USER'S MANUAL

MODEL 2070 CONTROLLER
TRAFFIC SIGNAL CONTROL PROGRAM

Version 2.10

November 1,2008

Draft

Caltrans

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**Neither the State of California, nor any officer
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Signal Control Program**

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General Information

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. will be using the Model 2070 Controller as a replacement for the Model 170 Controller in many transportation applications, the first being traffic signal control.

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. Three resource management software programs, called "managers," are provided to perform basic housekeeping functions in the controller. Each of these three 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 one 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 Manger
1-TRAFFIC SIGNAL CONTROL PROGRAM    2.10



```

This screen indicates that the 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, all input and output to the controller through the Front Panel is governed by the application program selected. 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 which 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. 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. Control flexibility is provided by numerous programming options and enhanced detector, coordination, time-of-day, preemption and diagnostic capabilities. 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
- Master Timer Sync
- Y-Coord Plan C and Plan D

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

- Compliant with AB3418 protocol
- Supports external WWV and UTB 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
- 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
- Truck Preemption with Master/Slave Option

Transit Priority

- Programmable green extension and early green by plan
- Programmable number of inhibit cycles by plan
- Priority phase hold during free operation

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

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. 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 three 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 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. For overlap bit settings, press the [A] through [F] keys to toggle the appropriate bit. For day-of-week bit settings, the days are entered by pressing the number keys: [1] is for Monday, [2] is for Tuesday, [3] is for Wednesday, [4] for is Thursday, [5] is for Friday, [6] is for Saturday and [7] for is 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. Some of the phase bit settings do not allow certain combinations of bit entries, and therefore the [9] key may be disabled. 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. All flag data are saved as soon as it is 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. The [ESC] key can be pressed to cancel any change made and restore the original selection. List type data entry which is 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 lasts about 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 which 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
3.2	1.5	6.2	2.1	3.4	1.7	6.4	2.3	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
3.1	1.6	6.3	2.2	3.3	1.8	6.5	2.4	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	FS/ST
3.2	1.1	3.4	1.3	1.2	3.8	3.7	2.8	2.5	5.1	5.2	6.7
2.3	1.5	2.4	1.7	1.4	3.5	3.6	6.1	2.6	5.3	5.4	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 be used in cabinets equipped with a Model 2010 or 210 Conflict Monitor. The 2010 monitor 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.

```
        2070 TRANSPORTATION CONTROLLER
-----------------------------------------------
     Traffic Signal Control Program  2.10


                Copyright (c) 2006
        California Department of Transportation
                All Rights Reserved
```

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:

```
 11:52:15        TSCP MAIN MENU     10/31/2008
-----------------------------------------------
 1-Displays             7-Coordination
 2-Controller           8-TOD Schedule
 3-Preemption           9-Utilities
 4-Commands             ---------------------
 5-Detectors            |   CALTRANS   332   |
 6-Comm/Logic           |  (TSCP Ver. 2.10)  |
```

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)

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Display Menu (1)

The **Display Menu** allows the selection of eight 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      7-Preempts
      2-Overlap Data      8-Checksum
      3-Coordination
      4-TOD Clock
      5-Comm Data
      6-Detectors
```

The sample screens below are examples of typical data displays. The screens show 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 consist of one screen 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
Phs     Interval    Time   Max |        Demand
 2    GREEN REST    0.0     20 |   VEH   .2...6..
 6    GREEN REST    0.0     20 |   PED   ........
-------------------------------------------
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.

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.
EALY WALK	Early 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 shows 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.

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 on the Phase Timing Display 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 the Phase Timing Display, 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 to call the phase. This allows the user to quickly place calls into the controller. This feature has no effect on phases which 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.

```
        Overlap    Timer    Color
   ------------------------------------------
           A       0.0      RED
           B       0.0      RED
           C       0.0      RED
           D       0.0      RED
           E       0.0      RED
           F       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 green extension period, which begins after the parent phase green ends.

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, sync phases, masked 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  ........
------------------------------------------
Phs     Interval    Time   Max   |    Demand
 2    GREEN REST     0.0    50    | Veh........
 6    GREEN REST     0.0    50    | Veh........
```

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.
AB3418	The plan is selected by a received AB3418 message.
SLAVE	The plan is selected by an incoming interconnect signal.
MANUAL	The plan is selected manually by the user.
LOGIC	The plan is selected by a soft logic equation.
YCOORD	The plan is selected by TOD function 12 or 13

The **Plan** field displays either current plan number (**1-9**), or **FLASH** during 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 may be different from the cycle length programmed for the plan when the controller is in transition.

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 which are lagging in the current plan are shown.
OMIT	The phases which are omitted in the current plan are shown.
MASK	The phases which have been masked are shown. This field changes as the cycle progresses. Phases are masked after they have been allowed to be served.
FORCE	The phases which have been forced off are shown. This field changes as the cycle progresses. Phases are forced off after they have been served.

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 on this screen are not applicable.

```
Plan 1      -1-   -2-   -3-   -4-   -5-   -6-   -7-   -8-
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    09:37:21         STANDARD TIME
Date    11/27/1998    Sunrise    06:36:12
Day     FRIDAY        Sunset     16:43:59
```

Field	Description
Time	The current time in 24-hour format (hour:minute:second).
Date	The current calendar date (month/day/year).
Day	The current day of the week, as determined from the date.
Sunrise and **Sunset**	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).

Communications Data (1-5)

The **Communications Data** display submenu allows the selection of four submenus relating to serial communications data. There is one selection for each of the four communication protocols supported by controller: **AB3418**, **Simplex, Complex,** and **WWV/UTB**.

```
         COMMUNICATIONS DISPLAY
--------------------------------------------
1-AB3418 Protocol
2-Simplex Protocol
3-Complex Protocol
4-WWV/UTB Protocol
```

AB3418 Communications Status (1-5-1) (Caltrans)

The **AB3418 Status** display screen shows in hexadecimal data the currently received poll from an AB3418 master along with this controller's response. The errors of the communications are also shown at the bottom of this display.

```
AB3418 STATUS       Com 1:ON 2:OFF 3:OFF
Poll: 7E 05 33 C0 84 C5 F3 7E
Resp: 7E 05 13 C0 84 22 01 47 A3 7E
Stat: OKAY
Errs:------------------------------------
Bad Value      0      Invalid Length    0
Read Only      0      Invalid Message   0
   Press * to reset error counters
```

The **Poll** field shows the incoming **AB3418** command message, which is variable length.
The **Resp** field shows the outgoing response, which is variable length.
The **Stat** field displays one of the following status messages about the incoming poll:

Status	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.

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.

The **AB3418 Communications Errors** shows the accumulated errors detected in the reception of AB3418 messages.

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.

<u>**Simplex Communications Status (1-5-2) (LA DOT only)**</u>

The **Simplex Communications Status** display shows the current simplex data along with the local plan selected for both the incoming and outgoing communications as well as the communication errors.

```
           SIMPLEX COMMUNICATIONS STATUS
           Plan  Data      Command Bits
 In:         5    09    .. .. .. R2 .. .. D2
 Out:      255    20    .. FR .. .. .. .. ..
 Errs:    --------------------------------
                Message Timeout      0
                Invalid Message      0
            Press * to reset error counters
```

The **Plan** field shows the incoming and outgoing **Simplex** plan number. If a -- is shown, then there is no incoming plan or the Simplex protocol has not been selected for any serial ports.
The **Data** field shows the incoming and outgoing **Simplex** message data. If a -- is shown, then there is no incoming data or the Simplex protocol has not been selected for any serial ports.
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.

The **Simplex Communications Errors** shows the accumulated errors detected in the reception of Simplex messages.

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 Communications Status (1-5-3) (LA DOT only)

The **Complex Communications 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 along with the communication errors.

```
        COMPLEX COMMUNICATIONS STATUS
Transmit: 0E 28 1A 02 96 DC
Received: 0E 28 1A 02 96 DC
  Status:  OKAY
  Errors:-------------------------------
  Header     0    Message Timeout     0
Checksum     0    Invalid Message     0
    Press * to reset error counters
```

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.

The **Complex Communications Errors** shows the accumulated errors detected in the reception of Complex messages.

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.

WWV/UTB Communications Status (1-5-4)

The **WWV/UTB Status** display screen shows in hexadecimal data the currently transmitted and received data to and from a WWV/UTB clock. The error and status of the communications is also shown at the bottom of this display.

```
          WWV/UTB COMMUNICATIONS STATUS
Poll: 514138010000
Resp: 0A00085800641C087C1C00000D
 Status:  OKAY
Errors------------------------------------
Status         0      Message Timeout        0
Hardware       0      Invalid Message        0
    Press * to reset error counters
```

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

The **Resp** 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 WWV time is valid.
STATUS ERROR	The WWV/UTB clock is unable to provide valid time.
HARDWARE ERROR	The WWV/UTB clock is reporting a hardware fault.
TIMEOUT ERROR	The WWV/UTB clock did not respond to the last poll message.
INVALID MESSAGE	The received data message was not of the proper length.
INACTIVE	The WWV/UTB protocol is not selected for any serial port, and no poll messages are being transmitted.

The **WWV/UTB Communications** Errors displays screen shows the accumulated errors detected in the reception of WWV/UTB messages.

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

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
      2-Delay Timers
      3-Extend Timers
      4-Failed Detectors
      5-System Det Data
```

Vehicle Counts (1-6-1)

The **Vehicle Counts** display screen consists of two pages, with data for sixteen detectors on each page. Press the [NEXT] key to advance through the two screens. The two screens are shown below.

```
      VEHICLE  COUNTS                    Pg 1/2
    #   Count    #    Count    #    Count    #     Count
    ------------------------------------------
    1       0   5       0   9       0   13       0
    2       0   6       0   10      0   14       0
    3       0   7       0   11      0   15       0
    4       0   8       0   12      0   16       0
```

```
      VEHICLE  COUNTS                    Pg 2/2
    #   Count    #    Count    #    Count    #     Count
    ------------------------------------------
    17      0   21      0   25      0   29       0
    18      0   22      0   26      0   30       0
    19      0   23      0   27      0   31       0
    20      0   24      0   28      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 two pages, with data for sixteen detectors on each page. Press the [NEXT] key to advance through the screens. The two screens are shown below.

```
      DELAY  TIMERS                      Pg 1/2
  #   Delay   #   Delay    #    Delay   #   Delay
  ------------------------------------------------
  1      0    5      0     9      0    13      0
  2      0    6      0    10      0    14      0
  3      0    7      0    11      0    15      0
  4      0    8      0    12      0    16      0
```

```
      DELAY  TIMERS                      Pg 2/2
  #   Delay   #   Delay    #    Delay   #   Delay
  ------------------------------------------------
  17     0   21      0    25      0    29      0
  18     0   22      0    26      0    30      0
  19     0   23      0    27      0    31      0
  20     0   24      0    28      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 is on, and the assigned phase is not green.

Extend Timers (1-6-3)

The **Extend Timers** display screen consists of two pages, with data for sixteen detectors on each page. Press the [NEXT] key to advance through the screens. The two screens are shown below.

```
      EXTEND  TIMERS                       Pg 1/2
  #   Extend   #   Extend   #   Extend   #   Extend
  --------------------------------------------------
  1    0.0    5      0.0   9      0.0   13      0.0
  2    0.0    6      0.0  10      0.0   14      0.0
  3    0.0    7      0.0  11      0.0   15      0.0
  4    0.0    8      0.0  12      0.0   16      0.0
```

```
      EXTEND  TIMERS                       Pg 1/2
  #   Extend   #   Extend   #   Extend   #   Extend
  --------------------------------------------------
  17   0.0   21      0.0  25      0.0   29      0.0
  18   0.0   22      0.0  26      0.0   30      0.0
  19   0.0   23      0.0  27      0.0   31      0.0
  20   0.0   24      0.0  28      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.

Failed Detectors (1-6-4)

The **Failed Detectors** 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 set detector maximum on time.

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

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 HISTORY       Pg 2/2
---------------------------------------------
      Detectors        1- 8:      .......8
      Detectors        9-16:      1….....
      Detectors       17-24:      ......7.
      Detectors       25-32:      ...4....
     Press * to clear detector history
```

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 shows data for sixteen system detectors. Press the

```
               SYSTEM DETECTOR DATA
     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

     -------------------------------------------
     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 shows data for sixteen system detectors.

```
                SYSTEM DETECTOR DATA
     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
     -------------------------------------------
     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 shows data for sixteen system detectors on each page.

```
            SYSTEM DETECTOR DATA
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
       ------------------------------------------
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 **Preempt Display** submenu allows the selection of two displays relating to preempts and a third Transit Priority. The first selection shows Railroad Preempts and the second selection shows the Emergency Vehicle Preempts.

```
             PREEMPT DISPLAY
       ------------------------------------------
1-Railroad Preempts
2-Emergency Vehicle Preempt
3-Transit Priority
4-Truck Preempt
```

Railroad Preempt (1-7-1)

The **Railroad Preempt** display screen shows the information on the Railroad Preempt timers. The **Delay, Clear 1, Clear 2, Clear 3, Hold** and **Exit** timers are shown for each of the two railroad preempts.

These timers count down from the point at which they take effect until they either reach zero or the railroad preempt input is removed.

```
           RAILROAD PREEMPT DISPLAY
       Delay    Clr1    Clr2    Clr3   Hold    Exit
RR1     0.0     0.0     0.0     0.0    0.0     0.0
RR2     0.0     0.0     0.0     0.0    0.0     0.0
       ------------------------------------------
PR State        RR1                    RR2
Input           OFF                    OFF
Status          OFF                    OFF
```

The bottom half of the **Railroad Preempt** display screen shows the state of the inputs, the preempt status and the power up condition.

The **Input** column indicates the state of the preempt input, it 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.

Emergency Vehicle Preempt (1-7-2)

The **Emergency Vehicle Preempt** display screen shows the status of the emergency vehicle preempts. The display screen shows information on the emergency vehicle preempt timers. The **Delay, Clear** and **Maximum** timers are shown for each of the four emergency vehicle preempts.

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.

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

The bottom half of the screen shows the state of the four emergency vehicle preempt inputs, as well as the status of the emergency vehicle preempt.

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.

Transit Priority (1-7-3)

The **Transit Priority** display screen show 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     Type     Group
   Mode    NONE      Request     0         0
   Timer     0       Manual      0         0
```

The Type field indicates the type of transit priority activity. This can be one of the following: **NONE, EARLY GREEN, GREEN EXTEND, FREE HOLD, PHASE CALL,** or **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, which must elapse before another request for transit priority will be served.

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

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

Truck preemption (1-7-4)

The **Truck Preempt** display screen shows the status of the Truck Preempt. The screen shows the state of the preempt timers as well as showing information on the truck, preempt flags.

```
         TRUCK PREEMPTION TIMERS
                         Flash      Next
   Passage   Carry   Clear   Sign    Preempt
    0.0       0.0      0       0         0
   ------------------------------------------
                     STATUS
   Truck  Sign  Preempt  Det2  Det3  Det4  Slave
   OFF    OFF     OFF     OFF   OFF   OFF   OFF
```

Field	Description
Passage	The passage time from detector 3 to detector 2.
Carry	Detector 2 carryover time.
Clear	The preempt clearance time.
Flash Sign	The time the sign will flash if a preempt is not permitted.
Next Preempt	The time remaining before the next preempt is allowed.

Field	Description
Truck	indicates if a truck has occupied both detectors 3 and 4. Active during the passage time.
Sign	On if the beacon is flashing.
Preempt	On if a preempt is allowed.
Det 2, Det 3, Det 4	Indicate if detectors 2, 3, or 4 are occupied.
Slave	On if slave input of slave output is active

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 CHECKSUMS
------------------------------------------
    Page 2 = 852E        Page  7 = D2FD
    Page 3 = C6C9        Page  8 = D364
    Page 4 = 5892        Page  9 = 0ED8
    Page 5 = 5739        Page 10 = 8D98
    Page 6 = 85AF        Page 11 = C381
      Pages Referenced to Timing Charts
```

Controller Menu (2)

Controller Menu (2)

The **Controller Menu** consists of six selections where various controller data parameters can be entered. Each of these six selections is described in the following sections.

```
            CONTROLLER MENU
------------------------------------------
 1-Configuration
 2-Phase Timing
 3-Ped/Bike Timing
 4-Overlap Timing
 5-Red Revert
 6-All-Red Seconds
```

Configuration (2-1)

The **Configuration** submenu consists of six selections where various controller configuration data can be entered.

```
       CONTROLLER CONFIGURATION MENU
------------------------------------------
 1-Phases Normal
 2-Phases Advanced
 3-Pedestrian
 4-Overlaps
 5-Inputs
 6-Outputs
```

Phases Normal (2-1-1)

The **Phase Normal Configuration** menu consists of five selections where various controller phase configuration data can be entered. Each of these five selections is described in the following sections.

```
       PHASES NORMAL CONFIGURATION MENU
------------------------------------------
 1-Permit/Restrict
 2-Phase Recalls
 3-Red/Yel Locks
 4-Phase Features
 5-Startup Parameters
```

Permit/Restrict (2-1-1-1)

The **Permit/Restrict** 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.

```
+---------------------------------------+
|          PHASES PERMITTED-RESTRICTED  |
|  -----------------------------------  |
|                   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 lead phases. For example, to configure Phase 1 for 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.

Phase Recalls (2-1-1-2)

The **Phase Recalls** data entry screen allows 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.

```
                     PHASES RECALLED
       -------------------------------------------

                          Normal         Active
       Vehicle Minimum    >.2...6..<     .2...6..
       Vehicle Maximum    ........       ........
          Pedestrian      .2...6..       .2...6..
            Bicycle       ........       ........
```

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 and no opposing calls exist.
Bicycle	The phases selected have a call placed for bicycle service whenever the phase is in the yellow or red interval.

Red/Yel Locks (2-1-1-3)

The **Locks** data entry screen allows the user to enter the Red Lock, Yellow Lock and Force-Off/Max-Out 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 the Time-of-Day function is in effect.

```
                   PHASE LOCKS
    --------------------------------------------
                        Normal        Active
        Red Lock      >........<      ........
      Yellow Lock      ........       ........
   Force/Max Lock      ........       ........

```

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 a detector reset is issued by the controller. 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.

Phase Features (2-1-1-4)

The **Phase Features** data entry screen allows 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.

```
                        FEATURES
   -------------------  Normal      Active
     Double Entry       >........<  ........
     Rest In Walk       ........    ........
     Rest In Red        ........    ........
       Walk 2           ........    ........
     Max Green 2        ........    ........
     Max Green 3        ........    ........
```

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. When phases are selected using Walk 2, the pedestrian time will be ignored in the phase force-off calculations during coordination . This is ideal when it is desired to run shorter cycle lengths with long pedestrian intervals for occasional pedestrians. (Pedestrian overrun feature only works with Walk 2 not Walk 1) During coordination, if Walk 2 phases are selected and Walk 2 timing has been input, if the pedestrian interval overruns the phase force-off point, the controller will be set free and resume coordination after the sync phases have been served or after one full cycle. Also time-of-day selectable in TOD Functions (8-3).
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.

Startup Parameters (2-1-1-5)

The **Startup** data entry screen allows the selection of First Phases Green, Startup Yellow Phases, Startup Yellow Overlaps, Startup All-Red, Startup Vehicle and Pedestrian Recalls.

```
                    STARTUP PARAMETERS
     ------------------------------------------
       First Phases Green        >.2...6..<
       Yellow Start Phases        ........
       Vehicle Calls              ........
       Pedestrian Calls           ........
       Yellow Start Overlaps       ......
       All-Red Startup Time         5.0
```

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.
Startup Yellow	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 nor overlaps are set, the controller will startup in an all-red condition following a long power failure or flashing condition.
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.
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 Startup Yellow Phases or Startup Yellow Overlaps are set. Valid range is 0-25.5 seconds.

Phases Advanced (2-1-2)

The **Phase Advanced Configuration** menu consists of four selections where all of the controller special operation phase configuration data can be entered.

```
     PHASES ADVANCED CONFIGURATION MENU
-------------------------------------------
   1-Call/Omit
   2-Flashing Colors
   3-Special Operation
   4-Protected Permissive
```

Call/Omit Phase (2-1-2-1)

The **Phase Call** data entry section 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.

```
            1    >...4....<           1    ........
   CALL     2    ........      OMIT   2    ....5...
    TO      3    ........       ON    3    ........
  PHASE     4    ........     GREEN   4    ........
            5    ........             5    ........
            6    ........             6    ........
            7    ........             7    ........
            8    ........             8    ........
```

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.

The **Phase Omit** data entry section 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.

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.

Flashing Colors (2-1-2-2)

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 (2-1-2-3)

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          >........<
         Leading Ped 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.

Leading Ped	The phases set will start the pedestrian walk while holding the phase red. When leading ped phases are selected, the Delay Walk Time in Phase Timing (2-2) is converted to Lead Walk timing for the selected Leading Ped Phases, otherwise, the timing behaves as a Delay Walk. If a ped is re-serviced during the phase cycle, then the total walk time will be the Lead Walk plus any Walk time so as to not short the Ped Walk time. Further, even though the phase is held red during the leading ped time, the phase is still timing minimum green, so consideration should be taken when setting the phase lead walk time, walk time, don't walk time and phase minimum green time. This is usually not a problem since most ped times exceed the phase minimum green anyhow.
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.

Special Operation (2-1-2-4)

```
                    SPECIAL OPERATION
        -------- FLASHING YELLOW OPERATION --------

         Protected Permissive         .......
                      --CAUTION--
            Cabinet must be on HW FLASH to set
          Protected Permissive Yellow Flashing
                 Press ESC key to return
```

Protected Permissive (four indicator heads only)	The phases set will allow protected permissive flashing yellow operation of the assigned left turn phases. Only odd left turn phases are permitted. The loadswitch output assignments are listed in the table below. The cabinet must be on hardware flash to set the phases. Protected Permissive operation can be set TOD using codes 41 and 42 and assigning the phases. Phases set here will operate all the time regardless of TOD.

Phases assigned as **Protected Permissive** will only work with its opposing through phase.

Protected Permissive Phase	Opposing Phase
1	2
3	6
5	4
7	8

Protected Permissive Phase	Loadswitch Output Assignment
1	41
3	43
5	45
7	47

Protected Permissive left turns operate as protected left turns during normal servicing of the left turns. Permissive operation flashes a yellow left turn arrow at the start of the opposing green through movement indicating that it is okay to turn left when safe to do so. The yellow left will continue flashing through the green, yellow and red times of the opposing through phase so as to avoid any conflict or red violation of the opposing phases. Extreme caution needs to be exercised when activating this type of operation because the left turn outputs will be disabled while the permissive yellow arrow is flashing. A normal three R,Y, G indicator head will not work for this operation, hence the indicator head needs to be changed out to a four indicator head.

Ped Circuits (2-1-3)

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

```
                       PEDESTRIAN CICUIT
    ------------------------------------------------
    Phase                       Phase
      1    Ped  >........<        5    Ped   ........
      2    Ped   .2......         6    Ped   .....6..
      3    Ped   ........         7    Ped   ........
      4    Ped   ...4....         8    Ped   .......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).

Overlaps (2-1-4)

The **Overlaps** data entry screen allows the selection of Parent, Omit and No Start phases for each of six available overlaps.

```
                      OVERLAP ASSIGNMENT
  OL  Parent          Omit          No Start          Not
  A   >........<      ........      ........          ........
  B   ........        ........      ........          ........
  C   ........        ........      ........          ........
  D   ........        ........      ........          ........
  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. Typical use is to delay the start of an overlap in a "Dallas" left turn signal.
Not	The Phases set will terminate the overlaps when a not phase is the next phase to be serviced. Since overlaps do not have assigned call detectors, the main parent phases should be put on recall so as to avoid resting on a not overlap phase. For example, if 2,6,3,and 8 are assigned as parent phases and 4 is assigned as a not phase, then it is recommended to put at least a min recall on 2,6 so that the overlap can be serviced without resting on the not overlap phase in the event there is no other demand.

Any overlap A-F can operate as 2-color (Ped/Yellow) or as 3-color overlap. To do a 2-color overlap, select the parent phases to be a combination of two phases (2,3) (4,5) (6,7) or (8,1) and omit the thru phase 2, 4, 6 or 8. The omitted parent thru phase will only start the overlap when that phase goes yellow and the next phase is a left-turn parent phase. The overlap will stay green through the left-turn parent phase. For this operation, a no U-turn sign must be posted at the left turn. Overlaps A-B have been assigned to the output files as 9, 10 and overlaps C-F have been assigned to the auxiliary output file 11-14 (see loadswitch assignments)

Inputs (2-1-5)

The **Input** submenu contains six selections for the various controller inputs, each of which is described in the following sections.

```
         CONTROLLER INPUT CONFIGURATION
    ---------------------------------------------
    1-Seven Wire I/C
    2-Manual Control
    3-Cabinet Status
    4-Special Functions
    5-Battery Backup
    6-Y Coordination
```

Seven Wire Interconnect (2-1-5-1)

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 **AB3418**, SIMPLEX 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 (2-1-5-2)

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        6.6             │
│                                                │
│                                                │
│                                                │
└──────────────────────────────────────────────┘
```

Input	Description
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, 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.
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 don't walk. If the phase is in green, it will advance to yellow. All intervals are timed by the controller, and the controller 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.

Cabinet Status (2-1-5-3)

The **Cabinet Status** data entry screen enables four special cabinet status inputs. The status of these inputs is used by the local controller.

```
┌─────────────────────────────────────────────┐
│       CABINET STATUS INPUT CONFIGURATION      │
│     -----------------------------------       │
│                                               │
│    Input        Port        Input       Port  │
│  Flash Bus     ›0.0‹      Flash Sense    6.7   │
│  Door Ajar      0.0        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.
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.
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.
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.

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. **Caltrans** controllers do **not** generate a software flash when a **Flash Sense** is detected. The controller continues to time normally.

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 reset the signals during hardware flash and after a conflict condition, and if set wrong can lead to undesirable operation.

Special Functions (2-1-5-4)

The **Special Functions** data entry screen enables and assigns the input ports for up to four special function inputs.

```
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. This setting does not affect the input port in any other way, and the special functions can be assigned to ports which are also used for other purposes such as detectors.

Battery Backup (2-1-5-5)

The **Battery Backup** assigns the input port and battery backup operation.

```
      BATTERY BACKUP CONFIGURATION
----------------------------------------------
   Port                 Operation
  >2.7<                   Normal


```

Port indicates the port assigned to monitor battery backup. The default port is spare 1. There are two types of operation **NORMAL** or **FLASHING**. When the port is turned on during battery backup operation, Normal operation allows the controller to service phases and Flashing operation puts the signal on Flash to help prolong the life of the batteries. A Battery Backup event will be recorded in the event record (9-1).

Y Coordination (2-1-5-6)

The **Yellow Yield Coordination** assigns the ports to yellow yield operation.

```
    YELLOW YIELD INPUT CONFIGURATION
----------------------------------------------
    Port C              Port D
    >6.1<                2.8



```

Port C and **Port D** fields indicate the input port assigned to yellow yield plans **C** and **D**.

Outputs (2-1-6)

To access the **Outputs**, the user must enter the correct password, otherwise a window will be displayed **PASSWORD PROTECTED!** The user must first enter the correct password at the Commands menu 4 Write Permission 6 (enter the password, then press the [ENTER] key), then press [ESC] to return to the previous menu.

```
           CABINET LOADSWITCH ASSIGNMENT
------------------------------------------------


                PASSWORD PROTECTED!




```

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 ASSIGNMENTS
A    > 1<       2      22       3       4      24   |      9
B      5        6      26       7       8      28   |     10
X     13       14       0      11      12       0   |      0
-----------------------------------------------------
A    -1-     -2-     -2P-     -3-     -4-     -4P-   |    -A-
B    -5-     -6-     -6P-     -7-     -8-     -8P-   |    -B-
X    -E-     -F-      *       -C-     -D-      *     |     *
```

```
        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 what circuits drive that 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
9-14	Overlaps A-F	R/Y/G
21-28	Pedestrians 1-8	DW/DW/W
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
41	Protected Permissive Phase 1	Flashing
43	Protected Permissive Phase 3	Flashing
45	Protected Permissive Phase 5	Flashing
47	Protected Permissive Phase 7	Flashing

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.

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.

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 eight screens used to input all phase timing data. These eight screens are arranged in four 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 use to increment and decrement values. Shown below are all eight 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     -1-   -2-   -3-   -4-        -5-   -6-   -7-   -8-
-----------------------------------------     --------------------
  ----Walk 1----    0    10     0    10         0    10     0    10
Flash Don't Walk    0    10     0    10         0    10     0    10
Minimum Green      10    10    10    10        10    10    10    10
Detector Limit     10    10    10    10        10    10    10    10
```

```
  PHASE TIMING     -1-   -2-   -3-   -4-        -5-   -6-   -7-   -8-
-----------------------------------------     --------------------
Maximum Initial    10    10    10    10        10    10    10    10
Maximum Green 1    50    50    50    50        50    50    50    50
Maximum Green 2    50    50    50    50        50    50    50    50
Maximum Green 3    50    50    50    50        50    50    50    50
```

```
  PHASE TIMING     -1-   -2-   -3-   -4-        -5-   -6-   -7-   -8-
-----------------------------------------     --------------------
 Extension        5.0   5.0   5.0   5.0        5.0   5.0   5.0   5.0
Maximum Gap       5.0   5.0   5.0   5.0        5.0   5.0   5.0   5.0
Minimum Gap       5.0   5.0   5.0   5.0        5.0   5.0   5.0   5.0
Add Per Veh       1.0   1.0   1.0   1.0        1.0   1.0   1.0   1.0
```

```
  PHASE TIMING     -1-   -2-   -3-   -4-        -5-   -6-   -7-   -8-
-----------------------------------------     --------------------
Reduce Gap By     0.0   0.0   0.0   0.0        0.0   0.0   0.0   0.0
Reduce Every      1.0   1.0   1.0   1.0        1.0   1.0   1.0   1.0
   Yellow         5.0   5.0   5.0   5.0        5.0   5.0   5.0   5.0
   All-Red        1.0   1.0   1.0   1.0        1.0   1.0   1.0   1.0
```

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.
Flash Dont Walk	The amount of time that the pedestrian clearance interval will be displayed. Valid range is 0-255 seconds.
Minimum Green	The minimum amount of time a phase will display a green indication. 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.. 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.
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.
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.
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.
Yellow	The amount of time that the phase will display a yellow indication upon termination. Valid range is 3.0-6.0 seconds. Settings outside this range will time either 3.0 or 6.0 seconds, whichever is closer. Phases flagged as Driveway Signals may NOT have a yellow time setting of zero, which indicates that the yellow interval cannot be skipped.

> **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.

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.

Ped/Bike Timing (2-3)

The **Ped/Bike Timing** data entry screens consist of two screens used to input all pedestrian and bike timing data. These two screens are arranged in one group 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 use to increment and decrement values. Shown below are all the two 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.

```
 PED/BIKE TIMING    -1-   -2-   -3-   -4-      -5-    -6-    -7-    -8-
----------------------------------------     ---------------------
   ----Walk 2----      0     0     0     0      0      0      0      0
Delay/Lead Walk        0     0     0     0      0      0      0      0
Solid Don't Walk       0     0     0     0      0      0      0      0
  Bike Green           0     0     0     0      0      0      0      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 ped/bike timing intervals:

> **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/Early Walk** The amount of time that the Walk display will be delayed from the beginning of green or started before the green. Delay applies only when a phase changes from red to green with a pedestrian call pending. Valid range is 0-255 seconds.

> **Solid Dont Walk** The amount of Flash Dont Walk time that will 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.

> **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.

> **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.

Overlap Timing (2-4)

The **Overlap Timing** data entry screen allows the user to enter all overlap timing data. The overlap Green extension, Yellow clearance and All-Red times are entered on this screen.

```
              OVERLAP TIMING
     ------------------------------------------
     Overlap    A      B      C      D      E      F
     Green    > 0.0<   0.0    0.0    0.0    0.0    0.0
     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
Green	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 3.0-6.0 seconds. Settings outside this range will time either 3.0 or 6.0 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 is 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.

Red Revert (2-5)

The **Red Revert** data entry screen allows the selection of the Red Revert time.

```
                    RED REVERT
------------------------------------------

                     Red
                    Revert
                    Time
                  > 5.0 <
```

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

All-Red (2-6)

The **All-Red** data entry screen allows the selection of the All-Red time.

```
      RECONFIGURE ALL-RED TIME TO SECONDS

---CHECK PHASE AND OVERLAP ALL-RED TIME---

      All-Red Time Seconds is:    OFF

      Press * to change all-red time
             Or ESC to cancel
```

The **All-Red Time to Seconds** changes the **All-Red** time from 1/10 second increments to 1 second increments. When All Red to Seconds is **OFF**, phase and overlap All-Red Time will be 0 to 25.5 seconds. When **All Red to Seconds** is **On** phase and overlap All Red Time will be 0 to 255 seconds. All-Red to Seconds operation is ideal for single-lane, one-way, operation when long red time is desirable.

Preemption Menu (3)

Preemption Menu (3)

In order for the user to enter **Preempts** options, the user must enter the correct password, otherwise a window will prompt **PASSWORD PROTECTED!** The password needs to be typed in 4-Commands menu in subsection 6-Write Permission (enter the password, then press [ENTER] key), then press [ESC] keypad to get to the previous screen.

```
               PREEMPT ACCESS DENIED!

               PASSWORD PROTECTED!



```

The **Preemption** menu screen allows the selection of one of the seven preempt submenus. The two Railroad Preempts are selected by pressing the number 1 or 2. 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 Truck Preempt is selected by pressing the F key.

```
               PREEMPTION MENU
  -------------------------------------------
 1-2-Railroad Preempts
 A-D-EV Preempts A,B,C,D
 E-Transit Priority
 F-Truck Preempt


```

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 below. 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 below. The Transit Priority and Truck Preempt selections lead to the sub-menu shown below.

The **Transit Priority** preempts have the lowest priority of all preempts. Emergency Vehicle Preempt 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 Preempts, Transit Priority preempts and Truck Preempts.

Railroad Preempt (3-1) and (3-2)

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

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

```
RR PREEMPT 1 - TIMING VALUES
-------------------------------------------
   Step         Time        Step        Time
 Clear 1      > 10<     Delay          0.0
 Clear 2         0      Hold            0
 Clear 3         0      Exit            5
 Preempt                Preempt
Min Green        0      Ped Clear       0
```

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 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 can 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.
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 dont 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 dont walk when the preempt starts shows a flashing dont walk indication. Valid range is 0-255 seconds.

If Caltrans 332 (CT-332) cabinet is selected, the Timing Values are preset to match C8 timing.

<u>**Phase Flags (3-1-2) and (3-2-2)**</u>

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.

```
┌─────────────────────────────────────────────┐
│       RR PREEMPT 1 - PHASE FLAGS              │
│  ───────────────────────────────────────     │
│                                               │
│   Step     Green Hold    Yel Flash   Red Flash│
│  Clear1    >.2..5...<     ........    ........ │
│  Clear2    ........       ........    ........ │
│  Clear3    ........       ........    ........ │
│   Hold     ........       ........    12345678 │
│                                               │
└─────────────────────────────────────────────┘
```

<u>Phase Flag</u>	<u>Description</u>
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.

If Caltrans 332 (CT-332) cabinet is selected, the Phase flags are preset to match C8 operation.

Pedestrian Flags (3-1-3) and (3-2-3)

The **Pedestrian 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.

```
         RR PREEMPT 1 - PED FLAGS
   ---------------------------------------------
    Step        Walk        Flash DW     Solid DW
    Clear1   >........<      ........     .2.4.6.8
    Clear2    ........       ........     ........
    Clear3    ........       ........     ........
     Hold     ........       ........     ........
```

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 Dont Walk	The phases selected will display a Flashing Don't Walk indication during of 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 Dont Walk	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 Dont Walk setting overrides the Walk setting, and the Solid Dont Walk setting applies to any phase set regardless of the Walk and Flash Dont 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 Dont Walk in the same step, only compatible phases will display a walk or flashing dont walk indication.

If Caltrans 332 (CT-332) cabinet is selected, the Ped flags are preset to match C8.

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.

```
┌─────────────────────────────────────────────┐
│    RR PREEMPT 1 - OVERLAP FLAGS               │
│    -----------------------------------------  │
│  Step    Green Hold      Yel Flash    Red Flash │
│ Clear1  >......<          ......       ......  │
│ Clear2   ......           ......       ......  │
│ Clear3  >......<          ......       ......  │
│ Hold     ......           ......       ABCDEF  │
│                                               │
└─────────────────────────────────────────────┘
```

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.

Nothing is preset for RR2 Overlap flags. Non conflicting overlaps can be set to operate during the RR2 limited operation by putting the overlaps in Green Hold condition.

If Caltrans 332 (CT-332) cabinet is selected, the Overlap flags are preset to match C8.

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.

```
┌─────────────────────────────────────────────┐
│      RR PREEMPT 1-EXIT PARAMETERS             │
│    -----------------------------------------  │
│    Phase        Overlap      Vehicle   Pedestrian │
│    Green        Green         Call        Call    │
│ >........<       ......      12345678   .2.4.6.8  │
│                                               │
│                                               │
└─────────────────────────────────────────────┘
```

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.
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 phases may be set, but only calls to permitted pedestrian phases are placed.

If Caltrans 332 (CT-332) cabinet is selected, the Exit parameters are preset to match C8.

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.

If Caltrans 332 (CT-332) cabinet is selected, the Configuration parameters are preset to match C8.

Emergency Vehicle Preempt (3-A), (3-B), (3-C) and (3-D)

The **Emergency Vehicle Preempt** data entry screen 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.

```
 EMERGENCY VEHICLE PREEMPT A
 --------------------------------------------
     Preempt Timers           Phase      Overlap
 Delay    Clear     Max       Green       Green
 >  0<      30        30      .2..5...    ......
                             -------Phase-------
   Port     Latching         Termination
   5.5        NO              FORCE-OFF
```

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 preemption. 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.

The following is a description of the above 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.

If Caltrans 332 (CT-332) cabinet is selected, the Emergency Vehicle Preemption parameters are preset to match C8.

<u>**Transit Priority (3-E)**</u>

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, one is for enable Transit Priority, and one is for Free Plan data.

```
      TRANSIT PRIORITY TIMING DATA ENTRY
   -------------------------------------------
                  Select Plan:
   1…9-Local Plans 1-9
   A-Enable Priority
   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 below.

Local Plans (3-E-1)...(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 and Minimum Green Factors are all entered on one screen.

```
LOCAL PLAN 1 - PRIORITY DATA
-------------------------------------------
                MIN GREEN FACTORS
-1-    -2-    -3-    -4-    -5-    -6-    -7-    -8-
> 5<      0      0      0      0      0      0      0
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 which must elapse after initiating a transit priority cycle. The cycle which initiated the transit priority is included in this count. Valid range is 0-255 cycles.

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 below 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 in order to validate the plan. Be sure to note the change made when this occurs.

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 used 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 below for a description of the
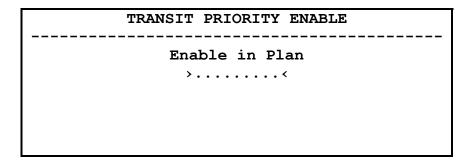
error messages. After the [∗] key is pressed, the Green Factor values for the Sync Phases will change if they are not the same as the Local Plan sync phase Green Factors in order to validate the plan. Valid range is 0-255 seconds.

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.

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 warning 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 which 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 Off 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.

Enable Priority (3-E-A)

```
          TRANSIT PRIORITY ENABLE
      ----------------------------------------
                 Enable in Plan
                 >.........<




```

Enables Transit Priority in plan by selecting valid plans 1-9.

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.

Truck Preempt (3-F)

The **Truck Preempt** submenu screen allows the selection of one of the two screens for data entry relating to Truck Preemption.

The **Truck Preemption Data** menu allows input of truck preempt timing.

```
        TRUCK PREEMPTION DATA          Pg 1/2
      ----------------------------------------
      Passage                  >20.0<
      Det 2 CarryOver            8.0
      Truck Clearance             30
      Next Preemption            120
      Hold Phases Grn          .......

```

The **Passage** entry is the passage time from Detector 3 to Detector 2. Activated when both Detectors 3 and 4 are occupied indicating a truck or long vehicle combination starting the passage timer. Valid range 0.0 to 25.5 seconds.

The **Det 2 CarryOver** entry is the accuation time on Detector 2 may be held or "stretched" to allow some latitude for slightly differing travel time from Detector 3 to Detector 2. Starts the carryover timer when activated. Valid range 0.0 to 25.5.seconds.

The **Truck Clearance** entry is the time to clear the preempt once it is activated. Once a truck preempt is activated it will place a hold on the truck phases until the clear timer expires or another preempt with a higher priority (i.e. RR or EV) terminates it. Valid range 0 to 255 seconds.

The **Next Preempt** entry is the allowed time between preempts. Allows the next preempt to be activated once the next preempt timer expires. Valid range 0 to 255 seconds.

The **Phase Green** entry are the phases that will be held green when a truck preempt is activated.

The **Truck Preemption Configuration** menu allows input of truck preempt phases and port assignments.

```
┌─────────────────────────────────────────────────┐
│   TRUCK PREEMPTION CONFIURATION      Pg 2/2       │
│   ---------------------------------------------   │
│  Det 2   Det 3   Det 4   Sign    Slave   Slave    │
│  Port    Port    Port    Port    Input   Output   │
│  >6.1<    2.8     2.7      22      0.0      0      │
│                                                   │
│                                                   │
│                                                   │
└─────────────────────────────────────────────────┘
```

The **Det 2,Det 3, Det 4** entries set the input ports for each detector. Port entry is the same as the detector configuration (5-2) ports.

The **Sign Port** entry assigns the output to the flashing beacon when a truck preempt is denied. Valid flashing sign outputs are 22 ped 2 yellow, 24 ped 4 yellow, 26 ped 6 yellow, or 28 ped 8 yellow. A 0 disables the output to the sign.

The combination of **Slave Input** and **Slave Output** can be used to configure two or more intersections in a master/slave configuration. The Slave Output from the master controller sends a signal during the Truck Preemption Clearance cycle to the Slave Input of the slave controller causing the slave controller to go into Truck Preemption. This configuration is ideal when two signalized intersections are close to each other without much storage between them.

The **Slave Input** entry sets the input port the slave controller uses to receive an output from the master in a master/slave configuration. Input entry is the same as the detector configuration (5-2) ports.

The **Slave Output** entry assigns the output from the master controller that sends an output signal to the slave in a master/slave configuration. Valid slave outputs are 22 ped 2 yellow, 24 ped 4 yellow, 26 ped 6 yellow, or 28 ped 8 yellow. A 0 disables the output.

Truck Preemption Operation:

Three detectors are placed in the approach lane used by trucks at distances 400 ft (120 m), 840 ft (252 m), and 870 ft (261 m) from the limit line. The detectors are designated D2, D3, and D4 as shown in the sketch below.

| 30 Ft | ← 440 Ft → | ← 200 Ft → | ← 200 Ft → |

D4   D3   D2   Beacon   Limit Line

D2 = Spare 3 ➔ 1 J 1 L
D3 = Spare 2 ➔ 1 J 1 U
D4=Spare 1 ➔ 1 I 1 L

Preemption Delay/Inhibit flashing beacon (if used) = Phase 2,4,6, or 8 ped yellow. Assign 22 (ped 2 yellow), 24 (ped 4 yellow), 26 (ped 6 yellow), or 28 (ped 8 yellow).

When both D4 and D3 are occupied, indicating a truck or long vehicle combination, the passage timer is started. When the passage timer expires, D2 is checked. If D2 is occupied any time during the carryover timer, it is assumed that a slow moving truck has traversed the 440 feet from D3.

At this time, if there has not been a truck pre-empt within a pre-set time, a preemption signal is sent to the controller. If there has been a recent preempt by a truck, a flashing beacon approaching traffic is switched on to indicate drivers that there will be no pre-empt at this time (preemption inhibit). Lacking a recent pre-empt, the controller condition is checked. If the controller is in a **WALK**, flashing **DON'T WALK**, or **MINIMUM GREEN** interval, the pre-empt is held and the flashing beacon is turned on (preemption delay). At the expiration of the above interval, the pre-empt is asserted, and the flashing beacon is turned off. The truck pre-empt sequences then take place and operation reverts to normal. The actuation on D2 may be held or "stretched" for an operator-settable interval (carryover) to allow some latitude for slightly differing travel time.

Command Menu (4)

Command Menu (4)

The **Command Menu** screen allows the selection of one of four 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 and to enter manual Priority Requests.

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

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.

```
       MANUAL COORDINATION PLAN SELECT
    ---------------------------------------------
              Manual Plan Entry
      Plan             >  0<
      Offset           A
```

Entering a zero will disable **Manual Plan** selection, and resume the default plan selection method. Entering numbers 1-9 will select coordination plans 1-9, respectively with selectable Offset A, B or C. Entering 15 or 254 will select software Flashing operation, and entering 14 or 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 a 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.

```
    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 Local Manual setting is toggled between OFF and ON. 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.

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.

Write Permission (4-6)

Write Permission allows the user to enter the password and have access to protected areas such as preemption and configuration flags. **Caltrans default password** is **332**. The default password can be changed in section 9-5-1. Note that before changing the default password, the password must be entered in section (4-6).

```
                 WRITE PERMISSION
-------------------------------------------


              PASSWORD  ›   0‹

        Enter Password to Access Phase Flags


```

Detector Menu (5)

Detector Menu (5)

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

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

Attributes (5-1)

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

```
      DETECTOR ATTRIBUTES              Pg   1/8
-------------------------------------
Det           Type             Phases      Lock
1       >COUNT+CALL+EXTEND<     .2......    RED
2        COUNT+CALL+EXTEND      .....6..    NO
3        COUNT+CALL+EXTEND      ...4....    NO
4        COUNT+CALL+EXTEND      .......8    NO
```

•
•
•

```
      DETECTOR ATTRIBUTES              Pg   8/8
-------------------------------------
Det           Type             Phases      Lock
29      >    PEDESTRIAN     <   .2......    NO
30           PEDESTRIAN         .....6..    NO
31           PEDESTRIAN         ...4....    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. Listed on the next page are the descriptions of the eleven types of detectors.

Type	Description
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.
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.
CALL	The detector input places a vehicle call to the selected phase during the yellow and red intervals.
EXTEND	The detector input places a vehicle call to the selected phase during the green interval.
COUNT+CALL	The detector input counts vehicles arriving and places a vehicle call to the selected phase during the yellow and red intervals.
CALL+EXTEND	The detector input places a vehicle call to the selected phase during all intervals.
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.
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.
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 the actuation is removed, whichever occurs first.
BICYCLE	The detector input places a bicycle call to the selected phase during the yellow and red interval, extends the selected phase during the green interval, and activates Bike Min Green and All-Red timers.
PEDESTRIAN	The detector input places a pedestrian call to the selected phase.

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 **Phase** 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. 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 setting 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 call received when the selected phase is Red. The YEL setting locks call received when the selected phases is Yellow or Red. Pedestrian detector calls are always locked; this setting has no effect on their operation. Select using the [+] and [−] keys.

The TSCP will not drop calls when a detector reset is issued by the controller. 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 eight screens for the thirty-two detectors, with four detectors shown on each screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown below. Pressing the [*] key at the first screen only allows the detectors to be reconfigured sequentially starting in slot 1 of the I input file.

```
DETECTOR CONFIGURATION           Pg  1/8
-------------------------------------------
Det    Delay        Extend     Recall     Port
1     >  0<          0.0         10         1.1
2        0           0.0          0         1.2
3        0           0.0         10         1.3
4        0           0.0         10         1.4
```

                              •
                              •
                              •

```
DETECTOR CONFIGURATION           Pg  8/8
-------------------------------------------
Det    Delay        Extend     Recall     Port
29    >  0<          0.0         10         5.1
30       0           0.0         10         5.2
31       0           0.0         10         5.3
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. 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, which prevents the detector from placing calls when it is 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.

Detector Fail Timers (5-3)

The **Detector Fail Timers** 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‹    (Minutes)
     Detector Fail Reset Time    120    (Minutes)


              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. A user requested Detector Reset will override this timer and immediately activate the Detector Reset line. 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.

```
            DETECTOR FAILURE OVERRIDE
     ---------------------------------------

          Det  1- 8:  ›........‹
          Det  9-16:  ........
          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 screen allows the user to assign detector inputs to the sixteen System Detectors.

```
          SYSTEM DETECTOR ASSIGNMENT
     --------------------------------------------
     Sys Det    1    2    3    4    5    6    7    8
     Det Num  > 2<   3    4    5    8    9   10   11
     .......
     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 this screen. 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 AB3418 protocol.

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 CIC operation.

```
                    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 clears all entries.

CIC Parameters Values (5-6-2)

The **CIC 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       >1.00<       1.00        1.00
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 Assignment (5-6-3)

The **Detector-To-Phase Assignment** data entry screen is used to set the detector assignments for CIC operation. There are sixteen System Detectors, with eight System Detectors shown on each half of the screen.

```
        CIC DETECTOR-TO-PHASE ASSIGNMENT
    --------------------------------------------
Sys Det   1    2    3    4    5    6    7    8
  Phase  >0<   0    0    0    0    0    0    0
........
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. Enter a zero to indicate that the System Detector is not used for CIC operation.

Communications/Soft Logic Menu (6)

Communications/Soft Logic Menu (6)

The **Communications / Soft Logic** submenu is used to select the Communications Parameters or Soft Logic Equation data entry screens.

```
       COMMUNICATIONS / SOFT LOGIC MENU
    ---------------------------------------
    1-Communication Parameters
    2-Soft Logic Equations
    3-Callback Numbers


```

Communication Parameters (6-1)

The **Communications Parameters** submenu allows the selection of one of the three serial ports which have communications parameter data entry screens. Select the serial port by pressing one of 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 below.

Serial Port (6-1-1), (6-1-2) and (6-1-3)

The **Serial Port** data entry screens allow the user to set the Protocol, Address, Limit Access, 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 1/2
    Address    >  0<      |  Data Bits      8
    Baud Rate  1200       |  Parity      NONE
    Protocol   AB3418     |  Stop Bits      1

    RTS Time   (ms)  |  Handshaking  |   Access
       On       20   |  ------------ |   Level
       Off      20   |    NORMAL     |     0
```

The **Address** entry is used to set the communications address for this serial port. Some communications protocols require an address to work, such as **AB3418** and **SINGLE**, while the **COMPLEX** protocol uses this entry to modify its operation. The **SIMPLEX** and **WWV/UTB**

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 to select.

Protocol	Description
NONE	The serial port is not used for communications. Any data received will be ignored, and no data will be transmitted.
AB3418/AB3418E	The serial port will accept commands from and provide a response to an AB3418 Master. When this protocol is selected, the valid range for the Address is 1-63.
MASTER	The serial port will broadcast AB3418 set time and set pattern messages out the port. This will allow TOD coordination to be established when a field master is not present. The time is broadcast once per second while the pattern is broadcast once per cycle. Note: The controller will not accept any responses from other local controllers and the interconnect wiring must be the same as though it were a field master. No Address is required.
SINGLE	The serial port will output AB3418 messages because the SINGLE protocol automatically polls AB3418/AB3418E messages on the controller. An address is required.
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.
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: 0 selects normal operation, 1 disables Master plan selection, 2 disables Slave plan selection, and 3 disables both Master and Slave plan selections.
UTB	The serial port will poll a UTB 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
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.

The **Limit Access** entry is used to restrict AB3418/AB3418E messages. Currently there are 4 levels of access.

Level	Access
0	No restrictions All AB3418/AB3418E messages (default)
1	AB3418/AB3418E Status only messages
2	AB3418* Short Status, Get Detector Information and Controller ID, AB3418E Status8 and Long Status Messages
3	Same as level 2 but includes AB3418E Set Manual Plan Message
4	Same as level 2 and 3 but includes AB3418 Set Time and Pattern

*AB3418 Set Time and Pattern, are not supported in levels 1, 2 or 3

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

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**.

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**. Note that the **NORMAL** setting must be used for the SIMPLEX, COMPLEX and WWV protocols to operate properly.

Changes to the Serial Port Parameter settings take effect immediately. Be sure to verify all Serial Port Parameters prior to connecting external communications equipment to the controller to prevent undesired operation.

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

```
AB3418 STATUS      Com 1:ON            Pg 2/2
Poll: 7E 05 33 C0 84 C5 F3 7E
Resp: 7E 05 13 C0 84 22 01 47 A3 7E
Stat: OKAY
Errs:--------------------------------------
Bad Value      0      Invalid Length    0
Read Only      0      Invalid Message   0
   Press * to reset error counters
```

The next screen shows the communication status. Refer to section **Comm Data (1-5)**.

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 four screens, with four equations on each screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown below:

```
    SOFT LOGIC EQUATIONS                    Pg 1/4
    ----------------------------------------------
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
 3    00.0   00    00.0   00    00.0   00    00.0
 4    00.0   00    00.0   00    00.0   00    00.0
```

                             •
                             •
                             •

```
    SOFT LOGIC EQUATIONS                    Pg 4/4
    ----------------------------------------------
EQ    Data   Op    Data   Op    Data   Op    Data
13   >00.0<  00    00.0   00    00.0   00    00.0
14    00.0   00    00.0   00    00.0   00    00.0
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, an understanding of their operation is necessary prior to implementing their operation in the field.

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 the 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.

The x in the opcodes represents either a 0, 1, 2 or 3 as shown below

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.

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 Data are available for use in the Soft Logic Equations. Where an **x** is used in the following table, it represents any decimal digit 0-9.

Data	Description		Data	Description
	Inputs			
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
	Outputs			
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

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

Command

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*

Coordination

2A.x	Command Local Plan 1-8	**2B.x**	Command Local Plan 9

Phases

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	**40.x**	Force/Max Lock phases
41.x	Double Entry phases	**42.x**	Rest In Walk phases
43.x	Rest In Red phases	**44.x**	Walk 2 phases
45.x	Max Green 2 phases	**46.x**	Max Green 3 phases

---------Data Words 50 through 7E are Read-Only---------

50.x	Special Functions on	**51.x**	Red phases
52.x	Yellow phases	**53.x**	Green phases
54.x	Don't 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

Data	**Description**	**Data**	**Description**
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**	RR Preempt Active
72.5	EV Preempt Active	**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	*Reserved*	**73.6**	*Reserved*
73.7	ATSAC comm valid	**73.8**	ATSAC "On-line" operation

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`74.x`	Current Local Plan 1-8	`75.x`	Current Local Plan 9
`7A.x`	Coded Status Bits, ring A	`7B.x`	Coded Status Bits, ring B
`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 50 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.

Callback Numbers (6-3)

The **Callback Numbers** submenu allows entering and changing callback phone numbers. The user must enter the correct password otherwise a window will prompt PASSWORD PROTECTED! The password must be entered at (see chapter 4 section 6 Write Permission) then press [ENTER] key and then press [ESC] to get to the previous page. Press the [NEXT] key to move to the next screen. Only the first and last screens are shown below.

```
┌─────────────────────────────────────────────────┐
│             CALLBACK ACCESS DENIED!               │
│                                                   │
│             PASSWORD PROTECTED!                   │
│                                                   │
│                                                   │
│                                                   │
│                                                   │
└─────────────────────────────────────────────────┘
```

Once the password has been entered, the user will be able to access the callback numbers:

```
┌─────────────────────────────────────────────────┐
│          CALLBACK NUMBERS 1            Pg 1/3     │
│       --------------------------------------      │
│  Line Out:      >0<         (0 or 9)              │
│  Long Dist:      1          (0 or 1)              │
│  Toll:           0          (0 or 1)              │
│  Delay:         10                                │
│  Area Code:    916          (Long distance only)  │
│  Phone Num:    555-1212                           │
└─────────────────────────────────────────────────┘
```

```
            CALLBACK NUMBERS 3                 Pg 3/3
--------------------------------------------------
Line Out:      >0<         (0 or 9)
Long Dist:      1          (0 or 1)
Toll:           0          (0 or 1)
Delay:         10
Area Code:     916         (Long distance only)
Phone Num:     555-1212
```

Enter the callback number, and the number will automatic be stored. Remember to press the [ENTER] key, after each selection

Function	Valid Range
Line Out	0 or 9 Default 0 (no line out required)
Toll	0 or 1 Default 0 (not a toll charge number)
Long Distance	0 or 1 Default 0 (not a long distance number)
Delay	the number of seconds the callback routine waits before dialing the modem. Valid 0 to 255 seconds. Default 10 seconds.
Area Code	3 digit area code required for long distance call
Phone number	7-digit phone number required for callback

Long Distance must be selected in order to enter the **Area Code.

Note: Remember the password has a built in time-out feature, if the password times-out before entering the numbers, then reentered the password and continue. The time-out value can be adjusted at (9-5).

Coordination Menu (7)

Coordination Menu (7)

The **Coordination** submenu allows the selection of thirteen data entry screens for Coordinated operation of the controller. Nine of these screens are for Local Plan data, one is for Master Timer Synchronization, two for Yellow Yield Coordination, and one is for Free Plan data.

```
        COORDINATION TIMING DATA ENTRY
-------------------------------------------
                  Select Plan:
1-Local Plans 1-9
A-Master Timer Sync
C-D Y-Coord Plans
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 below.

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, Multiplier, Permissive, Offset Green Factors, and the Lag, Sync, Hold, Omit, Min Recall, Max Recall, Ped Recall and Bike Recall phases are all entered on these three screens. Press the [NEXT] key to advance through the screens.

```
    LOCAL PLAN 1 - CYCLE DATA        Pg 1/3
-------------------------------------------
Cycle Length    > 90<    Plan    (A)     0
Multiplier       0.0   Offset    (B)     0
Permissive        0              (C)     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 **Multiplier** entry can be used to half or double the selected plan cycle length. Setting 0.5 will result in timing half the value of the plan cycle length and a setting of 2.0 will double the plan cycle length. Since a cycle length must be between 30 and 240seconds, the program will not run a half cycle for a plan cycle length less than 60 seconds. During a double cycle length operation, the local will ignore the first sync pulse from the master if the plan is selected in Master Timer Sync (7-A). Valid values are 0.0 no multiplier, 0.5 half multiplier, and 2.0 double multiplier.

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 below 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.

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.

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

```
    LOCAL PLAN 1 - GREEN FACTORS      Pg 2/3
   -----------------------------------------
    -1-    -2-   -3-    -4-   -5-    -6-   -7-    -8-
  > 10<    25    10     25    10     25    10     25

    - Press the F key to Toggle Between -
        GREEN FACTORS and FORCE-OFFS
          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 below 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. If Walk 2 phases are selected, the pedestrian interval will be ignored in the pedestrian phase green factor calculations.

Force-Offs, which are fixed points in the cycle when phases must end.
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 3/3
  -------------------------------------------
  - PHASE FLAGS -              - RECALL FLAGS -
  Lag    >.2.4.6.8<     Veh Min   .2.4.6.8
  Sync   .2...6..       Veh Max   .2...6..
  Hold   .......          Ped     .......
  Omit   .......          Bike    .......
            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 phase 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.

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 is a description of all of the possible warning 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.

Master Timer Sync (7-A)

```
┌──────────────────────────────────────────┐
│   SYNC LOCAL PLAN MASTER TIMER      Pg 1/2 │
│       TO FIELD MASTER TIMER                │
│ ------------------------------------------ │
│               Enable in Plans              │
│                 >.........<                │
│                                            │
│                                            │
│                                            │
└──────────────────────────────────────────┘
```

Enable in plans allows the master timer of the local controller to sync with the master timer of the field master at the start of each cycle, otherwise the master timer references midnight.

```
┌──────────────────────────────────────────┐
│   MASTER SUB MASTER CONFIGURATION   Pg 2/2 │
│ ------------------------------------------ │
│ Master              Input         Output   │
│ Offset              Port          Port     │
│                     >0.0<          0       │
│                                            │
│                                            │
└──────────────────────────────────────────┘
```

MSM Output MSM Output sends approximately a 1-second pulse to AUX output at the beginning of each cycle. Valid output values are 0,1,2,3, or 4. A zero value means disabled no output, a 1 sends a pulse to output (Offset 1 AUX 3 Red), 2 output (Offset 2 AUX 6 Red), 3 (Offset 3 AUX 6 Green), and 4 to Dial 3. The outputs can be tested using the special function in the Commands Menu (4-2). The current plan must be enabled for the MSM output to function. Both MSM Input and Output will work only with TOD plans.

Yellow Yield Coordination (7-C, 7-D)

The **Y-Coordination Plans C and D** Data entry screens allow the user to enter all timing and phase information relating to the yellow yield coordinated plans. The Long Green, No Green, Offset, Permissive, Offset, Phase Force-Offs, and the Coord, Lag, and Min Recall phases are all entered on these two screens. Press the [NEXT] key to advance through the screens.

```
┌──────────────────────────────────────────┐
│   Y-Coord  C - TIMINGDATA           Pg 1/2 │
│ ------------------------------------------ │
│ Long Green   >  0<       Sync     .2...6.. │
│ No Green        0        Lag      .2.4.6.8 │
│  Offset         0     Min Recall  ........ │
│ Permissive      0     Restricted  ........ │
│                                            │
│           Press * to verify plan           │
└──────────────────────────────────────────┘
```

The **Long Green** entry is used to enter the Long Green period for the selected Y-Coord Plan. The Long Green Period is the maximum amount of time the Master Controller green input can hold the sync phases. If the long green time expires, the slave intersection automatically starts the Offset timer so the sync phases can yield. Valid range is 0-239 seconds. Minimum Long Green Period is 40 seconds.

The **No Green** entry is used to enter the No Green period for the selected Y-Coord Plan. The No Green Period is the maximum amount of time the slave receives a no-green input from the Master Controller. If the no green time expires, the slave intersection automatically starts the Offset timer so the sync phases can yield. Valid range is 0-239 seconds. Minimum No Green Period is 40 seconds.

The **Offset** entry is used to enter the Offset Period for the selected Y-Coord Plan. The Offset is the amount of time the slave holds the sync phases after the Master Controller's synchronized phases yield (not green). 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 Y-Coord 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.

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

The **Lag** entry is used to select the phases that are to be Lagging in the Y-Coord 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 **Veh Min** entry is used to select the phases that are to have a Vehicle Minimum Recall placed in the Y-Coord 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 **Restricted** entry is used to select the phases that are to be Restricted during Y-Coord operation. **Both sync phase cannot be restricted at the same time.** Restricted phases for all operations should be set at (2-1-2).

```
   Y-Coord  C - FORCE-OFFS           Pg 2/2
  ------------------------------------------
   -1-    -2-   -3-    -4-    -5-   -6-   -7-   -8-
 >  35<     0    10     25     35     0    10    25



           Press * to verify plan
```

Force-Offs, are fixed points in the cycle when phases must end. **Y-Coordination Force-Offs start timing after the Offset timer has completed**. 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. Y-Coord 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.

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, Bike Recall and Conditional Service phases are all entered on these two screens. Press the [NEXT] key to advance through the screens.

```
    FREE PLAN - PHASE FLAGS        Pg 1/2
   ------------------------------------------
   - PHASE FLAGS -            - RECALL FLAGS -
                        |    Veh Min   .2.4.6.8
      Lag   >.2.4.6.8<  |    Veh Max   .2...6..
      Omit   .......    |      Ped     .......
                        |      Bike    .......
```

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.

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.

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

```
┌──────────────────────────────────────────────────┐
│  Free plan - CONDITIONAL SERVICE         Pg 2/2   │
│  ------------------------------------------------  │
│     Minimum                        Phases          │
│      Green              Normal          Active     │
│       > 10<             1...5...       ........     │
│                                                    │
│                                                    │
│                                                    │
└──────────────────────────────────────────────────┘
```

The **Normal Phase** entry is used to select the condition service phases during free operation. Normal phase entries will enable conditional service phases to operate all the time during free operation. If it is desired to enable/disable conditional service at certain times, use TOD Function codes 24 or 25 to activate conditional service and select the conditional service phases at 8-3 TOD Functions. Phases set here will operate all the time regardless of TOD. When using TOD Function codes 24 or 25, the conditional service phases should only be set at 8-3 TOD Functions. Active Phases are read only and displays the current active conditional service phases. Conditional service is disabled during coordination.

Conditional service has the capability to serve left turns (odd numbered phases) more than once in a signal cycle. The operator can select phase or phases for conditional service, however, the program will only allow selecting odd number phases. The conditional service phases will be re-serviced in the cycle if the following conditions are met:

1. There is a cross street call

2. There is no odd phase in service. The decision to go to conditional service is made when one of the opposing even through phases is ready to terminate.

3. Sufficient time remains on the concurrent through phase maximum extension to time a yellow change and red clearance interval for the terminating phase and a minimum of 10 seconds green for the conditional service phase.

The 10 second **Minimum Green** can be set by the operator, but the program will not allow any setting less than 10 seconds.

TOD Schedule Menu (8)

TOD Schedule Menu (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
    2-TOD Scheduler
    3-TOD Functions
    4-Solar Clock Data
    5-Sabbatical Clock
    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   >09:37:21<          DAYLIGHT TIME
    Date   11/14/2008             FRIDAY

    Daylight Saving Time    ON

```

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.

TOD Scheduler (8-2)

The **TOD Scheduler** submenu 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 Floating and Fixed Holiday schedules are all accessed from this screen.

```
┌─────────────────────────────────────────────────────┐
│          TIME-OF-DAY SCHEDULE SUBMENU                 │
│    -------------------------------------------        │
│        1-TOD Table 1        7-Weekday Tables          │
│        2-TOD Table 2        8-Float Holidays          │
│        3-TOD Table 3        9-Fixed Holidays          │
│        4-TOD Table 4                                  │
│        5-TOD Table 5                                  │
│        6-TOD Table 6                                  │
│                                                       │
└─────────────────────────────────────────────────────┘
```

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 below

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.

```
┌─────────────────────────────────────────────────────┐
│       TIME-OF-DAY TABLE 1                 Pg 1/2      │
│    -------------------------------------------------  │
│     #   Time   PLAN  Offset      #   Time   Plan  Offset │
│     1  >0000<     0    A    |    5  0000     0     A   │
│     2   0000      0    A    |    6  0000     0     A   │
│     3   0000      0    A    |    7  0000     0     A   │
│     4   0000      0    A    |    8  0000     0     A   │
│                                                       │
└─────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────┐
│       TIME-OF-DAY TABLE 1                 Pg 2/2      │
│    -------------------------------------------------  │
│     #   Time   PLAN  Offset      #   Time   Plan  Offset │
│     9   0000      0    A    |   13  0000     0     A   │
│    10   0000      0    A    |   14  0000     0     A   │
│    11   0000      0    A    |   15  0000     0     A   │
│    12   0000      0    A    |   16  0000     0     A   │
│                                                       │
└─────────────────────────────────────────────────────┘
```

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) with selectable Offset (OS) A, B or C, 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 seven 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.

Floating Holidays (8-2-8)

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

```
        FLOATING HOLIDAYS              Pg 1/4
-------------------------------------------
Entry     Month     Week       DOW       Table
  1        > 1<       3      M......       2
  2          2        3      M......       2
  3          0        0      .......       0
  4          0        0      .......       0
```

```
        FLOATING HOLIDAYS              Pg 4/4
-------------------------------------------
Entry     Month     Week       DOW       Table
 13          0        0      .......       0
 14          0        0      .......       0
 15          0        0      .......       0
 16          0        0      .......       0
```

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 four screens. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown below.

```
        FIXED HOLIDAYS            Pg 1/4
----------------------------------------
Entry      Month     Week      DOW      Table
  1       > 1<        3     M......       2
  2         2         3     M......       2
  3         0         0     .......       0
  4         0         0     .......       0
```

•
•
•

```
        FIXED HOLIDAYS            Pg 4/4
----------------------------------------
Entry      Month     Week      DOW      Table
 13         0         0     .......       2
 14         0         0     .......       2
 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 Function** 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 four screens, with four entries per screen. Press the [NEXT] key to advance through the screens. Only the first and last screens are shown below.

```
        TIME-OF-DAY FUNCTION              Pg 1/4
   ------------------------------------------
   #     Start   End      DOW     Action  Phases
   1    >0000<  0000    .......      0    ........
   2     0000   0000    .......      0    ........
   3     0000   0000    .......      0    ........
   4     0000   0000    .......      0    ........
```

•
•
•

```
        TIME-OF-DAY FUNCTION              Pg 4/4
   ------------------------------------------
   #     Start   End      DOW     Action  Phases
   13    0000   0000    .......      0    ........
   14    0000   0000    .......      0    ........
   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 possible Action codes are shown in the table below.

The **Phase** 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 22, Phases 1-4 are used to specify Special Functions 1-4 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	Y-Coordination Plan C.
13	Y-Coordination Plan D.
14	Free Operation.
15	Flashing Operation.
16	Walk 2 phases.
17	Maximum Green 2 phases.
18	Maximum Green 3 phases.
19	Rest in Walk phases
20	Rest in Red phases
21	Free Lag Phases
22	Special Functions.
23	Truck Preemption
24	Conditional Service Free Operation
25	Conditional Service Free Operation
26	Leading Pedestrian
41	Protected Permissive
42	Protected Permissive

If 100 is added to the Action codes shown above to create codes 101-111, 116-120 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 201-211, 216-220 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 22 can be used to activate the Special Functions. Action codes 112 to 115, 212 to 215 and 122 and 222 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 05:38:10
    Local Time Zone     8      Sunset  16:52:14



```

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
    01/10/5759      Sabbath    >........<
                    Holiday     ........

```

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

The **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 **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 programmed into the TSCP 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 Holiday is 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 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.

```
            TIME-OF-DAY CLOCK
   --------------------------------------------
    Time      >09:37:21<          DAYLIGHT TIME
    Date      11/14/2008              MONDAY

   Daylight Saving Time   ON


```

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 second Sunday in March, and moved back one hour at 2:00 AM on the first Sunday in November. Select with the [YES] and [NO] keys.

Utilities Menu (9)

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, and Access Utilities.

```
          UTILITIES MENU
------------------------------------------
1-Event Record
2-Diagnostic Tests
3-RAM Initialization
4-Copy Parameters
5-Access Utilities
```

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
4 00/00/0000 00:00:00 NONE
5 00/00/0000 00:00:00 NONE
6 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
TRUCK PREEMPT	A Truck Vehicle Preempt input was activated.
FIELD I/O ERROR	An error occurred communicating with the Field I/O Module.
BATTERY BACKUP	A Battery Backup input was activated.

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
 2-Output file Test
 3-Front Panel Test
 4-Display 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 is one screen for the 332 Cabinet Input File Test: the top portion of the screen represents the **I-File** while the bottom half represents the **J-File**. There is only one screen for the 337 Cabinet Input File Test.

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

```
Ring    332 CABINET - OUTPUT FILE TEST
 A      R..   ..G  R..   R..   R..   R..    Det
 B      R..   ..G  R..   R..   R..   R..   Reset
Aux     R..   R..  ...   R..   R..   ...     .
       ------------------------------------------
Phs      1     2    2P    3     4     4P     A
Phs      5     6    6P    7     8     8P     B
Ovrlp    E     F    ---   C     D     ---   Aux
```

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 line is ON.

```
        337 CABINET - OUTPUT FILE TEST
                                          Det
R..    ..G   R..   R..   R..   R..        Rst
                                            *
```

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 ESC twice to terminate test
```

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 Diagnostic Test Menu.

RAM Initialization (9-3)

The **RAM Initialization** submenu allows the selection of one of threee RAM Initialization Configurations. These are Caltrans 332, Universal 332, and Universal 337. Select the desired configuration by pressing one of the number keys [1] through [3].

```
             CONTROLLER INITIALIZATION
    -------------------------------------------
    1-Caltrans 332
    2-Universal 332
    3-Universal 337



```

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

Controller Initialization (9-3-1), (9-3-2) and (9-3-3)

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

```
           CONTROLLER INITIALIZATION
    --------------------------------------------


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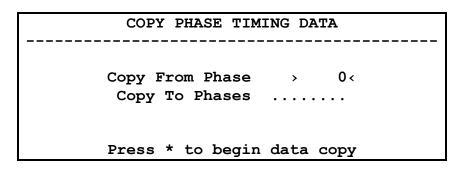
Press the [ESC] key to return to the Utilities Menu screen.

Copy Parameters (9-4)

The **Copy Parameters** screen allows the user to select one of three data copy utilities.

```
            COPY PARAMETERS
  -------------------------------------------
  1-Phase Timing Data
  2-Coordination Data
  3-Time-of-Day Table
  4-Transit Priority
  5-Configuration Data
```

Copy Phase Timing Data (9-4-1)

The **Copy 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
```

Copy Coordination Data (9-4-2)

The **Copy 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
```

Copy Time-Of-Day Table (9-4-3)

The **Copy Time-of-Day Table** screen allows the user to copy data between Time-of-Day Tables.

```
                COPY TIME-OF-DAY TABLE
    ---------------------------------------------


            Copy From Table   >    0<
             Copy To Tables  .......



             Press * to begin data copy
```

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:

```
        Copy completed. Press ESC for menu
```

Copy Transit Priority Data (9-4-4)

The **Copy 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.

```
             COPY TRANSIT PRIORITY 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 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:

```
        Copy completed. Press ESC for menu
```

Backup/Restore Configuration Data (9-4-5)

The **Backup/Restore Configuration** Data screen allows the user to backup and restore the controller configurations by Flash or Datakey.

```
    BACKUP/RESTORE CONTROLLER CONFIGURATION
    ---------------------------------------------
    1-Copy to Flash
    2-Copy from Flash
    3-Copy to Datakey
    4-Copy From Datakey


```

<u>**Copy To Flash (9-4-5-1)**</u>

This feature allows **Backup** of all the **TSCP** operation timing and configuration. Backup copies "tscpdata.dat" from static memory /r0 to flash memory /f0.

```
┌────────────────────────────────────────────────┐
│         BACKUP CONTROLLER CONFIGURATION          │
│                                                  │
│                                                  │
│         Press * To Begin Backup Procedure        │
│                                                  │
│                                                  │
│                                                  │
└────────────────────────────────────────────────┘
```

Press the [∗] key to initiate the backup procedure. When the copy is complete, the following message is shown:

```
┌────────────────────────────────────────────────┐
│         Copy completed. Press ESC for menu       │
└────────────────────────────────────────────────┘
```

<u>**Copy From Flash (9-4-5-2)**</u>

This feature allows previously saved timing and configuration to be restored.   A successful restore requires the signal to be on hardware flash. "tscpdata.dat" is copied from flash memory /f0 to static memory /r0.
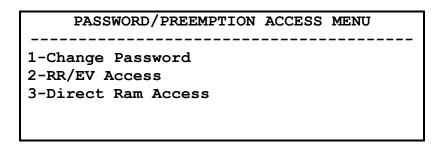
```
┌────────────────────────────────────────────────┐
│                  -- CAUTION --                   │
│                                                  │
│         SIGNAL MUST BE ON HARDWARE FLASH         │
│                                                  │
│                                                  │
│         Press * To restore configuration         │
└────────────────────────────────────────────────┘
```

Press the [∗] key to initiate the restore procedure. When the copy is complete, the following message is shown:

```
┌────────────────────────────────────────────────┐
│         Copy completed. Press ESC for menu       │
└────────────────────────────────────────────────┘
```

Copy To DataKey (9-4-5-3)

This feature allows **Backup** of all the **TSCP** operation timing and configuration. Backup copies "tscpdata.dat" from static memory /r0 to a dataKey.

```
┌─────────────────────────────────────────────┐
│        COPY CONFIGURATION TO DATAKEY          │
│                                               │
│                                               │
│          Press * To Copy to Datakey           │
│                                               │
│                                               │
│                                               │
│                                               │
└─────────────────────────────────────────────┘
```

Press the [∗] key to initiate the copy procedure. When the copy is complete, the following message is shown:

```
┌─────────────────────────────────────────────┐
│       Copy completed. Press ESC for menu      │
└─────────────────────────────────────────────┘
```

Copy From Datakey (9-4-5-4)

This feature allows saved timing and configuration to be restored from a datakey.   A successful restore requires the signal to be on hardware flash. "tscpdata.dat" is copied from a datakey to static memory /r0.

```
┌─────────────────────────────────────────────┐
│                 -- CAUTION --                 │
│                                               │
│         SIGNAL MUST BE ON HARDWARE FLASH      │
│                                               │
│                                               │
│                                               │
│          Press * To copy from datakey         │
└─────────────────────────────────────────────┘
```

Press the [∗] key to initiate the copy procedure. When the copy is complete, the following message is shown:

```
┌─────────────────────────────────────────────┐
│       Copy completed. Press ESC for menu      │
└─────────────────────────────────────────────┘
```

Access Utilities(9-5)

Caltrans **Access Utilities** currently has three options Change Password, RR Access and Direct Ram Access.

```
       PASSWORD/PREEMPTION ACCESS MENU
   ------------------------------------------
   1-Change Password
   2-RR/EV Access
   3-Direct Ram Access


```

Change Password (9-5-1)

The **Password** sub-menu allows changing the password. But before entering to this section the user must enter the password in section 4.6. The default password is **332.** New Password changes the default password. Valid password range 0 to 999. Timeout changes the password time out feature. Valid timeout range 1 to 255. All password-protected areas will be write protected when the password timeout expires.

```
                PASSWORD MENU
   ------------------------------------------


   Change Password    >332<
   Password Timeout    10    (Minutes)


```

RR/EV Access (9-5-2)

```
                PREEMPTION ACCESS
   ------------------------------------------



               Full RR/EV Access  >NO<


```

Allows Full **RR** and **EV Preemption Access**. **YES** or **NO**. The entry will automatically return to NO when the password timer expires

Terminate Program (9-6) (Unavailable LA DOT Only)

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.

Appendix A

Pin Assignments

Default ATSAC 332 Cabinet C1 Pin Assignments

PIN	I/O	FUNCTION	PIN	I/O	FUNCTION
1	*****	LOGIC GROUND	53	I 2-7	ADVANCE ENABLE
2	O 1-1	4P DONT WALK	54	I 2-8	FLASH BUS
3	O 1-2	4P WALK	55	I 3-1	Ø5 CALL+EXTEND
4	O 1-3	Ø4 RED	56	I 3-2	Ø1 CALL+EXTEND
5	O 1-4	Ø4 YELLOW	57	I 3-3	Ø7 CALL+EXTEND
6	O 1-5	Ø4 GREEN	58	I 3-4	Ø3 CALL+EXTEND
7	O 1-6	Ø3 RED	59	I 3-5	Ø8 COUNT+CALL+EXTEND
8	O 1-7	Ø3 YELLOW	60	I 3-6	Ø4 COUNT+CALL+EXTEND
9	O 1-8	Ø3 GREEN	61	I 3-7	Ø8 COUNT+CALL+EXTEND
10	O 2-1	2P DONT WALK	62	I 3-8	Ø4 COUNT+CALL+EXTEND
11	O 2-2	2P WALK	63	I 4-5	SYSTEM DETECTOR 3
12	O 2-3	Ø2 RED	64	I 4-6	SYSTEM DETECTOR 11
13	O 2-4	Ø2 YELLOW	65	I 4-7	SYSTEM DETECTOR 7
14	*****	INPUT GROUND	66	I 4-8	SYSTEM DETECTOR 15
15	O 2-5	Ø2 GREEN	67	I 5-1	Ø2 PEDESTRIAN
16	O 2-6	Ø1 RED	68	I 5-2	Ø6 PEDESTRIAN
17	O 2-7	Ø1 YELLOW	69	I 5-3	Ø4 PEDESTRIAN
18	O 2-8	Ø1 GREEN	70	I 5-4	Ø8 PEDESTRIAN
19	O 3-1	8P DONT WALK	71	I 5-5	EVA PREEMPT
20	O 3-2	8P WALK	72	I 5-6	EVB PREEMPT
21	O 3-3	Ø8 RED	73	I 5-7	EVC PREEMPT
22	O 3-4	Ø8 YELLOW	74	I 5-8	EVD PREEMPT
23	O 3-5	Ø8 GREEN	75	I 6-1	DOOR AJAR
24	O 3-6	Ø7 RED	76	I 6-2	SYSTEM DETECTOR 4
25	O 3-7	Ø7 YELLOW	77	I 6-3	SYSTEM DETECTOR 12
26	O 3-8	Ø7 GREEN	78	I 6-4	SYSTEM DETECTOR 8
27	O 4-1	6P DONT WALK	79	I 6-5	SYSTEM DETECTOR 16
28	O 4-2	6P WALK	80	I 6-6	MANUAL ADVANCE
29	O 4-3	Ø6 RED	81	I 6-7	FLASH SENSE
30	O 4-4	Ø6 YELLOW	82	I 6-8	STOP TIME
31	O 4-5	Ø6 GREEN	83	O 6-1	SPECIAL FUNCTION 1
32	O 4-6	Ø5 RED	84	O 6-2	SPECIAL FUNCTION 3
33	O 4-7	Ø5 YELLOW	85	O 6-3	OLD RED
34	O 4-8	Ø5 GREEN	86	O 6-4	OLD YELLOW
35	O 5-1	OLA GREEN	87	O 6-5	OLD GREEN
36	O 5-2	OLB GREEN	88	O 6-6	OLC RED
37	O 5-3	OLA YELLOW	89	O 6-7	OLC YELLOW
38	O 5-4	OLB YELLOW	90	O 6-8	OLC GREEN
39	I 1-1	SYSTEM DETECTOR 1	91	O 7-1	NOT ASSIGNED
40	I 1-2	SYSTEM DETECTOR 9	92	*****	LOGIC GROUND
41	I 1-3	SYSTEM DETECTOR 5	93	O 7-2	NOT ASSIGNED
42	I 1-4	SYSTEM DETECTOR 13	94	O 7-3	OLB RED
43	I 1-5	SYSTEM DETECTOR 2	95	O 7-4	OLB YELLOW
44	I 1-6	SYSTEM DETECTOR 10	96	O 7-5	OLB GREEN
45	I 1-7	SYSTEM DETECTOR 6	97	O 7-6	OLA RED
46	I 1-8	SYSTEM DETECTOR 14	98	O 7-7	OLA YELLOW
47	I 2-1	Ø2 CALL+EXTEND	99	O 7-8	OLA GREEN
48	I 2-2	Ø6 CALL+EXTEND	100	O 5-5	SPECIAL FUNCTION 2
49	I 2-3	Ø4 CALL+EXTEND	101	O 5-6	SPECIAL FUNCTION 4
50	I 2-4	Ø8 CALL+EXTEND	102	O 5-7	DETECTOR RESET
51	I 2-5	RR1 PREEMPT	103	O 5-8	WATCHDOG
52	I 2-6	RR2 PREEMPT	104	*****	INPUT GROUND

Default ATSAC 337 Cabinet C1 Pin Assignments

PIN	I/O	FUNCTION	PIN	I/O	FUNCTION
1	*****	LOGIC GROUND	53	I 2-7	ADVANCE ENABLE
2	O 1-1	4P DONT WALK	54	I 2-8	FLASH BUS
3	O 1-2	4P WALK	55	I 3-1	NOT ASSIGNED
4	O 1-3	Ø4 RED	56	I 3-2	Ø1 CALL+EXTEND
5	O 1-4	Ø4 YELLOW	57	I 3-3	NOT ASSIGNED
6	O 1-5	Ø4 GREEN	58	I 3-4	SYSTEM DETECTOR 1
7	O 1-6	Ø3 RED	59	I 3-5	SYSTEM DETECTOR 8
8	O 1-7	Ø3 YELLOW	60	I 3-6	SYSTEM DETECTOR 10
9	O 1-8	Ø3 GREEN	61	I 3-7	SYSTEM DETECTOR 9
10	O 2-1	2P DONT WALK	62	I 3-8	SYSTEM DETECTOR 7
11	O 2-2	2P WALK	63	I 4-5	NOT ASSIGNED
12	O 2-3	Ø2 RED	64	I 4-6	NOT ASSIGNED
13	O 2-4	Ø2 YELLOW	65	I 4-7	NOT ASSIGNED
14	*****	INPUT GROUND	66	I 4-8	NOT ASSIGNED
15	O 2-5	Ø2 GREEN	67	I 5-1	Ø2 PEDESTRIAN
16	O 2-6	Ø1 RED	68	I 5-2	Ø6 PEDESTRIAN
17	O 2-7	Ø1 YELLOW	69	I 5-3	Ø4 PEDESTRIAN
18	O 2-8	Ø1 GREEN	70	I 5-4	Ø8 PEDESTRIAN
19	O 3-1	NOT ASSIGNED	71	I 5-5	EVA PREEMPT
20	O 3-2	NOT ASSIGNED	72	I 5-6	EVB PREEMPT
21	O 3-3	NOT ASSIGNED	73	I 5-7	NOT ASSIGNED
22	O 3-4	NOT ASSIGNED	74	I 5-8	NOT ASSIGNED
23	O 3-5	NOT ASSIGNED	75	I 6-1	DOOR AJAR
24	O 3-6	NOT ASSIGNED	76	I 6-2	NOT ASSIGNED
25	O 3-7	NOT ASSIGNED	77	I 6-3	NOT ASSIGNED
26	O 3-8	NOT ASSIGNED	78	I 6-4	NOT ASSIGNED
27	O 4-1	NOT ASSIGNED	79	I 6-5	NOT ASSIGNED
28	O 4-2	NOT ASSIGNED	80	I 6-6	MANUAL ADVANCE
29	O 4-3	NOT ASSIGNED	81	I 6-7	FLASH SENSE
30	O 4-4	NOT ASSIGNED	82	I 6-8	STOP TIME
31	O 4-5	NOT ASSIGNED	83	O 6-1	NOT ASSIGNED
32	O 4-6	NOT ASSIGNED	84	O 6-2	NOT ASSIGNED
33	O 4-7	NOT ASSIGNED	85	O 6-3	NOT ASSIGNED
34	O 4-8	NOT ASSIGNED	86	O 6-4	NOT ASSIGNED
35	O 5-1	8P WALK	87	O 6-5	NOT ASSIGNED
36	O 5-2	NOT ASSIGNED	88	O 6-6	NOT ASSIGNED
37	O 5-3	8P DONT WALK	89	O 6-7	NOT ASSIGNED
38	O 5-4	NOT ASSIGNED	90	O 6-8	NOT ASSIGNED
39	I 1-1	Ø4 CALL+EXTEND	91	O 7-1	NOT ASSIGNED
40	I 1-2	SYSTEM DETECTOR 5	92	*****	LOGIC GROUND
41	I 1-3	SYSTEM DETECTOR 3	93	O 7-2	NOT ASSIGNED
42	I 1-4	SYSTEM DETECTOR 6	94	O 7-3	NOT ASSIGNED
43	I 1-5	Ø4 CALL+EXTEND	95	O 7-4	NOT ASSIGNED
44	I 1-6	NOT ASSIGNED	96	O 7-5	NOT ASSIGNED
45	I 1-7	SYSTEM DETECTOR 4	97	O 7-6	NOT ASSIGNED
46	I 1-8	NOT ASSIGNED	98	O 7-7	NOT ASSIGNED
47	I 2-1	NOT ASSIGNED	99	O 7-8	NOT ASSIGNED
48	I 2-2	NOT ASSIGNED	100	O 5-5	NOT ASSIGNED
49	I 2-3	Ø3 CALL+EXTEND	101	O 5-6	NOT ASSIGNED
50	I 2-4	SYSTEM DETECTOR 2	102	O 5-7	DETECTOR RESET
51	I 2-5	RR1 PREEMPT	103	O 5-8	WATCHDOG
52	I 2-6	RR2 PREEMPT	104	*****	INPUT GROUND

Default Universal 332 Cabinet C1 Pin Assignments

PIN	I/O	FUNCTION	PIN	I/O	FUNCTION
1	*****	LOGIC GROUND	53	I 2-7	ADVANCE ENABLE
2	O 1-1	4P DONT WALK	54	I 2-8	FLASH BUS (DIAL 2)
3	O 1-2	4P WALK	55	I 3-1	Ø5 COUNT+CALL+EXTEND
4	O 1-3	Ø4 RED	56	I 3-2	Ø1 COUNT+CALL+EXTEND
5	O 1-4	Ø4 YELLOW	57	I 3-3	Ø7 COUNT+CALL+EXTEND
6	O 1-5	Ø4 GREEN	58	I 3-4	Ø3 COUNT+CALL+EXTEND
7	O 1-6	Ø3 RED	59	I 3-5	Ø8 COUNT+CALL+EXTEND (RESET 2)
8	O 1-7	Ø3 YELLOW	60	I 3-6	Ø4 COUNT+CALL+EXTEND (FREE)
9	O 1-8	Ø3 GREEN	61	I 3-7	Ø8 COUNT+CALL+EXTEND (RESET 3)
10	O 2-1	2P DONT WALK	62	I 3-8	Ø4 COUNT+CALL+EXTEND (RESET 1)
11	O 2-2	2P WALK	63	I 4-5	Ø2 COUNT+CALL+EXTEND
12	O 2-3	Ø2 RED	64	I 4-6	Ø6 COUNT+CALL+EXTEND
13	O 2-4	Ø2 YELLOW	65	I 4-7	Ø4 COUNT+CALL+EXTEND
14	*****	INPUT GROUND	66	I 4-8	Ø8 COUNT+CALL+EXTEND
15	O 2-5	Ø2 GREEN	67	I 5-1	Ø2 PEDESTRIAN
16	O 2-6	Ø1 RED	68	I 5-2	Ø6 PEDESTRIAN
17	O 2-7	Ø1 YELLOW	69	I 5-3	Ø4 PEDESTRIAN
18	O 2-8	Ø1 GREEN	70	I 5-4	Ø8 PEDESTRIAN
19	O 3-1	8P DONT WALK	71	I 5-5	EVA PREEMPT
20	O 3-2	8P WALK	72	I 5-6	EVB PREEMPT
21	O 3-3	Ø8 RED	73	I 5-7	EVC PREEMPT
22	O 3-4	Ø8 YELLOW	74	I 5-8	EVD PREEMPT
23	O 3-5	Ø8 GREEN	75	I 6-1	DOOR AJAR (DIAL 3)
24	O 3-6	Ø7 RED	76	I 6-2	Ø2 COUNT+CALL+EXTEND
25	O 3-7	Ø7 YELLOW	77	I 6-3	Ø6 COUNT+CALL+EXTEND
26	O 3-8	Ø7 GREEN	78	I 6-4	Ø4 COUNT+CALL+EXTEND
27	O 4-1	6P DONT WALK	79	I 6-5	Ø8 COUNT+CALL+EXTEND
28	O 4-2	6P WALK	80	I 6-6	MANUAL ADVANCE
29	O 4-3	Ø6 RED	81	I 6-7	FLASH SENSE
30	O 4-4	Ø6 YELLOW	82	I 6-8	STOP TIME
31	O 4-5	Ø6 GREEN	83	O 6-1	SPECIAL FUNCTION 1
32	O 4-6	Ø5 RED	84	O 6-2	SPECIAL FUNCTION 3
33	O 4-7	Ø5 YELLOW	85	O 6-3	OLD RED
34	O 4-8	Ø5 GREEN	86	O 6-4	OLD YELLOW
35	O 5-1	OLA GREEN	87	O 6-5	OLD GREEN
36	O 5-2	OLB GREEN	88	O 6-6	OLC RED
37	O 5-3	OLA YELLOW	89	O 6-7	OLC YELLOW
38	O 5-4	OLB YELLOW	90	O 6-8	OLC GREEN
39	I 1-1	Ø2 COUNT+CALL+EXTEND	91	O 7-1	NOT ASSIGNED
40	I 1-2	Ø6 COUNT+CALL+EXTEND	92	*****	LOGIC GROUND
41	I 1-3	Ø4 COUNT+CALL+EXTEND	93	O 7-2	NOT ASSIGNED
42	I 1-4	Ø8 COUNT+CALL+EXTEND	94	O 7-3	OLB RED
43	I 1-5	Ø2 COUNT+CALL+EXTEND	95	O 7-4	OLB YELLOW
44	I 1-6	Ø6 COUNT+CALL+EXTEND	96	O 7-5	OLB GREEN
45	I 1-7	Ø4 COUNT+CALL+EXTEND	97	O 7-6	OLA RED
46	I 1-8	Ø8 COUNT+CALL+EXTEND	98	O 7-7	OLA YELLOW
47	I 2-1	Ø2 LIMITED	99	O 7-8	OLA GREEN
48	I 2-2	Ø6 LIMITED	100	O 5-5	SPECIAL FUNCTION 2
49	I 2-3	Ø4 LIMITED	101	O 5-6	SPECIAL FUNCTION 4
50	I 2-4	Ø8 LIMITED	102	O 5-7	DETECTOR RESET
51	I 2-5	RR1 PREEMPT	103	O 5-8	WATCHDOG
52	I 2-6	RR2 PREEMPT	104	*****	INPUT GROUND

Default Universal 337 Cabinet C1 Pin Assignments

PIN	I/O	FUNCTION	PIN	I/O	FUNCTION
1	*****	LOGIC GROUND	53	I 2-7	ADVANCE ENABLE
2	O 1-1	4P DONT WALK	54	I 2-8	FLASH BUS (DIAL 2)
3	O 1-2	4P WALK	55	I 3-1	NOT ASSIGNED
4	O 1-3	Ø4 RED	56	I 3-2	Ø1 COUNT+CALL+EXTEND
5	O 1-4	Ø4 YELLOW	57	I 3-3	NOT ASSIGNED
6	O 1-5	Ø4 GREEN	58	I 3-4	Ø3 COUNT+CALL+EXTEND (RESET 2)
7	O 1-6	Ø3 RED	59	I 3-5	Ø5COUNT+CALL+EXTEND (FREE)
8	O 1-7	Ø3 YELLOW	60	I 3-6	Ø1 COUNT+CALL+EXTEND (RESET 3)
9	O 1-8	Ø3 GREEN	61	I 3-7	Ø7 COUNT+CALL+EXTEND (RESET 1)
10	O 2-1	2P DONT WALK	62	I 3-8	Ø3 COUNT+CALL+EXTEND
11	O 2-2	2P WALK	63	I 4-5	NOT ASSIGNED
12	O 2-3	Ø2 RED	64	I 4-6	NOT ASSIGNED
13	O 2-4	Ø2 YELLOW	65	I 4-7	NOT ASSIGNED
14	*****	INPUT GROUND	66	I 4-8	NOT ASSIGNED
15	O 2-5	Ø2 GREEN	67	I 5-1	Ø2 PEDESTRIAN
16	O 2-6	Ø1 RED	68	I 5-2	Ø6 PEDESTRIAN
17	O 2-7	Ø1 YELLOW	69	I 5-3	Ø4 PEDESTRIAN
18	O 2-8	Ø1 GREEN	70	I 5-4	Ø8 PEDESTRIAN
19	O 3-1	NOT ASSIGNED	71	I 5-5	EVA PREEMPT
20	O 3-2	NOT ASSIGNED	72	I 5-6	EVB PREEMPT
21	O 3-3	NOT ASSIGNED	73	I 5-7	NOT ASSIGNED
22	O 3-4	NOT ASSIGNED	74	I 5-8	NOT ASSIGNED
23	O 3-5	NOT ASSIGNED	75	I 6-1	DOOR AJAR (DIAL 3)
24	O 3-6	NOT ASSIGNED	76	I 6-2	NOT ASSIGNED
25	O 3-7	NOT ASSIGNED	77	I 6-3	NOT ASSIGNED
26	O 3-8	NOT ASSIGNED	78	I 6-4	NOT ASSIGNED
27	O 4-1	NOT ASSIGNED	79	I 6-5	NOT ASSIGNED
28	O 4-2	NOT ASSIGNED	80	I 6-6	MANUAL ADVANCE
29	O 4-3	NOT ASSIGNED	81	I 6-7	FLASH SENSE
30	O 4-4	NOT ASSIGNED	82	I 6-8	STOP TIME
31	O 4-5	NOT ASSIGNED	83	O 6-1	NOT ASSIGNED
32	O 4-6	NOT ASSIGNED	84	O 6-2	NOT ASSIGNED
33	O 4-7	NOT ASSIGNED	85	O 6-3	NOT ASSIGNED
34	O 4-8	NOT ASSIGNED	86	O 6-4	NOT ASSIGNED
35	O 5-1	8P WALK	87	O 6-5	NOT ASSIGNED
36	O 5-2	NOT ASSIGNED	88	O 6-6	NOT ASSIGNED
37	O 5-3	8P DONT WALK	89	O 6-7	NOT ASSIGNED
38	O 5-4	NOT ASSIGNED	90	O 6-8	NOT ASSIGNED
39	I 1-1	Ø2 COUNT+CALL+EXTEND	91	O 7-1	NOT ASSIGNED
40	I 1-2	Ø6 COUNT+CALL+EXTEND	92	*****	LOGIC GROUND
41	I 1-3	Ø4 COUNT+CALL+EXTEND	93	O 7-2	NOT ASSIGNED
42	I 1-4	Ø8 COUNT+CALL+EXTEND	94	O 7-3	NOT ASSIGNED
43	I 1-5	Ø2 COUNT+CALL+EXTEND	95	O 7-4	NOT ASSIGNED
44	I 1-6	NOT ASSIGNED	96	O 7-5	NOT ASSIGNED
45	I 1-7	Ø4 COUNT+CALL+EXTEND	97	O 7-6	NOT ASSIGNED
46	I 1-8	NOT ASSIGNED	98	O 7-7	NOT ASSIGNED
47	I 2-1	NOT ASSIGNED	99	O 7-8	NOT ASSIGNED
48	I 2-2	NOT ASSIGNED	100	O 5-5	NOT ASSIGNED
49	I 2-3	Ø4 COUNT+CALL+EXTEND	101	O 5-6	NOT ASSIGNED
50	I 2-4	Ø8 COUNT+CALL+EXTEND	102	O 5-7	DETECTOR RESET
51	I 2-5	RR1 PREEMPT	103	O 5-8	WATCHDOG
52	I 2-6	RR2 PREEMPT	104	*****	INPUT GROUND

Caltrans 332 Cabinet C1 Pin Assignments

PIN	I/O	FUNCTION	PIN	I/O	FUNCTION
1	*****	LOGIC GROUND	53	I 2-7	SPARE 1
2	O 1-1	4P DONT WALK	54	I 2-8	SPARE 2
3	O 1-2	4P WALK	55	I 3-1	Ø5 COUNT+CALL+EXTEND
4	O 1-3	Ø4 RED	56	I 3-2	Ø1 COUNT+CALL+EXTEND
5	O 1-4	Ø4 YELLOW	57	I 3-3	Ø7 COUNT+CALL+EXTEND
6	O 1-5	Ø4 GREEN	58	I 3-4	Ø3 COUNT+CALL+EXTEND
7	O 1-6	Ø3 RED	59	I 3-5	Ø5 COUNT+CALL+EXTEND
8	O 1-7	Ø3 YELLOW	60	I 3-6	Ø1 COUNT+CALL+EXTEND
9	O 1-8	Ø3 GREEN	61	I 3-7	Ø7 COUNT+CALL+EXTEND
10	O 2-1	2P DONT WALK	62	I 3-8	Ø3 COUNT+CALL+EXTEND
11	O 2-2	2P WALK	63	I 4-5	Ø2 COUNT+CALL+EXTEND
12	O 2-3	Ø2 RED	64	I 4-6	Ø6 COUNT+CALL+EXTEND
13	O 2-4	Ø2 YELLOW	65	I 4-7	Ø4 COUNT+CALL+EXTEND
14	*****	INPUT GROUND	66	I 4-8	Ø8 COUNT+CALL+EXTEND
15	O 2-5	Ø2 GREEN	67	I 5-1	Ø2 PEDESTRIAN PB
16	O 2-6	Ø1 RED	68	I 5-2	Ø6 PEDESTRIAN PB
17	O 2-7	Ø1 YELLOW	69	I 5-3	Ø4 PEDESTRIAN PB
18	O 2-8	Ø1 GREEN	70	I 5-4	Ø8 PEDESTRIAN PB
19	O 3-1	8P DONT WALK	71	I 5-5	EVA PREEMPT
20	O 3-2	8P WALK	72	I 5-6	EVB PREEMPT
21	O 3-3	Ø8 RED	73	I 5-7	EVC PREEMPT
22	O 3-4	Ø8 YELLOW	74	I 5-8	EVD PREEMPT
23	O 3-5	Ø8 GREEN	75	I 6-1	SPARE 3
24	O 3-6	Ø7 RED	76	I 6-2	Ø2 CALL+EXTEND
25	O 3-7	Ø7 YELLOW	77	I 6-3	Ø6 CALL+EXTEND
26	O 3-8	Ø7 GREEN	78	I 6-4	Ø4 CALL+EXTEND
27	O 4-1	6P DONT WALK	79	I 6-5	Ø8 CALL+EXTEND
28	O 4-2	6P WALK	80	I 6-6	ADVANCE
29	O 4-3	Ø6 RED	81	I 6-7	FLASH SENSE
30	O 4-4	Ø6 YELLOW	82	I 6-8	STOP TIME
31	O 4-5	Ø6 GREEN	83	O 6-1	SPECIAL FUNCTION 1
32	O 4-6	Ø5 RED	84	O 6-2	SPECIAL FUNCTION 3
33	O 4-7	Ø5 YELLOW	85	O 6-3	OVERLAP B RED (AUX5)
34	O 4-8	Ø5 GREEN	86	O 6-4	OVERLAP B YELLOW (AUX5)
35	O 5-1	GREEN ARROW A 2PED YEL	87	O 6-5	OVERLAP B GREEN (AUX5)
36	O 5-2	GREEN ARROW B 6PED YEL	88	O 6-6	OVERLAP A RED (AUX4)
37	O 5-3	YELLOW ARROW A 4PED YEL	89	O 6-7	OVERLAP A YELLOW (AUX4)
38	O 5-4	YELLOW ARROW B 8PED YEL	90	O 6-8	OVERLAP A GREEN (AUX4)
39	I 1-1	Ø2 COUNT+CALL+EXTEND	91	O 7-1	OFFSET 1 (AUX3 RED)
40	I 1-2	Ø6 COUNT+CALL+EXTEND	92	*****	LOGIC GROUND
41	I 1-3	Ø4 COUNT+CALL+EXTEND	93	O 7-2	DIAL 3 (AUX3 GRN)
42	I 1-4	Ø8 COUNT+CALL+EXTEND	94	O 7-3	OVERLAP D RED (AUX2)
43	I 1-5	Ø2 COUNT+CALL+EXTEND	95	O 7-4	OVERLAP D YELLOW (AUX2)
44	I 1-6	Ø6 COUNT+CALL+EXTEND	96	O 7-5	OVERLAP D GREEN (AUX2)
45	I 1-7	Ø4 COUNT+CALL+EXTEND	97	O 7-6	OVERLAP C RED (AUX1)
46	I 1-8	Ø8 COUNT+CALL+EXTEND	98	O 7-7	OVERLAP C YELLOW (AUX1)
47	I 2-1	Ø2 LIMITED	99	O 7-8	OVERLAP C GREEN (AUX1)
48	I 2-2	Ø6 LIMITED	100	O 5-5	SPECIAL FUNCTION 2
49	I 2-3	Ø4 LIMITED	101	O 5-6	SPECIAL FUNCTION 4
50	I 2-4	Ø8 LIMITED	102	O 5-7	DETECTOR RESET
51	I 2-5	RR1 (FLASH)	103	O 5-8	WATCHDOG
52	I 2-6	RR2 (LIM. SERV.)	104	*****	LOGIC GROUND

Caltrans Default Detector Assignment

DETECTOR NUMBER	INPUT SLOT	PORT
1	2I2U	1.1
2	6J2U	1.2
3	4I6U	1.3
4	8J6U	1.4
5	2I2L	1.5
6	6J2L	1.6
7	4I6L	1.7
8	8J6L	1.8
9	2I4	2.1
10	6J4	2.2
11	4I8	2.3
12	8J8	2.4
13	5J1	3.1
14	1I1	3.2
15	7J5	3.3
16	3I5	3.4
17	5J9U	3.5
18	1I9U	3.6
19	7J9L	3.7
20	3I9L	3.8
21	2I3L	6.2
22	6J3L	6.3
23	4I7L	6.4
24	8J7L	6.5
25	2I3U	4.5
26	6J3U	4.6
27	4I7U	4.7
28	8J7U	4.8
29	PED	5.1
30	PED	5.2
31	PED	5.3
32	PED	5.4

Direct Connect Wiring

PC COM DB9 to 2070 C50S DB9 Serial Connection

PC COM DB9	2070 C50S DB9
NC	NC
2	3
3	2
5	1 & 5

NOTE: For the male configuration, pins 1 and 5 should be connected, then connect male 1 to female 5.

Appendix B

Timing Charts

Location:	**Designed By:**
System:	**District:**	**Installed By:**
Master At:	**I/C:**	**Service Info:**

Timing Change: **Date Start:**   **Date End:**   **Designed:**   **Installed:**

Intersection Layout

FLASH

P 1) [   ]
H 2) [   ]
A 3) [   ]
S 4) [   ]
E 5) [   ]
   6) [   ]
   7) [   ]
   8) [   ]

O A) [   ]
V B) [   ]
E C) [   ]
R D) [   ]
L E) [   ]
A F) [   ]
P

Comments and Notes:

RAM Checksum

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Post Mile:

CONFIGURATION PHASE FLAGS

Phases (2-1-1-1)

Permitted	
Restricted	

Phase Recalls (2-1-1-2)

Vehicle Min	
Vehicle Max	
Pedestrian	
Bicycle	

Phase Locks (2-1-1-3)

Red	
Yellow	
Force/Max	

Phase Features (2-1-1-4)

Double Entry	
Rest In Walk	
Rest In Red	
Walk 2	
Max Green 2	
Max Green 3	

Startup (2-1-1-5)

First Green Phases	
Yellow Start Phases	
Yellow Start Overlaps	
Startup All-Red	
Vehicle Recalls	
Pedestrian Recalls	

Call To Phase (2-1-2-1)   Omit On Green

1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	

Flashing Colors (2-1-2-2)

Yellow Flash Phases	
Yellow Flash Overlap	
Flash In Red Phases	
Flash In Red Overlap	

Special Operation (2-1-2-3)

Single Exit Phase	
Driveway Signal Phases	
Driveway Signal Overlaps	
Leading Ped Phases	

Protected Permissive (2-1-2-4)

Protected Permissive	

Pedestrian (2-1-3)

P1	
P2	
P3	
P4	
P5	
P6	
P7	
P8	

Overlap (2-1-4)

Overlap	Parent	Omit	No Start	Not
A				
B				
C				
D				
E				
F				

Phase (2-2)	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
--- Walk 1 ---								
Flash Don't Walk								
Minimum Green								
Det Limit								
Max Initial								
Max Green 1								
Max Green 2								
Max Green 3								
Extension								
Maximum Gap								
Minimum Gap								
Add Per Vehicle								
Reduce Gap By								
Reduce Every								
Yellow								
All-Red								
Ped/Bike (2-3)	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
--- Walk 2 ---								
Delay/Early Walk								
Solid Don't Walk								
Bike Green								
Bike All-Red								

P H A S E   T I M I N G

OVERLAP TIMING

Overlap (2-4)	A	B	C	D	E	F
Green						
Yellow						
Red						

Red Revert

Red Revert (2-5)	
Time	
Red To Sec (2-6)	
Red To Sec	

COORDINATION

Local Plan (7-1...9) TIMING DATA [Offsets]   Green Factors or Press [F] to Select Force-Off

	Cycle	Multi	Perm	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 1														
Plan 2														
Plan 3														
Plan 4														
Plan 5														
Plan 6														
Plan 7														
Plan 8														
Plan 9														

Master Timer Sync (7-A)

Enable in Plans

Master Sub Master

Input	
Output	

FREE PLAN PHASE FLAGS
(7-E) Free

Lag	Omit

Veh Min	Veh Max

Ped	Bike

Cond	Cond Grn

Local Plan (7-1...9) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 1								
Plan 2								
Plan 3								
Plan 4								
Plan 5								
Plan 6								
Plan 7								
Plan 8								
Plan 9								

MANUAL COMMANDS

Manual Plan (4-1)   *Plan: 1-9*
15 or 254 = Flash
14 or 255 = Free
Offset A, B, or C

Plan	OffSet

Special Function Override (4-2)

#	Control	#	Control
1		3	
2		4	

Detector Reset (4-3)	

Local Manual (4-4)	

DETECTORS

Detector Attributes (5-1)				Slot	Detector Configuration (5-2)				
Det	**Type**	**Phases**	**Lock**		**Det**	**Delay**	**Extend**	**Recall**	**Port**
1				I2U	1				
2				J2U	2				
3				I6U	3				
4				J6U	4				
5				I2L	5				
6				J2L	6				
7				I6L	7				
8				J6L	8				
9				I4	9				
10				J4	10				
11				I8	11				
12				J8	12				
13				J1	13				
14				I1	14				
15				J5	15				
16				I5	16				
17				J9U	17				
18				I9U	18				
19				J9L	19				
20				I9L	20				
21				I3L	21				
22				J3L	22				
23				I7L	23				
24				J7L	24				
25				I3U	25				
26				J3U	26				
27				I7U	27				
28				J7U	28				
29				I 12U	29				
30				I 13U	30				
31				I 12L	31				
32				I 13L	32				

Failure Times(5-3)	Minutes
Maximum On Time	
Fail Reset Time	

Failure Override (5-4)	
Detectors 1-8	
Detectors 9-16	
Detectors 17-24	
Detectors 25-32	

System Detector Assignment (5-5)								
Sys Det	1	2	3	4	5	6	7	8
Det Num								
Sys Det	9	10	11	12	13	14	15	16
Det Num								

CIC Operation (5-6-1)	
Enable in Plans	

CIC Values (5-6-2)	Volume	Occupancy	Demand
Smoothing			
Multiplier			
Exponent			

Detector-to-Phase Assignment (5-6-3)								
Sys Det	1	2	3	4	5	6	7	8
Phase								
Sys Det	9	10	11	12	13	14	15	16
Phase								

Input File Port-Bit Assignments

332 Cabinet - For Reference Only

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
I-	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
J-	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

TOD SCHEDULE

Table 1 (8-2-1)			Table 2 (8-2-2)			Table 3 (8-2-3)			Table 4 (8-2-4)			Table 5 (8-2-5)			Table 6 (8-2-6)		
Time	Plan	OS	Time	Plan	OS	Time	Plan	OS	Time	Plan	OS	Time	Plan	OS	Time	Plan	OS

WEEKDAY ASSIGNMENT

Weekday Table Assignments (8-2-7)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun

HOLIDAY TABLES

Floating Holiday Table (8-2-8)

#	Mnth	Week	DOW	Table
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

Fixed Holiday Table (8-2-9)

#	Mnth	Day	DOW	Table
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

Solar Clock Data (8-4)

North Latitude	
West Longitude	
Local Time Zone	

Sabbatical Clock (8-5)

Hebrew	
Sabbath	
Holiday	

Daylight Saving (8-6)

Enabled	

TOD FUNCTIONS

TOD Functions (8-3)

#	Start	End	DOW	Action	Phases
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Action Codes:
0. None
1. Permitted
2. Restricted
4. Veh Min Recall
5. Veh Max Recall
6. Ped Recall
7. Bike Recall
8. Red Lock
9. Yellow Lock
10. Force/Max Lock
11. Double Entry
12. Y-Coord C
13. Y-Coord D
14. Free
15. Flashing
16. Walk 2
17. Max Green 2

18. Max Green 3
19. Rest in Walk
20. Rest in Red
21. Free Lag Phases
22. Special Functions
23. Truck Preempt
24. Conditional Service
25. Conditional Service
26. Leading Ped

41. Protected Permissive
42. Protected Permissive

Action Code = Phases added to normal setting

100+Action Code = Phases removed

200+Action Code = Phases replaced

COMMUNICATIONS

C2 (6-1-1)	
Address	
Protocol	
Limit Access	
Baud	
Parity	
Data Bits	
Stop Bits	
RTS On Time	
RTS Off Time	
Handshaking	

C20 (6-1-2)	
Address	
Protocol	
Limit Access	
Baud	
Parity	
Data Bits	
Stop Bits	
RTS On Time	
RTS Off Time	
Handshaking	

C21 (6-1-3)	
Address	
Protocol	
Limit Access	
Baud	
Parity	
Data Bits	
Stop Bits	
RTS On Time	
RTS Off Time	
Handshaking	

Limit Access:

0-None

1-Status Only

2-Status, Set Pattern, Time

3-Status, Set Pattern, Time, Manual Plan

SOFT LOGIC

Soft Logic (6-2)							
#	Data	OP	Data	OP	Data	OP	Data
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

*Refer to User's Manual for Data and OP Codes

CALLBACK NUMBERS

Callback Numbers (6-3...3)	
Line Out	
Local Toll	
Long Distance	
Delay	
Area Code	
Phone Number	

Line Out	
Local Toll	
Long Distance	
Delay	
Area Code	
Phone Number	

Line Out	
Local Toll	
Long Distance	
Delay	
Area Code	
Phone Number	

RAILROAD PREEMPTION

RR 1	(3-1-1)	Timing	Phase Flags (3-1-2)			Pedestrian Flags (3-1-3)			Overlap Flags (3-1-4)		
	Delay		Grn Hold	Yel Flash	Red Flash	Walk	Flash DW	Solid DW	Grn Hold	Yel Flash	Red Flash
	Clear1										
	Clear 2										
	Clear 3										
	Hold										
	Exit										
	Min Grn										
	Ped Clr										

Exit Parameters (3-1-5)					Configuration (3-1-6)		
Phase Green	Overlap Green	Vehicle Recall	Ped Call		Port	Latching	Power-Up

RR 2	(3-2-1)	Timing	Phase Flags (3-2-2)			Pedestrian Flags (3-2-3)			Overlap Flags (3-2-4)		
	Delay		Grn Hold	Yel Flash	Red Flash	Walk	Flash DW	Solid DW	Grn Hold	Yel Flash	Red Flash
	Clear1										
	Clear 2										
	Clear 3										
	Hold										
	Exit										
	Min Grn										
	Ped Clr										

Exit Parameters (3-2-5)					Configuration (3-2-6)		
Phase Green	Overlap Green	Vehicle Recall	Ped Recall		Port	Latching	Power-up

EMERGENCY VEHICLE PREEMPTION

EVA (3-A)	Preempt Timers			Phase Green	Overlap Green
	Delay	Clear	Max		

	Port	Latching	Phase Termination

EVB (3-B)	Preempt Timers			Phase Green	Overlap Green
	Delay	Clear	Max		

	Port	Latching	Phase Termination

EVC (3-C)	Preempt Timers			Phase Green	Overlap Green
	Delay	Clear	Max		

	Port	Latching	Phase Termination

EVD (3-D)	Preempt Timers			Phase Green	Overlap Green
	Delay	Clear	Max		

	Port	Latching	Phase Termination

INPUTS

7 Wire I/C (2-1-5-1)			
	Input	**Port**	**Input**	**Port**
Enable				
Max ON				
Max OFF				

Manual Control (2-1-5-2)	
Input	**Port**
Manual Advance	
Advance Enable	

Cabinet Status (2-1-5-3)	
Input	**Port**
Flash Bus	
Door Ajar	
Flash Sense	
Stop Time	

Special Function (2-1-5-4)	
Input	**Port**
1	
2	
3	
4	

Battery Backup (2-1-5-5)	
Port	**Operation**

Y-Coordination (2-1-5-6)	
Port C	**Port D**

OUTPUTS

Loadswitch Assignments (2-1-6)						+
A						
B						
X						

Loadswitch Codes:
- **0**   Unused (no output)
- **1-8**   Vehicle 1-8
- **9-14** Overlap A-F
- **21-28** Ped 1-8
- **41-47** Special Functions
- **41** Protected Permissive Flashing Phase 1
- **43** Protected Permissive Flashing Phase 3
- **45** Protected Permissive Flashing Phase 5
- **47** Protected Permissive Flashing Phase 7

- **51-57** Special Functions
- **71-72** Seven Wire I/C

+ middle output of loadswitches 3 and 6 Channel 9 and 10

YELLOW YIELD COOORDINATION

Y-Coord Plans (7-C,D)	Long Grn	No Grn	Offset	Perm	Force-Offs								Coord	Lag	Min Recall	Restricted
					-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-				
Plan C																
Plan D																

TRANSIT PRIORITY

Local Plans (3-E1...9)	Early Green	Green Extend	Inhibit Cycles	Phase 1 Minimum	Phase 2 Minimum	Phase 3 Minimum	Phase 4 Minimum	Phase 5 Minimum	Phase 6 Minimum	Phase 7 Minimum	Phase 8 Minimum
Plan											
Plan											
Plan											
Plan											
Plan											
Plan											
Plan											
Plan											
Plan											

Enable Priority (3-E-A)	
Enable in Plan	

Free Plans (3-E-E)	
Max Green Hold	Hold Phase

Access Utilities (9-5)	
Password	***
Timeout	

TRUCK PREEMPTION

Truck Preemption (3-F)	Passage	CarryOver	Clearance	Next Preempt	Phase Green	Det 2 Port	Det 3 Port	Det 4 Port	Sign Outpu	Slave Input	Slave Outpu