GCI E84 PI/O Monitoring System
GCI EMS
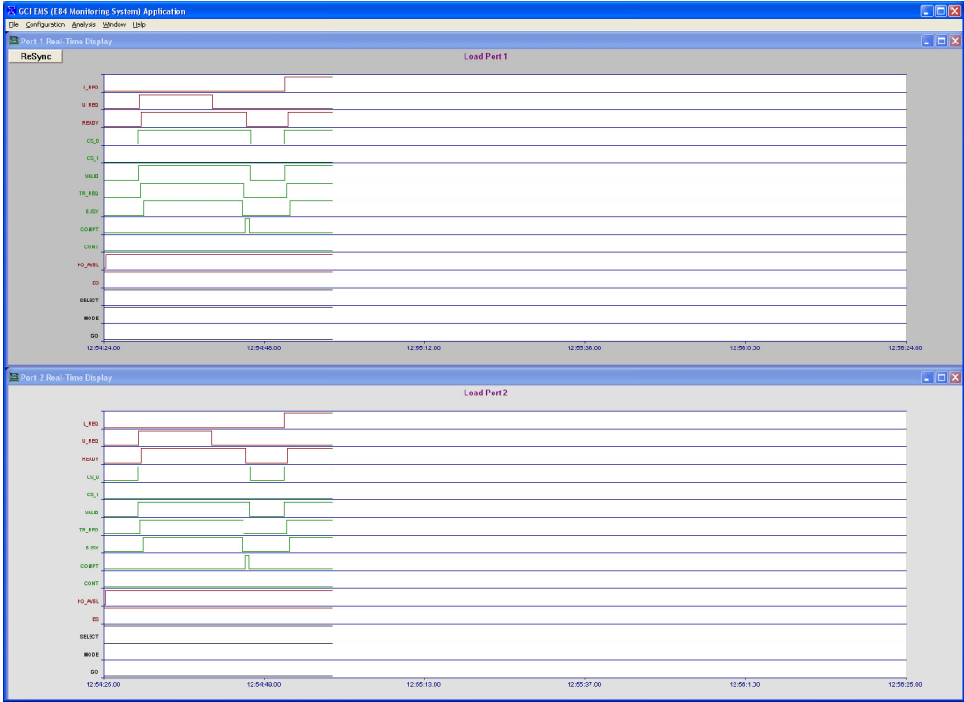
Users Manual

Version 1.11a

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Introduction

This document describes the setup and use of the GCI E84 PI/O Monitoring System (EMS). The EMS Application provides the functionality to display E84 PI/O signal transitions in real-time for two to four 300mm load ports simultaneously. It also records and logs all E84 PI/O signals to a system file for post acquisition graphical and text-based analysis.

System Setup

Figure 2 shows GCI EMS components consisting of a laptop PC, the EMS Application, two GCI Data Logging Devices (DLD's - GCI06001), two GCI E84 Optical Transceivers (GCI04002-5m) and associated cables. Systems can be ordered with additional DLD's and cables to support up to four load ports.
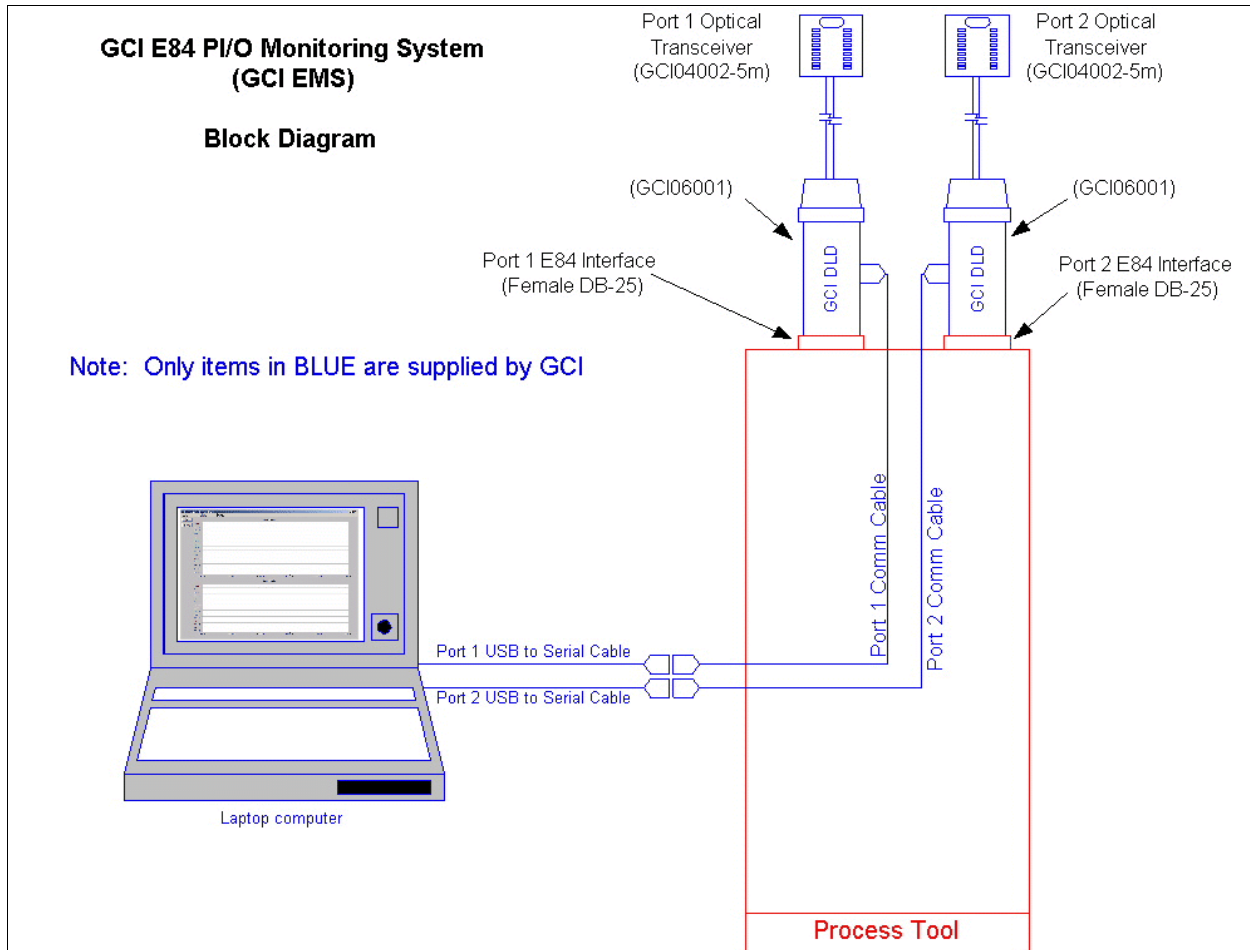
Figure 2 - GCI E84 PI/O Monitoring System Setup

Laptop PC Setup

The EMS Application is pre-loaded onto a laptop PC running Windows XP™.

Installation

An EMS Application installation CD is included. If it becomes necessary to re-install the Application, simply insert the installation CD and follow the on-screen instructions. The Application will be installed onto the C: drive, in a folder named **E84MonitoringSystem**. This folder will contain all required EMS Application files, including two sub-folders (**Documentation** and **GCI EMS**).

A shortcut to the EMS Application will be added to the Start menu and an ICON will be added to the desktop. A shortcut is also added to the systems Startup folder. This will cause the EM Application to start automatically when Windows XP™ starts.

Documentation

The **Documentation** folder contains this Users Manual in PDF format, along with the Users Manual for GCI's E84 Analysis Application. This document contains additional details on several Playback Analysis mode tools.

Recorded Data Organization

The **GCI EMS** folder is the location where all recorded E84 data is stored. The EMS Application organizes all recorded data by date. The Application creates monthly data sets within sub-folders. Each monthly data set folder is named with the year and month. For example, the folder **2008-04** will contain all recorded data from April of 2008. Within each monthly folder, the Application maintains daily log files for each connected load port. Daily log files are named with the year, month and date. For example, the file **2008-0409-P1.DAT** contains the daily log for load port 1 from April 9, 2008. Data from load port 2 will be stored in the file **2008-0409-P2.DAT**. Individual daily log files can be opened for analysis (see **Log File Playback State** below)**.**

The Application also maintains an index file for each connected load port within each monthly data set folder. This file is used by the Application during searches. It does not contain viewable E84 data and should not be opened for analysis.

Initial Application Configuration

The EMS Application is installed with several options set to default values. These options should be modified to reflect specific installation settings.

The Application defaults to having four load ports installed. Use the *Set Number of Ports* option to select the correct number of installed load ports.

The Application defaults the communication ports selected for each load port as COM4, COM5, COM6, and COM7. The first time the Application boots, error messages will be displayed for each COM port that does not exist on the system. After setting the correct number of load ports, use the *Configure COM Ports* option to set the COM ports used for each load port.

Pre-Installed 2 Port Configuration

For systems configured for two Load Ports, two USB-to-Serial cables are connected to the two available rear panel USB receptacles (labeled COM4 and COM5). **Figure 3** shows an image of the rear of the PC, and indicates where the two communications cables are connected. Two USB-to-Serial Converter cables are included, and configured as COM4 and COM5. Attach the supplied 15 foot Male-to-Female DB-9 cable labeled COM4 between the USB-to-Serial cable connected to COM4 (upper USB receptacle) and the DLD attached to Load Port 1.
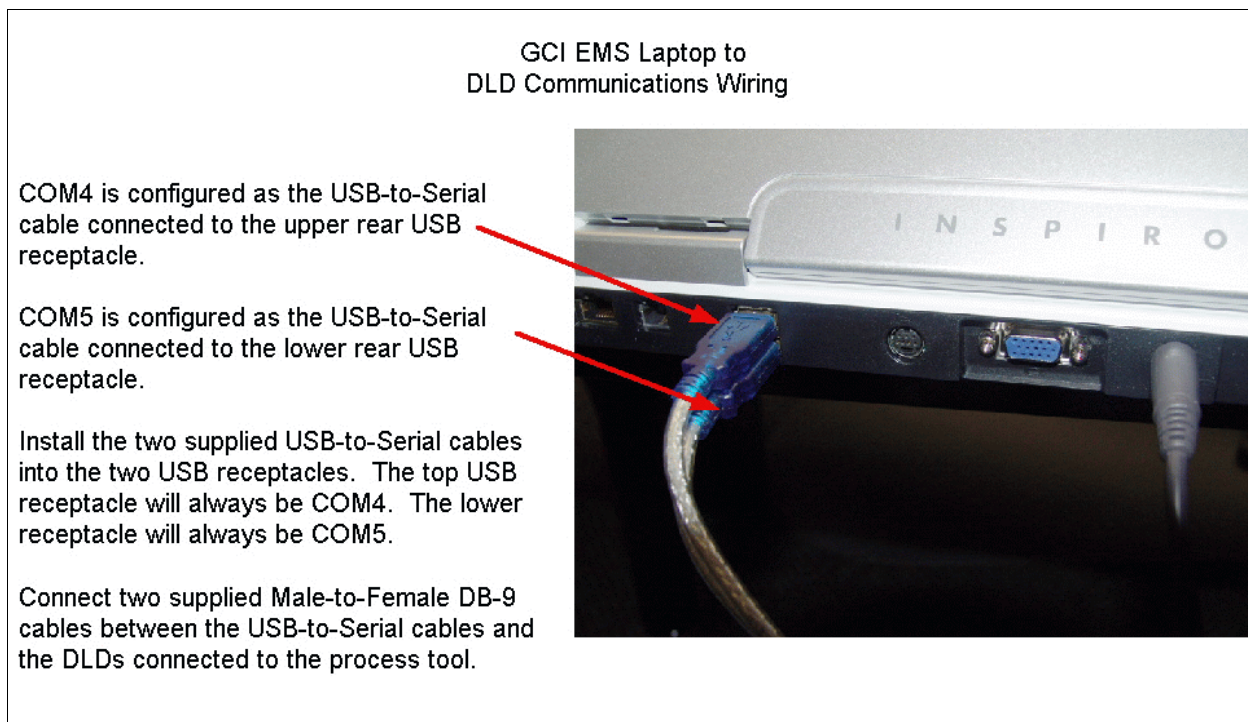
Figure 3 - Communications Cable Locations

Attach the supplied 15 foot Male-to-Female DB-9 cable labeled COM5 between the USB-to-Serial cable connected to COM5 (lower USB receptacle) and the DLD attached to Load Port 2. Attach the included mouse. Connect the laptop to AC power. The EMS is now ready to power up.

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Pre-Installed 3 Port Configuration

For systems configured for three Load Ports, install cables for Ports 1 and 2 as described above. Install the third supplied USB-to-Serial Converter cable to the upper USB receptacle on the right side of the PC (labeled COM6) for Port 3. Attach the supplied 15 foot Male-to-Female DB-9 cable labeled COM6 between the USB-to-Serial cables and the DLD attached to Load Port 3.

Attach the included mouse in the lower USB receptacle on the right side of the PC. Connect the laptop to AC power. The EMS is now ready to power up.

Pre-Installed 4 Port Configuration

For systems configured for four Load Ports, install cables for Ports 1, 2, and 3 as described above. Install the forth supplied USB-to-Serial Converter cable to the lower USB receptacle on the right side of the PC (labeled COM7) for Ports 4. Attach the supplied 15 foot Male-to-Female DB-9 cable labeled COM7 between the USB-to-Serial cables and the DLD attached to Load Ports 4.

For systems configured for four Load Ports, no external mouse is supplied. Use the built in mouse pad.

Data Logging Device (DLD's)

The included Data Logging Devices should be installed between the load ports E84 Interface connector (female DB-25) and the attached Optical Transceiver. The DLD receives power directly from the load ports E84 Interface.

When properly installed and powered, the DLD will illuminate a GREEN power LED (located just to the left of the DB-9 connector).

The DLD will also illuminate a RED status LED any time it has un-sent E84 Event Packets stored in it's internal RAM buffer.

System Startup

The laptop PC is configured to run the EMS Application at startup. When the PC is powered ON, and Windows XP™ finishes loading, the EMS Application will start automatically.

Additionally, a shortcut to the EMS Application is displayed on the system desktop.

EMS Application States

Synchronization State

Figure 4 shows the EMS Application startup screen. This screen shows one real-time graph windows for each installed load port, with "Synchronizing" displayed along the lower right edge. This indicates that the EMS Application is attempting to synchronize communications with the attached DLD's.

The EMS Application continuously attempts to establish communications with the attached DLD's. During this time, the user has access to previously recorded log files. Post acquisition analysis options are described below.

DLD Startup Timestamp Synchronization

When the EMS Application initiates it's internal communications ports, it queues up commands to synchronize the DLD's internal real-time clock with the PC's clock.   When the DLD communications is established,

Figure 4 - EMS Application Startup Screen

this command is sent, causing the DLD to reset it's internal real-time clock to match the PC's. This does not affect the timestamp connected to E84 Events already stored in the DLD's internal RAM buffer.

Additionally, each day at midnight, the EMS Application re-sends the clock synchronization command to each connected DLD. This ensures that the DLD's internal clock does not drift over time and remains in synch with the PC's.

DLD Buffer Flush

When communications have been established, each DLD automatically begins sending all E84 Events that are stored in their internal RAM buffers. Whenever the DLD is powered, it is logging E84 Events to it's internal RAM buffer. Once communications are established, the DLD has to flush the stored E84 Events from it's RAM buffer by sending them to the PC.

While the PC is receiving the stored E84 Events, it continues to display the *Synchronizing* message. Once all buffered E84 Events have been received by the PC, the EMS Application enters a Paused state.

EMS Application Paused State

The EMS Application enters the Paused state following DLD synchronization at startup. This state can also be entered anytime the user wishes to pause the real-time display by pressing the **Stop** button (located at the upper right hand side of the screen). **Figure 5** shows the system Paused screen.

While in the Paused state, the real-time graph windows are not updated, and a 'Paused' indicator is displayed at the lower left of each window. The EMS Application continues to process communications with the attached

Figure 5 - EMS Application Paused State Screen

DLD's, and writes any received events into the daily log files.

Press the **Start** button (located at the upper right hand side of the screen) to return the EMS Application to Real-Time Display. When returning to the Real-Time Display state, the real-time graph windows are cleared, the X-Axis labels are updated and E84 events received from the DLD's are displayed as they arrive.

Each Real-Time graph can be paused independently. The graph window for each connected load port contains a set of **Start** and **Stop** buttons.

Real-Time Display State

The Real-Time Display state is the main operating mode of the EMS Application. In this state, the EMS Application continuously displays E84 Events as they are received from the connected DLD's. **Figure 6** shows the Real-Time Display screen.

The DLD's continuously send E84 Events to the EMS Application. As each event is received, the EMS Application displays the event in the associated real-time graph. The DLD's send Heartbeat events every 250 milliseconds when no changes are detected on the E84 interface.

Figure 6 - EMS Application Real-Time Display Screen

These Heartbeat events are not added to the daily log files, but they are added to the real-time graphs.

When the graph window fills, the graph is shifted to the left by 50%. When the graph window shifts, the X-Axis time labels are updated.

E84 Graph Format

Each connected load port has it's own real-time graph window. Each window can be resized and/or moved. Each graph is titled with the load port number it is associated with. The graph titles can be modified using the Enter Test Information options described below.

The E84 Event data is displayed as a series of logic states for each of 15 signals. The E84 specification defines five passive equipment signals (L_REQ, U_REQ, READY, HO_AVBL, and ES). These signals are displayed on the graph in RED. The E84 specification defines seven active equipment signals (CS_0, CS_1, VALID, TR_REQ, BUSY, COMPT, CONT). These signals are displayed on the graph in GREEN.

Additionally, the E84 specification defines three control signals for use with Optical Transceivers. An industry standard has been defined for these three signals as SELECT and MODE (outputs from the passive equipment) and GO (input to the passive equipment). These three signals are displayed on the graph in BLACK. They are included because knowing the states of the control signals is critical when analyzing the E84 Events.

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X-Axis Timestamp Labels

The real-time graph displays timestamp information along the X-Axis. When the EMS Application is first started, the timestamp labels are displayed based on the PC's clock, and remain fixed while the EMS Application synchronizes communications with the attached DLD's. The timestamp labels also remain fixed while the EMS Application is in the Paused state.

When the EMS Application is taken out of the Paused state, and returned to the Real-Time Display state, the timestamp labels are re-displayed based on the timestamp of the first E84 Event packet received from each DLD.

Each DLD contains an internal real-time clock chip. If the DLD's real-time clocks are not in sync, the graph windows will display different X-Axis timestamp labels. The DLD's real-time clocks are automatically synchronized at system startup, and each day at midnight. They can also be manually synchronized using the Configure DLD option described below.

Re-Synching X-Axis Timestamp Labels

Over time, the timestamp labels displayed along the X-Axis may become out of sync with the system clock. When this happens, the user can re-sync the real-time graph windows by pressing the **ReSync** button (displayed at the upper left of the screen). This causes the EMS Application to clear the graphs, and re-set the timestamp labels based on the next E84 Event packet received.

Auto Pause on HO_AVBL Low State

This option automatically pauses the Real-Time Display any time the HO_AVBL signal is low. This display mode is available as an option in the **Configuration** menu. When enabled, this display mode removes the **Start** and **Stop** buttons from the display.

The E84 Specification defines that the ON state of the HO_AVBL signal indicates that the passive equipment (load port) is available for an automatic handoff. When OFF, this signal indicates that the passive equipment is not available for an automatic handoff. It also can indicate an error condition.
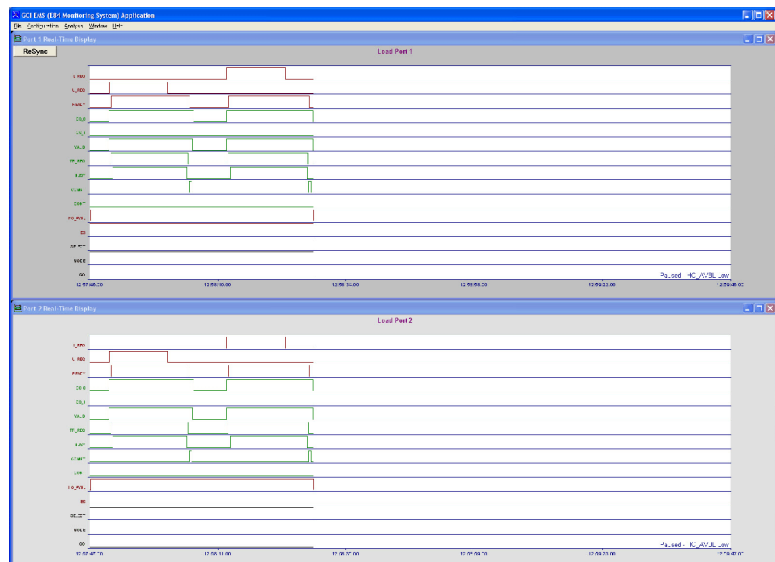
In the Auto Pause mode, the EMS Application continuously monitors each load ports HO_AVBL signal, and automatically pauses the Real-Time Display when it turns OFF. When paused due to HO_AVBL OFF, a 'Paused - HO_AVBL Low' indicator is displayed. While paused, the EMS Application behaves identically to the standard Paused state described above, with the following exception.

While paused, the EMS Application continuously monitors each load ports HO_AVBL signal, and automatically re-starts the Real-Time Display when it turns ON.

Log File Playback State

The user may display previously recorded daily log files using the Open Data Set for Playback described below. While in the Playback state, the real-time graph window is removed, and real-time display of E84 Events is disabled. Communications with the DLD's are still processed, and E84 Events received are written to the daily log files.

Figure 8 shows the Log File Playback screen. This state displays all E84 Events recorded within the chosen daily log file.

To exit the Playback State, press the **Exit Playback** option button.

Playback Analysis Options

While in the Playback state, the user has access to analysis tools based on the **GCI E84 Analysis Application**. Using the GCI E84 Analysis Application tools supported by the EMS Application, the user can Zoom into any section of the log file, measure the time between any two E84 Events and display detailed Error Analysis information (see the E84 Analysis Application Users Manual for details).

Figure 8 - EMS Application Log File Playback Screen

Analysis options are available through buttons displayed along the top of the screen. A slide bar is displayed at the bottom of the screen allowing the user to scroll through the data set.

A tabular list of time-stamped events is displayed at the right side of the screen.

Detailed E84 Handoff State

The Detailed E84 Handoff state displays detailed timing information for a signal E84 handoff attempt. This state is entered using the Search Logs option described below. While in the Detailed E84 Handoff state, the real-time graph window is removed, and real-time display of E84 Events is disabled. Communications with the DLD's are still processed, and E84 Events received are written to the daily log files.
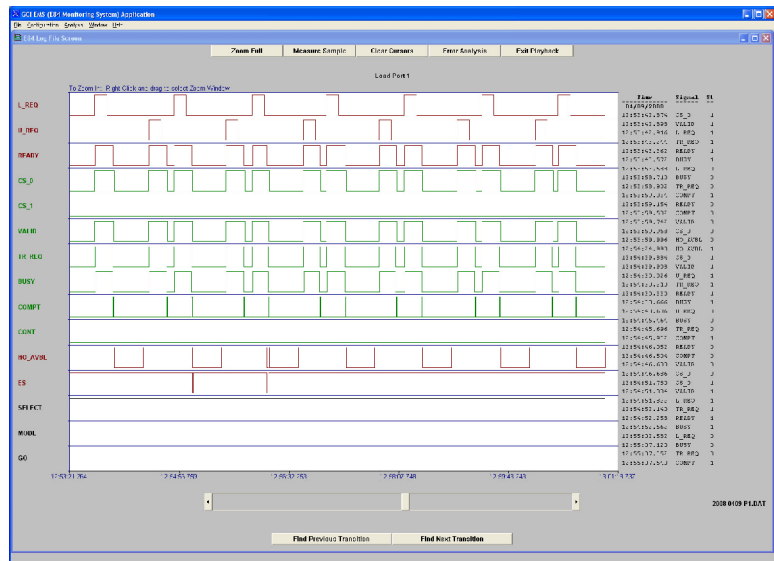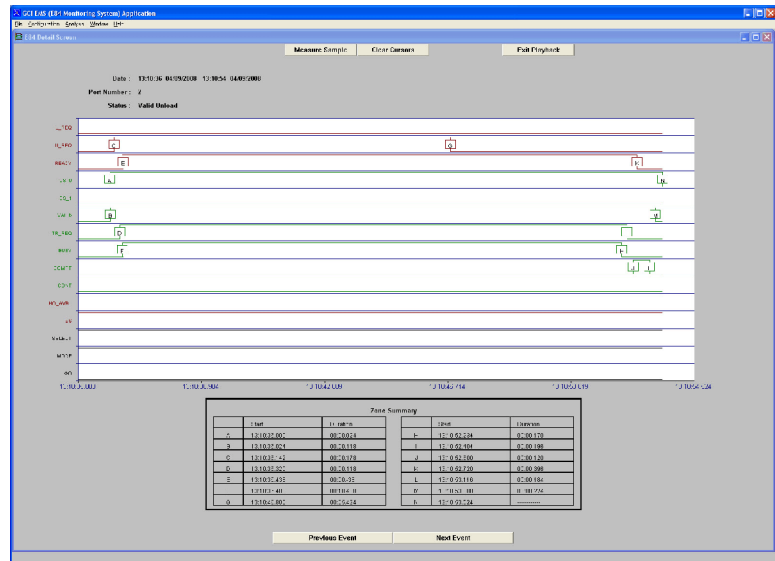
When the user selects a handoff event to display (using the Search Logs dialog box described below)

Figure 9 - EMS Application Detailed E84 Handoff Screen

the Detailed E84 Handoff Screen is displayed. This screen shows all E84 Events associated with the selected handoff, along with detailed timing information.

Option buttons at the bottom of the display allow the user to quickly move to the next / previous E84 handoff.

Zone Designators

The detailed graph shows the time chart for the selected handoff. For each signal state change, a Zone letter (A - N) is superimposed on the graph. This Zone letter relates to the handoff Boundary condition associated with that signal state change. Boundary zones are defined by the E84 Specification (Table 5 - Boundary Description). Not all boundary zone designators will be displayed for every handoff attempt.

Zone Summary Table

Below the graph window, a Zone Summary table is displayed. This table details the time that the particular zone started, and the time duration between it and the next zone. The start time is displayed in HH:MM:SS.mmm format (mmm = milliseconds). The time duration is in MM:SS.mmm format.

Detailed Analysis Options

The Detailed E84 Handoff state also provides the option to measure the time between any two E84 Events. No other analysis options provided during Log File Playback are supported by the Detailed E84 Handoff state.

EMS Application Menu Options

The EMS Application provides access to system options through a standard Windows menu bar. Several options are valid only within certain operating states. For example, during the Real-Time Display state, the option to Export the Graph as a Bitmap is not valid. System menu options that are not supported in the current operating state are disabled, and displayed in gray text.
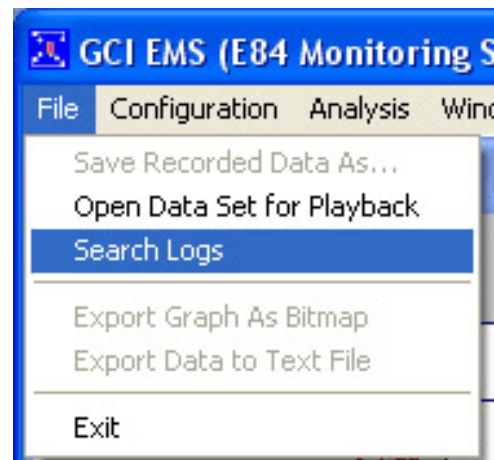
EMS Application File Menu

Figure 10 shows the EMS Application File Menu. It contains options to save the recorded data into a new file name, open a daily log file for display, search the event log files, and export the data as a bitmap graph or in text format. There is also an option to exit the EMS Application.

Save Recorded Data As...

This option is valid only within the Playback and Detailed Handoff states, and is disabled when in the Real-Time Display state.

When selected, a standard Windows Save As dialog box is displayed. The user can navigate to a desired folder on the

Figure 10 - EMS Application File Menu

system hard disk (or onto an optionally connected shared network location) and enter a file name to save the data to. The format for the saved data is the same as that used by the EMS and GCI E84 Analysis Applications. The saved data file can only be opened using one of these applications.

Open Data Set for Playback

This option is valid within all operating states.

When selected, a standard Windows Open dialog box is displayed. The user selects the desired daily log file (or data file saved using the Save Recorded Data As... option described above). The currently displayed graph window is removed, and replaced with the Playback Screen, displaying the data from the selected file. Playback Analysis options are then available for use with the displayed data.
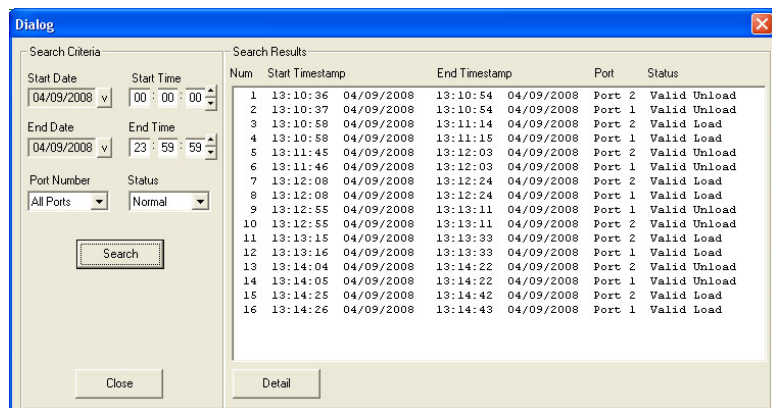
Search Logs

This option is valid within all operating states.

When selected, the EMS Application Search dialog box is displayed. This allows the user to search for specific E84 handoff attempts based on date range, port number, and status of the handoff.

Figure 11 shows the Search Logs dialog box.

On the left side of the dialog box, several search fields for defining search criteria. The search criteria defaults to those used in the previous search. The right side of the dialog box shows the results list based on the current set of search criteria.

Figure 11 - EMS Application Search Logs Dialog Box

After entering the desired search criteria, the user presses the **Search** button to display the search results.

Search Criteria

Start Date & Time
The *Start Date and Time* fields allows the user to search for E84 handoffs that occur AFTER the entered date / time.

End Date & Time
The *End Date and Time* fields allows the user to search for E84 handoffs that occur BEFORE the entered date / time.

If both *Start* and *End* fields are entered, the system searches for E84 handoffs that occurred BETWEEN the two dates / times.

Port Number
Searches for E84 handoffs that occurred on the selected Load Port. Searches can cover any single installed load port or all installed load port.

Status
Searches for E84 handoffs that completed Normally or for those that terminated with an Error.

Search Results List

A message is displayed in the search results list if no handoffs were found that matched the entered search criteria. If more than 500 handoffs were found, the first 500 are displayed in the results list, and a message indicating additional handoffs might also match the search criteria is displayed at the end.

If events are found, the search results list is filled with one record for each handoff found. Each record consists of the handoff Number, Start and End time, Port Number and completion Status.

The user can then scroll through the search results list and select the desired handoff record. To display the Detailed E84 Handoff screen for a specific handoff, simply select it, and press the **Detail** button. This closes the Search Logs dialog, and displays the Detailed E84 Handoff screen.

Export Graph as Bitmap

This option is valid only within the Playback and Detailed Handoff states, and is disabled when in the Real-Time Display state.

When selected, a standard Windows Save As dialog box is displayed. The user can navigate to a desired folder on the system hard disk (or onto an optionally connected shared network location) and enter a file name to export the graph into. The format for the exported graph is standard Windows bitmap.

The currently displayed graph is written as a bitmap image into the selected file. The user should ensure that the file extension is entered as .BMP so that other Windows applications can properly import the image.

Export Data to Text File

This option is valid only within the Playback and Detailed Handoff states, and is disabled when in the Real-Time Display state.

When selected, a standard Windows Save As dialog box is displayed. The user can navigate to a desired folder on the system hard disk (or onto an optionally connected shared network location) and enter a file name to export the data to. The format for the data is tabular ASCII text.

A header section details test information entered by the user (using the Enter Test Information option described below), along with DLD version and ID information. Following the header is one (or more) line(s) for each E84 Event in the data file. Each event is time-stamped, and shows the state of every E84 signal. E84 Error Analysis details are also included at the point where an error condition is detected.

Exit

This option is valid within all operating states. When selected, the EMS Application will close. Communications with the DLD's will be terminated, and no E84 Events will be added to the daily log files.

The DLD's will continue to write E84 Events into their internal RAM buffers. The DLD's have storage capabilities for 1000 E84 Events (approximately 50 valid E84 handoffs). If the EMS Application remains offline for an extended period, the DLD's internal RAM buffer may fill. If this occurs, the DLD will overwrite the oldest records with new ones, resulting in the loss of E84 Events.
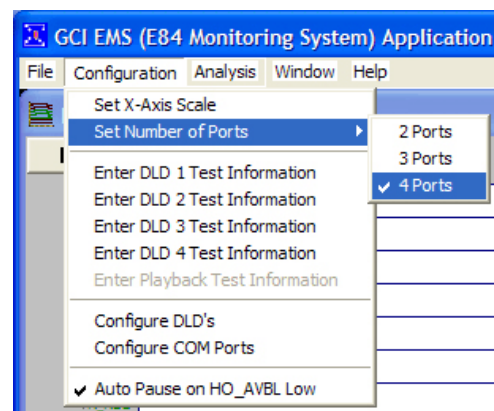
EMS Application Configuration Menu

Figure 12 shows the EMS Application Configuration Menu. It contains options to set the real-time displays X-Axis scale, set the number of load ports, enter test information, configure the DLD's and select system COM ports, and modify the Auto-Pause display mode.
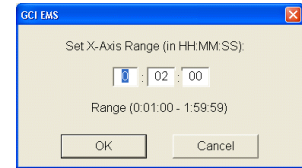
Set X-Axis Scale

This option is valid only within the Paused State, and is disabled in all other states.

When selected, the Set X-Axis Scale dialog box is displayed. This allows the user to set the scale of the X-Axis used in the Real-Time Display state.

Figure 12 - EMS Application Configuration Menu

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Figure 13 shows the Set X-Axis Scale dialog box. The current X-Axis Scale is displayed in HH:MM:SS. The scale can be set to any time value between 1 minute and 2 hours. The system defaults to 2 minutes.
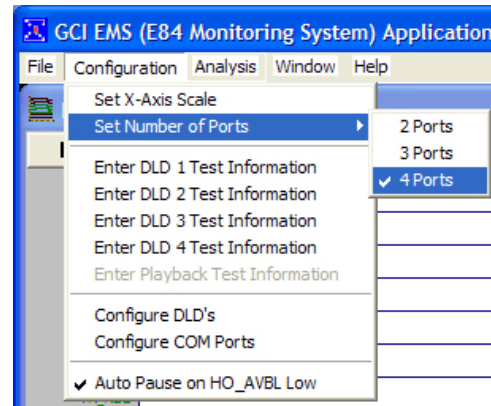

Figure 13 - Set X-Axis Scale Dialog Box

Care should be taken when changing the X-Axis Scale value. Larger time values will allow for more E84 Event date to be displayed on-screen at the same time, but makes it difficult to view the timing between events. Shorter time values expands the graph so inter-event timing is easier to see, but limits the number of events that can be displayed.

After entering a new X-Axis Scale value, the real-time graphs are re-displayed with the new values.

Set Number of Ports

Figure 14 shows a new option in the EMS Application menu bar that allows the user to configure the number of load ports connected to the system.   Use the **Set Number of Ports** option under the **Configuration** Menu to set the number of ports connected to the system.

If the number of ports actually connected does not match the setting in this menu, load port data will not be properly logged.

If more ports are connected than selected, there will be no graph displayed for the additional ports, and no data will be recorded.

Figure 14 - Set Number of Ports Menu

If less ports are connected than selected, the additional graphs will show as being OFFLINE, and no data will be recorded.

Enter DLD 1 Test Information
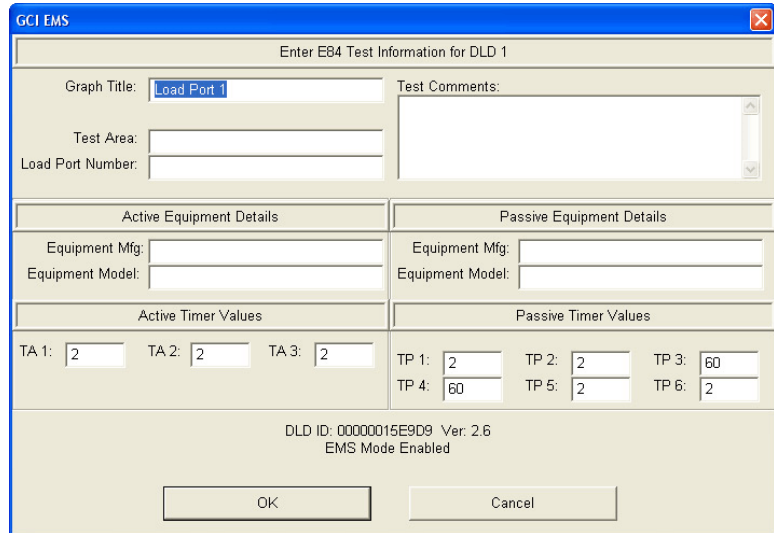**Enter DLD 2 Test Information**
Enter DLD 3 Test Information
Enter DLD 4 Test Information

These options are valid only within the Paused and Real-Time Display states, and are disabled when in the Playback and Detailed Handoff states. Only those options for connected DLD's are valid. All others are disabled.

When selected, these options display the Enter Test Information dialog box (**Figure 15**). This dialog box provides fields for detailing system setup including test comments, Active and Passive equipment manufacturers and model numbers, along with current E84 active and passive timeout settings.

The Graph Title can also be entered here, and will be displayed on the associated real-time graph.

The currently attached DLD ID and firmware version number is also displayed.

Figure 15 - EMS Application Enter Test Information Dialog Box

The information entered here is written as a header into the daily log files, and is exported into the text file generated by the Export Data to Text File option described above.

Enter Playback Test Information

This option is valid only within the Playback and Detailed Handoff states, and is disabled when in the Real-Time Display state.

When selected, this option displays the Enter Test Information dialog box (**Figure 15**) for the currently displayed data file. This dialog box provides fields for detailing system setup including test comments, Active and Passive equipment manufacturers and model numbers, along with current E84 active and passive timeout settings.

The Graph Title can also be entered here, and will be displayed on the Playback screen

The ID and firmware version number for the DLD used during recording are also displayed.

The information entered here is written as a header into the daily log file, and is exported into the text file generated by the Export Data to Text File option described above.

Configure DLD's

This option is valid only within the Paused and Real-Time Display states, and is disabled when in the Playback and Detailed Handoff states.

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When selected, this option displays the Configure DLD dialog box (**Figure 16**). This dialog box displays the current settings for each DLD connected, including the status of the DLD's real-time clock, the DLD's firmware version number and ID string.

The current settings are displayed when the dialog box is opened, and can be re-displayed using the **Get Current DLD Settings** button.
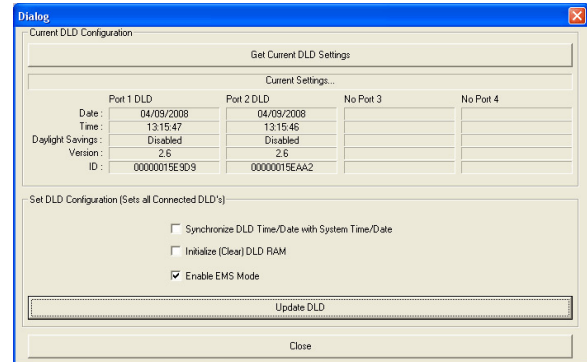
Figure 16 - EMS Application Configure DLD Dialog Box

Several option boxes are displayed near the bottom of the dialog box. These include options to Synchronize the DLD's real-time clock with the system clock, clear the DLD's RAM buffer, and enable / disable EMS Mode.

EMS Mode must be Enabled for the DLD to operate with the EMS Application. Disable EMS Mode ONLY if the connected DLD's are to be removed from the EMS and used in a standalone environment.

After selected the desired options, press the **Update DLD** button to write them to the connected DLD's. A message is displayed indicating that the EMS Application is attempting to update the DLD's. Do not close the dialog box until this status message is replaced by the Current Settings... message.

Configure COM ports

This option is valid only within the Paused and Real-Time Display states, and is disabled when in the Playback and Detailed Handoff states.

When selected, this option displays the Configure COM Ports dialog box (**Figure 17**). This dialog box provides options to set the system communications port connected to each DLD. These options are set at the factory and should not require modification.
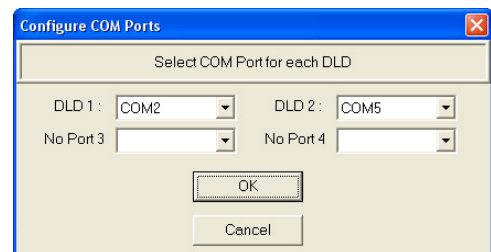
Figure 17 - Configure Ports Dialog Box

Auto Pause on HO_AVBL Low

This option enables / disables the Auto Pause display mode described above. When enabled, a check mark is displayed to the left of the option text.

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EMS Application Analysis Menu

Figure 18 shows the EMS Application Analysis Menu. It contains options to set the Playback E84 Analysis modes. See the E84 Analysis Application Users Manual for more details.

Figure 18 - EMS Application Analysis Menu

Ignore Idle Noise

This option is valid only within the Playback State, and is disabled in all other states.

When selected, the EMS Application ignores idle noise when displaying E84 Analysis Errors. Idle noise is defined as any E84 Error condition that does not occur within an E84 handoff. An E84 handoff starts with CS_0 and / or CS_1 turning ON, followed by VALID turning ON.

Ignore TD0 Warnings

This option is valid only within the Playback State, and is disabled in all other states.

When selected, the EMS Application does not process TD0 warning messages when displaying E84 Analysis Errors. The TD0 warning message is normally displayed when the time between CS_0 / CS_1 turning ON and VALID turning ON fails to adhere to the recommend but optional delay timer TD0 defined by the E84 Specification. The E84 Specification recommends a 100 to 200 millisecond delay between the CS and VALID events.

If this option is not set, then any E84 handoff that does not begin with a delay between the CS and VALID events is marked with a warning message.
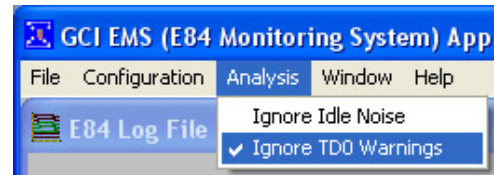
EMS Application Window Menu

Figure 19 shows the EMS Application Window Menu. It contains an standard options to adjust the real-time graph windows.

Figure 19 - EMS Application Window Menu
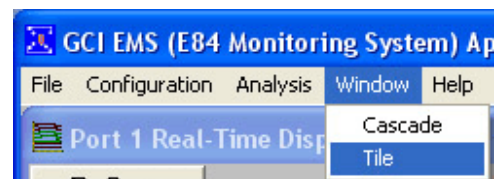
Cascade

The **Cascade** option will cascade the graph windows in order of load port number (with load port 1 being on top).

Tile

The **Tile** option will tile all graph windows so none overlap.

EMS Application Help Menu

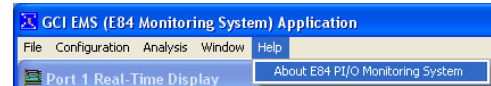**Figure 20** shows the EMS Application Help Menu. It contains an option to display version information about the EMS Application.

Figure 20 - EMS Application Help Menu

About E84 PI/O Monitoring System

When selected, this option displays the About EMS Application dialog box (**Figure 21**). Information displayed in this dialog box includes the EMS Application software version number, the ID strings for all connected DLD's, and the folder location where daily log files are stored.
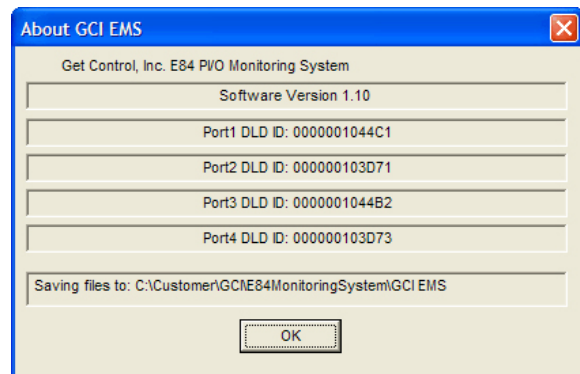
Figure 21 - About EMS Application

Version History

1.11a   Released 4/28/2010
- Fixed startup display issue on wide-screen monitors. This change forces a 'Tile Windows' operation at system start to ensure proper display of the graph windows when running on wide-screen resolution monitors. No other functional changes from version 1.11.

1.11   Released 4/4/2008
- Added DLD clock re-sync at midnight.
- Fixed problem in Playback Analysis screen that caused signal names to disappear when using the Zoom tool.
- Updated documentation screen shots.

1.1a   Documentation changes only. Updated Users Manual to reflect new shipping option that removes the USB Hub for three and four port configurations.

1.1   Released 6/2/2006
- Changes to support up to four connected DLD's, recording E84 signals from four load ports.

1.05a   Documentation changes only. Updated Users Manual to reflect laptop configuration as standard shipping option.

1.05   Released 7/20/2005
- Added new Auto-Pause display mode

1.01   Released 3/2/2005
- Added 'Offline' indicators when communications are lost with the DLD's.
- Corrected bug in Search Logs dialog box that caused a system error when the Time / Date fields were left blank
- Combined Config DLD dialog boxes into a single box

1.00   Released 2/25/2005
- Initial release