2010ECL(ip) Series
Event Logging Signal Monitor
- Training Seminar -
Not all symptoms of cabinet equipment malfunctions lead to the most obvious remedy.

These topics are intended to give an overall view of the important concepts needed to understand the operation of a basic signal monitor and in particular the EDI 2010ECL series signal monitor. These skills are needed to quickly and effectively trouble shoot a malfunctioning intersection.
The purpose of the signal monitor is to detect and respond to improper and potentially dangerous operating conditions resulting from the malfunction of the cabinet equipment, field wiring, or signal heads.

The diagnostic tools built into modern signal monitors can be used to quickly diagnose the cause of the malfunction and document the details. The signal monitor should be considered a tool just as a voltmeter or laptop computer would.

**STOP - LOOK - THINK - ACT**

In order to help increase safety levels and reduce liability risks, the first defense is to ensure that any malfunction is properly detected and responded to. A working and correctly installed signal monitor provides this function.

The sooner an intersection is returned to operation the better, both from a safety perspective and moving traffic perspective. Maintenance budgets are getting tighter putting more emphasis on quick and effective repair.
The 2010ECL is based on the Caltrans 210 Conflict Monitor specification and form factor. Enhancements have been made to provide a broader fault coverage as well as more diagnostic capabilities.

Red Monitoring, Dual Indication Monitoring, Clearance Monitoring are functions added to extend fault coverage. The Red Interface cable on the front panel is used to bring in the Red signals and additional control inputs.

A second high speed microprocessor (RMS-Engine) calculates true RMS voltages using over-sampled data from an on-board A/D converter.

A full intersection front panel display readily highlights improper signal displays.

The EDI ECcom software interfaces the 2010ECL to a laptop computer running Microsoft Windows. Event logging is a tool for trouble shooting and record keeping. Event logs are Previous Failures, AC Line events, Reset events, and Configuration change events. A separate log is presented that organizes the four types of records in chronological order. The Fault Signal Sequence display shows signal states leading up to the current fault.
Monitor Hardware Functions
The monitor Output Relay has the ultimate control of flashing operation. This relay provides the AC Line voltage to the mercury contactor and flash transfer relays when flashing operation is desired. It may be wired in parallel with the Police Flash switch.

The Stop Time output is used to hold the CU timing state at the time of a fault.

The Minimum Flash period is designed to provide 6-10 seconds of hardware flash following a power interruption, or low voltage condition. This provides a flashing transition from dark signals to the startup phase. It also holds off signal operation until the 2070 CU can boot-up and drive the load switches.
Signal monitors are voltage sensing devices. The thresholds for sensing a signal as ON or OFF are set differently for Green and Yellow colors than Red. This is due to the nature of the fault monitoring for each color set.

For Conflicts the monitor should sense a signal ON when the bulb first becomes visible as the voltage is increased. The Conflict fault exists when a signal is On when it should be Off. For Red Fail, the monitor should sense a signal OFF when the bulb first starts to become not visible as the voltage is decreased. The Red Fail fault exists when a signal is Off when it should be On.

A monitor shall sense a signal as OFF when its RMS voltage is below the lower threshold (15v / 50v). A monitor shall sense a signal as ON when its RMS voltage is above the upper threshold (25v / 70v). A monitor may or may not sense a signal as ON when the voltage lies between the upper and lower thresholds.
LEDguard®

The Signal Monitor can be configured to use a technique called EDI LEDguard that is designed to better monitor the characteristics of LED based signal loads. Each field signal input is measured and compared to both a high threshold and a low threshold value to determine On / Off status. Once the high and low On / Off thresholds have been determined using the input RMS voltage, the choice of threshold is determined by the fault being detected rather than the color of the signal.

This eliminates the ambiguity of the 20-60 Vrms range, and makes the monitoring system more tailored to the way in which LED signals fail.

LEDguard is not affected by the use of incandescent bulbs or a mixture of incandescent and LED bulbs.
Monitor Fault Coverage
Conflict

The Conflict function detects two or more active proceed channels which are programmed to be incompatible.

A proceed color is a Green or Yellow. Conflicts are usually caused by a load switch output shorted ON, a short circuit in the field, or loss of load in the field on Green or Yellow inputs. Improper programming of the CU or the monitor Program Card can also cause conflicts.
Red Fail

Red Fail will not detect a loss of load or burned out lamp on a Red signal. The “dark approach” may actually be the result of a faulty Yellow or Green signal.

The monitor senses voltage across the load. A “dark” signal head resulting from a burned out bulb or open field wire may have voltage present at the monitor inputs due to load switch leakage current. If the load switch output is On, line voltage will be present at the field terminal whether a load is present or not.

In most cases a Red Fail is caused by the CU not turning on a load switch, a faulty load switch not turning on an output, or improper programming.

A loss of load will NOT cause a Red Fail. Load switch leakage current will (usually) provide enough voltage across the load that the monitor will sense an active signal. This results in a Conflict or Dual Indication fault. The only way to detect a loss of Red load is with Dual Indication monitoring.

Red Fail also helps ensure that monitor “harness” connections are good so that conflicts can be detected.
Dual Indication Fail
This monitoring function will detect more than one input (color) of a channel active at the same time. This may be caused by a load switch output stuck ON, a short circuit in the field, or a loss of load (burned out bulbs or open field wire).

If a Green (or Yellow) signal stays ON due to short circuit or load switch failure it will be detected as a Dual Indication fault when the Yellow (or Red) signal on that channel activates. This will put the intersection to flash before the next conflicting phase is active, preventing a conflict display in the field.

**A loss of the Red load will be detected when that channel cycles to Green.**
Timing: 200 ms to 500 ms, 400 ms typical.
2010ECL Faults

- Clearance Fail
  - Measures the Yellow Change interval for an MUTCD 3 second minimum
  - Timing: 2.7 seconds typical
  - Enabled by Red Enable input and SSM switches (per channel)
  - Check CU programming, Preemption, 2070 Reset, Flash Sense 242 Isolator

The Minimum Yellow Clearance monitor ensures that a Green to Yellow to Red sequence has an MUTCD three second Yellow clearance interval. It is measured on vehicle channels which have a true Yellow signal.

To disable this function for a channel which does not have a true Yellow signal, the SSM switch for that channel should be OFF, or the Yellow Disable jumper should be in place. This would be the case for pedestrian and protected-permissive left turn channels for example.

This problem may be related to a controller malfunction, preemption problem, or programming error. Other common causes are improper signal sequences caused by spurious controller resets while in the side street phases, or flash transfer relay problems.

ECcom will report this fault with a short yellow or skipped yellow status.
CU Watchdog Monitor (WDT ERROR)

This logic level signal is toggled by the CU to indicate proper operation in the CU. It is not monitored at low voltage (<98) since the CU may be forced into reset at low AC Line levels by its own detection circuit.

24 Volt Monitor (VDC FAILED)

This input monitors the 24 Vdc power supply for proper operation. Proper operation is defined as greater than 22 Vdc. Improper operation is less than 18 Vdc.
2010ECL Faults

- **Diagnostic Fail**
  - Internal MPU watchdog circuit
  - ROM, RAM, or EEPROM failure
  - Internal power supply failure
  - Internal diagnostic failure
- **Program Card Ajar (PCA)**
  - Indicates the Program card is not in place or inserted properly
  - Flashing LED indicates *Configuration Change* fault

**Diagnostic Fail**

The 2010ECL has many internal diagnostic tests that ensure proper operation of the monitor. **THIS DOES NOT TAKE THE PLACE OF REGULAR MONITOR TESTING!** If the Diagnostic Fail LED has illuminated, other LEDs may not be valid. The unit should be tested before returning to service.

**Program Card Ajar**

If the Program Card is removed, the unit will go to the fault mode and illuminate the PCA Led. A manual Reset is required once the Program Card is inserted properly.

If the PCA Led is flashing, a *Configuration Change* fault has been detected.
The unit maintains an internally calculated CRC value of the current configuration settings. These settings include the permissive diode matrix, SSM switches, Yellow Disable switches, Option switches, SEL jumpers, and the Watchdog Enable switch. On power-up, reset, and periodically during operation, the unit will compare the current configuration settings with the previously stored value. If the settings have changed, the unit will automatically log the new setting.

When the Configuration Change Fault option is selected, any change in the configuration parameters will cause the unit to enter the fault mode. To indicate this fault mode the PCA indicator will flash at a 4 Hz rate. Depressing the Reset button for 5 full seconds will clear this fault and log the new configuration parameters.

If the Configuration Change Fault select jumper is not installed, the unit will not set the fault mode but will still log the configuration change.
The Recurrent Pulse detection (RP DETECT) function is designed to respond to fault conditions which are intermittent in nature and do not meet the requirements of typical continuous fault detection algorithms, yet may still produce improper signal displays. These input conditions are differentiated by their longer time constant and fault response times.

The figure shows an example of a recurrent Conflict fault. Channel 2 Green is detected active due to a malfunction of the load switch which caused the output to “flicker” On for 100 ms approximately every 200 ms. Since normal Conflict detection requires a continuous fault of at least 350 ms typical, this event could go undetected. The Recurrent Pulse detection algorithm will combine these pulses into one event and trigger a Conflict fault once the longer recurrent timing threshold is exceeded.
AC Line Power Failure

- Low voltage dropout level is 98 Vac
- Restore voltage is 103 Vac
- Dropout & restore timing is 400 +/- 50 ms
- CU AC Line reset must be set less than the monitor
- AC Line monitoring is a non-latched fault

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**AC Line Brownout Flash mode**

AC Line less than 98 Vrms, greater than 400 ms

Non-latching Fault (POWER LED flashes at 2 Hz)

AC Line greater than 103 Vrms, greater than 400 ms

No Fault (POWER LED illuminated)

POWER LED will change to a 4Hz flash rate during minimum flash interval.

CU dropout voltage must be less than monitor dropout voltage to prevent Red Fail at low AC Line. At least 5 Vac is recommended.
Load Switch Leakage Current
Because a monitor only senses voltage across the signal load and not current, the effect of driving the load with a solid state Load Switch can produce unexpected results when a component malfunctions. The effect of leakage current is important to understand for trouble-shooting reasons and proper system design especially as new signal technologies become available.

The load switch has a DC input which is optically isolated from the AC Line voltage. When a voltage less than 6 Vdc is applied to the input the input circuit will activate. The zero-cross circuit synchronizes the turn-on to the AC Line. The triac device will only conduct in one half cycle periods.

The triac needs to be protected against transient voltages by the resistor / capacitor snubber circuit shown. Off-state leakage current does not come through the triac switch, but through this snubber.
The leakage current can be easily estimated by knowing the value of the snubber components. A capacitor looks resistive to an ac voltage. The equivalent impedance is calculated as shown. Typical values for snubber capacitors range from 0.047uf to 0.1uf.

Most incandescent signals will have an off-state residual voltage due to this leakage current on the order of 0.5 Vac to 3 Vac depending on the value of the snubber and load. Modern LED signals have an electronic load circuit that clamps the off-state voltage to 4-6 Vrms. Since these values are less than the 15 V and 50 V thresholds, they are sensed as OFF.

The off-state voltage can be estimated by the leakage current (5ma) multiplied by the load resistance (100 ohms). When this off-state voltage increases to the 15 V to 25 V range on a Green or Yellow input, the monitor may incorrectly sense it as ON.

The maximum load impedance can be shown to be 2100 ohms for Green or Yellow, and 7000 ohms for Red. New technologies using solid state power supplies and LEDs must accommodate this parameter.

Capacitors can also be used as loads where power dissipation is an issue. Care should be taken since capacitor discharge times will skew the monitor sensing point and may cause Conflict or Dual Indication faults.

Example calculation for a 2000 ohm equivalent capacitor:

\[ C = \frac{1}{(2\pi f R)} = 1.3 \text{ uf} \]
When the load is removed from the load switch output, the monitor becomes the load. Recalculating the off-state voltage shows a residual voltage of 102 Vac. This will be sensed as an active signal by the monitor whether it is a Green, Yellow, or Red.

Thus, a loss of load will not cause a Red Fail, but will be detected as a Conflict fault (for Green, Yellow) or a Dual Indication fault (for Green, Yellow, or Red).

A good trouble shooting practice is to measure the off-state voltage of each input and ensure that is is less than the monitor minimum threshold.
Control Components
Red Enable Input

This input must be active (>70 Vac) to enable Red Fail, Dual Indication, and Clearance monitoring. If Red Enable is not active, the Red Fail Led will flash to indicate enhanced monitoring functions are disabled.

The Red Fail Led will also flash if Red Fail monitoring is disabled due to the EE input (MC Coil) being active or the Special Function inputs active.

Special Function Inputs

SF#1 and SF#2 will disable Red Fail monitoring when either input is active. This input is normally wired through a relay to an output from the CU which is activated during preemption or time-of-day flash. The Red Interface PCB provides this connection.

SF #1 and SF #2 use Red voltage thresholds (ON > 70 Vac, OFF < 50 Vac).
Programming Card
A diode in place between a channel pair makes that pair CONFLICTING.
NO diode in place, or backwards installed diode, OR OPEN CIRCUIT between a channel pair makes that pair PERMISSIVE!

Yellow Disable Jumpers
A jumper forces the Yellow input state to OFF in the monitor. It can be used where no Yellow is monitored on a channel, as in a pedestrian channel, to disable Clearance monitoring.

Red Interface Cable
This cable brings in the 16 Red inputs, Red Enable, Special Function #1 and #2, and Chassis Ground. Chassis Ground must be wired in cabinet also.

IF IT IS NOT CONNECTED... RED FAIL, DUAL INDICATION, AND Clearance MONITORING ARE DISABLED!
Minimum Flash Function

- Minimum of 6 seconds of flash following a power-up, interrupt, or brownout restore
- 5 transitions of the Watchdog input will terminate the minimum flash interval after 6 seconds
- Maximum of 10 seconds of flash; WDT Error or Red Fail will result if CU fails to start

Minimum Flash Interval
Following a power-up, or interrupt or brownout longer than 400 ms, the unit will time a minimum of 6 seconds of flash to allow the 2070 CU time to reboot and energize the signals and WDT output.

If the monitor detects 5 transitions of the Watchdog input after 6 seconds has elapsed, the minimum flash interval will be terminated and the Output relay energized (signals).

If the monitor does not detect 5 transitions of the Watchdog input before 10 seconds, a Watchdog or Red Fail fault will be detected.
During a fault, the Channel display will show the field signals active at the time of the fault for 6 seconds and then flash channels at fault for 2 seconds.

- Remove Program Card, Reset button controls display to view fault and field status for current & past 2 faults:
  - Multiple pulse on PCA Led indicates fault #1 (current), #2, or #3 (oldest)

If RP (Recurrent Pulse) Status exists then a third step will be added to the sequence that flashes the offending RYG input LED along with the RP DETECT indicator.

Previous fault display:

The Program Card must be removed to prevent the current fault from being reset. The Reset button is pressed and held for each mode.

<table>
<thead>
<tr>
<th>Reset</th>
<th>Event</th>
<th>PCA LED</th>
<th>Fault Status LEDs</th>
<th>Channel Status LEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>#1</td>
<td>Single flash</td>
<td>Current Fault Status (newest)</td>
<td>Current channel status</td>
</tr>
<tr>
<td>#1</td>
<td>#2</td>
<td>Double flash</td>
<td>Event #2 Fault Status</td>
<td>Event #2 channel status</td>
</tr>
<tr>
<td>#2</td>
<td>#3</td>
<td>Triple flash</td>
<td>Event #3 Fault Status (oldest)</td>
<td>Event #3 channel status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
<td>(repeats back to top)</td>
<td></td>
</tr>
</tbody>
</table>
RF 2010
Selects the 210ECL series Red Fail fault time of 850ms or the 2010ECL fault time of 1350ms.

RP DISABLE
In the ON position Recurrent Pulse Detection is disabled.

WD 1.0 SEC
OFF = 1.5 Second WDT ERROR timing (Caltrans)
ON = 1.0 Second WDT ERROR timing

GY ENABLE
This function may be used to accommodate 5 section signal heads with the missing Red arrow input tied to AC Line.

If the GY ENABLE switch is in the ON position, then any channel that has its SSM Switch in the OFF position will still detect a (G and Y) Dual Indication fault on that channel.

If the GY ENABLE switch is in the OFF position, then any channel that has its SSM Switch in the OFF position will not detect any Dual Indication fault on that channel.

The name of the option switch is what happens when the switch is in the ON position.
### 2010ECL Option Switches (SW-3)

- **Special Function input POLARITY**
  - OFF: SF#1 input *active disables* Red Fail monitoring
  - ON: SF#1 input *not active disables* Red Fail monitoring
- **RFSSM**
  - OFF: SSM switches also enable Red Fail monitoring
- **LEDguard**
  - ON: Signal Thresholds better suited to LED failure modes
  - Compatible with both LED and Incandescent loads
  - Compatible with ATSI testing

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**SPECIAL FUNCTION POLARITY**

<table>
<thead>
<tr>
<th>Polarity Switch</th>
<th>SF #1</th>
<th>SF #2</th>
<th>Red Failure Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>off</td>
<td>off</td>
<td>off</td>
<td>enabled</td>
</tr>
<tr>
<td>off</td>
<td>off</td>
<td>on</td>
<td>disabled - Preempt</td>
</tr>
<tr>
<td>off</td>
<td>on</td>
<td>off</td>
<td>disabled - Preempt</td>
</tr>
<tr>
<td>off</td>
<td>on</td>
<td>on</td>
<td>disabled - Preempt</td>
</tr>
<tr>
<td>on</td>
<td>off</td>
<td>off</td>
<td>disabled - Preempt</td>
</tr>
<tr>
<td>on</td>
<td>on</td>
<td>off</td>
<td>enabled</td>
</tr>
<tr>
<td>on</td>
<td>on</td>
<td>on</td>
<td>disabled - Preempt</td>
</tr>
</tbody>
</table>

SF #1 and SF #2 use Red voltage thresholds (ON > 70 Vac, OFF < 50 Vac).

**RFSSM**

Can be used to program Red Fail enable using the SSM switches if a jumper termination is not used on the Red Interface Cable board.

**LEDguard**

The Signal Monitor can be configured to use a technique called *LEDguard* that is designed to better monitor the characteristics of LED based signal loads. Each field signal input is measured and compared to both a high threshold and a low threshold value to determine On / Off status. Once the high and low On / Off thresholds have been determined using the input RMS voltage, the individual fault monitor functions use the appropriate threshold to determine if a fault condition exists.
2010ECL Options

- Watchdog Enable (SW-2)
  - ON = Enables WDT ERROR monitor
  - OFF = Disables WDT ERROR monitor and WDT ERROR Led flashes
- Watchdog Latch Enable (SEL1)
  - SEL1 Latch option requires reset to clear fault
  - No SEL1: AC Power cycle resets WDT Error. WDT Error LED remains illuminated until Reset

WATCHDOG ENABLE SWITCH
This switch will enable the Watchdog monitor function when placed in the ON position. This switch is intended to aid in trouble shooting a malfunctioning cabinet. The intersection should not be operated with this function disabled.

WATCHDOG LATCH ENABLE

Jumper out:
AC Line brownout restore will clear a WDT ERROR and allow the intersection to run. The WDT ERROR LED will remain illuminated until Reset (Caltrans).

Jumper in:
WDT ERROR is latched until Reset button is depressed or External Reset input is activated.
2010ECL Options

- Minimum Flash Enable
  - SEL2 jumper enables minimum flash interval on power-up, brownout restore, or interrupt restore. Required for 2070 compatibility
- Configuration Change Fault Enable
  - SEL3 jumper enables fault mode
  - Configuration Change is always logged
- Red Cable Fault Enable
  - SEL4 jumper enables fault mode if Red Cable is removed during operation
- Brownout Levels
  - SEL5 jumper enables 2070 compatible AC Line voltage and timing values. Required for 2070 compatibility

MINIMUM FLASH ENABLE
Jumper IN enables minimum flash interval on power-up, AC Line brownout restore, and AC Line interrupt restore. This function is required for compatibility with the 2070 Controller Unit. It is a preferred mode for 170 CU operation as well. This mode reflects typical NEMA operation.

CONFIGURATION CHANGE ENABLE
With the jumper IN, a configuration change will be logged and trigger a fault. The PCA LED will flash at a 4Hz rate to indicate this fault. A five second manual reset is required to enter the new configuration and reset the unit.

With the jumper OUT, the change will be logged but no fault is triggered.

RED CABLE FAULT ENABLE
With the jumper IN, the monitor will go to Red Fail fault if the Red Interface cable is removed (Channel Status = Off).

With the jumper OUT, the Red Interface cable can be unplugged. The unit will then function as basic 210 monitor with Red Fail, Dual Indication, and Clearance disabled.
SSM Switches in the ON position enable the Dual Indication and Clearance monitoring functions on an individual channel basis.

An SSM Enable switch should be OFF for channels that have the Red input tied to AC Line such as the left turn channel of a 5 section head, pedestrian channel, or any unused channels. An SSM Enable switch should also be OFF for any channels that do not monitor all three outputs of the corresponding Load Switch such as a pedestrian channel with no Yellow load.

If 5 section heads are used for protected / permissive phases, the GY ENABLE option should be considered.
A Typical 8-Phase Quad Setup

- Vehicle Thru Phases
  - SSM switches 2,4,6,8 ON
- Protected Left Turns
  - SSM switches 3,7 ON
- PPLT Left Turns
  - SSM switches 1,5 OFF
- Option Switches
  - GY Enable ON
  - RF2010 ON, RFSSM OFF, LEDguard ON
- Optional Consideration for Ped Monitoring
  - SSM switches 13,14,15,16 ON
  - Yellow Disable 13,14,15,16 Jumpered
Flashing Yellow Arrow Modes; FYA and FYAC

Two cabinet configurations are supported depending on the number of load switches provided and the capabilities of the Controller Unit. A Flashing Yellow Arrow approach is actually monitored using two physical channels of the Signal Monitor. In the basic FYA mode of the unit, one additional load switch is required for each FYA approach to be monitored. Thus a cabinet providing four vehicle phases, four pedestrian phases, and four FYA approaches would require sixteen load switches. The compact FYAc mode requires the Controller Unit to remap the Yellow outputs of the pedestrian load switches to drive the protected Green Arrow signals of the FYA approaches. In this mode the cabinet can provide the four FYA approaches with the existing twelve position output assembly.

FYA Channel Pair Enables

Four switches are provided to enable a channel pair for each FYA or FYAC approach.

- Channel 1-9
- Channel 3-10
- Channel 5-11
- Channel 7-12
EDI ECcom Software
Is your signal monitor trying to tell you something?

The EDI ECcom software package interfaces a Computer to the model 2010ECL. All events are time stamped with the time and date of the event. A monitor ID number may be assigned to the monitor.

RMS Field status and control input status may be obtained from the monitor in real time. Current configuration is displayed as well as time clock setting, monitor ID, cabinet voltage, temperature, and configuration CRC.

Event logs may be uploaded, displayed, stored as Ascii files, and printed. Monitor logs may also be cleared individually. The following event logs are available: Previous Failures, AC Line Events, Manual Reset Events, Configuration Change Events.

A chronological sort displays all event types sorted together by time stamp value.

The Trace display will show all signal states for up to 30 seconds prior to the current fault. This buffer is retained after reset but is overwritten with the next fault.

Why guess when you can know?
The typical task of the signal technician is to change the network settings of the Monitor when installing the unit. To do so requires an Ethernet connection to the Ethernet port of the unit.

Since the PC and monitor must be on the same subnet to communicate, this presents a problem when the TCP/IP settings of the PC are locked.

The ECcom function provides a simple way to change the Monitor network parameters without the need to temporarily change the PC network setup. The Search function (Setup / Comm Port / Settings - Search) identifies the connected device and provides a screen to change the settings of the Monitor port. Once the Monitor and PC are on the same subnet, full ECcom capabilities are enabled.
ECcom Ethernet Configuration

- SETUP / COMM PORT / SETTINGS menu item,
- Click on the SEARCH button.
- The Search function will find all EDI monitors on the local subnet.

The ECcom function provides a simple way to change the network parameters without the need to temporarily change the PC network setup. The Search function (Setup / Comm Port / Settings - Search) identifies the connected device and provides a screen to change the settings of the Ethernet port. Once the monitor and PC are on the same subnet, full ECcom capabilities are enabled.
ECcom Ethernet Configuration

- Right Click on the monitor entry that needs to be configured
- Select CONFIGURE SETTINGS
- Set the new network parameters

This window is used to set the IP Address, Subnet Mask, and Gateway Address (if needed) in the Ethernet port.
Flashing Yellow Arrow

LEFT TURN
YIELD
ON FLASHING
YELLOW
ARROW
Flashing Yellow Arrow Channel Pairs

- The monitor uses two paired channels to monitor the four outputs of the FYA Signal Output Group.

- Each FYA approach typically requires two load switches and two monitor channels.
- Unused Yellow output of the Protected channel must be disabled if not used to drive a signal head.
The choice between the standard FYA mode and the FYA Compact mode primarily is one of load switch count.

• The FYA mode requires load switches installed on channels 9-12 which means an Auxiliary File is needed.

• The FYAC mode uses the Ped Yellow load switch outputs and thus can be done with only a 12 position Output File.

In either case the monitor requires TWO channels per FYA approach.
Flashin Yellow Arrow Compact Mode

- **FYAC Mode**
  - Permissive OLP phases (Rarrow, Yarrow, fYarrow) are assigned to monitor channels 1, 3, 5, and 7
  - Protected phases (Garrow) are driven by the Y output of the PED load switches 13, 14, 15, 16
  - Protected phases (Garrow) are then remapped to monitor channels 9, 10, 11, and 12
FYAC Compact Mode Mapping

- The cabinet is wired such that the (unused) Ped Yellow load switch outputs are wired to the Signal Monitor inputs as follows:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Load Switch #</th>
<th>Monitor Physical Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ped 2 Yellow</td>
<td>3</td>
<td>Ch 9 Green (pin 13)</td>
</tr>
<tr>
<td>Ped 4 Yellow</td>
<td>6</td>
<td>Ch 9 Yellow (pin 16)</td>
</tr>
<tr>
<td>Ped 6 Yellow</td>
<td>9</td>
<td>Ch 10 Green (pin B)</td>
</tr>
<tr>
<td>Ped 8 Yellow</td>
<td>12</td>
<td>Ch 10 Yellow (pin U)</td>
</tr>
</tbody>
</table>

- The 2010ECL will then remap the physical inputs to monitor channels as follows:

<table>
<thead>
<tr>
<th>Monitor Physical Input</th>
<th>Monitor Logical Channel</th>
<th>Associated FYA Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 9 Green</td>
<td>Ch 9 Green (arrow)</td>
<td>Ch 1 (OLP)</td>
</tr>
<tr>
<td>Ch 9 Yellow</td>
<td>Ch 10 Green (arrow)</td>
<td>Ch 3 (OLP)</td>
</tr>
<tr>
<td>Ch 10 Green</td>
<td>Ch 11 Green (arrow)</td>
<td>Ch 5 (OLP)</td>
</tr>
<tr>
<td>Ch 10 Yellow</td>
<td>Ch 12 Green (arrow)</td>
<td>Ch 7 (OLP)</td>
</tr>
</tbody>
</table>
Flashing Yellow Arrow Configuration

• FYAC switch
  – OFF: Standard FYA mode is selected
    • 16/18 position Output + Aux Assembly
  – ON: Compact FYA mode is selected
    • 12 position Output Assembly

• FYA 1-9, 3-10, 5-11, 7-12 switches
  – ON: enables a channel pair for FYA monitoring functions
EDI 2010ECL Series

Setting the Standard for Quality and Reliability

Eberle Design Inc.
www.EDiTraffic.com

Thank you for using Eberle Design products.

Our goal is to provide you with the highest reliability, performance, and customer satisfaction possible.

Your inputs and comments are highly appreciated.