ITS Cabinet v1

(Intelligent Transportation System Roadside Cabinets)

CMU-212 Cabinet Monitor Unit
AMU-214 Auxiliary Monitor Unit
Auxiliary Display Unit
SIU-218 Serial Interface Unit
ECcom Software

080911

ITS Cabinet Design

- Under the guidance of a Joint AASHTO/ITE/NEMA Committee on the ATC, a Working Group was created in order to develop a standard for the Advanced Transportation Controller.
- The effort has produced a Cabinet standard, Advanced Transportation Controller (ATC) standard, and an Application Program Interface (API) standard.
- Standards are posted at: ww.ite.org/standards/atc
- Cabinet Standard is *Intelligent Transportation System (ITS) Standard Specification for Roadside Cabinets,* v01.02.17b November 2006.

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ITS Cabinet Design Goals

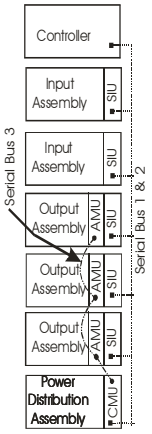
- Open architecture hardware and software platform for a wide variety of ITS applications.
- The ATC cabinet melds concepts from both the NEMA and Model 170 traffic signal. From the Model 170 it takes the concept of rack-mounted subassemblies. From NEMA, it borrows the basic serial connections between the controller and subassemblies.
- Modular architecture, highly “connectorized”.

ITS Cabinet Architecture

- Major Subsystems
  - Controller Unit (ATC)
  - Input Assembly
  - Output Assembly
  - Power Distribution Assembly
  - Power & Communications Distribution Assembly
  - Cabinet Monitoring System
- The cabinet is constructed in a modular manner with power distribution and serial connectors conveniently located throughout the cabinet to facilitate a wide variety of configurations and future expansion.

Serial Bus System (SB #1,2,3)

- Serial Bus #1 links the ATC to the SIUs in Input and Output Assemblies.
  - The SIUs perform the input / output (I/O) function for the ATC.
- Serial Bus #1 also links the ATC to the CMU in the PDA.
- Serial Bus #2 links the ATC to other devices in the cabinet for non-control applications.
- Serial Bus #3 links the CMU to the AMUs in the Output Assemblies and the Auxiliary Display Unit.



Cabinet Monitor System Block Diagram

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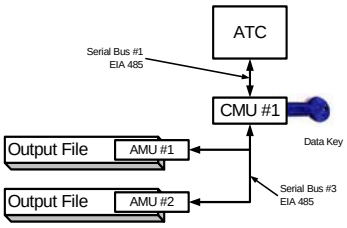
ITS Cabinet Monitoring System

- The CMU is housed in the PDA and provides the logical fault processing and cabinet relay (FTR) control function of the system.
- The CMU communicates with the ATC via an EIA-485 serial bus (SB #1).
- One AMU is housed in each Output Assembly and performs the voltage and current measuring function.
- The CMU communicates with the AMUs and Auxiliary Display Unit via an EIA-485 serial bus (SB #3).



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SIU-218 Serial Interface Unit

- One SIU is located in each Input and Output Assembly.
- The SIU converts serial data from the ATC into parallel outputs to the assembly.
- The SIU converts parallel inputs from the assembly into serial data to the ATC.
  - 54 programmable input / outputs
  - 4 opto-isolated inputs
- EDI diagnostic monitoring software uses the front panel serial port.

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AMU-214 Auxiliary Monitor Unit

- One AMU is housed in each Output Assembly.
- The AMU measures voltages on the field signal terminals, AC Line, and 24VDC. It also measures total current to each load switch.
- It reports back the voltage & current measurements to the CMU via Serial Bus #3
- The AMU configures itself for 6 or 14 channels based on it's SB #1 address assignment.

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CMU-212 Cabinet Monitor Unit

- The CMU is housed in the PDA and provides the fault monitoring logic and cabinet relay control function.
- The CMU-212 can be configured to monitor up to 28 physical load switch channels of three inputs per channel. An additional four virtual channels can be programmed to provide a total of 32 logical channels.
- The CMU is programmed using an interchangeable *Datakey* nonvolatile memory device.
- Detailed user interface is via *ECcom* laptop PC software (Ethernet or EIA-232) or Auxiliary Display Unit or CU display screens.

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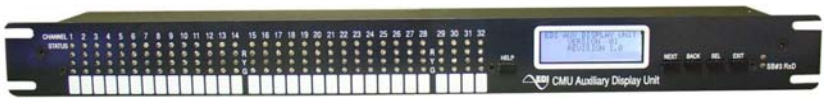
Auxiliary Display Unit

- The Auxiliary Display Unit (ADU) provides a 32 channel LED status display and an LCD *SmartMonitor*^{TM} interface to the CMU-212.
- The *SmartMonitor*^{TM} interface provides review of signal states, voltages, event logs, and the patented EDI Diagnostic Wizard function.
- Data is sent from the CMU-212 to the ADU via Serial Bus #3.



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CMU-212 Monitoring Functions

- Conflicting Channels
- Cabinet Power Supply (24VDC & 12VDC)
- Serial Bus #1 and #3 monitor
- Lack of Signal (“Red Fail”)
- Multiple Input (“Dual Indication”)
- Yellow Clearance
- Yellow + Red Clearance
- Field Check monitor and Field Check Status
- Flasher Alarm
- AC Line monitor
- CU / Local Flash (Local Flash, Ckt Breaker Trip, FSA)

CMU-212 Monitoring Functions

- Cabinet Control Signals
  - AC Line
  - Local Flash (LF) Status
  - Circuit Breaker Trip
  - Contactor Coil and Contactor Secondary
  - Flash Transfer Relay Coil Drive
  - Front & Rear Door Switch
  - Temperature
- Load Switch Current monitor is intended to detect the “no-load” field condition immediately and result in a Lack of Signal fault. This function requires current transformers installed in the Output Assembly.

CMU-212 Field Check Monitoring

- The CMU continuously compares the ATC output data to the field status.
- This diagnostic data will isolate whether the fault was due to an ATC malfunction OR a failure in the load bay or field.
- The field signals that malfunctioned are also directly identified via Field Check Status.

- Field Check is a simple yet very powerful concept that helps direct the field technician to the channels and colors that have failed.

CMU-212 SB #1 Frames

- The ATC and CMU exchange real-time data every 100 ms via SB #1

- All CMU programming and status is available in the ATC for viewing or system access.
  - Type 61/189 ATC Load Switch Driver / CMU Long Status
  - Type 62 Set Failed State Action (FSA)
  - Type 65/193 CMU Configuration (Datakey contents)
  - Type 67/195 ATC Load Switch Driver / CMU Short Status

CMU-212 SB #1 Status Frame

- Type 61 Command from ATC
  - Load Switch commands for channels 1:28
- Type 189 Response from CMU
  - Fault Type
  - Fault Channel Status
  - Channel Color Status
  - Field Check Status
  - Cabinet Control Status
  - AC Line Voltage
  - Field Terminal Voltages
  - Channel Load Currents
  - Time & Date
  - 24VDC & 12VDC Voltages
  - Output Assembly Flash Status

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CMU-212 Programming

- The CMU is programmed for the cabinet using a non-volatile memory device called a Datakey. The Datakey is the electronic equivalent of the Program Card and DIP Switches.

- Programming of the Datakey is with the EDI *MonitorKey* Programmer and *MonitorKey* software. USB or EIA-232.

- The Datakey provides very detailed and versatile CMU programming capabilities. The Datakey "stays" with the cabinet.

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EDI *MonitorKey*^{tm} Program

- Parameter Forms
  - › Unit Data
    - AMU Configuration, Minimum Flash, 12VDC Enable, Monitor & User ID
  - › Permissive Matrix
  - › Lack of Signal
    - Dark Channel Maps override Lack of Signal programming and are selected by the ATC
  - › Multiple Input
  - › Clearance
  - › Current Sense
    - Number of Primary Turns, Fault Current Threshold
  - › Field Check
  - › Yellow Disable
  - › Virtual Channels
- Parameter Consistency Check Wizard
  - › Verifies that parameters are consistent… not necessary correct!

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EDI *MonitorKey*^{tm} Program

- The *MonitorKey* Set-up Wizard will develop an initial template for a Datakey. Using a series of basic questions regarding intersection approach assignments, the Wizard will automatically format the parameter forms for:
  - AMU Configuration
  - Lack of Signal Enable
  - Multiple Input
  - Clearance
  - Field Check Enable
  - Yellow Disable
  - Current Sense Channel Enable
- These parameters are NOT set by the Wizard:
  - Permissive Matrix
  - Dark Channel Maps
  - Current Sense Threshold Parameters
  - Virtual Channel Assignments

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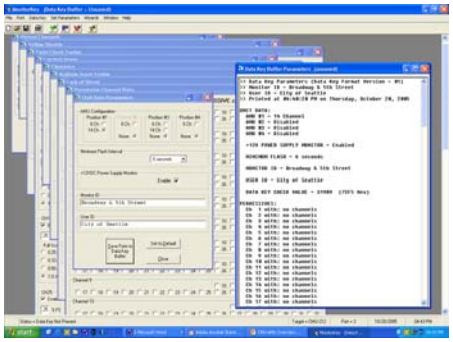
EDI *MonitorKey*^{tm} Program

- Read, Write, and Verify Datakey device
- Configuration Report details all Datakey parameters in text format
- Data Buffer Check Value is a quick way to detect CMU configuration parameters have been changed.



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AMU Output Assembly Addressing

- Each Output Assembly AMU must have a SB #3 address programmed via jumpers on the rear of the assembly.

AMU#1	AMU #2	AMU #3	AMU #4	Channels
14	X	none	none	14
14	X	14	X	28
14	X	6	none	20
14	X	6	6	26
6	none	none	none	6
6	6	none	none	12
6	6	6	none	18
6	6	6	6	24
6	None	14	X	20
6	6	14	X	26

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SIU Assembly Addressing

- Each Input and Output Assembly must have a SB #1 address for the SIU programmed via jumpers on the rear of the assembly.

Assembly	Address
14 pack in Assembly #1	1
14 pack in Assembly #3	3
6 pack in Assembly #4	4
6 pack in Assembly #1	5
6 pack in Assembly #2	6
6 pack in Assembly #3	7
Input #1	9
Input #2	10
Input #3	11
Input #4	12
Input #5	13

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ECcom

Signal Monitor Communications Software

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ECcom^{tm} Communications Software

- ECcom software is used to communicate with an EDI signal monitor to retrieve and display valuable diagnostic information.
- Maintenance incident documentation is easy, complete, and accurate.
- Monitor reports can be seamlessly uploaded to the central system.

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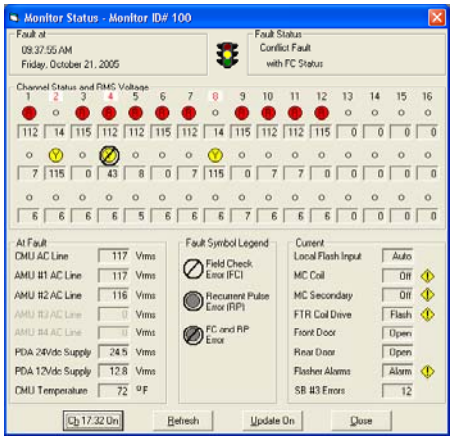
Why guess when you can know…

- Real time status shows all signal states, field terminal voltages, and cabinet control voltages.
- Current fault type and fault status is displayed with time and date stamp.
- Channels involved in the fault are directly indicated.



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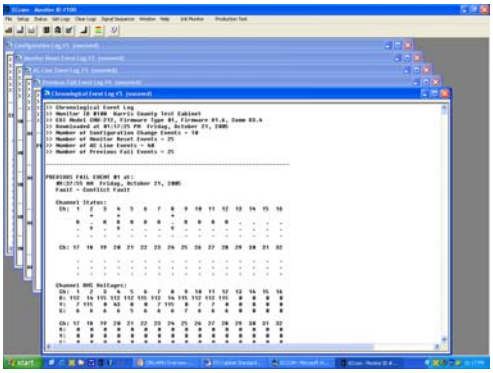
Diagnose with Accurate Information

- Four Event Log Types
  - Previous Failures (25)
  - Monitor Reset Events (25)
  - AC Line Events (40)
  - Configuration Change Events (10)
- Chronological sort of event types by time and date



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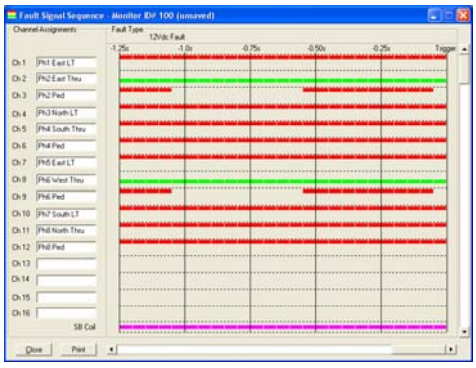
Diagnose with Accurate Information

- Signal Sequence Display
  - Graphically display signal states for 30 seconds prior to fault trigger.
  - 50 millisecond resolution.



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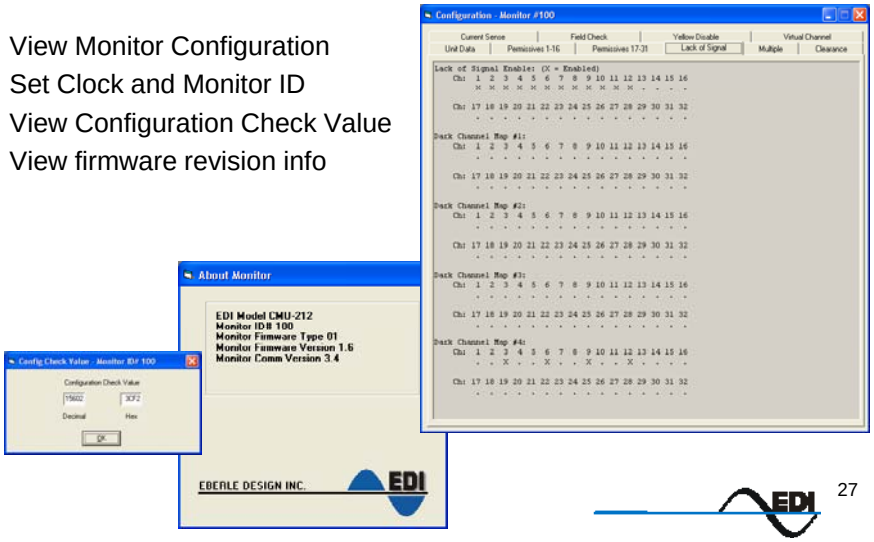
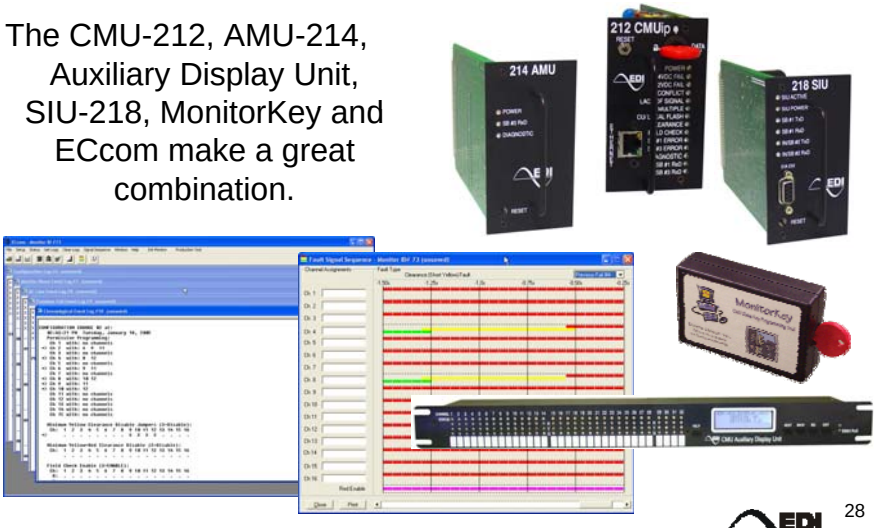
EDI ECcom Misc Functions

- View Monitor Configuration
- Set Clock and Monitor ID
- View Configuration Check Value
- View firmware revision info



ITS Cabinet Components

The CMU-212, AMU-214, Auxiliary Display Unit, SIU-218, MonitorKey and ECcom make a great combination.



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Setting the Standard
for
Quality and Reliability

Eberle Design Inc.

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