	O 36	SF2 G	101	O 37	SF1 Y			
102	O 38	DET RESET	103	O 39	WDT			
83	O 40	SF2 R	84	O 41	SF2 Y			
85	O 42	OLD R	86	O 43	OLD Y			
87	O 44	OLD G	88	O 45	OLC R			
89	O 46	OLC Y	90	O 47	OLC G			

10.6 TEES 332 CABINET

10.6.1 OUTPUT

C1 Pin #	Name	Function	Pin #	Name	Function	Pin #	Name	Function
2	O 0	4P DW	3	O 1	4P W	91	O 48	17R
4	O 2	4R	5	O 3	4Y	93	O 49	17G
6	O 4	4G	7	O 5	3R	94	O 50	10R
8	O 6	3Y	9	O 7	3G	95	O 51	10Y
10	O 8	2P DW	11	O 9	2P W	96	O 52	10G
12	O 10	2R	13	O 11	2Y	97	O 53	9R
15	O 12	2G	16	O 13	1R	98	O 54	9Y
17	O 14	1Y	18	O 15	1G	99	O 55	9G
19	O 16	8P DW	20	O 17	8P W	C11-1	O 56	CMU RESET
21	O 18	8R	22	O 19	8Y	C11-2	O 57	--
23	O 20	8G	24	O 21	7R	C11-3	O 58	--
25	O 22	7Y	26	O 23	YG	C11-4	O 59	--
27	O 24	6P DW	28	O 25	6P W	C11-5	O 60	--
29	O 26	6R	30	O 27	6Y	C11-6	O 61	--
31	O 28	6G	32	O 29	5R	C11-7	O 62	--
33	O 30	5Y	34	O 31	5G	C11-8	O 63	--
35	O 32	2P Y	36	O 33	6P Y			
37	O 34	4P Y	38	O 35	8P Y			
100	O 36	18Y	101	O 37	17Y			
102	O 38	DET RESET	103	O 39	WDT			
83	O 40	18R	84	O 41	18G			
85	O 42	12R	86	O 43	12Y			
87	O 44	12G	88	O 45	11R			
89	O 46	11Y	90	O 47	11G			

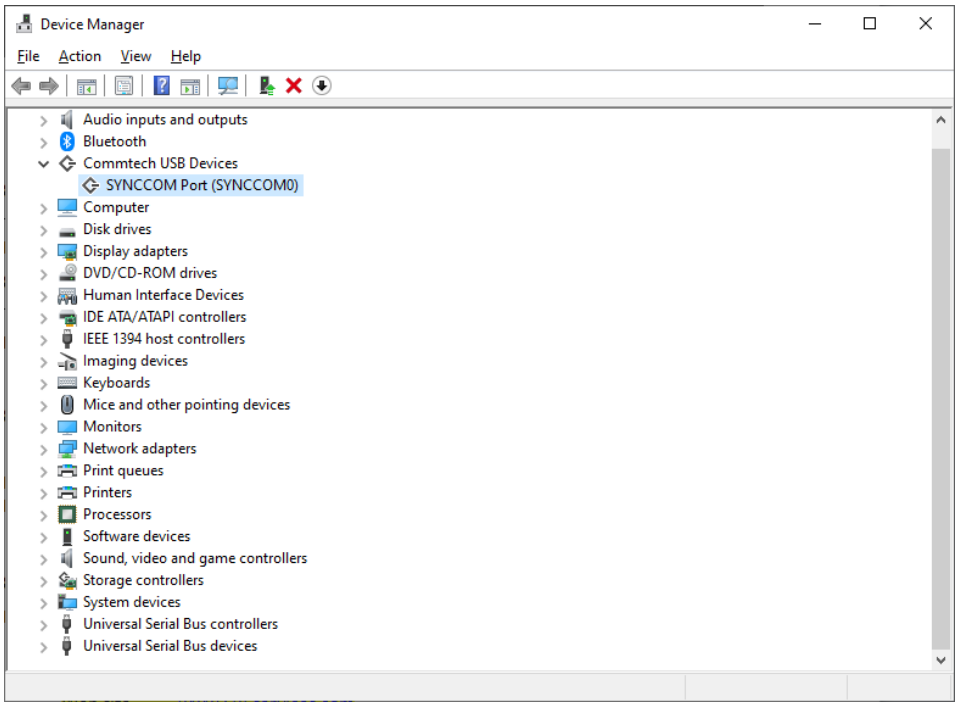
Section 11
Trouble Shooting

11.1 HDLC INTERFACE MODULE TEST

The functionality of the HDLC Interface Module (HIM) can be validated by using the included Loopback Plug.

11.1.1 HDLC INTERFACE MODULE USB PORT

To verify that the USB drivers are installed correctly, use the Device manager to inspect the properties of the *Commtech USB Device* as shown:



If this entry does not appear in the Device Manager, ensure that the USB cable is installed and that the HDLC Interface Module shows two green LEDs illuminated to the left of the DB-25 connector port. The top green LED indicates power to the module, and the bottom green LED indicates internal operation. The USB drivers may need to be reinstalled, see Section 2.4.

11.2 HDLC INTERFACE MODULE LOOPBACK TEST

Install the Loopback Plug onto the HDLC Interface Module. Be sure that the HDLC Interface Module USB cable is plugged into a USB port of the PC, and the device appears in the Device Manager form as shown in Section 11.1.1.

Run the Loopback test from the Command line:

1. On the Ask me anything at the bottom left of your screen, enter CMD. A command prompt window will appear.
2. Change to the folder that the Loopback-Test.exe program is saved.
3. Enter DIR. You should see a file named Loopback-Test.exe

4. If the USB port location is 0, Enter: *Loopback-Test 0*
5. The following will be displayed: TESTING, PLEASE WAIT
6. Check the status LEDs on the HDLC Interface Module while the test is running. If the module is working correctly then the program reports: TEST COMPLETE AND 0 ERRORS is displayed.
7. Enter EXIT to go back to Windows

11.3 HDLC INTERFACE MODULE WARRANTY

The HDLC Interface Module hardware product is covered by a limited five (5) year warranty against defects in workmanship. This warranty is available only to the original Customer and only covers defects in our workmanship. Any HDLC Interface Module or harness assembly that is returned to SRE Services LLC will, at the option of SRE Services LLC, be repaired or replaced at no charge — except for circumstances excluded by this warranty.

A Return Materials Authorization (RMA) must be obtained from SRE Services LLC before a return will be accepted. The Customer is responsible for shipping charges when they return a HDLC Interface Module to SRE Services LLC. SRE Services LLC will pay the shipping charges to send the module back to the Customer if a defect in workmanship is found. However, if no defect in workmanship is found, or the module is not found to be defective, or any of the following warranty exclusions occur, the Customer will be responsible for shipping charges both ways.

Warranty Exclusions:

This warranty does not cover problems or damage resulting from, but not limited to the following:

- Any modification, misuse, abuse, disassembly, misapplication, or unauthorized repair by anyone other than SRE Services LLC.
- Any improper operation, including any use not in accordance with any verbal product instructions or documentation.
- Connection to an improper voltage supply or ESD damage.
- Any other cause not related to workmanship.

11.4 TECHNICAL SUPPORT

Further technical support may be obtained by contacting SRE Services LLC.

Email: SreServices73@gmail.com

Web site: www.SreServicesLLC.com