

SECTION 678-2

CONFLICT-VOLTAGE MONITOR (Enhanced)

This Subsection covers the requirements for signal Conflict-Voltage Monitors of solid state rack mount design, interchangeable with the same type of different manufacture. A Conflict-Voltage Monitor, herein referred to as a Monitor Unit, shall be provided and wired into the cabinet with any Model 170 E Controller Assembly utilizing solid state load switches for controlling the signal head indicators.

Immediately following this Subsection, the following illustrations are provided:

- Figure 678-1: Model 210 Conflict-Voltage Monitor Wiring Chart
- Figure 678-2: Model 210 Conflict-Voltage Monitor Connector Pin List
- Figure 678-3: Model 210 Conflict-Voltage Monitor Red Input Connector Pin Assignments
- Figure 678-4: Model 210 Red Monitor Program Board
- Figure 678-5: Model 210 Red Monitor Program Board Schematic
- Figure 678-6: Model 210 Conflict Voltage Monitor

678-2.1 GENERAL:

The enhanced Monitor Unit is a device used in a traffic controller assembly to monitor traffic signals at an intersection for conflicting proceed indications caused by malfunctions of the controller, load switches, field wiring and loads, or mis-wiring of the cabinet. The Monitor Unit also provides error sensing of the cabinet 24 VDC supply and monitors the controller Watchdog output. The enhanced Monitor Unit is directly interchangeable with a standard model 210 SIGNAL MONITOR and complies with all specifications outlined in Chapter 4 (Model 210 Monitor Specifications) of the Traffic Signal Control Equipment Specifications January 1989).

When triggered by the detection of a fault condition which exists longer than the minimum period, the enhanced Monitor Unit will enter the fault mode causing the Output relay contacts to close and enabling the Stop-Time output to the controller. The cabinet assembly should be wired such that the closure of the conflict monitor Output relay contacts will cause an automatic switching of the field signal outputs from normal operation to flashing operation. The enhanced Monitor Unit will then display the appropriate fault indications and remain in this fault mode until a reset command is issued via the front panel RESET button or External Reset input. The loss of AC Line power will not reset the fault mode unless the fault is WDT Error, Diagnostic, or BND Fail. In the event of AC Line power loss the Monitor Unit will retain the status of all fault and channel indicators and will display the correct fault and channel status upon restoration of AC Line power.

The enhanced Monitor Unit incorporates all the basic features of a Model 210 Conflict-Voltage Monitor and adds an RS-232 serial port which gives the unit the capability to communicate with Controller Unit or PC based operational software for status and fault event data plus an enhanced event logging capability for full time stamped event reporting to the Controller Unit or PC based

678-2.2 Conflict Monitoring

The Monitor Unit shall be capable of monitoring 16 channels. Each channel monitors a Green, Yellow, and Red field signal output at the field terminals. A Program Card is provided for assigning conflicting channels and inhibiting Yellow monitoring for required channels.

The Monitor Unit detects the presence of conflicting Green or Yellow signals on the AC field terminations between any two or more channels assigned to conflict on the Program Card. The monitoring circuitry is capable of detecting either full wave or positive and negative half-wave field signal outputs at the specified voltage levels.

678-2.3 24 Volt DC Monitoring:

Sensing of the cabinet 24 VDC supply is provided as specified in Section 4.2, Chapter 4 of the Traffic Signal Control Equipment Specifications. When the 24 VDC input falls below the specified voltage levels the Monitor Unit will enter the fault mode causing the Output relay contacts to close and enabling the Stop Time output to the controller.

678-2.4 Controller Watchdog Monitoring:

Sensing of the controller Watchdog output is provided as specified in Section 4.3, Chapter 4 of the Traffic Signal Control Equipment Specifications. The Watchdog output from the Controller Unit is monitored for logic transitions. When a logic transition is not sensed for the specified period the Monitor Unit will enter the fault mode causing the Output relay contacts to close and enabling the Stop-Time output to the controller. This WDT Error fault mode is latched until a Reset command is applied or AC power is removed. If the WDT Error fault mode is reset from an loss of AC power, the WDT Error LED will remain illuminated to indicate a WDT Error existed but was cleared by the power loss. A Reset command is required to clear the LED fault indication.

678-2.5 Extended Features:

The following extended features are to be provided on the Monitor Unit to provide additional fault monitoring functions, to increase the reliability of the monitor operation, and enhance the diagnostic capabilities offered to the service technician.

678-2.5.1 Hardware Features

The Monitor Unit shall be a CMOS microprocessor based unit. All monitoring functions and features are firmware programmable which permits upgrades or modifications by simply replacing the EPROM device containing the firmware with the upgraded version. Thus, most changes to the Monitor Unit specifications may be accommodated without modifying the hardware.

Since all critical timing functions are accomplished by the microprocessor, the quartz crystal based accuracy results in very precise and repeatable measurements. This accuracy is maintained on functions from timing fault conditions to implementing a unique firmware based digital sampling and filtering algorithm. This algorithm is applied to all AC field signals to help eliminate false detection in a "noisy" AC line environment.

The use of voltage comparators for detecting field signal output status provides precise voltage level sensing of the field signals. Voltage references are temperature compensated for constant voltage levels within the operating temperature range.

A nonvolatile EEPROM device is utilized to retain fault status information in the event of an AC Line power interruption. The correct fault indications will be displayed upon restoration of AC Line power. This EEPROM device requires no battery back-up. Advanced event logging data and time of day in the Monitor Unit is stored in a battery-backed RAM memory. Should this battery fail, only event data will be lost. No monitor configuration programming is stored in this memory.

678-2.5.2 Red Failure Monitoring:

The Monitor Unit shall be designed to adapt Red Failure Monitoring to a conventional controller cabinet assembly. The simultaneous absence of active Green, Yellow, and Red field signal voltages on a channel places the Monitor Unit into the fault mode causing the Output relay contacts to close and enabling the Stop Time output to the controller. Sixteen Red signal inputs, a Red Enable input, and two Special Function preemption inputs (SF1,2) are connected to the monitor via a front panel connector (P1) and ribbon cable assembly. Chassis Ground may also be connected to the unit through pin P1-4. Jumper E1 must then be inserted to complete the connection.

This monitoring function is enabled by applying AC + to the Red Enable input (P1-20). Unused Red signal inputs must be tied to AC + to prevent a Red Failure on those channels. Red Failure monitoring is disabled for all channels when the Red Enable input is not active, a Preemption input (SF1,2) is active, or the EE input (MC Coil) is active.

678-2.5.3 GYR-DUAL Indication Monitoring:

This monitoring function detects simultaneous indications of active Green and Yellow, Green and Red, or Yellow and Red field signal outputs on the same channel. A GYR-Dual Indication fault places the Monitor Unit into the fault mode causing the Output relay contacts to close and enabling the Stop-Time output to the controller. GYR-Dual Indication Monitoring is enabled concurrently with Sequence Monitoring on a per channel basis using the SSM switches (see Section 678-4.2) and requires the Monitor Unit to be adapted for Red Signal Monitoring. GYR-Dual Indication Monitoring is disabled for all channels when the Red Enable input is not active or the EE input (MC Coil) is active.

An open or no load condition (i.e., burned-out bulb) may be detected as an active signal due to load switch leakage current and may cause a Dual Indication fault. Dual Indication Monitoring may also anticipate a possible Conflict in the event that a proceed signal on a channel is constantly detected as active.

678-2.5.4 GY-Dual Indication Monitoring:

This monitoring function detects a simultaneous indication of active Green and Yellow field signal outputs on the same channel. A GY-Dual Indication fault places the Monitor Unit into the fault mode causing the Output relay contacts to close and enabling the Stop Time output to the controller. It does not require the monitor to be adapted for Red Signal monitoring, and is enabled by setting an option switch labeled GY ENABLE in the ON position. GY-Dual Indication Monitoring may be enabled concurrently with GYR-Dual Indication Monitoring. When GY-Dual Indication Monitoring is enabled, all channels will be individually monitored for simultaneous indications of active Green and Yellow field signal outputs. Any channels which have been selected for GYR-Dual Indication Monitoring will function as described above in Section 678-2.5.3.

This monitoring function is useful if the Monitor Unit is not adapted for Red Signal Monitoring as in the case of a standard 210 Monitor Unit. This also accommodates Green and Yellow Dual Indication Monitoring on a five section signal head.

678-2.5.5 Sequence (Short or Absent Yellow) Monitoring:

This function detects the absence of a minimum period of active Yellow field signal output during a Green to Yellow to Red sequence. Sequence Monitoring is enabled concurrently with GYR-Dual Indication Monitoring on a per channel basis using the Programming Switches and requires the Monitor Unit to be adapted for Red Signal Monitoring. Sequence Monitoring is disabled for all channels when the Red Enable input is not active or the EE input (MC Coil) is active.

A Sequence (short or absent Yellow) fault condition will place the Monitor Unit into the fault mode causing the Output relay contacts to close and enabling the Stop Time output to the controller. This occurs when a Red input signal to a channel is active following the termination of an active Yellow input signal which is less than the minimum duration including zero (i.e. skipped). The minimum yellow clearance interval is programmed from 2.7 seconds to 4.1 seconds using the optional switches.

678-2.5.6 AC Line Brown-Out Detection:

When the AC Line voltage is below the "drop-out" level the Monitor Unit shall suspend all fault monitoring functions, close the Output relay contacts, and enable the Stop-Time output to the controller. This condition is maintained for a minimum period of 4.25 seconds. The AC indicator on the front panel will flash at a rate of 2 Hz to indicate the brownout status.

When the AC Line voltage returns above the "restore" level the monitor will resume normal operation and the AC power indicator on the front panel will remain illuminated.

Brown-out Detection is provided to prevent a dark intersection in the event a brown-out causes the cabinet controller to release control of the intersection. If this occurs and the intersection is not placed into flash, the monitor will detect a Red Failure (absence of signal) and will require a manual reset. The "low AC Line Voltage" level on the Controller Unit should be set approximately 5 volts below the monitor drop-out level.

678-2.5.7 Non-Volatile Fault Memory:

The loss of AC Line power to the monitor will not reset the following fault conditions: VDC Failed, Conflict, Red Failure, Dual Indication, and Sequence. The Monitor Unit shall store the fault and channel indicator status at the time the fault occurs into a non-volatile EEPROM device. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the Output relay and Stop-Time output will remain in the fault mode and the correct fault and channel indicators will be illuminated. This fault mode is maintained until the monitor is reset. If the AC Line voltage level falls below the Watchdog Disable level, a Watchdog Error will be reset when the AC Line voltage level returns above Watchdog Enable level. A BND fault will also be reset by an AC Line brownout or dropout.

The Monitor Unit shall use a lifetime lithium battery to maintain the event log data and the time of day clock. Should this battery fail, only event data and clock functions will be lost. No monitor configuration data is stored under battery

678-2.5.8 PCA (Program Card Absent) Indication:

If the Program Card is absent or not seated properly in the edge connector, the Monitor Unit shall enter the fault mode causing the Output relay contacts to close and enabling the Stop-Time output to the controller. The PCA indicator will illuminate to indicate this condition. A manual or external Reset is required after the Program Card is properly seated.

678-2.5.9 Internal Watchdog:

The Monitor Unit shall generate an internal watchdog pulse from its microprocessor. This occurs at least once per line cycle. If the internal hardware does not detect a watchdog pulse within approximately 200 milliseconds, the Monitor Unit shall enter the fault mode causing the Output relay contacts to close and enabling the Stop Time output to the controller. The DIAGNOSTIC indicator on the front panel will illuminate to indicate a monitor hardware and/or firmware failure.

This type of failure is configured as non-latching. If the microprocessor resumes operation the unit may return to normal operation. If latching operation is desired, a jumper shall be inserted. With latching operation, only a loss of AC Line will restore operation.

678-2.5.10 Reset Input Detection:

A reset command from either the front panel Reset button or External Reset input shall cause a one-time 300millisecond reset command to the monitor. If the reset command is maintained longer than 300 milliseconds, the monitor shall resume monitoring functions and the Reset command shall then provide input to the Diagnostic Display mode.

678-2.5.11 LED Test:

The Monitor Unit shall illuminate all front panel indicators for 300 milliseconds when a Reset command is issued by the front panel Reset button or External Reset Input. This function provides a way to check the operation of all front panel indicators.

678-2.5.12 Memory Test:

The Monitor Unit shall verify the proper operation of the memory devices (RAM, EPROM, & EEPROM) required to operate the monitor. This test shall be performed when AC Line power is applied, a Reset Command is issued to the monitor, and periodically during operation. If a memory error is detected, the Monitor Unit shall attempt to update the front panel display and then execute a STOP instruction. This will cause the Output relay contacts to close and enable the Stop-Time output to the controller. The DIAGNOSTIC indicator on the front panel will illuminate to indicate a monitor hardware and/or firmware failure. As a possible aid to the service technician the channel status indicators may display a code to indicate which memory device is failing. However, due to the nature of this failure mode, these indicators should be used only as a guide.

Memory Failure Indicators

Channel #1 status indicator: MPU on-chip memory

Channel #2 status indicator: static ram device

Channel #3 status indicator: EPROM device

Channel #4 status indicator: EEPROM device

678-2.5.13 Watchdog Monitoring Disabled Indicator

When the WDT ENABLE switch is in the OFF position to disable Watchdog Monitoring of the cabinet Controller, or the AC Line voltage is below the Watchdog disable level, the Monitor Unit shall flash the WDT ERROR indicator on the front panel once every 2 seconds. This function informs the service technician that the cabinet Controller Watchdog monitoring function is disabled.

678-2.5.14 Extended Monitor Function Disabled Indicator

When any of the Extended Monitoring functions (Red Fail, or Dual Indication, or Sequence) are disabled because the Red Enable input is not active or the EE input (MC Coil) is active or a Special Function input is active, the Monitor Unit shall flash the RED FAIL indicator on the front panel once every 2 seconds. This function informs the service technician that Extended Monitoring functions are disabled.

678-2.5.15 Internal Power Supply Monitoring:

This function facilitates the orderly initialization or "shut-down" of the Monitor Unit microprocessor. If the internal unregulated DC supply falls below 8 ± 1 Vdc, the microprocessor is placed in reset to suspend the execution of the firmware program. The Monitor Unit shall enter the fault mode causing the Output relay contacts to close and enabling the Stop Time output to the controller. The DIAGNOSTIC indicator on the front panel will illuminate to indicate a monitor hardware and/or firmware failure.

When the voltage level goes above 11 ± 1 Vdc, the reset is removed from the microprocessor which enables it to initialize and execute the program loop. This internal power supply monitoring insures that normal operation of the microprocessor only occurs when the internal power supply of the Monitor Unit is at the required voltage levels.

678-2.5.16 BND (Blinking/Noise/Dimming) Error Detection:

This error detection function shall supplement the unique firmware sampling and digital filtering method for sensing the field input signals. The Monitoring Unit field input sensing algorithm is designed to filter out relatively short term noise transients commonly found on the electrical service and provide noise immunity against false signal detection's. The BND Error Detection function is designed to detect and respond to irregular input waveforms which exhibit a longer time constant in comparison to the short term digital filtering time constant. This detection algorithm is intended to detect a signal that is: irregularly Blinking (flickering); has constant extraneous Noise; or is Dimmed invalidity under Controller Unit software control. These signals are differentiated in part due to the large time constants which may be associated with these irregular input wave forms and may indicate a malfunctioning component or improper operating mode within the cabinet assembly.

The BND Error Detection function is designed to recognize many of these possible input wave forms and shall place the Monitor Unit into the fault mode. If the aforementioned signal conditions exist for a pre-determined period of time, the Monitor Unit shall enter the fault mode, transfer the Output relay contacts to the Fault position, enable the Stop Time output to the controller, and illuminate the BND FAIL indicator. The Channel Status display will indicate the channels on which the fault occurred. The Monitor Unit shall remain in the fault mode until the unit is reset by the Reset button or the External Reset input. An AC Line brownout condition or a complete loss of AC Line power will reset the BND fault state of the monitor.

678-2.5.16.1 Blinking:

This blinking or flickering signal condition may exist under certain abnormal circumstances such as: controller output malfunction (i.e.; output toggling, pin wheeling, etc.); load switch malfunction (output shorting intermittently, zero cross failure, phase firing, etc.); intermittent field wiring or Neutral return (due to corrosion, poor termination, improper or poor cabinet grounding system, etc.). Another cause of flickering occurs when excessive AC voltage to a channel input in the OFF state occurs due to load switch "leakage current" and high load impedance. This high impedance load may be caused by dimmers, low wattage loads (7 watt test lamps, solid state loads, etc.), poor wire terminations, etc.. When the voltage level of a field input signal is near the threshold level of the input comparators, AC ripple and noise may produce a flickering effect.

NOTE: When the voltage level of a field input signal is reduced to within approximately 100 mV of the threshold level of the input comparators, the front panel channel indicators may flicker due to ac ripple and cause a BND error to be detected. This input threshold level may lie between 17 Vrms and 23 Vrms. The Traffic Signal Control Equipment Specification states that the input monitoring circuitry may or may not detect within a voltage range of 15 Vrms to 25 Vrms. To assist in testing and calibration a "BND Test Disable" option can be used to disable the BND function. This shall be for test purposes only. For the broadest fault coverage the Monitor Unit **SHALL NOT** be operated with the BND function disabled.

678-2.5.16.2 Noise:

Constant high-energy noise or transients on the field signal inputs may affect the integrity of the input sample if it occurs exactly within the narrow sampling "window" of the Monitor Unit. Depending on the severity and repetition rate of the input noise, a BND error may be detected after the samples have been corrupted for a continuous period of 90 to 200 line cycles.

This condition may not always be due to extraneous input noise. A faulty input comparator device may also result in reading invalid sampling data.

678-2.5.16.3 Dimming:

The sampling and filtering algorithm allows only half wave (positive or negative) suppressed dimming. Other dimming waveforms may be achieved under cabinet controller software control and will be detected as a BND error within approximately 90 periods of the input waveform.

678-2.5.17 Diagnostic Display Mode:

The Monitor Unit shall provide two means of displaying the individual Green, Yellow, and Red field status. The No Fault Diagnostic Display mode shows the individual colors while the monitor is not in the fault mode (intersection operating). The Fault Diagnostic Display mode shows the individual colors which were active at the time the monitor triggered to the fault mode (intersection in flash). The Fault Diagnostic Display mode also provides a review of previous fault events.

678-2.5.17.1 No Fault Diagnostic Display:

When the Monitor Unit is not in the fault state, the unit can display the active Green, Yellow, and Red field status individually. To enter this display mode depress and hold the Reset button. Each time the Reset button is activated and held, the next set of colors will be displayed on the channel status indicators. The display will continue to show the selected color as long as the Reset button is activated. This mode only affects the monitor display and normal fault processing will continue to occur. The sequence is as follows:

<u>Reset</u>	<u>Fault Status LED's</u>	<u>Channel Status LED's</u>
#1	(G) AC POWER LED flashes	Green field status 1-16
#2	(Y) VDC FAILED LED flashes	Yellow field status 1-16
#3	(R) WDT ERROR LED flashes	Red field status 1-16
...	(repeats back to top)	

678-2.5.17.2 Fault Diagnostic Display:

Once the Monitor Unit has been triggered by a fault, the Green, Yellow, and Red field input status active at the time of the current fault and the two previous faults may be displayed individually. This status is not reset by an AC Line power interruption. To enter this display mode remove the Program Card. The sequence is as follows:

<u>Reset</u>	<u>Event</u>	<u>PCA LED</u>	<u>Fault Status LED's</u>	<u>Channel Status LED's</u>
---	#1	Single Flash	Current Fault Status (newest)	Current channel status
#1	#1	Single Flash	(G) AC POWER LED flashes	Green field status 1-16
#2	#1	Single Flash	(Y) VDC FAILED LED flashes	Yellow field status 1-16
#3	#1	Single Flash	(R) WDT ERROR LED flashes	Red field status 1-16
#4	#2	Double Flash	Event #2 Fault Status	Event #2 channel status
#5	#2	Double Flash	(G) AC POWER LED flashes	Green field status 1-16
#6	#2	Double Flash	(Y) VDC FAILED LED flashes	Yellow field status 1-16
#7	#2	Double Flash	(R) WDT ERROR LED flashes	Red field status 1-16
#8	#3	Triple Flash	Event #3 Fault Status (oldest)	Event #3 channel status
#9	#3	Triple Flash	(G) AC POWER LED flashes	Green field status 1-16
#10	#3	Triple Flash	(Y) VDC FAILED LED flashes	Yellow field status 1-16
#11	#3	Triple Flash	(R) WDT ERROR LED flashes	Red field status 1-16
---			(repeats back to top)	

To enter this display mode remove the Program Card. Depressing the Reset button advances the display mode from the normal mode to the Green field input display. The (G) AC POWER LED will pulse ON once per second to indicate this mode. The channel display LED's will show the Green channels active at the time of the fault. The PCA LED will pulse once per second to indicate the current fault (#1, newest).

Depressing the Reset button again advances the display mode from the Green display mode to the Yellow field input display. The (Y) VDC FAIL LED will pulse ON once per second to indicate this mode. The channel display LEDs will show the Yellow channels active at the time of the fault.

Depressing the Reset button again advances the display mode from the Yellow display mode to the Red field input display. The (R) WDT ERROR LED will pulse ON once per second to indicate this mode. The channel display LEDs will show the Red channels active at the time of the fault.

Depressing the Reset button again advances the display mode from the Red display mode (of fault #1) to the fault display mode for fault #2. The PCA LED will pulse twice per second to indicate the previous fault (#2). Additional button closures will cycle through the colors for fault #2 and fault #3 (oldest). After the Red display for fault #3, the display will return to fault #1.

To exit this display mode, replace the Program Card. If the Program Card is removed while the Monitor Unit has not been triggered by a fault, the fault status display mode shall show the Green, Yellow, and Red channels active when the Program Card was removed. If a PCA fault is displayed during the review, the PCA LED will not flash during the Fault Status display step to indicate the fault number.

678-2.6 EVENT LOGGING FEATURES:

678-2.6.1 Basic Front Panel Event Display:

The Monitor Unit shall retain the three type fault events in nonvolatile memory which can be reviewed via the front panel display or through,

678-2-6.2 RS-232 Communications Port (Status/Event Reporting):

The Monitor Unit shall use the RS-232 port to communicate status to a Controller Unit operational software and event data to a PC or through,

678-2.6.2.1 BI Tran Systems 233 Program Conflict-Voltage-Monitor Status

The Monitor Unit status message format shall be compatible with BI Tran Systems Model 223 Software¹. On request from the operational software, the Monitor Unit provides the current field status if no fault has triggered the monitor. If the monitor is in the fault mode, the current fault status and field input status at the time of the fault is reported. The BI Tran Systems Model 223 Software manual should be consulted for details of operation.

¹ Bi Tran Systems, Inc. is located in Sacramento California, telephone number is 916-441-0260

or

678-2.6.2.2 Manufacturers Software Program - Conflict-Voltage Monitor Report

A Manufacturers software package that interfaces a Computer to the Monitor Unit Shall be furnished with the delivery of a Conflict-Voltage Monitor Unit. Operation of the software package shall be described in an Operations Manual which shall be supplied with the software program. The software program shall display the Monitor Units current status, the three fault events contained in the nonvolatile fault event log, and the current configuration of the unit. The following data shall be available from the Monitor Unit:

- a) Fault Type: the fault type description.
- b) Field Status: the current GYR field status if the monitor is not in the fault state or the latched field status and channel fault status at the time of the fault
- c) AC Line Voltage: the current AC Line voltage if the monitor is not in the fault state or the AC Line voltage at the time of the fault.

- d) Control Input Status: the current state of the Red Enable input, EE input, and Special Function #1 and #2 inputs if the monitor is not in the fault state or the status latched at the time of the fault.
- e) Previous Fault data: the fault type, field status, and AC Line voltage of the three previous faults.
- f) Program Card Matrix: the permissive programming for each channel.
- g) Yellow Disable Jumpers: the Yellow Disable programming for each channel.
- h) SSM Switches: the SSM Switch programming for each channel.
- i) Option Switches: GY Enable, BND Disable, SF Polarity, Sequence Timing.
- j) Watchdog Programming: Watchdog Enable and Watchdog timing.

678-2.6.3 Monitor Unit Status/Event Reporting:

The Monitor Unit shall use the RS-232 port to communicate status to a Controller Unit operational software and event data logs to a PC or,

678-2.6.3.1 BI Tran Systems 233 Program Conflict-Voltage-Monitor Status:

The Monitor Unit status message format and time/date message format shall be compatible with BI Tran Systems Model 223 Software. On request from the operational software, the Monitor Unit shall provide the current field status if no fault has triggered the monitor. If the monitor is in the fault mode, the current fault status and field input status at the time of the fault is reported. The operational software will also periodically synchronize the Monitor Unit's time clock. The BI Tran Systems Model 223 Software manual should be consulted for details of operation.

or

678-2.6.3.2 Manufacturers Monitor Report:

The Manufacturers Monitor Status/Event Software Package shall interface a Computer to the Monitor Unit. The software package shall display the Monitor Unit Status (S), Previous Fault (PF) event log, AC Line (AC) event log, Manual Reset (MR) event log, and the Configuration (CF) event log. All events are time stamped with the time and date of the event. Operation of the Software Package Program shall be described in the furnished Operational Manual. The following data is available from the model 210ECL:

General Data

- a) Monitor ID#: a four digit (0000-9999) ID number may be assigned to the monitor.
- b) Time and Date: each event is marked with the time and date of occurrence.
- c) Event Number: identifies the record number in the log. Event #1 is the most recent event.

Current Status (S)

- a) Fault Type: the fault type description.
- b) Field Status: the current GYR field status if the monitor is not in the fault state or the latched field status and fault channel status at the time of the fault.
- c) Cabinet Temperature: the current temperature if the monitor is not in the fault state or the latched temperature at the time of the fault.
- d) AC Line Voltage: the current AC Line voltage if the monitor is not in the fault state or the AC Line voltage at the time of the fault.
- e) Control Input Status: the current state of the Red Enable input, EE input, and Special Function #1 and #2 inputs if the monitor is not in the fault state or the status latched at the time of the fault.

Previous Fault (PF) Event Log

- a) Fault Type: the fault type description.
- b) Field Status: the latched field status and fault channel status at the time of the fault.
- c) Cabinet Temperature: the current temperature if the monitor is not in the fault state or the latched temperature at the time of the fault.
- d) AC Line Voltage: the current AC Line voltage if the monitor is not in the fault state or the AC Line voltage at the time of the fault.
- e) Control Input Status: the current state of the Red Enable input, EE input, and Special Function #1 and #2 inputs if the monitor is not in the fault state or the status latched at the time of the fault.

AC Line (AC) Event Logs

- a) Event Type: describes the type of AC Line event that occurred.
 - Power-up - AC on, monitor performed a cold start
 - AC Off - $0 \leq \text{AC Line} < 80 \text{ V}$
 - Brown-out - $80 < \text{AC Line} < \text{drop-out level}$

 - Restore - AC restored from AC brown-out or AC interruption (AC Off), no cold start
- b) AC Line Voltage: the AC Line voltage at the time of the event.

Manual Reset (MR) Event Log

- a) The monitor was reset from a fault by the front panel Reset button or External Reset input.

Configuration (CF) Event Log

- a) Program Card Matrix: the permissive programming for each channel
- b) Yellow Disable jumpers: the Yellow Disable programming for each channel.
- c) SSM Switches: the SSM Switch programming for each channel.
- d) Option Switches: GY Enable, BND Disable, SF Polarity, Sequence Timing.
- e) Watchdog Programming: Watchdog Enable and Watchdog timing.

678-2.6.3.3 Manufacturers Monitor Report Recommended Example:

An Example of each type of recommended record is shown below:

1) Previous Fault (PF) Event Log

>> Monitor # 175 Previous Fail Event Log <<
 >> Downloaded at 15:02:33, Wednesday, October 9, 1996 <<

Previous Fail Event # 1 at:
 20:41:22, Friday, January 26, 1996

Fault = Red Fail Fault

Ch:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
				*												
	R	R	R	-	R	R	R	-	R	R	R	R	R	-	R	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	G	-	-	-	-	--	G	-	G

AC Line = 119 Vac
 Temperature = 80 degrees F
 Red Enable = Active
 MC Coil (EE) = Off
 Special Function #1 = Off
 Special Function #2 = off

2) AC Line (AC) Event Log

>> Monitor #175 AC Line Event Log <<
 >> Downloaded at 14:01:05 Monday, January 29, 1996 <<

AC Event #1 at:
14:41:33 Tuesday, January 02, 1996
Restore AC & WDT
AC Line Voltage = 119 Vac

AC Event #2 at: 14:41:25 Tuesday, January 02, 1996
Brownout AC & WDT
AC Line Voltage = 85 Vac

3) Manual Reset (MR) Event Log

>> Monitor #175 Monitor Reset Event Log <<
>> Downloaded at 13:00:20 Monday, January 29, 1996 <<

Monitor Reset Event #1 at:
21:50:08 Friday, January 26, 1996

4) Configuration (CF) Event Log

>> Monitor #73 Configuration Log <<
>> Downloaded at 13:30:20 Monday, January 29, 1996 <<

Configuration Change #1 at:
15:23:25 Friday, January 12, 1996

Permissive Programming:

Ch 1 with: 5 6 15

Ch 2 with: 5 6 13 15

Ch 3 with: 7 8 16

Ch 4 with: 7 8 14 16

Ch 9 with: No Channels

Yellow Disable Jumpers (X = Disable)

Ch:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SSM Switches (X = ON)

Ch	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	X	X	X	X	X	X	X	X								

BND Disable Switch = OFF
GY Enable Switch = ON
SF Polarity Switch = OFF
Watchdog Enable Switch = ON
Watchdog Fault Timing = 1.5 seconds
Sequence Yellow Timing = 2.7 seconds

678-2.7 INSTALLATION:

The Monitor Unit shall be a plug-in module for the Type 170/179 output file. When inserted into the output file without the Red Interface cable assembly, it will operate as a standard 210 Signal Monitor.

678-2.7.1 Adapting Red Monitoring:

A Red Interface Adapter PCB and an Interconnecting cable is used to adapt Red Signal Monitoring to the controller cabinet assembly. The interconnecting cable is terminated at each end with identically polarized 20 pin plugs. To connect the Monitor Unit with the adapter PCB, insert the Interconnecting cable plug into the Red Interface connector (P1) until the two ejector latches "snap" into place over the cable plugs.

There shall be a Warning Label placed on the front of the Monitor Unit stating the following message:

- WARNING -

THE P1 RED INTERFACE CABLE SHOULD ALWAYS BE UNPLUGGED BEFORE REMOVING THE UNIT FROM CABINET TO PREVENT POTENTIAL EXPOSURE TO ELECTRICAL SHOCK.

678-2.7.1.1 Red Field Inputs

The pins numbered 1,2,3,5,7, and 9 through 19 of the Red Interface connector P1 correspond to Red channel inputs on the Monitor Unit. **All unused Red channel inputs shall be terminated to AC+ through the Red Monitor Program Board which is located in the cabinet assembly.** Pin #20 of P1 is the Red Enable input and must be active to enable Red Failure Monitoring, GYR-Dual Indication Monitoring, and Sequence Monitoring. The Red Enable input is normally connected to the load switch AC+ buss in order to disable Red Failure Monitoring, GYR-Dual Indication Monitoring, and Sequence Monitoring when the intersection is in hardware flash.

678-2.7.1.2 Special Function Preemt Inputs (SF1,2):

The pins numbered 8 and 6 of Red Interface connector P1 are Special Function inputs #1 and #2 respectively. These inputs require an AC+ input to disable the Red Failure monitoring function during preemption. An active signal on either input will disable Red Failure monitoring. The RED FAIL indicator will then flash once every two seconds to indicate that Red Failure monitoring is disabled.

Option Switch #3 of SW-3 labeled "POLARITY" may be used to change the polarity of the Special Function inputs. When the switch is in the OFF position, the Special Function inputs will be active when AC+ is present. AC+ present on either input will disable Red Failure monitoring. An unused preemption input may be left OPEN (no connection) if the polarity switch is in the OFF position. When the switch is in the ON position, the Special Function inputs will be active when AC+ is NOT present. Lack of AC+ on either input will disable Red Failure monitoring. See the following table.

<u>Polarity</u>	<u>SF #1</u>	<u>SF #2</u>	<u>Red Failure Monitoring</u>
off	off	off	enabled
off	off	on	disabled - Preempt
off	on	off	disabled - Preempt
off	on	on	disabled - Preempt
on	off	off	disabled - Preempt
on	off	on	disabled - Preempt
on	on	off	disabled - Preempt
on	on	on	Preempt

678-2.7.2 SSM Switch Programming:

The SSM dipswitches are located near the program card edge connector. The switch positions are labeled CH1 to CH16 on the PCB legend screen, corresponding to channels 1 through 16, respectively. To enable GYR-Dual indication and Sequence Monitoring on a channel, place the corresponding channel dipswitch to the ON position. Disabling Yellow input sensing on the program card will also disable GY-Dual Indication, GYR-Dual Indication and Sequence Monitoring for that channel regardless of the dipswitch position for that channel. The corresponding channel SSM dip switch must be placed in the OFF position when an unused Red field output terminal on the adapter PCB is connected to AC +.

678-2.7.3 Program Card Programming

This card provides the means to assign conflicting channels and to disable sensing of Yellow input signals. The card is initially supplied with 120 diodes mounted on the card. This permits all channels to conflict with all other channels. To program a NON-CONFLICTING channel pair, the removal of the appropriate diode(s) from the program card. To DISABLE sensing of a Yellow signal on a channel, solder a wire jumper between the hole pairs labeled for that channel.

Example: If channel 2 Green or Yellow is permissive with channel 6 Green or Yellow, disconnect the diode labeled "2-6". To disable Yellow signal sensing on channel 9, a jumper wire must be soldered in between the pair of holes labeled "9" in the area designated "YELLOW DISABLE" on the program card.

If the Program Card is removed or not seated properly in the edge connector, the Monitor Unit shall enter the fault mode causing the Output relay contacts to close and enabling the Stop-Time output to the controller. The PCA indicator will illuminate to indicate this condition. A manual Reset is required after the Program Card is properly seated.

678-2.7.4 Option Switch Programming

The Monitor Unit shall provide a minimum of five (5) options to modify the monitor operation. The option switches are labeled SW-3 and are located near the WD ENABLE toggle switch.

678-2.7.4.1 BND Disable Switch

Switch #1 of SW-3 is labeled "BND DISABLE". When this switch is in the ON position, BND Error Detection is DISABLED. To assist in testing and calibration this switch can be used to disable the BND function. This is for test purposes only. For the broadest fault coverage the Monitor Unit shall not be operated with the BND function disabled.

678-2.7.4.2 GY Enable Switch

Switch #2 of SW-3 is labeled "GY ENABLE". When this switch is in the ON position, all channels will be monitored for a simultaneous active Green and Yellow input regardless of the Red Enable input. This function is used to provide Dual indication monitoring for channels which have the Red input tied to AC+, such as a five section head, or cabinet assemblies which are not adapted for Red Monitoring.

678-2.7.4.3 Polarity Switch

Switch #3 of SW-3 is labeled "POLARITY". When this switch is in the OFF position, the active state of the two Special Function inputs is when AC+ is present. When this switch is in the ON position, the active state of the two Special Function inputs are inverted (i.e. AC+ present is NOT active). See Figure 4-1 for Special Function operation.

678-2.7.4.4 Sequence Timing Switches

Switches #4,5,6 of SW-3 are labeled "YEL TIME 1", "YEL TIME 2", and "YEL TIME 3". These switches modify the minimum Yellow Clearance time used by the Sequence Monitoring function. Each binary weighted switch position adds 0.2 seconds to the minimum Yellow Clearance time. Figure 4-2 shows the possible programming positions.

<u>YEL TIME 1</u>	<u>YEL TIME 2</u>	<u>YEL TIME 3</u>	<u>Minimum Yellow Timing</u>
off	off	off	2.7 seconds
off	off	on	2.9 seconds
off	on	off	3.1 seconds
off	on	on	3.3 seconds
on	off	off	3.5 seconds
on	off	on	3.7 seconds
on	on	off	3.9 seconds
on	on	on	4.1 seconds

Figure 4-2

678-2.7.5 Watchdog Programming

678-2.7.5.1 Watchdog Enable Switch

The toggle switch SW-2 labeled "WD ENABLE" provides control for the Watchdog Monitoring function. When the switch is in the ON position, the Watchdog Monitoring function is enabled. When the switch is in the OFF position, the Watchdog Monitoring function is disabled. The WDT ERROR LED will flash once every two seconds to indicate that Watchdog Monitoring is disabled.

678-2.7.5.2 Watchdog Timing Option

The fault timing value for Watchdog Monitoring can be selected as 1.5 seconds or 1.0 second. This can be selected by the removal of a diode. When the diode is absent, the Watchdog timing value defaults to 1.5 seconds. When the diode is present, the Watchdog timing value is set to 1.0 second.

678-2.7.6 Internal MPU Watchdog Latch Option

The internal MPU Watchdog circuit can be configured as a latching function. To enable the latching function a soldered wire jumper shall be placed into the proper jumper holes.

678-2.8 FRONT PANEL DESCRIPTION

678-2.8.1 Indicators

(G) AC POWER Indicator

The AC POWER indicator shall illuminate when AC Line voltage level is above the brownout "restore" level. It shall flash at a rate of 2Hz when the AC Line voltage is below the "drop-out" level. The indicator shall extinguish when the AC Line voltage is no longer sufficient to provide the DC voltages necessary for proper monitor operation (approximately 60 Vrms)

If the unit is in the Diagnostic Display mode, the AC POWER indicator shall flash ON once per second to indicate the Channel Status display is showing Green channel status.

(Y) VDC FAILED Indicator

The VDC FAILED indicator shall illuminate when a 24VDC fault condition is detected. This indicator shall remain extinguished if the monitor has not been triggered by a 24VDC fault. If the unit is in the Diagnostic Display mode, the (Y) VDC FAILED indicator shall flash ON once per second to indicate the Channel Status display is showing Yellow channel status.

(R) WDT ERROR Indicator

The WDT ERROR indicator will illuminate when a controller Watchdog fault is detected. If the WD ENABLE switch on the monitor is placed in the OFF position to disable Watchdog monitoring, or the AC Line voltage is below the Watchdog disable level, the WDT ERROR indicator shall flash ON once every 2 seconds. If the unit is in the Diagnostic Display mode, the (R) WDT ERROR indicator shall flash ON once per second to indicate the Channel Status display is showing Red channel status.

CONFLICT Indicator

The CONFLICT indicator will illuminate when a conflicting proceed signal fault is detected.

RED FAIL Indicator

The RED FAIL indicator shall illuminate when an absence of signal is detected on a channel(s). If the Red Enable input is not active, or a Special Function input is active, or the EE input (MC Coil) is active the RED FAIL indicator shall flash once every two seconds to indicate that Extended Monitoring functions are disabled.

DUAL IND Indicator

The DUAL IND indicator will illuminate when a GY-Dual or GYR-Dual Indication fault is detected on a channel(s).

SEQUENCE Indicator

The SEQUENCE indicator will illuminate when the minimum Yellow Clearance time has not been met on a channel(s) .

CHANNEL STATUS Indicators

During normal operation the Channel Status indicators will display all active proceed signals (Green or Yellow).

In the fault mode the Channel Status indicators shall display all proceed signals active at the time of a conflicting signal fault (CONFLICT), 24VDC fault (VDC FAILED), or Watchdog fault (WDT ERROR). In the event of a Red Failure, Dual Indication, Sequence, or BND fault only the channels on which the fault occurred will be displayed.

BND Indicator

The BND indicator shall illuminate when a BND ERROR fault is detected on a channel(s).

PCA Indicator

The PCA indicator will illuminate if the Program Card is absent or not properly seated. A manual Reset is required after the program card is properly seated. If the unit is in the Diagnostic Display mode, the PCA indicator will flash ON (once, twice, or three times) to indicate the fault event number being displayed.

DIAGNOSTIC Indicator

The DIAGNOSTIC indicator shall illuminate when one of the following faults are detected Internal Watchdog fault, Memory Test fault, or Internal power supply fault. This indicator is intended to inform the service technician of a monitor hardware or firmware failure. Due to the nature of these hardware or firmware failures, other fault indicators that may be concurrently illuminated may not be valid for trouble shooting purposes. The DIAGNOSTIC indicator shall also illuminate when the front panel Reset button is activated.

678-2.8.2 Front Panel Controls

RESET Button

Depressing the Reset button shall reset the Monitor Unit after it has been triggered by a fault. The monitor shall remain in the reset mode only if the fault condition has been restored to normal. In the event of a monitor hardware or firmware fault (DIAGNOSTIC) the Reset button may not reset the monitor. A power-up restart may be required.

The Reset button also provides control of the Diagnostic Display mode.

678-2.8.3 Red Interface Connector (P1)

This connector provides the required inputs for the Monitor Unit to monitor the Red Field Signal outputs. It is polarized to insure proper mating with the adapter cable. Ejector latches are included to facilitate removal and prevents the cable from inadvertently disconnecting. The Monitor Unit shall function as a standard 210 Signal Monitor when the cable is disconnected,

678-2.9 Specifications

678-2-9.1 Electrical

678-2-9.1.1 Power Requirements:

Operating Line Voltage	75 to 135 Vrms
Operating Line Frequency	60 ± 3 Hz
Power Consumption	5 W (nominal)

678-2-9.1.2 AC Voltage Monitors:

Green Signal Inputs	(no detect)	less than 15 Vrms*
	(detect)	greater than 25 Vrms*
Yellow signal Inputs	(no detect)	less than 15 Vrms*
	(detect)	greater than 25 Vrms*
Red Signal Inputs	(no detect)	less than 50 Vrms
	(detect)	greater than 70 Vrms
Red Enable Input	(no detect)	less than 50 Vrms
	(detect)	greater than 70 Vrms
Special Function Inputs	(no detect)	less than 50 Vrms
	(detect)	greater than 70 Vrms
Watchdog Enable	(enable)	greater than 103 ± 2 Vrms
	(disable)	less than 98 ± 2 Vrms
AC Line Brown-out	(dropout)	92 ± 2 Vrms
AC Line Brown-out	(restore)	98 ± 2 Vrms

678-2-9.1.3 DC Voltage Monitors:

+ 24VDC Input	(fault)	less than + 18 Vdc
	(no fault)	greater than + 18 Vdc
External Reset Input	(TRUE)	less than 3.5 Vdc
	(FALSE)	greater than 8.5 Vdc
Watchdog Input	(TRUE)	less than 3.5 Vdc
	(FALSE)	greater than 8.5 Vdc

* Positive or negative half wave input

678-2-9.2 Timing Functions:

Conflict	(no fault) (fault) (typical)	less than 200 milliseconds greater than 500 milliseconds 350 milliseconds
VDC failed	(no fault) (fault) (typical)	less than 200 milliseconds greater than 500 milliseconds 400 milliseconds
Watchdog	(no fault) (fault) (typical)	less than 900 milliseconds greater than 1600 milliseconds 1000 to 150 milliseconds
Dual Indication	(no fault) (fault) (typical)	less than 200 milliseconds greater than 500 milliseconds 400 milliseconds
Sequence	(no fault) (minimum)	greater than 2.8 seconds less than 2.6 seconds
Brown-out	(drop-out)	83 ± 17 milliseconds
Brown-out	(restore)	83 ± 17 milliseconds
Minimum flash after drop-out		4.25 seconds
Watchdog	(disable)	83 ± 17 milliseconds
Watchdog	(enable)	83 ± 17 milliseconds

678-2-9.3 Mechanical:

Height	9.3 inches
Width	1.38 inches
Depth	10.17 inches

678-2-9.4 Environmental:

Storage Temperature Range	-55 to + 90 °C
Operating Temperature Range	-37 to + 74 °C
Humidity Range	0 to 95 % Relative

678-2.10 Wiring Assignments:

678-2.10.1 Monitor Unit Connector (P3)

<u>Pin</u>	<u>Function</u>	<u>Pin</u>	<u>Function</u>
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Not Assigned
14	Not Assigned	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Not Assigned
17	Not Assigned	U	Channel 10 Yellow
===		===	
18	Channel 12 Yellow	V	Channel 12 Green
19	Not Assigned	W	Not Assigned
20	Chassis Ground	X	Not Assigned
21	AC -	Y	DC Ground
22	Watchdog Timer	Z	External Reset
23	+ 24 Volts DC	AA	+ 24 Volts DC
24	[Pins 24 and 25]	BB	Stop Time
25	[Are Tied Together]	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Not Assigned	EE	Output SW. Side #2 (MC Coil)
28	Output SW. Side #1	FF	AC Line

NOTE: Pins 23 and AA are shorted together. Maximum current rating is 500 milliamps. Pins 24 and 25 are shorted together. The monitor circuit and the Program card shall mate with a 28/56 pin double sided edge card connector having .156 inch centers.

(=== Position for key slot)

678-2.10.2 Program Card Connector (P3)

<u>Pin</u>	<u>Function (Component Side)</u>	<u>Pin</u>	<u>Function (Circuit Side)</u>
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	DC Ground	T	Conflict
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
===		===	
25	N.C.	CC	N.C.
26	N.C.	DD	N.C.
27	N.C.	EE	N.C.
28	Yellow Inhibit Common	FF	N.C.

=== Mating connector shall be keyed between pins 24 and 25 and also BB and CC.

The Monitor circuit and the Program Card shall mate with a 28/56 pin double sided edge card connector having 0.156 inch centers.

678-2.10.2 Program Card Connector (P3)

<u>Pin</u>	<u>Function (Component Side)</u>	<u>Pin</u>	<u>Function (Circuit Side)</u>
1	Channel 15 Red	11	Channel 9 Red
2	Channel 16 Red	12	Channel 8 Red
3	Channel 14 Red	13	Channel 7 Red
4	Chassis Ground (See Note)	14	Channel 6 Red
5	Channel 13 Red	15	Channel 5 Red
6	Special Function # 2	16	Channel 4 Red
7	Channel 12 Red	17	Channel 3 Red
8	Special Function # 1	18	Channel 2 Red
9	Channel 10 Red	19	Channel 1 Red
10	Channel 11 Red	20	Red Enable

NOTE: Pin # 4 may be used to connect the monitor chassis to the cabinet Earth Ground. To complete this connection, a soldered wire jumper may be required to be placed in a designated area of the monitor. Monitor Chassis Ground is also connected through the edge connector P2. The additional connection through the Red Interface Cable can provide the Chassis Ground connection to the monitor if the unit is removed from the cabinet with the Red Interface Cable attached. The cabinet assembly must also be wired to connect the other end of the Red Interface Cable to Earth Ground.

678-2.10.3 RS-232 Connector (J1)

<u>Pin</u>	<u>Function</u>	<u>I/O</u>
1	N.C.	
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Signal Ground	
6	N.C.	
7	N.C.	
8	N.C.	
9	N.C.	

The Data Terminal Ready (DTR) input must be in the high state (>4 Vdc) for the monitor RS-232 port to be active.

678-2.10.4 RS-232 Cables

There shall be a Monitor to PC and a Monitor to 170 Controller Unit cable(s) supplied for each five (5) conflict monitor units furnished.

CHANNEL	FUNCTION	SWPK#	OUTPUT FILE TERM. #
1	RED	1	FT3-125
	YELLOW	1	FT3-126
	GREEN	1	FT3-127
2	RED	2	FT3-128
	YELLOW	2	FT3-129
	GREEN	2	FT3-130
3	RED	3	FT2-116
	YELLOW	3	FT1-117
	GREEN	3	FT2-118
4	RED	4	FT1-101
	YELLOW	4	FT1-102
	GREEN	4	FT1-103
5	RED	5	FT3-131
	YELLOW	5	FT3-132
	GREEN	5	FT3-133
6	RED	6	FT3-134
	YELLOW	6	FT3-135
	GREEN	6	FT3-136
7	RED	7	FT2-122
	YELLOW	7	FT2-123
	GREEN	7	FT1-124
8	RED	8	FT1-107
	YELLOW	8	FT1-108
	GREEN	8	FT1-109
9	RED	9	FT6-A121
	YELLOW	9	FT6-A122
	GREEN	9	FT6-A123
10	RED	10	FT6-A124
	YELLOW	10	FT6-A125
	GREEN	10	FT6-A126
11	RED	12	FT5-A114
	YELLOW	12	FT5-A115
	GREEN	12	FT5-A116

Figure 678-1: MODEL D210 CONFLICT-VOLTAGE MONITOR WIRING CHART

CHANNEL	FUNCTION	SWPK#	OUTPUT FILE TERM. #
12	RED	14	FT4-101
	YELLOW	14	FT4-102
	GREEN	14	FT4-103
13	RED (DON'T WALK)	2P	SEE NOTE #2
	YELLOW	2P	T & B
	GREEN (WALK)	2P	FT2-115
14	RED (DON'T WALK)	4P	SEE NOTE #2
	YELLOW	4P	T & B
	GREEN (WALK)	4P	FT1-106
15	RED (DON'T WALK)	6P	SEE NOTE #2
	YELLOW	6P	T & B
	GREEN (WALK)	6P	FT2-121
16	RED (DON'T WALK)	8P	SEE NOTE #2
	YELLOW	8P	T & B
	GREEN (WALK)	8P	FT1-112

- NOTE:
- 1) T & B - Conductors connected to pin, two (2) feet in length with ring lug on unconnected end, tied and bundled separately, mark with Pin # & Function.
 - 2) For Red Monitor Hookup See Figure 678-4 "Red Monitor Program Board."
 - 3) Output File #2, SWPK #9,10,12, and 14 shall be wired for the DC 660A Cabinet. Otherwise T&B

**Figure 678-1: MODEL D210 CONFLICT-VOLTAGE MONITOR WIRING CHART
(Continued)**

PIN	FUNCTION	OUTPUT FILE TERM. #
1	CHANNEL 2 GREEN	FT3-130
2	CHANNEL 13 GREEN	FT2-115
3	CHANNEL 6 YELLOW	FT2-135
4	CHANNEL 4 GREEN	FT1-103
5	CHANNEL 14 GREEN	FT1-106
6	CHANNEL 8 YELLOW	FT1-108
7	CHANNEL 5 GREEN	FT3-133
8	CHANNEL 13 YELLOW	T & B
9	CHANNEL 1 YELLOW	FT3-126
10	CHANNEL 7 GREEN	FT2-124
11	CHANNEL 14 YELLOW	T & B
12	CHANNEL 3 YELLOW	FT2-117
13	CHANNEL 9 GREEN	FT6-A123 (OL1 GREEN)
14	NOT ASSIGNED	----
15	CHANNEL 11 YELLOW	FT5-A115 (OL3 YELLOW)
16	CHANNEL 9 YELLOW	FT6-A122 (OL1 YELLOW)
17	NOT ASSIGNED	----
--	KEY SLOT	----
18	CHANNEL 12 YELLOW	FT4-A102 (OL4 YELLOW)
19	NOT ASSIGNED	----
20	CHASSIS GROUND	01-9
21	AC NEUTRAL	01-10
22 *	WATCHDOG TIMER INPUT	C4-37
23	24 VDC INPUT	02-1
24	CONNECTED TO 25	----
25	CONNECTED TO 24	----
26	NOT ASSIGNED	----
27	NOT ASSIGNED	----
28	OUTPUT SW SIDE 1	AC+

* Indicates active level is a low voltage

Figure 678-2: MODEL D210 CONFLICT-VOLTAGE MONITOR CONNECTOR PIN LIST

<u>PIN</u>	<u>FUNCTION</u>	<u>OUTPUT FILE TERM. #</u>
A	CHANNEL 2 YELLOW	FT3-129
B	CHANNEL 6 GREEN	FT3-136
C	CHANNEL 15 GREEN	FT2-121
D	CHANNEL 4 YELLOW	FT1-102
E	CHANNEL 8 GREEN	FT1-109
F	CHANNEL 16 GREEN	FT1-112
G	CHANNEL 5 YELLOW	FT3-132
H	CHANNEL 1 GREEN	FT3-127
K	CHANNEL 15 YELLOW	T & B
L	CHANNEL 7 YELLOW	FT2-123
M	CHANNEL 3 GREEN	FT2-118
N	CHANNEL 16 YELLOW	T & B
P	NOT ASSIGNED	----
R	CHANNEL 10 GREEN	FT6-A126 (OL2 GREEN)
S	CHANNEL 11 GREEN	FT5-A116 (OL3 GREEN)
T	NOT ASSIGNED	----
U	CHANNEL 10 YELLOW	FT6-A125 (OL2 YELLOW)
-	KEY SLOT	----
V	CHANNEL 12 GREEN	FT4-A103 (OL4 GREEN)
W	NOT ASSIGNED	----
X	NOT ASSIGNED	----
Y	DC GROUND INPUT	O2-2
Z	* EXTERNAL RESET INPUT	O2-5
AA	24 VDC INPUT	O2-1
BB	* STOP TIMING OUT	O2-3
CC	NOT ASSIGNED	----
DD	NOT ASSIGNED	----
EE	OUTPUT SW SIDE 2	O1-12
FF	AC+ INPUT	O1-11

* Indicated active level is a low voltage

**Figure 678-2: MODEL D210 CONFLICT-VOLTAGE MONITOR CONNECTOR PIN LIST
(Continued)**

<u>PIN</u>	<u>FUNCTION</u>	<u>RED MONITOR PROGRAM BOARD INPUT (RMC)</u>	
1	CHANNEL 15 RED	1	
2	CHANNEL 16 RED	2	
3	CHANNEL 14 RED	3	
4	SPARE	4	
5	CHANNEL 13 RED	5	
6	SPARE	6	
7	CHANNEL 12 RED	7	(OL4)
8	RRPE INPUT	8	
9	CHANNEL 10 RED	9	(OL2)
10	CHANNEL 11 RED	10	(OL3)
11	CHANNEL 9 RED	11	(OL1)
12	CHANNEL 8 RED	12	
13	CHANNEL 7 RED	13	
14	CHANNEL 6 RED	14	
15	CHANNEL 5 RED	15	
16	CHANNEL 4 RED	16	
17	CHANNEL 3 RED	17	
18	CHANNEL 2 RED	18	
19	CHANNEL 1 RED	19	
20	"RED ENABLE" INPUT	20	

Figure 678-3: MODEL D210 CONFLICT-VOLTAGE MONITOR RED INPUT CONNECTOR PIN ASSIGNMENTS

RMCH1 - RMCH16 = RED MONITOR CHANNEL 1-16

SHUNT POSITIONING:

A PROGRAM R/M TO SWITCH PACK (A)

B PROGRAM R/M TO AC+ NO INPUT (B)

RMC - D210 RED MONITOR CONNECTOR

<u>P1</u>	<u>FIELD TERM</u>	<u>FUNCTION</u>	<u>210 RMC</u>	<u>D210 CHAN</u>
1	125	1R	(19)	1
2	126	2R	(18)	2
3	116	3R	(17)	3
4	101	4R	(16)	4
5	131	5R	(15)	5
6	134	6R	(14)	6
7	122	7R	(13)	7
8	107	8R	(12)	8
9	121	OL1R	(11)	9
10	124	OL2R	(9)	10
11	114	OL3R	(10)	11
12	101	OL4R	(7)	12
13	AC+	AC+ TO DISABLE--	--	--
14	AC+	RED MONITORING--	--	--

<u>P2</u>	<u>FIELD TERM</u>	<u>FUNCTION</u>	<u>D210 RMC</u>	<u>D210 CHAN</u>
1	T&B	013R	(5)	13
2	T&B	014R	(3)	14
3	T&B	015R	(1)	15
4	T&B	016R	(2)	16
5	T&B	RE Relay Com.	--	--
6	T&B	RM Relay N.C.	--	--

Figure 678-4: MODEL D210 RED MONITOR PROGRAM BOARD

<u>P3</u>	<u>FUNCTION</u>	<u>DESTINATION</u>
1	"RM" Relay Coil (+24VDC)	02-1 (Output File #1)
2	"RM" Relay Coil	TB8-19 (Interface Panel)

<u>P4</u>	<u>FUNCTION</u>	<u>DESTINATION</u>
1	Spare Input (RR-PE)	T&B
2	Spare Input	T&B
3	Spare Input	T&B

- Note: (1) T&B - Conductors connected to pin, two (2) feet in length with ring lug on unconnected end, tied and bundled separately, mark with pin # and function.
- (2) The "Red Monitor Program Board" shall use Shunt Jumpers to enable and disable each Monitor Channel Red Input. The Program Board shall be designed so that installing a jumper in position "A" will program the Red Monitor Channel to the load switch output and installing a jumper in position "B" will disable the Red Monitor Channel. Small terminal blocks with wire jumpers shall not be used.
- (3) Overlaps installed only for DC-660A Cabinets - Other T&B conductors.

**Figure 678-4: MODEL D210 RED MONITOR PROGRAM BOARD
(Continued)**