CITY OF LOS ANGELES

DEPARTMENT OF TRANSPORTATION

MODEL 2070 CONTROLLER

TRAFFIC SIGNAL CONTROL PROGRAM

(TSCP)

Version 3.28

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INTRODUCTION

The Model 2070 Controller is a first generation Advanced Transportation Controller (ATC) designed by LADOT and Caltrans. It is intended to be used in a variety of Intelligent Transportation Systems, including traffic signal control. This manual provides a brief introduction to the Model 2070 Controller as well as a detailed description of the Traffic Signal Control Program (TSCP).

The Model 2070 Controller is a microprocessor-based computer designed for field installation in Type 332 and Type 337 cabinets. The Model 2070 Controller is comprised of a number of interchangeable modules. Refer to the Training Manual on the Model 2070 Controller hardware for a detailed description of the functions of the various modules.

The Model 2070 Controller contains the OS-9 multi-tasking operating system installed in the CPU module, which allows this controller to run multiple application programs concurrently. Because the controller can be used for more than one function at a time, resource management software is required to manage the controller and coordinate the operation of the various application programs. Four resource management software programs, called "managers," are provided to perform basic housekeeping functions in the controller. Each of these four resource managers is responsible for one particular function as described below:

Manager	**Function**
Front Panel	Handles all keyboard input and display output to the Front Panel.
Field I/O	Handles all digital input and output through the Field I/O Module.
Serial Comm	Handles all communications through the Serial Ports and Modems.
Startup	Handles loading of all program modules on startup.

All of the managers become operational when the controller is turned ON and, except for the Startup Manager, they do not require any user configuration. Because the Model 2070 Controller contains a multi-tasking operating system, and its hardware resources are controlled by managers rather than directly by the application programs, the methods of user access to the controller are different from those of the Model 170 Controller. The primary method of user access to any of the application programs is through the front panel display and keyboard. Each application program can be accessed through the keyboard and display on the front panel, but only one application may be selected at a time.

Each application program running in the Model 2070 Controller has varying methods of displaying information to and receiving input from the front panel. Prior to accessing any application program, it must first be selected through the Front Panel Manager to obtain the resources of the front panel display and keyboard. Although only one program can be accessed through the front panel at any time, all programs continue to run in the controller.

When the Model 2070 Controller is turned ON, the Front Panel Manager starts operating and displays a list of the application programs which have also started and are available for access on the front panel. A typical display is shown below:

```
          Front Panel Manager
1-TRAFFIC SIGNAL CONTROL PROGRAM  3.28
```

This screen indicates that the LADOT Front Panel Manager is operating, and that the Traffic Signal Control Program (TSCP) is running in the controller. The number "1" on the left side of the display indicates the menu entry for this program. The Front Panel Manager allows the user to select the application program by pressing the number key corresponding to the application program listed. In this example, the Traffic Signal Control Program is the first application, and is accessed by pressing the [1] key. The number shown to the right of the Traffic Signal Control Program entry is the version number. All menu entries are listed with a single keyboard key followed by the dash character. Because the Model 2070 Controller is capable of running many application programs simultaneously, there will be instances where more than just the Traffic Signal Control Program will be operating.

Always be sure to select the proper application from the Front Panel Manager screen before entering or changing data in the controller.

Once an application program has been selected, the Front Panel Manager releases all control of the Front Panel to the program selected. From this point on, the application program selected governs all input and output to the controller through the Front Panel. Refer to the software documentation on each application for specific information relating to the data entry procedures for that program. This manual describes in detail the user interface procedures for the Traffic Signal Control Program.

Each application program has its own method of returning control to the Front Panel Manager, which should be used when access to the application is no longer required. However, there is an overriding method that can be used to immediately return control to the Front Panel Manager, regardless of the application program selected. Pressing the [*] key rapidly three times will cause the Front Panel Manager to take control and display the screen shown above. This method should only be used as a last resort, because the application programs may not be aware that they no longer have control of the front panel when this procedure is used. To return to the application, press the number key corresponding to the entry shown on the Front Panel Manager menu screen.

The Field I/O and Serial Comm Managers operate in the controller without any user interface required. They begin operation when the power is turned ON, and are accessed only through application programs.

OVERVIEW

The Traffic Signal Control Program (TSCP) allows the Model 2070 Controller to function as a two- through eight-phase, six-overlap, dual-ring traffic signal controller with support for Light Rail Train (LRT) operations. The TSCP can operate as a stand-alone actuated or non-actuated controller, or as part of an interconnected system to either the ATSAC system or a hard-wire or modem field master.

Programming the TSCP is completely menu-driven, and in most cases involves only option selection and numeric data entries. Numerous programming options and enhanced detector, coordination, time-of-day, preemption and diagnostic capabilities provide control flexibility. The operational features of the TSCP are highlighted below:

Actuated Control

- Eight-phase, dual-ring operation
- Six overlaps, with programmable parent, omit and no-start phases
- Pedestrian service on all phases
- Bicycle timing on all phases (green and all-red)
- Volume density operation with guaranteed passage
- Restricted phase operation
- Omit on Green feature to prevent left turn traps
- Two walk time settings
- Three maximum green time settings
- Fully programmable detector inputs
- Fully programmable loadswitch outputs
- Four special function outputs
- User programmable software logic
- Two- and three-section driveway signal head control for phases and overlaps
- Flash in Red outputs for phases and overlaps (mid-block pedestrian signals)
- Selectable phase termination method during Red Rest operation

Coordination

- Nine local plans
- Four on-line ATSAC plans
- Free and Flash operation
- Phase splits entered by green factor or force off
- Automatic calculation of force offs from green factors
- Vehicle min, vehicle max, pedestrian and bicycle recall by phase in each plan
- Lead-lag operation by plan
- Sync phase, hold phase and phase omit by plan
- Local pick-up cycle provides smooth transition from Free to coordinated operation
- Capable of both 7-wire and Simplex modem master and slave operation
- New Complex modem master and slave operation with time and plan data
- Local Critical Intersection Control (CIC)
- Manual override
- Plan verification prior to operation
- Improved short-way local plan transition cycles

Time-of-Day

- Separate control for Time-of-Day functions and plan selection
- Six plan selection tables, each with 16 plan entries
- 16 fixed and 16 floating holidays
- Extensive “look-back” feature for plan selection
- Automatic Daylight Saving correction
- Solar clock and Hebrew calendar for sabbatical pedestrian recall

Detectors

- Up to 32 programmable detectors (vehicle, bicycle or pedestrian)
- Up to 16 system detectors
- Vehicle detectors assignable to both phase and function
- Count, delay and extend timing on all detectors
- Red and yellow lock by detector
- Failure monitoring with automatic phase recall
- Failure recall times by detector

Communications

- Compatible with ATSAC system
- Compliant with AB3418 and AB3418E protocols
- Supports external WWV time clock
- Compatible with Model 170 Controller simplex modem system (master and slave)
- New complex modem system (master and slave) with time and plan
- High speed EIA-232 operation (up to 38400 bits per second)
- Programmable parity, data and stop bits

Preemption

- Two railroad and four emergency vehicle preempts
- Guaranteed first clearance interval including Right-of-Way Transfer Time
- Interval Control table for advance warning railroad preempts
- Latching or non-latching preempt inputs
- Fully programmable delay, clearance, hold and exit phases and overlaps
- Three clearance intervals for railroad preempts
- Maximum emergency vehicle preempt timer

Transit Priority

- Programmable green extension and early green by plan and LRT phase
- Programmable number of inhibit cycles by plan
- Priority phase hold during free operation
- Supports both TPS and BSP interfaces
- Maximum hold feature for use with LRT phases

Light Rail Train

- Two fully-programmable LRT phases
- Advance, release and 3-car train detector configurations
- Predictor communications
- Outputs for Auxiliary warning signs

Diagnostics and Utilities

- Complete event logging of all special conditions
- Input, output, display and keyboard tests
- RAM checksums for each timing chart page
- Copy feature for phase timing, local plans, time-of-day tables and transit priority data
- Controller copy feature to copy all configuration data from another controller

KEYBOARD AND DISPLAY OPERATIONS

The Traffic Signal Control Program is fully menu driven. The user can access all screens through the selection of menu choices. Menu selections are made by pressing the key corresponding to the selection desired. The selection key is always shown to the left of the choice, followed by the dash character. When more than one key can be used to select the choice, the range of valid keys is indicated by the first and last keys separated by an ellipsis (…). Once a menu selection key has been pressed, the selected screen or a sub-menu will be displayed from which further selections can be made. It may be necessary to proceed through up to three sub-menus to access certain screens. To return to a previous menu, press the [ESC] key. Repeated pressing of the [ESC] key will eventually return the display to the main menu.

On data entry screens, the position of the cursor is designated by two arrows pointing at a data entry position. The cursor position may be moved by pressing any of the four arrow keys [◀], [▶], [▲] or [▼]. If the data entry screen consists of only one page, the cursor will wrap around when it reaches the end of the screen. In the case of multiple page data entry screens, the cursor will move to the next adjacent page if moved beyond the end of the screen. The [NEXT] key may also be used to advance directly to the next page on multiple page data entry screens.

Once the desired data entry position is selected, data may be entered. There are three different types of data entry positions on the various data entry screens. These include decimal data entry, both with and without a decimal point, flag data entry and list data entry.

Decimal data entry is accomplished by pressing the number keys [0] to [9] corresponding to the data entered. As each key is pressed, the digits entered scroll from right to left. Fields with decimal points have the decimal placed automatically, and are entered identically to those without decimal points. Once the data entry process has begun by pressing a number key, the cursor arrows will begin flashing. This indicates that data entry is in progress. Continue entering the decimal digits until the desired number is shown in the field. If errors are made, either press the [ESC] key to completely cancel the entry, or press the [0] key until the display is cleared, and then enter the desired data. Once the entry is complete, press any of the four arrow keys [◀], [▶], [▲], [▼] or the [ENT] key to save the data. If the arrow keys are used, the data entered will be saved and the cursor will move to the next data entry position in the direction indicated by the arrow key pressed, which in some cases may be on the next data entry page. Pressing the [ENT] key will save the data without changing the cursor location, except on a few screens where the cursor is advanced to the next sequential entry location. Whenever accessing decimal data, the [+] or [–] keys can be used to increment or decrement the current value. The result is automatically saved without the need to press the [ENT] key.

There are five types of flag data entry. The first is Phase bit settings, which consist of eight bits numbered 1 through 8. The second is Overlap bit settings, which consist of six bits lettered A through F. The third is Light Rail phase bit settings, which consist of two bits lettered A and B.

The fourth is Plan bit settings, which consist of up to thirteen bits numbered 1 through 9 and A through D. The fifth is Day-of-Week bit settings, which consist of seven bits labeled MTWTFSS. Each entry type follows the same basic procedure: press the key corresponding to the desired bit to toggle that flag entry. The [0] key can be used to clear all bits, regardless of the flag data type. For Phase bit settings, the [9] key can be used to set all bits on, although some of the Phase bit settings do not allow certain combinations of bit entries, and therefore the [9] key is disabled for those particular entries. Additionally, entries such as Sync Phases allow only one phase in each ring to be set, and invalid bits are removed whenever any conflicting bits are entered. For Overlap bit settings, press the [A] through [F] keys to toggle the appropriate bit. For Light Rail phase bit settings, press the [A] and [B] keys to toggle the appropriate bit. For the Plan bit settings, press [1] through [9] and [A] through [D] to toggle the appropriate bit. The [E] key can be used to quickly set all bits. For Day-of-Week bit settings, pressing the number keys enters the days: [1] is for Monday, [2] is for Tuesday, [3] is for Wednesday, [4] is for Thursday, [5] is for Friday, [6] is for Saturday and [7] is for Sunday. These bits appear as the letters MTWTFSS to indicate which day is set. The [8] key can be pressed to set the five weekdays and the [9] key can be pressed to set the two weekend days. All flag data are saved as soon as they are entered, and it is not necessary to press the [ENT] key.

The list type data entry allows the selection of one setting for each entry, which is usually presented as text, but sometimes consists of discrete numbers. Press the [+] or [–] keys to advance through the available choices. Once the list type data entry process has begun by pressing the [+] or [–] key, the cursor arrows will begin flashing. The list of choices is cyclic, and continuing to press either the [+] or [–] key will eventually return to the original selection. After a change has been made, press the [ENT] key or any of the four arrow keys [◀], [▶], [▲], [▼] to save the data. If an arrow key is used, the data entered will be saved and the cursor will move to the next data entry position in the direction indicated by the arrow key pressed, which in some cases may be on the next data entry page. Pressing the [ENT] key will save the data without changing the cursor location. Before pressing the [ENT] key, the [ESC] key can be pressed to cancel any change made and restore the original selection. List type data entries which are shown as “YES” or “NO” may be toggled by pressing the [YES] or [NO] keys.

The function of the [*] key depends on the screen displayed. It is most often used to confirm a selection made prior to implementation. If unsure of the action about to be performed when requested to press the [*] key, press the [ESC] key instead to abort the procedure.

The Active LED on the front panel indicates the status of the controller, and blinks once per second during normal program operation. However, when the TSCP is creating a backup copy of all user data entered to the EEPROM, the Active LED will blink rapidly at five times per second. The copy procedure takes less than 30 seconds, and is initiated 60 seconds after the last data entry change was made. Do not turn the power to the controller OFF when the Active LED is blinking rapidly, or the backup copy will not be completed. If the backup copy is not completed when the power is turned OFF, all user-entered data will remain valid for only 30 days. A successful backup copy will save all user data in the EEPROM indefinitely. If the power is turned OFF during a backup copy, the copy procedure will automatically be restarted 60 seconds after the power is restored, provided that the original data are still valid.

The Aux switch on the front panel is used to implement the stop timing function. When the Aux switch is ON, all timing operations in the TSCP are halted until such time that the Aux switch is turned OFF. The Aux switch has no effect on the Time-of-Day clock.

INPUT ASSIGNMENTS

The TSCP provides complete flexibility when configuring inputs. All inputs are configured by assigning a function, such as a detector, to a physical input. The term "port" is used to identify each discrete physical input. The Model 2070 Controller has 64 input ports, organized as eight bytes of eight bits each. The port designation is a two-digit decimal number that identifies each input. A decimal point is used to separate the port byte and bit entries. The lowest valid port number is 1.1 and the highest is 8.8. Enter a port number of 0.0 to disable an input. All invalid port numbers will also disable the assigned input function. The input port numbers map directly to the C1 pins, which are connected to the cabinet input file. The diagrams below show the port numbers for each slot in the input file for both the Type 332 and Type 337 Cabinets:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
3.2	1.1	4.5	2.1	3.4	1.3	4.7	2.3	3.6		6.6	5.1	5.2	6.7
	1.5	6.2			1.7	6.4		3.8		2.7	5.3	5.4	6.8
3.1	1.2	4.6	2.2	3.3	1.4	4.8	2.4	3.5		2.8	5.5	5.6	2.5
	1.6	6.3			1.8	6.5		3.7		6.1	5.7	5.8	2.6

Type 332 Cabinet Input File Port Assignments

1	2	3	4	5	6	7	8	9	10	11
3.2	1.1	3.4	1.3	1.2	3.8	3.7	2.8	2.5	5.1	5.2
2.3	1.5	2.4	1.7	1.4	3.5	3.6	6.1	2.6	5.3	5.4

FS/ST
6.7
6.8

Type 337 Cabinet Input File Port Assignments

POWER UP OPERATION

The Model 2070 Controller power supply will continue to provide operating voltages during power failures shorter than 500 milliseconds and the Traffic Signal Control Program will function as though there was no interruption. If a power failure longer than 500 milliseconds occurs, the Model 2070 Controller will shutdown until the power is restored, at which time all applications programs, including the Traffic Signal Control Program, will be restarted. The Model 2070 Controller should only be used in cabinets equipped with a Model 2010 Conflict Monitor, which provides five seconds of cabinet flash upon power restoration to allow the Model 2070 Controller to load all of the necessary programs and begin operation.

TRAFFIC SIGNAL CONTROL PROGRAM

Upon initially selecting the TSCP from the Front Panel Manager menu by pressing the [1] key, the following banner screen will be shown on the display for five seconds.

```
   ADVANCED TRANSPORTATION CONTROLLER
   Traffic Signal Control Program  3.28
Los Angeles Department of Transportation
    Copyright (c) 1992-2003 by LADOT
```

The TSCP version number is shown on this screen, along with the copyright notice. During the five seconds when this screen is displayed, the [NEXT] key may be pressed to immediately bring up the Main Menu screen. Otherwise, after five seconds the following screen will be displayed:

```
              TSCP MAIN MENU
1-Displays   4-Commands   7-Coordination
2-Controller 5-Detectors  8-TOD Schedule
3-Preempts   6-Comm/Logic 9-Utilities
```

This is the TSCP Main Menu screen, from which all other screens can be accessed. Pressing the [*] key will return to the Front Panel Manager menu, and pressing the [NEXT] key will display the banner screen for five seconds. Pressing any of the number keys [1] to [9] will select one of the entries shown on this screen. All of these selections lead to sub-menus, which contain more selections. When viewing any of the sub-menu screens, press the [ESC] key to return to the previous menu. Repeated pressing of the [ESC] key will eventually return to this Main Menu.

DISPLAY MENU (1)

The Display Menu allows the selection of nine different displays. Each display shows various data and statuses of the TSCP. All displays are observe-only screens; data entry is not supported on any of these screens. Some selections lead to submenus with more choices.

```
              DISPLAY MENU
1-Phase Timing  4-TOD Clock  7-Preempts
2-Overlap Data  5-Comm Data  8-Checksum
3-Coordination  6-Detectors  9-LRT Data
```

The sample screens shown are examples of typical data displays. The controller shows the current status of the TSCP, and therefore the actual data values may vary from those shown here. All display messages shown on these screens are described in the text following the sample screens.

PHASE TIMING (1-1)

The Phase Timing display consists of two screens, the first of which shows the current phase timing in each ring along with the current interval being timed, the time remaining in that interval, and the time remaining on the maximum green timer. The phases with current vehicle and pedestrian demands are shown on the right side of the display.

```
                PHASE TIMING          Pg 1/2
Phs  Interval   Time  Max |    Demand
 2  GREEN REST   0.0   20 | VEH .2...6..
 6  GREEN REST   0.0   20 | PED ........
```

The **Phs** column shows the phase active in each ring. If no phase is shown, then that ring is resting in red.

The **Interval** column shows the current interval being timed in each ring. This field can show any of the following intervals:

Interval	Description
DELAY WALK	Delay Walk timing.
WALK	Pedestrian Walk timing.
WALK HOLD	The phase is held in Walk.
WALK REST	The phase is resting in Walk.
DONT WALK	Pedestrian Clearance timing.
MIN GREEN	Minimum Green timing.
BIKE GREEN	Bike Green timing.
ADDED INIT	Added Initial timing.
PASSAGE	Vehicle Gap timing without gap reduction.
REDUCE GAP	Vehicle Gap timing with gap reduction.
EXTENSION	Vehicle Extension timing.
GREEN HOLD	The phase is held in Green.
GREEN REST	The phase is resting in Green.
GUAR PASS	Guaranteed Passage timing; phase has gapped out.
YELLOW GAP	Yellow Clearance timing; phase has gapped out.
YELLOW MAX	Yellow Clearance timing; phase has maxed out.
YELLOW F/O	Yellow Clearance timing; phase has been forced off.
ALL-RED	All-Red Clearance timing.
RED REVERT	Red Revert timing.
RED HOLD	The phase is held in Red.
RED REST	The ring is resting in Red.

The **EXTENSION** interval is not normally displayed. Press the [*] key to enable this interval to be displayed when the controller is timing the **PASSAGE**, **GREEN HOLD**, **GREEN REST**, **REDUCE GAP** or **GUAR PASS** intervals. Press [*] again to return to the normal display mode.

The **Time** column shows the time remaining in the phase shown in each ring. These time values always count down to zero, and are in units of seconds or tenth-seconds as indicated by a decimal point.

The **Max** column shows the time remaining on the maximum green timer for the phase shown in each ring. This time value counts down when the maximum timer is active.

The **Veh** and **Ped** fields show the current demands for each phase. If the phase number appears, then there is demand on that phase; otherwise a dot will show in its place. Bike calls are shown as vehicle calls on this display.

Press the [NEXT] key to advance to the second screen.

PHASE TIMING							Pg 2/2
Phs	Min	Bike	Added	Limit	Max	Ext	Gap
2	10	0	0	0	20	5.0	3.0
6	10	0	0	0	20	5.0	3.0

The **Phs** column shows the phase active in each ring. If no phase is shown, then that ring is resting in red, and the entire row will be blank.

The **Min** column shows the time remaining on the minimum green timer for the current phase.

The **Bike** column shows the time remaining on the bike green timer for the current phase.

The **Added** column shows the time remaining on the added initial timer for the current phase.

The **Limit** column shows the time remaining on the limited detector timer for the current phase.

The **Max** column shows the time remaining on the maximum green timer for the current phase.

The **Ext** column shows the time remaining on the extension timer for the current phase.

The **Gap** column shows the time remaining on the gap timer for the current phase.

The following status messages will appear blinking on either of the Phase Timing Displays whenever their conditions exist:

Message	Description
FLASH	The controller is in software flash operation.
PREEMPT	The controller is serving a preempt.
PRIORITY	The controller is providing priority.
STOP TIME	The stop time input or Aux switch is ON.

While observing either of the Phase Timing Displays, pressing any of the numbered keys [1] to [8] will place a one-time call to the phase number corresponding to the key pressed. If the phase is green, the vehicle extension timer will be reset, and one vehicle extension will be timed. Otherwise, a locking call will be placed on the phase. This allows the user to quickly place calls into the controller. This feature has no effect on phases that are not currently permitted.

OVERLAP DATA (1-2)

The Overlap Data display screen shows information about the operation of the six overlaps. Both the color of the overlap and the time remaining on the overlap timer are displayed.

```
     Timer  Color          Timer  Color
OLA   0.0   RED     | OLD   0.0   RED
OLB   0.0   RED     | OLE   0.0   RED
OLC   0.0   RED     | OLF   0.0   RED
```

The **Timer** column shows the time remaining on the current active timer for the overlap. These timers count down from the programmed value to zero during each timed interval. When the overlap is green, the timer value will not always count down. The green timer counts down only during the overlap minimum green and green extension periods.

The **Color** column will show one of the following for each overlap:

Color	Description
RED	The overlap red output is ON.
YELLOW	The overlap yellow output is ON.
GREEN	The overlap green output is ON.
DARK	All overlap outputs are OFF due to an omit phase being active.

COORDINATION (1-3)

The Coordination display screen shows the status of coordinated operation. The following data are displayed on the first screen: the timing plan source, the timing plan number, the cycle length, offset, master cycle counter, local cycle counter, lag phases, omit phases, hold phases and forced off phases.

```
   COORDINATION   Pg 1/2 | Lag  .2.4.6.8
Source  TOD   Plan  FREE | Omit ........
Offset    0   Cycle    0 | Hold ........
Master    0   Local    0 | Forc ........
```

The **Source** field displays how the plan was selected and will be one of the following:

Source	Description
TOD	The plan is selected by the local TOD schedule.
ATSAC	The controller is either on-line under ATSAC control or the plan is selected by an ATSAC download.
SLAVE	The plan is selected by an incoming interconnect signal.
AB3418	The plan is selected by a received AB3418 message.
MANUAL	The plan is selected manually by the user.
LOGIC	The plan is selected by a soft logic equation.

When the **Source** field indicates **ATSAC**, the controller is on-line if the **Plan** field shows any of **A**, **B**, **C**, **D** or **FLASH**; the controller is off-line if the **Plan** field shows **1-9** or **FREE**.

The **Plan** field displays either current plan number (**1-9**), or **FLASH** during software Flashing operation or **FREE** during Free operation.

The **Offset** field shows the offset programmed for the current plan.

The **Cycle** field shows the current cycle length. This will be different from the cycle length programmed for the plan when the controller is in transition. While on-line under ATSAC control, this field shows the previous on-line cycle length.

The **Master** field shows the master cycle counter, which counts up from one to the programmed cycle length. If a zero is shown, then there is no plan selected and the controller is in either Free or Flash operation.

The **Local** field shows the local cycle counter, which counts up from one to the current cycle length. If a zero is shown, then there is no plan running. If this counter is stopped at a non-zero value, then a Stop Time input has been applied, and coordination will be suspended until the Stop Time input is removed.

The right hand side of the display shows information about the phases during coordinated operation as described below:

Field	Description
LAG	The phases that are lagging in the current plan are shown.
OMIT	The phases that are omitted in the current plan are shown.
HOLD	The phases that are held in the current plan are shown.
FORC	The phases that have been forced off are shown. This field changes as the cycle progresses.
SYNC	The phases that are synchronized in the current plan are shown.
MASK	The phases that have been masked are shown. This field changes as the cycle progresses. Phases are masked after they have been allowed to be served.

Note that the **SYNC** and **MASK** phases are not normally shown. Press the [*] key to toggle between the display of the **HOLD** and **FORC** phases and the **SYNC** and **MASK** phases.

Press the [NEXT] key to display the second screen, which contains detailed information on the current operation. The current plan is shown including any green factor or force-off data associated with the current plan. When the controller is in either Free or Flash operation, the data shown on this screen are not applicable.

Plan 1	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
Phs G/F:	10	26	10	25	10	26	10	25
Veh F/0:	61	0	17	46	61	0	17	46
Ped F/0:	0	80	0	36	0	80	0	36

The **Phs G/F** field shows the values of the green factors currently being used for this plan. These will differ from the programmed values when the controller is in transition, or if CIC is

enabled for the current plan. If the plan was programmed with force offs, the **Phs G/F** field will be replaced by **Phs F/O** to indicate such, and the programmed values will be shown.

The **Veh F/O** field shows the values of the current vehicle force offs as they will be applied in the current plan. These values are automatically calculated by the controller for all plans with green factors entered. For plans programmed with force offs, these values will be the same as the **Phs F/O** field, except during transition.

The **Ped F/O** field shows the values of the current pedestrian force offs as they will be applied in the current plan. These values are automatically calculated by the controller for all hold phases with pedestrian timing.

Press the [NEXT] key to return to the first Coordination Display screen.

TOD CLOCK (1-4)

The Time-of-Day Clock and calendar display shows the current time, date and day of week. Also shown is the time period in effect (either standard or daylight) and the time of local sunrise and sunset.

```
  TIME-OF-DAY CLOCK/CALENDAR DISPLAY
Time   15:37:21        DAYLIGHT TIME
Date  08/12/2002     Sunrise  06:11:07
Day     MONDAY        Sunset  19:43:40
```

The **Time** field shows the current time in 24-hour format (hour:minute:second).

The **Date** field shows the current calendar date (month/day/year).

The **Day** field shows the current day of the week, as determined from the date.

The **Sunrise** and **Sunset** fields are only displayed if the latitude, longitude and time zone information have been entered. Both are shown in 24-hour format (hour:minute:second).

STANDARD TIME will always be displayed if Daylight Saving correction is not enabled, otherwise **DAYLIGHT TIME** will be displayed when it is in effect from the first Sunday in April until the last Sunday in October.

This display is observe-only. The time and date are set in the TOD Schedule submenu (8-1).

COMM DATA (1-5)

The Comm Data display submenu allows the selection of six submenus relating to serial communications data. There is one selection for each of the six communication protocols supported by the controller: ATSAC, Simplex, Complex, AB3418, WWV and Predict.

```
        COMMUNICATIONS DISPLAY
1-ATSAC Protocol    4-AB3418 Protocol
2-Simplex Protocol  5-WWV Protocol
3-Complex Protocol  6-Predict Protocol
```

ATSAC PROTOCOL (1-5-1)

The ATSAC Protocol Display submenu allows the selection of four displays relating to the ATSAC protocol serial communications data.

```
     ATSAC COMMUNICATIONS DISPLAYS
1-ATSAC Status      4-ATSAC Errors
2-ATSAC Command
3-ATSAC Response
```

ATSAC STATUS (1-5-1-1)

The ATSAC Status display shows in hexadecimal data the currently received poll from ATSAC along with this controller's response. The status of the communications is also shown at the bottom of this display.

```
      ATSAC COMMUNICATIONS STATUS
 Poll: 01 FE 40 00 3F
 Resp: 22 00 10 00 01 00 01 34
 Stat: OKAY
```

The **Poll** field shows the incoming ATSAC command message, which is five bytes long.

The **Resp** field shows the outgoing response, which is either eight or nine bytes long.

The **Stat** field displays one of the following status messages about the incoming poll:

Stat	Description
OKAY	The data contains no errors. A response will be generated.
LOSS OF SIGNAL	There has been no valid data during the past 4 seconds.
HEADER ERROR	One or both of the first two bytes of the poll were in error.
CHECKSUM ERROR	The poll data did not validate the checksum received.
TIMEOUT ERROR	Too much time elapsed between consecutive data bytes.
INVALID MESSAGE	The poll data contains an invalid message number.
PROTOCOL NOT ENABLED	The selected protocol is not enabled for any comm port.
COMM PORT UNAVAILABLE	The comm port assigned to this protocol is already in use.

Note that the **Poll** and **Resp** fields shown above display only data intended for this controller. The ATSAC protocol includes data intended for other controllers, but these other data are not shown on this display. The **Stat** field, however, will report all errors in the data, including errors in messages not intended for this controller.

ATSAC COMMAND (1-5-1-2)

The ATSAC Command display shows the bits present in the ATSAC command message for this controller.

```
      ATSAC COMMAND DETAIL DISPLAY
   Bit:  1   2   3   4   5   6   7   8
Word 1:  .  FRE CYC FLS FO2 FO1 YLD HOL
Word 2: SF4 SF3 SF2 SF1 DET PO3 PO2 PO1
```

The two command bytes in the poll message are shown on the display, with each bit represented by either a dot if that bit is OFF, or a three-letter abbreviation if it is ON. The following is a description of the bits:

Bit	Description
FRE	The controller is placed in Free operation.
CYC	The controller is requested to call to the cycle controller phases.
FLS	The controller is placed in Flashing operation.
FO2	The current phase in Ring B is forced-off.
FO1	The current phase in Ring A is forced-off.
YLD	The controller is permitted to yield to side street calls when OFF.
HOL	The controller is on-line under ATSAC control.
SF4	Special function 4 is turned ON.
SF3	Special function 3 is turned ON.
SF2	Special function 2 is turned ON.
SF1	Special function 1 is turned ON.
DET	The detector reset output is activated.
PO3	Phase omit 3 is selected.
PO2	Phase omit 2 is selected.
PO1	Phase omit 1 is selected.

The phase omit bits (**PO1**, **PO2** and **PO3**) are used to select the on-line ATSAC plan. If all three phase omit bits are OFF, then ATSAC Plan A is selected. If phase omit 1 is ON, then ATSAC Plan B is selected. If phase omit 2 is ON, then ATSAC Plan C is selected. If phase omit 3 is ON, then ATSAC Plan D is selected. If more than one phase omit bit is ON, the highest bit is used to select the ATSAC plan.

ATSAC RESPONSE (1-5-1-3)

The ATSAC Response display shows the bits present in the ATSAC response message for this controller.

```
     ATSAC RESPONSE DETAIL DISPLAY
1: .2...6..   4: ........   7: 1.......
2: ........   5: ........   8: 12...6..
3: ........   6: ........
```

```
     ATSAC RESPONSE DETAIL DISPLAY
1: .2...6..   4: ........   7: ........
2: ........   5: ........   8: 1.......
3: ........   6: ........   9: 12...6..
```

The eight or nine bytes of the response message are shown in this display. Each bit in the message is represented by either a dot if the bit is OFF, or the number 1-8 if the bit is ON. The data in the response messages contains information on which phases are in green and walk, the status of the system detectors, the overlaps that are green, the special function inputs that are ON, miscellaneous controller and cabinet status bits and a checksum byte.

The bytes in an eight-byte response have the following meaning:

Byte	Description
1	Phase green returns.
2	Phase walk returns.
3	System Detector 1-8 volume bits.
4	System Detector 9-12 volume bits and 1-4 occupancy bits.
5	System Detector 5-12 occupancy bits.
6	Overlap green returns and Special Function inputs.
7	Controller and cabinet status bits.
8	Checksum byte.

The bytes in a nine-byte response have the following meaning:

Byte	Description
1	Phase green returns.
2	Phase walk returns.
3	System Detector 1-8 volume bits.
4	System Detector 9-16 volume bits.
5	System Detector 1-8 occupancy bits.
6	System Detector 9-16 occupancy bits.
7	Overlap green returns and Special Function inputs.
8	Controller and cabinet status bits.
9	Checksum byte.

ATSAC ERRORS (1-5-1-4)
The ATSAC Errors display screen shows the accumulated errors detected in the reception of ATSAC messages.

```
      ATSAC COMMUNICATIONS ERRORS
  Header      0    Message Timeout    0
Checksum      0    Invalid Message    0
   Press * to reset error counters
```

The maximum error count for each type of error is 255. Press the [*] key to reset all the error counters to zero. The meaning of each of the four errors is described below:

Error	Description
Header	One or both of the first two bytes in a poll were in error.
Checksum	The poll data did not validate the checksum received.
Message Timeout	Too much time elapsed between consecutive data bytes.
Invalid Message	The poll data contains an invalid message number.

All errors received on the communication line are counted, including errors in messages intended for other controllers.

SIMPLEX PROTOCOL (1-5-2)
The Simplex Protocol Display submenu allows the selection of two displays relating to the Simplex protocol serial communications data.

```
    SIMPLEX COMMUNICATIONS DISPLAYS
1-Simplex Status
2-Simplex Errors
```

SIMPLEX STATUS (1-5-2-1)
The Simplex Status display shows the current simplex data along with the local plan selected for both the incoming and outgoing communications.

```
     SIMPLEX COMMUNICATIONS STATUS
       Plan  Data      Command Bits
In:     5    09   .. .. .. R2 .. .. D2
Out:  255    20   .. FR .. .. .. .. ..
```

The **Plan** field shows the incoming and outgoing Simplex plan number. If a **--** is shown, then there is no incoming plan.

The **Data** field shows the incoming and outgoing Simplex message data. If a **--** is shown, then there is no incoming data.

The **Command Bits** field shows the seven-wire hardware interconnect bits in the data byte. The following bits may be displayed:

Command Bit	Description
FL	Flash is selected.
FR	Free is selected.
R3	Reset 3 is active.
R2	Reset 2 is active.
R1	Reset 1 is active.
D3	Dial 3 is selected.
D2	Dial 2 is selected.

If the following message is shown on the Simplex Communications Status screen, then the Simplex protocol has not been selected for any of the comm ports:

```
PROTOCOL NOT ENABLED
```

If the following message is shown on the Simplex Communications Status Screen, then the comm port assigned to the Simplex protocol is already in use by another applications program:

```
COMM PORT UNAVAILABLE
```

SIMPLEX ERRORS (1-5-2-2)

The Simplex Errors display screen shows the accumulated errors detected in the reception of Simplex messages.

```
SIMPLEX COMMUNICATIONS ERRORS
     Message Timeout    0
     Invalid Message    0
Press * to reset error counters
```

The maximum error count for each type of error is 255. Press the [*] key to reset all the error counters to zero. The meaning of each of the two errors is described below:

Error	Description
Message Timeout	Too much time has elapsed since the last data byte.
Invalid Message	The data byte contains an invalid combination of command bits.

COMPLEX PROTOCOL (1-5-3)

The Complex Protocol Display submenu allows the selection of two displays relating to the Complex protocol serial communications data.

```
   COMPLEX COMMUNICATIONS DISPLAYS
1-Complex Status
2-Complex Errors
```

COMPLEX STATUS (1-5-3-1)
The Complex Status display shows in hexadecimal data the currently received messages from a Complex master along with this controller's Complex message transmissions. The status of the communications is also shown at the bottom of this display.

```
    COMPLEX COMMUNICATIONS STATUS
Transmit: 0E 28 1A 02 96 DC
Received: 0E 28 1A 02 96 DC
 Status:  OKAY
```

The **Transmit** field shows the outgoing Complex command message, which is six bytes long.

The **Received** field shows the incoming Complex message, which is six bytes long.

The **Status** field displays one of the following status messages about the incoming message:

Status	Description
OKAY	The incoming data contains no errors.
LOSS OF SIGNAL	There has been no valid data during the past 10 seconds.
HEADER ERROR	One or more bytes of the message were in error.
CHECKSUM ERROR	The poll data did not validate the checksum received.
TIMEOUT ERROR	Too much time elapsed between consecutive data bytes.
INVALID MESSAGE	The poll data contains an invalid number of bytes.
PROTOCOL NOT ENABLED	The selected protocol is not enabled for any comm port.
COMM PORT UNAVAILABLE	The comm port assigned to this protocol is already in use.

COMPLEX ERRORS (1-5-3-2)
The Complex Errors display screen shows the accumulated errors detected in the reception of Complex messages.

```
    COMPLEX COMMUNICATIONS ERRORS
 Header     0    Message Timeout    0
Checksum    0    Invalid Message    0
   Press * to reset error counters
```

The maximum error count for each type of error is 255. Press the [*] key to reset all the error counters to zero. The meaning of each of the four errors is described below:

Error	Description
Header	One or both of the bytes of the message were in error.
Checksum	The poll data did not validate the checksum received.
Message Timeout	Too much time elapsed between consecutive data bytes.
Invalid Message	The poll data contains an invalid number of bytes.

All errors received on the communication line are counted.

AB3418 PROTOCOL (1-5-4)
The AB3418 Protocol Display submenu allows the selection of two displays relating to the AB3418 protocol serial communications data.

```
     AB3418 COMMUNICATIONS DISPLAYS
1-AB3418 Status
2-AB3418 Errors
```

AB3418 STATUS (1-5-4-1)
The AB3418 Status display screen shows in hexadecimal data the currently received poll from an AB3418 master along with this controller's response. The status of the communications is also shown at the bottom of this display.

```
      AB3418 COMMUNICATIONS STATUS
 Poll: 7E 05 33 C0 84 C5 F3 7E
 Resp: 7E 05 13 C0 84 22 01 47 A3 7E
 Stat: OKAY
```

The **Poll** field shows the incoming AB3418 command message, which is variable in length.

The **Resp** field shows the outgoing response, which is variable in length.

The **Stat** field displays one of the following status messages about the incoming poll:

Stat	Description
OKAY	The data contains no errors. A response will be generated.
LOSS OF SIGNAL	There has been no valid data during the past 240 seconds.
BAD MESSAGE TYPE	The message type is not one defined in the AB3418 protocol.
BAD DATA VALUE	The data field in the message contains an invalid value.
READ ONLY DATA	A write data request was received for a read-only data item.
BAD MESSAGE LENGTH	The message received was not of the proper length.
PROTOCOL NOT ENABLED	The selected protocol is not enabled for any comm port.
COMM PORT UNAVAILABLE	The comm port assigned to this protocol is already in use.

The **Poll** and **Resp** fields shown above display only data intended for this controller. The AB3418 protocol includes data intended for other controllers, but these other data are not shown on this display. The **Stat** field, however, will report all errors in the data, including errors in messages not intended for this controller.

AB3418 ERRORS (1-5-4-2)
The AB3418 Errors display screen shows the accumulated errors detected in the reception of AB3418 messages.

```
     AB3418 COMMUNICATIONS ERRORS
Bad Value    0   Invalid Length     0
Read Only    0   Invalid Message    0
   Press * to reset error counters
```

The maximum error count for each type of error is 255. Press the [*] key to reset all the error counters to zero. The meaning of each of the four errors is described below:

Error	Description
Bad Value	The data field in the message contains an invalid value.
Read Only	A write data request was received for a read-only data item.
Message Timeout	Too much time has elapsed between successive messages.
Invalid Message	The message received was not of the proper length or is not one of the types defined in the AB3418 protocol.

All errors received on the communication line are counted.

WWV PROTOCOL (1-5-5)
The WWV Protocol Display submenu allows the selection of two displays relating to the WWV protocol serial communications data.

```
      WWV COMMUNICATIONS DISPLAYS
1-WWV Status
2-WWV Errors
```

WWV STATUS (1-5-5-1)
The WWV Status display screen shows in hexadecimal data the currently transmitted and received data to and from a WWV clock. The status of the communications is also shown at the bottom of this display.

```
      WWV COMMUNICATIONS STATUS
Transmit: 514138010000
Received: 0A00085800641C087C1C00000D
 Status:  OKAY
```

The **Transmit** field shows the outgoing WWV poll message, which is six bytes long.

The **Received** field shows the incoming WWV response, which is thirteen bytes long.

The **Status** field displays one of the following status messages about the incoming response:

Stat	Description
OKAY	The received data contains no errors and the time is valid.
STATUS ERROR	The WWV clock is unable to provide valid time.
HARDWARE ERROR	The WWV clock is reporting a hardware fault.
TIMEOUT ERROR	The WWV clock did not respond to the last poll message.
INVALID MESSAGE	The received data message was not of the proper length.
INACTIVE	The program is waiting for the next minute to begin polling.
PROTOCOL NOT ENABLED	The selected protocol is not enabled for any comm port.
COMM PORT UNAVAILABLE	The comm port assigned to this protocol is already in use.

WWV ERRORS (1-5-5-2)

The WWV Errors display screen shows the accumulated errors detected in the reception of WWV messages.

```
      WWV COMMUNICATIONS ERRORS
 Status     0    Message Timeout    0
Hardware    0    Invalid Message    0
   Press * to reset error counters
```

The maximum error count for each type of error is 255. Press the [*] key to reset all the error counters to zero. The meaning of each of the four errors is described below:

Error	Description
Status	The WWV clock was unable to provide valid time.
Hardware	The WWV clock reported a hardware fault.
Message Timeout	The WWV clock failed to respond to a poll message.
Invalid Message	The message received was not of the proper length.

PREDICT PROTOCOL (1-5-6)

The Predict Protocol Display submenu allows the selection of two displays relating to the Predict protocol serial communications data.

```
   PREDICT COMMUNICATIONS DISPLAYS
1-Predict Status
2-Predict Errors
```

PREDICT STATUS (1-5-6-1)

The Predict Status display shows in hexadecimal data the currently received poll from the Predictor along with this controller's response. The status of the communications is also shown at the bottom of this display.

```
    PREDICT COMMUNICATIONS STATUS
Poll: 80 7F 00 00 00 00 00 00 00 FF
Resp: 30 40 F6 F6 00 00 5C
Stat: OKAY
```

The **Poll** field shows the incoming Predictor command message, which is four to eleven bytes long, depending on the number of controllers on the communications line.

The **Resp** field shows the outgoing response, which is seven bytes long.

The **Stat** field displays one of the following status messages about the incoming poll:

Stat	Description
OKAY	The data contains no errors. A response will be generated.
LOSS OF SIGNAL	There has been no valid data during the past 10 seconds.
HEADER ERROR	One or both of the first two bytes of the poll were in error.
CHECKSUM ERROR	The poll data did not validate the checksum received.
TIMEOUT ERROR	Too much time elapsed between consecutive data bytes.
INVALID MESSAGE	The poll data contains an invalid message number.
PROTOCOL NOT ENABLED	The selected protocol is not enabled for any comm port.
COMM PORT UNAVAILABLE	The comm port assigned to this protocol is already in use.

Note that the **Poll** field shows incoming data intended for this controller as well as other controllers. The **Resp** field shows the response from this controller only. The **Stat** field will report all incoming data errors, including errors in messages not intended for this controller.

PREDICT ERRORS (1-5-6-2)

The Predict Errors display screen shows the accumulated errors detected in the reception of Predictor messages.

```
    PREDICT COMMUNICATIONS ERRORS
 Header     0    Message Timeout    0
Checksum    0    Invalid Message    0
   Press * to reset error counters
```

The maximum error count for each type of error is 255. Press the [*] key to reset all the error counters to zero. The meaning of each of the four errors is described below:

Error	Description
Header	One or both of the first two bytes in a poll were in error.
Checksum	The poll data did not validate the checksum received.
Message Timeout	Too much time elapsed between consecutive data bytes.
Invalid Message	The poll data contains an invalid message number.

All errors received on the communication line are counted, including errors in messages intended for other controllers.

DETECTORS (1-6)

The Detectors display submenu allows the selection of five displays relating to detector data and operation. The first three selections show detector count, delay and extend data. The fourth selection shows which detectors have failed, and the fifth selection is for system detector data.

```
        DETECTOR DISPLAY MENU
1-Vehicle Counts    4-Detector Failures
2-Delay Timers      5-System Det Data
3-Extend Timers
```

VEHICLE COUNTS (1-6-1)

The Vehicle Counts display screen consists of four pages, with data for eight detectors on each page. Press the [NEXT] key to advance through the four screens. Only the first and last screens are shown.

```
          VEHICLE COUNTS          Pg 1/4
 # Count   # Count   # Count   # Count
 1    0    3    0    5    0    7    0
 2    0    4    0    6    0    8    0
                    .
                    .
                    .
          VEHICLE COUNTS          Pg 4/4
# Count   # Count   # Count   # Count
25    0   27    0   29    0   31    0
26    0   28    0   30    0   32    0
```

Each detector's count is shown to the right of the detector number in the column labeled **Count**. This is the number of actuations received on the detector since the assigned phase has changed from green to yellow. These data are used in conjunction with the add per vehicle phase setting to calculate the added initial green time.

DELAY TIMERS (1-6-2)

The Delay Timers display screen consists of four pages, with data for eight detectors on each page. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
          DELAY TIMERS            Pg 1/4
 # Delay   # Delay   # Delay   # Delay
 1    0    3    0    5    0    7    0
 2    0    4    0    6    0    8    0
                    .
                    .
                    .
          DELAY TIMERS            Pg 4/4
 # Delay   # Delay   # Delay   # Delay
25    0   27    0   29    0   31    0
26    0   28    0   30    0   32    0
```

Each detector's delay timer is shown to the right of the detector number in the column labeled **Delay**. This is the number of seconds of delay time remaining on the detector prior to the actuation being recognized by the controller. These values count down only when the detector input in ON, and the assigned phase is not green.

EXTEND TIMERS (1-6-3)

The Extend Timers display screen consists of four pages, with data for eight detectors on each page. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
          EXTEND TIMERS          Pg 1/4
 # Extend  # Extend  # Extend  # Extend
 1   0.0   3   0.0   5   0.0   7   0.0
 2   0.0   4   0.0   6   0.0   8   0.0
                    .
                    .
                    .
          EXTEND TIMERS          Pg 4/4
 # Extend  # Extend  # Extend  # Extend
25   0.0  27   0.0  29   0.0  31   0.0
26   0.0  28   0.0  30   0.0  32   0.0
```

Each detector's extend timer is shown to the right of the detector number in the column labeled **Extend**. This is the number of seconds of extend time (carry over) remaining on the detector since the last actuation. During the extend time, the detector input is still recognized by the controller. These values count down only when the detector input is OFF regardless of assigned phase status.

DETECTOR FAILURES (1-6-4)

The Detector Failures display screen shows the detectors that have failed. There are two screens, one for the currently failed detectors, and a second for detector failure history. A detector is identified as failed if its input has been continuously ON for more than the Detector Maximum On Time.

```
CURRENT DETECTOR  Det  1- 8:  .2......
    FAILURES      Det  9-16:  ....56..
Failure override  Det 17-24:  ........
 shown blinking   Det 25-32:  ..3.....
```

The failed detectors are presented as bits in the display. Each bit in each row represents one detector, offset by the detector numbers for that row. In the above example, the following detectors are shown as failed: 2, 13, 14 and 27. If the number shown is blinking, then the detector has been set to the failure override mode.

Press the [NEXT] key to advance to the second screen.

```
DETECTOR FAILURE  Det  1- 8:  .......8
    HISTORY       Det  9-16:  1.......
Press * to clear  Det 17-24:  ......7.
detector history  Det 25-32:  ...4....
```

The detector failure history is presented as bits in the display. Each bit in each row represents one detector, offset by the detector numbers for that row. In the above example, the following detectors are shown in the failure history: 8, 9, 23 and 28. Press the [*] key to clear the failed detector history display.

Press the [NEXT] key to return to the first screen.

SYSTEM DET DATA (1-6-5)

The System Detector Data submenu allows for the selection of system detector data in three different formats: raw, cyclic and hourly. These displays can be used to verify system detector operation and to view the volume and occupancy of the system detectors.

```
     SYSTEM DETECTOR DISPLAY MENU
1-Raw Detector Data
2-Cyclic Detector Data
3-Hourly Detector Data
```

RAW DETECTOR DATA (1-6-5-1)

The Raw Detector Data display screen consists of two pages, with data for eight system detectors on each page. Press the [NEXT] key to advance through the screens.

```
      SYSTEM DETECTOR DATA        Pg 1/2
RAW      1   2   3   4   5   6   7   8
Vol      0   0   0   0   0   0   0   0
Occ      0   0   0   0   0   0   0   0
                  .
                  .
                  .
      SYSTEM DETECTOR DATA        Pg 2/2
RAW      9  10  11  12  13  14  15  16
Vol      0   0   0   0   0   0   0   0
Occ      0   0   0   0   0   0   0   0
```

The **Vol** field shows the number of vehicles passing over the detector in the current computation period. The **Occ** field shows the number of seconds the detector is occupied in the current computation period. All values count up until the end of the computation period, then they are reset to zero.

CYCLIC DETECTOR DATA (1-6-5-2)

The Cyclic Detector Data display screen consists of two pages, with data for eight system detectors on each page. Press the [NEXT] key to advance through the screens.

```
       SYSTEM DETECTOR DATA          Pg 1/2
CYCLIC    1   2   3   4   5   6   7   8
 Vol      0   0   0   0   0   0   0   0
Occ %     0   0   0   0   0   0   0   0
                    .
                    .
                    .
       SYSTEM DETECTOR DATA          Pg 2/2
CYCLIC    9  10  11  12  13  14  15  16
 Vol      0   0   0   0   0   0   0   0
Occ %     0   0   0   0   0   0   0   0
```

The **Vol** field shows the number of vehicles that passed over the detector in the previous computation period. The **Occ %** field shows the percentage of time that the detector was occupied in the previous computation period. All values are updated at the end of each computation period.

HOURLY DETECTOR DATA (1-6-5-3)

The Hourly Detector Data display screen consists of two pages, with data for eight system detectors on each page. Press the [NEXT] key to advance through the screens.

```
       SYSTEM DETECTOR DATA          Pg 1/2
HOURLY    1   2   3   4   5   6   7   8
 Vol      0   0   0   0   0   0   0   0
Occ %     0   0   0   0   0   0   0   0
                    .
                    .
                    .
       SYSTEM DETECTOR DATA          Pg 2/2
HOURLY    9  10  11  12  13  14  15  16
 Vol      0   0   0   0   0   0   0   0
Occ %     0   0   0   0   0   0   0   0
```

The **Vol** field shows the number of vehicles that passed over the detector in the previous computation period, converted to vehicles per hour. The **Occ %** field shows the percentage of time that the detector was occupied in the previous computation period. All values are updated at the end of each computation period.

PREEMPTS (1-7)

The Preempts Display submenu allows the selection of four displays relating to preempts. The Railroad Preempts, Emergency Vehicle Preempts, Transit Priority and Interval Control Preempts are all selected from this screen.

```
            PREEMPT DISPLAY
1-Railroad          4-Interval Control
2-Emergency Vehicle
3-Transit Priority
```

RAILROAD PREEMPT (1-7-1)

The Railroad Preempt display screens show the status of the Railroad Preempts. This screen shows the state of the inputs, the preempt status, interval timers and Right-of-Way Transfer Time (RWTT).

```
        RAILROAD PREEMPT DISPLAY
       Input     Status    Timer   RWTT
RR1     OFF       OFF       ---     ---
RR2     OFF       OFF       ---     ---
```

The **Input** column indicates the state of the preempt input, and will be either **OFF** or **ON**.

The **Status** column indicates the current state of preempts, and will be one of the following:

Status	Description
OFF	The railroad preempt is inactive.
INHIBIT	The railroad preempt is inhibited.
STARTUP	The railroad preempt power up routine is active.
DELAY	The railroad preempt is timing the delay interval.
CLEAR 1	The railroad preempt is timing the first clearance interval.
CLEAR 2	The railroad preempt is timing the second clearance interval.
CLEAR 3	The railroad preempt is timing the third clearance interval.
HOLD	The railroad preempt is holding.
EXIT	The railroad preempt is timing the exit interval.
TRANSFER	The railroad preempt is transfering from RR2 to RR1.

The **Timer** column indicates the time remaining on the interval shown in the Status column. The timers count down from the point at which they take effect until they either reach zero or the railroad preempt input is removed. If **---** is shown, then that preempt is not active.

The **RWTT** column indicates the time remaining to complete the Right-of-Way Transfer Time. This timer counts down from the point at which the preempt starts until the start of the first clearance interval timer and represents the maximum amount of time it could take to transfer from any permitted phase to the clearance phases. If **---** is shown, then the timer is not active.

EMERGENCY VEHICLE PREEMPT (1-7-2)

The Emergency Vehicle Preempt display screens show the status of the emergency vehicle preempts. The first screen shows the state of the four emergency vehicle preempt inputs, as well as the status of the emergency vehicle preempt.

EV STATE	EVA	EVB	EVC	EVD
Input	OFF	OFF	OFF	OFF
Status	OFF	OFF	OFF	OFF

The **Input** row indicates the state of the preempt input, and will be either **OFF** or **ON**.

The **Status** row indicates the current state of preempts, and can be one of the following:

Status	Description
OFF	The preempt is inactive.
INHIBIT	The preempt is inhibited.
DELAY	The preempt is timing the delay interval.
HOLD	The preempt is waiting for a higher priority preempt to end.
CLEAR	The preempt is timing the clearance interval.

Press the [NEXT] key to display the second screen, which contains information on the emergency vehicle preempt timers. The Delay, Clear and Maximum timers are shown for each of the four emergency vehicle preempts.

EV TIMER	EVA	EVB	EVC	EVD
Delay	0.0	0.0	0.0	0.0
Clear	0.0	0.0	0.0	0.0
Max	0.0	0.0	0.0	0.0

These timers count down from the point at which they take effect until they either reach zero or the emergency vehicle preempt input is removed. Press the [NEXT] key to return to the first screen.

TRANSIT PRIORITY (1-7-3)

The Transit Priority display screen shows the status of the transit priority, manual and request timers, along with the transit priority parameters currently in use.

```
        TRANSIT PRIORITY DISPLAY
Type       NONE       TPS/LRT Type Group
Mode       NONE       Request   0     0
Timer        0        Manual    0     0
```

The **Type** field indicates the type of transit priority activity, and can be one of the following:

Type	Description
NONE	There is no transit priority active.
EARLY GREEN	The controller is providing Early Green priority.
GREEN EXTEND	The controller is providing Green Extend priority.
FREE HOLD	The controller is providing Free Hold priority.
PHASE CALL	The controller is providing Phase Call priority.
LRT HOLD	The controller is providing Light Rail Train Hold priority.
PHASE OMIT	The controller is providing Phase Omit priority.
PREEMPT	The controller is serving a preempt.

The **Mode** field indicates the mode of transit priority active, and can be one of the following:

Mode	Description
NONE	There is no transit priority active.
PREPARE	The controller is preparing for transit priority.
ACTIVE	Transit priority is currently active.
RECOVERY	The controller is recovering from transit priority.
INHIBIT	Transit priority is inhibited.

The **Timer** field indicates either the number of seconds transit priority has been active, or the number of cycles that must elapse before another request for transit priority will be served.

The **Request** fields indicate the Type and Group of the current TPS or LRT priority request. When both of these values are zero, then there is no TPS or LRT priority request.

The **Manual** fields indicate the Type and Group of the current Manual priority request. When both of these values are zero, then there is no Manual priority request.

INTERVAL CONTROL (1-7-4)
The Interval Control display screen shows the status of the Interval Control Preempt. This screen shows the state of the inputs and the Interval Control step and timer.

```
   INTERVAL CONTROL PREEMPT DISPLAY
  Input   Delay          Interval
    1       0.0       Step       0
    2       0.0       Timer    0.0
```

The **Delay** column indicates the amount of time remaining on the delay timer for that input.

The **Step** field shows the currently active step in the Interval Control preempt. If the step is zero, the Interval Control preempt is not active.

The **Timer** field shows the time remaining for the current step in the Interval Control preempt. The timer counts down for each step until the end of the Interval Control preempt.

CHECKSUM (1-8)
The Checksum display screen shows the hexadecimal checksums for all user-entered data in RAM. These values can be used to verify that all data has been entered correctly by comparing them to the expected value for each page of the Timing Chart. If the checksum does not match the expected value, then at least some of the programmed data in RAM has been changed.

```
            RAM CHECKSUM
  Page 2 = XXXX        Page 4 = XXXX
  Page 3 = XXXX        Page 5 = XXXX
   Pages referenced to Timing Chart
```

Be sure to note the new checksums whenever changes to user-entered data are made.

LRT DATA (1-9)
The LRT Data display submenu allows the selection of six displays relating to Light Rail Train operation.

```
         LIGHT RAIL DISPLAY
1-Phase Timing      4-Track Status
2-Control Data      5-Aux Sign Status
3-Detect Status     6-Predict Command
```

PHASE TIMING (1-9-1)

The Phase Timing display shows the current Light Rail phase timing along with the current interval being timed and the time remaining in that interval. The various statuses of the Light Rail phases are shown on the right side of the display.

```
     LRT Phase Timing     | 3-Car    ..
LRT    Interval    Time   | Demand   A.
 A   GREEN HOLD     20    | Holding  A.
 B    RED REST            | Inhibit  ..
```

The **Interval** column shows the current interval being timed by each Light Rail Phase. This field can show any of the following intervals:

Interval	Description
MIN GREEN	Minimum Green is timing.
GREEN HOLD	The Light Rail phase is holding in Green.
YELLOW	Yellow Clearance is timing.
ALL-RED	All-Red Clearance is timing.
RED REVERT	Red Revert is timing.
RED REST	The Light Rail phase is resting in Red.

The **Time** column shows the time remaining for each of the Light Rail phases. These time values always count down to zero, and are in units of seconds or tenth-seconds as indicated by a decimal point. The Red Rest interval does not have an associated Time value, and therefore this field will be blank during that interval.

The **3-Car** field shows the status of three-car train detection for each Light Rail phase. If a three-car train has been detected, then the associated Light Rail phase letter will appear, otherwise a dot will show in its place.

The **Demand** field shows the current demands for each Light Rail phase. If the phase letter appears, then there is demand on that Light Rail phase, otherwise a dot will show in its place.

The **Holding** field shows the status of the Light Rail phase hold. If the Light Rail phase letter appears, then that Light Rail phase is holding the compatible phases in order to complete its timing, otherwise a dot will show in its place.

The **Inhibit** field shows the status of Light Rail phase inhibits. If the Light Rail phase letter appears, then that Light Rail phase is inhibited from starting, otherwise a dot will show in its place.

While observing the LRT Phase Timing display, pressing the [A] or [B] keys will place a one-time call for the Light Rail phase corresponding to the key pressed. This allows the user to quickly place calls into the controller. This feature has no effect on Light Rail phases that are already timing or not currently permitted.

CONTROL DATA (1-9-2)

The Control Data display shows the status of six controls imposed on signal operation by Light Rail phase operation. The Call, Hold, Omit, Phase Hold, Omit Overlap and Non-Omit controls are all shown on this display.

```
            LRT Control Data
Call  ........   Phase Hold   ........
Hold  ........   Omit Overlap  ......
Omit  ........   Non-Omit     ........
```

The **Call** field shows the phases that have calls placed due to Light Rail phase demand.

The **Hold** field shows the phases that are held green due to Light Rail phase demand.

The **Omit** field shows the phases that are omitted due to Light Rail phase demand.

The **Phase Hold** field shows phases that are held green to complete Light Rail phase timing.

The **Omit Overlap** field shows overlaps that are omitted due to Light Rail phase demand.

The **Non-Omit** field shows the phases that will not be omitted until they are served. These phases were previously omitted with demand due to Light Rail phase demand.

DETECT STATUS (1-9-3)

The Detect Status display shows the status of Light Rail train detection for each of the Light Rail Phases. The Predict, Latch, Vacated, Release and Call status are all shown on this display.

```
            LRT Detect Status
LRT  Predict Latch Vacated Release Call
 A       .      .       .       .     *
 B       .      .       .       .     .
```

The **Predict** fields show the status of a Predictor call for Light Rail phase service. An asterisk will be shown whenever there is a Predictor demand on the Light Rail phase.

The **Latch** fields show the status of a latched call for Light Rail phase service. An asterisk will be shown whenever there is a latched call for demand on the Light Rail phase.

The **Vacated** fields indicate that the Light Rail phase Release detector input is no longer active, and the Light Rail phase is timing the Auxiliary Sign carryover. An asterisk will be shown until the end of the Auxiliary Sign carryover time.

The **Release** fields indicate that the Light Rail phase Release detector input has been active after the Call detector input was active. An asterisk will be shown until the Light Rail phase begins the yellow interval and the Release detector is deactivated.

The **Call** fields indicate that the Light Rail phase Advance or Release detector input has been active and placed a call for the Light Rail phase. An asterisk will be shown until the Light Rail phase Release detector is activated.

TRACK STATUS (1-9-4)

The Track Status Data displays consist of two screens, with data for each Light Rail phase on both the Normal and Reverse tracks. Press the [NEXT] key to advance through the screens.

NORMAL TRACK		Delay Adv	Delay Rel	Cur Dir	Last Dir	Last Det	Timer Nor	Timer Rev
LRA	*	0	0	NOR	NOR	REL	60	0
LRB		0	0	-	NOR	-	0	0

.
.
.

REVERSE TRACK	Delay Adv	Delay Rel	Cur Dir	Last Dir	Last Det	Timer Nor	Timer Rev
LRA	0	0	-	REV	-	0	0
LRB	0	0	-	REV	-	0	0

Both screens display the same information, the first is for Light Rail trains on the Normal Track and the second is for Light Rail trains on the Reverse Track. An asterisk will be shown to the right of the Light Rail phase name whenever there is a train on that track. In the above sample screens, the Normal track for LRA has an active train.

The **Delay** columns show the timers for the **Adv**ance and **Rel**ease detector travel times. These values will load and count down to zero once a train has been detected on the associated detector.

The **Cur Dir** column shows the current direction for the active train on that track. If a dash is shown, then the direction has not yet been determined or there is no train on that track. A train traveling in the normal direction is shown as **NOR** and a train traveling in the reverse direction is shown as **REV**.

The **Last** columns show the **Dir**ection of the last train and the last **Det**ector to be activated on the track. The direction field will show a dash if a train has not yet been detected on the track, otherwise a normal direction train will be shown as **NOR** and a reverse direction train shown as **REV**. The detector field will normally show a dash until a train is detected, and then will show the last detector activated as either **ADV** for the Advance detector or **REL** for the release detector.

The **Timer** columns show the **Nor**mal and **Rev**erse timers for each Light Rail track. The **Nor**mal timer is loaded when a train is first detected on a track and counts down to zero between detections on an active track. The **Rev**erse timer is loaded and begins counting down when the release detector is activated on a Reverse direction track. These timers are used to determine when the direction of travel changes for a track.

AUX SIGN STATUS (1-9-5)
The Aux Sign Status display shows the status and timers for the Light Rail phase Auxiliary Signs.

LRT Auxiliary Sign Status		
Aux Sign	Status	Timer
LRA	OFF	0.0
LRB	OFF	0.0

The **Status** column shows the status of the Auxiliary Sign. When the signs are active **ON** will be displayed, otherwise **OFF** will be displayed.

The **Timer** column indicates the time remaining on the Auxiliary Sign timer. The timer is loaded with the Auxiliary Sign Carryover time when the signs are turned ON, and begins counting down after the Release detector is deactivated.

PREDICT COMMAND (1-9-6)
The Predict Command display shows the status of the Predictor command and three-car train data.

LRT Predict Command			
LRT	Command	Description	3-Car
A	5	PRIORITY HOLD	*
B	0	NONE	.

The **Command** and **Description** columns shows the command received from the predictor for each Light Rail phase. Any one of the following commands can be received from the Predictor:

Command	Description
NONE	There is no command received from the Predictor.
DENY SERVICE	The LRT phase is denied from being served.
INHIBIT PRIORITY	The LRT phase is inhibited from priority service.
COMPATIBLE CALL	The LRT phase will call its compatible phases.
PRIORITY CALL	The LRT phase is called for priority service.
PRIORITY HOLD	The LRT phase is held in priority service.
HOLD OVERRIDE	The LRT phase is held in priority service override.
HOLD OVERRIDE DENY	The LRT phase's compatible phases are held in override.
LRT HOLD	The LRT phase will be held.
PRIORITY LRT CALL	The LRT phase will be called in priority service.
PRIORITY LRT HOLD	The LRT phase will be held in priority service.
LRT HOLD OVERRIDE	The LRT phase will be held in priority service override.
INCOMPATIBLE OMIT	The LRT phase's non-compatible phases are being omitted.

The **3-Car** fields show the status of a predicted three-car train for each Light Rail phase. An asterisk is shown when the Predictor indicates a three-car train is approaching, otherwise a dot is shown.

CONTROLLER MENU (2)
The Controller Menu consists of nine selections where various controller data parameters can be entered. Each of these nine selections is described in the following sections.

```
          CONTROLLER MENU
1-Configuration  4-Recalls  7-Call/Omit
2-Phase Timing   5-Locks    8-Red Revert
3-Overlap Timing 6-Features 9-Light Rail
```

CONFIGURATION (2-1)
The Configuration menu consists of nine selections where all of the controller configuration data can be entered.

```
     CONTROLLER CONFIGURATION MENU
1-Cabinet  4-Pedestrians       7-Startup
2-Phases   5-Flashing Colors   8-Inputs
3-Overlaps 6-Special Operation 9-Outputs
```

CABINET (2-1-1)
The Cabinet data entry screen allows the user to select both the cabinet type and configuration used for this particular installation. All inputs and outputs are reconfigured to their default setting whenever a change is made to the entries on this screen.

```
        CABINET CONFIGURATION
  Type  ›332‹  Configuration    ATSAC
  Any changes made require controller
   to be reconfigured to take effect
```

The **Type** entry indicates the type of cabinet the Model 2070 controller is housed in. The available choices for this entry are **332** and **337**. Selection is made with the [+] and [–] keys.

The **Configuration** entry indicates the default detector assignments used with this type of cabinet. The available choices for this entry are **ATSAC** and **UNIVERSAL**. Selection is made with the [+] and [–] keys.

After making any changes to the Type or Configuration entries, the following message is shown:

```
        CABINET CONFIGURATION
  Type  ›332‹  Configuration    ATSAC
    Press * to reconfigure controller
    or ESC to cancel any changes made
```

Press the [*] key to accept the changes made to the Type and Configuration entries, and to immediately reconfigure the controller as selected. Press the [ESC] key to cancel any changes made and restore the previous values.

When the* [*] *key is pressed, all controller configuration information is changed to the default settings for the Cabinet Type and Configuration selected. This may cause an immediate change of signal indications in the field and could result in an unsafe condition. The intersection should be placed in flashing operation prior to reconfiguring the controller. Press the* [ESC] *key to cancel any changes and retain the current cabinet configuration.

PHASES (2-1-2)

The Phases data entry screen allows the selection of Permitted and Restricted phases. Both Normal and Active phases are shown. Only Normal phases may be set by the user. The Active column displays which phases are currently in use, which may be different from the Normal column if either a Time-of-Day function or a preempt is in effect.

```
PHASE SELECTIONS    Normal     Active
  Permitted       ›12345678‹  12345678
  Restricted       ........   ........
```

When Normal phases are set or cleared, they are automatically transferred to the Active column, unless specifically overridden by either a TOD function or a preempt.

The following phase settings are entered on this screen:

Setting	Description
Permitted	The phases set are allowed to time. Only permitted phases can be timed under normal operation. Preemption can override.
Restricted	The phases set have restricted operation. Restricted operation is defined to mean the phase selected cannot time with any other phase selected, even though it might when unrestricted. Typical usage is for interlocking protected-only left turns, where it is necessary to ensure that both phases cannot time together.

When setting Restricted phases, it is also necessary to insure that the Lag phase settings are compatible with the phase restrictions. For example, to prevent Phases 1 and 5 from operating at the same time, set both phases as Restricted, and set one for lagging operation and the other for leading operation.

The Restricted Phase Selection can be used to configure certain phases in the controller for Exclusive operation. Only phases 1 or 2, and 3 or 4 can be configured for Exclusive operation, and the phases configured for Exclusive operation must also be either a lead phase or the only lag phase on that side of the barrier. For example, to configure Phase 1 for leading Exclusive Operation, set Phases 1, 5 and 6 for Restricted operation, and set Phase 1 as a lead phase.

Use care when assigning Restricted phases. Improper settings can cause restricted phases to not be served. When configuring Restricted phases for Exclusive phase operation, local timing plans should be programmed using Force Offs instead of Green Factors to ensure proper operation.

OVERLAPS (2-1-3)

The Overlaps data entry screens allow the selection of Parent, Omit and No Start phases for each of six available overlaps. There are three screens for the six overlaps. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
          OVERLAP ASSIGNMENT        Pg 1/3
Overlap     Parent      Omit     No Start
   A      ›........‹  ........  ........
   B       ........   ........  ........
                      :
                      .
                      .
          OVERLAP ASSIGNMENT        Pg 3/3
Overlap     Parent      Omit     No Start
   E      ›........‹  ........  ........
   F       ........   ........  ........
```

Setting	Description
Parent	The phases set are those which, when green, cause the overlap output to display a green indication. When the Parent phase goes yellow, the overlap will also go yellow, unless the next phase is a parent phase, in which case the overlap will remain green.
Omit	The phases set are those which, when ON, cause the overlap output to be omitted (dark). If the phase set is also a Parent, the overlap output will be omitted only during the parent phase green. This is used to generate a right-turn overlap from a standard three-color overlap. Typically, the parent through phase is set as Omit, and when it is green causes the overlap to be dark. This setting causes omission of the overlap green, yellow and red outputs when a non-Parent phase is set.
No Start	The phases set are those which cannot cause an overlap to change from red to green, but will allow an overlap that is already green to remain green. Phases set must also be set as a Parent. If both Omit and No Start parent phases are set, then the overlap will not start until the first pure parent phase is next. This feature is used for pre-signal operation.

PEDESTRIANS (2-1-4)

The Pedestrians data entry screen allows the selection of phase assignment to each of the eight pedestrian circuits.

```
            1P ›........‹  5P  ........
  PED       2P  .2......   6P  .....6..
CIRCUIT     3P  ........   7P  ........
            4P  ...4....   8P  .......8
```

Each pedestrian circuit can be assigned to one or more phases. When assigned to more than one phase, the pedestrian output will time with each phase assigned. If two concurrent phases are programmed, the pedestrian timing will be taken from the higher numbered phase. The assignments made here do not enable inputs to place calls for pedestrian service. These must be set separately in the Detector Submenu (5-1).

FLASHING COLORS (2-1-5)

The Flashing Colors data entry screen allows the selection of phases and overlaps to Flash Yellow when in flashing operation, and the selection of phases and overlaps to Flash In Red during normal operation.

```
          FLASHING COLORS
                  Phases    Overlaps
  Yellow Flash  ›........‹   ......
  Flash-In-Red   ........    ......
```

Setting	Description
Yellow Flash	The phases and overlaps set will flash their yellow output instead of their red output during software flash operation. Only two compatible phases and any number of overlaps may be set.
Flash-In-Red	The phases and overlaps set will flash their red output when they are not displaying a green or yellow indication. These settings do not affect software flashing operation. Typically used for vehicular phases at mid-block pedestrian crossings where a flashing red display is desired. Any number of phases and overlaps may be set.

SPECIAL OPERATION (2-1-6)

The Special Operation data entry screen allows the selection of Single Exit phases and the selection of phases and overlaps which are to be operated as Driveway Signals.

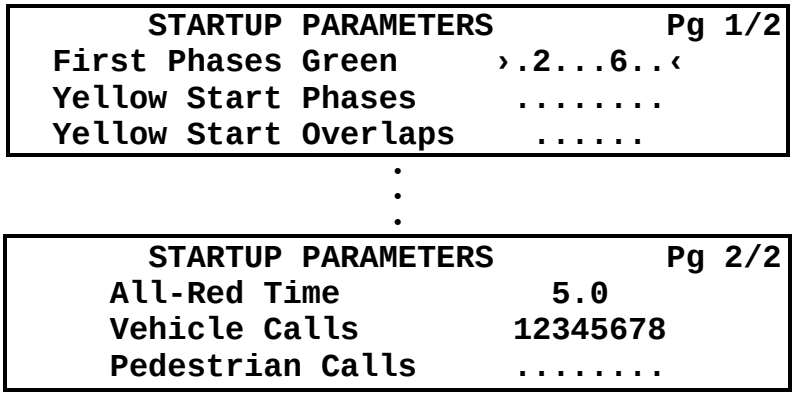
```
        SPECIAL OPERATION
  Single Exit Phases      ›........‹
  Driveway Signal Phases   ........
  Driveway Signal Overlaps  ......
```

Setting	Description
Single Exit	The phases set are allowed to terminate independent of the phase in the other ring whenever Rest in Red operation is in effect. Unless this feature is enabled, active Rest in Red phases will not terminate until both are ready to proceed to yellow together.
Driveway Signal	The phases and overlaps set will flash their green output when they are timing the green interval. These are also able to skip the yellow interval when it is programmed for zero time, otherwise they will time their yellow interval normally. This will accommodate both two- and three-section driveway signal heads.

Phases and overlaps programmed as Driveway Signals will not time a yellow interval if it is programmed to zero. Any non-zero value will cause the yellow interval to be displayed and timed.

STARTUP (2-1-7)

The Startup data entry screens allow the selection of First Phases Green, Yellow Start Phases, Yellow Start Overlaps, Startup All-Red and Startup Vehicle and Pedestrian Recalls. There are two screens; pressing [NEXT] will advance through the screens.



Setting	Description
First Phases	The phases set are the ones to display a green indication first following a long power failure or flashing condition. Only two compatible phases may be selected. If no phases are set, then the first phases to display green depend on the calls present at startup. It is recommended that phases always be programmed to ensure a defined startup sequence.
Yellow Start	The phases and overlaps set will display a yellow indication following a long power failure or flashing condition. Only two compatible phases and any overlaps can be programmed. If no phases or overlaps are set, the controller will startup in an all-red condition following a long power failure or flashing condition.
All-Red Time	Indicates the amount of time that the controller will display an All-Red condition following a long power failure or flashing condition if no Yellow Start Phases or Yellow Start Overlaps are set. Valid range is 0-25.5 seconds.
Vehicle Calls	The phases set will have a one-time vehicle call placed following a long power failure or flashing condition. Only calls to permitted phases are actually placed.
Pedestrian Calls	The Phases set will have a one-time pedestrian call placed following a long power failure or flashing condition. Only calls to permitted pedestrian phases are actually placed.

INPUTS (2-1-8)
The Input submenu contains four selections for the various controller inputs, each of which is described in the following sections.

```
     CONTROLLER INPUT CONFIGURATION
1-Seven Wire I/C    4-Special Functions
2-Manual Control
3-Cabinet Status
```

SEVEN WIRE INTERCONNECT (2-1-8-1)
The Seven Wire Interconnect data entry screen enables, sets the timers and assigns the ports used for slave Seven Wire Interconnect.

```
   7-WIRE I/C    | INPUT PORT ASSIGNMENT
 Enabled  › NO‹ | R1   3.8    Free  3.6
 Max ON    250  | R2   3.5     D2   2.8
 Max OFF   250  | R3   3.7     D3   6.1
```

Input	Description
Enabled	Indicates that slave seven wire interconnect is to be used for plan selection. This must be set to YES for the controller to use the other inputs to select a coordination plan.
Max ON	Indicates the maximum amount of time that the controller will allow a reset line (R1, R2 or R3) to be active and continue to select a coordination plan. Valid range is 0-255 seconds, but the value set must be higher than the highest cycle length expected on the line, or the controller may discontinue selecting the coordination plan from the interconnect during long cycles.
Max OFF	Indicates the maximum amount of time that the controller will allow a reset line (R1, R2 or R3) to be inactive and continue to select a coordination plan. Valid range is 0-255 seconds, but the value set must be higher than the longest break expected on the line, or the controller may discontinue selecting the coordination plan from the interconnect during a long break.
R1	The input port assigned to the Reset 1 line. Enter a valid input port number. Invalid entries will inhibit this input.
R2	The input port assigned to the Reset 2 line. Enter a valid input port number. Invalid entries will inhibit this input.
R3	The input port assigned to the Reset 3 line. Enter a valid input port number. Invalid entries will inhibit this input.
Free	The input port assigned to the Free line. Enter a valid input port number. Invalid entries will inhibit this input.
D2	The input port assigned to the Dial 2 line. Enter a valid input port number. Invalid entries will inhibit this input.
D3	The input port assigned to the Dial 3 line. Enter a valid input port number. Invalid entries will inhibit this input.

Whenever the seven wire interconnect is enabled, the controller will attempt to use these inputs to select the coordination plan. This overrides all Time-of-Day selections, but may be overridden by an ATSAC, AB3418, simplex, complex or manual plan selection.

The coordination plan selected is based on a combination of the Reset and Dial inputs. The following matrix translates the combinations into the nine possible coordination plan selections:

Plan	No Dial	Dial 2	Dial 3
Reset 1	1	2	3
Reset 2	4	5	6
Reset 3	7	8	9

The Free input will override all other inputs, and force Free operation. Any invalid combination of Resets and/or Dials will invalidate the slave seven wire interconnect plan selection, and the controller will revert to Time-of-Day plan selection. The slave Seven Wire Interconnect inputs do not support the selection of Flashing operation.

MANUAL CONTROL (2-1-8-2)

The Manual Control data entry screen enables and assigns the input ports for manual control. Manual control allows the intersection to be advanced by hand. The Manual Advance and Advance Enable ports are entered on this screen.

```
MANUAL CONTROL INPUT CONFIGURATION
        Input              Port
    Manual Advance          6.6
    Advance Enable        › 2.7‹
```

Input	Description
Manual Advance	Indicates the input port assigned for Manual Advance input. Enter a valid input port number. Invalid entries will inhibit this input. If the Advance Enable input is ON, each time the Manual Advance input goes from OFF to ON, the controller will advance the current phase. If the phase is in walk it will advance to flashing dont walk. If the phase is in green, it will advance to yellow. The controller times all intervals, and will stop only at the end of the walk and green intervals to wait for reactivation of this input. This input has no affect on the controller if the Advance Enable input is OFF.
Advance Enable	Indicates the input port assigned for the Advance Enable input. Enter a valid input port number. Invalid entries will inhibit this input. When this input is ON, all permitted phases are placed on vehicle and pedestrian recall, the controller is set to free operation, a local manual status is returned to ATSAC, and the controller stops phase timing at the end of each walk and green interval. The Manual Advance input must be activated to advance the controller into the next interval.

CABINET STATUS (2-1-8-3)

The Cabinet Status data entry screen enables four special cabinet status inputs. The status of these inputs is used by the local controller and also transmitted back to ATSAC.

CABINET STATUS INPUT CONFIGURATION			
Input	Port	Input	Port
Flash Bus	›2.8‹	Flash Sense	6.7
Door Ajar	6.1	Stop Time	6.8

Input	Description
Flash Bus	Indicates the input port assigned to the Flash Bus input. Enter a valid input port number. Invalid entries will inhibit the monitoring of this input. This input reports the status of the flasher bus, and should be ON whenever the flasher bus has AC power applied. The inverted state of this input is returned to ATSAC.
Door Ajar	Indicates the input port assigned to the Door Ajar input. Enter a valid input port number. Invalid entries will inhibit the monitoring of this input. This input reports the status of the door switch, and should be ON whenever the cabinet door is closed. The inverted state of this input is returned to ATSAC.
Flash Sense	Indicates the input port assigned to the Flash Sense input. Enter a valid input port number. Invalid entries will inhibit the monitoring of this input. This input reports the status of the flash transfer relays, and should be ON whenever the cabinet is in hardware flash. This input is used by the local controller to determine when the cabinet is in hardware flash and is returned to ATSAC.
Stop Time	Indicates the input port assigned to the Stop Time input. Enter a valid input port number. Invalid entries will inhibit the monitoring of this input. This input reports the status of the conflict monitor, and should be ON whenever the conflict monitor has detected a fault. This input is used by the local controller to determine when the conflict monitor has tripped and stop all timing operations, and is returned to ATSAC.

Whenever the Flash Sense input is continuously ON for more than two seconds without the Stop Time input being ON, the controller will generate a software flash output on the loadswitches so that the field outputs will display a flashing condition in the event of a cabinet relay failure.

It is very important that the Flash Sense and Stop Time inputs are correctly configured. The default values for all cabinet types and configurations are shown above. These should only be changed if the cabinet is rewired and these inputs are present on different ports. The Flash Sense and Stop Time inputs are used to reset the signals during hardware flash and after a conflict condition, and if set wrong can lead to undesirable operation.

SPECIAL FUNCTIONS (2-1-8-4)

The Special Functions data entry screen enables and assigns the input ports for up to four special function inputs. The status of these inputs are transmitted to ATSAC.

```
SPECIAL FUNCTION INPUT CONFIGURATION
 Input   Port          Input   Port
   1    › 0.0‹          3      0.0
   2      0.0           4      0.0
```

Entry	Description
Port	Indicates the input port assigned to this special function. Enter a valid port number. Invalid entries will not return any data to ATSAC. This setting does not affect the input port in any other way, and the special functions can be assigned to ports that are also used for other purposes such as detectors.

OUTPUTS (2-1-9)

The Output data entry screen allows the user to make the phase, pedestrian, overlap and other output loadswitch assignments. The screen format varies with the cabinet type selected. Sample displays for both the Type 332 and Type 337 cabinets are shown below:

```
   332 CABINET LOADSWITCH ASSIGNMENT
A  › 1‹   2   22    3    4   24  |  11
B    5    6   26    7    8   28  |  12
X   11   12    0   13   14   41  |  42
```

```
   337 CABINET LOADSWITCH ASSIGNMENTS

A  › 1‹   2    3    4   22   24  |  28
```

The Type 332 cabinet can house a maximum of eighteen loadswitches, arranged in three rows of six loadswitches each. The Type 337 cabinet can house a maximum of six loadswitches, arranged in one row. These screens are organized just as the loadswitches appear in their respective output files. The seventh loadswitch position on the far right of each row represents the center output of the pedestrian loadswitches in that row. For the Type 332 cabinet, the seventh loadswitch in the rightmost position of each row is actually the center outputs of the pedestrian loadswitches in positions three and six of the same row. For the Type 337 cabinet, the seventh loadswitch position is the center outputs of the pedestrian loadswitches in positions five and six.

Each loadswitch is assigned a numeric value, which represents the circuit that drives the loadswitch. The numbers have been chosen to simplify the assignment of circuits to loadswitches. Any number of loadswitches can be assigned to the same circuit, and in some cases, two circuits can be indirectly assigned to the same loadswitch. In either case, every loadswitch output can be assigned to a defined function.

The following are the circuit values used and their descriptions. The outputs are shown in reference to the loadswitch top/center/bottom (red/yellow/green) outputs. For the Special Function outputs, the · symbol designates the logical OR-ing of the functions indicated, and the + symbol designates the logical AND-ing of the functions indicated.

Circuit	Description	Outputs
0	No output	—/—/—
1-8	Phases 1-8	R/Y/G
11-16	Overlaps A-F	R/Y/G
21-28	Pedestrians 1-8	DW/DW/W
31-32	Light Rail Phases A-B	R/Y/G
35, 37 and 39	Light Rail Auxiliary Signs	A/A/B
41 and 51	Special Functions	1/1/3
42 and 52	Special Functions	2/2/4
43 and 53	Special Functions	1/2/3
44 and 54	Special Functions	1·2/1/2
45 and 55	Special Functions	3·4/3/4
46 and 56	Special Functions	1/2/1+2
47 and 57	Special Functions	3/4/3+4
61-62	Coded Status Bits	A/B/C
71	Seven Wire Interconnect	R1/R2/R3
72	Seven Wire Interconnect	Free/D2/D3
81	1.0 Hz Flashing Logic	P/P/N
82	2.5 Hz Flashing Logic	P/P/N
83	5.0 Hz Flashing Logic	P/P/N

Not all loadswitch positions have all three outputs available to be assigned. In Type 332 cabinets, loadswitch positions three and six in each row only have the red and green outputs available to the assigned circuit. The yellow outputs for these loadswitches are assigned to loadswitch position seven, which can only output green and yellow circuits. In Type 337 cabinets, loadswitch positions five and six only have the red and green outputs available to the assigned circuit. The yellow outputs for these loadswitches are assigned to loadswitch position seven, which can only output green and yellow circuits.

Pedestrian circuits 21-28 drive the red or yellow outputs with the Dont Walk indication, and the green output with the Walk indication. This allows two loadswitches to drive three pedestrian circuits when properly assigned. See the sample screen on the previous page of the Type 337 cabinet for an example of this type of assignment.

Light Rail Auxiliary Sign circuits 35 and 37 are flashing outputs, while circuit 39 are steady outputs.

Special Function circuits 41-47 remain active when the controller is in software Flashing operation. Circuits 51-57 will be dark when the controller is in software Flashing operation.

The Seven Wire Interconnect will activate the Free output during software Flashing operation.

PHASE TIMING (2-2)

The Phase Timing data entry screens consist of fourteen screens used to input all phase timing data. These fourteen screens are arranged in seven groups of two screens. Each group has related phase timing information for the eight phases, with four phases shown on each screen. Use the [◀], [▶], [▲] and [▼] keys to scroll in and between adjacent screens. The [NEXT] key can be used to advance to the next group, and the [*] key can be used to switch between phase screens within a group. The [+] and [–] keys can be used to increment and decrement values. Shown below are all fourteen data entry screens. The two screens within a timing group are shown adjacent to each other, and the names of the intervals have been omitted from the right hand screen for clarity. The interval names appear on all of the screens displayed in the controller.

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Walk 1	› 0‹	5	0	5	..	0	5	0	5
Walk 2	0	0	0	0		0	0	0	0
Delay Walk	0	0	0	0		0	0	0	0

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Flash Dont Walk	› 0‹	10	0	10	..	0	10	0	10
Solid Dont Walk	0	3	0	3		0	3	0	3
Minimum Green	5	5	5	5		5	5	5	5

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Bike Green	› 0‹	0	0	0	..	0	0	0	0
Det Limit	0	15	0	15		0	15	0	15
Max Initial	0	20	0	20		0	20	0	20

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Maximum Green 1	› 10‹	20	10	20	..	10	20	10	20
Maximum Green 2	10	20	10	20		10	20	10	20
Maximum Green 3	10	20	10	20		10	20	10	20

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Extension	›2.0‹	3.0	2.0	3.0	..	2.0	3.0	2.0	3.0
Maximum Gap	2.0	4.0	2.0	4.0		2.0	4.0	2.0	4.0
Minimum Gap	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Add Per Vehicle	› 0.0‹	2.0	0.0	2.0	..	0.0	2.0	0.0	2.0
Reduce Gap By	0.0	0.1	0.0	0.1		0.0	0.1	0.0	0.1
Reduce Every	0.0	1.0	0.0	1.0		0.0	1.0	0.0	1.0

PHASE TIMING	Ø1	Ø2	Ø3	Ø4		Ø5	Ø6	Ø7	Ø8
Yellow	› 3.5‹	4.0	3.5	4.0	..	3.5	4.0	3.5	4.0
All-Red	0.5	1.0	0.5	1.0		0.5	1.0	0.5	1.0
Bike All-Red	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0

The following is a description of all of the phase timing intervals:

Interval	Description
Walk 1	The minimum amount of time that the pedestrian Walk indication will be displayed. This is the first of two Walk values, which are selectable by Time-of-Day functions. Valid range is 0-255 seconds.
Walk 2	Same as Walk 1, except this is the second Walk timer selectable by Time-of-Day functions. Valid range is 0-255 seconds.
Delay Walk	The amount of time that the Walk display will be delayed from the beginning of green. Applies only when a phase changes from red to green with a pedestrian call pending. Valid range is 0-255 seconds.
Flash Dont Walk	The amount of time that the pedestrian clearance interval will be displayed. Valid range is 0-255 seconds.
Solid Dont Walk	The amount of Flash Dont Walk time that will be displayed as a solid Dont Walk indication. Valid range is 0-255 seconds. If set higher than the Flash Dont Walk time, then the entire pedestrian clearance will display a solid Dont Walk indication.
Minimum Green	The minimum amount of time a phase will display a green indication. Valid range is 0-255 seconds.
Bike Green	The minimum amount of time a phase will display a green indication when initiated with a Bike call. Minimum Green will override if set higher. Valid range is 0-255 seconds.
Detector Limit	The amount of time after the start of green when all Limited Detectors are disconnected and can no longer extend the phase. Valid range is 0-255 seconds.
Maximum Initial	The maximum amount of time that the variable initial green can assume, as determined by the Add Per Vehicle setting and the number of actuations received during the phase yellow and red. Minimum Green will override if set higher. Valid range is 0-255 seconds.
Maximum Green 1	The maximum amount of time a phase can continue to extend the green after minimum green timing is complete and there is an opposing call present. This is the first of three Maximum Green values, which are selectable by Time-of-Day functions. The Maximum Green is disabled under coordination if the phase is a Hold phase, or the controller is on-line under ATSAC control. Valid range is 0-255 seconds.
Maximum Green 2	Same as Maximum Green 1, except this is the second maximum timer selectable by Time-of-Day functions. Valid range is 0-255 seconds.
Maximum Green 3	Same as Maximum Green 1, except this is the third maximum timer selectable by Time-of-Day functions. Valid range is 0-255 seconds.

Interval	Description
Extension	The amount of time that the phase will remain green after the end of each vehicle or bicycle actuation, unless terminated by expiration of the Max Green timer or forced off. This is used to ensure a green indication for the last vehicle approaching the intersection, and is timed separately from the Gap. Valid range is 0-25.5 seconds.
Maximum Gap	The maximum amount of time allowed between vehicle actuations before the phase gaps out. This is the starting value of the gap timer during gap reduction. Valid range is 0-25.5 seconds.
Minimum Gap	The minimum amount of time allowed between vehicle actuations before the phase gaps out. This is the ending value of the gap timer during gap reduction, and must be set less than Maximum Gap for gap reduction to work. Valid range is 0-25.5 seconds.
Add Per Vehicle	The amount of time added to the variable initial green for each vehicle actuation on a count detector received during the phase yellow and red intervals. The detector with the highest count will be used to calculate the variable initial time for the phase using this value. Valid range is 0-25.5 seconds.
Reduce Gap By	The amount of time that the gap timer will be reduced by during gap reduction from Maximum Gap to Minimum Gap. The gap timer will not be reduced past the Minimum Gap setting. Valid range is 0-25.5 seconds.
Reduce Every	The amount of time between successive reductions in the gap timer when gap reduction is in effect. From the beginning of gap reduction, the gap timer will be reduced from Maximum Gap to Minimum Gap by the Reduce Gap By amount each Reduce Every time. Valid range is 0-25.5 seconds.
Yellow	The amount of time that the phase will display a yellow indication upon termination. Valid range is 3.0-7.0 seconds. Settings outside this range will time either 3.0 or 7.0 seconds, whichever is closer. Phases flagged as Driveway Signals may have a yellow time setting of zero, which indicates that the yellow interval is to be skipped, and should only be used when the phase is connected to two-section driveway signal head designs.
All-Red	The amount of time that the phase will display an All-Red indication following the yellow interval. Valid range is 0-25.5 seconds.
Bike All-Red	The amount of time that the phase will display an All-Red indication following the yellow interval if the phase was started with a bike call or received a bike call during the green or yellow intervals. This is timed concurrently with the All-Red interval, and if less than All-Red has no effect. Valid range is 0-25.5 seconds.

Gap reduction only occurs after the completion of Minimum Green timing if both the **Reduce Gap By** and **Reduce Every** entries are non-zero, the **Maximum Gap** setting is greater than the **Minimum Gap** setting and there is an opposing call present.

OVERLAP TIMING (2-3)

The Overlap Timing data entry screens allow the user to enter all overlap timing data. The overlap Min Green, Green Extension, Yellow clearance and All-Red times are entered on these two screens. Press the [NEXT] key to advance though the two screens.

```
            OVERLAP TIMING          Pg 1/2
OVERLAP      A     B     C     D     E     F
Min Grn  › 0.0‹  0.0   0.0   0.0   0.0   0.0
Grn Ext    0.0   0.0   0.0   0.0   0.0   0.0
```

```
            OVERLAP TIMING          Pg 2/2
OVERLAP      A     B     C     D     E     F
Yellow   › 0.0‹  0.0   0.0   0.0   0.0   0.0
All-Red    0.0   0.0   0.0   0.0   0.0   0.0
```

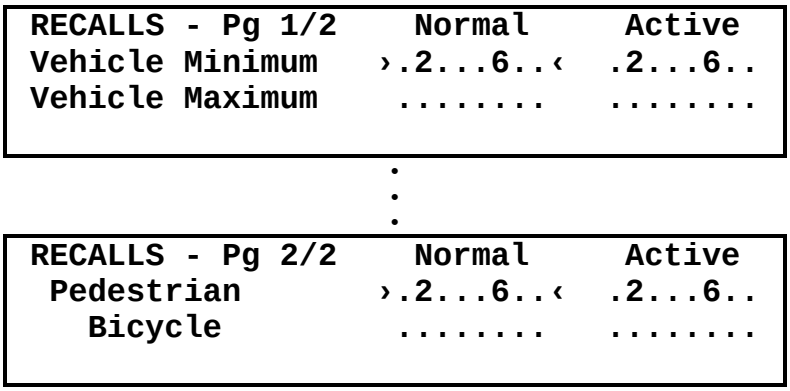
The following is a description of all of the overlap timing intervals:

Interval	Description
Min Grn	The minimum amount of time that the overlap will display a green indication. The overlap minimum green is normally governed by the parent phase minimum green and this interval need not be explicitly set. However, if a Light Rail phase is incompatible with an overlap, this setting should be used to guarantee the minimum amount of time the overlap will display a green indication. Valid range is 0-25.5 seconds.
Grn Ext	The amount of time that the overlap will extend the green indication after all parent phases have terminated. Typically used to generate a slot clearance overlap. Valid range is 0-25.5 seconds.
Yellow	The amount of time that the overlap will display a yellow indication upon termination. Valid range is 3.0-7.0 seconds. Settings outside this range will time either 3.0 or 7.0 seconds, whichever is closer. Overlaps flagged as Driveway Signals may have a yellow time setting of zero, which indicates that the yellow interval is to be skipped, and should only be used when the overlap is connected to a two-section driveway signal head.
All-Red	The amount of time that the overlap will display an All-Red indication following the yellow interval. Valid range is 0-25.5 seconds.

To have the overlap output follow the parent phase output exactly, all of the overlap timing values must be set to zero, including the yellow time. When all of the overlap timing values are set to zero, the overlap obtains its timing from the parent phase. This is typically used for right turn overlaps where explicit timing of the intervals is not required. Driveway signal overlaps cannot be configured in this manner because a zero yellow time will cause the yellow interval to be skipped.

RECALLS (2-4)

The Recalls data entry screens allow the user to enter the Vehicle Minimum, Vehicle Maximum, Pedestrian and Bicycle recall settings. The Normal and Active phases are shown. Only Normal phases may be set by the user. The Active phases show the phases that are currently in use, which may be different from the normal phase if a Time-of-Day function is in effect. There are two screens for the four entries. Press the [NEXT] key to advance though the two screens.

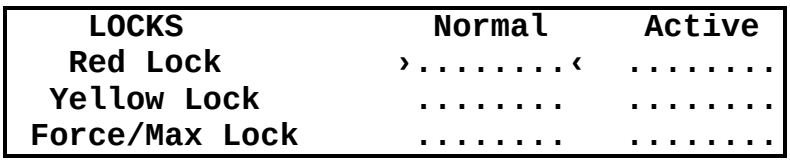


The following is a description of all of the recall settings:

Recall Setting	Description
Vehicle Minimum	The phases selected have a call placed for vehicle service whenever the phase is in the yellow or red interval.
Vehicle Maximum	The phases selected have a continuous call for vehicle service.
Pedestrian	The phases selected have a call placed for pedestrian service whenever the phase is in the yellow or red interval. If the phase is set as Rest in Walk, the call for pedestrian service will also be placed whenever the phase is not in the walk interval.
Bicycle	The phases selected have a call placed for bicycle service whenever the phase is in the yellow or red interval.

LOCKS (2-5)

The Locks data entry screen allows the user to enter the Red Lock, Yellow Lock and Force/Max Lock settings. The Normal and Active phases are shown. Only Normal phases may be set by the user. The Active phases show the phases that are currently in use, which may be different from the normal phase if a Time-of-Day function is in effect.



The following is a description of all of the settings:

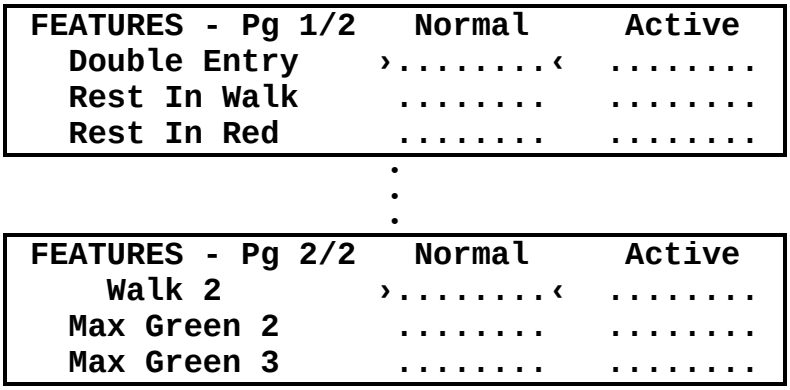
Setting	Description
Red Lock	The phases selected will retain all calls received during the red interval until the phase is serviced again.
Yellow Lock	The phases selected will retain all calls received during the yellow and red intervals until the phase is serviced again.
Force/Max Lock	The phases selected will retain any calls present at the time the phase was terminated by a force-off or maxed out until the phase is serviced again.

The Red Lock and Yellow Lock settings described here apply to all calls received on the phase from any detector input. The Detector Attributes (5-1) section provides an alternative method for setting Red Lock and Yellow Lock by detector.

The TSCP will not drop calls when the controller issues a detector reset. All vehicle calls present at the time a detector reset is activated will automatically become locked until they are serviced. It is not necessary to set phase locks to prevent dropped calls during a detector reset.

FEATURES (2-6)

The Features data entry screens allow the user to enter the Double Entry, Rest In Walk, Rest In Red, Walk 2, Max Green 2 and Max Green 3 settings. The Normal and Active phases are shown, but only Normal phases may be set by the user. The Active column shows the phases that are currently in use, which may be different from the normal phase if a Time-of-Day function is in effect. The six features are entered on two screens; press the [NEXT] key to advance through the screens.



The following is a description of all of the settings:

Features	Description
Double Entry	The phases selected will be serviced if there is a compatible phase being served in the other ring, even if no calls are present.
Rest In Walk	The phases selected will rest in walk at the end of walk as long as there are no serviceable calls on any opposing phases. If the phases set are the sync phases during coordinated operation, the yield point moves from the beginning of yellow to the beginning of pedestrian clearance of the selected sync phases.
Rest In Red	The phases selected will rest in a red indication in the absence of any calls to the phase.
Walk 2	The phases selected will use the Walk 2 setting when timing the walk interval in response to a pedestrian call.
Max Green 2	The phases selected will use the Maximum Green 2 setting when timing the maximum green interval.
Max Green 3	The phases selected will use the Maximum Green 3 setting when timing the maximum green interval. This setting overrides the Max Green 2 setting if both are active at the same time.

CALL/OMIT (2-7)
The Call/Omit menu consists of two selections where all of the Call to Phase and Omit on Green data can be entered.

```
          CALL/OMIT MENU
1-Call to Phase
2-Omit on Green
```

CALL TO PHASE (2-7-1)
The Call to Phase data entry screen allows the selection of the Call to Phase assignment for each of the eight phases. The Call to Phase feature places a call to the selected phases whenever there is a call on the phase indicated and that phase is not ON.

```
          Ø1 ›...4....‹   Ø5  ........
CALL TO   Ø2  ........    Ø6  ........
 PHASE    Ø3  ........    Ø7  ........
          Ø4  ........    Ø8  ........
```

In the above sample screen, Phase 4 will receive a vehicle call whenever there is a call on Phase 1 and Phase 1 is not green. Phase 1 will not place a call after Phase 4 is serviced if Phase 1 is next.

OMIT ON GREEN (2-7-2)
The Omit on Green data entry screen allows the selection of the Omit on Green phase assignment to any of the eight phases. The Omit on Green feature prevents the selected phases from being serviced whenever the indicated phase is green.

```
          Ø1 ›........‹   Ø5  ........
OMIT ON   Ø2  ....5...    Ø6  ........
 GREEN    Ø3  ........    Ø7  ........
          Ø4  ........    Ø8  ........
```

In the above sample screen, whenever Phase 2 is green, Phase 5 will be omitted, and not serviced unless already ON. If Phase 5 is ON when Phase 2 becomes green, this feature has no effect on the operation of Phase 5. If Phase 5 is not ON when Phase 2 becomes green, then Phase 5 is omitted until Phase 2 is no longer green. This feature can be used to prevent left-turn traps at locations with protected-permissive left turns and actuated cross streets. By setting the concurrent through movement to omit the left turn phase, the controller will not back into the left turn phase. This method of preventing a left-turn trap causes the left turn phase to be omitted until a call is serviced on a cross street phase, and should not be used with protected-only left turns.

RED REVERT (2-8)
The Red Revert data entry screen allows the selection of the Red Revert time.

```
RED REVERT

Red Revert Time  › 2.0‹
```

The **Red Revert Time** is the minimum amount of time a phase or overlap must display a red indication following a yellow indication before displaying another green indication. The Red Revert interval is timed concurrently with the All-Red interval. Valid range is 2.0-25.5 seconds. Settings less than 2.0 seconds will time 2.0 seconds.

LIGHT RAIL (2-9)
The Light Rail menu consists of six selections where the Light Rail configuration data is entered.

```
          LIGHT RAIL MENU
1-Configuration    4-Auxiliary Sign
2-Phase Setting    5-Detectors
3-Phase Timing     6-ATSAC Data
```

CONFIGURATION (2-9-1)
The Configuration data entry screen allows the selection of the Permitted Light Rail Phases as well as the selection of Light Rail Phase Recalls. Both Normal and Active phases are shown. Only Normal phases may be set by the user. The Active column displays which phases are currently in use, which may be different from the Normal column if a Time-of-Day function is in effect.

```
 LRT     Phase          Recall Type
CONFIG Permitted  Startup Minimum Dwell
Normal    ›AB‹      AB      ..     ..
Active     AB       AB      ..     ..
```

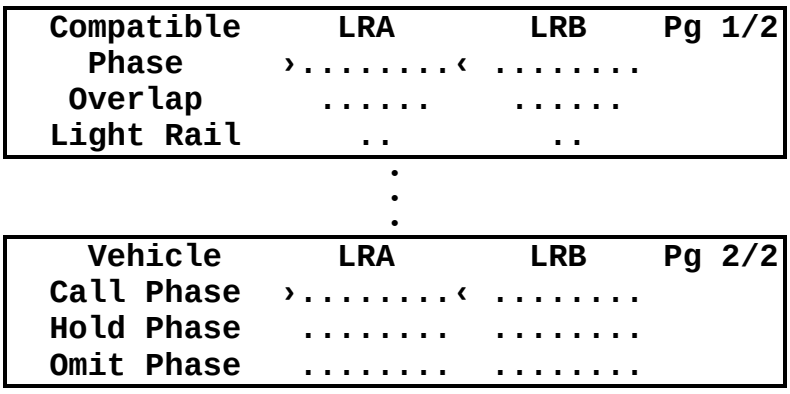
The **Phase Permitted** setting selects the Light Rail phases that are allowed to time. Only permitted phases can be served. Up to two Light Rail phases can be selected using the [A] and [B] keys.

The following three Recall Types are available for Light Rail phases. For each Recall Type, up to two Light Rail phases can be selected using the [A] and [B] keys.

Recall Type	Description
Startup	The Light Rail phases set are recalled and display their minimum green time after a power up or recovery from a flashing condition.
Minimum	The Light Rail phases set are recalled and display their minimum green time once per cycle.
Dwell	The Light Rail phases set are recalled and displayed for as long as possible each cycle. The length of green depends on the duration of their compatible phases.

PHASE SETTING (2-9-2)

The Phase Setting data entry screens allow the user to enter the Compatible Phase, Overlap and Light Rail data along with the Vehicle Call Phase, Hold Phase and Omit Phase settings. The six settings are entered on two screens; press the [NEXT] key to advance through the screens.



The following is a description of the Compatible settings:

Compatible	Description
Phase	The phases selected are compatible with the Light Rail phase indicated. Light Rail phases will only be served when all of the selected compatible phases are green. Any number of phases can be selected, however Light Rail phases will not remain ON between two consecutive phases.
Overlap	The overlaps selected are compatible with the Light Rail phase indicated. Light Rail phases will only be served when all non-compatible overlaps are red. Non-compatible overlaps that have a compatible parent will be terminated if the Light Rail phase has demand. Any number of overlaps may be selected.
Light Rail	The Light Rail phases selected are compatible with the Light Rail phase indicated. A Light Rail phase will not be served if another non-compatible Light Rail phase is already ON. Any number of Light Rail phases may be selected.

The following is a description of the Vehicle settings:

Vehicle	Description
Call Phase	The phases selected will have a call placed when there is demand for the Light Rail Phase indicated. Any number of phases may be selected. Typically, the compatible phases are selected.
Hold Phase	The phases selected will be held when there is demand for the Light Rail Phase indicated. Any number of phases may be selected.
Omit Phase	The phases selected will be omitted when there is demand for the Light Rail Phase indicated. Any number of phases may be selected.

PHASE TIMING (2-9-3)

The Phase Timing data entry screens allow the user to enter all of the Light Rail phase timing data. The six settings are entered on two screens; press the [NEXT] key to advance through the screens.

```
LIGHT RAIL PHASE     LRA     LRB    Pg 1/2
  Min Green        › 5‹      5
  Max Green          30      30
   Yellow           5.0     5.0
                     .
                     .
                     .
LIGHT RAIL PHASE     LRA     LRB    Pg 2/2
  All-Red 1        › 3.0‹    3.0
  All-Red 2          5.0     5.0
  Red Revert        10.0    10.0
```

The following is a description of all of the Light Rail phase timing intervals:

Interval	Description
Min Green	The minimum amount of time a Light Rail phase will display a green indication. Valid range is 0-255 seconds.
Max Green	The maximum amount of time a Light Rail phase can continue to display the green after the minimum green timing is complete. Valid range is 0-255 seconds.
Yellow	The amount of time that the Light Rail phase will display a yellow indication upon termination. Valid range is 3.0-7.0 seconds. Settings outside this range will time either 3.0 or 7.0 seconds, whichever is closer.
All-Red 1	The amount of time that the Light Rail phase will display an All-Red indication following the yellow interval. Valid range is 0-25.5 seconds.
All-Red 2	The additional amount of time that the Light Rail phase will display an All-Red indication following the yellow interval if a three-car train was detected before the start of the yellow interval. Valid range is 0-25.5 seconds.
Red Revert	The minimum amount of time that the Light Rail phase will display a Red indication before displaying another green indication. This is timed concurrently with the All-Red interval. Valid range is 2.0-25.5 seconds. Settings less than 2.0 seconds will time 2.0 seconds.

AUXILIARY SIGN (2-9-4)
The Auxiliary Sign data entry screen allows the user to enter all of the Auxiliary Sign timing and configuration data. The Pre-Start, Carryover and Sign Jumper settings are entered on this screen.

AUX SIGNS	LRA	LRB
Pre-Start	› 5‹	5
Carryover	5	5
Sign Jumper	AB	AB

The following is a description of all of the Auxiliary Sign configuration settings:

Interval	Description
Pre-Start	The maximum amount of time that the Auxiliary Signs will be active prior to the start of the Light Rail phase. Valid range is 0-255 seconds.
Carryover	The maximum amount of time that the Auxiliary Signs will remain active after the Release detector has been deactivated. Valid range is 0-255 seconds.
Sign Jumper	The Light Rail phases selected will activate their Auxiliary Signs with the Light Rail phase indicated, even if no call for service exists on that Light Rail phase. Any number of Light Rail phases may be selected.

DETECTORS (2-9-5)
The Detectors data entry screens allow the user to enter all of the Light Rail phase detector configuration data. There is a total of twenty-four detector entries on three screens; press the [NEXT] key to advance through the screens.

DETECTOR	Normal		Reverse		Pg 1/3
NUMBER	Adv	Rel	Adv	Rel	
LRA	›13‹	14	22	23	
LRB	29	30	6	7	

There are four detectors for each Light Rail phase, two for each track direction. The detectors are designated as **Adv**ance and **Rel**ease and the two track directions are **Normal** and **Reverse**. For each Light Rail phase, the corresponding detector number is entered. The detector numbers are those specified under the Detector Configuration (5-2) settings. The Advance detector will place a call for the indicated Light Rail phase and the Release detector will terminate that call. If a Release detector is activated without its associated Advance detector, then it will also place a call. Reverse track detectors are ignored when trains are operating in the Normal direction, and Normal track detectors are ignored when trains are operating in the Reverse direction.

For each of the eight detector settings, enter a valid detector number, or enter a zero to indicate that detector is not used. Valid detector number range is 1-32.

Press the [NEXT] key to advance to the second screen.

TRAVEL	Normal		Reverse		Pg 2/3
TIME	Adv	Rel	Adv	Rel	
LRA	› 5‹	0	5	0	
LRB	0	0	0	0	

For each detector shown on the previous data entry screen, there is an associated Travel Time parameter. The Travel Time is the amount of time it takes a Light Rail train to proceed from the detector to a point when the action that detector invokes is to occur. A zero value for travel time indicates that the action is to occur immediately upon activation of the detector. There are settings for the **Adv**ance and **Rel**ease detectors on both the **Normal** and **Reverse** directions of travel for each Light Rail phase. Enter the desired travel time in seconds. Valid range is 0-255 seconds.

Press the [NEXT] key to advance to the third screen.

3-CAR	Normal		Reverse		Pg 3/3
DETECTOR	Front	Back	Front	Back	
LRA	›13‹	24	22	25	
LRB	0	0	0	0	

For each Light Rail phase, it is possible to configure the controller to be able to identify three-car trains. This is done by monitoring two detector inputs, and if they are both simultaneously active, then a three-car train is identified. Shorter Light Rail trains will be unable to simultaneously occupy both detectors, and thus will not be identified as a three-car train. Enter the corresponding detector number for each Light Rail phase. Some or all of the detectors entered on this screen can be the same or different from those entered as the Advance and Release detectors. The **Front** detector is the detector closest to the front of the train and the **Back** detector is closest to the back of the train and are set for both the **Normal** and **Reverse** directions of travel for each Light Rail phase.

For each of the eight detector settings, enter a valid detector number, or enter a zero to indicate that detector is not used. Valid detector number range is 1-32.

The detectors used for Light Rail Train operation are processed in the same manner as all other detectors, and any Delay and/or Extend timing entered is applied to their inputs. These detector inputs are also monitored for failures, and a failed Advance or Release detector automatically recalls the Light Rail phase it is assigned to. A failed Three-Car detector selects three-car train operation for the Light Rail phase it is assigned to.

ATSAC DATA (2-9-6)

The ATSAC Data entry screen allows the selection of the Green Return and Phase Demand settings.

```
        LIGHT RAIL ATSAC DATA
   Status       LRA     LRB
Green Return   ›2.1‹    2.5    (word.bit)
Phase Demand    2.3     2.7    (word.bit)
```

The **Green Return** setting specifies which word and bit of the ATSAC communications response is to be used to report Light Rail phase green returns. The format of this data entry is word.bit, where the word is the response byte number and the bit is one of eight bits in that response byte. Valid range is 1.1-8.8 or 0.0 to indicate that the status is not to be returned.

The **Phase Demand** setting specifies which word and bit of the ATSAC communications response is to be used to report Light Rail phase demand. The format of this data entry is word.bit, where the word is the response byte number and the bit is one of eight bits in that response byte. Valid range is 1.1-8.8 or 0.0 to indicate that the status is not to be returned.

Note that non-zero values entered above will cause the Light Rail phase status to override the normal data placed in the ATSAC communications response. Typically, unused pedestrian walk returns in word 2 are used for Light Rail status.

PREEMPTS MENU (3)

The Preemps Menu screen allows the selection of one of the eight preempt submenus. The two Railroad Preempts are selected by pressing the [1] or [2] keys. The four Emergency Vehicle Preempts are selected by pressing the [A], [B], [C] or [D] keys. The Transit Priority preempts are selected by pressing the [E] key. The Interval Control preempt is selected by pressing the [F] key.

```
          PREEMPTION MENU
1…2-Railroad Preempt  F-Interval Control
A…D-Emergency Vehicle
 E –Transit Priority
```

The data entry screens for each of the two Railroad Preempts are identical, and therefore only the sample screens for Railroad Preempt 1 are shown. Likewise, the data entry screens for each of the four Emergency Vehicle Preempts are identical, and only the sample screens for Emergency Vehicle Preempt A are shown. The Transit Priority selection leads to the sub-menu shown.

The Transit Priority preempts have the lowest priority of all preempts. The next lowest priority preempt is the Interval Control preempt. Emergency Vehicle preempts are prioritized with Emergency Vehicle preempt A at the highest priority and Emergency Vehicle preempt D at the lowest priority. Railroad Preempt 1 has priority over Railroad Preempt 2. Both Railroad Preempts have priority over the Emergency Vehicle, Interval Control and the Transit Priority preempts.

The Interval Control preempt is typically used in conjunction with Light Rail Train operation to selectively restrict the operation of the controller in advance of a Railroad Preempt.

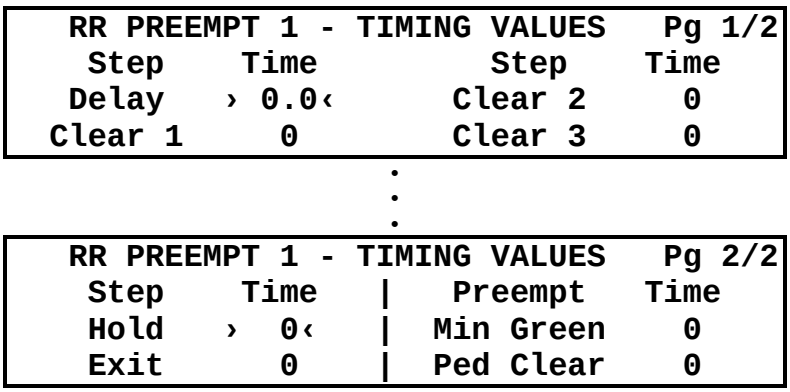
RAILROAD PREEMPT (3-1) and (3-2)

The Railroad Preempt submenu screens allow the selection of one of six screens for data entry relating to Railroad Preempts.

```
         RAILROAD PREEMPT 1
1-Timing Values     4-Overlap Flags
2-Phase Flags       5-Exit Parameters
3-Ped Flags         6-Configuration
```

TIMING VALUES (3-1-1) and (3-2-1)

The Timing Values data entry screen allows the entry of timing values for each of the following Railroad Preempt steps: Delay, Clear 1, Clear 2, Clear 3, Hold and Exit, as well as the Preempt Min Green and Ped Clearance times. There are two screens for the eight entries. Press the [NEXT] key to advance through the screens.



A description of each of the Timing Values is shown below:

Step	Description
Delay	The Delay time is the amount of time between the activation of the railroad preempt input and the beginning of the first clearance step. If the railroad preempt input is deactivated prior to completion of the delay interval, then the preempt is canceled unless the input is latched. Valid range is 0-25.5 seconds.
Clear 1	The Clear 1 time is the amount of time that the phases in the Clear 1 Step are active after the Delay Step is completed. The total time of the Clear 1 Step may exceed the time specified to provide yellow and all-red clearances to the phases serviced. Valid range is 0-255 seconds. If set to zero, this step is skipped.
Clear 2	The Clear 2 time is the amount of time that the phases in the Clear 2 Step are active after the Clear 1 Step is completed. The total time of the Clear 2 Step may exceed the time specified to provide yellow and all-red clearances to the phases serviced. Valid range is 0-255 seconds. If set to zero, this step is skipped.
Clear 3	The Clear 3 time is the amount of time that the phases in the Clear 3 Step are active after the Clear 2 Step is completed. The total time of the Clear 3 Step may exceed the time specified to provide yellow and all-red clearances to the phases serviced. Valid range is 0-255 seconds. If set to zero, this step is skipped.
Hold	The Hold time is the minimum amount of time that the phases in the Hold Step can be active after the Clear 3 Step is completed. The Hold Step phases will remain active until the Railroad Preempt input is removed. Calls are not automatically placed to the phases set for this step. Valid range is 0-255 seconds.
Exit	The Exit time is the minimum amount of time that the phases in the Exit Step are active after the Hold Step is terminated by deactivation of the Railroad Preempt input. Valid range is 0-255 seconds. If set to zero, the controller will resume normal operation immediately following the Hold Step.

Step	Description
Min Green	The Preempt Min Green is the amount of time that a green indication must be displayed prior to termination after the Delay Step is complete. Used to ensure that a phase which just turned green before the preempt was started is not shown a very short green indication. Valid range is 0-255 seconds.
Ped Clear	The Preempt Ped Clear is the amount of time that a flashing don't walk indication must be displayed prior to termination after the Delay Step is complete. Used to ensure that a phase which is in either walk or flashing don't walk when the preempt starts shows a flashing don't walk indication. Valid range is 0-255 seconds.

PHASE FLAGS (3-1-2) and (3-2-2)

The Phase Flags data entry screens allow the selection of the Green Hold, Yellow Flash and Red Flash Phases for each of the Clear 1, Clear 2, Clear 3 and Hold steps of the Railroad Preempt. There are two screens; press the [NEXT] key to advance through the two screens.

```
   RR PREEMPT 1 - PHASE FLAGS    Pg 1/2
 Step   Green Hold  Yel Flash  Red Flash
Clear1 ›........‹   ........   ........
Clear2  ........    ........   ........
```

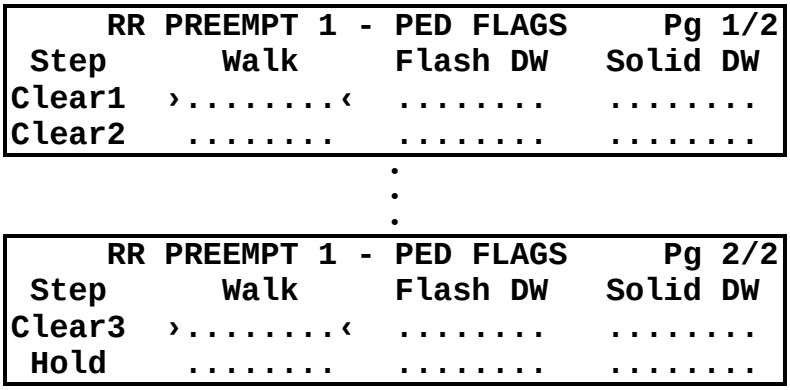
```
   RR PREEMPT 1 - PHASE FLAGS    Pg 2/2
 Step   Green Hold  Yel Flash  Red Flash
Clear3  ›........‹  ........   ........
 Hold    ........   ........   ........
```

Phase Flag	Description
Green Hold	The phases selected will display a green indication for the duration of the step. Up to two compatible phases may be selected, except for the Hold Step, where any phases may be selected.
Yellow Flash	The phases selected will display a flashing yellow indication for the duration of the step. Up to two compatible phases may be selected, except for the Hold Step, where any phases may be selected.
Red Flash	The phases selected will display a flashing red indication for the duration of the step. Any number of phases may be selected.

In each of the four steps, any phase, including those not normally permitted, may be assigned to any one of the three phase settings. The Yellow Flash setting overrides the Green Hold setting, and the Red Flash setting applies to any phase set, regardless of the Yellow Flash or Green Hold settings. If a phase is not set for any of these selections, then the phase will display a solid red indication for the duration of the step. If incompatible phases are set for Green Hold and Yellow Flash in the same step, only compatible phases will display a green or flashing yellow indication.

PED FLAGS (3-1-3) and (3-2-3)

The Ped Flags data entry screens allow the selection of the Walk, Flashing Don't Walk and Solid Don't Walk Phases for each of the Clear 1, Clear 2, Clear 3 and Hold steps of the Railroad Preempt. There are two screens; press the [NEXT] key to advance through the two screens.

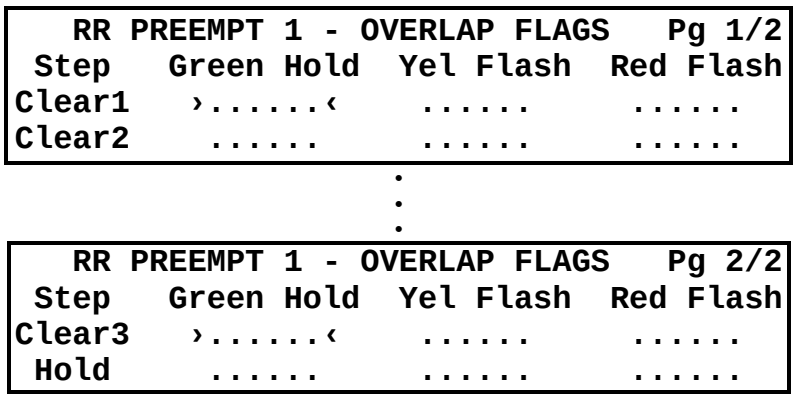


Pedestrian Flag	Description
Walk	The phases selected will display a Walk indication if a pedestrian call is present during the step. Up to two compatible phases may be selected, except for the Hold Step where any phases may be selected. Phases set must also be set as Green Hold or Yellow Flash phases in the same step or this setting has not effect.
Flash DW	The phases selected will display a Flashing Don't Walk indication during the step if the phase was previously displaying a walk indication. Up to two compatible phases may be selected, except for the Hold Step where any phases may be selected. Phases set must also be set as Green Hold or Yellow Flash phases in the same step or this setting has no effect.
Solid DW	The phases selected will display a Solid Don't Walk indication for the duration of the step. Any number of phases may be selected.

In each of the four steps, phases may be assigned to any one of the three pedestrian settings. The Flash Don't Walk setting overrides the Walk setting, and the Solid Don't Walk setting applies to any phase set regardless of the Walk and Flash Don't Walk settings. If a phase is not set for any of these selections, then the pedestrian output will be dark for the duration of the step. If incompatible phases are set for Walk and Flash Don't Walk in the same step, only compatible phases will display a walk or flashing don't walk indication.

OVERLAP FLAGS (3-1-4) and (3-2-4)

The Overlap Flags data entry screens allow the selection of the Green Hold, Yellow Flash and Red Flash overlaps for each of the Clear 1, Clear 2, Clear 3 and Hold steps of the Railroad Preempt. There are two screens; press the [NEXT] key to advance through the two screens.

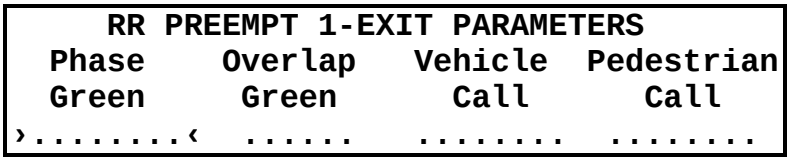


Overlap Flag	Description
Green Hold	The overlaps selected will display a green indication for the duration of the step if a parent phase is also set as a Green Hold or Yellow Flash phase. Any number of overlaps may be selected.
Yellow Flash	The overlaps selected will display a flashing yellow indication for the duration of the step if a parent phase is also set as a Green Hold or Yellow Flash phase. Any number of overlaps may be selected.
Red Flash	The overlaps selected will display a flashing red indication for the duration of the step. Any number of overlaps may be selected.

In each of the four steps, each overlap may be assigned to any one of the three overlap settings. The Yellow Flash setting overrides the Green Hold setting, and the Red Flash setting applies to any overlap set, regardless of the Yellow Flash and Green Hold settings. If an overlap is not set for any of these selections, then the overlap will display a solid red indication for the duration of the step.

EXIT PARAMETERS (3-1-5) and (3-2-5)

The Exit Parameters data entry screen allows the selection of the Phase Green, Overlap Green, Vehicle Call and Pedestrian Call phases for the Exit step of the Railroad Preempt.



Exit Parameter	Description
Phase Green	The phases selected will display a green indication for the duration of the Exit step. Up to two compatible phases may be selected.
Overlap Green	The overlaps selected will display a green indication for the duration of the Exit step if a parent phase is also set as a Phase Green for the Exit step. Any number of overlaps may be selected.

Exit Parameter	Description
Vehicle Call	The phases selected will have a one-time locking vehicle call placed during the Exit step. This allows the user to place vehicle calls to phases that may not have been served during the Railroad preempt. Any number of phases may be set, but only calls to permitted phases are placed.
Pedestrian Call	The phases selected will have a one-time pedestrian call placed during the Exit step. This allows the user to place pedestrian calls to phases that may not have been served during the Railroad preempt. Any number of phases may be set, but only calls to permitted pedestrian phases are placed.

CONFIGURATION (3-1-6) and (3-2-6)

The Configuration data entry screen allows the user to set the Port, Latching and Power Up State parameters for the Railroad preempt.

```
      RR PREEMPT 1 - CONFIGURATION

    Port     Latching       Power Up
    ›2.5‹      YES          FLASHING
```

Entry	Description
Port	Indicates the input port assignment for this Railroad Preempt. Enter a valid input port number. Invalid entries will inhibit the monitoring of the input and disable the Railroad Preempt.
Latching	The Latching entry allows the user to lock in Railroad Preempt inputs during the Delay Step. If the input is latched, then all steps will be executed even if the input is deactivated prior to completion of the Delay Step. If the input is not latched, then the preempt can abort during the Delay Step if the input is deactivated. Once the Delay Step is completed, the remaining steps will be executed regardless of the latch status. Use the [YES] and [NO] keys to select the entry.
Power Up	Indicates the condition of the controller if this Railroad Preempt input is ON when the controller recovers from a long power failure. Valid selections are **FLASHING** or **DARK**. If both Railroad Preempt inputs are active simultaneously during recovery from a long power failure and at least one is set for FLASHING operation, then Flashing operation will result. The FLASHING setting is used for Railroad Preempts that flash during the Hold Step and the DARK setting is used for Railroad Preempts that have Green Hold phases set during the Hold Step. Once the Railroad Preempt inputs are removed, the controller will initiate an all-red startup. Select with the [+] and [–] keys.

If either Railroad Preempt input becomes active while the controller is in Flashing operation, the controller will remain in Flashing operation until such time that both preempt inputs are deactivated. This applies to both software and hardware Flash operation, and termination of hardware Flash operation during a preempt will immediately initiate software Flash operation.

EMERGENCY VEHICLE PREEMPT (3-A), (3-B), (3-C) and (3-D)

The Emergency Vehicle Preempt data entry screens allow the entry of timing values for each of the Delay, Clear, Maximum, Phase Green and Overlap Green, Port, Latching and Phase Termination parameters for the Emergency Vehicle Preempt. These entries are on two screens.

```
   EMERGENCY VEHICLE PREEMPT A    Pg 1/2
   Preempt Timers      Phase     Overlap
 Delay  Clear   Max    Green      Green
 ›  0‹     0      0   .......    ......
```

The following is a description of the entries shown above:

Entry	Description
Delay	The amount of time between the activation of the emergency vehicle preempt input and the beginning of the clearance step. If the emergency vehicle preempt input is deactivated prior to completion of the delay interval, then the preempt is canceled, unless the input is latched. Valid range is 0-255 seconds. If set to zero, the preempt is initiated immediately.
Clear	The amount of time that the emergency vehicle phases and overlaps will be held in green once the preempt input is deactivated. Valid range is 0-255 seconds.
Maximum	The maximum amount of time that the emergency vehicle phases and overlaps can remain green after becoming green. This is used to terminate the emergency vehicle preempt if the input is not deactivated. Valid range is 0-255 seconds.
Phase Green	The phases selected will display a green indication for the duration of the emergency vehicle preempt. Up to two compatible phases may be selected, including those not normally permitted.
Overlap Green	The overlaps selected will display a green indication for the duration of the emergency vehicle preempt if a parent phase is also set as a Phase Green. Any number of overlaps may be selected.

Press the [NEXT] key to advance to the second screen.

```
   EMERGENCY VEHICLE PREEMPT A    Pg 2/2
                                   Phase
    Port     Latching           Termination
    ›5.5‹       YES              FORCE-OFF
```

The following is a description of all of the settings:

Entry	Description
Port	Indicates the input port assignment for this Emergency Vehicle Preempt. Enter a valid input port number. Invalid entries will inhibit the monitoring of the input and disable the Emergency Vehicle Preempt.
Latching	This entry allows the user to lock in Emergency Vehicle Preempt inputs during the Delay time. If the input is latched, then the preempt will be initiated even if the input is deactivated prior to completion of the Delay time. If the input is not latched, then the preempt can abort during the Delay time if the input is deactivated. Once the Delay time is completed, the preempt will be initiated regardless of the latch status. Use the [YES] and [NO] keys to select the entry.
Phase Termination	Indicates the method used by the controller to terminate conflicting phases after the Delay time is completed. Valid selections are **FORCE-OFF** or **ADVANCE**. The Force-Off selection will not shorten any walk or pedestrian clearance timing on terminating phases. The Advance selection will abort the walk timing, but not shorten the pedestrian clearance timing, on the terminating phases. Select with the [+] and [–] keys.

Press the [NEXT] key to return to the first screen.

TRANSIT PRIORITY (3-E)

The Transit Priority submenu allows the selection of ten data entry screens for Transit Priority operation of the controller. Nine screens are for Local Plan data and one is for Free Plan data.

```
  TRANSIT PRIORITY TIMING DATA ENTRY
             Select Plan:
1…9-Local Plans 1-9
 E –Free Plan
```

The data entry screens for each of the nine Local Plans are identical, and therefore only the sample screens for Local Plan 1 are shown.

LOCAL PLANS (3-E-1), (3-E-2), (3-E-3), (3-E-4), (3-E-5), (3-E-6), (3-E-7), (3-E-8), (3-E-9)

The Local Plans data entry screens allow the user to enter all timing information relating to the transit priority Local Plans. The Early Green, Green Extension, Inhibit Cycles, Minimum Green Factors or Minimum Force Offs, Minimum Cycle, Maximum Hold, and Early Green and Green Extend Phase enables are all entered on four screens. Press the [NEXT] key to advance through the four screens.

```
LOCAL PLAN 1 – TRANSIT PRIORITY   Pg 1/4
  Early Green   Green Extend   Inhibit
      › 15‹          15            2
       Press * to verify priority
```

The **Early Green** entry is used to set the maximum amount of Early Green for the selected Local Plan. Valid range is 0-240 seconds.

The **Green Extend** entry is used to set the maximum amount of Green Extension for the selected Local Plan. Valid range is 0-240 seconds.

The **Inhibit** entry is used to set the number of cycles that must elapse after initiating a transit priority cycle. The cycle that initiated the transit priority is included in this count. Valid range is 0-255 cycles.

Press the [NEXT] key to advance to the next screen.

```
LOCAL PLAN 1 – MIN GREEN FACTORS  Pg 2/4
  Ø1   Ø2   Ø3   Ø4   Ø5   Ø6   Ø7   Ø8
›  5‹  25    5   20    5   25    5   20
       Press * to verify priority
```

The timing information for each Transit Priority Local Plan may be entered in one of two ways. The first method is Green Factors, which are values for the amount of green displayed to each phase during the cycle. The second method is Force Offs, which are fixed points in the cycle when phases must end. The indication of which type of data are being entered is shown on the top line of the screen and will be either **MIN GREEN FACTORS** or **MIN FORCE OFFS**. The determination as to which type of data entry is made in the Coordinated Menu (7) data entry sections.

When entering Min Green Factor data on this screen, enter a non-zero value for each permitted phase that will operate during this Transit Priority Local Plan, which is the minimum amount of time that can be shown during a transit priority cycle. The amount of time entered must be more than the minimum time required for the phase to run, including all pedestrian timing if the phase is a pedestrian phase, but not more than the normal amount of time given during a non-transit priority cycle. Enter a zero for non-permitted phases. When finished, press the [*] key to check the plan. When the [*] key is pressed, all timing information relating to the Local Plan is checked to verify that the plan will be able to run. If there is an error, then a message will appear on the bottom of the screen. Refer to the table of possible error messages for a description of the error messages. After the [*] key is pressed, the Green Factor values for the Sync Phases will change if they are not the same as the Local Plan sync phase Green Factors in order to validate the plan. Valid range is 0-255 seconds.

When entering Force Off data on this screen, enter a non-zero value for each permitted phase that will operate during this Transit Priority Local Plan, which is the minimum Force Off that can be used during a transit priority cycle, except for the Sync Phases, which must be set to zero. Enter a zero for all non-permitted phases. The minimum Force Off entered must not be higher than the normal Force Off for this Local Plan. The calculation of minimum Force Offs must be done by the user to ensure that each phase has enough time to run in the cycle and still provide enough time for the Early Green and Green Extension. Local Plans that are programmed with Force Offs are only checked to ensure that the minimum Force Offs are not higher than the normal Force Offs. The controller does not verify the Force Offs for proper operation. Valid range is 0-255 seconds.

Press the [NEXT] key to advance to the next screen.

```
LOCAL PLAN 1 – LRT PRIORITY DATA  Pg 3/4
     Minimum Cycle     Maximum Hold
         › 70‹              30
       Press * to verify priority
```

The **Minimum Cycle** entry is used to set the minimum cycle length to use during recovery after a Light Rail priority hold. Set to zero to disable Light Rail priority hold. If the value is set lower than the true minimum cycle, it will be adjusted to the true minimum when the [*] key is pressed. Valid range is 0-240 seconds.

The **Maximum Hold** entry is used to set the maximum amount of time that the Light Rail priority phases can hold in green after their normal termination point. Set to zero to disable Light Rail priority hold. Valid range is 0-255 seconds.

Note that both of the above parameters must be non-zero to enable Light Rail priority hold.

Press the [NEXT] key to advance to the next screen.

```
LOCAL PLAN 1 – LRT PHASE ENABLE   Pg 4/4
      Early Green      Green Extend
         ›..‹               ..
       Press * to verify priority
```

The **Early Green** entry is used to select the Light Rail phases that will activate Early Green priority in the local plan. Any number of Light Rail phases may be set.

The **Green Extend** entry is used to select the Light Rail phases that will activate Green Extend priority in the local plan. Any number of Light Rail phases may be set.

Whenever changes are made to the Local Plan, the [*] key should be pressed to verify that the changes made have not caused an error in the plan. When the [*] key is pressed, all timing information relating to the Local Plan is checked to verify that the plan will be able to run. If there is an error, then a message will appear on the bottom of the screen. Refer to the table of possible error messages for a description of the error messages. The sync phase Minimum Green Factors will be adjusted by the controller when the [*] key is pressed if they are not the same as the Local Plan sync phase Green Factors to validate the plan. The Minimum Cycle value will be adjusted to the true minimum if it is set lower and the Maximum Hold parameter is also set for this plan. Be sure to note the changes made when this occurs.

If the Transit Priority Local Plan data entered contains errors, then the plan will not be able to initiate Transit Priority when requested. To prevent this, always press the [*] key to verify the plan prior to selecting the plan for operation. The following table is a description of all of the possible error messages that can appear when the Transit Priority Local Plan is verified.

Error	Description
Priority OKAY	There are no errors in the priority and it is ready to be used.
Local plan error Priority not verified	There is at least one error in the local plan that prevents it from being used. Transit Priority cannot be verified until the local plan is without any errors.
Early Green above maximum	The Early Green time entered exceeds the maximum amount of time available in the local plan.
Green Extension above maximum	The Green Extend time entered exceeds the maximum amount of time available in the local plan.
Phase # Min Green Factor below minimum	The Minimum Green Factor for the indicated phase is below the minimum amount necessary to serve the phase. Increase the Minimum Green Factor.
Phase # Min Green Factor above nominal	The Minimum Green Factor for the indicated phase is higher than the nominal green factor for that phase. The Minimum Green Factors cannot exceed the nominal Green Factors.
Phase # Min Force Off above nominal	The Minimum Force Off for the indicated phase is higher than the nominal force off for that phase. The Minimum Force Offs cannot exceed the nominal Force Offs.
Plans with FORCE OFFs are NOT verified	Plans that are entered with Force-Offs cannot be checked for errors other than Minimum Force Offs set above the nominal force offs. The plan will run as entered.
Minimum Cycle above Maximum	The Minimum Cycle entered exceeds the cycle length. The Minimum Cycle must be lower than the local plan cycle length.

FREE PLAN (3-E-E)

The Free Plan data entry screen allows the user to enter all priority data information relating to Free operation. The Max Green Hold and Hold Phases are all entered on this screen.

```
      FREE PLAN - PRIORITY DATA
Max Green Hold        Hold Phase
    › 10‹              .2...6..
```

The **Max Green Hold** entry is used to set the maximum amount of time that the Hold Phase will remain green without demand in the presence of opposing calls during Transit Priority Free Operation. Valid range is 0 to 255 seconds.

The **Hold Phase** entry is used to select the phases that will be held in green during Transit Priority Free Operation. Up to two compatible phases may be selected.

INTERVAL CONTROL (3-F)

The Interval Control submenu screen allows the selection of one of five screens for data entry relating to Interval Control Preempts.

```
          INTERVAL CONTROL DATA
1-Timing Values      4-Phase Permission
2-Phase Control      5-Configuration
3-Phase Recalls
```

TIMING VALUES (3-F-1)

The Timing Values data entry screen allows the entry of timing values for the eight steps of the Interval Control Preempt.

```
TIMING VALUES  Step Time      Step Time
  Step Time  |  #3    0   |   #6    0
   #1 ›  0‹  |  #4    0   |   #7    0
   #2    0   |  #5    0   |   #8    0
```

Each Interval Control Step will be timed for the duration entered. Valid range is 0-255 seconds. When entering data on these screens, the cursor will automatically advance to the next data entry position when the [ENT] key is pressed to save the data. The arrow keys can be used to override this feature and direct the cursor to a specific location.

PHASE CONTROL (3-F-2)

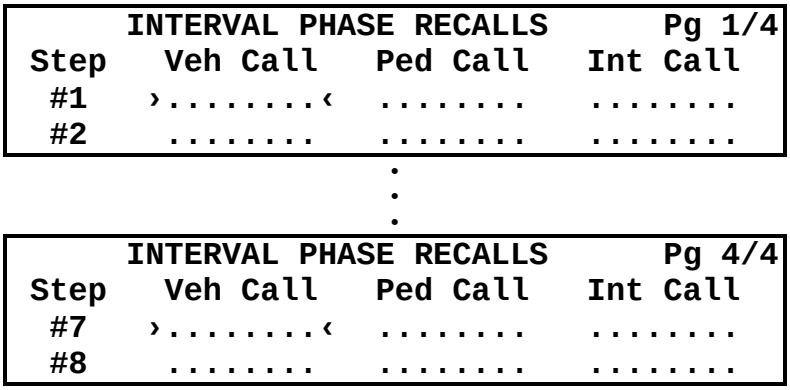
The Phase Control data entry screens allow the selection of the Hold, Force and Advance Phases for each of the eight steps in the Interval Control Preempt. There are four data entry screens; press the [NEXT] key to advance through the screens.

```
      INTERVAL PHASE CONTROL      Pg 1/4
 Step     Hold      Force     Advance
  #1   ›........‹  ........   ........
  #2    ........   ........   ........
                      :
                      :
                      :
      INTERVAL PHASE CONTROL      Pg 4/4
 Step     Hold      Force     Advance
  #7   ›........‹  ........   ........
  #8    ........   ........   ........
```

Phase Control	Description
Hold	The phases selected will be held in green for the duration of the step. Any number of phases may be selected.
Force	The phases selected will be forced off for the duration of the step. Any number of phases may be selected.
Advance	The phases selected will be advanced for the duration of the step. Any number of phases may be selected.

PHASE RECALLS (3-F-3)

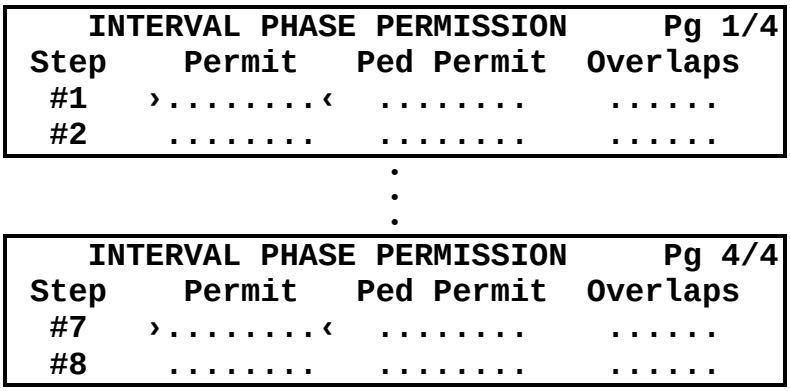
The Phase Recalls data entry screens allow the selection of the Vehicle Call, Pedestrian Call and Internal Call phases for each of the eight steps in the Interval Control Preempt. There are four data entry screens; press the [NEXT] key to advance through the screens.



Phase Recall	Description
Veh Call	The phases selected will have a vehicle call placed for the duration of the step. Any number of phases may be selected.
Ped Call	The phases selected will have a pedestrian call placed for the duration of the step. Any number of phases may be selected.
Int Call	The phases selected will have an internal call placed for the duration of the step. Internal calls are locked, and will be retained if the phase is not serviced during the step. Any number of phases may be selected.

PHASE PERMISSION (3-F-4)

The Phase Permission data entry screens allow the selection of the Permit, Ped Permit and Overlaps setting for each of the eight steps in the Interval Control Preempt. There are four data entry screens; press the [NEXT] key to advance through the screens.



Phase Permission	Description
Permit	The phases selected will be allowed to time for the duration of the step. Any number of phases may be selected, including phases that are not normally permitted.
Ped Permit	The phases selected will be eligible for pedestrian service for the duration of the step. Any number of phases may be selected.
Overlaps	The overlaps selected will be allowed to time if a parent phase is ON for the duration of the step. Any number of overlaps may be selected.

CONFIGURATION (3-F-5)

The Configuration data entry screen allows the selection of input Ports and Delay settings for the Interval Control Preempt.

```
      INTERVAL CONTROL CONFIGURATION
        Input       Port       Delay
          1         ›0.0‹        0
          2          0.0         0
```

Entry	Description
Port	Indicates the input port assignment for each of the two inputs assigned to the Interval Control Preempt. Enter a valid input port number. Invalid entries will disable that input to the Interval Control Preempt.
Delay	The Delay entry allows the user to specify the amount of time between activation of the input and the start of the first step in the preempt. Valid range is 0-255 seconds.

If either Interval Control Preempt input becomes active while the controller is already timing an Interval Control Preempt, that input is ignored until completion of the last programmed step in the active Interval Control Preempt. The controller will initiate Free operation as soon as the Delay interval has timed out, and will remain in Free operation for the duration of the Interval Control Preempt.

COMMANDS MENU (4)

The Commands Menu screen allows the selection of one of five command entry screens. These screens allow the selection of a Manual Plan, control the state of the Special Function outputs, activate the Detector Reset line, set the Local Manual Flag to release the controller from on-line ATSAC operation and to enter manual Priority Requests.

```
              COMMAND MENU
1-Manual Plan      4-Local Manual Flag
2-Special Function 5-Priority Request
3-Detector Reset
```

MANUAL PLAN (4-1)
The Manual Plan selection screen allows the user to enter the plan number to be run by the controller. This selection overrides all other plan selections, but does not affect on-line ATSAC operation.

```
MANUAL COORDINATION PLAN SELECT

Enter manual plan number ›  0‹
```

Entering zero will disable Manual Plan selection, and resume the default plan selection method. Entering numbers 1-9 will select coordination plans 1-9, respectively. Entering 254 will select software Flashing operation, and entering 255 will select Free operation. Entry of any other value will select Free operation.

SPECIAL FUNCTION (4-2)
The Special Function selection screen allows the user to override the normal Special Function operation and directly control the Special Function outputs.

```
        SPECIAL FUNCTION OVERRIDE
#  Control  Output    #  Control  Output
1  ›NORMAL‹   OFF     3   NORMAL    OFF
2   NORMAL    OFF     4   NORMAL    OFF
```

The column labeled **Control** allows the user to select from one of three output control modes. These modes are **NORMAL**, **OFF** and **ON**. Select using the [+] and [–] keys. The Normal selection allows the Special Function outputs to operate per an ATSAC or Time-of-Day command. The OFF and ON selections turn the Special Function output OFF and ON. These selections are provided to test the Special Function outputs by turning them ON and OFF.

The column labeled **Output** shows the current state of the Special Function outputs, and is an observe-only field.

DETECTOR RESET (4-3)
The Detector Reset selection screen allows the user to momentarily activate the Detector Reset output and reset all of the detectors.

```
MANUAL DETECTOR RESET
Press * to reset detectors
All pending calls will become locked
Press ESC to return to menu
```

When the [*] key is pressed, the Detector Reset output will be activated for 100 milliseconds, and all calls pending at that moment will become locked.

LOCAL MANUAL FLAG (4-4)

The Local Manual Flag selection screen allows the user to set the User Local Manual Flag causing the controller to be dropped "off-line" from the ATSAC system.

```
   CONTROLLER        User Setting = OFF
  LOCAL MANUAL         AUX Switch = OFF
Press * to toggle      Adv Enable = OFF
  User Setting         Soft Logic = OFF
```

When the [*] key is pressed, the User Setting is toggled between OFF and ON. This is one of four Local Manual flags, any of which being ON will cause the controller to be dropped "off-line" from the ATSAC system. The Aux Switch Local Manual flag is ON whenever the Aux Switch is ON (controller in stop time). The Adv Enable Local Manual flag is ON whenever the Advance Enable input is active. The Soft Logic Local Manual flag is ON whenever the soft logic local manual bit is set. On-line ATSAC operation cannot occur unless all four Local Manual flags are OFF.

PRIORITY REQUEST (4-5)

The Priority Request selection screen allows the user to enter a transit priority request and initiate transit priority operation if available in the current plan.

```
        MANUAL PRIORITY REQUEST
  Type ›0‹    Group  0     Time    0
  Enter priority Type and Group then
    enter Time of priority request
```

The Type and Group entries are single digit hexadecimal numbers that define the transit priority request. Valid range for both the Type and Group entries is 0-F. When a non-zero number is entered for the Time, transit priority will be initiated if available in the current local plan. The time entered is the duration of the transit priority request, in seconds. After the time is entered, the display will count down to zero, at which point the transit priority request will be removed. Entering a Time of zero when the display shows a non-zero number will immediately cancel the transit priority request. Valid range for the Time is 0-255 seconds.

DETECTORS MENU (5)

The Detectors submenu allows the selection of one of six detector data entry screens. These screens allow the entry of Detector Attributes, Detector Configuration, Detector Failure Times, Detector Failure Override, System Detector Assignments and CIC Parameters.

```
            DETECTOR MENU
1-Attributes        4-Failure Override
2-Configuration     5-System Detectors
3-Det Fail Times    6-CIC Parameters
```

ATTRIBUTES (5-1)

The Attributes data entry screens allow for the entry of the detector Type, Phase assignment and Lock mode. There are sixteen screens for the thirty-two detectors, with two detectors shown on each screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
     DETECTOR ATTRIBUTES          Pg  1/16
Det        Type              Phases     Lock
 1 ›   CALL+EXTEND     ‹   1.......     RED
 2         NONE             ........      NO
                    .
                    .
                    .
     DETECTOR ATTRIBUTES          Pg 16/16
Det        Type                Phase     Lock
31 ›   PEDESTRIAN     ‹   .....6..      NO
32     PEDESTRIAN         .......8      NO
```

The **Type** entry allows the selection of the detector type for each of the thirty-two detectors. Select using the [+] and [–] keys, or the number key shown. Listed below are the descriptions of the twelve types of detectors.

Key	Type	Description
0	NONE	The detector input is not used to place any calls to any phases. The detector may be used as a System Detector if it is programmed on the System Detectors assignment screen.
1	COUNT	The detector input counts vehicles arriving during the yellow and red intervals of the selected phase. This type of detector does not place any calls.
2	CALL	The detector input places a vehicle call to the selected phase during the yellow and red intervals.
3	EXTEND	The detector input places a vehicle call to the selected phase during the green interval.
4	COUNT+CALL	The detector input counts vehicles arriving and places a vehicle call to the selected phase during the yellow and red intervals.
5	CALL+EXTEND	The detector input places a vehicle call to the selected phase during all intervals.
6	COUNT+CALL+EXTEND	The detector input counts vehicles arriving during the yellow and red intervals and places a vehicle call to the selected phase during all intervals.
7	COUNT+EXTEND	The detector input counts vehicles arriving during the yellow and red intervals of the selected phase, and places a vehicle call to the selected phase during the green interval.
8	LIMITED	The detector input places a vehicle call to the selected phase during the yellow and red intervals, and places a hold on the selected phase during the green interval until the Detector Limit timer expires or actuation is removed, whichever occurs first.

Key	Type	Description
9	**BICYCLE**	The detector input places a bicycle call to the selected phase during the red interval, extends the selected phase during the green interval and activates Bike Min Green and All-Red timers.
A	**PEDESTRIAN**	The detector input places a pedestrian call to the selected phase.
B	**HOLDING**	The detector input places a hold on the selected phase during the green interval and places a call to the selected phase during the yellow and red intervals.

Any type of detector may be configured to function as a System Detector. This is done by programming the detector number on the System Detector Assignment screen (5-5).

The **Phases** entry is used to indicate which phases are assigned to the detector. If no phases are assigned, then the detector can only be used as a System Detector or Light Rail Detector. When multiple phases are assigned, each of the assigned phases will receive calls from the detector.

The **Lock** entry is used to indicate which detector inputs are locked upon receipt of a call. Available settings are **NO**, **RED** and **YEL**. The **NO** setting does not lock calls, and calls are dropped when the detector actuation is removed. The **RED** setting locks calls received when the selected phase is Red. The **YEL** setting locks calls received when the selected phase is Yellow or Red. Pedestrian detector calls are always locked; this setting has no effect on their operation. Select using the [+] and [–] keys, or press [0] for **NO**, [1] for **RED** and [2] for **YEL**.

The TSCP will not drop calls when the controller issues a detector reset. All vehicle calls present at the time a detector reset is activated will automatically become locked until they are serviced. It is not necessary to set detector lock to prevent dropped calls during a detector reset.

CONFIGURATION (5-2)

The Configuration data entry screens allow for the entry of the detector Delay, Extend and Recall times, and the input Port assignment. There are sixteen screens for the thirty-two detectors, with two detectors shown on each screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
    DETECTOR CONFIGURATION      Pg  1/16
Det   Delay    Extend    Recall    Port
 1    › 0‹      0.0        10       3.2
 2       0      0.0        10       1.1
                  .
                  .
                  .
    DETECTOR CONFIGURATION      Pg 16/16
Det   Delay    Extend    Recall    Port
31    › 0‹      0.0        10       5.2
32       0      0.0        10       5.4
```

The **Delay** entry is used to set the amount of time that the detector input is delayed. This is defined as the amount of time between the receipt of a call by the detector and the acknowledgment of the call by the controller. The Delay time is not applied when the assigned phase is green. The Delay time is always applied for Light Rail Detectors. Valid range is 0-255 seconds.

The **Extend** entry is used to set the amount of time that the detector input is extended. This is defined as the amount of time that a call is held by the controller after it has been dropped by the detector. The Extend time is always applied regardless of assigned phase status. Valid range is 0-25.5 seconds.

The **Recall** entry is used to set the amount of time that the detector will place a call to the assigned phase when a failure of the detector has been identified. A detector failure occurs if the detector remains in a continuous ON state for more than the failure Maximum On Time. Once a detector has failed, its normal operation is suspended. The detector will then place a call for service on the selected phase which remains until the number of seconds specified has elapsed after the start of green, at which point the call will be removed. This process of placing calls will repeat until the detector has resumed normal operation. Valid range is 0-255 seconds. Entering a zero disables the recall feature and prevents the detector from placing calls when it has failed.

The **Port** entry is used to assign the input port for the selected detector. Enter a valid input port number. Invalid entries will disable the detector input and suspend failure monitoring of the detector. Multiple detectors can be assigned to the same port.

DET FAIL TIMES (5-3)

The Detector Fail Times data entry screen allows for the entry of the Detector Maximum On and Detector Fail Reset Times.

```
        DETECTOR FAILURE TIMES
    Detector Maximum ON Time  › 10‹
    Detector Fail Reset Time   120
      Time values are in minutes
```

The **Detector Maximum ON Time** entry indicates the amount of time that is used to identify a detector failure. A detector is identified as failed if its input is ON continuously for the amount of time specified in this entry in minutes. The detector will be considered operational when its input has been OFF for at least the amount of time specified in this entry in seconds. Thus, if the default value of 10 is used, a detector is failed once its input has been ON continuously for 10 minutes. The detector will resume normal operation when its input has been OFF for at least 10 seconds. Enter zero to disable detector failure monitoring. Valid range is 0-255.

The **Detector Fail Reset Time** entry indicates the period of time, in minutes, between successive detector resets issued by the controller when any detector fails. Once a detector is identified as failed, the controller will begin resetting the detector at the interval specified in this entry. If all detectors are working, no detector resets will be issued. An ATSAC commanded or user requested Detector Reset will override this timer and immediately activate the Detector Reset output. Enter a zero to disable the resetting of failed detectors. Valid range is 0-255.

FAILURE OVERRIDE (5-4)

The Failure Override data entry screen allows the user to manually override detector failure monitoring and set any detector to operate as if it has failed.

```
                      Det  1- 8: ›........‹
DETECTOR FAILURE      Det  9-16:  ........
    OVERRIDE          Det 17-24:  ...4....
                      Det 25-32:  ........
```

The Failure Override data entry screen is provided so the user can, on a detector-by-detector basis, override detector failure monitoring and set a detector to operate as if it has failed. This is useful when a long-term detector failure has occurred, and it is desirable to activate the detector failure mode to prevent the issuing of Detector Resets for a detector that cannot resume normal operation or is turned OFF. There are thirty-two bit entries on this screen, one for each detector. The bit entries are divided into four groups of eight. To set a particular detector, move the cursor to the appropriate row and press the number key corresponding to the detector bit in that row. For example, to set Failure Override for detector 20, move the cursor to the third row labeled **Det 17-24:** and press the [4] key to set bit 4 ON. When a bit is ON, Detector Failure Override is set for that detector. In the above sample screen, Detector 20 is set for Failure Override.

SYSTEM DETECTORS (5-5)

The System Detectors data entry screens allow the user to assign detector inputs to the sixteen System Detectors. There are two screens for the sixteen system detectors, with eight system detectors shown on each screen. Press the [NEXT] key to advance through the two screens.

```
    SYSTEM DETECTOR ASSIGNMENT    Pg 1/2

Sys Det   1   2   3   4   5   6   7   8
Det Num › 2‹  3   4   5   8   9  10  11
```

```
    SYSTEM DETECTOR ASSIGNMENT    Pg 2/2

Sys Det   9  10  11  12  13  14  15  16
Det Num ›18‹ 19  20  21  24  25  26  27
```

Each System Detector can be assigned to a Detector number on these screens. Only valid Detectors may be assigned as System Detectors. A zero may be entered for unused System Detectors. Assigning a System Detector does not affect the normal operation of the detector to which it is assigned, which allows a detector to be used as both a phase detector and a System Detector. If a particular detector is to be used only as a System Detector, its detector type should be set as NONE. Only assigned System Detectors can be used for CIC operation and to transmit volume and occupancy data via the ATSAC and AB3418 protocols.

CIC PARAMETERS (5-6)
The CIC Parameters submenu allows the selection of three data entry screens for the various Critical Intersection Control Parameter data.

```
            CIC PARAMETERS
1-CIC Enable
2-Parameter Values
3-Detector to Phase Assignments
```

CIC ENABLE (5-6-1)
The CIC Enable data entry screen allows the user to enable the Critical Intersection Control operation for the selected local plans.

```
            CIC ENABLE

    CIC Enabled in Plans ›.........‹
```

The **`CIC Enabled in Plans`** entry selects the plans in which the CIC function is enabled. When enabled for a local coordination plan, the phase splits will be automatically adjusted to prevailing traffic conditions based on the system detector data. Any number of plans may be selected. Entries are toggled by pressing the [1] through [9] keys. Press [0] to clear all entries.

PARAMETER VALUES (5-6-2)
The Parameter Values data entry screen allows the user to enter the following CIC Parameters: Volume, Occupancy and Demand Smoothing; Volume and Occupancy Multipliers; and Volume and Occupancy Exponents.

```
CIC VALUES   Volume  Occupancy   Demand
Smoothing    ›0.66‹     0.66      0.66
Multiplier     4.0      0.33        **
 Exponent     0.50      1.00        **
```

A description of the CIC Values is shown below:

The **`Smoothing`** values for **`Volume`**, **`Occupancy`** and **`Demand`** are used to average the results of the demand calculations in the CIC algorithm. The valid range for all three of these parameters is 0-1.00. If values greater than 1.00 are entered, 1.00 will be used.

The **`Multiplier`** values for **`Volume`** and **`Occupancy`** are used to calculate the demand for each phase in the CIC algorithm. The Volume Multiplier valid range is 0-25.5 and the Occupancy Multiplier valid range is 0-2.55.

The **`Exponent`** values for **`Volume`** and **`Occupancy`** are used to calculate the demand for each phase in the CIC algorithm. The valid range for both of these parameters is 0-2.55.

DETECTOR TO PHASE ASSIGNMENTS (5-6-3)

The Detector To Phase Assignments data entry screens are used to set the detector assignments for CIC operation. There are two screens for the sixteen System Detectors, with eight System Detectors shown on each screen. Press the [NEXT] key to advance through the two screens.

```
CIC DETECTOR-TO-PHASE ASSIGNMENT  Pg 1/2

Sys Det   1   2   3   4   5   6   7   8
 Phase   ›0‹  0   0   0   0   0   0   0

                    .
                    .
                    .

CIC DETECTOR-TO-PHASE ASSIGNMENT  Pg 2/2

Sys Det   9  10  11  12  13  14  15  16
 Phase   ›0‹  0   0   0   0   0   0   0
```

Each System Detector can be assigned to any one of the eight phases for CIC operation. Enter the phase number (1-8) below each system detector number (1-16). Enter a zero to indicate that the System Detector is not used for CIC operation.

COMM / LOGIC MENU (6)
The Comm / Logic submenu is used to select the Communications Parameters and Soft Logic Equation data entry screens.

```
    COMMUNICATIONS / SOFT LOGIC MENU
1-Comm Parameters
2-Soft Logic Eqns
```

COMM PARAMETERS (6-1)
The Comm Parameters submenu allows the selection of one of the three serial ports, each of which has three data entry screens. Select the serial port by pressing the number keys [1] to [3].

```
       COMMUNICATIONS PARAMETERS
1-Serial Port #1 (C2)
2-Serial Port #2 (C20)
3-Serial Port #3 (C21)
```

The data entry screens for each of the three Serial Ports are identical, and therefore only the sample screens for Serial Port 1 are shown.

SERIAL PORT (6-1-1), (6-1-2) and (6-1-3)
The Serial Port data entry screens allow the user to set the Address, Protocol, Baud Rate, Data Bits, Parity, Stop Bits, RTS On and Off Times, and Hardware Handshaking for each Serial Port. There are three data entry screens for each serial port.

```
        SERIAL PORT 1              Pg 1/3

   Address ›  0‹   Protocol   ATSAC
```

The **Address** entry is used to set the communications address for this serial port. Some communications protocols require an address to work, such as ATSAC, AB3418 and PREDICT, while the COMPLEX protocol uses this entry to modify its operation. The SIMPLEX and WWV protocols do not use this entry. Valid range is 0-255, although not all protocols recognize all values.

The **Protocol** entry is used to set the communications Protocol for this serial port. The available selections are listed below. Use the [+] and [–] keys, or the number key shown to select.

Key	Protocol	Description
0	NONE	The serial port is not used for communications. Any data received will be ignored, and no data will be transmitted.
1	ATSAC	The serial port will accept commands from and provide a response to the ATSAC system. When this protocol is selected, the valid range for the Address is 0-15.

Key	Protocol	Description
2	**SIMPLEX**	The serial port will accept data from a Simplex Master for coordination plan selection, and will transmit Simplex commands to any connected Slave controllers. Both Master and Slave capabilities are enabled when this protocol selection is made. The Address entry is not used with this protocol.
3	**COMPLEX**	The serial port will accept data from a Complex Master for coordination plan selection, and will transmit Complex commands to any connected Slave controllers. Both Master and Slave capabilities are enabled when this protocol selection is made. The Address entry is used to modify the plan selection operation of this protocol as follows:

Address	Description
0	Normal operation: both time and plan are sent and received.
1	Master disable: only time is sent but time and plan received.
2	Slave disable: time and plan are sent but only time received.
3	Master and Slave disable: only time is sent and received.

4	**AB3418**	The serial port will accept commands from and provide a response to an AB3418 or AB3418E Master. When this protocol is selected, the valid range for the Address is 1-63.
5	**WWV**	The serial port will poll a WWV clock to obtain the current date and time, which is used to synchronize the controller's clock for time-of-day operation. The Address entry is not used with this protocol.
6	**PREDICT**	The serial port will accept commands from and provide a response to a Light Rail Train Predictor. When this protocol is used, the valid range for the Address is 1-8.

Press the [NEXT] key to advance to the second screen.

```
        SERIAL PORT 1                Pg 2/3

  Baud Rate   › 1200‹     Data Bits    8
  Parity        EVEN      Stop Bits    1
```

The **Baud Rate** entry is used to set the Speed of the Serial Port. Use the [+] and [–] keys to select from the following available rates: **1200**, **2400**, **4800**, **9600**, **19200** and **38400**.

The **Data Bits** entry is used to set the number of Data Bits in each byte. Use the [+] and [–] keys to select from the following number of bits: **5**, **6**, **7** and **8**.

The **Parity** entry is used to set the type of Parity used in each byte. Use the [+] and [–] keys to select from the following types: **NONE**, **EVEN** and **ODD**.

The **Stop Bits** entry is used to set the number of Stop Bits in each byte. Use the [+] and [–] keys to select from the following number of bits: **1**, **1.5** and **2**.

Press the [NEXT] key to advance to the third screen.

```
      SERIAL PORT 1              Pg 3/3
RTS On Time     ›  0‹  (milliseconds)
RTS Off Time      24   (milliseconds)
Handshaking     NORMAL
```

The **RTS On Time** entry is used to set the number of milliseconds that the Serial Port RTS line will be activated prior to transmitting data. This is used to establish carrier on the line so that the receiving modem can synchronize prior to the actual transmission of data. Valid entries are 0-255 milliseconds.

The **RTS Off Time** entry is used to set the number of milliseconds that the Serial Port RTS line will remain activated after transmitting data. This is used to ensure that the receiving modem has had enough time to acquire the data before releasing the line. Valid entries are 0-255 milliseconds.

The **Handshaking** entry is used to enable the use of the RTS and CTS signals to and from a modem. When Handshaking is used, the controller will assert the RTS line and wait for the CTS line to be asserted prior to transmitting data. If the CTS line is not asserted, then no data transmission will occur. When Handshaking is not used, transmissions are made regardless of the state of the CTS line. Use the [+] and [–] keys to select from the following types: **NONE**, **NORMAL**, **AUTO**, **AUTO CTS** and **AUTO RTS**.

Changes to the Serial Port Parameter settings take effect immediately. Some of the communications protocols listed above require different settings for the entries on all three screens. Be sure to verify all Serial Port Parameters prior to connecting external communications equipment to the controller to prevent undesired operation.

SOFT LOGIC EQUATIONS (6-2)

The Soft Logic Equations data entry screens allow the user to enter the Data and Opcodes for up to sixteen Soft Logic Equations. These equations are displayed on eight screens, with two equations on each screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
   SOFT LOGIC EQUATIONS          Pg 1/8
EQ  Data  Op  Data  Op  Data  Op  Data
 1 ›00.0‹ 00  00.0  00  00.0  00  00.0
 2  00.0  00  00.0  00  00.0  00  00.0
                  .
                  .
                  .
   SOFT LOGIC EQUATIONS          Pg 8/8
EQ  Data  Op  Data  Op  Data  Op  Data
15 ›00.0‹ 00  00.0  00  00.0  00  00.0
16  00.0  00  00.0  00  00.0  00  00.0
```

The Soft Logic Equations provide the user with a mechanism to customize the controller operation. When programmed, the sixteen Soft Logic Equations can be used to generate special outputs or modify the controller operation. Because of the possibilities with these equations, a thorough understanding of their operation is necessary prior to field implementation.

A Soft Logic Equation consists of up to four Data words and up to three Opcodes. Each Soft Logic Equation is independent of the others, except that Equation 1 is processed first and Equation 16 is processed last. Any intermediate results generated by a lower numbered equation can affect the result of higher numbered equations. This allows the processing of complex equations requiring more than three Opcodes, although special entries are required to achieve the desired results.

The Soft Logic Equations allow the user to customize the operation of the TSCP by providing a software implementation of what has traditionally been done with hardware jumpers or external logic. Various bits of data, including all inputs and outputs of the controller, can be manipulated with the Soft Logic Equations and then rewritten back to the controller for further processing. An example of the use of a Soft Logic Equation would be to modify a detector input to place a call on a phase only when another phase is green. This type of logic would require extensive cabinet rewiring to implement in hardware, but can be implemented with just one Soft Logic Equation. A typical equation for this type of operation is as follows:

```
03.2  10  53.4  01  03.2  00  00.0
```

This Equation says: “Take the input from port 3.2, AND it with the Phase 4 green output, and write the result back to input port 3.2.” Thus, unless Phase 4 is green, the detector input at port 3.2 is ignored. This type of logic can be used to disable detectors based on current phase color.

The Soft Logic Equations operate on positive logic where a 1 is true (ON) and a 0 is false (OFF).

The following Opcodes are available for use in the Soft Logic Equations:

Opcode	Description
00	No operation; used to mark the end of a Soft Logic Equation.
01	Write the result to the following Data.
02	Write the inverted result to the following Data.
03	OR the result into the following Data.
04	OR the inverted result into the following Data.
05	AND the result into the following Data.
06	AND the inverted result into the following Data.
1x	AND the prior Data with the following Data.
2x	OR the prior Data with the following Data.
3x	XOR the prior Data with the following Data.
4x	NAND the prior Data with the following Data.
5x	NOR the prior Data with the following Data.
6x	XNOR the prior Data with the following Data.

In the above table, the **X** in the Opcodes represents a **0**, **1**, **2** or **3** as shown below:

X	Description
0	Use the prior Data with the following Data.
1	Use the prior inverted Data with the following Data.
2	Use the prior Data with the following inverted Data.
3	Use the prior inverted Data with the following inverted Data.

The Opcodes are entered as two-digit hexadecimal numbers. Opcodes starting with a zero are used to write a result, while all other Opcodes are used to manipulate two Data bits. The second digit of all of the Opcodes that start with a non-zero number is used to alter the bits in the specified operation. Opcodes that start with a number higher than 6 are not defined.

The following page begins the listing of Data values that are available for use in the Soft Logic Equations. Where an **x** is used in a Data value, it represents any decimal digit 0-9.

Note that some of the Soft Logic Data codes have changed from previous versions of the Traffic Signal Control Program, and a number of new Soft Logic Data codes are now available. The following list of Soft Logic Data codes is valid for TSCP Version 3.00 and higher only. Always be sure to verify Soft Logic equation operation in a test controller prior to field implementation.

Data	Description	Data	Description
01.x	Input port #1	**02.x**	Input port #2
03.x	Input port #3	**04.x**	Input port #4
05.x	Input port #5	**06.x**	Input port #6
07.x	Input port #7	**08.x**	Input port #8
11.x	Output port #1	**12.x**	Output port #2
13.x	Output port #3	**14.x**	Output port #4
15.x	Output port #5	**16.x**	Output port #6
17.x	Output port #7	**18.x**	Output port #8
20.x	Internal Call phases	**21.x**	Veh Call phases
22.x	Ped call phases	**23.x**	Bike call phases
24.x	Hold phases	**25.x**	Omit phases
26.x	Ped Omit phases	**27.x**	Force Off phases
28.x	Ped Force phases		
29.1	Command Free operation	**29.2**	Command Flash operation
29.3	Command Local Manual	**29.4**	*Reserved*
29.5	*Reserved*	**29.6**	*Reserved*
29.7	*Reserved*	**29.8**	*Reserved*
2A.x	Command Local Plan 1-8	**2B.x**	Command Local Plan 9
2C.x	*Reserved*	**2D.x**	*Reserved*
2E.x	*Reserved*	**2F.x**	*Reserved*
30.x	Omit Overlaps		
31.x	Permitted phases	**32.x**	Restricted phases
33.x	*Reserved*	**34.x**	Veh Min Recall phases
35.x	Veh Max Recall phases	**36.x**	Ped Recall phases
37.x	Bike Recall phases	**38.x**	Red Lock phases
39.x	Yellow Lock phases	**3A.x**	Force/Max Lock phases
3B.x	Double Entry phases	**3C.x**	Rest In Walk phases
3D.x	Rest In Red phases	**3E.x**	Walk 2 phases
3F.x	Max Green 2 phases	**40.x**	Max Green 3 phases
41.x	Light Rail Phases Permitted	**42.x**	Light Rail Startup Recall
43.x	Light Rail Minimum Recall	**44.x**	Light Rail Dwell Recall
45.x	Light Rail Red phases	**46.x**	Light Rail Yellow phases
47.x	Light Rail Green phases	**48.x**	Light Rail Demand phases
49.x	Light Rail On phases	**4A.x**	Light Rail Holding phases
4B.x	Light Rail Call phases	**4C.x**	Light Rail Hold phases
4D.x	Light Rail Inhibit phases	**4E.x**	Light Rail 3-Car train phases
4F.x	Light Rail Served phases		

Data	Description	Data	Description
50.x	Special Functions On	**51.x**	Red phases
52.x	Yellow phases	**53.x**	Green phases
54.x	Dont Walk phases	**55.x**	Ped Clearance phases
56.x	Walk phases	**57.x**	Check phases
58.x	Next phases	**59.x**	On phases
5A.x	Veh Call phases	**5B.x**	Ped Call phases
5C.x	Bike Call phases	**5D.x**	Hold phases
5E.x	Omit phases	**5F.x**	Ped Omit phases
60.x	Force Off phases	**61.x**	Ped Force phases
62.x	Active Call phases	**63.x**	Committed next phases
64.x	Lag phases	**65.x**	Sync phases
66.x	Masked phases	**67.x**	Limited Hold phases
68.x	Failure Hold phases	**69.x**	Priority Call phases
6A.x	Red overlaps	**6B.x**	Yellow overlaps
6C.x	Green overlaps	**6D.x**	On overlaps
6E.x	Omit Overlaps	**6F.x**	*Reserved*
70.1	Interval Control Step 1	**70.2**	Interval Control Step 2
70.3	Interval Control Step 3	**70.4**	Interval Control Step 4
70.5	Interval Control Step 5	**70.6**	Interval Control Step 6
70.7	Interval Control Step 7	**70.8**	Interval Control Step 8
71.1	1.0 Hz Flashing Logic (P)	**71.2**	1.0 Hz Flashing Logic (N)
71.3	2.5 Hz Flashing Logic (P)	**71.4**	2.5 Hz Flashing Logic (N)
71.5	5.0 Hz Flashing Logic (P)	**71.6**	5.0 Hz Flashing Logic (N)
71.7	*Reserved*	**71.8**	*Reserved*
72.1	Free Operation	**72.2**	Flashing Operation
72.3	Local Manual	**72.4**	Railroad Preempt
72.5	Emergency Vehicle Preempt	**72.6**	Priority Active
72.7	Hebrew Sabbath	**72.8**	Hebrew Holiday
73.1	ATSAC Plan A	**73.2**	ATSAC Plan B
73.3	ATSAC Plan C	**73.4**	ATSAC Plan D
73.5	Predictor Comm Valid	**73.6**	*Reserved*
73.7	ATSAC Comm Valid	**73.8**	ATSAC On-Line Operation
74.x	Current Local Plan 1-8	**75.x**	Current Local Plan 9
76.x	*Reserved*	**77.x**	*Reserved*
78.x	*Reserved*	**79.x**	*Reserved*
7A.x	Coded Status Bits, ring A	**7B.x**	Coded Status Bits, ring B
7C.x	*Reserved*	**7D.x**	*Reserved*
7E.x	*Reserved*	**7F.x**	Scratch pad data

The Data are entered as three-digit hexadecimal numbers. The first two digits specify the Data word, and the last digit specifies a bit in that word. Two hexadecimal digits can be entered for the first two digits (00-7F), but only decimal digits can be entered for the third digit (0-9). Data words not listed above are not defined. When a zero is used in the third digit of a Data word, it means “no bits set” in that word, and when a nine is used, it means “any bits set” in that word. Typically the third digit is used to select the phase bit in a Data word.

Data words 45 through 7E are read-only and cannot be the result of a write Opcode (01-06). All other Data words support both read and write operations. The eight bits of Data word 7F are provided as a “scratch-pad” for complicated equations that require more than one line to enter. Intermediate results necessary to complete long equations can be written to and subsequently read from these data bits.

COORDINATION MENU (7)

The Coordination submenu allows the selection of sixteen data entry screens for Coordinated operation of the controller. Nine of these screens are for Local Plan data, four are for ATSAC Plan data, one is for Free Plan data, one is for ATSAC Flags and one is for Green Band Protect.

```
          COORDINATION MENU
   Select Plan:          E-Free Plan
1…9-Local Plans 1-9      F-ATSAC Flags
A…D-ATSAC Plans A-D      0-Green Protect
```

The data entry screens for each of the nine Local Plans are identical, and therefore only the sample screens for Local Plan 1 are shown. Likewise, the data entry screens for the four ATSAC Plans are identical, and only the sample screen for ATSAC Plan A is shown.

LOCAL PLANS (7-1), (7-2), (7-3), (7-4), (7-5), (7-6), (7-7), (7-8) and (7-9)

The Local Plans data entry screens allow the user to enter all timing and phase information relating to the coordinated Local Plans. The Cycle Length, Offset, Permissive, Green Factors/Force Offs, and the Lag, Sync, Hold, Omit, Min Recall, Max Recall, Ped Recall and Bike Recall phases are all entered on these four screens. Press the [NEXT] key to advance through the screens.

```
  LOCAL PLAN 1 - CYCLE DATA      Pg 1/4
 Cycle Length   Offset   Permissive
    › 90‹          0          0
      Press * to verify plan
```

The **`Cycle Length`** entry is used to enter the Cycle Length for the selected Local Plan. Valid range is 30-240 seconds.

The **`Offset`** entry is used to enter the Offset for the selected Local Plan. The Offset is the point in time relative to the Master Cycle when the Local Cycle will be at zero. Valid range is 0-239 seconds, but must be less than the Cycle Length entered above.

The **`Permissive`** entry is used to enter the Permissive period for the selected Local Plan. The Permissive Period is the amount of time after the Offset when the controller can yield to demand on any of the non-sync phases. Valid range is 0-239 seconds, but must be less than the Cycle Length entered above. Enter a zero to force the sync phases to end at the yield point.

Whenever changes are made to the Local Plan, the [*] key should be pressed to verify that the changes made have not caused an error in the plan. When the [*] key is pressed, all timing information relating to the Local Plan is checked to verify that the plan will be able to run. If there is an error, then a message will appear on the bottom of the screen. Refer to the table of possible error messages for a description of the error messages. The sync phase Green Factors may be adjusted by the controller when the [*] key is pressed if an incorrect amount of time was allocated to them in order to validate the plan. Be sure to note the change made when this occurs.

Press the [NEXT] key to advance to the second screen.

```
  LOCAL PLAN 1 - GREEN FACTORS    Pg 2/4
  Ø1   Ø2   Ø3   Ø4   Ø5   Ø6   Ø7   Ø8
› 10‹  25   10   25   10   25   10   25
        Press * to verify plan
```

The timing information for each Local Plan may be entered in one of two ways. The first and preferred method is to use Green Factors, which are values for the amount of green displayed to each phase during the cycle. The second method of data entry is to use Force Offs, which are fixed points in the cycle when phases must end. The indication of which type of data are being entered is shown on the top line of the screen. Press the [F] key to toggle between **GREEN FACTORS** and **FORCE OFFS**. Whenever the [F] key is pressed, all values on this screen are reset to zero. CIC operation can only occur in plans entered with Green Factors.

When entering Green Factor data on this screen, enter a non-zero value for each permitted phase that will operate during this Local Plan. The amount of time entered must be more than the minimum time required for the phase to run, including all pedestrian timing if the phase is a pedestrian phase. Enter a zero for non-permitted phases. When finished, press the [*] key to check the plan. When the [*] key is pressed, all timing information relating to the Local Plan is checked to verify that the plan will be able to run. If there is an error, then a message will appear on the bottom of the screen. Refer to the table of possible error messages for a description of the error messages. After the [*] key is pressed, the Green Factor values for the Sync Phases may change if there is an incorrect amount of time assigned to one of the other phases. The value shown after the [*] key is pressed is the minimum amount of time that the Sync Phases will be green each cycle. Valid range is 0-255 seconds.

When entering Force Off data on this screen, enter a non-zero value for each permitted phase that will operate during this Local Plan, except for the Sync Phases, which must be set to zero. Enter a zero for all non-permitted phases. The calculation of Force Offs must be done by the user to ensure that each phase has enough time to run in the cycle. Intentionally setting Force Offs below the minimum value necessary to service a phase may cause subsequent phases to be shortened or skipped if the phase cannot end when expected and may lead to undesirable operation. Local Plans that are programmed with Force Offs are only checked for valid Cycle Length, Offset, Permissive, Lag Phase and Sync Phase settings when the [*] key is pressed. The controller does not verify the Force Offs for proper operation. Valid range is 0-255 seconds.

Press the [NEXT] key to advance to the third screen.

```
  LOCAL PLAN 1 - PHASE FLAGS     Pg 3/4
  Lag   .2.4.6.8     Hold  ........
  Sync  .2...6..     Omit  ........
        Press * to verify plan
```

The **Lag** entry is used to select the phases that are to be Lagging in the Local Plan. Only one phase in each pair of phases can be selected (1 or 2, 3 or 4, 5 or 6, or 7 or 8).

The **Sync** entry is used to select the phases that are to be Synchronized in the Local Plan. Up to two compatible phases may be selected.

The **Hold** entry is used to select the phases that are to be on Hold in the Local Plan. Hold phases will rest in walk at the end of walk if a pedestrian call is present on the phase. Hold phases cannot max out. Any number of phases may be selected.

The **Omit** entry is used to select the phases that are to be Omitted in the Local Plan. Omitted phases will not be served whenever the Local Plan is in effect. Any phases except the Sync phases may be selected.

Changes to entries on this screen may affect the operation of the Local Plan. After making changes, press the [*] key to verify the Local Plan. If there are errors, then one or more of the settings made may be incorrect, and must be fixed before the plan can be run.

Press the [NEXT] key to advance to the fourth screen.

```
  LOCAL PLAN 1 - RECALL DATA     Pg 4/4
 Veh Min  .2.4.6.8    Ped  ........
 Veh Max  .2...6..   Bike  ........
        Press * to verify plan
```

The **Veh Min** entry is used to select the phases that are to have a Vehicle Minimum Recall placed in the Local Plan. Min Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

The **Veh Max** entry is used to select the phases that are to have a Vehicle Maximum Recall placed in the Local Plan. Max Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

The **Ped** entry is used to select the phases that are to have a Pedestrian Recall placed in the Local Plan. Ped Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted pedestrian phases will have a call placed.

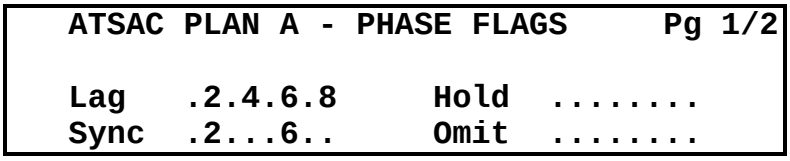
The **Bike** entry is used to select the phases that are to have a Bicycle Recall placed in the Local Plan. Bike Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

If the Local Plan data entered contains errors, then that plan will not run when called for by any of the plan selection methods. The controller will initiate Free operation until the plan is fixed, or another plan is selected. To prevent this, always press the [*] key to verify the plan prior to selecting the plan for operation. The following table has a description of all of the possible error messages that can appear when the Local Plan is verified.

Error	Description
Plan OKAY	There are no errors in the plan and it is ready to be used.
Sync phases not selected	There are no Sync phases selected for this plan. At least one Sync phase must be set for the plan to be used.
Invalid Sync phase combination	The Sync phases selected are not compatible or not permitted. Only compatible permitted phases may be set.
Lag phases not selected	There are no Lag phases selected for this plan. The Lag phases must be set for the plan to be used.
Invalid Lag phase combination	The Lag phases set are not correct. Set only one phase in each pair of phases to be the Lag phase.
Both Sync phases cannot be restricted	Both of the Sync phases are set for Restricted operation. This will prohibit both Sync phases from operating at the same time, a requirement for coordinated operation.
Sync phases cannot be Omit phases	One or more Sync phases are set as Omit phases. The Sync phases cannot be omitted for coordinated operation to work.
Not enough time for Ring # Sync phase	There is not enough time in the cycle to serve the minimum time required on the Sync phase in the ring indicated. Increase the cycle length or reduce the green factors for the non-sync phases.
Invalid Cycle Length	The Cycle Length entered is outside the range 30-240 seconds.
Invalid Offset	The Offset entered is greater than or equal to the Cycle Length.
Invalid Permissive	The Permissive period entered is greater than or equal to the Cycle Length.
Phase # Green Factor below minimum	The Green Factor entered for the phase indicated is less than the minimum time required to serve the phase. Increase the Green Factor for this phase.
Ring # Sync phase not green before yield	The Sync phase in the ring indicated will not be green before the yield point. This can occur in lead-lag operation if too little time is given to the sync phases. Increase the cycle length or reduce the green factors for the non-sync phases.
Plans with Force Offs are NOT verified	Plans that are entered with Force-Offs cannot be checked for errors other than Cycle Length, Offset and Permissive range checks. The plan will run as entered.

ATSAC PLANS (7-A), (7-B), (7-C) and (7-D)

The ATSAC Plans data entry screens allow the user to enter all phase information relating to on-line ATSAC Plans. The Lag, Sync, Hold, Omit, Min Recall, Max Recall, Ped Recall and Bike Recall phases are all entered on these two screens. Press the [NEXT] key to advance through the two screens.



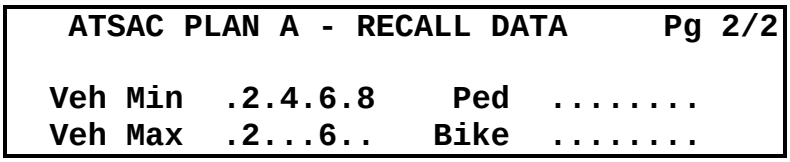
The **Lag** entry is used to select the phases that are to be Lagging in the ATSAC Plan. Only one phase in each pair of phases can be selected (1 or 2, 3 or 4, 5 or 6, or 7 or 8).

The **Sync** entry is used to select the phases that are to be Synchronized in the ATSAC Plan. Up to two compatible phases may be selected.

The **Hold** entry is used to select the phases that are to be on Hold in the ATSAC Plan. Hold phases will rest in walk at the end of walk if a pedestrian call is present on the phase. Hold phases require two ATSAC force-offs to terminate if pedestrians are serviced. Any number of phases may be selected.

The **Omit** entry is used to select the phases that are to be Omitted in the ATSAC Plan. Omitted phases will not be served whenever the ATSAC Plan is in effect. Any phases except the Sync phases may be selected.

Press the [NEXT] key to advance to the second screen.



The **Veh Min** entry is used to select the phases that are to have a Vehicle Minimum Recall placed in the ATSAC Plan. Min Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

The **Veh Max** entry is used to select the phases that are to have a Vehicle Maximum Recall placed in the ATSAC Plan. Max Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

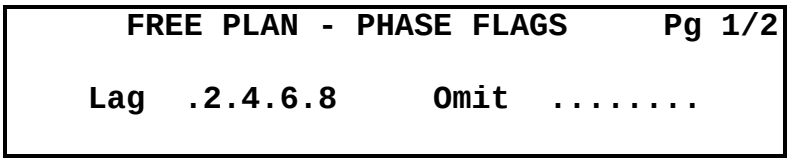
The **Ped** entry is used to select the phases that are to have a Pedestrian Recall placed in the ATSAC Plan. Ped Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted pedestrian phases will have a call placed.

The **Bike** entry is used to select the phases that are to have a Bicycle Recall placed in the ATSAC Plan. Bike Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

ATSAC plans are selected by the state of the three Phase Omit bits in the ATSAC command. The plans are selected as follows: If no Phase Omit bits are ON, then ATSAC Plan A is used. If Phase Omit bit 1 is ON, then ATSAC Plan B is used. If Phase Omit bit 2 is ON, then ATSAC Plan C is used. If Phase Omit bit 3 is ON, then ATSAC Plan D is used. If more than one Phase Omit bit is ON, the highest Phase Omit bit that is ON is used to select the ATSAC Plan.

FREE PLAN (7-E)

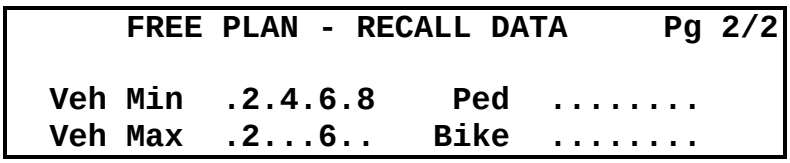
The Free Plan data entry screens allow the user to enter all phase information relating to Free operation. The Lag, Omit, Min Recall, Max Recall, Ped Recall and Bike Recall phases are all entered on these two screens. Press the [NEXT] key to advance through the screens.



The **Lag** entry is used to select the phases that are to be Lagging during Free Operation. Only one phase in each pair of phases can be selected (1 or 2, 3 or 4, 5 or 6, or 7 or 8).

The **Omit** entry is used to select the phases that are to be Omitted during Free Operation. Omitted phases will not be served whenever the Free Plan is in effect. Any number of phases may be selected.

Press the [NEXT] key to advance to the second screen.



The **Veh Min** entry is used to select the phases that are to have a Vehicle Minimum Recall placed during Free Operation. Min Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

The **Veh Max** entry is used to select the phases that are to have a Vehicle Maximum Recall placed during Free Operation. Max Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

The **Ped** entry is used to select the phases that are to have a Pedestrian Recall placed during Free Operation. Ped Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted pedestrian phases will have a call placed.

The **Bike** entry is used to select the phases that are to have a Bicycle Recall placed during Free Operation. Bike Recall phases will be serviced every cycle. Any number of phases may be selected, but only permitted phases will have a call placed.

ATSAC FLAGS (7-F)

The ATSAC Flags data entry screen allows the user to enter all phase information relating to ATSAC operation. The Enable Permissive Yield, Non-Latching Force Offs, and the Cycle Controller Vehicle and Pedestrian Calls are entered on this screen.

```
Enable Permissive Yield       › NO‹
Non-Latching Force Offs      ........
Cycle Controller Veh Call    ........
Cycle Controller Ped Call    ........
```

The **Enable Permissive Yield** entry is used to modify the operation of the ATSAC Yield command. When set to NO, the receipt of ATSAC Yield will cause a Force Off to be applied to the Sync phases immediately. This mode emulates a permissive period of zero. When set to YES, the application of a Force Off to the Sync phases is delayed until the ATSAC Yield command is removed. During the time between the receipt of the ATSAC Yield and its subsequent removal, the Sync phase holds are removed, which allows them to either extend or terminate based on demand. This mode emulates a non-zero permissive period, the length of which is determined by the ATSAC Yield command, but is never less than one second. Select with the [YES] and [NO] keys.

The **Non-Latching Force Offs** entry is used to select the phases that do not latch an ATSAC Force Off if it is received prior to when the phase is able to end. Unless set, all phases will latch ATSAC Force Offs and apply them as soon as possible if they are received prior to when the phase is ready to end. Any number of phases may be selected.

The **Cycle Controller Veh Call** entry is used to select the phases that are to have a one-time locking vehicle call placed on them upon request from the ATSAC system. Any number of phases may be selected. Calls are only placed to phases that are not green.

The **Cycle Controller Ped Call** entry is used to select the phases that are to have a one-time pedestrian call placed on them upon request from the ATSAC system. Any number of phases may be selected. Calls are only placed to phases that are not green.

GREEN PROTECT (7-0)
The Green Protect data entry screen allows the user to enable the Green Band Protect feature for any of the local and ATSAC plans.

```
          GREEN BAND PROTECT

    Enabled in Plans  ›............‹
```

The **Enabled in Plans** entry selects the plans in which the Green Band Protect feature is enabled. The Green Band Protect feature places a call and hold on the lag phase following a lead Sync phase when there is a call on any cross street phase or the non-sync lead phase. This ensures that the lag Sync phase does not end before the non-sync lag phase starts, thus protecting the Green Band. Any number of plans may be selected, but only plans configured for lead-lag Sync phase operation are affected. Entries are toggled by pressing the [1] through [9] keys for the local plans, and pressing [A] through [D] for the ATSAC plans. Press the [E] key to set all plans or press the [0] key to clear all plans.

TOD SCHEDULE (8)
The TOD Schedule submenu allows for the selection of six data entry screens relating to the various Time-of-Day entries, including the TOD Clock, TOD Schedules, TOD Functions, Solar Clock Data, Sabbatical Clock data and the Daylight Saving time enable.

```
       TIME-OF-DAY SCHEDULE MENU
1-TOD Clock Set     4-Solar Clock Data
2-TOD Schedules     5-Sabbatical Clock
3-TOD Functions     6-Daylight Saving
```

TOD CLOCK SET (8-1)
The TOD Clock Set data entry screen allows the user to set the current Time and Date in the controller. All TOD operations reference this clock. Correct Time and Date entries should be made on this screen before any of the Time-of-Day functions are enabled.

```
          TIME-OF-DAY CLOCK
Time  ›15:37:21‹       DAYLIGHT TIME
Date  08/12/2002          MONDAY
```

Enter the local Time and Date on this screen. The day of the week is automatically derived from the calendar date entered. Depending on the time of year and if Daylight Saving time has been enabled, either Standard Time or Daylight Time will be automatically displayed.

When setting the Time, enter the hours, minutes and seconds; then press the [ENT] key at the exact time entered to precisely set the clock. When setting the Date, enter the month, day and year. The year entry requires four digits.

If this controller is communicating with the ATSAC system, the following message will be shown on the bottom of the display:

```
Press * to get the Time from ATSAC
```

Press the [*] key to request a time broadcast from the ATSAC system. After the [*] key is pressed, the following message will be shown on the bottom of the display:

```
Waiting for ATSAC to send the Time
```

The controller is waiting for a Time broadcast message from the ATSAC system. After this has been received, the following message will be shown on the bottom of the display:

```
Time broadcast received from ATSAC
```

When this procedure is used, it will only set the Time entry; the Date must still be manually entered, and can be done while waiting for the Time broadcast to be received.

If this controller is communicating with a WWV clock, the following message will be shown on the bottom of the display:

```
Press * to repoll WWV clock
```

Press the [*] key to repoll the WWV clock. If the WWV clock is able to provide the Time and Date, the following message will be shown on the bottom of the display:

```
Time and Date set from WWV clock
```

If the WWV clock is unable to provide the Time or Date, the following message will be shown on the bottom of the display:

```
No valid response from WWV clock
```

TOD SCHEDULES (8-2)

The TOD Schedules menu allows for the selection of nine entries relating to the Time-of-Day Scheduler. The six Time-of-Day Tables, the Weekday Table and the Float and Fixed Holiday schedules are all accessed from this screen.

```
      TIME-OF-DAY SCHEDULES MENU
1-Table 1   4-Table 4   7-Weekday Table
2-Table 2   5-Table 5   8-Float Holidays
3-Table 3   6-Table 6   9-Fixed Holidays
```

The data entry screens for each of the six Time-of-Day Tables are identical, and therefore only the sample screens for Time-of-Day Table 1 are shown.

TABLE (8-2-1), (8-2-2), (8-2-3), (8-2-4), (8-2-5) and (8-2-6)
The Table data entry screens allow for the entry of the Time and Plan to be used when the selected Table is in effect. There are two screens used to display sixteen Time and Plan entries, with eight entries on each screen. Press the [NEXT] key to advance through the two screens.

```
TABLE 1  Pg 1/2  Time  Plan   Time  Plan
   Time  Plan  | 0000    0  | 0000    0
  ›0000‹   0   | 0000    0  | 0000    0
   0000    0   | 0000    0  | 0000    0
                    .
                    .
                    .
TABLE 1  Pg 2/2  Time  Plan   Time  Plan
   Time  Plan  | 0000    0  | 0000    0
  ›0000‹   0   | 0000    0  | 0000    0
   0000    0   | 0000    0  | 0000    0
```

The Time and Plan entries on these screens must be made in the order shown on the timing chart, starting with the entry on the top left of the first screen and proceeding down each row on each screen. Each entry consists of a Time value, in 24-hour format, and a Plan number to run starting at the Time specified. The Plan entry must be either the coordinated plan number (1-9), or 254 for Flashing operation or 255 for Free operation. A zero is entered to indicate that the selection is not used. All other Plan values will select Free operation. When entering data on these screens, the cursor will automatically advance to the next data entry position when the [ENT] key is pressed to save the data. The arrow keys can be used to override this feature and direct the cursor to a specific location.

The TSCP has an extensive look-back feature, whereby plan selections from a previous day are carried over to the next day. Once a plan is selected by any of the TOD Tables, that plan will remain in effect until another TOD plan is selected, even if the next selection does not occur for a number of days. The look-back will search through the previous TOD Tables, including holiday tables, to find the most recent plan selection.

WEEKDAY TABLE (8-2-7)
The Weekday Table data entry screen allows for the selection of the Time-of-Day Table to be used on each day of the week. There is one entry for each the seven days of the week.

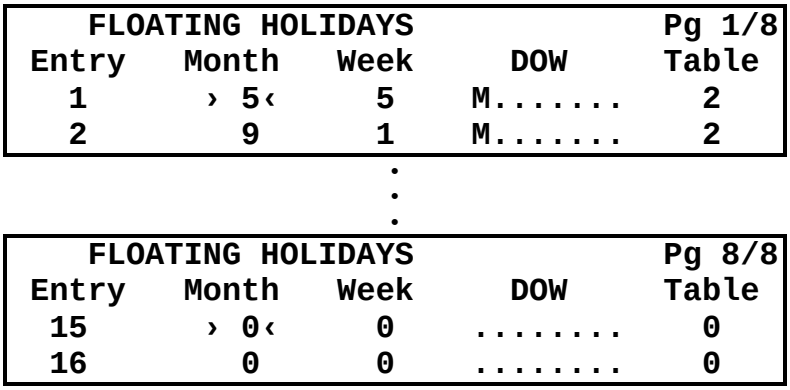
```
     WEEKDAY EVENT TABLE ASSIGNMENT

   Mon  Tue  Wed  Thu  Fri  Sat  Sun
   ›1‹   1    1    1    1    2    2
```

The seven entries for each day of week are the respective Table numbers that are to be in effect. Valid range is 1-6 corresponding to the six Time-of-Day Tables. Enter a zero to disable all Time-of-Day plan selections for that day.

FLOAT HOLIDAYS (8-2-8)

The Float Holidays data entry screens are used to program up to sixteen Floating Holiday Table settings. The sixteen Floating Holidays are shown on eight screens. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.



Floating Holidays are those holidays that always occur on a specific day in a specific week of a month, such as Thanksgiving, which always occurs on the fourth Thursday in November. Floating Holidays are identified by a month, week of the month, and day of the week. Up to sixteen Floating Holidays may be entered.

The **Month** entry specifies the month in which the Floating Holiday occurs. Valid range is 1-12.

The **Week** entry specifies which week of the month the Floating Holiday occurs. Valid range is 1-5. An entry of 5 is used to specify the last week in the month, regardless of the actual number of weeks in the month.

The **DOW** entry specifies the day of the week on which the Floating Holiday occurs. Any number of days may be selected, although typically only one day is set. Press keys [1] to [7] to select each day of the week, where 1 is Monday, 2 is Tuesday and 7 is Sunday; or press [8] to set all weekdays, or press [9] to set both weekend days.

The **Table** entry specifies the Time-of-Day Table that is used on the day of the Floating Holiday. Valid range is 1-6, corresponding to the six Time-of-Day Tables. Enter a zero to disable the Time-of-Day plan selections for this Floating Holiday.

FIXED HOLIDAYS (8-2-9)

The Fixed Holidays data entry screens are used to program up to sixteen Fixed Holiday Table settings. The sixteen Fixed Holidays are shown on eight screens. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
      FIXED HOLIDAYS                  Pg 1/8
Entry    Month     Day      DOW       Table
  1       › 1‹      1     MTWTF..       2
  2         7       4     MTWTF..       2
                    .
                    .
                    .
      FIXED HOLIDAYS                  Pg 8/8
Entry    Month     Day      DOW       Table
 15       › 0‹      0     ........      0
 16         0       0     ........      0
```

Fixed Holidays are those holidays that always occur on the same date in the year, such as Independence Day, which always occurs on July 4th. Fixed Holidays are identified by a month, day of the month and conditional day of the week. There are entries for up to sixteen Fixed Holidays.

The **Month** entry specifies the month in which the Fixed Holiday occurs. Valid range is 1-12.

The **Day** entry specifies the day of the month that the Fixed Holiday occurs. Valid range is 1-31.

The **DOW** entry specifies the conditional days of the week on which the Fixed Holiday can occur. Any number of days may be selected. Enter only the days of the week that the Fixed Holiday is observed on. If only the weekdays are specified (**MTWTF..**) and the holiday falls on a Saturday, then the Fixed Holiday program will be used on the preceding Friday; or if the holiday falls on a Sunday, then the Fixed Holiday program will be run on the following Monday. The automatic adjustment of the observed day of a Fixed Holiday can be disabled by setting all seven weekdays (**MTWTFSS**). Press keys [1] to [7] to select each day of the week, where 1 is Monday, 2 is Tuesday and 7 is Sunday; or press [8] for all weekdays or press [9] for both weekend days.

The **Table** entry specifies the Time-of-Day Table that is used on the day of the Fixed Holiday. Valid range is 1-6, corresponding to the six Time-of-Day Tables. Enter a zero to disable the Time-of-Day plan selections for this Fixed Holiday.

Fixed Holidays have precedence over Floating Holidays should both occur on the same day.

TOD FUNCTIONS (8-3)

The TOD Functions data entry screens are used to program up to sixteen Time-of-Day Functions. Each Time-of-Day Function consists of a Start and End Time, a Day Of Week setting, an Action code and a Phase selection. The Time-of-Day Functions are displayed on eight screens, with two entries per screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown.

```
      TIME-OF-DAY FUNCTIONS        Pg 1/8
 #  Start  End    DOW   Action  Phases
 1 ›0000‹ 0000  .......    0   ........
 2  0000  0000  .......    0   ........
                   .
                   .
                   .
      TIME-OF-DAY FUNCTIONS        Pg 8/8
 #  Start  End    DOW   Action  Phases
15 ›0000‹ 0000  .......    0   ........
16  0000  0000  .......    0   ........
```

The **Start** entry specifies the time at which the Time-of-Day function is to begin. The time must be entered in 24-hour format.

The **End** entry specifies the time at which the Time-of-Day function is to finish. The time must be entered in 24-hour format.

The **DOW** entry specifies the days of the week on which the Time-of-Day Function is to begin. If the End time is less than the Start time, the Time-of-Day Function will continue operating into the next day, otherwise the Time-of-Day Function will only be implemented on the days entered. Press keys [1] to [7] to select each day of the week, where 1 is Monday, 2 is Tuesday and 7 is Sunday, or press [8] for all weekdays or press [9] for both weekend days.

The **Action** entry specifies what Time-of-Day Function is to be implemented, and how it is to be implemented. All of the valid Action codes are shown in the following table.

The **Phases** entry specifies which Phases are to be affected by the implementation of this Time-of-Day Function. Any number of phases may be specified. For Action code 20, Phases 1-4 are used to specify Special Functions 1-4 respectively. For Action codes 21-24, Phases 1-2 are used to specify Light Rail phases A-B respectively.

The Action codes shown below cause the phases selected in the entry to be ADDED to the Normal phase settings.

Action Code	Description
0	No action; used to disable the function.
1	Permitted phases.
2	Restricted phases.
3	*Reserved.*
4	Vehicle Minimum Recall phases.
5	Vehicle Maximum Recall phases.
6	Pedestrian Recall phases.
7	Bike Recall phases.
8	Red Lock phases.
9	Yellow Lock phases.
10	Force/Max Lock phases.
11	Double Entry phases.
12	Rest In Walk phases.
13	Rest In Red phases.
14	Walk 2 phases.
15	Maximum Green 2 phases.
16	Maximum Green 3 phases.
17-19	*Reserved.*
20	Special Functions.
21	Light Rail Permitted phases.
22	Light Rail Startup Recall phases.
23	Light Rail Minimum Recall phases.
24	Light Rail Dwell Recall phases.

If 100 is added to the Action codes shown above to create codes 101-124, then the phases selected in the entry will be REMOVED from the Normal phase settings.

If 200 is added to the Action codes shown above to create codes 201-224, then the phases selected in the entry will REPLACE the Normal phase settings.

All other Action code values are invalid, and have no effect on the operation of the controller. Only Action code 20 can be used to activate the Special Functions. Action codes 120 and 220 are not valid.

SOLAR CLOCK DATA (8-4)

The Solar Clock Data entry screen allows the entry of the geographical data necessary to calculate the time of sunrise and sunset. These entries are North Latitude, West Longitude and Local Time Zone. The local sunrise and sunset times are also displayed on this screen.

```
            SOLAR CLOCK DATA
North Latitude  › 34‹     Today's Times
West Longitude   118    Sunrise 06:11:07
Local Time Zone    8    Sunset  19:43:40
```

The **North Latitude** setting specifies the geographical location of the controller north of the Equator. Los Angeles is located at approximately 34 degrees North Latitude. Valid range is 1-89 degrees. Enter zero to disable the calculation of sunrise and sunset times.

The **West Longitude** setting specifies the geographical location of the controller west of the Prime Meridian. Los Angeles is located at approximately 118 degrees West Longitude. Valid range is 1-179 degrees. Enter zero to disable the calculation of sunrise and sunset times.

The **Local Time Zone** setting specifies the number of hours local time is delayed from Greenwich Mean Time (GMT). Los Angeles is in the Pacific Time Zone, which is eight hours later than GMT. Do not adjust this entry for Daylight Saving Time. The controller will automatically subtract one hour whenever Daylight Saving Time is in effect. Valid range is 1-23 hours. Enter zero to disable the calculation of sunrise and sunset times.

If any of the entries on this screen are changed, the [*] key can be pressed to initiate a recalculation of the Sunrise and Sunset times. These times are normally calculated once a day at midnight and are not automatically updated when the entries on this screen are changed.

The Local Time Zone setting is required when a WWV clock is connected to the controller and the WWV protocol has been selected.

The Sunset Time is needed to implement the Sabbatical Pedestrian Recall feature described in the next section.

SABBATICAL CLOCK (8-5)

The Sabbatical Clock data entry screen allows the user to specify which phases are to be placed on Pedestrian Recall during the Hebrew Sabbath and specific Hebrew Holidays. The current Hebrew Date is also displayed on this screen.

```
          SABBATICAL CLOCK DATA
  Hebrew Date       Hebrew   Ped Recall
  13/03/5762        Sabbath  ›........‹
                    Holiday   ........
```

The **Hebrew Date** field displays the current date in the Hebrew calendar. This is calculated from the Gregorian date. The display format is month/day/year. This is an observe-only field.

The **Hebrew Sabbath** entry selects which phases are to be placed on Pedestrian Recall during the Hebrew Sabbath. The Hebrew Sabbath begins at sunset on Friday and continues until sunset on Saturday. Any number of phases may be selected, but only permitted pedestrian phases will have a call placed.

The **Hebrew Holiday** entry selects which phases are to be placed on Pedestrian Recall during any of the programmed Hebrew Holidays. Any number of phases may be selected, but only permitted pedestrian phases will have a call placed.

The table below lists the dates (month/day) in the Hebrew calendar when the Hebrew Holidays are implemented. These dates are fixed and cannot be changed by the user.

Hebrew Date	Holiday
1/1-1/2	Rosh Hashanah
1/10	Yom Kippur
1/15-1/16	Sukkot
1/22-1/23	Sukkot
8/15-8/16	Passover
8/21-8/22	Passover
10/6-10/7	Shevuot

The Hebrew day begins at local sunset, and therefore the starting time of the Hebrew Sabbath and Hebrew Holiday are determined by the calculated sunset time. If the time of sunset cannot be calculated due to incorrect or missing Solar Clock Data entries, sunset is deemed to occur at 6:00 PM. On any Hebrew Sabbath or Hebrew Holiday, an asterisk will be shown on this screen to the left of the **Sabbath** and **Holiday** entries to indicate this occurrence.

DAYLIGHT SAVING (8-6)

The Daylight Saving data entry screen allows the user to enable the automatic correction for Daylight Saving time.

```
DAYLIGHT SAVING TIME

Enable Daylight Saving Time  ›YES‹
```

The **Enable Daylight Saving Time** entry determines if the Time-of-Day Clock is to be automatically adjusted for Daylight Saving time in the spring and fall. When enabled, the Time-of-Day Clock will be moved ahead one hour at 2:00 AM on the first Sunday in April, and moved back one hour at 2:00 AM on the last Sunday in October. Select with the [YES] and [NO] keys.

UTILITIES MENU (9)

The Utilities submenu screen allows for the selection of various utility functions, including the Event Record, Diagnostic Tests, RAM Initialization, Copy Parameters, Direct RAM Access and Terminate Program.

```
            UTILITIES MENU
1-Event Record       4-Copy Parameters
2-Diagnostic Tests   5-Direct RAM Access
3-RAM Initialization 6-Terminate Program
```

EVENT RECORD (9-1)

The Event Record display screen shows all of the Events recorded by the controller. Up to 96 of the most recent events can be shown. Use the [▲] and [▼] keys to scroll through the list one entry at a time, or press the [NEXT] key to scroll through the entries one page at a time.

```
        CONTROLLER EVENT RECORD
 1 10/15/1998 10:41:57 CONFLICT
 2 07/03/1998 22:38:58 SHORT POWER FAIL
 3 00/00/0000 00:00:00 NONE
```

The Controller Event Record provides a history of various events occurring at the intersection. The table below lists all of the events that are recorded. Each event is time- and date-stamped to show when it occurred. The event record cannot be cleared, but the oldest events are discarded after more than 96 events have been accumulated.

Event	Description
NONE	No event occurred.
POWER FAIL	A power failure of unknown duration occurred.
LONG POWER FAIL	A power failure exceeding 500 milliseconds occurred.
SHORT POWER FAIL	A power failure of less than 500 milliseconds occurred.
STARTUP	The controller recovered from a Long Power Failure.
RESTART	The controller recovered from a Conflict or Flash condition.
SHUTDOWN	The TSCP was terminated by the user.
CONFLICT	The conflict monitor tripped.
FLASH	The cabinet was placed into flashing operation.
RR PREEMPT	A Railroad Preempt input was activated.
EV PREEMPT	An Emergency Vehicle Preempt input was activated.
FIELD I/O ERROR	An error occurred communicating with the Field I/O Module.

DIAGNOSTIC TESTS (9-2)

The Diagnostic Tests submenu allows the selection of one of four Diagnostic Tests. These tests can be performed while the controller is in service without disrupting normal operation.

```
          DIAGNOSTIC TESTS
1-Input File Test   4-Display Test
2-Output File Test
3-Front Panel Test
```

INPUT FILE (9-2-1)

The Input File Test allows the user to view the status of the controller inputs. The format of the display screen depends on the Cabinet Type Configuration. There are two screens for the 332 Cabinet Input File Test: one for the I-File and one for the J-File. Press the [NEXT] key to switch between the two displays. There is only one screen for the 337 Cabinet Input File Test.

```
   332 CABINET – INPUT FILE "I"   Pg 1/2
Slot   1 2 3 4 5 6 7 8 9 10 11 12 13 14
Upper  . * . . . . . * .  .  .  .  .  .
Lower  . . . . . * . * .  .  .  .  .  .
                    .
                    .
                    .
   332 CABINET – INPUT FILE "J"   Pg 2/2
Slot   1 2 3 4 5 6 7 8 9 10 11 12 13 14
Upper  * . . . . . . . .  .  .  .  .  .
Lower  * . . . . . . . .  .  *  .  .  .
```

The status of each input is shown by either a dot indicating the input is OFF, or an asterisk indicating the input is ON, for each of the slot positions in the input file. The Upper and Lower inputs to each slot are shown. For slots with common output wiring, both the upper and lower inputs will show ON simultaneously.

```
     337 CABINET – INPUT FILE "I"
Slot   1 2 3 4 5 6 7 8 9 10 11   FS/ST
Upper  . * . . . . . . .  .  .     .
Lower  . . . * . . . . *  .  .     .
```

The status of the Flash Sense and Stop Time inputs in the 337 Cabinet are shown on the right side of the screen. Although these inputs are directly wired to the controller and do not go through the Input File, they are shown on this screen so that their operation can be verified.

OUTPUT FILE TEST (9-2-2)

The Output File Test allows the user to view the status of the controller outputs. The format of the display screen depends on the Cabinet Type Configuration. Each Output Loadswitch position is represented, along with the Detector Reset Output.

```
     332 CABINET - OUTPUT FILE TEST
A    R..  ..G  R..  R..  R..  R..   Det
B    R..  ..G  R..  R..  R..  R..  Reset
X    R..  R..  ...  R..  R..  ...    .
```

For each loadswitch position, the status of the three outputs are shown by either a dot indicating the output is OFF, or the letters **R**, **Y**, or **G** indicating the output is ON. The Detector Reset output is shown on the right side of the screen. An asterisk is shown whenever the Detector Reset output is ON.

```
     337 CABINET - OUTPUT FILE TEST
                                      Det
A    R..  ..G  R..  R..  R..  R..   Reset
                                       .
```

FRONT PANEL TEST (9-2-3)

The Front Panel Test screen allows the user to verify the operation of the two Keyboards and Auxiliary Switch.

```
            FRONT PANEL TEST
Last key pressed shown below      Aux
 Left keypad   Right keypad      Switch
    [   ]         [   ]          OFF
```

Press each key and observe the display to confirm proper operation. The Aux switch can also be tested, however turning this switch ON implements the stop time function. Press the [ESC] key twice to exit this screen.

DISPLAY TEST (9-2-4)

The Display Test screen allows the user to verify the operation of the Liquid Crystal Display. During the test, each of the 160 character positions will be written with all of the displayable characters.

```
            DISPLAY TEST
     Press * to start and stop test
     Press + or - to change display
     Press ESC to terminate testing
```

Start the test by pressing the [*] key. Once started, the test may be stopped by pressing the [*] key. The [+] and [–] keys can be used to advance through the character set one at a time when the test is stopped. Press the [ESC] key to terminate the test and return to the previous menu.

RAM INITIALIZATION (9-3)

The RAM Initialization submenu allows the selection of one of four RAM Initialization Configurations. These are ATSAC 332, ATSAC 337, Universal 332 and Universal 337. Select the desired configuration by pressing one of the number keys [1] through [4].

```
      CONTROLLER INITIALIZATION
    Select Cabinet Configuration:
1-ATSAC 332         3-Universal 332
2-ATSAC 337         4-Universal 337
```

The Controller Initialization screens for each of the four Cabinet Configurations are identical, and therefore only the sample screen for the ATSAC 332 Cabinet Configuration is shown.

CONTROLLER INITIALIZATION (9-3-1), (9-3-2), (9-3-3) and (9-3-4)

The Controller Initialization screen confirms that the user is about to initialize the controller to the cabinet configuration selected.

```
      CONTROLLER INITIALIZATION
              ATSAC    332
   Press * to initialize controller
    or press ESC to return to menu
```

Press the [*] key to initialize the controller RAM with default values for the Cabinet Configuration selected. All phase timing parameters and local plan data will be set to zero during initialization. Press the [ESC] key to abort Controller Initialization and return to the previous submenu.

When the* [*] *key is pressed, all controller timing and configuration information is changed to default values for the Cabinet Configuration selected. This may cause an immediate change of signal indications in the field and could result in an unsafe condition. The intersection should be placed in flashing operation prior to this procedure being initiated. Press the* [ESC] *key to abort this procedure.

After pressing the [*] key, the following screen is displayed when the initialization is completed:

```
      CONTROLLER INITIALIZATION

       Initialization complete
```

Press the [ESC] key to return to the Utilities Menu screen.

COPY PARAMETERS (9-4)
The Copy Parameters screen allows the user to select one of five data copy utilities.

```
          COPY PARAMETERS
1-Phase Timing Data  4-Transit Priority
2-Coordination Data  5-Controller Copy
3-Time-of-Day Table
```

PHASE TIMING DATA (9-4-1)
The Phase Timing Data screen allows the user to copy data between Phases. Only phase timing data are copied.

```
       COPY PHASE TIMING DATA
      Copy From Phase    ›0‹
      Copy To Phases  ........
     Press * to begin data copy
```

The **Copy From Phase** entry selects the Phase from which data are copied. Enter a zero to clear all phase timing on the Copy To Phases.

The **Copy To Phases** entry selects the Phases to which data are copied. Any number of phases may be selected.

Press the [*] key to initiate the copy procedure. When the copy is complete, the following message is shown:

```
  Copy completed. Press ESC for menu
```

COORDINATION DATA (9-4-2)
The Coordination Data screen allows the user to copy data between Local Plans. All data associated with a Local Plan, except the Transit Priority data, are copied.

```
       COPY LOCAL PLAN DATA
      Copy From Plan    ›0‹
      Copy To Plans   .........
     Press * to begin data copy
```

The **Copy From Plan** entry selects the Local Plan from which data are copied. Enter a zero to clear all local plan data on the Copy To Plans.

The **Copy To Plans** entry selects the Local Plans to which data are copied. Any number of plans may be selected.

Press the [*] key to initiate the copy procedure. When the copy is complete, the following message is shown:

```
  Copy completed. Press ESC for menu
```

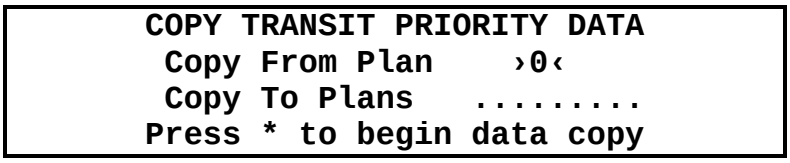
TIME-OF-DAY TABLE (9-4-3)
The Time-of-Day Table screen allows the user to copy data between Time-of-Day Tables.

The **Copy From Table** entry selects the Time-of-Day Table from which data are copied. Enter a zero to clear all time-of-day table data on the Copy To Tables.

The **Copy To Tables** entry selects the Time-of-Day Tables to which data are copied. Any number of tables may be selected.

Press the [*] key to initiate the copy procedure. When the copy is complete, the following message is shown:

TRANSIT PRIORITY DATA (9-4-4)
The Transit Priority Data screen allows the user to copy Transit Priority data between Local Plans. Only the Transit Priority data associated with the Local Plan are copied.



The **Copy From Plan** entry selects the Local Plan from which data are copied. Enter a zero to clear all transit priority local plan data on the Copy To Plans.

The **Copy To Plans** entry selects the Local Plans to which data are copied. Any number of plans may be selected.

Press the [*] key to initiate the copy procedure. When the copy is complete, the following message is shown:

CONTROLLER COPY (9-4-5)

The Controller Copy screen allows the user to copy all configuration data from another controller. When the procedure is completed, the RAM Checksums are automatically verified to ensure a successful copy. Only controllers with compatible program versions can be copied. Compatible programs versions have the same number before the decimal point. TSCP version 3.26 and higher can copy data from any 3.xx version of the TSCP. The copy procedure can be used to retrieve all configuration data from a controller that is actively running an intersection without affecting its operation. ***The copy procedure should not be used to copy data to a controller actively running an intersection, as the change in configuration data could cause undesirable operation!***

```
          CONTROLLER COPY
Connect controllers with transfer cable
 Set comm address in THIS controller
      Press * to begin data copy
```

A controller transfer cable must be connected between the two controllers using the serial port configured for ATSAC protocol. If the source controller does not have a serial port configured for the ATSAC protocol, one can be temporarily changed to complete the copy function. Set the address in the receiving controller the same as that which is in the source controller. Press the [*] key to initiate the copy procedure.

```
          CONTROLLER COPY
 Verifying TSCP version... OKAY
 Copy in progress...   0% complete
         Press ESC to cancel
```

If both controllers have compatible program versions, the copy procedure begins. The copy progress is shown on the screen, and is completed when 100% of the configuration data is transferred. To cancel the copy procedure, press the [ESC] key.

If the source controller has a different program version, the following screen will be displayed:

```
          CONTROLLER COPY
 Verifying TSCP version... INCORRECT
 Cannot copy from different versions
     Press ESC to return to menu
```

The controller copy procedure can only be performed between controllers with compatible program versions. Press [ESC] to return to the menu.

If there was a communications error while attempting to verify the program version, the following screen will be displayed:

```
          CONTROLLER COPY
  Verifying TSCP version... FAILED
Unable to communicate with controller
     Press ESC to return to menu
```

This indicates that the controller copy procedure was unable to communicate with the source controller. Verify that both controllers have a serial port configured for the ATSAC protocol and that both have the same address. The transfer cable must be connected to the same serial port on both controllers. Press [ESC] to return to the menu and attempt the copy procedure again.

When the copy procedure is completed, the RAM Checksums are verified. If there were no communication errors during the copy and the RAM Checksums match, the following screen will be displayed:

```
CONTROLLER COPY
Copy completed with no errors
RAM Checksums verified OKAY
Press ESC to return to menu
```

This indicates a successful copy of the data from the source controller. Press the [ESC] key to return to the menu. If a serial port was temporarily configured for ATSAC to perform the copy, this configuration is still in the receiving controller, and should be returned to the normal setting before use. ***Note that the date and time are not copied, and these entries should be checked in the receiving controller before use.***

If any errors were detected during the copy process, the following message is shown on the display, and the **#** symbol is replaced with the actual number of errors detected:

```
Copy terminated with # errors
```

If less than 9 errors are detected, the copy procedure was completed and the RAM Checksums are verified. If the RAM Checksums verify okay, the copy was successful. If the RAM Checksums do not match, the following is shown on the display:

```
RAM Checksums DO NOT match!
```

If the RAM Checksums do not match, then either too many errors occurred during the copy procedure and it was aborted, or some of the configuration data was changed in one of the controllers during the copy procedure. Do not change any configuration data in the source controller during the copy procedure or the checksums will not match. Press the [ESC] key to return to the menu and attempt the copy procedure again.

DIRECT RAM ACCESS (9-5)

The Direct RAM Access display and data entry screen allows the user to directly access certain data in the controller. This screen is provided to allow the user to examine data that may not be displayed on any other screen. Data can be observed and entered through this screen.

```
            DIRECT RAM ACCESS

Address    Decimal   Hex        Flag
 ›3000‹       0       00      ........
```

There are four data entry positions on this display: **Address**, **Decimal**, **Hex** and **Flag**.

The **Address** entry position allows the entry of a four-digit hexadecimal address of the memory location being accessed. Enter a hexadecimal number corresponding to a valid memory address. Valid range is 3000-4FFF.

Once the Address entry has been made, the data at the location selected will be shown in the Decimal, Hex and Flag displays. If no data are shown, then an invalid memory address has been selected. Press the [ESC] key to return the cursor to the Address entry position, and enter a valid memory address.

Once a valid memory location has been entered, the cursor will be placed at the Decimal entry position. The [NEXT] key can be used to move the cursor between the Decimal, Hex and Flag entry positions. Only one type of entry can be made at a time. Press the [ESC] key to return the cursor to the Address entry position.

The **Decimal** entry position allows the user to observe and change the value of the data shown in decimal notation. Enter decimal data using the number keys and press [ENT] to save. The [+] and [–] keys can be used to increment and decrement the displayed value by one.

The **Hex** entry position allows the user to observe and change the value of the data shown in hexadecimal notation. Enter decimal data using the alphanumeric keys and press [ENT] to save. The [+] and [–] keys can be used to increment and decrement the displayed value by one.

The **Flag** entry position allows the user to observe and change the value of the data shown in flag (bit) form. Enter flag data using the number keys. The [0] key can be used to clear all flags.

While observing a memory location, the arrow keys can be used to advance the Address entry to an adjacent memory location. Press the [▼] key to increase the memory location by one. Press the [▲] key to decrease the memory location by one. Press the [▶] key to increase the memory location by sixteen. Press the [◀] key to decrease the memory location by sixteen. When using the arrow keys to change memory locations, it is possible to select a non-existent memory address. This is indicated by the Decimal, Hex and Flag entry positions not showing any data. Either continue pressing the arrow key until a valid memory location is reached, or press the [ESC] key to return to the Address field and enter a new memory address location.

TERMINATE PROGRAM (9-6)

The Terminate Program screen allows the user to end the TSCP and stop all traffic control functions. This procedure is for upgrades only, and when selected the following warning is displayed. Press the [ESC] key to cancel this selection and return to the Utilities Menu.

```
TERMINATE PROGRAM
This procedure is for upgrades only
   Press ESC to cancel, or enter
   authorization code to proceed
```

Only authorized personnel are allowed to terminate the program. Do not attempt this procedure without authorization! If the TSCP is terminated, there is no way to restart it without turning the controller power OFF. This will cause a watchdog fault on the conflict monitor and place the intersection in flashing operation.

To terminate the TSCP, enter a five-digit authorization code, and press the [ENT] key. The authorization code entered will not be shown on the display. To abort this procedure, press the [ESC] key to return to the Utilities Menu.

If a valid authorization code has been entered, the following screen is displayed:

```
TERMINATE PROGRAM
   Press * to terminate program
Controller will display all-red for
  ten seconds then watchdog stops
```

Press the [*] key to begin the termination sequence, or press the [ESC] key to abort this procedure. Once the [*] key has been pressed, the following screen will be displayed:

```
TERMINATE PROGRAM

Waiting for phases to go to all-red
  Press ESC to abort termination
```

The termination sequence has begun once this screen is shown on the display. Press the [ESC] key to abort, otherwise the TSCP will end all phases and overlaps and go to an all-red display. This may require a few minutes because phases are allowed to time to their completion, and the all-red display does not occur until the controller advances to the next barrier crossing. Once the all-red condition has been reached, a beep will sound indicating the TSCP program has terminated and the display will return to the Front Panel Manager menu. For the next 10 seconds, the loadswitch outputs will maintain the all-red display and the watchdog output will continue to toggle. After the 10 seconds have elapsed, the watchdog stops and all loadswitch outputs are turned OFF. This causes a watchdog fault on the conflict monitor and places the intersection in flashing operation.

To restart the TSCP, the controller must be turned OFF for more than one second and then turned back ON.

DEFAULT ATSAC 332 CABINET C1 PIN ASSIGNMENTS

PIN	I/O	FUNCTION
1	*****	LOGIC GROUND
2	O 1-1	4P DONT WALK
3	O 1-2	4P WALK
4	O 1-3	Ø4 RED
5	O 1-4	Ø4 YELLOW
6	O 1-5	Ø4 GREEN
7	O 1-6	Ø3 RED
8	O 1-7	Ø3 YELLOW
9	O 1-8	Ø3 GREEN
10	O 2-1	2P DONT WALK
11	O 2-2	2P WALK
12	O 2-3	Ø2 RED
13	O 2-4	Ø2 YELLOW
14	*****	INPUT GROUND
15	O 2-5	Ø2 GREEN
16	O 2-6	Ø1 RED
17	O 2-7	Ø1 YELLOW
18	O 2-8	Ø1 GREEN
19	O 3-1	8P DONT WALK
20	O 3-2	8P WALK
21	O 3-3	Ø8 RED
22	O 3-4	Ø8 YELLOW
23	O 3-5	Ø8 GREEN
24	O 3-6	Ø7 RED
25	O 3-7	Ø7 YELLOW
26	O 3-8	Ø7 GREEN
27	O 4-1	6P DONT WALK
28	O 4-2	6P WALK
29	O 4-3	Ø6 RED
30	O 4-4	Ø6 YELLOW
31	O 4-5	Ø6 GREEN
32	O 4-6	Ø5 RED
33	O 4-7	Ø5 YELLOW
34	O 4-8	Ø5 GREEN
35	O 5-1	OLA GREEN
36	O 5-2	OLB GREEN
37	O 5-3	OLA YELLOW
38	O 5-4	OLB YELLOW
39	I 1-1	SYSTEM DETECTOR 1
40	I 1-2	SYSTEM DETECTOR 9
41	I 1-3	SYSTEM DETECTOR 5
42	I 1-4	SYSTEM DETECTOR 13
43	I 1-5	SYSTEM DETECTOR 2
44	I 1-6	SYSTEM DETECTOR 10
45	I 1-7	SYSTEM DETECTOR 6
46	I 1-8	SYSTEM DETECTOR 14
47	I 2-1	Ø2 CALL+EXTEND
48	I 2-2	Ø6 CALL+EXTEND
49	I 2-3	Ø4 CALL+EXTEND
50	I 2-4	Ø8 CALL+EXTEND
51	I 2-5	RR1 PREEMPT
52	I 2-6	RR2 PREEMPT
53	I 2-7	ADVANCE ENABLE
54	I 2-8	FLASH BUS
55	I 3-1	Ø5 CALL+EXTEND
56	I 3-2	Ø1 CALL+EXTEND
57	I 3-3	Ø7 CALL+EXTEND
58	I 3-4	Ø3 CALL+EXTEND
59	I 3-5	Ø8 COUNT+CALL+EXTEND
60	I 3-6	Ø4 COUNT+CALL+EXTEND
61	I 3-7	Ø8 COUNT+CALL+EXTEND
62	I 3-8	Ø4 COUNT+CALL+EXTEND
63	I 4-5	SYSTEM DETECTOR 3
64	I 4-6	SYSTEM DETECTOR 11
65	I 4-7	SYSTEM DETECTOR 7
66	I 4-8	SYSTEM DETECTOR 15
67	I 5-1	Ø2 PEDESTRIAN
68	I 5-2	Ø6 PEDESTRIAN
69	I 5-3	Ø4 PEDESTRIAN
70	I 5-4	Ø8 PEDESTRIAN
71	I 5-5	EVA PREEMPT
72	I 5-6	EVB PREEMPT
73	I 5-7	EVC PREEMPT
74	I 5-8	EVD PREEMPT
75	I 6-1	DOOR AJAR
76	I 6-2	SYSTEM DETECTOR 4
77	I 6-3	SYSTEM DETECTOR 12
78	I 6-4	SYSTEM DETECTOR 8
79	I 6-5	SYSTEM DETECTOR 16
80	I 6-6	MANUAL ADVANCE
81	I 6-7	FLASH SENSE
82	I 6-8	STOP TIME
83	O 6-1	SPECIAL FUNCTION 1
84	O 6-2	SPECIAL FUNCTION 3
85	O 6-3	OLD RED
86	O 6-4	OLD YELLOW
87	O 6-5	OLD GREEN
88	O 6-6	OLC RED
89	O 6-7	OLC YELLOW
90	O 6-8	OLC GREEN
91	O 7-1	NOT ASSIGNED
92	*****	LOGIC GROUND
93	O 7-2	NOT ASSIGNED
94	O 7-3	OLB RED
95	O 7-4	OLB YELLOW
96	O 7-5	OLB GREEN
97	O 7-6	OLA RED
98	O 7-7	OLA YELLOW
99	O 7-8	OLA GREEN
100	O 5-5	SPECIAL FUNCTION 2
101	O 5-6	SPECIAL FUNCTION 4
102	O 5-7	DETECTOR RESET
103	O 5-8	WATCHDOG
104	*****	INPUT GROUND

DEFAULT ATSAC 337 CABINET C1 PIN ASSIGNMENTS

PIN	I/O	FUNCTION
1	*****	LOGIC GROUND
2	O 1-1	4P DONT WALK
3	O 1-2	4P WALK
4	O 1-3	Ø4 RED
5	O 1-4	Ø4 YELLOW
6	O 1-5	Ø4 GREEN
7	O 1-6	Ø3 RED
8	O 1-7	Ø3 YELLOW
9	O 1-8	Ø3 GREEN
10	O 2-1	2P DONT WALK
11	O 2-2	2P WALK
12	O 2-3	Ø2 RED
13	O 2-4	Ø2 YELLOW
14	*****	INPUT GROUND
15	O 2-5	Ø2 GREEN
16	O 2-6	Ø1 RED
17	O 2-7	Ø1 YELLOW
18	O 2-8	Ø1 GREEN
19	O 3-1	NOT ASSIGNED
20	O 3-2	NOT ASSIGNED
21	O 3-3	NOT ASSIGNED
22	O 3-4	NOT ASSIGNED
23	O 3-5	NOT ASSIGNED
24	O 3-6	NOT ASSIGNED
25	O 3-7	NOT ASSIGNED
26	O 3-8	NOT ASSIGNED
27	O 4-1	NOT ASSIGNED
28	O 4-2	NOT ASSIGNED
29	O 4-3	NOT ASSIGNED
30	O 4-4	NOT ASSIGNED
31	O 4-5	NOT ASSIGNED
32	O 4-6	NOT ASSIGNED
33	O 4-7	NOT ASSIGNED
34	O 4-8	NOT ASSIGNED
35	O 5-1	8P WALK
36	O 5-2	NOT ASSIGNED
37	O 5-3	8P DONT WALK
38	O 5-4	NOT ASSIGNED
39	I 1-1	Ø4 CALL+EXTEND
40	I 1-2	SYSTEM DETECTOR 5
41	I 1-3	SYSTEM DETECTOR 3
42	I 1-4	SYSTEM DETECTOR 6
43	I 1-5	Ø4 CALL+EXTEND
44	I 1-6	NOT ASSIGNED
45	I 1-7	SYSTEM DETECTOR 4
46	I 1-8	NOT ASSIGNED
47	I 2-1	NOT ASSIGNED
48	I 2-2	NOT ASSIGNED
49	I 2-3	Ø3 CALL+EXTEND
50	I 2-4	SYSTEM DETECTOR 2
51	I 2-5	RR1 PREEMPT
52	I 2-6	RR2 PREEMPT
53	I 2-7	ADVANCE ENABLE
54	I 2-8	FLASH BUS
55	I 3-1	NOT ASSIGNED
56	I 3-2	Ø1 CALL+EXTEND
57	I 3-3	NOT ASSIGNED
58	I 3-4	SYSTEM DETECTOR 1
59	I 3-5	SYSTEM DETECTOR 8
60	I 3-6	SYSTEM DETECTOR 10
61	I 3-7	SYSTEM DETECTOR 9
62	I 3-8	SYSTEM DETECTOR 7
63	I 4-5	NOT ASSIGNED
64	I 4-6	NOT ASSIGNED
65	I 4-7	NOT ASSIGNED
66	I 4-8	NOT ASSIGNED
67	I 5-1	Ø2 PEDESTRIAN
68	I 5-2	Ø6 PEDESTRIAN
69	I 5-3	Ø4 PEDESTRIAN
70	I 5-4	Ø8 PEDESTRIAN
71	I 5-5	EVA PREEMPT
72	I 5-6	EVB PREEMPT
73	I 5-7	NOT ASSIGNED
74	I 5-8	NOT ASSIGNED
75	I 6-1	DOOR AJAR
76	I 6-2	NOT ASSIGNED
77	I 6-3	NOT ASSIGNED
78	I 6-4	NOT ASSIGNED
79	I 6-5	NOT ASSIGNED
80	I 6-6	MANUAL ADVANCE
81	I 6-7	FLASH SENSE
82	I 6-8	STOP TIME
83	O 6-1	NOT ASSIGNED
84	O 6-2	NOT ASSIGNED
85	O 6-3	NOT ASSIGNED
86	O 6-4	NOT ASSIGNED
87	O 6-5	NOT ASSIGNED
88	O 6-6	NOT ASSIGNED
89	O 6-7	NOT ASSIGNED
90	O 6-8	NOT ASSIGNED
91	O 7-1	NOT ASSIGNED
92	*****	LOGIC GROUND
93	O 7-2	NOT ASSIGNED
94	O 7-3	NOT ASSIGNED
95	O 7-4	NOT ASSIGNED
96	O 7-5	NOT ASSIGNED
97	O 7-6	NOT ASSIGNED
98	O 7-7	NOT ASSIGNED
99	O 7-8	NOT ASSIGNED
100	O 5-5	NOT ASSIGNED
101	O 5-6	NOT ASSIGNED
102	O 5-7	DETECTOR RESET
103	O 5-8	WATCHDOG
104	*****	INPUT GROUND

DEFAULT UNIVERSAL 332 CABINET C1 PIN ASSIGNMENTS

PIN	I/O	FUNCTION
1	*****	LOGIC GROUND
2	O 1-1	4P DONT WALK
3	O 1-2	4P WALK
4	O 1-3	Ø4 RED
5	O 1-4	Ø4 YELLOW
6	O 1-5	Ø4 GREEN
7	O 1-6	Ø3 RED
8	O 1-7	Ø3 YELLOW
9	O 1-8	Ø3 GREEN
10	O 2-1	2P DONT WALK
11	O 2-2	2P WALK
12	O 2-3	Ø2 RED
13	O 2-4	Ø2 YELLOW
14	*****	INPUT GROUND
15	O 2-5	Ø2 GREEN
16	O 2-6	Ø1 RED
17	O 2-7	Ø1 YELLOW
18	O 2-8	Ø1 GREEN
19	O 3-1	8P DONT WALK
20	O 3-2	8P WALK
21	O 3-3	Ø8 RED
22	O 3-4	Ø8 YELLOW
23	O 3-5	Ø8 GREEN
24	O 3-6	Ø7 RED
25	O 3-7	Ø7 YELLOW
26	O 3-8	Ø7 GREEN
27	O 4-1	6P DONT WALK
28	O 4-2	6P WALK
29	O 4-3	Ø6 RED
30	O 4-4	Ø6 YELLOW
31	O 4-5	Ø6 GREEN
32	O 4-6	Ø5 RED
33	O 4-7	Ø5 YELLOW
34	O 4-8	Ø5 GREEN
35	O 5-1	OLA GREEN
36	O 5-2	OLB GREEN
37	O 5-3	OLA YELLOW
38	O 5-4	OLB YELLOW
39	I 1-1	Ø2 COUNT+CALL+EXTEND
40	I 1-2	Ø6 COUNT+CALL+EXTEND
41	I 1-3	Ø4 COUNT+CALL+EXTEND
42	I 1-4	Ø8 COUNT+CALL+EXTEND
43	I 1-5	Ø2 COUNT+CALL+EXTEND
44	I 1-6	Ø6 COUNT+CALL+EXTEND
45	I 1-7	Ø4 COUNT+CALL+EXTEND
46	I 1-8	Ø8 COUNT+CALL+EXTEND
47	I 2-1	Ø2 LIMITED
48	I 2-2	Ø6 LIMITED
49	I 2-3	Ø4 LIMITED
50	I 2-4	Ø8 LIMITED
51	I 2-5	RR1 PREEMPT
52	I 2-6	RR2 PREEMPT
53	I 2-7	ADVANCE ENABLE
54	I 2-8	FLASH BUS (DIAL 2)
55	I 3-1	Ø5 COUNT+CALL+EXTEND
56	I 3-2	Ø1 COUNT+CALL+EXTEND
57	I 3-3	Ø7 COUNT+CALL+EXTEND
58	I 3-4	Ø3 COUNT+CALL+EXTEND
59	I 3-5	Ø8 COUNT+CALL+EXTEND (RESET 2)
60	I 3-6	Ø4 COUNT+CALL+EXTEND (FREE)
61	I 3-7	Ø8 COUNT+CALL+EXTEND (RESET 3)
62	I 3-8	Ø4 COUNT+CALL+EXTEND (RESET 1)
63	I 4-5	Ø2 COUNT+CALL+EXTEND
64	I 4-6	Ø6 COUNT+CALL+EXTEND
65	I 4-7	Ø4 COUNT+CALL+EXTEND
66	I 4-8	Ø8 COUNT+CALL+EXTEND
67	I 5-1	Ø2 PEDESTRIAN
68	I 5-2	Ø6 PEDESTRIAN
69	I 5-3	Ø4 PEDESTRIAN
70	I 5-4	Ø8 PEDESTRIAN
71	I 5-5	EVA PREEMPT
72	I 5-6	EVB PREEMPT
73	I 5-7	EVC PREEMPT
74	I 5-8	EVD PREEMPT
75	I 6-1	DOOR AJAR (DIAL 3)
76	I 6-2	Ø2 COUNT+CALL+EXTEND
77	I 6-3	Ø6 COUNT+CALL+EXTEND
78	I 6-4	Ø4 COUNT+CALL+EXTEND
79	I 6-5	Ø8 COUNT+CALL+EXTEND
80	I 6-6	MANUAL ADVANCE
81	I 6-7	FLASH SENSE
82	I 6-8	STOP TIME
83	O 6-1	SPECIAL FUNCTION 1
84	O 6-2	SPECIAL FUNCTION 3
85	O 6-3	OLD RED
86	O 6-4	OLD YELLOW
87	O 6-5	OLD GREEN
88	O 6-6	OLC RED
89	O 6-7	OLC YELLOW
90	O 6-8	OLC GREEN
91	O 7-1	NOT ASSIGNED
92	*****	LOGIC GROUND
93	O 7-2	NOT ASSIGNED
94	O 7-3	OLB RED
95	O 7-4	OLB YELLOW
96	O 7-5	OLB GREEN
97	O 7-6	OLA RED
98	O 7-7	OLA YELLOW
99	O 7-8	OLA GREEN
100	O 5-5	SPECIAL FUNCTION 2
101	O 5-6	SPECIAL FUNCTION 4
102	O 5-7	DETECTOR RESET
103	O 5-8	WATCHDOG
104	*****	INPUT GROUND

DEFAULT UNIVERSAL 337 CABINET C1 PIN ASSIGNMENTS

PIN	I/O	FUNCTION
1	*****	LOGIC GROUND
2	O 1-1	4P DONT WALK
3	O 1-2	4P WALK
4	O 1-3	Ø4 RED
5	O 1-4	Ø4 YELLOW
6	O 1-5	Ø4 GREEN
7	O 1-6	Ø3 RED
8	O 1-7	Ø3 YELLOW
9	O 1-8	Ø3 GREEN
10	O 2-1	2P DONT WALK
11	O 2-2	2P WALK
12	O 2-3	Ø2 RED
13	O 2-4	Ø2 YELLOW
14	*****	INPUT GROUND
15	O 2-5	Ø2 GREEN
16	O 2-6	Ø1 RED
17	O 2-7	Ø1 YELLOW
18	O 2-8	Ø1 GREEN
19	O 3-1	NOT ASSIGNED
20	O 3-2	NOT ASSIGNED
21	O 3-3	NOT ASSIGNED
22	O 3-4	NOT ASSIGNED
23	O 3-5	NOT ASSIGNED
24	O 3-6	NOT ASSIGNED
25	O 3-7	NOT ASSIGNED
26	O 3-8	NOT ASSIGNED
27	O 4-1	NOT ASSIGNED
28	O 4-2	NOT ASSIGNED
29	O 4-3	NOT ASSIGNED
30	O 4-4	NOT ASSIGNED
31	O 4-5	NOT ASSIGNED
32	O 4-6	NOT ASSIGNED
33	O 4-7	NOT ASSIGNED
34	O 4-8	NOT ASSIGNED
35	O 5-1	8P WALK
36	O 5-2	NOT ASSIGNED
37	O 5-3	8P DONT WALK
38	O 5-4	NOT ASSIGNED
39	I 1-1	Ø2 COUNT+CALL+EXTEND
40	I 1-2	Ø6 COUNT+CALL+EXTEND
41	I 1-3	Ø4 COUNT+CALL+EXTEND
42	I 1-4	Ø8 COUNT+CALL+EXTEND
43	I 1-5	Ø2 COUNT+CALL+EXTEND
44	I 1-6	NOT ASSIGNED
45	I 1-7	Ø4 COUNT+CALL+EXTEND
46	I 1-8	NOT ASSIGNED
47	I 2-1	NOT ASSIGNED
48	I 2-2	NOT ASSIGNED
49	I 2-3	Ø4 COUNT+CALL+EXTEND
50	I 2-4	Ø8 COUNT+CALL+EXTEND
51	I 2-5	RR1 PREEMPT
52	I 2-6	RR2 PREEMPT
53	I 2-7	ADVANCE ENABLE
54	I 2-8	FLASH BUS (DIAL 2)
55	I 3-1	NOT ASSIGNED
56	I 3-2	Ø1 COUNT+CALL+EXTEND
57	I 3-3	NOT ASSIGNED
58	I 3-4	Ø3 COUNT+CALL+EXTEND (RESET 2)
59	I 3-5	Ø5 COUNT+CALL+EXTEND (FREE)
60	I 3-6	Ø1 COUNT+CALL+EXTEND (RESET 3)
61	I 3-7	Ø7 COUNT+CALL+EXTEND (RESET 1)
62	I 3-8	Ø3 COUNT+CALL+EXTEND
63	I 4-5	NOT ASSIGNED
64	I 4-6	NOT ASSIGNED
65	I 4-7	NOT ASSIGNED
66	I 4-8	NOT ASSIGNED
67	I 5-1	Ø2 PEDESTRIAN
68	I 5-2	Ø6 PEDESTRIAN
69	I 5-3	Ø4 PEDESTRIAN
70	I 5-4	Ø8 PEDESTRIAN
71	I 5-5	EVA PREEMPT
72	I 5-6	EVB PREEMPT
73	I 5-7	NOT ASSIGNED
74	I 5-8	NOT ASSIGNED
75	I 6-1	DOOR AJAR (DIAL 3)
76	I 6-2	NOT ASSIGNED
77	I 6-3	NOT ASSIGNED
78	I 6-4	NOT ASSIGNED
79	I 6-5	NOT ASSIGNED
80	I 6-6	MANUAL ADVANCE
81	I 6-7	FLASH SENSE
82	I 6-8	STOP TIME
83	O 6-1	NOT ASSIGNED
84	O 6-2	NOT ASSIGNED
85	O 6-3	NOT ASSIGNED
86	O 6-4	NOT ASSIGNED
87	O 6-5	NOT ASSIGNED
88	O 6-6	NOT ASSIGNED
89	O 6-7	NOT ASSIGNED
90	O 6-8	NOT ASSIGNED
91	O 7-1	NOT ASSIGNED
92	*****	LOGIC GROUND
93	O 7-2	NOT ASSIGNED
94	O 7-3	NOT ASSIGNED
95	O 7-4	NOT ASSIGNED
96	O 7-5	NOT ASSIGNED
97	O 7-6	NOT ASSIGNED
98	O 7-7	NOT ASSIGNED
99	O 7-8	NOT ASSIGNED
100	O 5-5	NOT ASSIGNED
101	O 5-6	NOT ASSIGNED
102	O 5-7	DETECTOR RESET
103	O 5-8	WATCHDOG
104	*****	INPUT GROUND