LONG BEACH - LOS ANGELES RAIL TRANSIT PROJECT

DRAFT FINAL

FUNCTIONAL SPECIFICATION

for

MODIFICATIONS TO ATSAC CENTRAL COMPUTER SOFTWARE FOR LRT

City of Los Angeles

Prepared by

DKS Associates for TRANSCAL

on behalf of the

Los Angeles County Transportation Commission

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I. General

This functional specification describes software modifications to the City of Los Angeles' ATSAC central computer system. The modifications accommodate the operation of the Long Beach-Los Angeles Rail Transit Project within the City of Los Angeles. Modifications to the Model 170 universal/ATSAC program and associated hardware changes are contained in a separate functional specification.

The modifications accommodate the operation of light rail vehicles at traffic signals on light rail lines in Los Angeles. The initial application of this software is at intersections along the downtown Los Angeles and mid-corridor segments of the Long Beach-Los Angeles Rail Transit Project.

I.A. Operational Overview

The operation of traffic signals to accommodate LRT is generally accomplished by the local intersection controller. The modifications to the standard local controller program are described in the "Functional Specification for Local Traffic Signal Controller Software for LRT, City of Los Angeles." The additional features provided in the local controller include:

- operation of LRV phases;
- provision of LRT priority;
- communication with predictor controllers;
- prediction of LRV travel times; and,
- provision of miscellaneous LRT related features.

All previous features of the local signal controller software (Program 172D) are retained, including its communications with ATSAC central. Throughout this document, the lunar white signal indication of the LRV phase is referred to as LRV phase green.

In addition to the normal eight NEMA phases and four overlaps, the local controller software provides six LRV phases. An LRV phase is defined in terms of the automobile phases (NEMA phases 1-8) with which it is compatible. A phase is compatible if it does not conflict and can therefore be active at the same time. An LRV phase is not simply an overlap. It is more like a normal phase, it responds to detector inputs, may start and end at times which are different from those of its compatible phase(s), and has its own timing parameters (e.g. minimum green, maximum green, yellow, red clearance, etc.).

An unusual feature of an LRV phase is that it can be used to drive either three color (e.g. red, yellow, green) or two color (e.g. red, green) displays, with the latter having either of the two colors flashed during the yellow clearance interval. This permits the phase to output a flashing white T instead of a steady yellow T if desired, or to be used as a pedestrian overlap sometimes needed with light rail operations. When used to drive pedestrian displays, the red "DON'T WALK" symbol is flashed during yellow clearance.

An LRV phase can be given priority service similar to emergency vehicle preemption if the user so desires. The level of priority given to an LRV phase can vary from one timing plan to another and from one LRV phase to another, and can be changed manually by commands from ATSAC. The levels of priority available to LRV phases are:

- No Priority;
- Partial Priority (allows phase length manipulation); or,
- Full Priority (allows phase length and phase sequence manipulation).

Within partial and full priority, various parameters can be adjusted by the user to vary the degree of priority provided in each timing plan. In this way the degree of priority can be set at any point on a variable scale to suit traffic conditions at each time of the day and/or day of the week. Any level of priority can be used at any time regardless of whether the signal is coordinated or running free (uncoordinated), and regardless of whether it is under ATSAC control or not.

Partial priority allows compatible phases to be lengthened and conflicting phases to be shortened, to start an LRV phase at the appropriate time. The amount by which phases can be lengthened or shortened is set by the user and can be varied by timing plan. Full priority does everything that partial priority does, and in addition, it allows the phase sequence to be changed by omitting and inserting phases. If the signal is coordinated, both partial and full priority compensate for any changes and ensure the signal is back in step with its neighbors within one cycle after the LRV phase ends (when handed back to ATSAC).

The ATSAC operator can override the current level of priority at an individual signal controller by use of special function bits. The centrally selected level of priority remains in effect until changed by the operator or until the controller is removed from ATSAC control. Neither partial or full priority allow safe minimum times, pedestrian times, or clearance intervals to be shortened.

Each LRV phase can have up to three LRV detectors, as follows:

- Advance detector - usually close to the next upstream signal;
- Intermediate detector - usually at the end of a station platform; and,
- Stopline detector - usually about 70 feet before the stopline.

The LRV phase can be "called" by any of these detectors. The stopline detector also serves to terminate the LRV phase. Once started, an LRV phase remains green until it reaches a maximum green time, is forced-off, or until its stopline detector is activated (subject to a minimum green time). LRV phases do not have green extensions like vehicle phases.

The local signal controller knows the average time it takes an LRV to travel from each detector to the green point (the point where the LRV starts to slow if the LRV signal stays red). When an approaching LRV activates a detector, the local signal controller uses this travel time information to estimate when the LRV will be at its green point. It does not start the LRV phase **before** that time. Whether or not it can start the LRV phase at that time depends on where the signal is at in its cycle and the degree of LRV priority currently allowed. If no priority is currently allowed, nothing can be done to advance or retard the

next occurrence of the compatible phase(s) and therefore the LRV phase cannot be advanced in the cycle to reduce delay to the LRV. When an LRV phase is called, the local controller automatically places a call on a user selectable compatible phase to ensure that ATSAC cycles the controller to a compatible phase, regardless of whether or not this is the main street phase.

When partial or full priority is implemented, the local controller may advance or retard the timing and sequence of automobile phases. Since this local manipulation of phases would appear as an error to ATSAC, the local controller tells ATSAC central that it is in the "preempt" state when priority is set and the local controller begins to modify its operation (as a result of a detector actuation or message from the predictor). The local controller calculates new force-offs to provide the LRT green at the appropriate time. However, if the new force-offs are not implemented (for example, if the release detector is activated sufficiently early that a proposed green extension is not required) then the local controller does not send the preempt bit, since it would still be able to respond to ATSAC's normal commands. This preempt state typically lasts for two cycle lengths, because the local controller not only manipulates phases prior to the LRV phase, but also manipulates phases after the LRV phase to compensate for the earlier changes. During this time, ATSAC central "sees" the signal as being in preempt and does not attempt to control it until the preempt bit is removed. When the signal is handed back to ATSAC control, it is back "in-step".

If no priority is allowed, the local controller times the LRV phases within the constraints of the normal timing of other phases (including CIC splits and offset transitions), and therefore the local controller implements LRV phases without telling ATSAC central it is in the preempt state (i.e., the preempt bit is not sent from the local to ATSAC).

For each pair of adjacent LRT stations, there is a predictor controller connected to all of the local traffic signal controllers (and sign controllers) between those two LRT stations. At least once a second, the predictor sends a command message to each of its controllers (one at a time - not a broadcast message), and waits for the controllers to send back a response message. Usually the command message is simply "Do you have anything to report?" and the response is "No I do not!". Other messages are used to perform functions such as the following:

- providing information regarding an approaching LRV's predicted travel time;
- informing the signal controller of the direction of LRV travel on each track;
- informing the signal controller of the route of an LRV at switchpoints;
- updating of the predictor's time clock; and,
- relaying failure messages, regarding sign and predictor controllers to ATSAC.

When a local signal controller is notified of an approaching LRV, it predicts when the LRV is able to pass through its intersection. The prediction procedure consists of two major elements, as follows:

- use of LRV travel time parameters; and,
- a "look ahead" at signal operation.

LRV travel times, unaffected by signal operation, are specified by the user on a timing group (a set of LRT related parameters called by timing plans) basis. When a local controller is informed of an approaching LRV, the advance to green point travel time is applied to determine the LRV's arrival at the green point. The controller "looks ahead" to determine the status of its signal indications at this time. This determination is based on force-off values contained in the current plan, historical phase length data, and the level of priority currently allowed. These values indicate the predicted time the approaching LRV will be served by the signal. Finally, the LRV travel time from the green point to the next intersection's advance detector is added. This procedure is used to predict LRV travel times between intersections. Additionally, the local controller software allows for possible updates of the predicted travel time based on changes in signal operation, such as early termination (gap out) of a conflicting phase.

Operational procedures for coordination between LADOT and SCADA are discussed in Appendix A.

I.B. Hardware Requirements

No additional hardware is required at the ATSAC center, nor in the communications network between the ATSAC center and the local intersection controllers. Local controllers in LRT areas require dual ACIA ports and an internal and external modem. The local communications network is expanded to provide communications between the local controller and the predictor and the sign controller, and indirectly to the LRT SCADA system, but this has no impact on ATSAC local communications.

I.C. Terminology

Terms used in this specification are defined in the California Department of Transportation's "Traffic Signal Control Local Intersection Program", Section 86 of the California Department of Transportation's "Standard Specifications", the California Department of Transportation's "Traffic Signal Control Equipment Specifications - September 1987", and NEMA "Standards Publication TS 1-1983", unless otherwise defined within this document. Some terms peculiar to this specification are as follows.

ATSAC	- Automated Traffic Surveillance and Control System - the City of Los Angeles Department of Transportation's central traffic signal control system.
Compatible Phase	- A compatible phase is any automobile, pedestrian or other LRV phase which may run concurrently with an LRV phase.
Conflicting Phase	- A conflicting phase is any automobile, pedestrian or other LRV phase which conflicts with an LRV phase.
LB-LA RTP	- Long Beach - Los Angeles Rail Transit Project

LRT	- Light Rail TransitLRV-Light Rail Vehicle
LRV Phase Start	- The point in time when the LRV phase green (white "T" display) commences.
LRV Phase Termination	- The point in time when the LRV phase green ends.
LRV Phase End	- The point in time when the LRV phase red clearance ends.
Predictor	- A Model 170 controller that provides for communication of predicted LRT travel time information and other LRT related information between local traffic signal controllers.
Local Controller	- A Model 170 controller that controls traffic signal indications for any combination of automobiles, pedestrians or LRVs.
Sign Controller	- A Model 170 controller that operates illuminated signs that prohibit turns by automobiles at unsignalized crossings of the LRT tracks (e.g. driveways).
Timing Group	- A group of LRV related parameters which specify travel times, and values to be used in the implementation of, or recovery from, priority; called by each timing plan.
Track Section	- A section of track within a predictor area and extending either between two switch points or between a switch point and the border of the predictor area.

II. Program Modifications

The operation of the ATSAC central control software is modified to accommodate the additional features required for operation of light rail transit. All existing features are retained.

II.A. Download Current Plan Number

The local controller and the central computer contain timing values for all coordination plans (although in different formats). At present, when the controller is operating on-line under ATSAC control, the local does not know which plan is in operation. Under ATSAC, the central computer controls the intersection offsets and splits. The central computer does this by holding the controller on-line, issuing yields and force-offs, and cycling the controller (via message number 1 commands). When on-line, the local controller's time-of-day/day-of-week selection of timing plans is overridden by the timing plan selection of ATSAC (by time-of-day/day-of-week, traffic responsive operations or operator input). To accommodate LRT operation, the local controller must know what timing plan is currently selected by the central computer to:

- Operate LRV phases within the limits of the phase splits (when no priority is set); and
- Restore coordination prior to returning the local intersection to ATSAC control following LRT priority.

The ATSAC software is modified so that the plan number is downloaded to the local controller every time a plan change is implemented. Automatic plan number download occurs regardless of how the new plan is selected or the plan change is implemented. The download occurs at or before the start of any offset transition required by the plan change. The plan number is downloaded using Message #2.

II.B. Controller Type Code

The introduction of the modified local controller program for LRT operation introduces a second controller type to ATSAC. Previously all local intersection controllers had identical hardware and software specifications.

A new identification code is added to the controller database to indicate whether a particular controller is a "universal" or an "LRT" controller. This code prevents the incorrect database from being downloaded from ATSAC to the local controller.

Prior to downloading any data (except current plan number) from ATSAC to the local controller, ATSAC first interrogates the controller to determine its type. Then ATSAC compares the controller type with the type code in the database and confirms they are identical before downloading the ata. The controller type code in the local controller is

located in RAM at address location DØF. Draft RAM maps are attached as Appendix B. The interrogation of controller type uses Message #6.

II.C. Modify Universal Database

The LRT controllers require additional timing parameters. The universal database is expanded to accommodate all additional parameters stored in the local controller. All user interface and data manipulation features available for the original parameters are also available for the new LRT related parameters.

Table II.1
ADDITIONAL LOCAL CONTROLLER INPUT PARAMETERS

Function or Parameter	Range	Default Value
Per Controller (1)		
Communication Address	0 to 32	0
LRV Phases Permitted ? (6 bits)	No (0) or Yes (1)	0
Minimum Time for Predictor Clock Update	0 to 24 hrs	0 hrs
Omit Vehicle Service Before LRT Preempt ? (8 bits)	No (0) or Yes (1)	0
Omit Pedestrian Service Before LRT Preempt ? (8 bits)	No (0) or Yes (1)	0
Railroad Preemption Precedence	RR (1) or LRT (2)	1
Maximum Limited Service Time	0 to 255 secs	120 secs
Auxiliary LRV Output Time	0 to 255 secs	0 secs
Flash Auxiliary LRV Output	0 to 255 secs	0
Maximum Number of LRT Detections (in 10 minutes)	0 to 255	50
LRT Detector Checking (detectors 1- 8) Enabled ? (8 bits)	No (0) or Yes (1)	1
LRT Detector Checking (detectors 9-16) Enabled ? (8 bits)	No (0) or Yes (1)	1
Store Additional LRV Travel Time Data ?	No (0) or Yes (1)	0
Phase Split Monitoring Enabled ?	No (0) or Yes (1)	1
Per Ring (2)		
Per Timing Plan (37)		
Minimum Time for Sync Phase in Recovery	0 to 255 secs	0 secs
Per Automobile Phase (8)		
Minimum Green 2 [1]	0 to 255 secs	0
Minimum Green 3	0 to 255 secs	0
Per LRV Phase (6)		
Automobile Phases Compatible ? (8 bits)	No (0) or Yes (1)	0
Pedestrian Phases Compatible ? (8 bits)	No (0) or Yes (1)	0
LRV Phases Compatible ? (6 bits)	No (0) or Yes (1)	0
Compatible Automobile Phases to Call (8 bits)	No (0) or Yes (1)	0
Minimum Green 1	0 to 25.5 secs	5.0 secs
Yellow Clearance	0 to 25.5 secs	6.0 secs
Red Clearance	0 to 25.5 secs	3.0 secs
Red Revert	0 to 25.5 secs	5.0 secs

[1] Minimum 1 is the normal minimum green.

Table II.1 (cont)
ADDITIONAL LOCAL CONTROLLER INPUT PARAMETERS

Function or Parameter	Range	Default Value
Per LRV Phase (6) (cont)		
LRV Phase Load Switch Number [2]	0 to 183	0
Auxiliary LRV Output Load Switch Number [2]	0 to 183	0
Color to Flash Instead of Steady Yellow	None(0),Green(1),Red(2)	0
Green Return Bit Number [3]	0,21-28,65-68	0
Phase Call Bit Number [3]	0,21-28,65-68	0
Per LRT Detector (16)		
First Condition Required to Call Phase	0 to 16	0
Second Condition Required to Call Phase	0 to 16	0
Per Direction (Normal/Reverse) (2)		
Travel Time Advance to Green Point (Negative)	0 to 255 secs	0
Travel Time Advance to Green Point (Positive)	0 to 255 secs	0
Travel Time Intermediate to Green Point (Negative)	0 to 255 secs	0
Travel Time Intermediate to Green Point (Positive)	0 to 255 secs	0
Travel Time Green Point to Next Advance	0 to 255 secs	0
Maximum Delay Due to Stopping	0 to 255 secs	0
Release Detector Delay	0 to 25.5 secs	0.0 secs
Per Timing Plan (37)		
Earliest End of Green Enabled ? (per auto phase, 8 bits)	No (0) or Yes (1)	0
Partial Priority Enabled ? (per LRV phase, 6 bits)	No (0) or Yes (1)	0
Full Priority Enabled ? (per LRV phase, 6 bits)	No (0) or Yes (1)	0
Timing Group Number	1 to 8	1
Per Automobile Phase (8)		
Earliest End of Green	0 to 255 secs	0
Per LRV Phase (6)		
Maximum Early Green	0 to 255 secs	0 secs
Maximum Green Extension	0 to 255 secs	0 secs

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[2] The values of the output location are represented by a code explained in the text.

[3] These are the bits to be used by ATSAC, as received through the system control message response, for graphic display. The code for the bit numbers is explained in the text.

Table II.1 (cont)
ADDITIONAL LOCAL CONTROLLER INPUT PARAMETERS

Function or Parameter	Range	Default Value
Per Timing Group (8)		
Pedestrian Suppression Enabled ? (per ped phase, 8 bits)	No (0) or Yes (1)	0
Consecutive Priority Enabled ? (per LRV phase, 6 bits)	No (0) or Yes (1)	0
Maximum Time LRT Detector is On	0 to 255 minutes	5
Maximum Time LRT Detector is Off	0 to 255 minutes	60
Per Automobile Phase (8)		
Phase Length Reduction Weight Percentage	0 to 100 %	0 %
Per LRV Phase (6)		
Minimum Green 2	0 to 25.5 secs	0.0 secs
Maximum Green 1	0 to 255 secs	12 secs
Maximum Green 2	0 to 255 secs	18 secs
Recall	None (0), Min1 (1), Min2 (2), Max1 (3), Max2 (4), Dwell (5)	0
Maximum Preparation Time	0 to 255 secs	75 secs
Normal Direction Travel Time Percentage	1 to 255 %	100 %
Reverse Direction Travel Time Percentage	1 to 255 %	100 %
Recovery Method When Uncoordinated	1 to 3	1
Recovery Method When Coordinated	4 to 8	8
Auto Minimum Green for Checks	Min1 (1), Min2 (2), Min3 (3)	1
Per Track Section (8)		
Minimum Time to Preemption [4]	0 to 255 secs	0
Maximum Time to Preemption	0 to 255 secs	255
Call LRV Phases When LRV Hold Removed ? (6 bits)	No (0) or Yes (1)	0
Per Direction (Normal/Reverse) (2)		
Maximum Pass-Ons	0 to 7	7
Origin Section for "0" Pass-On Value	0 to 8	0
Advance Detector Number	0 to 16	0
Intermediate Detector Number	0 to 16	0
Stopline Detector Number	0 to 16	0
Terminate LRV Phase on Vacation of LRT Loop ?	No (0) or Yes (1)	0

[4] Time for LRV to travel from the start of phase omit track circuit to start of preemption track circuit.

Table II.1 (cont)
ADDITIONAL LOCAL CONTROLLER INPUT PARAMETERS

Function or Parameter	Range	Default Value
Per Input File Channel (Detector) (28)		
LRT Detector Number	0 to 16	0
Per Input File Channel (Isolator) (16)		
Isolator Attribute [5]	0 to 19	*
Per Condition Variable (16)		
Page Number	0 to 16	0
Row Number	0 to 16	0
Column Number	0 to 16	0
Bit Number [6]	0, 1 to 8	0
Per Condition (16)		
Required State of Condition Variable [7]	0 to 255	99

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[5] An isolator attribute is represented by a code explained in the text of the specification.

[6] A 0 value entered for this parameter indicates that the entire byte is read.

[7] The required state of the condition variables is specified as described in the text of the specification. The current status of condition variables is determined from communications with the predictor. Current applications require only reverse run inputs.

* Default values are displayed in the local specification

II.C.1. User Input Parameters.

A listing of all additional user input parameters, minimum ranges, resolutions, and default values, as applicable is contained in Table II.1. These parameters are defined below and are entered on a per controller, per ring, per LRV phase, per automobile phase, per LRV phase, per timing plan, per timing group, per track section, per input file location and/or per condition variable basis, as specified. A group is a set of LRV priority related parameters which are implemented by timing plan.

- Communication Address - The communication address of this controller.
- LRV Phases Permitted ? - LRV phases allowed by the controller.
- Minimum Time for Predictor Clock Updates - The minimum time between local intersection controller updates of the predictor's real time clock. A 0 value indicates this local signal controller does not update the predictor's time clock.
- Omit Vehicle Service Before LRT Preempt ? - The vehicle phases which may be omitted prior to a preemption, used only for mid-corridor type of operation.
- Omit Pedestrian Service Before LRT Preempt ? - The pedestrian phases which may be omitted prior to a preemption, used only for a mid-corridor type of operation.
- Railroad Preemption Precedence - The preemption routine (LRT or RR) which has precedence in the event of concurrent preemption demands, used only for mid-corridor type of operation.
- Maximum Limited Service Time - The maximum length of time that limited service operation during a preempt can take place, prior to switching to flashing red operation, used for mid-corridor type operation. A value of 255 indicates that there is no maximum limited service time.
- Auxiliary LRV Output Time - The time prior to the start of an LRV phase to activate an auxiliary output associated with that LRV phase. This feature may be used for activating "LRV APPROACHING" signs, for example.
- Flash Auxiliary LRV Output ? - Specifies the time the auxiliary output is flashed.
- Maximum Number of LRT Detections (in 10 minutes) - The maximum number of LRT detector activations that are expected to occur in a ten minute period. A value of 0 disables this aspect of LRT error checking.
- LRT Detector Checking Enabled ? - The detector error checking routines can be enabled or disabled for individual detectors. This parameter, and the Maximum Time LRT Detector is On or Off parameter, entered by timing group, must be enabled for error checking for a specific detector and for a specific time of day.
- Store Additional LRV Travel Time Data ? - Allows the user to utilize all available memory for storing additional historical LRV travel time data. This data includes actual and predicted LRV travel times, allowing a measure of the "accuracy" of predictions.

- Phase Split Monitoring Enabled ? - Enables the recording of real time split data for all phases permitted at the controller (auto, ped, and LRV).

- Minimum Time for Sync Phase in Recovery - The minimum length of time that the sync phase is green during recovery from full priority.

- Minimum Green 2 (Automobile Phases) - An alternate minimum green for each automobile phase. This alternate value is used during implementation of (and recovery from) priority.

- Minimum Green 3 (Automobile Phases) - Another alternate minimum green, also used in priority, for each automobile phase.

- Automobile Phases Compatible ? - The automobile phases which are compatible with each LRV phase. A compatible phase is defined as a phase which does not conflict with the LRV phase.

- Pedestrian Phases Compatible ? - The pedestrian phases which are compatible with each LRV phase. A compatible phase is defined as a phase which does not conflict with the LRV phase.

- LRV Phases Compatible ? - The LRV phases which are compatible with each LRV phase are specified by this parameter. A compatible phase is defined as a phase which does not conflict with the LRV phase.

- Compatible Automobile Phase to Call - The compatible automobile phase(s) which are to be called in conjunction with an LRV phase(s).

- Minimum Green 1 (LRV Phases) - The minimum time that each LRV phase, once begun, remains green.

- Yellow Clearance - The LRV yellow change interval time.

- Red Clearance - The LRV red change interval time.

- Red Revert - The minimum time an LRV phase must be red prior to redisplaying a green indication.

- LRV Phase Load Switch Number - The location of the load switch to which each LRV phase is output. The output file location is coded by entering the load switch number followed by a 0, if the entire load switch is used.

- Auxiliary LRV Output Load Switch Number - The load switch position number for output of the auxiliary LRV output. The output location is identified by a code consisting of the load switch number followed by a single digit code:

  1 - the upper load switch position;
  2 - the middle load switch position; and,
  3 - the lower load switch position.

- Color to Flash Instead of Steady Yellow - Substitutes a flashing green or red instead of the normal steady yellow output. This feature is most commonly used for LRV phases which are driving pedestrian displays.

- Green Return Bit - The bit number of the local controller's response to the System Control message from ATSAC, used to graphically display the LRV phase green returns. This allows any of the eight bits in byte 2 and the high four bits in byte 6 to be used for graphic display of the LRV phases. The bit numbers are defined as follows:

  Byte 2, bits 8 through 1 - 28 through 21, respectively; and,
  Byte 6, bits 8 through 5 - 68 through 65.

- Phase Call Bit - The bit number of the local controller's response to the System Control message from ATSAC, used to graphically display LRV phase calls. This allows any of the eight bits in Byte 2 and the high four bits in byte 6 to be used for graphic display of LRV phase calls. The bit numbers are is defined the same as LRV green returns.

- First Condition Required to Call Phase - The input condition (status of various inputs) which must be true for this LRV detector to call this phase.

- Second Condition Required to Call Phase - A second input condition which must be true for this LRV detector to call this phase.

- Travel Time Advance to Green Point - The LRV travel time between the advance detector and the LRV's green point. This is actually two parameters, one for negative values and one for positive values.

- Travel Time Intermediate to Green Point - The LRV travel time between a second advance detector and the LRV's green point. At most intersections this parameter is not used since there is only one advance detector. This is actually two parameters, one for negative values and one for positive values.

- Travel Time Green Point to Next Advance - The LRV travel time between the LRV's green point and the next downstream advance detector, assuming no delay from the traffic signal. This parameter reflects the travel time without deceleration and/or acceleration.

- Maximum Delay Due to Stopping - The maximum amount that the Travel Time Green Point to Next Advance parameter can be increased due to acceleration and/or deceleration of an LRV slowing (or stopping) for a red indication.

- Release Detector Delay - The length of time that the LRV green display is held after activation of the release detector.

- Earliest End of Green Enabled ? - Which phases utilize Earliest End of Green values during each timing plan.

- Partial Priority Enabled ? - The LRV phases which may use partial priority under a specific timing plan.

- Full Priority Enabled ? - The LRV phases which may use full priority during a specific timing plan.

- Timing Group Number - Which group of LRV timings are to be used for specific timing plans.

- Earliest End of Green - The earliest time (fixed within the cycle) at which a phase is allowed to terminate. Prior to the this point, the phase is held in green. Actual termination of the phase occurs as a result of a gap out (traffic demand) or a force-off of the phase.

- Maximum Early Green - The limit for how early a compatible phase may begin in order for the LRV phase to be served.

- Maximum Green Extension - The limit for an extension of a compatible phase in order for the LRV phase to be served.

- Pedestrian Suppression Enabled ? - The pedestrian phase that may be suppressed during priority.

- Consecutive Priority Service Enabled ? - Specifies if consecutive priority service is allowed. A no value is interpreted as meaning that if any LRV phase received the priority service, effecting normal signal operation, during the last cycle, no priority is allowed in the next cycle.

- Maximum Time LRT Detector is On - The maximum length of time any LRT detector can be continuously on. If the detector is on for longer than this period, a detector error is determined. A value of 0 for this parameter disables this test.

- Maximum Time LRT Detector is Off - The maximum length of time any LRT detector can be off. If the detector is off for longer than this period, a detector error is determined. A value of 0 for this parameter disables this test.

- Phase Length Reduction Weight Percentage - The amount of the required timing adjustment which is to be obtained from the candidate phase.

- Minimum Green 2 (LRV phases) - The minimum time which the LRV phase remains green. Always equal to or greater than Minimum Green 1.

- Maximum Green 1 - A maximum length of the LRV phase.

- Maximum Green 2 - An alternative maximum length of the LRV phase.

- Recall - The type, if any, of permanent (non-priority) call is placed for the LRV phase every cycle. This call is placed immediately after termination of the LRV phase during the previous cycle. An LRV phase can be recalled to its Minimum 1, Minimum 2, Maximum 1, or Maximum 2 value, or may be recalled to dwell in green for the length of the compatible phase(s).

- Maximum Preparation Time - The maximum predicted LRV travel time for which the local intersection controller adjusts its operation to accommodate the LRV within the user selected level of priority.

- Normal Direction Travel Time Percentage - The percentage modification of all travel time parameters, for the normal direction, during each timing plan,.

- Reverse Direction Travel Time Percentage - The percentage modification of all travel time parameters, for the reverse direction, during each timing plan.

- Recovery Method When Uncoordinated - The type of recovery utilized after the implementation of full priority when the traffic signal is operating uncoordinated.

- Recovery Method When Coordinated - The type of recovery utilized after the implementation of full priority when the traffic signal is coordinated.

- Auto Minimum Green for Checks - The set of automobile minimum greens used during each timing plan.

- Minimum Time to Preemption - The minimum amount of time between activation of the phase omit track circuit and commencement of preemption, used only for mid-corridor type of operation.

- Maximum Time to Preemption - The maximum time between activation of the phase omit track circuit and the beginning of preemption, used only for mid-corridor type of operation. If preemption has not begun after this time, normal operation resumes.

- LRV Phases to Call When "Hold" Removed (6 bits) - The LRV phases called on removal of an LRV "hold" bit (set by the predictor).

- Maximum Pass-Ons - The number of times that an LRV travel time message, regarding a particular LRV, may be "passed through" the predictor. The maximum pass-on value is used by the local signal controller to terminate the pass-ons of travel time messages. A 0 value is defined as no pass-ons.

- Origin Section for 0 Pass-Ons - When an LRV activates an advance detector, the local determines in which track section the LRV is traveling (through the user input parameters). The user may encode an advance detector in a section other than its true physical location. Allows the user to input the actual location of the detector for passing on the correct track section number in the LRV travel time messages to the predictor. A 0 value for this parameter means that no correction is required.

- Advance Detector Number - The identification number of the advance detector for each track section.

- Intermediate Detector Number - The identification number of the second advance, or intermediate, detector for each track section.

- Stopline Detector Number - The identification number of the stopline detector for each track section.

- Terminate LRV Phase on Vacation of LRT Loop ? - Specifies whether the LRT loop used as a stopline/release detector terminates the applicable LRV phase when the LRV initially activates the LRT loop, or when the LRV vacates the LRT loop.

- LRT Detector Number - The number of the LRT detector "connected" to each input file channel. A value of 0 indicates that this input file channel is not used for an LRT detector.

- Isolator Attribute - The isolator attribute describes the type of input (pedestrian push button, phase omit, preempt, etc.) of each isolator location in the input file. The attributes are identified by the following code:

  1 - advance;
  2 - advance enable;
  3 - phase 2 pedestrian push button;
  4 - phase 2 pedestrian push button;
  5 - phase 2 pedestrian push button;
  6 - phase 2 pedestrian push button;
  7 - flash sense;
  8 - stop time;
  9 - door ajar;
  10 - dial 2;
  11 - dial 3;
  12 - emergency vehicle A;
  13 - emergency vehicle B;
  14 - emergency vehicle C;
  15 - emergency vehicle D;
  16 - railroad preemption 1;
  17 - railroad preemption 2;
  18 - light rail preemption;
  19 - phase omit 1; and,
  20 - phase omit 2.

The default setting of each isolator is displayed in the local specification.

- Page Number - The page (memory location) containing the current status of this condition variable.

- Row Number - The row number (memory location) containing the current status of this condition variable.

- Column Number - The row number (memory location) containing the current status of this condition variable.

- Bit Number - The number of the bit containing the current status of this condition variable. A 0 value indicates that the entire byte contains the input status.

- Required State of Condition Variable - The state of each condition variable which must be true for each condition.

The required state of each condition variable consist of three digits, ABC. For each variable (X), the first digit (A) defines the form of the conditional statement for that variable and the second and third digits (B and C) define the values (Y and Z) the variable is tested against in the statement, as follows:

- A can have a value of 0 to 2, where:
  - 0 is defined as X is equal to Y or Z;
  - 1 is defined as X is not equal to Y or Z; and,
  - 2 is defined as X greater than Y but less than Z.

- B can have a value of 0 to 9 (this is limited to 0 to 5 if A equals 2), where:
  - 0 to 7 is defined as Y is equal to B;
  - 8 is defined as Y being equal to any value between 8 and 255, inclusive; and,
  - 9 is defined as ignore Y.

- C can have a value of 0 to 9 (this is limited to 0 to 5 if A equals 2 and B equals 5), where:
  - 0 to 7 is defined as Z is equal to C;
  - 8 is defined as Z being equal to any value between 8 and 255, inclusive; and,
  - 9 is defined as ignore Z.

All input parameters in the original Program 172D are maintained.

II.C.2. Data Entry. New data entry screens accommodate the entry of all additional local controller parameters. Suitable screens facilitate data entry in a logical hierarchical fashion, grouped according to RAM map pages, similar to the existing input screens. Default values are automatically inserted.

Error checking ensures that all data entered are consistent and within the range specified in Table II.1.

II.D. Graphical Display

The following modifications to ATSAC software are required to enable the ATSAC operators to display LRT related information.

II.D.1. Message 1. Bytes 2 and 6 of the Message 1 Response were previously defined as shown below.

Byte	Bit	Function
2	8	Phase 1 ped. walk return
	7	" 2 " " "
	6	" 3 " " "
	5	" 4 " " "
	4	" 5 " " "
	3	" 6 " " "
	2	" 7 " " "
	1	" 8 " " "
6	8	Overlap A green return
	7	" B " "
	6	" C " "
	5	" D " "
	4	Special function 1
	3	" " 2
	2	" " 3
	1	" " 4

New software at the local controller now allows the operator to optionally assign bits 1-8 of byte 2 and bits 5-8 of byte 6 as LRV phase green returns or LRV phase calls in addition to green returns, pedestrian walk returns and overlaps.

All the bits in bytes 2 and 6 are passed on to the graphics display processor from the communications buffer so the operator can assign them to icons on the graphics displays. The intersection operation report on the individual intersection graphics displays shows the status of the special function bits. Below is an example of the bit assignment for a typical LRT controller.

II.D.2. LRV Phase Entity. An LRV phase is shown on the graphics display by a new graphical entity with permitted colors of white, yellow and red, and a shape defined by the City of Los Angeles.

II.D.3. **LRV Phase Yellow.** No indication of LRV phase yellow is sent to the ATSAC controller from the local controller. Following termination of the green return of an LRV phase, the graphical display indicates LRV yellow for six seconds prior to the display turning red.

Byte	Bit	Default
2	8	LRV Phase 1 green return
	7	Phase 2 ped. walk return
	6	LRV Phase 2 green return
	5	Phase 4 ped. walk return
	4	LRV Phase 1 call return
	3	Phase 6 ped. walk return
	2	LRV Phase 2 call
	1	Phase 8 ped. walk return
6	8	Overlap A green return
	7	Overlap B green return
	6	Overlap C green return
	5	Overlap D green return
	4 & 3	LRV Priority override echo*
	2	Predictor controller status*
	1	Sign controller status*

* Special function bits.

II.E. Modifications to UTCS Pickup Routines

The method by which ATSAC picks up a controller after the preempt bit is cleared is modified. The intersection monitoring routine is modified to set the pickup state for LRV controllers to "wait for main street green (MSG)," and initialize interval pointers that would otherwise occur during the multi-state pickup process.

The control implementation process is modified so that the pickup routine suppresses the updating of interval pointers and calculation of offset corrections until the countdown timer is equal to the offset point.

APPENDIX A

Operational Procedures

Operational Procedures

It will be extremely important for ATSAC operators to keep the local controller data consistent with the data in the universal database. Should these data not be identical, the local controller may use different coordination timing during LRT priority, may not be in step when picked up by ATSAC, and may go through an additional transition period. The schedules at both the local controller and central computer must also be kept consistent, for the same reason.

For LRT intersections under CIC control, the phase minimums should be set sufficiently high so that, under no priority, no LRV phase is longer than its compatible phase(s) regardless of the CIC split implemented.

LADOT and RTD should establish various operational procedures to ensure coordination between the ATSAC operators and the LRT system operators.

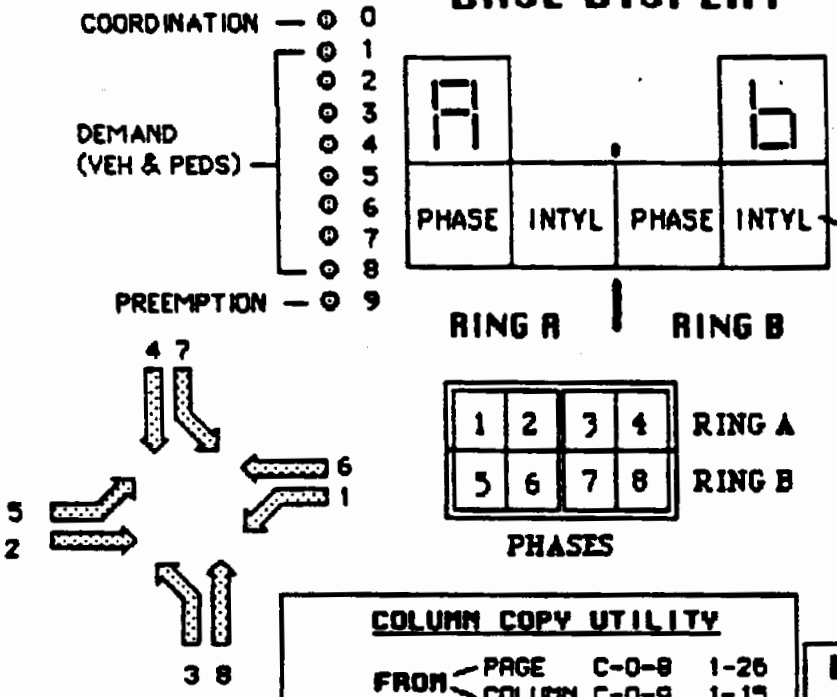
RTD should keep LADOT informed of schedule changes or other factors which may influence the impact of LRT on traffic signal operations. LADOT should keep RTD informed of the priority level set at each intersection to assist in LRT scheduling. ATSAC operators should inform LRT Central Control of equipment failures to provide advance warning to LRV operators. When a detector failure is noted at an LRT intersection, the ATSAC operator interrogates the local to determine whether an LRV detector is faulty, and, if so, reports the failed detector to LRT Central Control. The LRT supervisors will use the SCADA system to notify local signal controllers of reverse running.

APPENDIX B

Local Controller RAM Maps

PROGRAM
172
LRV

BASE DISPLAY



INTERVALS

- 0 - WALK
- 1 - FLASH DONT WALK
- 2 - MINIMUM GREEN
- 3 -
- 4 - VARIABLE INITIAL
- 5 - EXTENSION
- 6 -
- 7 - REDUCED GAP
- 8 - RED REST
- 9 - PREEMPTION
- A - STOP TIME
- B - RED REVERT
- C - GAP TERMINATION
- D - MAX TERMINATION
- E - FORCEOFF
- F - RED CLEARANCE

COLUMN COPY UTILITY

FROM	PAGE	C-0-8	1-26
	COLUMN	C-0-9	1-15
START AT	PAGE	C-0-A	1-26
	COLUMN	C-0-B	1-15
TOTAL COLUMNS		C-0-C	1-15

* WHEN COPY IS COMPLETED C-0-C = 0

bAdE EPROM ERROR, SEE C-E-D
WATCHDOG STOPS IF F-C-F = 0

bAdA TURN STOPTIME SW ON THEN OFF TO REINITIALIZE (LOW RAM)

bAdb TURN STOPTIME SW ON THEN OFF TO REINITIALIZE (HIGH RAM)

C-C-0 = 172 STOPS WATCHDOG

CONFIGURATION DATA

NOTE: "CONFIGURATION" KEY ENABLED (F-9-F = 255)

CABINET: (E+E+7)
- 1-UNIV 337
- 2-4TH PED 337
- 4-UNIV 332
- 5-ATSAC 337
- 6-4TH PED 337
- 8-ATSAC 332

EXTRA: (E+E+E)
- 1-TBC TYPE 1
- 4-EV ADVANCE
- 5-FLOAT PED
- 6-FP FLH RED

ICSEL: (E+E+F)
- 1-SIMPLEX IN
- 2-ATSAC
- 3-7 WIRE IN
- 4-FLH/FREE
- 5-SIMPLEX OUT
- 7-7 WIRE OUT

KEYSTROKES: E+E+INTERVAL

INTERVAL	PHASE 1	2	3	4	5	6	7	8
0 EXCLU PH								
1 OLA LS								
2 OLB LS								
3 OLC LS								
4 OLD LS								
5								
6 DRWY FLH								
7 CABINET								
8 FLASH IN RED								
9 OLY FLH								
A EMVEH A								
B EMVEH B								
C EMVEH C								
D EMVEH D								
E EXTRA								
F IC SELECT								

KEYSTROKES: E+F+INTERVAL

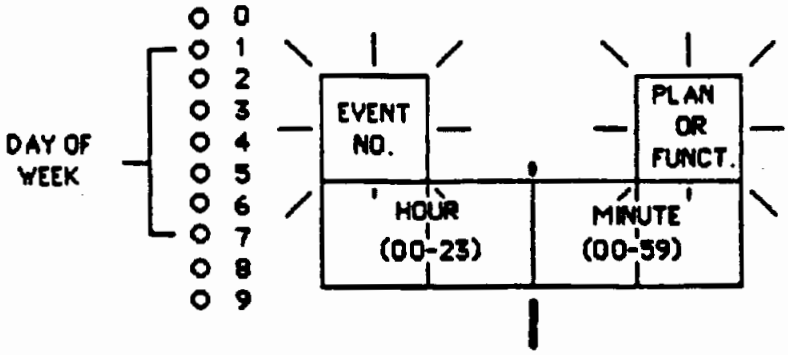
INTERVAL	PHASE 1	2	3	4	5	6	7	8
0 PERMIT								
1 GROM OLA								
2 GROM OLB								
3 GROM OLC								
4 GROM OLD								
5 PED2P								
6 PED6P								
7 PED4P								
8 PED8P								
9 FLH YELO								
A OVERLAP A								
B OVERLAP B								
C OVERLAP C								
D OVERLAP D								
E RESTRICTED								
F								

BI TRAN SYSTEMS, INC.

7-KEY

PROGRAM 172

TIME OF DAY DISPLAYS



TIME OF DAY FEATURES

KEYSTROKES: 7+EVENT#

FUNCTION BY PHASE

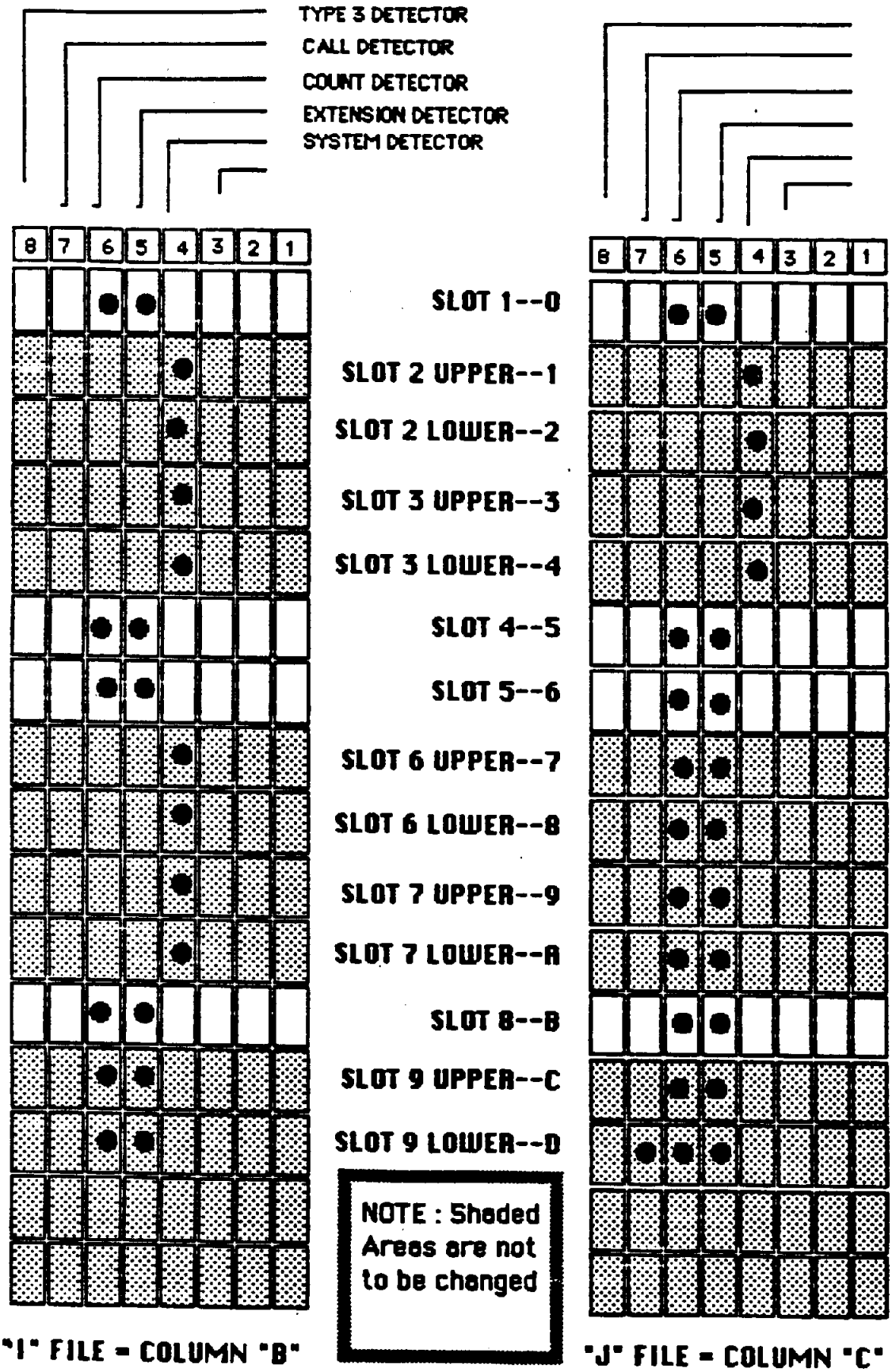
KEYSTROKES: D-F-EVENT #

EVENT	TIME	FUNCT	DAY OF WEEK S	M	T	W	T	F	S	1	2	3	4	5	6	7	8
0																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
A																	
B																	
C																	
D																	
E																	
F																	

NOTE: TO DISABLE TOD FUNCTION SET F-0-8 = 0

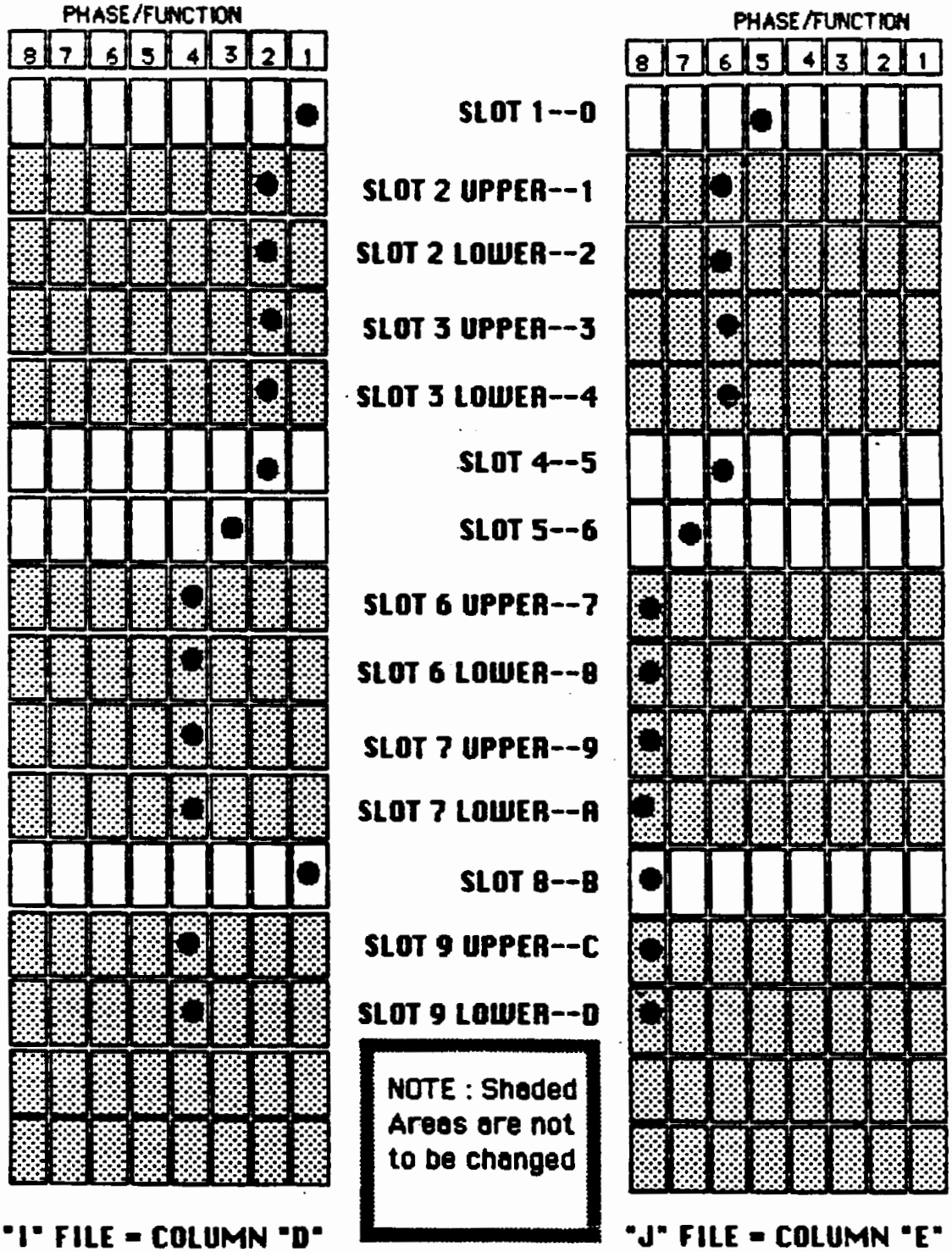
TIME OF DAY LOCAL FUNCTION CODES

0 - PHASES ALLOWED
1 - RED LOCK
2 - YELLOW LOCK
3 - VEH RECALL
4 - PED RECALL
5 - RESERVED
6 - VEH MAX RCL
7 - FORCE/MAX RCL
8 - DBL ENTRY
9 - MAX 2
A - RESERVED
B - RED REST
C - RESERVED
D - RESERVED
E - LOCAL
5-LRV TRAVEL
6 - FREE
7 - FLASH
8-SPLIT MON
F - TOD OUTPUTS
1 - TOD OUT 1
2 - TOD OUT 2
3 - TOD OUT 3



DETECTOR ATTRIBUTES("D")

ATSAC 332 CABINET

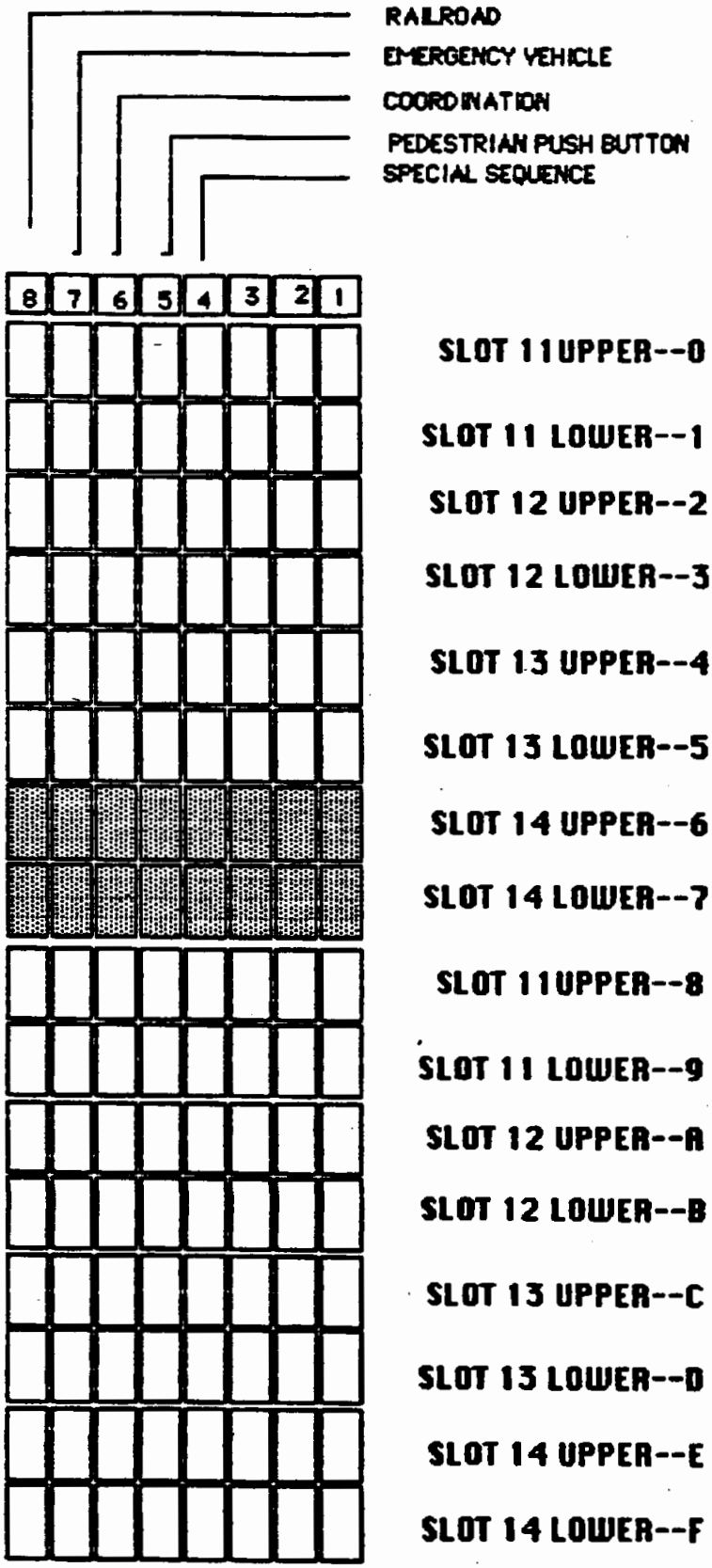


"I" FILE = COLUMN "D"

"J" FILE = COLUMN "E"

DETECTOR PHASES ("D")

ATSAC 332 CABINET



"I" File

"J" File

COLUMN "E" PAGE $22 - ATTRIBUTES
COLUMN "F" PAGE $22 - FUNCTIONS

LRU Green Parameters/Bank A

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		Max Early Green LRU 1A														
2		Max Early Green LRU 2B														
3		Max Early Green LRU 3C														
4		Max Early Green LRU 4D														
5		Max Early Green LRU 5E														
6		Max Early Green LRU 6F														
7																
8																
9																
A		Max Green Ext. LRU 1A														
B		Max Green Ext. LRU 2B														
C		Max Green Ext. LRU 3C														
D		Max Green Ext. LRU 4D														
E		Max Green Ext. LRU 5E														
F		Max Green Ext. LRU 6F														

LRU Green Parameters/Bank B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		Max Early Green LRU 1A														
2		Max Early Green LRU 2B														
3		Max Early Green LRU 3C														
4		Max Early Green LRU 4D														
5		Max Early Green LRU 5E														
6		Max Early Green LRU 6F														
7																
8																
9																
A		Max Green Ext. LRU 1A														
B		Max Green Ext. LRU 2B														
C		Max Green Ext. LRU 3C														
D		Max Green Ext. LRU 4D														
E		Max Green Ext. LRU 5E														
F		Max Green Ext. LRU 6F														

LRU Green Parameters/Bank C

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		Max Early Green LRU 1A														
2		Max Early Green LRU 2B														
3		Max Early Green LRU 3C														
4		Max Early Green LRU 4D														
5		Max Early Green LRU 5E														
6		Max Early Green LRU 6F														
7																
8																
9																
A		Max Green Ext. LRU 1A														
B		Max Green Ext. LRU 2B														
C		Max Green Ext. LRU 3C														
D		Max Green Ext. LRU 4D														
E		Max Green Ext. LRU 5E														
F		Max Green Ext. LRU 6F														

LRU Green Parameters/Bank 0

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		Max Early Green LRU 1A														
2		Max Early Green LRU 2B														
3		Max Early Green LRU 3C														
4		Max Early Green LRU 4D														
5		Max Early Green LRU 5E														
6		Max Early Green LRU 6F														
7																
8																
9																
A		Max Green Ext. LRU 1A														
B		Max Green Ext. LRU 2B														
C		Max Green Ext. LRU 3C														
D		Max Green Ext. LRU 4D														
E		Max Green Ext. LRU 5E														
F		Max Green Ext. LRU 6F														

LAU Coordination Parameters/Bank A

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Yield Points Permitted															
1	Yield Point phase 1															
2	Yield Point phase 2															
3	Yield Point phase 3															
4	Yield Point phase 4															
5	Yield Point phase 5															
6	Yield Point phase 6															
7	Yield Point phase 7															
8	Yield Point phase 8															
9																
A	RING A Recovery Time															
B	RING B Recovery Time															
C	Group Number															
D																
E	Partial Priorty/Plan/LAU															
F	Full Priorty/Plan/LAU															

LRU Coordination Parameters/Bank B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Yield Points Permitted															
1	Yield Point phase 1															
2	Yield Point phase 2															
3	Yield Point phase 3															
4	Yield Point phase 4															
5	Yield Point phase 5															
6	Yield Point phase 6															
7	Yield Point phase 7															
8	Yield Point phase 8															
9																
A	RING A Recovery Time															
B	RING B Recovery Time															
C	Group Number															
D																
E	Partial Priorty/Plan/LRU															
F	Full Priorty/Plan/LRU															

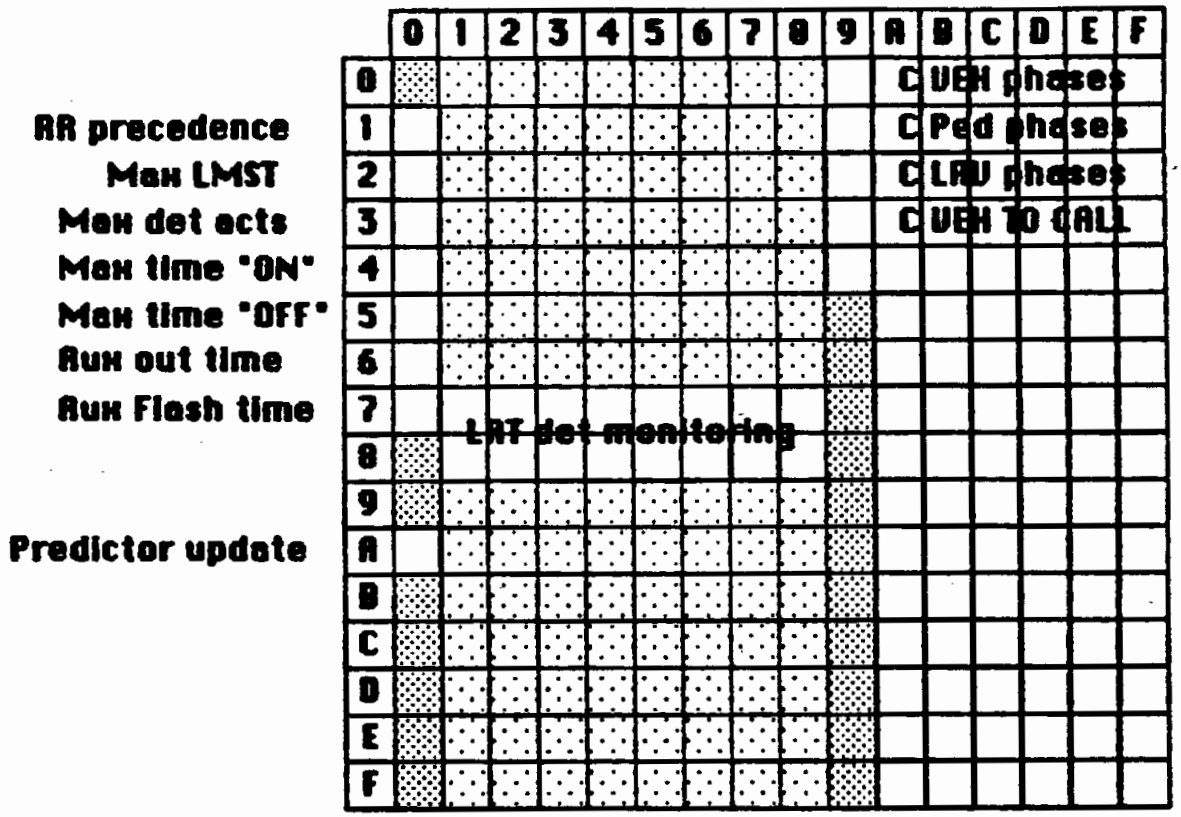
LRU Coordination Parameters/Bank C

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		Yield Points Permitted														
1		Yield Point phase 1														
2		Yield Point phase 2														
3		Yield Point phase 3														
4		Yield Point phase 4														
5		Yield Point phase 5														
6		Yield Point phase 6														
7		Yield Point phase 7														
8		Yield Point phase 8														
9																
A		RING A Recovery Time														
B		RING B Recovery Time														
C		Group Number														
D																
E		Partial Priorty/Plan/LRU														
F		Full Priorty/Plan/LRU														

LRU Coordination Parameters/Bank 0

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		Yield Points Permitted														
1		Yield Point phase 1														
2		Yield Point phase 2									Minimum Green 2					
3		Yield Point phase 3										Minimum Green 3				
4		Yield Point phase 4														
5		Yield Point phase 5														
6		Yield Point phase 6														
7		Yield Point phase 7														
8		Yield Point phase 8													Isolator inputs attributes	Isolator inputs functions
9																
A		RING A Recovery Time														
B		RING B Recovery Time														
C		Group Number														
D																
E		Partial Priorty/Plan/LRU														
F		Full Priorty/Plan/LRU														

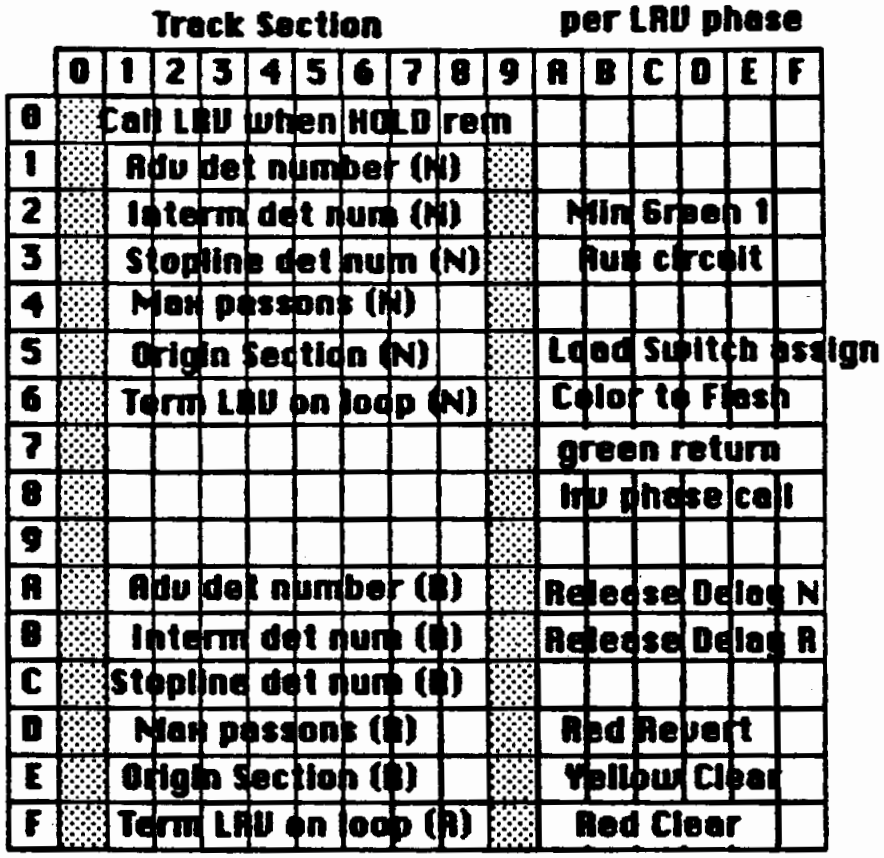
LRU Phase Configuration



page $23

Predictor-Local comm Address 0-0-0

LRU permit	$2390
LRU det enable	$2391
LRU det enable	$2392
LRU det fail	$2393
LRU det fail	$2394


Track Section
per LRU phase
0 1 2 3 4 5 6 7 8 9 A B C D E F
Call LRU when HOLD rem
Adv det number (N)
Interm det num (N)
Min Green 1
Stopline det num (N)
Aux circuit
Max passons (N)
Origin Section (N)
Load Switch assign
Term LRU on loop (N)
Color to Flash
green return
Inv phase call
Adv det number (R)
Release Delay N
Interm det num (R)
Release Delay R
Stopline det num (R)
Max passons (R)
Red Revert
Origin Section (R)
Yellow Clear
Term LRU on loop (R)
Red Clear

page $24

LRU timers (1-6)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		Curr Interval														
1		Curr timer														
2		Min Green														
3																
4																
5																
6																
7																
8		Max Green														
9																
A																
B		Release Delay														
C		Curr Color														
D		Red Revert														
E		Yellow Clear														
F		Red Clear														

Current Section and Switch Status

LRU phase to be called by LRU detector

LRU phase flags

Track Section + Switch Status

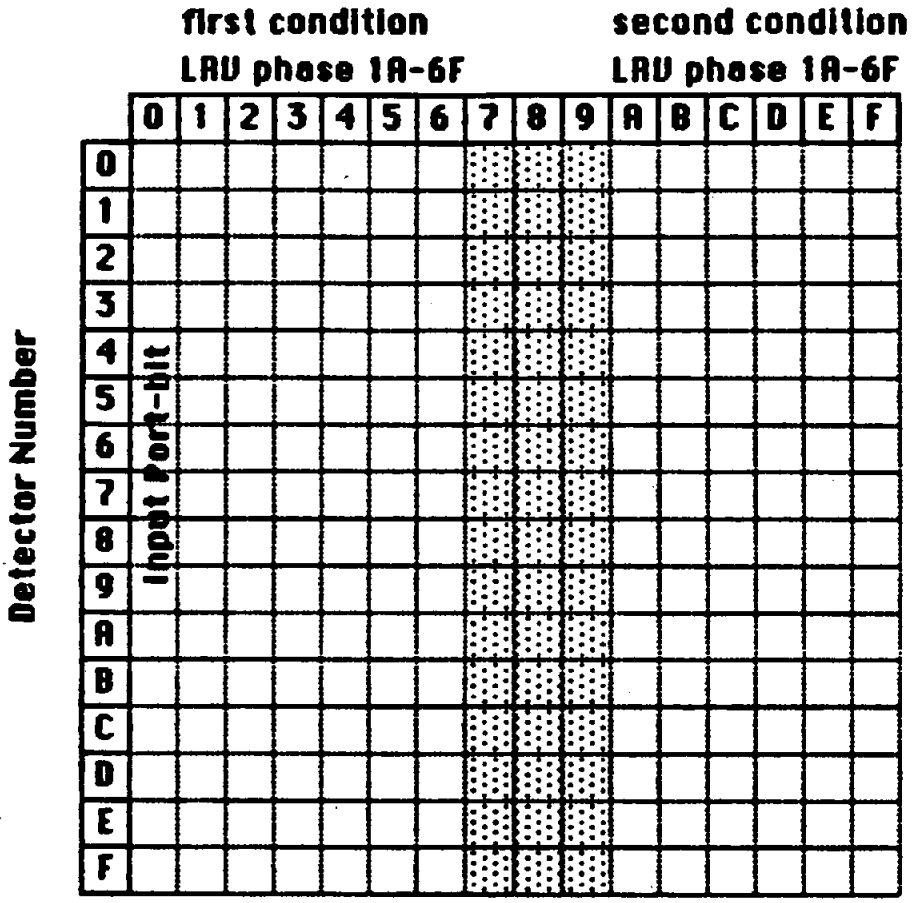
Condition Number

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1																
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

Track Status : 1=normal, 2=reverse, 3=hold, 99=dnm
Switch Status: 0=straight, 1=turn, 99=dnm

condition variable = ABC (3 digits)

Condition Variable Definition



Condition Number Entries 1-15

LRU Detector Number vs LRU phases

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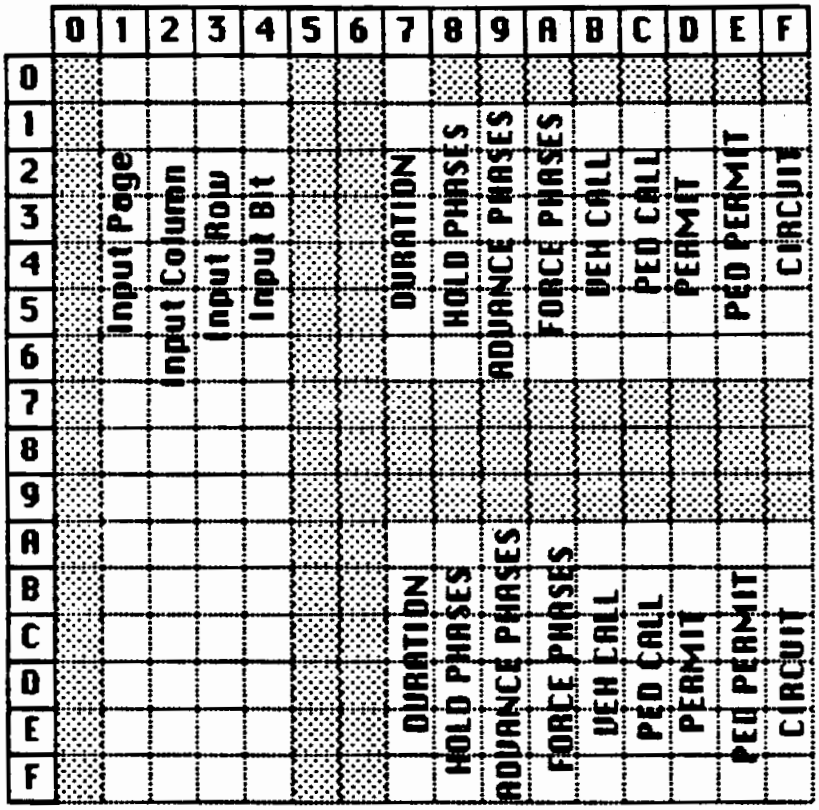
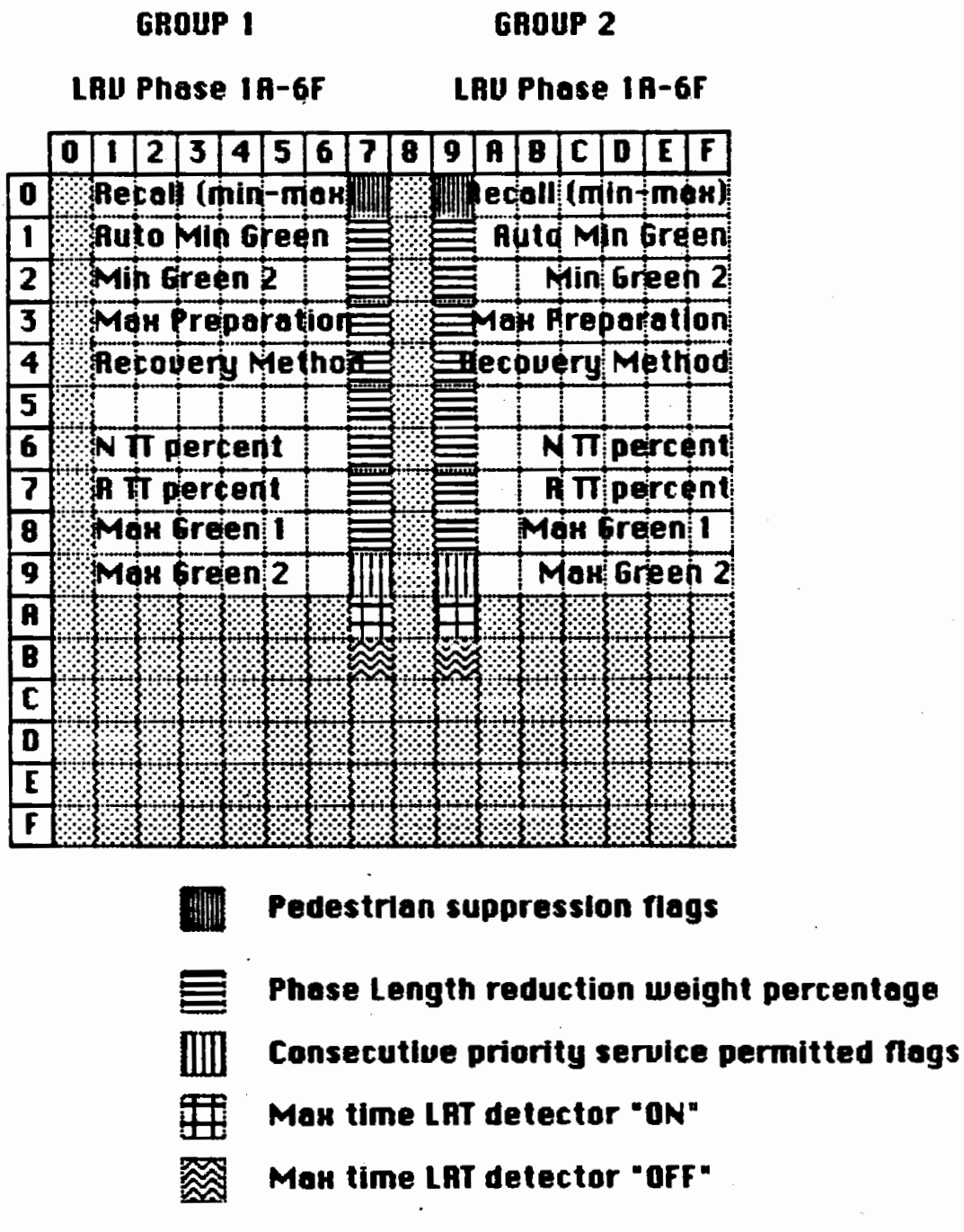

0 1 2 3 4 5 6 7 8 9 A B C D E F
Input Page
Input Column
Input Row
Input Bit
DURATION
HOLD PHASES
ADVANCE PHASES
FORCE PHASES
VEH CALL
PED CALL
PERMIT
PED PERMIT
CIRCUIT
Sequence 1
Sequence 2

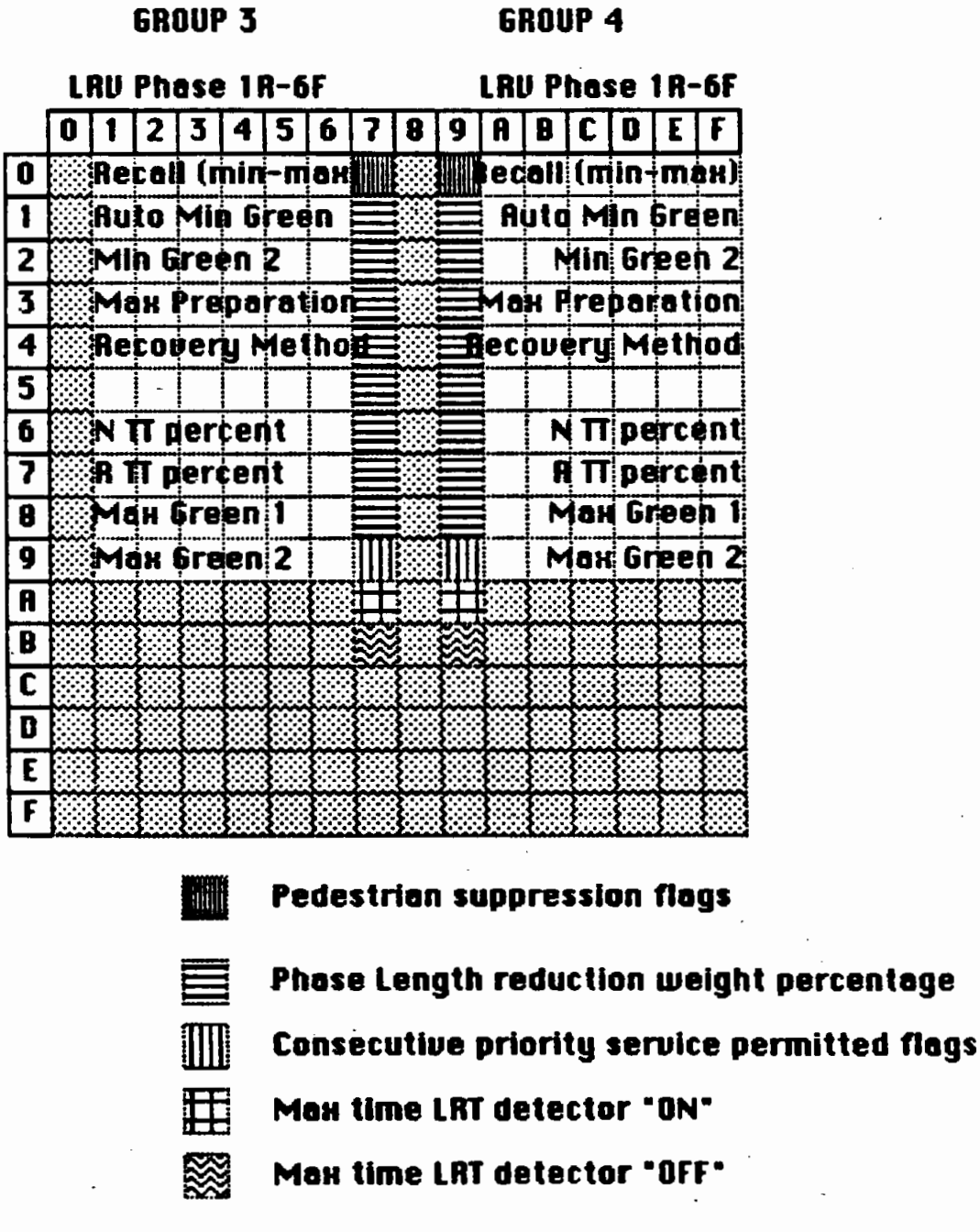
LRU Travel Time/LRU phase

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		Adv to GP (positive)														
2		Adv to GP (negative)														
3		Inter to GP (positive)														
4		Inter to GP (negative)														
5		GP to next Adv														
6																
7		Max Delay														
8																
9		Adv to GP (positive)														
A		Adv to GP (negative)														
B		Inter to GP (positive)														
C		Inter to GP (negative)														
D		GP to next Adv														
E																
F		Max Delay														

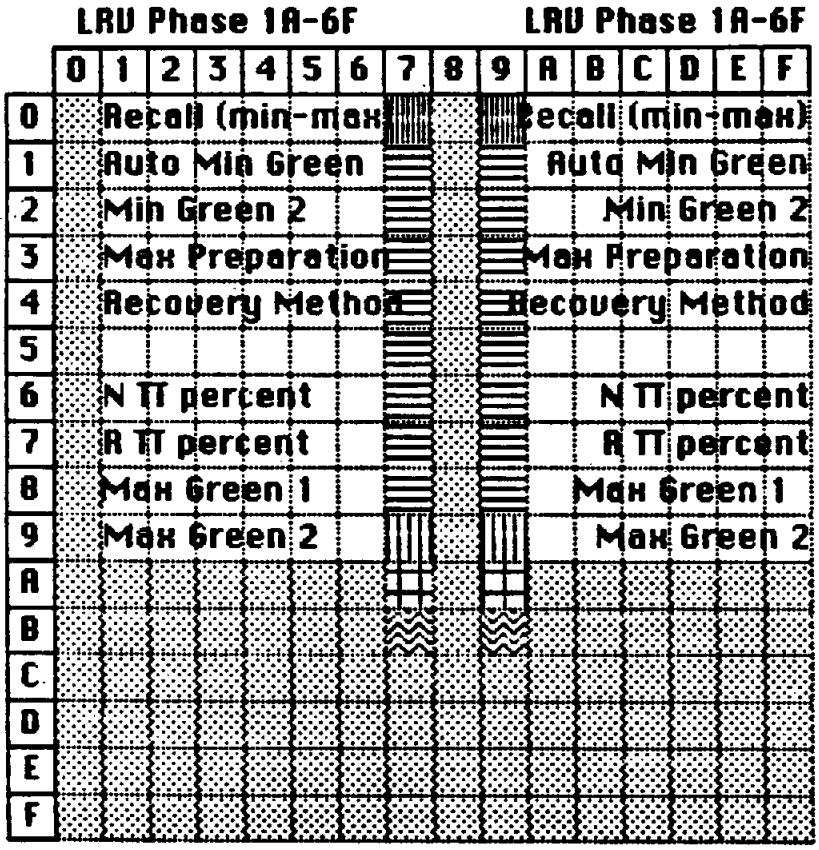
NORMAL

REVERSE


GROUP 1
LRU Phase 1A-6F
GROUP 2
LRU Phase 1A-6F
0 1 2 3 4 5 6 7 8 9 A B C D E F
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F
Recall (min-max)
Auto Min Green
Min Green 2
Max Preparation
Recovery Method
N TT percent
R TT percent
Max Green 1
Max Green 2
Recall (min-max)
Auto Min Green
Min Green 2
Max Preparation
Recovery Method
N TT percent
R TT percent
Max Green 1
Max Green 2
Pedestrian suppression flags
Phase Length reduction weight percentage
Consecutive priority service permitted flags
Max time LRT detector "ON"
Max time LRT detector "OFF"


GROUP 3
GROUP 4
LRU Phase 1R-6F
LRU Phase 1R-6F
0 1 2 3 4 5 6 7 8 9 A B C D E F
0 Recall (min-max) Recall (min-max)
1 Auto Min Green Auto Min Green
2 Min Green 2 Min Green 2
3 Max Preparation Max Preparation
4 Recovery Method Recovery Method
5
6 N TT percent N TT percent
7 R TT percent R TT percent
8 Max Green 1 Max Green 1
9 Max Green 2 Max Green 2
A
B
C
D
E
F
Pedestrian suppression flags
Phase Length reduction weight percentage
Consecutive priority service permitted flags
Max time LRT detector "ON"
Max time LRT detector "OFF"

GROUP 5 GROUP 6



Pedestrian suppression flags

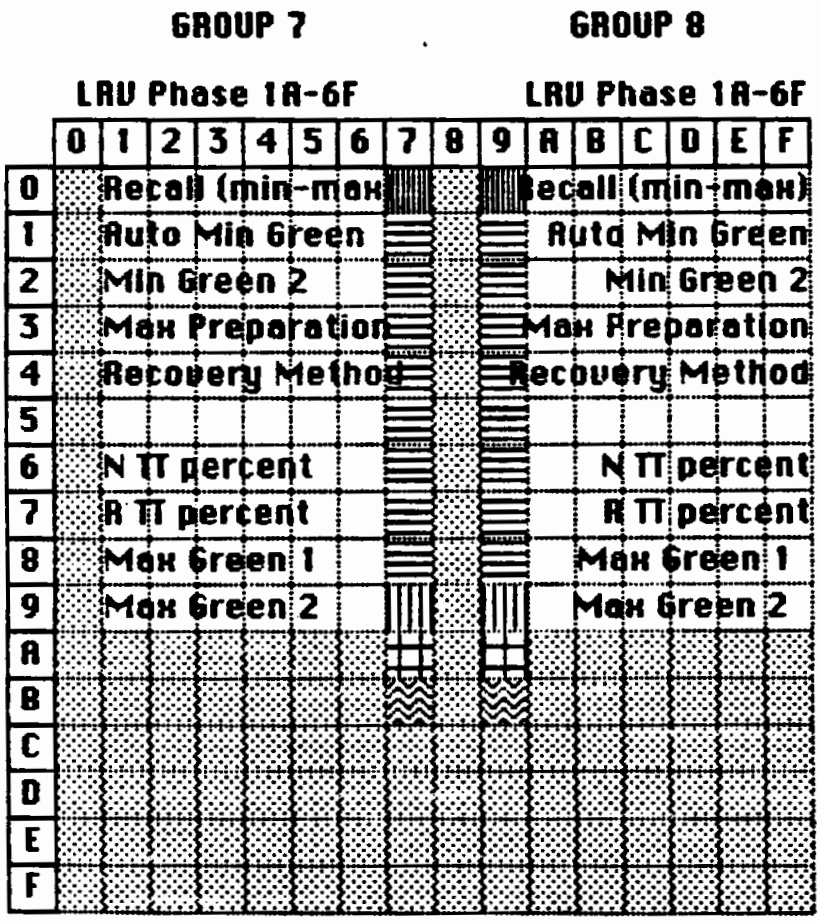
Phase Length reduction weight percentage

Consecutive priority service permitted flags

Max time LRT detector "ON"

Max time LRT detector "OFF"

page $2e



Pedestrian suppression flags

Phase Length reduction weight percentage

Consecutive priority service permitted flags

Max time LAT detector "ON"

Max time LAT detector "OFF"