McCain
A SWARCO Company

Omni eX®

Intersection Controller Software Manual

Software Version 3.3.0
Manual Version 1.1

VERSIONS

Rev	By	Date	Comments
A	D. Maas	04/17/2020	initial software release 2.00.00.0005
A.1	E. Itzel	04/17/2020	Additions and edits
B	E.Itzel	05/12/2020	Added additional Omni 2.0 references in Section1
C	E.Itzel	07/10/2020	Updating Omni installation guide for version 2.0.1.x
D			
E			
F	E.Itzel/J.Litvak	10/15/2020	Moved to Madcap Flare, created HTML
1.0	J Litvak	04/16/2021	Updated for Release 3.3.0. Added Note to Input Type in Table 4.38. Included Actuated Coordination chapter and Phase Reservice chapter into Chapter 5: Coordination.
1.1	M Zinn	05/5/21	Add place holders for VC, remote front panel, Add Note about Logic Input Pulsing Type.
1.1	M Zinn	06/22/21	Added images for Capture, Foothills Protocol, OMNI VERSION
1.1	J. Litvak	07/12/21	Added quick start guide

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1. Introduction

1.1 Overview

McCain's Omni eX® Intersection Control Software is an advanced, NTCIP-compliant program that is compatible with any ATC standard traffic Controller. Capable of operating on Model 2070 and NEMA based Controller platforms and interfacing with any style cabinet deployed in North America – Caltrans, NEMA TS2 Type 1 and Type 2, ITS and ATC cabinets – the revolutionary Omni eX intersection control software provides a single solution for any infrastructure.

This solution easily integrates with McCain's central software, Transparity® TMS, or any other NTCIP-compliant central system.

1.2 Benefits

- NTCIP compliant intersection control software promotes interoperability and interchangeability between manufacturers, providing users with a choice of vendors and protecting their investments.
- Compatible with any ATC standard Controller; vendor independent.
- Assignable inputs and outputs (I/O) to accommodate any type of standard or custom cabinet.
- User configuration is settable via the front-panel LCD and keypad interfaces, or with NTCIP via serial or Ethernet ports, or by transfer to USB drives. Built-in data validation ensures accuracy and consistency of user entered con-figuration data.
- Powerful data collection features, including measures of effectiveness (MOE) and detector data logging, with results storable locally via USB or to a central management system.

1.3 Features

1.3.1 Phases

- 16 volume/density vehicle phases
- 16 pedestrian phases
- 4 rings with flexible phase assignments and sequences
- 32 Channel supported, as with ATC and ITS cabinets
- Automatic barrier calculation based on compatible phases
- Exclusive pedestrian-phase operation
- Alternate timing for special vehicle or pedestrian operations

- Advance and delayed WALK operation
- 4 unique sets of phase timing and options, selectable by pattern

1.3.2 Coordination

- 250 patterns
- Single permissive mode
- Fixed or floating force off mode selection
- Reference cycle to beginning or end of main street green
- Phase sequence selection by pattern
- Recall selection by pattern
- Change phase, overlap, or detector options by pattern
- Texas Diamond support, 4-phase and 3-phase and separate modes

1.3.3 Inputs

- Alarm inputs (16)
- Special functions (16)

1.3.4 Outputs

- Alarm outputs (16)
- Special functions (16)

1.3.5 Field I/O

- All input and output functions are fully user assignable (I/O mapping)
- Flexible multi-input internal Boolean gates

1.3.6 Detection

- 128 local vehicle detectors
- 32 system detectors used as VOS detectors
- Phase assignments configurable per detector
- Detectors are assignable to multiple phases and/or overlaps
- Each detector supports all NTCIP detector options including count, call, and extension
- Delay and extend
- Volume/occupancy configurable per detector

- Detector failure monitoring (stuck on, stuck off, comm. fault and erratic calls) configurable by time-of-day (TOD)

1.3.7 **Communications**

- Fully NTCIP compliant communications, including all mandatory and optional objects
- Data validation during download process
- USB for quick database save/load, software update, log retrieval
- All industry standard communication infrastructures supported
- Time synchronization via D module input, GPS WWV, GPS NMEA, NTCIP, or NTP
- Peer to Peer sharing of I/O between intersections
- Web browser support

1.3.8 **Preemption**

- 16 preemption sequences
- Each sequence can be configured for railroad or emergency vehicle
- Definable priority and linking
- Flash, limited service
- Configurable controls for all phases and overlaps at each preempt stage

1.3.9 **Overlaps**

- 16 vehicle overlaps
- 16 pedestrian overlaps
- Negative (excluded) vehicle and pedestrian phases
- Flashing yellow arrow (PPLT)
- Flashing red arrow
- May be actuated by detectors

1.3.10 **Time of Day Scheduler**

- 64 schedules
- 64 day-plans
- 48 day-plan events
- 128 actions

1.3.11 **Time of Day/Day of Week Functions**

- Red rest by phase
- Vehicle recall by phase, Minimum, maximum, and soft recall
- Detector plan
- Pedestrian recall by phase
- Rest in walk
- Alternate phase timings and options
- Alternate detector configuration and diagnostics
- Alternate overlap configuration
- Phase Omit
- Pedestrian Omit
- Phase sequence
- Conditional service
- Second phase maximum

1.3.12 **Logs**

- Extensive event log for management and diagnostic purposes
- Cycle-based measures of effectiveness (MOE) 1000 events
- Detector volume, occupancy, and speed (VOS) 1000 events
- Dual-detector speed traps for precise speed measurement, 1000 events
- Event Logging:
    - Controller log (300 events in each section):
    - Operation
    - Detector
    - Communication
    - Access
    - Command
    - Preempt
    - Transit priority
- NTCIP Global Reporting conformance group for user defined event logging
- High Resolution Logging

2. PRODUCT DESCRIPTION

2.1 ATC CONTROLLER HARDWARE

2.1.1 ATC 2070 Controller Front Panel

Figure 2-1: McCain ATC 2070 Controller Front Panel

Table 2-1: McCain ATC 2070 Controller Front Panel

Item	Description
1	LCD Display: The Model 2070 Controller is fitted with an 8 line by 40-character backlit LCD display. The LCD displays Controller status and settings.
2	Keypads: The Model 2070 Controller provides two keypads to enter data and navigate the menus when setting up the Controller. The first of the two keypads enter data and values into the Controller and provides keys labeled 0-9 and A-F. The second keypad navigates through the menus.
3	Active LED: The red Active LED on the front panel of the Controller acts as a heartbeat indicator and indicates that the Controller is running correctly. When the Controller is running normally, the LED flashes at a rate of once every second.
4	Contrast Dial: The Contrast dial adjusts the contrast of the LCD display, making it appear darker or lighter. Turning the dial clockwise causes the display to become lighter; turning the dial counterclockwise causes the display to become darker.
5	C50S Port: The C50S port is a serial port for connecting a computer directly to the Controller for setup, monitoring and data transfers. It also provides access to the Linux console. (SP4)

2.1.2 **2070 Controller Back Panel**

Figure 2-2: McCain ATC 2070 Controller Back Panel

Table 2-2: McCain ATC 2070 Controller Back Panel

Item	Description
1	Asynchronous Serial Communications Module 2070-7A: (Shown in slot A2, these slots, A1 and A2, are generic communication slots as other serial communication modules can go here.) This optional serial communications module provides two 9 pin D-sub- miniature asynchronous serial communications ports, each capable of communicating from 0-38.4 K baud and provided with optical isolation. These ports conform to EIA-232 specifications for direct connection, specifically intended for connecting to modems or toa computer. The protocol of these ports is software configurable. Slot A2 has SP1 and SP2 whereas slot A1 (at far-left position) has SP3 and SP4.
2	Field I/O Module 2070-2A or 2070-2E: The Field I/O Module provides a mechanism for input and output interfaces. The field I/O module translates the CPU inputs and outputs into parallel inputs and outputs to allow the 2070 to be compatible with a Type 332 cabinet using the C1S and C11S connectors. The C12S connector provides EIA-485 outputs for SP3 and SP5 to allow control of an ATC or ITS cabinet. Other FIO modules can be used here (2070-2B or 2070-2N) that do not have the C1 and C11 but support ITS/ATC cabinets.
3	CPU Module ATC2070: The CPU module hosts the main processor and memory, as well as the USB, Ethernet and Datakey interfaces. This is where the operating system and application programs reside. SP8 is available here.
4	Power Supply Module: The power supply module is to provide power for the electronics inside the Module 2070 Controller from a standard 120 Volt AC input.

2.1.3 **ATC eX NEMA TS 2 Type 1 Controller**

Figure 2-3: McCain ATC eX NEMA TS 2 TYPE 1 Controller

Table 2-3: McCain ATC eX NEMA TS 2 TYPE 1 Controller

This table pertains to graphics from Figure "McCain ATC eX NEMA TS 2 TYPE 1 Controller" above to Figure "McCain ATC FLeX Controller Back Panel " on page 27	
1	LCD Display: The NEMA TS 2 Type 2 Controller incorporates a 16 line by 40-character backlit LCD display. The LCD displays Controller status and settings.
2	Keypads: The Controller provides a keypad for entering data and navigating the menus when setting up the Controller.
3	Active LED: The Red Active LED on the front panel of the Controller acts as a heartbeat indicator. When the Controller is running normally, the LED flashes at a rate of once every second.
4	Contrast Dial: Turning the Contrast dial clockwise makes the LCD display appear lighter; turning the dial counterclockwise makes the display appear darker.
5	Fuse Holder: The fuse holder houses the AC mains power fuse.

6	Power Switch: The front-panel power switch turns Controller power on and off.
7	Port A2: Used for power and fault monitor connectors for TS 2 Type 1 applications. It is not for TS 2 Type 2 applications.
8	SDLC Port (SP-3): The Controller provides a SDLC serial port for connecting to BIUs and the MMU in the cabinet. This port is provided through15 pin "D" type connector. The pins defined as per the NEMA TS 2 Type 2 standard.
9	Port 2 (SP-4): Port 2 is a general-purpose port.
10	Serial Ports SP-5 and SP-8: General-purpose ports that are user configurable. • Both ports are for connecting a computer directly to the Controller for setup, monitoring and data transfers. • Both ports are for communications using the NTCIP and AB3418 protocols. They are configurable to handshake with a modem, interfacing to a GPS/WWV device to get the time of day or other functions.
11	USB Ports: Provided to load and save databases to and from the Controller with a USB memory drive. This process is through the user interface at the Controller by scrolling to the appropriate menu.
12	Ethernet Ports: There are two general-purpose Ethernet interfaces available on the front panel of the Controller. • Port 1 is a 10/100 Base-T Ethernet switch with three RJ-45 jack connectors. • Port 2 is a 10/100 Base-T Ethernet port with one RJ-45 jack connector. • These two ports are independent, each having its own IP address. They can be used to separate Ethernet traffic within the cabinet into 2 independent networks. Potential applications include communications with a central system, other in-cabinet equipment, or a technician device such asa laptop. Each jack has two LED indicators to show the LINK ACT and 10- 100 TX status.

13	I/O Connectors "A," "B", "C" and "D": There are four Input / Output Connectors provided at the bottom of the front panel of the NEMA TS 2 Type 2Controller only. The connectors are designated A - D, with "A" at the bottom left and "D" at the bottom right. • Connectors "A," "B" and "C" are standard defined NEMA TS 2 Type A2 I/O connectors. • Connector "D" is a manufacturer-defined I/O connector. McCain offers multiple types of D connectors for direct connection to legacy cabinets such as Traconex, Multisonics, LMD, Peek and Eagle. The default D connector is equivalent to the D connector of the 2070-8 module for Model 2070 Controllers (Caltrans compatible). See Table 1 for the pinout of the default D connector. • Connector options: Traconex: 63 pins, plastic screw connector (similar to LMD 9200, but with different I/O map) LMD 9200: 63 pins, plastic screw connector (similar to Traconex, but with different I/O map) Multisonics 820A: 61 pins, metal bayonet connector (also used on 2070-8) Eagle: DB-37 type, EPAC compatible
14	On the right is the communications slot that accepts a 2070-7A asynchronous serial board for SP-1 and SP-2. This optional serial communications module provides two 9 pin D-subminiature asynchronous serial communications ports, each capable of communicating from 0-38.4K baud and provided with optical isolation. These ports conform to EIA- 232 specifications for direct connection, specifically intended for connecting to modems or to a computer. The protocol of these ports is software configurable.
15	Ethernet Ports: There are two general-purpose Ethernet interfaces available on the front panel of the Controller. • Port 1 is a 10/100 Base-T Ethernet switch with two RJ-45 jack connectors. • Port 2 is a 10/100 Base-T Ethernet port with one RJ-45 jack connector. • These two ports are independent, each having its own IP address. They can be used to separate Ethernet traffic within the cabinet into 2 independent networks. Potential applications include communications with a central system, other in-cabinet equipment, or a technician device such as a laptop. Each jack has two LED indicators to show the LINK ACT and 10- 100 TX status.
16	Serial Ports SP-5 and SP-3: this connector provides EIA-485 outputs for SP3 and SP5 to allow control of an ATC or ITS cabinet.

17	Serial Port SP-8: General-purpose port that is user configurable. This port is for connecting a computer directly to the Controller for setup, monitoring or data transfers. The communications can use either the NTCIP or AB3418 protocols. It may be configured to handshake with a modem or interfacing to a GPS/WWV device to get the time of day or other functions.
18	Datakey Socket: Insert and twist a datakey to lock it for usage. For saving or loading databases.
19	SD Card Slot: Install the non-volatile memory card into this slot. This supports the original standard Secure Digital (SD) format. Once inserted the Controller will automatically use this as a backup device for log files.
20	Port SP-1: This asynchronous serial communications port using a 9 pin D-subminiature connector, can communicate from 0-38.4 K baud using optical isolation. This port conforms to EIA-232 specifications for direct connection, specifically intended for connecting to modems or to a computer. The protocol of this port is software configurable.
21	Port SP-2: This asynchronous serial communications port using a 9 pin D-subminiature connector, can communicate from 0-38.4 K baud using optical isolation. This port conforms to EIA-232 specifications for direct connection, specifically intended for connecting to modems or to a computer. The protocol of this port is software configurable.
22	Optional 2070 C1S connector for a 332 cabinet Auxiliary output file.
23	Optional 2070 C11 connector for a 332 cabinet Main input/output files.

2.1.4 **ATC eX NEMA TS 2 Type 2 Controller**

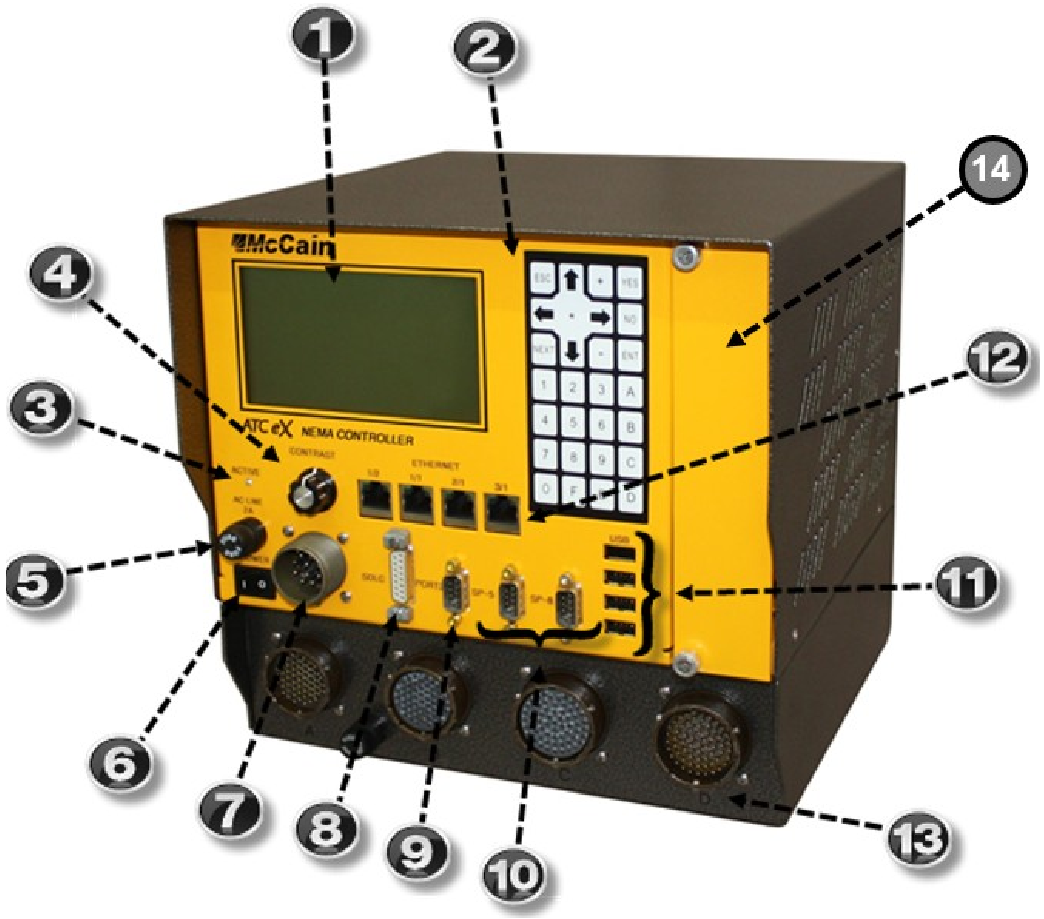


Figure 2-4: McCain ATC eX NEMA TS 2 Type 2 Controller

2.1.5 **ATC eX2 NEMA TS 2 Type 1**

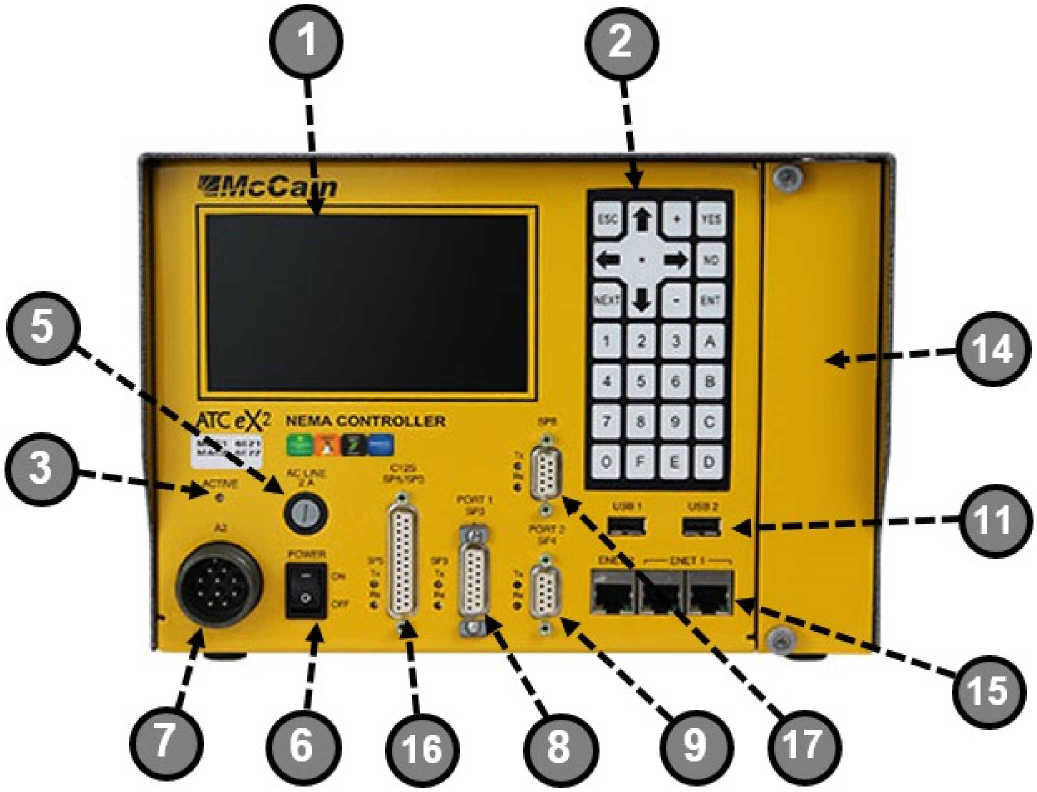


Figure 2-5: McCain ATC eX2 NEMA TS 2 TYPE 1 Controller

2.1.6 **ATC eX2 NEMA TS2 Type 2 Controller**

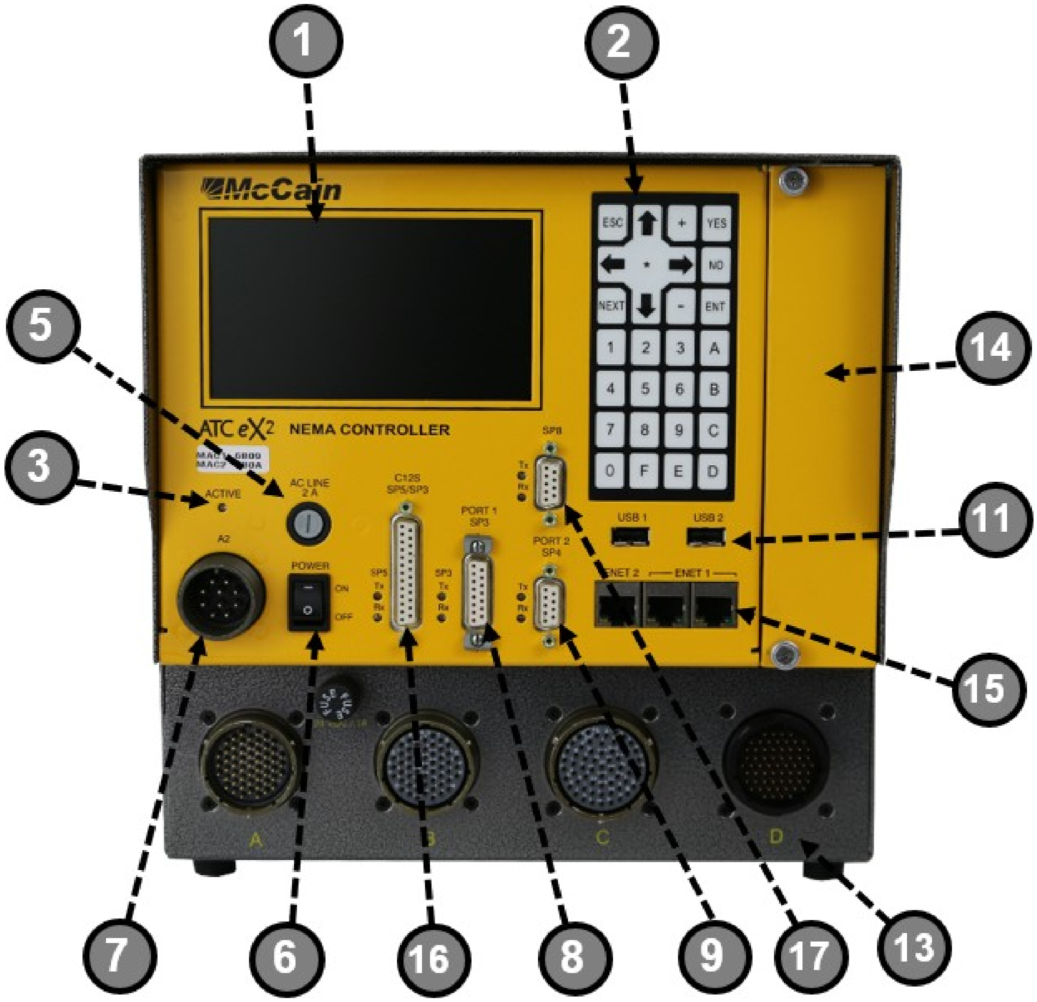


Figure 2-6: McCain ATC eX2 NEMA TS 2 TYPE 2 Controller

2.1.7 **ATC FleX Controller Front and Back Panel**

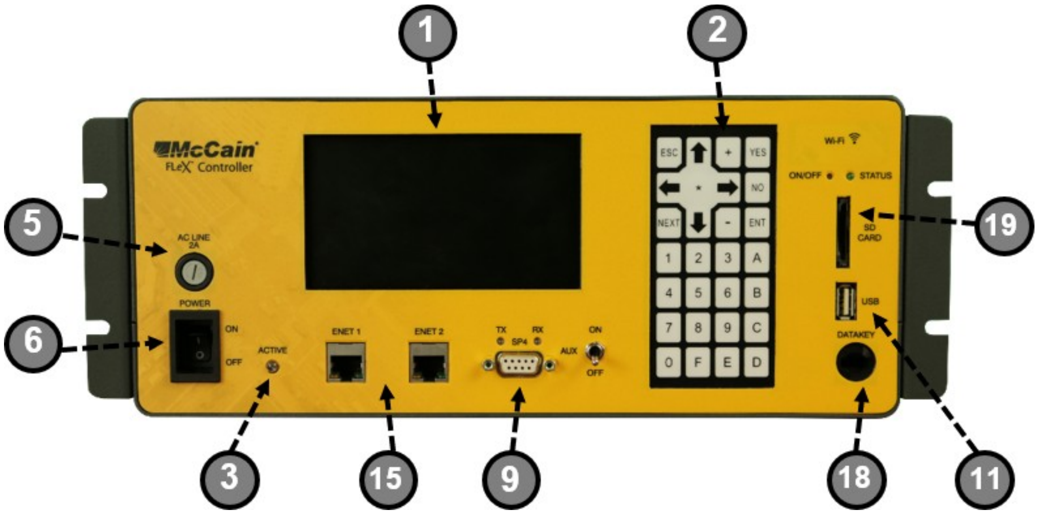


Figure 2-7: McCain ATC FLeX Controller Front Panel

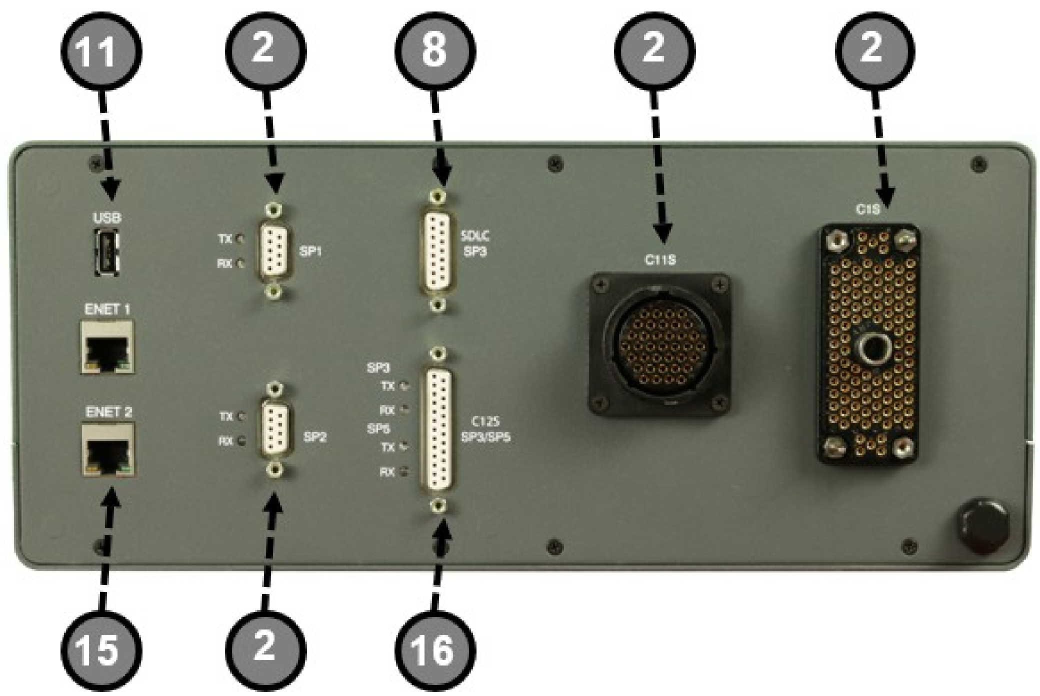


Figure 2-8: McCain ATC FLeX Controller Back Panel

2.1.8 **McCain 2070-1C CPU Module**

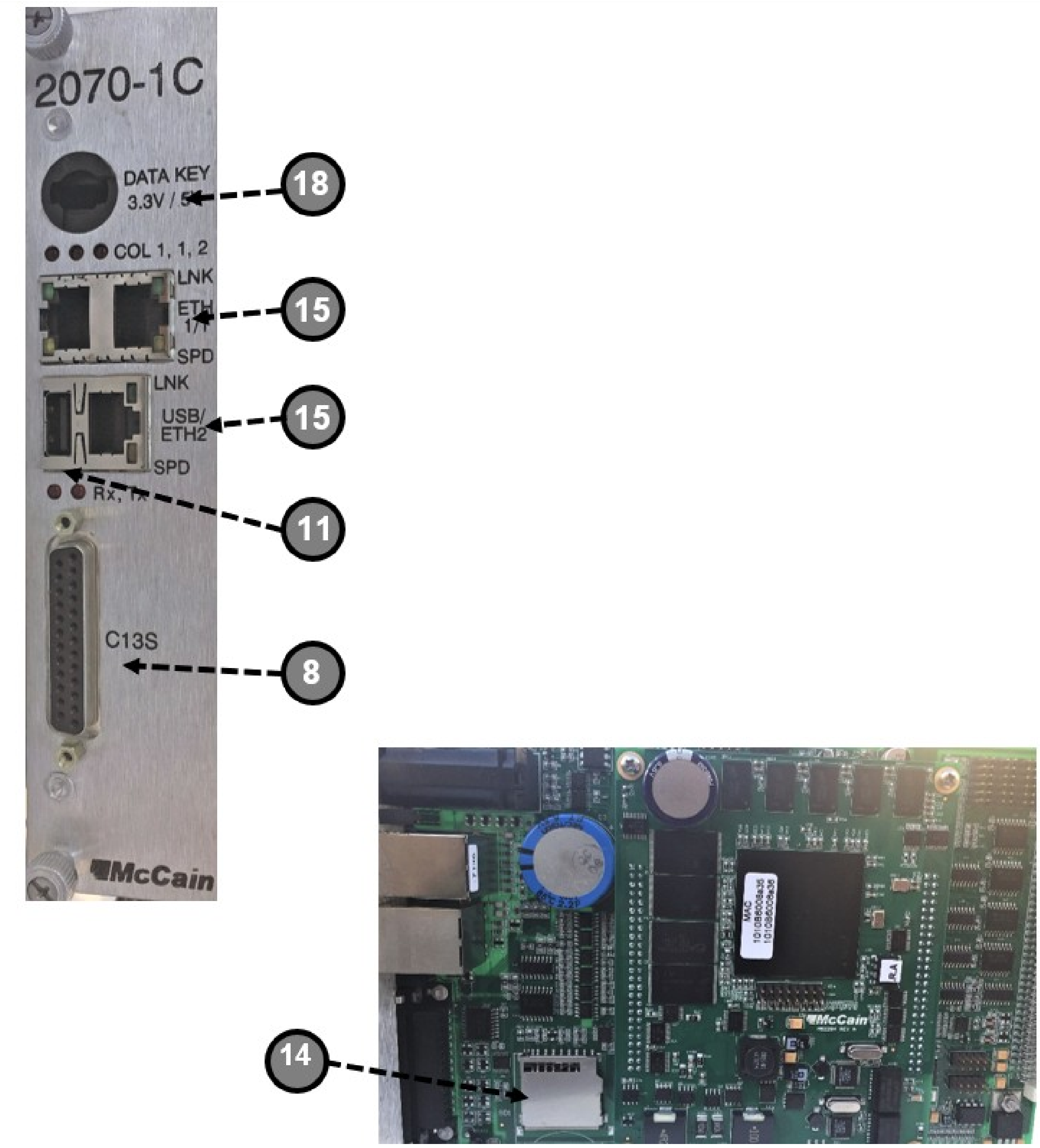


Figure 2-9: McCain ATC 2070-1C CPU Board

Table 2-4: I/O Connector "D" Pins for Caltrans 2070-8 interface

Pin	Function	I/O		Pin	Function	I/O
A	Detector 9	I		i	Door Ajar	I
B	Detector 10	I		j	Special Function 1	I
C	Detector 11	I		k	Special Function 2	I
D	Detector 12	I		m	Special Function 3	I
E	Detector13	I		n	Special Function 4	I

Pin	Function	I/O		Pin	Function	I/O
F	Detector 14	I		p	Special Function 5	I
G	Detector 15	I		q	Special Function 6	I
H	Detector 16	I		r	Special Function 7	I
J	Detector 17	I		s	Special Function 8	I
K	Detector 18	I		t	Preempt 1 In	I
L	Detector 19	I		u	Preempt 2 In	I
M	Detector 20	I		v	Preempt 3 In	I
N	Detector 21	I		w	Preempt 4 In	I
P	Detector 22	I		x	Preempt 5 In	I
R	Detector 23	I		y	Preempt 6 In	I
S	Detector 24	I		z	Alarm 1 Out	O
T	Clock Update	I		AA	Alarm 2 Out	O
U	Hardware Control	I		BB	Special Function 1 Out	O
V	Cycle Advance	I		CC	Special Function 2 Out	O
W	Max 3 Selection	I		DD	Special Function 3 Out	O
X	Max 4 Selection	I		EE	Special Function 4 Out	O
Y	Free	I		FF	Special Function 5 Out	O
Z	Not Assigned	I		GG	Special Function 6 Out	O
a	Not Assigned	I		HH	Special Function 7 Out	O
b	Alarm 1	I		JJ	Special Function 8 Out	O
c	Alarm 2	I		KK	Not Assigned	---
d	Alarm 3	I		LL	Detector Reset	o
e	Alarm 4	I		MM	Not Assigned	---
f	Alarm 5	I		NN	+24 VDC	---
g	Flash In	I		PP	2070N DC Gnd	---
h	Conflict Monitor Status	I				

2.2 KEYPADS AND DISPLAYS

The keypads on the McCain 2070 and ATC eX NEMA Controllers have 28 keys used for navigation and data entry.

The LCD display on McCain 2070 Controllers consists of 8 lines x 40 characters. The LCD display on McCain ATC eX NEMA Controllers consists of 16 lines x 40 characters.

2.2.1 **Keypads**

2070

ATC eX NEMA

Figure 2-10: McCain Traffic Controller Keypads

Table 2-5: Keypad Functions

Key	Function
1-9	Entry of numeric data. Toggles indices 1-9 (for example phase or overlap numbers 1-9).
0	Entry of numeric data. Toggles index 10 (for example phase or overlap number 10).
A-F	Entry of numeric data. Toggles indices 11-16 (for example phase or overlap numbers 11-16).
Arrow Keys	Navigation between fields and scrolling on pages larger than the LCD display 0F0F0F0F
ESC	Returns to the current menu's parent menu. 1F1F1F1F Aborts changes while editing a numeric field.
NXT/NEXT	Jumps to the next page on multi-page menus. Scroll down a page in help text. Next table entry for table data (like schedules, day plans, etc.) Used to set date fields to the currentdate.
ENT	Brings up the DB transaction finalization menu when a DB transaction is active. 2F2F2F2F Note that numeric field ranges validated automatically before the DB transaction finalization menu is displayed. Used to complete a DB transaction from the DB transaction finalization menu.
+	Toggles to next value in toggle type fields (wraps). Increments numeric field values (up tomax value, no wrap). Proceeds only if the current field value is within range. This functionality applies only to unsigned fields. Sets the sign to '+' for signed numeric fields.
-	Toggles to previous value in toggle type fields (wraps). Decrements numeric field values (down to min value, no wrap). Proceeds only if the current field value is within range. This functionality applies only to unsigned fields. Sets the sign to '-' for signed numeric fields.

YES	Sets all values to the max for grouped toggle-type field arrays. Answer YES for yes/no selections.
NO	Sets all values to the min for grouped toggle-type field arrays. Answer NO for yes/no selections. Clears the field for sequence-type fields. Sets value to the min for toggle-type fields. Sets character to the min value for text entry fields. Restores the original values of changedfields. 3F3F3F3F Aborts database transactions from the DB transaction finalization menu and discards the newly entered data.
*	Shows context-sensitive help text for each menu screen.

[1] When ‘U’, ‘D’, ‘L’ or ‘R’ is displayed in the top right corner of the menu screen scrolling using the arrow keys is possible. The directions are as follows: ‘U’ = up, ‘D’ = down, ‘L’ = left, ‘R’ = right.

[2] To switch between 2070 controller main status and main menu screens press the ESC or ENT keys

[3] There are a few exceptions to this rule:

- ENT is used to switch between the main status and main menu screens as mentioned in [2].
- Some menu screens require entering a value that serves as an index into another menu. For these menu screens the ENT key displays the next menu screen instead of bringing up the DB transaction finalization menu.

[4] Some fields that do not require consistency checks are not cached and therefore keep no original values – they are changed directly.

2.2.2 **Displays**

2.2.2.1 **Model 2070 Display**

The McCain 2070 Controller front-panel display is an 8-line by 40-column LCD.

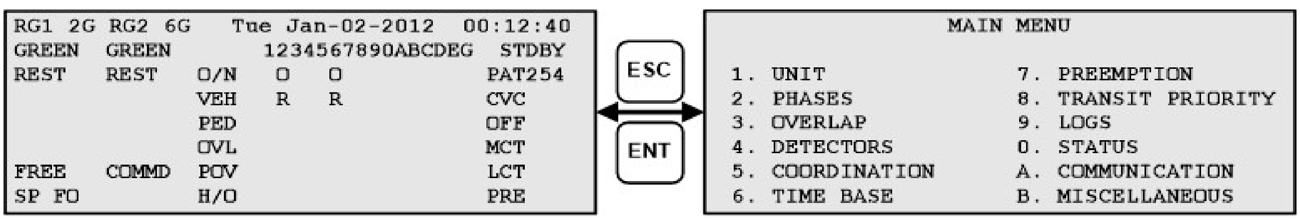


Figure 2-11: Model 2070 Display

The main status screen is the default display.

Press the ESC or ENT key to alternate between the status screen and the main menu.

All Controller menus are accessed from the main menu.

To display the main status screen from other menus, return to the main menu.

2.2.2.2 **NEMA TS 2 Display**

The McCain NEMA TS 2 Controller front-panel display is a 16-line by 40-column LCD.

```
RG1  2G  RG2  6G    Tue  Jan-02-2012   00:12:40
GREEN    GREEN          1234567890ABCDEG   STDBY
REST     REST     O/N   O    O             PAT254
                  VEH   R    R             CVC
                  PED                      OFF
                  OVL                      MCT
FREE     COMMD    POV                      LCT
SP FO             H/C                      PRE
                       MAIN MENU

 1.  UNIT                       7.  PREEMPTION
 2.  PHASES                     8.  TRANSIT PRIORITY
 3.  OVERLAP                    9.  LOGS
 4.  DETECTORS                  0.  STATUS
 5.  COORDINATION               A.  COMMUNICATION
 6.  TIME BASE                  B.  MISCELLANEOUS
```

Figure 2-12: NEMA TS 2 Display

The upper eight lines always show the main status display.

The lower eight lines always show the Controller menus.

2.2.2.3 **Web Browser Interface**

Omni has built-in support for a web browser to access the Controller software interface remotely and perform operator functions such as remote front panel access and database management. Accessing the Controller web interface is achieved by entering the IP Address of the Controller in the URL of the web browser and with a network connection between the PC and the Controller.

> **NOTE:** The following is a summary of the new Omni version 3 web user interface. For detailed descriptions of the functionality please refer to Section 7 in this manual.

The Omni version 3 web browser interface (web UI) utilizes the HTTPS protocol by default for secure communications. The webserver is also secured with a separate login credential that is not configured internally in the Omni database. Upon accessing the webserver, the user is required to log in.

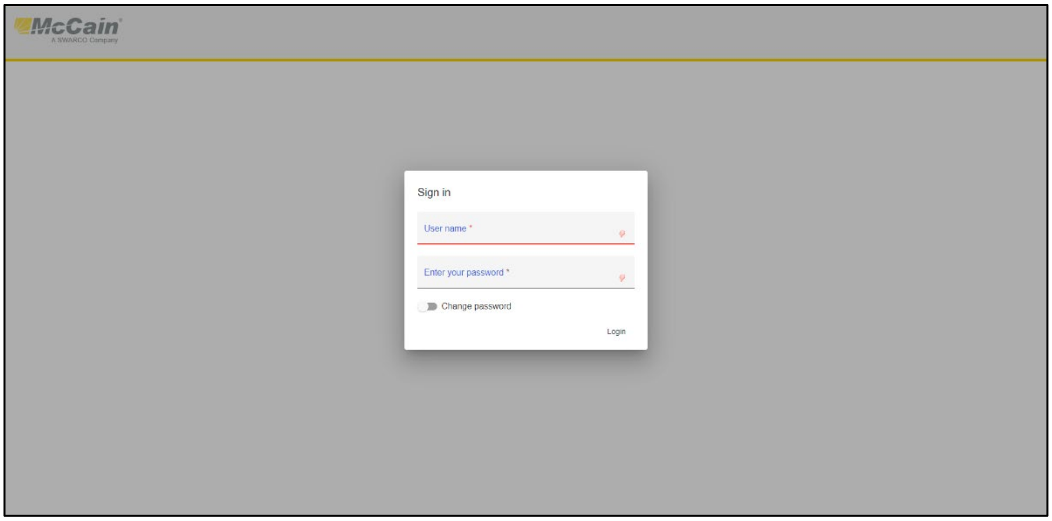


Figure 2-13: Web UI Login Screen

NOTE: The default login credentials for the Omni v3 webserver can be obtained by contacting McCain Support or the local McCain distributor.

After login is complete the Controller home page is displayed

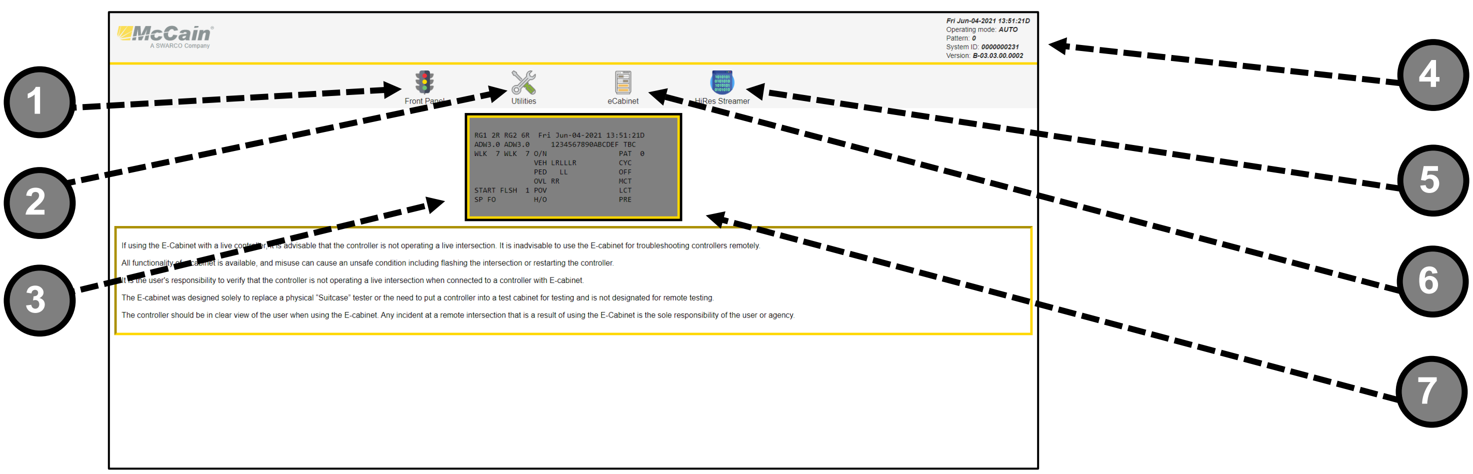


Figure 2-14: Controller Home Page

Table 2-6: Controller Home Page

Item	Description
1	Link to access the Controller remote front panel, allowing full access to the Controller front panel user interface.
2	Link to the database management page, allowing the user to remotely retrieve the Omni database from the Controller as an .MCB file or upload an Omni database to the Controller.

3	Front panel display showing the live status of the Omni front panel. This display is read only.
4	Basic Controller status display showing current date/time, operation mode, active pattern, Omni system ID and active Omni software version.
5	Link to HiRes Streamer allowing the live viewing of Controller high resolution data and exporting stored hi-res logs in .CSV file format for diagnostic purposes.
6	Link to eCabinet control panel to view all Controller inputs and control cabinet outputs.
7	The following disclaimer is included to promote safe operation of the Controller web user interface: Use of the E-Cabinet and/or Remote Front Panel with a live controller is prohibited when the controller is operating a live intersection. The E-Cabinet is not to be used for troubleshooting controllers remotely. All functionality of a cabinet is available, and misuse may cause an unsafe condition including flashing the intersection or restarting the controller. It is the user's responsibility to verify that the controller is not operating a live intersection when connected to a controller with E-Cabinet. The E-Cabinet was designed solely to replace a physical “Suitcase” tester or the need to put a controller into a test cabinet for testing and not for remote testing. The controller must be in clear view of the user when using the E-Cabinet. Any incident or accident at a remote intersection that is a result of using the E-Cabinet, Virtual Controller and/or Remote Front Panel is the sole responsibility and liability of the user or agency. User will use the E-Cabinet, Virtual Controller and/or Remote Front Panel strictly in accordance with any manuals and/or instructions provided by McCain. McCain shall not be responsible for any damages related to use of the E-Cabinet, Virtual Controller and/or Remote Front Panel other than strictly in accordance with McCain’s manuals and instructions. The Virtual Controller and/or Remote Front Panel are not designed for use with the E-Cabinet for the operation of live intersections. McCain expressly disclaims any express or implied warranty of fitness for such purpose. The E-Cabinet, Virtual Controller and Remote Front Panel are provided on an “as-is” and “where-is” basis and all representations and warranties, express or implied, relating to the E-Cabinet, Virtual Controller and Remote Front Panel are hereby expressly disclaimed and waived, including, without limitation, warranties as to merchantability, usefulness, title, non-infringement, and fitness for particular purpose. User assumes all risks related to or arising from use of the E-Cabinet, Virtual Controller and/or Remote Front Panel other than strictly in accordance with any manuals and/or instructions provided by McCain. McCain is not responsible and shall have no liability for any modifications the user makes to the E-Cabinet, Virtual Controller and/or Remote Front Panel or any use of the E-Cabinet, Virtual Controller and/or Remote Front Panel other than in strict accordance with any manuals and/or instructions provided by McCain.

3. USAGE

Omni eX intersection control software provides a menu-driven user interface to monitor and program the Controller. The following diagrams show the layout of the menu structure.

3.1 MENU STRUCTURE

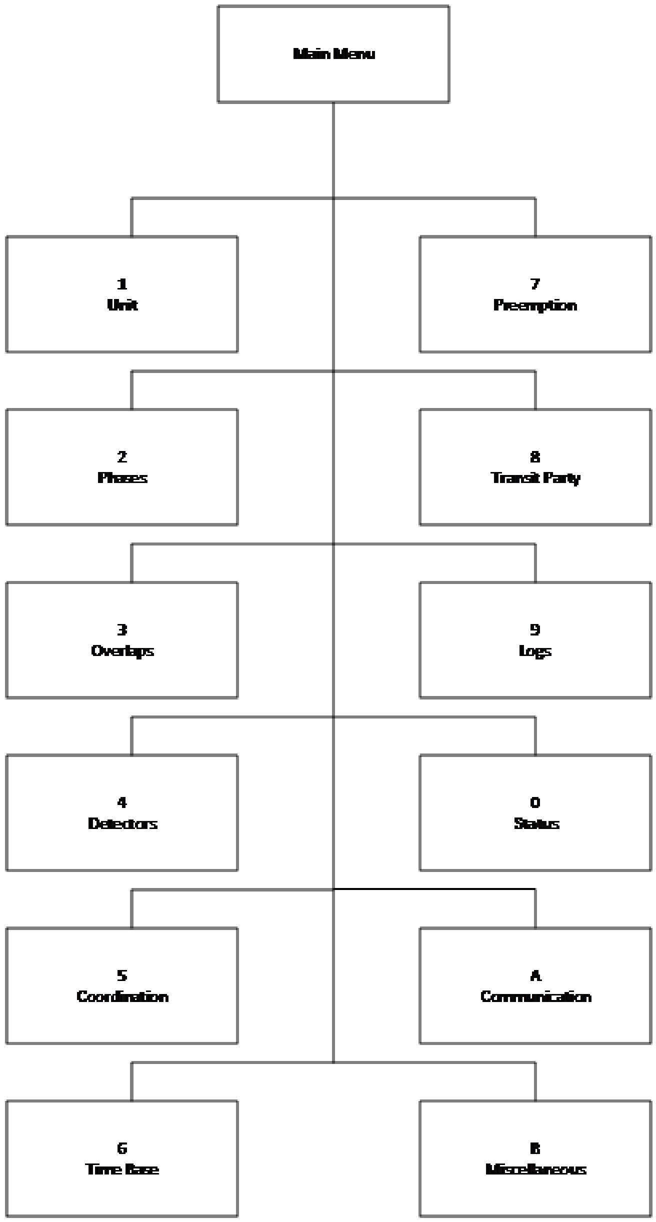


Figure 3-1: Main Menu

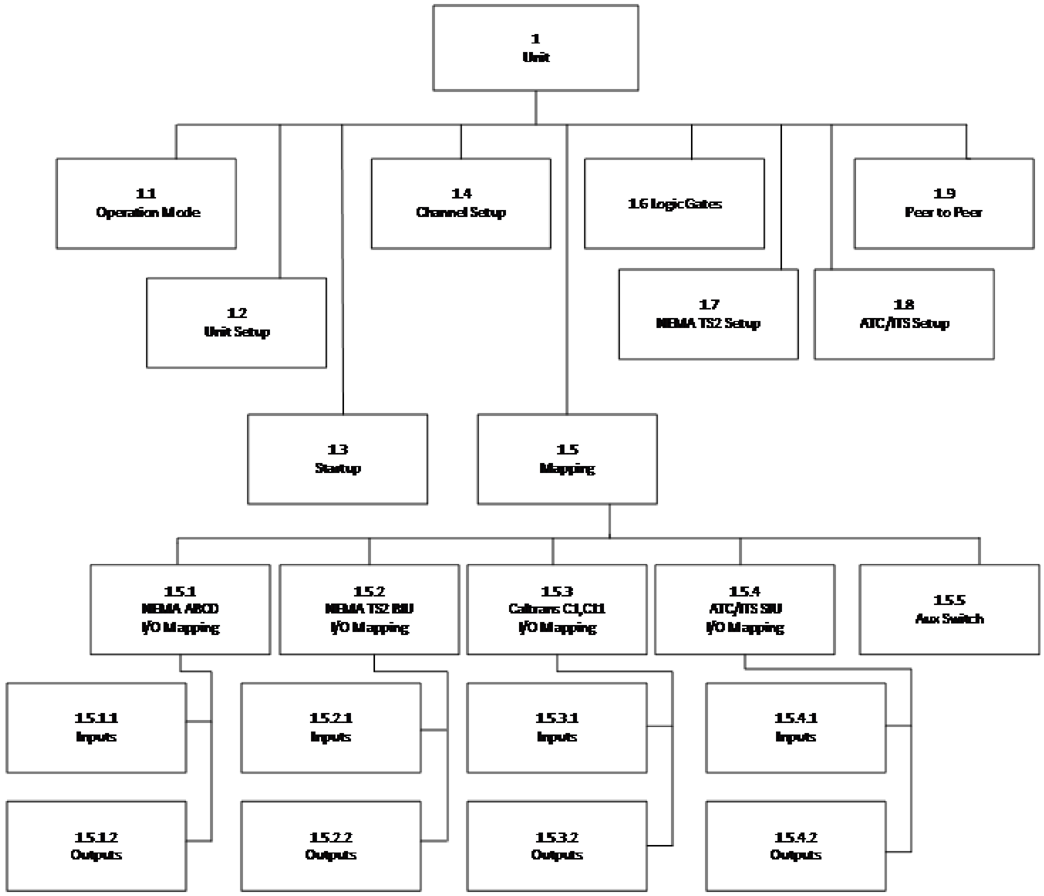


Figure 3-2: Unit Menu

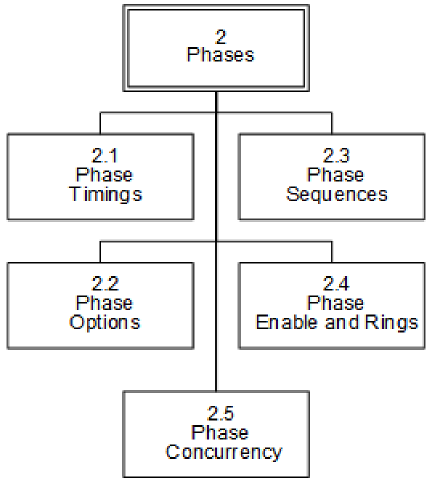


Figure 3-3: Phase Menu

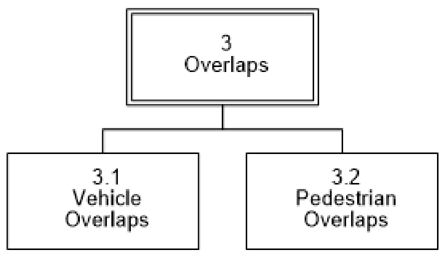


Figure 3-4:Overlaps Menu

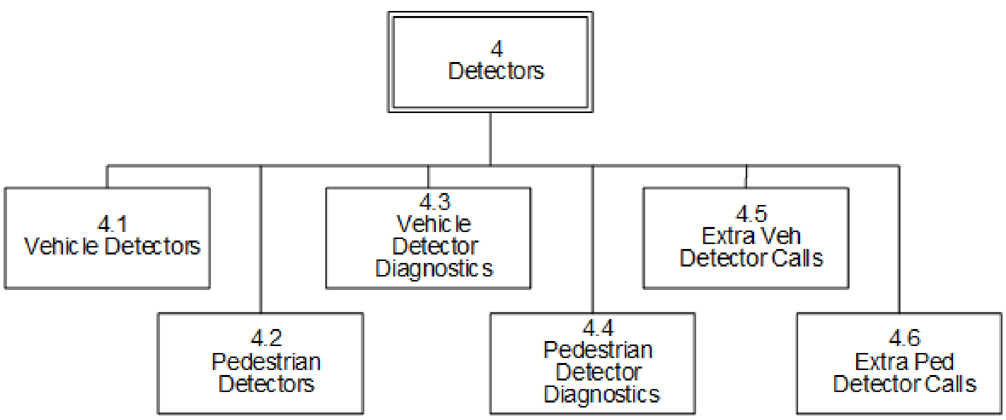


Figure 3-5: Detectors Menu

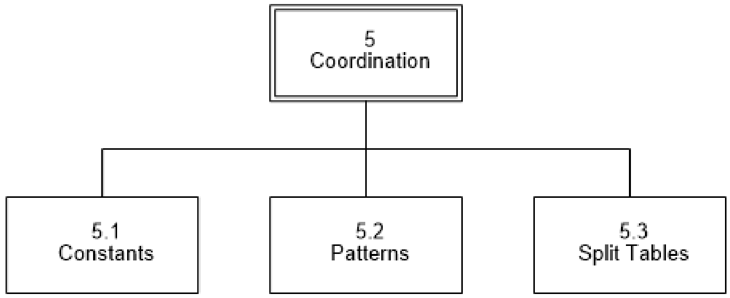


Figure 3-6: Coordination Menu

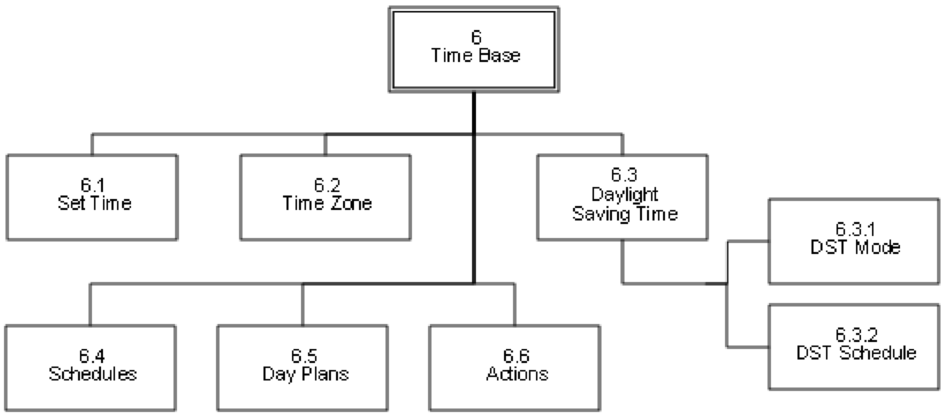


Figure 3-7: Time Base Menu

Figure 3-8: Preemption Menu

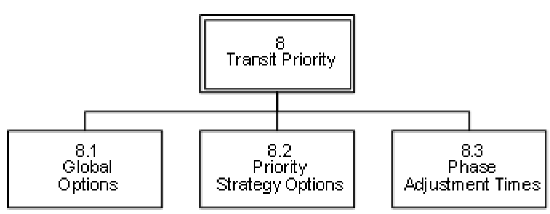


Figure 3-9: Transit Priority Menu

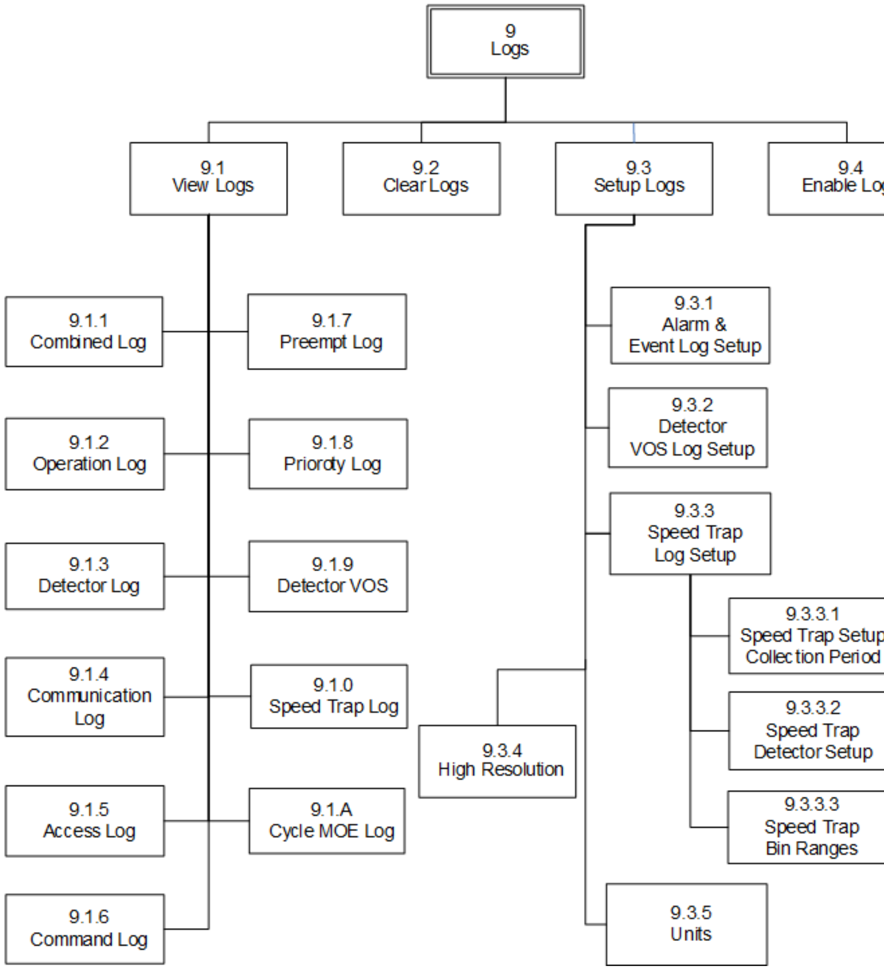


Figure 3-10: Logs Menu

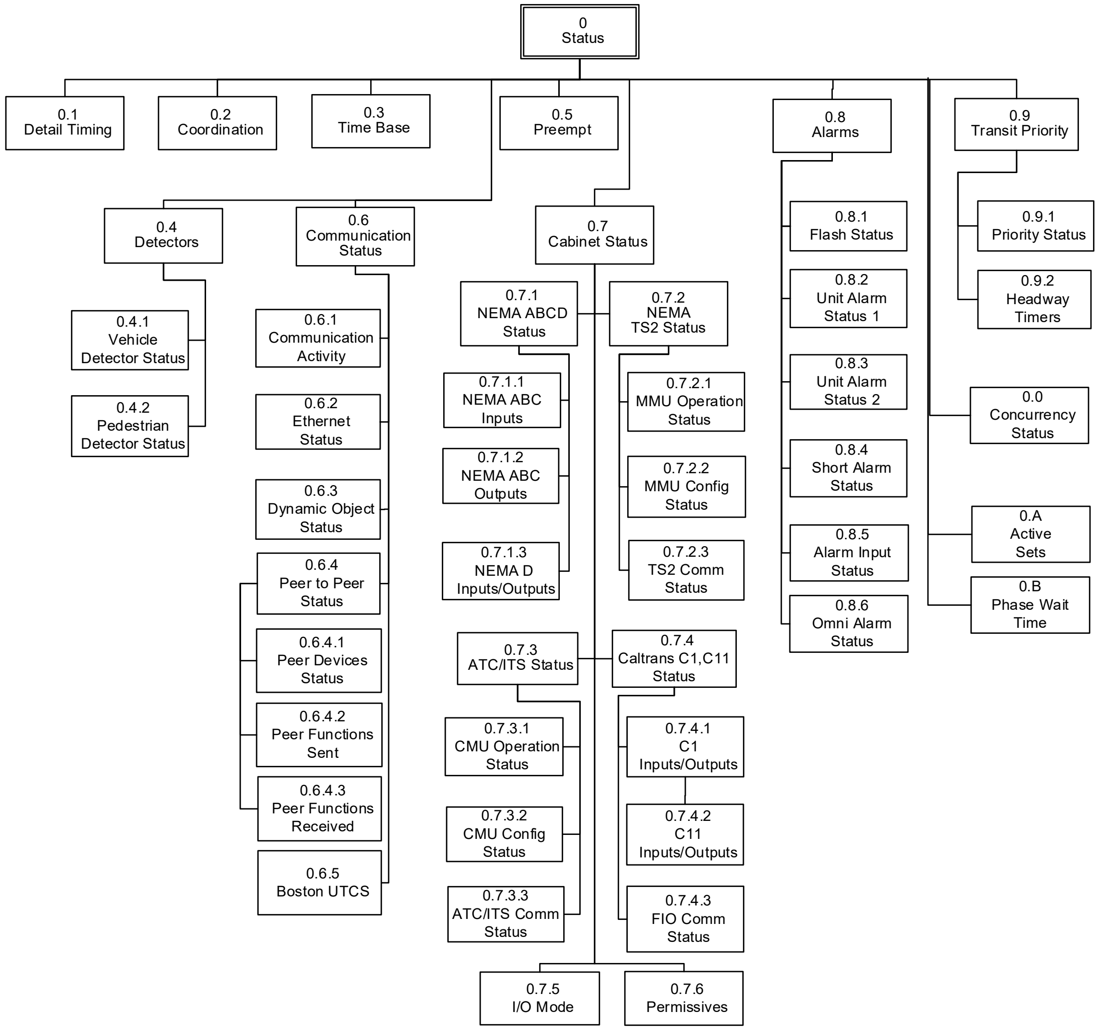


Figure 3-11: Status Menu

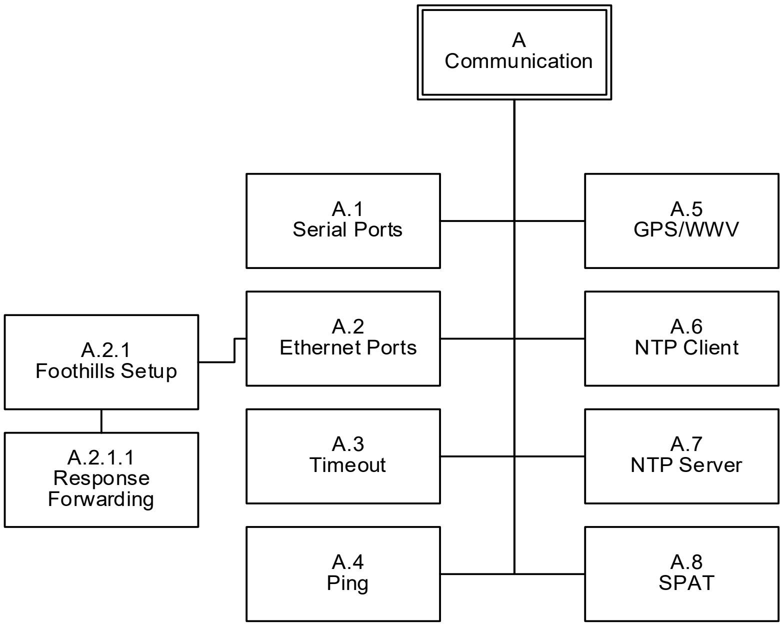


Figure 3-12: Communication Menu

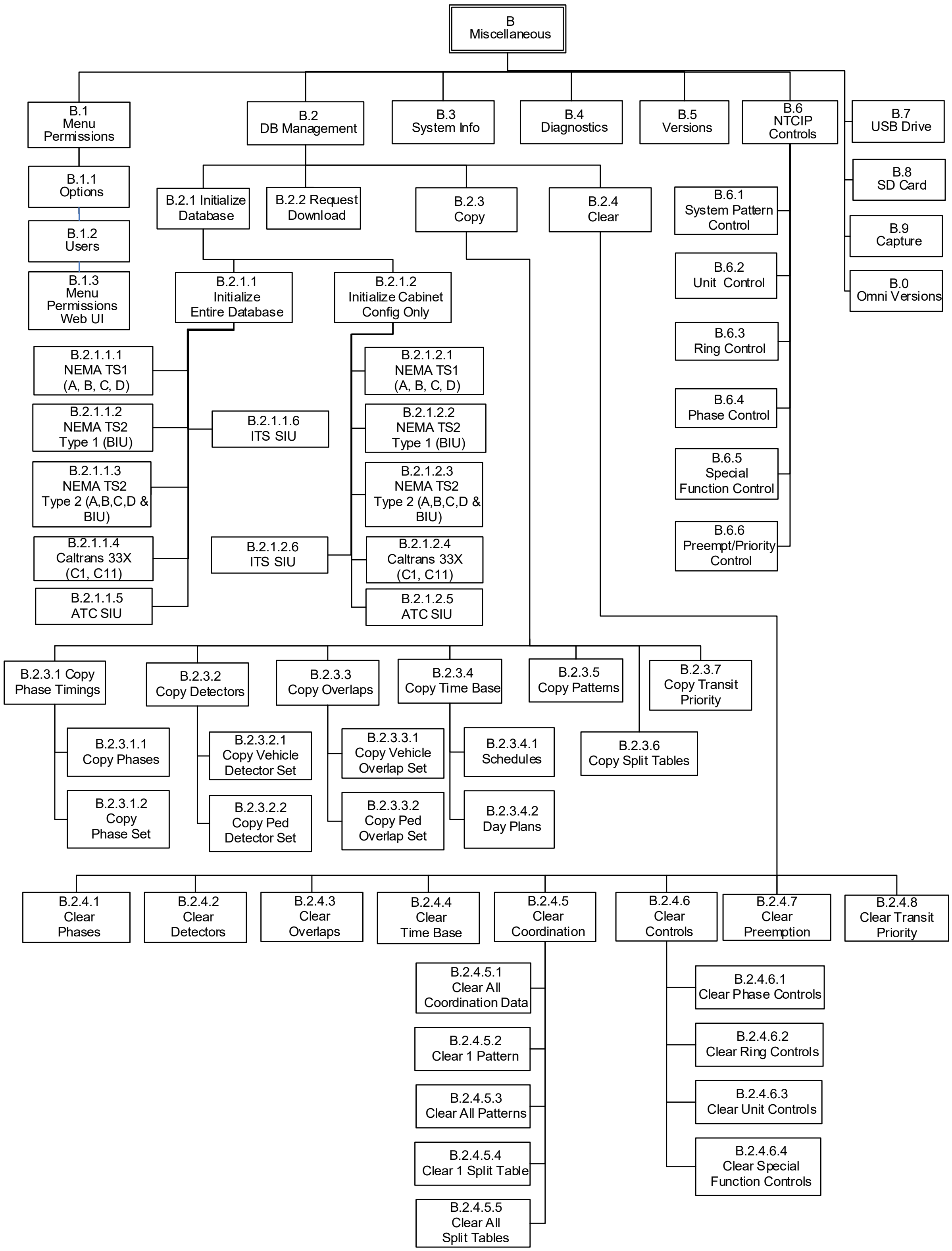


Figure 3-13: Miscellaneous Menu

3.2 Screen Navigation

On-screen instructions are provided to navigate from a parent menu to sub menus. This involves pressing a number associated with a sub menu or entering an index into a table (such as the Schedules Table) which causes the appropriate entry in the table to ESC to return to a parent menu screen.

Some menu screens allow navigation to fields or pages to view additional information associated with the menu screen. Additionally, some menu screens contain more information than the Controller can display. The user may navigate to different sections or pages of the menu screens to view the information.

To navigate within a menu screen, use the arrow keys and the NEXT key. The arrow keys scroll in the vertical and horizontal directions, while the NEXT key jumps to the next page when allowed. An example of functionality provided by the NEXT key is jumping forward a screen width in menu screens with long lists of similar fields. It can also be used to jump to the next table entry for table-based menus.

Whenever scrolling beyond the edge of the menu screen is possible, an appropriate indication is shown in the top right corner of the screen. These indications are as follows:

```
U = Up
D = Down
L = Left
R Right
```

Use the arrow keys to scroll in the desired direction.

3.3 Data Entry

There are several types of fields that can be edited in the menu.

3.3.1 Numeric Fields

Pressing a digit key clears the old value and the new value appears in the field.

As more digits are entered the numbers push left until the field is full. If more characters are entered than the length of the field, the leftmost character is discarded.

For example, if working with a field that is 3 digits wide:

```
enter 2                     2
enter 3                    23
enter 0                   230
enter 5                   305
enter 6                    56 (note leading zero is blanked)
```

The + key action depends on the field being edited.

- For unsigned fields it increments the value up to the max allowed, but it does not wrap the value back to the minimum. This action is only performed if the current field value is within range.
- For signed fields it sets the sign to positive.

The - key action depends on the field being edited.

- For unsigned fields it decrements the value down to the minimum allowed, but it does not wrap the value back to the maximum. This action is only performed if the current field value is within range.
- For signed fields it sets the sign to negative.

The NO key restores the original value. It the value entered is out of range, you will not be permitted to navigate away from the field until the value has been corrected.

3.3.2 **Toggle Fields**

- For toggle type fields use the + and - keys to toggle through the range of values the field supports.
- The YES key sets the value to the last (highest) value in the list.
- The NO key performs two functions:
  - If the current value of the field differs from the original value of the field, this key restores the original value of the field.
  - If the current value of the field is the same as the original value of the field, this key sets the value to the first (lowest) value in the list.

3.3.3 **Grouped Toggle Fields**

- These fields behave like an array of toggle fields. They are grouped together to allow convenient editing.
- The digit keys 1 – F are used as indices into the array. For example, pressing ‘1’ toggles 1 in the array, ‘0’ toggles 10 and ‘F’ toggles 16.
- The YES key sets all the fields in the array to their max value.
- The NO key performs two functions:
  - If the current value of the field differs from the original value of the field, this key restores the original value of the field.
  - If the current value of the field is the same as the original value of the field, this key sets all the fields in the array to their min value. For example:

INCLUDED PHASE 1234567890ABCDEF

enter 6 12345.7890ABCDEF

enter 7 12345..890ABCDEF

enter NO ....

enter YES 1234567890ABCDEF

3.3.4 **Phase Sequence Fields**

- Values are entered in the order you want them to appear on the screen.
- Enter number keys 1-9 for phases 1-9, 0 for phase 10, and A-F for phases 9-16.
- The NO key performs two functions:
  - If the current value of the field differs from the original value of the field, this key restores the original value of the field.
  - If the current value of the field is the same as the original value of the field, this key clears the field.For example:

```
enter 5     5
enter 8     5,8
enter B     5,8,B
enter 6     5,8,B,6
enter NO
enter 3     3
enter 4     3,4
```

3.3.5 **Text Fields**

To edit text fields, use the Left/Right arrow keys to position the cursor on a character position to be edited, use the +/- keys to scroll through the list of available characters.

3.3.6 **Database Transactions**

Changes to the Controller database are managed through a mechanism called “database transactions." When changes are entered via the Controller keypads, a transaction is started, and the database changes are stored in temporary memory. The transaction must be finalized to save the changes and make them permanent. In this way, a group of changes can be stored to the database all at once, and validity checks are performed on the entire database.

When attempting to edit a field that requires a database transaction, the menu performs the following checks:

- If a database transaction is already open, editing proceeds as normal.
- If a database transaction is not open, the menu attempts to open one.
- If a database transaction is successfully opened, editing proceeds as normal.
- If a database transaction cannot be opened, edits to the field are not allowed and an error message is displayed.

This could happen if a transaction is already open from another source; for example, if a download is in progress from a central system, or a database edit is in progress through the web interface.

While a database transaction is active the top line of the screen flashes this message:

<DB EDITING MODE ACTIVE – PRESS ENT>

When you are finished editing, press the ENT key to finalize or abort the database transaction. The DB Transaction menu opens and presents these options:

- Press the **YES** key to finalize the database transaction.

Performs validity checks. If the checks are successful, the changes are stored into the permanent database and the transaction is closed. If the validity checks are not successful, an error message is displayed, and the transaction remains open. You can correct the error and finalize the transaction again.

- Press the **NO** key to abort the database transaction.

All changes are discarded, and the transaction is closed.

- Press the **ESC** key to continue editing.

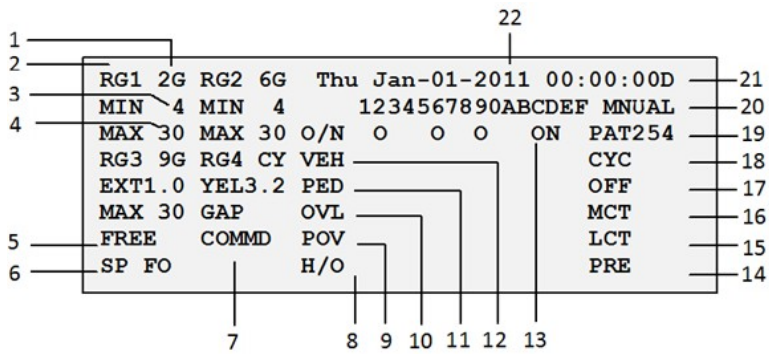
The transaction remains open and you can continue making changes.

- Press the ***** key to display help.

If a transaction is not finalized within 30 minutes of the last key press, it is automatically aborted.

4. Menus

4.1 Controller Status



The state of the traffic Controller determines the Controller status information displayed.

Table 4-1: States of Traffic Controller Status

Item	Description
1	Active phase in each ring and its output status. Phases are represented using 1 – 9 forphases 1 – 9 and 0 - F for phases 10 – 16. The output status can be G (green), Y (yellow) or R (red).
2	Current ring number. On this screen, status for four rings is displayed, denoted by RG1,RG2, RG3 and RG4. Note in Texas Diamond mode only two rings are used and so instead of Ring 3 and Ring 4, the following is displayed: "TX DIAMOND" "MODE: 4PHS" or "3PHS" or "SEP" depending on which mode.
3	• During green rest this field displays "GREEN REST" in combination with field 4. • During red rest this field displays "RED REST" in combination with field 4. • If stop time is applied to a ring, this field displays "STOP TIME" in combination with field 4. If a phase is to operate as a non-actuated phase via the Split Mode setting, this field may display "NONACT" otherwise it works the same as C-N-A.

Item	Description
4	Active interval and any applicable timers for the current ring. The specific information displayed varies with the current state of the traffic Controller. It is used to display the following timers: • Pedestrian walk timer with an entry of "WLK." • Pedestrian clear timer with an entry of "PCL." • Split timer with an entry of "SPL." • Max timer with a source-dependent entry. The entries are as follows: • "MAX" if the phase max 1 value is being used. • "MX2" if the phase max 2 value is being used. MX3 and MX4 are used for Max 3 and Max 4 respectively. • "DMX" if the phase is using the dynamic max value. • "MXP" if the phase is using the maximum value from a pattern. All times are displayed in seconds with a value of 0 to 99. Any time greater than 99 is shown as ** until it counts down to 99. The following additional information is also displayed: • During vehicle clearance timing this field indicates the reason for termination with the following entries: • "FOFF" if the ring was forced off. • "MAX" if the ring maxed out. • "GAP" if the ring gapped out. • "INT AD" if interval advance was used. • During green rest this field displays "GREEN REST" in combination with field 3. • During red rest this field displays "RED REST" in combination with field 3. • If stop time is applied to a ring, this field displays "STOP TIME" in combination with field 3.
5	Indicates the current operation as follows: • "FLASH": the reason for the flash or the state of flash-related interval is in field 7. • "PREMPT" when any of the Controller preempt inputs become active and its state is in field 7. • "SEQCHG" if a new sequence has been requested. • "MCE" if Manual Control Enable is active. • "EXTERNAL STRT" and in field 7 when an external start has been triggered. • "START" if the Controller is in startup.

Item	Description
	• "FREE" if any of the Controller inputs and/or programming cause it not to run coordination. • "COORD" if coordination is active and not preempted or overridden.
6	“SP FO”- Special Function outputs. Displays 16 special function outputs. The first 8 special function outputs alternate in the same space as the last 8 special function outputs. Special function 9's output are displayed in the same position as special function 1's output. Whether a specific output shows depends on whether its segment currently is set to be displayed. The values 1 – 9 are used to represent special functions 1 – 9, while 0 – F is used to represent special functions 10 – 16.
7	• Provides clarification for the status in the field labeled 5. Displays the following information depending on the value in field 5. • If the field 5 display is "FLASH" due to a flash status alarm state: ◦ "LOCAL" if the Controller unit local flash input is active, MMU Flash input is notactive, and flash is not commanded by the Master. ◦ "FAULTMN" if the Controller is currently in a fault monitor state. "MMU" if the Controller unit MMU flash input is active and the Controller is not instart-up flash. ◦ "MMU CF" if the Controller unit MMU flash input is active and the monitor detects a configuration fault. ◦ “CABFLT” if there is a cabinet fault i.e. TF BIU is not responding. • If the field 5 display is "FLASH" due to flash being serviced and no flash alarm states have been triggered: ◦ "W4ENTRY" while waiting for flash entry phases to go green. ◦ "ENTRY" while waiting for all red after timing the flash entry phases. ◦ "AUTO" while in flash and not timing the flash minimum timer. ◦ "YEL" while timing a yellow clearance time following flashing yellow on selected phases that do not match the flash exit phases in conjunction the flash exit yellow timer is in seconds. ◦ "RED" while timing an all red interval after flashing in conjunction the flash exit red timer is in seconds. ◦ "CYFAIL” When a local CU is operating in the non-coordinated mode, whether the result of a Cycle Fault or Free being the current normal mode, and cycling diagnostics indicate that a serviceable call exists that has not been serviced fortwo cycles. • If the field 5 display is "PREMPT" due to an active Controller preempt input: ◦ "ENTRY" if the preempt is timing the entry intervals. ◦ "TRACK" if the preempt is timing the track intervals.

Item	Description
	◦ "DWELL" if the preempt is timing the dwell intervals. ◦ "LINK" if the preempt is performing a linked operation. ◦ "EXIT" if the preempt is timing the exit intervals. ◦ "MX TO" if the preempt has exceeded Maximum Presence • If the field 5 display is "START" because the Controller is in startup: ◦ "FLSH" while timing the startup flash timer in conjunction with the startup flash timer in seconds. ◦ "RED" while timing the startup all red timer in conjunction with the startup all red timer in seconds. ◦ "PRMT" if the Controller is in startup with preempt with startup flash timer in seconds. ◦ "PREEMPT" if the Controller is in startup with preempt without flash timer. • If the field 5 display is "FREE" because the Controller is not running coordination: ◦ "COMMD" if the current pattern command is the free mode pattern. ◦ "TRANS" if the Controller has a pattern command but is cycling to the sync pointof the coordinated phases to begin coordination. (FREE TRANS) ◦ "EXTERN" when the Free Request input is active. ◦ "BAD PL" free - the called pattern is invalid. ◦ "BAD CT" the pattern cycle time is less than adequate to service the minimum requirements of all phases. ◦ "BAD SP" free - the sum of the critical path split times exceed the programmed cycle time. ◦ "BAD OF" the offset has an invalid length. ◦ "COFAIL" when a coordination fault is in effect and a cycle fault occurs again within two cycles of the coordination retry. ◦ "CYFAUL" when the Controller is operating in coordinated mode and cycling diagnostics indicate that a serviceable call exists that has not been serviced for two cycles. • If the field 5 display is "COORD" because coordination is active and not preempted or overridden: ◦ "COFAUL" when a cycle fault is in effect and the serviceable call has been serviced within two cycles after the cycle fault. ◦ "TRANS" when the Controller is performing an offset transition (correction in process, COORD TRANS). ◦ "ACTIVE" when none of the above is true.

Item	Description
8	Which phases are held or being omitted: • 'H' for hold. • 'O' for omit. • 'P' for pedestrian omit.
9	Which phases are held or being omitted: • 'H' for hold. • 'O' for omit. • 'P' for pedestrian omit.
10	Which overlaps are active: • 'G' for green. • 'N' for trailing green. • 'Y' for yellow. • 'D' for red clearance. • 'R' for red.
11	Which pedestrian movements have calls: • 'C' for a pedestrian detector input call. • 'R' for ped recall. • 'N' for call to non-actuated on the phase. • 'L' for locked pedestrian calls. • 'G' for calls placed by remote entities. • 'I' for a ped call generated from the front panel.
12	Vehicle demand: • 'C' for a vehicle detector call. • 'E' for a detector extension due to a queue or a passage call. • 'R' for min recall. • 'X' for max recall. • 'N' for call to non-actuated on the phase. • 'S' for soft recall. • 'F' for a call placed by detector diagnostics. • 'L' for locked vehicle calls.

Item	Description
	• 'G' for calls placed by remote entities. • 'I' for a call generated from the front panel. • 'T' for an internal call generated in Texas Diamond mode
13	Whether a phase is on or next: • 'O' for on. • 'N' for next.
14	Indicates an active Preempt program. Displays the number of the active Preempt Program (1-16). If the field is blank, no preempt is active. An '*' means the Preempt is either timing a delay or has reached a Maximum Presence timeout. During coordination offset transitioning or during TSP operation this may be replaced with LCL followed by a number indicating the current Local Cycle Length.
15	Local Cycle Timer which will increment from 0 to the local cycle value in seconds. During transition this value may be greater than the cycle length. When in sync this time may be different from the MCT by the pattern offset value.
16	Master Cycle Timer, which will increment from 0 in seconds. This timer starts the first time when the sync point is reached on the coordinated phases. The time is derived from the Controller clock referenced to midnight and the cycle length.
17	Current pattern offset in seconds.
18	Cycle length of the current pattern in seconds.
19	Current active pattern number. The values are as follows: • 1-250: Pattern – indicates the currently running pattern. • 254: Free – indicates free operation without coordination. • 255: Flash – indicates Automatic Flash without coordination. The pattern number flashes when pattern changes are in process.
20	Unit Control Status: • "SYSTM" – control by master or central commands. • "STDBY" – control via local from master or central command. • "MANUL" – when the coord operation mode is other than zero and Controller is not allowed to determine a mode automatically based on the possible sources (such as Interconnect, Time Base or System Commands). • "TBC" – control by the local Time Base. • "INTCN" – control by the local Interconnect inputs. • "INTBK" – control by local TBC due to invalid Interconnect inputs or loss of sync. • "EXTRN"- control by an input selecting a pattern

Item	Description
21	If Daylight Savings is active a 'D' is displayed following the time of the clock in 24-hour format. During capture this field is a “C.”
22	Current date and time.

During coordination or free mode, if a TSP request should come in, the Controller Status shows the ETA timer and the Service Phases for the request, but its position depends on whether the database has one or two rings defined or whether there are three of four rings defined.

For one/two rings the information is placed in the two rows above item #5. For three/four rings, the information replaces the Special Function Outputs in item #6. Free mode also shows the TSP Strategy number at item #14.

For 2 rings- TSP ETA: 001 PHS: 2,6

For 4 rings- ETA: 000 PH: 2,6

4.2 Front Panel Calls

From the status screen (8-line 2070 display) or Main Menu (16-line NEMA display) calls may be placed on vehicle phases and pedestrian movements as follows:

1. Press one of the following operation keys:
   - + to place a front panel vehicle call.
   - – to remove a previously placed front panel vehicle call.
   - YES to place a front panel pedestrian call.
   - NO to remove a previously placed front panel pedestrian call.
2. Press the number of the vehicle or pedestrian movement on which the call is to be placed or removed. The number key must be pressed within four seconds of the operation key. 1 – 9 are used for movements 1 – 9 and 0 – F are used for movements 10 – 16.
3. Double-click one of the following by pressing the same key twice within two seconds:
   - + to place front panel calls on all enabled vehicle phases.
   - – to remove all previously placed front panel vehicle calls.
   - YES to place front panel calls on all enabled pedestrian movements.
   - NO to remove all previously placed front panel pedestrian calls.

The ENTER key may be used to navigate to the main menu .

> NOTE: None of these calls from the front panel persist indefinitely. In fact, the call will timeout in 30 minutes, a fixed time period, after the last keyboard entry and the screen will return to the main menu. If a database transaction is open, then it is aborted.

4.3 Controller Menus

```
                  MAIN MENU

1. UNIT                  7. PREEMPTION
2. PHASES                8. TRANSIT PRIORITY
3. OVERLAP               9. LOGS
4. DETECTORS             0. STATUS
5. COORDINATION          A. COMMUNICATION
6. TIME BASE             B. MISCELLANEOUS
```

This is the main menu. Selections can be made using the digit keys (1 - B).

Table 4-2: Main Menu Entries

Item	Description
UNIT	Settings affecting the entire Controller. Includes operation mode, start up, channels, flash, cabinet setup and I/O mapping.
PHASES	Configure phase timing and options.
OVERLAPS	Configure overlap timing and options.
DETECTORS	Detector configuration.
COORDINATION	Configure coordination settings and patterns.
TIME BASE	Time of day clock and time base schedule configuration.
PREEMPTION	Preempt configuration.
TRANSIT PRIORITY	Transit priority configuration.
LOGS	Configure view and clear Controller event logs.
STATUS	View operational status.
COMMUNICATION	Configure external communication settings for serial and Ethernet.

MISCELLANEOUS	Miscellaneous settings such as controls, database management, system ID and software version information.

4.3.1 **Unit Menu**

```
1                    UNIT

1. OPERATION MODE          6. GATES
2. UNIT SETUP              7. NEMA TS2 SETUP
3. STARTUP                 8. ATC/ITS SETUP
4. CHANNEL SETUP           9. PEER TO PEER
5. I/O MAPPING
```

Main Menu > Unit

The following selectable entries are defined.

Table 4-3: Unit Menu Entries

Item	Description
OPERATION MODE	Selects Manual operation mode by pattern selection.
UNIT SETUP	Configure timing parameters that affect the entire unit.
STARTUP	Configure startup parameters that affect the entire unit.
CHANNEL SETUP	Configure channel assignments and flashing operation.
I/O MAPPING	Configure mapping of cabinet inputs and outputs.
GATES	Configure logic operations that combine and act on inputs and drive outputs.
NEMA TS 2 SETUP	NEMA TS 2 cabinet device configuration.
ATC/ITS SETUP	ATC/ITS Cabinet, Monitor and Port I/O configuration.
PEER TO PEER	Setup Peer Devices and Functions.

4.3.1.1 **Operation Mode**

```
1.1       OPERATION MODE

OPERATION MODE     0
0        = AUTOMATIC (TIME BASE OR SYSTEM)
1-250    = MANUAL PATTERN
253      = MANUAL TIME BASE (IGNORE SYSTEM)
254      = MANUAL FREE
255      = MANUAL FLASH
```

Main Menu > Unit > Operation Mode

Defines the operation or pattern selection mode to be used. The possible modes are listed in the Table below.

Table 4-4: Operation Mode Menu Entries

Item	Description
0	**Automatic Mode:** In this mode the Controller allows the coordination operation, free and flash to be determined automatically by either System Commands or Time Base Control. Inthe automatic mode, any of the patterns from 1 through 255 may be selected to be run by the Controller. If there is no active System Command, or if the System Command is zero, scheduled Time Base Control is used. If there is no active System Command orTime Base Event, the Controller will run free. Controller will respond to external Flash, Free, and Pattern Select inputs.
1-250	**Manual Pattern:** Manually selects the pattern or mode to be run. Controller will ignore System Pattern Commands and ignore external Flash, Free, and Pattern Select inputs. The Controller always runs this pattern at power up until this value is changed.
253	**Manual Time Base:** This value tells Controller to run local Time Base Control and ignore System Pattern Commands. Controller responds to external Flash, Free, and Pattern Select inputs.
254	**Manual Free:** Provides free operation without coordination or Automatic Flash from any source. Controller ignores System Pattern Commands and external Flash, Free, and Pattern Select inputs. This mode always uses Sequence #1.
255	**Manual Flash:**

	Provides for Automatic Flash without coordination or free from any source. Controller will ignore System Pattern Commands and external Flash, Free, and Pattern Select inputs.

4.3.1.2 **Unit Setup**

```
1.2            UNIT SETUP

AUTO PED CLEAR           NO
RED REVERT              2.0
MIN YELLOW TIME         3.0
TEXAS DIAMOND MODE      DISABLED
TEXAS DIAMOND TYPE      4-PHASE
```

Main Menu > Unit > Unit Setup

The following entries are defined.

Table 4-5: Unit Setup Menu Entries

Item	Description
AUTO PED CLEAR	**Automatic Pedestrian Clearance (toggle: yes, no)** When enabled, the Controller times the pedestrian clearance interval when Manual Control Enable (MCE) is active and prevents the pedestrian clearance interval from being terminated by the Interval Advance input.
RED REVERT	**Red Revert Time (number: 0-25.5 sec)** The Red Revert (provision within the Controller unit to assure a minimum red signal indication in a phase following the yellow change interval of that phase) in tenths ofa second (0.0 -25.5 seconds). This value provides the minimum red revert time for all phases (i.e. If it is greater than a phase red revert value, this value is used as the red revert time for the affected phase). This provides a minimum red indication following the yellow change interval and prior to the next display of green on the same signal output driver group. This is to avoid a sequence of color change such as green to yellow to green.
MIN YELLOW TIME	**Minimum Yellow Time (number: 0-25.5 sec)** The absolute Minimum Yellow Time is enforced unit wide. This minimum applies toall phases, overlaps, and preempt entry yellow intervals, except for phases and overlaps that have the No Minimum Yellow option enabled.
TEXAS DIAMOND MODE	**Texas Diamond Mode (toggle: Enabled, Disabled)** Select + to enable Texas Diamond Mode Select – to disable Texas Diamond Mode. A database initialization is started to convert to or from Texas Diamond configuration when this mode is changed.

TEXAS DIAMOND TYPE	**Texas Diamond Type (toggle: 3-phase, 4-phase, separate intersection)** Selects the default Texas Diamond operation type for the unit. This setting has no effect unless the Texas Diamond mode is enabled. The unit Texas Diamond type may be overridden by selecting a Texas Diamond type by pattern. See Chapter 6.

4.3.1.3 **Startup**

```
1.3               STARTUP
 PHASE#             1234567890ABCDEF
STARTUP PHASES      .G...G..........
NEXT PHASES         ................
STARTUP VEH CALL   XXXXXXXXXXXXXXXX
STARTUP PED CALL   XXXXXXXXXXXXXXXX
STARTUP FLASH        0
STARTUP ALL RED      0
```

Main Menu > Unit > Startup

Configures the Controller startup phases and sequence.

Table 4-6: Startup Menu Entries

Item	Description
STARTUP PHASES	**Startup Phases (grouped toggle: 1-F for phases 1-16)** Selects the startup state for each phase after power up or external restart. Thesemust be compatible phases. Available startup states: . = Phase not on (sits at red with no timers running) W = Green with Walk G = Green without Walk Y = Yellow Change R = Red Clearance
NEXT PHASES	**Startup Next Phases (grouped toggle: 1-F for phases 1-16)** Selects the next phases to be served after the Startup Phases. If no Next Phasesare selected, the next phases is the following phases in sequence after the Startup Phases, assuming they have calls.
STARTUP VEHCALL	**Startup Vehicle Call (grouped toggle: 1-F for phases 1-16)** Sets phases to get a locked call on startup (if not set, the phase will not receive a locked call on startup). • Use the 1 through F keys to toggle entries on and off.

Item	Description
	• YES sets all and NO clears all.
STARTUP PEDCALL	**Startup Vehicle Call (grouped toggle: 1-F for phases 1-16)** Sets phases to get a locked call on startup (if not set, the phase will not receive a locked call on startup). • Use the 1 through F keys to toggle entries on and off. • YES sets all and NO clears all.
STARTUP FLASH	**Startup Flash Time (number: 0-255 sec)** At power up, the Controller will remain in cabinet flash while timing this period, before timing Startup All Red if any time and beginning the Startup Phases.
STARTUP ALLRED	**Startup All Red Time (number: 0-255 sec)** At power up the unit times the Startup Flash period, if any, remains in Startup All Red while timing this period, begins the start phases. This interval will follow any configured Startup Flash interval.

4.3.1.4 **Channel Setup**

```
1.4             CHANNEL SETUP

                   11111111112222222222333
 CHAN#  12345678901234567890123456789012
TYPE:   VVVVVVVVPPPPOOOO................
SOURCE: 1234567824681234................
ALT1/2HZ ...............................
FLSHRED XXXXXXXX....XXXX................
FLSHYEL ................................
```

Main Menu > Unit > Startup > Channel Startup

This menu assigns functions to the cabinet output channels. Each channel has three outputs that drive a load switch and are monitored at the load by the cabinet conflict monitor. Consider the channel as a canal that carries the colors out of the Controller to the load switch. Each channel must have a source for the colors that it delivers to the cabinet, whether that be a vehicle phase, a pedestrian phase, or an overlap. The default channel assignment is different for each I/O configuration of the Controller.

All channel numbers are assumed to match the channel numbers in the conflict monitor (this is essential in NEMA TS 2 and ITS cabinets). Screen capture is a NEMA TS 2 type 2 default I/O map configuration. Other cabinets have different I/O configurations.

Omni's method for selecting between NEMA CVM flash (known as hardware or cabinet flash) and load switch flash (known as software flash) is to look at the NTCIP channel flash configuration. If the channel flash configuration is blank, use CVM flash; otherwise, use software flash. Software flash is always used during preemption since it has its own configuration during Preempt Dwell. *Omni* does not use CVM/FM flash during no fault conditions if CVM latch bit 150 is enabled in MMU.

NOTE: Some TS1 MMUs also have CVM latch, but the check for that state is not available, and so it must be disabled if using CVM flash.

Table 4-7: Channel Setup Menu Entries

Item	Description
TYPE	**Channel Type (toggle: V, P, O, E):** Defines the channel control type (vehicle phase, pedestrian phase or overlap). The following values are allowed: V - VEHICLE PHASE DISPLAY P - PEDESTRIAN PHASE DISPLAY O - OVERLAP DISPLAY E - PEDESTRIAN OVERLAP DISPLAY Press the cursor left and right arrows to select channel. Press the +/– keys to toggle the value.
SOURCE	**Channel Control Source**: defines the channel control source (i.e. the phase or overlap number that is assigned to the channel). Press the cursor left and right arrows to select channel. Press 1 TO F for Phase 1 to 16, 0 is 10. Press 1 TO F for Overlap A to P, 0 is J. Press NO to disable the channel, a period is displayed. NOTE: any channel that is not being driven by a vehicle phase or vehicle overlap source OR any channel that is not being driven by a pedestrian phase or pedestrian overlap source should be disabled, especially for TS1 cabinets.
ALT1/2HZ	**Alternate Half Hertz (toggle: "." = disabled, X = enabled)** Selects channels to flash on alternate half-hertz during startup or automatic flash.Press the cursor left and right arrows to select channels.

	Press the +/– or Yes/No keys to toggle the value.
FLSHRED	**Flash Red (toggle: "." = disabled, X = enabled)** Selects channels to flash red during startup or automatic flash. Channels not selected to flash red or yellow is dark. A channel cannot be selected as both flash red and flash yellow. Press the cursor left and right arrows to select channel. Press the +/– or Yes/No keys to toggle the value. NOTE: all 16 channels with no FLSHRED or FLSHYEL in a NEMA I/O configurationwill cause the Controller to drop CVM and initiate cabinet (hard) flash mode for pattern 255 and startup.
FLSHYEL	**Flash Yellow (toggle: "." = disabled, X = enabled)** Selects channels to flash yellow during startup or automatic flash. Channels not selected to flash red or yellow is dark. A channel cannot be selected as both flash red and flash yellow. Press the cursor left and right arrows to select channel. Press the +/– or YES/NO keys to toggle the value. NOTE: all 16 channels with no FLSHRED or FLSHYEL in a NEMA I/O configuration will cause the Controller to drop CVM and initiate cabinet (hard) flash mode for pattern 255 and startup.

4.3.1.5 **I/O Mapping**

```
1.5    I/O MAPPING

1. NEMA A,B,C,D
2. NEMA TS2 BIU
3. CALTRANS C1,C11
4. ATC/ITS SIU
5. AUX SWITCH
```

Main Menu > Unit > I/O Mapping

This menu accesses the Input/Output mapping settings. Any input or output function can be assigned to any of the available cabinet inputs or outputs. This eliminates the need for special wiring to perform remapping in custom cabinets or special applications.The default database contains typical I/O mapping for the selected cabinet type. The mapping may be easily modified by the user and saved with the database.

To proceed, use the number keys to select the type of I/O that is being used by your Controller and cabinet. For special applications, the different types of cabinet interfaces can be used at the same time, but typically only a single cabinet type will contain I/O mapping data.

NOTE: Any editing of the I/O map must be done with care and may require a rewire of the cabinet or a change of the monitor configuration. Furthermore, it may require a restart of the Controller.

To view the Functions available for either the Inputs or Outputs go to Appendix C.

4.3.1.5.1 NEMA ABCD I/O Mapping

```
1.5.1     NEMA A,B,C,D I/O MAPPING

1. INPUTS
2. OUTPUTS
```

The Index is used if there are more than one instance of a reference, e.g., there are 128 detectors so the index can be 1-128.

4.3.1.5.1.1 A,B,C,D Input Mapping

```
1.5.1.1   A,B,C,D INPUT MAPPING     D
PIN  DEFAULT      FUNCTION          IDX
A-f  VEH DET 1    VEHICLE DETECTOR    1
A-K  VEH DET 2    VEHICLE DETECTOR    2
B-N  VEH DET 3    VEHICLE DETECTOR    3
B-L  VEH DET 4    VEHICLE DETECTOR    4
C-P  VEH DET 5    VEHICLE DETECTOR    5
C-S  VEH DET 6    VEHICLE DETECTOR    6
```

Main Menu > Unit > I/O Mapping > NEMA A,B,C,D >Inputs

The NEMA A,B,C,D Input Mapping setup screen is used to program the NEMA ABCD input mapping settings.

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable. Use the + or – key to change the function. Use the RIGHT ARROW key to get to the index and press the numeric keys to change the number.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.1.2 A,B,C,D Output Mapping

```
1.5.1.2   A,B,C,D OUTPUT MAPPING    D
PIN  DEFAULT      FUNCTION          IDX
A-D  PHS1/CH1 R  CHANNEL RED          1
A-F  PHS2/CH2 R  CHANNEL RED          2
B-F  PHS3/CH3 R  CHANNEL RED          3
B-G  PHS4/CH4 R  CHANNEL RED          4
C-H  PHS5/CH5 R  CHANNEL RED          5
C-G  PHS6/CH6 R  CHANNEL RED          6
```

…

```
D-JJ SPCL FUNC 8 SPECIAL FUNC OUTPUT    8
```

Main Menu > Unit > I/O Mapping > NEMA A,B,C,D > Outputs

The NEMA A,B,C,D Output Mapping setup screen is used to program the NEMA ABCD output mapping settings.

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable. Use the + or – key tochange the function. Use the RIGHT ARROW key to get to the index and press the numeric keys to change the number.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.2 NEMA TS 2 BIU I/O Mapping

```
1.5.2     NEMA TS2 BIU I/O MAPPING

1.  INPUTS
2.  OUTPUTS
```

Main Menu > Unit > I/O Mapping > NEMA TS 2 BIU I/O Mapping

Choose whether to program input or output mapping settings.

4.3.1.5.3 NEMA TS 2 BIU Input Mapping

```
1.5.2.1  NEMA TS2 BIU INPUT MAPPING

           SELECT A BIU:  0

 BIU 1-4  ARE TERMINAL & FACILITIES BIUS
 BIU 9-12 ARE DETECTOR BIUS

   ENTER BIU NUMBER THEN PRESS ENT
```

Enter a BIU number to program and press Enter to program the NEMA BIU SDLC input mapping settings

```
1.5.2.1  BIU 9  INPUT MAPPING     D
PIN  DEFAULT     FUNCTION            IDX
IO1  CHN 1 CALL  VEHICLE DETECTOR      1
IO2  CHN 2 CALL  VEHICLE DETECTOR      2
IO3  CHN 3 CALL  VEHICLE DETECTOR      3
IO4  CHN 4 CALL  VEHICLE DETECTOR      4
IO5  CHN 5 CALL  VEHICLE DETECTOR      5
IO6  CHN 6 CALL  VEHICLE DETECTOR      6
```

…

```
OPT4 RESERVED    RESERVED CANNOT MAP
```

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and is not editable.

NOTE: A detector BIU can have only the 16 detector channel function assignments changed; all other pins are reserved.

Other input functions that are not vehicle detectors may be found in the TF BIUs.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.4 NEMA TS 2 BIU Output Mapping

```
1.5.2.2  NEMA TS2 BIU OUTPUT MAPPING

            SELECT A BIU:   0

 BIU 1-4  ARE TERMINAL & FACILITIES BIUS
 BIU 9-12 ARE DETECTOR BIUS

     ENTER BIU NUMBER THEN PRESS ENT
```

Main Menu > Unit > I/O Mapping > TS 2 BIU> Outputs

Enter a BIU number and press Enter to program the NEMA BIU SDLC output mapping settings.

```
1.5.2.2  BIU 1  OUTPUT MAPPING   D
PIN  DEFAULT     FUNCTION            IDX
O1   PHS1/CH1 R  CHANNEL RED          1
O2   PHS1/CH1 Y  CHANNEL YELLOW       1
O3   PHS1/CH1 G  CHANNEL GREEN        1
O4   PHS2/CH2 R  CHANNEL RED          2
O5   PHS2/CH2 Y  CHANNEL YELLOW       2
O6   PHS2/CH2 G  CHANNEL GREEN        2
```

…

```
IO24 INPUT       I/O USED AS INPUT
```

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable. Note the TFBIUs have both input and output functions accessible from either menu 1.5.2.1 or 1.5.2.2. Detector BIUs have only four output pins by default for Detector Reset.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.5 CALTRANS C1,C11 Mapping

```
1.5.3    CALTRANS C1,C11 I/O MAPPING

1. INPUTS
2. OUTPUTS
```

Main Menu > Unit > I/O Mapping > CALTRANS C1,C11 I/O Mapping

```
1.5.3.1  C1,C11 INPUT MAPPING       D
PIN    DEFAULT    FUNCTION            IDX
C1-39 PHS2/DET2  VEHICLE DETECTOR       2
C1-40 PHS6/DET16 VEHICLE DETECTOR      16
C1-41 PHS4/DET8  VEHICLE DETECTOR       8
C1-42 PHS8/DET22 VEHICLE DETECTOR      22
C1-43 PHS2/DET3  VEHICLE DETECTOR       3
C1-44 PHS6/DET17 VEHICLE DETECTOR      17
```

…
C11-30 SPARE   UNUSED INPUT

Choose whether to program input or output mapping settings.

4.3.1.5.5.1 C1, C11 Input Mapping


```
1.5.3.1  C1,C11 INPUT MAPPING       D
PIN    DEFAULT    FUNCTION            IDX
C1-39 PHS2/DET2  VEHICLE DETECTOR       2
C1-40 PHS6/DET16 VEHICLE DETECTOR      16
C1-41 PHS4/DET8  VEHICLE DETECTOR       8
C1-42 PHS8/DET22 VEHICLE DETECTOR      22
C1-43 PHS2/DET3  VEHICLE DETECTOR       3
C1-44 PHS6/DET17 VEHICLE DETECTOR      17
```

…
C11-30 SPARE   UNUSED INPUT

Main Menu > Unit > I/O Mapping > CALTRANS C1,C11 Mapping > Inputs

The C1,C11 Input Mapping setup screen is used to program the CALTRANS C1,C11 input mapping settings.

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable. Use the + or – key to change the function. Use the RIGHT ARROW key to get to the index and press the numeric keys to change the number.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.5.2 C1, C11 Output Mapping

```
1.5.3.2  C1,C11 OUTPUT MAPPING     D
PIN     DEFAULT    FUNCTION            IDX
C1-2    PD4/CH6 R CHANNEL RED            6
C1-3    PD4/CH6 G CHANNEL GREEN          6
C1-4    PH4/CH5 R CHANNEL RED            5
C1-5    PH4/CH5 Y CHANNEL YELLOW         5
C1-6    PH4/CH5 G CHANNEL GREEN          5
C1-7    PH3/CH4 R CHANNEL RED            4
```

```
…
C11-8   SPARE      UNUSED OUTPUT
```

Main Menu > Unit > I/O Mapping > CALTRANS C1,C11 Mapping > Outputs

The C1, C11 Output Mapping setup screen is used to program the CALTRANS C1,C11 output mapping settings.

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable.

Use the + or – key to change the function. Use the RIGHT ARROW key to get to the index and press the numeric keys to change the number.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.6 ATC/ITS SIU I/O Mapping

```
1.5.4     ATC/ITS SIU I/O MAPPING

1. INPUTS
2. OUTPUTS
```

Main Menu > Unit > I/O Mapping > ATC/ITS SIU I/O Mapping

Choose whether to program input or output mapping settings.

4.3.1.5.7 ATC/ITS SIU Input Mapping

```
1.5.4.1  ATC/ITS SIU INPUT MAPPING

          SELECT A SIU:   0

     SIU 1-7    ARE OUTPUT SIUS
     SIU 9-13   ARE INPUT SIUS

    ENTER SIU NUMBER THEN PRESS ENT
```

Main Menu > Unit > I/O Mapping > ATC/ITS SIU Input Mapping

Enter a SIU number to program, press ENT.

ATC Cabinet Output SIUs:

- SIU 1 = 1st output SIU (used for 16 or 32 channel output assembly)
- SIU 3 = 2nd output SIU (used for 32 channel output assembly only)

ITS Cabinet Output SIUs:

- SIU 1 = Output SIU 1 (14-pack output SIU in position 1)
- SIU 2 = Reserved
- SIU 3 = Output SIU 3 (14-pack output SIU in position 3)
- SIU 4 = Output SIU 4 (6-pack output SIU in position 4)
- SIU 5 = Output SIU 5 (6-pack output SIU in position 1)
- SIU 6 = Output SIU 6 (6-pack output SIU in position 2)
- SIU 7 = Output SIU 7 (6-pack output SIU in position 3)

ATC and ITS Cabinet Input SIUs:

- SIU 9 = Input SIU 1 (input SIU in position 1)
- SIU 10 = Input SIU 2 (input SIU in position 2)
- SIU 11 = Input SIU 3 (input SIU in position 3)
- SIU 12 = Input SIU 4 (input SIU in position 4)
- SIU 13 = Input SIU 5 (input SIU in position 5)

```
1.5.4.1    SIU 9 INPUT MAPPING              D
PIN    DEFAULT     FUNCTION                 IDX
I00    SPARE       UNUSED INPUT
I01    SPARE       UNUSED INPUT
I02    SPARE       UNUSED INPUT
I03    SPARE       UNUSED INPUT
I04    SPARE       UNUSED INPUT
I05    SPARE       UNUSED INPUT
```

```
OPT4   SPARE       UNUSED INPUT
```

Main Menu > Unit > I/O Mapping > ATC/ITS SIU I/O Mapping > Inputs

The ATC/ITS SIU Input Mapping setup screen programs the ATC/ITS SIU input mapping settings.

Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.8 ATC/ITS SIU Output Mapping

```
1.5.4.2  ATC/ITS SIU OUTPUT MAPPING

            SELECT A SIU:   0

     SIU 1-7     ARE OUTPUT SIUS
     SIU 9-13    ARE INPUT SIUS

    ENTER SIU NUMBER THEN PRESS ENT
```

Main Menu > Unit > I/O Mapping > ATC/ITS SIU Output Mapping

Enter a SIU number to program, press ENT.

ATC Cabinet Output SIUs:

- SIU 1 = 1st output SIU (used for 16 or 32 channel output assembly)
- SIU 3 = 2nd output SIU (used for 32 channel output assembly only)

ITS Cabinet Output SIUs:

- SIU 1 = Output SIU 1 (14-pack output SIU in position 1)
- SIU 2 = Reserved
- SIU 3 = Output SIU 3 (14-pack output SIU in position 3)
- SIU 4 = Output SIU 4 (6-pack output SIU in position 4)

- SIU 5 = Output SIU 5 (6-pack output SIU in position 1)
- SIU 6 = Output SIU 6 (6-pack output SIU in position 2)
- SIU 7 = Output SIU 7 (6-pack output SIU in position 3)

ATC and ITS Cabinet Input SIUs:

- SIU 9 = Input SIU 1 (input SIU in position 1)
- SIU 10 = Input SIU 2 (input SIU in position 2)
- SIU 11 = Input SIU 3 (input SIU in position 3)
- SIU 12 = Input SIU 4 (input SIU in position 4)
- SIU 13 = Input SIU 5 (input SIU in position 5)

```
1.5.4.2   SIU 1 OUTPUT MAPPING          D
PIN    DEFAULT      FUNCTION              IDX
IO0    CHN RED 1    CHANNEL RED             1
IO1    CHN YEL 1    CHANNEL YELLOW          1
IO2    CHN GRN 1    CHANNEL GREEN           1
IO3    CHN RED 2    CHANNEL RED             2
IO4    CHN YEL 2    CHANNEL YELLOW          2
IO5    CHN GRN 2    CHANNEL GREEN           2
```

```
IO53   SPARE        UNUSED OUTPUT
```

Main Menu > Unit > I/O Mapping > ATC/ITS SIU I/O Mapping >Outputs

The ITS SIU Output Mapping setup screen programs the ITS SIU output mapping settings. Each pin can be mapped to a function and index. If the selected function does not require an index, the IDX field is blank and will not be editable.

Additional pins can be displayed by pressing the DOWN ARROW key.

4.3.1.5.9 Aux Switch Input Mapping

```
1.5.5    AUX SWITCH INPUT MAPPING

INPUT       FUNCTION                    IDX
AUX SWITCH  STOP TIME ALL RINGS
```

Main Menu > Unit > I/O Mapping > Aux Switch

This menu allows any input function to be assigned to the Aux switch on the 2070 front panel. By default, it is assigned to Stop Time All Rings, but it can be changed to any of the other available input functions if desired.

This setting has no effect if the Controller does not have an Aux switch, such as the ATCeX NEMA Controller.

4.3.1.5.10 Gates

```
1.6                 GATES


             SELECT A GATE: 0
                  (1-64)


     ENTER GATE NUMBER THEN PRESS ENTER
```

Main Menu > Unit > Gates > Select a Gate

Configures logic operations that combine and act on inputs and outputs. For example, gates may be used to combine detectors, to turn on an output based on a set of inputs, or to flash an output.

```
1.6                GATE 1               D
TYPE UNUSED  OUT  MODE  NORMAL
     FUNCTION               IDX ! DLY EXT ?
IN1  UNUSED                  1  N   O   0 0
IN1  UNUSED                  1  N   O   0 0
IN1  UNUSED                  1  N   O   0 0
IN1  UNUSED                  1  N   O   0 0
OUT  UNUSED                  1  N   O   0 0
```

DLY/EXT UNITS TENTH

This screen configures the selected I/O gate.

Three types of I/O gates are available: "OR," "AND" and "XOR." If set to "UNUSED," this gate is ignored.

There are ten different output modes.

Table 4-8: Gate Output Modes

Gate Output Mode	Description
NORMAL	Generates a continuous output while the input logic remains true. No additional output processing is applied.

LATCH	Generates continuous output until reset, even if the input logic is no longer true. Gate inputs 1-3 may be used to set the latch and gate input 4 resets the latch. Note the reset input takes precedence over the set inputs.
ONE SHOT	Generates a fixed-length output pulse that turns off even if the input logic is still true. The pulse duration is user configurable in tenths of seconds (0-25.5 sec), via the output extend time parameter. If the output extend time is zero, the One Shot will generate a 0.1 second pulse when triggered. Note that this is triggered only when the input transitions from false to true.
FLASH	Generates a flashing output at the specified rate whenever the gate output is true. The available rates are as follows (FPM = Flashes Per Minute): • Flash at 0.5Hz / 30FPM • Flash at 1Hz / 60FPM • Flash at 1.7Hz / 100FPM • Flash at 2Hz / 120FPM • Flash at 2.5Hz / 150FPM • Flash at 3.3Hz / 200FPM • Flash at 5Hz / 300FPM

Up to 4 inputs can be configured. Select the input function and index. Select if input should be inverted, delayed, or extended, prior to processing the gate. Select the function associated with the gate's output. Select if the output should be inverted, delayed, or extended, after the gate was processed.

To view the Functions available for the Gates Inputs or Outputs go to "GateFunctions" in Gate Functions.

4.3.1.5.11 I/O Logic

I/O gates are virtual, and logic circuits attach to the inputs and outputs of the Controller. Software gates are used to construct logic circuits. Physical inputs or outputs are mapped to logic circuits using the existing Logic Input and Logic Output functions.

- Logic Input in the I/O mapping defines an input pin that is used in gates.
- Logic Output in the I/O mapping assigns the output of a gate to a Controlleroutput.
- Logic Output can connect the output one gate to the input of another, to facilitate creating a chain of gates which perform a more complex multi-stage logicfunction.

4.3.1.5.12 Gate Types

Up to 64 gates are supported. Each gate may be disabled (default) or may be configured as one of three basic gate types: AND, OR, or XOR. Each gate type supports up to 4 inputs and 1 output. Any gate inputs that are unused are ignored. The different gate types function like typical hardware gates. The gates are processed in order from gate 1 to gate 64.

Table 4-9: Gate Types

Gate Type	Description
UNUSED	The gate is disabled (default setting).
AND	The output is TRUE if all inputs are TRUE, and FALSE under all other conditions.
OR	The output is TRUE if any input is TRUE, and FALSE otherwise. (Inclusive OR)
XOR	The output is TRUE if one and only one input is TRUE, and FALSE under all other conditions. (Exclusive OR)

The existing Logic Input and Logic Output functions are used on the I/O mapping screens to connect physical cabinet I/O pins to gates. For example, a physical input can be assigned to a Logic Input on the Input Mapping screen, while that same Logic Input can be used as a gate input on the Gate screen. Similarly, a Logic Output can be assigned at the output of a gate, and that same Logic Outputcan be assigned to a physical output on the Output Mapping screen.

All existing input and output function types that appear on the Input and Output Mapping screens can also be entered as gate inputs. For example, Channel Green 2 could be entered as a gate input to allow that green output to be fed back into a gate.

NOTE: The Preemption (Priority) Pulsing function is intended to be used to activate logic when it's associated raw input pin is pulsing, but not steady. For example, it can be used to respond to low priority calls from preemption equipment that pulses inputs to the Controller at 6.25 Hz in order to activate functions that normally require a steady input, such as preemption.

The Logic Output function is also used to interconnect multiple gates. If the output of a gate is mapped to a Logic Output, that Logic Output can be used as an input to other gates.

Up to 64 Logic Inputs and 64 Logic Outputs are supported.

Although the maximum index of 64 is the same, there is no dependency between the indices of Logic Inputs, Logic Outputs, and gate numbers. Any Logic Input or Logic Output may be assigned to any gate. However, a specific Logic Output should not be assigned as the output of more than one gate. In that scenario, the higher numbered gate determines the state of that logic output (i.e. last set wins) simply because the gates are processed in ascending numerical order.

NOTE: The gates are processed sequentially, and any logic output defined in a higher numbered gate cannot be used in a lower number gate.

The following lists clarify what types of assignments can be made on each of the I/O mapping screens. The notation "X → Y" means that X is mapped to Y, and that X determines the state of Y.

Input Mapping Screen:

- physical input pin → input function (e.g. Vehicle Detector)
- physical input pin → Logic Input
- Constraints: A specific input function can only be mapped to one input pin (one-to-one).

Output Mapping Screen:

- output function (e.g. Channel Green) → physical output pin
- Logic Output → physical output pin
- Constraints: None. An output function can be mapped to many output pins (one-to-many).

Gate Screen:

- Gate input:
  - input function (e.g. Vehicle Detector) → gate input
  - output function (e.g. Channel Green) → gate input
    - Logic Input (from Input Mapping screen) → gate input
    - Logic Output (from another gate) → gate input
  1. Constraints: None. Any input function can be mapped to many gate inputs (one-to-many).
- Gate output:
  - gate output → input function (e.g. Vehicle Detector)
  - gate output → Logic Output (used on Output mapping screen or to as aninput to another gate)
  - Constraint: A Logic Output can only be mapped to the output of one Gate (one-to-one).

To make sure all Logic Inputs and Logic Outputs have a known state, any Logic Input or Logic Output that is unassigned should have a state of FALSE. Likewise, all gates should have a known state. If all inputs to a gate are unassigned, the gate IOS should be constant FALSE unless the Invert option is enabled. If the Invert option is enabled, the gate IOS should be constant TRUE. The gate Output Mode should be applied in the normal manner to determine FOS. This will allow a gate to be configured to drive an always-on flasher, for example, or to drive a one-shot output that occurs only at startup.

By default, a gate with no assigned inputs and an output mode of NORMAL has a constant FALSE output if an output function is assigned. If a gate has a type of UNUSED or an output function of UNUSED, it is considered disabled and does not require any processing at all.

4.3.1.5.13 Gate Input/Output Options

1. Select the function associated with the gate input or output.
2. Select if the input or output should be inverted, delayed, or extended.

Table 4-10: Gate I/O Options

Gate I/O Option	Description
FUNCTION	The **Function of the Gate** pin either provides input to a Gate input ordrives an output from a Gate output. Either is a list of possible functions whichare accessed by the + or - keys to step through the list of choices, of which, the list is different for the Gates inputs than for the Gate outputs.
IDX	**The Function Index (IDX)** is used for those functions that have more than one instance, usually found in a table of similar functions. i.e. Preempt Detector or Vehicle Detector. The Index identifies which one of the multiple instances, PreemptDetector 3 or Vehicle Detector 1. Those functions that have only one instance do not use the Index, i.e. Walk Rest Modifier.
!	**Invert (toggle: Y, N)** The gates have the option to invert any gate input or output. This eliminates the need for NAND, NOR and NOT as discrete gate types.
DLY	**Delay Time (number: 0-25.5 sec, displayed as tenths if DLY/EXT UNITS areset to TENTH)** Each gate input and output have a configurable delay time that can be applied, entered in tenths of seconds. If delay time is configured, the gate input or out- put is TRUE only after the raw input or output state has been TRUE for the con- figured delay time.
EXT	**Extend Time (number: 0-25.5 sec, displayed as tenths if DLY/EXT UNITS isset to TENTH)** Each gate input and output has a configurable extension time that can be applied, entered in tenths of seconds. If extension time is configured, the gate input oroutput stays TRUE for the configured extension time after the raw input

	or output state has transitioned to FALSE. Note that for a one-shot mode the extension on the output sets the pulse duration time.
?	**Current State (0,1)** This shows the current state or each gate input and output once the gate is entered into the database. 0 = False/Off, 1 = True/On.
DLY/EXT UNITS	**Delay/Extend Units (Tenth, Sec, Min, Hour)** This sets the current range of each gate's inputs and outputs as follows: TENTH…0.0-25.5 in tenth seconds (default) SEC…….0-255 in whole seconds MIN…….0-255 in whole minutes HOUR….0-255 in whole hours

4.3.1.5.14 Gate Input Definitions

LOGIC INPUT FUNCTION	INDEX RANGE	DESCRIPTION
UNUSED INPUT	--	currently available and is not assigned
LOGIC INPUT	64	connect input pin into gates
LOGIC OUTPUT	64	output from gate
PREEMPT DETECTOR	16	place a preemption request
PEDESTRIAN DETECTOR	16	activate a ped call
VEHICLE DETECTOR	128	make vehicle actuation
VEH DETECTOR FAULT	128	Unused except by gate
SPECIAL FUNC INPUT	16	activate a special function
AUTO FLASH REQUEST	0	request automatic flash (soft flash)
LOCAL FLASH SENSE	0	auto/flash switch, cabinet in flash user request
MMU/CMU FLASH SENSE	0	feedback from CMU/MMU for cabinet in fault flash
MAN CONTROL ENABLE	0	Manual Control Enable
INTERVAL ADVANCE	0	Interval Advance
MIN RECALL	0	Minimum Recall on all phases
EXTERNAL START	0	External Start, go to Startup routine
STOP TIME ALL RINGS	0	Stop Time on all 4 rings.
STOP TIME RING	4	Stop Time for one specific ring
FORCE OFF RING	4	Force Off one specific ring
RED REST RING	4	Red Rest for one specific ring, if no calls
OMIT RED CLEAR RING	4	Omit Red Clearance timing per ring
PED RECYCLE RING	4	Recycle pedestrian per ring
INHIBIT MAX RING	4	Inhibit Maximum Green termination per ring
MAX 2 RING	4	Maximum Green 2 timing per ring
MAX 3 ALL RINGS	0	Unused except by gate
MAX 4 ALL RINGS	0	Unused except by gate
CALL TO NON-ACT	2	Call to Non-Actuated operation for phase groups
WALK REST MODIFIER	0	Walk Rest Modifier for C-N-A phases
FREE REQUEST	0	Request free mode

LOGIC INPUT FUNCTION	INDEX RANGE	DESCRIPTION
ALARM INPUT	16	generate an Alarm
ALTERNATE SEQUENCE	4	Unused except by gate
ADDRESS BIT	32	Unused except by gate
OFFSET INPUT	3	Unused except by gate
TIMING PLAN INPUT	4	Unused except by gate
PHASE OMIT	16	omit the phase
PHASE HOLD	16	hold a phase
PED OMIT	16	omit the pedestrian phase
CABINET DOOR OPEN	0	generate an alarm when the cabinet door is open
TEST INPUT	3	Unused except by gate
INDICATOR LAMP CTRL	0	Unused except by gate
DIMMING ENABLE	0	Unused except by gate
CYCLE ADVANCE	0	Unused except by gate
TBC ONLINE	0	Unused except by gate
CLOCK UPDATE	0	Sets the Controller clock to the time of day specified in Sync Reference Time
HARDWARE CONTROL	0	Unused except by gate
CONFLICT MON STATUS	0	Unused except by gate
MODE SELECT BIT	3	Unused except by gate
CHANNEL RED	32	drive red output of a load switch
CHANNEL YELLOW	32	drive yellow output of a load switch
CHANNEL GREEN	32	drive green output of a load switch
PREEMPT ACTIVE	8	preempt is active
DETECTOR RESET	0	Detector Reset on all detector
DET RESET SLOTS	4	Detector Reset for one input file
FAULT MONITOR	0	Fault Monitor output
VOLTAGE MONITOR	0	Controller Voltage Monitor output
FLASHING LOGIC	0	NEMA constant flashing output
AUTO FLASH STATUS	0	Automatic Flash Status output
WATCHDOG	0	Watchdog output
FREE STATUS	0	Free Mode Status output
CODED STATUS BIT A	4	Ring Coded Status Bit A output
CODED STATUS BIT B	4	Ring Coded Status Bit B output
CODED STATUS BIT C	4	Ring Coded Status Bit C output
OFFSET OUTPUT	3	Unused except by gate
TIMING PLAN OUTPUT	4	Unused except by gate
TBC AUX OUTPUT	8	TBC Aux Status output
SPECIAL FUNC OUTPUT	16	Special Function Status output
ALARM OUTPUT	16	Alarm Status output
PHASE ON	16	Phase On output
PHASE NEXT	16	Phase Next output
PHASE CHECK	16	Phase Check output
PREEMPT DWELL	8	Preempt Dwell Active
PRIORITY REQUEST	16	activate TSP request
PRIORITY CHECKOUT	16	remove TSP request
PRIORITY ACTIVE	16	TSP Strategy active
NO START DELAY PHS	16	skip phase start delay timer
NO START DELAY OVL	16	skip overlap start delay timer
MAX WALK	0	extend the Walk timing

LOGIC INPUT FUNCTION	INDEX RANGE	DESCRIPTION
MAX RECALL	0	Max Recall on all phases.
PREEMPT GATE DOWN	8	truncate preempt Track Green timer
PATTERN SELECT	255	select one pattern out of 255
PATTERN ACTIVE	255	Pattern Active
ADVANCE WARN PHASE	16	Advance Warning Phase Active
ADVANCE WARN OVRLAP	16	Advance Warning Overlap Active
PREEMPT STEADY	8	preempt input in Steady state
PREEMPT PULSING	8	preempt input in Pulsing state
PRIORITY STEADY	16	priority input in Steady state
PRIORITY PULSING	16	priority input in Pulsing state
ADV TSP OUTPUT	16	Advance TSP as an input

LOGIC OUTPUT FUNCTION	INDEX RANGE	DESCRIPTION
UNUSED INPUT	--	currently available and is not assigned
LOGIC OUTPUT	64	gate output drive pin or gate
PREEMPT DETECTOR	16	Preemption request
PEDESTRIAN DETECTOR	16	ped call
VEHICLE DETECTOR	128	vehicle actuation
VEH DETECTOR FAULT	128	Unused except by gate
SPECIAL FUNC INPUT	16	special function request
AUTO FLASH REQUEST	0	automatic flash (soft flash) request
LOCAL FLASH SENSE	0	auto/flash switch in flash
MMU/CMU FLASH SENSE	0	CMU/MMU fault flash
MAN CONTROL ENABLE	0	Request Manual Control Enable
INTERVAL ADVANCE	0	Interval Advance
MIN RECALL	0	Minimum Recall
EXTERNAL START	0	External Start
STOP TIME ALL RINGS	0	Stop Time all rings.
STOP TIME RING	4	Stop Time ring
FORCE OFF RING	4	Force Off ring
RED REST RING	4	Red Rest ring
OMIT RED CLEAR RING	4	Omit Red Clearance ring
PED RECYCLE RING	4	Recycle pedestrian
INHIBIT MAX RING	4	Inhibit Maximum Green
MAX 2 RING	4	Maximum Green 2 ring
MAX 3 ALL RINGS	0	Unused except by gate
MAX 4 ALL RINGS	0	Unused except by gate
CALL TO NON-ACT	2	Call to Non-Actuated
WALK REST MODIFIER	0	Walk Rest Modifier
FREE REQUEST	0	Request free mode
ALARM INPUT	16	Request Alarm
ALTERNATE SEQUENCE	4	Unused except by gate
ADDRESS BIT	32	Unused except by gate
OFFSET INPUT	3	Unused except by gate
TIMING PLAN INPUT	4	Unused except by gate
PHASE OMIT	16	omit phase
PHASE HOLD	16	hold phase
PED OMIT	16	omit pedestrian phase

LOGIC OUTPUT FUNCTION	INDEX RANGE	DESCRIPTION
CABINET DOOR OPEN	0	Cabinet door alarm
TEST INPUT	3	Unused except by gate
INDICATOR LAMP CTRL	0	Unused except by gate
DIMMING ENABLE	0	Unused except by gate
CYCLE ADVANCE	0	Unused except by gate
TBC ONLINE	0	Unused except by gate
CLOCK UPDATE	0	Sets the Controller clock to the time of day specified in Sync Reference Time
HARDWARE CONTROL	0	Unused except by gate
CONFLICT MON STATUS	0	Unused except by gate
MODE SELECT BIT	3	Unused except by gate
I/O USED AS OUTPUT	--	
PRIORITY REQUEST	16	activate TSP request
PRIORITY CHECKOUT	16	remove TSP request
NO START DELAY PHS	16	skip phase start delay timer
NO START DELAY OVL	16	skip overlap start delay timer
MAX WALK	0	Max Walk
MAX RECALL	0	Max Recall
PREEMPT GATE DOWN	8	truncate Track Green timer
PATTERN SELECT	255	select pattern
LOGIC INPUT	64	Connection input out of gate
ADV TSP INPUT	16	Priority advance request.
BEGIN CYCLE PULSE	0	Cycle start pulse output

4.3.1.6 **NEMA TS 2 Setup**

```
1.7         NEMA TS2 DEVICE SETUP

                TF      DET
                1234    90AB
   BIU          XX..    X...
   MMU          YES
   COMM PORT    SP3
```

Main Menu > Unit >NEMA TS 2 Device Setup

This screen is used to configure the NEMA TS 2 cabinet BIU and MMU devices.

BIU and MMU devices can be enabled and disabled by moving the cursor to a field and pressing a number key to toggle status of the desired device.

‘X’ = Device Enabled‘.’ = Device Disabled

The MMU can be disabled if set to NO, or enabled in two different modes, YES or SEND.If set to YES, the MMU is enabled for normal NEMA TS 2 operation. If set to SEND, the MMU is enabled in a special “send only” mode. The Controller transmits the Load Switch Driver frame 0 to the MMU but does not expect any response from the MMU. This mode allows the Controller to send the output states to non-MMU devices which listen to the SDLC bus, such as video detection equipment.

The COMM PORT option selects the desired SDLC communications port which is used to talk to the enabled TS 2 devices. Options are SP3 (NEMA SDLC port), SP5 (C12 port on 2070-2A/B/E module), and SP8 (C13 port on CPU module). Normally SP3 is used, which is the “PORT 1” connector on the ATC eX NEMA Controller or on a 2070-2N module. Controller must be rebooted for a comm. port change to take effect.

4.3.1.7 ATC/ITS Device Setup

```
1.8         ATC/ITS DEVICE SETUP
                      OUTPUT    INPUT
                      1234567   90ABC
SIU                   X......   XX...
2070 FIO MODULE       NO
CMU                   YES
CMU TYPE              2212(ATC)
COMM PORT             SP5
```

Main Menu > Unit > ATC/ITS Device Setup

This screen is used to configure ATC/ITS Cabinet and 2070 field I/O devices. SIU Devices can be enabled and disabled by pressing a number key to toggle the status of the desired device.

SIU, CMU and FIO devices can be enabled and disabled by moving the cursor to a field and pressing a number key to toggle the status of the desired device. Press 0-C for SIU10-13.

‘X’ = Device Enabled‘.’ = device Disabled

ATC Cabinet Output SIUs:

- SIU 1 = 1st output SIU (used for 16 or 32 channel output assembly)
- SIU 3 = 2nd output SIU (used for 32 channel output assembly only)

ITS Cabinet Output SIUs:

- SIU 1 = Output SIU 1 (14-pack output SIU in position 1)
- SIU 2 = Reserved
- SIU 3 = Output SIU 3 (14-pack output SIU in position 3)
- SIU 4 = Output SIU 4 (6-pack output SIU in position 4)
- SIU 5 = Output SIU 5 (6-pack output SIU in position 1)
- SIU 6 = Output SIU 6 (6-pack output SIU in position 2)
- SIU 7 = Output SIU 7 (6-pack output SIU in position 3)

ATC and ITS Cabinet Input SIUs:

- SIU 9 = Input SIU 1 (input SIU in position 1)
- SIU 10 = Input SIU 2 (input SIU in position 2)
- SIU 11 = Input SIU 3 (input SIU in position 3)
- SIU 12 = Input SIU 4 (input SIU in position 4)
- SIU 13 = Input SIU 5 (input SIU in position 5)

The 2070 FIO Module should be enabled if using a 2070-2A/E, 2070-2N or 2070-8 FIO module and if inputs/outputs are assigned to the connectors on those modules.

The CMU can be disabled if set to NO, or enabled in two different modes, YES or SEND. If set to YES, the CMU is enabled for normal operation. If set to SEND, the CMU is enabled in a special “send only” mode. The Controller will transmit the Switch Pack Drivers frame 61 to the CMU but will not expect any response from the CMU. This mode allows the Controller to send the output states to non-CMU devices which listen to the SDLC bus, such as video detection equipment.

The CMU Type can be either 212 for an ITS cabinet or 2212 for an ATC cabinet.

The COMM PORT option selects the desired SDLC communications port which is used to talk to the enabled devices. Options are SP3 (NEMA SDLC port), SP5 (C12 porton 2070-2A/B/E module), and SP8 (C13 port on CPU module). Normally, SP5 is used tocommunicate to a 2070-2A/E field I/O module for Caltrans cabinets, or routed externally via a 2070-2B module to communicate to an ITS or ATC cabinet. Controller must be rebooted for a communication port change to take effect.

NOTE: for the McCain ATC Backpack cabinet, there is only one SIU (#1) and six slots that can drive up to eight Channels (red, yellow andgreen outputs) via at most four HDSPs (High Density Switch Packs) and up to 16 detector inputs via at most four-detector four channel cards.

4.3.1.8 **Peer to Peer Setup**

```
1.9         PEER TO PEER SETUP

   1. PEER DEVICES
   2. PEER FUNCTIONS
```

Main Menu > Unit > Peer to Peer Setup

This screen is used to configure the Peer to Peer Devices and Functions. Peer to Peer uses UDP/IP and is only supported on the Controller's Ethernet ports.

It is the Remote Function that drives the Peer to Peer and affects the Local Function. The lists under the Remote Functions are the same as the lists under the Gate inputs whereas the lists under Local Functions are the same as the lists under the Gate outputs. If the Remote Function is looked upon as the initiating event such as when the Channel Green goes true, the Local Function is the target of this eventsuch as Manual Control Enable becoming active.

4.3.1.8.1 Peer Devices

```
1.9.1           PEER DEVICES

          SELECT A PEER DEVICE
                 (1-8)
```

Main Menu > Unit > Peer to Peer > Peer Devices

This screen is used to select a Peer to Peer Device to configure. Up to eight Remote Peers can be used. Pressing the NEXT key will go to the next Peer Device.

Each Peer Device (another ATC Controller running *Omni)* must be given a unique System ID number both at the remote Controller (B.3) and the same System ID number here and typically each should have a unique IP Address (A.2) before data interchange can occur.

Table 4-11: Peer Device Configuration

Peer Device	Description
SYSTEM ID	**System ID** number of the Remote Peer unit (0 - 4,294,967,295) This ID number also serves to link configured functions with this device.
IP ADDRESS	**IP Address** of the Remote Peer (0.0.0.0, decimal, each position is 0-255) Several functions may be sourced by this Remote Peer. Both the Remote Peer IP Addressand the IP Address of the local Peer should be in the same subnet unless the Remote Peer is available through a Gateway.
PORT	**P2P Port Number (0-65535, default shown as 49255)** The P2P Port Number of the Remote Peer as defined in the Remote Peer's Ethernet Port Settings (A.2). If this is 0 (zero) the default P2P port (49255) is used.
MESSAGE TIMEOUT	**Message Timeout (0-25.5 seconds, default of 1.0 sec. shown)** A timer value for waiting on an acknowledgement from the Remote Peer. Once it is expired there is an automatic retry.

MAX RETRIES	**Max Retries (0-255, default of 3 shown)** The number of retries that a Peer will make to send a message before dropping the Remote Peer from the list of live configured Peers.
HEARTBEAT TIME	**Heartbeat Time (0-255 seconds, default of 30 sec. shown)** Heartbeat sets theminimum rate at which data from a Peer is updated. The Heartbeat is a refresh of the current state of the Remote Function if it has not changed state already.

4.3.1.8.2 Peer Functions

```
1.9.2          PEER FUNCTIONS

         SELECT A PEER FUNCTION: 0
                  (1-32)

  ENTER A FUNCTION NUMBER THEN PRESS ENT
```

Main Menu > Unit > Peer to Peer > Peer Functions

This screen is used to configure a Peer to Peer Function. Select one of the device functions to configure. Up to thirty-two functions can be used per device.

This screen links the Remote Function of the Remote Peer identified by the Peer Device Number to a Local Function in the Local Peer. Pressing the NEXT key goes to the next Peer Function.

Table 4-12: Peer Functions

Peer Function	Description
PEER DEVICE NUMBER	The **Peer Device Number (1-8)** of the Remote Peer unit. This number should be the same Peer Device Number as configured for the given Peer Device. (see 1.9.1)This forms the link to tie these functions with a given Remote Peer Device. Once entered, the System ID of the selected device is displayed in parenthesis as a reference.
REMOTE FUNCTION	The **Remote Function** of the Remote Peer to provide input to a Local Function.This is a list of possible functions which are accessed by the + or - keys to step through the list of choices, of which, the same selection is found with the Gates inputs.
REMOTE FUNCTION IDX	The **Remote Function Index (IDX)** is used for those functions that have more than one instance, usually found in a table of similar functions, i.e. Preempt Detector or Vehicle Detector. (The allowable range for the selected Remote Function is shown in parentheses). The index identifies which one of the multiple instances, Preempt Detector 3 or Vehicle Detector 1. Those

	functions that have only one instance do not use the Index, i.e. Walk Rest Modifier.
LOCAL FUNCTION	The **Local Function** of the Local Peer to be driven by a Remote Function. This is alist of possible functions which are accessed by the + or - keys to step through the list of choices, of which, the same selection is found with the Gates outputs.
LOCAL FUNCTION IDX	The **Local Function Index (IDX)** is used for those functions that have more thanone instance, usually found in a table of similar functions. i.e. Preempt Detector or Vehicle Detector. (The allowable range for the selected Remote Function is shownin parenthesis.) The Index identifies which one of the multiple instances, Preempt Detector 3 or Vehicle Detector 1. Those functions that have only one instance do not use the Index, i.e. Walk Rest Modifier.
DEFAULT STATE	The **Default State (Off / On)** sets the Default Value for this function. This is the value that is input to the Local Peer when the Remote Peer is not available.

There are Status screens for monitoring the Peer to Peer communication and operation. From the Main Menu go to Status, Communications, Peer to Peer (0.6.4) and select either 1.) Peer Devices, or 2.) Peer Functions Sent for Local Functions being sentout, or 3.) Peer Functions Received from the Remote Peer Device.

4.3.2 **Phases**

```
2                  PHASES

1. PHASE TIMINGS
2. PHASE OPTIONS
3. PHASE SEQUENCES
4. PHASE ENABLE AND RINGS
5. PHASE CONCURRENCY
```

Main Menu > Phases

This menu contains settings that configure, monitor or control phase functions for this device. Selections can be made using the digit keys (1 - 5). There are four data sets for Phase Timing and Phase Options.

4.3.2.1 **Phase Timing**

2.1 PHASE TIMINGS SET 1 DR

PHASE#	1	2	3	4	5	6	7	8
MIN GRN	4	15	4	15	4	15	4	15
PASS/10	20	50	20	50	20	50	20	50
MAX 1	15	45	15	45	15	45	15	45
MAX 2	15	45	15	45	15	45	15	45
MAX3	0	0	0	0	0	0	0	0
MAX4	0	0	0	0	0	0	0	0
YEL/10	30	40	30	40	30	40	30	40
RED/10	10	20	10	20	10	20	10	
WALK	0	7	0	7	0	7	0	7
PED CLR	0	15	0	15	0	15	0	15
ADDIN/10	0	0	0	0	0	0	0	0
MAX INIT	0	0	0	0	0	0	0	0
TBR	0	0	0	0	0	0	0	0
CBR	0	0	0	0	0	0	0	0
TTR	0	0	0	0	0	0	0	0
REDUCE/10	0	0	0	0	0	0	0	0
MIN GP/10	0	0	0	0	0	0	0	0
DM LIMIT	0	0	0	0	0	0	0	0
DM STP/10	0	0	0	0	0	0	0	0
RED RV/10	20	20	20	20	20	20	20	20
CS MIN	0	0	0	0	0	0	0	0
ALT MINGR	0	0	0	0	0	0	0	0
ALT PS/10	0	0	0	0	0	0	0	0
ALT WALK	0	0	0	0	0	0	0	0
ALT PDCLR	0	0	0	0	0	0	0	0
ADV WALK	0	0	0	0	0	0	0	0
DLY WALK	0	0	0	0	0	0	0	0
ST DLY/10	0	0	0	0	0	0	0	0
GRN CL/10	0	0	0	0	0	0	0	0

Main Menu > Phases > Phase Timings > Select a Phase Timings Set (1-4)

Phase Timing settings are entered in columns for the appropriate Phase and in Rows by the timing interval.

The additional phase parameters shown below the LCD window can be displayed by pressing the DOWN ARROW key. Phases 9-16 can be displayed by pressing the RIGHT ARROW key.

Table 4-13: Phase Timing

Item	Description
MIN GRN	**Minimum Green Time (number: 0-255 sec)** Controls the duration of the phase Minimum Green interval. This is the first timed portion of the green interval which may be set in consideration of the storage of vehicles between the zone of detection for the approach vehicle detector(s) and the stop line. Minimum Green is the Minimum display of Green for the associated phase and cannot be Forced Off.
PASS/10	**Passage Time (number: 0-25.5 sec, stored as tenths)** Controls the extensible portion of the Green. This is a function of vehicle actuations that occur during the Green interval. The phase remains in the extensible portion of the Green interval so long as the passage timer has not timed out. The timing of this portion of the Green interval is reset with each subsequent vehicle actuation and does not commence to time again until the vehicle actuation is removed.
MAX 1	**Maximum Green Time 1 (number: 0-255 sec)** Controls the maximum length of time this phase may be held green in the presence of a serviceable conflicting call.In the absence of a serviceable conflicting call the maximum green timer is held reset unless max vehicle recall is enabled for this phase. This is the default maximum value to use. It may be overridden via an external input, or Coord Maximum Mode or other method.
MAX 2	**Maximum Green Time 2 (number: 0-255 sec)** An alternative Max Time that controls the maximum length of time this phase may be held green in the presence of aserviceable conflicting call. In the absence of a serviceable conflicting call the maximum green timer is held reset unless max vehicle recall is enabled for this phase. This may be implemented as the max green timer via an external input, or Coord Maximum Mode or other method.
MAX 3	**Phase maximum green 3 (1-255 seconds).** This parameter determines the maximum length of time this phase may be held green in the presence of a serviceable conflicting call. In the absence of a serviceable conflicting call the maximum green timer is held reset unless max vehicle recall is enabled for this phase. This may be implemented as the max green value via an external input, coord maximum mode or other method.
MAX 4	**Phase maximum green 4 (1-255 seconds).** This parameter determines the maximum length of time this phase may be held green in the presence of a serviceable conflicting call. In the absence of a serviceable conflicting call the maximum green timer is held reset unless max vehicle recall is enabled for this phase. This may be implemented as the max green value via an external input, coord maximum mode or other method.
YEL/10	**Yellow Change Time (number: 0-25.5 sec, stored as tenths)** Controls the duration of the Phase Yellow Change interval following the green interval. The phase Yellow time is subject to the Unit Min Yellow Time. This entry may be set less than the Unit Min Yellow Time, but the Controller will not time a value less

Item	Description
	than the Unit Min Yellow Time unless the No Min Yellow phase option is enabled for this phase.
RED/10	**Red Clearance Time (number: 0-25.5 sec, stored as tenths)** Controls the PhaseRed Clearance interval. The Red Clearance interval follows the Yellow Clearance interval during the Red Clearance Interval and no Green Interval may be shown to any conflicting phase. This Red Clearance interval is subject to omission in response to operation of the per-ring Omit Red Clearance input.
WALK	**Walk Time (number: 0-255 sec)** Controls the amount of time the phase walk indication is displayed when a pedestrian demand is serviced. An entry of 0 seconds disables pedestrian service and no displays (Walk and Pedestrian Clearance) for theassociated phase. The phase Walk time provides sufficient time to clear the pedestrians off the curb or the landing area.
PED CLR	**Pedestrian Clearance (Flashing Don't Walk) Time (number: 0-255 sec)** Controls the duration of the phase pedestrian clearance output (if present) and the flashing period of the Don't Walk output. The phase Pedestrian Clearance time provides sufficient time to clear the pedestrians from the crosswalk from "curb to curb."
ADD IN/10	**Added Initial Time (number: 0-25.5 sec, stored as tenths)** Controls the variable initial timing period in association with the Minimum Green Phase Timing Entry, Maximum Initial Phase Timing Entry, Phase Associated Detector Input(s) and Phase Options Added Initial Calculation. This entry is multiplied by the number of Associated Detector Inputs recorded on the Yellow and Red phase intervals. Only Detector Inputs which are assigned to the Phase and selected for ADDED INIT are counted. The final calculation is either based upon the sum of all phase-associated detector inputs if the Phase Option selection for ADDED INIT is not selected. If the Phase Option ADDED INIT is selected the calculation is based on the Detector input with the highest count. The restraints on the Variable Initial are that it cannot be less than the Minimum Green nor greater than the Maximum Initial. An entry of 0disables this function for the phase. The variable initial time functions as the Phase Minimum Time, it cannot be shortened by a Force Off.
MAX INIT	**Maximum Initial Green Time (number: 0-255 sec)** Controls the Variable Initial Timing Period by providing a Maximum Value for the calculation. A value of 0 disables the Variable Initial Calculation. Note that setting this value will affect the phase service minimum times of the split for coordination.
TBR	**Time Before Reduction (number: 0-255 sec)** Controls the length of time before the gap reduction period begins. This Interval begins with the Phase Green and a serviceable conflicting call. If the serviceable conflicting call is removed before completion of this time (or time to reduce), the timer resets. Upon completion of the Time Before Reduction period or the Cars Before Reduction parameter is satisfied, whichever occurs first, the linear reduction of the allowable gap from the passage time begins. A value of 0 disables this function.

Item	Description
CBR	**Cars Before Reduction (number: 0-255 cars)** Controls the length of time before the gap reduction period begins. This Interval begins with the Phase Green and a serviceable conflicting call. The entry works concurrently with Time Before Reduction. Upon completion of the Time Before Reduction period OR the Cars Before Reduction parameter is satisfied, whichever occurs first, the linear reduction of theallowable gap from the passage time begins. For a Detector Input to be counted inCars Before Reduction the Detector must have a CALL PHASE assignment to conflicting phase and the detector input must be selected as ADD INIT under Detectors.If all serviceable conflicting calls are removed The Cars Before Reduction Counter is reset. A value of 0 disables this function.
TTR	**Time To Reduce (number: 0-255 sec)** Controls the length of time over which theallowable gap is reduced from the passage value to the Minimum Gap value. If at any time the serviceable conflicting call is removed the TTR resets and the Timingof the TBR CBR and TTR waits until a serviceable conflicting call is present. A value of 0 disables this function.
REDUCE/10	**Reduce By (number: 0-25.5 sec, stored as tenths)** Controls the rate of reductionduring the Time to Reduce period. As an alternative to linear reduction timing of gap reduction this entry allows a step reduction of the gap to occur. This phase entry may be used for volume density gap reduction whereby the unit extension, or allowed time spacing between successive vehicle actuations on the phase displaying the green in the extensible portion of the interval is reduced. The entry is thetenths of seconds to reduce the gap by. The frequency of the reduction produces the minimum gap after a time equal to the phase Time To Reduce entry. A value of 0 disables this stepping function but provides Gap reduction on a liner basis.
MIN GP/10	**Minimum Gap Time (number: 0-25.5 sec, stored as tenths)** Controls the lower limit of the Gap Time. The reduction of the allowable gap continues until the gap reaches a value equal to or less than the Minimum Gap after which the allowable gap remains fixed at the Minimum Gap setting. The entry for Minimum Gap is disabled if the phase entry setting for Time Before Reduction is 0.
DM LIMIT	**Dynamic Maximum Green Limit (number: 0-255 sec)** Controls the Phase Maximum Time based on the reason for termination of the phase in the previous cycle. This setting determines either the upper or the lower limit of the phase Maximum time. The normal maximum(i.e. max1, max2, etc.) determines the other limit as follows: when dynamic max limit is larger than the normal maximum, it becomes the upper limit. When dynamic max limit is smaller than the normal maximum, it becomes the lower limit setting. This setting and the Dynamic Max Step entry increments or decrements the Max Timer for the next service. Maximum recall or a failed detector that is assigned to the associated phase disables dynamic max operation for the phase. An entry of 0 disables the operation of Dynamic Max.

Item	Description
DM STP/10	**Dynamic Maximum Green Step (number: 0-25.5 sec, stored as tenths)** Controls the incremental value added or subtracted to the Max Timer for the next service based on the reason for the phase termination. If a phase reaches max twice in a row, and on each successive max out thereafter, one Dynamic Maximum Step value is added to the running maximum until such addition would mean the running maximum was greater than the larger of normal max or dynamic max limit. If a phase gaps out twice in a row, and on each successive gap out thereafter, one dynamic max step value is subtracted from the running maximum until such subtraction would mean the running maximum was less than the smaller of the normal maximum or the Dynamic Max Limit. If a phase gaps out in one cycle and maxes out in the next cycle, or vice versa, the running max does not change.
RED RV/10	**Red Revert Time (number: 0-25.5 sec, stored as tenths)** Controls the Phase Red Revert interval. Red Revert assures a minimum red signal interval phase following the Yellow change interval before another Green interval can be displayed on the same phase. The unit RED REVERT provides a minimum Red Revert time for all signal displays. The Phase Red Revert parameter may increase the Red Revert time for a specific phase. If the Phase Red Revert parameter is less than the unit Red Revert the unit Red Revert time is used.
CS MIN	**Conditional Service Minimum Time (number: 0-255 sec)** When the Conditional Service phase option is enabled, this parameter can be used to specify the minimum amount of time that must be remaining on other rings Maximum Green timer, when free, or Split Time when coordinated, for this phase to do conditional service. The remaining time for conditional service time must always include thephase minimum service time, i.e. minimum green + clearance. If the Conditional Service Minimum time is larger than the phase minimum service time, Conditional Service Minimum is used instead of the phase service minimum time.
ALT MINGR	**Alternate Minimum Green Time (number: 0-255 sec)** This value is used for the minimum green time if the phase is called by a detector with the Alt Min Green option enabled.
ALT PS/10	**Alternate Passage Time (number: 0-25.5 sec, stored as tenths)** Initiated by a designated detector input that has been associated as an Alternate Passage detector input.
ALT WALK	**Alternate Walk Time (number: 0-255 sec)** This value is used for the walk time if the ped is called by a detector with the Alt Ped Time option enabled.
ALT PDCLR	**Alternate Pedestrian Clearance Time (number: 0-255 sec)** This value is used for the ped clearance time if the ped is called by a detector with the Alt Ped Time option enabled.
ADV WALK	**Advance Walk Time (number: 0-255 sec)** Entry of other than zero will begin timing phase walk while delaying the vehicle green display for this many seconds.

Item	Description
DLY WALK	**Delay Walk Time (number: 0-255 sec)** Entry of other than zero will delay the beginning of the phase walk this many seconds after the vehicle green has been displayed.
ST DLY/10 (Start Delay)	**Start Delay Time (number: 0-25.5 sec)** stored as tenths) Delayed start of green. An entry other than zero will keep this phase at red for this amount of time. An Overlap that has this phase as an Included Phase will go green at the start of this time just as if this time is a part of Minimum Green.
GRN CL/10	**Green Clearance Time (number: 0-25.5 sec)** stored as tenths) When the phase terminates, it will remain green for this amount of time before beginning the yellow change interval. If configured, the Advance Warning output for this phase is active during the green clearance interval.

Omni can do Volume Density, both Variable Initial and Gap Reduction as shown in Figure 4-1 and Figure 4-2.

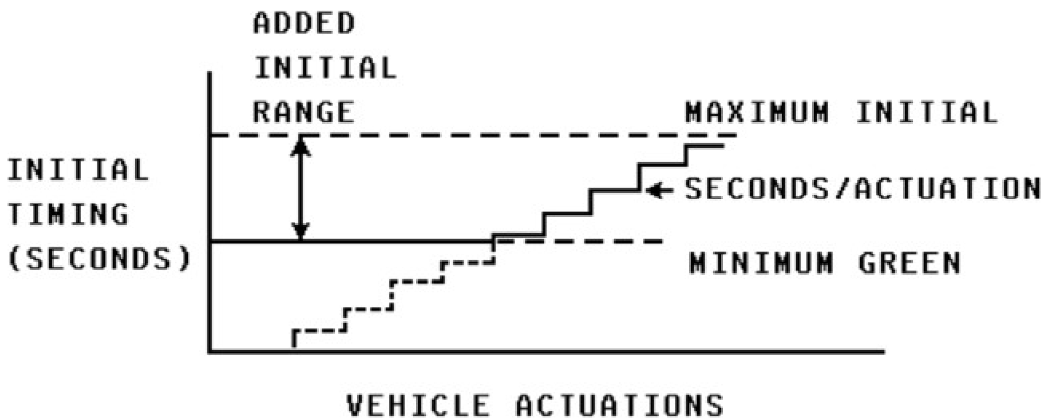


Figure 4-1: Volume Density, Variable Initial Green

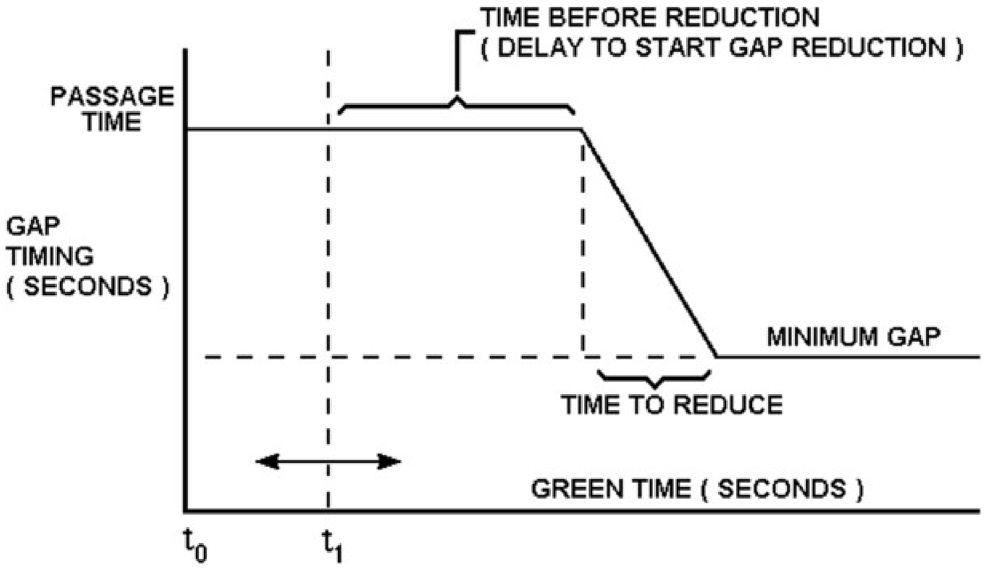


Figure 4-2: Gap Reduction

NOTES:
1. **to** = Start of phase Green.
2. **t1** = Registration of serviceable conflicting call.
3. **Time Before Reduction** shall not start timing before **t1**.
4. **Maximum** timer start shall be conditional upon being in the **Green** interval and registration of a serviceable conflicting call - vehicle or pedestrian.
5. **Passage Time** portion of **Green** interval must time concurrently with **Initial** subject to vehicle actuation.

4.3.2.1.1 Exclusive Pedestrian

Exclusive Pedestrian is a phase with NO associated vehicle movement. This could be a pedestrian scramble (diagonal crossing or X-crossing) or a mid-block crossing. The phase must be enabled and can be assigned to any ring but with no concurrent or compatible phases.

The phase is placed in the Sequence table at the desired position, either after the main street phases or after the side street phases for the pedestrian scramble crossing. For a mid-block crossing it is placed after the vehicle phase.

Enter the desired Walk interval and Pedestrian Clearance interval times. Zero out all vehicle related green times of Minimum Green, Passage, Maximum Green and so on. This ensures that the coordinator understands that this phase is a pedestrian movementonly. Also enter zero for the Yellow Change interval since there is no associated vehicle movement. In the Phase Options also check the No Minimum Yellow so that the phase will not time the Unit Minimum Yellow.

If any time is desired for display of a steady Don’t Walk before vehicle movements resume, enter that time in the Red Clearance. Under coordination, enter a split timelarge enough for the Walk + Pedestrian Clearance + Red Clearance so that the split time is not overrun.

This phase can be assigned to any channel but only as a Pedestrian type. Within preemption, if this phase is to run as Track, Dwell, or Cycling, both a Preempt Phase and a Preempt Pedestrian Phase must be designated even though there is no associated vehicle movement.

4.3.2.2 **Phase Options**

Main Menu > Phases > Phase Options > Select a Phase Options Set (1-4)

```
2.2          PHASE OPTIONS SET 1          D
                              1111111
 PHASE #              1234567890123456
PHASE OMIT            ................
PED OMIT              ................
MIN VEH RECALL        ..X....X........
MAX VEH RECALL        ................
SOFT VEH RECALL       ................
```

```
PED RECALL            ................
PED RECYCLE           ................
COND SERVICE          ................
DETECTOR LOCK         ................
DUAL ENTRY            ................
SIMULTANEOUS GAP      ................
GUARANTEED PASSAGE    ................
ADDED INITIAL CALC    ................
WALK REST             ................
RED REST              ................
FLASH ENTRY           ................
FLASH EXIT            ................
CNA-1                 ................
CNA-2                 ................
NO BACKUP             ................
MAX WALK              ................
MAX EXTENSION         ................
SEQUENTIAL TIMING     ................
NO MIN YELLOW         ................
FDW PED RECYCLE       ................
```

Phase Options Entries are entered in columns for the appropriate Phase. The additional phase option parameters shown below the LCD window can be displayed by pressing the DOWN ARROW key.

Phase Options allow features to be enabled or disabled for selected phases. Phases are selected in each entry by using the UP and DOWN arrow Key to highlight the Phases and selecting the phases by pressing the alphanumeric keys for the phases desired. Phases 1-9 are selected by Numeric keys 1-9, Phase 10 is selected by Numeric Key 0, Phases 11-16 are selected by Alpha keys A-F respectively. All Phases is selected by pressing the YES key. No Phases is selected by pressing the NO Key.

Pedestrian service can be made to rest in Walk for the coordination sync phases via two methods: Either the phase is set as Call to Non-Actuated with Walk Rest Modifier (pedestrian service always runs with no push button required, the phase is flagged for C-N-A and unit C-N-A is active and unit WRM is active) or Ped Recall and Walk Rest are flagged for the phase. Both these methods also work when free.

Pedestrian service can occur repeatedly for the coordination sync phases if there are no conflicting calls present via two methods: Either the phase is set as Call to Non-Actuated with the phase flagged for Ped Recycle (pedestrian service will repeat with no push button required, the phase is flagged for C-N-A and unit C-N-A is active) or the phase is flagged for Ped Recycle and another push button actuation is received.

Finally, pedestrian service on the coordination sync phases can be repeated immediately during pedestrian clearance via the phase being flagged for Flashing Don't Walk Recycle. Any push button actuation during the clearance time will result in an immediate return to walk time.

Any pedestrian phase can run again if there is a new demand for service and if and only if there are no other conflicting calls registered. Note that flagging a phase for Ped Recall and Ped Recycle together does not result in the pedestrian service running repeatedly.

Table 4-14: Phase Options

Item	Description
PHASE OMIT	**Phase Omit (grouped toggle: . = disabled, X = enabled)** Sets omitted phases. Causes the program logic to ignore all phases flagged while the configured plan is active. If a flagged phase is in service when the plan takes effect, it is forced off (even if there is no call to a conflicting phase).
PED OMIT	**Pedestrian Omit (grouped toggle: . = disabled, X = enabled)** Sets omitted pedestrian phases. Causes the program logic to ignore all ped phases flagged while the configured plan is active. If a flagged phase is in service when the plan takes effect, it is forced off (even if there is no call to a conflicting phase).
MIN VEH RECALL	**Minimum Vehicle Recall (grouped toggle: . = disabled, X = enabled)** Selects phases that have a recurring demand for vehicle service when the phase is not in its green interval.
MAX VEH RECALL	**Maximum Vehicle Recall (grouped toggle: . = disabled, X = enabled)** Selects phases with demand and call such that the timing of the green interval for that phase is extended to maximum green time. The maximum timing commences to time as if there were always a serviceable conflicting call, but the phase does not terminate unless there is an actual serviceable conflicting call.
SOFT VEH RECALL	**Soft Vehicle Recall (grouped toggle: . = disabled, X = enabled)** Selects phases for placement of demand when all conflicting phases are in green dwell or red dwell and there are no serviceable conflicting calls.
PED RECALL	**Pedestrian Recall (grouped toggle: . = disabled, X = enabled)** Selects phases with recurring pedestrian demand that function in the same manner as an external pedestrian call except that it does not recycle the pedestrian service until conflicting phase is serviced. Any phase may be selected but only phases with phase timing entries of greater than 0 are provided Pedestrian Service.

PED RECYCLE	**Pedestrian Recycle (grouped toggle: . = disabled, X = enabled)** Controls the recycling of the pedestrian movement during coordinated operation. The effect depends on whether the phase is operating in the actuated or non-actuated mode: • In the actuated mode if a serviceable pedestrian call exists on the subject phase and the Hold input is active, the pedestrian movement is recycled when the Pedestrian Recycle input is active, regardless of whether a serviceable conflicting call exists. • In the non-actuated mode if the subject phase has reached the Green Dwell / Select state, the Pedestrian Omit is not active on the phase and a serviceable conflicting call does not exist, the pedestrian movement is recycled when the pedestrian recycle input is active.
COND SERVICE	**Conditional Service (grouped toggle: . = disabled, X = enabled)** Selects actuated leading phases that may be served while operating in the Free or Coordinated Mode. When timing phases concurrently with the next serviceable call on a phase that conflicts with more than one of the phases timing (about to cross a barrier), if oneof the lagging phases is prepared to terminate due to gap out, the ring containing the gapped-out phase reverts to a preceding vehicle phase if all the following conditions apply: • A call exists on a preceding actuated vehicle phase. • The Conditional Service option is on the leading phase. • There is sufficient time remaining before max time out of the phase(s) not prepared to terminate in the other ring while free or sufficient time remaining in the Split Time while coordinated. “Sufficient time remaining” by default means that there is sufficient time to serve clearance time of the lagging phase plus minimum green plus clearance on the conditionally served phase. The Conditional Service Minimum parameter may be used to require a larger amount of remaining time. Note: during coordination only the coordinated (Sync) phases may do Conditional Service. Note:older versions of Omni before 1.11 had the lagging phases flagged to do conditional service to the leading phase. This is now inverted in that the leading phase to receive conditional service is now flagged.
DETECTOR LOCK	**Detector Locking Enable (grouped toggle: . = disabled, X = enabled)** Selects phases that have vehicle detector memory (a vehicle detector call during the PhaseYellow and Red intervals is stored). Detector Options provides the opportunity to select this functionality on a detector basis. Selection of this entry on a phase basis as LOCKING forces the operation of all phase associated detectors to respond as LOCKING regardless of their Detector Option entry for Locking. Note: NTCIP defines the option in the inverse sense, as Detector Non-Locking.
DUAL ENTRY	**Dual Entry (grouped toggle: . = disabled, X = enabled)** Selects phases in multiple ring configurations that become active upon entry into a concurrency group (crossing a barrier) when no calls exist in its ring within its concurrency group. Any phase may be selected. However, if two phases are

	selected in the same ring and barrier the dual entry phase is the first phase in the present sequence.
SIMULTANEOUS GAP	**Simultaneous Gap Enable (grouped toggle: . = disabled, X = enabled)** Selects phases in multi-ring configurations that allowed to revert to the extensible portion once in a Gapped-Out state if the other rings have not gapped out yet. Note: NTCIP defines the option in the inverse sense, as Simultaneous Gap Disable.
GUARANTEED PASSAGE	**Guaranteed Passage (grouped toggle: . = disabled, X = enabled**) Selects actuated phases operating in volume density mode (using gap reduction) that retain the right of way for the unexpired portion of the passage time following the decision to terminate the green due to a reduced gap.
ADDED INITIAL CALC	**Added Initial Calculation (grouped toggle: . = disabled, X = enabled)** Selects Phases that use an alternate methodology for calculating the Variable Initial interval. Selection of a phase compares the counts of all associated detector inputs which have Added Init enabled under detector options. The largest count is used to calculate the Variable Initial Interval. A Phase which is not selected sums all associateddetector inputs which have Added Init enabled under detector options. This sum is used to calculate the Variable Initial Interval. This entry has no effect if the selected Phase Timing Entry for Added Init is 0.
WALK REST	**Walk Rest (grouped toggle: . = disabled, X = enabled**) Also known as Actuated Rest In Walk. Selects actuated phases that rest at the end of the phase Walk interval, as opposed to the end of the Green interval, when no serviceable conflicting call is present. Registration of a serviceable conflicting call initiates the timing of the Pedestrian Clearance interval. Walk Rest does not create demand for pedestrian service.
RED REST	**Red Rest (grouped toggle: . = disabled, X = enabled)** An operating mode in which the signal “rests” in red for all approaches, and gives a green indication to the first approach that is actuated
FLASH ENTRY	**Flash Entry (grouped toggle: . = disabled, X = enabled)** Selects phases to service before initiating a Planned Flash Operation. Planned Flash is based on the Unit Flash Channel selections and therefore Flashes the Load switches. Planned Flash is initiated by External Input, TBC or Command. The Controller exits presently servicing phases to service the FLASH ENTRY PHASE(S) (both Vehicle and Pedestrian Service), clear to an All Red, initiate flashing operation in accordance with the UNIT FLASH CHANNELS Selected. Phases selected must be compatible.
FLASH EXIT	**Flash Exit (grouped toggle: . = disabled, X = enabled)** Selects phases to service when exiting a Planned Flash Operation. When exiting the Planned Flash operation,the Controller terminates the flashing operation and service the FLASH EXIT PHASE(S) with Vehicle and Pedestrian demand. Phases selected must be compatible.

CNA-1	**Call to Non-Actuated 1 (grouped toggle: . = disabled, X = enabled)** Selects phases that respond as Non-Actuated Phases when the external input CNA1 is activated. Non-Actuated phase operation is defined in NEMA TS 2 section 3.5.3.2.3. Non-Actuated phases have a permanent demand placed for vehicle and pedestrian service.
CNA-2	**Call to Non-Actuated 2 (grouped toggle: . = disabled, X = enabled)** Selects phases that respond as Non-Actuated Phases when the external input CNA2 is activated. Non-Actuated phase operation is defined in Section 4.3.1.5.2 NEMA TS 2 BIU I/O Mapping. Non-Actuated phases have a permanent demand placed for vehicle and pedestrian service.
NO BACKUP	**No Backup (grouped toggle: . = disabled, X = enabled**) Prevents backup to this phase, avoiding yellow trap. If enabled, this phase is omitted when the next phase in sequence is on if the next phase in sequence is in the same barrier group. In applications where there are opposing protected-only and protected/permissive left turns as with a five section signal head, the phase with the protected-only left turn should have No Backup turned ON thus preventing a yellow trap. Backing into the phase with the protected/permissive left turn will not cause a yellow trap, because vehicles facing the opposing protected-only left turn are prevented from turning left during the yellow change interval of their adjacent through movement. Caution should be exercised if this is applied to left turns on an intersection that may have light to no vehicle demand on the cross streets at late hours, as drivers could be waiting too long for service that may never come. As a clarification, this is applied only to leading left turn phases, not lagging left turn phases. If by time of day the sequence ischanged to lagging left turns this option will have NO effect on a lagging left turn.
MAX WALK	**Maximum Walk (grouped toggle: . = disabled, X = enabled)** If enabled, the Max1 time is used as the initial ped Walk time if there is a ped call when the phase first goes green. The Max Green timer will count down as if there is a conflicting call.At the end of the walk time, the Controller will enter walk rest. When a conflicting call is registered, the Controller will begin timing ped clearance. If the conflicting call is removed before the end of ped clearance, the ped is reserviced usingthe normal Walk time and return to walk rest if there is no conflicting call. If the Max Walk input is assigned in the I/O mapping, this feature is externally activated and is only active on the selected phases while that input is on. If the Max Walk input is not assigned, this feature is always active on the selected phases. Max Walk Mode is disabled if either of the CNA inputs is active.
MAX EXTENSION	**Maximum Extension (grouped toggle: . = disabled, X = enabled**) If enabled, the max green timer will not begin counting down until after the minimum green and initial green timers are expired.
SEQUENTIAL TIMING	**Sequential Timing (grouped toggle: . = disabled, X = enabled)** If enabled, the extension timer will not begin counting down until after the minimum green and initial green timers are expired.

NO MIN YELLOW	**No Minimum Yellow (grouped toggle: . = disabled, X = enabled)** If enabled, the phase is permitted to time a Yellow Change interval that is less than the Unit Minimum Yellow time. If disabled, the phase Yellow Change interval will always be a least the Unit Minimum Yellow time, even if the configured Yellow Change time is less.
FDW PED RECYCLE	**Flashing Don't Walk Pedestrian Recycle (grouped toggle: . = disabled, X = enabled)** If enabled, pedestrian service is permitted to immediately recycle to Walk if a new pedestrian call is placed during the Flashing Don't Walk pedestrian clearance interval. If this option is not enabled, pedestrian service is not allowed to recycleback to Walk until the Flashing Don't Walk pedestrian clearance interval has completed timing the full duration.

4.3.2.3 **Phase Sequences**

```
2.3          PHASE SEQUENCE 1

RING 1 1,2,3,4
RING 2 5,6,7,8
RING 3
RING 4
```

Main Menu > Phases > Phase Sequences > Select a Phase Sequence (1-16)

The order of position within a ring sequence determines the phase sequence for the ring (i.e. Ring 1 (phase 1, 2, 3 and 4) or Ring 2 (phase 5, 6, 7 and 8)). The number of the phase does not determine which phase is served next. A Phase Sequence with Ring 1 as 8,7,6,5 and Ring 2 as 4,3,2,1 and with the same Phase Concurrency, and Phase Startup but different Ring Assignment as the default database will start up and run as follows: 6 and 2, 5 and 1, 8 and 4, 7 and 3. The phase numbers should not be ordered in a manner that would violate the Controller configuration, see Phase Concurrency and Ring Assignment. The Controller always expects that Ring 1 has phase assignments.

If there are to be phase reversals amongst the phase pairs to be implemented by time of day define additional sequences that have the phase pairs reversed. (i.e. default setup has Ring 1 with 1,2,3,4 and Ring 2 with 5,6,7,8 in Sequence 1 whereas Sequence 2 could have Ring 1 with 2,1,3,4 and Ring 2 has 5,6,7,8 with phase pair 1 and 2 reversed).

Note 1: Pattern 254, Free mode, always uses Sequence table #1.

> Note 2: Phase sequences are not editable in Texas Diamond mode. Sequences are determined automatically based on the current Texas Diamond type and are labeled as such on this screen.

4.3.2.4 **Phase Enable and Rings**

```
2.4         PHASE ENABLE AND RINGS
                     1111111
 PHASE#   1234567890123456
ENABLE    XXXXXXXX
RING 1    XXXX
RING 2        XXXX
RING 3
RING 4
```

Main Menu > Phases > Phase Enable and Rings

Phases must be enabled and assigned to one of the rings to be usable. If a phase is never to be used, remove the Phase Enable here rather than apply a Phase Omit in the Phase Options. Any phase that does not have the Enable set is treated as if it does not exist. This screen allows phases to be assigned one of 4 possible rings. A ring consists of one or more sequentially timed and individually selected conflicting phases so arranged as to occur in an established order. Within a ring any phases assigned there time sequentially and are never capable of timing concurrent with other phases in the same ring.

Phases are selected by highlighting the appropriate Enable or Ring row and pressing the alphanumeric keys to toggle the appropriate column. Keys 1-9 toggle phases 1-9, key 0 toggles phase 10, Keys A-F toggle phases 11-16 respectively. The YES Key selects all phases, and the NO key clears all phases. All Enabled Phases must be assigned into one of the rings. Disabled phases may not be selected. The default configuration represents a standard dual-ring intersection, where Ring 1 contains Phases 1-4 and Ring 2 contains Phases 5-8.

4.3.2.1 Phase Concurrency

```
2.5           PHASE CONCURRENCY          D
                     1111111
 PHASE#    1234567890123456
PHASE 1    ....XX..........
PHASE 2    ....XX..........
PHASE 3    ......XX........
PHASE 4    ......XX........
PHASE 5    XX..............
```

```
PHASE 6    XX..............
PHASE 7    ..XX............
PHASE 8    ..XX............
PHASE 9    ................
…
PHASE 16   ................
```

Main Menu > Phases > Phase Concurrency

Phase Concurrency selects phases that may be serviced simultaneously and independently with another phase in another ring. By selecting concurrent phases and having them assigned to specific rings creates a barrier in which the rings are interlocked such that no concurrent service of conflicting phases occurs, and phases currently being served must terminate together to facilitate crossing the barrier.

The additional phase parameters shown below the LCD window is displayed by pressing the DOWN ARROW key.

Phases are selected by highlighting the appropriate Phase row and pressing the alpha-numeric keys to toggle the appropriate column.

- Keys 1-9 toggle phases 1-9
- Key 0 toggles phase 10
- Keys A-F toggle phases 11-16 respectively
- The YES Key selects all phases
- The NO key selects NO phases.
- Only enabled phases may be selected
- Phases assigned to the same ring may not be selected as concurrent
- The selection of a phase concurrent requires the selection to be made in bothplaces

The default configuration represents a standard dual-ring intersection where Ring 1 contains Phases 1-4 and Ring 2 contains phases 5-8. In this example, the selection of phase 5 & 6 as concurrent in the phase 1 row requires that phase 1 also be selected as concurrent in the phase 5 and phase 6 rows. Phase Concurrency is a mutual dependency, Phase 1 is concurrent with phase 5 and phase 5 is concurrent with phase 1 and must be explicitly configured as such.

An Exclusive phase would have no Phase Concurrency with phases in any other ring. Restricted Phases would have no concurrency between themselves but would retain concurrencies with the other phases. Restricted Phases will also require a phase reversal in one of the rings.

NOTE: Phase concurrency is not editable in Texas Diamond mode. Concurrency is determined automatically based on the current Texas Diamond type and are labeled as such on this screen.

4.3.3 **Overlaps**

```
3               OVERLAPS

1. VEHICLE OVERLAPS
2. PEDESTRIAN OVERLAPS
```

Main Menu > Overlaps

An overlap is vehicle or pedestrian signal that allows traffic movement concurrent with one or more “included” or “parent” phases. There are four data sets for both vehicle overlaps and pedestrian overlaps.

The following selectable entries are defined:

Table 4-15: Overlaps

Item	Description
Vehicle Overlaps	Settings that allow you to configure vehicle overlaps
Pedestrian Overlaps	Settings that allow you to configure pedestrian overlaps

4.3.2.2 Vehicle Overlaps

```
3.1   VEHICLE OVERLAP  1/A IN SET 1      R
TYPE      NORMAL
INCLUDED PHASES  ...............
MODIFIER PHASES  ...............
EXCLUDED PHASES  ...............
EXCLUDED PEDS    ...............
EXCLUDED WALKS   ...............
NO TRAIL GRN PHS ...............
```

```
DET CALL PHASES  ...............
TRAILING GRN        0
TRAILING YEL       0.0
TRAILING RED       0.0
START DELAY        0.0
ACTUATED ONLY     NO
DETECTOR LOCK     NO
NO MIN YELLOW     NO
```

Main Menu > Overlaps > Vehicle Overlaps

Overlaps B-P can be displayed by pressing the NEXT key.

Table 4-16: Vehicle Overlaps

Item	Description
TYPE	**Overlap Type (toggle)** Select the vehicle overlap type using the + and – keys. Theavailable overlap types are as follows. NORMAL: The overlap is controlled only by the included phases. The overlap outputis green when: • An included phase is green. • An included phase is yellow or red clearance and an included phase is next. Theoverlap output is yellow when: • An included phase is yellow, and an included phase is not next. The overlap output is red when: • The overlap green and yellow are not on. MINUS GRN_YEL: Minus Green Yellow. The overlap is controlled by the included phases and the modifier phases. The overlap is green when: • An included phase is green, and a modifier phase is not green. • An included phase is yellow or red clearance and an included phase is next and amodifier phase is not green. The overlap output is yellow when:

	• An included phase is yellow, and a modifier phase is not yellow, and an included phase is not next. The overlap output is red when: • The overlap green and yellow are not on. Usually a two-color right turn overlap FYA: Flashing Yellow Arrow for a Protected/ Permissive Turn. Configure the permissive movement as an Included phase, and the protected movement as a Modifier phase. (i.e. INC PH = 2, MOD PH = 1, always the opposing through movement is theIncluded phase whereas the left turn is the Modifier phase). A four-color display. FYA NO RED: Flashing Yellow Arrow without Red Clearance. Same operation as FYA but skip red clearance on the overlap when it is going from modifier phase toincluded phase. A four-color display. FRA: Flashing Red Arrow for a Protected/Permissive Turn. This is similar to FYA, but flashes red arrow during permissive movement instead of yellow arrow. (flash red output of overlap instead of flashing green output of overlap) A three-color display.
INCLUDED PHASES	**Included Phases (grouped toggle: "." = disabled, 0-F = enabled)** When an included phase output is green or when the Controller is cycling between included phases, the overlap output is green.
MODIFIER PHASES	**Modifier Phases (grouped toggle: "." = disabled, 0-F = enabled)** Modifier phases modify the operation of the overlap, and their effect may depend on the overlap type. For a Minus Green Yellow overlap, it will not be green when any modifier phase is green. If there are no modifier phases, a Minus Green Yellow overlap will behave the same as a Normal overlap. For FYA or FYA RED, the overlap is dark when the modifier phase is green (which the protected left turn phase green output is supplying the Steady Green Arrow).
EXCLUDED PHASES	**Excluded Phases (grouped toggle: "." = disabled, 0-F = enabled)** Excluded phases are phases with which the overlap is not desired to be compatible. The overlap is not active when any phase in this list is active, even if the phase is compatible with an overlap included phase. i.e. if Overlap A is a normal 2+3 overlap it is obviously not compatible with phases 1 and 4 so these do not need to be put here. Overlap A is naturally compatible with phases 5, 6 and 7, 8. However perhaps the overlap should not run with either phase 5 or 6- which are concurrent with phase 2 or it should not run with either phase 7 or 8- which are concurrent with phase 3. It would be either of these phases that would be put in this list to let Omni know to change the normal concurrency for the overlap.
EXCLUDED PEDS	**Excluded Peds (grouped toggle: "." = disabled, 0-F = enabled)** Excluded pedsare vehicle phase pedestrian movements (not ped overlaps) with which the associated overlap is incompatible. The overlap is not active when the pedestrian movement is active for any phase in this list. The overlap may be compatible with the associated vehicle movement for these phases, but it is incompatible with the pedestrian movement.

EXCLUDED WALKS	**Excluded Walks (grouped toggle: "." = disabled, 0-F = enabled)** Excluded walks are vehicle phase pedestrian movements (not ped overlaps) with which the associated overlap is incompatible. The overlap is not active when the pedestrian movement is in walk interval for any phase in this list. The overlap may be compatible with the associated vehicle movement or pedestrian clearance for these phases, but it is incompatible when the pedestrian movement is in a walk interval.
NO TRAIL GRN PHS	**No Trailing Green Phases (grouped toggle: "." = disabled, 0-F = enabled**) If theoverlap is terminating with one of these phases, the overlap Trailing Green interval skipped.
DET CALL PHASES	**Detector Call Phases (grouped toggle: "." = disabled, 0-F = enabled**) Selectsthe phases that will be called when the overlap has a detector call. If no phases are selected, all Included Phases will be called.
TRAILING GRN	**Trailing Green Time (number: 0-255 sec)** Upon termination, the overlap will remain green for this amount of time before going to the Trailing Yellow Change interval. If configured, the Advance Warning Overlap output is turned on during Trailing Green. Trailing Yellow and Trailing Red times will follow the Trailing Green. Note that during coordination any terminating overlap that is timing any Trailing Green or Yellow or Red may cause the associated phase split time to be overrun. The phase's split time may need to be increased to accommodate the additional time of the slower following overlap.
TRAILING YEL	**Trailing Yellow Change Time (number: 0-25.5 sec, stored as tenths)** Determines the length of the Yellow Change interval for this overlap. If Trailing Green, Yellow and Red are all set to zero, the Yellow Change time of the terminating included phase is used. However, if this overlap is FYA and there is noTrailing Green or Trailing Yellow time used the overlap uses the Yellow Change time of the Modifier phase. The actual duration of the yellow change time will not be less than Unit Minimum Yellow unless the No Minimum Yellow option is enabled for this overlap.
TRAILING RED	**Trailing Red Clearance Time (number: 0-25.5 sec, stored as tenths)** Determines the length of the red clearance interval for this overlap. If Trailing Green, Yellow andRed are all set to zero, the Red Clearance time of the terminating included phase is used.
START DELAY	**Start Delay Time (number: 0-25.5 sec, stored as tenths)** Overlap delayed start ofgreen time. When the overlap would normally begin service, it will wait and display solid red for this amount of time before beginning service. This allows included phases to begin service in advance of the overlap.

ACTUATED ONLY	**Actuated Only Mode (toggle: No = disabled, Yes = enabled)** If enabled, the overlap has service when it has a detector call (which calls the selected Detector Call Phases). When an overlap is setup as actuated-only, it may get called and begin service near the end of the parent phase green, but to avoid the overlap going green briefly and terminating without serving an adequate minimum green time, the actuated overlap's minimum green time stems from the largest minimum green of theoverlap's parent phases. However, the overlap may not start at all if there is insufficient remaining time to run the overlap minimum green based on either the Maximum Green time of the current parent phase when the Controller is free or on the current parent phase split time when it is coordinated. If disabled, the overlap will run when an Included Phase is active.
DETECTOR LOCK	**Detector Locking (toggle: No = disabled, Yes = enabled**) If enabled, any calls from detectors assigned to the overlap is locked by the overlap until the overlap has been served. If disabled, calls may still be locked by the detector if that option is enabled.
NO MIN YELLOW	**No Minimum Yellow (toggle: No = disabled, Yes = enabled)** If enabled, the overlap is permitted to time a trailing yellow time that is less than the Unit Minimum Yellow time. If disabled, the overlap trailing yellow time will always be a least the Unit Minimum Yellow time, even if the configured Trailing Yellow time is less.

The next tables present the color sequence as seen on the main street side of the barrier with Flashing Yellow Arrow overlaps for both left turns. Shown are the lead-lead arrangement, the lag-lag arrangement, and finally a lead-lag arrangement. Note that the left turns have control by a four-color signal: a steady red arrow, a steady yellow arrow, a flashing yellow arrow, and a green steady arrow. The first three colors come from the overlap output whereas the fourth color is the green output of the left turnphase.

Table 4-17: Lead – Lead Phasing, R1- 1,2; R2- 5,6

	Phase 6			Phase 1/Overlap A				Phase 5/Overlap B				Phase 2		
	R	Y	G	RA	YA	FYA	GA	RA	YA	FYA	GA	R	Y	G
Red Clearance														
Protected Left Turn														
Yellow Change														
Left Turn Red Clear														
Permissive Phase														
Yellow Change														
Red Clearance														

Table 4-18: Lag – Lag Phasing, R1- 2,1; R2- 6,5

	Phase 6			Phase 1/Overlap A				Phase 5/Overlap B				Phase 2		
	R	Y	G	RA	YA	FYA	GA	RA	YA	FYA	GA	R	Y	G
Red Clearance														
Permissive Phase														
Yellow Change														
Red Clearance														
Protected Left Turn														
Yellow Change														
Left Turn Red Clear														

Table 4-19: Lead – Lag Phasing, R1- 2,1: R2- 5,6

	Phase 6			Phase 1/Overlap A				Phase 5/Overlap B				Phase 2		
	R	Y	G	RA	YA	FYA	GA	RA	YA	FYA	GA	R	Y	G
Red Clearance														
Protected Left Turn														
Yellow Change														
Left Turn Red Clear														
Permissive Phase														
Yellow Change														
Red Clearance														
Protected Left Turn														
Yellow Change														
Red Clearance														

Legend							
	Red Ball Red Arrow		Yel Ball Yel Arrow		Yel Flashing Arrow		Grn Ball Grn Arrow

arrow to govern the permissive left turn. This would indicate a stop firstand proceed if Left turn movements at intersections have been one of the more dangerous vehicular movements ever since the first automobile turned left in front of a heavy freight wagon. Most intersections with automated traffic control have historically left the driver of the vehicle to his own judgment and without any protection from opposing vehicle movements.

In general, permissive left turns during the circular green have grown progressively more difficult with the increase in traffic volumes.

The use of protected left turns by means of arrow indications will provide a significant measure of safety albeit with an increase in wait time for other vehicular movements. Using a protected/permissive left turn movement is a means of addressing that increase in wait time by giving two methods for vehicles to turn left; both a protected movement with a green arrow while other conflicting vehicle movements are stopped, and a permissive movement that is possible once there is a gap in conflicting vehicles with a flashing yellow arrow giving cautionary indication.

Omni supports either Flashing Yellow Arrow (FYA) or Flashing Red Arrow (FRA) operation as used in protected/permissive left turn movements, since some agencies prefera flashing red the right of way is clear. The flashing yellow arrow is a cautionary indication but too many drivers mistaken any flashing yellow display as proceed at posted speed with no thought about taking precautions.

Omni has the ability for scheduled changes with the protected/permissive left turn movement display using the four-color signal. The Flashing Yellow Arrow (FYA) operation can be made as protected only, permissive only or both protected and permissive by time of day scheduled changes. Some of these configurations would need to be placed into one of the Overlap Table sets so that each set can be selected by time of day pattern. These tables would have a similar configuration except for the specific change required for desired operation.

By default, Vehicle Overlap Table set 1 is selected in the Pattern Tables. (Split Table 1, Sequence Table 1, Phase Timings Table 1, Phase Options Table 1, Ped Overlap Table 1, Transit Priority Table 1, Vehicle Detector Table 1, Ped Detector Table 1, etc.) The pattern tables would need to be edited to change which overlap table set is desired. These patterns are called by the Action table which is indexed by the Day Plan table based on the hour and minute data therein.

When configuring the Vehicle Overlap, using Vehicle Overlap Table 1, the **Overlap Type** would need to be set to ‘FYA’ for the Flashing Yellow Arrow Protected/Permissive Left Turn. The **Included Phases** needs to be set to the conflicting opposing through movement of the left turn. The **Modifier Phases** would be set to the left turn movement only. For example, in a NEMA dual ring eight phase quad intersection and considering one of the left turns, the **Included Phases** would be set to Phase 2 and the **Modifier Phases** would be set to Phase 1.

If all four left turn movements at this intersection were to be made into FYA types, four overlaps would need to be configured in one overlap table set in the same manner for this operation to occur. This provides the leading protected left turn movements that are followed by the lagging permissive left turn movements.

NOTE: The FYA overlap always uses the **Modifier Phases** clearance times for the Steady Yellow and Steady Red arrows.

For **Texas Diamond mode** operation of the Controller, there can be multiple phases that drive an overlap for the left turn movement. To use a FYA in this mode of operation,there will still be only one phase for the **Included Phase** as the opposing through movement, for example phase 2. The left turn movement may have phases 1 and 9 and 10.

These three phases will go into the **Modifier Phases**. Thus, the overlap will now provide the Steady Red Arrow, the Steady Yellow Arrow and Flashing Yellow Arrow. As stated previously, the left turn phase drives the green arrow but now there are three phases, so a second Vehicle Overlap is needed with a **Normal Type**. Into this overlap's **Included Phases** go the left turn phases of 1 and 9 and 10. It is now the Green output of this overlap that provides the Steady Green Arrow. This Green Arrow will remain active when moving between the left turn movements.

There are some agencies that are concerned about the potential conflicting movement when the opposing through movement is terminating simultaneously with the permissive left turn movement. The protected left turn movement already has the opposing through movement halted and so does not have this potential problem. When the steady yellow arrow is displayed to terminate the permissive left turn, the opposing through movement is also terminating and so a vehicle driver may decide to complete the left turn while a through vehicle movement is also deciding to pass through the intersection on a circular yellow indication. However, by applying double clearing timing to the overlap governing the protected/permissive left turn, a measure of safety is provided.

The FYA is handled by a specific vehicle overlap type. For example, to configure a leading protected left turn followed by the lagging permissive left turn, use Overlap #1 in Overlap Set #1:

Overlap #1

Type:	FYA
Included Phases:	2
Modifier Phases:	1
Excluded Phases:	none
Excluded Peds:	none
No Trail Green Phases:	1
Detector Call Phases:	none
Trailing Green:	3.0
Trailing Yellow:	3.0
Trailing Red:	2.0
Start Delay:	0.0

Actuated Only: No

Detector Lock: No

No Minimum Yellow: No

The first three parameters are all that are needed for normal FYA operation. The double clearance is accomplished by placing the value of the opposing movement Yellow Change into the Trailing Green parameter. Without it, the overlap (FYA) terminates simultaneously with the opposing through movements.

NOTE: Whenever a value is placed into the Trailing Green parameter, the Trailing Yellow and Trailing Red must also have clearance values entered.

The No Trailing Green set to Phase #1 ensures that the protected Green Arrow does not lengthen by the Trailing Green value; however, the Trailing Green is used by the Flashing Yellow Arrow before it advances to the Steady Yellow and Steady Red Arrows. This ensures that the opposing through movement (Phase #2) has terminated and reached a circular red. This lengthens the split time needed by three seconds for the phases (#2) that accompany the FYA governed movement.

For lagging protected left turns with leading permissive, the above configuration does not change at all. Instead, the **Ring Sequence** is changed using alternate phase pairs as expected in normal NEMA dual ring eight phase intersections. This places the conflicting opposing through movement in the first position of the sequence with the protected left turn movement in the second position. This sequence change is calledfor by time of day change in the pattern table. For example, the first **Ring Sequence** is configured for the usual NEMA dual ring configuration with Ring 1 having a phase sequence as 1, 2, 3, 4 and Ring 2 having a phase sequence as 5, 6, 7, 8. The second **Ring Sequence** may have Ring 1 with a phase sequence as 2, 1, 3, 4 and Ring 2 as 6, 5, 7, 8. This places both left turns on the main street as lagging left turn movements.

To omit the protected left turn operation of FYA by time of day schedule, apply a Phase Omit to the left turn phase. The overlap runs as a Permissive Only left turn with the FYA displayed during the conflicting opposing through movement. Select this same Vehicle Overlap table set in the pattern table but select the Split Mode in the Split table to have the Phase Omit applied to the left turn phase.

NOTE: The FYA overlap uses only the **Modifier Phases** clearance times for the Steady Yellow and Steady Red arrows.

To run the overlap as a Permissive Only left turn that has a three-color signal with a flashing yellow arrow rather than the four-color protected/permissive left turn, change the configuration as follows: set the **Included Phases** as before but do not set any **Modifier Phases**. The left turn is always governed by this dedicated signal. This may also be done in one of the Overlap Table sets to be called by time of day as a permissive only left turn using the four-color signal.

To omit the permissive left turn operation of FYA by time of day schedule, make another copy of the Vehicle Overlap table configuration into another Overlap Table set. modify the contents of the overlap in the other table set as follows: remove the configured **Included Phases**. The overlap runs as a Protected Only left turn with the FYA **never** being displayed during the conflicting opposing through movement but only the Steady Green arrow during the protected turn. Select this Vehicle Overlap table set in the pattern table. Note that the FYA overlap uses only the **Modifier Phases** clearance times for the Steady Yellow and Steady Red arrows. At the time of FYA mode change between regular protected/permissive and protected only operation, the software gracefully terminates or begins the overlap as called for in the schedule.

If neither the Included Phases clearance times nor the Modifier Phases clearance times are satisfactory, you may elect to enter explicit clearance times for the vehicle overlap itself which is used instead.

To suppress the FYA display during a conflicting pedestrian movement, the **Excluded Ped** flag can be set for the conflicting pedestrian phase in the overlap table. By setting this flag in the appropriate Vehicle Overlap table, the FYA display is not seen while the pedestrian movement is timing during these certain times of day. The overlap remains at a Steady Red Arrow and once the pedestrian movement is finished the Flashing Yellow Arrow can begin.

For NEMA TS 2 usage of FYA, the MMU must be the newer MMU2 model or a smart monitor that understands the four-color displays of the FYA. Additional details of this are in the NEMA TS 2 Amendment 4 FYA manual. Configurations of FYA for Omni NEMA TS 2 follow.

First, setup the overlaps as follows:

	Olap 1	Olap 2	Olap 3	Olap 4
Type	FYA PPLT	FYA PPLT	FYA PPLT	FYA PPLT
Included Phases	2	4	6	8
Modifier Phases	1	3	5	7

A. Following the information in the NEMA TS 2 Amendment 4 FYA manual,the **FYA Mode A configuration** would be as follows for an NEMA TS 2 cabinet. (Omni database atcDatabase_0022220001.gz).

The alternate Channel Assignments for the default NEMA TS 2 cabinet setup are as follows:

										1	1	1	1	1	1	1
Channel#-	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
Type-	v	v	v	v	v	v	v	v	o	o	o	o	p	p	p	p
Source-	1	2	3	4	5	6	7	8	1	2	3	4	2	4	6	8

The changes for MODE A are as follows:

The Channel Assignments remain unchanged as shown above.

The I/O Map remains with the defaults, no changes with the ped channels on 13-16. (1.5.2.2).

B. Following the information in the NEMA TS 2 Amendment 4 FYA manual,the **FYA Mode B configuration** would be as follows for an NEMA TS 2 cabinet. (Omni database atcDatabase_0022220002.gz)

The Channel Assignments for the default NEMA TS 2 cabinet setup is as follows:

										1	1	1	1	1	1	1
Channel#-	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
Type-	v	v	v	v	v	v	v	v	p	p	p	p	o	o	o	o
Source-	1	2	3	4	5	6	7	8	2	4	6	8	1	2	3	4

The changes for MODE B are as follows:

The Channel Assignments remain unchanged as shown above.

The I/O Map remains with the defaults, no changes with the ped channels on 9-12. (1.5.2.2)

C. Following the information in the NEMA TS 2 Amendment 4 FYA manual, the **FYA Mode C configuration** would be as follows for an NEMA TS 2 cabinet. (Omni database atcDatabase_0022220003.gz)

The alternate Channel Assignments for the default NEMA TS 2 cabinet setup is as follows:

										1	1	1	1	1	1	1
Channel#-	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
Type-	v	v	v	v	v	v	v	v	o	o	o	o	p	p	p	p
Source-	1	2	3	4	5	6	7	8	1	2	3	4	2	4	6	8

The changes for MODE C are as follows:

The Channel Assignments are changed as follows:

										1	1	1	1	1	1	1
Channel#-	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
Type-	o	v	o	v	o	v	o	v	v	v	v	v	p	p	p	p
Source-	1	2	2	4	3	6	4	8	1	3	5	7	2	4	6	8

The I/O Map remains with the defaults, no changes with the ped channels on 13-16. (1.5.2.2)

D. Following the information in the NEMA TS 2 Amendment 4 FYA manual, the **FYA Mode D configuration** would be as follows for an NEMA TS 2 cabinet. (Omni database atcDatabase_0022220004.gz)

The Channel Assignments for the default NEMA TS 2 cabinet setup is as follows:

```
                             1 1 1 1 1 1 1
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-     v v v v v v v v p p p p o o o o
Source-   1 2 3 4 5 6 7 8 2 4 6 8 1 2 3 4
```

<u>The changes for MODE D are as follows:</u>

The Channel Assignments are changed as follows

```
                             1 1 1 1 1 1 1
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-     o v o v o v o v p p p p v v v v
Source-   1 2 2 4 3 6 4 8 2 4 6 8 1 3 5 7
```

The I/O Map remains with the defaults, no changes with the ped channels on 9-12. (1.5.2.2)

E. Following the information in the NEMA TS 2 Amendment 4 FYA manual, the **FYA Mode E configuration** would be as follows for an NEMA TS 2 cabinet. (Omni database atcDatabase_0022220005.gz)

The alternate Channel Assignments for the default NEMA TS 2 cabinet setup is as follows:

```
                             1 1 1 1 1 1 1
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-     v v v v v v v v o o o o p p p p
Source-   1 2 3 4 5 6 7 8 1 2 3 4 2 4 6 8
```

<u>The changes for MODE E are as follows:</u>

The Channel Assignments are changed as follows:

```
                             1 1 1 1 1 1 1
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-     o v o v o v o v v v v v p p p p
Source-   1 2 2 4 3 6 4 8 1 3 5 7 2 4 6 8
```

The I/O Map changes are as follows: (1.5.2.2)BIU #1 outputs:

O1	PHS1/CH1	R	CHANNEL RED	1
O2	PHS1/CH1	Y	CHANNEL YELLOW	1
O3	PHS1/CH1	G	CHANNEL GREEN	1
O4	PHS2/CH2	R	CHANNEL RED	2
O5	PHS2/CH2	Y	CHANNEL YELLOW	2
O6	PHS2/CH2	G	CHANNEL GREEN	2
O7	PHS3/CH3	R	CHANNEL RED	3
O8	PHS3/CH3	Y	CHANNEL YELLOW	3
O9	PHS3/CH3	G	CHANNEL GREEN	3
O10	PHS4/CH4	R	CHANNEL RED	4
O11	PHS4/CH4	Y	CHANNEL YELLOW	4
O12	PH4S/CH4	G	CHANNEL GREEN	4
O13	PHS5/CH5	R	CHANNEL RED	5
O14	PHS5/CH5	Y	CHANNEL YELLOW	5
O15	PHS5/CH5	G	CHANNEL GREEN	5
IO1	PHS6/CH6	R	CHANNEL RED	6
IO2	PHS6/CH6	Y	CHANNEL YELLOW	6
IO3	PHS6/CH6	G	CHANNEL GREEN	6
IO4	PHS7/CH7	R	CHANNEL RED	7
IO5	PHS7/CH7	Y	CHANNEL YELLOW	7
IO6	PHS7/CH7	G	CHANNEL GREEN	7
IO7	PHS8/CH8	R	CHANNEL RED	8
IO8	PHS8/CH8	Y	CHANNEL YELLOW	8
IO9	PHS8/CH8	G	CHANNEL GREEN	8

BIU #2 outputs:

O1	PED2/CH9	R	CHANNEL RED	9
O2	PED2/CH9	Y	CHANNEL YELLOW	9
O3	PED2/CH9	G	CHANNEL GREEN	9
O4	PED4/CH10	R	CHANNEL RED	10
O5	PED4/CH10	Y	CHANNEL YELLOW	10
O6	PED4/CH10	G	CHANNEL GREEN	10
O7	PED6/CH11	R	CHANNEL RED	11
O8	PED6/CH11	Y	CHANNEL YELLOW	11
O9	PED6/CH11	G	CHANNEL GREEN	11
O10	PED8/CH12	R	CHANNEL RED	12
O11	PED8/CH12	Y	CHANNEL YELLOW	12
O12	PED8/CH12	G	CHANNEL GREEN	12
O13	OVLA/CH13	R	CHANNEL RED	13
O14	OVLA/CH13	Y	CHANNEL GREEN	9
O15	OVLA/CH13	G	CHANNEL GREEN	13
IO1	OVLB/CH14	R	CHANNEL RED	14
IO2	OVLB/CH14	Y	CHANNEL GREEN	10
IO3	OVLB/CH14	G	CHANNEL GREEN	14
IO4	OVLC/CH15	R	CHANNEL RED	15
IO5	OVLC/CH15	Y	CHANNEL GREEN	11
IO6	OVLC/CH15	G	CHANNEL GREEN	15
IO7	OVLD/CH16	R	CHANNEL RED	16
IO8	OVLD/CH16	Y	CHANNEL GREEN	12
IO9	OVLD/CH16	G	CHANNEL GREEN	16

For left turn movements on channels 1, 3, 5, and 7, the Flashing Yellow Arrow and Steady Yellow and Steady Red outputs are driven by the overlap. The Steady Green output for the left turn vehicle phases of channels 9 - 12 are redirected in the I/O map via channels 13 through 16 in place of the non-used Yellow output of the pedestrian phases.

NOTE: In this configuration where the I/O map redirects an output, the monitor needs to have the Field Check disabled for that output.

F. Following the information in the NEMA TS 2 Amendment 4 FYA manual, the **FYA Mode F configuration** would be as follows for an NEMA TS 2 cabinet. (Omni database atcDatabase_0022220006.gz)

The Channel Assignments for the default NEMA TS 2 cabinet setup are as follows:

```
                                1 1 1 1 1 1 1
Channel#-  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-      v v v v v v v v p p p p o o o o
Source-    1 2 3 4 5 6 7 8 2 4 6 8 1 2 3 4
```

<u>The changes for MODE F are as follows:</u>

The Channel Assignments are changed as follows:

```
                                1 1 1 1 1 1 1
Channel#-  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-      o v o v o v o v p p p p v v v v
Source-    1 2 2 4 3 6 4 8 2 4 6 8 1 3 5 7
```

The I/O Map changes are as follows: (1.5.2.2):BIU #1 outputs:

O1	PHS1/CH1	R	CHANNEL RED	1
O2	PHS1/CH1	Y	CHANNEL YELLOW	1
O3	PHS1/CH1	G	CHANNEL GREEN	1
O4	PHS2/CH2	R	CHANNEL RED	2
O5	PHS2/CH2	Y	CHANNEL YELLOW	2
O6	PHS2/CH2	G	CHANNEL GREEN	2
O7	PHS3/CH3	R	CHANNEL RED	3
O8	PHS3/CH3	Y	CHANNEL YELLOW	3
O9	PHS3/CH3	G	CHANNEL GREEN	3
O10	PHS4/CH4	R	CHANNEL RED	4
O11	PHS4/CH4	Y	CHANNEL YELLOW	4
O12	PHS4/CH4	G	CHANNEL GREEN	4

O13	PHS5/CH5	R	CHANNEL RED	5
O14	PHS5/CH5	Y	CHANNEL YELLOW	5
O15	PHS5/CH5	G	CHANNEL GREEN	5
IO1	PHS6/CH6	R	CHANNEL RED	6
IO2	PHS6/CH6	Y	CHANNEL YELLOW	6
IO3	PHS6/CH6	G	CHANNEL GREEN	6
IO4	PHS7/CH7	R	CHANNEL RED	7
IO5	PHS7/CH7	Y	CHANNEL YELLOW	7
IO6	PHS7/CH7	G	CHANNEL GREEN	7
IO7	PHS8/CH8	R	CHANNEL RED	8
IO8	PHS8/CH8	Y	CHANNEL YELLOW	8
IO9	PHS8/CH8	G	CHANNEL GREEN	8

BIU #2 outputs:

O1	PED2/CH9	R	CHANNEL RED	9
O2	PED2/CH9	Y	CHANNEL GREEN	13
O3	PED2/CH9	G	CHANNEL GREEN	9
O4	PED4/CH10	R	CHANNEL RED	10
O5	PED4/CH10	Y	CHANNEL GREEN	14
O6	PED4/CH10	G	CHANNEL GREEN	10
O7	PED6/CH11	R	CHANNEL RED	11
O8	PED6/CH11	Y	CHANNEL GREEN	15
O9	PED6/CH11	G	CHANNEL GREEN	11
O10	PED8/CH12	R	CHANNEL RED	12
O11	PED8/CH12	Y	CHANNEL GREEN	16
O12	PED8/CH12	G	CHANNEL GREEN	12
O13	OVLA/CH13	R	CHANNEL RED	13
O14	OVLA/CH13	Y	CHANNEL YELLOW	13
O15	OVLA/CH13	G	CHANNEL GREEN	13

IO1	OVLB/CH14	R	CHANNEL RED	14
IO2	OVLB/CH14	Y	CHANNEL YELLOW	14
IO3	OVLB/CH14	G	CHANNEL GREEN	14
IO4	OVLC/CH15	R	CHANNEL RED	15
IO5	OVLC/CH15	Y	CHANNEL YELLOW	15
IO6	OVLC/CH15	G	CHANNEL GREEN	15
IO7	OVLD/CH16	R	CHANNEL RED	16
IO8	OVLD/CH16	Y	CHANNEL YELLOW	16
IO9	OVLD/CH16	G	CHANNEL GREEN	16

For left turn movements on channels 1, 3, 5, and 7, the Flashing Yellow Arrow and Steady Yellow and Steady Red outputs are driven by the overlap. The Steady Green output for the left turn vehicle phases of channels 13 - 16 are redirected in the I/O map via channels 9 through 12 in place of the non-used Yellow output of the pedestrian phases.

NOTE: In this configuration where the I/O map redirects an output, the monitor needs to have the Field Check disabled for that output.

G. Following the information in the NEMA TS 2 Amendment 4 FYA manual, the **Alternate FYA Mode G configuration** is as follows for an NEMA TS 2cabinet.

NOTE: This configuration uses only twelve channels out of 16 and will require I/O mapping changes. (Omni database atcDatabase_ 0022220007.gz)

The Channel Assignments for the default NEMA TS 2 cabinet setup is as follows:

```
                                1 1 1 1 1 1 1
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-     v v v v v v v v p p p p o o o o
Source-   1 2 3 4 5 6 7 8 2 4 6 8 1 2 3 4
```

<u>The changes for MODE G are as follows:</u>

The Channel Assignments are changed as follows:

```
                            1 1 1 1 1 1 1 1 1 1 2
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
Type-     o v o v o v o v p p p p . . . . v v v v
Source-   1 2 2 4 3 6 4 8 2 4 6 8         1 3 5 7
```

The I/O Map changes are as follows: (1.5.2.2):BIU #1 outputs:

O1	PHS1/CH1	R	CHANNEL RED	1
O2	PHS1/CH1	Y	CHANNEL YELLOW	1
O3	PHS1/CH1	G	CHANNEL GREEN	17
O4	PHS2/CH2	R	CHANNEL RED	2
O5	PHS2/CH2	Y	CHANNEL YELLOW	2
O6	PHS2/CH2	G	CHANNEL GREEN	2
O7	PHS3/CH3	R	CHANNEL RED	3
O8	PHS3/CH3	Y	CHANNEL YELLOW	3
O9	PHS3/CH3	G	CHANNEL GREEN	18
O10	PHS4/CH4	R	CHANNEL RED	4
O11	PHS4/CH4	Y	CHANNEL YELLOW	4
O12	PHS4/CH4	G	CHANNEL GREEN	4
O13	PHS5/CH5	R	CHANNEL RED	5
O14	PHS5/CH5	Y	CHANNEL YELLOW	5
O15	PHS5/CH5	G	CHANNEL GREEN	19
IO1	PHS6/CH6	R	CHANNEL RED	6
IO2	PHS6/CH6	Y	CHANNEL YELLOW	6
IO3	PHS6/CH6	G	CHANNEL GREEN	6
IO4	PHS7/CH7	R	CHANNEL RED	7
IO5	PHS7/CH7	Y	CHANNEL YELLOW	7
IO6	PHS7/CH7	G	CHANNEL GREEN	20
IO7	PHS8/CH8	R	CHANNEL RED	8
IO8	PHS8/CH8	Y	CHANNEL YELLOW	8

IO9	PHS8/CH8	G	CHANNEL GREEN	8

BIU #2 outputs:

O1	PED2/CH9	R	CHANNEL RED	9
O2	PED2/CH9	Y	CHANNEL GREEN	1
O3	PED2/CH9	G	CHANNEL GREEN	9
O4	PED4/CH10	R	CHANNEL RED	10
O5	PED4/CH10	Y	CHANNEL GREEN	3
O6	PED4/CH10	G	CHANNEL GREEN	10
O7	PED6/CH11	R	CHANNEL RED	11
O8	PED6/CH11	Y	CHANNEL GREEN	5
O9	PED6/CH11	G	CHANNEL GREEN	11
O10	PED8/CH12	R	CHANNEL RED	12
O11	PED8/CH12	Y	CHANNEL GREEN	7
O12	PED8/CH12	G	CHANNEL GREEN	12
O13	OVLA/CH13	R	CHANNEL RED	13
O14	OVLA/CH13	Y	CHANNEL YELLOW	13
O15	OVLA/CH13	G	CHANNEL GREEN	13
IO1	OVLB/CH14	R	CHANNEL RED	14
IO2	OVLB/CH14	Y	CHANNEL YELLOW	14
IO3	OVLB/CH14	G	CHANNEL GREEN	14
IO4	OVLC/CH15	R	CHANNEL RED	15
IO5	OVLC/CH15	Y	CHANNEL YELLOW	15
IO6	OVLC/CH15	G	CHANNEL GREEN	15
IO7	OVLD/CH16	R	CHANNEL RED	16
IO8	OVLD/CH16	Y	CHANNEL YELLOW	16
IO9	OVLD/CH16	G	CHANNEL GREEN	16

NOTE: The vehicle channels, 17 through 20, are not driving anythingon the street and so have no load connected. Instead, they serve as the source data for the re-assignment in the I/O map.

For left turn movements on channels 1, 3, 5, and 7, the Red and Yellow outputs are coming from the Overlap 1 through 4, which takes care of the Steady Red and Steady Yellow Arrows. The Green output is from the left turn vehicle phases redirected in the I/O map via channels 17 through 20 to drive the Steady Green Arrow.

Lastly, the Flashing Yellow Arrow output is coming from the overlap channels 1, 3, 5,and 7 replacing the Ped Yellow outputs on Channels 9 through 12 via the I/O map.

NOTE: In this configuration where the I/O map redirects an output, the monitor needs to have the Field Check disabled for that output.

Following the information in the NEMA TS 2 Amendment 4 FYA manual,the **Alternate FYA Mode H configuration** would be as follows for an NEMATS 2 cabinet.

NOTE: This configuration uses only twelve channels out of 16 and requires I/O mapping changes. (Omni database atcDatabase_ 0022220008.gz).

The alternate Channel Assignments for the default NEMA TS 2 cabinet setup are as follows:

```
                                1 1 1 1 1 1 1
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
Type-     v v v v v v v v o o o o p p p p
Source-   1 2 3 4 5 6 7 8 1 2 3 4 2 4 6 8
```

The changes for MODE H are as follows:

The Channel Assignments are changed as follows:

```
                                1 1 1 1 1 1 1 1 1 1 2
Channel#- 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
Type-     o v o v o v o v o o o o p p p p v v v v
Source-   1 2 2 4 3 6 4 8 . . . . 2 4 6 8 1 3 5 7
```

The I/O Map changes are as follows: (1.5.2.2)BIU #1 outputs:

O1	PHS1/CH1	R	CHANNEL RED	1
O2	PHS1/CH1	Y	CHANNEL YELLOW	1
O3	PHS1/CH1	G	CHANNEL GREEN	17
O4	PHS2/CH2	R	CHANNEL RED	2
O5	PHS2/CH2	Y	CHANNEL YELLOW	2
O6	PHS2/CH2	G	CHANNEL GREEN	2
O7	PHS3/CH3	R	CHANNEL RED	3
O8	PHS3/CH3	Y	CHANNEL YELLOW	3
O9	PHS3/CH3	G	CHANNEL GREEN	18
O10	PHS4/CH4	R	CHANNEL RED	4
O11	PHS4/CH4	Y	CHANNEL YELLOW	4
O12	PHS4/CH4	G	CHANNEL GREEN	4
O13	PHS5/CH5	R	CHANNEL RED	5
O14	PHS5/CH5	Y	CHANNEL YELLOW	5
O15	PHS5/CH5	G	CHANNEL GREEN	19
IO1	PHS6/CH6	R	CHANNEL RED	6
IO2	PHS6/CH6	Y	CHANNEL YELLOW	6
IO3	PHS6/CH6	G	CHANNEL GREEN	6
IO4	PHS7/CH7	R	CHANNEL RED	7
IO5	PHS7/CH7	Y	CHANNEL YELLOW	7
IO6	PHS7/CH7	G	CHANNEL GREEN	20
IO7	PHS8/CH8	R	CHANNEL RED	8
IO8	PHS8/CH8	Y	CHANNEL YELLOW	8
IO9	PHS8/CH8	G	CHANNEL GREEN	8

BIU #2 outputs:

O1	PED2/CH9	R	CHANNEL RED	9
O2	PED2/CH9	Y	CHANNEL YELLOW	9
O3	PED2/CH9	G	CHANNEL GREEN	9
O4	PED4/CH10	R	CHANNEL RED	10
O5	PED4/CH10	Y	CHANNEL YELLOW	10
O6	PED4/CH10	G	CHANNEL GREEN	10
O7	PED6/CH11	R	CHANNEL RED	11
O8	PED6/CH11	Y	CHANNEL YELLOW	11
O9	PED6/CH11	G	CHANNEL GREEN	11
O10	PED8/CH12	R	CHANNEL RED	12
O11	PED8/CH12	Y	CHANNEL YELLOW	12
O12	PED8/CH12	G	CHANNEL GREEN	12
O13	OVLA/CH13	R	CHANNEL RED	13
O14	OVLA/CH13	Y	CHANNEL YELLOW	1
O15	OVLA/CH13	G	CHANNEL GREEN	13
IO1	OVLB/CH14	R	CHANNEL RED	14
IO2	OVLB/CH14	Y	CHANNEL YELLOW	3
IO3	OVLB/CH14	G	CHANNEL GREEN	14
IO4	OVLC/CH15	R	CHANNEL RED	15
IO5	OVLC/CH15	Y	CHANNEL YELLOW	5
IO6	OVLC/CH15	G	CHANNEL GREEN	15
IO7	OVLD/CH16	R	CHANNEL RED	16
IO8	OVLD/CH16	Y	CHANNEL YELLOW	7
IO9	OVLD/CH16	G	CHANNEL GREEN	16

> NOTE: Vehicle channels 17 through 20 are not driving anything on the street and so have no load connected. Instead they serve as the source data for the re-assignment in the I/O map.

For left turn movements on channels 1, 3, 5, and 7, the Red and Yellow outputs are coming from the Overlap 1 through 4 which takes care of the Steady Red and Steady Yellow Arrows. The Green output is from the left turn vehicle phases redirected in the I/O map via channels 17 through 20 to drive the Steady Green Arrow.

Lastly the Flashing Yellow Arrow output is coming from the overlap channels 1, 3, 5, and 7 replacing the Ped Yellow outputs on Channels 13 through 16 via the I/O map. Note in this case where the I/O map redirects an output the monitor will need to have the Field Check disabled for that output.

4.3.3.1 **Pedestrian Overlaps**

```
3.2       PED OVERLAP 1/A IN SET 1        R

INCLUDED PHASES ................
EXCLUDED PHASES ................
DET CALL PHASES ................
INTERVALS        NONE
ACTUATED ONLY    NO
```

Main Menu > Overlaps > Pedestrian Overlaps

Table 4-20: Pedestrian Overlap

Item	Description
INCLUDED PHASES	**Included Phases (grouped toggle: . = disabled, 0-F = enabled**) When an Included Phase is serving a pedestrian movement or when the Controller is cycling between included phases, the overlap output is dependent on the ped overlap's intervals setting. Otherwise the ped overlap displays Don't Walk.
EXCLUDED PHASES	**Excluded Phases (grouped toggle: . = disabled, 0-F = enabled)** When an excluded phase is next, the ped overlap will terminate. When an excluded phase is on, the ped overlap will remain in don't walk.
DET CALL PHASES	**Detector Call Phases (grouped toggle: . = disabled, 0-F = enabled)** Selects the phases that is called when the pedestrian overlap has a detector call. If no phases are selected, then all Included Phases is called.

INTERVALS	**Ped Overlap Intervals (toggle: None, Walk, Ped Clearance)** This setting controls the pedestrian overlap output when serving pedestrian movements on included phases. The intervals are as follows: • None: The ped overlap is disabled. • Walk: Extended Walk interval. The ped overlap displays walk during the walk interval of the first included phase. The overlap continues to display walk while thenext phase in sequence is an included phase and has pedestrian demand. When the last included phase in sequence begins timing ped clearance, the ped overlap will also display ped clearance for the duration of the included phase ped clearance interval. • Ped Clearance: Extended Ped Clearance interval. The ped overlap displays walk during the walk interval of the first included phase. It displays ped clearance during the ped clearance interval of the first included phase. It remains in ped clearance (flashing don't walk) while the next phase in sequence is an included phase and has pedestrian demand. When the next included phase begins walk, the overlap also goes back to walk. The ped overlap terminates when the last included ped phase terminates.
ACTUATED ONLY	**Actuated Only Mode (toggle: No = disabled, Yes = enabled)** If enabled, the pedestrian overlap will only be served when it has a detector call and an Included Phase is serving the pedestrian movement. If disabled, the pedestrian overlap is served when an Included Phase is serving the pedestrian movement.

The Pedestrian Overlap setup screen sets the configuration of pedestrian overlaps. Pedestrian overlaps B-P can be displayed by pressing the NEXT key.

4.3.4 **Detectors**

```
4                 DETECTORS

1. VEHICLE DETECTORS
2. PEDESTRIAN DETECTORS
3. VEHICLE DETECTOR DIAGNOSTICS
4. PEDESTRIAN DETECTOR DIAGNOSTICS
5. EXTRA VEH DETECTOR CALLS
6. EXTRA PED DETECTOR CALLS
```

Main Menu > Detectors

Detectors are external devices that indicate the presence of vehicles and pedestrians to the Controller. There are four data sets for each of these.

The following selectable entries are defined.

Table 4-21: Detectors

Item	Description
1	Vehicle Detectors: configuration of vehicle detector settings
2	Pedestrian Detectors: configuration of pedestrian detector settings
3	Vehicle Detector Diagnostics: configuration of vehicle detector diagnostic settings
4	Pedestrian Detector Diagnostics: configuration of ped detector diagnostic settings
5	Extra Veh Detector Calls: Assign a single veh detector to multiple phases/overlaps
6	Extra Ped Detector Calls: Assign a single ped detector to multiple phases/overlaps

4.3.4.1 **Vehicle Detectors**

```
4.1       VEHICLE DETECTOR SET 1          DR
 DETECTOR#       1       2       3       4
CALL PHASE       1       2       3       4
SWITCH PHASE     0       0       0       0
CALL           YES     YES     YES     YES
PASSAGE        YES     YES     YES     YES
ADDED INIT     YES     YES     YES     YES
QUEUE           NO      NO      NO      NO
```

```
YELLOW LOCK     NO      NO      NO      NO
RED LOCK        NO      NO      NO      NO
VOLUME          NO      NO      NO      NO
OCCUPANCY       NO      NO      NO      NO
DELAY          0.0     0.0     0.0     0.0
EXTEND         0.0     0.0     0.0     0.0
QUEUE LIMIT      0       0       0       0
VOS LENGTH     0.0     0.0     0.0     0.0
ALT PASSAGE     NO      NO      NO      NO
ALT MIN GRN     NO      NO      NO      NO
ADAPTIVE        NO      NO      NO      NO
```

Main Menu > Detectors > Vehicle Detectors

In Texas Diamond mode, Vehicle Detector Set 1 is set up for Type 4 Phase, Detector Set 2 is set up for Type 3 Phase and Detector Set 3 is set up for Type Separate automatically when Texas Diamond Mode is enabled. Vehicle detectors respond to the presence of a vehicle.

The additional phase parameters shown below the LCD window can be displayed by pressing the DOWN ARROW key. Detectors 5-128 can be displayed by pressing the RIGHT ARROW or the '+' key.

Table 4-22: Vehicle Detectors

Item	Description
CALL PHASE	Vehicle Detector Call Phase (0-16): The assigned phase number for the detector input. The associated detector capability to affect the traffic engine is enabled when this setting is a non-zero value.
SWITCH PHASE	Vehicle Detector Switch Phase (0-16): The vehicle detector actuation is capableof being switched to another phase when the assigned phase is yellow or red and the switch phase is green. Detector switching provides a per detector entry identifying the switch phase that receives the switched actuation.
CALL	Call (Yes / No): If enabled the Controller places a demand for vehicular service on the assigned phase when the phase is not timing the green interval and an actuation (the operation of any type of detector) is present.
PASSAGE	Passage (Yes / No): If enabled, the Controller maintains a reset to the associated phase passage timer for the duration of the detector actuation when the phase is green. This option will cause the detector to apply the normal passage time to the assigned phase.
ADDED INIT	Added Initial (Yes / No): If enabled, the Controller accumulates detector actuationcounts for use in the added initial calculations. Counts are accumulated from the beginning of the yellow interval to the beginning of the green interval of the phase assigned to this detector.
QUEUE	Queue (Yes / No): If enabled the Controller extends the green interval of the assigned phase until a gap occurs (no actuation) on this detector or until the green has been active longer than the vehicle detector queue limit time. This detector will not reload until the phase starts again.
YELLOW LOCK	Yellow Lock Call (Yes / No): If enabled, the detector locks a call to the assigned phase if an actuation occurs while the phase is not timing green (is yellow or red).
RED LOCK	Red Lock Call (Yes / No): If enabled, the detector locks a call to the assigned phase if an actuation occurs while the phase is not timing green or yellow (is red).
VOLUME	Volume Detector (Yes / No): If enabled the detector collects data for the associated detector volume during the Volume Occupancy collection period (the number of vehicles passing a given point per unit of time).
OCCUPANCY	Occupancy Detector (Yes / No): If enabled the detector collects data for the associated detector occupancy during the Volume Occupancy collection period. (Occupancy is a measurement of vehicle presence within a zone of detection, expressed in a percentage of time that a given point or area is occupied by a vehicle).

DELAY	Vehicle Detector Delay (0-255.0 seconds): The detector delay parameter is in tenths of a second. A time-period when a detector actuation (input recognition) is delayed when the phase is not green. Once the actuation has been present for the delay time it is continued for as long as the actuation is present.
EXTEND	Vehicle Detector Extend (0-25.5 seconds): The detector extend parameter is in tenths of a second. The period a vehicle detector actuation (input duration) is extended from the point of termination, when the phase is green.
QUEUE LIMIT	Vehicle Detector Queue Limit (0-255 seconds): The detector queue limit parameter is in seconds. The length of time that an actuation from a queue detector may continue into the phase green. This time begins when the phase becomes green. When the time expires, the associated detector input is ignored until the phase goes green again. If the actuation is removed, the phase may gap out.
VOS LENGTH	Vehicle Detector VOS Length (0-99.9 meters or 0-327.7 feet): The total of the loop length plus the average vehicle length. Used for single detector speed estimation. Only needed for VOS log. Entered in feet or meters, depending on Unit setting in Log Setup menu (4.3.7).
ALT PASSAGE	Alternate Passage (Yes / No): If enabled, this detector will call for Alternate Passage time. If disabled, the detector will call for normal passage time.
ALT MIN GRN	Alternate Minimum Green (Yes / No): If enabled, this detector calls for Alternate Minimum Green time. If disabled, the detector calls for normal minimum green time.
ADAPTIVE	Adaptive Detector (Yes / No) If enabled, this detector is used to compute the adaptive split utilization time for this phase. This is seen in the Detailed Phase Timing Status screen as AEX.

4.3.4.1.1 Video Detection for Caltrans Cabinets

Omni eX will logically “or” any BIU detector inputs with those from the C11 connector if they are assigned to use same detector input. Use the FIO C12 25 pin connector, with an appropriate adapter cable to get access to SP3, besides SP5.

There is an LED on the FIO back panel that lights if SP3 is enabled on the FIO board. If it is not lit, the FIO unit must be pulled out for a configuration switch to be set. There is a toggle switch on the board to enable SP3 out through the C12S connector. If it is enabled, reinsert the FIO. The LED should light.

In the documentation for the Wavetronix radar detector, or similar video detector that needs SDLC communication, it should indicate what vehicle detector BIU it uses, whether Vehicle Detector BIU 9 or 10 or 11 or 12. Once this is known, go to menu 4.3.1.2 in Omni for NEMA TS 2 Device Setup. By default, for a Caltrans cabinet all BIUs are disabled by showing a dot and the MMU is shown as “No” for disable. The Comm. Port default is shown as SP3, leave this as is; otherwise, change it to SP3. On the line for the BIUs press the number key corresponding to the BIU desired, 9 for detector BIU 9, 0 for detector BIU 10, A for detector BIU 11, or B for detector BIU 12. Next, on the line for the MMU use the + or - keys to change selection from No to Send, but not Yes. This will enable TF BIU load switch data to be sent out on the SDLC but not to expect any response messages. This is used by the Wavetronix or similar video detectors.

Finally, editing must be done in the I/O map. Go to menu 4.3.1.5 to configure the inputs for the NEMA TS 2 Detector BIU that was selected in the preceding paragraph.The default input assignment is shown on the left column whereas the right will show unused. Assign which vehicle detector input is desired by setting the function to a Vehicle Detector and the index corresponding to the detector number. You also need to set the detector attributes for the vehicle detectors coming from the Wavetronix.

Go to the Detector screen in menu 4.3.3 and press Next to get to the detectors corresponding to the ones edited in the I/O Map menu. Enter the attributes desired such as Call Phase assignment and attributes such as Call or Passage or Added Initial, etc.

4.3.4.2 **Pedestrian Detectors**

```
4.2       PEDESTRIAN DETECTOR SET 1
 DET#          1  2  3  4  5  6  7  8
CALL PHASE     1  2  3  4  5  6  7  8
ALT PED TIME   N  N  N  N  N  N  N  N

 DET#          9 10 11 12 13 14 15 16
CALL PHASE     0  0  0  0  0  0  0  0
ALT PED TIME   N  N  N  N  N  N  N  N
```

Main Menu > Detectors > Pedestrian Detectors

A pedestrian detector (i.e. a ped push button) places calls for pedestrian service on the associated phase.

Table 4-23: Pedestrian Detectors

Item	Description
CALL PHASE	**Pedestrian Detector Call Phase (0-16):** The detector will place locked calls for ped service on the selected phase if the phase has pedestrian timing.
ALT PED TIME	**Pedestrian Detector Alternate Time (Y/N)**: If enabled, this detector will call for Alternate Walk and Alternate Ped Clearance time. If disabled, this detector will call for normal Walk and Ped Clearance time.

4.3.2.3 Vehicle Detector Diagnostics

```
4.3    VEHICLE DETECTOR DIAG SET 1      R

 DET#       1   2   3   4   5   6   7   8
NO ACT      0   0   0   0   0   0   0   0
MAX PR      0   0   0   0   0   0   0   0
ER CNTS     0   0   0   0   0   0   0   0
FAIL TM     0   0   0   0   0   0   0   0
TS2 DIAG   NO  NO  NO  NO  NO  NO  NO  NO
```

Main Menu > Detectors > Vehicle Detector Diagnostics

Press the Right Arrow or Next key to display detectors 9-128.

Table 4-24: Vehicle Detector Diagnostics

Item	Description
NO ACT	**Detector No Activity**: Parameter in minutes (0-255 min). If an active detector doesnot exhibit an actuation (the operation of any type of detector) in the specified period, it is considered a fault by the diagnostics and the detector is classified as failed and generates a Detector Alarm. A value of 0 disables this diagnostic for this detector.
MAX PR	**Detector Maximum Presence diagnostic parameter in minutes (0-255 min.)** If an active detector exhibits continuous detection for too long a period, it is considered a fault by the diagnostics and the detector is classified as failed and generates a Detector Alarm. A value of 0 disables this diagnostic for this detector.
ER CNTS	**Detector Erratic Counts diagnostic parameter in counts/minute (0-255**) If an active detector exhibits excessive actuations, it is considered a fault by the diagnostics and the detector is classified as failed and generates a Detector Alarm. A value of 0 disables this diagnostic for this detector.
FAIL TM	**Detector Fail Time (0-255 sec)**. If a detector diagnostic indicates that the associated detector is failed, a call is placed on the associated phase during all non-green intervals. When each green interval begins, the call is maintained for the length of time specified here and removed. If the value is 255, a constant call is placed on the associated phase (max recall). If the value is zero, no call is placed on the associated phase for any interval (no recall).
STATUS	**NEMA TS2 Detector Status Diagnostics (Yes/No)** This enables / disables the NEMA Reported Alarms. This requires that the vehicle detector cards support serial communications with a Detector BIU in the input file. The faults reported are for inductive loops as follows: • Excessive Change Fault - This detector has been flagged as non-operational due to an inductance change that exceeded expected values. • Shorted Loop Fault - This detector has been flagged as non-operational due to a shorted loop wire. • Open Loop Fault - This detector has been flagged as non-operational due to an open loop (broken wire). • Watchdog Fault - This detector has been flagged as non-operational due to a watchdog error.

4.3.4.3 **Pedestrian Detector Diagnostics**

```
4.4   PEDESTRIAN DETECTOR DIAG SET 1    R

 DET#      1   2   3   4   5   6   7   8
NO ACT     0   0   0   0   0   0   0   0
MAX PR     0   0   0   0   0   0   0   0
ER CNTS    0   0   0   0   0   0   0   0
```

Main Menu > Detectors > Pedestrian Detector Diagnostics

Press the Right Arrow or Next key to display detectors 9-16.

Table 4-25: Pedestrian Detector Diagnostics

Item	Description
MAX PR	**Pedestrian Detector Maximum Presence diagnostic parameter (0-255 min)** If an active detector exhibits continuous detection for too long a period, it is considereda fault by the diagnostics and the detector is classified as failed and generates a Detector Alarm. A value of disables this diagnostic for this detector.
ER CNTS	**Pedestrian Detector Erratic Counts diagnostic parameter (0-255 counts / minute)** If an active detector exhibits excessive actuations, it is considered a fault by the diagnostics and the detector is classified as failed and generates a Detector Alarm. A value of 0 disables this diagnostic for this detector.

4.3.2.4 Extra Vehicle Detector Calls

```
4.5       VEHICLE DETECTOR SET 1       D
DET    CALL PHASES        CALL VEH OVERLAPS
  1    ................   ................
  2    ................   ................
  3    ................   ................
  4    ................   ................
  5    ................   ................
  6    ................   ................
```

Main Menu > Detectors > Extra Veh Detector Calls

This menu allows a vehicle detector to be assigned to multiple phases or vehicle overlaps. Use the Up and Down arrows to scroll through all 128 vehicle detectors.

Table 4-26: Extra Vehicle Detector Calls

Item	Description
CALL PHASES	**Call Phases (grouped toggle: . = disabled, 0-F = enabled)** Select one or more call phases to which the detector is assigned. These call phases are in addition to any Call Phase that is assigned in the Vehicle Detector configuration menu. All enabled detector functions, including calling, extension, queue, added initial, locking, and alternate timing are applied to all assigned call phases. Assigning a Call Phase here is equivalent to assigning it in the Vehicle Detector configuration menu.
CALL VEH OVERLAPS	**Call Vehicle Overlaps (grouped toggle: . = disabled, 0-F = enabled)** Select oneor more vehicle overlaps to be called by the detector. When an overlap is called, it will by default place non-locking calls on all included phases until the overlap has been served, so the overlap is served at the earliest opportunity. Alternatively, you may select specific phases to be called by configuring the Detector Call Phasessetting in the Vehicle Overlap configuration menu. When a detector is assigned to an overlap, only the calling function is active. Overlap detectors cannot perform extension or added initial functions.

4.3.2.5 Extra Pedestrian Detector Calls

```
4.6      PEDESTRIAN DETECTOR SET 1     D
DET    CALL PHASES        CALL PED OVERLAPS
  1    ................   ................
  2    ................   ................
  3    ................   ................
  4    ................   ................
  5    ................   ................
  6    ................   ................
```

Main Menu > Detectors > Extra Ped Detector Calls

This menu allows a pedestrian detector to be assigned to multiple phases or pedestrian overlaps. Use the Up and Down arrows to scroll through all 16 pedestrian detectors.

Table 4-27: Extra Pedestrian Detector Calls

Item	Description
CALL PHASES	Call Phases (grouped toggle: . = disabled, 0-F = enabled) Select one or more call phases to which the detector is assigned. These call phases are in addition to any Call Phase that is assigned in the Pedestrian Detector configuration menu. All enabled detector functions including calling and alternate ped timing are applied to all assigned call phases.
CALL PED OVERLAPS	Call Ped Overlaps (grouped toggle: . = disabled, 0-F = enabled) Select one or more pedestrian overlaps to be called by the detector. When a pedestrian overlap is called, it will by default place non-locking ped calls on all included phases until the overlap has been served, so the overlap is served at the earliest opportunity. Alternatively, you may select specific phases to be called

Item	Description
	by configuring the Detector Call Phases setting in the Pedestrian Overlap configuration menu.

4.3.5 **Coordination**

```
5              COORDINATION

1.  CONSTANTS
2.  PATTERNS
3.  SPLIT TABLES
```

Main Menu > Coordination

This menu provides access to the patterns and coordination features. Patterns are used not only to select the coordination options, but also to select the currently active parameter sets, such as phase timing, overlap options, detector options, transit priority options, etc. Patterns can be selected by a variety of sources included manual, time base schedule, central system, or external inputs. Patterns may be used during free or coordinated operation to select the desired parameter sets. This makes patterns a very powerful feature in Omni because they can be used to change almost any aspect of the Controller operation simply by changing the pattern via any of the available pattern selection sources.

Under CIC control, the Central Management station can alter the pattern cycle time and offset value in addition to split table.

Under coordination, an intersection that is vital in efficiently moving traffic may be remotely monitored by central software. Using detector volume and occupancy data central may decide in real time to adjust the current splits to be used next cycle. Rather than altering the database, the intersection may utilize Critical Intersection Control (CIC), whereby the central software sends changes to splits that must fit the current plan cycle length and offset to accommodate next cycle implementation of new split lengths.

4.3.5.1 **Constants**

```
5.1               CONSTANTS              D
CORRECTION MODE    ADDONLY
MAX CYCLE TRANS    3
COORD MAX MODE     MAXINHIBIT
COORD FORCE MODE   FLOATING
PERM STRATEGY      MAXIMUM
OMIT STRATEGY      MINIMUM
```

```
SYNC POINT          START GREEN
NO EARLY RETURN     DISABLED
SYNC REF TIME       00:00
```

Main Menu > Coordination > Constants

The additional phase parameters shown below the LCD window can be displayed by pressing the DOWN ARROW key.

The Coordination Constants are parameters that apply to all coordinated patterns. In some cases, these parameters are defaults that may be overridden within the individual patterns if desired.

The coordinator will automatically apply both a hold and a recall on the coordination sync phases during coordination. By default, the coordinator will determine when to open the service window for the non-sync phases (remove the phase omits) and when to close the window (reapply the phase omits). The user may vary the parameters based on either non-sync phase minimum times or on non-sync phase maximum timesor manually entered times.

Table 4-28: Constants

Item	Description
CORRECTION MODE	**Coord Correction Mode.** The possible modes are: . • Dwell: When changing offset (the time relationship, expressed in seconds, between the starting point of the first coordinated phase green and a system reference point), the coordinator establishes a new offset by dwelling in the coordphase(s) until the desired offset is reached . • Shortway (smooth): When changing offset, the coordinator establishes a new offset by adding or subtracting to/from the timings in a manner that limits the cycle change. The subtraction cannot violate any phase minimum service requirements.(default) • Add Only: When changing offset, the coordinator establishes a new offset by adding to the timings in a manner that limits the cycle change.

Item	Description
MAX CYCLE TRANS	**Maximum Cycle Transition (1-4)**. Determines the possible cycle lengths to use when performing offset seeking. The use of this entry is determined by the selectionof the Coord Correction Mode. If the selection mode is Shortway, this entry determines the percentage change in the cycle length by the following: 1) Cycle length may adjust longer or shorter by 50%. 2) Cycle length may adjust longer or shorter by 25%. 3) Cycle length may adjust longer or shorter by 17%. (default) 4) Cycle length may adjust longer or shorter by 12.5%. If the selection is Dwell or Add Only, this entry determines the maximum amount of time the cycle may be lengthened by the following: 1) Cycle length may be longer by100%. 2) Cycle length may be longer by 50%. 3) Cycle length may be longer by 33%. 4) Cycle length may be longer by 25%.
COORD MAX MODE	**Coord Maximum Mode**. The possible modes are: • Maximum 1: The internal maximum 1 timing is in effect for all phases while the coordinator is running this pattern. If the Maximum 1 Green time is shorter than the Split time the phase will Max Out under constant demand. During coordinationonly the sync phases cannot max out because of the hold applied on them. • Maximum 2: The internal maximum 2 timing is in effect for all phases while the coordinator is running this pattern. If the Maximum 2 Green time is shorter than the Split time the phase will Max Out under constant demand. During coordinationonly the sync phases cannot max out because of the hold applied on them. • Max Inhibit: The internal maximum timing is inhibited while the coordinator is running this pattern. Neither Max1 nor Max2 will cause the phase to terminate due to reaching Maximum Green time; only the split time rules length of service with a Force Off under constant demand (default).
COORD FORCE MODE	**Coord Force Mode.** The possible modes are: • Floating: Each non-coord phase is forced to limit its time to the split time value under constant demand. Any unused split time (the time in the cycle allocated to aphase) will revert to the coord phase. • Fixed: Each non-coord phase is forced off at a fixed position in the cycle under constant demand. Any unused split time will revert to the following phase (default).

Item	Description
PERM STRATEGY	**Permissive Point Strategy** to be used during coordination. This decides when to not apply the phase on the non-sync phases to keep the window of opportunity for service open the longest. Possible modes are: • Minimum: The next split is permitted to serve as soon as the previous split has completed its minimum phase service requirements (minimum green + yellow change +red clearance). This has an accumulated effect, i.e. if each split is 25% of the cycle length whereas the phase minimum service time for each split is only 15% of the cycle length the second split could be permitted at 15%, the third split couldstart at 30% and the fourth split could start at 45%. • Maximum: The next split is only permitted to serve when the previous split reaches its constant-demand Force Off point, i.e. if each split uses 25% of the cycle length the second split will not start before 25% of the cycle has passed, the third splitwill not start before 50% of the cycle has passed and the fourth split will not start before 75% of the cycle (default). • Manual: Permissive points are manually configured.
OMIT STRATEGY	**Omit Point Strategy** to be used during coordination. This decides when to apply the phase omit to close the window of opportunity for service. The possible modes are: • Minimum: A split is omitted when it can no longer serve its own minimum service requirements before the constant-demand Force Off point in the cycle. This does not have an accumulated effect since each split's omit point is calculated on the split's own constant demand Force Off point; i.e. If each split is 25% of the cycle length and the minimum service requirement of each split is at 15% of the cycle length the second split is omitted at 35% of the cycle length, the third at 60% and the fourthat 85% (default). • Maximum: A split is omitted only when the following splits can no longer serve at least their minimum phase service requirements before they would be forced off. This is the last point at which the split can start without having to skip following splits or overrun the cycle length; i.e. If each split is 25% of the cycle length and the phase minimum service time required is at 15% of the cycle length the second split is omitted at 55% and the third at 70% and the fourth at 85%. • Manual: Omit points are manually configured.
SYNC POINT	Selects the **Sync Reference Point** (or T0) for the beginning of the coordination local cycle. The possible values are: • Start Green: Local cycle will begin at start of green for the earliest coordinated phase. (default) • End Green: Local cycle will begin at end of green for the earliest coordinated phase.

Item	Description
NO EARLY RETURN	**No Early Return (Enabled / Disabled):** If enabled, the coordinator is not allowed to return to main street green before sync point (T0) occurs and remains in the last split until T0. If disabled, the coordinator can return to main street green before T0, if other splits terminated early (default = No).
SYNC REFERENCETIME	**Pattern Sync Reference Time (00:00 midnight default)** is entered as time of day, HH:MM. When the value is set to 24:00, the time of the most recent time baseevent is used as the sync reference. When set to 03:00 the sync reference time is 3:00 am and not midnight. This time is also used by the Clock Update input to reset the clock to a specific time.

4.3.5.2 **Patterns**

```
5.2            PATTERN   1              D

CYCLE TIME              0
OFFSET TIME             0
SPLIT                   0
SEQUENCE                0
PHASE TIMINGS SET       1
PHASE OPTIONS SET       1
```

```
VEH OVERLAP SET       1
PED OVERLAP SET       1
TRANS PRIORITY SET    1
VEHICLE DET SET       1
PED DET SET           1
VEH DET DIAG SET      1
PED DET DIAG SET      1
DETECTOR RESET        NO
MAX 2 PHASES          ................
MAX 3 PHASES          ................
MAX 4 PHASES          ................
CORRECTION MODE       DEFAULT (ADDONLY)
COORD MAX MODE        DEFAULT (MAXINHIBIT)
COORD FORCE MODE      DEFAULT (FLOATING)
PERM STRATEGY         DEFAULT (MAXIMUM)
OMIT STRATEGY         DEFAULT (MINIMUM)
NO EARLY RETURN       DEFAULT (DISABLED)
TX DIAMOND TYPE       NOT ENABLED
USE PERCENT           NO (MINIMUM)
ACT COORD ENABLE      NO (DISABLED)
ACT COORD VALUE       0
```

Main Menu > Coordination > Patterns

Patterns 2 – 250 can be accessed by pressing the RIGHT ARROW or NEXT key.

Table 4-29: Patterns

Item	Description
CYCLE TIME	**Pattern Cycle time: (0-255)** The total time needed to complete one complete sequence of the signals around an intersection. For an actuated Controller unit, a complete cycle is dependent on the presence of calls on all phases. The minimum service requirements of a phase with pedestrian timing running non-actuated include minimum green, or walk and pedestrian clear, whichever is greater, plus yellow clearance and red clearance. The minimum requirements of a phase without pedestrian actuation include minimum green, yellow clearance and red clearance. If the pattern cycle time is zero and the associated split table (if any) contains values greater than zero, the Controller utilizes the split time values as maximum values for each phase. The sum of the splits for each ring should equal the cycle time; specifically, the sum of the split times for phases in use on each side of the barrier should equal the sum in the other rings.
OFFSET TIME	**Pattern Offset time (0-254)** The offset defines by how many seconds the Local Cycle Time sync point lags the Master Cycle Time (sync point) for this pattern. An offset value equal to or greater than the pattern cycle time results in free operation regardless of coordination control from any source. While this condition exists, the local free bit of Unit Alarm Status1 and the local override bit of Short Alarm Status are set to one.
SPLIT	**Pattern Split Number (1-250)** Selects split table to use for this pattern.
SEQUENCE	**Pattern Sequence: (1-16)** Select sequence to use with this pattern.
PHASE TIMINGS SET	**Phase Timings Set (1-4**) Select set to use with this pattern.
PHASE OPTIONS SET	**Phase Options Set (1-4)** Select set to use with this pattern.
VEH OVERLAP SET	**Vehicle Overlap Set (1-4)** Select set to use with this pattern.
PED OVERLAP SET	**Pedestrian Overlap Set (1-4)** Select set to use with this pattern.
TRANS PRIORITY SET	**Transit Priority Set (1-4)** Select set to use with this pattern.
VEHICLE DET SET	**Vehicle Detector Set (1-4)** Select set to use with this pattern.
PED DET SET	**Pedestrian Detector Set (1-4)** Select set to use with this pattern.
VEH DET DIAG SET	**Vehicle Detector Diagnostics Set (1-4)** Select set to use with this pattern.

Item	Description
PED DET DIAG SET	**Pedestrian Detector Diagnostics Set (1-4)** Select set to use with this pattern.
DETECTOR RESET	**Detector Reset (Yes/No)** If enabled detectors are reset when this pattern is initiated.
MAX 2 PHASES	**Maximum 2 Green (grouped toggle: "." = disabled, 0-F = enabled)** Select whichphases are to run Max 2 during this coord pattern. Phases not selected will continue to use Max 1. This can overlay the Coord Maximum Mode when it is set for Maximum 1. This has no effect if the Coord Maximum Mode is set to Max 2 or Max Inhibit. If this pattern has split times but no cycle time this has no effect since the length of service under constant demand is ruled only by the split time.
MAX 3 PHASES	**Maximum 3 Green (grouped toggle: "." = disabled, 0-F = enabled)** Select which phases are to run Max 3 during this coord pattern. Phases not selected will continue to use Max 1. This can overlay the Coord Maximum Mode when it is set for Maximum 1. This has no effect if the Coord Maximum Mode is set to Max 2 or Max Inhibit. If this pattern has split times but no cycle time this has no effect since the length of service under constant demand is ruled only by the split time.
MAX 4 PHASES	**Maximum 4 Green (grouped toggle: "." = disabled, 0-F = enabled)** Select which phases are to run Max 4 during this coord pattern. Phases not selected will continue to use Max 1. This can overlay the Coord Maximum Mode when it is set for Maximum 1. This has no effect if the Coord Maximum Mode is set to Max 2 or Max Inhibit. If this pattern has split times but no cycle time this has no effect since the length of service under constant demand is ruled only by the split time.
CORRECTION MODE	**Pattern Correction Mode:** Use the + and – keys to toggle through the different modes. Default uses the setting in the Coordination Constants. Otherwise this will override the Coordination Constant Coord Correction Mode for this pattern.
COORD MAX MODE	**Pattern Max Mode**: Use the + and – keys to toggle through the different modes. Default uses the setting in the Coordination Constants. Otherwise this will override the Coordination Constant Coord Max Mode for this pattern.
COORD FORCE MODE	**Pattern Force Mode**: Use the + and – keys to toggle through the different modes. Default uses the setting in the Coordination Constants. Otherwise this will overridethe Coordination Constant Coord Force Mode for this pattern.
PERM STRATEGY	**Pattern Perm Strategy:** Use the + and – keys to toggle through the different strategies. Default uses the setting in the Coordination Constants. Otherwise this will override the Coordination Constants Perm Strategy for this pattern.
OMIT STRATEGY	**Pattern Omit Strategy:** Use the + and – keys to toggle through the different strategies. Default uses the setting in the Coordination Constants. Otherwise this will override the Coordination Constants Omit Strategy for this pattern.

Item	Description
NO EARLY RETURN	**Pattern No Early Return:** Use the + and – keys to toggle through the different enables. Default uses the setting in the Coordination Constants. Otherwise this will override the Coordination Constants No Early Return for this pattern.
TX DIAMOND TYPE	**Pattern Texas Diamond Type**: Select + and – to cycle through the different typesfor the pattern. Default will use, if enabled in the Unit Setup menu, the Texas Diamond Type setting in the Unit Setup menu otherwise this will override that type for this pattern. Refer to Chapter 6 for Texas Diamond operation.
USE PERCENT	**Use percentage values** If enabled percent values is used for phase reservice begin and end times and for the Actuated Coord Value.
ACT COORD ENABLED	**Actuated Coordination Enable** Omni 2.0 Feature- See Section 5.11 Actuated Coordination If enabled, the coordinator will release the hold at the point in the local cycle set in the Act Coord Value If there are no detector calls on the Sync phases.
ACT COORD VALUE	Actuated Coordination Value If enabled the coordinator will release the hold on the coordinated phases at this point (in seconds) in the local cycle. If Use Percent is set, this value is the percentage of the cycle where the hold is released.

4.3.5.3 **Split Table**

```
5.3            SPLIT TABLE   1           R
 PHASE#     1    2    3    4    5    6
TIME        0    0    0    0    0    0
MODE     NONE NONE NONE NONE NONE NONE
COORD       .    .    .    .    .    .
MIN TIME    0    0    0    0    0    0
MAN PERM    0    0    0    0    0    0
MAN OMIT    0    0    0    0    0    0
```

```
RSV CNT     0    0    0    0    0    0
RSV START   0    0    0    0    0    0
RSV END     0    0    0    0    0    0
```

Main Menu > Coordination > Split Table

The initial menu shows phases 1-6 in spit table 1. Phases 7 – 16 can be displayed using the RIGHT ARROW key. Press the Next key to access the next split table.

Table 4-30: Split Tables

Item	Description
TIME	**Split Time in seconds (0-255)** The time that the split phase is permitted to receive (i.e. before a Force Off is applied) when constant demands exist on all phases. In Floating Coord Force Mode, this is always the maximum time a non-coordinated phase is permitted to receive. In Fixed Coord Force Mode, the actual allowed time may be longer if a previous phase gapped out. The split time includes all phase clearance times for the associated phase. The split time must be longer than the sum of the phase minimum service requirements for the phase. When the time is not adequate to service the phase minimum service requirements of the phase, free (operation without coordination control from any source) mode is the result. The phase minimum service requirements of a phase with pedestrian timing running non-actuated or ped recall include minimum green, or walk plus pedestrian clear, whichever is greater, plus yellow change plus red clearance. The phase minimum service requirements of a phase without pedestrian actuation include minimum green plus yellow change plus red clearance. If the cycle time entry of the associated pattern table entry is zero (i.e. the device is in free mode), the value of this setting is applied, if non-zero, as a maximum time for the associated phase. If the critical path through the phase diagram is less than the cycle time entry of the associated pattern table entry, all extra time is allotted to the coordination phase in each ring. If the critical path through the phase diagram is greater than the cycle timeentry of the associated pattern table entry (and the cycle time is not zero) the device operates in free mode. While the free mode condition exists, the local override bit of short alarm is set to one.
MODE	**Split Mode.** These modes do not override the Phase Options recalls but are logically "OR"ed with them. The following options are available: • None: No split mode control. • MINV (Min Vehicle Recall): This phase operates with a minimum vehicle recall. • MAXV (Max Vehicle Recall): This phase operates with a maximum vehicle recall. • PED (Ped Recall): This phase operates with a pedestrian recall. • MXVP (Max Vehicle and Ped Recall): This phase operates with a maximum vehicle & pedestrian recall. • OMIT (Phase Omitted): This phase is omitted. Use this by time of day to skip a phase under coordination or use this mode and zero for split time for a phase that is only called by preemption. • NACT (Non-Actuated): This phase operates in non-actuated mode. The phase operates the same as setting Call to Non-Actuated in both the Phase Options and the Unit Call to Non-Actuated parameter.

Item	Description
COORD	**Coordinated Phase: ("X" – yes, "." – no)** Selects the associated phase to be a coordinated or Sync phase. Every ring must have a Coordinated Phase on the same side of the barrier.
MIN TIME	**Split Minimum Time: (0-255)** The alternate minimum time in seconds that this phase could be reduced to during transition. However, if it is desired to have a minimum time greater than the phase minimum service time that time value is placed here. No vehicle phase can be reduced smaller than its phase minimum service times as follows: Minimum Green + Yellow Change + Red Clearance Or for a pedestrian movementwith a Ped Recall or C-N-A, the phase minimum service time is as follows: Walk + Pedestrian Clearance + Yellow Change + Red Clearance . NOTE: if a phase has Max Initial set this value replaces Minimum Green for the phase minimum service time as follows: Max Initial + Yellow Change + Red Clearance NOTE: if a phase has Green Clearance set this value is added into the phase minimum service time as follows: Minimum Green + Green Clearance + Yellow Change + Red Clearance.
MAN PERM	**Manual Split Permissive: (0-255)** Seconds past T0 to permit this phase if Per- missive Strategy is set to manual.
MAN OMIT	**Manual Split Omit: (0-255)** Seconds past T0 to omit this phase if Omit Strategy is set to manual.
RSV CNT	**Reservice count: (0-5)** Omni 2.0 Feature- See "Software Installation" on page 317. Maximum number of times the phase may be reserviced in a cycle. A value of 0 disables reservice. This value will range from 0 to 5.
RSV START	**Reservice Start**: Time on the local cycle timer when the phase will first be eligible for reservice. If Use Percent is set for the current pattern, this value is the percentage of the cycle.
RSV END	**Reservice End**: Time on the local cycle timer when the phase will no longer be eligible for reservice. If Use Percent is set for the current pattern, this value is the percentage of the cycle.

4.3.6 **Time Base**

Main Menu > Time Base

```
6               TIME BASE

1.  SET TIME
2.  TIME ZONE
3.  DAYLIGHT SAVING TIME
4.  SCHEDULES
5.  DAY PLANS
6.  ACTIONS
```

Main Menu > Time Base

Controller time settings and time-based traffic signal operating schedules, day plans and actions.

4.3.6.1 **Set Time**

```
6.1               SET TIME

  TIME         20:04:00
  DATE         01/02/2017   WEDNESDAY

         PRESS YES TO SET TIME
```

Main Menu > Time Base > Set Time

The internal time clock must be set before time of day operation. Use the arrow keys to move the cursor to the item to change and enter the numeric data. Press the “Yes” key to set the time. The day of week is automatically calculated from the date.

NOTE: Any central system sends a clock update using Global Time, the number of seconds since the epoch of 00:00:00 (midnight) January 1, 1970 UTC (a.k.a. Zulu or GMT).

Table 4-31: Set Time

Item	Description
TIME	Current time: hour (0-23), minute (0-59), seconds (0-59)
DATE	Current date: month (1-12), day of month (0-31) and year

4.3.6.2 **Time Zone**

```
6.2              TIME ZONE

  TIME ZONE OFFSET    -08:00:00

  US TIME ZONES:
    HST = -10:00:00  AKST = -09:00:00
    PST = -08:00:00   MST = -07:00:00
    CST = -06:00:00   EST = -05:00:00
```

Main Menu > Time Base > Time Zone

Use the arrow keys to move the cursor to the item to be changed. Use the "+" or "-" keys to change the sign. Enter the numeric data and press "ENT" followed by the "YES" key to save the Time Zone Offset to the database.

Table 4-32: Time Zone

Item	Description
TIME ZONE OFFSET	Indicates the offset between local Standard Time and UTC in HH:MM:SS. Positivevalues indicate local times in the Eastern Hemisphere up to the International Date Line and negative values indicate local times in the Western Hemisphere back to the International Date Line. This value does not change in response to a Daylight-Saving Time event. Offsets for US time zones are shown on the screen as a guide.

4.3.6.3 **Daylight Saving Time**

```
6.3        DAYLIGHT SAVING TIME

1. DST MODE
2. DST SCHEDULE
```

Main Menu > Time Base > Daylight Saving Time

View or configure the Daylight-Saving Time options.

4.3.6.3.1 DST Mode

```
6.3.1            DST MODE

  DST MODE   ENABLED
```

Main Menu > Time Base > Daylight Saving Time > Mode

Enable or Disable Automatic Daylight-Saving Time clock adjustment. If enabled, the Controller clock is automatically adjusted at the dates/times configured in the DST schedule.

4.3.6.3.2 DST Schedule

```
6.3.2            DST SCHEDULE          D
YEAR  -----BEGIN------    -----END--------
  1   03/14/2010  02:00   11/07/2010  2:00
  2   03/13/2011  02:00   11/06/2011  2:00
  3   03/11/2012  02:00   11/04/2012  2:00
  4   03/10/2013  02:00   11/03/2013  2:00
  5   03/09/2014  02:00   11/02/2014  2:00
  6   03/08/2015  02:00   11/01/2015  2:00
```

Main Menu > Time Base > DST Schedule

Daylight Saving Time beginning and ending dates and times are entered year-by-year and must be in ascending order for table to function properly. The table is initialized with the DST schedule for the United States from years 1970-2065. Entries can be created up to the year 2100.

From a communication standpoint we support all the objects in the DST table. From a functional standpoint though, we currently only support the “absolute” mode, i.e. dstBeginMonth = 13. In this mode, the database is configured with explicit DST start and end time for each DST transition (as opposed to rule-based mode where DST start = 2nd Sunday in March).

The default Omni database is pre-configured with DST change times for the US through the year 2065, so it does not need to be manually configured, but it can be modified either locally via the Controller front panel (menu 6.3.2) or remotely via NTCIP. This would only need to be done if the US DST rules are changed or if the Controller is used outside the US.

Omni also does not use the dstSecondsToAdjust parameter. It currently always adjusts by 1 hour, i.e. +3600 sec at DST start and -3600 sec at DST end.

NOTE: DST is managed within the Omni application. The Linux clock follows the local Controller clock.

4.3.6.4 **Schedules**

```
6.4            SCHEDULE    1
       JFMAMJJASOND          SMTWTFS
MONTH  ............      DAY .......
                     1111111111222222222233
          1234567890123456789012345678901
DATE      ...............................
DAY PLAN  (0-64)    0
```

Main Menu > Time Base > Schedule > Select a Schedule

Schedules are used to select desired day plans for time base operation. If multiple schedules are enabled for a specific date, the most restrictive schedule is used. For example, a “normal” schedule can be set up that includes every weekday for normal operation, and a “holiday” schedule can be set up that selects a specific weekday as a holiday. The holiday schedule is selected on that day because it selects fewer days,or in other words, is more restrictive.

Time base schedule number (1-64):

Schedules 2 – 64, can be displayed by pressing the NEXT key.

Table 4-33: Schedules

Item	Description
MONTH	**Month(s) of Year: (grouped toggle: “.” = disabled, 0-B = enabled)** Each entry represents a specific month. If the entry is enabled (X), the schedule is enabledduring the associated month. If the entry is disabled (.), the schedule is not enabled during the associated month.
DAY	**Day(s) of Week: (grouped toggle: “.” = disabled, 1-7 = enabled)** Each entry represents a specific day of the week. If the entry is enabled (X), the schedule is enabled during the associated DOW. If the entry is disabled (.), the schedule is not enabled during the associated DOW.
DATE	**Date(s) of Month: (grouped toggle: “.” = disabled, 0-F = enabled)** Each entry represents a specific date of the month. If the entry is enabled (X), the scheduleis enabled during the associated date. If the entry is disabled (.), the schedule is not enabled during the associated date.

Item	Description
DAY PLAN	**Day Plan (0-64)** The Day Plan number selects which specific table from the Day Plan tables when this Schedule is active.

Perhaps the user wants to setup a recurring holiday schedule for a floating holiday like Labor Day, which is the first Monday in September. To do this, create this schedule:

Month= Sept

Day = Mon

Date = 1-7

Use a date range to filter out which occurrence you are interested in:

1-7 = 1st occurrence, e.g. Labor Day

8-14 = 2nd occurrence, e.g. Columbus Day

15-21 = 3rd occurrence, e.g. Presidents Day, MLK Birthday22-28 = 4th occurrence, e.g. Thanksgiving

29-31 = 5th occurrence, not used in US

25-31 = last occurrence, e.g. Memorial Day

4.3.6.5 **Day Plans**

```
6.5            DAY PLAN   1           R

 EVENT#    1   2   3   4   5   6   7   8
HOUR       0   0   0   0   0   0   0   0
MINUTE     0   0   0   0   0   0   0   0
ACTION     0   0   0   0   0   0   0   0
```

Main Menu > Time Base > Day Plans > Select a Day Plan

Select a time base day plan number (1-64).

Day plans are used to select which actions are to occur (an event) at a specific time within a single 24-hour day. Each event within the day plan has a time of day, defined bythe hour and minute when the event becomes active, and an action that is selected by the event.

Day plans 2 - 64 can be displayed by pressing the NEXT key. Events 9 - 48 can be displayed by pressing the RIGHT ARROW key.

Table 4-34: Day Plans

Item	Description
HOUR	**Day Plan Hour: (0-23)** Sets the hour that the associated event becomes active.
MINUTE	**Day Plan Minute: (0-59)** Sets the minute of hour that the associated event becomes active.
ACTION	**Day Plan Action: (0-128)** Specifies which Action in the Action table that is selected by the event.

4.3.6.6 **Actions**

```
6.6                ACTION  1           D
PATTERN                 0
AUX FUNCTION           ........
SPECIAL FUNCTION       ................
DETECTOR RESET          NO
DETECTOR VOS LOG       NO ACTION
SPEED TRAP LOG         NO ACTION
CYCLE MOE LOG          NO ACTION
```

```
HI-RES LOG             NO ACTION
```

Main Menu > Time Base > Actions

Select an Action number (1-128)

Action 2-128 can be displayed by pressing the NEXT key.

Time Base Actions define the actions that are taken in response to Day Plan Events. When a scheduled Day Plan Event occurs, the associated Action is enabled. Actions call for Pattern numbers and can set specific outputs to be generated. The Auxiliary Functions are Time Based Control Aux. outputs only. Special Function outputs can be set by either Time-Based Control or by System command. Auxiliary Functions are intended for local control of logic and outputs, while Special Functions can be activated locally or controlled by a remote source, such as a system or master. If your application does not require remote control, use Auxiliary Functions. Logs and detector resets can also be called for by Actions.

Table 4-35: Actions

Item	Description
PATTERN	**Time Base Action Pattern: (0-255)** The pattern that is active when this action is active. 0 = No pattern selected, default to Free, 1-250 = Pattern 1-250, 254 = Free, 255 = Flash
AUX FUNCTION	**Auxiliary Function Outputs: (grouped toggle: "." = disabled, 1-8 = enabled)** These outputs is turned on when this action is active. (TBC Aux output)

Item	Description
SPECIAL FUNCTION	**Special Function Outputs: (grouped toggle: "." = disabled, 0-F = enabled)** These outputs is turned on when this action is active. These is logically combined with any System Special Functions, either one will turn on the output.
DETECTOR RESET	**Detector Reset: (Yes / No)** If enabled, the Detector Reset output is activated for one second following the time that this action is activated.
DETECTOR VOS LOG	**Detector VOS Log: (toggle, No Action, Start Logging, Stop Logging**) If enabled (Time-base) in Log Setup, this will either start, stop or continue.
SPEED TRAP LOG	**Speed Trap Log: (toggle, No Action, Start Logging, Stop Logging)** If enabled (Time-base) in Log Setup, this will either start, stop or continue.
CYCLE MOE LOG	**Cycle MOE Log: (toggle, No Action, Start Logging, Stop Logging**) If enabled (Time-base) in Log Setup, this will either start, stop or continue.
HI-RES LOG	**High Res Log: (toggle, No Action, Start Logging, Stop Logging)** If enabled (Time-base) in Log Setup, this will either start, stop or continue.

4.3.7 **Preemption**

```
7                  PREEMPT 1                D
TRACK PHASES            ...............
TRACK OVERLAPS          ...............
TRACK PEDS              ...............
TRACK PED OVERLAPS      ...............
DWELL PHASES            ...............
DWELL OVERLAPS          ...............
DWELL PEDS              ...............
```

```
DWELL PED OVERLAPS      ...............
CYCLING PHASES          ...............
CYCLING OVERLAPS        ...............
CYCLING PEDS            ...............
CYCLING PED OVERLAPS    ...............
EXIT PHASES             ...............
LOCKING                   YES
OVERRIDE FLASH            YES
OVERRIDE PREEMPT+1        YES
FLASH DWELL                NO
ENTER ALL RED              NO
IGNORE NO BACKUP           NO
MAX PRESENCE FLASH         NO
GATE DOWN FLASH            NO
TRACK GREEN                 0
MIN TRACK GREEN             0
GATE DOWN EXTENSION       0.0
DELAY                       0
EXTENSION                   0
MAXIMUM PRESENCE            0
MINIMUM DURATION            0
MINIMUM DWELL               0
LINKED PREEMPT              0
ENTER MIN GREEN           255
ENTER MIN WALK            255
ENTER MIN PED CLEAR       255
ENTER MIN YELLOW          25.5
ENTER MIN RED CLEAR       25.5
TRACK MIN YELLOW          25.5
TRACK MIN RED CLEAR       25.5
EXIT PED CLEAR             0
EXIT YELLOW                0.0
EXIT RED CLEAR             0.0
```

Main Menu > Preemption > Select a Preempt (1-16)

Preemption allows the transfer from normal signal control to a special signal control mode for servicing railroad crossings, emergency vehicle passage, and other special tasks. The additional preempt parameters shown below the LCD window can be displayed by pressing the DOWN ARROW key.

For the fields which select phases, press 1-9 for phases 1-9, press 0 for phase 10, and press A-F for phases 11-16. Press NO to clear all phases, or YES to select all phases.For the fields which select overlaps, press 1-9 for overlaps A-I, press 0 for overlap J, and press A – F for overlaps K-P. Press NO to clear all overlaps, or YES to select all overlaps.

Table 4-36: Preemption

Item	Description
TRACK PHASES	**Track Phases: (grouped toggle: "." = disabled, 0-F = enabled, default = none)**Selects phases that is active during the Preempt Track Service interval. These phases is served before the Dwell phases. There must be phases entered hereand time into Track Green for the Track Service Interval to run. These must be compatible phases on the same side of the barrier.
TRACK OVERLAPS	**Track Overlaps: (grouped toggle: "." = disabled, 0-F = enabled, default = none)** Selects overlaps that are permitted to be active with the Track Phases during the Preempt Track Service interval. One of the Included Phases of the Track Overlap must be also be in the Track Phases.
TRACK PEDS	**Track Peds: (grouped toggle: "." = disabled, 0-F = enabled, default = none)**Selects ped phases that are permitted to be active with the Track Phases during Preempt Track Service interval if the pedestrian movements have a ped call. The Track Peds must also have their phase in the Track Phase object.
TRACK PED OVERLAPS	**Track Ped Overlaps: (grouped toggle: "." = disabled, 0-F = enabled, default =none)** Selects ped overlaps that are permitted to be active with the Track Phases during Preempt Track Service interval. One of the Included Phases must also be in the Track Phases and in the Track Peds and have a ped call.
DWELL PHASES	**Dwell Phases: (grouped toggle: "." = disabled, 0-F = enabled, default = none)** Selects phases that is served first at the beginning of the Preempt Dwell interval. If the Dwell Flash bit is set these are the phases that will flash yellow and allother phases not listed in here will flash red. If the Dwell Flash bit is set the Cycling Phases is ignored. If the Dwell Flash bit is not set after the dwell phases have been served, the cycling phases is served next, if any. These must be compatible phases on the same side of the barrier.
DWELL OVERLAPS	**Dwell Overlaps: (grouped toggle: "." = disabled, 0-F = enabled, default = none**) Selects overlaps that are permitted to be active with the Dwell Phases during the Preempt Dwell Interval. One of the Included Phases of the Dwell Overlap must be also in the Dwell Phases.
DWELL PEDS	**Dwell Peds: (grouped toggle: "." = disabled, 0-F = enabled, default = none**) Selects ped phases that are permitted to be active with the Dwell Phases during Preempt Dwell Service interval if the pedestrian movements have a ped call. The Dwell Peds must also have their phase in the Dwell Phases object.

Item	Description
DWELL PED OVERLAPS	**Dwell Ped Overlaps: (grouped toggle: "." = disabled, 0-F = enabled, default =none)** Selects ped overlaps that are permitted to be active with the Dwell Phases during Preempt Dwell Service interval. One of the Included Phases must also be in the Dwell Phases and in the Dwell Peds and have a ped call.
CYCLING PHASES	**Cycling Phases: (grouped toggle: "." = disabled, 0-F = enabled, default = none)** Selects phases that are permitted to be served based on demand during thePreempt Cycling Interval. These phases is served after the Dwell Phases, subject to demand. The Preempt Cycling Interval is sometimes referred to as "Limited Service."
CYCLING OVERLAPS	**Cycling Overlaps: (grouped toggle: "." = disabled, 0-F = enabled, default = none)** Selects overlaps that are permitted to be active with the Cycling Phases during the cycling interval. One of the Included Phases of the Cycling Overlap must be also in the Cycling Phases.
CYCLING PEDS	**Cycling Peds: (grouped toggle: "." = disabled, 0-F = enabled, default = none)**Selects ped phases that are permitted to be active with the Cycling Phases duringthe cycling interval, subject to demand. Cycling Peds must also have their phase in the Cycling Phases object.
CYCLING PED OVERLAPS	**Cycling Ped Overlaps: (grouped toggle: "." = disabled, 0-F = enabled, default = none)** Selects ped overlaps that are permitted to be active with the Cycling Phases during the cycling interval. One of the Included Phases must also be in theCycling Phases and in the Cycling Peds and have a ped call.
EXIT PHASES	**Exit Phases: (grouped toggle: "." = disabled, 0-F = enabled, default = none)**Selects phases that is served following preempt. These phases is served after the Dwell and Cycling phases. If no Exit phases are configured, the next phases in sequence is served based on demand. These must be compatible phases on the same side of the barrier.
LOCKING	**Preempt Locking Memory: (Yes / No, default = Yes)** When set to YES, the preemption is served even if the call is removed during the preempt delay time. When set to NO, the preemption will not be served if the call is removed during the preempt delay time. Note: NTCIP defines this option in the opposite sense, as Non-Locking Memory.
OVERRIDE FLASH	**Override Automatic Flash: (Yes / No, default = Yes)** When set to YES, this preempt will override automatic flash. When set to NO, this preempt will not be served if called during automatic flash. Note: NTCIP defines this option in the opposite sense, as Do Not Override Flash.
	Priority Of Preempt Inputs: (Yes / No, default = Yes) If set to YES, this preempt has higher priority than the next higher numbered preempt and will override it. If setto NO, this preempt has equal priority to the next higher numbered preempt and willnot override it, they is served on a first-come-first-served basis. Example:

Item	Description
OVERRIDE PREEMPT +1	• Preempt 1 = YES, Preempt 2-3 = NO • Preempt 4 = YES, Preempts 5-8 = NO o 1 is highest priority and will override 2 or higher o 2-4 are equal priority and will not override one another but will override 5-8 o 5-8 are equal priority, will not override one another o All 16 preempts can be programmed in this manner Note: NTCIP defines this option in the opposite sense, as Do Not Override Preempt+1.
FLASH DWELL	**Flash Dwell mode: (Yes / No, default = No**) If enabled, the phases selected as preempt Dwell Phases will flash yellow during the dwell interval. All active phasesnot selected as Dwell Phases will flash red. The overlaps selected as Dwell Overlaps will flash yellow during the dwell interval. All active overlaps not selected as Dwell Overlaps will flash red. The Cycling Phases setting is ignored if Flash Dwell mode is enabled.

ENTER ALL RED	**Enter All Red: (Yes / No, default = No)** If set to YES, all phases is forced tored before entering the track phases. The phases will stay in red for the unit red revert time
IGNORE NO BACKUP	**Ignore No Backup: (Yes / No, default = No**) If set to YES, the Controller will ignore Protected/ Permissive “anti-backup protection” when going to the preempt phases.This will allow quicker response to a preemption but may cause a motorist to be caught in a protected/ permissive “yellow trap”. This is also applicable to Exit Phases, but this does not apply to Cycling Phases. Without Ignore No Backup set then anytime the No Backup Phase Option has been used, the preempt will terminate all phases before going to the preempt phases. This option will also not forceconcurrent phases to terminate when a terminating Flashing Yellow Arrow (FYA) that are not permitted during a preemption.
MAX PRESENCE FLASH	**Max Presence Flash (Yes / No, default = No)** This changes the behavior of the preempt run when the Max Presence timer expires. With the default of NO then thepreempt input is ignored upon expiration of the timer and the preemption run ends.With this set to YES then when the Max Presence timer expires the preemption run will go to all red flash regardless of any Dwell Phases or any Cycling Phases or linked preempt.

Item	Description
MIN TRACK GREEN	**Min Track Green time (0-255 sec, default = 0)** Minimum amount of track clearance green time that must be performed before Track Green can be truncated by theGate Down input. This value is ignored if there is no Gate Down input for this preempt.
TRACK GREEN	**Track Clear Green time (0-255 sec, default = 0):** This parameter controls the green timing for the track clearance movement. Track clear phase(s) are enabled in the preempt Track Phase setting. If this value is zero, the track clearance movement is omitted regardless of the Track Phase programming. This overrides any phase timing for the Track phases. If there is no Gate Down input for this preempt in the I/O Map, then this is a fixed value duration; otherwise, this is the maximum time duration for Track Green which could be truncated by the Gate Down input.
GATE DOWN FLASH	**Gate Down Flash (Yes / No, default = No)** This determines what happens if the Gate Down input is not received before the Track Green time expires. If set to YES,then go to Preempt Flash or all red flash and remain there until both the Gate Downinput and the Preempt request are removed. If NO, then end Track Green and proceed to Track Clearance and serve the preempt. If there is no Gate Down input for this preempt then this parameter is ignored and uses the default of NO.
GATE DOWN EXTENSION	**Gate Down Extension time (0-25.5 sec, default = 0)** Amount of time between receipt of Gate Down input activation and the actual truncation of Track Green. If this value is zero, then Track Green is truncated immediately albeit subject to Minimum Track Green time. If Gate Down input has been activated but the Gate Down Extension time would exceed Track Green time, Track Green will terminate at the end of Track Green time. This is ignored if there is no Gate Down input for this preempt.
DELAY	**Preempt Delay time (0-600 sec, default = 0)**: The amount of time that the preemption input must be active prior to initiating preempt service. If locking is enabled, the preemption is served even if the call is removed prior to Completion of this delay time. Minimum Duration starts at the end of the delay timing.
EXTENSION	**Preempt Extension time (0-255 sec, default = 0)** Amount of time to extend the preempt request after the input has been removed.
MAXIMUM PRESENCE	**Maximum Presence time (0-65535 sec, default = 0)**: This determines the maximum time that a preempt call may remain active and be considered valid. When the preempt call has been active for this time-period or longer, the Controller will return to normal operation. This preempt call is considered invalid until when a change in state occurs (no longer active). When this parameter is set to zero, the Maximum Presence feature is disabled.

MINIMUM DURATION	Preempt Minimum Duration time (0-65535 sec, default = 0): This value controls the minimum duration of the preempt service. The duration begins timing at the endof preempt delay (if configured) and prevents an exit from the dwell interval until this time has elapsed. This is useful for defining how long Cycling shall continue or how long to keep a Link active.
MINIMUM DURATION	**Preempt Minimum Duration time (0-65535 sec, default = 0)**: This value controls the minimum duration of the preempt service. The duration begins timing at the endof preempt delay (if configured) and prevents an exit from the dwell interval until this time has elapsed. This is useful for defining how long shall Cycling continue or how long to keep a Link active.
MINIMUM DWELL	**Minimum Dwell Interval (0-255 sec, default = 0)**: This parameter controls the minimum duration of the dwell interval. The dwell interval will not terminate until the completion of preempt Minimum Duration, preempt Minimum Dwell (this setting), and the call is no longer present. When this time has expired but either the input is still active or the Minimum Duration is still timing, the preemption can begin the Cycling Phases if any, or it can start the Link to the next preempt identified in the Link parameter.
LINKED PREEMPT	**Linked Preempt (0-15, default = 0)**: Provides a means to define a higher priority preempt to be combined (linked) with this preempt. At the end of preempt dwell green, the linked preempt will receive an automatic call that is maintained whilethe demand for this preempt is active. Any value that is not a higher priority preempt or a valid preempt is ignored. Minimum Duration for the original preempt starts timing at the end of any Delay and in conjunction with the Entry Phases with any Track Phases or if no Track at the Dwell interval (when Minimum Dwell starts timing). If Minimum Duration > Minimum Dwell, the linked preempt is called even if the input is no longer active. The linked preempt will continue until the Minimum Duration of the original preempt is expired. Once a link begins, i.e. after Minimum Dwell of the original preempt, the Minimum Duration of the linked preempt is also enforced. This duration starts timing after Minimum Dwell of the original preempt is expired.
ENTER MIN GREEN	**Entry Minimum Green time (0-255 sec, default = 255)**: A preempt initiated transition will not cause the termination of an existing green prior to its display for the lesser of the phase's minimum green time or this period. **Caution: if this value is zero, phase green is terminated immediately.**
ENTER MIN WALK	**Entry Minimum Walk time (0-255 sec, default = 255)**: A preempt initiated transition will not cause the termination of an existing walk prior to its display for the lesserof the phase's walk time or this period. **Caution: if this value is zero, phase walk is terminated immediately.**
ENTER MIN PED CLEAR	**Entry Minimum Ped Clearance time (0-255 sec, default = 255)**: A preempt initiated transition will not cause the termination of a ped clearance prior to its display for the lesser of the phase's ped clearance time or this period. **Caution: if this value is zero, ped clearance is terminated immediately.**

ENTER MIN YELLOW	**Entry Minimum Yellow Change time (0-25.5 sec, default = 25.5)**: This parametercontrols the yellow change timing for a normal yellow change signal terminated by a preempt initiated transition. A preempt initiated transition will not cause the termination of a yellow change prior to its display for the lesser of the phase's yellow change time or this period. Leaving this at the full value will ensure the current phase in service when the preempt becomes active will time its full value as specified in the Phase Timing table. **Caution: if this value is zero, phase yellow change is terminated immediately.**
ENTER MIN RED CLEAR	**Entry Minimum Red Clearance time (0-25.5 sec, default = 25.5)**: This parametercontrols the red clearance timing for a normal red clear signal terminated by a preempt initiated transition. A preempt initiated transition will not cause the termination ofa red clear prior to its display for the lesser of the phase's red clear time or this period. Leaving this at the full value will ensure the current phase in service when thepreempt becomes active will time its full value as specified in the Phase Timing table. **Caution: if this value is zero, phase red clearance is terminated immediately.**
TRACK MIN YELLOW	**Track Clearance Yellow Change time (0-25.5 sec, default = 25.5)**: The lesser of the phase's yellow change time or this parameter controls the yellow timing for the track clearance movement. Track clear phase(s) are enabled in the preempt Track Phase setting.
TRACK MIN RED CLEAR	**TRACK MIN RED CLEAR Track Clearance Red Clear time (0-25.5 sec, default = 25.5)**: The lesser of the phase's red clear time or this parameter controls the red clear timing for the track clearance movement. Track clear phase(s) are enabled in the preempt Track Phase setting.
EXIT PED CLEAR	**Preempt Exit Ped Clear time (0-255 sec, default = 0)**: The greater of this time or the normal phase ped clearance time is used when exiting preempt.
EXIT YELLOW	**Preempt Exit Yellow Change time (0.0-25.5 sec, default = 0.0)**: The greater of this time or the normal phase yellow change time is used when exiting preempt.
EXIT RED CLEAR	**Preempt Red Clearance time (0.0-25.5 sec, default = 0.0)**: The greater of this time or the normal phase red clearance time is used when exiting preempt.

Any Preempt run can be disabled by setting Track Clearance Green time and Preempt Minimum Duration time and Preempt Dwell time to zero and setting Preempt Dwell Phases to none. With these four parameters set as described, the preempt is disabled and will not start.

The time overrides any phase green timing. For example, if the phase Minimum Green is 20 seconds and Track Clearance time is 10 seconds, the phases are green for only 10 seconds. If the phases have a Minimum Green of 5 seconds and Track Clearance is 10 seconds, the phases are green for 10 seconds, since a hold is applied.

The Gate Down input truncates the Track Clearance time but not any phase Minimum Green. Therefore, if the phase Minimum Green is shorter than the Track Clearance time and the phase Minimum Green time has expired, the Gate Down truncates the remaining Track Clearance time.

4.3.8 **Transit Priority**

```
8          TRANSIT PRIORITY

1. GLOBAL OPTIONS
2. PRIORITY STRATEGY OPTIONS
3. PHASE ADJUSTMENT TIMES
```

Main Menu > Transit Priority

Select the setting to edit Transit Signal Priority (TSP), which improves travel times, schedule adherence, and operating costs for public transportation by reducing delay at intersections.

On roads equipped with TSP, traffic signals are notified of approaching vehicles before their arrival at intersections. This gives traffic signal Controllers the chance to adjust timing to reduce delay for the transit vehicle. Green lights can be lengthened for transit vehicles, while lights in the opposing directions can be shortened or even skipped. These timing adjustments increase the probability of transit vehicles getting a greenlight when they arrive at intersections and reducing the wait time.

Omni accommodates all types of transit vehicle detection and provides up to 16 unique priority “strategies” that determine how the Controller responds to a priority request. In addition, there are 4 different sets of transit priority options, so the priority operation can be changed in response to a time of day schedule or special events.

The TSP can do additional operations other than just adjusting the phase timing. The TSP can do phase insertion, calling a phase for service by the Transit Vehicle only when needed, both in Free and Coordinated operation. The TSP can also do Queue Jump signals whereby if the Transit Vehicle has a dedicated lane or track, it can be given agreen indication before any other vehicle movement starts.

The TSP can also accept an Estimated Time of Arrival (ETA) whereby the Controller is given information about the pending arrival of a transit vehicle. While the ETA timer is decrementing, the Controller does not start any TSP adjustments until either the timer reaches zero, or while under coordination the timer reaches one cycle length of the current pattern.

The TSP Request can be of various methods as well, either using a constant steady input demand or a low priority type that has a pulsating input. Either of these methods will use of a presence mode of sensing such that when the transit vehicle is within a zone of detection the demand is placed. Additionally, the TSP can use a momentary input mode known as a “Check In,” somewhat akin to pushing a button to alert the Controller of demand for TSP.

After the transit vehicle is served, a mode of Checkout Mode is configured. First choice follows a “Check In;" it is a “Check Out” mode that is a momentary input to terminate the TSP Request. Other methods for removing the Request are when the service phase starts green or when the service phase ends green or a time length to keep the Request active until that time expires.

There are also features such as Headway timers to keep a spacing between TSP Requests and Preempt Lockout timers that keep TSP Requests at bay following preemptions.

4.3.8.1 **Transit Priority Global Options**

```
8.1  TRANSIT PRIORITY GLOBAL OPTIONS

STRATEGY ENABLED       ....................
GLOBAL HEADWAY           0
PREEMPT LOCKOUT TIME     0
NODE NUMBER            0000000001
NODE NAME:             default
```

Main Menu > Transit Priority > Global Options

The Global Options affect all Priority Strategies in all Transit Priority Sets.

Table 4-37: Transit Priority Global Options

Item	Description
STRATEGY ENABLED	**Global Priority Strategy Enable: (grouped toggle: “.” = disabled, 0-F = enabled, default = none**) Enables or disables the selected priority strategies. To enable a strategy, it must be enabled both here and in the Priority Strategy Optionsfor the active Priority Strategy Set. Multiple Strategies can be configured but only those that are enabled here will allow Requests. Enter 1-F for priority strategy 1-16, enter 0 for priority strategy 10.
GLOBAL HEADWAY	**Global Headway Time (0 – 255 min, default = 0**): All priority requests is locked out for this amount of time after a Priority Request has been served. There isalso a per-strategy headway setting in the priority strategy options. This will minimize the impact on this intersection by only serving TSP Requests when this time has expired.
PREEMPT LOCKOUT TIME	**Global Preempt Lockout Time (0 – 255 min, default = 0)**: All priority requests is locked out for this amount of time after a preemption is served. There is also a per-strategy preempt lockout setting in the priority strategy options.
NODE NUMBER	**TPRG (Transit Priority Request Generator) Node Number: (0 - 4,294,967,295, default = 1)** Only required if using theoptional remote TPRG system. This would identify a given intersection for a remote TPRG. Each intersection involved with the TPRG must have a unique Node Number.

NODE NAME	**TPRG Node Name: (text string, default = “”)** Only required if using the optional remote TPRG system. To edit the name, use the left/right arrow keys to move to the desired character position, use the +/- keys to select the desired character. Multiple intersections involved with the TPRG could have the same Node Name (perhaps all on the same corridor) or all could have unique Node Names.

4.3.8.2 **Priority Strategy Options**

```
8.2  PRIORITY STRATEGY  1 IN SET 2     D
STRATEGY ENABLED    YES
OVERRIDE STRATEGY+1 NO
SERVICE PHASES      .2...6..........
CALL PHASES         ................
OMIT PHASES         ................
OMIT PEDS           .2..............
QUEUE JUMP PHASES   ................
```

```
ETA                  12
INPUT FUNCTION      PRIORITY
INPUT INDEX           1
INPUT TYPE          STEADY
REQUEST MODE        PRESENCE
CHECKOUT MODE       CHECKOUT_LEAD
REQUEST TIMEOUT     180
MAX PRESENCE        180
MAX PRESENCE CLEAR    0
MIN ON TIME          1.0
MIN OFF TIME         1.0
DELAY TIME            0
EXTEND TIME           0
HEADWAY TIME         30
PREEMPT LOCKOUT       0
ARRIVAL WINDOW        0
```

Main Menu > Transit Priority > Priority Strategy Options

Priority Strategy Options determine how the Controller will respond to priority requests. Different strategies may be set up to serve different approaches to the intersection, different routes, different types of vehicles, etc. The following options are available.

Table 4-38: Priority Strategy Option

Item	Description
STRATEGY ENABLED	**Priority Strategy Enabled (toggle: Yes, No, default = No**) Select Yes to enablethe strategy, or No to disable it. To enable a strategy, it must also be enabled in the transit priority Global Options. By time of day different Transit Priority Sets could be selected that enable or disable this Strategy.
OVERRIDE STRATEGY+1	**Override Priority Strategy+1 (toggle: Yes, No, default = No)** Determines relative priority of priority strategies. If set to YES, this strategy has higher priority than the next higher numbered strategy and will override it. If set to NO, this strategy has equal priority to the next higher numbered strategy and will not override it, they is served on a first-come-first-served basis. Example: • Strategy 1 = YES, Strategy 2-3 = NO • Strategy 4 = YES, Strategies 5-8 = NO o 1 is highest priority and will override 2 or higher o 2-4 are equal priority and will not override one another but will override 5-8 o 5-8 are equal priority, and will not override one another
SERVICE PHASES	**Priority Service Phases (grouped toggle: 1-F, default = none)** These are the phases which will receive priority service when this strategy is active. These phase(s) will receive early green and/or extended green service as needed. In multi-ring configurations, a compatible service phase could be designated in each ring, but unsymmetrical operation is possible. Every TSP Strategy MUST have at least one service phase. These phases will receive a recall and a hold by the TSP at the end of any ETA. Can be used for phase insertion.
CALL PHASES	**Call Phases (grouped toggle: 1-F, default = none)** These phases will have Vehicle calls while the priority strategy is active. Service phases already have automatic calls, so they do not need to be included here.
OMIT PHASES	**Omit Phases (grouped toggle: 1-F, default = none)** These phases will have theirservice omitted while the priority strategy is active. Under coordination, these phase-omits is applied when the remaining ETA is within one coordination pattern cycle time. When free they are applied immediately regardless of ETA.
OMIT PEDS	**Omit Peds (grouped toggle: 1-F, default = none)** These phases will have their pedestrian service omitted while the priority strategy is active. Under coordination,these ped omits is applied when the remaining ETA is within one coordination pattern cycle time. When free they are applied immediately, regardless of ETA.

Item	Description
QUEUE JUMP PHASES	**Queue Jump Phases (grouped toggle: 1-F, default = none)** These phases will receive Queue Jump with automatic Start Green Delay while the priority strategy is active. Start of green on Queue Jump phases is delayed by the amount of Queue Jump time configured in the Priority Strategy Phase Adjustment Time set- tings (8.3). By using an overlap that has the Service Phase as the Included Phase, the overlap is green while the Service Phase waits in Red for the automatic Start Green Delay of the TSP to finish. The overlap therefore gives the Queue Jump signal to the transit vehicle.
ETA	**Estimated Time of Arrival (number: 0-255 sec, default = 0)** Indicates the typical travel time in seconds of the Transit Vehicle from the detection point to the intersection stop bar. A value of zero allows any phase adjustments to occur immediately. A large value delays the application of any phase adjustments or omits until the time is equal to the cycle length of the coordination cycle. When running freeany omits are applied immediately; however, any holds on the service phases are applied when the timer reaches zero.
INPUT FUNCTION	**Priority Request Input Function (toggle: None, Preempt, Priority, default = none)** Selects the cabinet input function which activates this priority strategy. Priority service may be activated by Preempt or Priority inputs. If set to None, the strategy can still be called via remote request from a central system. Priority inputs may need a change in the I/O Map to have Priority inputs assigned to an input pin.
INPUT INDEX	**Priority Request Input Function Index (number: 0-16, default = 0)** This is the input function index which activates this priority strategy. For example, if the strategy is activated by Priority input 2, the index is 2. If this Strategy is called by a Preempt input #5 this index is 5
INPUT TYPE	**Priority Request Input Type (toggle: Steady, Pulsing, default = Steady)** Selects whether the priority strategy is activated when the cabinet input is on steady(a.k.a. high priority) or pulsing (a.k.a. low priority such as an Opticom unit). Selects whether the priority strategy is activated when the cabinet input is on steady (aka high priority) or pulsing (a.k.a. low priority such as an Opticom unit). **NOTE:** A low priority (pulsing Input) will require 1.0 seconds to be determined as a low priority input and it will require 1.0 seconds for the priority requested to terminate after the input is removed. This is because the input has to be read through 1 cycle on or off to determine the input state.
REQUEST MODE	**Priority Request Mode (toggle: Presence, Check In Lead, Check In Trail, default = Presence)** Selects the mode of operation for the cabinet input which requests this priority strategy. In Presence mode, the request is active while the input is on. In Check In mode, the physical input is momentary, and the Request isactive until Checkout or Timeout occurs. For Check In mode, the Request can be triggered by either the leading or trailing edge of the input pulse.
	Checkout Mode (toggle: Checkout Lead, Checkout Trail, Timeout, Service Phase Green, Service Phase Gap, default = Checkout Lead) Selects the Checkout Mode. This option is only relevant if the request mode is

Item	Description
CHECKOUT MODE	set to Check In Lead or Check In Trail. The Checkout event can be triggered by either the Leading or Trailingedge of checkout detector pulse, or by the Checkout Timeout (i.e. if there is no checkout detector), or at the beginning of the Service Phase Green (i.e. if the transit vehicle stops at the stop bar), or at the termination of the green by the Service PhaseGap. Regardless of the selected mode, the Priority Request is automatically cancelled if the timeout expires before the checkout event.
REQUEST TIMEOUT	**Automatic Checkout Timeout (number: 0-255 sec, default = 180)** Timeout in seconds after which priority requests is automatically canceled even if no checkout event has occurred, useful if the input is stuck on. This timeout can also serve as a maximum request duration if the Request Mode is set to Presence. Be aware that for large values of ETA, this Timeout can remove the Request before the ETA has expired. If Timeout is set to zero the Timeout is disabled, and the Request can remain indefinitely.

	Max Presence Time (number: 0-255 sec, default = 180) Maximum time in seconds that the cabinet input can remain continuously activated. If this limit is exceeded, the Priority Request is cancelled and the input is ignored, a fault condition until the input has been deactivated for at least the Max Presence Clear time. NOTE: This timer is NOT for Check In mode as it only applies to an input remaining active in the Presence Request Mode. Be aware that for large values of ETA, this Max Presence can remove the Request before the ETA has expired. IfMax Presence is set to zero, the Max Presence is disabled, and the cabinet input can remain indefinitely
MAX PRESENCE CLEAR	**Max Presence Clear Time (number: 0-255 sec, default = 0)** If the Max Presence time has expired, the cabinet input must be deactivated for at least this amount oftime before it can place Priority Requests again.
MIN ON TIME	**Minimum On Time (number: 0-25.5 sec, stored as tenths, default = 0.0)** This is a noise filter for the cabinet input associated with this Priority Strategy. The input must be activated for this amount of time before it takes effect.
MIN OFF TIME	**Minimum Off Time (number: 0-25.5 sec, stored as tenths, default = 0.0)** This isa noise filter for the cabinet input associated with this Priority Strategy. The input must be deactivated for this amount of time before it takes effect.
DELAY TIME	**Delay Time (number: 0-255 sec, default = 0)** When a Priority input is activated, the start of Priority Request is delayed for this amount of time. If the input is removed while this delay is timing, then the Priority Request will not occur.
EXTEND TIME	**Extend Time (number: 0-255 sec, default = 0**) When a Priority input is removed, the Priority Request is extended for this amount of time.

HEADWAY TIME	**Priority Strategy Headway Time (number: 0-255 min, default = 0**) Service requests for this strategy is locked out for this amount of time after this strategy has been served. Prevents multiple closely spaced service requests for this strategy. There is also a global headway setting in the Global Options that prevents multiple closely spaced service requests for all strategies.
PREEMPT LOCKOUT	**Priority Strategy Preempt Lockout Time (number: 0-255 min, default = 0)** Requests for this priority strategy is locked out for this amount of time after any preempt has been served. There is also a global preempt lockout setting in the Global Options that affects all priority strategies.
ARRIVAL WINDOW	**Arrival Window time (number 0-255 sec, default = 0)** Once ETA has expired the Arrival Window time is compared to the position in the Service Phase green time to determine whether to reduce all phases to get to the Service Phases quickly next cycle or to now extend the green of the Service Phases. Currently supported in Free mode.

To achieve the shortest recovery times when using the TSP during coordination, it is advisable to set both the reduction and extension times on all phases that are to be involved. While the Request is Active, it is only the Service Phases that are extended if a time is entered in the Phase Adjustment table. Other phases that have a reduction time are reduced by that amount, except if the requested reduction violates the phase service minimum times. No split can be made shorter than the phase service minimum times, for a vehicle phase that is minimum green plus yellow change plus red clearance and for a pedestrian phase that is walk time plus pedestrian clearance plus yellow change plus red clearance.

Once the TSP is in Recovery, it looks at what phases can be reduced as per the phase adjustment table while not violating the phase service minimum times. If there are reduction times entered for the service phases in addition to the extension times, those reduction times can be used to speed up the recovery process.

4.3.8.3 **Phase Adjustment Times**

```
8.3  PRIORITY STRATEGY  1 IN SET 1       R
 PHASE#    1   2   3   4   5   6   7   8
REDUCE     5   0   5  10   5   0   5  10
EXTEND     0  12   0   0   0  12   0   0
QJUMP/10   0   0   0   0   0   0   0   0
```

Main Menu > Transit Priority > Phase Adjustment Times

These options control the amounts of phase adjustment time that can be applied during service of this priority strategy. The next priority strategy can be displayed by pressing the Next key.

Table 4-39: Phase Adjustment Times

Item	Description
EXTEND	**Phase Extension Time (number: 0-255 sec, default = 0)** Maximum green extension time allowed for service phases during service of this Priority Strategy. This time may be truncated if the Priority Request is removed before the maximum green extension is reached. This time may not occur if the Priority Request is removed once the Service Phase finishes timing Minimum Green. The Service Phases always has a Hold and a recall applied while the Priority Request is active regardless of Free or Coordinated mode and are terminated by a Force Off at the end of the Extend time.
REDUCE	**Phase Reduction Time (number: 0-255 sec, default = 0)** Maximum green reduction time allowed for non-service phases during service of this Priority Strategy. In Free mode and with constant vehicle demand, phases are forced off at this many seconds before reaching Maximum Green. Under coordination, splits are reduced by this many seconds.
QJUMP/10	**Queue Jump Time (number: 0-25.5 sec, stored as tenths, default = 0.0)** Queue jump time to be used during service of this priority strategy. Phases selected as queue jump phases in the priority strategy options will delay start of green by this amount of time. This is generally used to allow transit vehicles to proceed before normal vehicles.

It is possible to apply the TSP to only one ring in a standard dual ring configuration: both the phase adjustment times and a singular service phase. But be aware that in a standard dual ring configuration, the two rings must cross the barriers together, meaning that both rings must be ready to terminate together. If only one ring is extended on a phase at the barrier, the other ring is extended as well, even though there is no extension time for that ring.

It is possible for TSP operation while in free mode. The Service Phase receives a recall, useful if the Service Phase is to be called only for TSP demand. The Service Phase also has a Hold applied. Reduction times entered into the Phase Adjustment table affect the Maximum Green time that the non-service phase is normally extendedby placing a Force Off to terminate the phase early by the amount of reduction time.

The Service Phase is extended with a Hold applied during extension time in the Phase Adjustment table before a Force Off is applied to end the extension. There is no Recovery following the TSP Request while in free mode because the Controller is allowed to use the normal Maximum Green times again.

4.3.9 **Logs**

```
9                    LOGS

1. VIEW LOGS
2. CLEAR LOGS
3. SETUP LOGS
4. ENABLE LOGS
```

Main Menu > Logs

These options allow you to view, clear, or configure the Controller logs.

4.3.9.1 **View Logs**

```
9.1              VIEW LOGS

1. COMBINED (2-8)       7. PREEMPT
2. OPERATION            8. PRIORITY
3. DETECTOR             9. DETECTOR VOS
4. COMMUNICATION        0. SPEED TRAP
5. ACCESS               A. CYCLE MOE
6. COMMAND
```

Main Menu > Logs > View Logs

Select the type of log to view.

1. Combined (2-8): This log shows all events from the Operation, Detector, Communication, Access,Command, Preempt and Priority logs. These logs include the types of alarms andevents that are enabled in the Log Setup menu.
2. Operation: Shows operational events such as power up and pattern change.
3. Detector: Shows detector faults.
4. Communication: Shows system communication events.
5. Access: Shows user activity such as database changes.
6. Command: Shows events related to commanded mode of operation.
7. Preempt: Shows preempt events.
8. Priority: Shows transit priority events

9. Detector VOS: Shows historical detector Volume Occupancy and Speed (VOS)data.
10. Speed Trap: Shows historical speed trap data.
11. Cycle MOE: Shows historical cycle Measures of Effectiveness (MOE) data.

Data in these logs are sorted into chronological order from newest to oldest.

4.3.9.1.1 Combined Log

```
9.1.1           COMBINED LOG            D
 #   DATE  TIME           EVENT
001 02/06 22:36 MANUAL PATTERN/MODE
002 02/06 22:36 POWER RESTORED
003 02/06 11:04 POWER LOST
004 02/06 02:04 DATA CHANGE
005 02/06 02:04 DATA CHANGE
006 02/06 01:53 DATA CHANGE
```

This is the Combined View of all logs, specifically the Operation, Detector, Communication, Access, Command, Preempt, and Priority logs. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. More events can be seen by pressing the DOWN key. The log automatically wraps around when you pass the last entry. The Combined log can hold up to 2100 events (7*300). All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.2 Operation Log

```
9.1.2          OPERATIONS LOG           D
 #   DATE  TIME           EVENT
001 02/06 22:36 FREE BY COMMAND
002 02/06 22:36 POWER RESTORED
003 02/06 11:30 POWER LOST
```

This is the Operations log view, dedicated to only the Operation events. Each entry in the log has an entry number followed by the date (month, date) and the time (hour, minute) and the name of the event. More events can be seen by pressing the DOWN key. The Operations log holds up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form.

4.3.9.1.3 Detector Log

```
9.1.3          DETECTOR LOG            D
 #   DATE  TIME            EVENT
```

This is the Detector log view, dedicated to only Detector events. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. This log is empty. Any log that is not enabled and has been cleared will look like this. More events can be seen by pressing the DOWN key. The Detector log can hold up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.4 Communication Log

```
9.1.4        COMMUNICATION LOG         D
 #   DATE  TIME           EVENT
```

This is the Communication log view, dedicated to only Communication events. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. This log is empty. Any log that is not enabled and has been cleared looks like this. More events are seen by pressing the DOWN key.The Communication log can hold up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.5 Access Log

```
9.1.5             ACCESS LOG           D
 #   DATE  TIME            EVENT
001 02/06 02:07 DATA CHANGE
002 02/06 02:07 DATA CHANGE
003 02/06 02:04 DATA CHANGE
004 02/06 02:04 DATA CHANGE
005 02/06 02:04 DATA CHANGE
006 02/06 01:53 DATA CHANGE
```

This is the Access log view, dedicated to only Access events. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. More events are seen by pressing the DOWN key. The Access log can hold up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.6 Command Log

```
9.1.6           COMMAND LOG              D
 #   DATE  TIME            EVENT
001 02/06 22:36 MANUAL PATTERN/MODE
```

This is the Command log view, dedicated to only Command events. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. More events are seen by pressing the DOWN key. The Command log can hold up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.7 Preempt Log

```
9.1.7           PREEMPT LOG              D
 #   DATE  TIME            EVENT
```

This is the Preempt log view, dedicated to only Preempt events. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. More events are seen by pressing the DOWN key. The Preempt log can hold up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.8 Transit Priority Log

```
9.1.8       TRANSIT PRIORITY LOG            D
 #   DATE  TIME             EVENT
```

This is the Transit Priority log view, dedicated to only Priority events. Each entry in the log has an entry number followed by the date (month, date), the time (hour, minute), and the name of the event. More events are seen by pressing the DOWN key. The Transit Priority log can hold up to 300 events. All events are stored with ASCII descriptions and are displayed in readable form from newest to oldest.

4.3.9.1.9 Detector VOS Log

```
9.1.9         DETECTOR VOS LOG   PG 1 OF 5
END: 02/08 14:45  PERIOD:    1min  #:   1
  DET#     1    2
   VOL     6    6
   OCC   157  154
 SPEED     0    0
```

This is the Detector VOS log view, dedicated to only Detector Volume, Occupancy and Speed data. More Detector VOS data for detectors configured with Volume and Occupancy is seen by pressing the UP/DOWN key as indicated by the page numbers. The Detector VOS log can hold up to 1000 events. This log is stored in a compressed binary format and displayed in readable form.

On the first line below the screen title (second row of screen text) beginning on the left side is the END time with date and time when this data was collected based on the Collection Period (from menu 9.3.2) shown here as PERIOD with 1 minute. Next is the Sequence number for each collection interval. Use either the LEFT / RIGHT arrow keys or the + / - keys to step through each collection period of data.

The next screen row is the Detector number associated with the column of collected data. Use the UP / DOWN key to see additional detectors of each sequence sample period. The Detector Volume is the count of cars per sample period. The Occupancy is expressed as a percent of occupancy per sample period. (200% is occupancy for the whole period whereas 100% is occupancy for ½ period.) The Speed is the estimated speed for a single detector speed trap configuration and the VOS length is in the Vehicle Detector data.

4.3.9.1.10 Speed Trap Log

```
9.1.0          SPEED TRAP LOG              D
END: 02/08 16:33  PERIOD:    1min  #:    1
TRAP AVG  000+
   1    0    5
   2    0    5
   3    0    0
   4    0    0
   5    0    0
  …
  16    0    0
```

This is the Speed Trap log view, dedicated to only Speed Trap data. More Speed Traps can be seen by pressing the UP/DOWN key. The Speed Trap log can hold up to 1000 events. This log is stored in a compressed binary format and is displayed in readable form.

On the first line below the screen title (second row of screen text) beginning on the left side is the END time with date and time when this data was collected based on the Collection Period (from menu 9.3.3.1) shown here as PERIOD with 1 minute. Next is the Sequence number for each collection interval. Use the + / - keys to step through each collection period of data.

NOTE: The Speed Trap supports 16 traps either with one detector each or with pairs of detectors each.

Next line are the labels for the Traps and their data followed by 16 rows of trap number and speed data, both the average speed and the Speed Bin counts. Each Speed Bin column is labeled with the speed range for that bin as defined in menu 9.3.3.3. Use the UP / DOWN keys to see the other detector speed traps. When changing the bin ranges, it is best to clear the log and start fresh.

4.3.9.1.11 Cycle MOE (Measure of Effectiveness) Log

```
9.1.A            CYCLE MOE LOG
 ST:01/01 00:00:00 PAT:000 CL:000  FREE
PHS# 1   2   3   4   5   6   7   8
SPL  00  00  00  00  00  00  00  00
USE  00  00  00  00  00  00  00  00
PHS# 9   10  11  12  13  14  15  16 0001
SPL  00  00  00  00  00  00  00  00
USE  00  00  00  00  00  00  00  00
```

This is the Cycle MOE (Measure of Effectiveness) log view, dedicated to only Cycle MOE data. More Cycle MOE data (older) could be seen by pressing either the RIGHT arrow or the + key while previous entries (newer) are seen by pressing the LEFTarrow key or the key. The Cycle MOE log can hold up to 1000 events. Once full, older cycles are deleted when new ones are added. This log is stored in a compressed binary format and displayed in readable form.

On the first line below the screen title (second row of screen text) beginning on the left side is the Stop Time with date and time when this sample was recorded. Next is the current Pattern number followed by the Cycle Length and the state of the coordinator. The next row is labels for the first eight Phases. the assigned Split time is shown for each phase while in coordination, and below that is the time used by each phase including clearance times. From this log, one could determine if the phases are using the split time of the pattern or if in transition or in Transit Priority whereby the time used is different from the pattern split times. One can also see the number of cycles used to get into sync. Each cycle has a count number shown on the far right in the sixth row. Currently, this log does not record free operation.

4.3.9.2 **Clear Logs**

```
9.2            CLEAR LOGS
    LOGS TO CLEAR:        ALL LOGS
           PRESS YES TO CLEAR
```

Main Menu > Logs > Clear Logs

Allows any or all Controller logs to be cleared. Select the desired logs to be cleared, date and time, and press the Yes key to proceed.

Table 4-40: Clear Logs

Item	Description
LOGS TO CLEAR	Use the + and – keys to scroll through the list of available logs to clear, All Logs, Combined Logs, Operation, Detector, Access, Command, Communication, Preempt, Priority, MOE, Detector VOS, Speed Trap, High Resolution.

4.3.9.3 **Setup Logs**

```
9.3             SETUP LOGS

1.  ALARMS AND EVENTS
2.  DETECTOR VOS
3.  SPEED TRAP
4.  HIGH RESOLUTION
5.  UNITS
```

Main Menu > Logs > Setup Logs

Select the type of log to be configured. The Alarms and Events allow the user to decide what type of Events or Alarms are logged into the Combined, Operations, Detector, Communication, Access, Command, Preempt, and Priority logs. The Detector VOS con figures the collection periods. The Speed Trap configures the collection period, the detectors used and distance between pairs and any speed bins or counts of cars passing within specific speed ranges. The Units configures measurements based on English or Metric system used.

4.3.9.3.1 Alarms and Events

```
9.3.1  ALARM & EVENT LOG SETUP         D
POWER ON/OFF                    LOG
LOW BATTERY                     LOG
CYCLE FAULT                     LOG
COORD FAULT                     LOG
CYCLE FAIL                      LOG
COORD FAIL                      LOG
MMU FLASH                       LOG
```

```
LOCAL FLASH                    LOG
LOCAL FREE                      LOG
PATTERN CHANGE                  LOG
COMMAND CHANGE                  LOG
DOOR AJAR STATUS CHANGE         LOG
DETECTOR STATUS CHANGE          LOG
PREEMPT STATUS CHANGE           LOG
ALARM STATUS CHANGE             LOG
RESPONSE FAULT                  LOG
COMMUNICATIONS STATUS           LOG
DATA CHANGE KEYBOARD            LOG
ACCESS CODE                     LOG
CONTROLLER DOWNLOAD             LOG
PRIORITY REQUESTS               LOG
MANUAL CONTROL ENABLE           LOG
STOP TIME                       LOG
```

Main Menu > Logs > Setup Logs > Alarms and Events Log Setup

Selects the types of events that are included in the Operation, Detector, Access, Command, Communication, Preempt, and Priority logs. Use the up and down arrows to select the log item. Use the + and – keys to turn the selected log item on or off (“Log” =On, or “No Action” = Off).

Table 4-41: Alarms and Events Log Setup

Item	Description
POWER ON/OFF	Enable any Power changes to Operations log
LOW BATTERY	Not used
CYCLE FAULT	Enable any Cycle Fault changes to Operations log
COORD FAULT	Enable any Coord Fault changes to Operations log
CYCLE FAIL	Enable any Cycle Fail changes to Operations log
COORD FAIL	Enable any Coord Fail changes to Operations log

Item	Description
MMU FLASH	Enable any MMU Flash changes to Operations log
LOCAL FLASH	Enable any Local Flash changes to Operations log
LOCAL FREE	Enable any Local Free changes to Operations log
PATTERN CHANGE	Enable any Pattern changes to Operations log
COMMAND CHANGE	Enable any Command changes to Command log
DOOR AJAR STATUS CHANGE	Enable any Door Ajar Status changes to Operations log
DETECTOR STATUS CHANGE	Enable any Detector Status changes to Detector log.
PREEMPT STATUS CHANGE	Enable any Detector Status changes to Detector log.
ALARM STATUS CHANGE	Enable any Alarm Status changes to Operations log
RESPONSE FAULT	Enable any Response Fault changes to Operations log
COMMUNICATIONS STATUS	Enable any Communication status changes in Communication log.
DATA CHANGE KEYBOARD	Enable any keyboard entry to be logged in Access log.
ACCESS CODE	Enable logging any change to Access Codes to Access log
CONTROLLER DOWNLOAD	Enable logging of Download to Controller in Access log.
PRIORITY REQUESTS	Enable logging of TSP Requests in Priority log
MANUAL CONTROL	Enable logging of Manual Control
STOP TIME	Enable logging of Stop Time

4.3.9.3.2 Detector VOS

```
9.3.2    DETECTOR VOS LOG SETUP

COLLECTION PERIOD             0
COMBINED PERIODS              0
```

Main Menu > Logs > Setup Logs > Detector VOS

Table 4-42: Detector VOS

Item	Description
COLLECTION PERIOD	**Volume Occupancy Log Collection Period (0-255 sec)** Defines the length of theVolume/Occupancy/Speed collection period. Affects both real-time reporting via NTCIP/AB3418 and local logging. A value of zero disables VOS data reporting and logging.
COMBINED PERIODS	**Combined Periods (0-255)** The number of Collection Periods that is combined into each VOS log entry. This allows the log entries to represent a time-period longer than 255 sec. A value of zero is the same as 1. Only affects local logging, not real-time reporting via NTCIP/AB3418.

4.3.9.3.3 Speed Trap

```
9.3.3     SPEED TRAP LOG SETUP

1. COLLECTION PERIOD
2. DETECTOR SETUP
3. SPEED BIN RANGES
```

Main Menu > Logs > Setup Logs > Speed Trap

Select the detector speed trap setting to configure.

4.3.9.3.3.1 Collection Period

```
9.3.3.1     SPEED TRAP LOG SETUP

COLLECTION PERIOD        00:00:00
```

Main Menu > Logs > Setup Logs > Speed Trap > Collection Period

Enter the speed trap log collection period in (HH:MM:SS). A setting of zero disables speed trap logging.

4.3.9.3.3.2 Detector Setup

```
9.3.3.2    SPEED TRAP DETECTOR SETUP     R

 TRAP#    1     2     3     4     5     6     7
DET1      0     0     0     0     0     0     0
DET2      0     0     0     0     0     0     0
DIST    0.0   0.0   0.0   0.0   0.0   0.0   0.0
 (DIST VALUES IN FEET)
```

Main Menu > Logs > Setup Logs > Speed Trap > Detector Setup

Enter detector settings for up to 16 traps. Note that for NEMA TS 2 Type 1 or Type 2 cabinets, using Detector BIUs or for the ITS cabinets using Detector SIUs, it is recommended that the speed trap detector pairs should be on the same detector BIU/SIU to ensure the time resolution has no discrepancy between the detector pair data. This cannot be guaranteed when the pair of detectors are on different BIUs/SIUs.

Table 4-43: Detector Setup

Item	Description
DET1	**Vehicle detector number 0-128**. Represents the upstream detector in a dual detector speed trap. If Det2 is not entered, it represents a single detector used for speed estimation based on average vehicle length. A value of zero disables this speed trap.
DET2	**Vehicle detector number 0-128**. Represents the downstream detector in a dual detector speed trap.
DIST	This is either the **Distance** between Det1 and Det2 if two detectors are used, or the average vehicle length + loop length to be used for single detector speed estimation using Det1, no second detector is entered. This value is entered in feet or meters, depending on the Units setting in menu 9.3.5. (0-99.9 meters or 0-327.7 feet)

4.3.9.3.3.3 Speed Bin Ranges

```
9.3.3.3      SPEED TRAP BIN RANGES
BIN#   1     2     3     4     5     6     7    8
MPH      0   20    40    60    80   100     0    0

BIN#   9     10    11    12    13    14    15   16
MPH      0    0     0     0     0     0     0    0
```

Main Menu > Logs > Setup Logs > Speed Trap > Speed Bin Ranges

Use the right, left, up and down arrow keys to select bins and the keypad to enter a speed for each bin.

Each entry represents the lower speed threshold for each of the 16 speed bins. Each speed bin collects a count of the number of recorded speed measurements within the range of the bin. Each entry should be greater than the previous entry and less than the next higher numbered entry. The allowed values are 0-255 KPH or 0-158 MPH, depending on the Units setting in menu 9.3.5. If the value for bin 1 is greater than zero, lesser speeds will not be counted. A value of zero for bins other than Bin 1 disables those bins, so fewer than 16 bins can be used.

4.3.9.3.4 High Resolution

```
9.3.4     HIGH RESOLUTION LOG SETUP       D
ACTIVE PHASE EVENTS             YES
ACTIVE PEDESTRIAN EVENTS        NO
BARRIER / RING EVENTS           NO
PHASE CONTROL EVENTS            NO
OVERLAP EVENTS                  NO
DETECTOR EVENTS                 NO
PREEMPTION EVENTS               NO

COORDINATION EVENTS             NO
CABINET / SYSTEM EVENTS         NO
```

Main Menu > Logs > Setup Logs > High Resolution Log Setup

Selects the types of events that are included in the High-Resolution logs. Use the up and down arrows to select the log item. Use the + and – keys to turn the selected log item on or off (“Yes” = On, or “No” = Off).

High resolution data logging is supported by the *Omni eX* intersection control software starting with version 1.7.0 of the program. While there are no officially adopted standards or reference implementations for high resolution data logging, the implementation in the program follows the work in this area performed by Purdue University and Indiana DOT. This has been reviewed by Utah DOT and Florida DOT.

4.3.9.3.4.1 Log Files

The program stores high resolution data in files, where each file contains data for a five-minute period. These files are binary data and as such are not in a readable form. The program creates a file when the Controller is powered on or when logging is enabled, so the start time of the period is variable and not necessarily the beginning of the minute at even multiples of five minutes.

Up to 24 hours of events are stored on the Controller. Log files are stored in volatile memory or RAM disk and are lost if power is removed from the Controller. In a FLeX con troller or 2070 CPU card version 3 which support an SD card, the High-Resolution log is stored there as an optional backup device, which can have space for much longer data collection than 24 hours.

Log files vary in size depending on activity (actuations, phase changes, etc.), so any estimates for file size are approximate and cannot be guaranteed. As a rule of thumb, given a typical eight phase intersection with pedestrian operation, approximately 1 kilobyte of data is logged per minute. Therefore, log files do not typically exceed 5 kilobytes.

4.3.9.3.4.2 File Naming

Log files that are currently being written (i.e., open) have an extension '.inprogress,' while those that are complete have an extension '.dat.' For example:

- MCCN_0000000123_20151112_180734.dat
- MCCN_0000000123_20151112_182234.inprogress

The components of the file name are as follows:

- MCCN: vendor identifier for McCain
- 0000000123: SYSTEM_ID of Controller
- 20151112: date that file was created in YYYYMMDD (ex. November 12, 2015)
- 180734: time of day that file was created in HHMMSS (18:07:34 shown)

If a file of the same name exists when a file is created, a letter is appended to the filename to ensure uniqueness. For example:

- MCCN_0000000123_20151112_180734a.dat

If the Controller clock is changed to a time that falls outside the current five-minute logging period, the currently-open file is closed, and a new file is started.

4.3.9.3.4.3 *Event Codes*

The program uses the high-resolution event enumerations defined by Purdue University and Indiana DOT, with the following exceptions:

- Coordination event 150: In the event parameter, transition states 2-4 are not differentiated. State 2 is always reported during transition.
- Preemption event 101: Not supported.
- Barrier event 31: Now supported in version 3.3.0 v1.1.
- Pedestrian event 24: Now supported in version 3.3.0 v1.1..
- Controller Clock Updated event 181: The parameter indicates the time correction in the range (-127 to 127) instead of (0 to 255). This event is timestamped with the clock time before the clock was updated. In this way, it can be used in conjunction with vendor-specific alarm value 3 (see description below) to calculate the exact amount of the clock adjustment.

4.3.9.3.4.4 *Vendor-Specific Events*

The following events are implemented with the Vendor Specific Alarm event (185):

- Parameter 0: buffer overflow (should never happen)
- Parameter 1: logging enabled
- Parameter 2: logging disabled
- Parameter 3: new time after clock was updated

4.3.9.3.4.5 *Controlling Logging*

Enable high resolution logging at the unit level (Menu 9.4) and choose the event categories of interest (Menu 9.3.4).

4.3.9.3.4.6 *Retrieving Logs*

High-resolution log files are intended to be retrieved in an automated fashion by a computer program running on a central system or laptop for further manipulation and analysis. As such, logs cannot be viewed on the front panel of the Controller and must be retrieved via IP communications or saved with all other Controller logs to a USB. Connect to the Controller via FTP or SCP and log in with username and password. Using the binary transfer mode, upload the completed files (.dat extension) from **/mnt/rd/hrLogs**.

The completed files may be deleted; otherwise, they are automatically deleted as needed once the maximum number of files has accumulated or upon power loss. All log files on the USB are compressed ending in a Linux file extension of .gz and must be extracted from the compressed file (i.e. 7-Zip, WinZip).

Logs are now stored in different directories depending on the running version of Omni and the controller type. Consult the table below to determine the log file source location.

Table 4-44: Log File Source Location for EB2 and EB3

Log Type	Source location
Controller Log	/atc/omni/activeVersion/symlinks/sram
MOE Log & VOS Log	/atc/omni/activeVersion/symlinks/sandbox/traffic/logs
Hi Res Data	/atc/omni/activeVersion/symlinks/sandbox/hiResData

Uploads of the currently-open file (.inprogress extension) may not succeed and are discouraged.

4.3.9.3.4.7 Converting Logs to CSV

The high-resolution log files contain binary data and, as such, are not in human-readable form. However, using either the supplied utility or selecting the option in the menu for saving logs to USB, the data can be converted to comma separated value (CSV) format, which can be opened in text editors, imported into spreadsheet programs such as Microsoft Excel, uploaded to a relational database management system, and further converted to other formats. Omni 2.0 requires a different parser utility than Omni 1.x asthe high-resolution log file structure has changed. Contact McCain technical support toobtain the parser utilities.

The utility is supplied in versions for Windows and Linux. The usage is the same for both, and byte ordering is handled automatically as needed. For more information onthe High-Resolution Data Enumerations found within the csv file, refer to the Purdue University E-Pubs website to obtain the PDF describing the enumerations.
http://docs.lib.purdue.edu/jtrpdata/3/

4.3.9.3.4.8 Using the CSV Utility

Run the CSV utility with no parameters to display help text and other information.

Table 4-45: CSV Utility Parameters

Item	Description
h	Include file header data in output
e	Include event data in output
s	Include system ID with event data
q	Include file sequence number with event data
n	Include event numbers with event data
d	Include textual descriptions with event data

Item	Description
-o[file]	Output to specified file If -o included and file not specified, output to input_file1.csvIf -o not included, output to screen (stdout)
-x	Decode all high-resolution events within the controller, no input file is required

Description:

Parse high resolution log files from McCain Omni eX.
Output in CSV format to screen or to file.
Must include -h and/or -e option to select output data.
If multiple input files are specified, all output is combined.
Program version: 1.2.2
Supported log file version: 1
Copyright (c) 2020, McCain, Inc.

Use the -o parameter to output CSV to a file.

C:\test>hrLogPrint -h -e -d -o MCCN_0000000123_20160211_165530.datOutput file: MCCN_0000000123_20160211_165530.csv

Exclude the -o option to output to the screen

C:\test>hrlogprint -h -e -s -q -n -d MCCN_0000000123_20160301_171219.dat

System ID, File Seq Num, Event Num, Timestamp, Event Code, Event

Param, Event Description

0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Input Filename: MCCN_0000000123_20160301_171219.dat
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Log File Version: 1
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Omni Version: 1.7.1.5671
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,IP Addr: 010.001.003.183
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,MAC Addr: 10:10:B6:00:18:05
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,System ID: 0000000123
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,System Name:
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,File Sequence Num: 116
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Start Time: 2016-03-01 17:12:19
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Event Count: 208
0000000123,0000000116,00001,2016-03-01 17:12:53.5,005,004,Phase Max Out
0000000123,0000000116,00002,2016-03-01 17:12:53.5,005,008,Phase Max Out
0000000123,0000000116,00003,2016-03-01 17:12:53.5,043,004,Phase Call Registered
0000000123,0000000116,00004,2016-03-01 17:12:53.5,043,008,Phase Call Registered
0000000123,0000000116,00005,2016-03-01 17:12:53.5,007,004,Phase Green Termination
0000000123,0000000116,00006,2016-03-01 17:12:53.5,008,004,Phase Begin Yellow Clearance

0000000123,0000000116,00007,2016-03-01 17:12:53.5,007,008,Phase Green Termination
0000000123,0000000116,00008,2016-03-01 17:12:53.5,008,008,Phase Begin Yellow Clearance
0000000123,0000000116,00009,2016-03-01 17:12:57.5,009,004,Phase End Yellow Clearance
0000000123,0000000116,00010,2016-03-01 17:12:57.5,010,004,Phase Begin Red Clearance
0000000123,0000000116,00011,2016-03-01 17:12:57.5,009,008,Phase End Yellow Clearance
0000000123,0000000116,00012,2016-03-01 17:12:57.5,010,008,Phase Begin Red Clearance
0000000123,0000000116,00013,2016-03-01 17:12:59.5,044,001,Phase Call Dropped
0000000123,0000000116,00014,2016-03-01 17:12:59.5,044,005,Phase Call Dropped
0000000123,0000000116,00015,2016-03-01 17:12:59.5,000,001,Phase On
0000000123,0000000116,00206,2016-03-01 17:16:48.5,001,008,Phase Begin Green
0000000123,0000000116,00207,2016-03-01 17:16:52.5,003,004,Phase Min Complete
0000000123,0000000116,00208,2016-03-01 17:16:52.5,003,008,Phase Min Complete

0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Input Filename: MCCN_0000000123_20160301_171219.dat
0000000123,0000000116,00000,2016-03-01 17:12:19.0,255,Log File Version: 1

Multiple input files can be processed with a single command, and wildcards are supported. If there are multiple input files, all output is combined in a single file. If the output file already exists, the output is appended to the existing file. If no output filename is specified, the name of the first input file is used as the output file name.

C:\>hrlogprint -h -e -d -o *.dat

Output file: MCCN_0000000123_20160301_163719.csv

4.3.9.3.4.9 Viewing CSV files in Microsoft Excel

When viewing a CSV file in Excel, you may want to modify the default cell format in the Timestamp column to show the full timestamp resolution:

Right click on the top column label of the Timestamp column and select Format Cells...in the context menu. A Format Cells dialog box is displayed. In the Number tab, select the Custom category.

Enter the following format code into the Type box (you can copy and paste from here):yyyy-mm-dd hh:mm:ss.0

Click OK.

The values in the Timestamp column can be used directly in formulas, for example, to calculate the difference between timestamp values.

4.3.9.3.4.10 Parser Revision History

Version 2.7 07/21/2021:

- Added support for multiple input files
- Added -n option
- Changed -h option to output header info in event data formatVersion 1.1.1, 03/24/2016:
- Fixed formatting of large system ID and file sequence number values in outputwhen -n option is used.

Version 1.2.0, 05/09/2016:

- Split -n option into -n and -q to allow event numbers and file sequence numbers tobe individually selectable
- Added filename to some error messages

Version 1.2.1, 06/07/2016:

- Remove extraneous spaces after commas in CSV output

Version 1.2.2. 11/22/2016

- Fixed errors in print utility

4.3.9.3.5 Units

```
9.3.5            LOG UNITS

LOG UNITS: ENGLISH

ENGLISH UNITS = FEET AND MPH
METRIC UNITS  = METERS AND KPH
```

Main Menu > Logs > Setup Logs > Units

Selects the type of units to be used when setting up and displaying the Detector VOS and Speed Trap logs. Also affects the detector VOS length shown on the Vehicle Detector Setup menu. This setting only affects how length and speed data are displayed on the Controller. The logs and real-time data always use metric units. (0-99.9 meters = 0-327.7 feet)

4.3.9.4 **Enable Logs**

```
9.4            ENABLE LOGS

DETECTOR VOS:     DISABLED
SPEED TRAP:       DISABLED
CYCLE MOE:        DISABLED
HIGH RESOLUTION:  ENABLED
```

Main Menu > Logs > Enable Logs

Selects the ability to begin collecting data for the Log immediately (Enable), or to stop collecting data for the Log (Disabled), or to control the start and stop of data collection by time of day schedule (Time-base). By default, all logs are disabled.

4.3.10 **Status**

```
0                 STATUS
  1.DETAIL TIMING    7.CABINET
  2.COORDINATION     8.ALARMS
  3.TIME BASE        9.TRANSIT PRIORITY
  4.DETECTORS        0.CONCURRENCY
  5.PREEMPT          A.ACTIVE SETS
  6.COMMUNICATION    B.PHASE WAIT TIME
```

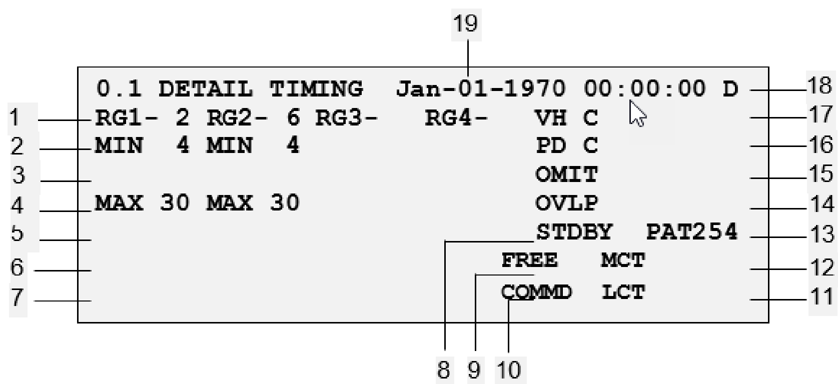
Main Menu > Status

Select the status screen to monitor.

Table 4-46: Status Screens to Monitor

Item	Description
DETAIL TIMING	Detailed Timing Status.
COORDINATION	Coordination Status.
TIME BASE	Time Base Status.
DETECTORS	Detector Status.
PREEMPT	Preempt Status.
COMMUNICATION	Communication Status.
CABINET	Cabinet Status.
ALARMS	Alarms Report Status.
TRANSIT PRIORITY	Transit Priority Status.
CONCURRENCY	Ring, Sequence and Concurrency structure
ACTIVE SETS	Data Sets currently active
PHASE WAIT TIME	Current vehicle phase wait timers

4.3.10.1 **Detail Timing Status**



Main Menu > Status > Detail Timing

The following table is a list of information provided by this menu screen. The state of the traffic Controller determines what information is displayed at a given time.

Table 4-47: Detail Timing Status

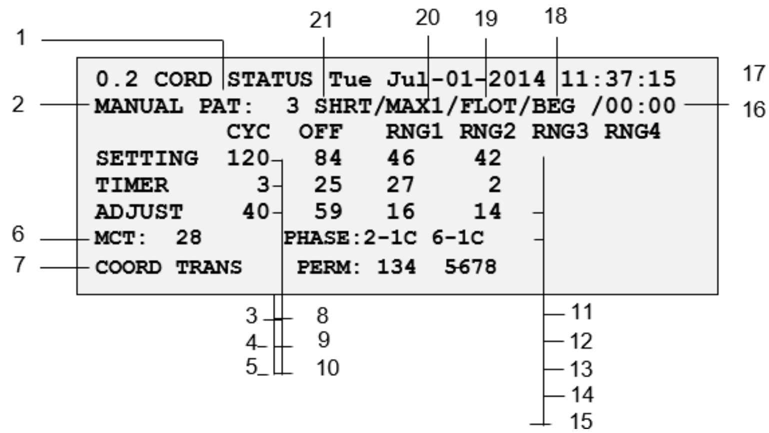
Item	Description
1	Indicates the active phase in each ring. Phases are represented using 1 – 9 for phases 1 – 9 and 10-16 for phases 10 – 16.
2	Displays the active interval and any applicable timers for the current ring. The specific information displayed varies with the current state of the traffic Controller. It is used to display the following timers: • Minimum Green timer with an entry of "MIN." • Extension timer with an entry of "EXT." • Green Clearance timer with an entry of "GCL" • Yellow Clearance timer with an entry of "YEL."
3	• Red Clearance timer with an entry of "RED." The minimum timer is displayed in seconds from 0 to 255; however, if the time exceeds 99 seconds the display shows "**". The EXT, GCL, YEL and RED timers are displayed in 0.1 seconds and only show the units digit with a decimal pointand the tenths of seconds, i.e. 19.9 seconds displays as "9.9". Note: if the phase is timing Alternate Minimum Green or Alternate Extension, the display still shows MINor EXT, but the times are from the Alternate timings. The following additional information is also displayed: • During green rest this field displays "GREEN REST" in combination with field 3. • During red rest this field displays "RED REST" in combination with field 3.

Item	Description
	• If a phase is operating as a non-actuated phase via the Split Mode setting this field may display "NONACT" timer otherwise it works the same as C-N-A.
4	• MXP- if the phase is using the Maximum value from a pattern; • SPL- if the Max is inhibited and in coordination using the Split time. • RRV- if the phase is timing Red Revert The Maximum Green timers are displayed in seconds from 0 to 255; however, if the time exceeds 99 seconds the display shows "**".
5	This is a Ring 1 active interval and timer. Shows the following: • Variable Initial Timer with an entry of "VIN" • Gap Timer Value with an entry of "GAP" • Last Car Passage Timer with an entry of "LCP" • Overlap Green Extension timer with an entry of "OAG" • Overlap Yellow Clearance timer with an entry of "OAY" • Overlap Red Clearance timer with an entry of "OAR" • During stop time this field displays "STOP TIME" along with field 6. Overlap Timers if an overlap is terminating or extending because of the phase in this ring. Overlap A shows OAG, Overlap B shows OBG, etc The Variable Initial and the Overlap Green Extension timers are displayed in seconds from 0 to 255, however if the time exceeds 99 seconds the display shows "**" Gap, Last Car Passage, Overlap Yellow and Overlap Red are displayed in 0.1 seconds and only display the units digit with a decimal point and the tenths of seconds, i.e. 19.9 seconds displays as 9.9.
6	This is a Ring 1 active interval and timer. Shows the following: • Time Before Reduction Timer with an entry of "TBR" • Time to Reduce Timer with an entry of "TTR" • Cars Before Reduction Counter with an entry of "CBR"

Item	Description
	If the phase timing entries for Time Before Reduction (TBR), Time To Reduce (TTR)and Cars Before Reduction (CBR) for the active phase are equal to 0 for all entries this item is left blank until the phase terminates green. If both CBR and TBR are active TBR and CBR is displayed (flashed) alternately on a 0.5 second basis. When theTBR Timer reaches 0 or the CBR Counter (increments from 0) reaches the CBR entry the TTR timer starts and displays "TTR". When TTR reaches 0 the display is blanked. When the Phase Next decision is made for this ring the reason for termination is displayed as follows: • Force Off with an entry of "FOROFF" • Gap Out with an entry of "GAPOUT" • Max Out with an entry of "MAXOUT" • Interval Advancewith an entry of "INTADV" • During stop time this field displays "STOP TIME" along with field 5.
7	This is a Ring 1 indication for active Hold and Phase Next. Shows the following: • Hold on a phase with no Ped Call with an entry of "HOLD" • Phase Next decision is made with an entry of "XX NXT" The number displayed (XX) is the number of the phase to be served next.
8	Unit Control Status: • "SYSTM" – control by master or central commands. • "STDBY" – control via local from master or central command. • "MANUL" – when the coord operation mode is other than zero and Controller is notallowed to determine a mode automatically based on the possible sources (such as Interconnect, Time Base, or System Commands). • "TBC" – control by the local Time Base. • "INTCN" – control by the local Interconnect inputs. • "INTBK" – control by local TBC due to invalid Interconnect inputs or loss of sync. • “EXTRN”- control is by an input selecting a pattern
9	This field provides an indication of the Current Operation. It is the same as Current Operation shown on the Main Status Menu item 5.
10	This field provides clarification for the Status in the field labeled 9. It is the same as the field labeled 7 in the Main Status Menu.

Item	Description
11	Local Cycle Timer which increments from 0 to the local cycle value in seconds. During transition this value may be greater than the cycle length. When in sync this time may be different from the MCT by the pattern offset value.
12	Master Cycle Timer, which increments from 0 in seconds. This timer starts when the sync point is reached on the coord phases. The time is derived from the Controller clock referenced to midnight and the cycle length.
13	This is the current executing pattern number.
14	This field is an indication of an Overlap "ON." Overlap is ON if its output is Green or itis timing Yellow or Red clearance. Overlap On is indicated by displaying the overlap under the appropriate column. For example, Overlap A ON displays an "A" under thefirst column. Since there are 16 overlaps possible and 8 columns if Overlap J is "ON it display in the second column as "J." If both Overlap "B" and "J" are ON they alternate on the Display in second column as "B" "J".
15	This field is an indication of an OMIT applied to a phase. OMITS are displayed as number of phase in appropriate column. For phases 9-16 display as 9, 0, A, B, C, D,E, F. in columns 1-8 respectively. If both phase 1 and 9 are on, the display alternates between 1 and 9 at 0.5 second intervals.
16	This field indicates demand for pedestrian service on a phase. Demand is displayed as the number of the phase in the appropriate column. Phases 9-16 are displayed as 9, 0, A, B, C, D, E, F, in columns 1-8 respectively. If both phase 1 and 9 are on, the display alternates between 1 and 9 at 0.5 second intervals.
17	This field is an indication of demand for vehicle service on a phase. Demand is displayed as number of phase in appropriate column. For phases 9-16 display as 9, 0,A, B, C, D, E, F. In columns 1-8 respectively. If both phase 1 and 9 are on, the display alternates between 1 and 9 at 0.5 second intervals.
18	This field indicates whether Daylight Savings is active. If Daylight Savings is active a 'D' is displayed.
19	This is the current date and time.

4.3.10.2 **Coordination Status**



Main Menu > Status > Coordination

Displays the current coordination pattern, cycle timers and ring split timers. Coordination information is provided in the Table below.

Table 4-48: Coordination Status

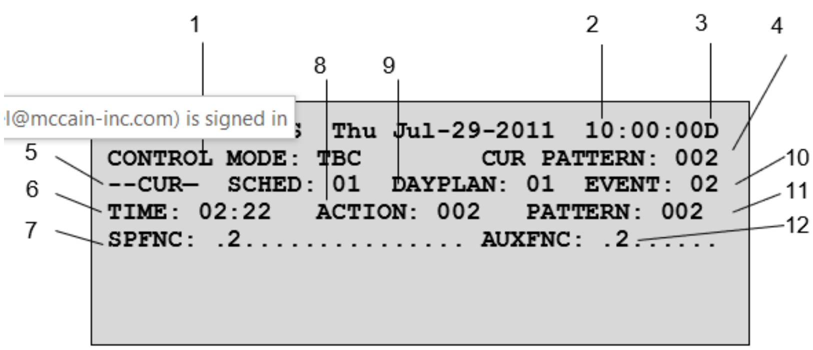
Item	Description
1	This field displays the current active pattern number. • 1-250: current pattern • 254: free operation • 255: flash
2	This field displays the current Unit Control Status: • "SYSTEM" (System control) - control by master or central commands. • "STDBY" (System standby) - control by local based on master or central commandto use local control. • "BAKUP" (Backup mode) - local time base schedule control due to communication timeout. • "MANUAL" (Manual) - control by entry other than zero in Operation Mode. • "TBC" (Time base) - control by the local time base.
3	This is the current pattern cycle length. If CIC is active, the CIC cycle length is shown instead.
4	This is the current local cycle timer, which increments to the cycle length. During transition this value may be greater than the programmed cycle length.

Item	Description
5	During offset transition this field shows the current adjustment to the local cycle length. It is calculated every cycle and shows the difference between the requestedcycle length and the transition cycle length. If CIC is active and not in offset transition, this field will show the pattern cycle length.
6	This is the Master Cycle Timer, which increments from 0.
7	This field displays the Local Free Status or coordinator status. The following states are displayed: • FREE COMMD (commandFree) – Free due to command • FREE TRANS (transitionFree) – Free while transitioning to sync point • FREE EXTERN (inputFree) – Free due to external input • FREE PATTRN (coordFree) – Free due to a pattern with cycle length = 0 • BAD PLAN (badPlan) – Free due to plan diagnostic • BAD CYCLE (badCycleTime) – Free due to cycle time diagnostic • BAD SPLIT (splitOverrun) – Free due to split diagnostic • CYCLE FAULT (failed) – Free due to cycling diagnostic • CYCLE FAIL (failed) – Flash due to cycling diagnostic • COORD FAULT (failed) – Recovering coordination after Cycle Fault • COORDFAIL (failed) – Free due to cycling diagnostic • COORD TRANS – Coordinated offset transition • COORD ACTIVE – Coordinated mode active and offset achieved • PREEMPT – Free because preempt is active • SEQCHG – Free due to pending sequence change If CIC operation is active, the current CIC mode is displayed here while coordination is active.
8	This is the current pattern offset value. If CIC is active, the CIC offset is shown instead.
9	This is the current offset value for the executing cycle. It is equal to the pattern offset value when the Controller is not in offset transition.
10	During offset transition this field shows the current adjustment to the offset. It is calculated every cycle and shows the difference between the requested offset value and the actual offset value during the current cycle. If CIC is active and not in offset transition, this field will show the pattern offset value.
11	This is the split value for the active phase in the ring. If CIC is active, the CIC split value is shown.

Item	Description
12	This is the current split timer for the active phase in the ring.
13	During offset transition this field shows the adjustment to the split of the active phase in the ring. If CIC is active and not in offset transition, this field will show the CIC pattern split value for the active phase in the ring.
14	The first part of this field indicates the phase active in this ring. 1-F for phase 1-16. The second part of this field indicates the split mode: 1= coord phase 2= none 3= min vehicle recall 4= max vehicle recall 5=ped recall 6=max vehicle + ped recall 7=omit phase 8=non-actuated phase If there is demand for service on a conflicting phase, the letter C s shown at the end. For example, “2-1C” as shown above indicates that phase 2 is active, it is a coordinated phase, and there is demand on a conflicting phase.
15	This indicates the permitted phases for this ring (up to 4 phases per ring). 1-F is shown for phases 1-16.
16	This field displays the sync reference time in hours and minutes. The master cycle time is referenced to this time of day.
17	This is the current date and time.
18	This field displays whether the local cycle is synchronized to the beginning of sync phase green (BEG) or at the end of sync phase green (END).
19	This field indicates the active Force Off mode. "FLOT" = floating forceoffs, "FIX" = fixed forceoffs.
20	This field indicates the maximum green mode during coordination. • "MAX1" (maximum1) – Maximum Green 1 is in effect. • "MAX2" (maximum2) – Maximum Green 2 is in effect. • "INHB" (maxInhibit) – Maximum Green timing is inhibited while coordination is active.

Item	Description
21	This field indicates the active offset correction mode. • “DWEL" (dwell) – when changing offset, the coordinator establishes a new offset bydwelling in the coord phase(s) until the desired offset is reached. • " SHRT" (shortest way) - when changing offset, the coordinator establishes a new offset by adding or subtracting to / from the timings in a manner that limits the cyclechange. • “ADD" (add only) - when changing offset, the coordinator establishes a new offset by adding to the timings.

4.3.10.3 Time Base Schedule Status



Main Menu > Status > Time Base

This menu displays time base schedule status, including information about the current (-

-CUR---) and next (--NXT---) scheduled event. Blank fields indicate that no scheduled events are configured.

Table 4-49: Time Base Scheduler Status

Item	Description
1	Current control mode. This field displays the value of the unit control status: • "SYSTEM" (System control) - control by master or central system commands. • "STDBY" (System standby) - control by local time base schedule due to master or central system command to use local control. • "BACKUP" (Backup mode) – local time base schedule control due to communication timeout. • "MANUAL" (Manual) – manual control by entry other than zero in Operation Mode. • "TBC" (Time base) – Time Base Control by local time base schedule.
2	Current date and time.
3	A “D” in this field indicates that daylight saving time is active.
4	Current active pattern. The control mode determines how the active pattern is selected. If the control mode is not TBC, the active pattern may differ from what is selected by the time base schedule.
5	Current Schedule number.
6	Current event start Time in hours and minutes.
7	Current Special Functions. Shows special functions that are activated by the currentaction. Functions that are ON are indicated by a number in the corresponding position.
8	Current Action number.
9	Current Day Plan number.
10	Current Event number
11	Current Pattern number. Shows the pattern that is selected by the current action.
12	Current Auxiliary Functions. Shows aux functions that are activated by the currentaction. Functions that are ON are indicated by a number in the corresponding position.

4.3.10.4 **Detector Status**

```
0.4          DETECTOR STATUS

      1. VEHICLE DETECTORS
      2. PEDESTRIAN DETECTORS
```

Main Menu > Status > Detectors

The Detector Status Menu screen accesses vehicle and pedestrian detector status screens for the Controller.

4.3.10.4.1 Vehicle Detector Status

```
    0.4.1   VEHICLE DETECTOR STATUS  1 OF 4
                         1111111111222222222233
      DET #1234567890123456789012345678901 2
1   PHASE................................
2   ACTIVE ................................
3   FAULT................................
4   ALARM................................
```

Main Menu > Status > Detectors > Vehicle Detectors

Press the DOWN ARROW key to display additional vehicle detectors.

NOTE: Only two digits are used for the detector numbers.

Numbers 1 through 99 are obvious but starting at detector 100 – 109 it is displayed as 00 – 09 detector 110 – 119 is shown as A0 – A9 and finally detector 120 – 128 is shown as B0 – B8.

Information is provided in the following table.

Table 4-50: Vehicle Detector Status

Item	Description
1	Displays phase assignments • 1 - F, 0 is phase 10 • . not assigned

Item	Description
2	Indicates whether the detector input is active. • X Active • E Extending, timing detector extend after actuation and continuing call • D Delaying, timing detector delay but has not placed call yet • . Not Active
3	Displays Controller detector diagnostic faults: • F configuration fault, detector is assigned but not configured, NEMA • C Communication fault, failure in serial communication, NEMA • E Erratic Count fault, Controller diags fault for too many actuations • M Max Presence fault, Controller diags fault for detector stuck on • N No Activity fault, Controller diags fault for detector stuck off • U Other fault, a fault has occurred but is not any of the above • . no faults
4	Indicates alarms reported by the detectors, supported by NEMA detector BIUs whenenabled in the Vehicle Detector Diag Set menu (4.3) • E Excessive inductance change • S Shorted loop • O Open loop • W Watchdog, detector card not responding • U Other alarm, an alarm has occurred but not one of the above. • . No reported alarm

4.3.10.4.2 Pedestrian Detector Status

```
0.4.2  PEDESTRIAN DETECTOR STATUS
                          1111111
        DET # 1234567890123456
1       PHASE  12345678........
2      ACTIVE  ................
3       FAULT  ................
```

Main Menu > Status > Detectors >Pedestrian Detectors

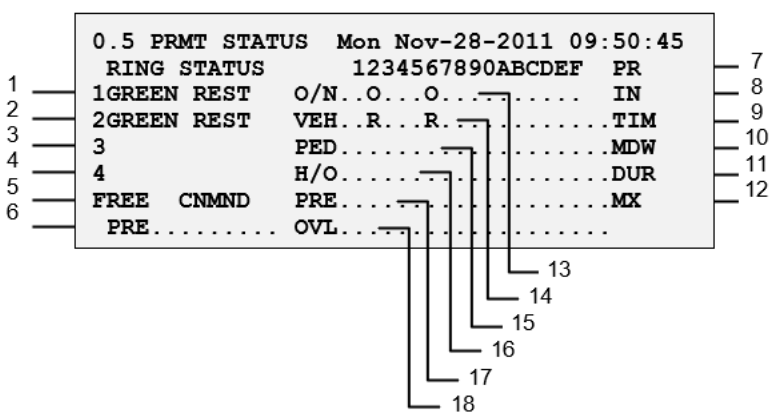
The Pedestrian Detector Status Screen indicates assigned phase numbers for the sixteen pedestrian detector inputs and active detectors as well as gives an indication of detector fault status.

Further information is provided in the following Table.

Table 4-51: Pedestrian Detector Status

Item	Description
1	Displays phase assignments. • 1 - F, 0 is 10 phase numbers • .Not assigned
2	Indicates whether the detector input is active. • X Active • Not active
3	Displays Controller pedestrian detector diagnostic faults: • F Configuration fault • C Communication fault • E Erratic Count fault • M Max Presence fault • N No Activity fault • U Other alarm, an alarm has occurred but not one of the above • . No faults

4.3.10.5 **Preempt Status**



Main Menu > Status > Preempt

The preempt status screen displays the state of a specific preempt.The following information is provided.

Table 4-52: Preempt Status

Item	Description
1	Ring 1 Status, current phase interval: • MN 00 – Minimum Green and timer • MN 00 WK 00 – Minimum Green and timer, Walk and timer • MN 00 PC 00 – Minimum Green and timer, Pedestrian Clearance and timer • EX0.0 MX 10 – Vehicle Extension and timer, Maximum Green and timer • YC0.0 – Yellow Change and timer • RC0.0 – Red Clearance and timer • GREEN REST • RED REST • STOP TIME
2	Ring 2 Status, current phase interval like Ring 1.
3	Ring 3 Status, current phase interval like Ring 1.
4	Ring 4 Status, current phase interval like Ring 1.
5	Current Controller operation status: • FREE – MCE active or equivalent • FREE COMMD – pattern 254 • OF SK – offset seeking • COORD LCT 00 – Coord Active and Local Cycle Timer • ST TM – Stop Time
6	Current Preempt Input Active, a number is shown for each input active, a period for each preempt input not active.
7	Current Preempt Running (PR), none = blank, current = PRE x, where x = preempt number.

Item	Description
8	Current preempt interval (IN): • Blank – no preempt active • DELY – Preempt Delay Interval • ENTR – Preempt Entry Interval • TRCK – Preempt Track Interval • DWL – Preempt Dwell Interval • LINK – Preempt Link Active • EXIT – Preempt Exit Interval
9	Interval Timer in seconds (TIM), this either shows the Delay timer, or shows the Track Service timer, or shows the Preempt Elapsed Timer following any Delay or Track Service time.
10	Minimum Dwell timer (MDW), this shows the timer for the Dwell interval.
11	Minimum Duration timer (DUR), this shows the Minimum Duration timer.
12	Maximum Presence timer (MX), this shows the Maximum Presence timer, if the database value is zero during an active preempt this shows NU (not used).
13	Bit field for which phases are on (O) and which phases are next (N).
14	Vehicle demand as follows: • 'C' for a vehicle detector call. • ‘E’ for a detector extension due to a queue or a passage call. • 'R' for min recall. • 'X' for max recall. • 'N' for call to non-actuated on the phase. • 'S' for soft recall. • ‘F’ for a call placed by detector diagnostics • ‘L’ for locked vehicle calls • ‘G’ for calls placed by remote entities • ‘I” for a call generated from the front panel

Item	Description
15	Which pedestrian movements have calls as follows: • 'C' for a pedestrian detector input call. • 'R' for ped recall. • 'N' for call to non-actuated on the phase. • 'L' for locked pedestrian calls. • 'G' for calls placed by remote entities. • 'I' for a ped call generated from the front panel.
16	Bit field for which phases are hold (H) and which phases are omit (O).
17	Which preemption inputs have calls.
18	Which overlaps are active as follows: • 'G' for green. • 'N' for trailing green. • 'Y' for yellow. • 'D' for red clearance. • 'R' for red.
19	Which ped overlaps are active as follows: • 'W' for walk. • 'C' for ped clear. • 'D' for don't walk.

4.3.10.6 **Communications Status**

```
0.6           COMMUNICATION

1. COMMUNICATION ACTIVITY
2. ETHERNET STATUS
3. DYNAMIC OBJECT STATUS
4. PEER TO PEER
```

Main Menu > Status > Communication

Real-time communications status. Displays Ethernet IP addresses, Controller protocols and I/O activity.

4.3.10.6.1 Communication Activity

```
0.6.1      COMMUNICATION ACTIVITY

NTCIP GETS         0   AB3418 GETS      0
NTCIP SETS         0   AB3418 SETS      0
NTCIP ERRS         0   AB3418 ERRS      0
NTCIP TRAPS        0   BLOCK GETS       0
DB TRANS           0   BLOCK SETS       0
DB TRANS ERRS      0   BLOCK ERRS       0
```

Main Menu > Status > Communication > Communication Activity

This screen shows counters for various types of communication activity. Any communication to the Controller, whether through serial or Ethernet, increments one of the counters. When any counter overflows it wraps back to zero and keeps counting, so they do not provide an absolute count of these events, only an indication of activity.

Front panel operations do not affect these counters.

4.3.10.6.2 Ethernet Status

```
0.6.2        ETHERNET STATUS

ETHERNET 1: 10.1.3.183
ETHERNET 2: 0.0.0.0

TCP SEG IN         0   UDP DATA IN      0
TCP SEG OUT        0   UDP DATA OUT     0
TCP RCV ERRS       0   UDP ERRORS       0
```

Main Menu > Status > Communication > Ethernet Status

Displays real-time communications status for Ethernet:

- Configured IP addresses for Ethernet 1 and 2 adapters
- TCP and UDP packet counters for sending and receiving of data
- Packet errors

4.3.10.6.3 Dynamic Object Status

```
0.6.3      DYNAMIC OBJECT STATUS
GETS        0
SETS        0
ERRS        0
PERSISTENCE        0
CONFIG ID       0000

ENTER NUM FOR DYN OBJ DETAIL (1-13):
```

Main Menu > Status > Communication > Dynamic Object Statu

This screen shows counters indicating NTCIP dynamic object STMP activity. To view configuration information for a specific dynamic object, enter the dynamic object number and press ENTER.

```
0.6.3      DYNAMIC OBJECT  1 STATUS

         OWNER  [EMPTY]
        STATUS  INVALID
NUMBER OF VARS   0
```

These 13 objects are undefined by default in the Controller. They are to be configured by Central software with any objects that are within the Controller and provide a shorthand to get or set information whereby no standard Object IDentifier numbers (OID) are needed in the message.

4.3.10.6.4 Peer to Peer Status

```
0.6.4       PEER TO PEER STATUS

   1. PEER DEVICES
   2. PEER FUNCTIONS SENT
   3. PEER FUNCTIONS RECEIVED
```

Main Menu > Status > Communication > Peer to Peer Status > Peer Devices Status

This screen shows the menu of Devices or Functions to monitor the communication thereof.

4.3.10.6.4.1 Peer Devices Status

```
0.6.4.1     PEER DEVICES STATUS
ID          STATUS    TIME SND RCV ERR DLAY
11110030    CONCTD    1702   6  73   0 .950
```

Main Menu > Status > Communication > Peer to Peer Status > Peer Devices Status

This screen shows the status of Peer Devices communication with this Local as follows.

Table 4-53: Peer Devices Status

Item	Description
ID	The System ID of the Remote Peer
STATUS	Connection Status as follows: NO CON – no connection established REGSTR – registration sent to server (remote peer) CONCTD – connected, keep alive D SENT – data sent awaiting acknowledgement BAD IP – registration sent, NAK with wrong IP DV FUL - registration sent, NAK with peer list full FN FUL - registration sent, NAK with function list full TIMOUT - registration sent, time out no response CN ERR - registration sent, NAK with unknown error
TIME	duration of current connection in seconds
SND	count of messages sent to Remote
RCV	count of messages received from Remote
ERR	count of message errors
DLAY	average round trip message delay in milliseconds

4.3.10.6.4.2 *Peer Functions Sent*

```
0.6.4.2    PEER FUNCTIONS SENT
SYSTEM ID LOCAL FUNCTION         IDX STATE
 11110030 PHASE ON               2   ON
```

Main Menu > Status > Communication > Peer to Peer Status > Peer FunctionsSent

This screen shows the status of Peer Functions Sent from Local to Remote as follows.

Table 4-54: Peer Functions Sent

Item	Description
SYSTEM ID	The System ID of the Remote Peer.
LOCAL FUNCTION	The name of the Local Function whose state is being sent to the Remote.
IDX	The Index of the Local Function, used if the function has more than one instance.
STATE	The current state of the Local Function being sent to the Remote (ON/OFF).

4.3.10.6.4.3 Peer Functions Received

```
0.6.4.3   PEER FUNCTIONS RECEIVED
SYSTEM ID LOCAL FUNCTION        IDX STATE
 11110030 SPECIAL FUNC INPUT    1   OFF
```

Main Menu > Status > Communication > Peer to Peer Status > Peer Functions Received

This screen shows the status of Peer Functions Received at Local from Remote as follows.

Table 4-55: Peer Functions Received

Item	Description
SYSTEM ID	The System ID of the Remote Peer.
LOCAL FUNCTION	The name of the Local Function whose state is being driven by the Remote.
IDX	The Index of the Local Function, used if the function has more than one instance.
STATE	The current state of the Local Function being received from the Remote as (ON/OFF).

4.3.10.7 **Cabinet Status**

```
0.7            CABINET STATUS

1. NEMA ABCD STATUS
2. NEMA TS2 STATUS
3. ATC/ITS STATUS
4. CALTRANS C1, C11 STATUS
5. I/O MODE
6. PERMISSIVES
```

Main Menu > Status > Cabinet

Select the cabinet for viewing status.

4.3.10.7.1 NEMA ABCD Status

```
0.7.1         NEMA ABCD STATUS

1. NEMA A,B,C INPUTS
2. NEMA A,B,C OUTPUTS
3. NEMA D INPUTS/OUTPUTS
```

Main Menu > Status > Cabinet > NEMA ABCD Status

Select the status to view.

4.3.10.7.1.1 NEMA A,B,C Inputs

```
1 —— 0.7.1.1     NEMA A,B,C INPUTS
     -PHSE-12345678-RING-12-RING-12     CNA2 .
      VDET ........ STOP .. PEDR ..     IADV .
      PDET ........ FOFF .. -UNIT-      MCE  .
      OMIT ........ RRST .. MODE   ...0 EXST .
      POMT ........ ORCL .. EXT REC  .  TSTA .
      HOLD ........ MAX2 .. WLK RES  .  TSTB .
      PRMT ......   MXIH .. CNA1     .  LAMP .
                                  2 3 4 5
```

Main Menu > Status > Cabinet > NEMA ABCD Status > NEMA ABC Inputs

The NEMA ABC Inputs Status Screen displays a wide range of information regarding the Controller current NEMA inputs, such as vehicle detector, ped detector, phase omit, phase hold, ring, stop time, ring max 2, CNA1, CNA2, etc.

NOTE: This screen reflects the active I/O mapping. It represents the states of the standard input pins and functions as defined by NEMA TS2.

The following information is provided:

Table 4-56: NEMA A, B, C Inputs

Item	Description
1	VDET, PDET, OMIT, POMT, and HOLD will show the phase number in its columnwhen active. STOP, FOFF, RRST, ORCL, MAX2, MXIH, and PEDR, will show thering number in its column when active, PRMT will show the preempt number whenactive. EXT REC, WLK RES, CNA1, CNA2, IADV, MCE, EXST, TSTA, TSTB, and LAMP will show a number one when active.
2	The I/O Mode Bit A on pin "q" on the A connector. If the input is true an A is displayed.
3	The I/O Mode Bit B on pin "y" on the A connector. If the input is true a B is displayed.
4	The I/O Mode Bit C on pin "HH" on the A connector. If the input is true a C is displayed.

Item	Description
5	This field represents the value of the I/O Mode Bits A, B & C. • Mode A Bit = 1 • Mode B Bit = 2 • Mode C Bit = 4 If all three bit are on this field displays the value 7.

4.3.10.7.1.2 NEMA A,B,C Outputs

```
0.7.1.2      NEMA A,B,C OUTPUTS
 -PH-12345678 -PH-12345678 -RING-
 GRN ........ PON ........ CODST1 ...0
 YEL ........ NXT ........ CODST2 ...0
 RED ........ CHK ........ -UNIT-
 WLK ........ OVG ....     FLSH LOG  .
 PCL ........ OVY ....     VOLT MON  .
 DWK ........ OVR ....     FAULT MON .
```

Main Menu > Status > Cabinet > NEMA ABCD Status > NEMA ABC Outputs

NEMA ABC Outputs Status Screen displays a wide range of information regarding the Controller current NEMA outputs. Channel green, yellow, red output walk, don’t walk, phase next, phase on, unit status, etc.

> NOTE: This screen reflects the active I/O mapping. It represents the states of the standard output pins and functions as defined by NEMATS 2.

GRN, YEL, RED, WLK, PCL, DWK, PON, NXT, and CHK show the phase number in its column when active. OVG, OVY, and OVR show the overlap letter (A-D) in its column when active. FLSH LOG, VOLT MON, and FAULT MON show a number one when active.

The following information is provided.

Table 4-57: NEMA A,B,C Outputs

Item	Description
	CODST1
1	This field represents pin “CC” on the A connector. If this output is true an "A" is displayed in this field.
2	This field represents pin “r” on the A connector. If this output is true a "B" is displayed in this field.
3	This field represents pin “Y” on the A connector. If this output is true a "C" is displayed in this field.
4	This field represents the value of the Coded Status Bits A, B & C for Ring 1. • CS A Bit = 1 • CS B Bit = 2 • CS C Bit = 4 If all three bit are on this field displays the value 7.
	CODST2
1	This field represents pin “A” on the C connector. If this output is true an "A" is displayed in this field.
2	This field represents pin “B” on the C connector. If this output is true a "B" is displayed in this field.
3	This field represents pin “c” on the C connector. If this output is true a "C" is displayed in this field.
4	This field represents the value of the Coded Status Bits A, B & C for Ring 2. • CS A Bit = 1 • CS B Bit = 2 • CS C Bit = 4 If all three bits are on this field displays the value 7.

4.3.10.7.1.3 NEMA D Inputs / Outputs

```
0.7.1.3     NEMA D INPUTS/OUTPUTS
INPUT-1111111111122222     OUTPUT-12345678
 DET#9012345678901234       SFUNC........
 DET ................       PRMPT......
SFUNC........ CM STATUS.      ALARM OUT..
ALARM........  FREE.  FLASH.  DET RESET.
CLK UP. MX3.  PIN Z. CYC AD.      PIN KK.
DR AJR. MX4.  PIN a. HW CUT.      PIN MM.
```

Main Menu > Status > Cabinet > NEMA ABCD Status > NEMA D Inputs/Outputs

The NEMA D Inputs/Outputs Status Screen displays a wide range of information regarding the Controller D connector input and output. All entries indicate if the pin is true by displaying an "X" in the appropriate column.

NOTE: This screen reflects the active I/O mapping. It represents the states of the standard input/output pins and functions as defined by the Model 2070 specification for the 2070-8 D connector.

4.3.10.7.2 NEMA TS2 STATUS

```
0.7.2          NEMA TS2 STATUS

1. MMU OPERATION STATUS
2. MMU CONFIGURATION STATUS
3. TS2 COMMUNICATION STATUS
```

Menu > Status > Cabinet > NEMA TS 2 Status

These items show the operational status and configuration of the NEMA TS 2 cabinet and CMU (Conflict Monitor Unit). Select the item to view.

4.3.10.7.2.1 MMU Operation Status

```
0.7.2.1    MMU OPERATION STATUS
                 1111111  NO FAULT
 CHAN#  1234567890123456
RED     ................
YELLOW  ................
GREEN   ................
CVM   OK    24VM2 OK    RED ENABLE   NO
24VIH OFF  24VM2 OK   RESET.      OFF
```

Main Menu > Status > Cabinet > NEMA TS 2 Status > MMU Operation Status

This screen shows the current status of the NEMA TS 2 MMU, including channel and fault status. This information is received from the MMU via the SDLC bus.

- **Controller channel usage does not match MMU program card:**
  The Controller analyses the phase-to-ring assignments, overlap configuration, phase concurrency, and channel configuration. Based on that data, it calculates the channel compatibility. It compares that calculated compatibility matrix against the MMU program card. If the Controller programming is more permissive than the MMU program card, the Controller will trigger CVM flash. This is shown as a "PERMISSIVE FAULT."

  Solution:

  - Correct the disparity between the Controller programming and the MMU program card. Refer to menu Channel Permissive Status (0.7.6)
  - Make sure unused channels have the Source set to disabled in menu 1.4.
  - Don't forget to include any enabled ped, vehicle overlap, and ped overlap channels in the MMU program card.
  - Overlap channels must be programmed to be compatible with all included phases,
    and other phases that are compatible with the included phases.

- **Controller has lost communication with the MMU or an enabled TF BIU:**
  The MMU and TF BIUs are considered critical devices, so if the Controller loses communication or has lots of errors in the communication to one of those devices, it will trigger CVM flash. This is shown as "SDLC COMM FAULT."

  Solution:

  - Make sure unused BIUs are disabled in menu 1. Unit > 7. NEMA TS 2 Setup.
  - Make sure SDLC cables are connected to Controller, MMU, and BIUs.
  - Check Tx/Rx LEDs on all BIUs and MMU to see which ones are communicating.
  - Check TS 2 comm. status in menu 0.7.2.3. (TS 2 Communication Status)

4.3.10.7.2.2 MMU Configuration Status

```
0.7.2.2    MMU CONFIGURATION STATUS
COMPAT    1111111
CH234567890123456      MIN FLASH TIME
 1                     24 VOLT LATCH
 2                     CVM/FAULT LATCH
 3                                1111111
 4                     CH 1234567890123456
 5                YELDIS................
```

Main Menu > Status > Cabinet > NEMA TS 2 Status > MMU Configuration Status

This screen shows the current configuration of the NEMA TS 2 MMU program card. This information is received from the MMU via the SDLC bus. Press the DOWN key to see the remaining Compatible Channels.

4.3.10.7.2.3 TS 2 Communication Status

```
0.7.2.3    TS2 COMMUNICATION STATUS     D
DEVICE    TX FRAMES     RX FRAMES     ERRORS
MMU          278833        278833          0
TF BIU1      139476        139476          0
TF BIU2      139476        139476          0
TF BIU3           0             0          0
TF BIU4           0             0          0
DR BIU1      139476        139476          0

DR BIU2           0             0          0
DR BIU3           0             0          0
DR BIU4           0             0          0
```

Main Menu > Status > Cabinet > NEMA TS 2 Stat > TS 2 Communication Status

This screen shows communication activity and errors for SDLC communication from the Controller to the NEMA TS 2 cabinet devices. If a Tx/Rx counter overflows, it will wrap back to zero and keep counting. Error counters do not wrap. Press the DOWN key to see the other BIUs.

4.3.10.7.3 ATC/ITS Status

```
0.7.3        ATC/ITS STATUS

1. CMU OPERATION STATUS
2. CMU CONFIGURATION STATUS
3. ATC/ITS COMMUNICATION STATUS
```

Main Menu > Status > Cabinet > ATC/ITS Status

These items show the operational status and configuration of the ATC or ITS cabinet and CMU. Select the item to view.

4.3.10.7.3.1 CMU Operation Status

```
0.7.3        ATC/ITS STATUS

1. CMU OPERATION STATUS
2. CMU CONFIGURATION STATUS
3. ATC/ITS COMMUNICATION STATUS
4. CHANNEL LOAD CURRENT STATUS
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Operation Status

Select the status to view.

4.3.10.7.3.2 CMU Channel Status

```
0.7.3.1.1     CMU CHANNEL STATUS
                       1111111111222222222233
 CHAN#   12345678901234567890123456789012
RED      ................................
YELLOW   ................................
GREEN    ................................
FAULT    ................................
CMU: NO FAULT            CU: NO FAULT
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Operation Status > Channel Status

This screen shows real time channel and fault status from the CMU.

The bottom row shows fault information from the CMU (Conflict Monitor Unit) and CU (Controller Unit). If the CMU fault status shows NFSA, a non-latched fault was triggered by the CU. If the CMU fault status shows LFSA, a latched fault was triggered by the CU. All other CMU faults are triggered by the CMU itself.

These types of faults may be triggered by the CU:

- SDLC COMM: A fault has been detected in the SDLC comm. from the CU to the CMU or an output SIU. See the communication status menu to identify the affected device.
- PERMISSIVE: The permissive channel programming in the CMU Datakey is not compatible with the channel configuration and phase concurrency in the CU.
- AMU CONFIG: The AMU configuration in the CMU Datakey is not compatible with the enabled output SIUs in the ITS Device Setup (menu 1.8).

4.3.10.7.3.3 Channel Voltage Status

```
0.7.3.1.2    CHANNEL RMS VOLTAGES          D

 CHAN#       1    2    3    4    5    6    7    8

RED          0    0    0    0    0    0    0    0
YELLOW       0    0    0    0    0    0    0    0
GREEN        0    0    0    0    0    0    0    0
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Operation Status > InputRMS Voltages Status

This screen shows the real-time RMS voltage on the red, yellow, and green output of each monitored channel. Press the Down Arrow to view additional channels.

4.3.10.7.3.4 General Operation Status

```
0.7.3.1.3    GENERAL OPERATION STATUS    D
DATE                       00/00/00
TIME                       00:00:00
CMU TEMPERATURE            -40 F
CMU AC RAW                   0 V
PDA 24V DC SUPPLY            0 V
PDA 12V DC SUPPLY            0 V
STARTUP FLASH CALL         INACTIVE
FLASHER OUTPUT FAIL        INACTIVE
REAR DOOR                   CLOSED
FRONT DOOR                  CLOSED
MC COIL                     INACTIVE
MC SECONDARY                INACTIVE
FTR COIL DRIVE              INACTIVE
OUTPUT RELAY XFER           INACTIVE
FLASH XFER STATUS           OK
CMU CONFIG CHANGED          INACTIVE
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Operation Status > General Operation Status

This screen shows the general ITS cabinet operation status. This information is received from the CMU via the SDLC bus. This information is useful for troubleshooting purposes. The following items are included. Press the DOWN key to see more CMU Status items. For more information, refer to the ITS Cabinet standard.

1 CMU date and time

2 CMU temperature

3 CMU AC raw voltage (RMS).

4 Cabinet PDA 24v DC supply voltage

5 Cabinet PDA 12v DC supply voltage

6 Startup flash call, causes Controller to return to startup phases (Active, Inactive)

7 Flasher output fail (Active, Inactive)

8 Cabinet front and rear door status (Open, Closed)

9 Main contactor coil (Active, Inactive)

10 Main contactor secondary coil (Active, Inactive)

11 Flash transfer relay coil drive (Active, Inactive)

12 Output relay transfer (Active, Inactive)

13 Flash transfer status (Ok, Fault)

14 CMU Datakey configuration changed (Active, Inactive)

15 CMU Configuration Status

4.3.10.7.3.5 CMU Configuration Status

```
0.7.3.2    CMU CONFIGURATION STATUS

1. PERMISSIVE CHANNELS
2. FIELD CHECK ENABLE
3. MISCELLANEOUS CMU CONFIG
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Configuration Status

These items show the current CMU configuration, as programmed in the CMU Datakey. Select the item to view.

4.3.10.7.3.5.1 Permissive Channels

```
0.7.3.2.1   CMU PERMISSIVE CHANNELS      D
                    1111111111222222222222333
 CHAN#    2345678901234567890123456789012
CH 1      ...............................
CH 2      ...............................
CH 3      ...............................
CH 4      ...............................
CH 5      ...............................
CH 6      ...............................
CH 7      ...............................
CH 8      ...............................
CH 9      ...............................
CH 10     ...............................
CH 11     ...............................
CH 12     ...............................
CH 13     ...............................
CH 14     ...............................
CH 15     ...............................
CH 16     ...............................
CH 17     ...............................
CH 18     ...............................
CH 19     ...............................
CH 20     ...............................
CH 21     ...............................
CH 22     ...............................
CH 23     ...............................
CH 24     ...............................
CH 25     ...............................
CH 26     ...............................
CH 27     ...............................
CH 28     ...............................
CH 29     ...............................
CH 30     ...............................
CH 31     ...............................
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Configuration Status >Permissive Channels

This screen shows the permissive (non-conflicting) channel matrix. Press the DOWN key to see more Permissive Channel data. This is the Permissive Configuration of the CMU Datakey. When any conflicting channels are concurrently active for 500ms or more, the CMU will trigger latched flash.

4.3.10.7.3.5.2 Field Check Enable

```
0.7.3.2.2   CMU FIELD CHECK ENABLE
                 11111111112222222222333
 CHAN#  12345678901234567890123456789012

RED     ................................
YELLOW  ................................
GREEN   ................................
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Configuration Status > Field Check Enable

This screen shows outputs that are enabled for field check in the CMU Datakey configuration. If enabled, the CMU compares the active states of the field signals with the states reported by the CU. When a mismatch is detected for 1000ms or more, the CMU triggers latched fault flash.

Field check faults are typically caused by an incorrectly wired or improperly configured cabinet.

4.3.10.7.3.5.3 Miscellaneous CMU Config

```
0.7.3.2.3   MISCELLANEOUS CMU CONFIG D
                 11111111112222222222333
 CHAN#  12345678901234567890123456789012
LSE     ................................
DCM 1   ................................
DCM 2   ................................
DCM 3   ................................
DCM 4   ................................
GYMCE   ................................
YRMCE   ................................
GRMCE   ................................
MYCE    ................................
MYRCE   ................................
YID     ................................
OCSER   ................................
OCSEY   ................................
OCSEG   ................................
```

Main Menu > Status > Cabinet > ATC/ITS Status > CMU Configuration Status > Miscellaneous CMU Config

This screen shows miscellaneous CMU channel configuration as programmed in the CMU Datakey. Press the DOWN key to see more configuration options. The following channel options are displayed.

Table 4-58: CMU Config Channel Options

Item	Description
LSE	Lack of Signal Enable
DCM1	Dark Channel Map #1
DCM2	Dark Channel Map #2
DCM3	Dark Channel Map #3
DCM4	Dark Channel Map #4
GYMCE	Green-Yellow Multiple Channel Enable
YRMCE	Yellow-Red Multiple Channel Enable
GRMCE	Green-Red Multiple Channel Enable
MYCE	Minimum Yellow Change Enable
MYRCE	Minimum Yellow Change Plus Red Clearance Enable
YID	Yellow Input Disable
OCSER	Output Load Current Sense Enable red channel
OCSEY	Output Load Current Sense Enable yellow channel
OCSEG	Output Load Current Sense Enable green channel

4.3.10.7.3.6 ATC/ITS Communication Status

```
0.7.3.3  ATC/ITS COMMUNICATION STATUS    D
DEVICE     TX FRAMES    RX FRAMES     ERRORS
CMU                0            0          0
SIU 1              0            0          0
SIU 2              0            0          0
SIU 3              0            0          0
SIU 4              0            0          0
SIU 5              0            0          0
SIU 6              0            0          0
SIU 7              0            0          0
SIU 9              0            0          0
SIU 10             0            0          0
SIU 11             0            0          0
SIU 12             0            0          0
SIU 13             0            0          0
```

Main Menu > Status > Cabinet > ATC/ITS Status > ATC/ITS Communication Status

This screen shows communication activity and errors for SDLC communication from the Controller to the ITS cabinet devices. If a Tx or Rx counter overflows, it wraps back to zero and keeps counting. Error counters do not wrap. Press the DOWN key to see additional SIU stats.

4.3.10.7.4 Caltrans C1,C11 Status

```
0.7.4         CALTRANS C1,C11 STATUS

1. C1 INPUTS/OUTPUTS
2. C11 INPUTS/OUTPUTS
3. FIO COMMUNICATION STATUS
```

Main Menu > Status > Cabinet > Caltrans C1,C11 Status

These items show the operational status of the 2070 Field I/O (FIO) module

.

4.3.10.7.4.1 Caltrans C1 Inputs / Outputs

```
0.7.4.1  CALTRANS C1 INPUTS/OUTPUTS
INPUT34444444444555556666667777   6667
 PIN 9012345678905678901234566789   7980
 DET ............................PED....
OUTPT12234456678891111I  INPUTS   123456
SWPK  P  P  P  P 01234    PREEMPT......
  ON ..................... ST. SPARE53. 54.
 DET RESET. WDT.          FS. PINS75. 80.
```

1

Main Menu > Status > Cabinet > Caltrans C1,C11 > Caltrans C1 Inputs/Outputs

The Caltrans C1 Connector Inputs/Outputs Status Screen displays a wide range of information regarding the C1 connector input /output pin assignments status.

All entries except those otherwise indicated, e.g. SWPK described below, indicate if the pin is true by displaying a "X" in the appropriate column.

> NOTE: The functions shown here do not reflect the active I/O mapping. They represent the functions as assigned in a typical default Caltrans cabinet.

This field displays the switch pack output. This field indicates if the color output is true by displaying a G = green, Y = yellow, R = red. If two indications are on, as might be on Ped channels, they alternate for 0.5 second.

4.3.10.7.4.2 Caltrans C11 Inputs / Outputs

```
0.7.4.2  CALTRANS C11 INPUTS/OUTPUTS
  PIN#   12345678
 OUTPUTS ........

         11111111122222222223
   PIN#  01235678901234567890
  INPUTS ....................
```

Main Menu > Status > Cabinet > Caltrans C1,C11 Status > Caltrans C11 Input-s/Outputs

The Caltrans C11 Connector Inputs/Outputs Status Screen displays a wide range of information regarding the C11 connector input /output pin assignments status.

All entries indicate if the pin is true by displaying a "X" in the appropriate column.

4.3.10.7.4.3 FIO Communications Status

```
0.7.4.3     FIO COMMUNICATION STATUS

DEVICE  TX FRAMES     RX FRAMES     ERRORS

FIO             0             0          0
```

Main Menu > Status > Cabinet > Caltrans C1,C11 Status > FIO CommunicationStatus

This screen shows communication activity and errors for SDLC communication from the Controller to the 2070 Field I/O (FIO) module. If a Tx/Rx counter overflows, it wraps back to zero and keeps counting. Error counters do not wrap.

4.3.10.7.5 I/O Mode

```
0.7.5              I/O MODE

              ENABLED              TYPE
ATC/ITS SDLC    N
NEMA TS2 SDLC   Y
NEMA A,B,C,D    Y                 TRACONEX
LCD             Y                 16 LINE
```

Main Menu > Status > Cabinet > I/O Mode

This screen shows the current Controller software configuration. It shows the active cabinet interfaces and LCD display type. If the NEMA ABCD cabinet interface is active, it shows which type of D connector was detected by the software.

CALTRANS = Caltrans 2070N compatible

TRACONEX = Traconex compatible

LMD9200 = LMD9200 compatible

820A = Multisonics 820A compatible

EAGLE = Eagle compatible

NOTE: Pin labels for the D connector shown in I/O mapping screens

1.5.1.1 and 1.5.1.2 vary depending on which type of connector box is installed. The Eagle, Traconex, and LMD9200 D connectors use numeric pin designations, while Caltrans and 820A use letters.

4.3.10.7.6 Channel Permissive Status

```
0.7.6   CHANNEL PERMISSIVE STATUS      D
CHAN  # 12345678901234567890123456789012
TYPE:   VVVVVVVVPPPPOOOO................
SOURCE  1234567824681234................
CHAN  1 ................................
CHAN  2 ................................
CHAN  3 ................................
CHAN  4 ................................
CHAN  5 ................................
CHAN  6 ................................
CHAN  7 ................................
CHAN  8 ................................
CHAN  9 ................................
CHAN 10 ................................
CHAN 11 ................................
CHAN 12 ................................
CHAN 13 ................................
CHAN 14 ................................
CHAN 15 ................................
CHAN 16 ................................
CHAN 17 ................................
CHAN 18 ................................
CHAN 19 ................................
CHAN 20 ................................
CHAN 21 ................................
CHAN 22 ................................
CHAN 23 ................................
CHAN 24 ................................
CHAN 25 ................................
CHAN 26 ................................
CHAN 27 ................................
CHAN 28 ................................
CHAN 29 ................................
CHAN 30 ................................
CHAN 31 ................................
CHAN 32 ................................
```

Main Menu > Status > Cabinet > Channel Permissive Status

This screen shows the permissive (non-conflicting) channel matrix. Press the DOWN key to see more Permissive Channel data. This is the Permissive Configuration of both the

Controller and the CMU Datakey or the MMU program card. Calculated permissive data from the Controller is shown with a "C". Permissive data read from the monitor is shown with an "M." If both the calculated Controller permissive and the monitor permissive match it is shown with an "X". The monitor permissive configuration may be more permissive than the Controller but if the Controller is more permissive than the monitor, the monitor goes into Permissive Fault mode. Correct the monitor configuration to avoid the fault.

4.3.10.7.6.1 Alarms

```
0.8                 ALARMS
1. FLASH STATUS
2. UNIT ALARM STATUS 1
3. UNIT ALARM STATUS 2
4. SHORT ALARM STATUS
5. ALARM INPUT STATUS
6. OMNI ALARM STATUS
```

Main Menu > Status > Alarms

Select the alarm status screen to monitor:

Table 4-59: Alarm Status Screens

Item	Description
FLASH STATUS	Displays unit flash status.
UNIT ALARM STATUS 1	Displays coordination alarms.
UNIT ALARM STATUS 2	Displays miscellaneous alarms.
SHORT ALARM STATUS	Displays condensed Controller summary status.
ALARM INPUT STATUS	Displays alarm summary.
OMNI ALARM STATUS	Displays additional alarms.

4.3.10.7.7 Flash Status

```
0.8.1          FLASH STATUS

PREEMPT           .      LOCAL MANUAL    .
STARTUP           .      AUTOMATIC       .
MMU               .      NOT FLASH       X
FAULT MONITOR     .      OTHER           .
```

Main Menu > Status > Alarms > Flash Status

Displays the following information:

Table 4-60: Flash Status

Item	Description
PREEMPT	The Controller is currently timing the preempt flash.
START-UP	The Controller is currently timing the start-up flash period.
MMU	The Controller unit MMU flash input is active and is not in start- up flash.
FAULT MONITOR	The Controller is currently in a fault monitor state.
LOCAL MANUAL	The Controller unit Local Flash input is active, MMU flash input is not active and flash is not commanded by the master.
AUTOMATIC	The Controller is currently in an automatic flash state.
NOT FLASH	The Controller is not in flash.
OTHER	The Controller is in flash for some other reason.

4.3.10.7.8 Unit Alarm Status 1

```
0.8.2        UNIT ALARM STATUS 1

CYCLE FAULT      .     MMU FLASH       .
COORD FAULT      .     LOCAL FLASH     .
COORD FAIL       .     LOCAL FREE      X
CYCLE FAIL       .     COORD ACTIVE    .
```

Main Menu > Status > Alarms > Unit Alarm Status 1

Displays the following information:

Table 4-61: Unit Alarm Status 1

Item	Description
CYCLE FAULT	When the Controller unit is operating in the coordinated mode and cycling diagnostics indicate that a serviceable call exists that has not been serviced for two cycles, a Cycle Fault is logged, and the Controller reverts to free.
COORD FAULT	While a Cycle Fault is in effect and the serviceable call has been serviced within two cycles after the Cycle Fault, it becomes a Coord Fault. Coordination will retry.

Item	Description
COORD FAIL	When a Coord Fault is in effect and a Cycle Fault occurs again within two cycles ofthe coordination retry, it becomes a Coord Fail. Coordination retry shall not occur unless there is changes to the database or a power recycle.
CYCLE FAIL	When a local Controller unit is operating in the non-coordinated mode, whether freebecause of Cycle Fault, and cycling diagnostics indicate that a serviceable call exists that has not been serviced for two cycles, it shall become Cycle Fail. The inter-section shall go into Flash and remain there unless the database is changed, or power is recycled.
MMU FLASH	When the Controller unit CMU / MMU Flash Sense input remains active for a period of time exceeding the start-up flash time.
LOCAL FLASH	When the Controller unit Local Flash Sense input becomes active, MMU Flash Sense input is not active, and Auto Flash (Soft Flash, Pattern 255) is not com-manded by the system.
LOCAL FREE	When any of the Controller inputs and/or programming cause it not to run coordination.
COORD ACTIVE	When coordination is active and not preempted or overridden.

The cycling diagnostic shall be a phase by phase test. For this test, the following definitions are included:

Not Serviced—A phase does not go green.

Serviceable Call—A phase has a call and can be serviced normally.

Serviced Normally—The following conditions must be true:

a. The Phase Is Active
b. The Phase Omit Is Not Active
c. No Phase Hold Is Active
d. External Start Is Not Active
e. No Stop Time Is Active
f. Manual Control Enable Is Not Active
g. Programmed Flash Is Not Active

Two Cycles—When running coordinated, two times the pattern cycle length. When running non-coordinated, two times the longest path between barriers (Maximum Green, Yellow, and Red timing sum).

4.3.10.7.9 Unit Alarm Status 2

```
0.8.3        UNIT ALARM STATUS 2

POWER RESTART              .
LOW BATTERY                .
RESPONSE FAULT             .
EXTERNAL START             .
STOP TIME                  .
OFFSET TRANSITIONING       .
```

Main Menu > Status > Alarms > Unit Alarm Status 2

Displays the following information:

Table 4-62: Unit Alarm Status 2

Item	Description
POWER RESTAR T	When power returns after a power interruption. Once set, a bit shall maintain its statewhile the condition exists. Bit 0 (Power Restart) status shall be maintained until a READ of this object occurs.
LOW BATTERY	When any battery voltage falls below the required level (not applicable).
RESPONSE FAULT	When any NEMA TS 2 Port 1 response frame fault occurs.
EXTERNAL START	When the CU External Start becomes active.
STOP TIME	When any Stop Time input is active.
OFFSET TRANSITION	Whenever the CU is performing an offset transition (correction in process)

4.3.10.7.10 Short Alarm Status

```
0.8.4        SHORT ALARM STATUS

PREEMPT              .   COORD ALARM        .
T&F FLASH            .   DETECTOR FAULT     .
LOCAL CYCLE ZERO     .   NON-CRITICAL ALARM .
LOCAL OVERRIDE       X   CRITICAL ALARM     .
```

Main Menu > Status > Alarms > Short Alarm Status

When doing remote monitoring using NTCIP, this Status provides the overall view ofwhat is happening with the Controller. From here, more detailed information can be viewed in other Status objects. It displays the following information.

Table 4-63: Short Alarm Status

Item	Description
PREEMPT	When any of the Controller Preemptions are active.
T&F FLASH	When either the Local Flash or CMU/MMU Flash input becomes active.
LOCAL CYCLE ZERO	When running coordinated and the local cycle timer has passed through zero. A status flag is set until read by central.
LOCAL OVERRIDE	When any external input or CU programming has prevented the Controller from responding to a system pattern command, i.e. when in Manual Pattern control or else either Free Request or Auto Flash Request becomes active.
COORD ALARM	When any of the Coordination Alarms become true. (See Unit Alarm Status 1, Cycle Fault, Coord Fault, Coord Fail, Cycle Fail)
DETECTOR FAULT	When any Detector Alarm fault occurs via either Vehicle or Pedestrian Diagnostics.
NON-CRITICAL ALARM	When a physical alarm input is active, i.e. Cabinet Door is open, or any Alarm inputs (see Alarm Input Status).
CRITICAL ALARM	When any Stop Time input is active.

4.3.10.7.11 Alarm Input Status

```
0.8.5      ALARM INPUT STATUS
                  1111111
 ALARM#   1234567890123456
STATUS    ................
```

Main Menu > Status > Alarms > Alarm Input Status

Displays the following information:

Table 4-64: Alarm Input Status

Item	Description
STATUS	Indicates which external Alarm inputs are currently active. X = Active.

4.3.10.7.12 Omni Alarm Status

```
0.8.6         OMNI ALARM STATUS

TSP ACTIVE            .  DOWNLOAD REQUEST   .
CIC ACTIVE            .  MANUAL CONTROL     .
DB TRANSACTION        .  CAB DOOR OPEN      .
KEYPAD ACTIVE         X  CAB FAULT          .
WEB UI ACTIVE         .  SP FUNC OUTPUT     .
```

Displays the following information.

Table 4-65: Omni Alarm Status

Item	Description
TSP ACTIVE	Indicates when any TSP request is currently active. X = Active.
CIC ACTIVE	Indicates when CIC command is currently active. X = Active.
DB TRANSACTION	Indicates when any database modification is active. X = Active
KEYPAD ACTIVE	Indicates that any key has been pressed on the front panel. X = Active
WEB I ACTIVE	Indicates when any browser is engaged remotely. X = Active
DOWNLOAD REQUEST	Indicates when a database download request has been requested from central. X = Active
MANUAL CONTROL	Indicates when the Controller is in manual operation, not TBC and not System control. X = Active
CAB DOOR OPEN	Indicates when the Controller is in manual operation, not TBC and not System control. X = Active
CAB FAULT	Indicates when the Controller is in manual operation, not TBC and not System control. X = Active

Item	Description
SP FUNC OUTPUT	Indicates when the Controller is in manual operation, not TBC and not System control. X = Active

4.3.10.8 **Transit Priority Status**

```
0.9      TRANSIT PRIORITY STATUS

1. PRIORITY STATUS
2. HEADWAY TIMERS
```

Main Menu > Status > Transit Priority

Select desired submenu.

4.3.10.8.1 Priority Status

```
0.9.1         PRIORITY STATUS           D
INPUTS:     1234567890ABCDEF NO REQUEST
  PREEMPT   ........         NOT ACTIVE
  PRIORITY  ................
  CHECKOUT  ................
SVC PHASE   ................
QJMP PHASE  ................
PHASE ADJUSTMENT TIMES:
```

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

Main Menu > Status > Transit Priority > Priority Status

Displays the following information:

Table 4-66: Priority Status

Item	Description
PREEMPT	Shows which Preempt inputs are active with the Preempt number.
PRIORITY	Shows which Priority Request inputs are active with the Priority number.
CHECKOUT	Shows which Priority Checkout inputs are active with the Checkout number.

Item	Description
SVC PHASE	When a Priority Request is active, this shows the requested service phases using the phase numbers.
QJMP PHASE	When a Priority Request is active, this shows the requested queue jump phases using the phase numbers.
PHASE ADJUSTMEN T TIMES	When a Priority Request is active, this shows the requested queue jump phasesusing the phase numbers.
NO REQUEST	Shows the current Priority Request status as follows: NO REQUEST – TSP inactive STRATEGY XX – Priority Request for Strategy XX
NOT ACTIVE	Shows the current Priority Strategy service status as follows: • NOT ACTIVE – no Priority Requests active • NO ACTION – waiting for ETA to finish •NO ADJ XITION – no TSP adjustment while coordinator in offset correction • EARLY GREEN – service phase was green earlier in cycle • EXTEND GREEN = service phases being extended • RECOVERY – while in coordination the TSP is performing reductions or extensions to return cycle and split times to normal
ADDITIONA LSTATUS	Additional status information when active: DURATION:085 – duration timer of active Priority Request ETA: 136 – Estimated Time of Arrival countdown timer B4 GREEN: 000 – when in Free mode, this shows the unreduced time until the service phase goes green, an estimate at best as it is reset when each non-service goes green. This is not used during coordination

4.3.10.8.2 Priority Headway Timers

```
0.9.2      PRIORITY HEADWAY TIMERS
GLOBAL PE LOCK: 0      GLOBAL HEADWAY: 0
STRATEGY:    1    2    3    4    5    6    7    8
 PE LOCK     0    0    0    0    0    0    0    0
 HEADWAY     0    0    0    0    0    0    0    0
STRATEGY:    9   10   11   12   13   14   15   16
 PE LOCK     0    0    0    0    0    0    0    0
 HEADWAY     0    0    0    0    0    0    0    0
```

Main Menu > Status > Transit Priority > Headway Timers

Displays the following information:

Table 4-67: Priority Headway Timers

Item	Description
GLOBAL PE LOCK	Shows global preempt lockout timer.
GLOBAL HEADWAY	Shows global headway timer.
PE LOCK	Shows preempt lockout timer for each priority strategy.
HEADWAY	Shows headway timer for each priority strategy.

4.3.10.9 **Phase Concurrency**

```
0.0  CONCURRENCY     FEB-08-2016 23:05:10
 PATTERN: 254
SEQUENCE:    1

R1: 12|34|
R2: 56|78|
R3:
R4:
```

Main Menu > Status > Concurrency

This shows the current ring and sequence structure for Sequence 1. The vertical bars between phases in each ring denotes a barrier as determined by the Phase Concurrencies. The following table is a sample of how phases may look:

Phase Concurrency All Sixteen Phases in One Ring:

R1: 1|2|3|4|5|6|7|8|9|0|A|B|C|D|E|F|

With no Phase Concurrencies defined a barrier is indicated between all phases.All sixteen phases evenly divided amongst the four rings:

R1: 12|34
R2: 56|78|
R3: 90|AB|
R4: CD|EF|

An eight phase two ring but with scrambled phase positions:

R1: 68|25|
R2: 41|37|

Or this:

R1: AF|0E|
R2: D9|CB|

A twelve phase three ring split (no Phase Concurrencies):

Ring Groups: [1] [2] [3]
R1: 1|2|3|4|
R2: 5|6|7|8|
R3: 9|0|A|B|

With no Phase Concurrencies a barrier appears between all phases. Notice that whenever there are multiple rings that are split (not concurrent) there is also shown theseparate Ring Groups.

Sixteen phases in four rings split looks similar:

Ring Groups: [1] [2] [3] [4]

R1: 1|2|3|4
R2: 5|6|7|8|
R3: 9|0|A|B|
R4: C|D|E|F|

Sixteen phases in two rings but NOT split:

R1: 1234|5678|
R2: 90AB|CDEF|

An eight phase two ring with phases 1 and 5 restricted (no Phase Concurrency between1 and 5):

R1: 12|34|
R2: 65|78|

NOTE: Phase 1 and 5 cannot exist in the same position within their respective rings when they are not concurrent. The Sequence defined must have one of the concurrent phase pairs in reversed order, either 1 and 2 or 5 and 6 should be reversed in a lead lag relationship.

Texas Diamond 4 Phase mode of operation will show Sequence #17, Texas Diamond 3 Phase mode will show Sequence #18 and Texas Diamond Separate mode will show Sequence #19. Otherwise, normal operation will show which one of the normal 16 sequences is in use.

4.3.10.10 **Active Sets**

```
0.A  ACTIVE SETS     FEB-08-2016 23:05:10
 PATTERN: 254
SEQUENCE:   1
 PHASE TIMINGS: 1       VEH DETS: 1
 PHASE OPTIONS: 1       PED DETS: 1
  VEH OVERLAPS: 1       VEH DET DIAGS: 1
  PED OVERLAPS: 1       PED DET DIAGS: 1
TRANS PRIORITY: 1
```

Main Menu > Status > Active Sets

This shows the current active data sets for the current pattern. Texas Diamond 4 Phase mode of operation shows Sequence #17, Texas Diamond 3 Phase mode shows Sequence #18 and Texas Diamond Separate mode shows Sequence #19. Likewise, the Active Vehicle Detector set changes with each Texas Diamond mode. Otherwise, normal operation shows which one of the normal 16 sequences is in use. See Section 5.15 New Status Display- Phase Wait Times for more information.

4.3.11 **Communications**

```
A        COMMUNICATION SETTINGS

1. SERIAL PORTS          8.   SPAT
2. ETHERNET PORTS
3. TIMEOUT
4. PING
5. SERIAL TIME SOURCE
6. NTP CLIENT
7. NTP SERVER
```

Main Menu > Communications

Select an item to view or modify the communication settings.

4.3.2.6 Serial Port Settings

```
A.1          SERIAL PORT SETTINGS
PORT          SP1
PROTOCOL      NONE
ADDRESS           0     GROUP ADDRESS     0
SPEED         1200      PARITY         NONE
DATA BITS     8         STOP BITS      1
FLOW CTRL     NONE
CTS DELAY       0       RTS EXTEND        0
```

Main Menu > Communications > Serial Ports

Table 4-68: Serial Ports

Item	Description
PORT	Use the + and - keys to select the Serial Port to edit, SP1, SP2, SP3, SP4, SP5, or SP8
PROTOCOL	Select the Serial Port Protocol: • NONE - port is not used • NTCIP/AB3418 - port is used for NTCIP and/or AB3418E client communications. • TERMINAL - port is a Linux terminal (available on SP4 only) • TRACONEX WWV/GPS – port is used to synchronize the Controller clock with a GPS or WWV device such as the 2070-7G module. (See Menu A.5) • EDI CMU – port is used to set the time on an EDI conflict monitor. The time is set once per minute to keep the monitor in sync with the Controller. • AB3418 MASTER – The current time and pattern are broadcast from this port onceper minute. This can be used to keep the time and pattern in sync on a group of Controllers that are connected via a shared comm. channel. NMEA GPS - Only SP2 and SP3 are used to synchronize the Controller clock with a GPS device that provides the NMEA standard message. Other ports should not be used. • BOSTON UTCS – port is used to interface with the Boston Urban Traffic Control System
ADDRESS	PMPP or Drop Address (1-8192) for NTCIP and AB3418E communications on this port. • A value of zero disables comm. for these protocols on this port. • A value of 8192 enables the Controller to respond to any address.
GROUP ADDRESS	The HDLC Group Address (1-62) for NTCIP and AB3418E communications on this port. • A value of zero disables group addresses for these protocols on this port.
SPEED	Use the + and - keys to select the baud rate (Speed) for this port.
PARITY	Use the + and - keys to select between no Parity, even parity, and odd parity for this port.
DATA BITS	Use the + and - keys to select between 7 and 8 Data Bits for this port.
STOP BITS	Use the + and - keys to select between 1 and 2 Stop Bits for this port.
	Use the + and - keys to select the Flow Control method for this port:

Item	Description
FLOW CTRL	• None - no flow control • RTS Timed - the port ignores CTS, turns on RTS when transmitting, and leaves RTS on for a configurable extension after the data is transmitted. • RTS/CTS Auto - the port transmits only when the CTS line is asserted to transmit it asserts RTS, waits for CTS, transmits the data, turns RTS off after a configurable extension time. • Bidirectional - the port controls RTS based on the status of the receive buffer. RTS is asserted continuously while the receive buffer has room. If the receive buffer approaches full, the port de-asserts RTS until enough data has been processed tocreate sufficient receive capacity. The port transmits only when CTS is externally asserted.
CTS DELAY	The CTS Delay time in milliseconds to wait between assertion of RTS and start of data transmission when Flow Control mode is set to RTS Timed.
RTS EXTEND	The RTS Extend time in milliseconds that RTS remains asserted after data transmission is finished, when Flow Control mode is set to either RTS Timed or RTS CTS Auto.

```
A.1          SERIAL PORT SETTINGS
PORT          SP1
PROTOCOL      BOSTON UTCS
ADDRESS     : 0
              1   2   3   4   5   6   7   8
 GRNRTN:      0   0   0   0   0   0   0   0
 DETS:        0   0   0   0   0   0   0   0
 SYSDETS:     0   0   0   0   0   0   0   0
```

When the Protocol is Boston UTCS the screen changes and these parameters apply:

Table 4-69: Boston UTCS Serial Parameters

Item	Description
PORT	Use the + and - keys to select the Serial Port to edit, SP1, SP2, SP3, SP4, SP5, or SP8.
PROTOCOL	For the given port the protocol is set to BOSTON UTCS
ADDRESS	Select the drop address (0-7) for the Boston UTCS
GRNRTN	Select a mapping for each bit of the Green Return feedback to the Boston UTCS: 1-8 for phase green 1-8, 9-16 for ped walk 1-8, 17-24 for overlap green 1-8

Item	Description
DETS	Select a detector (0-128) to map for each of the eight Boston UTCS stop bar detectors.
SYSDETS	Select a detector (0-128) to map for each of the eight Boston UTCS system detectors to gather Volume and Occupancy.

4.3.11.1 Ethernet Port Settings

```
A.2       ETHERNET PORT SETTINGS       D
PORT                ETHERNET 1
IP ADDRESS          192.168.1.1
SUBNET MASK         255.255.255.0
GATEWAY             0 .0 .0 .0
NTCIP PORT          161     UDP
AB3418 PORT         8001    UDP
AB3418 ADDR         1
AB3418 GROUP ADDR   0
PEER TO PEER PORT   49255
1.FOOTHILL SETUP    PRESS NXT TO SET
```

Main Menu > Communications > Ethernet Ports

Table 4-70: Ethernet Port Settings

Item	Description
PORT	**Ethernet Port (1,2)** Use the + and - or Next key to select the port to edit.
IP ADDRESS	Enter the four octets of the **IP Address** of the selected Ethernet port.
SUBNET MASK	Enter the four octets of the **Subnet Mask** for the selected Ethernet port.
GATEWAY	Enter the four octets of the IP address of a **Gateway** router for this port.
NTCIP PORT	Use the + and - keys to select the NTCIP Port mode as UDP or TCP. Enter the IP port number (1-65535) for NTCIP communications. Default NTCIP Port number is161. • A value of zero disables NTCIP communications for this port. • This port is typically used for both SNMP and STMP communication, but separate ports can also be used. See notes following this table.
AB3418 PORT	Use the + and - keys to select the AB3418E Port mode as UDP or TCP. Enter the IPport number (1-65535) for AB3418E communications. Default AB3418 Port numberis 8001. • A value of zero disables AB3418E communications for this port.

Item	Description
	• This port can also be used as a secondary port for NTCIP. See notes following this table.
AB3418 ADDR	Enter the PMPP address (1-8192) for AB3418E communications on this port. Default AB3418 Address is 1. • A value of zero disables the AB3418E protocol on this port. • A value of 8192 enables the Controller to respond to any address.
AB3418 GROUP ADDR	The HDLC group address (1-62) for AB3418E communications on this port. Default AB3418 Group Address is 0. • A value of zero disables group addresses for the AB3418E protocol on this port.
PEER TO PEER PORT	The UDP/IP port number for all Peer to Peer communication. (1 - 65535) This is typically left at its default of 49255 but may be changed to ensure compatibility with fire-walls.
FOOTHILL SETUP	Submenu to configure the Foothills transit protocol

When using NTCIP, if you want to send SNMP and STMP to the same network port, use the NTCIP port and ignore the AB3418 port. If you want SNMP and STMP to go to different ports, you can use the AB3418 port as a secondary port for NTCIP. For example, set NTCIP port = 161 for SNMP and AB3418 port = 501 for STMP. To use the AB3418 port as a secondary NTCIP port, the “AB3418 ADDR” field must be set to 0.

4.3.11.1.1 Foothills Protocol

There is special functionality provided in the Omni Software to allow LA Metro with its specific protocols to report back to its system. The settings for these are found under the ethernet page and are embedded so that most users will not encounter them. This section will explain how to access this special functionality

Scroll below the PEER TO PEER PORT and the following will appear.

```
A.2       ETHERNET PORT SETTINGS    U
GATEWAY             0  .0  .0  .0
NTCIP PORT          161    UDP
AB3418 PORT         8001   UDP
AB3418 ADDR         1
AB3418 GROUP ADDR   0
PEER TO PEER PORT   49255
1. FOOTHILL SETUP   PRESS NXT TO SET
```

Select the FOOTHILL SETUP by pressing the NXT on the keypad. There are several pages that follow. The first page will be used to set up the Ethernet port number, Foothills address, city code and the number of response forwards needed.

```
A.2.1    FOOTHILL SETUP - ETHERNET 1
FOOTHILL PORT         161
FOOTHILL ADDRESS        0
FOOTHILL CITY CODE   0
FOOTHILL RESP FRWD X...
1. RESP FRWD SETUP
```

The FOOTHILL RESP FRWD requires an “X” in any one of the four positions designated by the periods. X= use “.” = not used. Select the number of IP addresses the Response will be forwarded to. Select the “NXT” button again and Omni will provide a page to program the 4 possible IP addresses to forward responses.

```
A.2.1.1   FOOTHILL RESPONSE FORWARDING
   IP ADDRESS         PORT
1. 10 .1  .1  .111      162
2. 0  .0  .0  .0          0
3. 0  .0  .0  .0          0
4. 0  .0  .0  .0          0
```

4.3.11.2 **Communication Timeout**

```
A.3        COMMUNICATION TIMEOUT

UNIT BACKUP TIME (SEC)       0

CURRENT BACKUP TIMER:        0
CURRENT BACKUP MODE:       OFF
```

Main Menu > Communications > Communications Timeout

The unit backup time is a timeout for detecting loss of communication with a central system. It represents the amount of time between the last command received from the central system and when the Controller recognizes loss of communication. The valid range is 0-65535 seconds. A value of zero disables the backup timer.

When any of the following system control parameters is set, the backup timer is reset.After being reset, it times the unit backup time interval. If the unit backup time interval expires without a set operation to any of these control parameters, the Controller reverts to backup mode, which is the “loss of communication” state. The control parameters which reset the backup timer are:

- Phase Control Group Phase Omit
- Phase Control Group Ped Omit
- Phase Control Group Hold
- Phase Control Group Forceoff
- Phase Control Group Vehcall
- Phase Control Group Pedcall
- System Pattern Control
- System Sync Control
- Preempt Control State
- Ring Control Group Stoptime
- Ring Control Group Forceoff
- Ring Control Group Max2
- Ring Control Group Maxinhibit
- Ring Control Group Pedrecycle
- Ring Control Group Redrest
- Ring Control Group Omit Red Clear
- Unit Control
- Special Function Output Control

This screen also shows the current backup timer value and backup mode. Backup mode ON = Controller is in backup mode (communication has been lost), OFF = Controller is not in backup mode (communication is active, or the backup timer is disabled).

4.3.11.3 **Ping**

```
A.4                  PING
  ADDRESS                    RESULT
    0.  0.  0.  0.   - - - - - - - - - - -
    0.  0.  0.  0.   - - - - - - - - - - -
    0.  0.  0.  0.   - - - - - - - - - - -
    0.  0.  0.  0.   - - - - - - - - - - -

   PRESS YES TO PING, PRESS NO TO CLEAR
```

Main Menu > Communications > Ping

This screen allows you to ping other network IP addresses to test connectivity. Enter IP addresses of devices to ping, press YES to initiate the ping process. Press NO to clear the results.

4.3.2.7 Serial Time Source Configuration

```
A.5   SERIAL TIME SOURCE CONFIGURATION

START TIME  00:00   INTERVAL  00:00

TIME OF LAST ATTEMPT: 00:00:00
LAST RESULT.........: NO SERIAL PORT

       PRESS YES TO SET TIME NOW
```

Main Menu > Communications > Serial Time Source Configuration

Uses start time and interval to enable scheduled updates of the Controller time from a TRACONEX WWV/GPS device such the 2070-7G module or a NMEA GPS.

The time is updated each day at the specified start time and is updated again at each interval after the start time. For example:

- If the start time and interval are both 00:00, the Controller time is set once per day at midnight.
- If the start time is 00:00 and interval is 01:00, the time is set once per hour.

Pressing the "YES" key sets the Controller time immediately.

To verify that the Controller can talk to a GPS module, press the Yes key and the controller updates the status screen, and shows a response message. If the Controller shows “No Serial Port," the serial port must be configured. Use SP1 specifically for the 2070-7 GPS when it is installed in slot A2; otherwise, use SP3 when it is installed in slotA1. If it shows "No GPS installed" the Controller is not finding it and cannot talk to the GPS. If it shows "GPS not locked" it is talking to the GPS, but the GPS has not yet locked in on multiple satellites. Once lock is achieved the response is "Success".

When the McCain 2070-7G module is installed in the McCain NEMA ATC eX Omni controller in slot A2, the serial port (SP1) must be configured; otherwise, if it is in slot A1 configure SP3. Using the Communications menu and the Serial Port submenu (A.1), configure SP1 for 1200 baud, 8 data bits, no parity, 1 stop bit, no flow control, and the protocol must be TRACONEX WWV/GPS. The GPS module itself must have the toggle switch set to "Operation Mode" and the configuration jumper/switches must be set to "Normal." There is also a Tracking LED on the face of the module. At power-up it is a steady Red color. While attempting to lock onto multiple satellites this LED is blinking Red. Once lock is obtained this LED is a blinking Green color.

NOTE 1: The 2070-7 GPS module is set up at the factory with the time zone set internally to Pacific. You must use the Windows GPS Setup utility to change this. The toggle switch on the module must be set to "Configure" mode. Use a standard serial cable between the computer running the setup utility and the serial port on the GPS. Install the GPS in the module slot on the Controller, power it up, and use the Windows software to change the setting. This is described in the GPS user manual. The software is included with the GPS module.

NOTE 2: For the NMEA (National Marine Electronics Association) GPS clock, the “sentence” used by OMNI is the GPRMC message, which is parsed to see if lock is achieved. Once lock is established, the date and time is read to set the internal clock of OMNI. All other sentences received are ignored.

4.3.11.4 **NTP Client**

```
A.6      NTP CLIENT CONFIGURATION
SERVER ADDRESS     0.   0.   0.   0
START TIME   00:00    INTERVAL   00:00

TIME OF LAST ATTEMPT: 00:00:00
LAST RESULT.........: ---------------

       PRESS YES TO SET TIME NOW
```

Main Menu > Communications > NTP Client

Allows the Controller clock to be set from a Network Time Protocol (NTP) server. The start time and interval are used to enable scheduled updates of the Controller time from a NTP server.

The time is updated each day at the specified start time and is updated again at each interval after the start time. For example:

- If the start time and interval are both 00:00, the Controller time is set once per day at midnight.
- If the start time is 00:00 and interval is 01:00, the time is set once per hour.

Pressing the "YES" key sets the Controller time immediately.

4.3.11.5 **NTP Server**

```
A.7       NTP SERVER CONFIGURATION

NTP SERVER   DISABLED

STATUS       NTP SERVER IS NOT RUNNING
```

Main Menu > Communications > NTP Server

The Controller can act as a Network Time Protocol (NTP) time server for other Controllers or devices on the network. This allows other Controllers to synchronize their time to this Controller. Use the +/- or Yes/No keys to enable/disable the NTP server feature. The Status line shows if the server is currently running.

4.3.12 **SPAT Settings**

```
A.8               SPAT SETTINGS
DESTINATION:          SPAT1
UNICAST ENABLE:       NO
DEST IP ADDR:         0   .0   .0   .0
DEST PORT:            1
```

Main Menu > Communications > SPAT Settings

The Controller can transmit SPAT (signal phasing and timing) messages to other devices on the network. This allows other devices such as connected vehicles to receive data to determine how much time is remaining before the signal terminates its green indication. Omni version 3.3 and newer has the ability to send SPAT messages to up to four destinations simultaneously. Select the desired SPAT destination by using the +/- keys, use the +/- or Yes/No keys to enable/disable the SPAT broadcasting feature. Set the IP address and the UDP port accordingly of the destination device receiving the SPAT messages.

4.3.13 **Miscellaneous**

```
B            MISCELLANEOUS

1. MENU PERMISSIONS 6. SYSTEM CONTROLS
2. DB MANAGEMENT    7. USB DRIVE
3. SYSTEM INFO      8. SD CARD
4. DIAGNOSTICS      9. CAPTURE
5. VERSIONS         0. OMNI VERSIONS
```

Main Menu > Miscellaneous

This menu provides access to miscellaneous configuration options, control functions and information.

4.3.13.1 **Menu Permissions**

Main Menu > Miscellaneous > Menu Permissions

View and modify the menu security settings. When the menu permissions feature is enabled, users are required to log in to the Controller with a User ID and PIN before accessing the menus. Each user has a configurable set of permissions that determine which settings they are permitted to edit. This also provides the ability to view and modify the parameters for the login process and session management of the Web UI.

4.3.13.1.1 Menu Permissions Options

```
B.1.1     MENU PERMISSIONS OPTIONS

FRONT PANEL                   NO
ALLOW READ-ONLY               NO
TIMEOUT (MIN)                 60
```

Main Menu > Miscellaneous > Menu Permissions > Options

Provides options for configuring the menu permissions feature.

Table 4-71: Menu Permissions Options

Item	Description
FRONT PANEL	Enable or disable the menu security feature. If enabled, users are prompted to log in before accessing the Controller menus.
ALLOW READ-ONLY	Enable or disable read-only access. If enabled, users can access the menus in read-only mode (i.e. no editing is allowed) without logging into the controller.
TIMEOUT	If a user is logged in and there has been no keyboard activity for this amount of time, the user is automatically logged out.

4.3.13.1.2 Menu Permissions Users

```
B.1.2       MENU  PERMISSIONS  USERS      DR
 USER#          1     2     3     4     5     6
USER ID      0000  0000  0000  0000  0000  0000
PIN          0000  0000  0000  0000  0000  0000
OPERATION     NO    NO    NO    NO    NO    NO
UNIT          NO    NO    NO    NO    NO    NO
I/O MAP       NO    NO    NO    NO    NO    NO
PHASE         NO    NO    NO    NO    NO    NO
```

Main Menu > Miscellaneous > Menu Permissions > Users

This menu contains menu security user information for up to 64 users. Scroll right for additional users and scroll down for additional permissions.

Table 4-72: Menu Permissions Parameters

Item	Description
USER ID	A unique **User ID** is assigned to each user. User IDs contain hex digits 0-F. Valid user IDs range from 0001-FFFE. User ID 0000 means the user is disabled. User ID FFFF cannot be used because it is reserved for read-only access.
PIN	The **Personal Identification Number (PIN)** is a password that must be entered along with the User ID during login. PINs contain hex digits 0-F. Valid PINs rangefrom 0000-FFFF. If a user who does not have security permission views this menu, all PINs are hidden and XXXX is displayed instead.
OPERATION	Permission category: Operation mode and set current time/date.
UNIT	Permission category: Unit and phase configuration.
I/O MAP	Permission category: I/O mapping, gates and cabinet setup
PHASE	Permission category: Phase timing and options
OVERLAP	Permission category: Vehicle and ped overlap configuration
DETECTOR	Permission category: Vehicle and ped detector configuration
COORD	Permission category: Coordination and pattern settings
TIMEBASE	Permission category: Time options and time base schedule
PREEMPT	Permission category: Preempt configuration
TRANSIT	Permission category: Transit priority configuration
LOGS	Permission category: Configure and clear logs
COMM	Permission category: Communications settings
SECURITY	Menu security settings
DATABASE	Database initialization, download request, load from USB
SW UPDATE	Update Omni traffic control program or ATC Controller diagnostic program from USB

4.3.13.1.3 Menu Permissions Web User Interface

```
B.1.3 MENU PERMISSIONS WEB UI

1. FAILED ATTEMPTS LOCKOUT      4
2. LOCKOUT TIME (MIN)          15
3. UNAUTHORIZED ACCESS ALARM   10
4. INACTIVITY TIMEOUT (MIN)   255
```

Main Menu > Miscellaneous > Menu Permissions > Web UI

Item	Description
FAILED ATTEMPTS LOCKOUT	Defines how many unsuccessful login attempts are allowed. After this number of attempts the user must wait for a time configured in the option "time to wait after tries".
LOCKOUT TIME	Time in minutes to wait after the unsuccessful tries to login have occurred.
UNAUTHORIZED ACCESS ALARM	Defines how many login requests must be received by the controller in order to fire the alarm indicating that some remote program tried to get the username or password.
INACTIVITY TIMEOUT	If a user session is active, this is the time of inactivity in minutes before the session is forcefully cancelled. This configuration is set to protect the user session from being accessed by another user when the session remains open for a long time.

4.3.13.1.4 Database Management

Main Menu > Miscellaneous > DB Management

```
B.2           DB MANAGEMENT

1. INITIALIZE DB
2. REQUEST DOWNLOAD
3. COPY
4. CLEAR
```

This menu contains tools for managing the Controller database.

Table 4-73: Database Management

Item	Description
INITIALIZE DB	Reinitializes the database to one of the default configurations. You are prompted to select the desired cabinet configuration. **Note: This should not be done while the Controller is operating an inter-** **section. The Controller will attempt to identify if the cabinet is in flash beforeallowing the initialization to proceed. The Controller must be restarted after the database has been initialized.**
REQUEST DOWNLOAD	Requests a download from a central system.
COPY	Copies one item's settings to another. Useful for configuring several phases or patterns with similar settings, for example.
CLEAR	Clears selected settings.

4.3.13.1.5 Initialize Database

```
B.2.1       INITIALIZE DATABASE

1. ENTIRE DATABASE
2. CABINET CONFIG ONLY
```

Menu > Miscellaneous > DB Management > Initialize DB

Choose whether to initialize the entire database or only the Cabinet Configuration.

4.3.13.1.5.1 Initialize Entire Database Selection

```
B.2.1.1  INITIALIZE ENTIRE DATABASE
       SELECT DEFAULT CABINET CONFIG
 1. NEMA TS1 (A,B,C,D)
 2. NEMA TS2 TYPE 1 (BIU)
 3. NEMA TS2 TYPE 2 (A,B,C,D & BIU)
 4. CALTRANS 33X (C1,C11)
 5. ATC (SIU)
 6. ITS (SIU)
```

Main Menu > Miscellaneous > DB Management > Initialize DB > Entire Database

Choose which type of Cabinet Configuration to use when initializing the database. This not only changes the I/O map for the required interface connections, but also changes the setup of the vehicle and pedestrian detectors. It also changes the Channel configuration.

4.3.13.1.5.1.1 Initialize Entire Database Execution

```
B.2.1.1 INITIALIZE ENTIRE DATABASE
      SELECT OUTPUT CHANNEL SETUP

1. CHAN 9-12 = PEDS,      13-16= OVERLAPS
2. CHAN 9-12 = OVERLAPS, 13-16= PEDS
```

Main Menu > Miscellaneous > DB Management > Initialize DB > Entire Database > Either NEMA TS1 or NEMA TS 2 Type 1 or NEMA TS 2 Type 2 or the ATC will ask about Output Channel Setup.

Select 1 or 2 to re-initialize the entire database to the chosen configuration and follow the onscreen prompts.

4.3.13.1.5.2 Initialize Cabinet Config selection

```
B.2.1.2   INITIALIZE CABINET CONFIG
       SELECT DEFAULT CABINET CONFIG
 1. NEMA TS1 (A,B,C,D)
 2. NEMA TS2 TYPE 1 (BIU)
 3. NEMA TS2 TYPE 2 (A,B,C,D & BIU)
 4. CALTRANS 33X (C1,C11)
 5. ATC (SIU)
 6. ITS (SIU)
```

Main Menu > Miscellaneous > DB Management > Initialize DB > Cabinet Configuration Only

Choose which type of Cabinet Configuration to use when initializing the database. This not only changes the I/O map for the required interface connections, but also changes the setup of the vehicle and pedestrian detectors. It also changes the Channel configuration.

4.3.13.1.5.2.1 Initialize Cabinet Config Execution

```
B.2.1.2  INITIALIZE CABINET CONFIG
    SELECT NEMA TS2 TYPE 2 I/O MODE
   1. MODE 0 (TS1 COMPATIBLE)
   2. MODE 1 (HARDWIRE INTERCONNECT)
   3. MODE 2 (SYSTEM INTERFACE)
   4. MODE 6 (BOSTON UTCS)
```

Main Menu > Miscellaneous > DB Management > Initialize DB > Cabinet Configuration Only > NEMA TS 2 Type 2 (A, B, C, D & BIU) > Select NEMA TS 2 Type2 I/O Mode

Select 1 - 4 to re-initialize the cabinet configuration for the chosen I/O Mode selected.This screen is followed by the selection of the Output Channel Setup and select 1 or 2 therein. follow the onscreen prompts.

4.3.13.1.6 Request Download

```
B.2.2        REQUEST DOWNLOAD

  REQUEST DOWNLOAD FROM CENTRAL  NO

     PRESS YES TO REQUEST DOWNLOAD
              FROM CENTRAL
```

Main Menu > Miscellaneous > DB Management > Request Download

Press YES to request a download from the central system. A status screen is displayed to show the status of the download. Press ESC to cancel.

4.3.13.1.7 Copy

```
B.2.3                COPY
1. PHASE TIMINGS AND OPTIONSS
2. DETECTORS
3. OVERLAPS
4. TIME BASE
5. PATTERNS
6. SPLIT TABLES
7. TRANSIT PRIORITY
```

Main Menu > Miscellaneous > DB Management > Copy

Select which type of setting to copy.

4.3.13.1.7.1 Copy Phases Timings

```
B.2.3.1     COPY PHASE TIMINGS


       1. COPY PHASE
       2. COPY PHASE SET
```

Main Menu > Miscellaneous > DB Management > Copy > Copy Phase Timings

Select whether to copy a single-phase timing and options to another phase and/or phases or to copy a complete Phase Timing Data set to another dataset.

4.3.13.1.7.1.1 Copy Phases

```
B.2.3.1.1       COPY PHASES

   IN PHASE DATA SET     0
   COPY FROM PHASE       0
                                1111111
   TO                   1234567890123456
   PHASES               ................
          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Phase Timings and Options > Copy Phase

This menu screen copies one phase's timing settings to one or more other phases.

Table 4-74: Copy Phases

Item	Description
IN PHASE DATA SET	Select the phase data set (1 – 4)
COPY FROM PHASE	Select the phase to copy settings from (1 – 16)
TO PHASES	Select the phases to copy settings to

4.3.13.1.7.1.2 Copy Phase Set

```
B.2.3.1.2      COPY PHASE DATA SET

    FROM PHASE DATA SET     0
    TO PHASE DATA SET       0



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Phase Timings and Options > Copy Phase

This menu screen copies one phase data set to another.

Table 4-75: Copy Phase Set

Item	Description
COPY PHASE DATA SET	Select the data set to copy settings from (1 – 4)
TO PHASE DATA SET	Select the data set to copy settings to (1 - 4)

4.3.13.1.7.2 Copy Detectors

```
B.2.3.2        COPY DETECTORS


       1. VEHICLE DETECTOR SET
       2. PED DETECTOR SET
```

Main Menu > Miscellaneous > DB Management > Copy > Copy Detectors

Select whether to copy a vehicle detector set to another detector set or to copy a pedestrian detector set to another data set.

4.3.13.1.7.2.1 Copy Vehicle Detector Set

```
B.2.3.2.1   COPY VEHICLE DETECTOR SET

   FROM DETECTOR DATA SET     0
   TO DETECTOR DATA SET       0



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy >Detectors >Vehicle Detector Set

This menu screen copies one detector's timing settings to another detector.

Table 4-76: Copy Vehicle Detector Set

Item	Description
FROM DETECTOR DATA SET	Select the data set to copy settings from (1 – 4)
TO DETECTOR DATA SET	Select the data set to copy settings to (1 – 4)

4.3.13.1.7.2.2 Copy Ped Detector Set

```
B.2.3.2.2  COPY PED DETECTOR SET

    FROM PED DETECTOR DATA SET      0
    TO PED DETECTOR DATA SET        0



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Detectors >Ped Detector Set

This menu screen copies one phase data set to another.

Table 4-77: Copy Ped Detector Set

Item	Description
COPY PED DETECTOR DATA SET	Select the data set to copy settings from (1 – 4)
TO PED DETECTOR DATA SET	Select the data set to copy settings to (1 – 4)

4.3.13.1.7.3 Copy Overlaps

```
B.2.3.2        COPY OVERLAPS


       1. VEHICLE OVERLAP SET
       2. PED OVERLAP SET
```

Main Menu > Miscellaneous > DB Management > Copy > Copy Overlaps

Select whether to copy a vehicle overlap set to another overlap set or to copy a pedestrian overlap set to another data set.

4.3.13.1.7.3.1 Copy Vehicle Overlap Set

```
B.2.3.2.1  COPY VEHICLE OVERLAP SET

    FROM VEHICLE OVERLAP DATA SET     0
    TO VEHICLE OVERLAP DATA SET       0



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy >Overlaps > Vehicle Overlap Set

Overlap sets contain both vehicle and ped overlap settings. This menu screen copies the vehicle overlap settings from one overlap set to another.

Table 4-78: Copy Vehicle Overlap Set

Item	Description
COPY VEHICLE OVERLAP DATA SET	Select the data set to copy settings from (1 – 4)
TO VEHICLE OVERLAP DATA SET	Select the data set to copy settings to (1 – 4)

4.3.13.1.7.3.2 Copy Ped Overlap Set

```
B.2.3.2.2  COPY PED OVERLAP SET

    FROM PED OVERLAP DATA SET      0
    TO PED OVERLAP DATA SET        0



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Overlaps > Ped OverlapSet

Overlap sets contain both vehicle and ped overlap settings. This menu screen copies the ped overlap settings from one overlap set to another.

Table 4-79: Copy Ped Overlap Set

Item	Description
COPY PED OVERLAP DATA SET	Select the data set to copy settings from (1 – 4)
TO PED OVERLAP DATA SET	Select the data set to copy settings to (1 – 4)

4.3.13.1.7.4 Copy Time Base

```
B.2.3.4      COPY TIME BASE

1. SCHEDULES
2. DAY PLANS
```

Main Menu > Miscellaneous > DB Management > Copy > Time Base

Select whether to copy schedules or day plans.

```
B.2.3.4.2     COPY DAY PLANS
FROM DAY PLAN  0    PRESS YES TO PROCEED
                       11111111112222222222333
   TO   12345678901234567890123456789012
DAY PLN................................
        33333334444444444555555555566666
   TO   34567890123456789012345678901234
DAY PLN................................
   TO   34567890123456789012345678901234
SCHED   ................................
```

4.3.13.1.7.4.1 Copy Schedules

Main Menu > Miscellaneous > DB Management > Copy > Time Base > Copy Schedules

This menu screen copies one schedule's settings to one or more other schedules.

Table 4-80: Copy Schedules

Item	Description
COPY FROM SCHED	Select the schedule to copy settings from (1 – 64)
TO SCHED	Select the schedule(s) to copy settings to (1 – 64)

4.3.13.1.7.4.2 Copy Day Plans

Main Menu > Miscellaneous > DB > Copy > Time Base > Copy Day Plans

This menu screen copies one day plan's settings to one or more other day plans.

Table 4-81: Day Plans

Item	Description
COPY FROM DAY PLN	Select the day plan to copy settings from (1 – 64)
TO DAY PLN	Select the day plan(s) to copy settings to (1 – 64)

4.3.13.1.7.5 Copy Patterns

```
B.2.3.5       COPY PATTERNS

  COPY FROM PATTERN    0
         TO PATTERN    0


          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Copy Patterns

This menu screen copies one pattern's settings to another.

Table 4-82: Copy Patterns

Item	Description
COPY FROM PATTERN	Select the pattern to copy settings from (1 – 250)
TO PATTERN	Select the pattern to copy settings to (1 –250)

4.3.13.1.7.6 Copy Split Table

```
B.2.3.6      COPY SPLIT TABLE

  COPY FROM SPLIT TABLE    0
         TO SPLIT TABLE    0


          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Copy Split Table

This menu screen copies one split table's settings to another.

Table 4-83: Copy Split Table

Item	Description
COPY FROM SPLIT TABLE	Select the split table to copy settings from (1 – 250)
TO SPLIT TABLE	Select the split table to copy settings to (1 –250)

4.3.13.1.7.7 Copy Transit Priority

```
B.2.3.7   COPY TRANSIT PRIORITY SET

    FROM TRANSIT PRIORITY SET     0
    TO TRANSIT PRIORITY SET       0


          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Copy > Priority

This menu screen copies one priority set's data settings to another.

Table 4-84: Copy Transit Priority

Item	Description
FROM PRIORITY SET	Select the transit priority to copy settings from (1 – 4)
TO PRIORITY SET	Select the transit priority to copy settings to (1 –4)

4.3.13.1.8 Clear

```
B.2.4           CLEAR

1.  PHASES             5.  COORDINATION
2.  DETECTORS          6.  SYSTEM CONTROLS
3.  OVERLAPS           7.  PREEMPTION
4.  TIME BASE          8.  TRANSIT PRIORITY
```

Main Menu > Miscellaneous > DB Management > Clear

Select settings to clear.

4.3.13.1.8.1 Clear Phases

```
B.2.4.1       CLEAR PHASE SET

    PHASE DATA SET:    0

   (CLEARS PHASE TIMINGS AND OPTIONS)

          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Phases

Enter the number of the data set to clear and press the YES key to execute.

4.3.13.1.8.2 Clear Detectors

Main Menu > Miscellaneous > DB Management > Clear > Detectors

```
B.2.4.2      CLEAR DETECTOR SET

    DETECTOR DATA SET:    0

   (CLEARS VEHICLE AND PED DETECTORS)

          PRESS YES TO PROCEED
```

Enter the number of the data set to clear and press the YES key to execute.

4.3.13.1.8.3 Clear Overlaps

```
B.2.4.3       CLEAR OVERLAP SET

    OVERLAP DATA SET :    0

    (CLEARS VEHICLE AND PED OVERLAPS)

          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Overlaps

Enter the number of the data set to clear and press the YES key to execute.

4.3.13.1.8.4 Clear Time Base

```
B.2.4.4     CLEAR TIME BASE
1.  CLEAR ALL TIME BASE DATA
2   CLEAR ONE SCHEDULE
3.  CLEAR ALL SCHEDULES
4.  CLEAR ONE DAY PLAN
5.  CLEAR ALL DAY PLANS
6.  CLEAR ONE ACTION
7.  CLEAR ALL ACTIONS
```

Main Menu > Miscellaneous > DB Management > Clear > Time Base

Select which type of time base data to clear.

4.3.13.1.8.4.1 Clear All Time Base Data

```
B.2.4.4.1   CLEAR ALL TIME BASE DATA

        CLEAR ALL TIME BASE DATA?



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Time Base > Clear AllTime Base Data

Confirm all time base data to be cleared.

4.3.13.1.8.4.2 Clear One Schedule

```
B.2.4.4.2    CLEAR ONE SCHEDULE

           CLEAR SCHEDULE:  0



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Time Base > Clear OneSchedule

Select one schedule to be cleared.

4.3.13.1.8.4.3 Clear All Schedules

```
B.2.4.4.3   CLEAR ALL SCHEDULES

         CLEAR ALL 64 SCHEDULES?



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Time Base > Clear AllSchedules

Confirm all schedules to be cleared. There are similar menu screens for the Day Plans and the Actions.

4.3.13.1.8.5 Clear Coordination

Main Menu > Miscellaneous > DB Management > Clear > Coordination

```
B.2.4.5     CLEAR COORDINATION

1. CLEAR ALL COORDINATION DATA
2. CLEAR ONE PATTERN
3. CLEAR ALL PATTERNS
4. CLEAR ONE SPLIT TABLE
5. CLEAR ALL SPLIT TABLES
```

Select which coordination data to clear. The choices are similar to the Time Base Clear menus.

4.3.13.1.8.6 Clear System Controls

```
B.2.4.6     CLEAR SYSTEM CONTROLS

            1.PHASE
            2.RING
            3.UNIT
            4.SPECIAL FUNCTION
```

Main Menu > Miscellaneous > DB Management > Clear > Controls

Select which type of control data to clear.

4.3.13.1.8.6.1 Clear Phase Controls

```
B.2.4.6.1   CLEAR PHASE CONTROLS

       CLEAR ALL PHASE CONTROLS?


          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Controls > Phase

Press yes to clear all phase controls.

4.3.13.1.8.6.2 Clear Ring Controls

```
B.2.4.6.2   CLEAR RING CONTROLS

        CLEAR ALL RING CONTROLS?


          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Controls > Ring

Press yes to clear all ring controls.

4.3.13.1.8.6.3 Clear Unit Controls

```
B.2.4.6.3   CLEAR UNIT CONTROLS

        CLEAR ALL UNIT CONTROLS?



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Controls > Unit

Press yes to clear all unit controls.

4.3.13.1.8.6.4 Clear Special Function Controls

```
B.2.4.6.4  CLEAR SPECIAL FCTN CONTROLS

  CLEAR ALL SPECIAL FUNCTION CONTROLS?



          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Controls > Special Function

Press yes to clear all special function controls.

4.3.13.1.8.7 Clear Preemption

```
B.2.4.7     CLEAR PREEMPTION

                     12345678
          PREEMPT #  ........

           PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Preemption

Select the Preempt plans to be cleared.

4.3.13.1.8.8 Clear Transit Priority

```
B.2.4.8     CLEAR TRANSIT PRIORITY SET

      TRANSIT PRIORITY SET:   0


          PRESS YES TO PROCEED
```

Main Menu > Miscellaneous > DB Management > Clear > Priority

Select the Transit Priority sets to be cleared.

4.3.13.2 **System Info**

```
B.3           SYSTEM INFO
SYSTEM ID   0000000000

NAME

LOC
```

Main Menu > Miscellaneous > System Info

To edit the Name or Location, use the arrow keys to move the cursor to the desired position, use the +/- keys to select the desired character. An initialized database has a SYSTEM ID set to all zeroes.

Table 4-85: System Info

Item	Description
SYSTEM ID	SYSTEM ID is a unique Controller/database/location identifier. (0 - 4,294,967,295) This ID is used to identify the Controller/location when connected to a central system. It is also used to identify database files for this Controller when saved to USB.
NAME	A System Name, an optional text string
LOC	System Location, an optional text string

4.3.13.3 **Diagnostics**

```
B.4     SWITCH TO DIAGNOSTIC PROGRAM

              << WARNING >>
   SIGNAL OPERATION WILL BE DISRUPTED.
       CABINET WILL GO TO FLASH.

      YES = PROCEED      NO = CANCEL
```

Main Menu > Miscellaneous > Diagnostics

The diagnostic program provides Controller hardware diagnostics. (Diagnostics version3.1.0) Special loopback cables are required for the communications and Input / Output tests. When the diagnostic program is started, the Omni program is shut down and the Controller is restarted with the diagnostic program.

The screen first displays the Linux version information. (On the 2070 chassis, press ENT key to continue to the hardware list). The hardware configuration is also displayed.(For the hardware of Version 2 of the engine board; 128MB DRAM, 8MB FRAM, 2MB SRAM, MAC addresses, default IP Addresses, clock date and time. Press ENTER key to continue to the Diagnostics menu.

To return to Omni, go into the Extras menu, and select the option to Exit Diagnostics.That re-enables Omni and restarts the Controller.

To use the diagnostic program, follow the onscreen prompts to access tests and settings. For more detailed information and the pinouts or part numbers of the loopback connectors see Appendix C: ATC eX 2070 Diagnostic Acceptance Test (DAT) for more information.

Table 4-86: Diagnostics

Item	Description
CPU	CPU settings and tests. 1. Clock (set the system clock) 2. USB (test USB ports with a correctly configured USB device) 3. AC Fail (detect power interrupts and failures) 4. DRAM 5. Flash 6. SRAM 7. Datakey (2070), Harness Fault Monitor (NEMA) 8. EEPROM (2070)
INPUTS/OUTPUTS	On a NEMA Type 2 chassis: 1. Standard a. Loopback b. False Inputs 2. Traconex a. Loopback b. False Inputs 3. TPRG a. Loopback

Item	Description
	b. False Inputs On a 2070 chassis:1. 2070-2A a. Loopback b. False Inputs2. 2070-2N a. Fault Monitor and C15S
SERIAL PORTS	For a NEMA Type 2 chassis: 1. Port 1 SDLC (SP3) 2. SP-5 Port 3. SP-8 Port 4. SP-1 & SP-2 Ports 5. Ethernet Ports For a 2070 chassis: 0. SP-1 and SP-3 ports 1. SP-2 port 2. SP-8 port 3. Ethernet ports 4. SP-1 and SP-2 ports 5. C15S (SP3S)
FRONT PANEL	Tests front panel status lights, sounds, key controls and LCD display. 1. Active LED 2. Backlight 3. Active beep 4. Keyboard 5. Display

Item	Description
CONTINUOU STEST	These tests continue to run until aborted. Use the Up and Down arrows and the Yes and No keys to select and deselect tests. Press ENT to begin testing and ESCto abort testing. For a NEMA Type 2 chassis: • DRAM • SRAM • Port 1 SDLC (SP3) • SP-5 Port • SP-8 Port • SP-1 & SP-2 Ports • I/O Loopback • I/O False Inputs • Trac I/O Loopback • Trac I/O False Inputs • TPRG I/O Loopback • TPRG I/O False Inputs for a 2070 chassis: • DRAM • SRAM • I/O Loopback • I/O False Inputs • I/O 2N Fault Mon • SP-1 and SP-3 ports • SP-2 port • SP-8 port • SP-1 and SP-2 ports • C15S (SP3S)
LOGS	Display test logs: • System • Error • Summary

Item	Description
	• Extended
TOOLS/EXTRAS	• Configure Ethernet • Run Script from USB or Run Installer • Manage Services • Manage Users • Exit Diagnostic (re-enables Omni and restarts Controller)

4.3.13.4 **Omni Versions**

```
B.5           OMNI VERSIONS

OMNI   :  D-03.03.00.0420
DBASE  :  1
UBOOT  :  U-Boot 1.3.0-rc2.9 (Oct 15 2020
KERNEL:  2.6.39.4 3.346 PREEMPT Mon Mar
BSP    :  3.346 PREEMPT Mon Mar 29 10:07:
```

Main Menu > Miscellaneous > Versions

Displays software version information for the Linux operating system, BSP, and the Omni eX intersection control software.

4.3.13.5 **System Controls**

```
B.6            SYSTEM CONTROLS

1. SYSTEM PATTERN CONTROL
2. UNIT CONTROL
3. RING CONTROL
4. PHASE CONTROL
5. SPECIAL FUNCTION CONTROL
6. PREEMPT/PRIORITY CONTROL
```

Main Menu > Miscellaneous > System Controls

View and modify the functions that a central system uses to remotely control operations.

These commands are disabled in when in Communications Backup mode (see Communications Timeout menu A.3)

NOTE: All system controls are temporary and are cleared when the Controller is restarted or when the Controller goes into Communications Backup mode. The system controls should not be considered part of the Controller configuration. These menus are providedprimarily to view or test the system controls. Use with caution if the controller is actively communicating with a central system, since local changes can override system commands.

4.3.13.5.1 System Pattern Control

```
B.6.1     SYSTEM PATTERN CONTROL
          CURRENT VALUE     123
          NEW VALUE         231

0        = STANDBY (TIME BASE OR FREE)
1-250    = SELECT PATTERN
254      = FREE
255      = FLASH
```

Main Menu > Miscellaneous > Controls > System Pattern Control

Selects the active system pattern or mode to be used when the Unit Operation Mode (Menu 1.1) is Automatic (zero).

Enter the pattern or mode value, press the YES key to set or the NO key to abort.

Table 4-87: System Pattern Control

Item	Description
CURRENT VALUE	Displays the currently set system pattern control value.
NEW VALUE	Enter the new system pattern value.
0	Standby: The system relinquishes control of the device. Local time base pattern selection is used, if enabled, otherwise free operation is used.

Item	Description
1-250	Select Pattern: Selects a pattern that determines the operating mode of the con- troller. If an unsupported pattern is selected, free operation is used.
254	Free: Requests free operation.
255	Flash: Requests automatic flash.

4.3.13.5.2 Unit Control

```
B.6.2           UNIT CONTROL

EXTERNAL MIN RECALL    .
CALL TO NON ACT 1      .
CALL TO NON ACT 2      .
WALK REST MODIFIER     .
INTERCONNECT           .
DIMMING ENABLE         .
```

Main Menu > Miscellaneous > Controls > Unit Control

This menu is used to activate unit control functions (**.** = false / disabled, X = true /enabled).

Table 4-88: Unit Control

Item	Description
EXTERNAL MIN RECALL	When set to 1, causes a recurring demand on all vehicle phases for a minimum vehicle service.
CALL TO NON ACT 1	When set to 1, causes any phase(s) appropriately programmed in the phase options setting to operate in the non-actuated mode.
CALL TO NON ACT 2	When set to 1, causes any phase(s) appropriately programmed in the phase options setting to operate in the non-actuated mode.
WALK REST MODIFIER	When set to 1, causes any non-actuated phases to remain in the timed-out walk state (rest in walk) in the absence of a serviceable conflicting call.
INTERCONNEC T	Currently has no effect because interconnect mode is not supported.

Item	Description
DIMMING ENABLE	Currently has no effect because dimming is not supported.

4.3.13.5.3 Ring Control

```
B.6.3         RING CONTROL            D
 RING#           1234
STOP TIME        ....
FORCE OFF        ....
MAX 2            ....
MAX INHIBIT      ....
PED RECYCLE      ....
RED REST         ....
```

```
OMIT RED CLEAR  ....
```

Main Menu > Miscellaneous > Controls > Ring Control

Ring controls affect any active phase in the selected rings. Move the cursor to the desired item and press the 1-4 keys to toggle the desired ring, or press Yes to select all rings, or No to clear all rings. “X” = Enabled, “**.**” = Disabled.

The following ring control functions are available.

Table 4-89: Ring Control

Item	Description
STOP TIME	Applies Stop Time to the selected rings.
FORCE OFF	Applies Force Off to the selected rings.
MAX 2	Enables Maximum Green 2 (Max 2) on the selected rings.
MAX INHIBIT	Inhibits termination from Maximum Green on the selected rings.
PED RECYCLE	Enables Pedestrian Recycle on the selected rings.
RED REST	Enables Red Rest on the selected rings.
OMIT RED CLEAR	Omits Red Clearance on the selected rings.

4.3.13.5.4 Phase Control

```
B.6.4         PHASE CONTROL          D
                      1111111
              1234567890123456
PHASE OMIT    ................
PED OMIT      ................
PHASE HOLD    ................
FORCE OFF     ................
VEH CALL      ................

PED CALL      ................
```

Main Menu > Miscellaneous > Controls > Phase Control

Phase controls affect the selected phases. Move the cursor to the desired item and press the 1-F keys to toggle the desired phase, where 1-9 = phases 1-9, 0 = phase 10, A-F = phases 11-16. Press Yes to select all phases, or No to clear all phases. “X” = Enabled, “**.**” = Disabled.

The following phase control functions are available.

Table 4-90: Phase Control

Item	Description
PHASE OMIT	Omits the selected phases.
PED OMIT	Omits pedestrian service on the selected phases.
PHASE HOLD	Places a Hold on the selected phases.
FORCE OFF	Places a Force Off on the selected phases.
VEH CALL	Places a call for vehicle service on the selected phases.
PED CALL	Places a call for pedestrian service on the selected phases.

4.3.13.5.5 Special Function Control

```
B.6.5   SPECIAL FUNCTION CONTROL


                             1111111
 FUNCION#               1234567890123456
SPECIAL FUNCTION ON     ................
```

Main Menu > Miscellaneous > Controls > Special Function Control

This screen shows special function control, which enables the selected special function outputs. Press the 1-F keys to toggle the desired special function number, where 1-9 = functions 1-9, 0 = function 10, A-F = functions 11-16. Press Yes to select all special functions, or No to clear all special functions. “X” = Enabled, “**.**” = Disabled.

4.3.13.5.6 Preempt/Priority Control

```
B.6.6     PREEMPT/PRIORITY CONTROL

                  1234567890ABCDEF
PREEMPT CALL      ................
PRIORITY CALL     ................
PRIORITY CHECKOUT ................
ETA            0  0  0  0  0  0  0  0
               0  0  0  0  0  0  0  0
```

Main Menu > Miscellaneous > Controls > Preempt Control

These controls place internal calls for Preempt or Transit Priority service. Press the 1-F keys to toggle the desired preempt or priority strategy number, where 1-9 = preempt/priority 1-9, 0 = preempt/priority strategy 10, A-F = preempt/priority strategy 11-16. Press Yes to select all, or No to clear all. “X” = Enabled, “**.**” = Disabled.

4.3.13.6 **USB Flash Drive**

```
B.7              USB DRIVE

1. SAVE DATABASE TO USB
2. LOAD DATABASE FROM USB
3. SAVE LOG FILES TO USB
4. UPDATE SOFTWARE FROM USB
```

This menu is automatically displayed when a USB drive or other similar USB storage device is plugged into the Controller. It is only accessible while the USB drive is connected. When you unplug the USB drive from the Controller, the menu automatically returns to the last menu that was active before the USB drive was connected. You can also manually Escape from and re-enter the USB menu while a USB drive is connected.

It is now possible to have databases saved in subfolders that are within the default OmniDatabase folder. These must be created or deleted ahead of time on a computer while the USB drive is inserted into a USB port of the computer.

NOTE: Any name longer than 25 characters will appear truncated on the Controller screen.

If the USB Drive menu is selected but the USB drive is NOT installed, the Controller reports this error.

```
B.7              USB DRIVE

           NO USB DRIVE FOUND
          PRESS ESC TO GO BACK
```

4.3.13.6.1 Save Database to USB

```
B.7.1       SAVE DATABASE TO USB

SELECTED FOLDER: OmniDatabase
FILE NAME: atcDatabase_0000000000.gz
SYSTEM ID: 0000000000
FILE NUMBER: 00

YES = SAVE DATABASE, NEXT = BROWSE
```

Main Menu > Miscellaneous > USB Drive > Save Database to USB

The USB drive can contain databases from multiple Controllers. Database files stored on the USB drive are named with the System ID of the Controller, i.e. "atcDatabase_ 0000000000.mcb" where the System ID is 0000000000. The file extension ".mcb" is a Linux designation for a compressed file. By default, databases are stored in a folder named "OmniDatabase" located on the root of the USB drive. The file is composed of the NTCIP Data Block definitions, both standard definitions and custom ones by McCain.

It is now possible to save multiple versions of the same database by setting the two-digit File Number to a value other than 00. The File Number is appended onto the filename, ex: "atcDatabase_0000000000_01.mcb.

NOTE: File Number of 00 is not appended.

The appended number is only a part of the filename, it is not a part of the database.Press the Yes key to save the database.

```
B.7.1      SAVE DATABASE TO USB

DATABASE SAVED TO USB:

atcDatabase_0000000000.gz

PRESS ESC TO RETURN
```

If the database is to be saved in a different folder located under the default database directory press the Next key to browse the available subfolders. Use the Up and Down arrow keys to move the highlight to the desired subfolder. The example subfolderis named Test1. Press Yes to select this folder.

```
B.7.1      SAVE DATABASE TO USB        D
> OmniDatabase
  > Test1



YES = SAVE IN SELECTED FOLDER
NEXT = GO TO SUBFOLDER, ESC = GO BACK
```

If the database that is to be saved on the USB drive has the same filename as another database already on the USB drive in the same folder the following warning message is displayed. Press the Yes key to overwrite the file or press the No key to cancel the Save operation.

```
B.7.1      SAVE DATABASE TO USB

FILE ALREADY EXISTS, OVERWRITE?

atcDatabase_0000000000.mcb

YES = OVERWRITE, NO = CANCEL
```

Once the database is successfully saved on the USB the Controller will display the following message.

```
B.7.1     SAVE DATABASE TO USB

DATABASE SAVED TO USB:

atcDatabase_0000000000.mcb

PRESS ESC TO RETURN
```

4.3.13.6.2 Load Database from USB

When loading a database from USB drive to the Controller, the Controller System ID is used by default to select the desired database. (Filename is atcDatabase_0000000000.gz if System ID is 0000000000.) By default, the database files are in the root folder named "OmniDatabase" on the USB drive.

```
B.7.2    LOAD DATABASE FROM USB

SELECTED FOLDER: OmniDatabase
FILE NAME: atcDatabase_0000000000.mcb
SYSTEM ID: 0000000000
FILE NUMBER: 00

YES = LOAD DATABASE, NEXT = BROWSE
```

If this is the database desired, press the Yes key.

Once the database is successfully loaded the Controller responds with the following message:

```
B.7.2    LOAD DATABASE FROM USB

DATABASE LOADED FROM USB:

atcDatabase_0000000000.mcb

PRESS ESC TO RETURN
```

However, if a different database is desired or if one is unsure what databases or subfolders are available on the USB drive, press the Next key to browse what files are present. On this screen, the current folder being browsed is shown at the top followed by any subfolders available and any database files present starting numerically from atcDatabase_0000000000.gz if it exists. Use the Up and Down keys to move the highlight to the desired file or subfolder. press the Yes key to select a file or press the Next key to enter a subfolder.

```
B.7.2    LOAD DATABASE FROM USB        D
> OmniDatabase
   atcDatabase_0000000000.mcb
   atcDatabase_0000000001.mcb
   atcDatabase_0000000002.mcb
   atcDatabase_0000000003.mcb
YES = SELECT FILE, NO = DELETE FILE
NEXT = GO TO SUBFOLDER, ESC = GO BACK
```

Pressing the No key will delete the file from the subfolder. This action will bring up a confirmation screen. Press Yes to confirm the deletion or press No to cancel the deletion.

The subfolders themselves can only be removed by a computer and not by the Controller. Press the Escape key to return to the previous folder or to return to the Load Database screen.

4.3.13.6.3 Save Log Files to USB

```
B.7.3       SAVE LOG FILES TO USB

     INCLUDE HIGH RESOLUTION LOGS?
         1. DO NOT INCLUDE
         2. SAVE DAT FILES
         3. SAVE AS CSV FILE

   SELECT 1-3 TO PROCEED.   NO = CANCEL
```

Saves log files from the Controller to a USB drive.

The USB drive can contain log files from multiple Controllers. Log files stored on the USB drive are named with the System ID of the Controller. When saving the log files toUSB, any existing log files already stored on the USB device with the same System IDare overwritten.

Filenames are: “logs_0000000000_20180124_000609.tar.gz” assuming the System IDis 0000000000 and the date is Jan 24, 2018 and the time is 00:06:09. This is a compressed file of all the Controller logs such as Operation, VOS, Speed Trap, MOE, etc. and optionally the High-Resolution log. All Controller log files are stored in a folder named “OmniLogs” in the root directory.

Press the number selection, 1-3, to save or press No to cancel. Pressing 1 saves all log files into one compressed Comma Separated Value (CSV) file, except the High-Resolution log is not included.Pressing 2 saves all files as CSV and the High-Resolution in the binary format with file extension of DAT of which these is in a subfolder named “hrLogs” and pressing 3 saves all files including the High-Resolution in a CSV format with an extension of CSV. Once saved, there is one combined and compressed log file shown in this confirmation.

The “.gz” is a Linux extension meaning that it is a compressed file (GZ=GNU Zip). The“.tar” is also a Linux extension meaning that it is a collection of several files into one archive file (TAR=Tape ARchive).

4.3.13.6.4 Update Software from USB- Omni 3 and newer

> NOTE: See "Software Installation" on page 265 for the complete Omni 3.0 updateprocedure.

Omni version 3 reintroduced the ability to upgrade the Omni application without the need to access Diagnostics. This feature is only available on the ATC Controllers equipped with engine board series 3 (EB3)- ATC eX2, Flex, and 2070-1C CPU module.

The software is distributed as a compressed file in the .MCFW format. Copy the .MCFW file to the OmniSoftware folder on the USB flash drive insert USB drive in the Controller.

> NOTE: If the Controller is operating a live intersection in the field, the intersection should be put into cabinet flash safely before performingthe software update as a precaution.

It is recommended to save the database in the Controller to the USB drive as a precautionary backup.

```
B.7.2    LOAD DATABASE FROM USB

DELETE FILE FROM USB?

atcDatabase_0000000000.mcb

YES = SELECT FILE.  NO = CANCEL
```

However, if the Controller is being updated from an older version of Omni 1.x or 2.x **or** is an ATC eX or 2070ATC unit this USB drive menu is not used. Instead select Diagnostics from the Miscellaneous menu. (B.4) Within Diagnostics at the main menu select Extras (7) and Run Script (2). insert the USB and follow the screen prompts.

To update Omni 3 to a newer release of Omni 3.x, insert the USB drive while Omni is running and select Update Software from USB. (B.7.4) The Controller reads what versions of Omni software packages are available for selection. Press the corresponding item number key to begin the installation.

```
B.0.1          INSTALL OMNI              D

1. omni-B-3.3.0.2.mcfw
2. omni-D-3.3.0.484.mcfw
3. omni-R-3.2.0.44.mcfw
```

The Controller displays a confirmation dialog showing the selected version Press the ENT key to begin the installation or the ESC key to cancel the installation.

```
B.0.1          INSTALL OMNI

INSTALL omni-D-3.3.0.484.mcfw

             ENT: Yes ESC: No
```

As each file is being loaded there are more status screens for each file. Omni displays the following screen while it is loading the software package that has the necessary files needed for operation. The Controller will also complete the active cycle and rest in main-street green during the software installation.

```
B.0.1        INSTALL OMNI

INSTALLATION COMPLETE

WAITING FOR ALL RED SO CONTROLLER CAN
RESTART …
```

Once the installation is finished and Omni has restarted, remove the USB flash drive, and restore operation by toggling the cabinet flash switch back to automatic operation.

4.3.13.7 **SD Card**

This screen is displayed when no SD card is installed in the FLeX Controller or if Omni is installed in a 2070 version 2 CPU card without a slot for SD cards. Omni automatically detects and mounts or unmounts SD cards as needed. Press ESC to return to the Miscellaneous menu.

```
B.8                 SD CARD

                NO SD CARD FOUND
              PRESS ESC TO RETURN
```

This screen is displayed if an SD card has been installed in the FLeX Controller or the 2070 version 3 CPU card. Press ESC to return to the Miscellaneous menu.

```
B.8                 SD CARD

          SD CARD MOUNTED SUCCESSFULLY
              PRESS ESC TO RETURN
```

The card must be formatted with the FAT or FAT32 file system before being inserted into the Controller.

NOTE: Linux supports the SD card in version 2.6.39 and performs any data write to the SD card.

In Omni version 1.11 and later, if the SD card is installed, all High-Resolution logs are stored here.

4.3.13.8 **Capture**

B.9 provides a capture file that can be sent to McCain support for help with troubleshooting configurations and bug resolution. This is accomplished by the capture routine recording the traffic engine in Omni.

If a user identifies an issue such as a configuration or suspected bug, the capture utility is started and stopped once the event is seen again. The file that is produced can be sent to McCain for review and evaluation. Start by entering B.9 from the main menu.

```
B.9            START CAPTURE
               << WARNING >>
   SIGNAL OPERATION WILL BE DISRUPTED
        ALL PHASES WILL GO TO RED
      THEN CONTROLLER WILL RESTART

          PRESS YES TO PROCEED
     PRESS ESC TO ABORT THE CAPTURE
```

To continue enter YES or hit the ESC to abort the capture process.

```
B.9        START CAPTURE

       ENTER THE CAPTURE NAME
NAME:
   WARNING!!! CONTROLLER WILL RESTART
      AFTER ALL PHASES ARE RED
   PRESS ENT TO RESTART AND CAPTURE
    PRESS ESC TO ABORT THE CAPTURE
```

Enter a capture name, which is the file name that the capture utility uses to store the data.

```
B.9        START CAPTURE

       ENTER THE CAPTURE NAME
NAME:1234
   WARNING!!! CONTROLLER WILL RESTART
      AFTER ALL PHASES ARE RED
   PRESS ENT TO RESTART AND CAPTURE
    PRESS ESC TO ABORT THE CAPTURE
```

After entering the name hit ENT. The controller waits until an all red condition and then restarts. This takes approximately 1 second. The controller will be running in normal operation without going through a restart.

> **!** CAUTION: Depending on the cabinet and controller the intersection may experience a flash condition. There should be caution taken when doing this in the field.

Once the capture is running there are two ways to determine the controller is recording a capture file (.mcc). The first is to look at the main status screen. There will be a "C" to the right of the date and time as shown here.

```
RG1  3Y RG2  7Y  Tue Jun-22-2021 15:45:34C
YEL2.0 YEL2.0     1234567890ABCDEF MANUL
MAX    MAX    O/N   ON  ON         PAT254
              VEH FFFFFFFF         CYC
              PED                  OFF
              OVL                  MCT
FREE   COMMD  POV                  LCT
SP FO         H/O                  PRE
```

The other option is to go into the capture window by going to B.9 and verifying that the file size is increasing.

```
B.9         CAPTURE STATUS

STATUS:CAPTURING
  NAME:1234.mcc
  SIZE:0000112226
 PRESS ENT TO STOP THE CAPTURE AND MAKE
         THE CAPTURE FILE
```

The capture file continues to write until the capture utility has been stopped. If the capture file is allowed to run, the file will begin to overwrite the oldest data first. To stop the capture hit ENT from B.9.

```
9.1   CAPTURE

      PLEASE INSERT USB DRIVE
   OR PRESS ESC TO ABORT CAPTURE
```

The controller then prompts for a USB device to be inserted into the USB port. Once the USB device has been entered, it will copy automatically.

4.3.13.9 **Omni Versions**

B.0 allows the user to install Omni as previously described or select from previously loaded versions of Omni. To switch to a previously installed version, go to B.0.2.

```
B.0.2           SWITCH OMNI

ACTIVE  : D-3.3.0.504
INACTIVE: D-3.3.0.420

            ENT: Yes  ESC: No
```

To keep the current active version, hit ESC; to switch versions, hit ENT. The active version becomes the inactive, and the inactive becomes the active. This utility only shows the last two versions installed. To load other versions the normal installation process must be used.

5. COORDINATION

5.1 INTRODUCTION

Coordination is defined as the synchronization of signalized intersections in a corridor or arterial to establish progression of traffic. The intent of coordinating traffic signals is to provide smooth flow of traffic along streets and highways to reduce travel times, stops and delay. The need for coordinated progression is typically determined by performing an engineering study. The study looks at the trade-off between traffic volume versus distance between intersections and traffic delays. Typically, coordination is warranted if the intersections on a corridor are closely spaced (within one half mile) or there are large traffic volumes. If the study indicates coordination is warranted, a coordination plan can be prepared that will best address the specific needs of the signal system.

5.2 TRAFFIC SIGNAL COORDINATION

There are three basic requirements for traffic signal coordination:

1. All signalized intersections in the corridor must have the same CYCLE LENGTH or multiples of the same cycle length. Cycle length defines the time required for a complete sequence of indications governing conflicting traffic movements. Too long of a cycle length may cause excessive traffic delays, especially to any cross traffic. Too short of a cycle length may impeded the progression of platoons of traffic along the coordinated corridor. For example, it may be possible to coordinate a group of intersections in which they all use 100 second cycle lengths. It isalso possible to coordinate a group of intersections using a mix of 50 second and100 second cycle lengths.

2. Each local intersection must have a synchronization reference point, LOCAL ZERO REFERENCE, a point within the cycle known as “time zero” (T0). For the local intersection signal, this is when the green indication either begins or ends on the coordinated corridor. This reference point of coordination is often referred to as the yield point but may be better defined as the deterministic point. This point is necessary for coordination to operate because it is a point where the Controller decides to terminate the coordinated phase for a serviceable call on any other phase. The local zero reference is needed to relate the timing of each local inter-section to the timing of other intersections in the coordinated system.

3. A master reference location must be selected for the coordinated corridor. Typically, one intersection within the corridor is chosen as the master location and receives an offset time of zero seconds. The vehicle travel time from the masterreference location to another local intersection on the corridor is called the OFFSET and is determined separately for each intersection. This is restated as OFFSET equals Travel Time from Master Reference Location to the Local Inter-section.

The following Figure 5-1, Figure 5-2, and Figure 5-3 demonstrate the relationship of these basic coordination requirements.

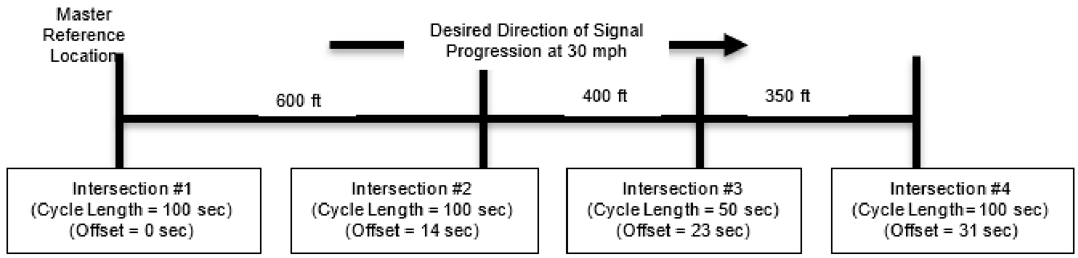


Figure 5-1 Corridor Coordination

intersections all have the same cycle lengths or multiples of the same number; therefore, they can be coordinated together. Intersection #1 is the location of the master reference and has an offset of 0 seconds. Intersection #2 is 600' downstream and needs an offset of 14 seconds since it takes that long to travel between the two intersections at 30 mph (44 feet per second). To travel from Intersection #1 to Intersection #3 takes 23 seconds and is the offset for that intersection.

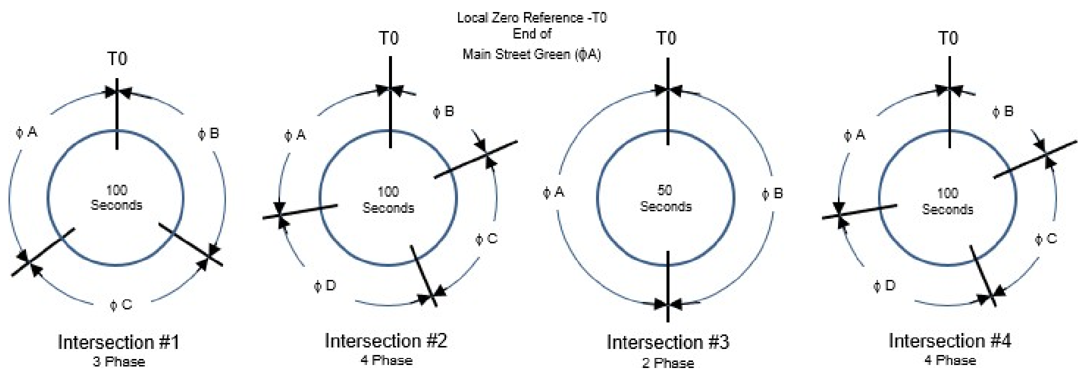


Figure 5-2: Intersection Local Cycle (1)

Figure 5-2 consists of a series of simplified local cycle diagrams, one for each intersection. Notice that these cycles are split into either two, three or four parts, one for each phase or traffic movement. These diagrams show that the local zero reference for each intersection is at the END of the main street phase green. These diagrams have not yet been offset to the master reference; therefore, all show the local zero reference in the "12 o'clock" position. When the offsets are applied to the diagrams they become rotated to resemble those in Figure 5-3.

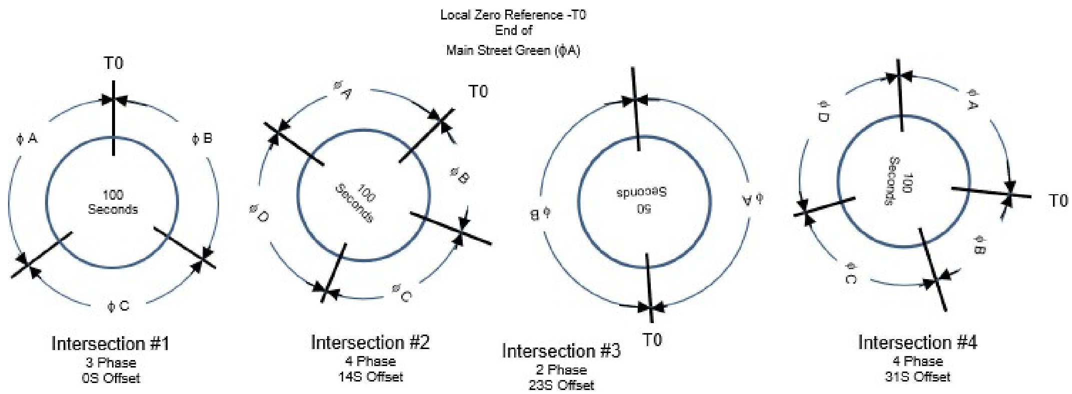


Figure 5-3: Intersection Local Cycle (2)

These offsets progress a group of vehicles through these four intersections from left to right at 30 mph. If progression is necessary in the other direction at a different time of theday or if progression is desired in both directions simultaneously, a change in offset values is required (and perhaps a change of cycle length too). The ability to vary offset times and other coordination parameters is explained later in this chapter.

In older coordinated corridor implementations, there was a wired interconnection from the master reference location to each of the other coordinated intersections along the corridor. Each intersection was receiving a synchronization pulse that indicated when the master location was at T0. Each intersection made sure its local cycle reference point was offset from the master sync pulse. If it was not, the local intersection needed to do offset seeking to get into step with the master. Other interconnecting wiresselected which timing dial to use and which offset desired.

5.3 Time Based Coordination

Modern Controllers like Omni use Time Based Coordination whereby no wired interconnect is required to establish the master reference at each intersection. The Controller Time of Day clock is the source of the master reference. The Sync Reference Time, which by default is at midnight, ensures that all patterns' master cycle times are started from this point.

For example, if the pattern cycle length is 60 seconds, at midnight and at the top of every minute thereafter the Master Cycle Time (MCT) begins at zero and counts upwardfrom there to 59 seconds. If the pattern cycle length was 125 seconds, at midnight the MCT starts incrementing from zero. At two minutes and five seconds after midnight the MCT will start from zero again. The software automatically calculates the starting number for MCT based on the cycle length and the current local time when the new pattern is loaded.

There are differences in the coordination needs of pre-timed Controllers and actuated Controllers. In a pre-timed Controller, the cycle length is fixed and does not vary from cycle to cycle. Therefore, if any point within the cycle is synchronized, the entire cycle is synchronized as well. So, to synchronize a pre-timed Controller it is only necessary to address the three basic requirements, cycle length, local zero reference and master reference (offset).

5.4 Coordination Actuated Controller

In a coordinated actuated Controller, establishing a cycle length is a considerably complex process. This is because the cycle length of an actuated Controller normally varies from cycle to cycle depending on vehicle demand. A fixed cycle length must be "artificially imposed" on an actuated Controller to obtain coordinated operation. To accomplish this, certain functions are used in the software such as permissive periods, holds and force offs. These functions force the Controller to operate within the constraints of a "local cycle" while still allowing the Controller to operate in an actuated mode.

In Omni, the coordinated phases have a hold applied which does not allow the coordinated phases to gap out early; rather, they are forced off at the appropriate time in the cycle to enable service for any other phases that have demand. These other non-coordinated phases have a "window" of opportunity for service to satisfy their demand.

These windows open when the permit occurs in the cycle and close when the omit happens later in the cycle. By default, these permits and omits are calculated by the coordinator software automatically. Under constant demand, all non-coordinated phases are served in order as defined by the current sequence and are terminated each in turn with a Force Off to meet the constraints of the split time.

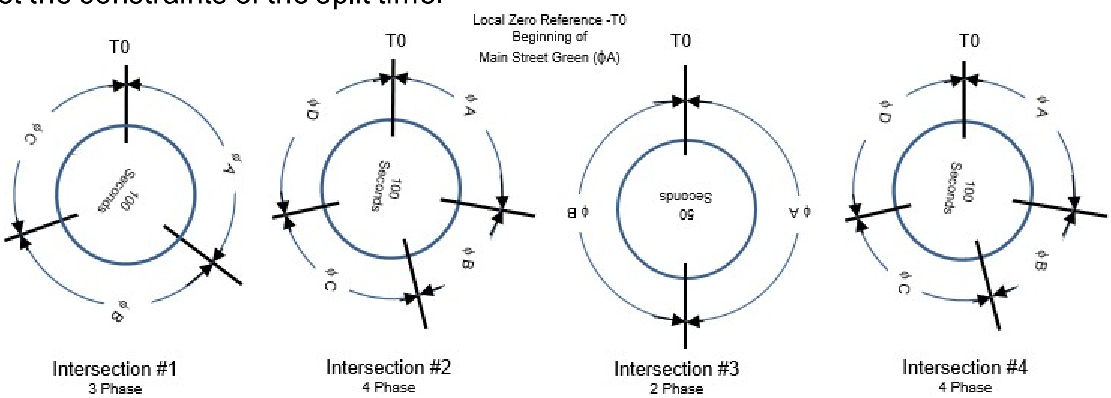


Figure 5-4: Intersection Local Cycle (3)

Figure 5-4 shows the same four intersections as Figure 5-3 that are without the Offset but with the Zero Reference Point (T0) set at beginning of green of the coordinated phases at the "12 o'clock" position. Applying the offsets to each intersection local cycle time has the similar effect of rotating the cycle diagram localcycle zero point as was seen in Figure 5-3.

5.2 Phase Split Times

In Omni the local cycle time is subdivided into splits, one for each phase. The split time must at least be long enough to accommodate the phase service minimum times which are Minimum Green, plus Yellow Change, plus Red Clearance for any actuated vehicle phase.

Splits may be longer than the phase service minimum times during which the phase may extend its green time due to vehicle demand but is terminated by a Force Off when the split time has been consumed. For any non-actuated pedestrian phase (a pedestrian phase with a pedestrian recall or a C-N-A, a Call to Non-Actuated), the split time must be long enough to accommodate the pedestrian phase service minimum times which are Walk, plus Pedestrian Clearance, plus Yellow Change, plus Red Clearance.

An actuated pedestrian movement may have a split time shorter than the non-actuated pedestrian phase service minimum time.

All phases assigned to the same ring must have split times that sum to the cycle time. For any multiple ring configurations, each ring must have split times for each phase that also sum to the cycle time. For each ring, those phases on the same side of the barrier must have split sums that are equal since each ring must terminate simultaneously when crossing the barrier. Of course, any ring that has phases that have gapped or terminated earlier than their split time requires that ring to wait for the other ring that is still meeting its demand before it can cross a barrier. All rings must terminate together when crossing a barrier because it is at the barrier that the rings are interlocked together, such as moving from serving the main street to serving the side street.

For example, if Intersection #1 has a 100 second cycle and has three phases, the split times for phase A plus phase B plus phase C must equal 100 seconds. (A+B+C=100) If Intersection #1 has two rings and each ring has three phases, both rings must have a sum of split times equal to 100 seconds. (A+B+C=D+E+F=100) If the intersection has five phases and two rings and one ring has three phases, that ring's sum must equal the cycle length for phase A plus phase B plus phase C. (A+B+C=100) The second ring with phases D and E that are compatible with phases A and B must sum to equal phase A plus phase B. (A+B=D+E).

For an individual phase, if its Minimum Green is 5 seconds and its Yellow Change is 3 seconds and its Red Clearance is 2 seconds, the phase service minimum time is 10 seconds. Any split for this phase must be equal to or greater than 10 seconds. If its split time is set to 25 seconds, there are 15 seconds of time for the phase to be extended beyond the phase service minimum time. During coordination transition or offset seeking, phases may have their split times either lengthened or shortened while the coordinator is working to obtain its sync point. Splits cannot be made shorter than the phase minimum service times.

However, Omni has a Split Minimum Time that can be set to a value greater than the phase service minimum time and this is the minimum time that is used when in transition whenever it has been determined to shorten a phasesplit time during the offset seeking.

5.3 Sync Phases

If the Zero Reference Point (T0) is at the default of beginning of green of the sync phases, the sync phases split time will cover at least its Minimum Green time plus Yellow Change time plus Red Clearance time or at least the split's Minimum Time, if that is a non-zero value.

Because the coordinator applies a Hold and a call on the Sync Phases, the phases will remain at green regardless of demand on the Sync Phases.

The Force Off time in the cycle is at the Sync Phase Split time minus the sum of Yellow Change time plus Red Clearance time. If the Sync Phase has a pedestrian movement concurrently timing and the phase is running as C-N-A with Walk Rest Modifier or is actuated but has Walk Rest enabled (either of these will cause the coordinated phase to rest in green and walk), the Force Off time in the cycle will occur at the Split time minus the Pedestrian Clearance time plus Yellow Change time plus Red Clearance time.

5.5 Maximum Cycle Transition

Maximum Cycle Transition (1-4) determines the possible cycle lengths to use when performing offset seeking. The use of this entry is determined by the selection of the Coord Correction Mode. If the selection mode is Shortway, this entry determines the percentage change in the cycle length by the following:

1. Cycle length may adjust longer or shorter by 50%.
2. Cycle length may adjust longer or shorter by 25%.
3. Cycle length may adjust longer or shorter by 17%. (default)
4. Cycle length may adjust longer or shorter by 12.5%.

Note that a setting of 1 for Maximum Cycle Transition means a large change in cycle length by almost 150% greater or a drastic shortening of the cycle length down to one half the normal cycle length. Conversely, using a setting of 4 for Maximum Cycle Transition means that cycles deviate from the norm by small amounts but that also implies that it may take many more cycles to finish the offset seeking. If the selection is Dwell or Add Only, this entry determines the maximum amount of time the cycle may be lengthened by the following:

1. Cycle length may be longer by 100%.
2. Cycle length may be longer by 50%.
3. Cycle length may be longer by 33%.
4. Cycle length may be longer by 25%.

The value for this parameter (1-4) and its name of Maximum Cycle Transitions is only a guideline for the coordinator. In a perfect world with idealized settings, this value could be interpreted as the maximum number of cycles spent in transition to achieve synchronization. But what this really is selecting, is the maximum amount of lengthening or shortening of the overall cycle length expressed as a percentage. The amount of shortening or lengthening is distributed over the whole cycle wherever possible among the split times. When the Coord Correction Mode is set to Shortway, the software looks to see where the offset is at currently versus where it needs to be when loading a new pattern. The Master

Cycle Timer is set automatically based on the Sync Reference time (usually midnight) of the TOD clock. The Local Cycle Timer must be adjusted by shortening or lengthening the cycle to arrive at the offset difference between the Master and Local Cycle timers.

Of course, shortening any phase's split time is constrained by those phase times that cannot be touched, namely the phase Minimum Green time, the Maximum Initial Greentime, the Walk time, the Pedestrian Clearance time, the Green Clearance time, the Yellow Change time, and the Red Clearance time. That leaves only phases that are in the process of doing any green extension time that may be shortened. If a phase that is doing green extension is also simultaneously timing the walk and pedestrian clearance times, for as long as the pedestrian is actively timing, no shortening is possible. If the pedestrian movement is with a pedestrian recall or the phase is set as non-actuated, there may never be any shortening possible.

5.6 Shortening the Cycle Length

The software may decide to try shortening the cycle length at the top of the cycle. However, after the decision has been made, pedestrian calls may get locked in on phases that at first appearance as good candidates to get shortened. If the pedestrian times either fill the split or exceed the split's time value, no shortening is possible for thatsplit during cycle transition.

The software now checks at the top of the next cycle to see if it was successful in shortening the previous cycle and tests to see how much more adjustment is needed. If the previous cycle was unable to shorten the cycle, the software will decide to lengthen the cycle on the next try. If there continues to be more pedestrian demand, the software may resort to using the Add Only method automatically. This is only a temporary application of this method rather than a permanent one. Perhaps the next pattern change will not be accompanied with heavy pedestrian demand and so Shortway is successful.

The maximum amount of change in the cycle length is listed above in the definition of Maximum Cycle Transition. This is in the user manual and in the Help screens of *Omni eX*. Using the Shortway method with a value of 3 for Maximum Cycle Transition, the cycle may increase or decrease by 17%. For a 130 second cycle this may increase up to 152 seconds or shrink down to 108 seconds.

5.7 Coordination Force Mode

Compared to the Coordination Correction modes of Shortway or Add Only, Dwell will only affect the split times of the sync phases, but not any other phases. The coordinator will dwell on the sync phases and lengthen their splits by the amount per cycle specifiedby the Maximum Cycle Transitions over one or more cycles to achieve the correction required.

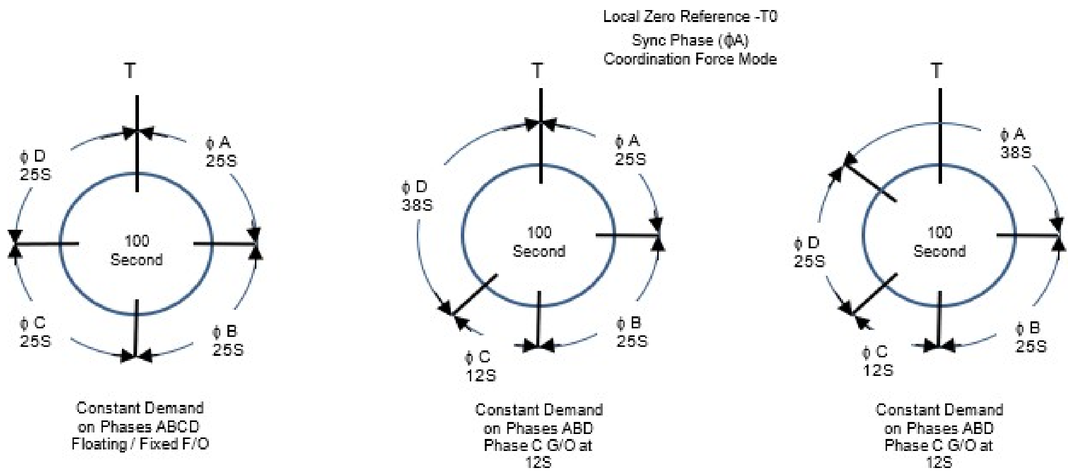


Figure 5-5: Coordination Force Mode

In Figure 5-5, we have a single ring with four phases, each with a 25 second split and a 100 second cycle. Phase A is the sync phase. The Coordination Force Mode selects when in the cycle time the phases are forced off. These forceoffs are applied to actuated phases that have continuous vehicle demand,whether they are extending the green of the phase beyond its Minimum Green and/or its Maximum Initial Green or are timing Maximum Green via a Max Recall.

The actuated phases that are extending their green are using the Passage time, also known as Vehicle Extension time via a set amount of time for every vehicle that passes over the detector. When the Controller is in Free operation , the limit of total vehicle actuations is governed by Maximum Green if there are calls for conflicting phases. During coordination, which usually has Maximum Inhibit selected for the Coordination Maximum Mode, only the split time for each phase sets the maximum amount of time the phase may be extended. Otherwise, it may be either Maximum Green 1 or Maximum Green 2 that limits the amount of green extension and the phase terminates by having maxed out. Of course, if the split time is less than Maximum Green for that phase that phase is forced off because of the split time. For further discussion, we assume that Maximum Inhibit is the current Coordination Maximum Mode.

For either Coordination Force Modes, Fixed or Floating, when all phases (phases A, B, C, D) have constant or continuous demand, the phases fill the splits completely. For example, with a 100 second cycle and all four splits having equal 25 second split times, each phase has ¼ of the 100 second cycle, as seen in the first diagram. Each phase has 5 seconds of Minimum Green, 3.0 seconds of Yellow Change and 2.0 seconds of Red Clearance. (Vehicle Extension is 2.0 seconds, Maximum Green 1 is 15 seconds, and Maximum Green 2 is 10 seconds). Using Beginning of Green sync point for coordination Phase A, Phase A starts at zero seconds in the local cycle, Phase B starts at 25 seconds, Phase C starts at 50 seconds and Phase D starts at 75 seconds. Changes in split utilization occur only for those phases that gap out or no longer have any further vehicle demand.

In the second diagram, Phase C gaps out at 12 seconds into its split. With Fixed Force Off, the time in the cycle when the phase is forced off during constant demand is unchanging, and since all four phases have the same split time of 25 seconds, each phase is forced off at 20 seconds into its split time assuming full demand. (Split Time 25 – (Yellow Change 3.0 + Red Clearance 2.0) = 20) Phase C would be forced off at 70 seconds in the Local Cycle time. But since the phase has gapped out way before reaching the Force Off time, its remaining split time is given to the following phase or Phase D in the second diagram. So, Phase D starts earlier, and, with constant demand, runs longer to 38 seconds. This passing of unused split time occurs ONLY for phases that gap out, never for max out.

In the third diagram, Phase C again gaps out at 12 seconds into its split. With Floating Force Off, the time in the cycle when the phase is forced off during constant demand is variable. It is not at a fixed point in the cycle. Rather, it is referenced to when the split starts. Again, under full constant demand on all phases, it looks identical to the Fixed Force Off mode. But since Phase C gaps out at 12 seconds into its split and Phase D starts earlier in the cycle, with constant demand on Phase D it is forced off at 20 seconds into its split time which ensures that Phase D only occupies a 25 second split regardless of when it started. Therefore, the unused time of Phase C gets passed to the Coordinated phase, not the subsequent phase.

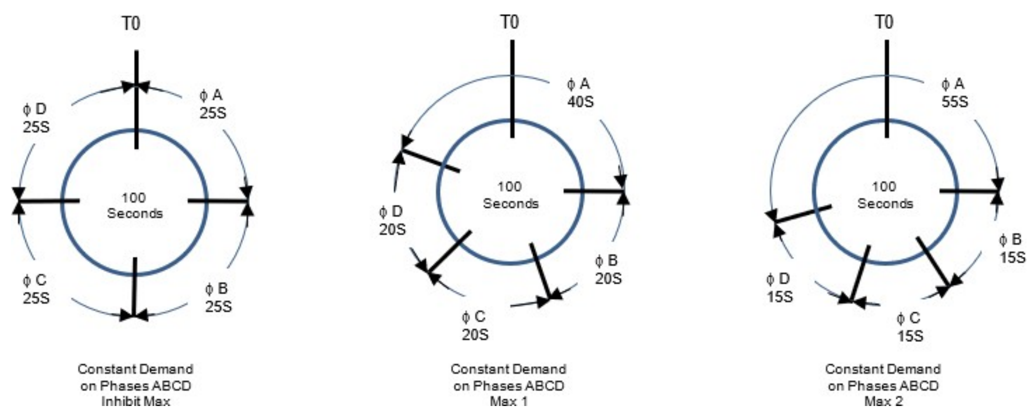


Figure 5-6: Coordination Max Mode

All four phases have the following timings:

Minimum Green = 5.0

Passage = 2.0

Maximum Green 1 = 15.0

Maximum Green 2 = 10.0

Yellow Change = 3.0

Red Clearance = 2.0

Split Time = 25

Cycle length = 100

5.8 Coordinated Max Mode

In Figure 5-6, the Coordination Maximum Mode selects how phases with constant demand are terminated. By default, all phases are terminated by a Force Off applied from the coordinator because termination from Maximum Green timers expiring are inhibited. Maximum Green timers always time when there is constant demand on a phase and conflicting demand from any other phase, but this phase remains green. This is seen in the first diagram.

NOTE: By default, each phase Maximum Green timer runs simultaneously with the Minimum Green.

In the second diagram, Coordination Maximum Mode is set to Maximum 1. Now phases B, C and D are terminated by Maximum Green 1 of each phase such that Maximum Green 1 of 15 seconds + Yellow Change of 3.0 seconds + Red Clearance of 2.0 = 20 seconds total which is 5 seconds less than the split time of 25 seconds.

In the third diagram, the mode is changed to Maximum 2 and phases B, C and D are terminated by Maximum 2. Now we have these phases with Maximum Green 2 of 10 seconds + Yellow Change of 3.0 seconds + Red Clearance of 2.0 = 15 seconds total which is 10 seconds less than the split time of 25 seconds.

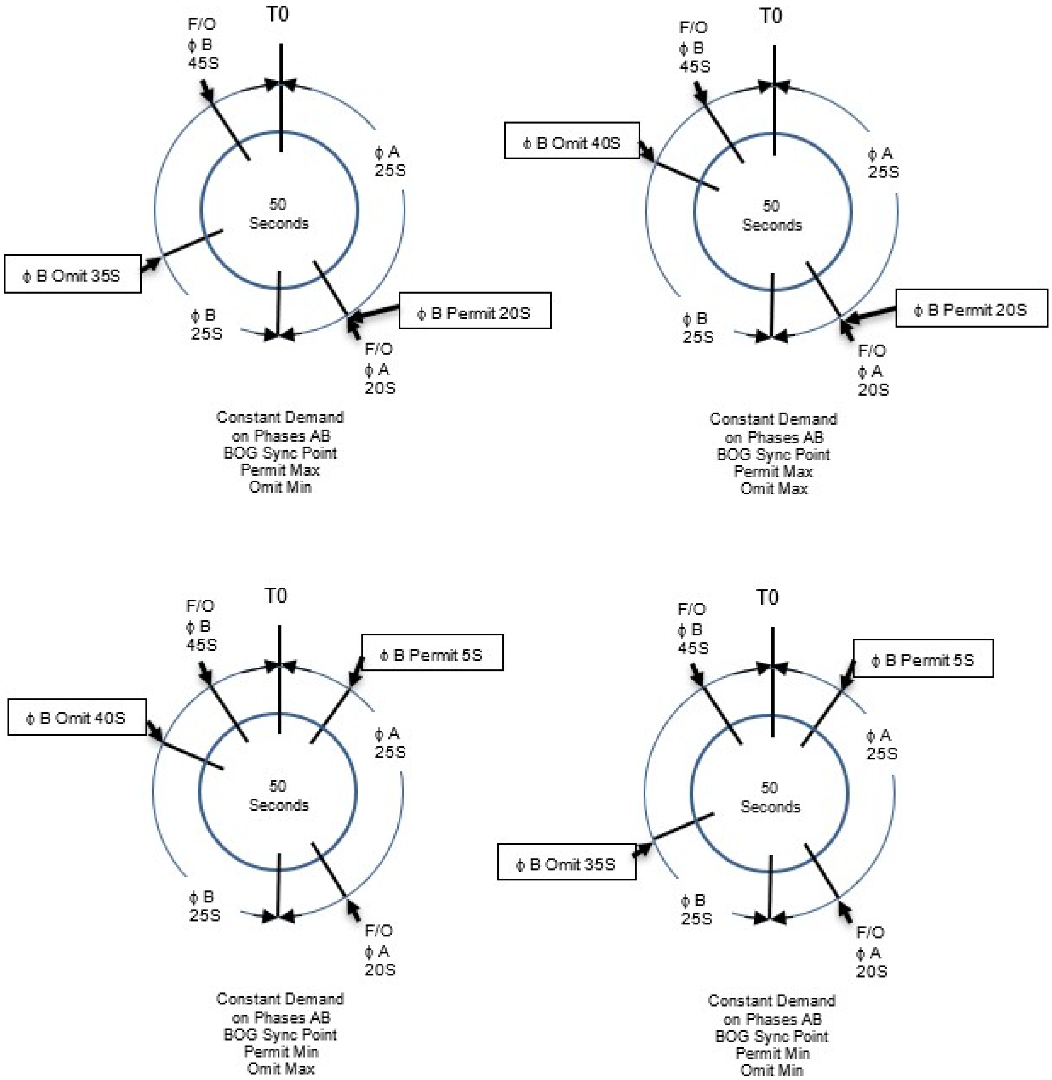


Figure 5-7: Permit and Omit w/ BOG

5.9 Permit and Omit with Beginning of Green (BOG)

In Figure 5-7, we have a single ring with two phases each with 25 second split and a 50 second cycle, Phase A is the sync phase and the Coordination Sync point is when Phase A starts green. Shown in these diagrams is when the Phase Omit is turned on for Phase B and when it is turned off. The times in the cycle when this Omit is applied or removed is controlled by the Permit selection and the Omit selection (either Maximum or Minimum or Manual). The Maximum and Minimum are calculated by the coordinator software based on cycle length, split times, and phase minimum service times (Minimum Green, Yellow Change, and Red Clearance). The first diagram shows the default of Permit Maximum and Omit Minimum. The second diagram shows Permit Maximum and Omit Maximum. The third diagram shows

Permit Minimum and Omit Maximum. The fourth diagram shows PermitMinimum and Omit Minimum.

If either the Permit or Omit is set to manual the user must calculate these times based on the cycle length, which phase is the sync phase, the split times, each phase minimum service times, and the sync point of the coordination phase.

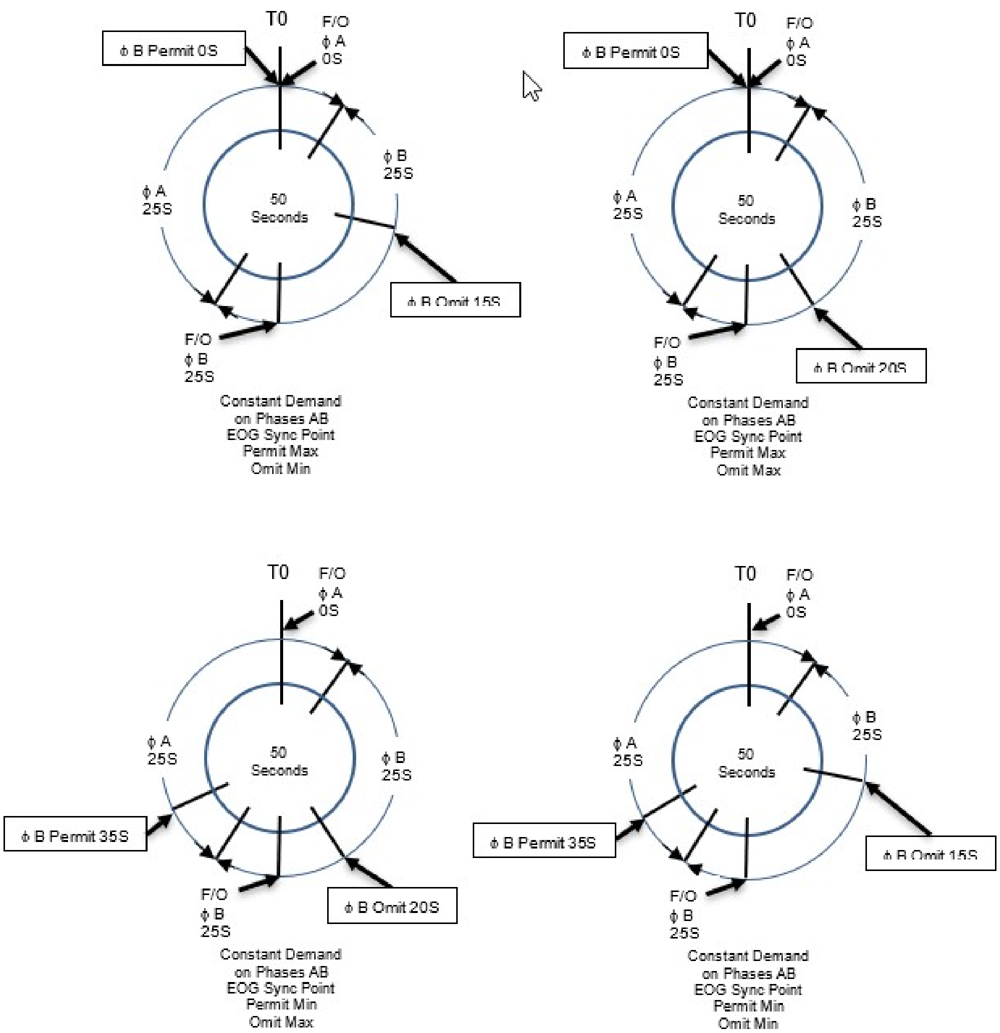


Figure 5-8: Permit and Omit w/ EOG

5.10 Permit and Omit with End of Green (EOG)

In Figure 5-8 , we have a single ring with two phases each with 25 second split and a 50 second cycle, Phase A is the sync phase and the Coordination Sync point is when Phase A ends green. Shown in these diagrams is when the Phase Omit is turned on for Phase B and when it is turned off. The first diagram shows the default of Permit Maximum and Omit Minimum. The second diagram shows Permit Maximum and Omit Maximum. The third diagram shows Permit Minimum and Omit Maximum. The fourth diagram shows Permit Minimum and Omit Minimum.

5.11 Actuated Coordination

The typical intersection in the majority of North America operates as a Semi-Actuated mode. This means that the main street phases operate on recall or Non-actuated mode (CNA). During coordination, the coordinator calculates the point in the cycle that the Main Street (Coord Phases) must terminate to service the non-coordinated phases.

5.11.1 **Coordinated Phase Force Off Point Calculation**

The coordinator typically takes the Main Street Split time and deducts the Red Clearance time, Yellow Clearance time and the Pedestrian Clearance time from the split to determine when the Green/Walk must be forced off (pushed into Green/FDW).

5.11.1.1 **Coordinated Phase Force Off Point Calculation Example**

In this example a 6-phase split side street intersection is used, (phases 1/5) are omitted in the Split table for this pattern (1) which is running a 70 second cycle with the followingsequence:

1-2|3-4|

5-6|

Coordinated phases are 2/6 Split time = 35 seconds, Split mode set to 8 (NACT) Non-coordinated phase 3 Split time = 17 seconds, Split mode set to 2 (none) Non-Coordinated phase 4 Split time = 18 seconds, Split mode set to 2 (none)

PHASE TIME

0	Min GR	Max 1	Yellow CL	Red CK	Walk	Ped CLR
1	4	15	4.0	2.0	0	0
2	4	15	4.0	2.0	7	10
3	4	15	4.0	2.0	0	0
4	4	15	4.0	2.0	0	0
5	4	15	4.0	2.0	0	0

0	Min GR	Max 1	Yellow CL	Red CK	Walk	Ped CLR
6	4	15	4.0	2.0	7	10
7	4	15	4.0	2.0	0	0
8	4	15	4.0	2.0	0	0

Since the coordinated phases are non-actuated, the engine places vehicle and pedestrian demand on 2/6 each cycle bringing on 2/6 Green/Walk and holding in Green/Walk until 19 seconds past L0 (35, -2.0 (Red Clearance), -4.0 (Yellow Clearance), -10 (Pedestrian Clearance) =19. Since detection is not used, the platoon may have already passed through the intersection. When the FO is applied, the Controller moves into Green/FDW, Yellow Clearance, Red Clearance and terminates the phase.

5.11.2 **Actuated Coordination Option**

Actuated Coordination introduces an option to allow the coordinate phases to yield early (gap out) if there is no demand on the coordinated phases from the assigned vehicle detectors. If enabled, the coordinator takes the calculated FO point from the non-actuated operation minus the programmed seconds or percentage of the **mcAtcPatternActuatedCoordValue** parameter to determine if the Coordinated phases can be released.

5.11.3 **Actuated Coordination Database Additions**

There are three new parameters in the individual pattern tables in Omni menu 5.2:

USE PERCENT	YES/NO
ACT COORD ENABLE	YES/NO
ACT COORD VALUE	(0-255)

5.11.4 **Actuated Coordination Operation**

Use Percent determines if the parameter to yield early is in seconds or percentage of the pattern cycle length.

Actuated Coord Enable controls if this pattern is using Actuated Coordination.

Actuated Coord Value is used to determine when the Coordinator should drop the Hold and the CNA control (if active) on the Coord phases.

These actions allow the Controller to advance into Green/FDW. After the FDW time expires, the normal detector processing allows the coordinated phases to be extended if any actuations on the coordinated phase detectors are active. If not, the coordinator issues Force Off controls to advance the Controller into Green/FDW, Yellow Clearance, Red Clearance, and terminates the phase.

5.12 Phase Reservice During Coordinated Operation

Most traffic engineers feel that the ability to reservice non-coordinated phases during the Yield period of a cycle increases efficiency and improves intersection performance. The McCain Omni reservice operation is designed to provide a mechanism to calculate the unused non-coordinated phase time in a cycle and select the phase(s) that can be reserviced based on a weighted process, and still be back into the coordinated phase(s) to not compromise the expected Green band.

In order for the process to start, the user enables a phase(s) reservice by setting a non-zero value for the max reservice count value.

In this example, phases 3 and 4 are enabled and permitted to be reserved a maximum of 2 times in the current cycle. The Default value is 0 (disabled).

PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
0	0	2	2	0	0	0	0
PH9	PH10	PH11	PH12	PH13	PH14	PH15	PH16
0	0	0	0	0	0	0	0

5.13 New Phase Max Reservice Count Rows Addedto Split Tables

Enabled phases are evaluated for potential reservice once the normal sequence has been satisfied. There are four factors used to determine the priority of selection for reservice, in the following order:

Item	Description
User window (Time or Percentage)	Allows the user to specify the cycle counter beginning and ending values for when a phase is preferred to be reserviced. If these values are zero, the Controller will evaluate the remaining factors to determine phase reservice.
Volume Density, added initial count	Preference to utilize the volume of calls arriving during the RED period of this phase to determine the number of vehicles waiting. If this data is not available, wait time and minimum split value is the only criteria.
Phase wait time	The value programmed by the user in the current Split table. If left zero, the minimum service time is calculated.
Minimum phase split time	The value programmed by the user in the current Split table. If left zero, the minimum service time is calculated.

Immediately prior to each barrier crossing, the Controller evaluates phases for reservice.If it is determined that there is sufficient time to reservice at least one of the reservice phases, and the phases in the current or a previous barrier are eligible for reservice, the coordinator applies omits to all phases (including the coordinated phases) but not to the eligible reservice phases. This allows the sequencer to select the reservice phases next and “backup” to serve them again.

For an example of operation, assume the following Phase sequence:

1-2|3-4|
5-6|

At the Yield point, the Controller serves phases 3 and phase 4 (assuming they have demand). As phase 4 is terminated, the process checks to see if any phases are ‘enabled’ for reservice. Assume that now both phases 3 and 4 have additional demand.

The Controller first checks to see if the position within the cycle is active in the user selection. If so, it moves to that phase(s).

Next, the Controller evaluates the remaining time and determines if there is adequate time to serve at least the minimum phase service time of a phase enabled for reservice. If there is sufficient time to serve both phases, the 3-4 sequence begins again. However,if they both cannot be served, the following priority evaluation takes place.

1. The value of Added Initial actuations (if programmed) is evaluated. If both enabled phases have the same number of vehicles waiting, the phase with the longest wait time is chosen.
2. Phase wait time

When reservice is enabled for any phase in the active split, the coordinator automatically uses Floating Force Off mode regardless of the current setting in **mcAtcPatternCoordForceMode**. This allows the phases to receive their full programmed split and provide more opportunity to do reservice.

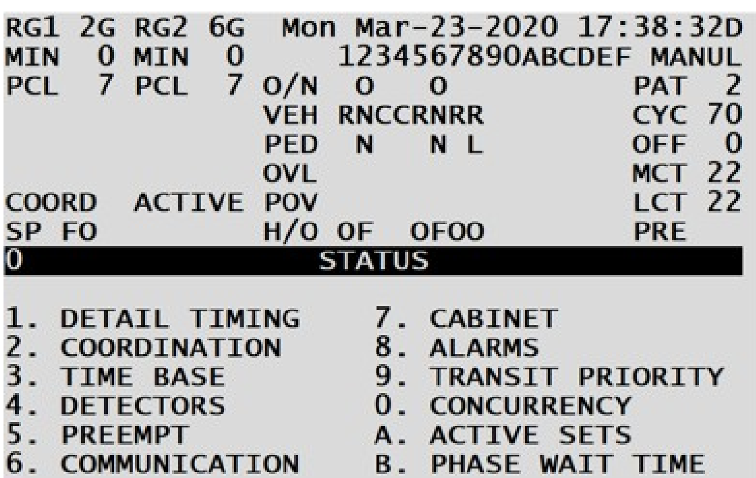
5.14 New Database Values

There are three new parameters in the individual split tables per phase for Phase Reservice in Omni menu 5.3:

- **Rsv Cnt**- max number of times a phase is reserved (0 disables, max is 5 times)per cycle.
- **Rsv Start**- time in the local cycle time when phase is eligible for reservice (seconds or percent).
- **Rsv End**- time in the local cycle time when phase is no longer eligible for reservice (seconds or percent).

5.15 New Status Display- Phase Wait Times

There is a new status screen added to Omni to reveal the values for the Phase Wait Timers added as part of the requirements for phase reservice. The new display is available as option B from the existing status menu 0.



The new status display for the phase wait timers shows all 16 phases on one screen. The layout uses 4 symmetrical columns, but because of the 40-column screen size, the word “phase” is abbreviated as “PHS” to maintain legibility.

Note that phase 4 has a wait time of 13.7 seconds in the figure below:

Phase wait timers are based on vehicle detector phase call status only. Phase option recalls and remote phase calls do not trigger the phase wait timer.

```
RG1 3G RG2      Mon Mar-23-2020 17:45:04D
EXT2.0 RED         1234567890ABCDEF MANUL
SPL   2 REST    O/N    O              PAT   2
                VEH  RNECRNRR         CYC  70
                PED   N    N L        OFF   0
                OVL                   MCT  64
COORD   ACTIVE  POV                   LCT  64
SP FO           H/O O OOO OO          PRE
0.B             PHASE WAIT TIMERS
PHS    WAIT PHS    WAIT PHS    WAIT PHS    WAIT
 1      0.0  5      0.0  9      0.0 13      0.0
 2      0.0  6      0.0 10      0.0 14      0.0
 3      0.0  7      0.0 11      0.0 15      0.0
 4     13.7  8      0.0 12      0.0 16      0.0
```

6. Texas Diamond Operation

Texas Diamond is a strategy used to control two closely-spaced intersections associated with freeway on and off ramps. When Texas Diamond is enabled, and the type is selected, the Controller initializes phase enable, phase ring assignment, phase sequence, phase concurrency, overlaps, channel assignment and detectors to achieve the selected Texas Diamond Type.

The three types supported in Omni eX software are 3-Phase, 4-Phase, and Separate. This default configuration is intended to run on the ATC eX NEMA Controller configured as NEMA TS 2 since the channel and detector initialization do not match a 332-type cabinet configuration and sixteen channels are used.The three Texas Diamond types are all dual-ring configurations using eight to fourteen phases. For most modes, the first eight phases are the primary phases whereas the remaining phases are secondary.

NOTE: Sequence and concurrency cannot be modified when in Texas DiamondMode.

6.1 Intersection Layout

For each type the standard phase configuration is as seen below. All movements except Ø2 and Ø6 are controlled by overlaps. The default overlap configuration is defined later in this document. Ø4 is assigned to the south-bound frontage road and Ø8 is assigned to the north-bound frontage road as shown below (taken from the Texas Diamond specification). However, most frontage roads are one-way and operate using a single phase, although Ø3 and Ø7 are typically omitted from the sequence. Ø3 and Ø7 are used if the freeway exit ramps lead into the intersection separately from the frontage road.

When the exit ramps merge into the frontage road before the intersection, these phases are not used. In Omni, use menu Phase Enable and Rings (2.4) and remove the Enable for phases 3 and 7. All phase movements are shown as numbers next to arrows. Letters A and B are overlaps driven by the adjacent left turn phases or the opposing through movements. Numbers within boxes are vehicle detectors.

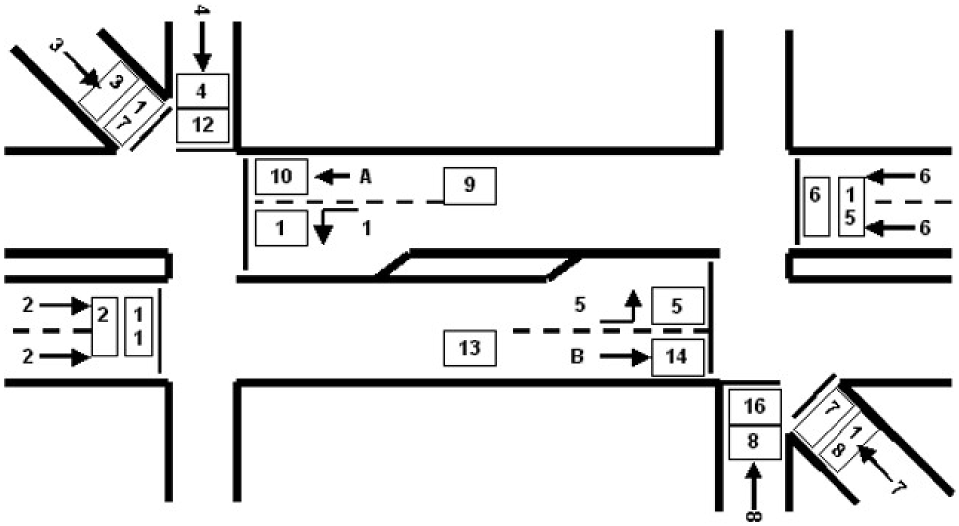


Figure 6-1: Standard Phase Configuration

Table 6-1: Default Overlap Configuration for all Texas Diamond Modes

Overlap	Phase
A	1+2+9+10
B	5+6+13+14
I	1+9+10
J	3+11
K	4+12
L	5+13+14
M	7+15
N	8+16

This default overlap configuration is used for any of the Texas Diamond modes. Overlaps A and B are the cross-traffic movements of the intersecting arterial which are greenwhen any of the adjacent left turn phases are green or when the entering opposing cross traffic through movements of phases 2 and 6 are green. Overlaps I and L are green when any of the left turn phases are green. Overlaps J and M are green if any of the exit ramp phases are green. Overlaps K and N are green when any of the frontage road phases are green.

Overlap programming is integral to the traffic signal display forDiamond mode and is subject to operator modification. Care should be taken when such modifications are contemplated. If phases 3 and 7 are not enabled, Texas Diamond 4 Phase Mode has four primary phase pairs: 2 and 5, 4 and 5, 1 and 6, 1 and 8. For the Texas Diamond 3 Phase mode there would remain three primary phase pairs: 4 and 8, 2and 6, 1 and 5.

Table 6-2: Default Channel Configuration for all Texas Diamond Modes

Channel No.	Source (Overlap)	Type
1	9 (I)	O
2	2	V
3	0 (J)	O
4	A (K)	O
5	B (L)	O
6	6	V
7	C (M)	O
8	D (N)	O
9	1 (A)	O
10	2 (B)	O
11	3 (C)	O
12	4 (D)	O
13	2	P
14	4	P
15	6	P
16	8	P

6.2 Texas Diamond Coordination

Under coordination, only the primary phases are controlled. Primary phases are phases needing timing control parameters by coordination. Unused phases in a particular Diamond mode sequence are never primary. The primary phases for each Diamond mode sequence are as follows:

Four-Phase Diamond mode – 1, 2, 3, 4, 5, 6, 7, 8, 12, and 16

Three-Phase Diamond mode – 1, 2, 3, 4, 5, 6, 7, 8, 9, and 13

If either 4 or 3 is unused, 13 is not primary. Likewise, if either 8 or 7 is unused, 9 is not primary. Separate Intersections mode and NEMA mode – 1, 2, 3, 4, 5, 6, 7, and 8.

Front panel entry of Diamond mode sequence coordination phase times is designed to verify the entered time against the sequence selected for that timing plan. Coordination phase times for non-primary phases serve as the maximum time for that phase when that timing plan is active.

In Three-Phase Diamond mode, coordination permissive operation might preclude service of 1 and 5 when transitioning from 2+6 to 4 or 8 if the calls arrive after the vehicle permissive has closed on 1 and 5.

The CU does not calculate the cycle length for any Diamond mode sequence. The user

must enter the proper cycle length to run for each Diamond mode sequence under coordination. The CU verifies the cycle against the calculated bad plan cycle (phase times for Ring 1 phases less than 9, for example phases 1, 2, 3, and 4). Care must be taken that a cycle length is entered, or a bad plan is noted.

Texas Diamond Mode 3 Phase:

For the coordination of the primary phases, the split times MUST be entered for these phases, if enabled.

The cycle length should equal the sum of the pattern times for Phases 4, 9, 3, 2, and 1

OR 8, 13, 7, 6, and 5. The pattern split time for Phases 9 and 13 should be set to limit the Phase 4 + 8 to Phase 3+7 clearance if phases 3 and 7 are used. Usually the sync phases are phases 2 and 6.

For the Non-Primary Phases of Texas Diamond 3 Phase mode, the pattern split time for Phase 10 is assumed to be less than or equal to the pattern split time for Phase 1. Likewise, the pattern split time for Phase 14 is also assumed to be less than or equal to the pattern split time for Phase 5.

Texas Diamond Mode 4 Phase:

The coordination primary phases (split times must be entered for these phases, if active) and the cycle length should equal the sum of the pattern split times for Phases 2, 3,4, 6, 7, and 8. The sync phases are usually either phase 1 and 6 OR phase 2 and 5.

For Primary phases, the pattern split time for Phase 1 should be based on whether it isone of the sync phases.

- Coordinated Phases = 1 and 7:
  - Phase 1 time = Phase 6 + 7 time - Phase 12 time + Phase 8 Min Green
- Coordinated Phases = 1 and 8:
  - Phase 1 time = Phase 6 + 7 + 8 time - Phase 12 time
- All Others:
  - Phase 1 time = Phase 6 time - Phase 12 time + Phase 8 Min Green

Likewise, the pattern split time for Phase 5 should be based on whether it is one of the sync phases.

- Coordinated Phases = 3 and 5:
    - Phase 5 time = Phase 2 + 3 time - Phase 16 time + Phase 4 Min Green
- Coordinated Phases = 4 and 5:
    - Phase 5 time = Phase 2 + 3 + 4 time - Phase 16 time
- All Others:
    - Phase 5 time = Phase 2 time - Phase 16 time + Phase 4 Min Green

The pattern split time for Phase 12 is assumed to be less than the pattern split time for Phase 6.

The pattern split time for Phase 16 is assumed to be less than the pattern split time for Phase 2.

For the Non-Primary Phases of Texas Diamond 4 Phase mode, the pattern split time for

Phase 9 (left to right clearances) is assumed to be less than the pattern split time for Phase 3, 4, or 12.

The pattern split time for Phase 11 (3+5 to 1+6 clearance) is assumed to be less than

the pattern split time for Phase 6.

The pattern split time for Phase 13 (right to left clearances) is assumed to be less than the pattern split time for 7, 8, or 16.

The pattern split time for Phase 15 (1+7 to 2+5 clearance) is assumed to be less than

the pattern split time for Phase 2.

6.1 Texas Diamond 3 Phase Operation

This operation works best when the frontage road spacing is greater than 350-400 ft. and there is adequate left-turn storage to prevent the left-turn queues from spilling over into the through movement. When 3-Phase type is selected, the sequence and concurrency are automatically set so that we get the following phase sequence.

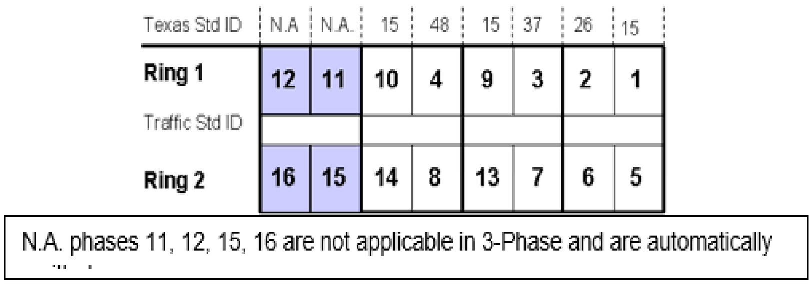


Figure 6-2: Texas Diamond 3 Phase Operation

Table 6-3: Phase Ring Concurrent Phases Concurrency

Phase	Ring	Concurrent Phases
1	1	5,6
2	1	5,6
3	1	7,13
4	1	8,14
5	2	1,2
6	2	1,2
7	2	3,9
8	2	4,10
9	1	7,13
10	1	8,14
11	1	15,16
12	1	15,16
13	2	3,9
14	2	4,10
15	2	11,12
16	2	11,12

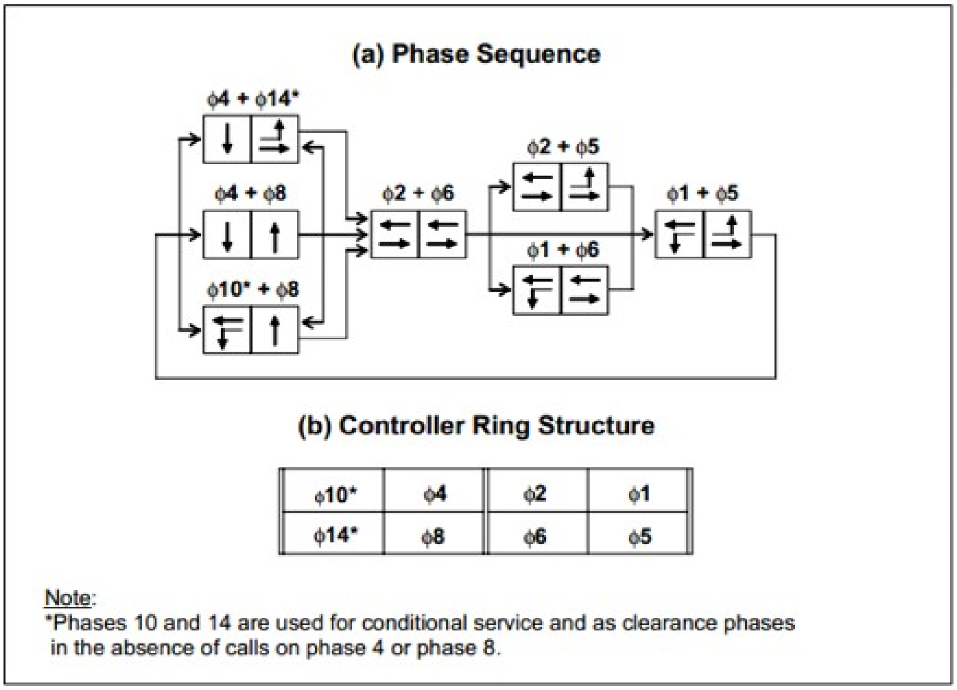


Figure 6-3: Standard 3 Phase Sequence Diagram (no phases 3, 7, 9 and 13)

Figure 6-3 shows the standard phase sequence when phases 3 and 7 (the freeway exit ramp movement) are not used. If phases 3 & 7 are used, 4 & 8 would be followed by a clearance interval (9 & 13) and sequence to 3 & 7, followed by 2 & 6.

Table 6-4: Default Detector Configuration for Texas Diamond 3 Phase Mode (Detector Set #2)

Detector #	Call Phase	Switch Phase	Delay	Extend
1	1	0		
2	2	0	2.0	
3	3	0	2.0	
4	4	0	2.0	
5	5	0		
6	6	1	2.0	
7	7	0	2.0	
8	8	0	2.0	
9	9	0		
10	10	0		

11	2	0		0.2
12	4	0		0.2
13	13	0		
14	14	0		
15	6	0		0.2
16	8	0		0.2
17	3	0		0.2
18	7	0		0.2

6.2 Texas Diamond 4 Phase Operation

The four-phase mode is best suited for application at relatively narrow interchanges, and typically performs best at interchanges with widths of 400 feet or less. The four external approaches to the interchange (φ2, φ4, φ6, and φ8) are served sequentially in a clockwise direction, together with the appropriate downstream internal left-turn movement (φ1 or φ5) required for progression. Ideally, all movements are permitted to move through the entire interchange upon receiving green. When 4-Phase mode is selected, the sequence and concurrency is set so that we get the following phase sequence.

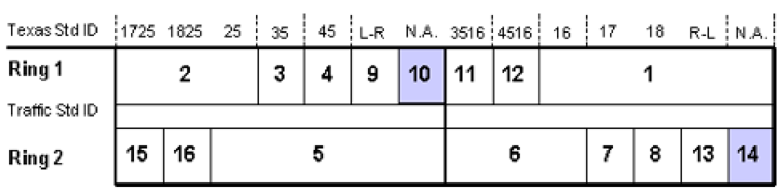


Figure 6-4: Standard 4 Phase Sequence Diagram (no phases 3, 7, 11 and 15)

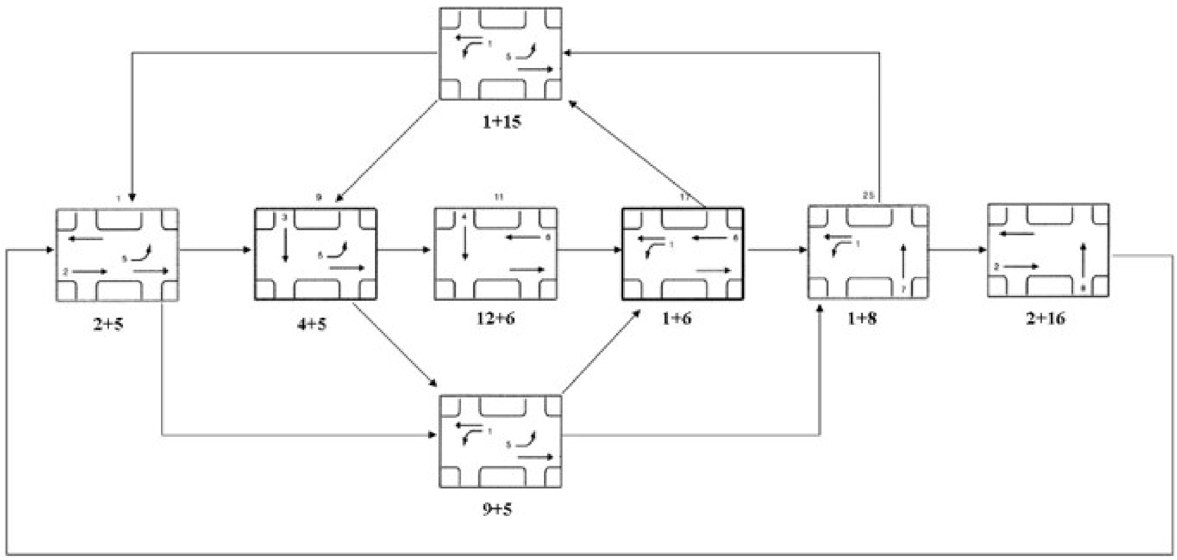


Figure 6-5: Phase 12 Provides Advance Green Time for Phase 6.

Note that Phase 16 is advance green for Phase 2.

Table 6-5: Concurrency for Texas Diamond 4 Phase Mode

Phase	Ring	Concurrent Phases
1	1	6,7,8,13,14
2	1	5,15,16
3	1	5
4	1	5
5	2	2,3,4,9,10
6	2	1,11,12
7	2	1
8	2	1
9	1	5
10	1	5
11	1	6
12	1	6
13	2	1
14	2	1

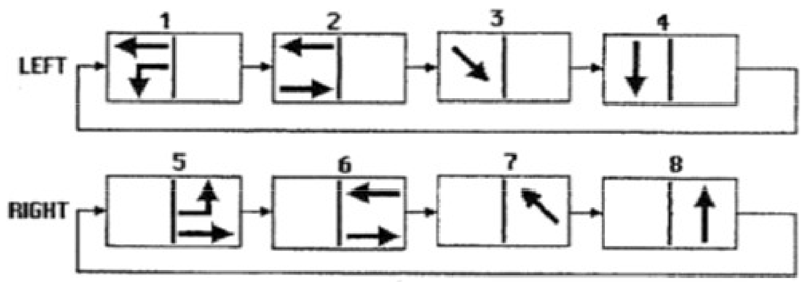
15	2	2
16	2	2

Table 6-6: Default Detector Configuration for Texas Diamond 4 Phase Mode (Detector Set #1)

Detector #	Call Phase	Switch Phase	Delay	Extend
1	6	9		
2	2	0	2.0	
3	3	11	2.0	
4	4	12	2.0	
5	2	13		
6	6	0	2.0	
7	7	15	2.0	
8	8	16	2.0	
9	6	9		
10	6	9		
11	2	0		0.2
12	4	12		0.2
13	2	13		
14	2	13		
15	6	0		0.2
16	8	16		0.2
17	3	11		0.2
18	7	15		0.2

6.3 TEXAS DIAMOND SEPARATE OPERATION

In the separate intersection mode defined by the TxDOT Controller specification, interior left turns 1&5 lead the external crossing arterial through movements 2 & 6. One ring controls each side of the diamond interchange, and no barriers exist between rings. When in Separate mode the concurrency and phase sequence is set so that we have the following sequence.



*** phases 3 and 7 are not typically used

Figure 6-6: Texas Diamond Separate Operation

Table 6-7: Concurrency for Texas Diamond Separate Mode

Phase	Ring	Concurrent Phases
1	1	5, 6, 7, 8, 13, 14, 15, 16
2	1	5, 6, 7, 8, 13, 14, 15, 16
3	1	5, 6, 7, 8, 13, 14, 15, 16
4	1	5, 6, 7, 8, 13, 14, 15, 16
5	2	1, 2, 3, 4, 9, 10, 11, 12
6	2	1, 2, 3, 4, 9, 10, 11, 12
7	2	1, 2, 3, 4, 9, 10, 11, 12
8	2	1, 2, 3, 4, 9, 10, 11, 12
9	1	5, 6, 7, 8, 13, 14, 15, 16
10	1	5, 6, 7, 8, 13, 14, 15, 16
11	1	5, 6, 7, 8, 13, 14, 15, 16
12	1	5, 6, 7, 8, 13, 14, 15, 16
13	2	1, 2, 3, 4, 9, 10, 11, 12
14	2	1, 2, 3, 4, 9, 10, 11, 12
15	2	1, 2, 3, 4, 9, 10, 11, 12
16	2	1, 2, 3, 4, 9, 10, 11, 12

***Although phases 9-16 are shown on concurrency and sequence, these phases are not used in the operation of the intersection.

Table 6-8: Default Detector Configuration for Texas Diamond Separate Mode (Detector Set #3)

Detector #	Call Phase	Switch Phase	Delay	Extend
1	1	0		
2	2	0	2.0	
3	3	0	2.0	
4	4	0	2.0	
5	5	0		
6	6	0	2.0	
7	7	0	2.0	
8	8	0	2.0	
9	1	2		
10	1	2		
11	2	0		0.2
12	4	0		0.2
13	5	6		
14	5	6		
15	6	0		0.2
16	8	0		0.2
17	3	0		0.2
18	7	0		0.2

7. Software Installation

7.1 Introduction to Omni eX® Version 3 Installation Method

The new version of Omni eX® intersection control software 3.0 is a continuation of the improvements found in the legacy versions of *Omni eX*. This chapter details the installation procedure for moving the *Omni eX* application from a version 1.x to the latest version of *Omni eX* 3.0, version 3.3.0 (further referenced as 3.0).

In addition to traffic application additions, there are changes in the kernel, root file system, installation procedure and policy, MIBs, and data storage organization. For additional information please see the official *Omni eX* 3.0 Internal and External Release Notes.

In the effort to streamline the installation process and minimize installation time the ATC Controller will first be reloaded using the TeraTerm application and the McCain BSP Loader utility. This ensures that the ATC Controller file system has been properly prepared for use by *Omni eX* 3.0. The BSP Loader will automatically detect the Controller type and allow the user to upgrade the Linux BSP from any supported kernel and BSP previously installed on the Controller.

For safety, traffic operation must be stopped in order to begin the firmware installation process.

7.2 Preparation

7.2.1 Determine if a Database Update is Required

Please be aware that this installation process will delete any active and inactive older versions of *Omni eX* version 1.x and the configuration databases. In addition, Omni version 3 no longer supports importing Omni version 1.x **.GZ** database files. If a database update is required Omni version 2.0.1.25 must be loaded first in order to convert the version 1.x .**GZ** database file to a usable version 2.x **.MCB** database file in order to be imported into version 3.

NOTE: Engine Board series 3 (EB3) Controllers consisting of ATC eX2, Flex, and 2070 1C modules running Linux kernel 2.6.22 BSP#19 will require an update to Kernel 2.6.39.4 BSP#303 prior to installation of the Omni 2.0.xxx.0 interim firmware. This upgrade can be accomplished by using the McCain BSP Loader, ensuring the Controller is running the proper version of uBoot and Linux prior to the upgrade.

NOTE: Upgrading a Controller from *Omni eX* version 1.x to version 3.x will require up to 20 minutes. Upgrades that do not require database conversion from Omni version 1 to Omni version 3 will take 15 minutes. During this time traffic operations in the ATC Controller is stopped

7.2.2 **USB Flash Drives**

The user will need two (2) USB flash drives partitioned with FAT32 file system to complete the update; one (1) **freshly formatted** USB flash drive is needed to install the software installation packages (provided by McCain) in specific order to achieve the firmware update and another blank USB flash drive to back up the existing *Omni eX* database from the Controller.

NOTE: Please ensure that the USB update stick is freshly formatted and loaded with the supplied *Omni eX* version 3.x installation files. Once *Omni eX* version 3.0 is installed, future software builds is delivered as .mcfw files and can be copied directly into the Omni Software folder found on the USB flash drive

To perform this software update, the user must obtain the *Omni eX* 2.x/3.x update package consisting of the installation files, installation scripts and supporting files. Contact McCain support if you do not have the specific update package required.

The update package will contain all files and applications needed to accomplish the upgrade to Omni version 3:

Name	Status	Date modified	Type	Size
McCain ATC Linux full update 303 for EB3		1/21/2021 9:46 AM	File folder	
McCain_ATC_BSP_Loader_1p11		4/10/2021 10:10 AM	File folder	
Omni_v3_USB_installation		1/25/2021 11:46 AM	File folder	
Network Connections - Shortcut		3/24/2021 1:43 PM	Shortcut	1 KB
OEM-TFTP-Server.EXE		6/24/2003 12:04 PM	Application	8,187 KB
Omni v3 deployment guide.pdf		1/27/2021 7:04 PM	Adobe Acrobat D...	791 KB
omni_2.0.1.25_USB.zip		10/27/2020 4:32 PM	Compressed (zipp...	60,466 KB
Omni_v3_USB.zip		3/31/2021 7:37 AM	Compressed (zipp...	92,158 KB
putty-0.69-installer.msi		11/24/2020 3:03 PM	Windows Installer ...	2,823 KB
putty-64bit-0.69-installer.msi		11/24/2020 3:03 PM	Windows Installer ...	2,984 KB
teraterm-4.97.exe		6/17/2019 5:48 PM	Application	13,827 KB

- Folder **McCain ATC Linux full update 303 for EB3** contains the standalone installation package to install Linux kernel 2.6.39.4 BSP #303. This is typically used to wipe and reinstall Linux on an EB3 unit and is included in this package as an option.

- Folder **McCain_ATC_BSP_Loader v1pXX** is the BSP loader package that is used in this procedure and is the primary focus of this document.
- Folder **Omni_v3_USB_installation** is the unzipped contents of the included **Omni_v3_USB.zip** file containing all necessary files and folders to provision a USB flash drive to be used in the Omni v3 installation process.
- Shortcut **Network Connections – Shortcut** is a convenience shortcut to allow the user to quickly access the Windows Control Panel Network Connections window regardless of the version of Windows running on the workstation.
- File **Omni_v3_USB.zip** contains the zipped contents of the folder Omni_v3_USB_installation available for the user's convenience.
- File **Omni_v2.0.1.25_USB.zip** contains the zipped contents of the Omni version 2.0.1.25 USB installation to be used for database conversion.
- File **OEM-TFTP-Server.EXE** is the Solarwinds 2002 TFTP server freeware application that is used in the external TFTP installation method used in Section 3.
- Files **putty-0.69-installer.msi** and **putty-64bit-0.69-installer.msi** are installation files for the Putty SSH application that can be optionally used to access Linux via SSH.
- File **TeraTerm-4.97.exe** is the installer for the TeraTerm application used in the BSP Loader process.

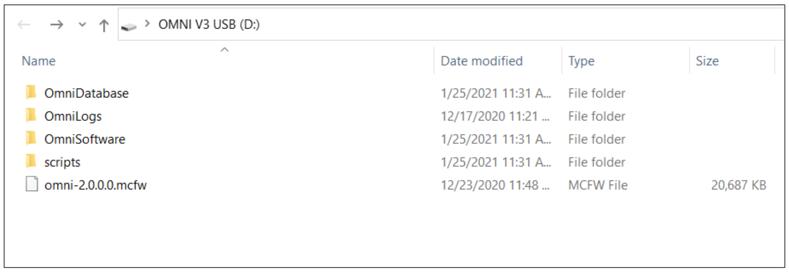
> **NOTE:** The *Omni eX* version 3 installation script found on the USB flash drive updates the McCain Installer utility that runs in Diagnostics. The script automatically updates the McCain Installer on a Controller that was previously running Omni 2.x.

It is recommended that all previous versions of *Omni eX* 1.x and 2.x be replaced with 3.0.

To place the update files on the USB:

1. After you have downloaded the Omni_v3_USB.zip onto your PC/laptop, insert a **freshly formatted** USB flash drive for the *Omni eX* installation files into a desktop PC or laptop USB port.
2. Open File Explorer and locate the file "Omni_v3_USB.zip".

3. Extract the contents onto the root directory of the USB (not in a file or folder but directly onto USB).



Verify that the files and folders were correctly extracted to the root of the USB drive

NOTE: The McCain Installer is deployed into Diagnostics during the 2.0 install. For version 1 deployments Diagnostics will show the menu item as "Run Script from USB."

7.2.3 **Laptop/Workstation**

The first step in the upgrade procedure requires a complete Linux reload of the ATC Controller using the TeraTerm installation method. A Windows PC/laptop is required to complete this task. This chapter explains the installation process that is achieved by running a script within the TeraTerm application.

You will need both a serial and Ethernet connection between the PC/laptop and the Controller. The serial connection is used to send commands to the Controller. The Ethernet connection is used to transfer files via TFTP. The PC/laptop acts as a TFTP server and the Controller acts as a client. The update package includes a TFTP server program that can be run on demand, but an optional third-party server application is also supported.

Overall requirements:

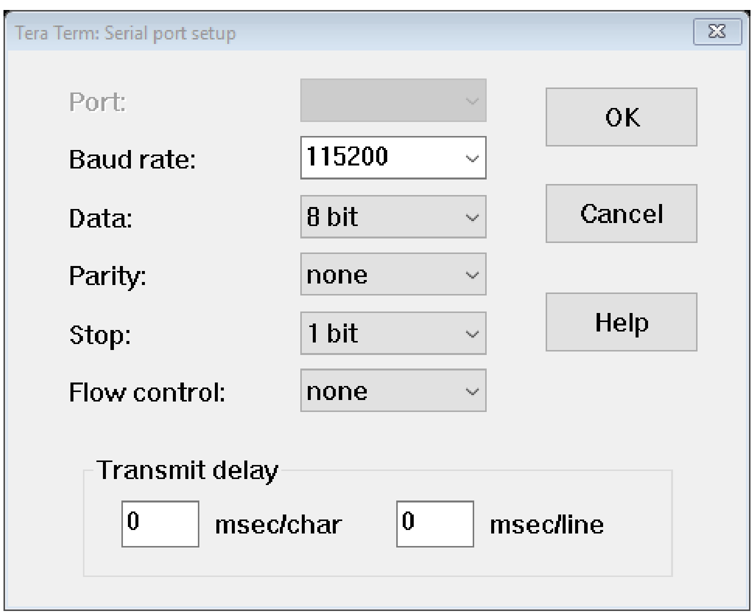
- PC/laptop with Microsoft Windows, Ethernet port, serial port
- TeraTerm terminal application
- Optional Solarwinds 2002 TFTP server application
- Null modem serial cable (see Section 7.8.2 C50S Null Modem Cable)
    - DB9 female to female for eX Controller connected to **Port 2** on the eX
    - DB9 male to female for eX2 and Flex Controllers connected to **Port 2 SP4** on the eX2

- C50S null modem cable for 2070LX and 2070ATC Controllers. Note that C50S cable can also be used with eX2.
- Ethernet cable
- BSP Loader update utility package provided by McCain Support
- TeraTerm and Solarwinds TFTP application to be provided in the same update package

7.2.3.1 **Preparation**

Install TeraTerm application on a PC running Microsoft Windows. The TeraTerm application is used to perform the installation. TeraTerm is a free open source program that runs on all desktop versions of Microsoft Windows since Windows 95. To install TeraTerm:

1. If not provided by McCain Support, download the EXE installer program from http://ttssh2.sourceforge.jp/ or http://logmett.com/freeware/TeraTerm.php
2. Run the installer program.
3. When prompted to select components, you may choose any options that you want. The “Compact installation” option is sufficient.
4. **Configure TeraTerm serial port settings.** Click on **Setup > Serial**. Select the physical serial COM port, set the Baud rate to **115200**, data to **8 bits**, Parity to **none**, Stop to **1 bit** and Flow control to **none.** Click OK, go to the **Setup > Save Setup** menu and click the **Save** button to save these settings. The next time you run TeraTerm, it will automatically load these settings.



5. **Configure workstation/laptop IP address: network settings.** There are many different methods to access the Network Connections window in the Control Panel. The simplest method is to click the Windows Start button on the Windows taskbar and type the command **ncpa.cpl.** This is a shortcut to open Network Connections.

6. Right click on the wired Ethernet interface that is used and select **Properties**. Double click on Internet Protocol Version 4 and select **Use the following IP address**. Specify an IP address and subnet mask to be used *(example* ***192.168.1.88*** *subnet mask* ***255.255.255.0****)*

> **NOTE:** The specified IP is temporary, to be used for the direct connection to the ATC Controller. It does not need to be compatible with existing networks.

7.2.3.2 Identify the Current Version of Linux for the Target ATC Engine Board

1. McCain has different generations of engine boards for the ATC series Controllers. Each generation of engine board has a different Linux kernel as well as a board support package (BSP). Use menu B.5.2 in *Omni eX* or see the Diagnostics home screen for the current running version of Linux.
    1. For Engine Board Series 2 (EB2)- NEMA eX, 2070ATC CPUs:
        1. Minimum supported Linux Kernel version is 2.6.22 BSP #401
        2. uBoot version 1.3.0-rc2 build 2013
    2. For Engine Board Series 3 (EB3)- NEMA eX2, Flex, 2070-1C CPUs:
        - **I.** Minimum supported Linux Kernel 2.6.39.4 BSP #303
        - II. uBoot version 1.3.0-rc2 September 14 2017
2. EB3 units shipped prior to 2018 were originally loaded with EB2 Linux **2.6.22 BSP#19**. These units must be upgraded using the BSP Loader method to ensure the proper kernel and BSP version is installed prior to commencing the Omni 3.x installation.

7.3 Upgrading to Omni V3 from Omni V1 Using BSP Loader

7.3.1 Summary of Installation Steps

1. Backup the existing Omni database to the backup USB flash drive specified in Section 1. This should be a freshly formatted USB dedicated to database backup - NOT the USB with the installer.

> **NOTE:** You will not be able to restore your database without completing this step.

2. Perform a full Linux kernel reload using TeraTerm and the McCain BSP Loader to install Omni 2.0 for database conversion.
3. To convert the database from Omni version 1, install Omni version 2.0.1.25.
    A. Insert the backup USB flash drive and load the Omni version 1.x .GZ database onto the Controller. Leave the USB flash drive plugged into the Controller and access menu B.7.1 to save the database back to the USB as a .MCB file.
4. Install Omni 2.0.100.0 using TeraTerm and the McCain BSP Loader.
5. Install Omni 3.3.x using McCain Installer from McCain Installer.
6. Reboot to Omni restore .MCB database.

> **NOTE:** Step 3 is an optional step and only necessary if a database conversion from Omni version 1 is required in this upgrade. Please proceed to Step 4 if database conversion is not required.

7.3.2 **Backing Up Existing Omni Database**

First, make note of the database unique System ID on Controller menu page B.3. Insert the USB thumb drive dedicated to saving the current Omni eX 1.x version into the USB port on the Controller while the 1.x version of Omni eX is running, and menu B.7 USB DRIVE will appear. Save a copy of the intersection database as a precaution.\

Do not use the USB with the backup of the current Controller database.

```
B.7                 USB DRIVE

1.   SAVE DATABASE TO USB
2.   LOAD DATABASE FROM USB
3.   SAVE LOG FILES TO USB
4.   UPDATE SOFTWARE FROM USB
```

Press **1** to save the Omni eX 1.x database to the USB device. Remove the USB from the USB port on the Controller before proceeding. This USB drive houses the existing 1.x databases and is not required until after the *Omni eX* 2.0 installation has completed.

7.3.3 **Perform Full Linux Reload to Provision Omni 2.0.1.25**

If a database conversion from Omni version 1.x is required, Omni 2.0.1.25 must first be installed. The following table defines the installation path to Omni 2.0 for different Controllers and Linux BSPs:

CONTROLLER TYPE	KERNEL & BSP	UPGRADE PATH FOR DB CONVERSION
NEMA ATC eX/2070ATC	2.6.22 with BSP below #401	Upgrade to kernel 2.6.22 407 before loading Omni 2.0.1.25 using BSP Loader method
NEMA ATC eX/2070ATC	2.6.22 BSP #401-407	Direct upgrade to Omni 2.0 supported via USB
NEMA ATC eX/2070ATC	2.6.39.4 BSP#408	Downgrade to kernel 2.6.22 #407 prior to installing Omni 2.0.1.25
ATC eX2/Flex/2070 1C CPU	2.6.22 BSP #19	Use BSP Loader or standalone package #303 to install kernel 2.6.39.4 BSP 303 prior to installing Omni 2.0.1.25
ATC eX2/Flex/2070 1C CPU	2.66.39.4 BSP #303-305	Direct upgrade to Omni 2.0 supported via USB
ATC eX2/Flex/2070 1C CPU	2.6.39.4 BSP #314	Downgrade to kernel 2.6.39.4 303 prior to installing Omni 2.0.1.25

.

7.3.3.1 **Install Omni 2.0 to Convert an Omni Version 1 Database**

NOTE: This is an optional step and only necessary if a database conversion from Omni version 1 is required in this upgrade.

After the Linux reload, Diagnostics will automatically load and display an information page about the diagnostics version (3.2.0 or older) and the LINUX OS version.

Press **ENT** to continue. Diagnostics will display a hardware information screen showing Controller memory and other hardware information including the Ethernet MAC addresses and IP addresses.

Press **ENT** to continue and view the Diagnostics Main menu. Select 7 for the Tools menu in Diagnostics version 3.1.1.

```
                 MAIN MENU

    1.   CPU
    2.   INPUT/OUTPUTS
    3.   SERIAL PORTS
    4.   FRONT PANEL
    5.   CONTINUOUS TEST
    6.   LOGS
    7.   TOOLS
```

Press **2** to run a USB script. Insert the USB memory stick with the new *Omni eX* installation files and press **ENT** to begin. Do **NOT** use the USB with the backup of the current Controller database.

```
7.0                  TOOLS
   1. CONFIGURE ETHERNET
   2. RUN USB SCRIPT
   3. MANAGE SERVICES
   4. MANAGE USERS
   5. EXIT DIAGNOSTIC
```

The script will first read what scripts are on the USB and list them as shown below.

```
7.2            RUN USB SCRIPT
1.Prepare_Omni_v3
2.Prepare_Omni_v3.sh
```

NOTE: If there are two scripts, select either one; they are the same script. This is to support legacy Controllers.

Press **1** to continue. The screen will change to the following: (Pressing **ESC** will return to the Tools menu 7.0 of Diagnostics).

```
7.2               RUN USB SCRIPT
FILE: prepare_Omni_v3.sh
INFO: Preparation Controller for Omni
version 3 and above



YES = RUN SCRIPT, ESC = GO  BACK
```

Press the **YES** key to start the script. The script will run and unpack the required programs, taking about a minute. The **MCCAIN INSTALLER** (called **MCINSTALLER** in the initial release of Omni 2.0) will load automatically:

```
MCCAIN INSTALLER

VERSION 1.11

1. SECURE INSTALL OMNI FROM USB
2. MANAGE OMNI VERSIONS
3. REMOVE ALL OMNI FROM DEVICE
4. REBOOT CONTROLLER
```

Press option 1. SECURE INSTALL OMNI FROM USB is the correct one to use and will display the following screen.

```
INSTALL OMNI FROM USB

PLEASE INSERT USB DEVICE AND PRESS ENT
```

Press **ENT** and when the USB device is detected the McCain firmware (MCFW) version is displayed as shown.

```
MCFW FILE SELECTION

0. omni-R-2.0.1.25.mcfw
1. omni-R-2.0.99.0.mcfw
2. omni-R-3.2.0.44.mcfw
```

Figure 7-1 Example of available Omni versions

Press **0** to select **Omni 2.0.1.25** version of *Omni eX* to install.

The screen changes to the following:

```
OMNI-R-2.0.1.25.MCFW

1. INSTALL
2. PURGE AND INSTALL

PRESS ESC TO RETURN
```

Select **2** for **Purge and Install** to install the desired version of Omni eX.

The Board Support Package (**BSP**) is extracted before the actual installation begins. The hardware is examined to verify the engine board type, and the correct BSP is installed with an indication of progress.

```
OMNI INSTALLER

BSP – INSTALL 0%

EXTRACTING MCFW PACKAGE
```

```
OMNI INSTALLER

BSP – INSTALL 30%

BSP INSTALLING
```

Next, *Omni eX* 2.0 is extracted before its installation can begin. The *Omni eX* installation will also display its indication of progress.

```
        OMNI INSTALLER

   OMNI – INSTALL 30%

   INSTALLING OMNI
```

NOTE: The BSP updates can take up to 3 minutes for each step.

Ultimately, the Omni eX 2.0 installation completes, and the following screen is displayed.

```
      REBOOT CONTROLLER

  PRESS YES TO REBOOT
```

Remove the USB thumb drive and press **YES** to reboot the Controller.

7.3.4 **Using Omni 2.0.1.25 to Upgrade the Version 1.x .GZ Database**

After Omni 2.0.1.25 loads, insert the USB flash drive used to back up the Omni version 1.x .GZ database. The USB Drive menu will appear automatically; select item 2. Load Database From USB. Press the Next key and use the arrow keys to browse the list of databases stored on the USB flash drive. Highlight the database to be loaded and press Yes. Omni will automatically convert and load the database.

```
B.7                  USB DRIVE

  1. SAVE DATABASE TO USB
  2. LOAD DATABASE FROM USB
  3. SAVE LOG FILES TO USB
  4. UPDATE SOFTWARE FROM USB
```

Leave the USB flash drive inserted and return to Menu B.7. Select item **1 Save Database to USB** and save the database back to the USB by pressing **YES.** The database intersection ID is preserved from the version 1.x database.

NOTE: Omni 2.0 will automatically change the filename and database structure to .MCB format but will not alter the original saved .GZ database that resides on the USB flash drive.

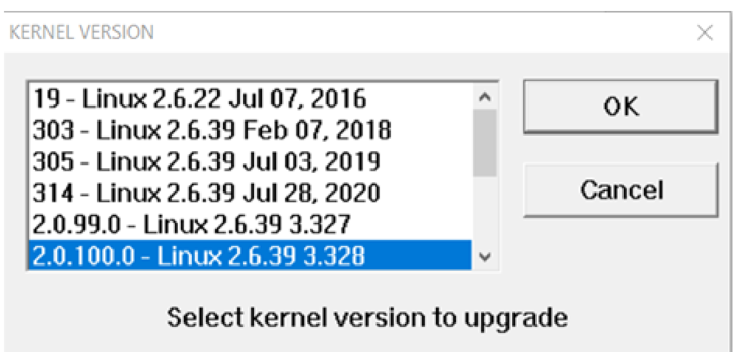
```
B.7                  USB DRIVE

1.SAVE DATABASE TO USB
2.LOAD DATABASE FROM USB
3.SAVE LOG FILES TO USB
4.UPDATE SOFTWARE FROM USB
```

7.4 Installation of Interim Omni 2.0.XX.0 Firmware

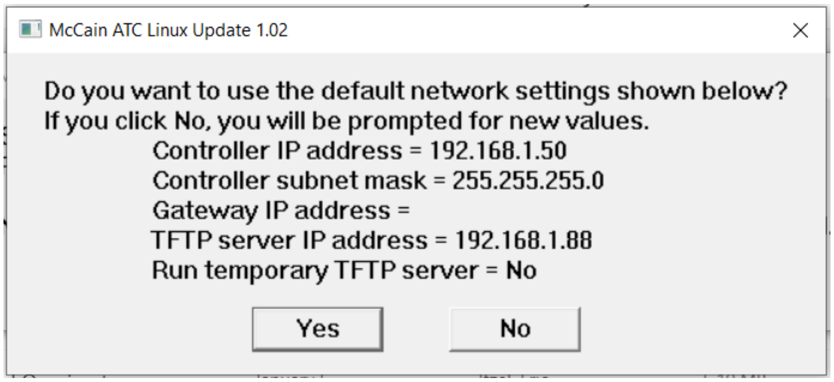
Omni 2.0.XX.0 is loaded using TeraTerm and the McCain BSP Loader utility. This method allows for instant upgrade from all supported builds of Linux and BSP running all McCain ATC Controllers. The McCain BSP Loader Utility uses a similar installation procedure defined in this chapter. The following steps describe the specific loading procedure for the BSP Loader utility.

NOTE: The network.cfg file located in the TFTP Root or BSP Loader folder defines the network parameters used during the TeraTerm installation process. Please configure the IP address and TFTP values to the desired settings for this upgrade.

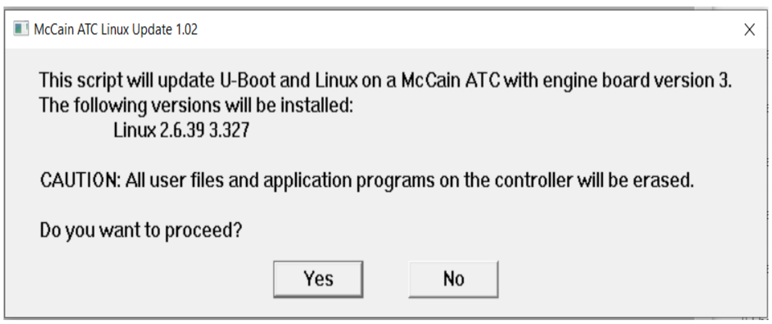
NOTE: Omni 2.0.XX.0 is an interim build of Omni that <u>must</u> be loaded prior to installing Omni version 3. The current version of the interim build is 2.0.100.0 and is further referenced as 2.0.XX.0.for the remainder of this document.



Execute the linux_update.ttl script located in the BSP Loader package folder or TFTP Root. Upon execution the script automatically identifies the Controller type and displays a list of BSPs that can be loaded onto the Controller.

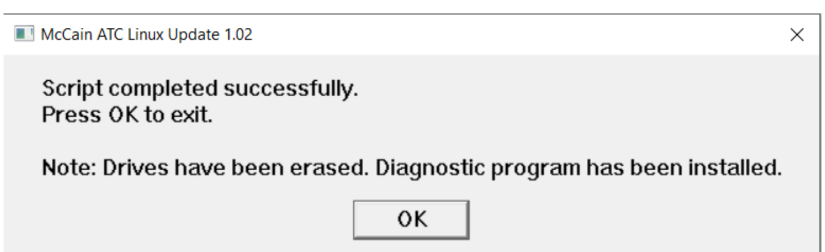


Select **2.0.100.0** and press **OK** for the update process. TeraTerm displays a confirmation dialog showing the Linux and BSP version that is loaded. Press **YES** to continue.



TeraTerm displays a confirmation dialog showing the network configuration settings found in **network.cfg**. Press **YES** to access the settings or press **NO** to customize the settings to match the upgrade environment.

The installation commences and takes approximately 8 minutes. The Controller reboots and upon completion, a confirmation dialog is displayed in TeraTerm stating that the upgrade was successful, and the ATC Controller automatically loads the McCain Installer Utility.



7.5 Installation of Omni 3.3.0.XX

From the McCain Installer main menu press **1 SECURE INSTALL OMNI FROM USB**.

```
            MCCAIN INSTALLER

  VERSION
   1.29

    1.SECURE INSTALL OMNI FROM USB
    2.MANAGE OMNI VERSIONS
    3.REBOOT CONTROLLER
```

The following screen is displayed:

```
          INSTALL OMNI FROM USB

PLEASE INSERT USB DEVICE AND PRESS ENT
```

Press **ENT** and when the USB device is detected the McCain firmware (MCFW) version is displayed as shown.

```
            MCFW FILE SELECTION

 0. omni-R-2.0.1.25.mcfw
 1. omni-R-2.0.99.0.mcfw
 2. omni-R-3.3.0.XX.mcfw
```

Select **omni-R-3.3.0.XX.mcfw** where **XX** is a specific version number**.** The screen changes to the following:

```
               OMNI-R-3.3.0.XX.MCFW
1.   INSTALL


               PRESS ESC TO RETURN
```

Figure 7-2 Example of Available Omni Versions for Installation

Select **1** for **Install** to install Omni eX version 3.3.0.XX. The Omni installation commences and displays the installation status screens. Once the installation has completed, press **YES** to restart the Controller.

NOTE: Omni 3.0 sometimes will not trigger an automatic restart after a successful install. Press 0 to restart the Controller and load Omni 3.0.

7.6 Restoring .MCB database in Omni 3.0

Once Omni 3.0 has been successfully loaded, the converted MCB database needs to be restored to the Controller. Insert the USB drive that the MCB database was saved to and wait for the following menu to appear:

```
B.7                USB

  1. SAVE DATABASE TO USB
  2. LOAD DATABASE FROM USB
  3. SAVE LOG FILES TO USB
  4. INSTALL OMNI
```

Press **2** to load the database from the USB flash drive. Press the **Next** key and use the arrow keys to browse the list of databases stored on the USB flash drive. Highlight the database to be loaded and press **YES**. Omni will load the database and display the following screen.

```
B.7.2     LOAD DATABASE FROM USB

Source Make: McCain
Source Model: Omni eX application
Source Version: R-02.00.01.00xx
Source Type: Software
Database Validation OK.
Database committed.
PRESS ESC TO RETURN
```

Press **ESC** to return to the USB drive menu. Press **ESC** again to exit the menu.

Remove the USB flash drive as prompted.

```
B.7     USB DRIVE SAFELY EJECTED

              TO CONTINUE
          REMOVE THE USB DRIVE
```

Omni version 3 has been successfully installed.

NOTE: Although no longer necessary in Omni version 3 the best practice of power cycling the Controller and verifying that the database reloads properly is still encouraged.

7.7 New Installation of Omni V3 Using BSP Loader

7.7.1 Summary of Installation Steps

1. Install interim firmware Omni 2.0.100.0 using TeraTerm and BSP Loader Utility

2. Install Omni 3.2.x using McCain Installer from Diagnostics
3. Reboot to Omni restore .MCB database if necessary

7.7.2 Perform Full Linux Reload to Provision Omni 2.0.XX.0

The following table defines the installation path to Omni 2.0.XX.0 for different Controllers and Linux BSPs:

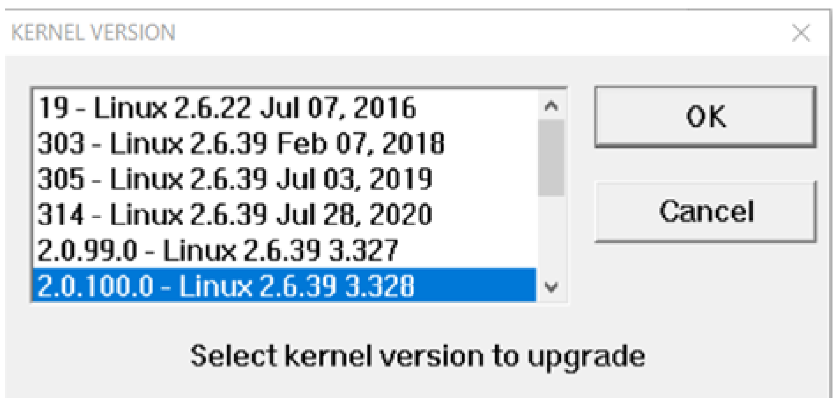
CONTROLLER TYPE	KERNEL & BSP	UPGRADE PATH FOR DB CONVERSION
NEMA ATC eX/2070ATC	2.6.22 with BSP below #401	Upgrade to kernel 2.6.22 #407 prior to loading Omni 2.0.XX.0 using USB method or direct upgrade to Omni 2.0.XX.0 using BSP Loader method.
NEMA ATC eX/2070ATC	2.6.22 BSP #401-407	Direct upgrade to Omni 2.0.XX.0 supported using USB or BSP Loader methods
NEMA ATC eX/2070ATC	2.6.39.4 BSP#408	Downgrade to kernel 2.6.22 #407 prior to installing Omni 2.0.XX.0 using BSP Loader method
ATC eX2/Flex/2070 1C CPU	2.6.22 BSP #19	Upgrade to kernel 2.6.39.4 #305 prior to installing Omni 2.0.XX.0 using USB method or direct upgrade to Omni 2.0.XX.0 using BSP Loader method
ATC eX2/Flex/2070 1C CPU	2.66.39.4 BSP #303-305	Direct upgrade to Omni 2.0.XX.0 supported using USB or BSP Loader method
ATC eX2/Flex/2070 1C CPU	2.6.39.4 BSP #314	Direct upgrade to Omni 2.0.XX.0 using BSP Loader method

NOTE: Downgrading or reloading a Controller running Omni version 2.0.XX.0 or newer will require a full reload starting from BSP #407 for EB2 Controllers and #303/305 for EB3 Controllers. This ensures the upgrade process can be executed in proper sequence

7.7.2.1 **Installation of Interim Omni 2.0.XX.0 Firmware**

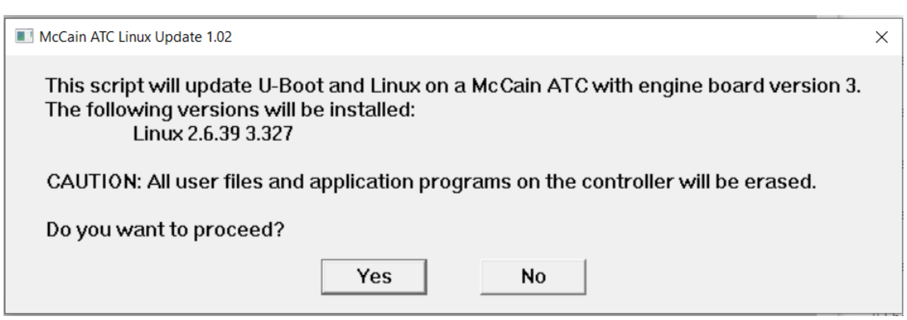
Omni 2.0.XX.0 is loaded using TeraTerm and the McCain BSP Loader utility. This method allows for a quick upgrade from all supported builds of Linux and BSP running all McCain ATC Controllers. The McCain BSP Loader Utility uses a similar installation procedure. The following steps describe the specific loading procedure for the BSP Loader utility.

> **NOTE:** The network.cfg file located in the TFTP Root or BSP Loader folder defines the network parameters used during the TeraTerm installation process. Please configure the IP address and TFTP values to the desired settings for this upgrade.

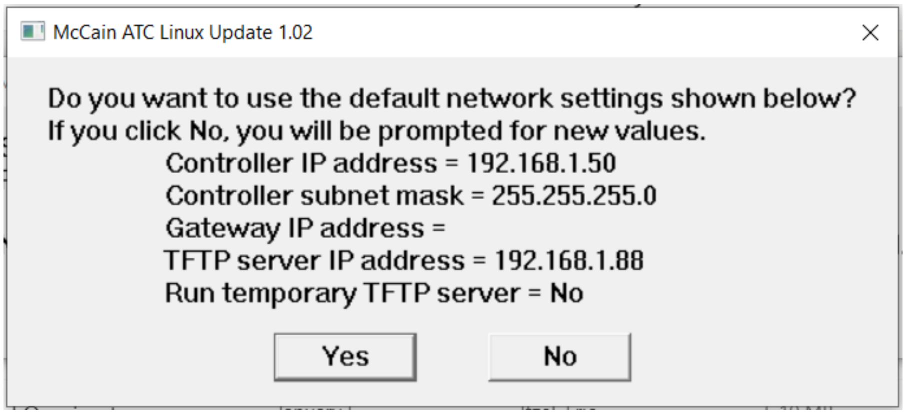


Execute the **linux_update.ttl** script located in the BSP Loader package folder or TFTP Root. Upon execution the script automatically identifies the Controller type and displays a list of BSPs that can be loaded onto the Controller.

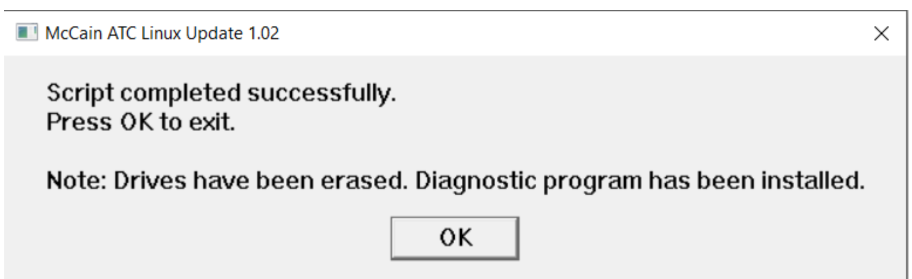
Select **2.0.XX.0** and press **OK** to begin the update process. TeraTerm displays a confirmation dialog showing the Linux and BSP version that is loaded. Press **YES** to continue.



TeraTerm displays a confirmation dialog showing the network configuration settings found in **network.cfg**. Press **YES** to access the settings or press **NO** to customize the settings to match the upgrade environment.

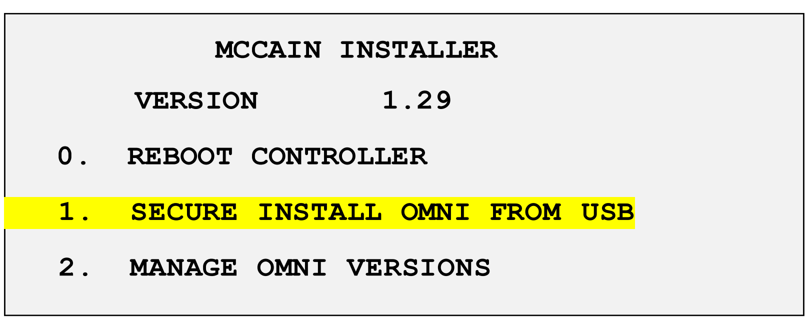


The installation commences and takes approximately 8 minutes. The Controller reboots and a confirmation dialog is displayed in TeraTerm stating that the upgrade was successful. The ATC Controller automatically loads the McCain Installer Utility.



7.7.3 **Installation of Omni 3.3.0.xx**

From the McCain Installer main menu press **1 SECURE INSTALL OMNI FROM USB**.



The following screen is displayed:

```
            INSTALL OMNI FROM USB

PLEASE INSERT USB DEVICE AND PRESS ENT
```

Press **ENT** and when the USB device is detected the McCain firmware (MCFW) version is displayed as shown.

```
            MCFW FILE SELECTION

  0. omni-R-2.0.1.25.mcfw
  1. omni-R-2.0.98.0.mcfw
  2. omni-R-2.0.99.0.mcfw
  3. omni-R-3.1.0.39.mcfw
  4. omni-R-3.3.0.xx.mcfw
```

Select **omni-R-3.2.0.xx.mcfw.** The screen changes to the following:

```
            OMNI-R-3.3.0.xx.MCFW

  1. INSTALL



           PRESS ESC TO RETURN
```

Select **1** for **Install** to install Omni eX version **3.3.0.xx**. The Omni installation commences and displays the installation status screens. Once the installation has completed, press **YES** to restart the Controller.

NOTE: Omni 3.0 sometimes will not trigger an automatic restart after a successful install. Press 0 to restart the Controller and boot into Omni 3.0.

7.7.4 **Restoring .MCB database in Omni 3.0**

Once Omni 3.0 has been successfully loaded, any MCB database can be restored to the Controller. Insert the USB drive that the MCB database was saved to and the following menu appears:

```
B.7                USB DRIVE

    1.SAVE DATABASE TO USB
    2.LOAD DATABASE FROM USB
    3.SAVE LOG FILES TO USB
    4.INSTALL OMNI
```

Press **2** to load the database from the USB flash drive. Press the **Next** key and use the arrow keys to browse the list databases stored on the USB flash drive. Highlight the database to be loaded and press **YES**. Omni loads the database and displays the following screen:

```
B.7.2      LOAD DATABASE FROM USB

Source Make: McCain
Source Model: Omni eX application
Source Version: R-02.00.01.00xx
Source Type: Software
Database Validation OK.
Database committed.
PRESS ESC TO RETURN
```

Press **ESC** to return to the USB drive menu. Press **ESC** again to exit the menu. Remove the USB flash drive as prompted.

```
B.7
        USB DRIVE SAFELY EJECTED
               TO CONTINUE
           REMOVE THE USB DRIVE
```

> **NOTE:** Although no longer necessary in Omni version 3 the best practice of power cycling the Controller and verifying that the database reloads properly is still encouraged.

Omni version 3 has been successfully installed.

7.8 NOTES AND TROUBLESHOOTING

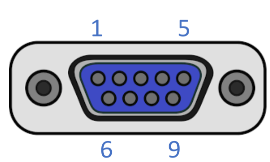
7.8.1 Notes

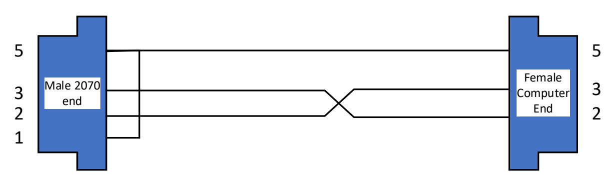
1. Downgrading or reloading a Controller running Omni version 2.0.98.0 or newer will require a full reload starting from BSP #407 for EB2 Controllers and #305 for EB3 Controllers. This ensures the upgrade process can be done in proper sequence.
2. If the TeraTerm upgrade script fails, it is best to completely close and reopen TeraTerm before retrying.
3. Some early release ATC eX2 Controllers may be running Linux version 2.6.22, the Linux kernel used by the eX Controllers. They must first be upgraded using the BSP Loader method prior to upgrading to Omni version 3.
4. After installing Omni 2.0/3.0, the Diagnostics application changes to version 3.1.6 and in the Tools menu, selection 7.2 changes from "**Run USB Script**" to "**Run Installer**." Furthermore, in the USB menu B.7 there is no longer an option **4** to update software. The MCCAIN INSTALLER is available on Diagnostics **menu 7 Tools item 2 RUN INSTALLER** and is used to install and manage all versions of Omni 3.0 and newer.
5. In the event of an error in the BSP installation, the TeraTerm log can be found in the TFTP installation folder- filename "*linux_update.log.*"

6. If anything goes wrong with the Omni installation, logs are placed in the omniLogs folder on the USB. Contact McCain technical support for further assistance.
7. In the event of an upgrade failure on EB3 due to loading Linux 2.6.39.4 BSP 314 or newer on a Controller running 2.6.22:
   a. If possible, make a note of the error message displayed in TeraTerm. Restart TeraTerm.
   b. From TeraTerm, boot the Controller into U-Boot by powering up the Controller and pressing the backspace key on the PC keyboard.
   c. From the U-Boot prompt, enter the command ***erase all***.
   d. Once the command completes and the U-Boot prompt (=>) appears, install Linux kernel 2.6.39.4 BSP 303 using either Section 7.7.1 Part 1 or Part 2 described in this document.
   e. Once Linux kernel 2.6.39.4 BSP 303 is successfully loaded, proceed with loading Linux kernel 2.6.39.4 BSP 314 using either Section 7.7.1 Part 1 or Part 2 described in this document.

7.8.2 **C50S Null Modem Cable**

The cable used must be a null modem cable, and it must have a jumper installed between pins 1 and 5 of the plug inserted into C50S. A diagram of the wiring of the cable is provided below:





7.8.3 **Optional: Connecting to C22S**

This description is provided in case there is no way of building the C50S cable described above. It requires that a **2070-7A** card be installed in slot **A1** of the 2070. You may use a standard null modem cable to connect to **C22S** on the back of the 2070. The **2070-7A** card ***must*** be installed in slot **A1** (the slot to the far left when looking at the rear of the 2070).

8. Browser Based Front Panel Access and Virtual Controller with E-Cabinet

8.1 Purpose and Design

The purpose of this chapter is to introduce a new feature of Omni that allows the user to remotely communicate to the Controller and perform all the same functions that can be done at the Controller from a remote location. This allows the user to investigate issues from an office or home location as necessary. Also, it allows the user to remotely update the configuration, change the database, or modify parameters as needed without having to go to the intersection.

The user can also upload databases without having to visit the Controller locally and download databases remotely without having to restart the Controller. Note that users should use caution with this feature. The update takes place during an all red condition and takes 2 – 5 seconds. Once the new database is in place and verified, the Controller goes back to normal operations.

The Browser based front panel can also be emulated with the cloud-based Virtual Controller. The Virtual Controller is a virtualized ATC Controller running Omni eX including the front panel web UI. We provide this to customers that need an additional method of testing databases or programming functionalities for evaluation.

The web based Virtual Controller requires user credentials that must be requested through McCain support. Once the user is granted access, they receive a user account to log in online to the Virtual Controller. Each user gets two remote sessions so that they can open one session with the front panel view, while the other session provides the view of the E-Cabinet. The E-Cabinet is a virtual suitcase tester that allows the user to test every I/O that Omni has. This is a cabinet agnostic application configurable to the user's preference and can be reconfigured as necessary.

The rest of this chapter provides instruction for the process of accessing and using the Browser based Front Panel or Virtual Controller and E-Cabinet.

NOTE: The default login credentials for the Omni v3 webserver are username *administrator,* password *McCain01*.

The Web served functions are provided for use in configuring, troubleshooting, and performing diagnostics on the intersection database. The customer is responsible for all programming and verification of the configurations developed in the Web Virtual Controller and while using the remote front panel. Training is suggested and provided at user request for any of the functions that are provided within the Web based functions. Any use of the Web based products is the sole responsibility and at the liability of the user.

The Controller allows both the front panel and the E-Cabinet to be used at the same time. The E-Cabinet functionality in the Controller is specifically designed to be used while the operator is in front of the Controller to test functionality on a bench or test environment.

The E-Cabinet is not designed to be used while connected to a remote Controller operating an intersection. For this reason, only the front panel should be used to access a remote Controller. Caution should be used when connecting to a Controller operating an intersection as there are functions that can cause hazardous conditions resulting in the cabinet going into a flash condition.

8.2 Front Panel Access

The Remote Front Panel is easy to access. An Ethernet connection to the Controller is required, and the computer must be on the same network. A VPN connection into a remote Controller is also an option, if necessary. The front panel can be viewed from any computer or mobile device including laptops, tablets, and smartphones if they have an internet connection.

The Omni eX version 3 webserver is secured using login credentials. The credentials can be obtained by contacting McCain technical support or a sales representative.

Once this information is received the user can access the remote Front Panel from any device that supports IP communications including Laptops, PCs, tablets, and cell phones. Google Chrome is suggested as the preferred web browser, but others such as Firefox and Safari are also supported. The web session will automatically timeout after 5 minutes of inactivity.

8.2.1 Accessing the Remote Front Panel or Virtual Controller

1. Enter the IP address of the Controller in the address bar of the browser. The welcome page (splash page) will appear.
2. For the Virtual Controller a unique URL is provided for each user. This is provided through McCain support, our distributors, or sales staff.
3. Enter the Username and Password provided.

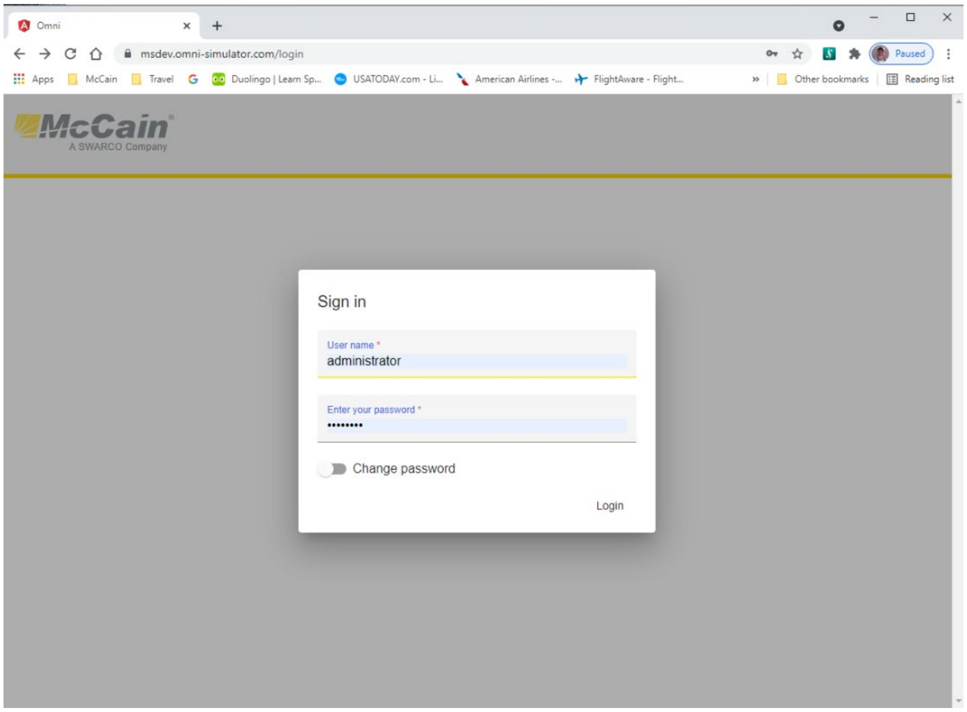


Figure 8-1: Login Page

4. After entering the Username and Password, the welcome page appears.
    a. In the upper right corner of the page is the Controller information:
        - Date and time of the Controller including Daylight Savings Time
        - Operation Mode (Auto / Manual / System Control / System Standby / Backup / Timebase)
        - Pattern running on the Controller (254 = Free, 255 = Flash, 0 = Auto)
        - System ID of the Controller
        - Omni Version
    b. In the center is the front panel to provide instant information about the intersection operation.
    c. Above the display are four icons for navigating to other functions of the browser based front panel, or the web based Virtual Controller.
    d. A disclaimer is provided for use of the E-Cabinet from remote locations.

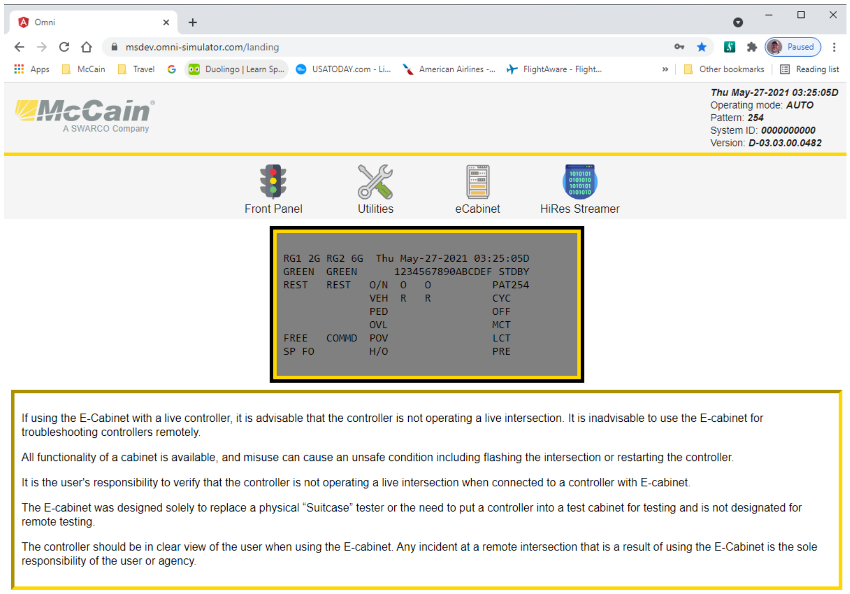


Figure 8-2: Welcome Page

5. Once the login is successful the user is provided with 4 options:

   a.  This is the front panel selection and will provide the user with a front panel access.

   b.  This is the utilities page and provides the user with an upload and download function.

   c.  This is the E-Cabinet simulation and provides the user a way of monitoring outputs from the Controller and providing inputs into the Controller.

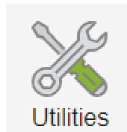
   d. 

This is the hi-res data streamer and will provide the ability to look at streaming hi-res data in real time.

8.2.1.1 **Front Panel** 

The front panel appears like a McCain eX2 Controller when it is connected to either a NEMA or Caltrans Controller. If a Caltrans Controller is being accessed (2070-1C), only 8 lines are displayed. If a NEMA or ATC Controller is being accessed, 16 lines are displayed. Depending on the scaling of the window on the device accessing the Controller, the keypad appears either on the side of the display or underneath the display on the front panel.

All keystrokes required to program the Controller directly are the same on the remote Front Panel.

8.2.1.2 **Remote Upload/Download** 

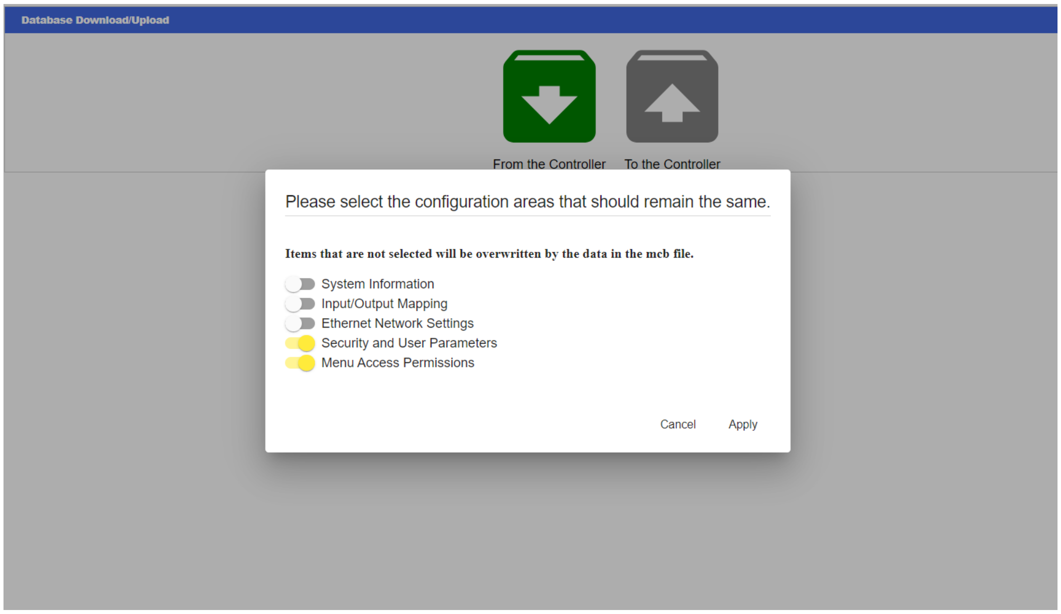
Utilities are used for uploading and downloading of the databases. Uploading of logs is not yet available.

The remote front panel and the Web Virtual Controller can upload and download the database configured to any file location the user desires. The user can load a database onto a thumb drive to be used at a remote location. Conversely, the user can pull a configuration off a Controller onto a laptop or other device for future use. The upload and download features are found under the Utilities section of the Browser.

1.  This is the download button that allows the user to download the database currently running on the controller and save it as a .MCB file on the device or a location of their choice.

2.  This is the upload button and allows the user to upload the database from their workstation device to the controller to become the active database. Additional

prompts are provided to allow the user to choose which sections of the database are to be replaced, as well as a final confirmation prior to implementing the new database.



a. After the database file stored on the user device is selected and uploaded, a dialog box will pop up allowing the user to select which sections of the database are replaced. The user must select which optional sections of the database are overwritten by clicking on each individual slider button, changing the indicator color to yellow. Click **Apply** to confirm the selection.

   Definitions of each object are as follows:

   i. System information: this is the database ID and description found in Menu B.3 in Omni.

   ii. Input/Output mapping: the database I/O map and channel setup, including all custom I/O pin mapping.

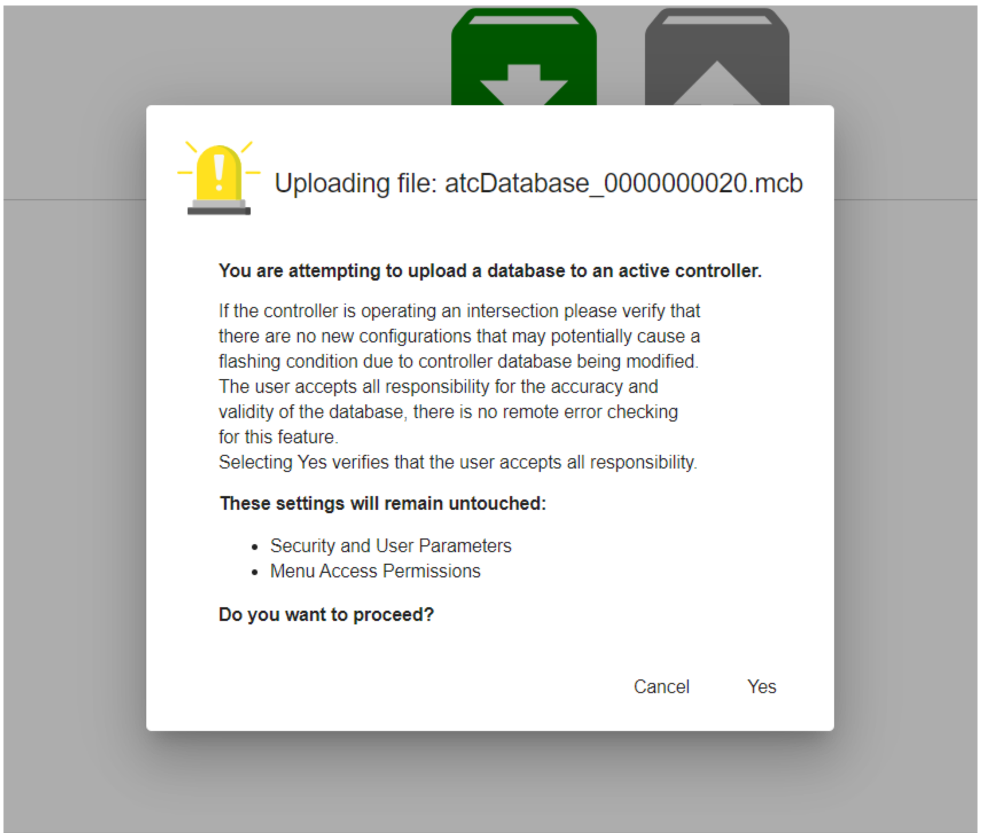
   iii. Ethernet network settings: the Ethernet settings found in menu A.2.

> **NOTE:** Activating this setting when uploading a database with an Ethernet configuration different from the active Controller will change the IP address of the Controller and force the user to reconnect using the new Ethernet settings.

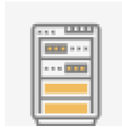
iv. Security and User Parameters: Activating this setting replaces all front panel user configuration with what is supplied in the uploaded database.

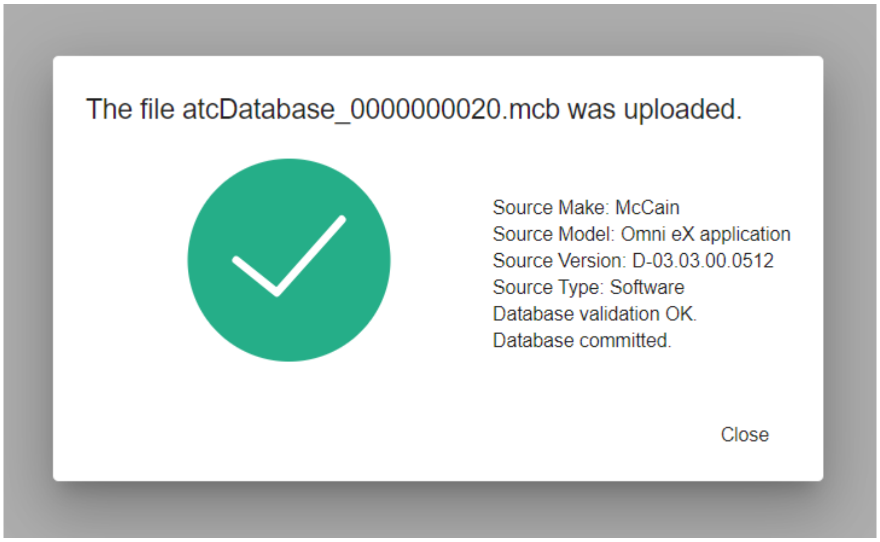
v. Menu Access Permissions: This setting is used in conjunction with Security and User Parameters to define the access control lists assigned to each user

b. A confirmation dialog will appear providing a summary of the database upload action, including the database ID and the sections of the database to be replaced or preserved. Click Yes to Proceed or Cancel to Abort.



c. After the database is uploaded and committed a confirmation screen appears showing the database was committed successfully and providing additional information including the source database version, the database validation, and statement showing that the database was committed.

8.2.1.3 **eCabinet Feature** 



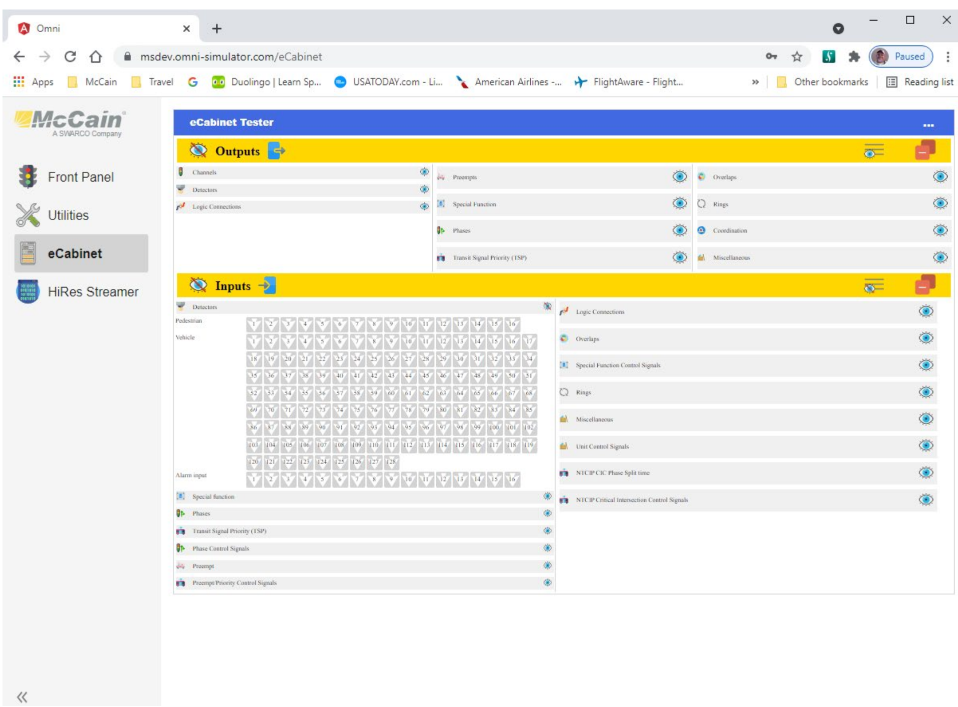


Figure 8-3: eCabinet Feature on Virtual Controller

The E-cabinet is user configurable in the Virtual Controller. Every input and output that Omni is programmed to use is viewable on the E-Cabinet. The E-Cabinet is divided into two sections:

1. Inputs for functions like detection, preemption, logic, special functions, etc.
2. Outputs for signal colors, overlaps phase next, special functions, etc.

Each division is also subdivided into sections which can be reduced or even hidden if not used. The Input division and Output division can be rearranged top to bottom for user preference and each section can be brought up or down within the division and up to three columns can be selected by grabbing the title of the section and dragging it to the right of the first column.

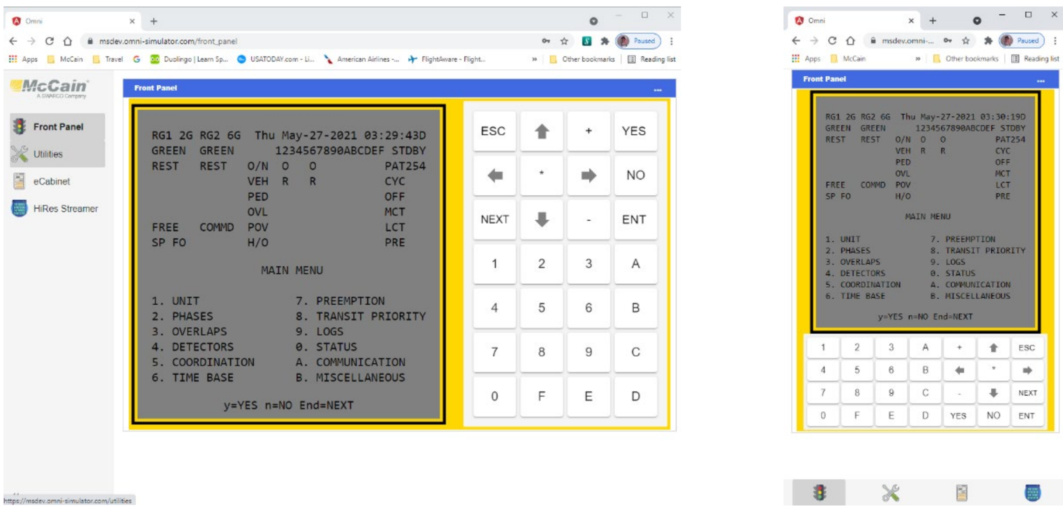


Figure 8-4: Remote Front Panel and Virtual Controller

These two images are from a laptop monitor where the Google Chrome window was scaled differently. Both provide the same information, but the scaling will rearrange the page.

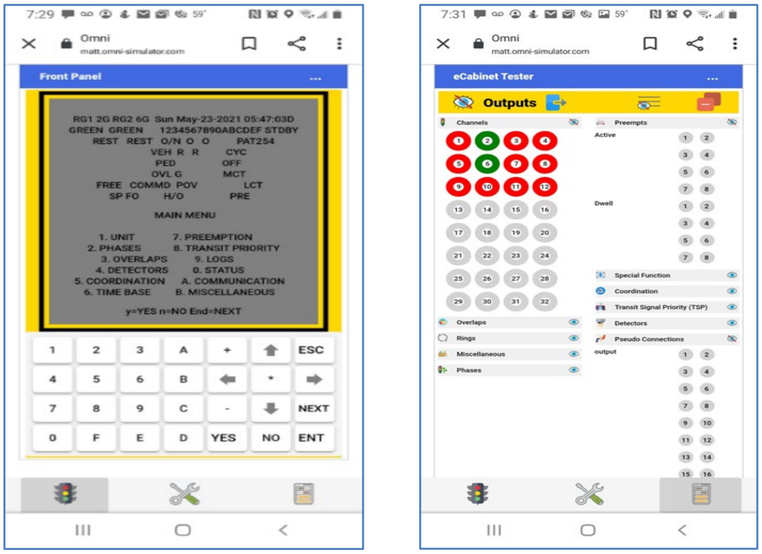
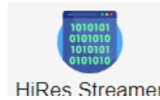


Figure 8-5: Laptop Monitor Pages

The Browser based Remote front panel can be viewed on a cell phone as shown above. In either case the functionality is the same. The keystrokes can be entered in two ways::

1. Using the mouse or pointer from the device that has accessed the Controller, click on the keypad button just as if it was done directly on the Controller.
2. If using a keyboard on a computer, strike the keys associated with the keypad buttons.
    a. 1 – 0 on the keyboard = 1 – 10 in the Controller.
    b. A – F on the keyboard = 11 – 16 in the Controller
    c. N on the keyboard = No in the Controller
    d. Y on the keyboard = Yes in the Controller
    e. + and – on the keyboard are the same in the Controller
    f. “Esc” on the keyboard is the same in the Controller
    g. Arrow keys on the keyboard are the same on the Controller.
    h. “End” Key on the keyboard is the Next key on the Controller.

8.2.1.4 **Hi-Res Streaming Data Feature** 

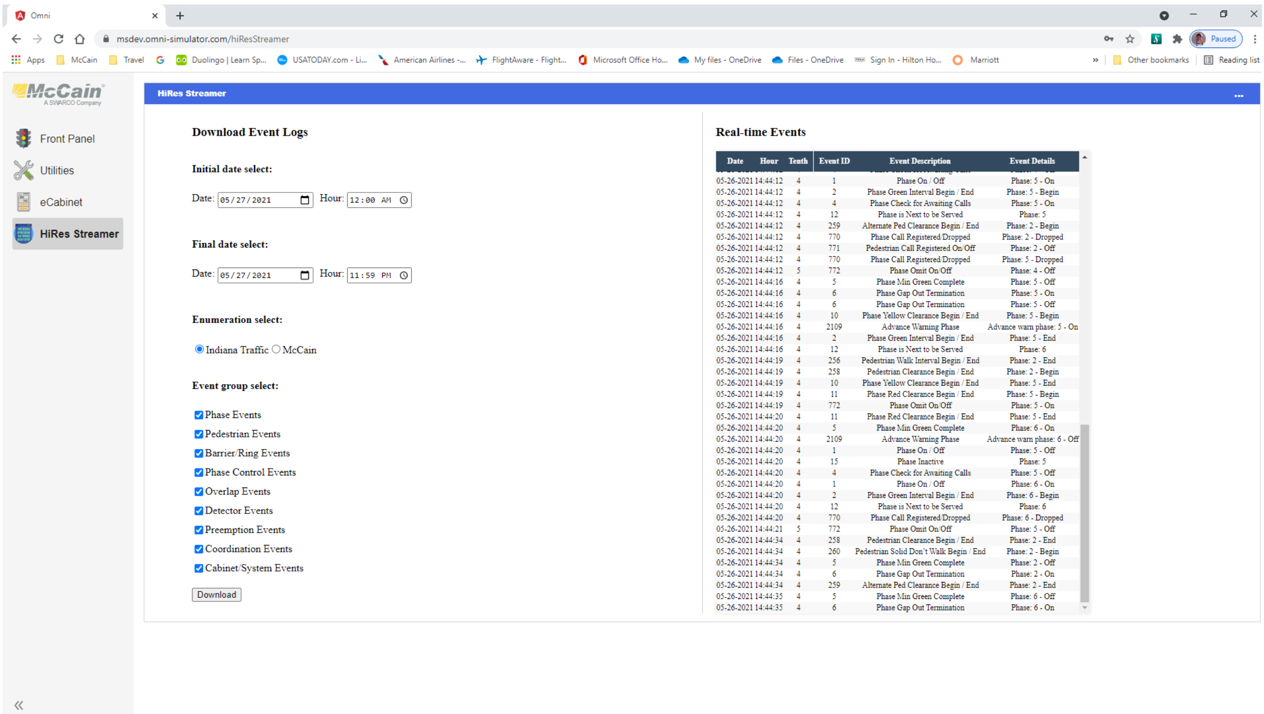


Figure 8-6: Hi-Res Streaming Data Feature

Hi-Res data streaming is provided for real time viewing. The user can select a time sequence to view historical data and can also select which events to view. The Browser based Hi-Res data streamer provides the standard Indiana enumerations but also provides additional data that McCain has developed that exceeds what the Indiana enumerations provide. All Hi-Res data can be downloaded into a .csv file.

Appendix A: CONFORMANCE

Omni eX intersection control software has been designed to conform to the following standards.

Standard	Description
ATC 5.2b	ATC Controller Standard
NEMA TS 2-2003	NEMA traffic Controller standard
NTCIP 1103 v2.17	Transportation Management Protocols (SNMP, STMP)
NTCIP 1201 v3.07	Global Objects
NTCIP 1202 v2.19	Actuated Signal Controller Objects
NTCIP 2101:2001 v01.19	Point to Multi-Point Protocol Using RS-232 Sub-network Profile
NTCIP 2104:2003 v01.11	Ethernet Subnetwork Profile
NTCIP 2201:2003 v01.15	Transportation Transport (T2) Profile
NTCIP 2202:2001 v01.05	Internet Transport Profile (TCP/IP and UDP/IP)

Appendix B: GATE FUNCTIONS

Logic Input Function	Index range	Description
UNUSED INPUT	--	currently available and is not assigned
LOGIC IN CNCTN	64	connect input pin into gates
LOGIC OUT CNCTN	64	output from gate
PREEMPT DETECTOR	8	place a preemption request
PEDESTRIAN DETECTOR	16	activate a ped call
VEHICLE DETECTOR	128	make vehicle actuation
VEH DETECTOR FAULT (DEP)*	128	Unused except by gate
SPECIAL FUNC INPUT	16	activate a special function
AUTO FLASH REQUEST	0	request automatic flash (soft flash)
LOCAL FLASH SENSE	0	auto/flash switch, cabinet in flash user request
MMU/CMU FLASH SENSE	0	feedback from CMU/MMU for cabinet in fault flash
MAN CONTROL ENABLE	0	Manual Control Enable
INTERVAL ADVANCE	0	Interval Advance
MIN RECALL	0	Minimum Recall on all phases
EXTERNAL START	0	External Start, go to Startup routine
STOP TIME ALL RINGS	0	Stop Time on all 4 rings.
STOP TIME RING	4	Stop Time for one specific ring
FORCE OFF RING	4	Force Off one specific ring
RED REST RING	4	Red Rest for one specific ring, if no calls
OMIT RED CLEAR RING	4	Omit Red Clearance timing per ring
PED RECYCLE RING	4	Recycle pedestrian per ring
INHIBIT MAX RING	4	Inhibit Maximum Green termination per ring
MAX 2 RING	4	Maximum Green 2 timing per ring

MAX 3 ALL RINGS	0	Unused except by gate
MAX 4 ALL RINGS	0	Unused except by gate
CALL TO NON ACT	2	Call to Non-Actuated operation for phase groups
WALK REST MODIFIER	0	Walk Rest Modifier for C-N-A phases
FREE REQUEST	0	Request free mode
ALARM INPUT	16	generate an Alarm
ALTERNATE SEQUENCE (DEP)	4	Unused except by gate
ADDRESS BIT (DEP)	32	Unused except by gate
OFFSET INPUT (DEP)	3	Unused except by gate
TIME PLAN IN (DEP)	4	Unused except by gate
PHASE OMIT	16	omit the phase
PHASE HOLD	16	hold a phase

Logic Input Function	Index range	Description
PED OMIT	16	omit the pedestrian phase
CABINET DOOR OPEN	0	generate an alarm when the cabinet door is open
TEST INPUT	3	Unused except by gate
INDICATOR LAMP CTRL (DEP)	0	Unused except by gate
DIMMING ENABLE (DEP)	0	Unused except by gate
CYCLE ADVANCE (DEP)	0	Unused except by gate
TBC ONLINE (DEP)	0	Unused except by gate
CLOCK UPDATE	0	Set the Controller clock to the time of day specified in Sync Reference Time
HARDWARE CONTROL (DEP)	0	Unused except by gate
CONFLICT MON STATUS (DEP)	0	Unused except by gate
MODE SELECT BIT (DEP)	3	Unused except by gate
CHANNEL RED	32	drive red output of a load switch
CHANNEL YELLOW	32	drive yellow output of a load switch
CHANNEL GREEN	32	drive green output of a load switch
PREEMPT ACTIVE	8	preempt is active
DETECTOR RESET	0	Detector Reset on all detector
DET RESET SLOTS	4	Detector Reset for one input file
FAULT MONITOR	0	Fault Monitor output
VOLTAGE MONITOR	0	Controller Voltage Monitor output
FLASHING LOGIC	0	NEMA constant flashing output
AUTO FLASH STATUS	0	Automatic Flash Status output
WATCHDOG	0	Watchdog output
FREE STATUS	0	Free Mode Status output
CODED STATUS BIT A	4	Ring Coded Status Bit A output
CODED STATUS BIT B	4	Ring Coded Status Bit B output
CODED STATUS BIT C	4	Ring Coded Status Bit C output

OFFSET OUTPUT	3	Unused except by gate
TIMING PLAN OUTPUT	4	Unused except by gate
TBC AUX OUTPUT	8	TBC Aux Status output
SPECIAL FUNC OUTPUT	16	Special Function Status output
ALARM OUTPUT	16	Alarm Status output
PHASE ON	16	Phase On output
PHASE NEXT	16	Phase Next output
PHASE CHECK	16	Phase Check output
PREEMPT DWELL	8	Preempt Dwell Active
PRIORITY REQUEST	16	activate TSP request

Logic Input Function	Index range	Description
PRIORITY CHECKOUT	16	remove TSP request
PRIORITY ACTIVE	16	TSP Strategy active
NO START DELAY PHS	16	skip phase start delay timer
NO START DELAY OVL	16	skip overlap start delay timer
MAX WALK	0	extend the Walk timing
MAX RECALL	0	Max Recall on all phases.
PREEMPT GATE DOWN	8	truncate preempt Track Green timer
PATTERN SELECT	255	select one pattern out of 255
PATTERN ACTIVE	255	Pattern Active
ADVANCE WARN PHASE	16	Advance Warning Phase Active
ADVANCE WARN OVRLAP	16	Advance Warning Overlap Active
PREEMPT STEADY	8	preempt input in Steady state
PREEMPT PULSING	8	preempt input in Pulsing state
PRIORITY STEADY	16	priority input in Steady state
PRIORITY PULSING	16	priority input in Pulsing state
ADV TSP OUTPUT	16	Advance TSP as an input

Logic Output Function	Index range	Description
UNUSED INPUT	--	currently available and is not assigned
LOGIC OUTPUT	64	gate output drive pin or gate
PREEMPT DETECTOR	16	Preemption request
PEDESTRIAN DETECTOR	16	ped call
VEHICLE DETECTOR	128	vehicle actuation
VEH DETECTOR FAULT	128	Unused except by gate
SPECIAL FUNC INPUT	16	special function request
AUTO FLASH REQUEST	0	automatic flash (soft flash) request
LOCAL FLASH SENSE	0	auto/flash switch in flash

MMU/CMU FLASH SENSE	0	CMU/MMU fault flash
MAN CONTROL ENABLE	0	Request Manual Control Enable
INTERVAL ADVANCE	0	Interval Advance
MIN RECALL	0	Minimum Recall
EXTERNAL START	0	External Start
STOP TIME ALL RINGS	0	Stop Time all rings.
STOP TIME RING	4	Stop Time ring
FORCE OFF RING	4	Force Off ring
RED REST RING	4	Red Rest ring
OMIT RED CLEAR RING	4	Omit Red Clearance ring
PED RECYCLE RING	4	Recycle pedestrian
INHIBIT MAX RING	4	Inhibit Maximum Green

Logic Output Function	*Index range*	*Description*
MAX 2 RING	*4*	*Maximum Green 2 ring*
MAX 3 ALL RINGS	0	Unused except by gate
MAX 4 ALL RINGS	0	Unused except by gate
CALL TO NON ACT	2	Call to Non-Actuated
WALK REST MODIFIER	0	Walk Rest Modifier
FREE REQUEST	0	Request free mode
ALARM INPUT	16	Request Alarm
ALTERNATE SEQUENCE	4	Unused except by gate
ADDRESS BIT	32	Unused except by gate
OFFSET INPUT	3	Unused except by gate
TIMING PLAN INPUT (DEP)	4	Unused except by gate
PHASE OMIT	16	omit phase
PHASE HOLD	16	hold phase
PED OMIT	16	omit pedestrian phase
CABINET DOOR OPEN	0	Cabinet door alarm
TEST INPUT	3	Unused except by gate
INDICATOR LAMP CTRL	0	Unused except by gate
DIMMING ENABLE	0	Unused except by gate
CYCLE ADVANCE	0	Unused except by gate
TBC ONLINE	0	Unused except by gate
CLOCK UPDATE	0	Set the Controller clock to the time of day specified in Sync Reference Time
HARDWARE CONTROL	0	Unused except by gate
CONFLICT MON STATUS	0	Unused except by gate
MODE SELECT BIT	3	Unused except by gate
PRIORITY REQUEST	16	activate TSP request
PRIORITY CHECKOUT	16	remove TSP request

NO START DELAY PHS	16	skip phase start delay timer
NO START DELAY OVL	16	skip overlap start delay timer
MAX WALK	0	Max Walk
MAX RECALL	0	Max Recall
PREEMPT GATE DOWN	16	truncate Track Green timer
PATTERN SELECT	255	select pattern
LOGIC INPUT	64	Connection input out of gate
ADV TSP INPUT	16	Priority advance request.
BEGIN CYCLE PULSE	0	Cycle start pulse output

* (DEP) – If marked, the signal has been identified for deprecation, it will currently function but is removed at some point. Use of this signal is removed. Please work away from these signals if currently used. If the deprecated signals (input / output) do nothing in the system, they are included as deprecated so that when a database is loaded, it will not fail to load. It may not function as originally intended however the database will load.

Appendix C: ATC eX 2070 Diagnostic Acceptance Test (DAT)

C.1 GENERAL DESCRIPTION

This Appendix describes the operation of McCain Diagnostic Acceptance Test (DAT) software for the McCain ATC eX 2070 Controller units.

The McCain ATC DAT is used for testing and validating the hardware of the McCain ATC eX 2070 Controller units. It includes separate tests menus for the CPU, Field I/O, Serial Ports and Front Panel, as well as a Continuous Test menu for SRAM, DRAM, serial ports, and Field I/O. An Error logging report is available to use for troubleshooting purposes. There is also a set of utilities available for configuring Ethernet IP addresses and running scripts from USB memory devices. DAT can disable itself.

NOTE: McCain ATC DAT is a suite of test programs which can be stored in a USB memory stick.

```
usb 1-1.2: new full speed USB device using fhci_hcd_of and address 4
usb 1-1.2: configuration #1 chosen from 1 choice
scsi1 : SCSI emulation for USB Mass Storage devices
scsi 1:0:0:0: Direct-Access     SanDisk  Cruzer          8.01 PQ: 0 ANSI: 0 CCS

sd 1:0:0:0: [sda] 15682559 512-byte hardware sectors (8029 MB)
sd 1:0:0:0: [sda] Write Protect is off
sd 1:0:0:0: [sda] Assuming drive cache: write through
sd 1:0:0:0: [sda] 15682559 512-byte hardware sectors (8029 MB)
sd 1:0:0:0: [sda] Write Protect is off
sd 1:0:0:0: [sda] Assuming drive cache: write through
 sda: sda1
sd 1:0:0:0: [sda] Attached SCSI removable disk
```

C.2 DAT VERSION DISPLAY

When the Controller launches, the ATC DAT shows the version screen displaying the DAT version, Linux image version, U-Boot version, DRAM, FLASH, and SRAM memory configurations. It also displays the MAC addresses, IP addresses, and the Controller date and time.

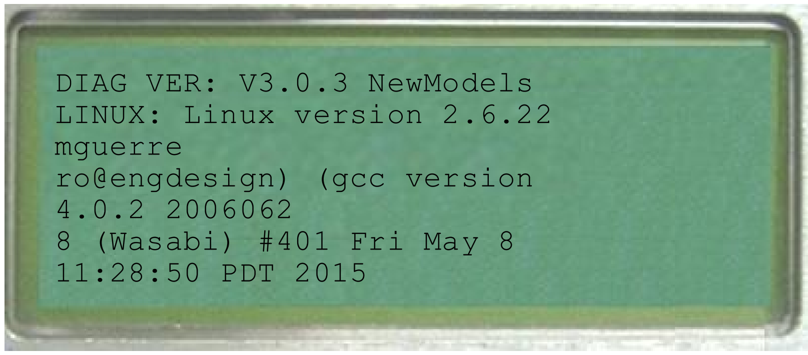


Figure C- 1: Main Menu Part 1

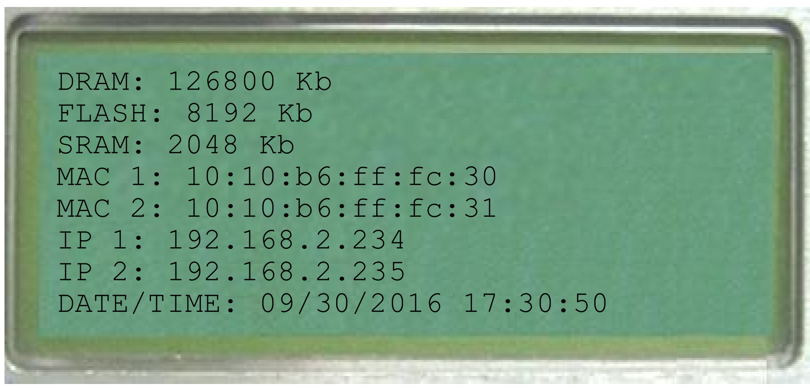


Figure C- 2: Main Menu Part 2

Press ENT two times to continue.

C.3 MAIN MENU

The Main menu displays the current list of supported tests (Figure C- 3: ATC Test Menu).

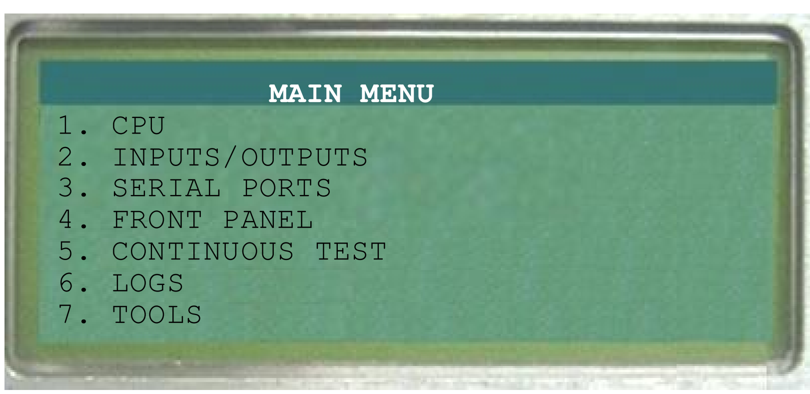


Figure C- 3: ATC Test Menu

The DAT main menu displays 7 options. Selecting the options enters the module's test menus or Controller features.

C.3.1 CPU TEST

The CPU menu consists of one Controller feature and 7 individual tests to validate USB ports and ACFAIL functionality, System memory (DRAM), FLASH memory, SRAM, Datakey receptacle, and 2070 host EEPROM. During the progress of the test, the Controller active LED flashes. Select option **1** from DAT menu, and the CPU menu appears (Figure C- 4: CPU Menu):

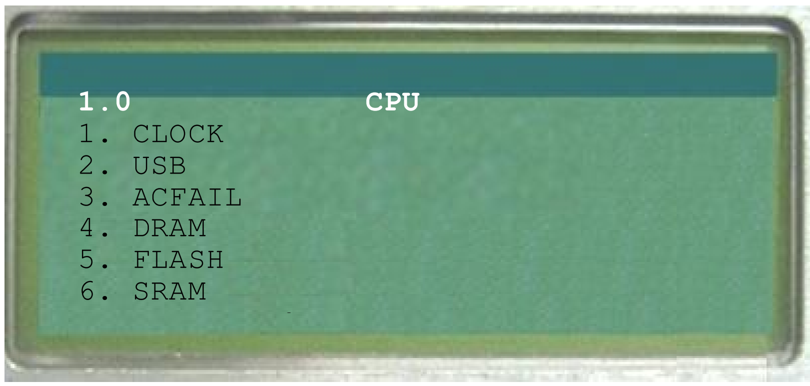


Figure C- 4: CPU Menu

C.3.1.1 Set Clock

Select **1** from CPU menu to **set the clock**. This feature allows the user to view and set the Controller clock. Figure C- 5: Clock shows the display.

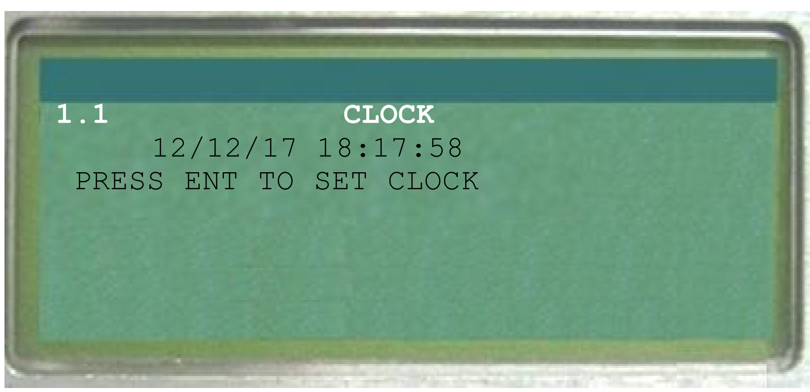


Figure C- 5: Clock

Press **ENT** to set the system clock. The date and time format is "**MM/dd/yy hh:mm:ss**". Navigate with arrow keys to set a field value. When done, press **ENT** to set system clock; press **ESC** to return to the CPU menu.

C.3.1.2 USB Ports Test

Select **2** from CPU menu, and the **USB ports test** is executed (Figure C- 6: USB Test Insert).

The USB test consists of detecting a USB memory stick device in all USB Controller ports, each one at one time. The test asks user to insert the USB device in one port at time, it has a time out of 20 seconds. When time out elapses or user does not insert a USB device, the test fails in that port.

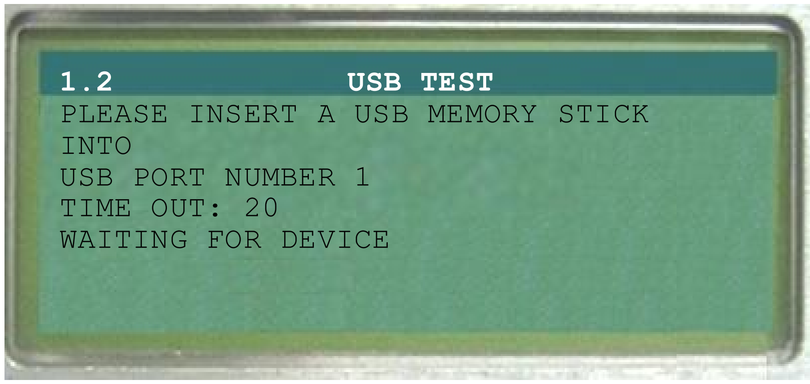


Figure C- 6: USB Test Insert

The sequence of the test for each port is:

1. wait for device,
2. USB device detected,
3. USB device detected OK,
4. DAT asks for user to remove USB device,
5. Repeat this sequence for the next port.

After completing the test for all ports, the following screen is displayed (Figure C- 7: USB Test Complete).

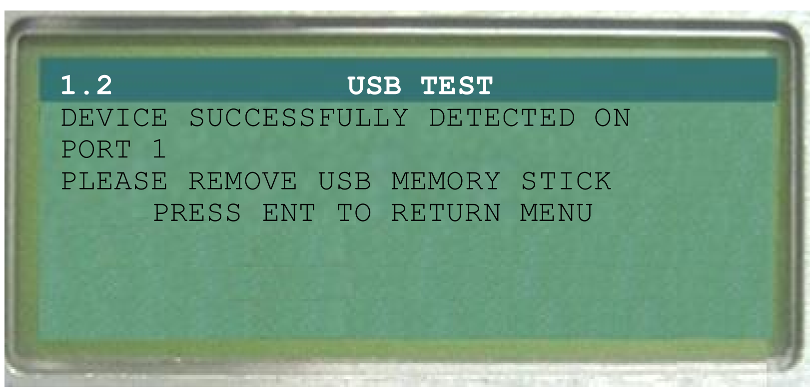


Figure C- 7: USB Test Complete

If the USB device was not inserted into the correct port, the test shows an error (Figure C- 8: USB Test Not Detected).

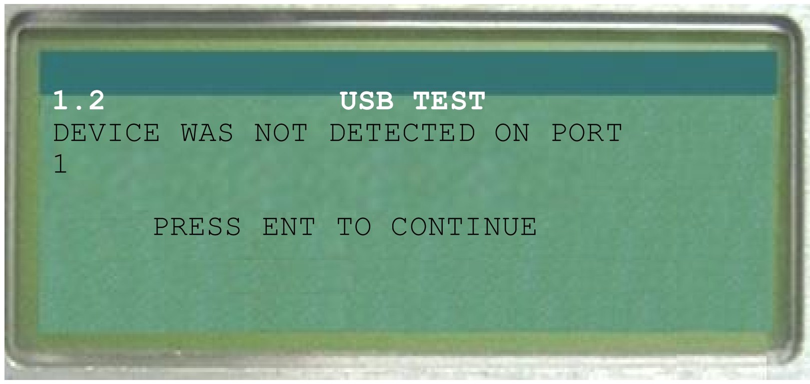


Figure C- 8: USB Test Not Detected

After test end press **ENT** to return to the CPU menu.

C.3.1.3 ACFAIL Test

Select **3** from CPU menu to execute the **ACFAIL test** (Figure C- 9: ACFAIL Test).

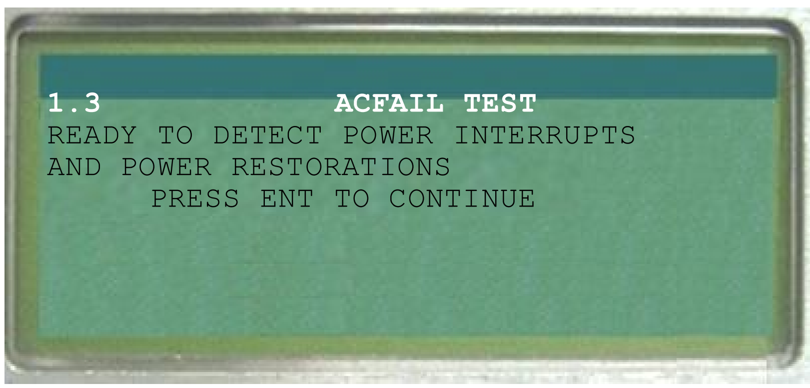


Figure C- 9: ACFAIL Test

The ACFAIL test detects Controller power interrupts and power restorations (Figure 55). The user may simulate power interruptions by turning off and on the Controller quickly or by connecting an external power interrupt device. Press ENT to start the detection.

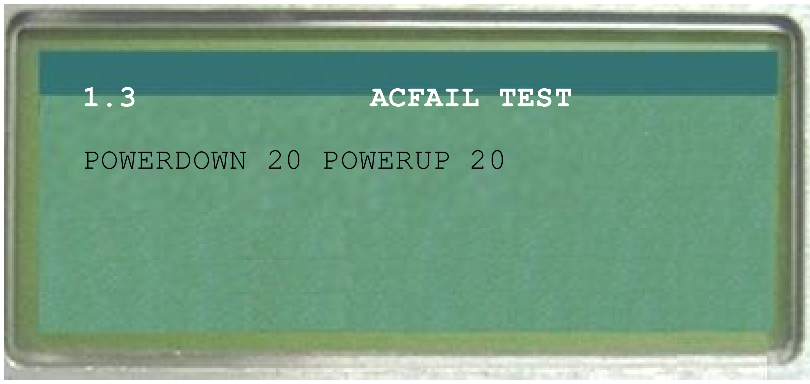


Figure C- 10: Monitoring ACFAIL

Power down and Power up counters roll over to zero when 1000 power failures have been detected.

Press **ESC** to exit ACFAIL test and return to the CPU menu.

C.3.1.4 Memory (DRAM) Test

Select **4** from the CPU menu to execute the **Memory (DRAM) test** (Figure C- 11: Memory Test).

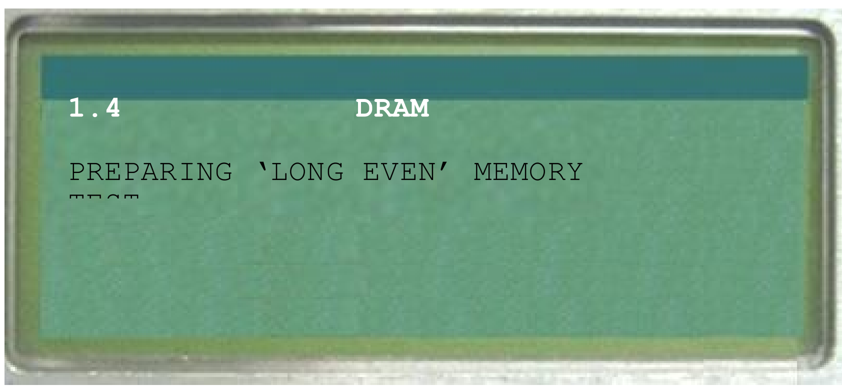


Figure C- 11: Memory Test

The memory test requests all memory available from the operating system and performs 4 memory tests.

Long odd. Consists of writing the pattern 0x55555555, reading back the contents and comparing it with the pattern.

Long even. Consists of writing the pattern 0xAAAAAAAA, reading back the contents and comparing it with the pattern.

Long count. Consists of writing a sequence from 0x00000000 to the end of memory in each long word location of the memory requested, reading back the contents and comparing it with the sequence.

Byte count***. Similar to the long count test, it writes, reads, and compares in byte mode.

After the test is executed, the screen displays Pass or Fail (Figure C- 12: Memory Test Result).

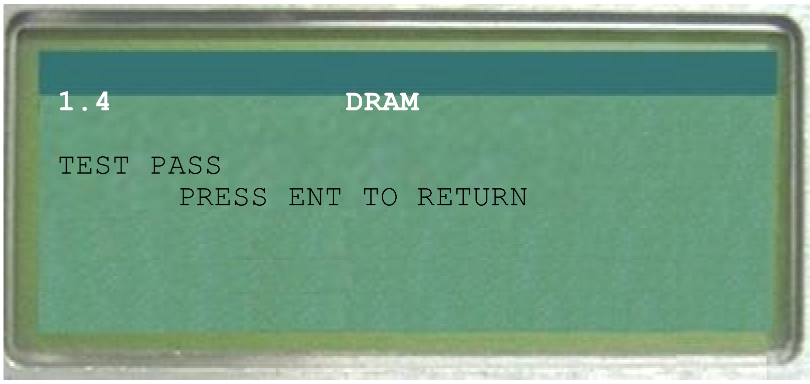


Figure C- 12: Memory Test Result

While the test is executed, the test displays status and progress such “allocating XXXX bytes,” “compare ok at XXXXX,“ or “compare ok 25 MB.” If the test fails, it displays the memory offset number where the test stopped, indicating an error.

Press **ENT** to return to the CPU menu.

C.3.1.5 FLASH Memory Test

Select **5** from CPU menu to execute the **FLASH memory test** (Figure C- 13: Flash Test)

Figure C- 13: Flash Test

The Flash test creates multiple data files with random binary information in the flash drive (/atc). The size of this file is 64kB, which is equivalent to one FLASH memory sector, and the FLASH is populated with these files. The test writes, reads back, and compares the data. The test passes if the comparison is identical; otherwise, the test fails, and the files are erased after the test ends (Figure C-14: Flash Test Result)

WARNING: Turning off the Controller in this test could cause FLASH data corruption.

While the test is executing, the test displays the status and progress, in the form of “reading data”, and “clearing data.” If the test fails, it displays the memory offset number where the test stopped, indicating the error.

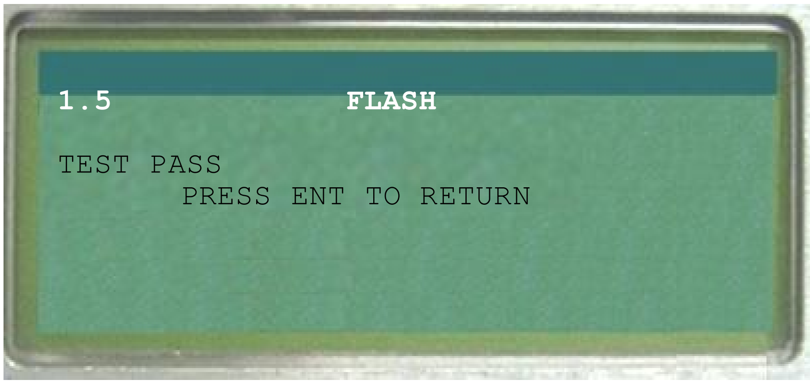


Figure C- 14: Flash Test Result

Press **ENT** to return to the CPU menu.

C.3.1.6 SRAM Test

Press **6** from the CPU menu to execute the **SRAM test** (Figure C- 15: SRAM Test)

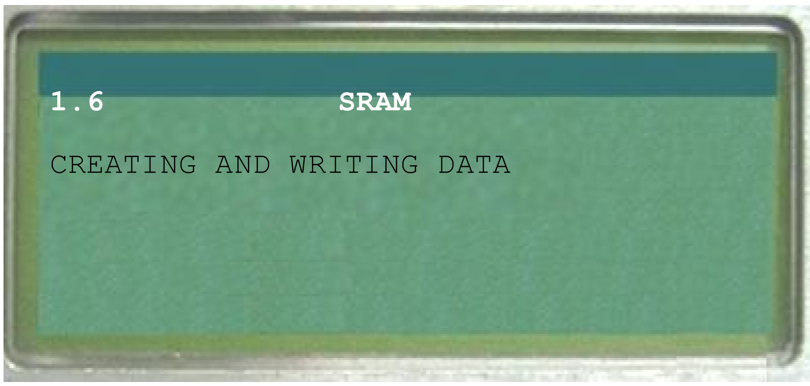


Figure C- 15: SRAM Test

The SRAM test creates multiple data files with random data information in the flash drive (/sram). The size of these files is 1024 bytes, and these files populate the SRAM memory. The test writes, reads back, and compares the data in the files. The test passes if the comparison is exactly the same; otherwise, the test fails. These files are erased after the test ends (Figure C- 16: SRAM Test Result).

While the test is executing, the test displays the status and progress, in the form of “reading data,” and “clearing data.” If the test fails, it displays the memory offset number where the test stopped, indicating an error.

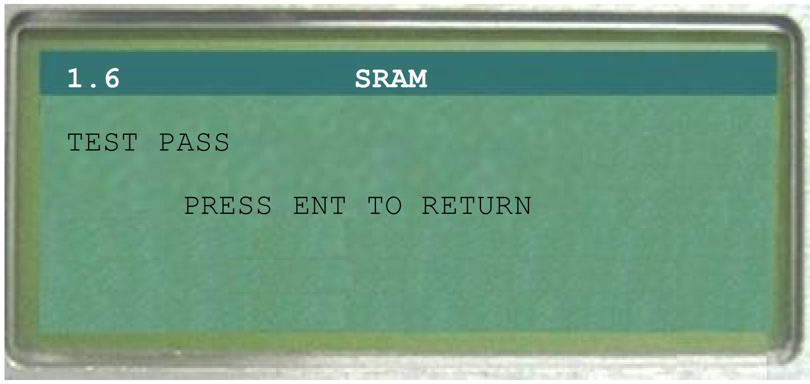


Figure C- 16: SRAM Test Result

Press **ENT** to return to the CPU menu.

C.3.1.7 Datakey Test

Press **7** from the CPU menu to execute the **Datakey test** (Figure C- 17: Datakey Test).

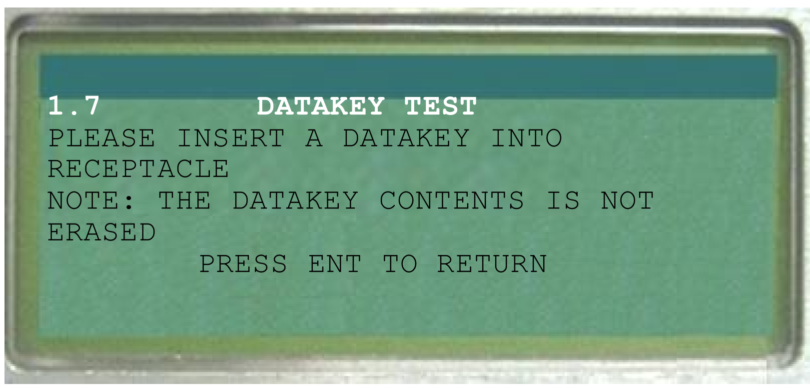


Figure C- 17: Datakey Test

The Datakey test reads the datakey type. This test was designed to test the datakey circuitry located in the hostboard PCB. During the test, the datakey content is not affected. If the datakey type was successfully read, the next screen appears (Figure C- 18: Datakey Test Result) indicating the test has passed.

Figure C- 18: Datakey Test Result

If the datakey was not inserted or detected, the following message is displayed (Figure C- 19: Datakey Test Not Inserted).

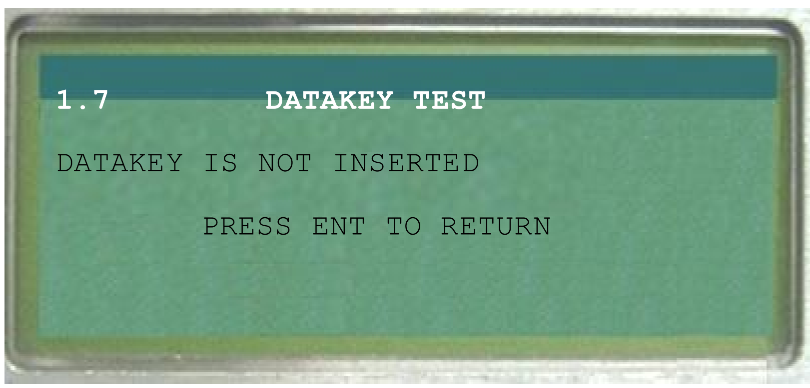


Figure C- 19: Datakey Test Not Inserted

Press **ENT** to return to the CPU menu.

C.3.1.8 EEPROM Test

Press **8** from the CPU menu to execute the **EEPROM test**.

This test verifies the correct functionality of the EEPROM circuitry by testing the first byte of memory.

If the test passes, the following screen appears (Figure C- 20: EEPROM Test).

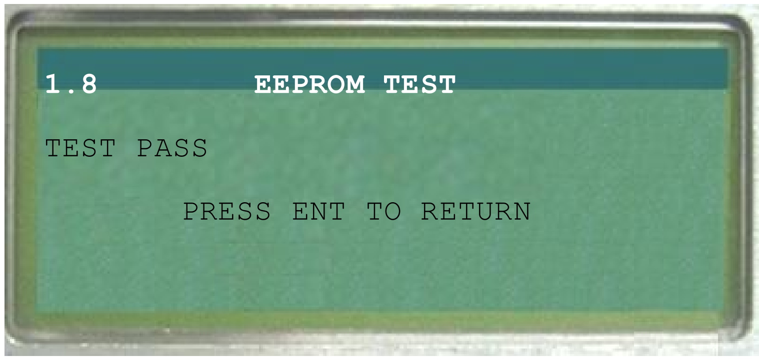


Figure C- 20: EEPROM Test

Press **ENT** to return to CPU menu.

Once returned to the CPU menu, press **ESC** again to return to the DAT Main menu.

C.3.2 INPUTS / OUTPUTS TEST

Two types of Field I/O modules may be tested: the **2070-2A** and the **2070-2N**. Testing of 2070-2A consists of 2 individual tests, **Loopback** and **False Inputs**. Testing of 2070-2N consists of one test, the **Fault Monitor & C15s test**. One Field I/O module may be tested at a time. Figure C- 21: Inputs and Outputs Test displays the I/O menu.

Figure C- 21: Inputs and Outputs Test

Depending of which Field I/O module is inserted into the ATC 2070 Controller; the user must select the module to test.

C.3.2.1 2070-2A Tests

After pressing **1** to perform tests with the 2070-2A, Figure C- 22: 2070-2A Tests displays the available tests for the I/O module.

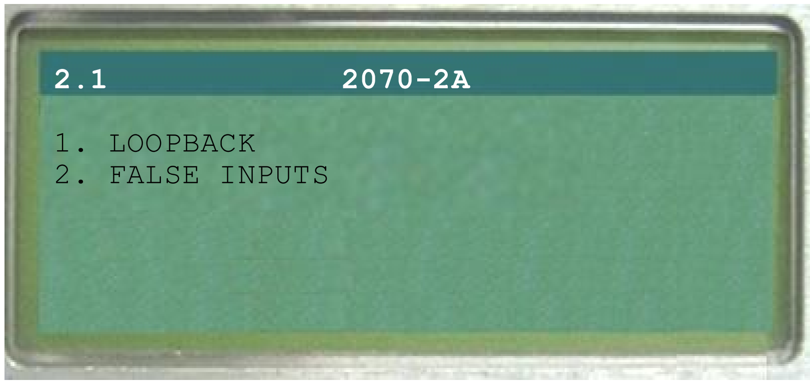


Figure C- 22: 2070-2A Tests

C.3.2.1.1 Loopback Test

- Press **1** to perform the Loopback test
- Ensure the C1S-C11S Loopback (M33826) is inserted in the back of the 2070-2A module before performing the Loopback test.

The test pass screen is displayed in Figure C- 23: 2070-2A Loopback Test.

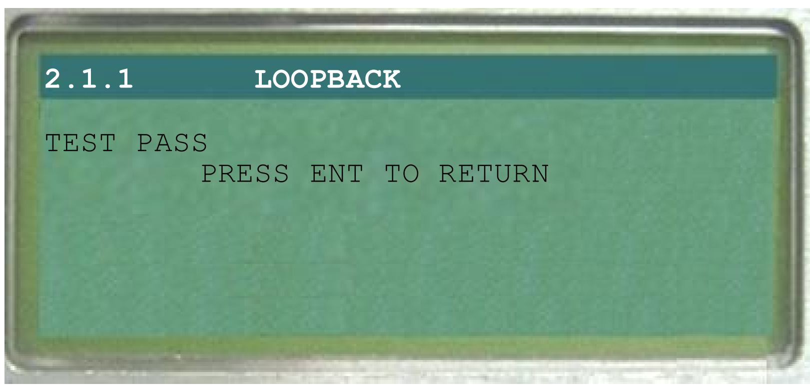


Figure C- 23: 2070-2A Loopback Test

If the test fails, it shows the compare fail position. The error log shows further information.

The Loopback test consists of checking all the 64 inputs and outputs, one to one.

C.3.2.1.2 False Inputs Test

- Press **2** to perform the False Inputs test.
- Ensure the C1S-C11S Loopback (M33826) cable is not connected (Figure C- 24: 2070-2A False Inputs Test)

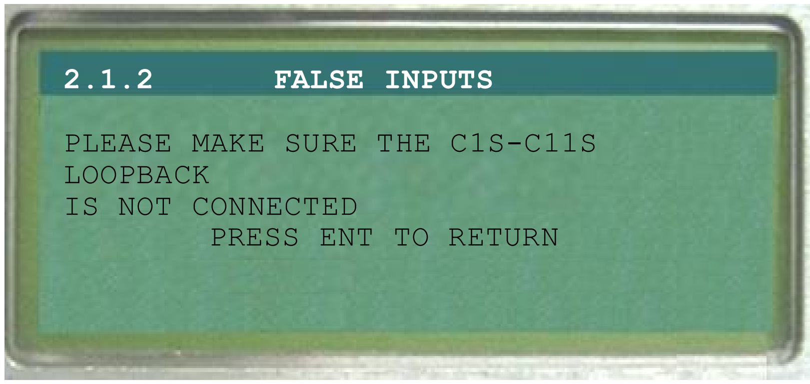


Figure C- 24: 2070-2A False Inputs Test

Test pass is shown in Figure C- 25: 2070-2A False Inputs Test Pass.

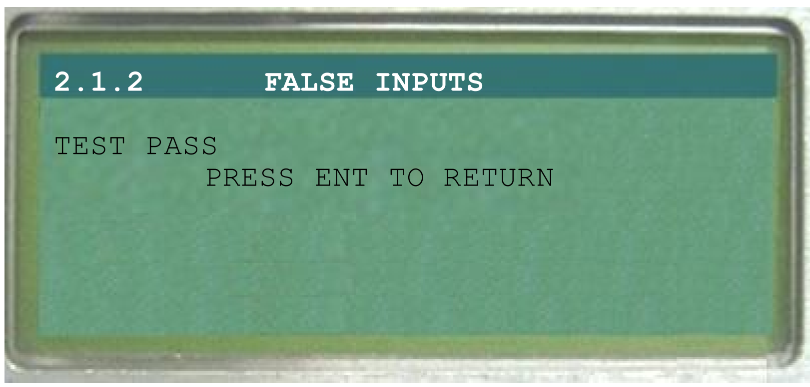


Figure C- 25: 2070-2A False Inputs Test Pass

If it fails, it displays the inputs fail port where an input or a group of inputs has been detected (Figure C- 26: 2070-2A False Inputs Test Fail).

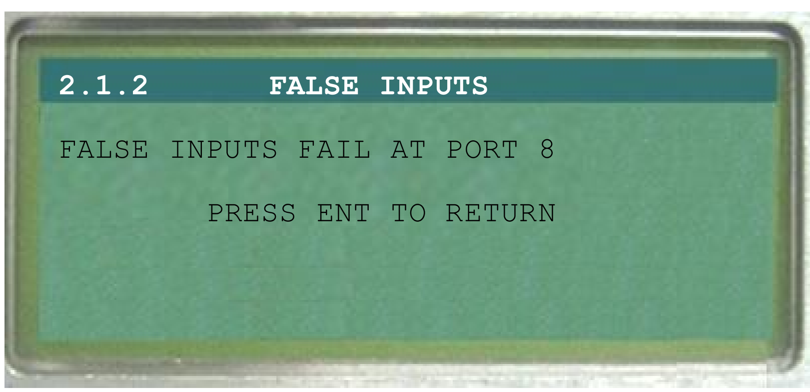


Figure C- 26: 2070-2A False Inputs Test Fail

Press **ENT** to return to the Inputs and Outputs menu.

C.3.2.2. 2070-2N Tests

Press **2** to test a 2070-2N module (F).

Figure C- 27: 2070-2N Test

C.3.2.2.1 Fault Monitor & C15S

The 2070-2N module has only one test. The **Fault Monitor & C15s** test consists of checking the proper functionality of the Fault monitor lines located at the A connector and the SP3S channel located at C15s.

- Ensure that the 2070-2N A-C15S power loopback (M59821) is correctly inserted into the A and C15s connectors before performing the test.
- Press **1** to perform the Fault Monitor & C15s test. If the inserted module is not a 2070-2N, the following message is displayed (Figure C- 28: 2070-2N Test, Incorrect Module).

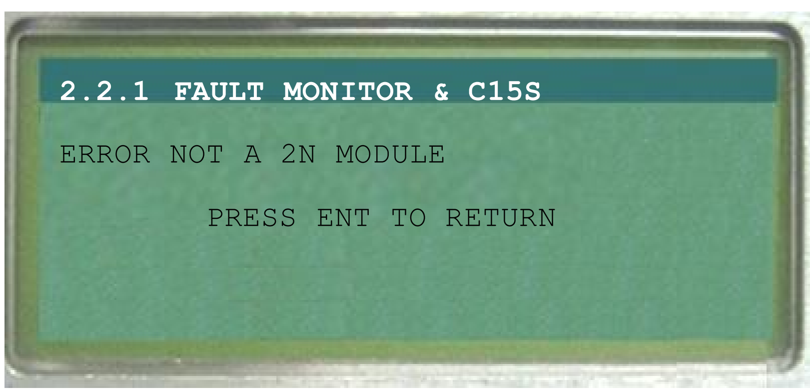


Figure C- 28: 2070-2N Test, Incorrect Module

Test pass is shown at Figure C- 29: 2070-2N Test Pass. If the test fails, test errors are stored in the Error Log.

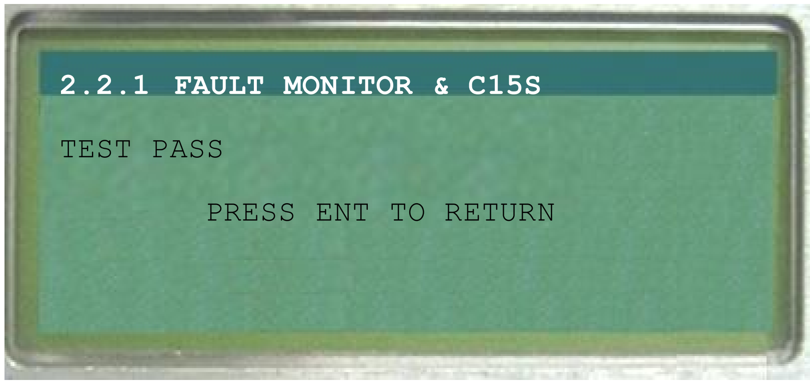


Figure C- 29: 2070-2N Test Pass

Press **ENT** to return to the 2070-2N menu; press ESC twice to return to the Main menu.

C.3.3 SERIAL PORTS

The Serial Ports test consists of 6 individual test combinations. During execution of the tests the active LED flashes.

Press **3** from the Main menu to display the Serial Ports menu (Figure C- 30: Serial Ports Menu).

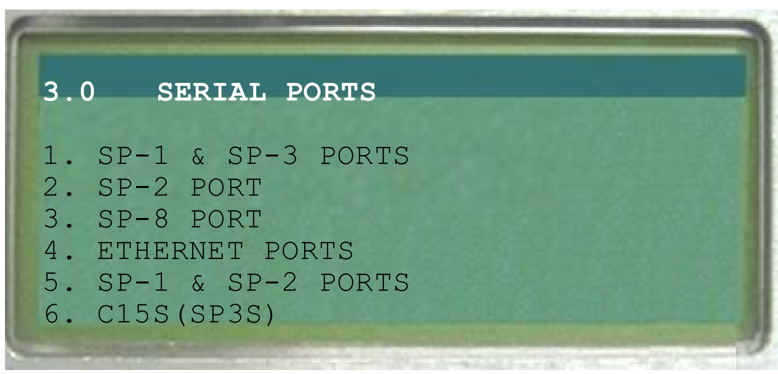


Figure C- 30: Serial Ports Menu

C.3.3.1 SP-1 and SP-3 Ports Test

SP-1 & SP-3 test. Runs at 38.4 Kbps in asynchronous mode, it also tests the proper operations of RTS, CTS, DCD control lines.

- Make sure two **2070-7A** boards are inserted into the Controller at slot A1 and A2.
- Connect **Asynchronous double loopback (M33828)** into the two **C21S** connectors.
- Press **1** to run the test.

C.3.3.2 SP-2 Port Test

SP-2 test. Runs at 38.4 Kbps in asynchronous mode, it also tests the proper operations of RTS, CTS, DCD control lines.

- Make sure a **2070-7A** board is inserted into the Controller slot A2.

- Connect **Asynchronous male Single Loopback (M33827)** into the **C22S** connector.
- Press **2** to run the test.

C.3.3.3 SP-8 Test

SP-8 test runs at 38.4 Kbps in asynchronous mode, it also tests the proper operations of RTS, CTS, DCD control lines.

- Connect **Asynchronous DB25 male Single Loopback (M33832)** into the **C13S** connector.
- Press **3** to run the test.

C.3.3.4 Ethernet Ports Test

ETHERNET PORTS test tests two Ethernets ports at time.

- Press **4** to run the test.
- Connect **ETHERNET CABLE (M59824)** into the **PORT2** and **PORT 1, SLOT 1** connector, (Figure C- 31: Ethernet Test 1 and Figure C- 35: Ethernet Test Step 2).
- Press **ENT** to test
- Connect **ETHERNET CABLE (M59824)** into the **PORT2** and **PORT 1, SLOT 2** connector, (Figure C- 33: Ethernet Test 3 and Figure C- 36: Ethernet Test Step 3)
- Press **ENT** to test
- Connect **ETHERNET CABLE (M59824)** into the **PORT2** and **PORT 1, SLOT 3** connector, (Figure C- 34: Ethernet Test Step 1 and Figure C- 36: Ethernet Test Step 3)
- Press **ENT** to test

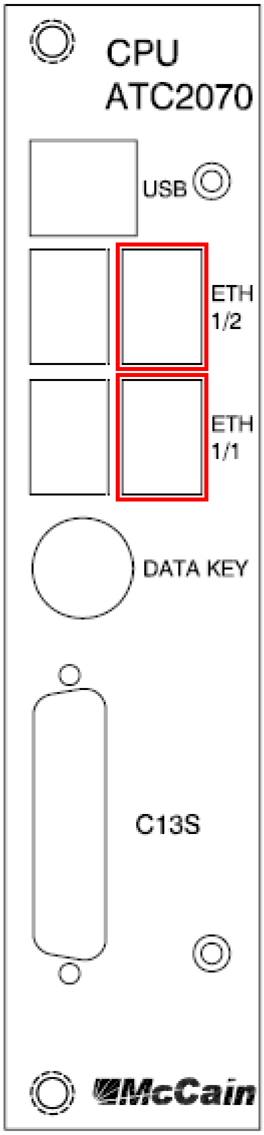


Figure C- 31: Ethernet Test 1

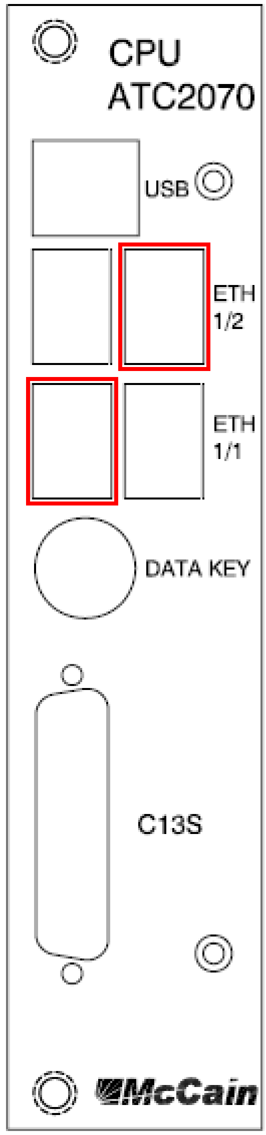


Figure C- 32: Ethernet Test 2

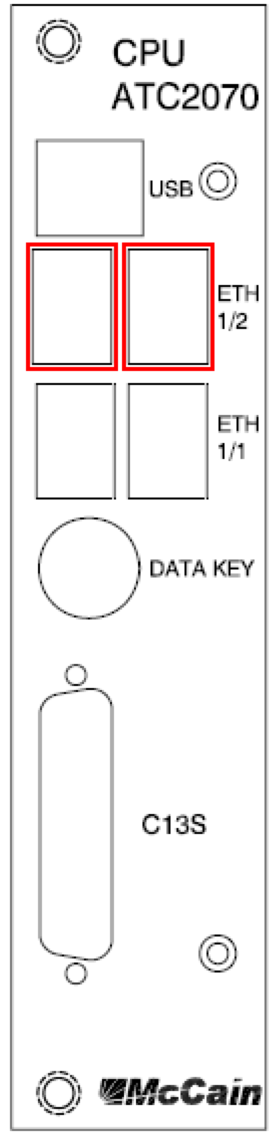


Figure C- 33: Ethernet Test 3

Figure C- 34: Ethernet Test Step 1

Figure C- 35: Ethernet Test Step 2

Figure C- 36: Ethernet Test Step 3

C.3.3.5 SP-1 and SP-2 Port Test

SP-1 & SP-2 test runs at 38.4 Kbps in asynchronous mode, it also tests the proper operations of RTS, CTS, DCD control lines.

- Make sure a **2070-7A** board is inserted into the Controller slot A2.
- Connect **Asynchronous double loopback (M33828)** into the **C21S** and **C22S** connectors.
- Press **5** to run the test.

C.3.3.6 C15S (SP3S) Port Test

C15S (SP3S) test. Runs at 153.6 Kbps in synchronous mode. This test can be performed in the 2070-2A/2070-2E, 2070-2N or 2070-7B module.

2070-2E/2070-2A

- Insert the module 2070-2E/2070-2A at slot A3 with the S1 switch in **ON** position.
- Connect **Synchronous Single Loopback (M59818)** into the **C12S** connector.
- Press **6** to run the test.

2070-2N

- Insert the module 2070-2N at slot A3.
- Connect **Synchronous Single Loopback (M59818)** into the **C15S** connector.
- Press **6** to run the test.

2070-7B

- Insert the module 2070-7B at slot A1.
- Connect **Synchronous Single Loopback (M59818)** into the **C21S.**
- Press **6** to run the test.

Pressing the keys from **1** to **6** executes the corresponding test; if the test fails or passes the user is notified. Press **ESC** to return to Main menu.

> **NOTE:** “Ethernet cable” is a standard cable with a standard pinout configuration used for networking.

C.3.4 FRONT PANEL TEST

The testing for the front panel is sequential, meaning that the features cannot be tested separately or in isolation.

Select option **4** from DAT Main menu, and the sequential test starts:

The Active LED flashes.

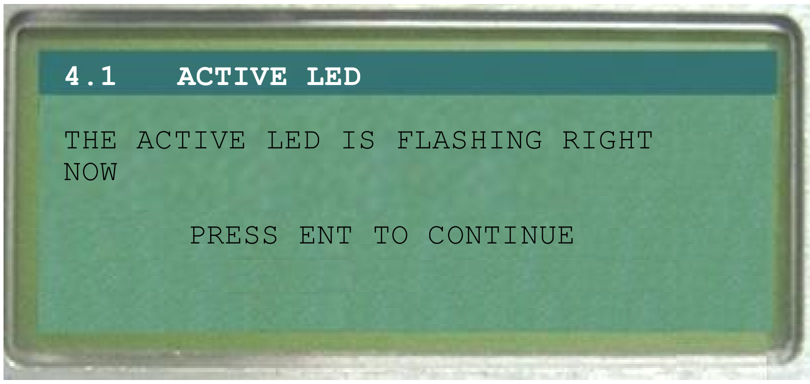


Figure C- 37: Front Panel LED Test

After pressing **ENT**, the backlight flashes at the rate of once per second (Figure C- 38: Front Panel Backlight Test).

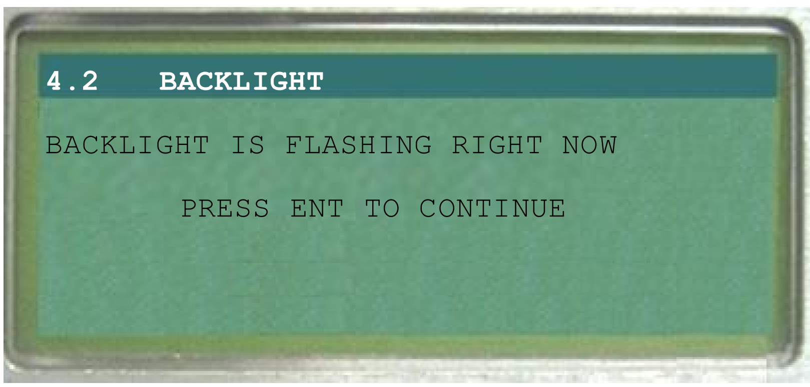


Figure C- 38: Front Panel Backlight Test

After pressing **ENT**, the next screen appears, and a beep is heard every second.

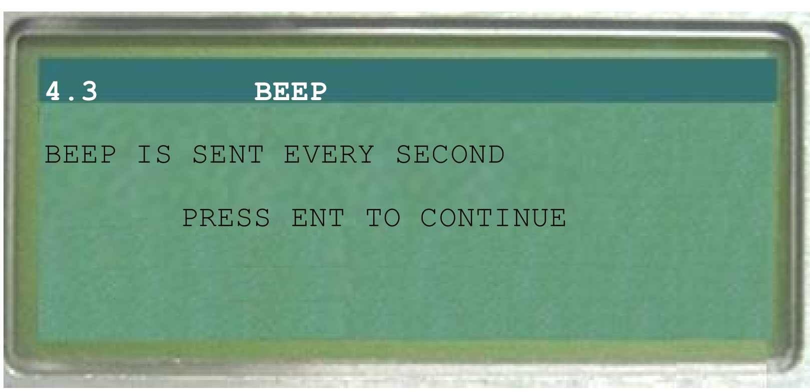


Figure C- 39: Front Panel Beep Test

After pressing **ENT**, the test screen validates the switch and keypads functionality. To confirm each key, it is pressed, and the output is written below the corresponding character on the screen, which also shows the status of the front panel AUX switch. To skip the test, press any key 3 times consecutively.

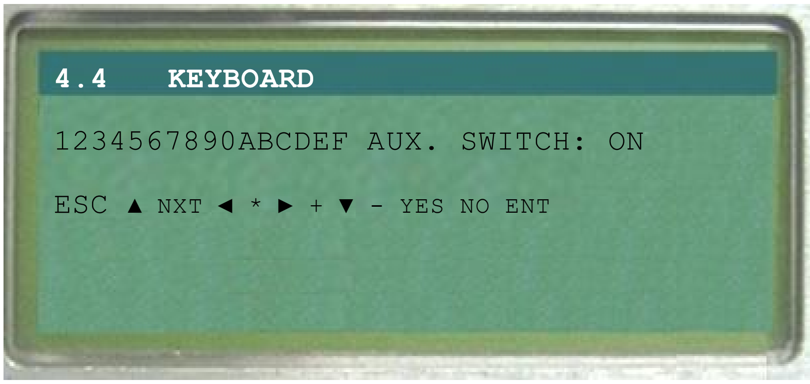


Figure C- 40: Front Panel Keyboard Test

After pressing the same key 3 times consecutively, the next test screen validates the proper functionality of each pixel on the LCD display by filling and blanking the Panel LCD continuously at the rate of one second each (Figure C- 41: Front Panel Blank Test).

Figure C- 41: Front Panel Blank Test

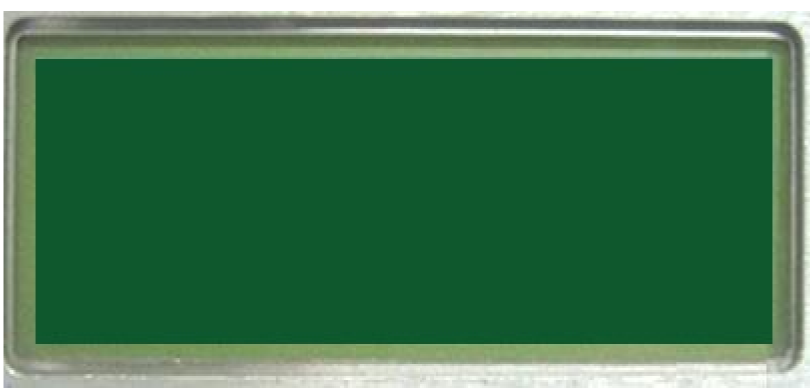


Figure C- 42: Front Panel Fill Test

After pressing any key, the test for the front panel module is finished and the Main menu is displayed.

C.3.5 CONTINUOUS TEST

The continuous test menu includes tests for DRAM, SRAM, Field I/O (2070-2A or 2070-2N), SP-1 & SP-3 PORTS, SP-2, SP-8, SP-1 & SP-2 PORTS and C15S (SP3S). After selecting option **5** from DAT Main menu, the Setup Continuous Tests menu appears (Figure C- 43: Continuous Setup Test Page 1). During the continuous test the active LED flashes.

The tests to be performed are selected/deselected by positioning the cursor on the check boxes and pressing the keys **YES** or **NO**. User can scroll down to continue the test listing. Pressing **ENT** starts the continuous test.

1. Use the ***Basic Test Configuration A*** if the Controller has the 2070-2A field I/O. Select: DRAM, SRAM, I/O LOOPBACK, SP-1 & SP-3 PORTS, SP-2 and SP-8 and follow the next steps:
    - Make sure the two **2070-7A** boards are inserted in the Controller slots A1 and A2.
    - Connect the **Asynchronous Double Loopback** into the two **2070-7A C21S** connectors ports
    - Connect the **Asynchronous male Single Loopback** into the **2070-7A C22S** located at the slot A2.
    - Connect the **Asynchronous DB25 male Single Loopback** into **C13S** connector located in the ATC2070 CPU board.
    - Connect the **C1S-C11S Loopback** to **2070-2A** Field I/O board.

2. Use the ***Basic Test Configuration B*** if the Controller has the 2070-2N field I/O. Select: DRAM, SRAM, I/O 2N FAULT MON, SP-1 & SP-2 PORTS and SP-8 and follow the next steps:
    - Make sure the **2070-7A** board is inserted in the Controller slot A2.
    - Connect the **Asynchronous Double Loopback** into the **2070-7A** board **C21S** and **C22S** connectors.
    - Connect the **Asynchronous DB25 male Single Loopback** into **C13S** connector located in the ATC2070 CPU board.
    - Connect the **A-C15S power loopback** to **2070-2N** Field I/O board.

When ready, press **ENT** to start the continuous test. User may stop the test any time.

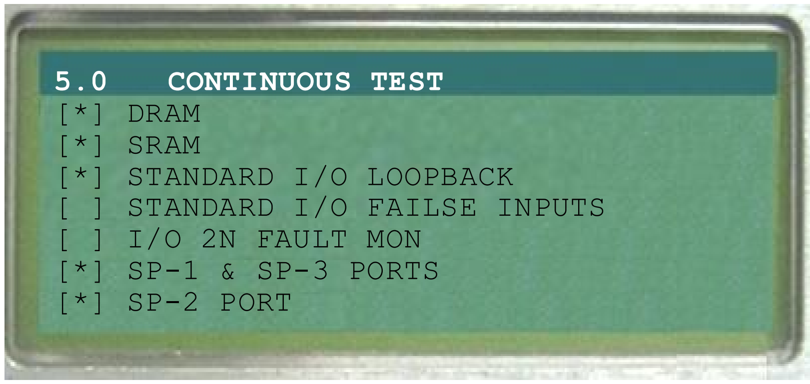


Figure C- 43: Continuous Setup Test Page 1

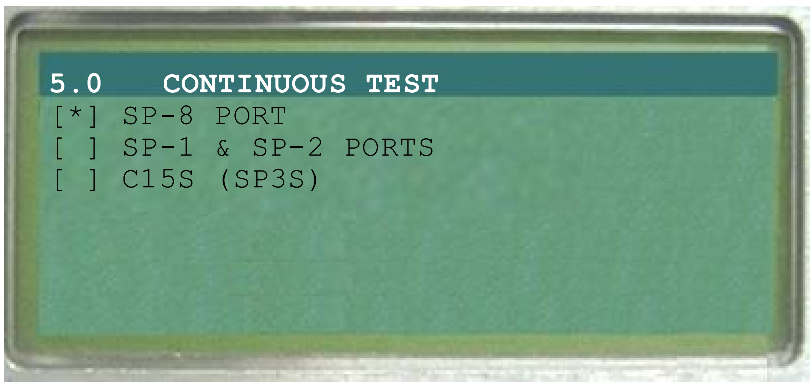


Figure C- 44 Continuous Setup Test Page 2

During the test, the next screen is displayed (Figure C- 45: Continuous Test Running). The left number indicates the pass count and the right number indicates the fail count.

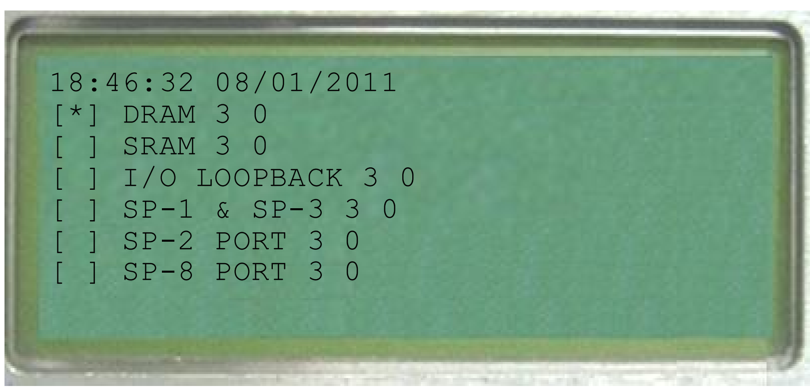


Figure C- 45: Continuous Test Running

The number located on the right indicates the test failures count; it rolls over to zero after 1,000,000 errors. The Controller date and time is always displayed at the top of the screen.

The user may stop/interrupt the test by pressing ESC (Figure C- 46: Continuous Test Abort). Before stopping the continuous test, the Controller prompts the user to confirm this action.

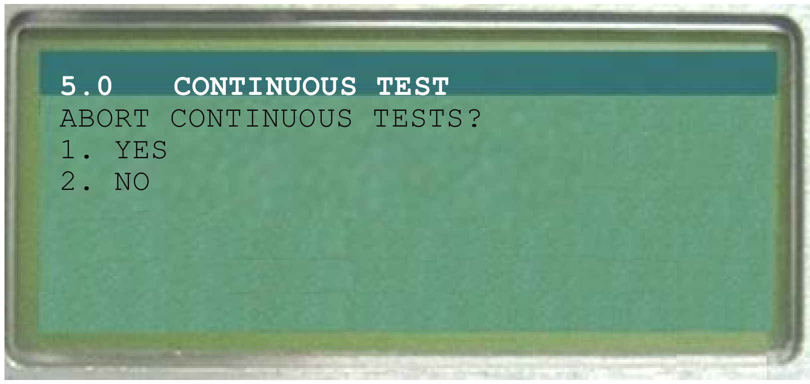


Figure C- 46: Continuous Test Abort

Once the test has been stopped, the user may see the Continuous Test Summary (Figure C- 47: Continuous Test Prompt to Show Summary). The Continuous Test Summary describes how many pass and fail cycles occurred per test, during the entire continuous test (Figure C- 48: Continuous Test Summary). Errors are registered in the Error Log.

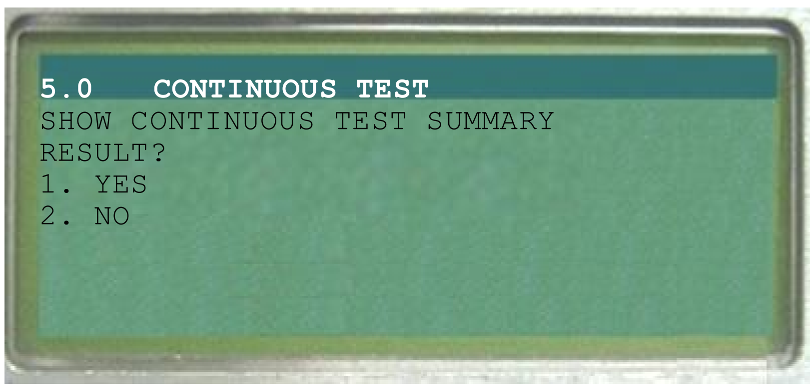


Figure C- 47: Continuous Test Prompt to Show Summary

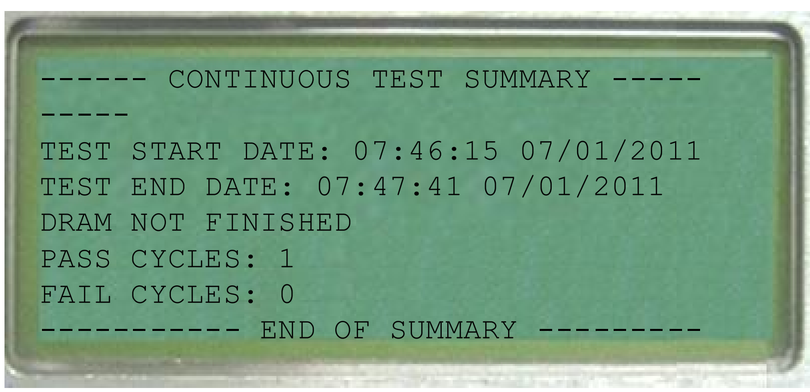


Figure C- 48: Continuous Test Summary

Press the up and down keys to scroll up and down. Press **0** to erase the Summary Log.

Press ESC to return to the Main menu.

C.3.6 LOGS

Press **6** key from the Main menu to view DAT logs menu (Figure C- 49: Log Menu). Four types of logs may be generated by the DAT. These are:

- **SYSTEM LOG**. This contains logged DAT events such: change of date, Controller power down and launch of DAT. This is limited to 64KB.
- **ERROR LOG**. Contains all the errors logged generated from tests. This is limited to 64KB.
- **SUMMARY LOG**. After running and stop a continuous test the Summary Log is generated.
- **EXTENDED LOG**. After running and stopping a continuous test, the Extended Log is generated. This indicates the date and time when a test starts and ends. This is limited to 64KB.

These four logs are statically saved on the SRAM drive (/sram)

Figure C- 49: Log Menu

C.3.6.1 System Log Test

Press **1** to show the **System Log** (Figure C- 50: System Log): The user may scroll up and down using the arrow keys. Press **0** to erase the log.

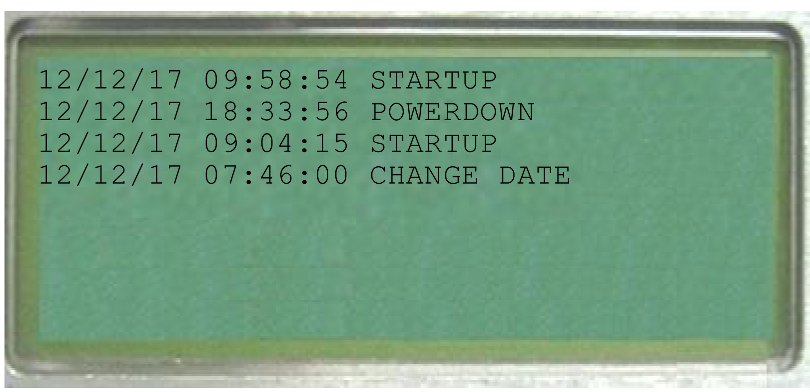


Figure C- 50: System Log

C.3.6.2 Error Log Test

Press **2** to show the **Error Log** (Figure C- 51: Error Log): The user may scroll down and up using the arrow keys. Press **0** to erase the log.

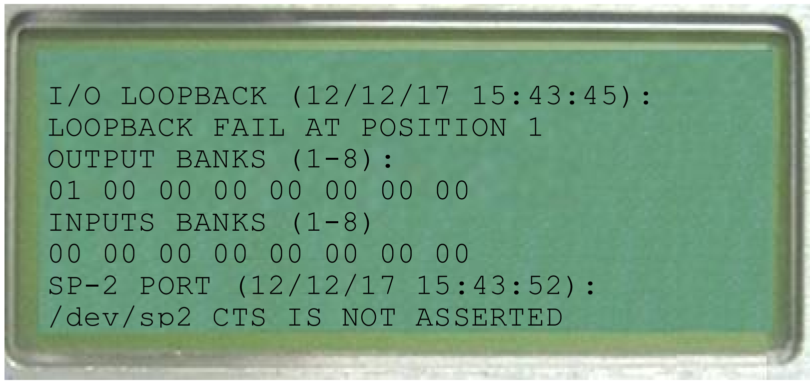


Figure C- 51: Error Log

C.3.6.3. Summary Log Test

Press **3** key to show the **Summary Log**. The user may scroll down and up using the arrow keys. Press **0** to erase the log

C.3.6.4. Extended Log Test

Press **4** key to show the **Extended Log** (Figure C- 52: Extended Log). The user may scroll down and up using the arrow keys. Press **0** to erase the log

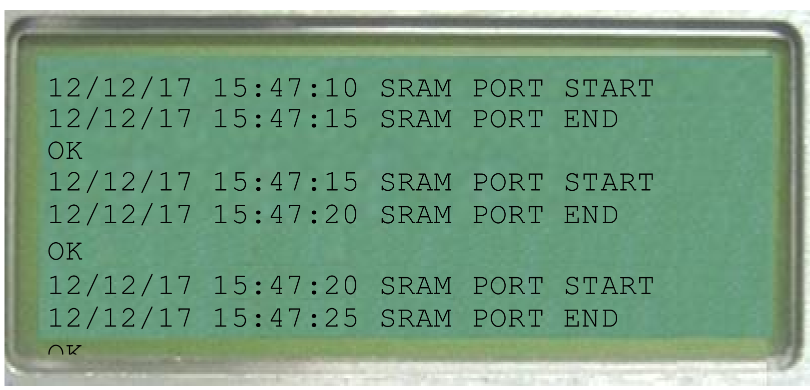


Figure C- 52: Extended Log

C.3.7 TOOLS

Press **7** from Main menu to access the Controller **Tools** features. The Tools menu includes a menu to configure the Controller's Ethernet ports, an option to run Linux scripts from USB, and options to Manage Services and Manage Users and an option to exit the DAT. Figure C- 53: Tools Menu displays the DAT Tools menu.

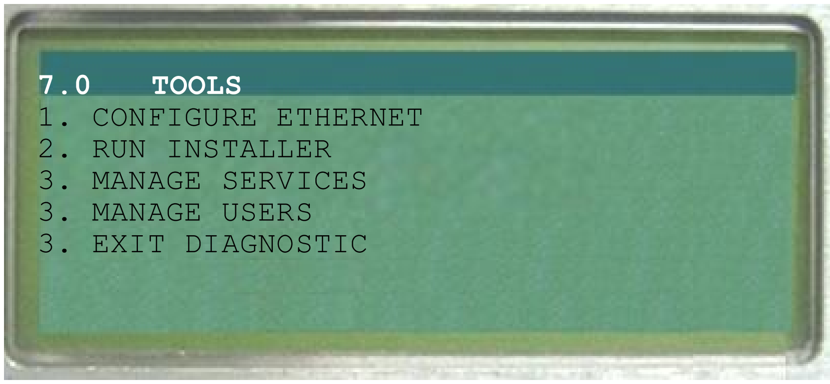


Figure C- 53: Tools Menu

C.3.7.1 Configure Ethernet

Press 1 from extras menu to view/set the Controller Ethernet settings. Ethernet screen is displayed on Figure C- 54: Ethernet Port 0 Configuration and Figure C- 55: Ethernet Port 1 Configuration.

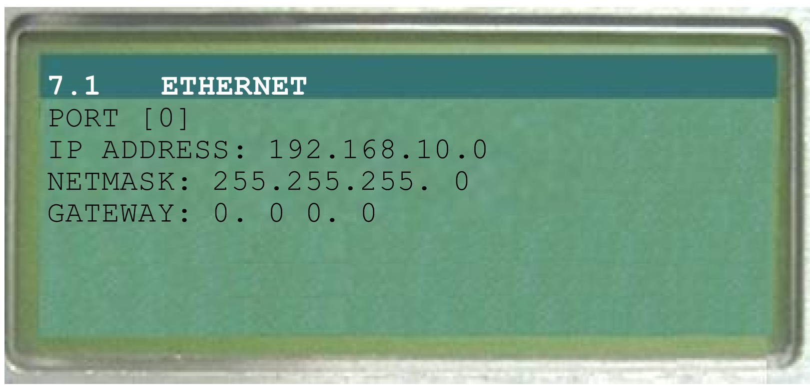


Figure C- 54: Ethernet Port 0 Configuration

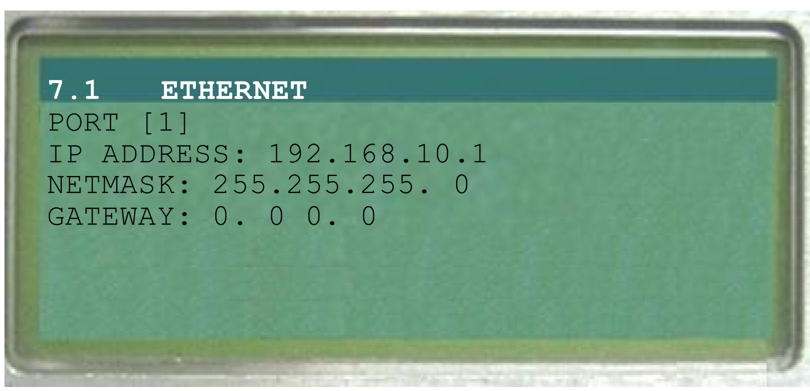


Figure C- 55: Ethernet Port 1 Configuration

Navigate with arrow keys to set a field value, press YES and NO keys to change port parameter, port 0 indicates eth0, port 1 indicates eth1. When done, press **ENT** to save Ethernet parameters, otherwise, press **ESC** to return to the Tools menu.

C.3.7.2 RUN INSTALLER

Press **2** from the Tools menu to Run Installer. This allows the user to install *Omni* software from a USB. Three submenu are:

1. Secure Install Omni from USB – This option requires a USB formatted as FAT and contains a .mcfw (macro that runs on Linux) and contains the *Omni* files.
2. Manage Omni Versions – The Controller is able to manage and store multiple versions of *Omni.* The user can select different versions as necessary from this menu selection.
3. Reboot Controller – This reboots the Controller and if an *Omni* version is installed correctly, restarts *Omni*.

C.3.7.3 MANAGE SERVICES

Press **3** from the Tools menu to Manage Services. This allows the user to turn on services that by default are off:

1. SSH/SCP is used in the process of uploading ATSPMs to *Transparity*. If ATSPMs are being provided by the Controller, this needs to be turned ON.
2. FTP – File Transfer Protocol is not used very much anymore and should be left OFF.
3. NFS – Unless needed this should also remain OFF.

C.3.7.4 MANAGE USERS

Press **4** from the Tools menu to Manage Users. This allows an agency to set up users to access the Controller using a 4 digit Username and a 4-digit PIN. Users can be set up as:

1. Limited (view only) – only able to view configurations and data, can't add users.
2. Admin (full access) – change data, configurations, add users.

C.3.7.5 EXIT DIAGNOSTIC

Press **5** from the Tools menu to reboot the Controller to *Omni* if it is installed.

> **NOTE:** Use of third-party software may eliminate or remove this diagnostics feature during its installation process.

Appendix D: Cable Pinouts for Diagnostics

This section describes the pinout configuration for the cables and loopback connectors used in the McCain ATC eX Diagnostics Acceptance Tests (DAT).

D.1 DB15 Synchronous Single Loopback (M59818)

This loopback connector is used to test the synchronous ports individually. It is used on the C15S (SP3S) port in the 2070-2N or in the C21S port in the 2070-7B module.

DB15 Male connector, P/N= M44765 x 1EA.
Hood Locking DB15, P/N= M24548 x 1EA.
Label for identifying the loopback.

Configuration:

DB15 Male	
FROM	**TO**
1 (TxD+)	5 (RxD+)
3 (TxCLKO+)	7 (RxCLK+)
9 (TxD-)	13 (RxD-)
11(TxCLKO-)	15 (RxCLK-)

D.2 DB25 Synchronous single loopback (M59822).

This loopback connector is used to test the synchronous port individually; it is used on C12S (SP3S) port in the 2070-2A / 2070-2E.

DB25 Male connector, P/N= M17043 x 1EA.
Hood Locking DB25, P/N= M17042 x 1EA.
Label for identifying the loopback.

Configuration:

DB25 Male	
FROM	**TO**
5 (TxD+)	6 (RxD+)
7 (TxC+)	8 (RxC+)
18 (TxD-)	19 (RxD-)
20 (TxC-)	21 (RxC-)

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D.3 DB9 ASYNCHRONOUS SINGLE LOOPBACK (M33827).

This loopback connector is used to test in asynchronous mode one port (SP-2)

DB9 Male connector, P/N= M17045 x 1EA.
Hood Locking DB9, P/N= M17047 x 1EA.
Label for identifying the loopback.

Configuration:

DB9 Male	
FROM	**TO**
2 (Rx)	3 (Tx)
1 (DCD)	8 (CTS)
8 (CTS)	7 (RTS)

D.4 DB9 – DB9 ASYNCHRONOUS DOUBLE LOOPBACK (M33828).

This loopback cable is used to test communications between two asynchronous ports; for example, it is used on a 2070-7A C21S and C22S when running the Continuous test, option SP-1 & SP-2 PORTS.

DB9 Male connector, P/N= M17045 x 2EA
Hood Locking DB9, P/N= M17047 x 2EA.
Cable, 22, 6 conductors, 1 foot long.
Label for identifying the loopback.

Configuration:

DB9 Male #1	DB9 Male #2
FROM	**TO**
2 (Rx)	3 (Tx)
3 (Tx)	2 (Rx)
5 (GND)	5 (GND)
7 (RTS)	8 (CTS), 1 (DCD)
8 (CTS), 1 (DCD)	7 (RTS)

D.5 DB25 ASYNCHRONOUS SINGLE LOOPBACK (M33832).

This loopback cable is used to test communications on connector C13S located in the CPU module, it test the SP-8 port.

DB25 Male connector, P/N= M17043 X 1EA.
Hood locking DB25,   P/N= M17042 X 1EA.
Label for identifying the loopback.

Configuration:

DB25 Male	
FROM	**TO**
1, TxD+	2, RxD+
3, TxCLK+	4, RxCLK+
5, RTS+	6, CTS+
7, DCD+	6, CTS+
14, TxD-	15, RxD-
16, TxCLK -	17, RxCLK -
18, RTS -	19, CTS -
20, DCD -	19, CTS -

D.6 Terminal Cable (M59816).

This cable is used as terminal, this is connected in the C50S from the front panel.

DB9 Male connector, P/N= M17045 x 1EA.
DB9 Female connector, P/N= M17046 x 1EA.
Hood Locking DB9, P/N= M17047 x 2EA.
Cable, 22, 2 conductors, 10 foot long.
Label for identifying the cable.

Configuration:

DB9 Male	DB9 Female
FROM	**TO**
2 (Rx)	3 (Tx)
3 (Tx)	2 (Rx)
5 (GND)	5 (GND)
5 (GND), 1 ()	

D.7 A - C15S power loopback (M59821)

This loopback is used to test the 2070-2N module.

P/N	DESCRIPTION	QTY.
M17371	POWER CORD,6',3 CONDUCTOR	1 EA
M22878	CABLE TIE/LABEL 4”	1 EA
M23023	CONN,18-1 0,PLUG W/SKTS	1 EA
M23020	CONN, HOOD-KING COUNTY CLAMP W/BUSH	1 EA
M44765	CONN, 15POS, PLUG, SOLDER CUP, SIZE 2,	1 EA
M24548	SHELL, DB CONN SIZE 2;45/STRAIGHT EXIT	1 EA
M24636	TERM,#6,RD,RING TONG TAP, AWG 22-16	1 EA
M13875	CABLE, 22AWG, BLK/WHT, 7/30 STR,GREY	0.75 FT

P/N	DESCRIPTION	QTY.
M13946	WIRE, 20, GRN, 19 STR	0.60 FT

A – C15S POWER LOOPBACK	
FROM	**TO**
Pin “A” (A Connector)	White cable (AC Power Cord)
Pin “C” (A Connector)	Black cable (AC Power Cord)
Pin “H” (A Connector)	Green cable (AC Power Cord)
	Term #6
Pin “F” (A Connector)	Pin10 (DB15)
Pin “G” (A Connector)	Pin 8 (DB15)
Pin 1 (DB15)	Pin 5 (DB15)
Pin 3 (DB15)	Pin 7 (DB15)
Pin 9 (DB15)	Pin 13 (DB15)
Pin 11 (DB15)	Pin 15 (DB15)

D.8 C1S-C11S Loopback (M33826).

This loopback is used to test the Field I/O 2070-2A / 2070-2E module.

P/N	DESCRIPTION	QTY.
M11625	SCREW,4-40 X 1/4,PH,PN,SS	2 EA
M11643	SCREW,4-40 X 3/8,SL,FIL SS	2 EA
M11734	WASHER,#6,SPLIT LOCK,SS	4 EA
M24527	PIN HOOD,EXTERNAL CLOSED M SERIES	1 EA
M24523	CONN,PLUG HOUSING,104POS RECT.	1 EA
M24531	SOCKET,CORNER 104CF CONN ECTORS,SS	2 EA
M24530	GUIDE PIN KIT,104CF,SS .130 SPAC SERIES	2 EA
M24528	SHIELD KIT, 104CF M SERIES, 2PC 45 DEG	1 EA
M24566	CONN,CPC 23-37 PLUG REVERSE SEX	1 EA
M24562	CABLE CLAMP,CPC SHELL 23 BULK PKG	1 EA
M24724	PIN,TYPE III,CRIMP GLD/NICKEL AWG 24-20	128 EA
M13844	WIRE,22,BLK,19STR MIL-W-16878/2	30 FT
M13920	EXPANDO BRAID,1/2",BLACK	1 FT
N/A	LABEL FOR IDENTIFYING THE LOOPBACK	1 EA

CONFIGURATION			
WIRES IN C1S		WIRES IN C1S	
FROM	TO	FROM	TO
2, C1S	39, C1S	103, C1S	74, C1S
3, C1S	40, C1S	83, C1S	75, C1S
4, C1S	41, C1S	84, C1S	76, C1S
5, C1S	42, C1S	85, C1S	77, C1S
6, C1S	43, C1S	86, C1S	78, C1S
7, C1S	44, C1S	87, C1S	79, C1S
8, C1S	45, C1S	88, C1S	80, C1S
9, C1S	46, C1S	89, C1S	81, C1S
10, C1S	47, C1S	90, C1S	82, C1S
11, C1S	48, C1S		
12, C1S	49, C1S	WIRES IN C11S	
13, C1S	50, C1S	FROM	TO
15, C1S	51, C1S	1, C11S	23, C11S
16, C1S	52, C1S	2, C11S	24, C11S
17, C1S	53, C1S	3, C11S	25, C11S
18, C1S	54, C1S	4, C11S	26, C11S
19, C1S	55, C1S	5, C11S	27, C11S
20, C1S	56, C1S	6, C11S	28, C11S
21, C1S	57, C1S	7, C11S	29, C11S
22, C1S	58, C1S	8, C11S	30, C11S
23, C1S	59, C1S		
24, C1S	60, C1S	WIRES FROM C1S TO C11S	
25, C1S	61, C1S	FROM	TO
26, C1S	62, C1S	27, C1S	10, C11S
31, C1S	63, C1S	28, C1S	11, C11S
32, C1S	64, C1S	29, C1S	12, C11S
33, C1S	65, C1S	30, C1S	13, C11S
34, C1S	66, C1S	91, C1S	15, C11S
35, C1S	67, C1S	93, C1S	16, C11S
36, C1S	68, C1S	94, C1S	17, C11S
37, C1S	69, C1S	95, C1S	18, C11S
38, C1S	70, C1S	96, C1S	19, C11S
100, C1S	71, C1S	97, C1S	20, C11S
101, C1S	72, C1S	98, C1S	21, C11S
102, C1S	73, C1S	99, C1S	22, C11S

D.9 Ethernet Cable (M59824).

This cable is used to test communications, it test the Ethernet ports in the CPU module.

Cable Ethernet, P/N= M57012 X 1EA.
Conn RJ45,   P/N= M57013 X 2EA.

Configuration:	
1	White/Orange.
2	Orange.
3	White/Green.
4	Blue.
5	White/Blue.
6	Green.
7	White/Brown.
8	Brown.

Appendix E: Quick Start Guide

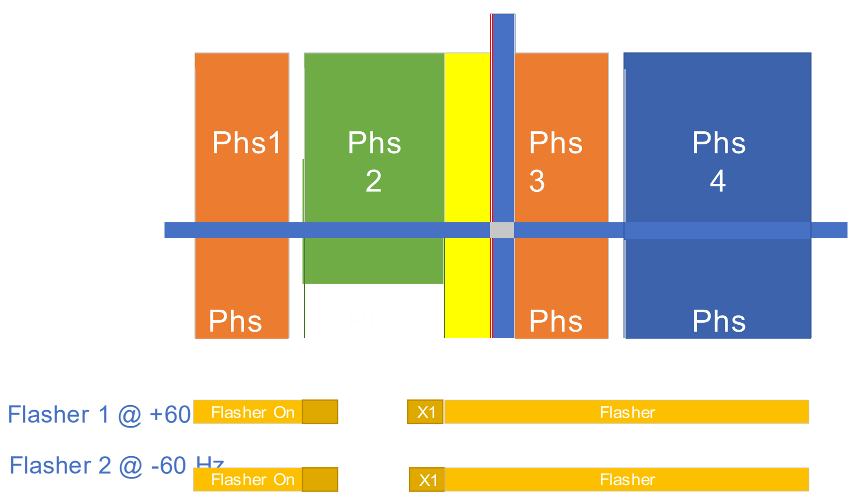
E.1 Ethernet Cable (M59824).

This section provides instructions on how to set up an advanced warning beacon for high speed approaches to an intersection. In this example, the following conditions are used:

- TS2 Type 1 cabinet running eX2 controller and Omni 1.11.13
- 8 phase intersection using phases 1 - 8 and are located on channels 1 - 8
- Peds are P2, P4, P6, P8 and are located on channels 13, 14, 15, 16
- Advanced flashers are on channels 9 and 10 and use two outputs per channel to produce a Wig Wag output for the flashers.
- There is an advance flasher for each approach which are configured separately to turn on with their appropriate phase.

Phases 2 and 6 are the high-speed approaches and are the phases used to activate the advance flasher beacons. For this example, the following scenario is programmed:

X2 is the time after phases 2 and 6 green start that the flashers should end



X1 is the time before phases 2 and 6 green end that the flashers should start

Flasher 1 is associated with Phase 2and Flasher 2 is associated with Phase 6. For both flashers there are two programmable times, X1 and X2. X1 is the advance start time which can be programmed to turn on some "X" seconds before the end of Phase Green. X2 is the time after Phase Green starts that the flasher will turn off.

Note that the flasher remains on after Phase Green starts, allowing the platoon waiting on the Green to start moving.

The flasher starts again before the Phase Green ends, to ensure that vehicles approaching have advance warning that the light is about to change. The MUTCD has prescribed programmabletimes and distances from the intersection that AWBs (also called Advance Warning Flashers (AWF)) should be placed. This document outlines the steps to program *Omni eX* for AWBs; however, times must be provided by a Traffic Engineer.

E.1.1 Programming the Omni Controller

There are several steps to program the Omni Controller for using Advance Warning Flashers. In order of configuration the user must:

1. Set up the phases, channels and cabinet configuration as would normally be done in any configuration setup.
2. Configure the logic to provide the outputs necessary to drive the flasher beacons.
3. Configure the outputs on the selected load switches used for the flasher beacons.
4. Cabinet testing should be performed in a test environment prior to installation in the field.

E.1.2 Configure Channels and Phase Timings

```
1.4             CHANNEL SETUP
                 11111111112222222222333
 CHAN#  12345678901234567890123456789012
TYPE    VVVVVVVVOOOOPPPPVVVVVVVVVVVVVVVV
SOURCE  12345678....1234................
ALT1/2HZ................................
FLSHRED XXXXXXXX....XXXX................
FLSHYEL ................................

Press Q to exit
y=YES n=NO x=NEXT
```

As seen here, channels 1 – 8 are set up as vehicles, Peds are located on channels 13 – 16, and there are no assigned outputs for channels 9 – 12. The outputs for the flashers come out on channels 9 and 10 but are assigned later in a following step when the I/O mapping is done. This is configured from the Main Menu by selecting 1 for Unit and 4 for Channel Setup. For reference, M-1-4 is the format in this text for guidance to the required menu page.

```
2.1         PHASE TIMINGS SET 1         DR
 PHASE#     1   2   3   4   5   6   7   8
MIN GRN     5  10   5   5   5  10   5   5
PASS/10     0   0   0   0   0   0   0   0
MAX 1       7   7   7   7   7   7   7   7
MAX 2       0   0   0   0   0   0   0   0
YEL/10     30  40  30  40  30  40  30  40
RED/10     10  20  10  20  10  20  10  20

Press Q to exit
y=YES n=NO x=NEXT
```

Times must be adjusted accordingly. This is done in page M-2-1(1). There are four timing sets, with (1) as the first timing set. Provide timing for all the phases in use as necessary.

```
2.1         PHASE TIMINGS SET 1        U R
 PHASE#     1   2   3   4   5   6   7   8
ALT WALK    0   0   0   0   0   0   0   0
ALT PDCLR   0   0   0   0   0   0   0   0
ADV WALK    0   0   0   0   0   0   0   0
DLY WALK    0   0   0   0   0   0   0   0
ST DLY/10   0   0   0   0   0   0   0   0
GRN CL/10   0  50   0   0   0  50   0   0

Press Q to exit
y=YES n=NO x=NEXT
```

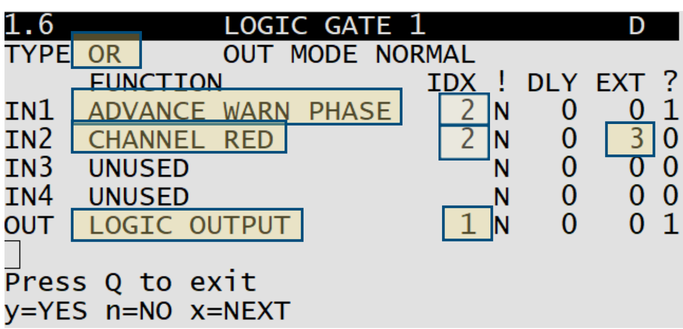
Scroll all the way to the bottom of the page. The “GRN CL/10” provides one of the times mentioned above, X1. This entry is in 10ths of seconds so the 50 seen here is 5 seconds. This sets the time that the flashers will turn on prior to the end of Phase 2 and Phase 6 Green. It is more apparent in the next several steps which describe how this function is used.

E.1.3 Programming the Gates

The next steps utilize the ability of the *Omni Ex* controller to use logic statements to perform unique operations. For this example, the gates are used to turn the flashers on and off during certain sequences, as well as make the flashers “Wig-Wag” to provide more visibility as required by MUTCD. There are a total of 8 gates programmed. The first 4 set up the outputs necessary to drive the indications on the AWB. The second 4 gates are used to make the signal indications “Wig-Wag.” Start off by going to M-1-6(1).

There are several items that must be programmed. In steps 1 – 4 after setting up the illustrated items, scroll down to the bottom of each page and set the “DLY / EXT UNITS to SEC so that the extensions set for IN2 on each page is 3 seconds. Default for this function is TENTH or 1/10 of a second.

All logic functions can be selected with the cursor. By using the “+” or “-“ keys, selections can be made for a list of functions. Click ENTER when the selection is made to enter it.



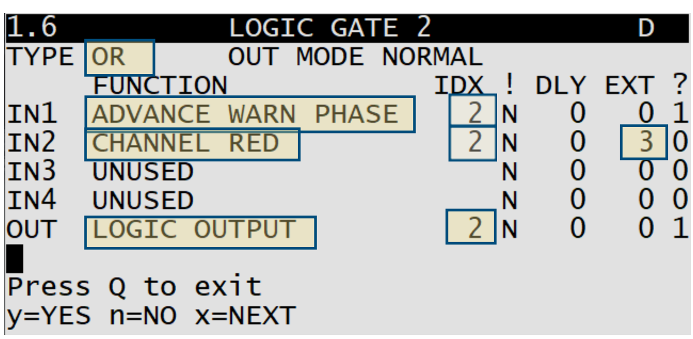
Type – set to “OR.”

IN1 – set to “ADVANCE WARN PHASE

- IDX – set to 2 – this selects phase 2.

IN2 – set to “CHANNEL RED.”

- IDX – set to 2 – this selects phase 2 Red.
- EXT – set to the number of seconds required for the AWB to stay on after Phase 2 Green turns on; in the example, “3” seconds are programmed.



OUT – set to LOGIC OUTPUT.

- IDX – set to 1 to select the first Logic Output.

- This must be repeated in M-1-6(2)to provide the second output for the “Wig-Wag” indication for the first flasher. The only change in Gate 2 is:

- OUT – set to LOGIC OUTPUT.
  - IDX – set to 2 to select the second Logic Output.

```
1.6           LOGIC GATE 3              D
TYPE OR         OUT MODE NORMAL
     FUNCTION                  IDX ! DLY EXT ?
IN1  ADVANCE WARN PHASE          6 N  0   0 1
IN2  CHANNEL RED                 6 N  0   3 1
IN3  UNUSED                        N  0   0 0
IN4  UNUSED                        N  0   0 0
OUT  LOGIC OUTPUT                3 N  0   0 1

Press Q to exit
y=YES n=NO x=NEXT
```

Follow the steps from gates 1 and 2 for gates 3 and 4 (M-1-6(3, 4)). Modify the IDX for Inputs 1and 2 to be phase 6 and program the LOGIC OUTPUT for gate 3 to be 3 and LOGIC OUTPUT for gate 4 to be 4.

```
1.6           LOGIC GATE 4              D
TYPE OR         OUT MODE NORMAL
     FUNCTION                  IDX ! DLY EXT ?
IN1  ADVANCE WARN PHASE          6 N  0   0 0
IN2  CHANNEL RED                 6 N  0   3 0
IN3  UNUSED                        N  0   0 0
IN4  UNUSED                        N  0   0 0
OUT  LOGIC OUTPUT                4 N  0   0 0

Press Q to exit
y=YES n=NO x=NEXT
```

Steps 5 through 8 program the first four logic outputs to become flashing outputs which are programmed such that LOGIC OUTPUTS 1 and 2 “WIG-WAG” or alternate on and off and flash based on the controller flashing logic.

```
1.6           LOGIC GATE 5              D
TYPE AND        OUT MODE NORMAL
     FUNCTION                  IDX ! DLY EXT ?
IN1  LOGIC OUTPUT                1 N  0   0 0
IN2  FLASHING LOGIC                N  0   0 1
IN3  UNUSED                        N  0   0 0
IN4  UNUSED                        N  0   0 0
OUT  LOGIC OUTPUT                5 N  0   0 0

Press Q to exit
y=YES n=NO x=NEXT
```

In Gate 5 the following must be programmed:

- TYPE – set this to “AND.”
- IN1 – set to LOGIC OUTPUT.
  - IDX – set this to 1.
- IN2 – Set to FLASHING LOGIC.
- OUT – set to LOGIC OUTPUT.
  - IDX – set this to 5.

```
1.6           LOGIC GATE 6              D
TYPE AND        OUT MODE NORMAL
     FUNCTION                  IDX ! DLY EXT ?
IN1  LOGIC OUTPUT                2 N  0   0 1
IN2  FLASHING LOGIC                Y  0   0 0
IN3  UNUSED                        N  0   0 0
IN4  UNUSED                        N  0   0 0
OUT  LOGIC OUTPUT                6 N  0   0 0

Press Q to exit
y=YES n=NO x=NEXT
```

In Gate 6 the following must be programmed:

- TYPE – set this to “AND.”
- IN1 – set to LOGIC OUTPUT.
  - IDX – set this to 2.
- IN2 – Set to FLASHING LOGIC.
  - ! – set to “Y” – this inverts the flash sothat it is off when Gate 5 is on.
- OUT – set to LOGIC OUTPUT.
  - IDX – set this to 6.

Gates 7 and 8 are similar to 5 and 6 except that IN1 and IN2 are set to LOGIC OUTPUTS 3 and 4 instead of 1 and 2. Also the LOGIC OUTPUTS are set to 7 and 8. Everything else is identical.

```
1.6           LOGIC GATE 7              D
TYPE AND      OUT MODE NORMAL
     FUNCTION                 IDX ! DLY EXT ?
IN1  LOGIC OUTPUT              3  N   0   0 1
IN2  FLASHING LOGIC               N   0   0 0
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT              7  N   0   0 0

Press Q to exit
y=YES n=NO x=NEXT
```

Gate 7 – set up similar to Gate 5.

```
1.6           LOGIC GATE 8              D
TYPE AND      OUT MODE NORMAL
     FUNCTION                 IDX ! DLY EXT ?
IN1  LOGIC OUTPUT              4  N   0   0 1
IN2  FLASHING LOGIC               Y   0   0 0
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT              8  N   0   0 0

Press Q to exit
y=YES n=NO x=NEXT
```

Gate 8 – set up similar to Gate 6.

This is the final Gate that must be programmed. To review, the first four gates were used to set up outputs that drive the 4 indications: two for phase 2 and two for phase 6. The last four gates use the first four outputs along with controller flashing logic to drive the four outputs used to drive the load switches in the next steps.

E.1.4 Mapping the Outputs in the Cabinet

This step uses the outputs from Gates 5 – 8 to drive the Red and Green outputs on the load switches 9 and 10. Use the ESC key on the keypad to go back to the main menu. From here the I/O mapping can be found with M-1-5. The selections here may vary depending on cabinet type. In this example, a TS2 cabinet is used. There are 5 selections:

1. NEMA A, B, C, D – this is a standard TS1 cabinet or TS1 - type 2 hybrid where the load switches are still being driven by the A, B, C and D connectors.
2. NEMA TS2 BIU – this is a standard TS2 cabinet.
3. CALTRANS – C1, C11 – this is used on any 33X style rack mount cabinet
4. ATC / ITS SIU – is used in the original ITS cabinets or the latest ATCC style cabinets.
5. AUX SWITCH – is used to configure the Aux Switch located on the front of 2070 controllers for special functions.

For this example, select 2, then select 2 again for OUTPUTS. In a standard TS2 cabinet BIU's 1 – 4 are the Output BIUs used to drive the load switches. BIU1 is for the first 8 load switches and BIU2 is for the second 8 load switches. Since this example is using load switches 9 and 10, a "2" is entered next to SELECT A BIU:

M-1-5-2-2(2) navigates to this page. There are 4 lines that must be modified. Under Function the default Output is viewed. These can be reassigned by selecting them with the cursor and scrolling up ordown to the desired output using the “**+**” or “**-**“ keys and hitting ENTER as before.

```
1.5.2.2    BIU 2  OUTPUT MAPPING           D
PIN   DEFAULT       FUNCTION              IDX
01    PED2/CH9   R  LOGIC OUTPUT            5
02    PED2/CH9   Y  CHANNEL YELLOW          9
03    PED2/CH9   G  LOGIC OUTPUT            6
04    PED4/CH10  R  LOGIC OUTPUT            7
05    PED4/CH10  Y  CHANNEL YELLOW         10
06    PED4/CH10  G  LOGIC OUTPUT            8

Press Q to exit
y=YES  n=NO  x=NEXT
```

- PIN 01 Ped2/Ch9 R – select LOGIC OUTPUT.
  - IDX – set this to 5.
- PIN 03 Ped2/Ch9 R – select LOGIC OUTPUT.
  - IDX – set this to 6.
- PIN 04 Ped2/Ch9 R – select LOGIC OUTPUT.
  - IDX – set this to 7.
- PIN 06 Ped2/Ch9 R – select LOGIC OUTPUT.
  - IDX – set this to 8.

E.1.5 Testing the Configuration

In order to test this configuration, the MMU must be programmed to match the controller. This requires no additional jumpers to be added. The permissives in the controller and the MMU are the standard configuration for an 8-phase intersection with peds on 13 - 16. Channels 9 and 10 are not programmed to be phase outputs and the monitor won’t monitor them. Since they are not critical to the operations of the intersections the cabinet will not go into flash if any of the indications failed in the field.

Wiring up the field wires is the same as a standard 8 phase intersection. The AWF should be wired as follows:

- Channel 9 is for the phase 2 approach and Channel 10 is for the phase 6 approach.
- The Green outputs on each load switch should be wired to one indication of the AWB and the Redoutputs should be wired to the other indication.
- The Wig-Wag affect is present in the field as the Red and Green outputs alternate on and off.

E.1.6 Conclusion of the Setup

This concludes the setup. This can be used for any type of cabinet or number of approaches. For additional approaches, additional Gates and mapping may be needed. Cabinet configurations require mapping to each output as needed.

E.2 Flashing Yellow Arrow (FYA) set up for mode G

There are 8 modes of Flashing Yellow Arrow that have been designated by NEMA for operations at intersections. *Omni eX* software, by default, uses mode B when FYA is programmed. Two of the FYA operations that NEMA provisioned utilize the unused Ped Yellows as the FYA indication or the Green arrow indication, which reduces the number of load switches needed for the FYA operations. Mode G and Mode H remap *Omni eX* and reconfigure the overlaps to utilize the unused Yellows.

Mode G is also called compact mode because it can be configured to work in older TS1 cabinets with only 12 channels. Each FYA indication requires 4 outputs. These are Green Arrow, Yellow Arrow, Flashing Yellow Arrow, and Red Arrow. Channels 1, 3, 5, and 7 plus the unused Yellows of 9, 10, 11, and 12 provide the 16 outputs required for 4 FYA Indications. The following documentation prepares *Omni eX* to use Mode G as the type of FYA.E.2.1 (Unit/Channel Setup).

- Set Left Turn Vehicle Channels (1,3,5,7) to be Overlaps.
- Set Ped Phases to 9, 10, 11, 12.
- Set Channels 13, 14, 15, 16 to Vehicles (These are dummy phases that are used to drive the Green Arrow Indication on Channels 1, 3, 5, 7.

E.2.1 (Overlaps/Vehicle Overlaps/Set 1/Overlap 1) Enter

- Set Overlap 1 TO FYA.
- Set Included Phase to 2.
- Set Modifier Phase to 1.
- If you want to delay the permissive Yellow termination until after the opposing through set do this; otherwise, skip this step.
    - No Trailing Green Phase to 1.
    - Trailing Green to some value – 3 seconds is good.
    - Trailing Yellow to whatever the opposing thru Yellow is.
    - Trailing Red to whatever the opposing thru Red is.
- Do the same thing to Overlaps 2, 3 and 4.
    - OL 2 should be Phases 4, 3.
    - OL 3 should be Phases 6, 5.
    - OL 4 should be Phases 8, 7.

E.2.2 (Unit/IO Mapping/NEMA TS2 BIU/Outputs)

- BIU 1 Select – Setting the Protected LT Phase which are on 13 – 16 to Channels 1, 3, 5, 7.
    - Phases 1, 3, 5, 7 Greens should be modified like this:

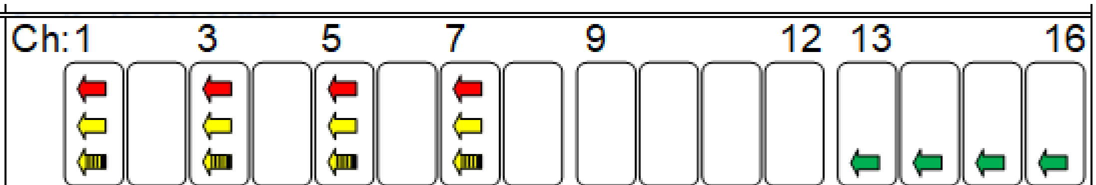
PIN	DEFAULT		FUNCTION	IDX
03	PHS1/CH1	G	CHANNEL GREEN	13
09	PHS3/CH3	G	CHANNEL GREEN	14
O15	PHS5/CH5	G	CHANNEL GREEN	15
I06	PHS7/CH7	G	CHANNEL GREEN	16

- BIU 2 Select – Setting the unused Yellows to output Overlaps 1,2,3,4 Flashing Yellow Arrows which are on the Green Output of the overlaps.
    - PEDS 2, 4, 6, 8 Yellows need to be modified to look like this:

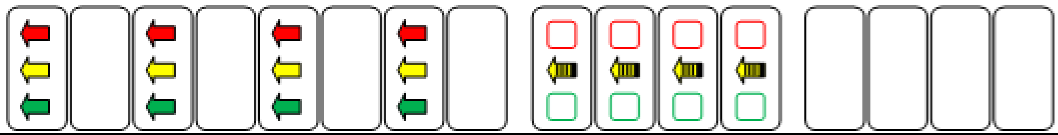
02	PED2/CH9	Y	CHANNEL GREEN	1
05	PED4/CH10	Y	CHANNEL GREEN	3
08	PED6/CH12	Y	CHANNEL GREEN	5
11	PED8/CH13	Y	CHANNEL GREEN	7

The standard FYA (Mode B) is set so that the FYA OVL is FYA, YA and RA drivers, and the protected phases 1, 3, 5, 7 only protect the GA. Mode G is expecting to see the GA, YA, and RA on the protected phases 1, 3, 5, 7, and the FYA on unused peds 9, 10, 11, 12 channels (see the following page) for diagrams.

This essentially makes channels 1, 3, 5, 7 emulate the protected phase, even though it is the overlap, and redirects the FYA from the overlap to unused peds Yellows on 9, 10, 11, 12 as Mode G requires.



Mode D	Protected Turn Channels (Ga)	Opposing Through Channels	Permissive Turn Channels (Ra, Ya, fYa)	Green Arrow Signal Driver Source
	13	2	1	13 Green
	14	4	3	14 Green
	15	6	5	15 Green
	16	8	7	16 Green



Mode G	Protected Turn Channels (Ra, Ya, Ga)	Opposing Through Channels	Permissive Turn Channels (fYa)	Flashing Yellow Arrow Signal Driver Source
	1	2	9	9 Yellow (Ped)
	3	4	10	10 Yellow (Ped)
	5	6	11	11 Yellow (Ped)
	7	8	12	12 Yellow (Ped)

E.3 Flashing Yellow Arrow (FYA) set up for mode H

This is a quick setup guide for Flashing Yellow Arrow (FYA) operations in the Omni eX® controller versions 1.11.13 or higher. This section provides the basic set up and configuration for an H mode FYA. Any number of FYA overlaps can be set up; however, this helps to set up all four approaches. In this set up, the phase assignments must be modified as well as the BIU #1 and BIU #2 Outputs. First, we set up the four overlaps 1 – 4 to be Flashing Yellow Arrow (FYA) overlaps. We also configure the FYA indication to lag or terminate after the opposing through ball for safer operations. This step is optional but is preferred because of safety for the permissive portion of the FYA. It is assumed that the operation of FYA is understood and the programming of the MMU2 or CMU is complete.

The MMU2 should be programmed for Mode H and all 4 overlaps selected.

Mode H FYA is similar to Mode G in the fact that it uses the unused Yellow indication for the ped channels. The difference is that the pedestrian channels are on 13 – 16 instead of 9 – 12. For this reason, this cannot be used in a 12-position cabinet and is not considered compact mode.

E.3.1 Main Menu (MM) 3.1.1 / 1 – 4

From the Main Menu (MM) go to the Overlap page (3), select Vehicle overlaps (1), and the 1st overlap set (1). Next, select the overlap to program as a FYA. In this example, 1 – 4 are set up.

```
RG1 2G RG2 6G  Thu Apr-30-2020 12:44:12D
GREEN  GREEN      1234567890ABCDEF STDBY
REST   REST   O/N  O   O           PAT254
              VEH  R   R           CYC
              PED                  OFF
              OVL                  MCT
FREE   COMMD  POV                  LCT
SP FO         H/O                  PRE
3.1  VEHICLE OVERLAP  1/A IN SET 1   D
TYPE                 NORMAL
INCLUDED PHASES  ................
MODIFIER PHASES  ................
EXCLUDED PHASES  ................
EXCLUDED PEDS    ................
EXCLUDED WALKS   ................
NO TRAIL GRN PHS ................
```

Set Type to FYA. Included Phase is 2 and modifier phase is 1. This sets the opposing thru and opposing left as the parent phases of overlap 1.

```
RG1 2G RG2 6G  Thu Apr-30-2020 12:50:57D
GREEN  GREEN      1234567890ABCDEF STDBY
REST   REST   O/N  O   O           PAT254
              VEH  R   R           CYC
              PED                  OFF
              OVL G                MCT
FREE   COMMD  POV                  LCT
SP FO         H/O                  PRE
3.1  VEHICLE OVERLAP  1/A IN SET 1   D
TYPE                 FYA
INCLUDED PHASES  .2..............
MODIFIER PHASES  1...............
EXCLUDED PHASES  ................
EXCLUDED PEDS    ................
EXCLUDED WALKS   ................
NO TRAIL GRN PHS 1...............
```

Next, set the trailing Green options to protect the permissive Yellow against the opposing protected thru movement upon termination.

```
RG1 2G RG2 6G  Thu Apr-30-2020 12:50:09D
GREEN  GREEN      1234567890ABCDEF STDBY
REST   REST   O/N  O   O           PAT254
              VEH  R   R           CYC
              PED                  OFF
              OVL G                MCT
FREE   COMMD  POV                  LCT
SP FO         H/O                  PRE
3.1  VEHICLE OVERLAP  1/A IN SET 1  UD
NO TRAIL GRN PHS 1...............
DET CALL PHASES  ................
TRAILING GRN       3
TRAILING YEL      3.5
TRAILING RED      1.0
START DELAY       0.0
ACTUATED ONLY    NO
```

E.3.2 Main Menu 3.1.1

Continue these same steps for Overlaps 2, 3, and 4, each time starting from MM 3.1.1. and selecting a new overlap number. Each time the NO TRAIL GRN PHS must be set to the protected left turn 1, 3, 5 or 7, respectively, in order to assure that only the permissive portion of the overlap receives trailing Green time.

E.3.3 Main Menu 1.4

Program the channel assignments by starting at the Main Menu (MM) and selecting 1 for Unit and 4 for Channel Assignments. Set the pedestrian to be on channels 13 – 16. Overlaps are on 9 – 12, but also set up channels 17 – 20 as overlaps.

> **NOTE:** Channels 17 – 20 are used internally in the controller and do not have any outputs. They drive the outputs for the FYA.

```
RG1 2G RG2 6G   Thu Apr-30-2020 13:00:11D
GREEN  GREEN        1234567890ABCDEF STDBY
REST   REST   O/N  O   O               PAT254
              VEH  R   R               CYC
              PED                      OFF
              OVL G                    MCT
FREE   COMMD  POV                      LCT
SP FO         H/O                      PRE
1.4           CHANNEL SETUP
                 11111111112222222222333
 CHAN#   12345678901234567890123456789012
TYPE     VVVVVVVVOOOOPPPPOOOOVVVVVVVVVVVV
SOURCE   12345678567824681234............
ALT1/2HZ................................
FLSHRED XXXXXXXX....XXXX................
FLSHYEL ................................
```

E.3.4 Main Menu 1.5.2.2 / 1

Next, the outputs for channels 1, 3, 5, 7 must have the Yellow and Red outputs reassigned to the Overlap Yellow and Red.

13 – 16 must be reassigned on the unused portion of the peds to output the permissive Green (FYA) output of the overlap.

Go to Main Menu, (MM) then 1 for Unit, then 5 for I/O mapping, then 2 for NEMA TS2 BIU, then 2 for Outputs. Now select BIU 1. For this example, Output channels 1, 3, 5, 7 are all modified.

However, this Guide only shows the changes in Channel 1; the steps are the same for 3, 5, and 7. For channel 1, the Red and Yellow outputs must be changed to 17 red and 17 Yellow respectively. Channel 1 Green remains the same as it is the Protected Green Arrow.

```
RG1 2G RG2 6G   Thu Apr-30-2020 13:15:06D
GREEN  GREEN        1234567890ABCDEF STDBY
REST   REST   O/N  O   O               PAT254
              VEH  R   R               CYC
              PED                      OFF
              OVL G                    MCT
FREE   COMMD  POV                      LCT
SP FO         H/O                      PRE
1.5.2.2   BIU 1  OUTPUT MAPPING        D
PIN  DEFAULT     FUNCTION              IDX
O1   PHS1/CH1  R CHANNEL RED            17
O2   PHS1/CH1  Y CHANNEL YELLOW         17
O3   PHS1/CH1  G CHANNEL GREEN           1
O4   PHS2/CH2  R CHANNEL RED             2
O5   PHS2/CH2  Y CHANNEL YELLOW          2
O6   PHS2/CH2  G CHANNEL GREEN           2
```

E.3.5 Main Menu 1.5.2.2 / 2

In this next step, BIU #2 is modified. From MM 1.5.2.2 select BIU #2 for changes. The modifications on BIU #2 are to modify the Yellow outputs. Again, only the first channel 13 is shown, but channels 14, 15, 16 must be programmed in a similar way.

OVLA/CH13 Y must be modified for CHANNEL GREEN from Overlap 17 as shown below.

```
RG1 2G RG2 6G   Thu Apr-30-2020 14:12:29D
GREEN  GREEN       1234567890ABCDEF STDBY
REST   REST   O/N  O   O           PAT254
              VEH  R   R           CYC
              PED                  OFF
              OVL G                MCT
FREE   COMMD  POV                  LCT
SP FO         H/O                  PRE
1.5.2.2   BIU 2  OUTPUT MAPPING     UD
PIN  DEFAULT     FUNCTION             IDX
O13  OVLA/CH13 R CHANNEL RED           13
O14  OVLA/CH13 Y CHANNEL GREEN         17
O15  OVLA/CH13 G CHANNEL GREEN         13
IO1  OVLB/CH14 R CHANNEL RED           14
IO2  OVLB/CH14 Y CHANNEL GREEN         18
IO3  OVLB/CH14 G CHANNEL GREEN         14
```

OVL/CHN 14, OVL/CHN 15, and OVL/CHN 16 also need to be modified for CHANNEL GREEN 18, 19 and 20, respectively.

E.4 HAWK Pedestrian Signals

This is a quick set up guide for the HAWK signal. This is a basic guide and may not cover everything needed. In this example, Phase 2 is the vehicle phase and Phase 1 is the pedestrian Phase. Channel 2 is the Load Switch for Phase 2 and Channel 9 is the Load Switch for Ped Phase 1.

```
RG1 2G          Mon Apr-27-2020 09:36:51D
GREEN              1234567890ABCDEF STDBY
REST          O/N  O                PAT254
              VEH  R                CYC
              PED                   OFF
              OVL                   MCT
FREE   COMMD  POV                   LCT
SP FO         H/O                   PRE
1.4           CHANNEL SETUP
                 11111111112222222222333
 CHAN#  12345678901234567890123456789012
TYPE    VVVVVVVVPPPPOOOOVVVVVVVVVVVVVVVV
SOURCE  .2......1.......................
ALT1/2HZ................................
FLSHRED ................................
FLSHYEL ................................
```

Set the output channels that will be used.

```
RG1 2G          Mon Apr-27-2020 09:41:34D
GREEN              1234567890ABCDEF STDBY
REST          O/N  O                PAT254
              VEH  R                CYC
              PED                   OFF
              OVL                   MCT
FREE   COMMD  POV                   LCT
SP FO         H/O                   PRE
2.1         PHASE TIMINGS SET 1      U R
 PHASE#     1   2   3   4   5   6   7   8
ALT WALK    0   0   0   0   0   0   0   0
ALT PDCLR   0   0   0   0   0   0   0   0
ADV WALK    0   0   0   0   0   0   0   0
DLY WALK    0   0   0   0   0   0   0   0
ST DLY/10   0   0   0   0   0   0   0   0
GRN CL/10   0  70   0   0   0   0   0   0
```

Provides a Green clearance time – used to prevent excessive HAWK activations.

```
RG1 2G          Mon Apr-27-2020 09:43:38D
GREEN              1234567890ABCDEF STDBY
REST          O/N  O                PAT254
              VEH  R                CYC
              PED                   OFF
              OVL                   MCT
FREE   COMMD  POV                   LCT
SP FO         H/O                   PRE
2.1         PHASE TIMINGS SET 1      UDR
 PHASE#     1   2   3   4   5   6   7   8
MAX 2      15  45  15  45  15  45  15  45
YEL/10     30  40  30  40  30  40  30  40
RED/10     10  25  10  20  10  20  10  20
WALK        7   7   0   7   0   7   0   7
PED CLR    15  15   0  15   0  15   0  15
ADD IN/10   0   0   0   0   0   0   0   0
```

```
RG1 2G          Mon Apr-27-2020 09:46:04D
GREEN              1234567890ABCDEF STDBY
REST          O/N  O                PAT254
              VEH  R                CYC
              PED                   OFF
              OVL                   MCT
FREE   COMMD  POV                   LCT
SP FO         H/O                   PRE
2.1         PHASE TIMINGS SET 1      UDR
 PHASE#     1   2   3   4   5   6   7   8
YEL/10     30  40  30  40  30  40  30  40
RED/10     10  25  10  20  10  20  10  20
WALK        7   7   0   7   0   7   0   7
PED CLR    15  15   0  15   0  15   0  15
ADD IN/10   0   0   0   0   0   0   0   0
MAX INIT    0   0   0   0   0   0   0   0
```

Set the Yellow and all Red times for the vehicle phases on Phase 2.

Set the Ped Walk and Ped Clearance on Phase 1.

```
RG1 2G              Mon Apr-27-2020 09:49:35D
GREEN                  1234567890ABCDEF STDBY
REST             O/N  O                PAT254
                 VEH  R                CYC
                 PED                   OFF
                 OVL                   MCT
FREE   COMMD     POV                   LCT
SP FO            H/O                   PRE
2.2        PHASE OPTIONS SET 1            D
                                  1111111
 PHASE#                 1234567890123456
PHASE OMIT              ................
PED OMIT                ................
MIN VEH RECALL          .X..............
MAX VEH RECALL          ................
SOFT VEH RECALL         ................
```

Set a Recall to bring the HAWK back to rest even if vehicles are present.

```
RG1 2G              Mon Apr-27-2020 09:51:40D
GREEN                  1234567890ABCDEF STDBY
REST             O/N  O                PAT254
                 VEH  R                CYC
                 PED                   OFF
                 OVL                   MCT
FREE   COMMD     POV                   LCT
SP FO            H/O                   PRE
2.4        PHASE ENABLE AND RINGS
                              1111111
 PHASE# 1234567890123456
ENABLE  XX..............
RING 1  XX..............
RING 2  ................
RING 3  ................
RING 4  ................
```

Make sure to enable and set ring's concurrencies in 2.4 and 2.5.

```
RG1 2G              Mon Apr-27-2020 09:53:11D
GREEN                  1234567890ABCDEF STDBY
REST             O/N  O                PAT254
                 VEH  R                CYC
                 PED                   OFF
                 OVL                   MCT
FREE   COMMD     POV                   LCT
SP FO            H/O                   PRE
2.3          PHASE SEQUENCE  1

RING 1 1,2
RING 2
RING 3
RING 4
```

Set up your phase sequence using phases 1 and 2, in 2.3.

```
RG1 2G              Mon Apr-27-2020 09:53:11D
GREEN                  1234567890ABCDEF STDBY
REST             O/N  O                PAT254
                 VEH  R                CYC
                 PED                   OFF
                 OVL                   MCT
FREE   COMMD     POV                   LCT
SP FO            H/O                   PRE
2.3          PHASE SEQUENCE  1

RING 1 1,2
RING 2
RING 3
RING 4
```

Gate 1 – Sets up the Flashing Yellow beacon driver which will be used in next step.

```
RG1 2G              Mon Apr-27-2020 09:56:27D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6                LOGIC GATE 1            D
TYPE AND           OUT MODE FLASH 1HZ/60FPM
     FUNCTION                 IDX ! DLY EXT ?
IN1  CHANNEL GREEN              2 N   0   0 1
IN2  ADVANCE WARN PHASE         2 N   0   0 0
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT               1 N   0   0 0
```

Gate 2 – Provides the Flash or Steady output to Logic output 2 which will be mapped later to Channel 2 yellow.

```
RG1 2G              Mon Apr-27-2020 09:57:22D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6                LOGIC GATE 2            D
TYPE OR            OUT MODE NORMAL
     FUNCTION                 IDX ! DLY EXT ?
IN1  LOGIC INPUT                1 N   0   0 0
IN2  CHANNEL YELLOW             2 N   0   0 0
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT               2 N   0   0 0
```

Gate 3 – Sets up the Flashing Red Beacon Output #1 for the Wig Wag operation (Wig)

```
RG1 2G              Mon Apr-27-2020 09:58:36D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6                LOGIC GATE 3            D
TYPE AND           OUT MODE NORMAL
     FUNCTION                 IDX ! DLY EXT ?
IN1  CHANNEL YELLOW             9 N   0   0 0
IN2  FLASHING LOGIC               N   0   0 1
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT               3 N   0   0 0
```

Gate 4 – Sets up the Flashing Red Beacon Output #2 For the Wig Wag operation (Wag).

```
RG1 2G              Mon Apr-27-2020 09:59:50D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6                LOGIC GATE 4            D
TYPE AND           OUT MODE NORMAL
     FUNCTION                 IDX ! DLY EXT ?
IN1  CHANNEL YELLOW             9 N   0   0 0
IN2  FLASHING LOGIC               Y   0   0 0
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT               4 N   0   0 0
```

Gate 5 – Sets up the Steady Red operation for the Red beacon for full stop during Ped walk indication.

```
RG1 2G              Mon Apr-27-2020 10:01:29D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6                LOGIC GATE 5            D
TYPE AND           OUT MODE NORMAL
     FUNCTION                 IDX ! DLY EXT ?
IN1  CHANNEL RED                2 N   0   0 0
IN2  PHASE ON                   1 N   0   0 0
IN3  UNUSED                       N   0   0 0
IN4  UNUSED                       N   0   0 0
OUT  LOGIC OUTPUT               5 N   0   0 0
```

Gate 6 – Drives the Red Beacon # 1 to either Flash or be solid.

```
RG1 2G             Mon Apr-27-2020 10:03:40D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6              LOGIC GATE 6              D
TYPE OR           OUT MODE NORMAL
     FUNCTION                IDX ! DLY EXT ?
IN1  LOGIC INPUT               3 N   0   0 0
IN2  LOGIC INPUT               5 N   0   0 0
IN3  CHANNEL GREEN             9 N   0   0 0
IN4  UNUSED                      N   0   0 0
OUT  LOGIC OUTPUT              1 N   0   0 0
```

Gate 7 – Drives the Red Beacon # 2 to either Flash or be solid.

```
RG1 2G             Mon Apr-27-2020 10:05:54D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.6              LOGIC GATE 7              D
TYPE OR           OUT MODE NORMAL
     FUNCTION                IDX ! DLY EXT ?
IN1  LOGIC INPUT               4 N   0   0 0
IN2  LOGIC INPUT               5 N   0   0 0
IN3  CHANNEL GREEN             9 N   0   0 0
IN4  UNUSED                      N   0   0 0
OUT  LOGIC OUTPUT              7 N   0   0 0
```

Mapping 1 – Sets Channel 2 Yellow to be driven by Logic Output 2 for Flashing or Solid Operations.

```
RG1 2G             Mon Apr-27-2020 10:07:06D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.5.1.2   A,B,C,D OUTPUT MAPPING        UD
PIN  DEFAULT       FUNCTION              IDX
C-D  PHS8/CH8   R  CHANNEL RED             8
A-Z  PHS1/CH1   Y  CHANNEL YELLOW          1
A-b  PHS2/CH2   Y  LOGIC OUTPUT            2
B-E  PHS3/CH3   Y  CHANNEL YELLOW          3
B-c  PHS4/CH4   Y  CHANNEL YELLOW          4
C-J  PHS5/CH5   Y  CHANNEL YELLOW          5
```

Mapping 2: Set PHS2/CH2 R for Logic Output 6.

```
RG1 2G             Mon Apr-27-2020 10:14:29D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.5.1.2   A,B,C,D OUTPUT MAPPING        UD
PIN  DEFAULT       FUNCTION              IDX
C-f  PHS7/CH7   G  CHANNEL GREEN           7
C-x  PHS8/CH8   G  CHANNEL GREEN           8
A-E  PED1       R  UNUSED OUTPUT
A-G  PED2/CH9   R  LOGIC OUTPUT            7
B-a  PED3       R  UNUSED OUTPUT
B-J  PED4/CH10  R  CHANNEL RED            10
```

Mapping 3: Channel 2 Red is one of the Red Beacon Outputs #1, Channel 9 Red output is remapped for the second Red Beacon outputs #2.

```
RG1 2G             Mon Apr-27-2020 10:12:09D
GREEN                  1234567890ABCDEF STDBY
REST              O/N  O                PAT254
                  VEH  R                CYC
                  PED                   OFF
                  OVL                   MCT
FREE    COMMD     POV                   LCT
SP FO             H/O                   PRE
1.5.1.2   A,B,C,D OUTPUT MAPPING         D
PIN  DEFAULT       FUNCTION              IDX
A-D  PHS1/CH1   R  CHANNEL RED             1
A-F  PHS2/CH2   R  LOGIC OUTPUT            6
B-F  PHS3/CH3   R  CHANNEL RED             3
B-G  PHS4/CH4   R  CHANNEL RED             4
C-H  PHS5/CH5   R  CHANNEL RED             5
C-G  PHS6/CH6   R  CHANNEL RED             6
```

E.4.1 Cabinet Setup (Load Switches [LS])

Wiring up the load switches is not standard and may not be set up this way based on the channels selected as outputs to the signal heads. Based on this example, the load cabinet wiring is as follows:

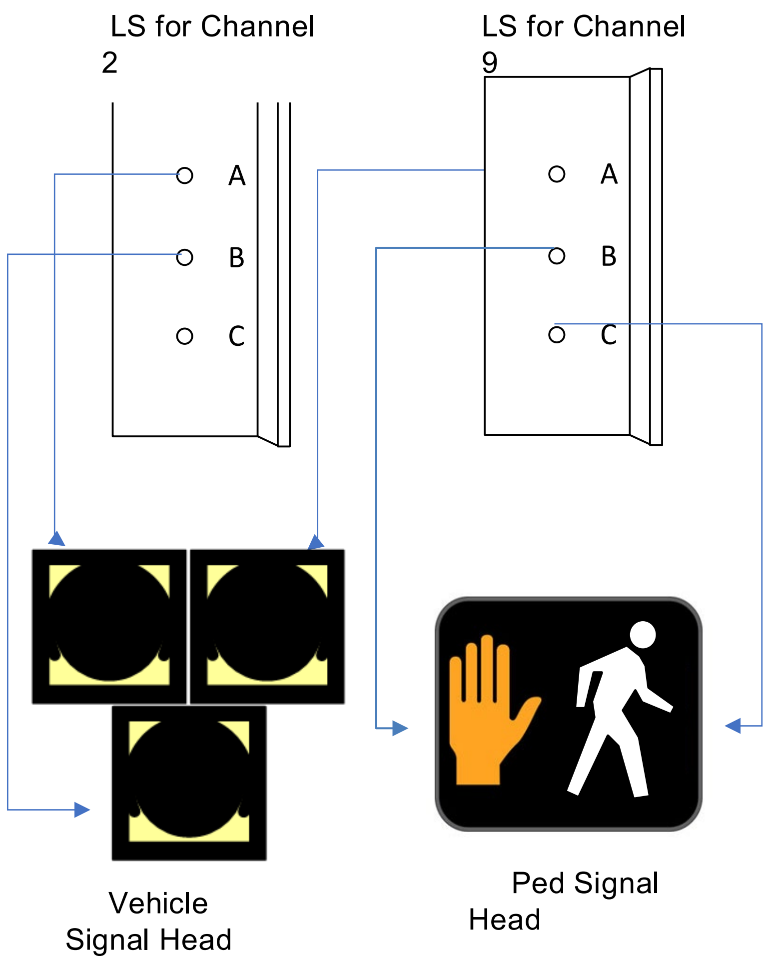


Figure E- 1: Load Cabinet Wirin

E.4.2 Monitor Setup

Always verify that that the monitor is correctly set up. Do not use "out of the box" settings for monitors to run the HAWK signal. Verify the concurrency; 2 and 9 are not concurrent. Checks and monitoring for Reds and short Yellows are set correctly.

Disclaimer: There are several ways to set up a HAWK Signal, with this as just one example. Verify all operations and test the HAWK in a lab or bench environment before deploying live at a crosswalk location. Cabinets can vary and may need additional modifications not explained in this document. Consult McCain support at: support@mccain-inc.com if you need assistance or help with setting up the HAWK Signal.

Appendix F: GLOSSARY

3AG	Glass Fuse size 1.25” x 0.25”
A	Ampere
AC	Alternating Current
AC+	120 Volts AC, 60 hertz ungrounded power source
AC-	120 Volts AC, 60 hertz grounded return to the power source
AGENCY	Purchasing Agency
ANSI	American National Standard Institute
ASCII	American Standard Code for Information Interchange
Assembly	A complete machine, structure or unit of a machine that was manufactured by fitting together parts and/or modules
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
BRG	Baud Rate Generator
Bit	Binary Digit, the basic unit of digital data
BIU	Bus Interface Unit (NEMA)
Boot up	Code executed immediately after reset
bps	Bit per second
C	Celsius
C Language	The ANSI C Programming Language
Cabinet	An outdoor enclosure generally housing the controller unit and associated equipment
Caltrans	California Department of Transportation
Channel	An information path from a discrete input to a discrete output
Component	Any electrical or electronic device
Controller Unit	That portion of the controller assembly devoted to the operational control of the logic decisions programmed into the assembly
CMU	Conflict Monitor Unit

CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CTS	Clear To Send
CU	Controller Unit
CVM	Controller Voltage Monitor (NEMA)
DAT Program	The AGENCY's Diagnostic and Acceptance Test Program
dB	Decibel
DC	Direct Current
DCD	Data Carrier Detect
DIN	Deutsche Industrie Norm
DRAM	Dynamic Random-Access Memory
DUART	Dual Universal Asynchronous Receiver Transmitter
EA	Each piece
EG	Equipment Ground
EIA	Electronic Industries Association
EMI	Electro Magnetic Interference
Equal	Connectors: comply with physical dimensions, contact material, plating and method of connection. Devices: comply to function, pin out, electrical and operating parameter requirements, access times and interface parameters of the specified device
ERX	Ethernet reception
ETL	Electrical Testing Laboratories, Inc
ETX	Ethernet transmission
FHWA	Federal Highway Administration
Firmware	A computer program or software stored permanently in PROM, EPROM, ROM or semi-permanently in EEPROM
FLASH	A DC powered IC Memory Device with nonvolatile, electrically erasable, programmable, 100K read/write minimum cycles and fast access time features
FM	Fault Monitor (NEMA)
FPA	Front Panel Assembly

FRAM	Flash RAM
FSK	Frequency-Shift Keying
FT	Foot Distance Measure unit
FYA	Flashing Yellow Arrow
GAL	Gate Array Logic
GPS	Global Positioning System
HEX	Hexadecimal
Hz	Hertz
IC	Integrated Circuit
I.D.	Identification
IEEE	Institute of Electrical and Electronics Engineers
IRQ	Interrupt request
ISO	International Standards Organization
ITS	Intelligent Transportation Systems
Jumper	A means of connecting/disconnecting two or more conductors by soldering/de-soldering a conductive wire or by PCB post jumper
KB	Kilobyte
Kbps	Kilo Bit-Per-Second
KHz	Kilohertz
LB	Pound Measure Weight Unit
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LOGIC	Negative Logic Convention (Ground True) State
LSB	Least Significant Byte
lsb	Least Significant Bit
m	Milli or a thousandth
mA	MilliAmpere
Mb	Megabit
MB	Megabyte

Mbps	Mega Bit-Per-Second
MC	Millisecond Counter
MCB	Main Controller Board
McCain	Manufacturer
MCU/MPU	Microcontroller Unit, Microprocessor Unit, or Integrated
MIL	Military Specifications
MMU	Malfunction Management Unit (NEMA)
MOE	Measures of Effectiveness
MODEM	Modulation/Demodulation Unit
Module	A functional unit that plugs into an assembly
MOS	Metal-Oxide Semiconductor
Motherboard	A printed circuit connector interface board with no active or passive components
mS	Millisecond
MSB	Most Significant Byte
msb	Most Significant Bit
N	Newton: SI unit of force
n	nano
NEMA	National Electrical Manufacturer's Association
NLSB	Next Least Significant Byte
nlsb	Next Least Significant Bit
NMSB	Next Most Significant Byte
nmsb	Next Most Significant Bit
NTCIP	National Transportation Communications for ITS Protocol
PCB	Printed Circuit Board
PDA	Power Distribution Assembly
Power Fail	A Power Failure is said to have occurred when the incoming line voltage falls below 92 +/- 2 VAC for 50ms. See Power Conditions
Power Restore	Power is said to be restored when the incoming line voltage equals or exceeds 97 +/- 2 VAC for 50ms. See Power Conditions

Power Conditions	16.7ms (one 60Hz cycle) reaction period is permitted to be included in the 50ms timing or added to (67ms duration). The hysteresis between power failure and power restoration voltage settings is a minimum of 5VAC with a threshold drift of no more than 0.2VAC
PPLT	Protected/Permissive Left Turn
ppm	Parts per million
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
RISC	Reduced Instruction Set Computer
RMS	Root-Mean-Square
ROM	Read Only Memory Device
RTC	Real Time Clock
RTS	Request to Send
RXC	Receive Clock
RXD	Receive Data
R/W	Controller Unit Read/Write Control Line
SCC(n)	Serial Communications Controller
SCI	Serial Communications Interface
SCP	Serial Control Protocol
SDLC	Synchronous Data Link Control
S	Logic State
s	second
Second Sourced	Produced by more than one manufacturer
SMC	Serial Management Controller
SP1	System Serial Port #1
SP2	System Serial Port #2
SP3	System Serial Port #3
SP4	System Serial Port #4
SP5	System Serial Port #5

SP6	System Serial Port #6
SP8	System Serial Port #8
SP(n)	Serial Port (n)
SRAM	Static Random-Access Memory
SW	Switch
TB	Terminal Block
TOD	Time Of Day Clock
TTL	Transistor-Transistor Logic
TSD	Thumb Screw Device. A retractable screw fastener with projecting stainless steel screw, spring and natural aluminum knob finish. (TSD No.2 is flat black.) TSD No.1 - 8-32 SOUTHCO #47-62-301-20 or equal. TSD No.2 - 8-32 SOUTHCO #47-62-301-60 or equal. TSD No.3 - M3 SOUTHCO #47-82-101-10 or equal.
TXC	Transmit Clock
TXCI	Transmit Clock Input
TXCO	Transmit Clock Output
u	Micro
UL	Underwriters Laboratories, Inc
VAC	Voltage Alternating Current
VDC	Voltage Direct Current
VOS	Volume, Occupancy and Speed
x	Number Value
XX	Manufacturer's Option
WDT	Watchdog Timer: A monitoring circuit, external to the device watched, which senses an Output Line from the device and reacts
WWV	Radio station operated by the United States National Institute of Standards and Technology. WWV continuously transmits official US Government frequency and time reference signals.

Appendix G: INDEX

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