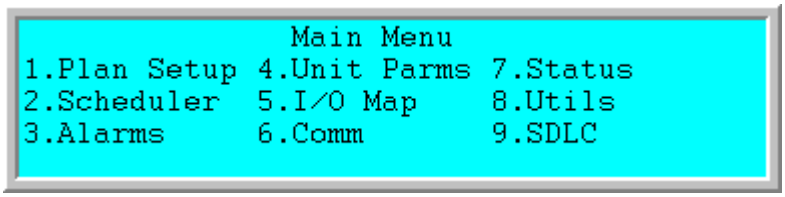
Training Manual

For

Lane Control Module for the ATMS Controller

Developed for the City of Jacksonville Flordia



November 2019

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Table of Contents

1 Introduction

1.1 Lane Control Unit Software

The Lane Control Unit (LCU) software has been developed specifically for the City of Jacksonville.

1.1.1 Feature Highlights

Normal, Pre-Game, and Post-Game Operational Plans

The LCU software supports normal, pre-game, and post-game operational plans. It also includes transitions between operational plans.

Flexible Design

The LCU software allows the operator to have detailed control over the operational transitions and the output to the signal heads.

Automatic and Manual Mode

The LCU software can be controlled through time-of-day scheduling or manually. Manual control can be done at the cabinet or remotely via central software.

Operational Status

The LCU software provides detailed status of the current operation.

1.2 Operational Features

1.2.1 Manual Control

An operator may control the lane control unit at the cabinet.

1.2.2 Remote Control

A central software user may remotely send a plan in the form of a pattern to take effect.

1.2.3 Time of Day Schedule

A time of day schedule may be used to control which plan is in effect.

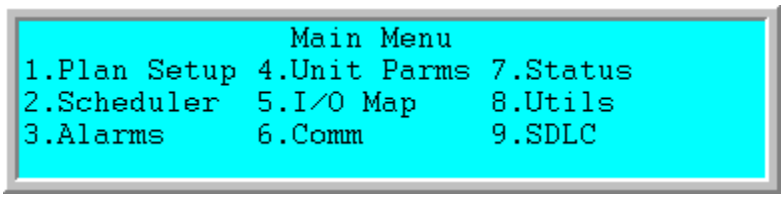
1.3 Glossary

The following acronyms will be used in this manual

BOS - Blank Out Sign - for side street indicators that show no left turn, no right turn
LCU - Lane Control Unit - the lane control hardware and software
LUS - Lane Use Signal - the indicator above the lanes

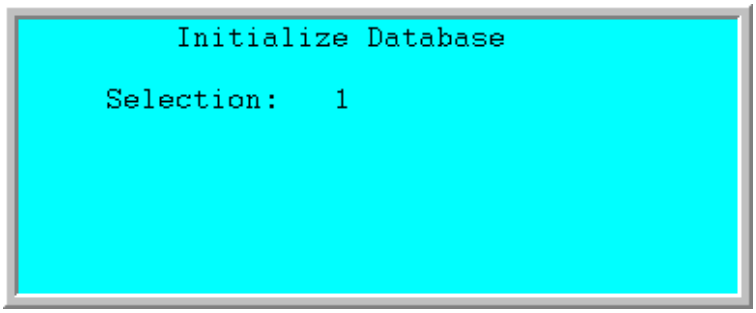
2.1 Database Initialization

All menus will be accessed by the front panel keypad via the main menu screen which is displayed below:

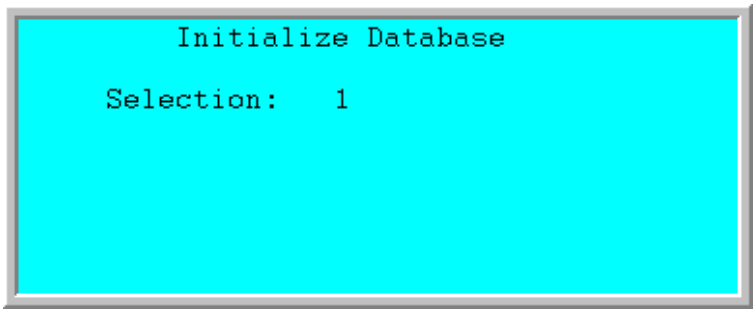


The controller is pre-configured for all 16 lane control locations. The controller may be initialized to one of the 16 locations by using the Init Dbase utility:

Select **MM->8** to access the Login and Utilities screen. Select item **4** to initialize the controller database.



On the Initialize Database screen, enter the number of the lane control location. Valid entries are 1 thru 16. See Appendix 12.2 Plan Definitions for information on the configuration of each individual location.

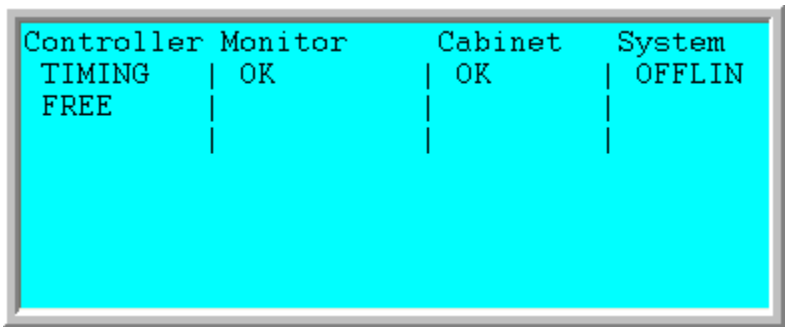


PLEASE NOTE ------ PLEASE NOTE ------ PLEASE NOTE

After initializing the database, the user must physically power down the controller unit to reset the hardware inputs and outputs for proper field displays.

2.2 Overview

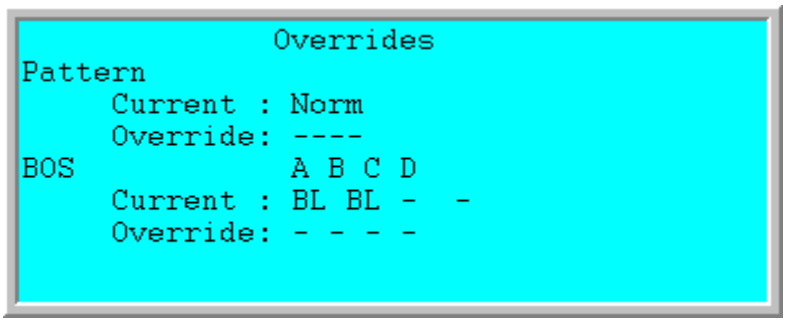
The Overview screen indicates the overall status of the controller, cabinet, and malfunction monitoring unit. The operator can get to the Overview screen by pressing ***ESC->F->9***. This screen is very useful for determining current operational modes. The example below represents a system that is operating normally/



2.3 Keyboard Input

2.3.1 Plan Selection

The user may select the current plan directly from the controller keyboard. From the ***MM->8->3*** screen, the operator may select enter the desired plan in the Pattern Override field.



2.3.2 BOS Override

From the same screen as above, the operator may override the output to the blank-out signs. Any value set in the BOS Override field will override the regular LCU BOS output, regardless of the current plan.

2.4 Manual Control

An operator may determine the lane operation by using a manual control input within the cabinet. Note that manual control takes precedence over all other control inputs.

2.5 Remote Control

A central system user will be able to determine the lane control operation by using the Instant Pattern function within ATMS and choosing the specific lane control operation as shown in the following table:

Lane Control Operation
--- (Revert back to highest priority Plan)
Normal
Pre-Game
Post-Game
Auxiliary Plan 1
Auxiliary Plan 2
Auxiliary Plan3
Flash
Auxiliary Plan4
Auxiliary Plan 5
Auxiliary Plan 6

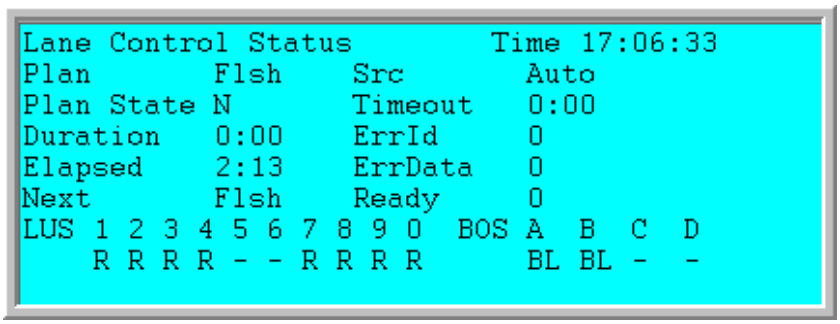
2.6 Automatic Time of Day Schedule

The lane control system can be controlled using the time of day schedule. The pattern value used in the time of day schedule represents the plan. . Valid patterns are 0 thru 10 as described below

Pattern #	Lane Control Operation
0	Default (Flash)
1	Normal
2	Pre-Game
3	Post-Game
4	Auxiliary Plan 1
5	Auxiliary Plan 2
6	Auxiliary Plan3
7	Programmed Flash
8	Auxiliary Plan4
9	Auxiliary Plan 5
10	Auxiliary Plan 6

2.7 Status

The operator can access the status display via ***MM->7***. See Chapter 9 for further details concerning this screen.



2.8 Alarms and Errors

2.8.1 Alarms

The lane control software will produce various alarms:

ALARM_LCU_ERROR	**101**	An error occurred. The error value is in the data portion of the alarm. See below for possible values. The data value is an 8-bit number. The first 4 bits is the Error ID. The second 4 bits contain the Error Data. See the Error table below for details on Error ID and Error Data.
ALARM_LCU_PLAN_EXPIRED	**102**	A plan has expired but it is still active. This will apply to pre-game and post-game plans.
ALARM_LCU_PLAN_ACTIVATED	**103**	A plan has become active.

2.8.2 Errors

ID	Error	Description	Error Data
1	**BAD_PLAN**	The mode or input refers to a non-existent plan.	The plan id being requested.
2	**MISSING_MODE**	A plan transition has been requested but either the clearance or all red transition mode is missing.	The mode id being requested.
3	**MISSING_NEXT_PLAN**	The next plan being requested is missing.	The plan id being requested.
4	**BAD_MODE**	The mode id is out of range. Valid values are 1 thru 5.	The mode id being requested.
5	**BAD_MODE_TYPE**	The mode type is out of range. Valid values are 1 thru 3 representing normal, clearance, and all red.	The actual value of the mode type being requested.
6	**MANUAL_INPUT**	There is a problem with the manual input. More than one manual input are on simultaneously. The lane control software will default to the current plan.	0

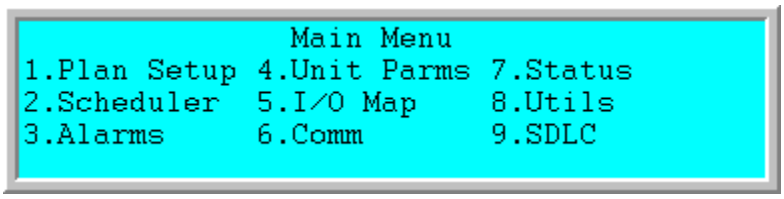
2.9 Faults

If there is a problem with the plan definition or the lane control input, the lane control software will cause the channels to go dark and set the CVM output to low.

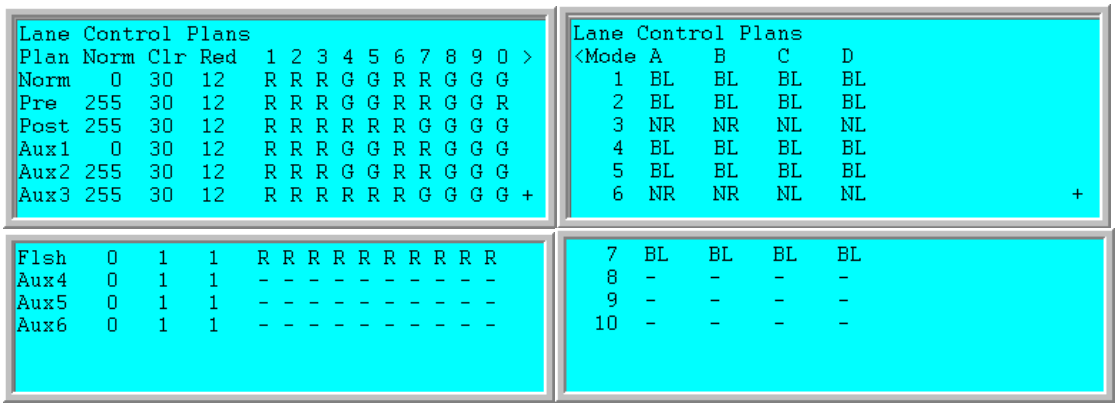
3.1 Lane Control Plans

A lane control plan is a traffic flow plan consisting of *normal operation*, *clearance transitional operation*, and *all-red transitional operation*. There are 3 lane control plans for this implementation: *normal* (plan 1), *pre-game* (plan 2), and *post-game* (plan 3). Selection of the transitional modes will vary depending on the next active lane control plan. There are 6 Auxiliary plans as well as a Flash plan that are also available.

Lane control setup is done using the ***MM->1***, Plan Setup item.



Select the plan Setup menu item to configure the Plans for the location that you are currently controlling.



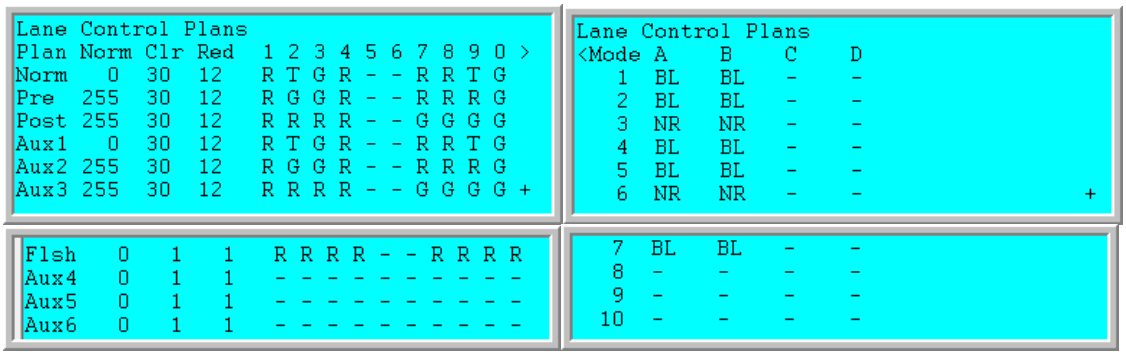
3.2 Plan Modes

A plan mode defines the normal or transitional operation within a lane control plan. Each mode is applicable to a specific next lane control plan. That is, the mode's use will be determined by the lane control plan that will become active next.

The lane control plan mode specifies the color indication for each of the lane-use signals and the blank-out signs.

Lane control plan modes will have an expected duration. The duration can be indefinite or a specific number of minutes. If the mode is active for more than the specified number of minutes, the control program will generate an alarm.

The screens below reflect initialization for location # 1.



The parameter definitions are as follows:

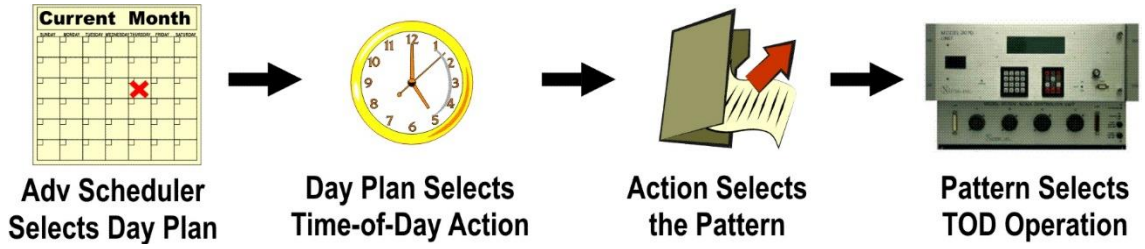
Plan (Type) in column 1	The type of plan. The user can set up timing and output parameters for each plan. Plan types are **Norm** (Normal), **Pre** (Pregame), **Post** (Postgame), **Aux1** (Auxiliary Plan 1), **Aux2** (Auxiliary Plan 2), **Aux3** (Auxiliary Plan 3), **Flsh** (Flash), **Aux4** (Auxiliary Plan 4), **Aux5** (Auxiliary Plan 5) and **Aux6** (Auxiliary Plan 6).
Duration in column 2	The amount of time ***in minutes***, that the mode is to be active. For the Normal Plan, Normal Mode, the duration is 0 indicating that it is indefinite. The Normal Mode of the Pre- and Post-Game plans is set to 255, indicating that after that time, the controller will generate an alarm. For transitional modes, clearance and all red, the duration is the amount of time that will elapse before the controller moves to the next mode.
Clr in column 3	Transitional Yellow clearance time. This is the duration of clearance time before the controller moves to the next mode. This value is programmed in 10 second increments. For example programming a 6 in this field will correspond to 60 seconds of yellow clearance time.
Red in column 4	Transitional Red clearance time. This is the duration of clearance time before the controller moves to the next mode. This value is programmed in 10 second increments. For example programming a 6 in this field will correspond to 60 seconds of yellow clearance time.
1 – 10 in columns 5-14	The LUS channel values. Possible values are ***R*** (Red), ***Y*** (Yellow), ***G*** (Green), and ***T*** (Turn). See the I/O Mapping section for exact details on which channels are active based on the LUS channel values.
A – D in column 15-19	The BOS channel values. See the I/O Mapping section for exact details on which channels are active based on the BOS channel values. Values are – for dark, ***BL*** for blank, ***NL*** for no left turn, and ***NR*** for no right turn.

4 Scheduler

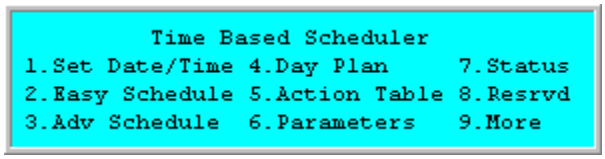
4.1 Theory of Operation

The *Advanced Schedule* is a fully compliant NTCIP based time-of-day schedule. NTCIP defines an annual schedule in terms of day-of-week, month and day-of-month. This implies that the schedule applies to the current year. Cubic | Trafficware provides *Easy Schedule* to facilitate programming the NTCIP *Advanced Schedule*; however, there is only one schedule in the controller database because *Easy Schedule* is provided as an alternative method of programming the *Advanced Schedule*.

The *Advanced Schedule* selects the *Day Plan* for the current day. The *Day Plan* contains the time-of-day events for the current day used to select actions from the *Action Table*. The controller updates the current TBC pattern once per minute based on the scheduled events from the *Action Table*.



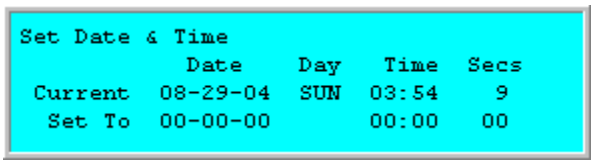
Each day the controller checks the *Scheduler* to determine the most applicable *Day Plan*. If the current day is not specified in the *Advanced Schedule*, the controller will run "free" in Pattern# 0. The controller checks the current *Day Plan* once per minute to retrieve the current time-of-day action. The controller then performs a lookup in the *Action Table* to determine the active *TBC Pattern*. The *TBC Pattern* determines the current time-of-day operation of the controller.



All programming related to the Scheduler is accessed from MM->2 shown to the right.

4.2 Controller Time Base (MM->2->1)

The *Set Date/Time* entry screen allows the user to set the current time and date also referred to as the controller's time base.



Date

The *Date* parameter is entered in MM-DD-YY format. All six numeric digits must be entered, including leading zeroes. Setting the date automatically updates the *Day* field.

Day

The Day parameter specifies the day of week (SUN-SAT). Setting the date automatically updates the Day field. Therefore, it is not necessary to update this field after the date has been set.

Time

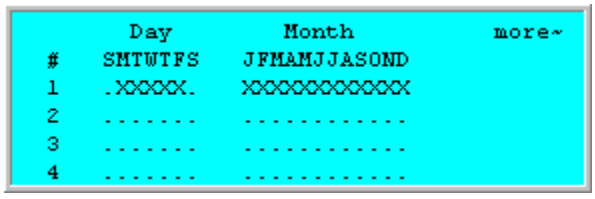
The *Time* parameter is entered as HH:MM in 24-hour military format. All four numeric digits must be entered including any leading zeros. Pressing the Enter key after entering the 4 time digits will automatically zero out the *Seconds* field

Secs

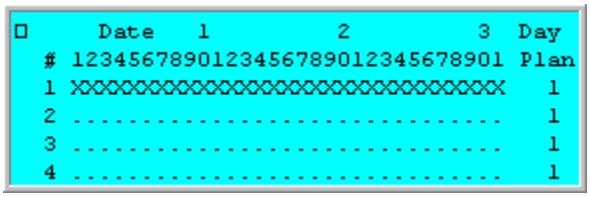
The *Seconds* parameter will update the seconds portion of the real time clock seconds. The second entry is provided separately from the hour and minute fields to facilitate setting the time base to a known reference.

4.3 Advanced Schedule (MM->2->3)

The NTCIP based *Advanced Schedule* is an annual calendar for the current year used to select the *Day Plan* for the current day. Each entry of the scheduler specifies a day-of-week, month, day-of-month, and the *Day Plan* assigned to the entry. Each entry identifies the day or range of days during which the *Day Plan* is in effect.



It is possible for two or more schedule entries to specify the same day of the year. In this situation, the scheduler will always select the most specific entry. An entry is defined as more specific if the range of days defined by that entry is narrower in scope than another entry. For example, the user may assign *Day Plan* 1 for the entire month of March in one entry and *Day Plan* 2 for March 7 in a separate entry. This would appear to be a duplicate entry because two different day plans are programmed for March 7. However, in this situation, the *Advanced Schedule* would select *Day Plan* 2, because it more specific to the current day. The priority order of day plan selection is based upon month, day-of-week, then day of month. If no *Day Plan* is assigned to the current date (based on the time base of the unit), the controller will run free in *Pattern # 0*.



The user may select multiple entries for *Day*, *Month*, and *Date*. For example, selecting all fields under *Day* implies that this entry applies to every day of the week. If a *Day* field is not selected, then the schedule is not considered valid for that particular day. Therefore, when entering a schedule event for a specific date, such as March 7, it is good practice to make that event applicable to every day of the week. This will prevent the user from having to change the day-of-week for the entry when the calendar year changes.

Day

The *Day* parameter defines the day-of-week or multiple days for the entry.

Month

The *Month* parameter defines the month or range of months for the entry based on *Begin Month–End Month*.

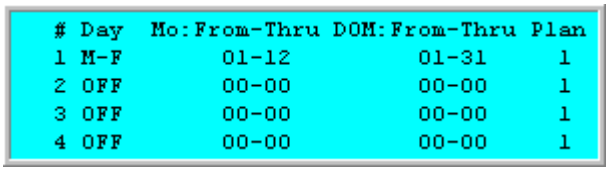
Date

The *Date* parameter indicates which days of the month that the entry will be allowed. More than one day of month may be selected.

Day Plan

The *Day Plan* number selects the Day Plan (1-32) placed in effect when the scheduled entry becomes active.

4.4 Easy Schedule (MM->2->2)



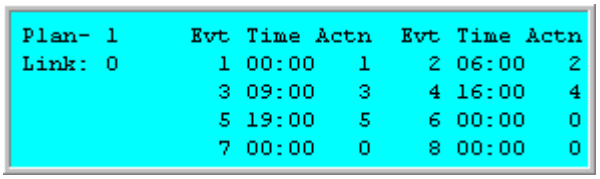
#	Day	Mo:From-Thru	DOM:From-Thru	Plan
1	M-F	01-12	01-31	1
2	OFF	00-00	00-00	1
3	OFF	00-00	00-00	1
4	OFF	00-00	00-00	1

Easy Schedule is an alternative method of coding the NTCIP based *Advanced Schedule*. The *Day* entry provides a separate entry for each day-of-week or range of days (M-F or ALL). Setting the *Day* selection to OFF disables the event #.

The *Month* and *DOM* (Day-Of-Month) entries specify begin and end values for each range. Four digits must be provided for each entry (including zero place holders). The range specified will automatically be transferred to the *Advanced Schedule* as a range of "X" values for the individual month and day entries. This "easy" method allows each entry to be specified as a range instead of having to code each individual "X" field in the *Advanced Schedule*.

Note that each entry provided in *Easy Schedule* applies to a consecutive range of days, months or days of month. It is possible to specify a non-consecutive range in the *Advanced Schedule* (such as a DOM entry including 1-4, 7, 20-25, 30 in the same event#). This complex *DOM* entry will display in *Easy Schedule* as "**-**" because it is not defined as a consecutive series of days. Complex events are programmed in the *Advanced Schedule* and less complex entries are programmed in *Easy Schedule* as a shortcut method.

4.5 Day Plan Table (MM->2->4)



Plan- 1	Evt	Time	Actn	Evt	Time	Actn
Link: 0	1	00:00	1	2	06:00	2
	3	09:00	3	4	16:00	4
	5	19:00	5	6	00:00	0
	7	00:00	0	8	00:00	0

The *Scheduler* reads the active *Day Plan* for the current date once per minute to update the current *Action*. The *Action* drives the active *Pattern* and controls the state of the special function outputs from the *Action Table*.

Time

The *Time* parameter in 24-hour military format (HH:MM) defines the time-of-day that the associated *Action* will become active. All four numeric digits must be entered, including any leading zeroes.

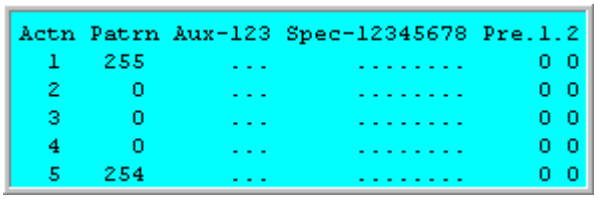
Action

The *Action* parameter (1-100) is associated with the *Action* in the *Action Table*. **NTCIP defines Action 0 as the "do-nothing" action.** Therefore, do not be misled into thinking that Action 0 places the intersection into free operation. It is good practice to assign an event and *Action* at 00:00 for every *Day Plan* called by the *Advanced Schedule*. This insures that even if the controller date is changed and a new *Day Plan* is referenced that at least the first *Action* at specified for 00:00 will be selected.

Link

The Link parameter joins (or links) two or more *Day Plans* to increase the number event entries from 16 to 32. The link parameter contains the *Day Plan* number the *Day Plan* is linked to. Multiple *Day Plans* may link to the same *Day Plan* by specifying the same *Link* entry in each plan; however, linking more than two *Day Plans* in a chain is not supported.

4.6 Action Table (MM->2->5)



The *Action* selected by the current *Day Plan* controls the state of *Auxiliary* and *Special Function* hardware outputs. In addition, the source of the source of preempt 1 and 2 may be selected by the current *Action* table. The time-of-day *Scheduler* allows the Day Plan to call different *Actions* to turn outputs ON and OFF and share the same pattern between actions. This scheme minimizes the number of patterns required to cycle outputs ON and OFF.

Pattern

The *Pattern* parameter (1-48) defines the *TBC Pattern* selected by the current *Action*. For Lane control the only valid patterns are 0 thru 10 as described below

Pattern #	Lane Control Operation
0	Default (Flash)
1	Normal
2	Pre-Game
3	Post-Game
4	Auxiliary Plan 1
5	Auxiliary Plan 2
6	Auxiliary Plan3
7	Programmed Flash
8	Auxiliary Plan4
9	Auxiliary Plan 5
10	Auxiliary Plan 6

Aux Outputs

The *Auxiliary* settings define the state of each auxiliary output when the associated action is active. These outputs are activated by *Day Plan Actions* or are manually controlled from the central system. The controller provides 3 *Aux* outputs and per action.

Special Function Outputs

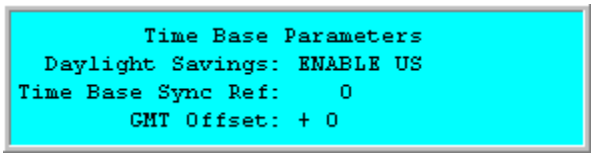
The *Special-Function* settings defines the state of each special function output when the associated action is active. These outputs are activated by *Day Plan Actions* or manually controlled from the central system. The controller provides 8 *Special Function* outputs per action.

Preempt Outputs

The software allows the source of the inputs for preempt 1 and 2 to be programmed through the *Action Table*. The source for Pre.1 and Pre.2 may be set to a value between 0 and 4. Zero calls for the default input for each preempt. Setting Pre.1 to 3 would source preempt 1 with the input from Preempt 3 when the action is active.

4.7 Time Base Parameters (MM->2->6)

Time Base Parameters provide additional NTCIP features to modify the behavior of the controller's Time Base.



Daylight Savings

The *Daylight Savings* parameter determines specifies if daylight savings is active, and which method is be used. The ENABLE US mode references daylight savings to the current federally mandated references.

Time Base Sync Ref

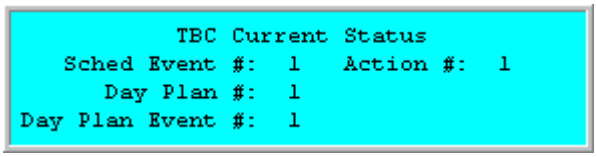
The *Time Base Synchronization Reference* defines the number of minutes after midnight to synchronize the time base. This reference provides the zero point for the TBC counter uses to synchronize the offset called in the pattern.

GMT Offset

The *GMT (Greenwich Mean Time) Offset* adjusts the system time base for Universal Standard Time .

4.8 Time Base Status (MM->2->7)

Interpreting *Time Base Status* requires a thorough understanding of the relationship between the *Advanced Schedule*, day plans and actions. Compare these four status fields with the graphic provided. If you visualize these status fields as four steps used to select the current TBC pattern based on the current date and time, then you will understand the NTCIP time-of-day scheduler.



1. The *Schedule Event #* is the active event selected by the scheduler based on the current day-of-week, month and day-of-month. This event # is useful to determine which event is more specific if more than one entry in the scheduler references the current day.
2. The *Day Plan #* is the active day plan specified by the scheduler for the current Schedule Event #. The *Day Plan #* is programmed for each event in the *Advanced Schedule* and *Easy Schedule*.
3. The *Day Plan Event #* is the active day plan entry selected by the scheduler for the current time-of-day. The *Day Plan* Event # references the event selected in the active Day Plan #.
4. The *Action #* is the active action selected by the scheduler for the current *Day Plan*. The controller reads the current Day Plan entries once every minute to update the current *Action#.* This value is used to reference the *Pattern #* and the special function output status specified in the *Action Table*.

4.9 Time Base Scheduler – More Features (MM->2->9)

```
     Time Based Scheduler - more
1.Copy DayPlan
2.Control
3.GPS/WWV Status
```

4.9.1 Copy Day Plan Utility (MM->2->9->1)

The Copy Day Plan Utility copies the 16 Event # entries from one Day Plan # to another Day Plan #. The Link field specified in the From #: Day Plan is not copied.

```
        Copy DayPlan Progam
   From #:  0     To #:  0
```

4.9.2 TBC Manual Control Screen (MM->2->9->2)

The TBC Manual Control Screen allows the user to manually select the active Pattern and special function outputs as a keyboard entry. These selections override the Pattern and special function outputs specified for the current Action called from the Time Base Scheduler. Therefore, this screen provides the ability to override the actions of the scheduler.

```
TBC Control              Spec.Fcn
              Pattern    1.3.5.7.
 Current TOD    255      ........
      Set To      0      ........
```

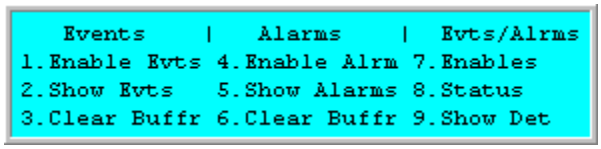
The controller also allows the active Pattern to be manually controlled from the Test Mode under MM->2->1. However, patterns selected from the Test Mode cannot be overridden by future events in the scheduler, whereas patterns entered from the TBC Manual Control Screen are replaced by the next scheduled event.

4.9.3 GPS/WWV Status (MM->2->9->3)

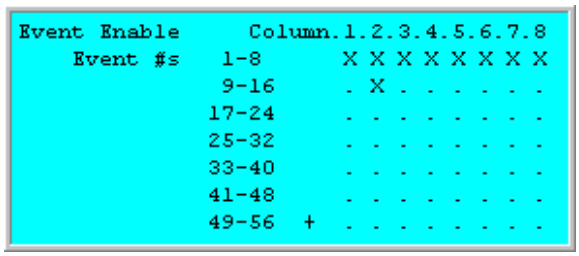
See chapter 8 for further details.

5 Events and Alarms (MM->3)

StreetWise and ATMS provides a distinction between *low-priority events* and *high-priority alarms.* *Events* are uploaded periodically (perhaps only once per day) for historical purposes. However, *alarms* are typically relayed to central as soon as possible.

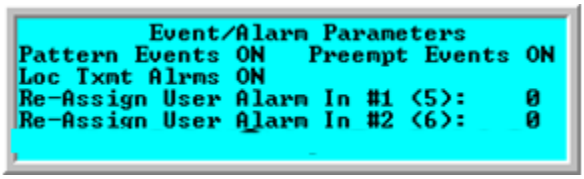


A maximum of 128 events and alarms may be enabled through separate controller menus; however, each numbered events refers to the same numbered alarm. If an alarm is to be enabled, it must first be enabled as an event. However, an event may be enabled as an event without being enabled as an alarm. This scheme allows user defined high-priority alarm to be reported immediately to central while low-priority events are stored for record purposes.



5.1 Pattern / Preempt Events (MM->3->7->1)

Pattern changes and *Preempt Events* are stored in the events log and enabled separately from *Event / Alarm Parameters*.



Pattern Events

A *Pattern Event* and time-stamp is generated whenever there is a change in the active coordination pattern.

Preempt Events

A *Preempt Event* and time-stamp is generated whenever preemption begins or ends.

Local Transmit Alarms

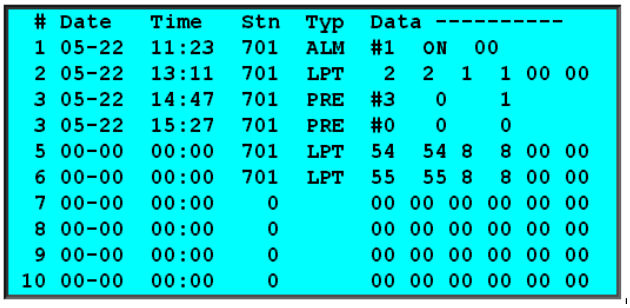
Do not enable *Local Transmit Alarms* if the local controller is being polled by a closed loop master, StreetWise or ATMS. This feature should only be enabled if the local controller is programmed to forward alarms over a dialup modem.

Re-Assign User Alarm IN

These two entries allow the general-purpose NEMA Inputs, Alarm In 1 and Alarm In 2 to be mapped to the alarm # that is entered. If this entry is 0, then the Alarm inputs are mapped to their default alarm numbers that are shown in parenthesis. The alarm input flexibility that this provides allows users to mimic other manufacturers controllers when replacing them in existing non-standard NEMA cabinets.

5.2 The Events Buffer (MM->3->2)

The *Events Buffer* stores event data so it can be uploaded to a closed loop master and/or the central system. In the example above, each event is date and time stamped with the "Stn" (controller Station ID address).

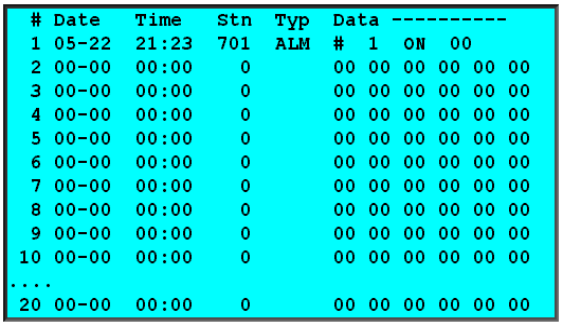


#	Date	Time	Stn	Typ	Data ----------
1	05-22	11:23	701	ALM	#1 ON 00
2	05-22	13:11	701	LPT	2 2 1 1 00 00
3	05-22	14:47	701	PRE	#3 0 1
3	05-22	15:27	701	PRE	#0 0 0
5	00-00	00:00	701	LPT	54 54 8 8 00 00
6	00-00	00:00	701	LPT	55 55 8 8 00 00
7	00-00	00:00	0		00 00 00 00 00 00
8	00-00	00:00	0		00 00 00 00 00 00
9	00-00	00:00	0		00 00 00 00 00 00
10	00-00	00:00	0		00 00 00 00 00 00

- Event# 1 records Alarm# 1 when the controller was last powered up
- Event# 2 records a local pattern event (LPT) when pattern # 2 became active
- Event# 3 records preempt #3 activated at 14:47
- Event# 4 shows when the preempt left at 15:27
- Event# 5 records a local pattern event (LPT) running NTCIP pattern # 254 (FREE).
- Event# 6 records a local pattern event (LPT) running NTCIP pattern # 255 (FLASH)

The *Event Buffer* (internal buffer) holds 40 events and a separate *Event Display Buffer* (shown above) displays the last 10 events until the central can poll the information from the local controller. After 10 events are recorded, the most recent event will be placed in Event #1 and all events will pushed down the list to the next event # (First-in First-out stack). Therefore, *Local Events* should be polled from the central frequently enough to avoid losing any event information stored in the controller's event buffer. The central interprets these event codes to generate query reports at the central office, so you don't have to view them from the controller.

5.3 The Alarms Buffer (MM->3->5)

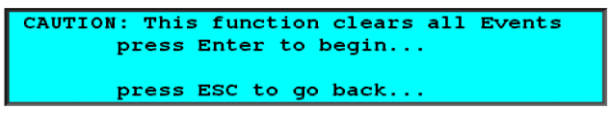


#	Date	Time	Stn	Typ	Data ----------
1	05-22	21:23	701	ALM	# 1 ON 00
2	00-00	00:00	0		00 00 00 00 00 00
3	00-00	00:00	0		00 00 00 00 00 00
4	00-00	00:00	0		00 00 00 00 00 00
5	00-00	00:00	0		00 00 00 00 00 00
6	00-00	00:00	0		00 00 00 00 00 00
7	00-00	00:00	0		00 00 00 00 00 00
8	00-00	00:00	0		00 00 00 00 00 00
9	00-00	00:00	0		00 00 00 00 00 00
10	00-00	00:00	0		00 00 00 00 00 00
....					
20	00-00	00:00	0		00 00 00 00 00 00

The internal *Alarms Buffer* and *Event Buffer* are very similar; however, only events that are enabled as alarms under menu MM->1->6->4 will be logged to the *Alarm Buffer*. Alarms enabled under menu MM->3->4 MUST also be enabled as events under menu MM->3->2 to be stored in the *Alarm Buffer*. Note that local pattern events (LPT) and preempt events (PRE) are stored in the *Event Buffer*, not in the *Alarm Buffer*. However, if preempts are required as alarms, the preempt inputs may be wired to external alarm inputs in the cabinet as shown in the table.

The internal *Alarm Buffer* holds 20 alarms, all of which are displayed on the front panel until the central can poll the information from the local controller. As new alarms are added to the alarm buffer, it will always overwrite the alarms beginning at Alarm #1. Existing alarms will remain, if not overwritten. For example, if all 20 alarms are stored in the buffer, the 21st alarm will overwrite Alarm #1 and the existing alarms will remain in the buffer and still be displayed. Also a power down/up will clear the internal alarm buffer.

5.4 Clear Event and Alarm Buffers.

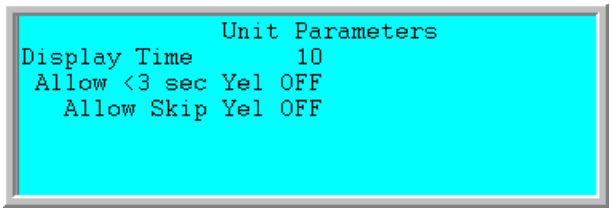


MM->3->3 clears the *Event Buffer* and MM->3->6 allows the user to manually clear the *Alarm Buffer*.

5.5 Lane Control Specific Alarms

The lane control software will produce the alarms as described below:

ALARM_LCU_ERROR	**101**	An error occurred. The error value is in the data portion of the alarm. See below for possible values. The data value is an 8-bit number. The first 4 bits is the Error ID. The second 4 bits contain the Error Data. See the Error table below for details on Error ID and Error Data.
ALARM_LCU_PLAN_EXPIRED	**102**	A plan has expired but it is still active. This will apply to pre-game and post-game plans.
ALARM_LCU_PLAN_ACTIVATED	**103**	A plan has become active.



6.1 Display Time

The *Display Time* sets the timeout (0-99 minutes) that reverts the front panel display to its default screen and logs off the user. If security is set under MM->8->2, the user must "log in" with a security access code after the Display Time expires. If the Display Time is set to zero, a value of one minute is used to insure that the screen does not timeout.

6.2 Unused Parameters

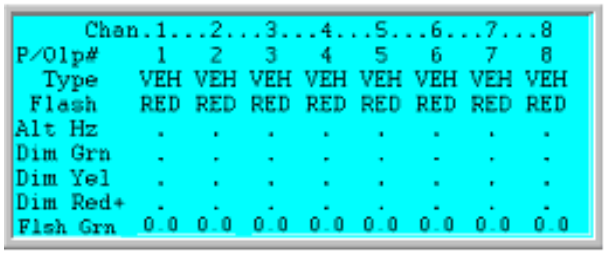
Allow <3 sec Yel and *Allow Skip Yel* parameters are not used in the LCS software and should not be programmed.

7 Channel and I/O Programming

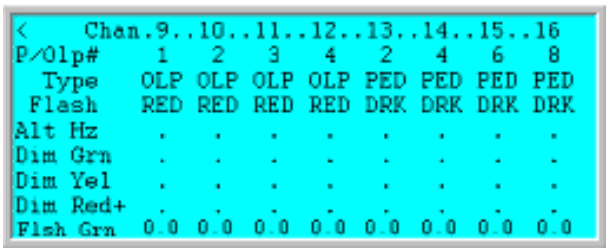
7.1 Channel Assignments (MM->5->1)

A *Channel* is an output driver (or load switch) used to switch AC power to a signal display. A channel is simply an output path composed of three signals - red, yellow, and green. All of the controller's main outputs (vehicle phases, overlaps, pedestrian outputs) consist of these three signals. Channel assignment allows these outputs to be applied to any of the available load switch channels. Therefore, a particular phase output or overlap output is not dedicated to a fixed channel as in the TS1 specification. This provides more flexibility to the assignment of hardware outputs.

Output mapping is accomplished by selecting a source number (1-16 for phase or overlap 1-16) followed by the source type (OLP, VEH, PED). The associated output channel will then display indications based upon the state of the assigned source. The default channel assignments shown below are defaults programmed for STD8 operation for a 16 channel cabinet



Chan.	1	2	3	4	5	6	7	8
Ø/Olp#	1	2	3	4	5	6	7	8
Type	VEH	VEH	VEH	VEH	VEH	VEH	VEH	VEH
Flash	RED	RED	RED	RED	RED	RED	RED	RED
Alt Hz	.	.	.	.	.	.	.	.
Dim Grn	.	.	.	.	.	.	.	.
Dim Yel	.	.	.	.	.	.	.	.
Dim Red+	.	.	.	.	.	.	.	.
Flsh Grn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



< Chan.	9	10	11	12	13	14	15	16
Ø/Olp#	1	2	3	4	2	4	6	8
Type	OLP	OLP	OLP	OLP	PED	PED	PED	PED
Flash	RED	RED	RED	RED	DRK	DRK	DRK	DRK
Alt Hz	.	.	.	.	.	.	.	.
Dim Grn	.	.	.	.	.	.	.	.
Dim Yel	.	.	.	.	.	.	.	.
Dim Red+	.	.	.	.	.	.	.	.
Flsh Grn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

MM->5->1: Channel Assignments for Channels 1-8 (left menu) and Channels 9-16 (right menu)

7.1.1 Ø/Olp# and Type

The channel source (*Ø/Olp#)* directs one of the 16 phase or overlap outputs to each load switch channel. The *Channel Type* (VEH, PED or OLP) programs the channel as either a vehicle, pedestrian or overlap output. A channel may be programmed as inactive (dark) by entering a zero value for the channel source *(Ø/Olp#).*

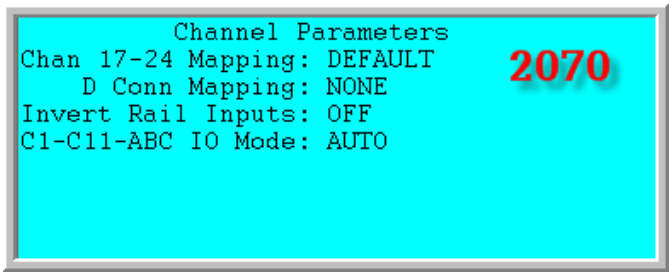
7.1.2 Flash, Alt Hz, Dim Parameters

These parameters are not used by this software.

.

7.2 Channel Parameters (MM->5->3)

The *Channel I/O Parameters* allow the user to customize I/O assignments for TS2, 2070 and 2070N controllers.



Channel 17-24 Mapping

NEMA does not define more than 16 output channels, so the DEFAULT setting defines channels 17-24. These additional outputs are provided in a Type-1 terminal facility using additional BIU devices to extend the channel outputs.

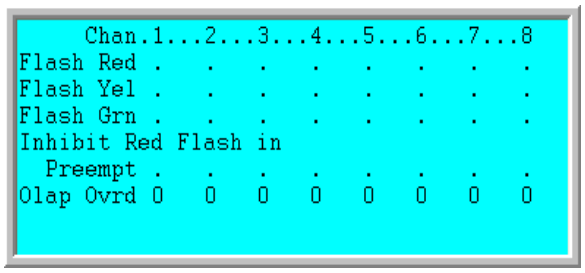
D-connector Mapping

D-connector Mapping defines the inputs and outputs of the D-connector for one of the following cabinet configurations. Chapter 14 of the NTCIP Controller manual lists the pin-out assignments for the D-connector for each of these settings.

NONE: no D-connector inputs or outputs (required for TS2 Type-2 I/O Modes 0,1, 2 or 6). If TS2 I/O Mode is not Mode 0, the *D-connector Mapping* MUST Be set to NONE.
TX2-V14: pin assignment compatible with Cubic | Trafficware Model 900-TX2CL, version 14
DIAMOND: pin assignment compatible with Cubic | Trafficware Model 900-DIA6CL, version 6
LIGHT RAIL: pin assignment compatible with the light-rail definitions.

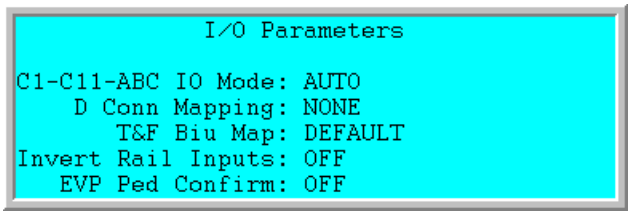
7.2.1 Chan+ Flash Settings (MM->5->4)

The Chan+ settings allow the user to flash any combination of outputs for channels 1-24. In addition, the user can turn off flashing red outputs for a particular phase during all preemptions or for any overlap number.



7.3 IO Parameters

The *IO Parameters* are found at **MM->5->6.** The TS2 *IO Parameter* allows the user to customize the IO Modes defined by NEMA for the ABC connectors and custom modes supported in the controller firmware. The 2070 *IO Parameter* supports custom modes for the C1 connector. In addition, the 2070 provide a USER mode that allows the user to redefine any input or output provided on the C1 connector.



C1-C11-ABC IO Mode (2070 Only)

This setting remaps the C1-C11 connector of the 2070 controller and the A-B-C connectors of the 2070N controller.

NONE	Disables the I/O for the 2070 and 2070N controllers
AUTO	Applies the I/O standard published in the CALTRANS TEES Specification
Mode 0	Reserved
Mode 1	Applies the New York DOT I/O mode settings
Mode 2	Applies the Dade County, Florida I/O mode settings
Mode 3-7	Reserved
USER	Applies USER I/O mapping.

T&F BIU Map

The Terminal and Facilities BIU inputs and Outputs can be mapped using this parameter. The mapping selections may include:

DEFAULT, SOLO TF BIU1, 24 OUT CHAN, USER

If the user wants to modify this mapping, please program these changes at MM->5->9->1->9 for BIU inputs and MM->5->9->2->9 for BIU outputs.

Invert Rail Inputs

A preemption input normally is open and when a contact closure is made, that input is recognized by the controller. Some railroads use a normally closed input and when it is open, that indicates that a railroad is preempting the controller. Agencies in the past had to create electrical relays to accommodate these rail preemption inputs. Setting this parameter to "ON" will eliminate the need for that additional cabinet relay wiring.

EVP Ped Confirm

This parameter is used for preemption confirmation lights. The selections are as follows:

OFF – No preemption confirmation lights are needed

ON FLASH - The pedestrian clearances outputs (Yellows) are used for Preemption confirmations in the following manner:

a. If the preemption is a rail, then all the ped clear outputs (yellows) flash

b. If the preemption is low priority, then all the ped clear outputs flash

c. If the preemption is high priority, then all the dwell phases and the initial dwell phases for the given preempt will be solid yellow to act as confirmations, while all other ped clear outputs will flash yellow.

ON DARK – This parameter works the same as ON FLASH except that the outputs are dark when they should be flashing.

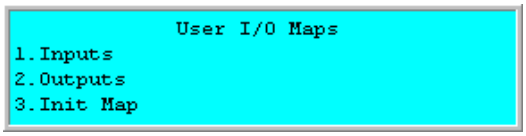
a. If the preemption is a rail, then all the ped clear outputs (yellows) are dark

b. If the preemption is low priority, then all the ped clear outputs are dark

c. If the preemption is high priority, then all the dwell phases and the initial dwell phases for the given preempt will be solid yellow to act as confirmations, while all other ped clear outputs will be dark

NOTE: *The EVP Ped Confirm outputs may be affected if you set a Ped output to control a Flashing Yellow Arrow overlap.*

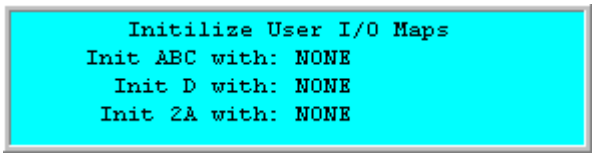
7.4 2070 IO User Map (MM->5->9)



MM->5->9 is used to customize the I/O pin assignments for the 2070 C1-C11 connector and the A-B-C connectors (2070N version).

Customizing the I/O maps for the 2070 involves three steps:

- Step 1 – Set *C1-C11-ABC IO Mode to* **USER** under menu MM->5->6
- Step 2 - Initialize the User I/O Maps from MM->5->9->3 (menu shown to the right)
- Step 3 – Customize the I/O Maps under MM->5->9 with selection *1.Inputs* and *2.Outputs*



Selecting *3.Init Map,* from the menu above allows NEMA A-B-C, D-connector and 2A (C1) connector to be initialized with several factory default settings as shown below.

Initializing the 2070 ABC, D and 2A Connectors (MM->5->9->3)

The **ABC connector configurations** for the 2070N are:

- **NONE** – A-B-C inputs and outputs deactivated
- **AUTO** – default NEMA TS1 A-B-C I/O (Mode 0)
- **Mode 0–7** – Modes 0-5 (defined by NEMA) and Modes 6 and 7 (defined by the manufacturer) are listed in the NTCIP Controller Manual. The 2070 I/O mode is selected by initializing ABC from the above menu. The TS2 I/O modes are specified as a *Unit Parameter*. These modes only applies to the TS2 and not to the 2070.
- **USER** – allows the user to configure each pin of the A-B-C connectors for the 2070N from menu MM->5->9

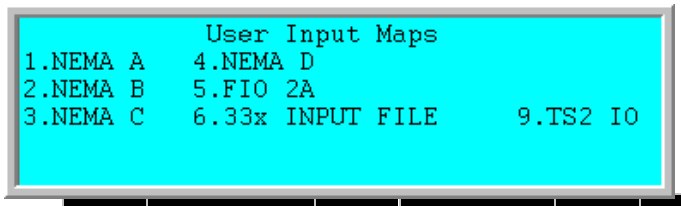
The **D connector configurations** for the 2070N controller are:

- **NONE** – All D-connector inputs and outputs are deactivated.
- **TEES** – The D-connector conforms to the TEES configuration defined in Chapter 14.
- **820A-VMS** – The D-connector conforms to I/O map of the 820A controller.

The **2A (C1) connector configurations** are:

- **NONE** – All C1-connector inputs and outputs are deactivated.
- **Mode 0** – C1 inputs and outputs conform to the latest Caltrans / SCDOT 2070 TEES specification. This will be used with Model 332/336 cabinets.
- **Mode 1**– C1 inputs and outputs conform to 179 controller defaults defined by the New York DOT. This will be used with Model 330 cabinets.
- **Mode 2**- Reserved
- **Mode 3**- Reserved

7.5 Customizing 2070 Inputs (MM->5->9->1)



After initializing the default I/O, you may customize the input maps selecting *1.Inputs* from MM->5->9->1. Each input pin on the A-B-C connector, D-connector and 2A (C1) connector may be redefined using the function numbers provided in the chart below.

Func	Input	Func	Input	Func	Input	Func	Input	Func	Input
0	Unused	50	Veh Call 50	100	Veh Chng 36	150	Ped Omit 6	200	Pre 3 In
1	Veh Call 1	51	Veh Call 51	101	Veh Chng 37	151	Ped Omit 7	201	Pre 4 In
2	Veh Call 2	52	Veh Call 52	102	Veh Chng 38	152	Ped Omit 8	202	Pre 5 In
3	Veh Call 3	53	Veh Call 53	103	Veh Chng 39	153	Ph Omit 1	203	Pre 6 In
4	Veh Call 4	54	Veh Call 54	104	Veh Chng 40	154	Ph Omit 2	204	Pre 7 In
5	Veh Call 5	55	Veh Call 55	105	Veh Chng 41	155	Ph Omit 3	205	Pre 8 In
6	Veh Call 6	56	Veh Call 56	106	Veh Chng 42	156	Ph Omit 4	206	Cab Flash
7	Veh Call 7	57	Veh Call 57	107	Veh Chng 43	157	Ph Omit 5	207	Comp StopTm
8	Veh Call 8	58	Veh Call 58	108	Veh Chng 44	158	Ph Omit 6	208	Local Flash
9	Veh Call 9	59	Veh Call 59	109	Veh Chng 45	159	Ph Omit 7	209	TBC Input
10	Veh Call 10	60	Veh Call 60	110	Veh Chng 46	160	Ph Omit 8	210	Dim Enable
11	Veh Call 11	61	Veh Call 61	111	Veh Chng 47	161	R1 Frc Off	211	Auto Flash
12	Veh Call 12	62	Veh Call 62	112	Veh Chng 48	162	R1 Stop Tim	212	Alt Seq A
13	Veh Call 13	63	Veh Call 63	113	Veh Chng 49	163	R1 Inh Max	213	Alt Seq B
14	Veh Call 14	64	Veh Call 64	114	Veh Chng 50	164	R1 Red Rest	214	Alt Seq C
15	Veh Call 15	65	Veh Chng 1	115	Veh Chng 51	165	R1 PedRecyc	215	Alt Seq D
16	Veh Call 16	66	Veh Chng 2	116	Veh Chng 52	166	R1 Max II	216	Plan A
17	Veh Call 17	67	Veh Chng 3	117	Veh Chng 53	167	R1 OmtRdClr	217	Plan B
18	Veh Call 18	68	Veh Chng 4	118	Veh Chng 54	168	Non-Act I	218	Plan C
19	Veh Call 19	69	Veh Chng 5	119	Veh Chng 55	169	R2 Frc Off	219	Plan D
20	Veh Call 20	70	Veh Chng 6	120	Veh Chng 56	170	R2 Stop Tim	220	Addr Bit 0
21	Veh Call 21	71	Veh Chng 7	121	Veh Chng 57	171	R2 Inh Max	221	Addr Bit 1
22	Veh Call 22	72	Veh Chng 8	122	Veh Chng 58	172	R2 Red Rest	222	Addr Bit 2
23	Veh Call 23	73	Veh Chng 9	123	Veh Chng 59	173	R2 PedRecyc	223	Addr Bit 3
24	Veh Call 24	74	Veh Chng 10	124	Veh Chng 60	174	R2 Max II	224	Addr Bit 4
25	Veh Call 25	75	Veh Chng 11	125	Veh Chng 61	175	R2 OmtRdClr	225	Offset 1
26	Veh Call 26	76	Veh Chng 12	126	Veh Chng 62	176	Non-Act II	226	Offset 2
27	Veh Call 27	77	Veh Chng 13	127	Veh Chng 63	177	Ext Start	227	Offset 3
28	Veh Call 28	78	Veh Chng 14	128	Veh Chng 64	178	Int Advance	228	33x Flash Sense
29	Veh Call 29	79	Veh Chng 15	129	Ped Call 1	179	IndLampCtrl	229	33x CMU Stop
30	Veh Call 30	80	Veh Chng 16	130	Ped Call 2	180	Min Recall	230	GateMode0
31	Veh Call 31	81	Veh Chng 17	131	Ped Call 3	181	ManCtrlEnbl	231	GateMode1
32	Veh Call 32	82	Veh Chng 18	132	Ped Call 4	182	Mode Bit A	232	GateMode2
33	Veh Call 33	83	Veh Chng 19	133	Ped Call 5	183	Mode Bit B	233	GateMode3
34	Veh Call 34	84	Veh Chng 20	134	Ped Call 6	184	Mode Bit C	234	GateOpen1
35	Veh Call 35	85	Veh Chng 21	135	Ped Call 7	185	Test A	235	GateClose1
36	Veh Call 36	86	Veh Chng 22	136	Ped Call 8	186	Test B	236	GateOpen2
37	Veh Call 37	87	Veh Chng 23	137	Hold 1	187	Test C	237	GateClose2
38	Veh Call 38	88	Veh Chng 24	138	Hold 2	188	WalkRestMod	238	Reserved
39	Veh Call 39	89	Veh Chng 25	139	Hold 3	189	Unused	239	Reserved
40	Veh Call 40	90	Veh Chng 26	140	Hold 4	190	Free	240	Logic1
41	Veh Call 41	91	Veh Chng 27	141	Hold 5	191	Flash In	241	Logic2
42	Veh Call 42	92	Veh Chng 28	142	Hold 6	192	Alarm 1	242	Logic3
43	Veh Call 43	93	Veh Chng 29	143	Hold 7	193	Alarm 2	243	Logic4
44	Veh Call 44	94	Veh Chng 30	144	Hold 8	194	Alarm 3	244	Logic5
45	Veh Call 45	95	Veh Chng 31	145	Ped Omit 1	195	Alarm 4	245	Logic6
46	Veh Call 46	96	Veh Chng 32	146	Ped Omit 2	196	Alarm 5	246	Logic7
47	Veh Call 47	97	Veh Chng 33	147	Ped Omit 3	197	Alarm 6	247	Logic8
48	Veh Call 48	98	Veh Chng 34	148	Ped Omit 4	198	Pre 1 In	248	Logic9
49	Veh Call 49	99	Veh Chng 35	149	Ped Omit 5	199	Pre 2 In	249	Logic10

Func	Input	Func	Input	Func	Input	Func	Input	Func	Input
250	Reserved	260	Ped Call 13	270	Hold 15	280	Ph Omit 9	290	Reserved
251	Reserved	261	Ped Call 14	271	Hold 16	281	Ph Omit 10	291	Reserved
252	Reserved	262	Ped Call 15	272	Ped Omit 9	282	Ph Omit 11	292	Reserved
253	Reserved	263	Ped Call 16	273	Ped Omit 10	283	Ph Omit 12	293	Reserved
254	False	264	Hold 9	274	Ped Omit 11	284	Ph Omit 14	294	Reserved
255	True	265	Hold 10	275	Ped Omit 12	285	Ph Omit 14	295	Reserved
256	Ped Call 9	266	Hold 11	276	Ped Omit 13	286	Ph Omit 15	296	Reserved
257	Ped Call 10	267	Hold 12	277	Ped Omit 14	287	Ph Omit 16	297	Reserved
258	Ped Call 11	268	Hold 13	278	Ped Omit 15	288	Reserved	298	Reserved
259	Ped Call 12	269	Hold 14	279	Ped Omit 16	289	Reserved	299	Reserved

7.5.1 33x Input File (MM->5->9->1->6)

The 33.X INPUT FILE is used in conjunction with USER IO Mode to allow the user to customize the input pins of the C1.

Inputs 1-64 on this menu correspond with I1-1 through I8-8

```
Input Category Idx  Description
  1   DETECTOR   2  Detector 2
  2   PEDCALL    2  P 2 PedCall
  3   HOLD       2  Ph2 Hold
  4   OMIT       2  Ph 2 Omit
  5   PEDOMIT    2  Ped 2 Omit
  6   RING       2  R1 StopTime
  7   CABINET    2  CNA 1
  8   PREEMPT    2  Preempt 2
  9   UNUSED     1  Unused
```

DETECTOR: Indexes 1-64 assign any vehicle detector to any input pin
PEDCALL: Index 1-8 assigns the input to one of the 8 *Ped Detectors*
HOLD: Indexes 1-16 apply a hold on phases 1-16 if CNA operation is in effect
OMIT: Indexes 1-16 apply an omit on phases 1-16
PEDOMIT: Indexes 1-16 apply a ped omit on phases 1-16
RING: The indexes below apply the following ring features

Index	Description	Index	Description
1	R1 Frc Off	8	R1 Frc Off
2	R1 Stop Time	9	R1 Stop Time
3	R1 Inh Max	10	R1 Inh Max
4	R1 Red Rest	11	R1 Red Rest
5	R1 Ped Recycle	12	R1 Ped Recycle
6	R1 Max II	13	R1 Max II
7	R1 Omit Red Clearance	14	R1 Omit Red Clearance

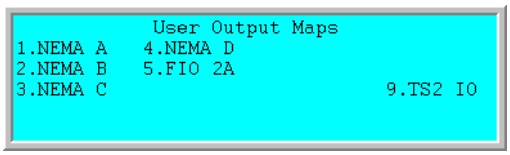
CABINET: The indexes below apply the following cabinet features

Index	Description	Index	Description
1	CNA2	11	Cab Flash
2	CNA1	12	33x Stop Time
3	External Start	13	Local Flash
4	Interval Advance	14	TBC Input
5	Door Open	15	Dim Enable
6	Min Recall	16	Auto Flash
07	Manual Control Enable	17	33xFlash Sense
8	Walk Rest Modifier	18	33xCMUStop
9	Free Command	19	Unused
10	Flash Input	20	Unused

PREEMPT: Indexes 1-10 apply a call to preempts 1-10
UNUSED: The input pin is unused

7.6 Customizing 2070 Outputs (MM->5->9->2)

After initializing the default I/O, you may customize the output maps selecting *2.Outputs* from MM->5->9->2. Each output pin on the A-B-C connector, D-connector and 2A (C1) connector may be redefined using the function numbers provided in the chart below.



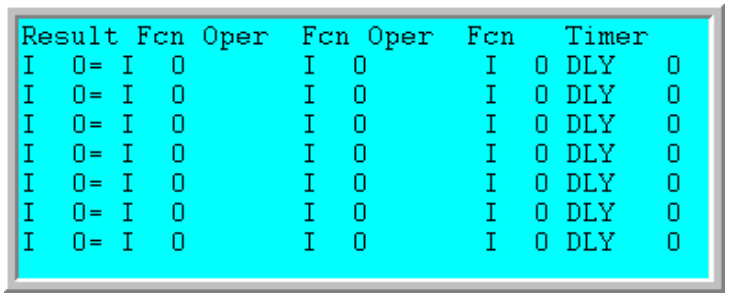
Func	Output	Func	Output	Func	Output	Func	Output	Func	Output
0	Unused	50	Ch2 Green	100	R2 Status A	150	Reserved	200	Reserved
1	Ch1 Red	51	Ch3 Green	101	R2 Status B	151	Reserved	201	Reserved
2	Ch2 Red	52	Ch4 Green	102	R2 Status C	152	Reserved	202	Reserved
3	Ch3 Red	53	Ch5 Green	103	Special 1	153	Reserved	203	Reserved
4	Ch4 Red	54	Ch6 Green	104	Special 2	154	Reserved	204	Reserved
5	Ch5 Red	55	Ch7 Green	105	Special 3	155	Reserved	205	Reserved
6	Ch6 Red	56	Ch8 Green	106	Special 4	156	Reserved	206	Reserved
7	Ch7 Red	57	Ch9 Green	107	Special 5	157	Reserved	207	Reserved
8	Ch8 Red	58	Ch10 Green	108	Special 6	158	Reserved	208	Reserved
9	Ch9 Red	59	Ch11 Green	109	Special 7	159	Reserved	209	Reserved
10	Ch10 Red	60	Ch12 Green	110	Special 8	160	Reserved	210	Reserved
11	Ch11 Red	61	Ch13 Green	111	Fault Mon	161	Reserved	211	Reserved
12	Ch12 Red	62	Ch14 Green	112	Voltage Mon	162	Reserved	212	Reserved
13	Ch13 Red	63	Ch15 Green	113	Flash Logic	163	Reserved	213	Reserved
14	Ch14 Red	64	Ch16 Green	114	Watchdog	164	Reserved	214	Reserved
15	Ch15 Red	65	Ch17 Green	115	Not Used	165	Reserved	215	Reserved
16	Ch16 Red	66	Ch18 Green	116	Pre Stat 1	166	Reserved	216	Reserved
17	Ch17 Red	67	Ch19 Green	117	Pre Stat 2	167	Reserved	217	Reserved
18	Ch18 Red	68	Ch20 Green	118	Pre Stat 3	168	Reserved	218	Reserved
19	Ch19 Red	69	Ch21 Green	119	Pre Stat 4	169	Reserved	219	Reserved
20	Ch20 Red	70	Ch22 Green	120	Pre Stat 5	170	Reserved	220	Reserved
21	Ch21 Red	71	Ch23 Green	121	Pre Stat 6	171	Reserved	221	Reserved
22	Ch22 Red	72	Ch24 Green	122	TBCAux/Pre1	172	Reserved	222	Reserved
23	Ch23 Red	73	Ph 1 Check	123	TBCAux/Pre2	173	Reserved	223	Reserved
24	Ch24 Red	74	Ph 2 Check	124	LdSwtchFlsh	174	Reserved	224	Reserved
25	Ch1 Yellow	75	Ph 3 Check	125	TBC Aux 1	175	Reserved	225	Reserved
26	Ch2 Yellow	76	Ph 4 Check	126	TBC Aux 2	176	Reserved	226	Reserved
27	Ch3 Yellow	77	Ph 5 Check	127	TBC Aux 3	177	Reserved	227	Reserved
28	Ch4 Yellow	78	Ph 6 Check	128	Free/Coord	178	Reserved	228	Reserved
29	Ch5 Yellow	79	Ph 7 Check	129	Time plan A	179	Reserved	229	Reserved
30	Ch6 Yellow	80	Ph 8 Check	130	Time plan B	180	Reserved	230	GateOpen1
31	Ch7 Yellow	81	Ph 1 Next	131	Time plan C	181	Reserved	231	GateClose1
32	Ch8 Yellow	82	Ph 2 Next	132	Time plan D	182	Reserved	232	GateOpen2
33	Ch9 Yellow	83	Ph 3 Next	133	Offset Out1	183	Reserved	233	GateClose2
34	Ch10 Yellow	84	Ph 4 Next	134	Offset Out2	184	Reserved	234	Reserved
35	Ch11 Yellow	85	Ph 5 Next	135	Offset Out3	185	Reserved	235	Reserved
36	Ch12 Yellow	86	Ph 6 Next	136	Auto Flash	186	Reserved	236	Reserved
37	Ch13 Yellow	87	Ph 7 Next	137	PreemptActv	187	Reserved	237	Reserved
38	Ch14 Yellow	88	Ph 8 Next	138	Reserved	188	Reserved	238	Reserved
39	Ch15 Yellow	89	Phase 1 On	139	Reserved	189	Reserved	239	Reserved
40	Ch16 Yellow	90	Phase 2 On	140	Audible Ped 2	190	Reserved	240	Logic1
41	Ch17 Yellow	91	Phase 3 On	141	Audible Ped 4	191	Reserved	241	Logic2
42	Ch18 Yellow	92	Phase 4 On	142	Audible Ped 6	192	Reserved	242	Logic3
43	Ch19 Yellow	93	Phase 5 On	143	Audible Ped 8	193	Reserved	243	Logic4
44	Ch20 Yellow	94	Phase 6 On	144	Reserved	194	Reserved	244	Logic5
45	Ch21 Yellow	95	Phase 7 On	145	Reserved	195	Reserved	245	Logic6
46	Ch22 Yellow	96	Phase 8 On	146	Reserved	196	Reserved	246	Logic7
47	Ch23 Yellow	97	R1 Status A	147	Reserved	197	Reserved	247	Logic8
48	Ch24 Yellow	98	R1 Status B	148	Reserved	198	Reserved	248	Logic9
49	Ch1 Green	99	R1 Status C	149	Reserved	199	Reserved	249	Logic10

Func	Output	Func	Output	Func	Output	Func	Output	Func	Output
250	Reserved	260	Reserved	270	Reserved	280	Reserved	290	Reserved
251	Reserved	261	Reserved	271	Reserved	281	Reserved	291	Reserved
252	Reserved	262	Reserved	272	Reserved	282	Reserved	292	Reserved
253	Reserved	263	Reserved	273	Reserved	283	Reserved	293	Reserved

254	False	264	Reserved	274	Reserved	284	Reserved	294	Reserved
255	True	265	Reserved	275	Reserved	285	Reserved	295	Reserved
256	Reserved	266	Reserved	276	Reserved	286	Reserved	296	Reserved
257	Reserved	267	Reserved	277	Reserved	287	Reserved	297	Reserved
258	Reserved	268	Reserved	278	Reserved	288	Reserved	298	Reserved
259	Reserved	269	Reserved	279	Reserved	289	Reserved	299	Reserved

7.7 2070 Programmable IO Logic (MM->5->7)

The 2070 *IO Logic* feature allows the user to "logically" combine IO to create new inputs and outputs that extend the functionality of the controller. The following are descriptions of each field



Result
The user sets this field to either an **I** (for Input) or **O** (for Output). This selection determines if you are assigning the result of the statement to an input or an output.

The user can optionally set a **!** prior to the **I** or **O** term result. The exclamation point indicates that the result is inverted during evaluation of the statement.

Fcn
This is the IO Function Number as described in this chapter.

This software utilizes 10 Logic Functions variable numbered 240-249, where Functions 240-249 are functions "Logic 1" - "Logic 10". Whether they are denoted as input or output, they point to the same location. Think of these functions as temporary storage locations. If you want to feed the output of one statement into the next, you can make an assignment of the first statement to one of these logic variables, and they use it as a term in the next statement.

Operator

This is the Logical Operation (Boolean Logic). Among the choices are: AND, NAND, OR, NOR, XOR, XNOR

The logic will follow the following truth tables-- Where '0' represents OFF or False and "1" represents ON or True

AND NAND

0	0	0		0	0	1
0	1	0		0	1	1
1	0	0		1	0	1
1	1	1		1	1	0

OR NOR

0	0	0		0	0	1
0	1	1		0	1	0
1	0	1		1	0	0
1	1	1		1	1	0

XOR XNOR

0	0	0		0	0	1
0	1	1		0	1	0
1	0	1		1	0	0
1	1	0		1	1	1

Timer

The timer can optionally be specified to SHIFT, DELAY, or EXTEND the result of the logic statement for the number of seconds specified by the user.

SHF- Shift logic

DLY- Delay logic by ### - the number of seconds to SHF/DLY/EXT

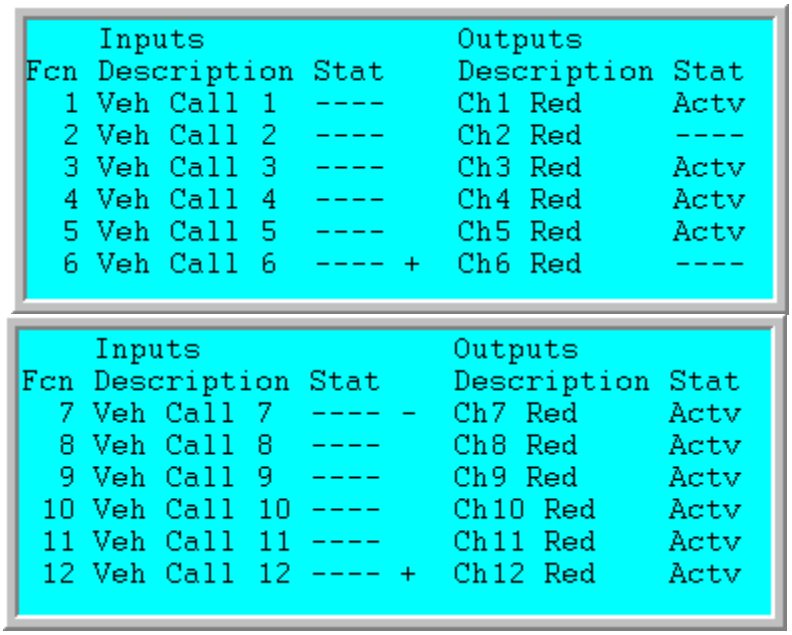
EXT – Extend logic

This timer operates similar to detection delay and extend.

In summary, the logic statement is performed from left to right. The result of each statement is accumulated. For example, "1 AND 2 AND 3" is processed as follows " (RESULT OF 1 AND 2) AND 3".

7.8 2070 IO Viewer (MM->5->8)

An *IO Viewer* provides a real-time status monitor of all available inputs and outputs to the controller.



Inputs			Outputs	
Fcn	Description	Stat	Description	Stat
1	Veh Call 1	----	Ch1 Red	Actv
2	Veh Call 2	----	Ch2 Red	----
3	Veh Call 3	----	Ch3 Red	Actv
4	Veh Call 4	----	Ch4 Red	Actv
5	Veh Call 5	----	Ch5 Red	Actv
6	Veh Call 6	---- +	Ch6 Red	----

Inputs			Outputs	
Fcn	Description	Stat	Description	Stat
7	Veh Call 7	---- -	Ch7 Red	Actv
8	Veh Call 8	----	Ch8 Red	Actv
9	Veh Call 9	----	Ch9 Red	Actv
10	Veh Call 10	----	Ch10 Red	Actv
11	Veh Call 11	----	Ch11 Red	Actv
12	Veh Call 12	---- +	Ch12 Red	Actv

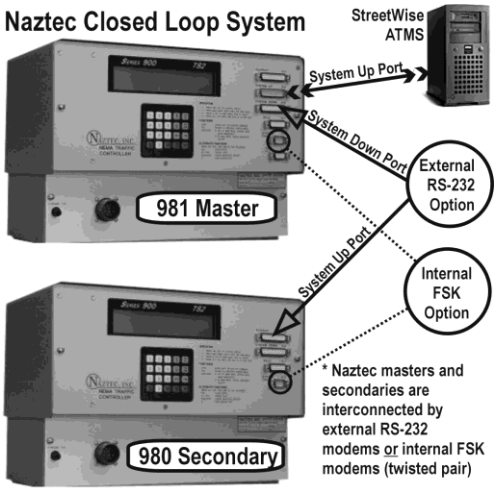
The screens will display Input functions an output functions by function number as described earlier in this chapter.

8.1 Communication Menu (MM->6)

```
          Communication Menu
1.General Parms   4.Req Downld 7.Status
2.Port Parms      5.IP Setup
3.Reserved        6.Binding
```

MM->6 configures the controller communications ports. The following sections describe the proper setup, observation, and use of the RS-232 communication ports and the Ethernet port provided with the 2070.

8.2 Central Communications



StreetWise or ATMS provides either direct communication to each controller in the system (master-less), or communicates with closed loop masters that serve as communication buffers for the secondary controllers in the system.

A 2070 master controller interconnects up to 32 secondary controllers using RS-232 modems communicating at 600 - 57.6 Kbaud. Full and half-duplex asynchronous communication is supported.

The figure on the left describes the RS2 Communications using Cubic | Trafficware NEMA controllers. The 2070's can be substituted in this figure.

8.3 General Communication Parameters (MM->6->1)

```
General Parms          SysUp Modem Parms
StationID    :     0   EnableMdm :OFF
GroupID      :     0   IdleTime  :  0
MasterID     :     0   DialTime  :  0
BackupTime   :     0   Tel:0,0-000-000-0000
                       Alt:0,0-000-000-0000
```

MM->6->1: 2070 Controller (v60/65)

8.3.1 Station ID (Range 1 - 9,999 – see Note below)

The Station ID is a unique identification number (or address) assigned to every master and secondary controller in the system. When a StreetWise or ATMS initiates a communication poll to a *Station ID*, all controllers on the same communication path (including the controllers in the master's subsystem) receive the same poll request. However, the only controller responding to this request is the *Station ID* matching the ID contained in the poll request. This unique controller addressing provides the poll/response system typically found in point-to-point traffic control systems.

Note: The Cubic | Trafficware DEFAULT protocol supports controller addresses in the range of 1-9,999; however, the valid range under the NTCIP protocol is 1-8192.

8.3.2 Master Station ID (1 - 9,999)

The Master Station ID is the ID of the master controller when the secondary is operating in a system under a master. Valid Master IDs are in the range of 1-9,999 under the Cubic | Trafficware DEFAULT protocol and 1-8192 under NTCIP.

8.3.3 Group ID

The Group ID is reserved for future under NTCIP using a broadcast message to all secondary controllers programmed with the same group address. Currently, the secondary controllers a response message is received by the central or master when a secondary controller is polled within a system. A group broadcast does not expect a reply message and provides no status indicating that the message was actually received.

8.3.4 Backup Time (2070 NTCIP Protocol)

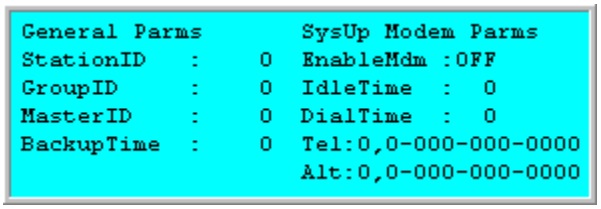
Backup Time is an NTCIP object used to revert a secondary controller to local time base control if system communication is lost. The *Backup Time* (specified in seconds) is a countdown timer that is reset by any valid poll received from a closed loop master or from the central office. Therefore, it is possible for a secondary operating under closed loop to receive polls that set the clock or gather status or detector information without receiving an updated Sys pattern.

The 2070 controller uses the NTCIP *Backup Time* to test the communications, so any poll received by the secondary resets the *Backup Time*.

8.3.5 Setting the Dial-Up Modem Parameters (MM->6->1)

EnableMdm

The EnableMdm field is used to turn the port on or off. In the off position, the port is not available for dial-up communications.



DialTime

The dial time parameter tells the controller how long to wait after dialing a phone line for a connection to be made. A value of 0 to 255 seconds may be entered. If a connection is not made within the programmed dial time, the controller will attempt the call again using the alternate telephone number.

IdleTime

This parameter tells the controller how often to query the modem to verify that it is still communicating. A value of 0 to 255 minutes may be entered.

Tel

This is the primary telephone number the controller uses to establish communications.

Alt

This is the secondary telephone number the controller uses to establish communications. This number will be used if the dial time expires without a connection when attempting to connect using Tel#1. If the controller is unable to connect using Tel#2, it will try again using Tel#1.

8.4 2070 Communications Port Parameters (MM->6->2)

After a system reset (SYSRESET), the 2070 serial ports are initialized as follows. The board label and slot position of each SP port are also provided as a reference. Note that the port must be assigned to the correct slot position in the 2070. Slot positions are read left to right with A1 at the far left when viewed from the back of the controller.

Serial Port	Board	Slot	Connector	Default Settings When the 2070 is Reset
SP1	2070-7A	A2	C21S	1.2 Kbps, 8-bit, 1 stop, no parity, no pause, no echo
SP1S	2070-7B	A2	TBD	1.2 Kbps, 8-bit, 1 stop, no parity, no pause, no echo
SP2	2070-7A	A2	C22S	
SP2S	2070-7B	A2	TBD	
SP3	2070-7A	A1	C21S	
SP3S	2070-2A/2B	A3	C12S	614.4 Kbps
SP4	FPA		C50S	9.6 Kbps, 8-bit, 1 stop, no parity, no pause, XDR off, xoff
SP5S	2070-2A/2B	A3	C12S	614.4 Kbps
SP8	2070-1B	A5	C13S	
SP8S	2070-1B	A5	C13S	

The *Communications Port Parameters* under menu MM->6->2 (menu to the right) allow you to change the default baud rate settings and the FCM (Flow Control Mode) of the eight 2070 serial ports. This programming overrides the default baud rate settings shown to the right when the 2070 is reset.

```
        Hardware Port Parameters
/SP# Baud FCM
 1   9600  6
 2   9600  6
 3   1200  0
 4   1200  0
```

FCM	Description of FCM (Flow Control Mode)
0	**No Flow Control Mode:** The CTS and CD signals are set asserted internally, so the serial device driver can receive data at all times. Upon a write command, the serial device driver asserts RTS to start data transmission, and de-asserts RTS when data transmission is completed. When user programs issue the first RTS related command, the driver switches to Manual Flow Control Mode.
1	**Manual Flow Control Mode:** The serial device driver transmits and receives data regardless of the RTS, CTS, and CD states. The user program has absolute control of the RTS state and can inquire of the states of CTS and CD. The states of CTS and CD are set externally by a DCE. The device driver doesn't assert or de-assert the RTS.
2	**Auto-CTS Flow Control Mode:** The serial device driver transmits data when CTS is asserted. The CTS state is controlled externally by a DCE. The user program has absolute control of the RTS state. The CD is set asserted internally. The device driver doesn't assert or de-assert the RTS.
3	**Auto-RTS Flow Control Mode:** The CTS and CD are set asserted internally. The serial device driver receives and transmits data at all times. Upon a write command, the serial device driver asserts RTS to start data transmission, and de-asserts RTS when data transmission is completed. If the user program asserts the RTS, the RTS remains to be on until user program de-asserts RTS. If user program de-asserts RTS before the transmitting buffer is empty, the driver holds RTS on until the transmitting buffer is empty. Parameters related to delays of the RTS turn-off after last character are user configurable.
4	**Fully Automatic Flow Control Mode:** The serial device driver receives data when CD is asserted. Upon a write command, the serial device driver asserts RTS and wait for CTS, starts data transmission when CTS is asserted, and de-asserts RTS when data transmission is completed. Parameters related to delays of RTS turn-off after last character are user configurable. If user program asserts the RTS, RTS remains to be on until user program de-asserts RTS. If user program de-asserts RTS before the transmitting buffer is empty, the driver holds RTS on until the transmitting buffer is empty.
5	**Dynamic Flow Control Mode:** The Serial device driver maintains a transmit buffer and a receive buffer with fixed sizes, controls the state of RTS and monitors the state of CTS. The transmission and reception of data are managed automatically by the serial device driver. The serial device driver transmits data when CTS is asserted. The serial device driver asserts RTS when its receiving buffer is filled below certain level (low watermark), and de-asserts RTS when its receiving buffer is filled above certain level (high watermark).
6	**Naztec Enhanced Flow Control Mode**: This is the recommended flow control mode for all RS-232 applications using the 2070. This mode combines the features of modes 0 and 2 and provides a hardware RTS/CTS handshake with any device connected to the serial port. However, request-to-send and clear-to-send are controlled directly from the Cubic | Trafficware control program rather than through the OS-9 operating system. This method allows the Cubic | Trafficware control program to communicate with some devices that cannot be interfaced through OS-9.

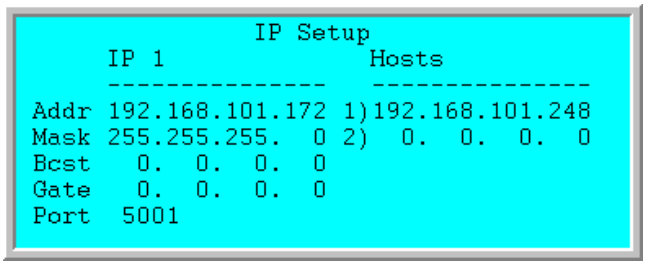
FCM definitions above were taken from Section 9.2.7.2.5, CALTRANS TEES Specification dated November 19, 1999

8.5 Request Download (MM->6->4)

The *Request Download* screen allows an operator in the field to request a download of the permanent file in the StreetWise or ATMS database by selecting LOCAL from the menu shown in the menu to the right.

8.6 2070 IP Setup (MM->6->5)

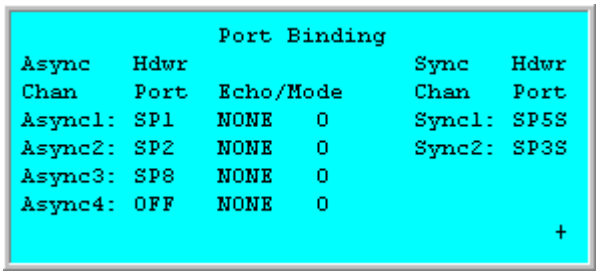
The *IP Setup* menu configures the two IP (Internet Protocol) ports implemented through the controller's Ethernet interface (2070-1B CPU Module). The IP settings are used to identify a 2070 residing on a TCP/IP network like the Station ID is used to identify a controller residing on a serial data link



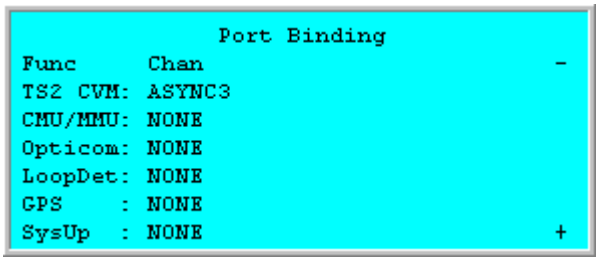
The *IP Address* and *Mask* must be configured correctly for the local network. IP 1 is assigned to the local controller. Host 1 is the IP address of the central computer. The *Broadcast* and Gateway addresses can usually be set to 0.0.0.0 unless subnet addressing or routing is called for. The port # will match the Ethernet drop's port # as setup by the central. Changes to *IP Setup* take effect when the user leaves menu MM->6->5.

8.7 2070 Binding (MM->6->6)

The *Binding* menu associates the physical hardware ports of the 2070 controller with the logical ports assigned through software. Please refer to section 14.4 if you are not familiar with the 2070 I/O modules.



For most applications, "Software Ports" SP1 and SP2 correspond with the 9-pin serial connectors, C21S and C22S on the 2070-7A card. Recall from the table in section 9.5 that the 2070-7A card must reside in slot A2 to support these two ports.



The FIO 20 interface supports the ATC cabinet and 2070N expansion chassis. This interface requires that "Software Port" SP5 correspond with the FIO 20 interface. The hardware connector for FIO 20 is identified as the C12S connector on the 2070-2A and Field I/O Modules.

The FIO 20 interface must also be assigned to SP5 to the Cubic | Trafficware Test Box with the C12S connector. The Cubic | Trafficware Test Box essentially emulates the operation of the 2070N expansion chassis.

8.8 Basic IP Interface Connectivity Test

The following guidelines should be used to test basic connectivity between a 2070 controller and a laptop computer. The communication protocol for the 2070 is NTCIP by default.

The network should be properly configured by your network administrator. As a minimum, the controller settings under MM->6->5 must provide the local IP address and mask settings for the network (typically the IP 1 address for the 2070).

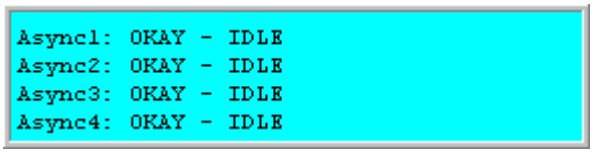
The first three numbers of the IP address must be shared by all devices on the network (including the central computer). The last 3-digit number must be unique for all devices on the network (similar to the unique *Station ID* used with serial communications). For example, the central computer might be assigned an IP address xxx.yyy.zzz.001 and the local controller xxx.yyy.zzz.002. Every device on this network would share the same "network" address xxx.yyy.zzz. However, each device, including the central computer (.001) would be required to have a unique address on the network.

You can test connectivity using a "cross-over" Ethernet cable to interface the controller directly with the Ethernet port of your computer. A "cross-over" cable is similar to a null-modem cable that switches transmit and receive pairs between two RS-232 devices. You cannot directly connect the controller to a computer using the same RJ45 Ethernet cable that you use to connect to your local computer network. Your computer must also be configured with a "static" IP address instead of the "dynamic" address typically used with LAN and dial-up Internet connections. Changing your network settings is not advised unless you know what you are doing because this will disrupt your LAN and Internet connection.

For this test, assume that the computer is configured with "fixed" IP address 192.168.001 and the controller is configured with 192.168.100.002 under MM->6->5. The network interface of the computer and local controller share the same *Mask* address 255.255.255.0. Basic connectivity of the Ethernet circuit may be confirmed by running a command line program, called *Ping* from Windows. Select *Run* from the *Start Menu*, enter "command" and press OK. This launches a command window where you can execute the ping command. Enter the command "ping 192.168.100.002" and press return. If the Ethernet circuit is functional, you should see a several replies from the controller each time the computer "pings" it's local IP address. If the controller does not respond, you will see a timeout message indicating that the Ethernet interface is not connected. If this basic "ping test" passes from the StreetWise or ATMS communication server, but you cannot communicate with the same controller in StreetWise or ATMS , then you have an error in your com server software configuration.

8.9 2070 Com Status

The TS2 *Communication Status Screen* monitors the activity of each communication port and shows transmitting (TX) or receiving (Rx) bytes as well as an indication of com activity.



8.10 TS2 GPS Interface

Cubic | Trafficware controllers can be used to update the time sync from GPS receivers such at the Garmin GPS 16 (shown below). The controller date is not automatically updated, just the time sync. Therefore, you must manually adjust the current date from the MM->4->1 screen or through the central system.

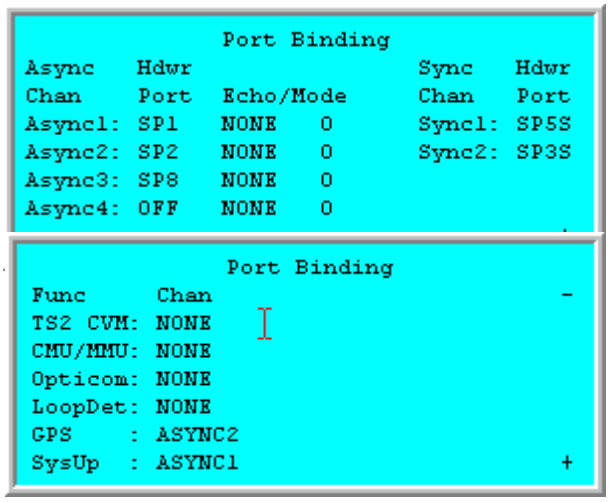
see: http://www.garmin.com/products/gps16/

The following steps are required to setup the GPS interface.

1) Set the com port mode (MM->6->2) for "GPS" for the com port interfaced to the GPS.

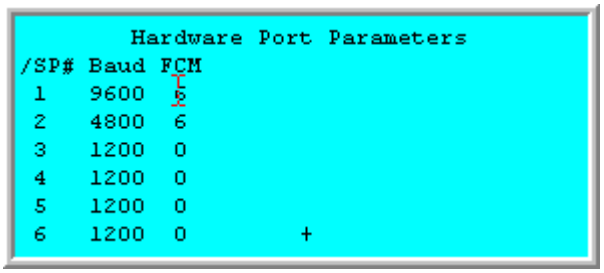
The GPS interface for the 2070 is identical to the operation for the TS2 discussed in the last section with the exception of the com port settings.

The 2070 provides 4 hardware serial ports (SP1, SP2, SP3 and SP8) which may be assigned to the 4 logical ports (ASYNCH 1-4) under the port binding menu. The default programming assumes that SP1 and SP2 located on the 2070-7A card are assigned to ASYNCH1 and ASYNCH2 respectively. SP8 is typically assigned to ASYNCH3 and dedicated for the internal hardware of the controller.

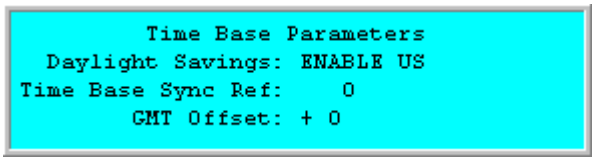


In the example to the right, SP1 on a 2070-7A card is assigned to the system and SP2 is assigned to the GPS unit. The baud rate of SP2 must be set to 4800 under MM->6->2 as shown below.

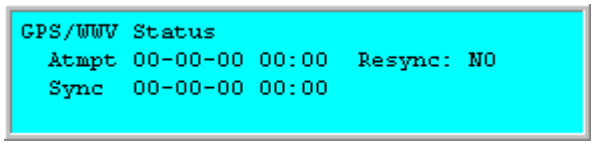
2) Set the baud rate of GPS com port to "4800" under MM->6->2.



3) You must set the GMT offset under *Time Base Parameters* (MM->2->6) for your time zone (EST = -5, CST = -6, PST = -8). Be sure to select the proper +/- sign.



4) Use the MM->2->9->3 status screen to display the last date/time stamp the controller attempted a resync with the GPS device.



5) The MM->2->9->3 screen can also be used to manually resync the GPS unit.. You should Resync the GPS at this time.

   The controller will automatically resync the time from the GPS twice per hour at approximately 13 and 43 minutes past the hour, every hour. The MM->2->9->3 screen provides the last date/time stamp when the controller attempted to communicate with the GPS device. The status also shows the time returned by the GPS and a text message indicating if the attempt was successful. The menu also allows the used to manually force the controller to resync the GPS. Toggle the *Resync* setting to "YES" and press <ENTR> under MM->4->9->3.

The following status messages are displayed after the controller attempts to communicate with the GPS.

"OK Reply" - the received message was correct and implemented

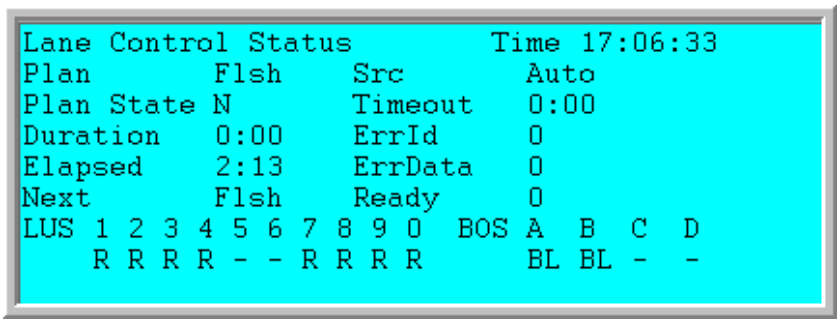
"No Reply" - the controller did not receive a reply from the GPS module

"No Signal" - the GPS module has not acquired a signal from the satellite

"Bad Reply" - the receive message had a data error

NOTE: If a function port is not assigned, then the GPS status screen at MM->2->9->3 displays "NO PORT" at all times.

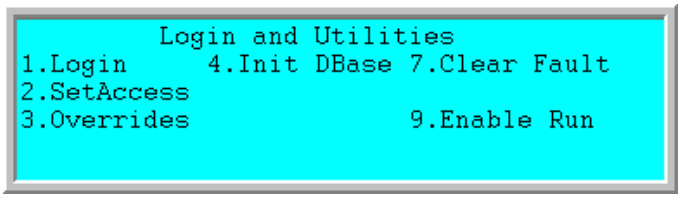
9.1 Lane Control Status Display (MM->7)



Plan	The plan currently in effect. Possible values are ***Norm*** (Normal), ***Pre*** (Pre-Game), and ***Post*** (Post-Game).
Plan State	The type of plan in effect. Possible values are ***N*** (Normal), ***C*** (Clearance), ***R*** (All Red), and ***F*** (Flash). When the mode type is ***C*** or ***R***, the ***Next*** value will indicate the plan to which the controller is transitioning. When the Plan State is ***F*** (Flash), the ***Next*** value will always indicate the ***Plan*** value, even if the controller went into flash when plan state ***C*** or ***R*** was in effect, it will elapse time for the current transition period. If the flash plan state ends before the transition mode has fully elapsed, the controller will remain in the transition mode for the remaining time. If the flash plan state ends after the allotted time (Duration) for the transition mode, then controller will resume at the start of the next mode. For example, if the controller goes into flash during the clearance transition and stays there past the duration, then the controller will resume operation in the red transition. Similarly, if the controller goes into flash during the red transition and stays there past the duration, the controller will resume at the start of the normal mode for the plan to which it was transitioning.
Duration	The amount of time in minutes and seconds a plan state is to be in effect. For the Normal plan state, this value is 0:00, indicating indefinite. For the Normal plan state of the pre-game and post-game plans, the value is set to 255:00, indicating that though a long time, it is finite and will generate an alarm once it has expired.
Elapsed	The amount of time in minutes and seconds the controller has been in the current plan state.

Next	The plan to which the controller is transitioning. When the controller is not transitioning, the ***Next*** value is the same as the ***Plan*** value. Note that when the controller is in flash, the ***Next*** value is always the ***Plan*** value, indicating that it will stay in flash indefinitely until the flash condition is removed.
Src	The input from which the current operation originated. Possible values are ***Keyboard***, ***Manual***, ***Remote***, ***TimeOfDay***, and ***Auto***.
Timeout	When the ***Src*** is ***Remote***, this value is the amount of time in minutes the current plan is to be in effect.
ErrId	Information about the current error. See section 2.8.2 for details on how to interpret these values.
ErrData	
Ready	Indicates if the software has detected a fault of some kind. When ***Ready*** is 0, the MMU will detect a fault and stop timing.
LUS 1 – 10	The LUS channel values. Possible values are ***R*** (Red), ***Y*** (Yellow), ***G*** (Green), and ***T*** (Turn). See the I/O Mapping section for exact details on which channels are active based on the LUS channel values.
BOS A - D	The BOS channel values. See the I/O Mapping section for exact details on which channels are active based on the BOS channel values. Values are – for dark, ***BL*** for blank, ***NL*** for no left turn, and ***NR*** for no right turn

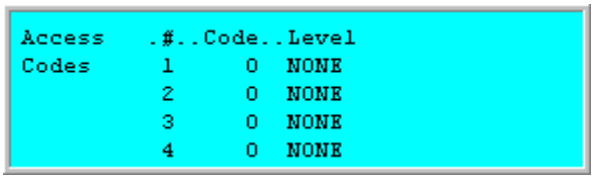
10.1 Login and Set Access



Up to 64 separate password logins are provided to control keyboard access to the controller database. The level of security can also be assigned to each user to control the ability to edit the database, load software and assign passwords. Various utilities are also provided from this menu to load the controller software (flash the EEPROMS), initialize the controller's database, print the database and perform diagnostic tests that interrogate the memory, ports and hardware associated with the controller.

10.1.1 Login Utilities (MM->8->1 & MM->8->2)

If any *Access Codes* are programmed under MM->8->2, the user will be required to provide a valid user number and access code to enable the keyboard. Programming all access codes under MM->8->2 to zero and setting the Level to NONE, disables all login procedures in the controller.



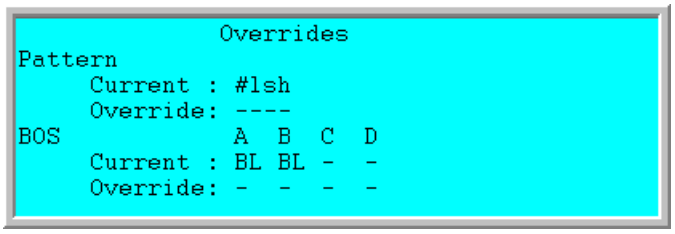
A maximum of 64 individual users and 4-digit access codes may be programmed by a SECUR user. Therefore, if access security is used, at least one access # should have *SECUR Level* access.

The security Level (from highest to lowest) is assigned as follows:

- **SECURE** User has full access to the database including the ability to assign passwords
- **SW LD** User has full access to the database and the ability to run diagnostics and load the controller software. The user may not assign passwords.
- **DIAG** User has edit access to the database plus the ability to run diagnostic utilities. The user cannot load controller software (reflash the controller) or assign security passwords
- **ENTRY** User has edit access to the database but cannot run diagnostics, load software or assign passwords
- **NONE** View only access to the database

10.2 Overrides (MM→8→3)

10.2.1 Current Plan (Pattern)

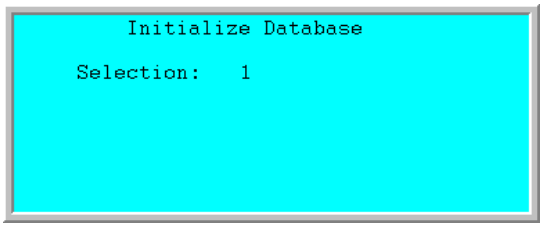


The operator may override the current plan by entering the plan identifier in the Overrides screen. The keyboard input takes precedence over the manual input in the cabinet.

10.2.2 BOS Output

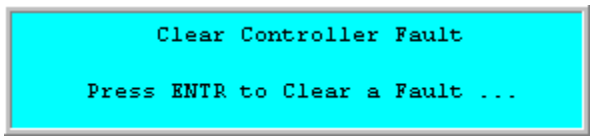
The operator may force output to a BOS channel at any time. The override value is what will be sent to the BOS channel regardless of the plan or current output. However, it is possible that overriding the output will cause the MMU to detect a fault and cause the controller to stop timing.

10.3 Initialize Database (MM→8→4)



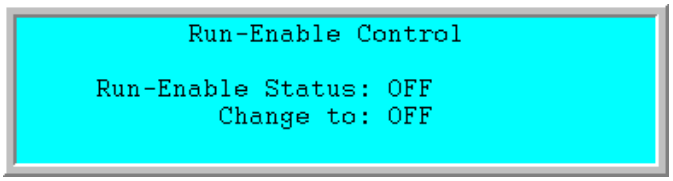
The LCU can be initialized to one of the 16 location settings as described in the document entitled *Special Provision Reversible Lane Control Logic Item No. 681-111*. Once initialized, the parameters can be overridden at the console and uploaded to a central system.

10.4 Clear Fault (MM→8→7)



"Critical SDLC Faults" isolate errors defined by the NEMA TS2 specification. A controller fault is generated when communication is lost to an SDLC device (BIU) defined in MM->9. "Critical SDLC Faults" are cleared from menu MM->8->7 by pressing the **ENTR** key.

10.5 Enable Run Timer (MM→8→9)



Enable Run shows the current status of the ***Run Timer*** programmed under menu **MM->1->7**. As discussed in chapter 2, the Run Timer is used with the ***Clear & Init All*** **utility (MM->8->4->1).** This utility allows the user to initialize the controller to a default database after turning the **Run Timer to OFF (MM->1->7)**. The run timer disables all outputs from the controller and insures that the cabinet is in flash when the database is initialized. The user should use caution when initializing the controller database because all existing program data will be erased and overwritten. When the initialization is complete, the user should turn the **Run Timer to ON (MM->1->7)** to finalize the initialization (i.e. finalizing phase sequence and concurrency based on phase mode programming, latching output mapping, binding communications, etc.) and activate the unit. Note: when the run timer is first activated, calls are placed for all phases not omitted and for pedestrians that have walk and Ped clearance times that are programmed under MM→1→1→1.

11 SDLC Programming

Channel and *SDLC* features are programmed from MM->9. The SDLC interface is a high-speed (153.6 Kbps) serial data bus that transmits Type-1 messages between the SDLC devices between the controller, terminal facility (or back-panel), detector rack and MMU. The BIU (Bus Interface Unit) is the primary SDLC device responsible for transmitting and receiving standard messages defined in the NEMA TS2 specification. Any BIU enabled in the controller will immediately begin communicating through the SDLC interface as long as the *Run-Timer* is ON.

```
            TS2 & FIO SDLC
1.TS2 Devices 4.MMU Permissives 7.Status
2.Parms       5.MMU Map
```

11.1 Activating TS2 Devices (MM->9->1)

Individual BIU devices are enabled by selecting an "X" under the device on this screen. The first eight BIUs support the terminal facility (cabinet) followed by eight BIUs for detection and one BIU for the MMU. NEMA only defines the first four terminal facility BIUs (5-8 are reserved for future expansion). Peer-to-peer BIU functions are also reserved for future implementation. The Diag selection is reserved for manufacturer's testing purposes.

```
SDLC Device: Term/Fac  Detector MMU Diag
      BIU #: 12345678  12345678
Dev. Present XX......  X.......  X   .
Peer-to-Peer ........  ........  .   .
```

11.2 SDLC Parameters (MM->9->2)

The following SDLC parameters modify the default operation of the SDLC interface.

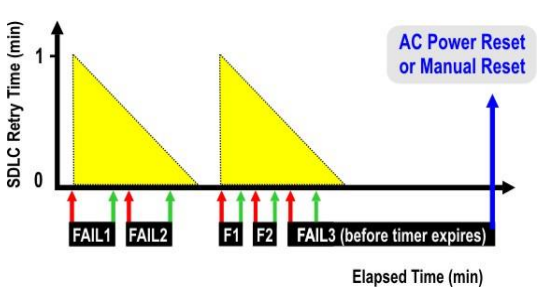
```
            SDLC Parameters
SDLC Retry Time:   0
TS2 Det Faults : ON
```

11.2.1 SDLC Retry Time

SDLC Retry Time (0- 255 minutes) is a countdown timer initiated by a critical SDLC fault that determines how the controller recovers from SDLC communication errors.

1) If the *SDLC Retry Time* is zero, a critical SDLC fault is latched by the controller until AC power is cycled or the fault is cleared manually by an operator using keystrokes MM->8->7.
2) If the *SDLC Retry Time* is not zero, a critical SDLC fault holds the controller in the fault mode until proper SDLC communication is restored. Once SDLC communication is restored, the SDLC Retry Time continues to count down and test successive faults as shown below. The first two SDLC communication faults allow the controller to recover once the communications is restored. However, if a third fault occurs before the *SDLC Retry Time* expires, a critical SDLC fault is latched by the controller until AC power is cycled or the fault is cleared manually by an operator using keystrokes MM->8->7.

You can test this feature by connecting a TS2 Test Box to the unitSet the *SDLC Retry Time* to 1 minute (MM->1->2->1). Now, manually disconnect the SDLC interface cable on the front of the unit and note that the controller registers a critical SDLC fault. If you re-insert the SDLC cable before the *SDLC Retry Time* expires, the SDLC communication will be restored. However, if you wait longer than the *SDLC Retry Time* or create more than two faults before the timer has expired, the controller will not recover and you will need to reset AC power or manually clear the fault from MM->8->7.



Changing the *SDLC Retry Time* to 1 minute helps troubleshoot intermittent SDLC problems to verify a marginal BIU in the system. Cubic | Trafficware has seen cases where a BIU from a different manufacturer creates random SDLC errors that the controller traps properly as required by NEMA. This problem can sometimes be corrected by setting *SDLC Retry Time* to 1; however, Cubic | Trafficware recommends that *SDLC Retry Time* should be set to zero as a default to trap all SDLC errors at the first failure.

11.2.2 TS2 Detector Faults

Set *TS2 Detector Faults* to ON to allow faults reported by detector BIUs to generate detector events. Set this entry to OFF to prevent BIU generated detector faults from recording events. This parameter is useful in cases where a TS2 detector rack is not fully populated with loop detectors. In such cases, this parameter may be set to OFF, thereby preventing numerous unwanted detector events from being reported upon power-up.

11.3 MMU Permissives (MM->9->4)

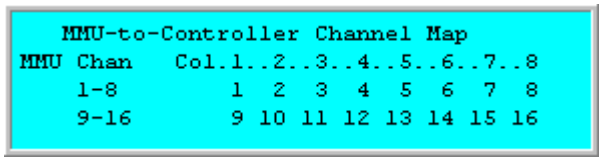
MMU Permissives are only required in a TS2 type-1 configuration. When an MMU (Malfunction Management Unit) is present, the values programmed in this table must reflect the jumper settings on the MMU programming card or the controller will declare an MMU Permissive fault and go to flash.

```
Chan.16..14..12..10.9.8.7.6.5.4.3.2
 1    . . X X . . . . . X . . . . .
 2    . . X X . . . . . X . X . .
 3    X X . . . . . X . . . .
 4    X X . . . . . X . X .
 5    . . . . . . . . . . .
 6    . . . . . . . . . X 'C'-Copy Perms
 7  + . . . . . . . . .         from MMU
```

The screen is laid out to form a diagonal matrix with channels 1-16 assigned to the rows and columns as shown to the right. This configuration is very similar to the layout of the jumper settings of MMU programming card. Compatible (or permissive) channels are indicated by a 'X' at the intersection of each channel number within the matrix. Compatible channels may display simultaneous green, yellow and/or walk indications without generating an MMU conflict fault.

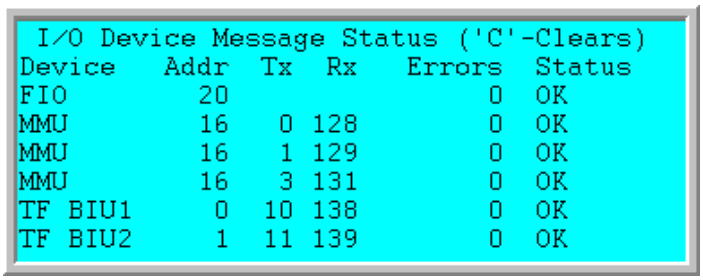
11.4 Channel MMU Map (MM->9->5)

The *MMU Map* entries are used to map each of the 16 MMU channels to the 24 output channels provided in the TS2 terminal facility (cabinet). The first row correlates to MMU channels 1-8, and the second row correlates to MMU channels 9-16. A '0' entry defaults to the standard one to one mapping.



11.5 SDLC Status Display (MM->9->7)

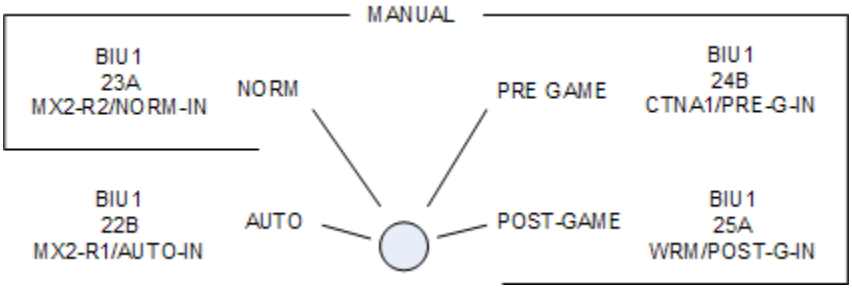
The *SDLC Status Display* summarizes random frame errors for each BIU enabled under MM->9->1 and reports the status of each device. This display is useful to isolate a BIU failure in a TS2 or 2070 type-1 cabinet facility after checking the *Overview Status Screen* discussed in Chapter 2.



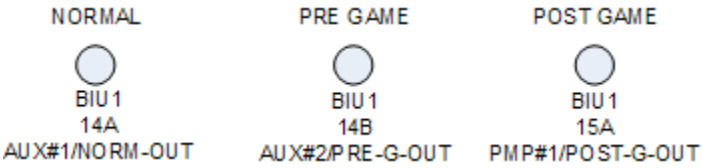
12 Appendices

12.1 I/O Mapping

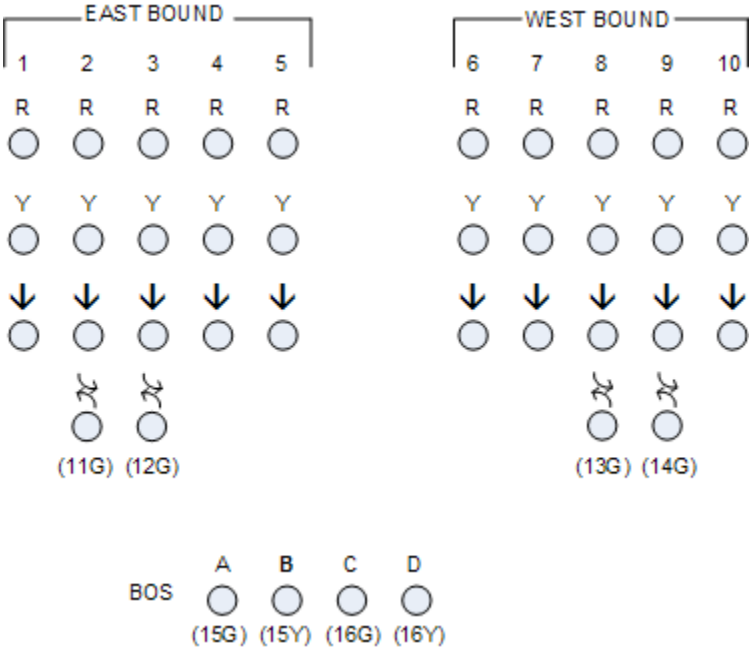
12.1.1 Manual Control Input



12.1.2 Status Output



12.1.3 Channel Output



12.2 Plan Definitions

12.2.1 Normal Plan

Normal Operation

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	N	0	1	X	T	G	X			X	X	T	G	**1**	BL	BL		
2	N	0	1	X	T	G	X			X	X	T	G	**2**	BL	BL	BL	BL
3	N	0	1	X	T	G	X			X	X	T	G	**3**	BL	BL	BL	BL
4	N	0	1		X	X	G	G	X	X	T	G	G	**4**	BL	BL	BL	BL
5	N	0	1	X	X	G	G			X	X	T	G	**5**	BL	BL		
6	N	0	1	X	X	G	G			X	X	G	G	**6**	BL	BL		
7	N	0	1	X	X	G	G			X	X	G	G	**7**	BL	BL		
8	N	0	1	X	X	G	G			X	X	G	G	**8**	BL	BL		
9	N	0	1	X	X	G	G			X	X	G	G	**9**	BL	BL	BL	BL
10	N	0	1	X	X	X	G	G	X	X	G	G	G	**10**	BL	BL	BL	BL
11	N	0	1	X	X	T	G	G	X	X	X	G	G	**11**	BL	BL		
12	N	0	1	X	X	T	G	G	X	X	T	G	G					
13	N	0	1	X	X	T	G	G	X	X	T	G	G					
14	N	0	1	X	X	T	G	G	X	X	T	G	G					
15	N	0	1	X	X	T	G	G	X	X	T	G	G					
16	N	0	1	X	X	T	G	G	X	X	T	G	G					

Normal Plan Clearance Transition to Pre-Game

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	C	5	2	X	T	G	X			X	X	Y	G	1	BL	BL		
2	C	5	2	X	T	G	X			X	X	Y	G	2	BL	BL	BL	BL
3	C	5	2	X	T	G	X			X	X	Y	G	3	BL	BL	BL	BL
4	C	5	2		X	X	G	G	X	X	Y	G	G	4	BL	BL	BL	BL
5	C	5	2	X	X	G	G			X	X	Y	G	5	BL	BL		
6	C	5	2	X	X	G	G			X	X	Y	G	6	BL	BL		
7	C	5	2	X	X	G	G			X	X	Y	G	7	BL	BL		
8	C	5	2	X	X	G	G			X	X	Y	G	8	BL	BL		
9	C	5	2	X	X	G	G			X	X	Y	G	9	BL	BL	BL	BL
10	C	5	2	X	X	X	G	G	X	X	Y	G	G	10	BL	BL	BL	BL
11	C	5	2	X	X	T	G	G	X	X	X	G	G	11	BL	BL		
12	C	5	2	X	X	T	G	G	X	X	T	G	G					
13	C	5	2	X	X	T	G	G	X	X	T	G	G					
14	C	5	2	X	X	T	G	G	X	X	T	G	G					
15	C	5	2	X	X	T	G	G	X	X	T	G	G					
16	C	5	2	X	X	T	G	G	X	X	T	G	G					

Normal Plan All Red Transition to Pre-Game

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	R	2	2	X	T	G	X			X	X	X	G	1	BL	BL		
2	R	2	2	X	T	G	X			X	X	X	G	2	BL	BL	BL	BL
3	R	2	2	X	T	G	X			X	X	X	G	3	BL	BL	BL	BL
4	R	2	2		X	X	G	G	X	X	X	G	G	4	BL	BL	BL	BL
5	R	2	2	X	X	G	G			X	X	X	G	5	BL	BL		
6	R	2	2	X	X	G	G			X	X	X	G	6	BL	BL		
7	R	2	2	X	X	G	G			X	X	X	G	7	BL	BL		
8	R	2	2	X	X	G	G			X	X	X	G	8	BL	BL		
9	R	2	2	X	X	G	G			X	X	X	G	9	BL	BL	BL	BL
10	R	2	2	X	X	X	G	G	X	X	X	G	G	10	BL	BL	BL	BL
11	R	2	2	X	X	T	G	G	X	X	X	G	G	11	BL	BL		
12	R	2	2	X	X	T	G	G	X	X	T	G	G					
13	R	2	2	X	X	T	G	G	X	X	T	G	G					
14	R	2	2	X	X	T	G	G	X	X	T	G	G					
15	R	2	2	X	X	T	G	G	X	X	T	G	G					
16	R	2	2	X	X	T	G	G	X	X	T	G	G					

Normal Plan Clearance Transition to Post-Game

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	C	4	3	X	Y	Y	X			X	X	T	G	1	NRT	NRT		
2	C	4	3	X	Y	Y	X			X	X	T	G	2	NRT	NRT	NLT	NLT
3	C	4	3	X	Y	Y	X			X	X	T	G	3	NRT	NRT	NLT	NLT
4	C	4	3		X	X	Y	Y	X	X	T	G	G	4	NRT	NRT	NLT	NLT
5	C	4	3	X	X	Y	Y			X	X	T	G	5	NRT	NRT		
6	C	4	3	X	X	Y	Y			X	X	G	G	6	NLT	NLT		
7	C	4	3	X	X	Y	Y			X	X	G	G	7	NLT	NLT		
8	C	4	3	X	X	Y	Y			X	X	G	G	8	NLT	NLT		
9	C	4	3	X	X	Y	Y			X	X	G	G	9	NRT	NRT	NLT	NLT
10	C	4	3	X	X	X	Y	Y	X	X	G	G	G	10	NRT	NRT	NLT	NLT
11	C	4	3	X	X	Y	Y	Y	X	X	X	G	G	11	NLT	NLT		
12	C	4	3	X	X	Y	Y	Y	X	X	Y	G	Y					
13	C	4	3	X	X	Y	Y	Y	X	X	Y	G	Y					
14	C	4	3	X	X	Y	Y	Y	X	X	Y	Y	Y					
15	C	4	3	X	X	Y	G	G	X	X	Y	Y	Y					
16	C	4	3	X	X	Y	G	G	X	X	Y	Y	Y					

Normal Plan All Red Transition to Post-Game

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	R	1	3	X	X	X	X			X	X	T	G	1	NRT	NRT		
2	R	1	3	X	X	X	X			X	X	T	G	2	NRT	NRT	NLT	NLT
3	R	1	3	X	X	X	X			X	X	T	G	3	NRT	NRT	NLT	NLT
4	R	1	3		X	X	X	X	X	X	T	G	G	4	NRT	NRT	NLT	NLT
5	R	1	3	X	X	X	X			X	X	T	G	5	NRT	NRT		
6	R	1	3	X	X	X	X			X	X	G	G	6	NLT	NLT		
7	R	1	3	X	X	X	X			X	X	G	G	7	NLT	NLT		
8	R	1	3	X	X	X	X			X	X	G	G	8	NLT	NLT		
9	R	1	3	X	X	X	X			X	X	G	G	9	NRT	NRT	NLT	NLT
10	R	1	3	X	X	X	X	X	X	X	G	G	G	10	NRT	NRT	NLT	NLT
11	R	1	3	X	X	X	X	X	X	X	X	G	G	11	NLT	NLT		
12	R	1	3	X	X	X	X	X	X	X	X	G	X					
13	R	1	3	X	X	X	X	X	X	X	X	G	X					
14	R	1	3	X	X	X	X	X	X	X	X	X	X					
15	R	1	3	X	X	X	G	G	X	X	X	X	X					
16	R	1	3	X	X	X	G	G	X	X	X	X	X					

12.2.2 Pre-Game Plan

Normal Operation

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	N	255	2	X	G	G	X			X	X	X	G	**1**	BL	BL		
2	N	255	2	X	G	G	G			X	X	X	G	**2**	BL	BL	BL	BL
3	N	255	2	X	G	G	G			X	X	X	G	**3**	BL	BL	BL	BL
4	N	255	2		X	G	G	G	X	X	X	G	G	**4**	BL	BL	BL	BL
5	N	255	2	X	G	G	G			X	X	X	G	**5**	BL	BL		
6	N	255	2	X	G	G	G			X	X	X	G	**6**	BL	BL		
7	N	255	2	X	G	G	G			X	X	X	G	**7**	BL	BL		
8	N	255	2	X	G	G	G			X	X	X	G	**8**	BL	BL		
9	N	255	2	X	T	G	G			X	X	X	G	**9**	BL	BL	BL	BL
10	N	255	2	X	X	X	G	G	X	X	G	G	G	**10**	BL	BL	BL	BL
11	N	255	2	X	X	T	G	G	X	X	X	G	G	**11**	BL	BL		
12	N	255	2	X	X	T	G	G	X	X	T	G	G					
13	N	255	2	X	X	T	G	G	X	X	T	G	G					
14	N	255	2	X	X	T	G	G	X	X	T	G	G					
15	N	255	2	X	X	T	G	G	X	X	T	G	G					
16	N	255	2	X	X	T	G	G	X	X	T	G	G					

Pre-Game Plan Clearance Transition to Post-Game

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	C	5	3	X	Y	Y	X			X	X	X	G	1	NRT	NRT		
2	C	5	3	X	Y	Y	Y			X	X	X	G	2	NRT	NRT	NLT	NLT
3	C	5	3	X	Y	Y	Y			X	X	X	G	3	NRT	NRT	NLT	NLT
4	C	5	3		X	Y	Y	Y	X	X	X	G	G	4	NRT	NRT	NLT	NLT
5	C	5	3	X	Y	Y	Y			X	X	X	G	5	NRT	NRT		
6	C	5	3	X	Y	Y	Y			X	X	X	G	6	NLT	NLT		
7	C	5	3	X	Y	Y	Y			X	X	X	G	7	NLT	NLT		
8	C	5	3	X	Y	Y	Y			X	X	X	G	8	NLT	NLT		
9	C	5	3	X	Y	Y	Y			X	X	X	G	9	NRT	NRT	NLT	NLT
10	C	5	3	X	X	X	Y	Y	X	X	G	G	G	10	NRT	NRT	NLT	NLT
11	C	5	3	X	X	Y	Y	Y	X	X	X	G	G	11	NLT	NLT		
12	C	5	3	X	X	Y	Y	Y	X	X	Y	G	Y					
13	C	5	3	X	X	Y	Y	Y	X	X	Y	G	Y					
14	C	5	3	X	X	Y	Y	Y	X	X	Y	Y	Y					
15	C	5	3	X	X	Y	G	G	X	X	Y	Y	Y					
16	C	5	3	X	X	Y	G	G	X	X	Y	Y	Y					

Pre-Game Plan All Red Transition to Post-Game

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	R	2	3	X	X	X	X			X	X	X	G	1	NRT	NRT		
2	R	2	3	X	X	X	X			X	X	X	G	2	NRT	NRT	NLT	NLT
3	R	2	3	X	X	X	X			X	X	X	G	3	NRT	NRT	NLT	NLT
4	R	2	3		X	X	X	X	X	X	X	G	G	4	NRT	NRT	NLT	NLT
5	R	2	3	X	X	X	X			X	X	X	G	5	NRT	NRT		
6	R	2	3	X	X	X	X			X	X	X	G	6	NLT	NLT		
7	R	2	3	X	X	X	X			X	X	X	G	7	NLT	NLT		
8	R	2	3	X	X	X	X			X	X	X	G	8	NLT	NLT		
9	R	2	3	X	X	X	X			X	X	X	G	9	NRT	NRT	NLT	NLT
10	R	2	3	X	X	X	X	X	X	X	G	G	G	10	NRT	NRT	NLT	NLT
11	R	2	3	X	X	X	X	X	X	X	X	G	G	11	NLT	NLT		
12	R	2	3	X	X	X	X	X	X	X	X	G	X					
13	R	2	3	X	X	X	X	X	X	X	X	G	X					
14	R	2	3	X	X	X	X	X	X	X	X	X	X					
15	R	2	3	X	X	X	G	G	X	X	X	X	X					
16	R	2	3	X	X	X	G	G	X	X	X	X	X					

Pre-Game Plan Clearance Transition to Normal Plan

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	C	4	1	X	Y	G	X			X	X	X	G	1	BL	BL		
2	C	4	1	X	Y	G	Y			X	X	X	G	2	BL	BL	BL	BL
3	C	4	1	X	Y	G	Y			X	X	X	G	3	BL	BL	BL	BL
4	C	4	1		X	Y	G	G	X	X	X	G	G	4	BL	BL	BL	BL
5	C	4	1	X	Y	G	G			X	X	X	G	5	BL	BL		
6	C	4	1	X	Y	G	G			X	X	X	G	6	BL	BL		
7	C	4	1	X	Y	G	G			X	X	X	G	7	BL	BL		
8	C	4	1	X	Y	G	G			X	X	X	G	8	BL	BL		
9	C	4	1	X	Y	G	G			X	X	X	G	9	BL	BL	BL	BL
10	C	4	1	X	X	X	G	G	X	X	G	G	G	10	BL	BL	BL	BL
11	C	4	1	X	X	T	G	G	X	X	X	G	G	11	BL	BL		
12	C	4	1	X	X	T	G	G	X	X	T	G	G					
13	C	4	1	X	X	T	G	G	X	X	T	G	G					
14	C	4	1	X	X	T	G	G	X	X	T	G	G					
15	C	4	1	X	X	T	G	G	X	X	T	G	G					
16	C	4	1	X	X	T	G	G	X	X	T	G	G					

Pre-Game Plan All Red Transition to Normal Plan

2 PLAN 2 TO PLAN 1 - ALL RED

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	R	2	1	X	Y	G	X			X	X	X	G	1	BL	BL		
2	R	2	1	X	Y	G	X			X	X	X	G	2	BL	BL	BL	BL
3	R	2	1	X	Y	G	X			X	X	X	G	3	BL	BL	BL	BL
4	R	2	1		X	X	G	G	X	X	X	G	G	4	BL	BL	BL	BL
5	R	2	1	X	X	G	G			X	X	X	G	5	BL	BL		
6	R	2	1	X	X	G	G			X	X	X	G	6	BL	BL		
7	R	2	1	X	X	G	G			X	X	X	G	7	BL	BL		
8	R	2	1	X	X	G	G			X	X	X	G	8	BL	BL		
9	R	2	1	X	X	G	G			X	X	X	G	9	BL	BL	BL	BL
10	R	2	1	X	X	X	G	G	X	X	G	G	G	10	BL	BL	BL	BL
11	R	2	1	X	X	T	G	G	X	X	X	G	G	11	BL	BL		
12	R	2	1	X	X	T	G	G	X	X	T	G	G					
13	R	2	1	X	X	T	G	G	X	X	T	G	G					
14	R	2	1	X	X	T	G	G	X	X	T	G	G					
15	R	2	1	X	X	T	G	G	X	X	T	G	G					
16	R	2	1	X	X	T	G	G	X	X	T	G	G					

12.2.3 Post-Game Plan

Normal Operation

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	N	255	3	X	X	X	X			G	G	G	G	**1**	NRT	NRT		
2	N	255	3	X	X	X	X			G	G	G	G	**2**	NRT	NRT	NLT	NLT
3	N	255	3	X	X	X	X			G	G	G	G	**3**	NRT	NRT	NLT	NLT
4	N	255	3		X	X	X	X	G	G	G	G	G	**4**	NRT	NRT	NLT	NLT
5	N	255	3	X	X	X	X			G	G	G	G	**5**	NRT	NRT		
6	N	255	3	X	X	X	X			G	G	G	G	**6**	NLT	NLT		
7	N	255	3	X	X	X	X			G	G	G	G	**7**	NLT	NLT		
8	N	255	3	X	X	X	X			G	G	G	G	**8**	NLT	NLT		
9	N	255	3	X	X	X	X			G	G	G	G	**9**	NRT	NRT	NLT	NLT
10	N	255	3	X	X	X	X	X	X	G	G	G	G	**10**	NRT	NRT	NLT	NLT
11	N	255	3	X	X	X	X	X	X	G	X	G	G	**11**	NLT	NLT		
12	N	255	3	X	X	X	X	X	X	G	X	G	X					
13	N	255	3	X	X	X	X	X	X	G	X	G	X					
14	N	255	3	X	X	X	X	X	X	X	X	X	X					
15	N	255	3	X	X	X	G	G	X	X	X	X	X					
16	N	255	3	X	X	X	G	G	X	X	X	X	X					

Post-Game Plan Clearance Transition to Normal Plan

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	C	4	1	X	X	X	X			Y	Y	Y	G	1	NRT	NRT		
2	C	4	1	X	X	X	X			Y	Y	Y	G	2	NRT	NRT	NLT	NLT
3	C	4	1	X	X	X	X			Y	Y	Y	G	3	NRT	NRT	NLT	NLT
4	C	4	1		X	X	X		Y	Y	Y	G	G	4	NRT	NRT	NLT	NLT
5	C	4	1	X	X	X	X			Y	Y	Y	G	5	NRT	NRT		
6	C	4	1	X	X	X	X			Y	Y	G	G	6	NLT	NLT		
7	C	4	1	X	X	X	X			Y	Y	G	G	7	NLT	NLT		
8	C	4	1	X	X	X	X			Y	Y	G	G	8	NLT	NLT		
9	C	4	1	X	X	X	X			Y	Y	G	G	9	NRT	NRT	NLT	NLT
10	C	4	1	X	X	X	X	X	X	Y	G	G	G	10	NRT	NRT	NLT	NLT
11	C	4	1	X	X	X	X	X	X	Y	X	G	G	11	NLT	NLT		
12	C	4	1	X	X	X	X	X	X	Y	X	G	X					
13	C	4	1	X	X	X	X	X	X	Y	X	G	X					
14	C	4	1	X	X	X	X	X	X	X	X	X	X					
15	C	4	1	X	X	X	G	G	X	X	X	X	X					
16	C	4	1	X	X	X	G	G	X	X	X	X	X					

Post-Game Plan All Red Transition to Normal Plan

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	R	2	1	X	X	X	X			X	X	X	G	1	NRT	NRT		
2	R	2	1	X	X	X	X			X	X	X	G	2	NRT	NRT	NLT	NLT
3	R	2	1	X	X	X	X			X	X	X	G	3	NRT	NRT	NLT	NLT
4	R	2	1		X	X	X		X	X	Y	G	G	4	NRT	NRT	NLT	NLT
5	R	2	1	X	X	X	X			X	X	Y	G	5	NRT	NRT		
6	R	2	1	X	X	X	X			X	X	G	G	6	NLT	NLT		
7	R	2	1	X	X	X	X			X	X	G	G	7	NLT	NLT		
8	R	2	1	X	X	X	X			X	X	G	G	8	NLT	NLT		
9	R	2	1	X	X	X	X			X	X	G	G	9	NRT	NRT	NLT	NLT
10	R	2	1	X	X	X	X	X	X	X	G	G	G	10	NRT	NRT	NLT	NLT
11	R	2	1	X	X	X	X	X	X	X	X	G	G	11	NLT	NLT		
12	R	2	1	X	X	X	X	X	X	X	X	G	X					
13	R	2	1	X	X	X	X	X	X	X	X	G	X					
14	R	2	1	X	X	X	X	X	X	X	X	X	X					
15	R	2	1	X	X	X	G	G	X	X	X	X	X					
16	R	2	1	X	X	X	G	G	X	X	X	X	X					

Post-Game Plan Clearance Transition to Pre-Game Plan

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	C	5	2	X	X	X	X			Y	Y	Y	G	1	NRT	NRT		
2	C	5	2	X	X	X	X			Y	Y	Y	G	2	NRT	NRT	NLT	NLT
3	C	5	2	X	X	X	X			Y	Y	Y	G	3	NRT	NRT	NLT	NLT
4	C	5	2		X	X	X	X	Y	Y	Y	G	G	4	NRT	NRT	NLT	NLT
5	C	5	2	X	X	X	X			Y	Y	Y	G	5	NRT	NRT		
6	C	5	2	X	X	X	X			Y	Y	Y	G	6	NLT	NLT		
7	C	5	2	X	X	X	X			Y	Y	Y	G	7	NLT	NLT		
8	C	5	2	X	X	X	X			Y	Y	Y	G	8	NLT	NLT		
9	C	5	2	X	X	X	X			Y	Y	Y	G	9	NRT	NRT	NLT	NLT
10	C	5	2	X	X	X	X	X	X	Y	G	G	G	10	NRT	NRT	NLT	NLT
11	C	5	2	X	X	X	X	X	X	Y	X	G	G	11	NLT	NLT		
12	C	5	2	X	X	X	X	X	X	Y	X	G	X					
13	C	5	2	X	X	X	X	X	X	Y	X	G	X					
14	C	5	2	X	X	X	X	X	X	X	X	X	X					
15	C	5	2	X	X	X	G	G	X	X	X	X	X					
16	C	5	2	X	X	X	G	G	X	X	X	X	X					

Post-Game Plan All-Red Transition to Pre-Game Plan

LUS				Eastbound					Westbound					Blankout Signs				
	Mode	Dur	Next	1	2	3	4	5	6	7	8	9	10	BOS	A	B	C	D
1	R	1	2	X	X	X	X			X	X	X	G	1	NRT	NRT		
2	R	1	2	X	X	X	X			X	X	X	G	2	NRT	NRT	NLT	NLT
3	R	1	2	X	X	X	X			X	X	X	G	3	NRT	NRT	NLT	NLT
4	R	1	2		X	X	X	X	X	X	X	G	G	4	NRT	NRT	NLT	NLT
5	R	1	2	X	X	X	X			X	X	X	G	5	NRT	NRT		
6	R	1	2	X	X	X	X			X	X	X	G	6	NLT	NLT		
7	R	1	2	X	X	X	X			X	X	X	G	7	NLT	NLT		
8	R	1	2	X	X	X	X			X	X	X	G	8	NLT	NLT		
9	R	1	2	X	X	X	X			X	X	X	G	9	NRT	NRT	NLT	NLT
10	R	1	2	X	X	X	X	X	X	X	G	G	G	10	NRT	NRT	NLT	NLT
11	R	1	2	X	X	X	X	X	X	X	X	G	G	11	NLT	NLT		
12	R	1	2	X	X	X	X	X	X	X	X	G	X					
13	R	1	2	X	X	X	X	X	X	X	X	G	X					
14	R	1	2	X	X	X	X	X	X	X	X	X	X					
15	R	1	2	X	X	X	G	G	X	X	X	X	X					
16	R	1	2	X	X	X	G	G	X	X	X	X	X					