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AGRAMMATIC GUIDE SIGNS FOR USE ON NTROLLED ACCESS HIGHWAYS

I. III. Traffic Engineering Evaluation of Diagrammatic Guide Signs

Appendixes A, B, and C to Part 2

J.H. Sanders, M.J. Ganslaw, and G.S. Kolsrud

December 1972
Final Report

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7. Author(s)
James H. Sanders, Mark J. Ganslaw and Gretchen S. Kolsrud.

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3027 Rosemary Lane, Falls Church, Va. 22042 and
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16. Abstract The purpose of the diagrammatic signing research project was to develop warrants and standards for the use of diagrammatic guide signs on controlled access highways. Volume III of this report is published in 4 bound books - 1 book for each of its 3 parts, plus the present book containing appendixes to Part 2. The appendixes in this book are: A. The Traffic Evaluator System, B. Questionnaire Forms and Protocol, and C. Questionnaire Items by Respondent Class.

Research findings obtained under the project indicate that drivers require more time to read and interpret information on diagrammatic signs in comparison with conventional signs. Moreover, as the graphic component on the sign becomes more complex, driver information interpretation time increases. Accordingly, in those cases where diagrammatic signs have been recommended, the standards specify that simple graphic designs must be used. Research results clearly indicate that diagrammatic guide signs will produce a benefit to motorist performance at interchanges where traffic must exit to the left of the through route. Such interchanges include major forks where exiting traffic must take the left fork. Also included are interchanges where there is a single left exit from the roadway and where there is a left exit in combination with a right exit.

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FHWA-RD-No.	Vol. No.	Book title	Note on contents
73-21	I	Recommendations for Diagrammatic Guide Signs.	
73-22	II	Laboratory, Instrumented Vehicle, and State Traffic Studies of Diagrammatic Guide Signs.	
73-23	III	Traffic Engineering Evaluation of Diagrammatic Guide Signs. Part 1: Technical Overview of the I-495 (Capital Beltway)/ I-70S Field Study.	First of 3 parts, each issued as a separate book, with an additiona book for Part 2 appendixes.
73-24	III	Traffic Engineering Evaluation of Diagrammatic Guide Signs. Part 2: The I-495 (Capital Beltway)/I-70S Field Study.	Second of 3 parts
73-25	III	Traffic Engineering Evaluation of Diagrammatic Guide Signs: Appendixes A, B, & C to Part 2.	
73-26	III	Traffic Engineering Evaluation of Diagrammatic Guide Signs. Part 3: Synthesis and Conclusions.	Third (last) of 3 parts.

APPENDIX A

Traffic Evaluator System

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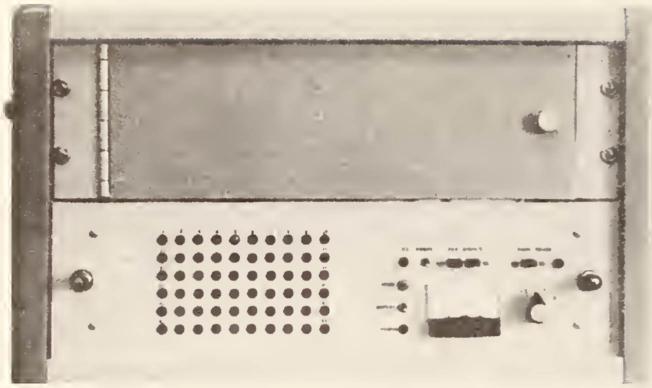

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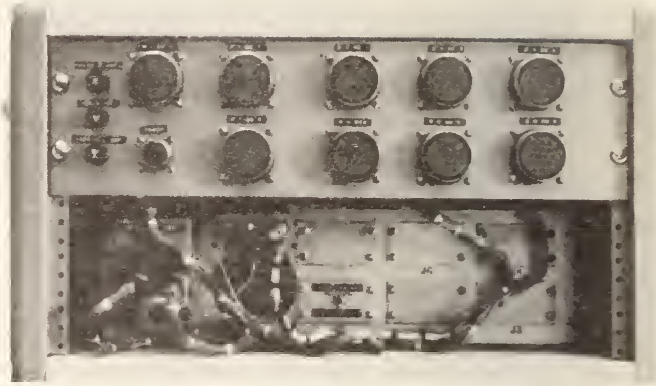

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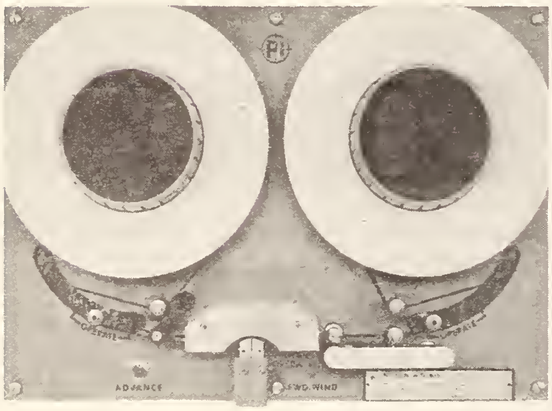

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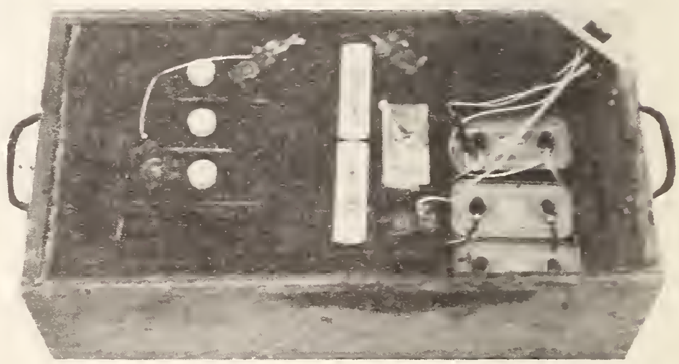


POWER SUPPLY

ELECTRONICS UNIT OF THE TRAFFIC EVALUATOR SYSTEM

THE TRAFFIC EVALUATOR SYSTEM

Introduction

Design and development of the Traffic Evaluator System (TES) was begun by the Federal Highway Administration in 1969. It was intended to provide for large scale data collection which would describe the operating characteristics of traffic over an extensive segment of roadway. Bio-Technology, Inc. has been using the system since August 1971 and has further developed it into an efficient operating system. The TES is now a rugged, portable, battery-operated system which records on magnetic tape time and positional data regarding the physical characteristics of traffic. The TES consists of three primary component groups: (1) an array of vehicle sensors and connector cables, (2) a digital tape recorder and electronics unit, and (3) a set of computer programs which translate the data recorded in the field into precise descriptions of driver-vehicle behavior.

The sections which follow will discuss each of these component groups. While it cannot be stated that the techniques described are the only ones available nor that they are the optimum procedures, the information presented is the result of extensive research and testing and is believed to represent the state-of-the-art as of this writing. Where problem areas exist, advances in available materials may yield more appropriate equipment.

To understand the sections which follow, it is first necessary to know what the equipment is intended to do. In general, the TES provides a method for automatic collection of data on moving vehicles, permitting the physical characteristics of traffic to be faithfully reproduced by computer processing. The behavior and interactions of all traffic passing through the instrumented segment of highway during the period of data collection may be studied in accurate detail. The hardware and software as developed or refined under this contract represent one of the most powerful tools for traffic analysis ever developed. This user's guide is intended to present complete information to allow the behavioral scientist to intelligently and properly use and maintain this equipment.

Description

The TES comprises a Precision Instruments Corporation 7-channel incremental digital tape recorder and Raytheon Computer logic modules. Power requirements are 12 and 6 volt car batteries and 12 and 6 volt dry cells. After initialization, the entire unit is self-operating.

This equipment serves to record data taken from vehicle wheel sensors and human observers in such a manner as to reproduce electronically the track of all vehicles on multilane highway, and the interactions of vehicles within the instrumented section.

Basically, when a switch is closed by a vehicle passing over a detector placed on the surface of the road, an input data recognition circuit encodes the signal through a six-bit binary diode matrix according to the switch number. A timing sequence is initiated whereby the switch code along with the time of the initial switch closure is loaded into the first stage of a 6-stage storage register. This register is provided so that data are not lost if they occur faster than the rate at which the tape recorder can record them. In the 6-stage memory, data are shifted in turn through to the last register at which time a step warning command is issued to the recorder. Passive until this command is received, the recorder comes to full power and receives the 18 bit time and switch code in three six-bit bytes. The sequence is the high order time code, low order time code, and switch code. A seventh bit for each byte is developed as a parity bit by the tape recorder circuitry.

The time code is developed by an internal clock which operates at one megahertz. This rate is divided to produce a time bit which increments every half millisecond. The 12 bit time register cycles every 2.016 seconds. At the end of each time cycle a code at time zero is recorded permitting the software to keep syncronized with actual elapsed time.

Supporting Materials and Equipment

The purpose of this section is to describe the materials used in connection with the Traffic Evaluator System. The next section will discuss applications. In general, the object is to place sensors on the surface of a highway to detect the presence of vehicles, and to transmit this information to the recorder.

Vehicle Sensors

Requirements. The TES is intended to be used as a short-term measurement system. One of the primary advantages to the system is portability. Thus the vehicle sensors must yield reliable and high precision time measurements (5×10^{-4} sec) of vehicle passage. The TES develops vehicle data depending on individual axles, therefore the sensors must be responsive to all axles of vehicles. The sensors must be easy to install without modification of the highway, and must be easy to remove.

Options. There are two primary methods of detecting the presence of an axle (wheel) in wide use in traffic research. They are the pnumatic tube and the ribbon switch. Pnumatic tubes are low in cost and are rugged. Their re-use factor may be high but in warm humid weather they may be expected to fail after sensing about 25,000 vehicles. When used over more than three lanes they may move several inches when crossed near the mid-point. The sensitivity depends upon the equipment used to translate air pressure changes to electrical signals. This equipment may be expensive when detection of small, slow vehicles at extreme distances is required. The TES is lane-dependent, therefore a system of decoding must be used to determine the lateral position of a vehicle. This requires multiple tubes for each detection point. To avoid damage to the road surface, the tubes must be attached and stretched between points on the shoulder, not always possible in soft-shoulder areas. Further discussions of road tube applications may be found in DOT HS-800 408, Development of Violation Sampling and Recording Techniques, Kelly Scientific Corp., August 1970.

The preferred device is the ribbon switch. The devices used with the TES are products of Tapeswitch Corporation of America, Farmingdale, New York. A ribbon switch is a normally open momentary contact switch constructed as a long, thin pair of metal contacts separated by a linear insulator. When pressure is applied to the surface of the switch, the conductors are pressed together and an electrical circuit is completed (see Figure A-1). Several models are available; those which produced the best results are described below. The opinions expressed and experiences related are those of Bio-Technology, Inc.

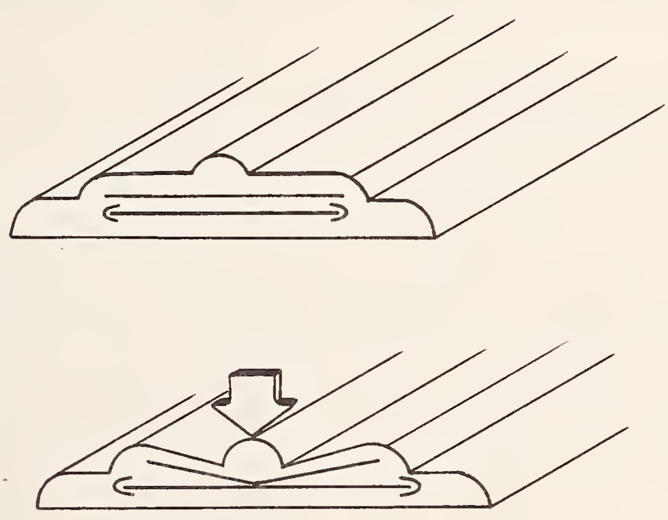


Figure A–1. Operation of Ribbon Switches

Description of Vehicle Sensors Used

Model 131-AMT. This model is the lightest of all the products useful for vehicle detection. It is light grey, approximately 3/4-inch wide by 3/16-inch thick. It requires 40 ounces of pressure to operate.

Model RB. This model is designed for vehicle measures. It is 1-3/4 inches wide by 3/8-inch thick, grey, and requires about 20 pounds of pressure to operate.

Model RBS. This model consists of a type 171-IS tapeswitch enclosed in a neoprene sheath. The package is 2 inches wide by 7/16-inch thick, charcoal grey, and requires over 20 pounds of pressure to activate. This is the heaviest of the products evaluated (17 ounces per foot).

Model 171-IS. This is the switch used in the RBS assembly. It is similar in size and operation to the model 131-AMT but contained in a black plastic jacket designed to be inserted and anchored in the larger sleeve.

The various models described above have all been used under many different situations. Our experience has been that the Model 171-IS is the most appropriate switch for traffic research with the TES. The Model 131-AMT has the advantage of lower cost. It is not designed for highway use and is not as rugged as the 171-IS. It is very sensitive to water, and frequently will become shorted due to internal moisture even when exposed to morning dew. The extruded jacket is not resistant to abrasion and may develop pinholes after exposure to a few hundred cars.

Model RB switches are heavy duty tapeswitch sensors. They have produced reliable data on interstate highway for several weeks under the additional stress of being installed and removed at several sites. The expected useful life is in the order of 50,000 vehicles. There are two major disadvantages to this switch; the high profile results in a report audible to the driver of the subject vehicle when struck at speeds over 20 mph, and the switch material becomes too hard for reliable sensing at temperatures below 50° F. The sound made by this switch is similar to that made by a pnumatic tube. When the switches are deployed in arrays and camouflaged, a number of the motorists will stop and examine their tires to see if a flat has occurred, causing anomalistic behavior to be recorded. The initial cost, while higher than other types, may be reduced considerably by reuse after being rebuilt by Tapeswitch Corporation.

The model RBS switch was not useful for collection of covert data due to its large physical dimensions.

The model 171-IS, intended to be used as the sensor element in the RBS assembly, is the best product for vehicle detection under all conditions when used without the outer sheath. This model has a useful life similar to the RB, but a low profile which yields quiet operation. This switch is comparably low in cost.

A modification referred to as the Model 170-IS was designated for use by Bio-Technology, Inc. This designator refers to the ribbon switch with attached waterproof leadwire cut to specified length and terminated in spade lug connectors. These were purchased in six and ten foot switch lengths with an assortment of 20,30,40, and 50 foot leadwires to allow for various placements.

All tapeswitches have in common two major problems. First, the switches must be placed perpendicularly to the flow of traffic, or short life will result. The failure mode consists of the metal contact strips being forced out the end of the plastic covering. Second, the end of the switch with leadwires attached is highly vulnerable to damage and should be placed where minimum probability of being run over occurs. The failure mode is separation of the leadwire strands due to metal fatigue at the point where the wire stiffens due to solder from the switch-leadwire junction. Individual strands of leadwire may connect together across the end of the switch before complete failure occurs, causing a shorted condition followed by an open circuit several vehicles later. A manufacturing change to spot welding rather than soldering leadwires might considerably reduce failure when used as described in this report.

Due to the geometry of the highway segment under study, neither of the above precautions may be feasible. A multi-lane curved section will invariably result in both failure types. Fortunately, placement of the lead-wire connection on the lane divider line and use of a shorter (six foot) switch where possible will give data on several thousand vehicles before replacement is required.

Attachment of Sensors to the Highway

Requirements. To achieve mobility, minimize interference with traffic, and not cause damage to the highway, the sensors must be mounted on the surface of the road under study. Since placement of the switches is critical and determines the accuracy of measures, the attachment method must insure their immobility. Finally, the removal of sensors must be easy and should not leave any residue on the highway.

Options. The above requirements are satisfied by several types of adhesives. At one location (inside a tunnel) the switches were imbedded in hot tar strips due to the oily, wet conditions which prevailed. In another situation, the switches were placed in a thin layer of epoxy resin and allowed to cure before traffic was routed back over the test section. These techniques both have the serious disadvantages of requiring long times for installation and removal, and both leave material on the highway.

The most frequently used and by far most satisfactory method of attachment is with adhesive tape. When tape is used, a second set of requirements is developed. (1) The switch must adhere to the road surface in all weather (2) The tape must not be destroyed by the combination of wet abrasive action of vehicle tires, and (3) The tape must blend in with the color of the highway to permit unobtrusive measures. No adhesive has been identified which will adhere to a wet highway surface. All deployments therefore are made, by necessity, in dry weather. No adhesive has been found which will adhere to a highway at low temperatures. All winter applications were made using a propane torch to temporarily heat a strip of the road to about 120° F before placing the tape in position. This technique was found to be highly successful. The same technique was tried to dry a damp road surface, but the energy required to drive water from the microscopic cracks in asphalt was too great. The capillary action of water moving beneath the adhesive mass also was instrumental in the failure of the adhesion.

Description of Adhesives Used

Three types of tape were found to be useful for attachment of tapeswitches to the highway. Some twenty different tapes of many manufacturers were evaluated in field tests, but none were superior for this application.

Two layers of adhesive were used to secure the tapeswitches and leadwires to the highway, an underlayer and a cover. The underlayer used was Type P-50 double faced cloth tape made by the Permacel Division of Johnson & Johnson. This white tape was purchased in 2 inch widths on 25 yard rolls. The 10 mil adhesive mass on both faces effectively grips the asphalt or concrete surface and prevents movement of the tapeswitch. To secure the leadwires and camouflage the switches, a cover of Permacel P-676 tape in 6 inch width was used across the entire roadway. P-676 is a single faced vinyl impregnated waterproof duct tape. This tape is manufactured differently than others tested in that the coating (which provides color and waterproof qualities) is heat-sealed under high temperature and pressure, melting the vinyl into the cloth base. All other tapes delaminated under wet, abrasive conditions. This particular tape is available in many colors. However, all colors except silver leave the adhesive mass on the highway when the tape is removed. For this reason, silver was selected for the diagrammatic signing research. The color was acceptable with regard to blending with the surface of the road. On other projects olive drab color was used, and the strips went virtually unnoticed by the driver-public. Under relatively low volume conditions the adhesive did not adhere so well to the road that an objectionable amount was left behind.

As was stated above, all deployments were conducted in dry weather. Our experience with P-676 adhesive shows that the tape will not be affected by rain if provided at least twelve hours to cure before rain begins. Conversely, the entire array of tape and vehicle sensors will be destroyed if rain begins shortly after deployment.

Deployment of the Data Collection System

The Traffic Evaluator System has been used under several contracts in a variety of ways. The techniques described below are those which yielded the best results under general conditions. Specific applications may require modifications. "Deployment" is the entire process of installing the hardware on the highway. "Operation" refers to the necessary attention to establish and maintain operation. "Undeployment" refers to the removal of material from the site.

Preparation for Deployment

1. Selection of Roadway Segment to be Instrumented. This procedure is discussed in the main text. It is an integral part of the experimental design and includes determination of the trap separation distances, number of pairs to be used in each lane, and the physical reference point from which all measures will be made. Since the TES is a powerful tool for a before-after type study, permanent reference points should be selected.

2. Notification of Appropriate Authorities. The installation and operation of the TES usually requires the services of police to direct traffic during the deployment and undeployment phases. In addition to that support, it will frequently be necessary to advise state and local authorities of the nature and duration of the study. When operations within a municipality are contemplated, it is advisable to inform the local police even though a Federal, State, or County road is to be studied.

3. Preliminary Measures. The segment of road to be instrumented is measured to an accuracy of 0.5% or better, and the upstream point for each trap is marked using permanent day-glow paint on both edges of the road. For trap separations in the order of 300 feet, a measuring wheel is adequate. The road must be marked on both sides to insure accurate placement of the switches perpendicular to the flow of traffic. When instrumenting a curved section, the trap separation measure should be made to the mid-point of the lanes(s) to be instrumented (by interpolation). If the road segment has a high degree of curvature, trap separation may have

to be reduced below 100 feet or increased above 300 feet to maintain separation of the switches on the inside lane within 0.5% of those in the outside lane. All measures are along the path of the vehicles to be studied. The distances from the leadwire end of each switch to the place where the leadwire will interconnect with cables to the electronics unit is measured to determine the minimum required leadwire lengths. Finally, the length of cable required from each switch pair termination to the site selected for the electronics unit is measured for each set of traps. Figure A-2 illustrates a sample deployment plan.

4. Switch Preparation. Tapeswitches with appropriate leadwire lengths are selected and the terminal end of the leadwire is tagged with the length of the leadwire. Also, a mark is made on the upper surface of the nonleadwire end of the switch indicating the lead length. Double faced tape is applied to the lower surface of the switch, using a roller to insure a good seal. The protective paper should not be removed from the external tape surface until the switch is placed on the road. After tape is applied,the switches must not be rolled or bent or the adhesive will separate from the switch. For best results, tape should be applied in a warm room at least eight hours before deployment.

5. Cable Preparation. From the table of required cable lengths, an appropriate number of cables should be selected and tags applied to both ends indicating to which group the cable is to be connected.

6. Cable Installation. Because of the difficulty of maneuvering through the area near highways and the need to use available camouflage, cables and their terminating boxes are installed in daylight, usually the afternoon before deployment of the switches. The primary difficulty which will be encountered is the tendency of the soft brass cable connectors to deform if allowed to strike the road, and the care that is required to keep them clean. Before deployment, plastic bags are taped over the ends of the cables to exclude water and dirt. These are not removed until the connector is ready to be inserted in the appropriate receptical. Cables are supplied with the TES in several lengths. Most are 330 feet, but several are around 100 feet. (These were severed by vehicles and connectors were applied to the new ends.) They may be connected together like household extension cords to construct the required cable run.

   The end of the cable with the female connector is routed from the appropriate road switch termination point to the recorder location. The latter is generally located at a camouflage

CABLE LENGTHS

FROM TES TO TRAP:	LENGTH
1	500′
2	200′
3	100′
4	400′
5	700′
6	1000′

LEADWIRE LENGTHS

SWITCHES	TRAP	LENGTH
A,B	All	20′
C,D	1-3	20′
C,D	4-6	40′
E,F	1-3	40′
E,F	406	60′

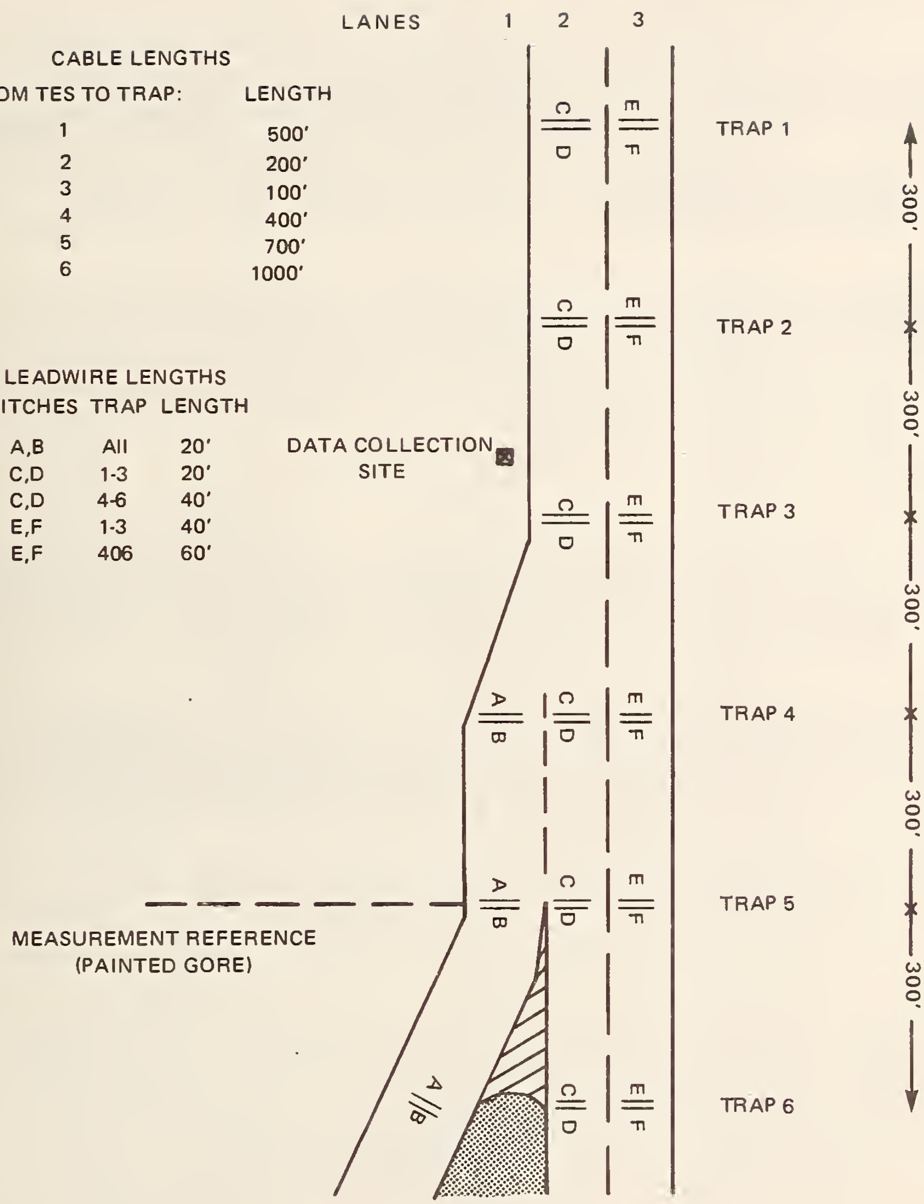


Figure A–2. Minimum information required for a Deployment Plan.

point with good drainage in case of rain. Excess cable should be coiled at the recorder location.

The female end of the cable is connected to one of the terminal strip boxes supplied with the system. Leave the box near the appropriate point to be connected to the switch leadwires after deployment. It is necessary to select a hidden place or pile grass, etc. over the box to reduce vandalism.

7. Miscellaneous Equipment. The list shown in Table A-1 is representative of materials required in the deployment phase.

8. Loading. The vehicle used to proceed to the deployment site is loaded with equipment in reverse order to the anticipated need. Since most deployments are actually done between midnight and six a.m. (to minimize hazard and interference with traffic) the loading step is important.

Traffic Control

A four man deployment crew is recommended. The discussion which follows assumes a three lane interstate highway deployment at night with police support for traffic control. Switches are to be applied as shown in Figure A-3, in pairs across all three lanes.

The traffic volume at this site during the hours of deployment is assumed to be under 500 vehicles per hour. For safety reasons, and to avoid antagonizing the motoring public, a total queue of 30 vehicles per lane is the maximum which should be tolerated. A reasonably well rehearsed crew can deploy a strip of three switches in five to eight minutes on warm surfaces. The police are therefore requested to completely stop all traffic for the time required to deploy one strip of three switches. Traffic is then allowed to proceed until the crew is ready to deploy another strip.

On occasion the police would not agree to stop all traffic, but attempted to route vehicles along the shoulder or other available route during deployment. This rerouting involved the use of a great many traffic cones and the attendent time required to set them out. After the first two strips were applied the crew moved to the next deployment point, 300 feet down-stream, which required replacement of all traffic control devices. This operation required four police officers, ten personnel from the state highway department, and six vehicles. The results were unsatisfactory from a safety consideration since several drivers refused to proceed along the shoulder, and one drove over a box of equipment narrowly missing one of the deployment crew members. Stopping all traffic, on the other hand, required only two

TABLE A-1

Typical Materials Required for Deployment

PRIMARY MATERIALS

1. Prepared Switches
2. Prepared Cable
3. Cover Tape
4. Terminal Boxes

TOOL KIT

1. Measuring Tape
2. Screwdrivers
3. Chalklines
4. Extra Chalk and String
5. Torch and Solder
6. Label Tags
7. Bags for Cable Ends
8. Kiel
9. Roll Double Faced Tape
10. Masking Tape
11. Electrical Tape
12. Leadwire Extensions
13. Lantern Mantles and Fuel
14. Torch Striker
15. Wooden Matches
16. Magic Marker
17. Spare Cables
18. Spare Switches
19. Extra Cover Tape
20. Brooms
21. Four Foot Rods
22, Coleman Lanterns
23. Emergency Beacon
24. C.B. Radios
25. Extra Terminal Boxes
26. Measuring Wheel
27. Flares
28. Medical Kit
29 Continuity Tester
30. Flashlights and Batteries

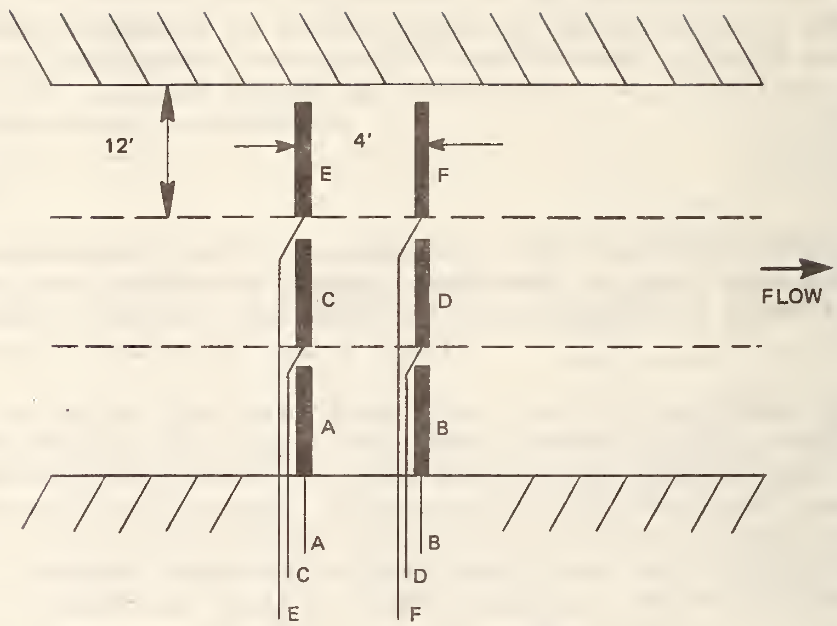


Figure A–3. Typical Placement of Six Ten-Foot Tapeswitches police officers with an adequate supply of flares and their cars with the flashing beacons illuminated. Generally it was most convenient to stop traffic at the same point for the deployment of the entire 1500 foot array. As the deployment crew gets farther from the police crew, reliable communications becomes more important and the lag between the time police stop vehicles and the time the last car has passed the deployment point is increased. Because of frequency incompatability, it was found effective to provide a citizen's band radio set for both the police crew and the deployment crew rather than to request a third officer to stay at the deployment site to provide communications.

Procedure for Deployment

1. One man acts as the deployment coordinator. His primary task is to insure a safe and accurate deployment. It must be understood by both the deployment crew and the police that he alone will request the police to stop and release traffic. He must be alert to the possibility that a vehicle may not stay behind the vehicle stop point. When this occurs, a command to clear the road should result in all personnel going to the nearest shoulder immediately, leaving equipment behind.

2. When ready, the coordinator requests the police to stop traffic.

3. When the road is clear, the chalk line is snapped across the entire road between the marks previously painted on the edge of the road. Using two four foot rods at each edge and a third in the center, a second line is snapped exactly four feet downstream from the first line. Sweeping and traffic will not degrade the lines.

4. a) Man (1) rewinds chalk line
   b) Man (2) sweeps the upstream line area
   c) Man (3) places three switches near the installation point behind the sweeper. He must insure that the lead lengths are distributed correctly.

5. a) Man (1) and (2) hold switches up while man (3) removes the paper backing from the double faced tape.

   b) Man (3) dresses the leadwire to the shoulder while (1) and (2) position the switch along the downstream side of the chalk line.

6. Step 5 is repeated for the other two switches.

7. While the last switch is being positioned, man (1) proceeds to the first switch with a roll of cover tape.

8. Man (1) presses the tape over the switches while man (2) backs across the road unrolling the tape. Man (3) maintains the leadwires neatly on the downstream side of the switches. If the leadwires are placed upstream, the switches will not be activated

reliably due to wheel bounce. It is not necessary to press the cover tape down carefully since the traffic will do that step nicely. However, any exposed adhesive will adhere to the wheels of passing cars and cause the entire strip to come up. If the tape becomes tangled, do not attempt to unsnarl it, but tear off the damaged section, overlap the positioned strip at least 6 inches, and continue.

9. When all personnel and equipment are clear of the highway, the coordinator requests the police to release the traffic.

10. Switches are prepared along the shoulder, and when ready, Steps 2 through 9 are repeated at the downstream line four feet from the first strip just installed.

11. At this point three pairs of leadwires extend from the end of each of the two strips of cover tape. They are marked, for example, 10,20, and 30 (referring to the length of the leads). These will be connected to terminal strips and then to cables which lead to the site of the electronics unit. To minimize the time when police support is required, however, it is best to complete the installation of the remaining switches in the array before doing work along the shoulder such as leadwire connection.

12. When the deployment has been completed, connections between the switch and the cable terminal boxes are made. The leadwires extending from each strip of three switches should be labeled according to the lead length. Thus the longest will correspond to switches E and F of Figure A-3, etc. For this example, the upstream longest lead is connected to the pair of screws in the terminal box marked "E". See Figure A-4. The rest of the leads are connected as above. The orientation of the switch leads is immaterial. Later discussions of the input wiring of the electronics unit will allow the experimenter to select the most appropriate terminals for the switches and to avoid duplication.

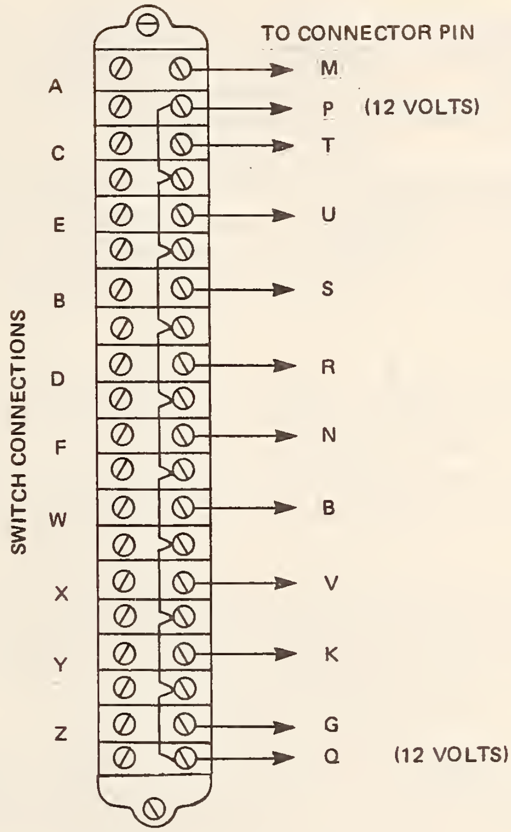


Figure A–4. Interface Connections at Terminal Boxes

Input Arrangement

Introduction. To select appropriate inputs for the system's switches, it is necessary to understand something of how the signals from switches are recorded. The discussion which follows is the minimum information needed to properly use the system.

Code Conversion. The user of the system can directly address 60 different inputs. Each of these is recognized by the TES as a discrete switch, either open or closed. It does not matter how a switch is activated, whether by a vehicle tire (ribbon switch), human observer (pushbutton), photocell (relay), etc.

For convenience, these 60 inputs are available at nine input connectors containing 10 inputs each. (Therefore, 30 inputs appear twice) Table A-2 lists the inputs available at each of the nine connectors. The letters in the table refer to the pin designations molded on the connectors in the back of the electronics unit (see Figure A-6, page A-23).

The use of the inputs is determined by the experimental designer, and is primarily dictated by efficient use of cables. To process the data it is necessary to know the code assigned to each switch being monitored by the TES. Inputs used for other than vehicle tracking are treated differently by the computer program that processes the data.

Terminal Boxes. So that the terminal boxes are not required to be used at specific locations in the array of roadswitches, the inputs are designed A,B,C,D,E,F,W,X,Y,Z to match the ten codes available at each input. See Table A-2. The arrangement is actually A,C,E,B,D,F,W,X,Y,Z for ease of connection to leadwires as they come off the road (see Figure A-4). Thus, two switches connected to contacts A and B in a terminal box plugged into connector RS1 on the electronics unit would use codes 1 and 2, respectively. If it were plugged into connector MC1, the same switches would activate codes 37 and 38.

Manual Coding

Code Boxes. Figure A-5 shows a typical code box supplied with the TES. To avoid accidental duplication of codes, only buttons one through eight of the pushbuttons are internally connected to the cable. These boxes are normally connected to one of the "MC" inputs (for Manual Code), but may be used with any of the nine inputs. When a button is pressed, the appropriate code is written on the magnetic tape.

Table A-2

Switch Codes Available at Each of the Nine Evaluator Input Connections

CONNECTOR PIN	R - S GROUP						M-C GROUP			TERMINAL BOX LABEL
	1	2	3	4	5	6	1	2	3	
M	01	07	13	19	25	31	37	45	53	A
S	02	08	14	20	26	32	38	46	54	B
T	03	09	15	21	27	33	39	47	55	C
R	04	10	16	22	28	34	40	48	56	D
U	05	11	17	23	29	35	41	49	57	E
N	06	12	18	24	30	36	42	50	58	F
B	37	39	41	43	45	47	43	51	59	W
V	38	40	42	44	46	48	44	52	60	X
K	49	51	53	55	57	59	1	3	5	Y
G	50	52	54	56	58	60	2	4	6	Z
P	-----12 Volts----------------------									
Q	----12 Volts-----------------------									

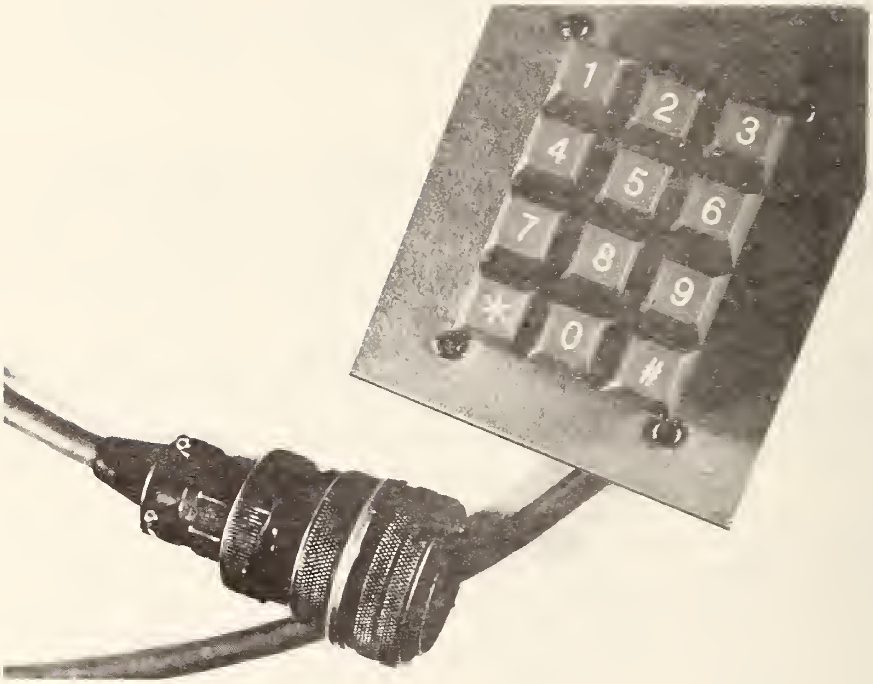


Figure A–5. Manual Code Pushbutton Box

Other Arrangements. In some cases such as arrays which require a large number of road switches it may not be convenient to use the code boxes as designed. For example, it may be necessary to code dichotomous events by three observers. Three two-button boxes may be built and connected to a terminal box and then to the electronics unit.

Automatic Coding.

Some data collection plans require notation of periodic events such as the yellow phase of a traffic signal. If connection to the primary device controller is possible, a relay contact may be wired directly to one of the spare inputs at a terminal box. Whenever the relay closes, the appropriate code will be written on the TES magnetic tape.

Retrieval of Information

General Data Arrangement. The electronics unit/recorder system writes four kinds of data on the magnetic tape:

1. File Marks
2. Record Gaps
3. Time Groups
4. Switch Codes

File marks are written whenever the operator presses the "File" button on the front panel. These are used to define sections of tape containing useful data. Accurate time logs must be maintained to process the data. For example, a data collection log might appear as shown in Table A-3 (See also Figure A-2, page A-9).

Record gaps are automatically written on the tape to permit the tape to be read by the computer program which will analyze the data.

Time groups and switch codes are always written together. That is, the appearance of a switch code is mated with the time that code appeared, and the two groups are recorded. A very accurate clock within the equipment runs up to 2.0160 seconds, and resets. The reset event is seen by the system as another switch input, and time (0000) and the switch code assigned to the clock (00) are recorded. This gives a record on the tape of relative time since device activation. The processing program begins with the time of day the system was started and adds 2.016 seconds every time a clock reset is recorded.

Road Switch Codes. Activation of any input line causes the clock to be read and recorded with the code for that line. Thus a two axle vehicle crossing road switches 7 and 8 might produce a record:

Table A-3

Example of Data Collection Log

Tape Contents

File Mark
0903 Begin Data
1152 File Mark
(Accident on Road)
1241 Begin Data
1934 End Data
File Mark

Road Codes Used

	Trap Number					
	1	2	3	4	5	6
Lane 1				19,20	25,26	31,32
Lane 2	3,4	9,10	15,16	21,22	27,28	33,34
Lane 3	5,6	11,12	17,18	23,24	29,30	35,36

Manual Coding

(Into Trap 3)

Lane 1 None
Lane 2 37 through 44
Lane 3 45 through 52

Other Events

Codes 54 and 57

Time	Code	
1200.0	7	
1247.0	8	(Front Axle)
1320.0	7	
1367.5	8	(Rear Axle)

This record describes a vehicle as follows: (switches 7 and 8 are exactly four feet apart).

1. The front axle required (1247.0 - 1200.0) or 47.0 milliseconds to go four feet. Its speed may be calculated as 58.027 miles per hour.

2. The rear axle required (1367.5 - 1320.0) or 47.5 milliseconds to go four feet. Its speed is therefore 57.416 miles per hour.

3. The average axle speed is 57.722 m.p.h.

4. The time between the front and rear axles hitting switch 7 is (1320.0 - 1200.0) or 120 milliseconds. These axles required 1367.5 - 1247.0) or 120.5 milliseconds to cross switch 8.

5. The average calculated wheelbase is therefore 10.180 feet.

Vehicle-Related Manual Codes. A feature of the software permits the user to assign codes to be associated with the record of specific vehicles. To do this it is necessary that the codes be inserted into the data at a point the logic of the program can recognize. The rules for vehicle related coding must be followed exactly.

One of the traps, or sets of switches across the road, is selected for coding. The human observer must depress the appropriate code button at a time when the vehicle to receive the code will be the next vehicle to hit the upstream switch of the pair being coded into. For example, Table A-3 indicates that manual code 37 (which could mean one occupant was in the vehicle, for example) is used to code vehicles into trap 3, lane 2. The "Road codes used" list of the same table shows that the upstream switch at trap 3 in lane 2 was number 15. When the software detects a code 37, it is held in memory until a hit is recognized on switch 15. The manual code is then assigned to the vehicle which hit the selected road switch. Up to seven codes may be associated with each vehicle. Only one trap may be selected for coding, and it must be the same for all instrumented lanes.

Other codes. Coding not related to vehicles as discussed above may be used, but there is no provision for assigning these codes to vehicles. An auxillary program may be written to search the edited data and print the time of day each of these codes occurred. The software as supplied only provides counts for each of these codes.

Using the Data Collection System

Cable Connection. During the deployment phase cables were run from each set of road switches to the recorder site. The trap number should be tagged to each end of each cable. On the back of the recorder/ electronics unit are nine female connectors (See Figure A-6). Six are labeled "RS1" to "RS6". The cables are connected to the appropriate RS (Road Switch) input. Manual code cables are connected to appropriate "MC" inputs.

Power Connection. A single cable is used to provide power connection. The battery box supplied with the system has four different power supplies, all connected to an eight pin power connector. The power requirements are:

1. Twelve volt wet cell for the tape recorder.
2. Six volt wet cell for the electronics unit.
3. Six volt dry cell for bias in the electronics unit.
4. Twelve volt dry cell for switch operation.

The dry cells should be replaced every six months. The wet cells (automobile batteries) will operate the system for one to four days depending on the traffic volume, but should be recharged every day. The six volt wet cell delivers a steady four amperes to the unit. The twelve volt cell is used only when the recorder is actually writing data (the recorder is turned off automatically between switch inputs). It may be expected to provide reliable power for about 600,000 switch closures.

Power Supply Checks. Refer to Figure A-7. With the power cord connected and the tape recorder properly threaded, press the main power switch. Using the meter select switch, read the condition of the 12 volt recorder battery, the six volt electronics battery, and the six volt dry cell bias battery. These should indicate as shown in Table A-4. Select one of the two meter-off positions after this check.

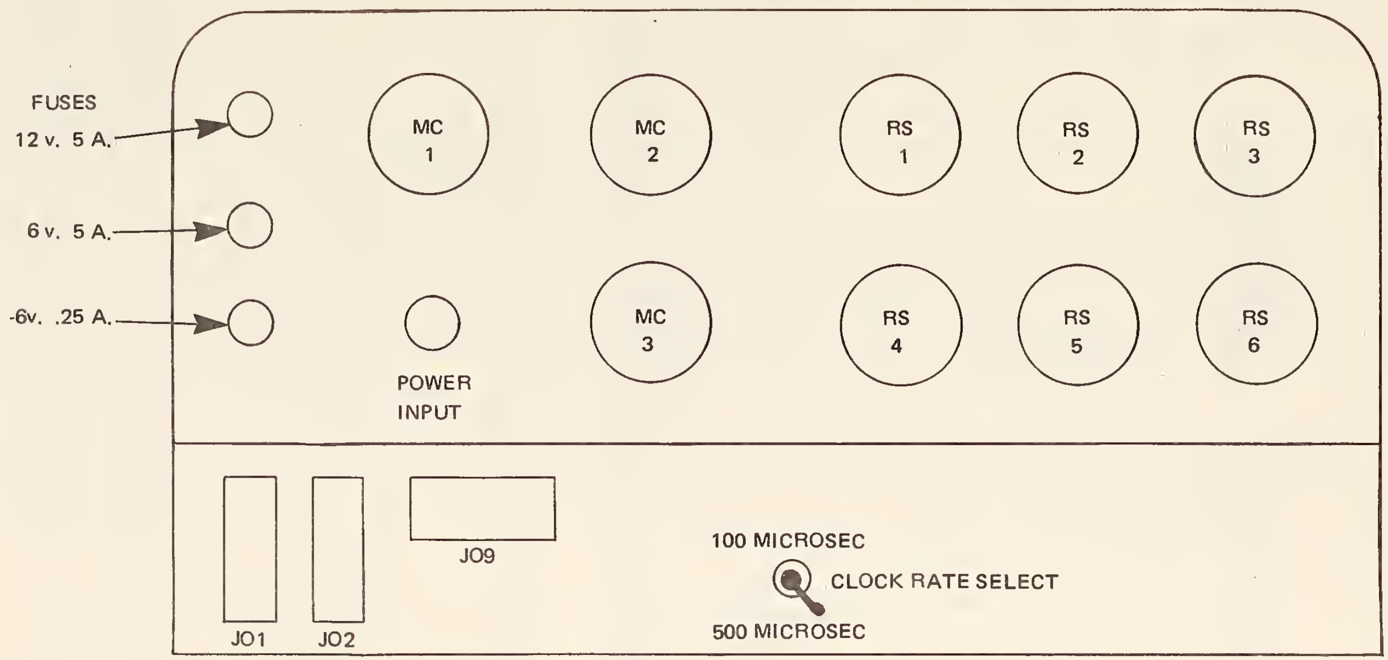


Figure A–6. Back Panel Layout

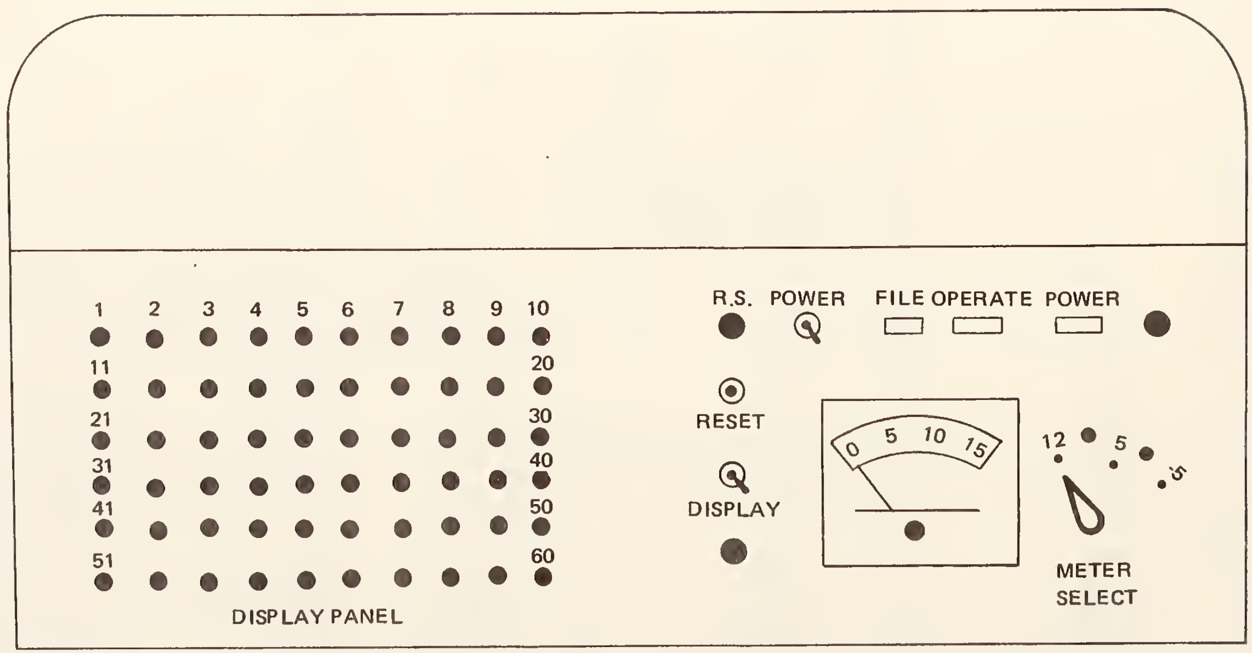


Figure A–7. Front Panel Layout

Table A-4

Expected Voltage Readings

Battery	Switch Position	Meter Reading
12 v. Recorder	+12	11.5 - 13
6 v. Power	+5	4.8 - 5.3
6 v. Bias	-5	4.8 - 5.3

NOTE: The 12v Roadswitch Battery is not metered or fused.

Use of the Display Panel. With the main power and R.S. power switches on, turn on the display and press the reset button. As vehicles cross each of the road switches, the lamp corresponding to that switch will light and remain lighted until the display is reset. Select the lamp pair corresponding to two switches which can be seen. Reset the display and watch these lamps when a vehicle is about to cross the switches. You should be able to verify in this manner that all inputs are properly connected and that all systems are operating properly.

The display unit consumes considerable power even though solid state lamps (light emitting diodes) are used instead of ordinary bulbs. The display should be turned off when not in use.

Starting Data Collection. When the proper connection of switches has been established, verify that the magnetic tape is positioned at the reflective strip and press the "File" button. When ready to begin collecting data, note the exact time and press the "Operate" button. Listen for the sound of the recorder writing data to insure final correct operation. The system will operate unattended until turned off.

Ending Data Collection. Another file mark must be recorded at the end of data. The power is then turned off, cables removed and protected with plastic bags, and the system is ready to be removed. Before the data tape can be processed it must be rewound. This can be done by hand or by reversing the tape reels and running the recorder in the fast forward mode. Damage will result from turning the recorder tape hubs by hand. Whenever the recorder is not in use, the fast forward lever should be opened to prevent a groove being pressed into the capstan wheel.

Undeployment

The process of removing switches from the road is essentially the reverse of the deployment. Police support will be required for safety if the traffic volume is high. Leadwires should be disconnected from the terminal boxes before the switches are moved. To remove the switches without destroying them, the following procedure has been found effective.

1. Carefully lift and remove the strip of cover tape while keeping the switches in contact with the road. The tape is extremely difficult to separate if it becomes stuck to itself.

2. The switches are lifted from the road, leaving the double faced tape behind. They may then be coiled loosely, being careful to avoid sharp bends.

3. Finally, the double faced tape is removed and all tape is discarded.

Care should be exercised when picking up the cables to avoid damage to the connectors. They should be covered with plastic bags as soon as they are disconnected.

Troubleshooting the Traffic Evaluator System

Little can be done in the field to repair certain kinds of malfunctions. Those problems which most frequently occur are tabulated. If the problem is in a roadswitch, replacement is the only solution. This ais a difficult task under multilane installations, however, since the switches and leadwires are installed as a unit across all instrumented lanes. It is also difficult to measure accurately the required four foot separation after the cover tape is applied. Two features of the software should influence the decision to replace faulty switches. If the failed switch is not in the first trap, the wheelbase of the subject vehicle will have been calculated by the time the vehicle reaches the trap containing a faulty switch. If one of the two switches operates normally, the program will determine the times that the missing switch would have been hit using the calculated wheelbase measures of the oldest vehicles in all lanes reconstructed at the previous trap. Then, with several candidates, it proceeds with the normal vehicle tracking logic until the best fit is obtained.

The second feature provides for vehicle tracking across a detector pair which is completely inoperative; for example, a vehicle may be tracked at traps 1,2,4,5,6, even if trap 3 is missing completely. Finally, if one of two switches is missing in the first trap, the software assumes a wheelbase of 9.2 feet, calculates the missing switch times, and then proceeds to try to connect this vehicle with another's appearance at trap 2. Candidates which appear likely are identified and their measured wheelbase is substituted for the assumed 9.7 feet until the best match is found. These rather complicated subroutines have been tested at length by processing data known to be good, and then reprocessing the same data with code 99 substituted for the actual code of switches in various locations in the array. Virtually the same results were computed when as many as 12 switches were missing from a 36 switch array.

Most of the problems with the system will be identified by listening to the sound made by the recorder. Others will be detected by observation of the display panel. Subtle failures in the electronic system are either detected by a technician making a thorough inspection, or by the failure of the software to construct vehicles from the data tapes collected.

Since the sound of the data being recorded contributes much to the detection of problems, the user is urged to become familiar with the four basic sounds. They are:

1. With no input to the system. The recorder will write a clock reset code every 2.016 seconds. Actually, three words of data are being written. With experience you can hear a particular type of fault where only two of the three words are written.

2. With road switches connected and a fairly high volume of traffic.

3. When the File Mark is being written.

4. When the recorder is writing continuous data. This is an abnormal condition. It may be compared with 3 above by removing card 12B from the electronics unit. The sound is slightly lower in pitch than when a file mark is written.

Field Repairs

Equipment Required

1. Slotted head screwdriver
2. Pocket multi-meter to measure voltage and continuity
3. A five foot wire with large clips on each end

Problem

Recorder is heard writing clock resets 5 times as often as it should.

Solution

A switch located in the center of the back of the electronics unit selects a clock rate of 100 or 500 microseconds. Position it for 500 microseconds.

Problem

Recorder is heard writing clock resets at a variable rate.

Solution

The wet cell batteries need to be recharged.

Problem

Recorder does not write.

Solution

a) Tape is not properly threaded.

b) Twelve or 6 volt wet cell battery is not connected or requires recharging.

c) Fuse blown. (See Figure A-6, page A-23).

Problem

Recorder runs continuously.

Solution

a) If the "buzz" associated with writing data is not heard, the fast forward lever is open.

b) One or more of the logic cards in the electronics unit is loose in its socket.

c) Shop troubleshooting is required.

Problem

Unit operated properly but stopped.

Solution

a) Tape reel hub was not tightened and the end-of-tape lever has released.

b) See "Recorder does not write."

Problem

Record gaps are recorded at frequent intervals. (They sound like 3/4 second long file marks.)

Solution

a) The bias battery connections are loose, or the battery should be replaced, or the bias fuse has blown.

b) Shop troubleshooting is required.

Problem

Unit writes continuously as long as one input is closed.

Solution

This problem is usually found in the shop since it is difficult to hear except for manual code buttons. A capacitor is used to isolate the input from the electronics. Its function is to provide only one pulse for a switch closure no matter how long it remains closed. If this capacitor shorts, the code for that input is recorded repeatedly as long as the switch is closed. In the field, the best solution is to omit use of the faulty input.

Problem

The display does not light.

Solution

a) Display switch or R.S. power switch is off.

b) 6 Volt fuse blown

c) Road switch power is not applied. Inspect the battery connections or replace the battery. Measure the voltage between pin P of any input connector and the negative terminal of the 12 volt wet cell. If not 12 volts, a fault lies in the circuitry of the road switch battery.

d) Shop repair of display is required.

Problem

The display of an entire group of switches connected to a single cable does not light.

Solution

a) The cable is connected to the wrong input or not tightened properly.

b) One or more of the cable connections between the recorder and the terminal box is loose or cross-threaded.

c) The road switches are not connected to the terminal box.

d) Road switch power is not applied to the switches. To test for this condition:

1. Establish a ground return by connecting a five foot wire with clips on each end between the negative terminal of the 12 volt wet cell and the case of the recorder/electronics unit.

2. Using a multimeter, measure road switch voltage at the suspected terminal box between pins "P and "E" (all of the pins on the outside ring which are not connected, except "A", are grounded shields).

3. Remove the cliplead before resumption of data collection.

Problem

A lamp comes on for an unused input or for a used input without activation of that input.

Solution

Generally this is caused by inadvertent duplication of an input code. It is frequently difficult to trace. The most likely sources are:

a) A roadswitch is connected across two input lines instead of between an input line and the common 12 volt power line inside a terminal box.

b) If the problem is with input 1 through 6 or 37 through 60, the code may have been duplicated. These codes are available at two different connectors. See Table A-2.

c) Under certain conditions this may be caused by a shorted switch. Continue to the next solution.

Problem

One switch fails to light on the display when activated.

Solution

1. Note a switch in the same terminal box which operates normally.

2. At the terminal box remove the inoperative switch and verify continuity between the 12 volt power terminal of the good switch and that of the bad switch.

3. Using the continuity tester measure resistance across the suspected switch leads. A normally operating switch will cause a noticeable jump in the meter when a vehicle crosses it, while a failed switch will either be shorted or open. A switch may show 100 to 5,000 ohms if it contains water. Faulty switches should not be reconnected to the system.

Shop Troubleshooting Hints

There are a few problems which have developed several times. Changes in physical layout and the addition of diodes to the input circuit have generally omitted the majority of them. The most frequent failures are discussed below.

Problem

Recorder runs continuously due to a faulty input.

Solution

1. Remove clock card B-1.
2. With the recorder writing continuous data, read the octal value of the code being written at the memory output. See procedure, "Memory," page 35.
3. Refer to the table of octal codes, page 37, to identify the faulty input circuit.
4. The level converter for the faulty input will be high, generally due to a failed input transistor punctured by a large negative transient. Replace the protective diode as well as the level converter.
5. At times, there will be more than one failure. In this case, the memory readout is the OR combination of all the failed circuits. For example, 000101 could represent input 5, or inputs 1 and 4, or 5 and 1, etc.

Problem

Data appears to be valid but the software cannot reconstruct vehicles.

Solution

The most likely problem is a failed flip-flop in the memory or a bad gate in the output multiplexer. Verify with procedure "Multiplexer," page 36. Read each stage of memory in turn to find the register which is not able to change states, and replace.

Problem

The edit program which processes the data prints "multiple hits on code XX."

Solution

The program identifies and ignores hits of the same switch code that are less than 10 milliseconds apart. The one-shot multivibrator associated with the named code is supposed to be activated for about 30 milliseconds to prevent contact bounce from triggering the same input several times for one hit. The primary reason to repair this fault is to prevent the memory from being filled with spurious data. Re-time the one-shot using the potentiometer on the circuit card, or replace.

Problem

Edit program resynchronizes frequently when attempting to process the data.

Discussion

The Edit Program is used to separate the data recorded in the field into groups of 18-bit words representing a time and switch code group. This is not as simple as might appear since there are no separation codes recorded, only a continuous string of six-bit bytes. Under conditions of very heavy traffic, the memory may be full when a clock reset is signaled. The Edit program senses the missing reset and supplies it. Other times, only two of the three bytes are recorded. The program identifies this condition and omits the bad data. Altogether there are five types of resync messages produced by the Edit program. If these occur more than once or twice in a record, the following may solve the problem.

Solution

The timing of words sent to the recorder must be separated by at least 5 milliseconds since that is the maximum writing speed of the recorder. The STEP WARNING command must precede the first STEP command by at least 0.5 milliseconds. This timing is controlled by a Multivibrator at 36A28. The timing capacitors are mounted on the bottom of the wire-wrapped connector board.

Electronic Unit Inspection

Equipment Required

1. Screwdrivers
2. Soldering iron
3. Assortment of small insultated clipleads
4. Oscilloscope
5. Bounce free switch
6. Logic state probe
7. Voltmeter
8. Assorted replacement printed circuit boards
9. Miscellaneous resistors and capacitors
10. Several card extenders

Periodic Inspection

The following discussion will assume that a technician familiar with solid state logic circuitry will inspect the equipment. Normal procedure such as maintanence and repair of batteries, cables, etc. is not covered, nor is repair to the tape recorder itself.

The tape recorder technical manual for Model 1387 may be ordered from Precision Instrument Company, 3170 Porter Drive, Palo Alto, California.

The technician is assumed to have become familiar with the layout and operation of the TES.

Procedure

1. Slide the electronics unit out and remove the top panel. The connectors should not be removed.

2. Using rubber bands, support the recorder tape tensioning arms to operate position.

3. Apply power and verify the clock reset is being written every two seconds.

4. Remove the clock oscillator, card B-1.

Input Circuits

The following checks will verify operation of all input circuits from the input connectors to the diode matrix as well as the light display.

1. Connect a voltmeter to common at the negative terminal of the 6 volt wet cell, and verify +12 volts at Pins P and Q of all nine input connectors.

2. Connect a probe to the positive terminal of the road switch battery.

3. Turn on and reset the display.

4. Using a mirror or assistant, toggle each input from 1 to 60 with the probe, verify that the correct light comes on, and that the recorder writes only one word (three byes) of data for each input. The sequence of inputs is pins M,S,T,R,U,N,B,V,K,G on inputs RS-1 to RS-6, then MC-1 to MC-3. The display should be completely illuminated after RS-6. Reset and check the MC connectors. See also Table A-2.

Memory

The following checks will verify operation of the diode matrix and memory sections.

1. Put card 33B on an extender board. This card is the last stage of memory. The switch code appears on pins 26-20-18-8-5-4. We will write two codes to verify propagation and change of state, octal 07 and 70.

2. Toggle input "N" on "RS-1", Using a level detector, read 000111 on the above six pins. Toggle input "T" on connector "MC3". Read code 111000.

To observe propagation of both logic states through the 12 bits of memory used for the time code, it is necessary to induce both states into memory, toggle an input to propagate the induced code, and read the output results.

3. Remove cards 5B and 6B.

4. Following the table below, ground each of the input pins in turn and observe that the low thus entered is propagated to the output when the machine is toggled at any input.

INPUT PIN	OUTPUT PIN
23B-12	32B-18
-16	-8
22B-36	34B-31
-33	-32
-37	-26
-21	-20
-24	-18
- 9	- 8
-12	- 5
-16	- 4
21B-36	33B-31
-33	-32

5. Replace all cards. Verify clock resets are being recorded.

Record Counter

To test the counter chain which commands the recorder to write a record gap, a high frequency counter is needed. A completely adequate check may be performed using the internal counter, however.

1. With the recorder writing clock resets every 2.016 seconds, connect a jumper from 5B-7 to 37A-15. This may be easily done using test point 7 on card 5B and test point 4 on 37A.

2. The high frequency pulse chain thus fed into the record gap counter will cause the recorder to write a 3/4 second record gap after every four clock resets.

Multiplexer

The following will test the multiplexer that feeds the recorder three six-bit words for each input signal.

1. Place cards 35B and 36B on extender cards.

2. Remove cards 1B,5B, 6B.

With cards 5B and 6B removed, the 12 time-code bits will remain high. We will input appropriate switch codes and observe the low signal being transferred to the recorder during cycle 3 of the multiplexer.

The recorder input leads are marked channel B,A,8,4,2 and 1. These refer to bits representing powers of two 32,16,8,4,2,1 respectively. For convenience we will use inputs 20 and 42, found at pins S on RS-4 and U on MC-1 respectively. These generate octal codes 25 (010101) and 52 (101010) to the recorder.[1]

---

[1] The reader may notice that the decimal equivalent of octal 25 is 21, not 20. Remember that the internal clock reset function uses code 01, and that the computer program subtracts one from all codes to permit the system user to number his addressable inputs from 1 to 60 rather than 2 to 61. The following table octal codes may be useful.

Octal Value of Codes Actually Recorded for Each Input

INPUT PIN	RS-1	RS-2	RS-3	RS-4	RS-5	RS-6	MC-1	MC-2	MC-3
M	02	10	16	24	32	40	46	56	66
S	03	11	17	25	33	41	47	57	67
T	04	12	20	26	34	42	50	60	70
R	05	13	21	27	35	43	51	61	71
U	06	14	22	30	36	44	52	62	72
N	07	15	23	31	37	45	53	63	73
B	46	50	52	54	56	60	54	64	74
V	47	51	53	55	57	61	55	65	75
K	62	64	66	70	72	74	02	04	06
G	63	65	67	71	73	75	03	05	07

3. The pins to be examined are:

Power of Two	Card	Pin
32	35B	11
16	35B	24
8	35B	33
4	36B	11
2	36B	24
1	36B	33

4. Connect a D.C. scope to pin 35B-11. Toggle input RS-4, pin S. A 5 millisecond low should be seen during multiplexer cycle three. Toggle input MC-1,U. The signal should remain high. Repeat for pins 35B-33 and 36B-24.

5. Repeat step 4 for the other three pins. This time the signal should go low when MC-1, U is activated and remain high for activations of RS-4,S.

6. Ground each of the following inputs in sequence. Observe a low being propagated during cycle one of the multiplexed output.

23B-12
-16
22B-36
-33
-37
-21

7. Repeat step 7 for the following and observe a low during cycle two of the multiplexed output.

22B-24
-9
-12
-16
21B-36
-33

Memory Storage

The following steps will test the storage feature of the memory. Refer to the schematic diagram, "Memory Load and Shift Control".

1. Under normal conditions, the memory will store up to five inputs if they occur before the recorder has completed writing the data contained in the sixth, or output, stage. To demonstrate the storage and shifting capabilities, it is necessary to slow the system down to permit examination of the register. After each 18 bit word is recorded, 19B-10 is cycled from a normally high state to a 250 nanosecond wide low state, resetting 38B at pin 35. This produces a high at 39B-30. When the memory shift timing circuit is properly arranged, 39B-27 also goes high, resetting 37B-35 which causes a full shift cycle down the memory (assuming that data is present at memory register 5).

2. Prepare an extender board with pin 28 open. Connect the normally low output of a bounce-free switch to 36A-28. Install card 36A on the extender board in slot 36A.

3. Remove card 1B.

4. Carefully toggle, in sequence, inputs RS-4, S and MC-1, U. Repeat three times. The memory is now full. Each input must be hit exactly once. Terminate the 12 volt probe with a 0.1 mfd capacitor bypassed with a 1 megohm resistor to insure only one hit is obtained.

5. Read the memory output. Code 010101 should be found on Test Points 2,4,5,6,7 and 8 of card 33B.

6. Cycle the bounce-free switch 3 times. The capstan wheel of the recorder may be observed to move 1/200 inch with each cycle.

7. Read the memory output. Code 101010 should now have shifted to the output.

8. Continue to cycle the switch, and note the memory shift on every third cycle.

9. After the sixth word has been written from the last memory stage, the entire memory will contain octal code 52. Further depressions of the bounce-free switch will have no effect.

10. Toggle input RS-1,N.

11. Code 000111 should be available at the memory output.

This complete the inspection and test procedure for the entire unit. Restore the system to normal operation.

Circuit Description

Introduction

The operation of the electronics unit is dependent upon several timing circuits. The basic assumption (which has been shown to be true through extensive use) is that the probability of two inputs arriving at the same time is very low.

The following information conisists of a brief discussion of the operation of each of the major sections of the unit. The card layout is shown in Table A-5. The schematic diagram is included on Figure A-10.

Input Circuit

Sixty identical input circuits connect from the inputs on Amphenol connectors at the back panel to the diode matrix. The basic circuit is shown in Figure A-8.

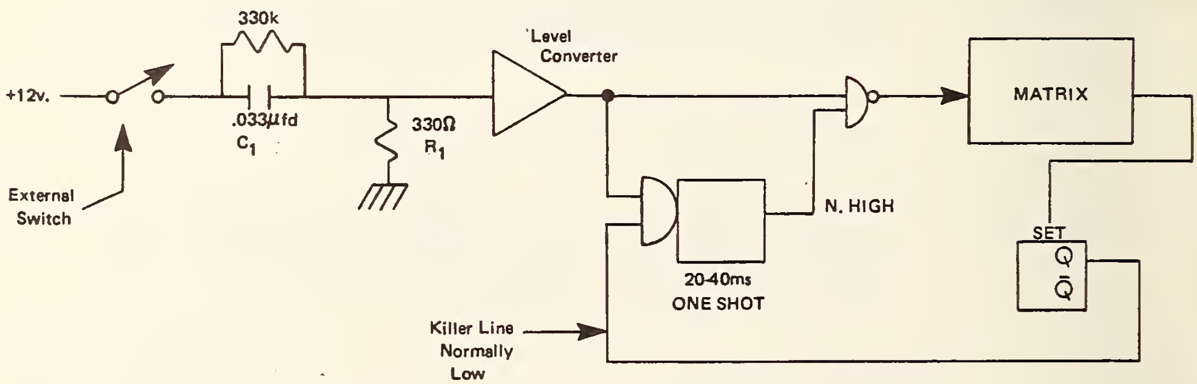


Figure A–8. Simplified Input Schematic

Table A-5

Card Slot Assignments for Electronics Package

Socket	Row A	Row B	Socket	Row A	Row B	Row C
1	XRB3	MCG20	21	MDG2	MFF1	
2	XRB3	-	22	MDG2	↓	
3	MLC4	MUC2	23	MOS10	↓	
4.	MOS10	MFF3	24	↓	↓	
5	↓	MUC2	25	↓	↓	
6	↓	MUC2	26	↓	↓	
7	MLC4	MDG5	27	↓	↓	
8	MOS10	MUC2	28	↓	↓	
9	↓	MUB3	29	↓	↓	
10	↓	MUB3	30	↓	↓	
11	MLC4	——	31	MDG2	↓	MFF2
12	MOS10	X4	32	MDG2	↓	↓
13	↓	X4	33	XDL1	↓	↓
14	↓	MLC4	34	XDL1	↓	↓
15	MLC4	↓	35	MDG2	MDG2	↓
16	MOS10	↓	36	MMV1	MDG2	↓
17	↓	MDG5	37	MDG2	MFF2	↓
18	↓	MOS10	38	MDG2	MFF2	↓
19	MLC4	MOS10	39	MFF3	MDG4	
20	MDG2	MDG5	40	MMV1	MFF3	

Operation. When a switch closes, 12 volts is applied to the R_1C_1 network. The high initial charging current causes nearly 12 volts to appear at the input to the level converter across pull-down resistor R_1. The level converter output goes high for about one time constant, or 11 microseconds. The nand gate is then forced low. When any input to the matrix goes low, a flip-flop is set, raising a killer line common to all input. The high killer line and the high level converted output fire the one shot multivibrator which is adjusted to go low for about 30 milliseconds. This low output turns off the nand gate. The entire cycle requires about 800 nanoseconds.

When the switch has opened, C_1 discharged, and the one shot has cycled, the same input may be reactivated. Because of switch bounce, the one shot should not be adjusted for less than 20 milliseconds. To prevent data loss from tandem axles, the timing should not be greater than 40 milliseconds.

Memory Loading

The timing diagram shown in Figure A-9 shows the sequence of events which cycle each stage of memory in turn to the output. This is a complex process and is only briefly outlined below. Refer to Figure A-10, pages 10 and 12, for the following discussion.

Operation (General). The presence of nonzero switch code at the output of the diode matrix makes flip flop 40B-23 high. When 37A-7 transitions from high to low, 40B-18 goes high . 600 ns later, 37A-11 goes high, causing 1) 39B-29 to go low, resetting 37B-36 and 2) the recognized data signal to load into memory stage 1, setting 37B-13. The propagation delay through 38A-4 and 18B-30 allows a few nanoseconds to load the signal into memory before the killer line 18B-30 cuts off the input signal. If no other data is stored, the new code is shifted rapidly to the sixth stage and its presence is sensed by 39B-32 going low. This eventually causes flip-flop 23B-25 to set.

Memory Readout. When the flip flop at 23B-25 is set, a command signal is applied to the recorder (STEP WARNING). The recorder then transitions from a near power off condition to a ready state. This requires 0.5 milliseconds.

Multivibrator 36A is set to delay .5 milliseconds before pin 28 goes high giving a STEP command to the recorder. Note that CL-1 is normally high, so as soon as data is loaded into the memory and the recorder powers up, the first six bit byte may be recorded. After a delay of 2 milliseconds, 36A-28 drops, shifting CL-1 off and CL-2 on. C1-2 enables the next six bits of data to be multiplexed to the recorder when 36A-28 goes high three milliseconds later. The cycle is repeated to write the third byte.

When CL-3 goes high, a count is entered into the record gap counter at 39A-15. When CL-3 goes low, one shot 19B-10 cycles low for .5 microseconds, resetting 23B-25.

The series of pulses from 39B-28 which search for more data are resumed.

Tape Recorder

Requirements for Maintenance

The only maintenance required for the PI-1387 is periodic cleaning of the tape contacting surfaces. In the course of normal operation, oxide particles from the magnetic tape are deposited on magnetic heads and tape-guiding components. If these deposits are allowed to build up, proper tape contact is lost, and degraded performance results.

Magnetic Head. Clean frequently and thoroughly with swab (Q-tip) and PI Header Cleaner or denatured alcohol. Do not use isopropyl alcohol. Do not allow Head Cleaner to drip or spray on painted surfaces as it will mar the finish. Allow the swab to become thoroughly soaked with the cleaner. Hold the swab against the head for a moment to allow the cleaner time to loosen the contaminants, and scrub the head firmly with the swab. If any film remains, repeat the operation.

Capstan and Pinch Roller. Clean the rubber pinch roller and metal capstan frequently with a clean, dry cloth. Wipe the contaminants from the rollers, rotating each separately to ensure the entire surface has been cleaned.

Tape Path and Guides. Clean guides and tape contacting surfaces frequently with a clean, dry cloth. Tape oxide will be deposited on these surfaces; it is important that they be kept clean. If wiping with a clean cloth does not remove oxide film, use the method described for cleaning the magnetic head.

Specifications

The recorder is a write only, 1/2" magnetic tape incremental, 0-200 steps per second, 200 characters per inch, 7 track. Coding is NRZI binary, with internal switch selectable odd/even vertical parity - even longitudinal parity. It accepts 7" diameter IBM hub reels of 600 foot 1.5 mil tape. It requires 40 watts peak when stepping, less than 1 watt during standby. The supply is 12 volts d.c. ± 15%.

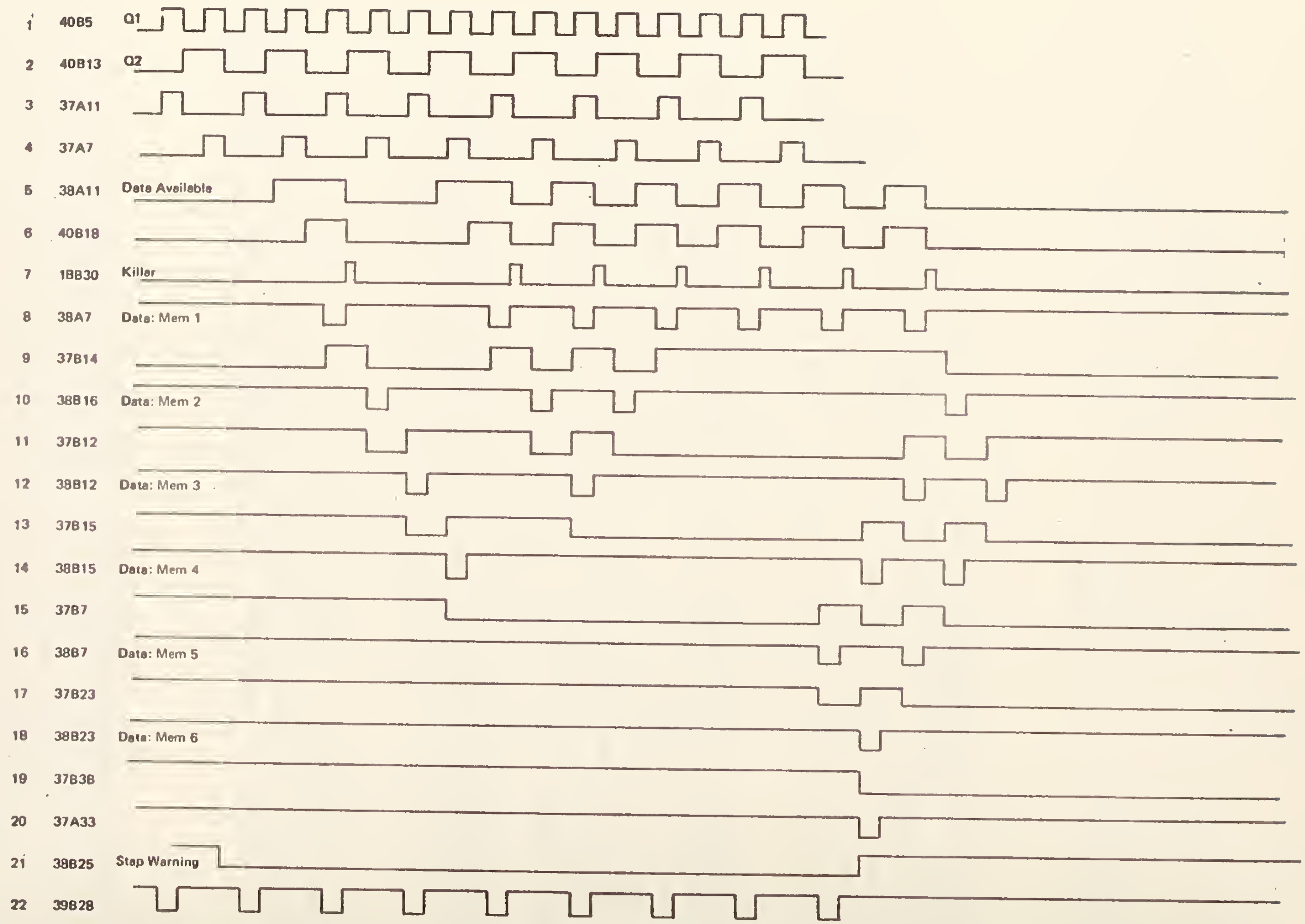


Figure A–9. Memory Circuit Timing Diagram

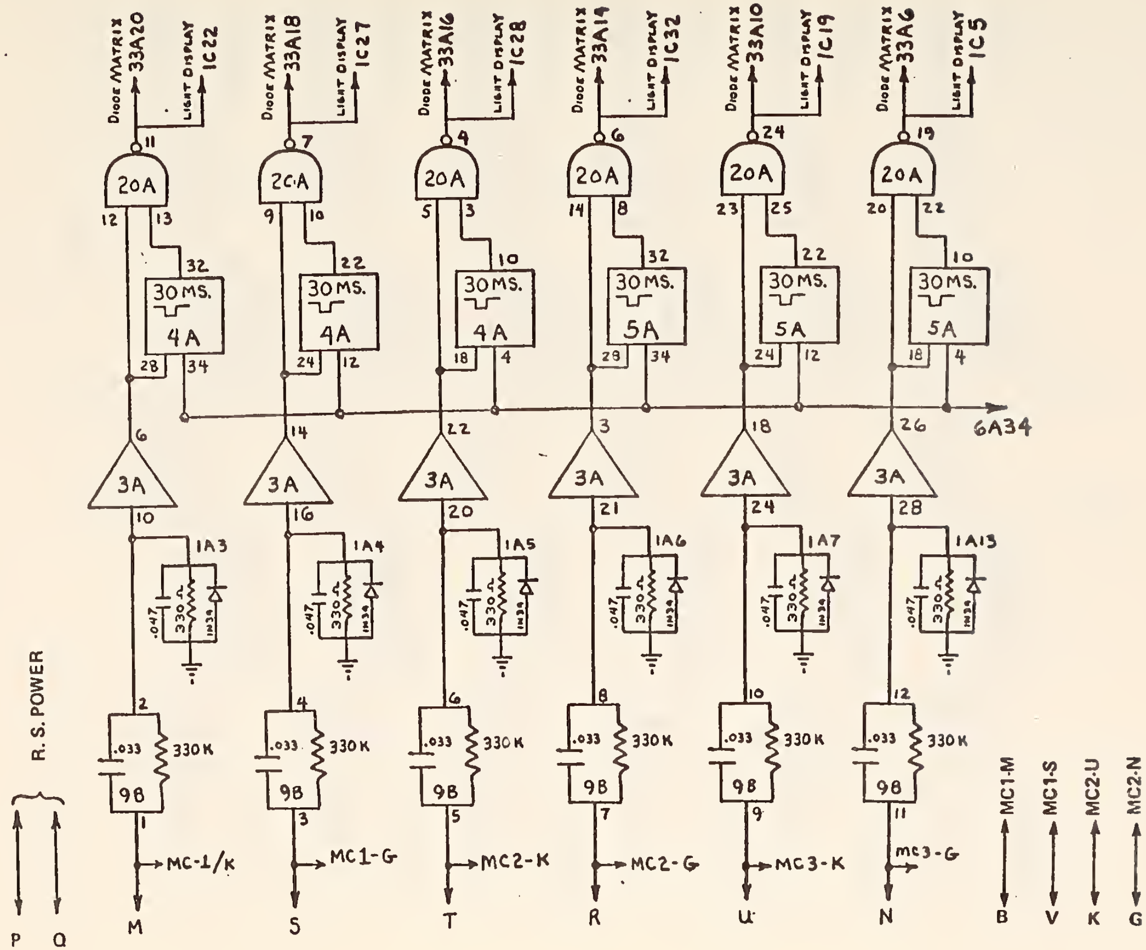


Figure A–10. (Page 1) Input Wiring for Connector RS–1.

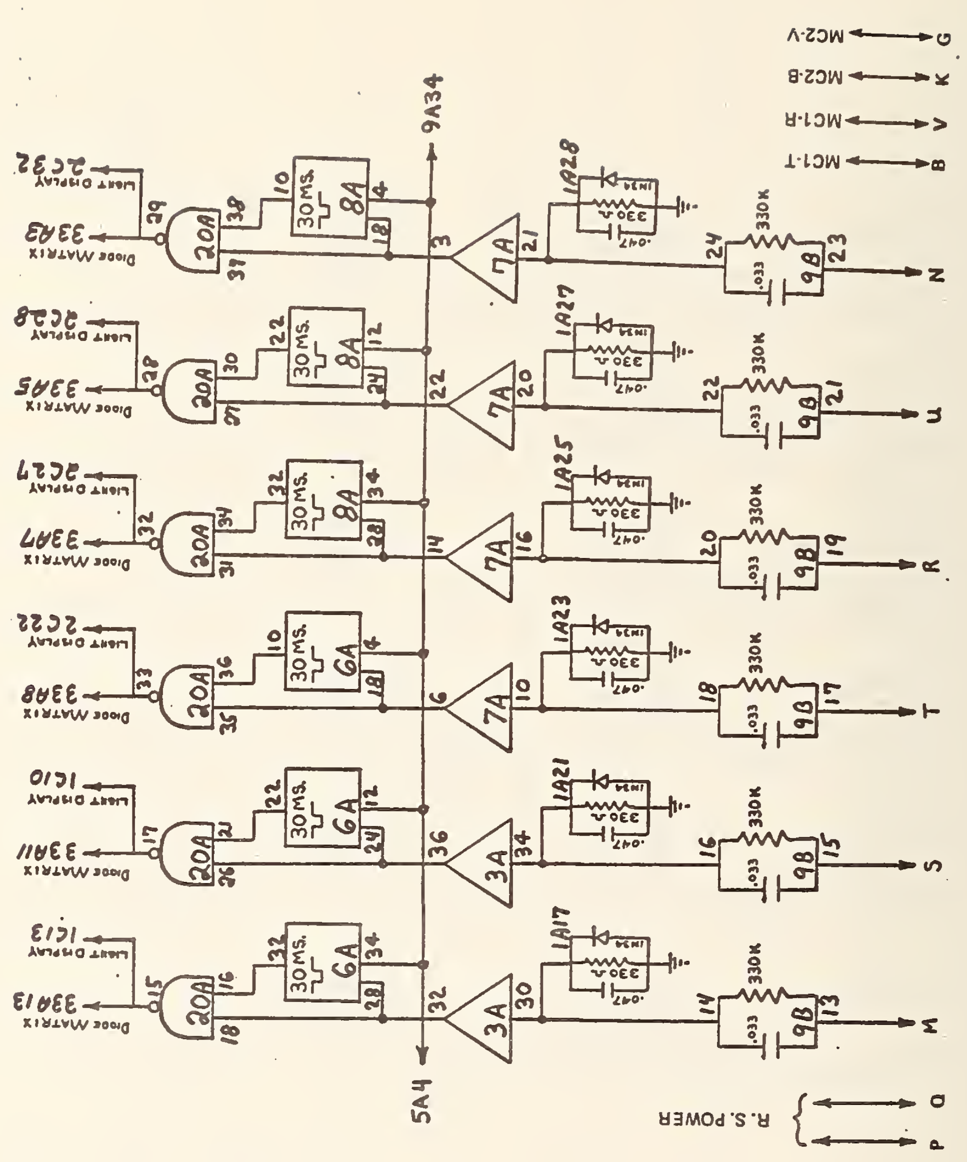


Figure A—10. (Page 2) Input Wiring for Connector RS–2

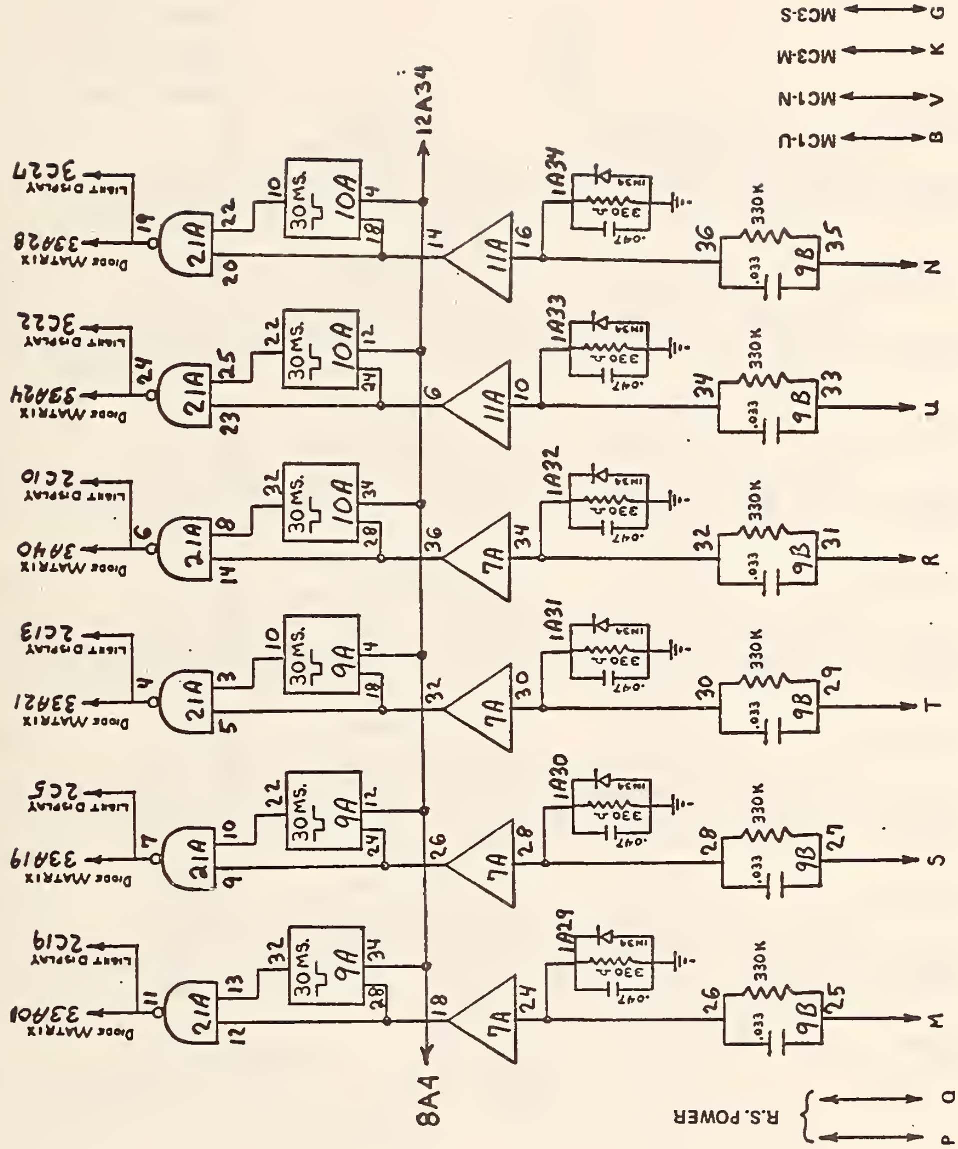


Figure A–10. (Page 3) Input Wiring for Connector RS–3

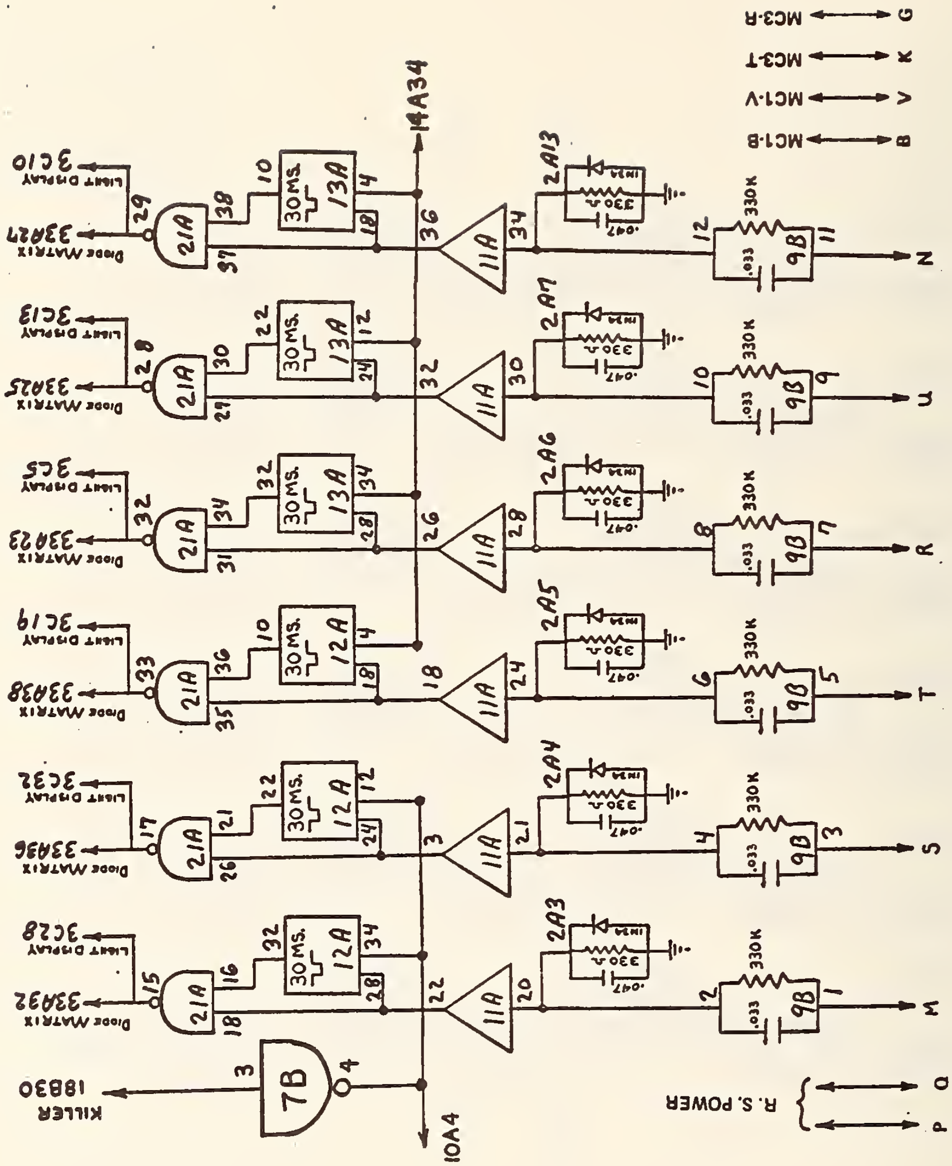


Figure A–10. (Page 4) Input Wiring for Connector RS–4

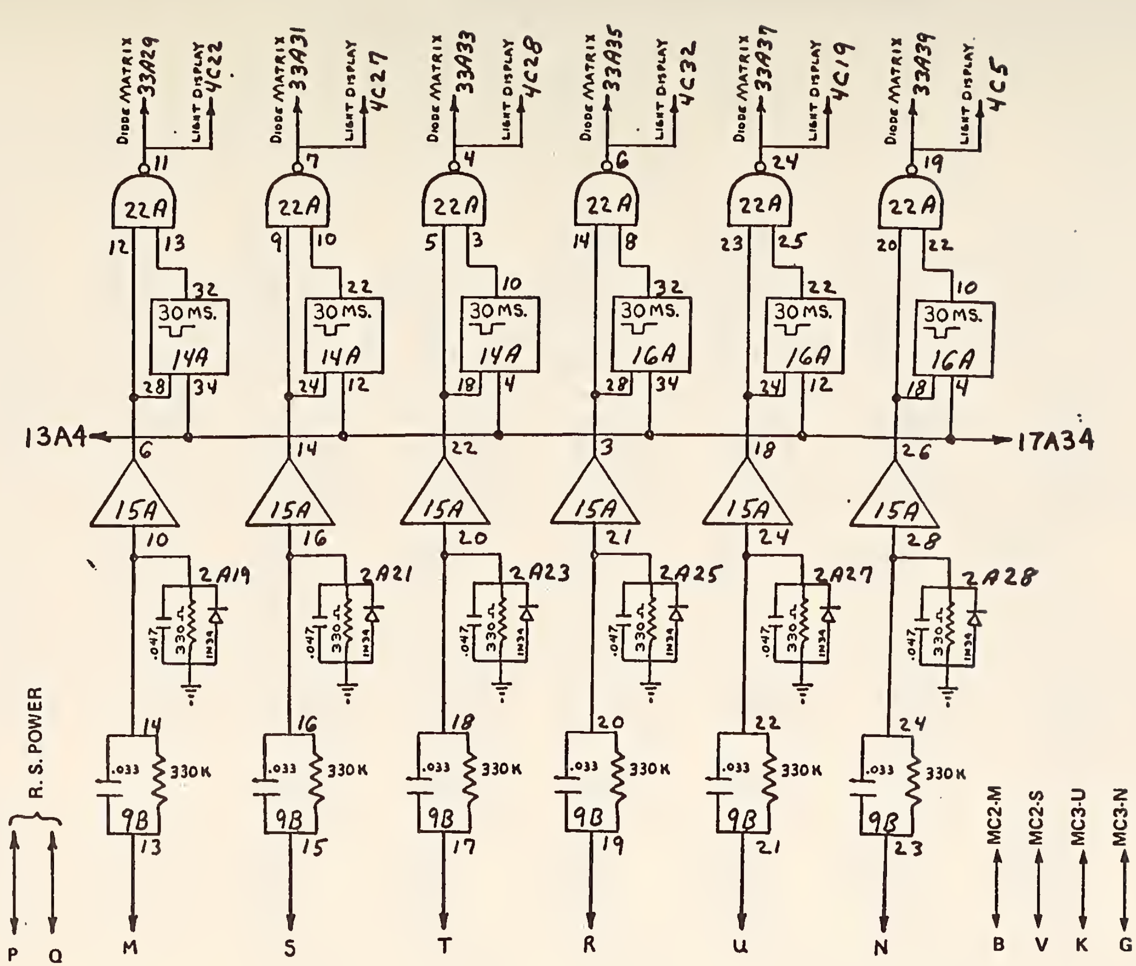


Figure A–10. (Page 5) Input Wiring for Connector RS–5

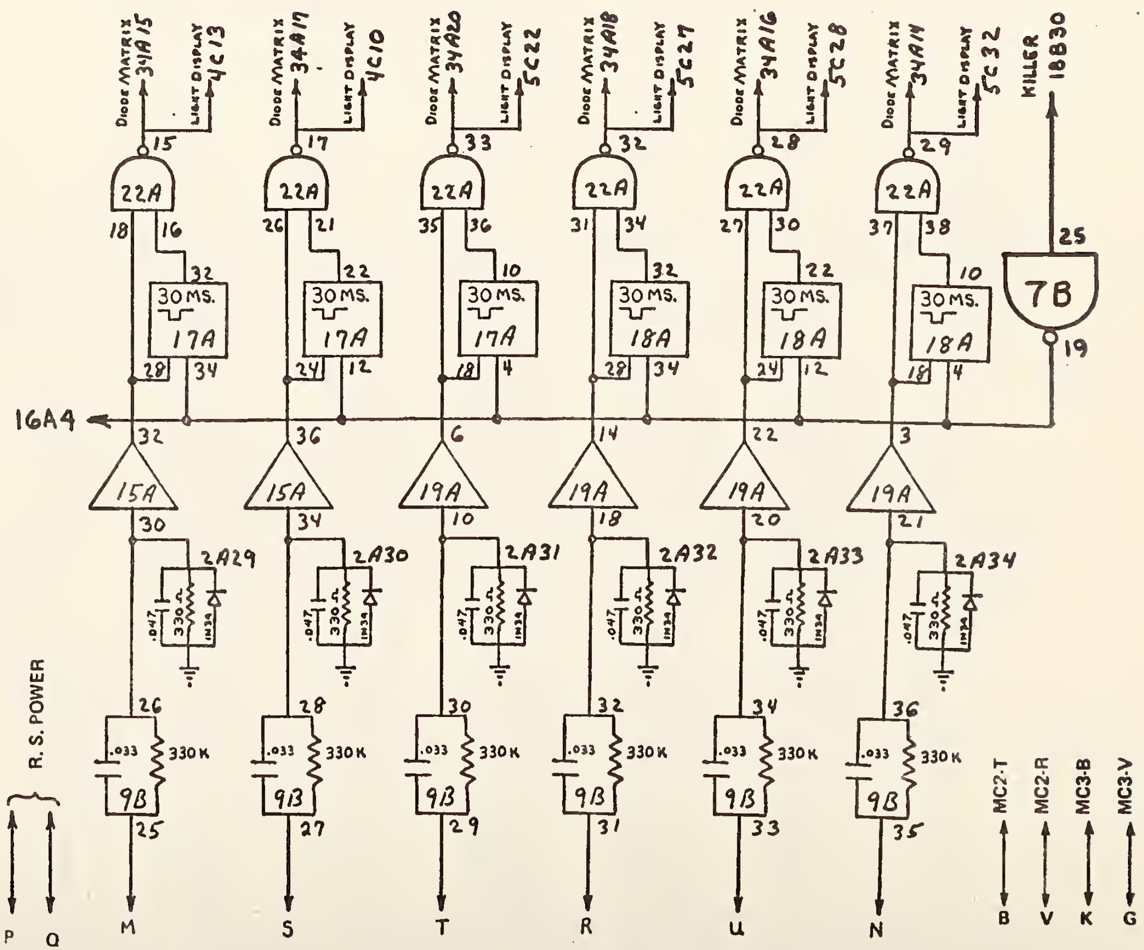


Figure A–10. (Page 6) Input Wiring for Connector RS–6

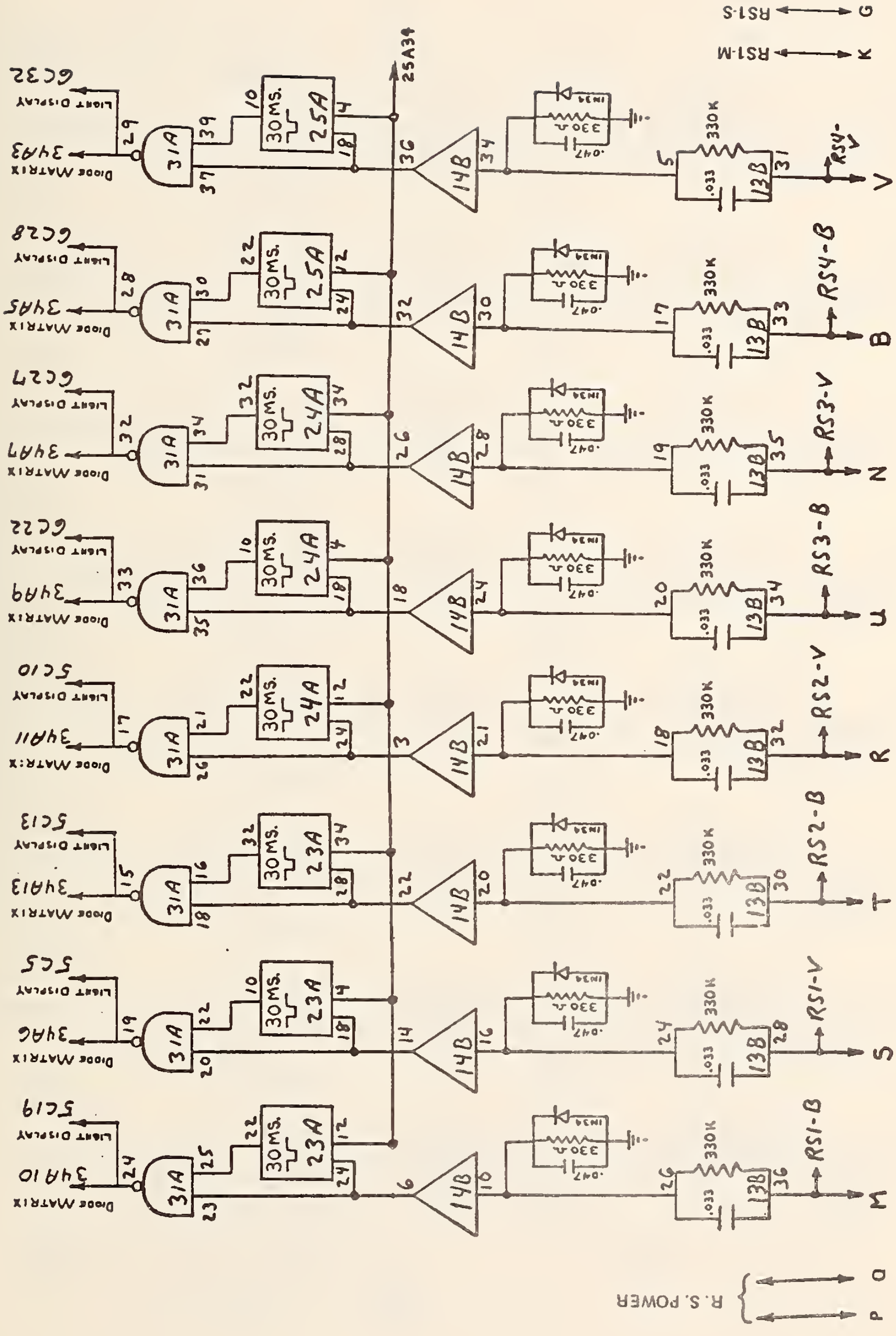


Figure A–10. (Page 7) Input Wiring for Connector MC–1

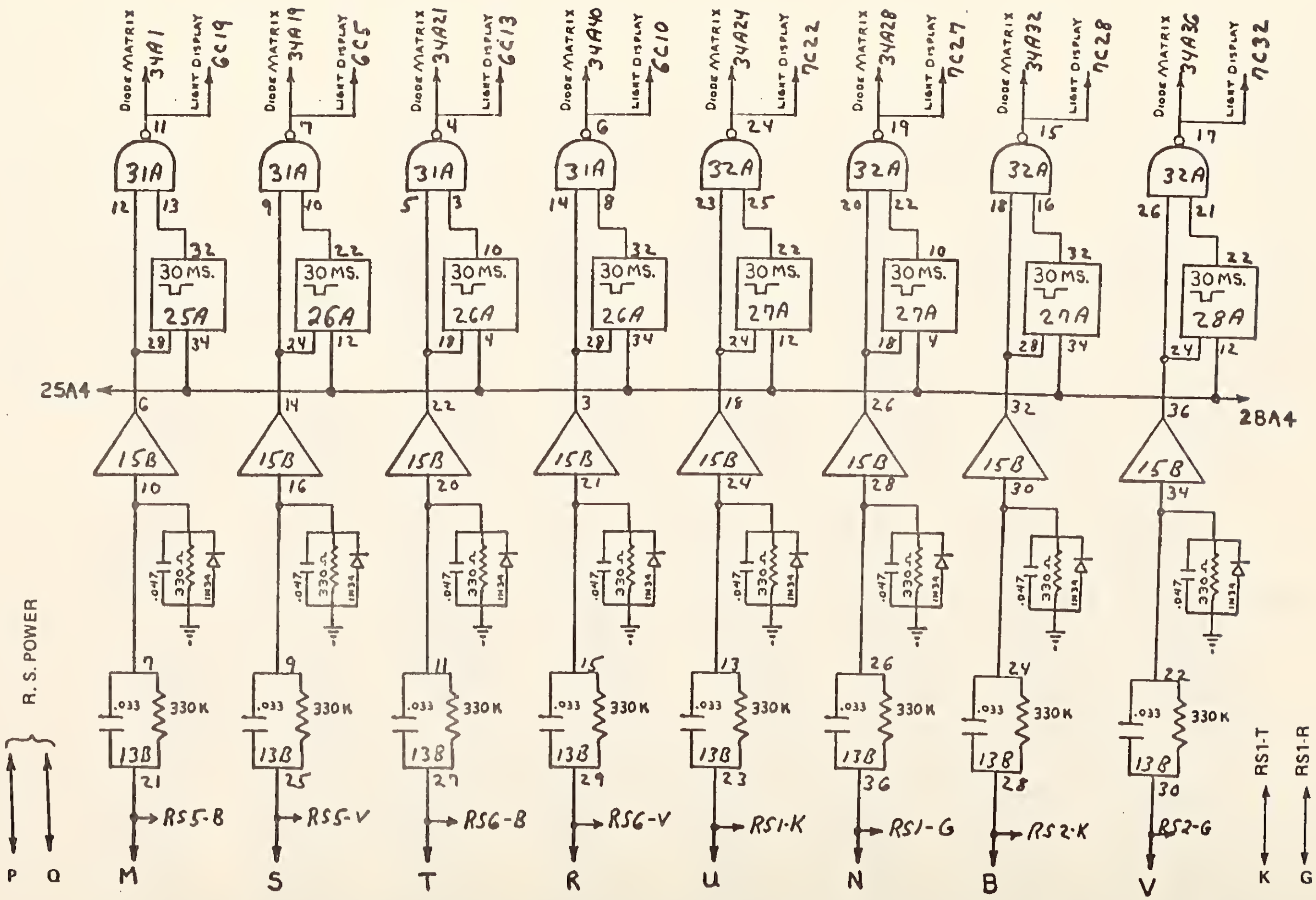


Figure A–10. (Page 8) Input Wiring for Connector MC–2

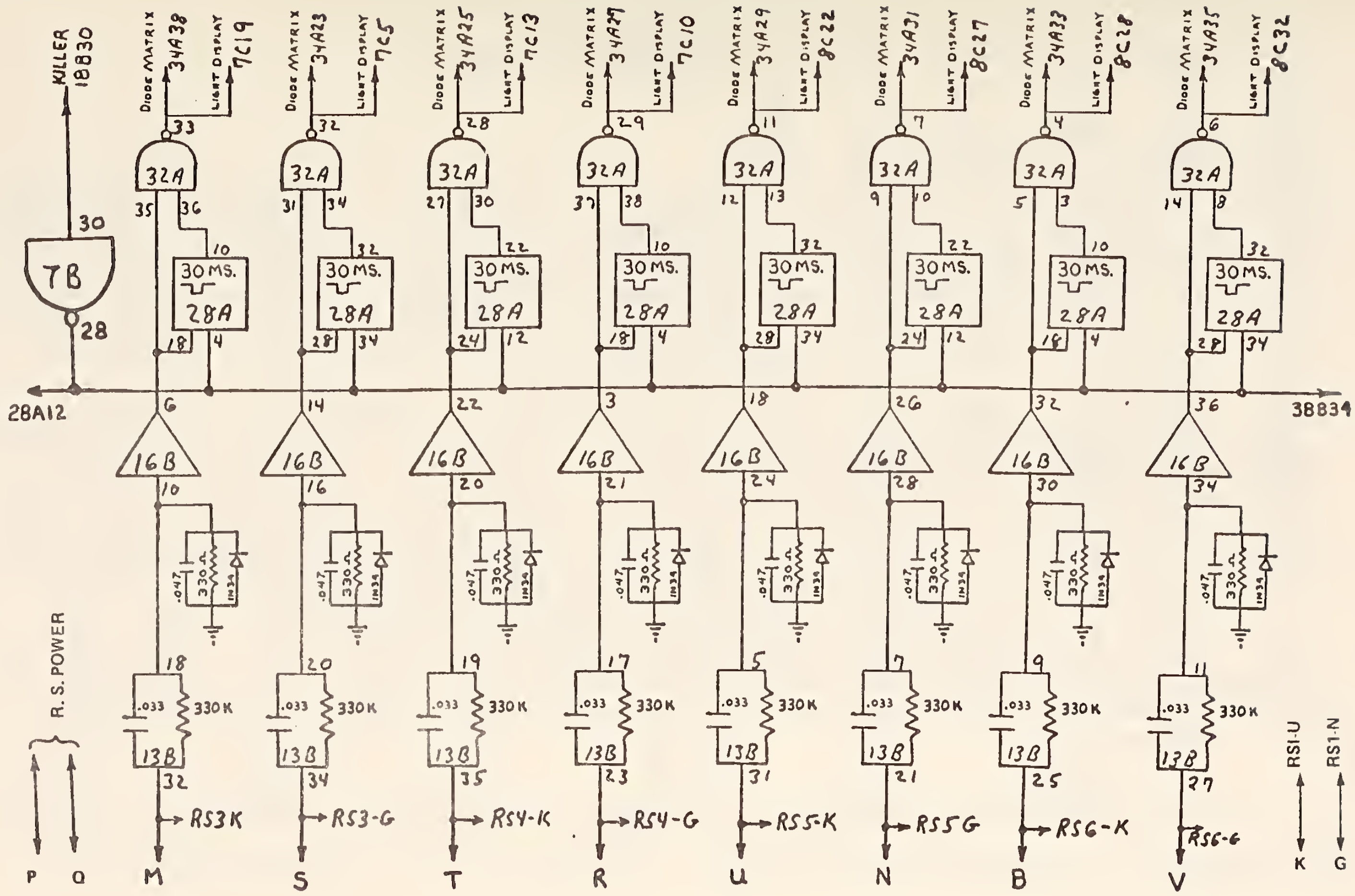


Figure A-10. (Page 9) Input Wiring for Connector MC-3

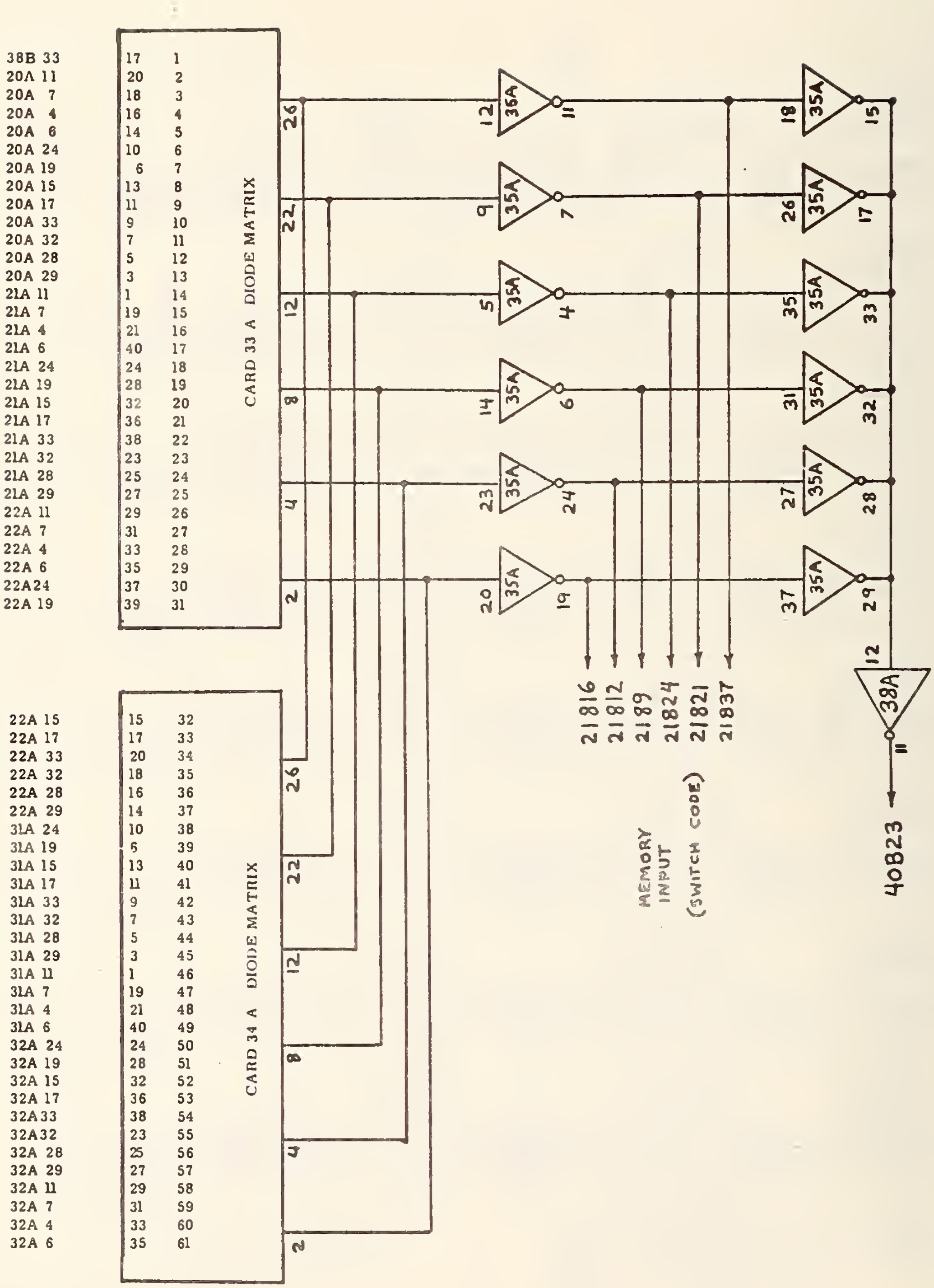


Figure A–10. (Page 10) Input Line Encoding Matrix

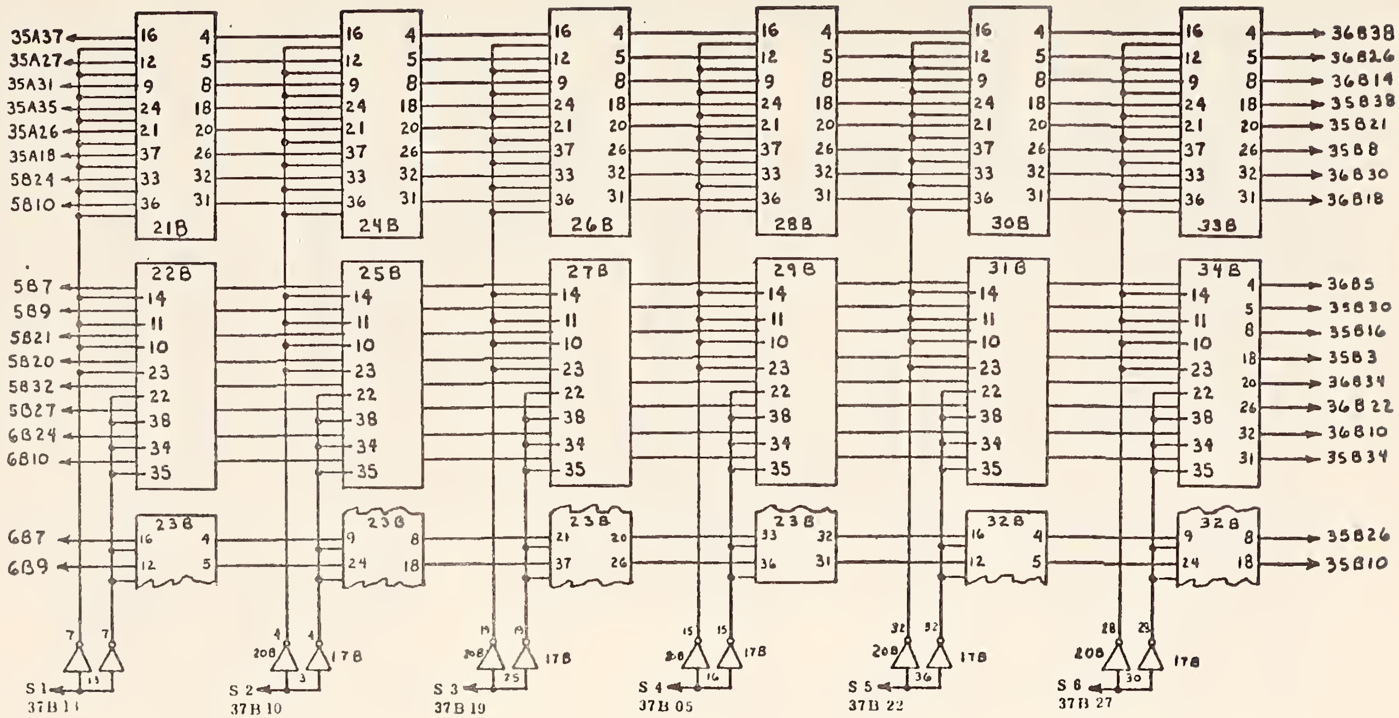


Figure A–10. (Page 11) Six Word by Eighteen Bit Memory

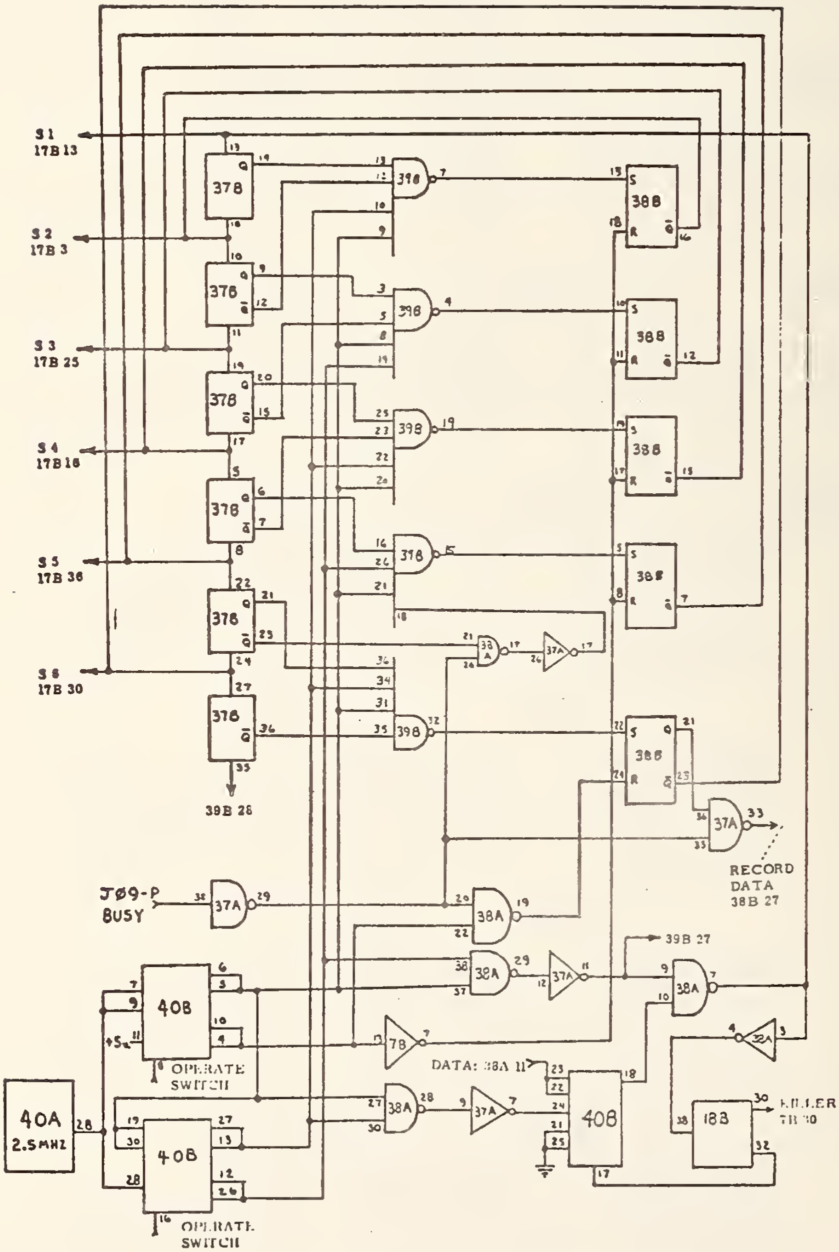


Figure A–10. (Page 12) Memory Load and Shift Control Circuit

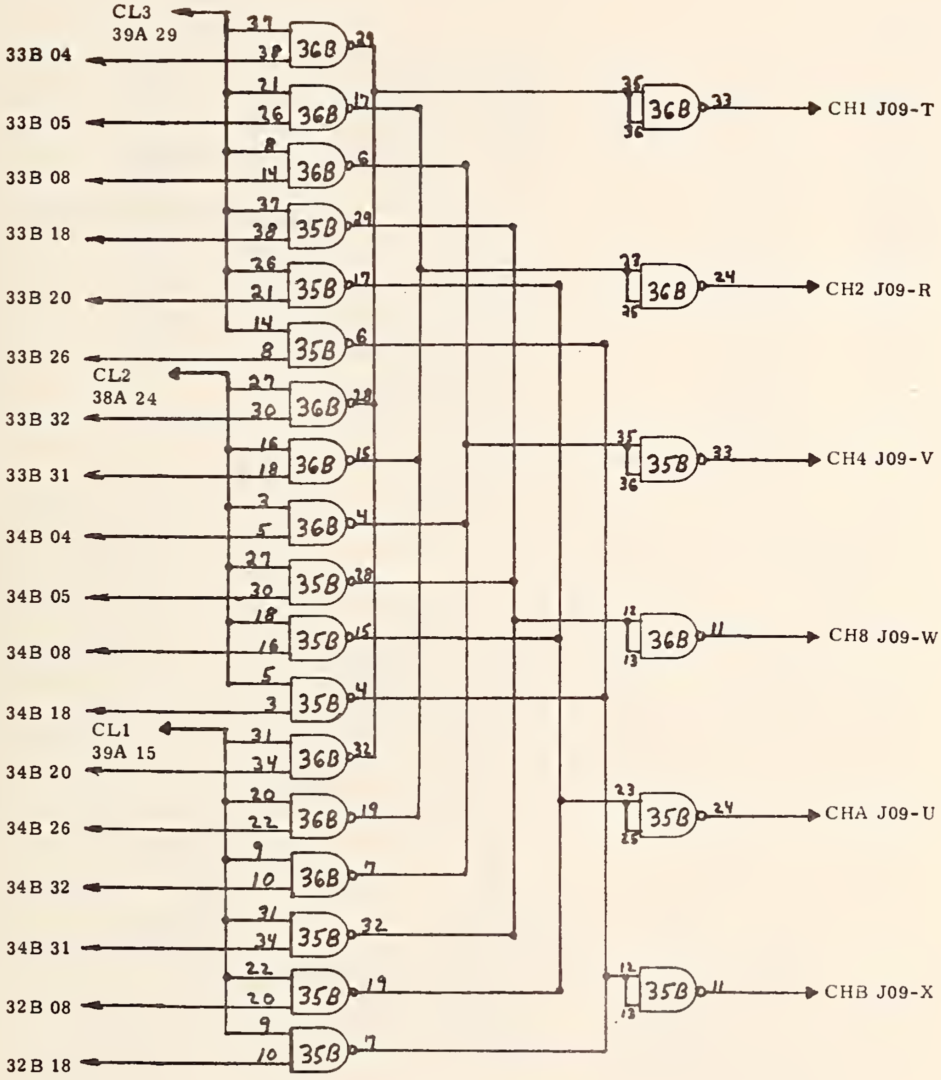


Figure A–10. (Page 13) Recorder Input Signal Multiplexer

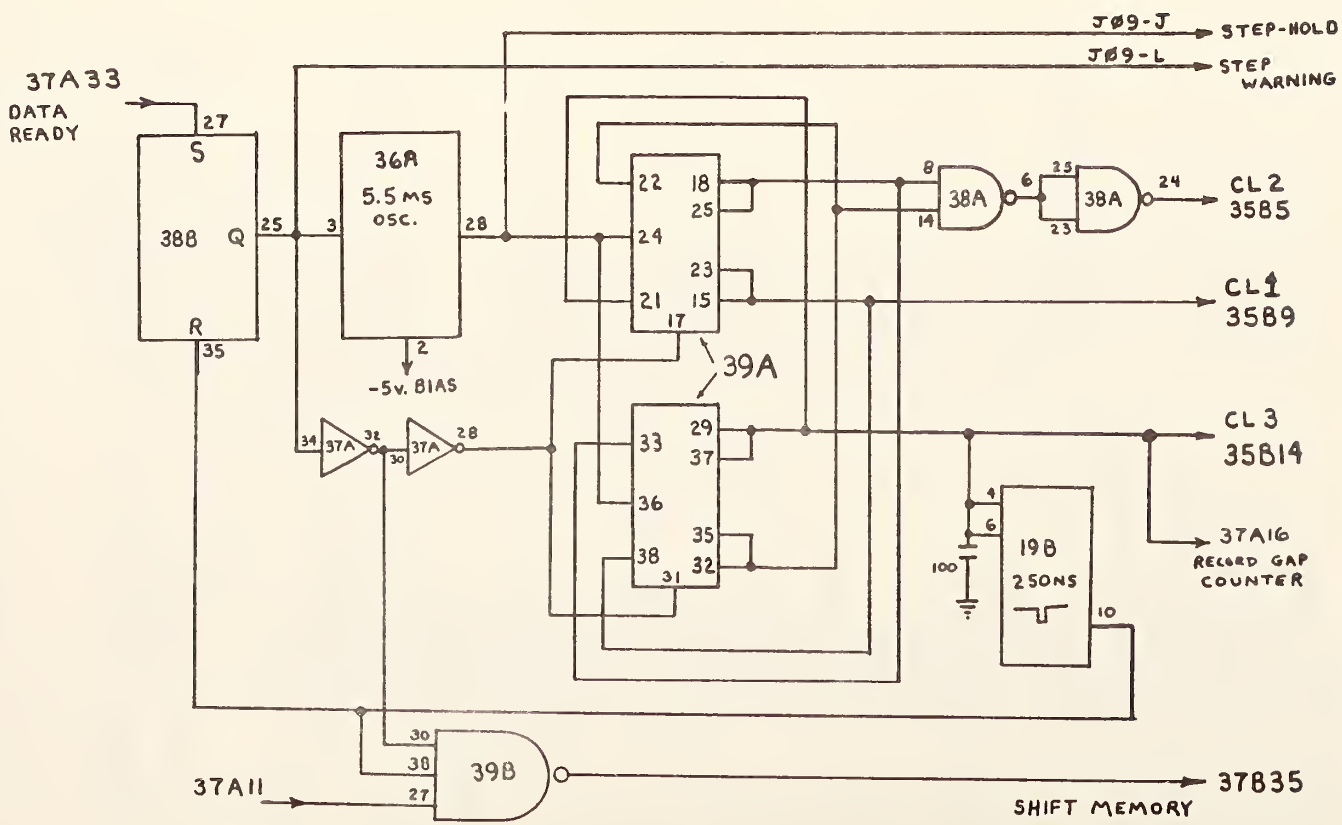


Figure A-10. (Page 14) Memory Readout Multiplex Control Circuit

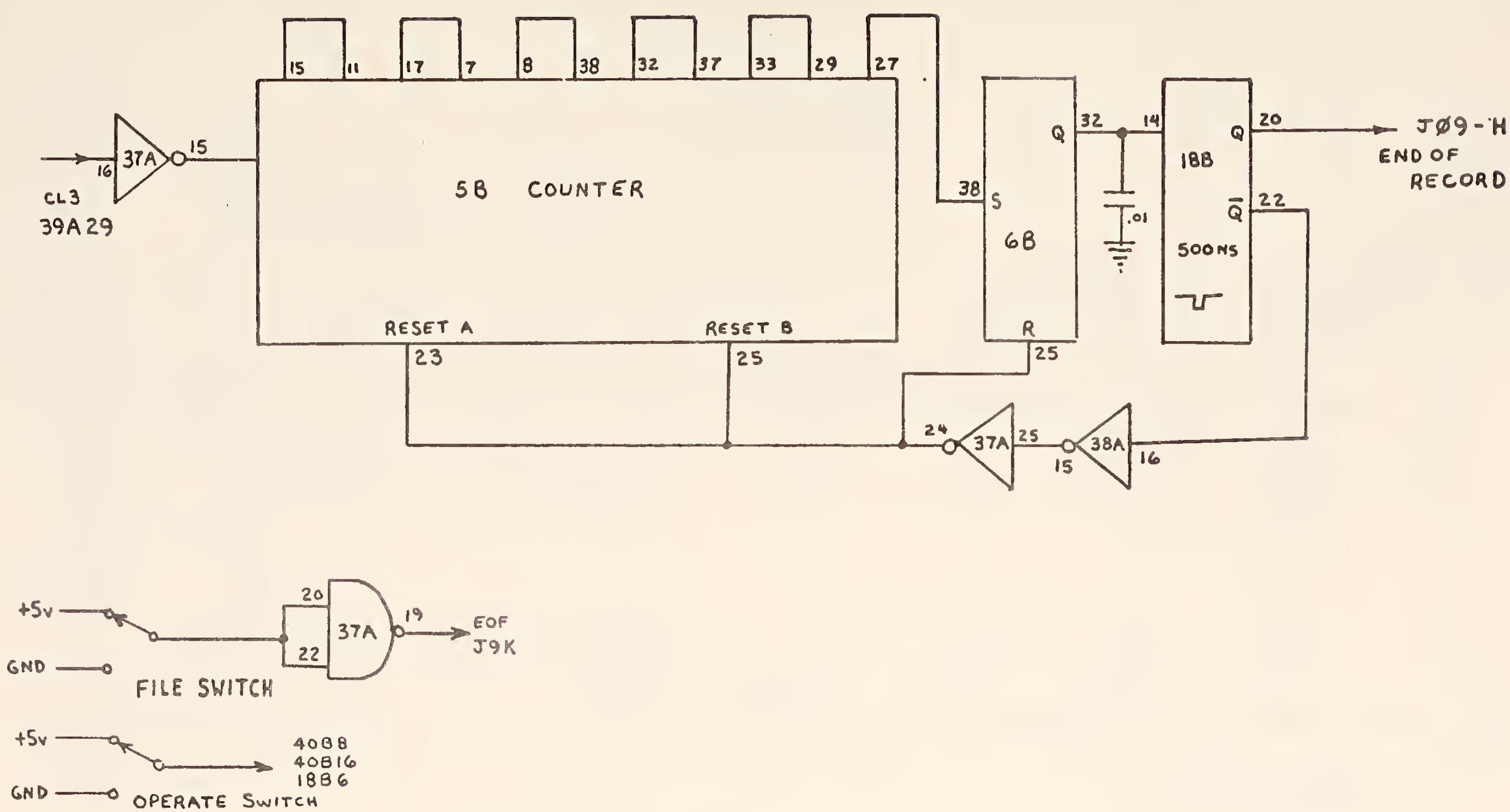


Figure A–10. (Page 15) End of Record Counter

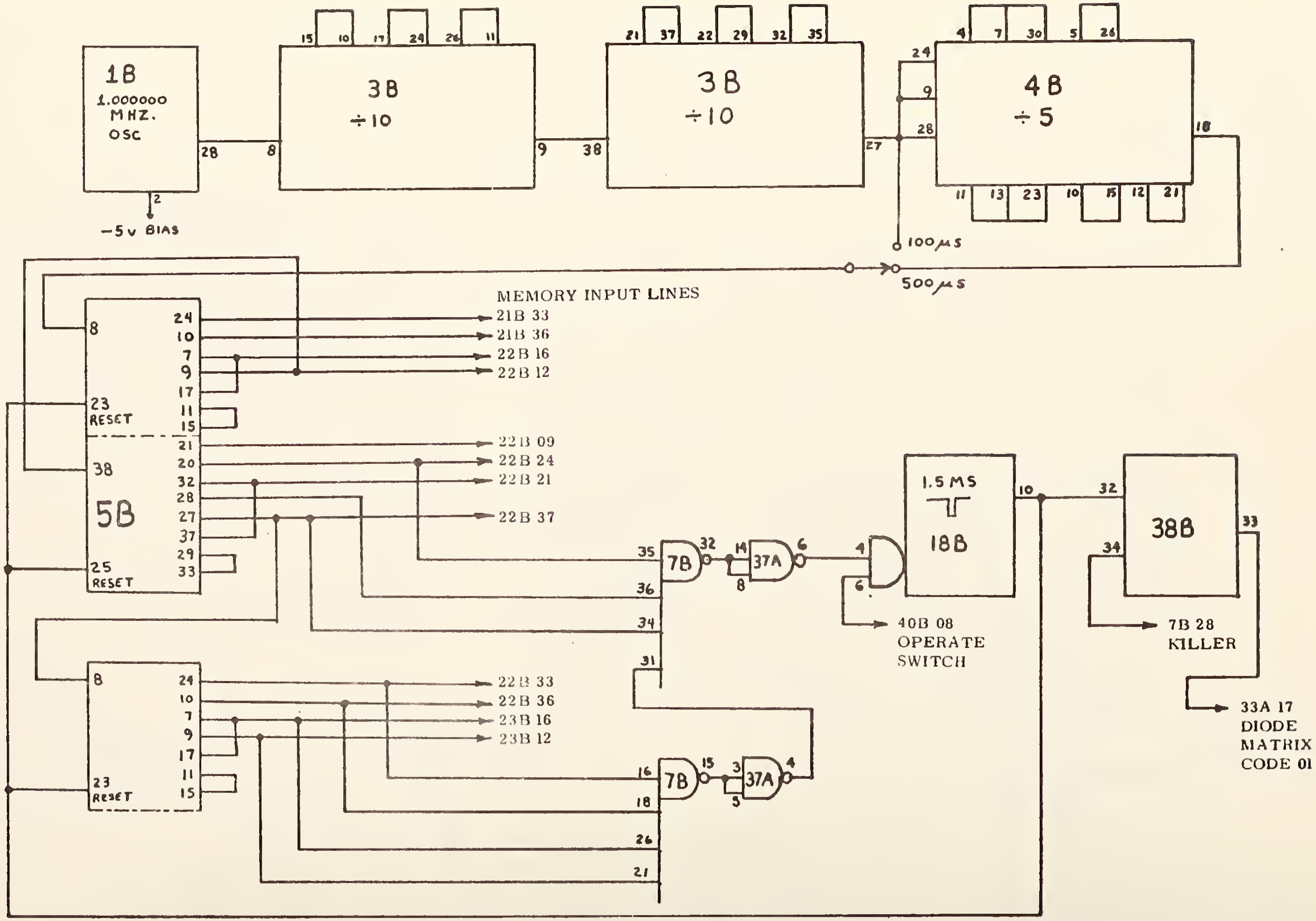


Figure A-10. (Page 16) Clock Circuit

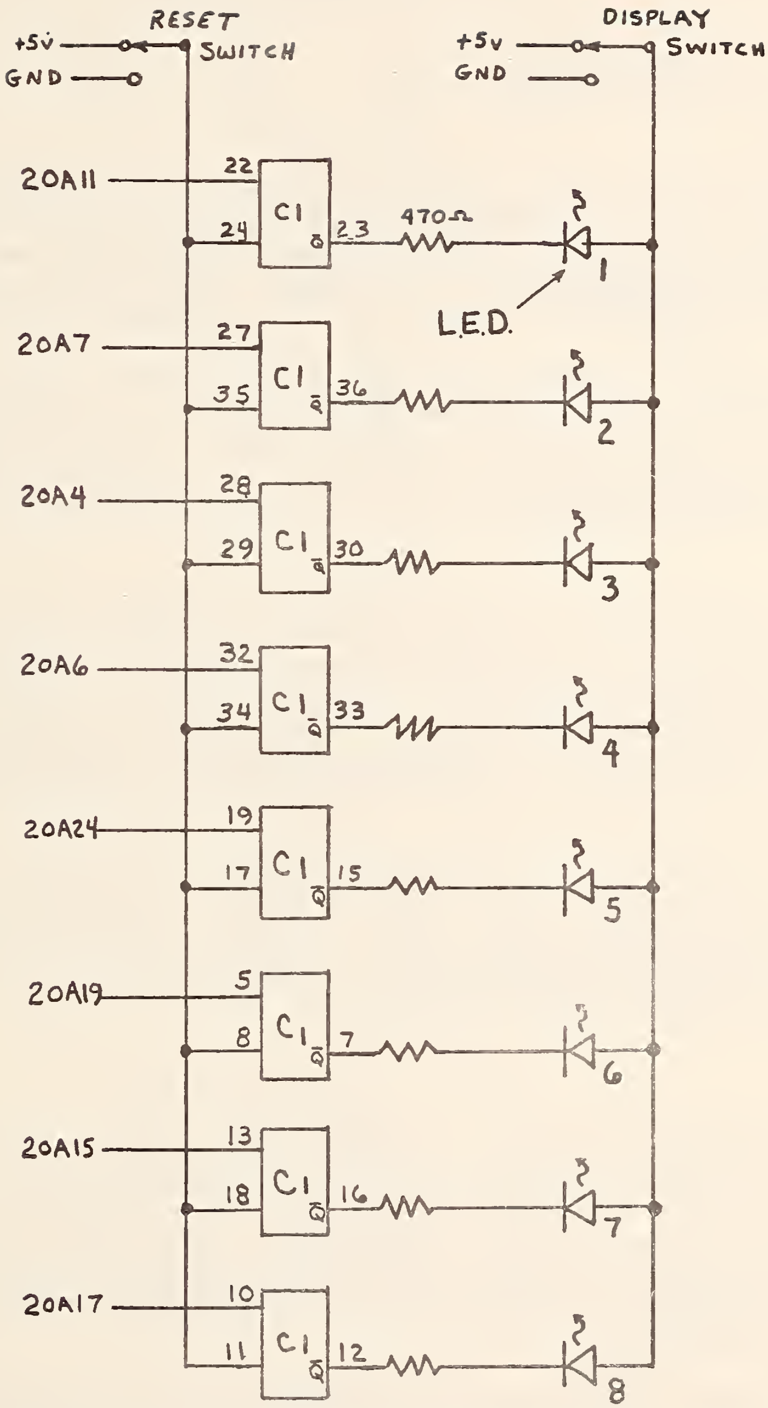


Figure A–10. (Page 17) Wiring Diagram for Light-emitting Diode Display. (Typical Wiring for One of Eight Cards)

Traffic Evaluator Software

Introduction

The purpose of the Traffic Evaluator Software is to process the data recorded by the Traffic Evaluator hardware (hereafter referred to as raw data) in a manner that will construct vehicle trajectories and events into summaries of traffic characteristics and violations occurring at the test site. All software was programmed in FORTRAN for the CDC 6700.

The total software package necessary to perform this processing consists of three programs. The sequence of processing steps is illustrated in Figure A-11. The first program, designated EDIT, is a preprocessing program that reads the raw data tape and generates a new data tape with times and devices codes of the raw data tape reformatted to facilitate subsequent processing.

The data output of EDIT is written on an intermediate tape, which is then read by the processing and analysis program, ANALYSIS. This program reads the tape generated by the EDIT and translates detector activations into vehicle positions and speeds, which in turn are used to connect these actuations into vehicle trajectories. In addition, this program matches manual coding inputs with the corresponding vehicle trajectories, thus allowing subsequent stratifications of local and foreign vehicles.

The vehicle trajectory data output of ANALYSIS is written on a tape which is then read by the post analysis program. This program translates vehicle trajectories into traffic characteristics and violations summaries such as speed and headway distribution, hazardous maneuvers, headway violations, and speed violations. These summaries are also stratified by local, foreign, exiting and through vehicles.

Edit Program

The program operation begins by reading and writing four data cards that are used as descriptive headings of the test site/conditions. The headings are also written on the intermediate output tape for subsequent use as headings on the processed output data. The program then reads control parameters that determine the program operation. These parameters determine the starting and ending file/record positions of the input data that is to be processed.

After the control parameters have been read, the raw data tape is read one record at a time. The data have been recorded on this tape in the form of three character words (a character contains six bits) with the first two characters containing the time of detector actuation and the third

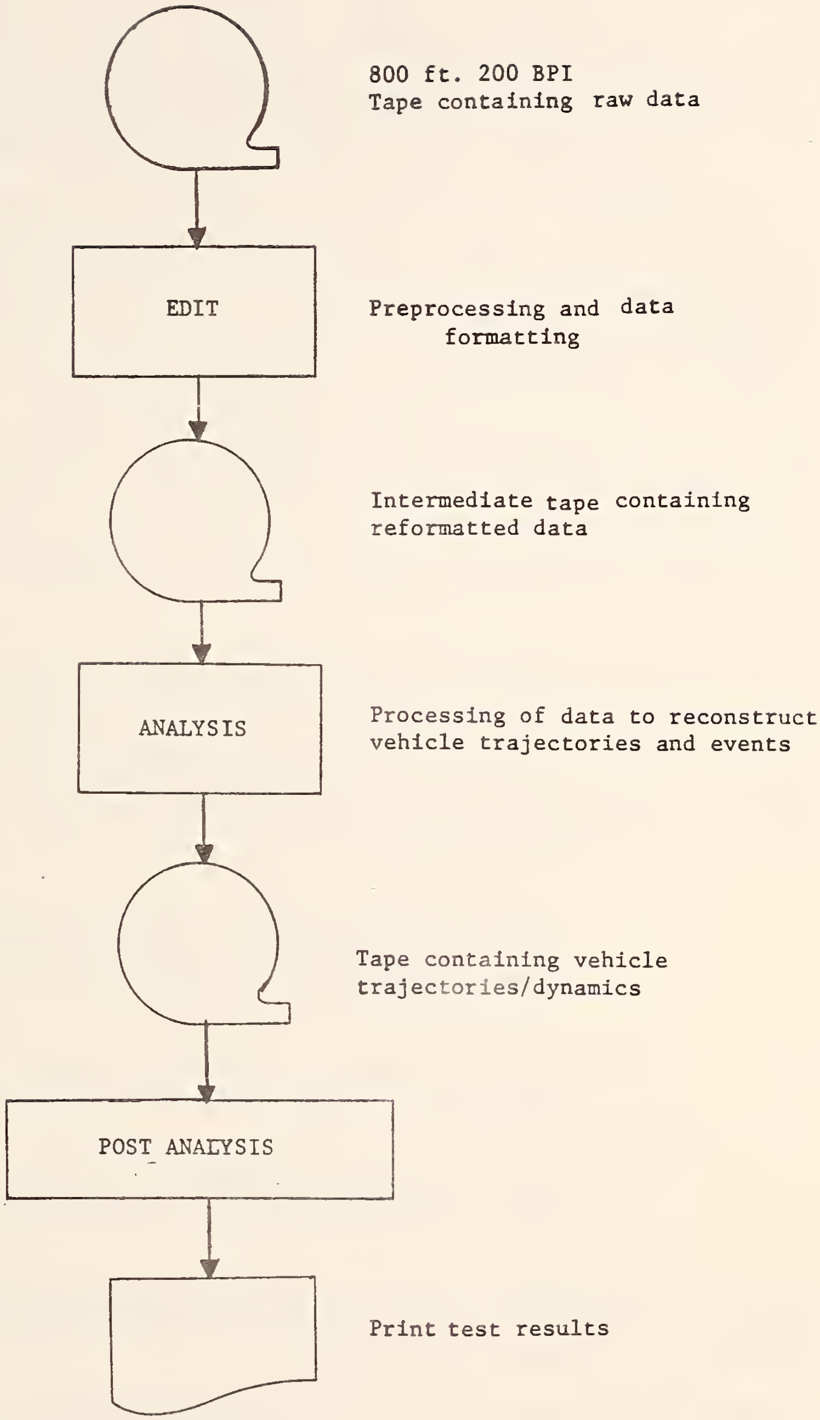


Figure A-11
Job Flow

character containing the number of the detector that has been actuated, hereafter called the device code. Device codes are numbered through 63, and times indicate the number of 1/2 millisecond time increments that have transpired since the last time the clock counter recycled. Device code 1 is actuated to signify the occurrence of a clock recycle.

The processing of an input record begins by scanning the input record to locate the first clock recycle and then back-tracks to the first data word in the record. This step, known as synchronization, is necessary to determine the location in the record of the first data word so that subsequent identification of three character groups can be performed. Following the synchronization of the data record, the program alternately processes times and device codes using the function subroutine MTGET to extract one character at a time from the input data and shift it to the lower six bit positions of the computer word. Two character pairs are then combined to obtain an actuation time which is then divided by two to obtain the actuation time in milliseconds. A code is obtained after each actuation time and reduced by one for compatibility with the processing program which determines clock recycle by testing for device code of zero.

Occasionally, the portable recorder will omit data or place extraneous data on the raw data tape. When this occurs, EDIT processing will become unsynchronized. That is device codes may be interpreted as actuation times and vice versa. To prevent this from occurring, EDIT continuously tests actuation times to insure that they are in monotonic increasing order between any two clock resets. If this test is not satisfied, the program checks for the following conditions:

1. Erroneous data, when eliminated from the input stream yields an increasing sequence of actuation times. (Corrected by eliminating the erroneous time actuation.)

2. Possible loss of clock reset (corrected by inserting a clock reset).

3. Possible loss of either 6 or 12 bits of input data (corrected by shifting the input data stream, appropriately).

If none of these above conditions are detected, resynchronization is performed. That is, the program scans for the next clock reset, and the processing of the input continues.

When the processing of each three character data word has been completed, it is tested to determine if end of data for that record has been reached. If it has, the data is written on the output tape and the next record is read. If this is not the case, the data is stored in a buffer area and scanning and processing of data words continues.

Processing is terminated when the specified number of files/records have been processed and there are no more data sets to be processed.

Time Estimates. Data collected as described in the main text required about 35 C.P.U. seconds per actual hour of data to edit. This figure is only approximate since it is dependent on the volume of traffic, number of switches, etc.

Table A-6

EDIT Program Input Data Formats

Data Name	Dimension	Description	Format		No. of Cards
INFO	32	Heading describing test site and conditions.	8A10		4
ISF	-	Starting file number	I3	7I3	1
ISR	-	Starting record number	I3		
IEF	-	Ending file number	I3		
IER	-	Ending record number	I3		
IPD	-	Control parameter for printing decimal data IPD=record no. to be printed	I3		
IWF	-	Control parameter for writing output tape: =1 for output tape =0 no output tape	I3		
IPO	-	Control parameter for printing octal form of input data IPO = no. words of each record to be dumped	I3		

Repeat 4 INFO cards and 1 control parameter cards for each data set on the raw data tape.

Table A-7

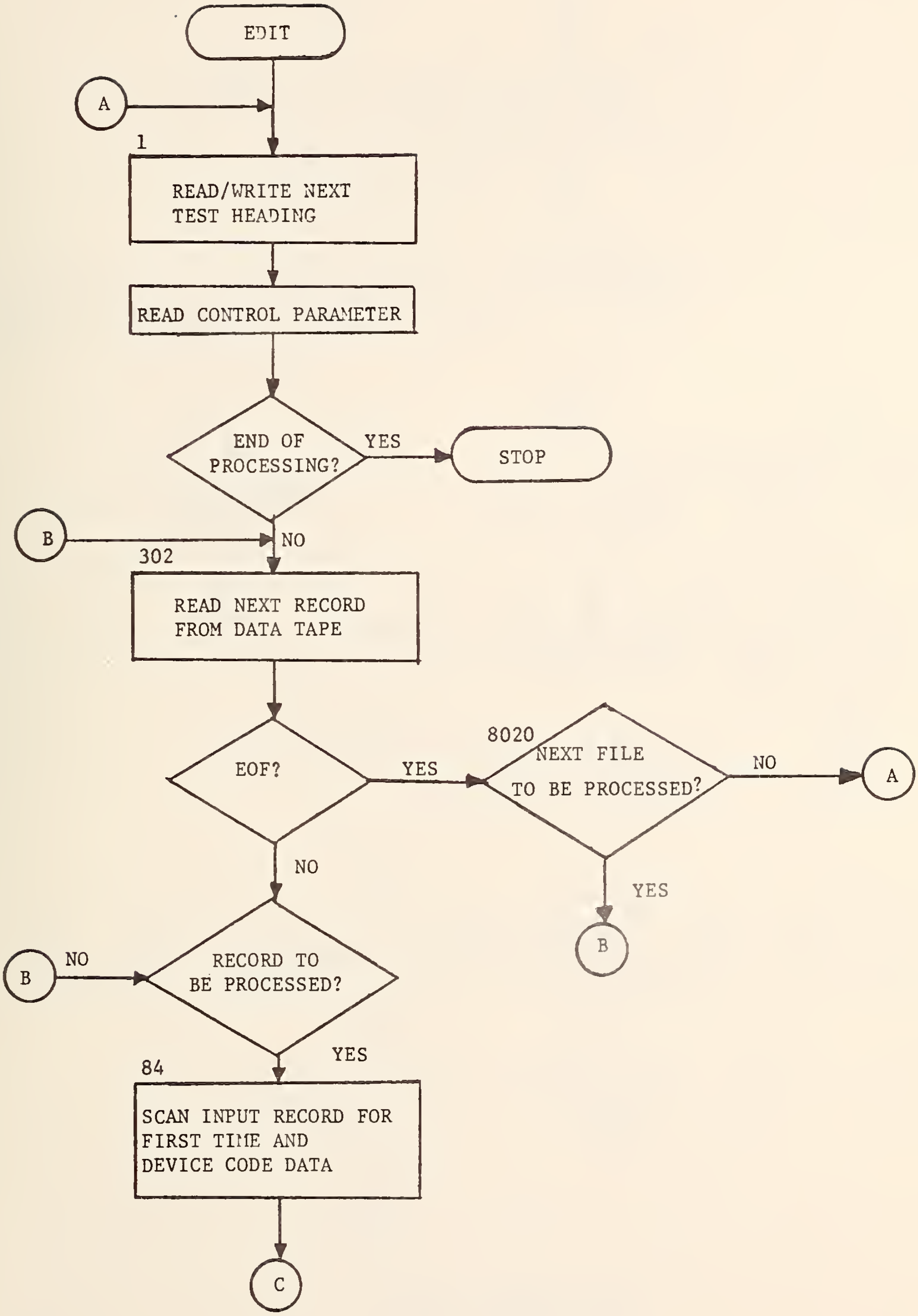
EDIT Program Variable Definitions

Variable Name	Type	Dimension	Definition	Initial Value
I (II)	Integer	1400	Buffer area for input data.	0
JU	Integer	-	Status of input word = -1 if no parity errors 0 if EOF encountered 1 if parity errors	-
L	Integer	-	Record length of input data	-
KK1	Integer	-	Current character being extracted from 60 bit data word.	-
KSYNK	Integer	-	3 Character component of data word being scanned. Used for comparison with clock recycle input.	-
KWD1	Integer	-	Counter maintaining location in 60 bit word of first character used to assemble value of time.	-
KWD2	Integer	-	Counter maintaining location in 60 bit word of second character used to assemble value of time.	-
KWD	Integer	-	Counter maintaining location in 60 bit word used to identify device code.	-
LKAR	Integer	-	Counter used to maintain location in 60 bit word of last character extracted.	-
ITM(I)	Real	4200	Buffer area used to store time of device actuation.	-

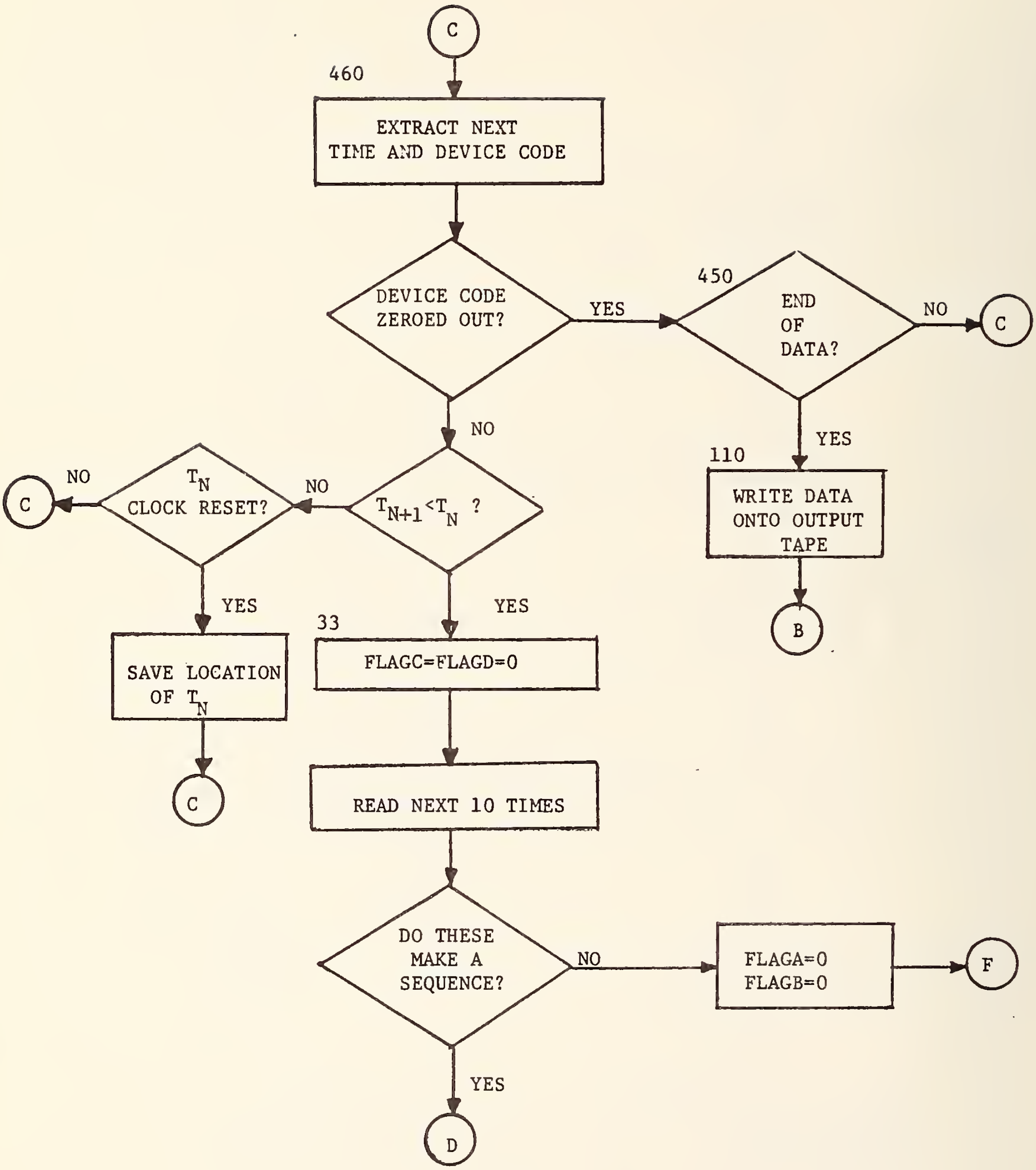
Table A-7

EDIT Program Variable Definitions

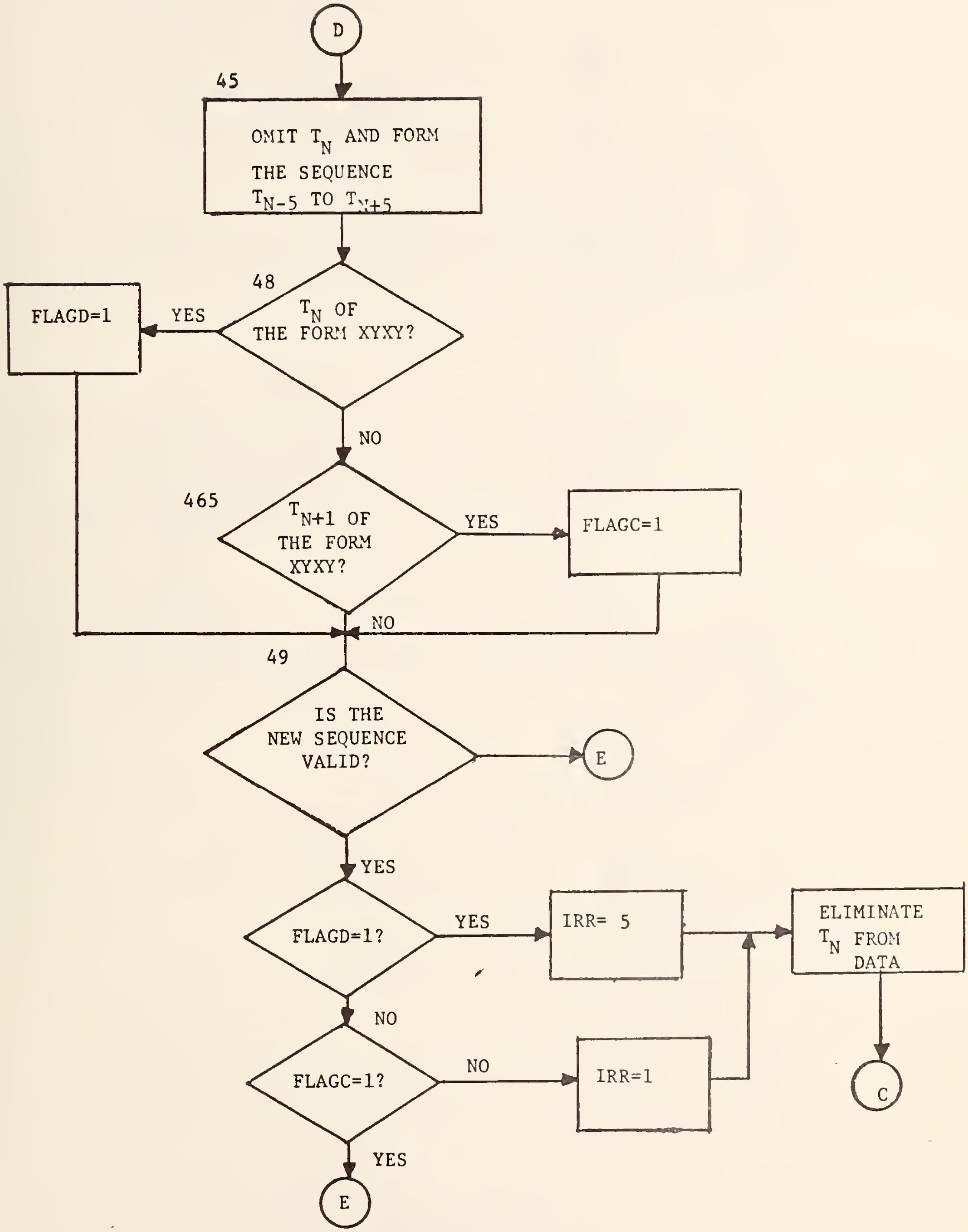
Variable Name	Type	Dimension	Definition	Initial Value
IDVC(I)	Integer	4200	Buffer area used to store device code.	-
HITS(I)	Integer	64	Accumulated hits for device I	0
IFLCT	Integer	-	No. files output on tape	0
NUMZ	Integer	-	No zero codes found for each record.	0



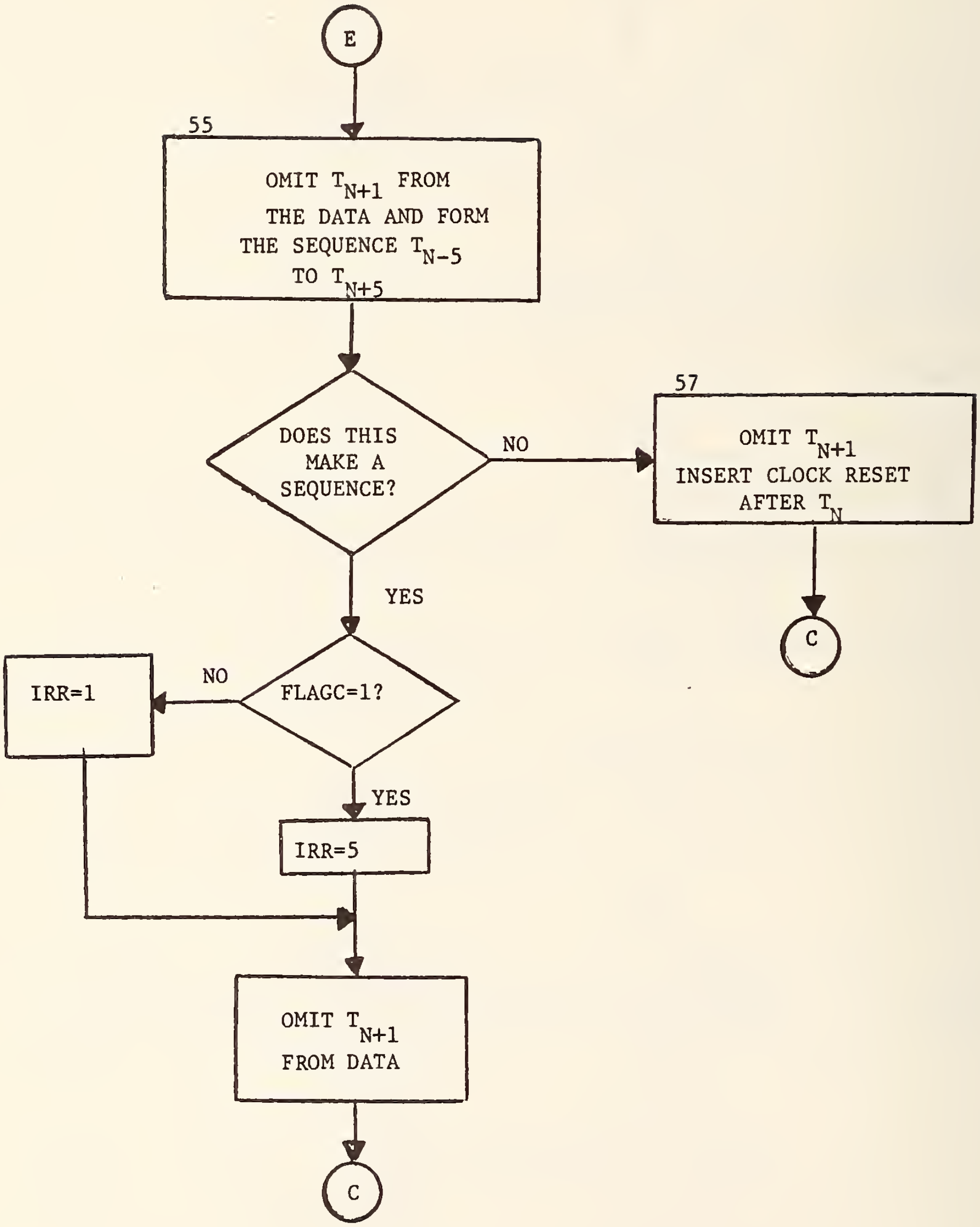
EDIT Program (1 of 5)



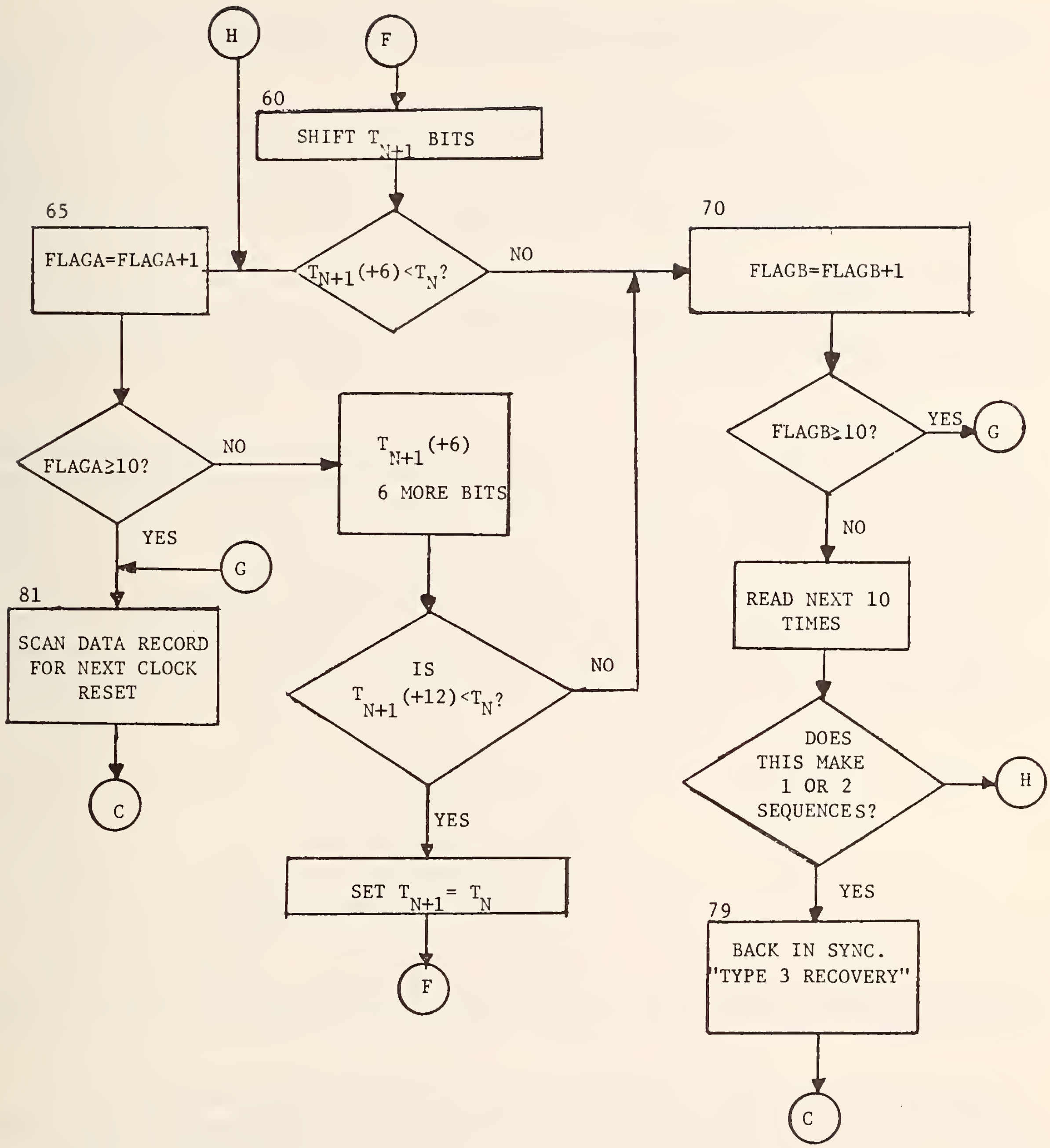
EDIT Program (2 of 5)



EDIT Program (3 of 5)



EDIT Program (4 of 5)



EDIT Program (5 of 5)

ANALYSIS Program

The tape generated by EDIT is read and processed by ANALYSIS. This program consists of 25 subroutines which:

a. Translate detector actuations into vehicle positions and velocities.

b. Connect vehicle positions into vehicle trajectories.

Main Program. The main program controls the overall flow of system processing. This program first calls BSRD to read the parameters that describe the test conditions and control the processing being performed. Subroutine CONVRT is next called to convert the parameters to the correct units for subsequent processing and to initialize all variables.

This program then calls RDATA when additional data is required, maintains the updated value of current time, and calls PROCESS to initiate conversion of test data to parameters of vehicle motion. When the current value of time equals the length of an analysis period, SUMARY is called to print the results of the analysis. When there are no more test data or no more analysis periods are to be processed, the program terminates execution.

Subroutine ERROR. This subroutine prints error messages as they are generated by the program. The following messages are printed for the value of the parameter I:

I	Message
1	Negative Device Code
2	Unrecognizable Device Code on Input Data
3	Analysis Terminated by End of Data Prior to End of Analysis Period

The subroutine returns to the calling program after printing the appropriate error message.

Subroutine BSRD. This subroutine reads the parameters and control variables that describe the test site conditions. The sequence and format of the data being read is shown in Table A-8, and the variable definitions are given in Table A-9.

Subroutine CONVRT. This subroutine converts all test parameters so that they will be consistent with the data being processed. In particular, all speeds read by BSRD are in units of miles per hour, and are converted to ft/ms. In addition all time parameters are converted to msec.

CONVRT also computes the number of analysis periods on the basis of the analysis interval, and the times at which the data collection was initiated and terminated.

Subroutine RDATA. This subroutine reads the test data prepared by Program EDIT. The first time it is called, RDATA reads and writes the test headings from the tape and returns to the main program. On subsequent calls, RDATA reads test data and returns activation times and device codes to the main program.

Each time a new data record is read, RDATA tests for an end of data indicator. If this is the case, control is immediately returned to the main program.

Subroutine PROCES. The processing of vehicles is initiated by a call to subroutine PROCES. This subroutine first determines whether the activation is an event code or belongs to a trap. In the case of an event code, the activation is saved for subsequent processing and control returned to the main program.

Before processing the current activation, the program checks each trap for old entry activations. If any exist and the axle in front of this old activation is within the distance SPLIM, the exit actuation is falsified using the speed of this axle, and the exit time processed via a call to EXYT.

PROCES then identifies the lane and trap of the detector that has been activated. A determination is then made whether the detector actuated is an entry or exit detector and on this basis call either ENTRE or EXYT, respectively.

Finally, subroutine AXDISC is invoked for each trap to flush old axle groups from the tables. Control is then returned to the main program.

Subroutine ENTRE. Subroutine ENTRE generates axle entry flags associated with each entry detector in the grid. However, because of faulty detectors or recording hardware, two consecutive entry activations may occur without an intermediate exit activation at any particular trap.

If the previous axle at the same trap is within SPLIM ft., the exit activation is falsified using the speed of this axle.

If this condition is not met and the trap is the first one in the grid, the exit activation is falsified using a 9.2 ft. wheelbase for the vehicle.

Otherwise, the subroutine checks back up to 2 traps (via calls to VEHCHK) for a matching vehicle that could have caused these successive entry activations. If such a vehicle is located, its wheelbase is used to falsify the exit activation.

In each of the above cases, the falsified exit activation is processed via a call to EXYT. Finally, an axle entry flag is set for the current entry activation.

Subroutine EXYT. Subroutine EXYT is called upon activation or falsification of an exit detector. The primary purpose of this subroutine is to add axles (via a call to UPDATE) to the axle position and velocity tables as exits are found corresponding to previous axle entry activations. Control is then passed to the axle discrimination subroutine AXDISC which begins the process of relating groups of axles to specific vehicles.

However, because of faulty detectors or recording hardware two consecutive exit activations may occur without either entry activation occurring. If the second exit activation is within SPLIM feet of the axle in front of it, the speed of this axle is used to falsify the entry switch.

If this condition is not met and the trap is the first one in the grid, the entry activation is falsified using a 9.2 ft. wheelbase for the vehicle.

Otherwise, EXYT checks back up to 2 traps (via calls to VEHCHK) for a matching vehicle that could have caused these successive exit activations. If such a vehicle is found, its wheelbase is used to falsify the entry activation.

Subroutine UPDATE. This subroutine adds axles to the axle position and speed tables. In order to circumvent faulty activations, axles less than two feet apart are not entered in the tables.

Subroutine AXDISC. This subroutine begins the process of relating groups of axles to specific vehicles. Subroutine AXDISC accumulates axles into groups if:

a) they are within SPLIM feet of each other

b) their speeds are within the speed tolerance SPDTOL

If both of these conditions are met, the newest axle is flagged to indicate that it belongs to this group. If these conditions are not met and only one of the axles was formed via falsified activations, its time activations are re-computed(via a call to AXCHG) based on the speed of the non-falsified axle. If conditions a) and b) are now met, the newest axle is flagged, and control is returned to the calling program.

When a group of axles is more than SPLIM feet from the trap, subroutine VEHID is called to process this group.

Subroutine AXCHG. This subroutine is called by AXDISC to check if one of two successive axles was formed by falsified detector activations. If this test is met, the time activations of the falsified axle are re-computed using the speed of the other axle.

Subroutine VEHID. This subroutine is called by AXDISC to determine whether the group of axles that has been accumulated represents a truck, platoon, or single automobile. VEHID determines whether the activations have been caused by a truck by determining whether any 2 successive axles are less than 6 feet apart, or whether an odd axle count exists in the current axle group. If this is not the case, a platoon is assumed of length equal to one-half the number of axles counted.

VEHID then computes the:

a) mean axle speed

b) following time and space gap between the current vehicle and the preceeding vehicle

c) speed difference between the current and preceeding vehicle.

The speed and headway distributions are then updated, via calls to SUMUP. The above computed following distance is then inserted into the vehicle tables as the tailway for the preceding vehicle. If all tailways have been inserted for this vehicle, subroutine TAPOUT is invoked to output this vehicle data to tape.

VEHID then examines any outstanding coder hits that are associated with the current vehicle. Control is then passed to GRID for spatial hook-up and generation of the entire vehicle trajectory.

Subroutine SUMUP. This subroutine is called by VEHID to update the speed and headway distributions.

Subroutine GRID. The main purpose of this routine is to spatially relate detector actuations into vehicle trajectories over the entire grid. GRID is called by VEHID everytime a group of axles forms a vehicle. If the vehicle has entered the first trap in a lane, the vehicle is assigned a unique ID number and the vehicle data is stored in the vehicle tables.

If this is not the first trap, GRID checks back up to 2 traps (via calls to VEHCHK) for a matching vehicle that could have caused these current activations. In addition to checking the vehicle dynamics, the program also checks the number of axles and the wheelbase for consistency from trap to trap. If any one of these conditions is not met, GRID checks for a possible straddle (via a call to STDCHK). If a straddle is not found, the vehicle is assigned a unique ID number, the vehicle data is stored in the vehicle tables and subroutine RECORD is invoked to also store this data in the output tables.

If all conditions are met, the vehicle is entered into the tables at the current trap and recorded at the previous trap.

Subroutine UPVEH. This subroutine updates the vehicle tables to allow for insertion of the next vehicle.

Subroutine LANCHK. This subroutine searches for unmatched vehicles at a given trap. The sequence of lanes that are searched depends upon the upstream lane as follows:

Upstream Lane #	Sequence of Lanes Searched
1	2 3 4
2	1 3 4
3	2 4 1
4	3 2 1

Subroutine VEHCHK. This subroutine determines whether two vehicles at different traps are actually the same vehicle. Let S_i and S_j be the vehicle's speeds at traps i and j and D be the distance between the two traps.

Let Δt be the time elapsed between the activations at traps i and j, and let $V = D/\Delta t$ be the average speed of the vehicle.

Let XMAX = max (S_i, S_j) and XMIN = min (S_i, S_j).

If XMAX-XMIN<SLIM(1), then recompute XMAX = max (S_i, S_j) + STOL(1) and XMIN = min (S_i, S_j) - STOL(1).

If SLIM(1)<XMAX-XMIN< SLIM(2), then recompute XMAX= max (S_i, S_j) + STOL (2) and XMIN = min(S_i, S_j) - STOL(2). Now in order for the two actuations to match up, the following test must be satisfied:

$$\text{XMIN} \leq V \leq \text{XMAX}$$

If not, the routine checks to see if the upstream trap is the first one in the grid and the vehicle's axle spacing is 9.2 ft. If so, the speed of the vehicle at the upstream trap is changed using the wheelbase at the downstream detector and the above test tried again.

Subroutine REMOVE. This routine searches the vehicle tables for vehicles that have not been matched up and have exceeded the allowable holding time. These old vehicles are then eliminated from the tables if all tailways have been inserted.

Subroutine STDCHK. This routine searches the vehicle tables for vehicles that have straddled.

Subroutine RECORD. This routine enters the vehicle data into the output tables.

Subroutine SUMARY. This subroutine is called at the end of each analysis period to print the results. This printout includes a summary of vehicles tracked through the grid, a summary of lane changes, straddles and event coder hits, and the first four moments of absolute speeds, relative speeds, time headway gaps and space headway gaps at each trap in the grid.

Subroutine MOMENT. This routine computes the mean, standard deviation, skewness and kurtosis of a set of data.

Subroutine GET. Given a vehicle ID number, this routine determines whether that vehicle has been recorded in the output tables at a given trap.

Subroutine TAPOUT. Given a vehicle ID number, this subroutine writes the vehicle data on the output tape.

Subroutine TYPE. Given the distance between the front two axles and the number of axles, the routines classifies the vehicle as one of the following:

Type	Classification
0	Automobile with wheelbase less than 8.5 feet
1	Automobile with wheelbase between 8.5 and 12 feet
2	2 Axle-truck (wheelbase between 12 and 15 feet)
3	3 Axle-truck (wheelbase between 12 and 15 feet)

Type	Classification
4	2 or 3 axle-bus (wheelbase greater than 15 feet)
5	Multi-axle truck (more than 3 axles)

Subroutine MEMSET. This subroutine initializes an entire array to a given constant.

Time Estimates. The computer time required to reconstruct vehicle trajectories is dependent on the traffic volume, number of lanes, number of switches, etc. An approximation of 110 C.P.U. seconds per hour of data collected may be used for conditions as described in the main text.

Post-Analysis Program

The listing of the program used for this project is included at the end of this appendix. It is not documented since the approach used will vary depending on the nature of the study at hand. The listing is provided here as an aid to experienced programmers in developing software appropriate to future studies using the Traffic Evaluator System.

Table A-8

Input Data Formats

Data Name	Dimension	Units	Format		Number of Cards
IHST	-	-	I1		1
INTRVL	4	hrs. & minutes	4I1	3(4I1,1X)	1
START	4	" " "	4I1		
STP	4	" " "	4I1		
NLANE	-	-	I2	2I2	1
NDEV	-	-	I2		
NEVCNT	-	-	I2		1
IDEVCD	(24,6)	-	24(I2,1X)		1 for each lane
DSPEED	6	mph	6F10.2		1
NPOS	1	-	I2	13I2	1
LPOS	6	-	I2	2I2	
PPOS	6	-	I2		
EDEV	(8,6)	-	8(I2,1X)		1 for each coder position
RLIM	-	ms	E15.8	5E15.8	1
SPDTOL	-	mph	E15.8		
PLTTIM	-	sec	E15.8		
VLIM	-	sec	E15.8		
ALIM	-	ft/sec^2	E15.8		
SPLIM	1	ft	E15.8	5E15.8	1
AXTOL	1	ft	E15.8		
STDTOL	1	ms	E15.8		
SLIM	2	mph	2E15.8		
STOL	2	mph	2E15.8	3E15.8	1
SMIN	1	mph	E15.8		
DSPAIR	8	ft	8F10.0		1
NPSTRT	1	-	I2	2I2	1
NPSTP			I2		

Table A-9

Analysis Variable Definitions

Data Name	Type	Dimension	Description	Initial Value
LANE	Integer	-	Current Lane	Set-up
PAIR	Integer	-	Current Trap	Set-up
TIME	Double	-	Current Time (ms)	Set-up
NPR	Integer	-	#Analysis Periods +1	Set-up
INTMS	Integer		#ms per each anlaysis period	Set-up
RLIM	Real	-	Allowable time limit for entry flags (ms)	Input
SPDTOL	Real	-	Speed tolerance for 2 successive axles (mph) (convert to ft/ms)	Input
SMIN	Real	-	Min speed (mph) (convert to ft/ms)	Input
NEVCNT	Integer	-	#Event counter devices/coder buttons	Input
EVTDEV(I)	Integer	64	Event counter device codes	Input
PR	Integer	-	Current Analysis period	0
IEV (I)	Integer	64	Event count, ith device	0
NLANE	Integer	-	# of lanes	Input
NDEV	Integer	-	# device codes in each lane	Input
IDEVCD(I,J)	Integer	(24,6)	Ith device code, lane J	Input
NAXLES(I,J)	Integer	(6,6)	# axles in lane I, trap J	0

Table A-9

Analysis Variable Definitions

Data Name	Type	Dimension	Description	Initial Value
NFLGAX(I,J)	Integer	(6,6)	# flagged axles in lane I, trap J	0
FINDEX	Integer	-	Index of first flagged axle more than SPLIM from exit detector (in current lane)	-
PLTOON	Integer	-	Platoon size	-
SPEED	Real	-	Vehicle speed (ft/ms.)	-
FOLLOW	Real	-	Following distance (ft)	-
PRTIME (I,J)	Double	(6,6)	Rear axle time of previous vehicle in lane I, trap J	-1
PRSPED(I,J)	Real	(6,6)	Speed of previous vehicle in Lane I, trap J (ft/ms)	-
DELSPD	Real	-	Difference in speeds between vehicles (ft/ms)	-
C1	Real	-	Conversion factor mph to ft/ms	-
C2	Real	-	Conversion factor ft/ms to mph	-
C3	Real	-	Conversion factor ft/ms^2 to $miles/hr^2$	-
ICD	Integer	-	Last device code read from input test data	-
ITM	Real	-	Last time associated with ICD read from input test data	-
START (4)	Integer	(4)	Start time (24 hr. time) (4I1)	Input
STP (4)	Integer	(4)	Stop time (24 hrs. time) (4I1)	Input

Table A-9

Analysis Variable Definitions

Data Name	Type	Dimension	Description	Inital Value
INTRVL (I)	Integer	(4)	Analysis interval 1, 2 = hrs., 3, 4 = min. (4I1)	Input
AXTIME(I,J,K)	Double	(17,4,6)	Time for Ith axle in lane J, trap K	-
AXFLAG(I,J,K)	Logical	(17,4,6)	Flag for Ith axle in lane J, trap K	False
AXSPED(I,J,K)	Real	(17,4,6)	Speed for Ith axle in lane J, trap K	-
AXENRY(I,J)	Double	(6,6)	Axle entry time for lane I,trap J	-1
ITYPE	Integer	-	Current vehicle type (1=auto, 2=non-auto)	-
NPAIR	Integer	-	# traps per lane	Set-up
NOVEH	Integer	-	Current vehicle ID#	-
IPLTN	Integer	-	Current platoon #	-
AXCNT	Integer	-	# axles, current vehicle	-
FTIME	Double	-	Front axle time (ms)	-
RTIME	Double	-	Rear axle time (ms)	-
FSPEED	Real	-	Front axle speed (ft/ms)	-
RSPEED	Real	-	Rear axle speed (ft/ms)	-
NCROSS(I,J,K)	Integer	(6,6,6)	Vehicles of type I crossing trap K in lane J	-

Table A-9

Analysis Variable Definitions

Data Name	Type	Dimension	Description	Initial Value
IX(I)	Integer	80	Heading from raw data tape	Input
IDVEH(I,J,K)	Integer	(17,4,6)	ID# of vehicle I,lane J,trap K	-
IVTYPE(I,J,K)	Integer	(17,4,6)	Vehicle type of vehicle I, lane J, trap K	-
IPLTON(I,J,K)	Integer	(17,4,6)	Platoon # for vehicle I, lane J, trap K	-
IAXLE(I,J,K)	Integer	(17,4,6)	# axles for vehicle I, lane J, trap K	-
FTM(I,J,K)	Double	(17,4,6)	Front axle time (ms),vehicle I, lane J, trap K	-
FSPD (I,J,K)	Real	(17,4,6)	Front axle speed (ft/ms),vehicle I, lane J, trap K	-
RTM (I,J,K)	Double	(17,4,6)	Rear axle time (ms),vehicle I, lane J, trap K	-
RSPD (I,J,K)	Real	(17,4,6)	Rear axle speed (ft/ms) vehicle I, lane J, trap K	-
ASPEED (I,J,K)	Real	(17,4,6)	Average speed (ft/ms), vehicle I, lane K, trap L	
VEHCNT(I,J)	Integer	(6,6)	# vehicles in tables at lane I, trap J	-
ISTRDL(I,J)	Integer	(6,6)	# straddles, lane I, trap J	-
VLIM	Real	-	Time limit (sec) for removing vehicles from tables (converted to sec.)	Input
ALIM	Real	-	Max acceleration (ft/sec^2) -converted to (ft/ms^2)	Input
SPLIM	Real	-	Max distance allowed between 2 successive axles (ft)	Input
DSPEED(I)	Real	6	Default speed for lane I (mph) converted to ft/ms	Input

Table A-9

Analysis Variable Definition

Data Name	Type	Dimension	Description	Initial Value
LANCHG(I,J,K)	Integer	(6,6,6)	# lane changes between trap K and K-1 from lane I to lane J	-
AXEXYT(I,J)	Double	(6,6)	Axle exit switch time for lane I, trap J (only set when AXENRY (I,J)=-1)	-1
FLTIME	Double	-	Following time of previous vehicle (ms)	-
SPACE	Real	-	Distance between front 2 axles	-
AXSPAC (I,J,K)	Real	(17,4,6)	Distance between front 2 axles of vehicle I, lane J, trap k	-
THEAD(I,J,K)	Real	(17,4,6)	Time headway gap vehicle I, lane J, trap K	-
SHEAD(I,J,K)	Real	(17,4,6)	Space headway gap vehicle I, lane J, trap K	-
ICODE (I,J,K)	Integer	(17,4,6)	Event codes, vehicle I, lane J, trap K	-
TAIL(I,J,K)	Real	(17,4,6)	Tailway space gap, vehicle I, lane J, trap K	-
AXTOL	Real	-	Distance tolerance allowed between SPACE readings from trap to trap	Input
STDTOL	Real	-	Straddle time tolerance	Input
EVTIME(I,J)	Double	(6,6)	Time of event hits, lane I, trap J	-1
IHST	Integer	-	Control parameter: = 0 print distributions = 1 do not print distributions = 9 stop processing	Input

Table A-9

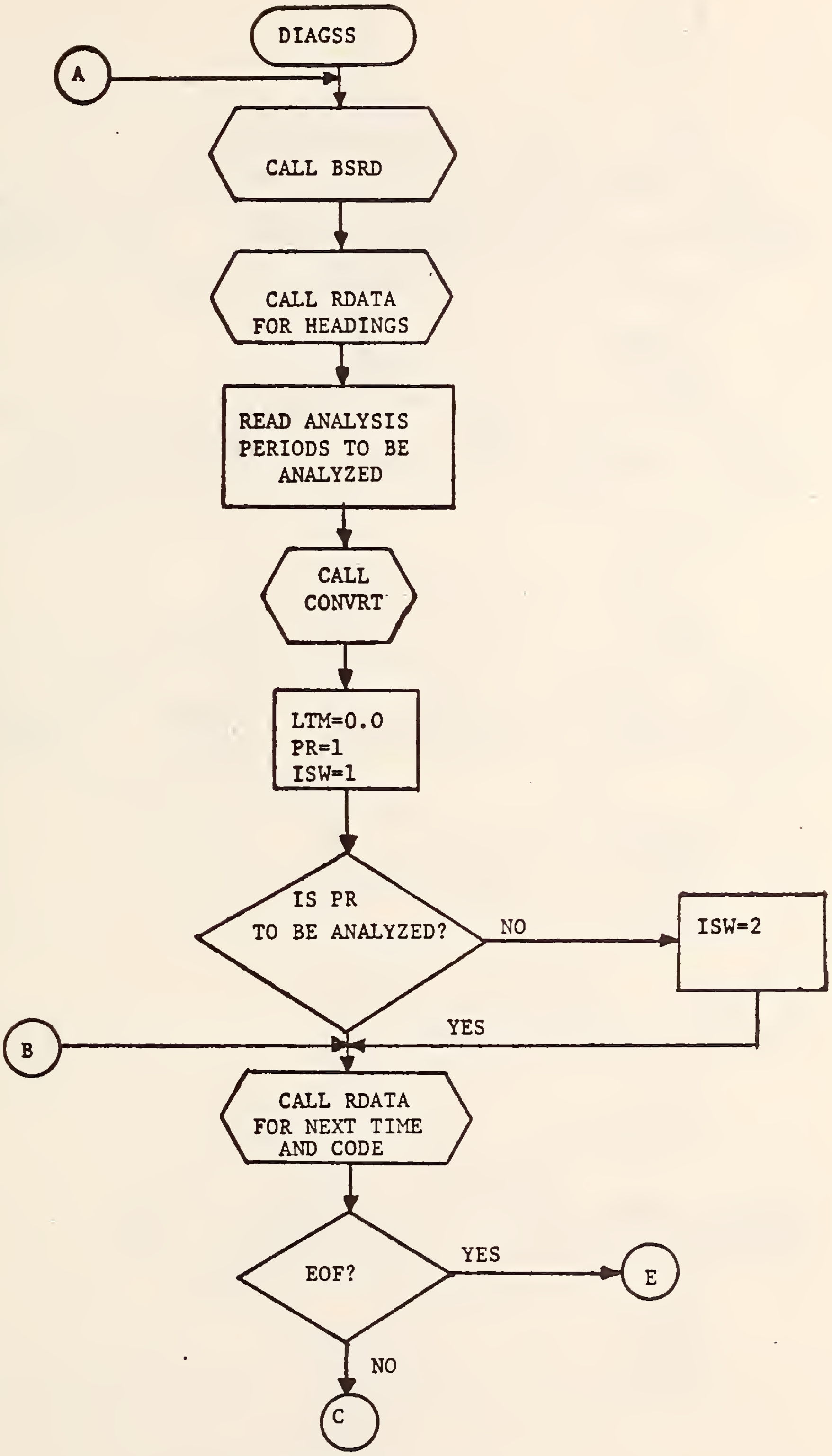
Analysis Variable Definition

Data Name	Type	Dimension	Description	Initial Value
SLIM(I)	Real	2	Vehicle checking constants used by subroutine VEHCHK	Input
STOL(I)	Real	2	Vehicle checking constants used by subroutine VEHCHK	Input
NVEH	Integer	-	# Vehicles in output tables	0
IVEH(I)	Integer	75	Vehicle ID# of I^{th} vehicle in output tables	0
INDEX(I,J)	Logical	(75,6)	= True if I^{th} vehicle recorded at trap J = False if I^{th} vehicle not recorded at trap J	False
NSAMP(I,J)	Integer	(4,6)	Sample size for distribution I at trap J I = 1 speed distribution I = 2 relative speed distribution I = 3 time headway gap distribution I = 4 space headway gap distribution	0
ASUM(I,J,K)	Real	(4,4,6)	First 4 moments of speed, lane J, trap K	0
RSUM (I,J,K)	Real	(4,4,6)	First 4 moments of relative speed, lane J, trap K	0
THSUM (I,J,K)	Real	(4,4,6)	First 4 moments time headway gap, lane J, trap K	0
SHSUM (I,J,K)	Real	(4,4,6)	First 4 moments space headway gap, lane J, trap K	0
NTRACK(I)	Integer	6	# Vehicles tracked through I traps	0
NCR	Integer	-	# outstanding coder hits not yet associated with a vehicle	0
NPOS	Integer	-	# coding positons	Input
LPOS(I)	Integer	6	Lane # for coding position I	Input

Table A-9

Analysis Variable Definition

Data Name	Type	Dimension	Description	Initial Value
PPOS(I)	Integer	6	Trap # for coding position I	Input
LCDR(I)	Integer	4	Storage area for coder hits belonging to current vehicle	-
DSPAIR (I)	Real	8	Distance between trap I and trap I + 1	Input
IEVCDR(I,J)	Integer	(6,6)	I^{th} unprocessed coder hits at coding position J	-
KKK	Integer	-	Control parameter for bypassing the removal of old vehicles from the tables (1=on, o=off).	Set-up
ITYP(I)	Integer	75	Type of I^{th} vehicle in output tables.	-
NPRD(I)	Integer	75	Type of vehicle in front of I^{th} vehicle in output tables	-
NPLTON(I)	Integer	75	Platoon # of I^{th} vehicle in output tables	-
NAXL(I)	Integer	75	# axles in I^{th} vehicle in output tables	-
NCODE(I)	Integer	75	Coder hits associated with I^{th} vehicle in output tables.	
LN(I,J)	Integer	(6,75)	Lane # of J^{th} vehicle in output tables at the I^{th} trap.	-
BFF(I,J,K)	Real	(9,6,75)	Vehicle output buffer area for K^{th} vehicle at trap J	-



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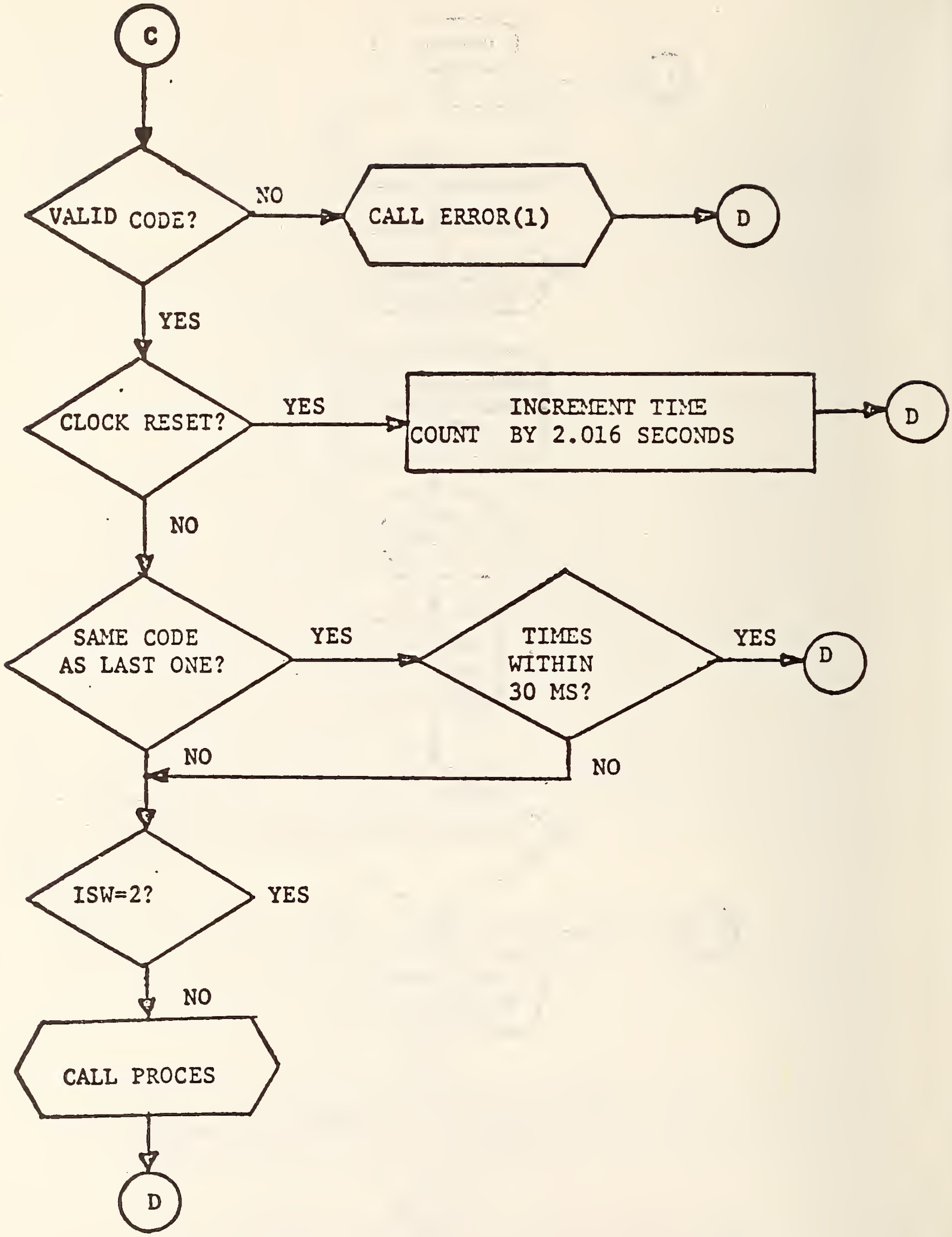

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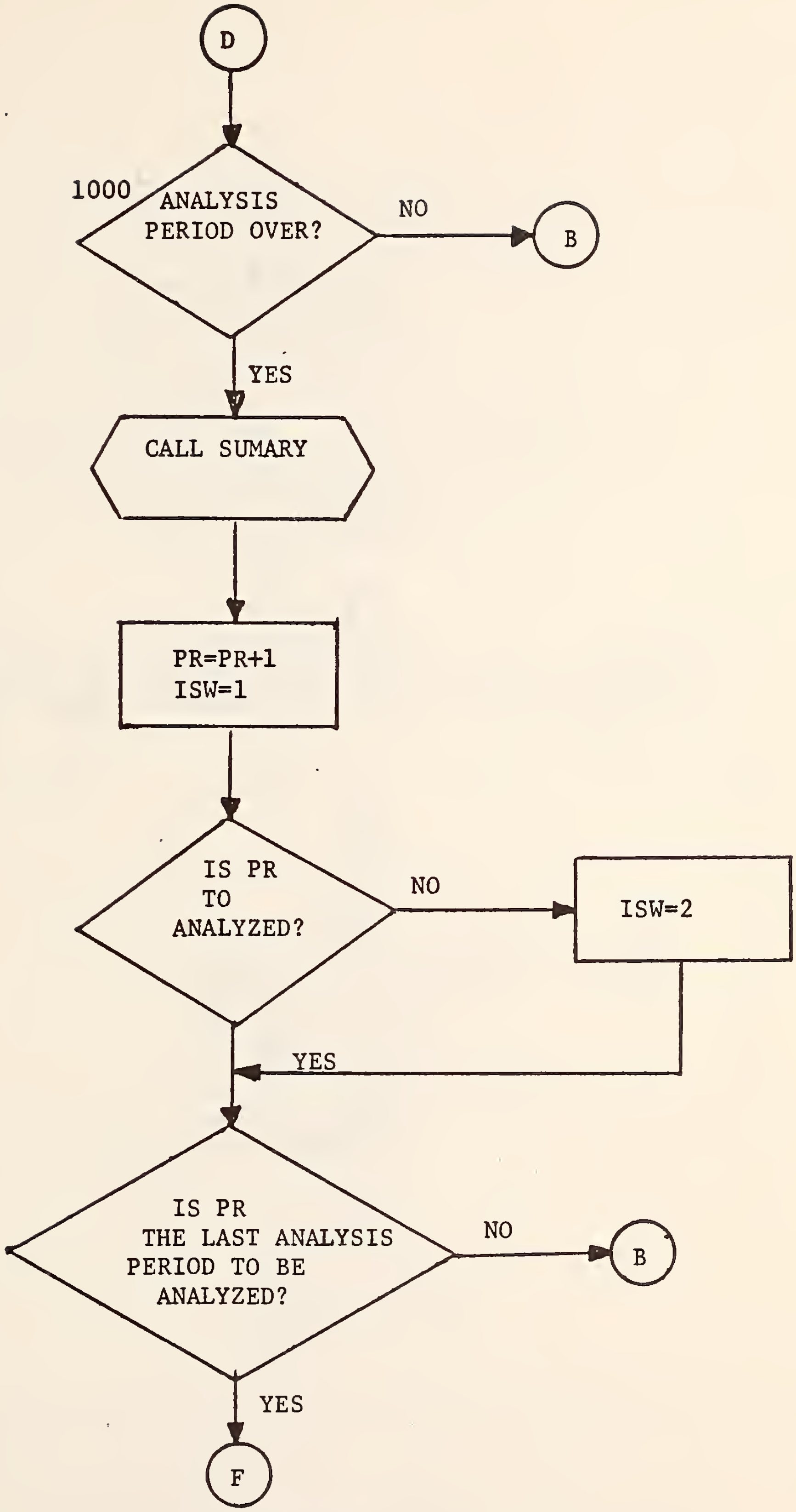

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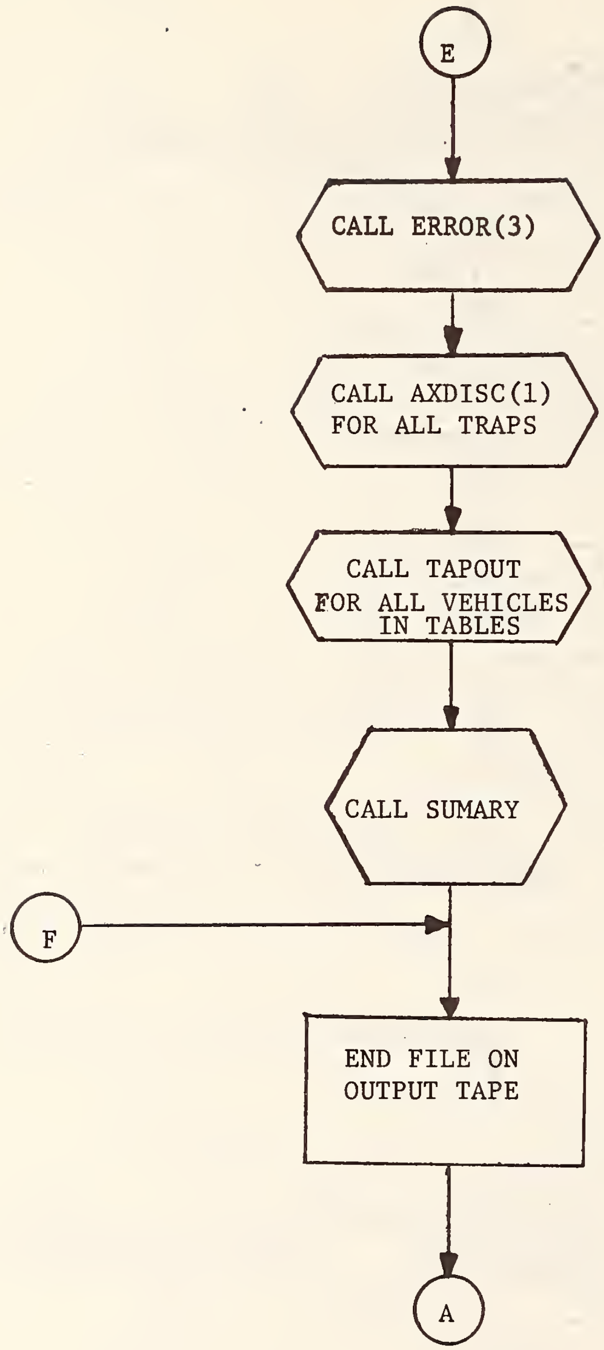

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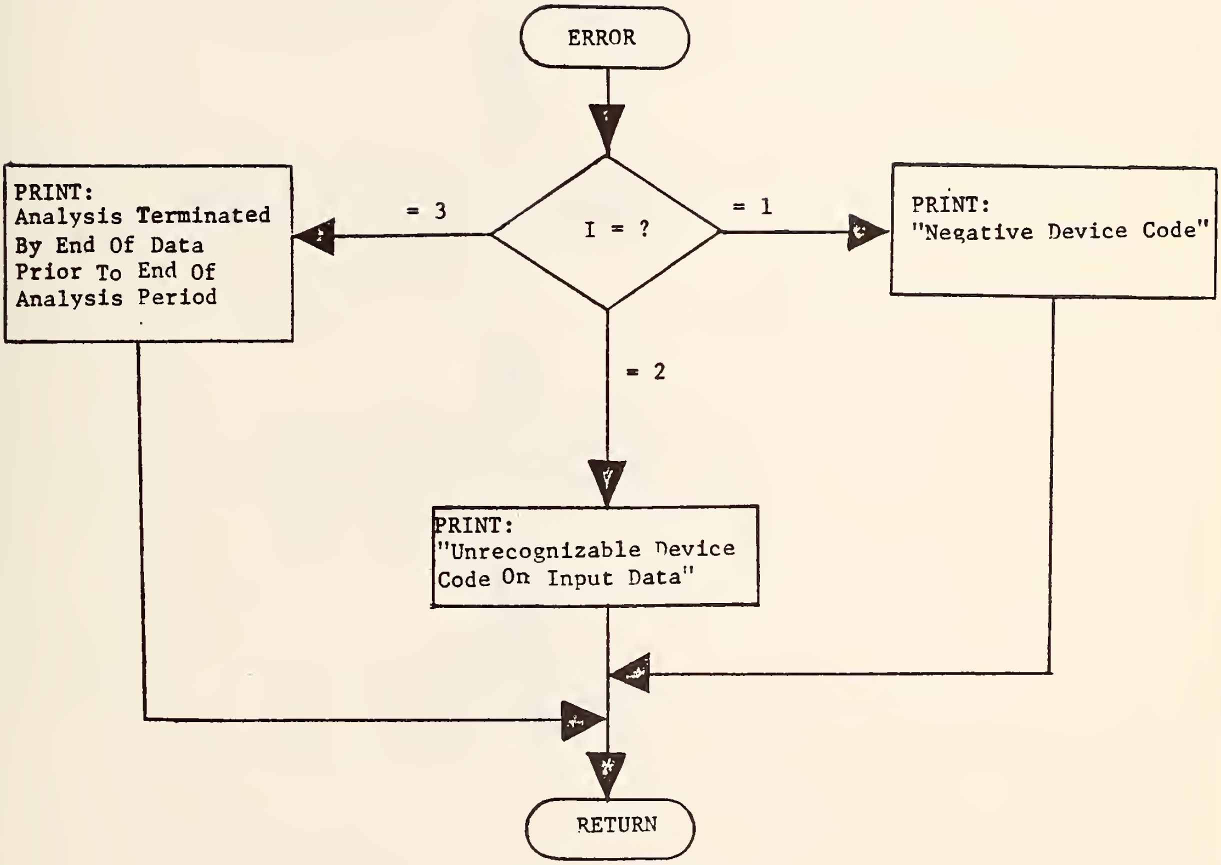

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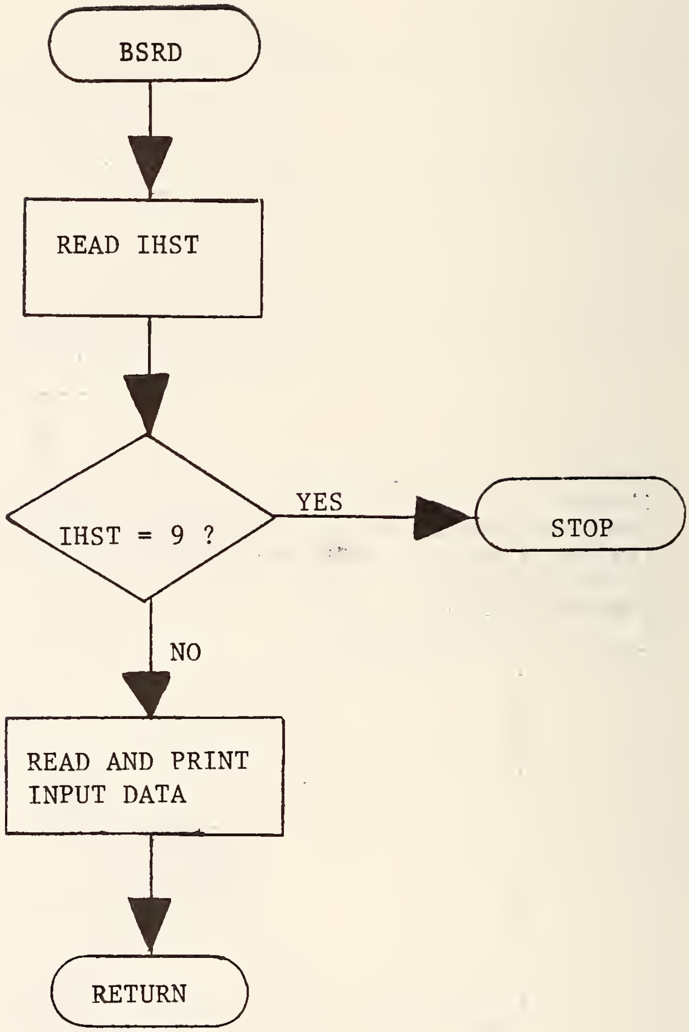

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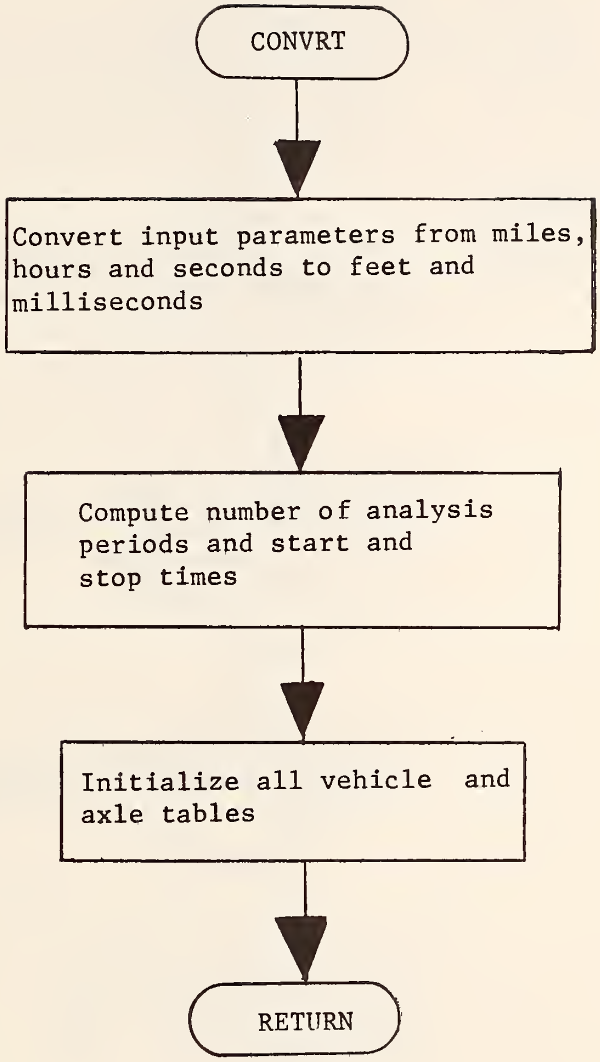

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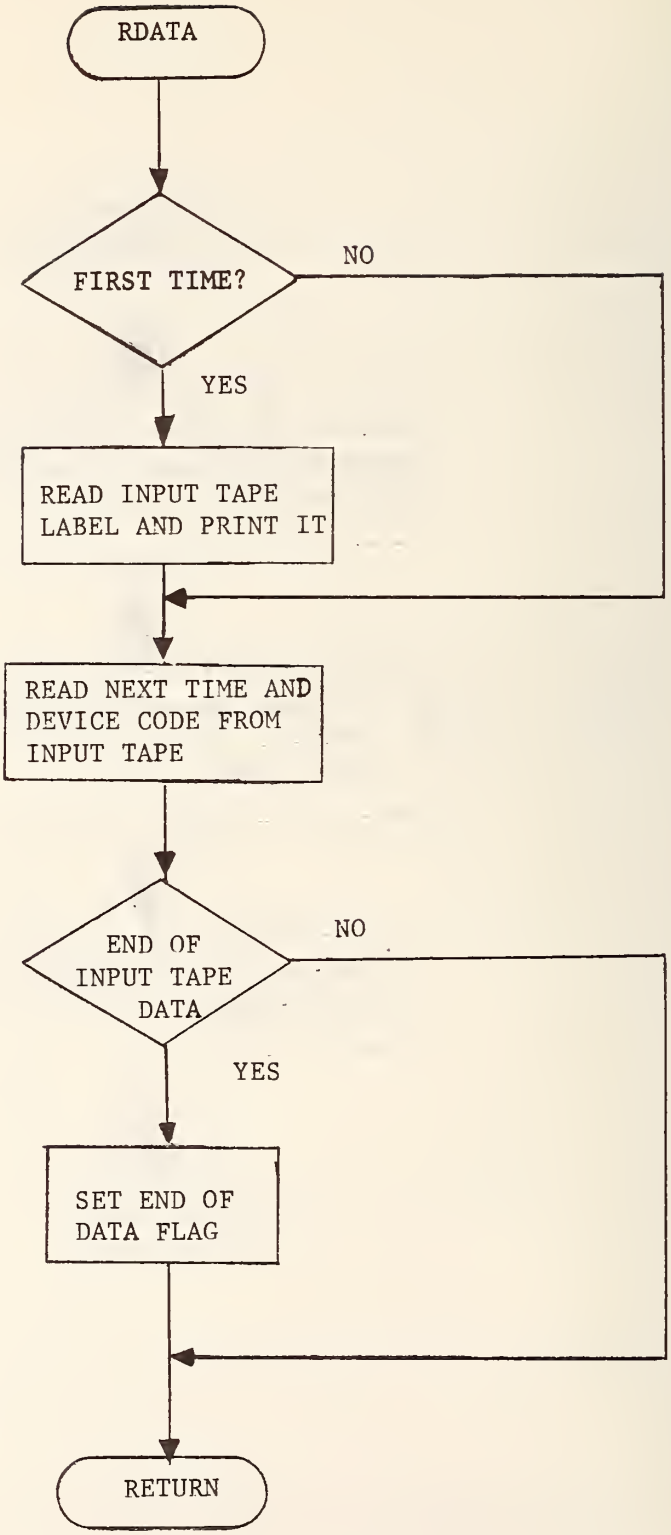
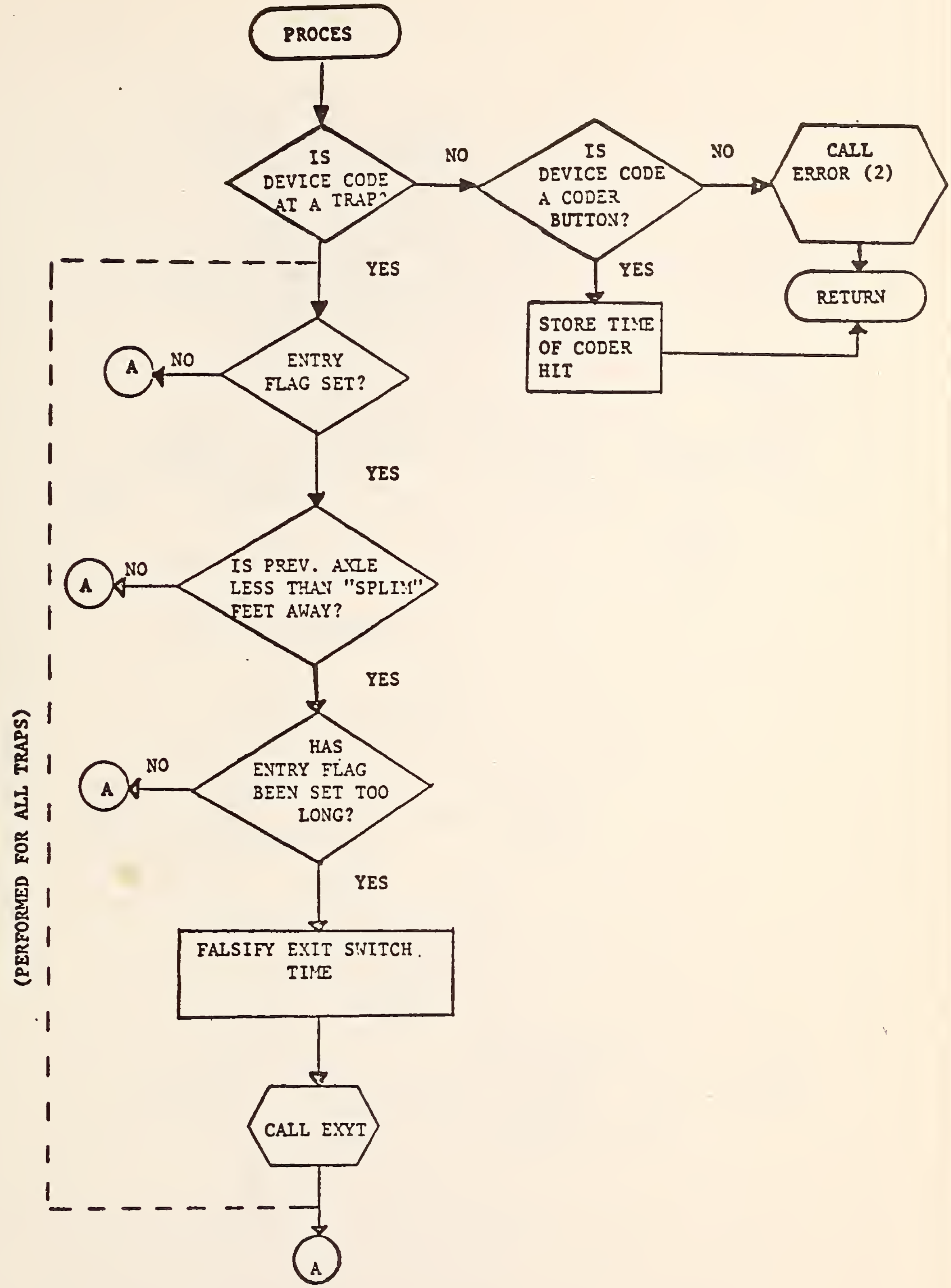


SUBROUTINE RDATA



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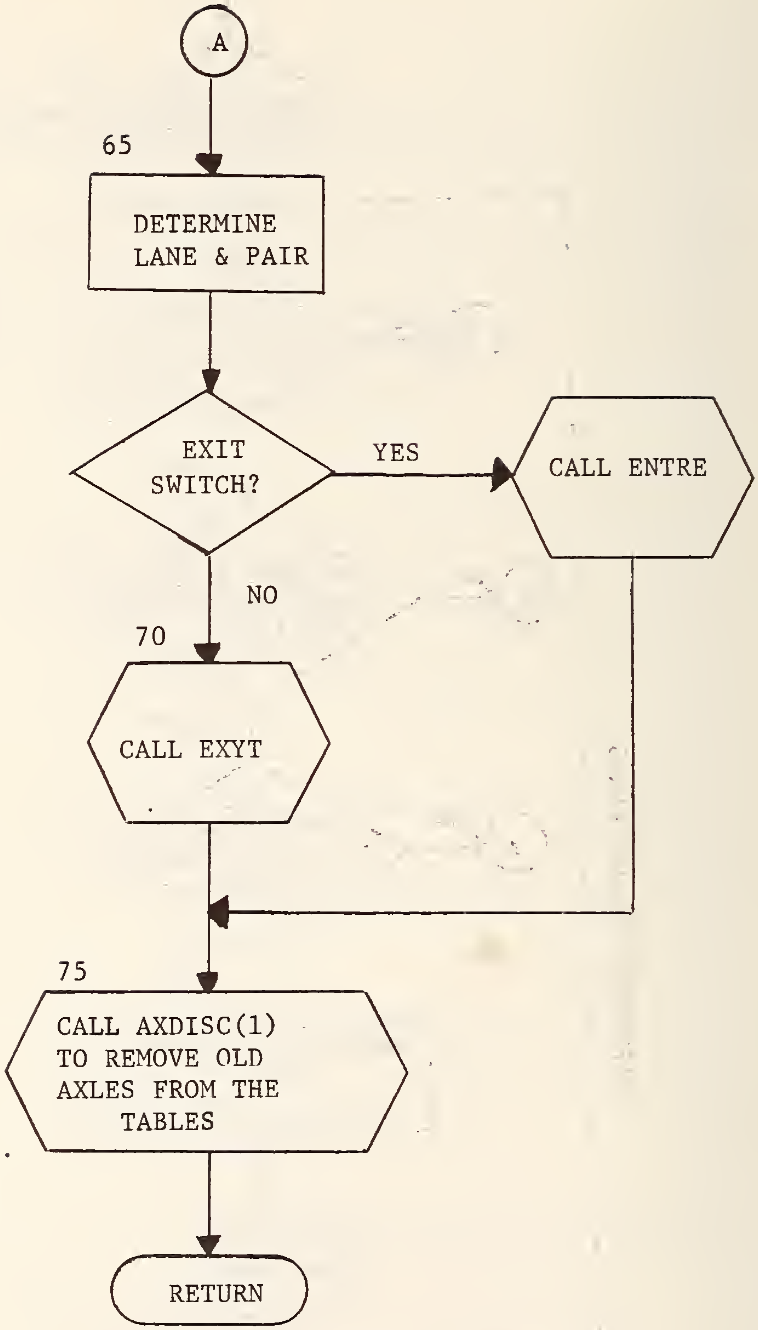

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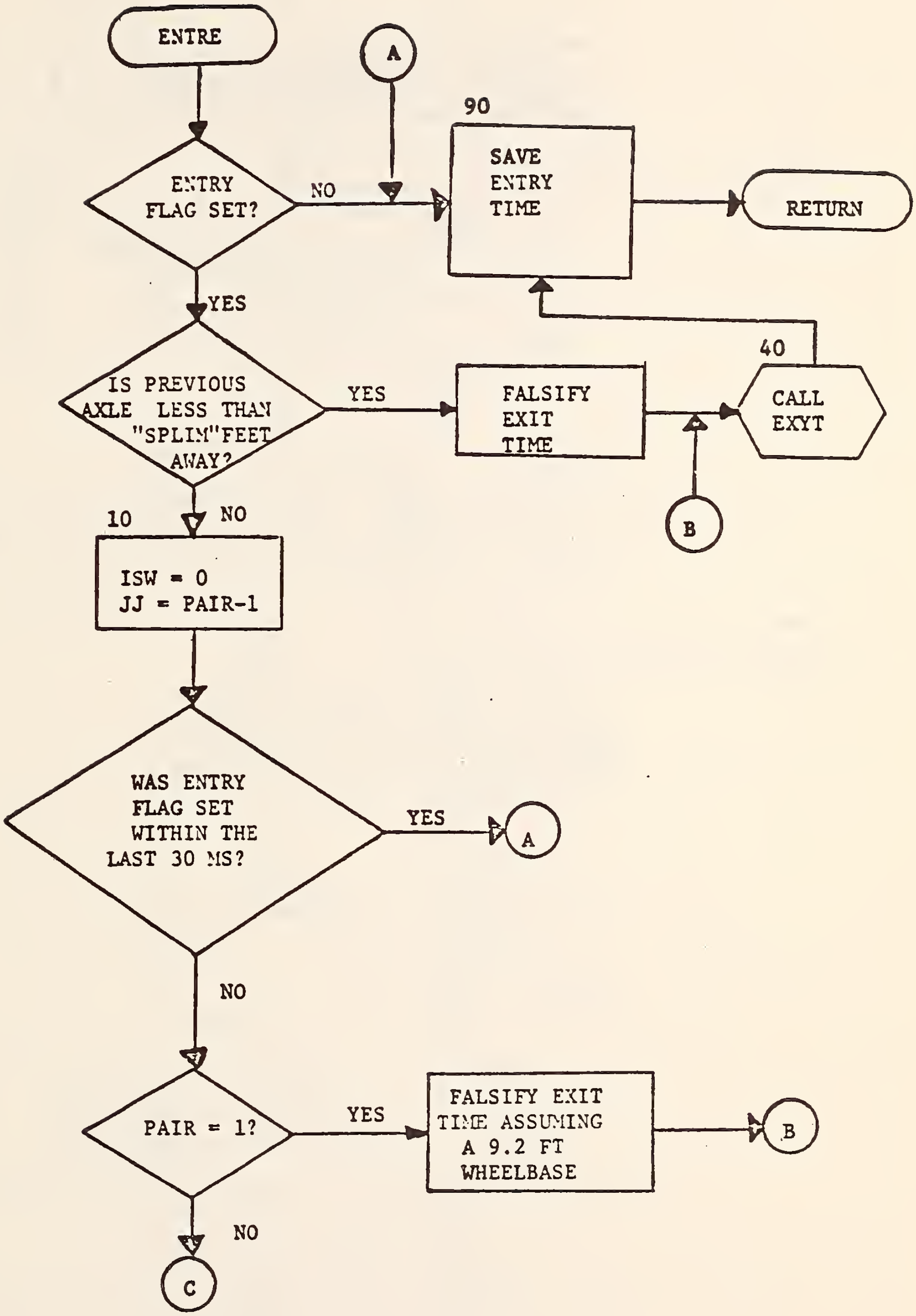

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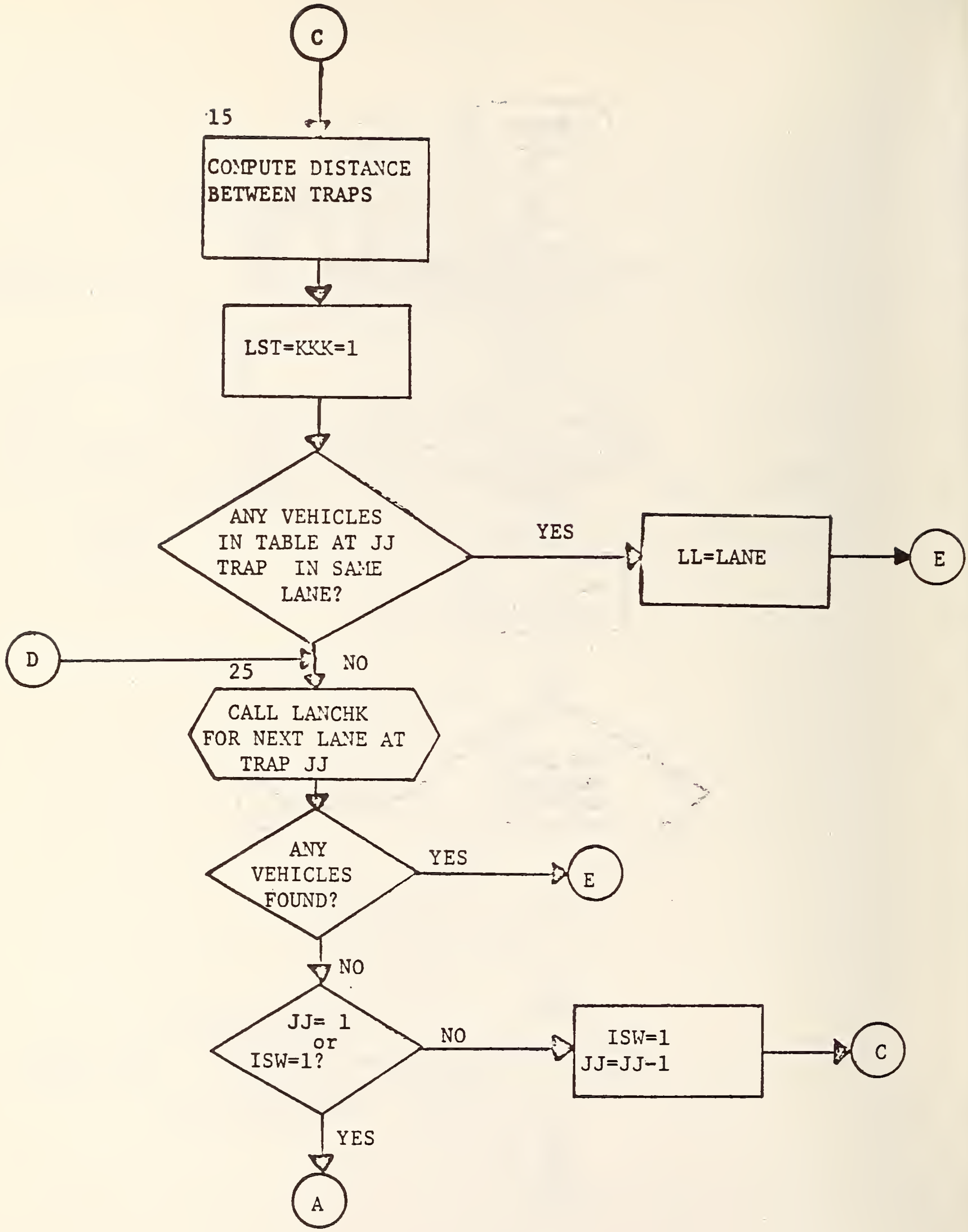

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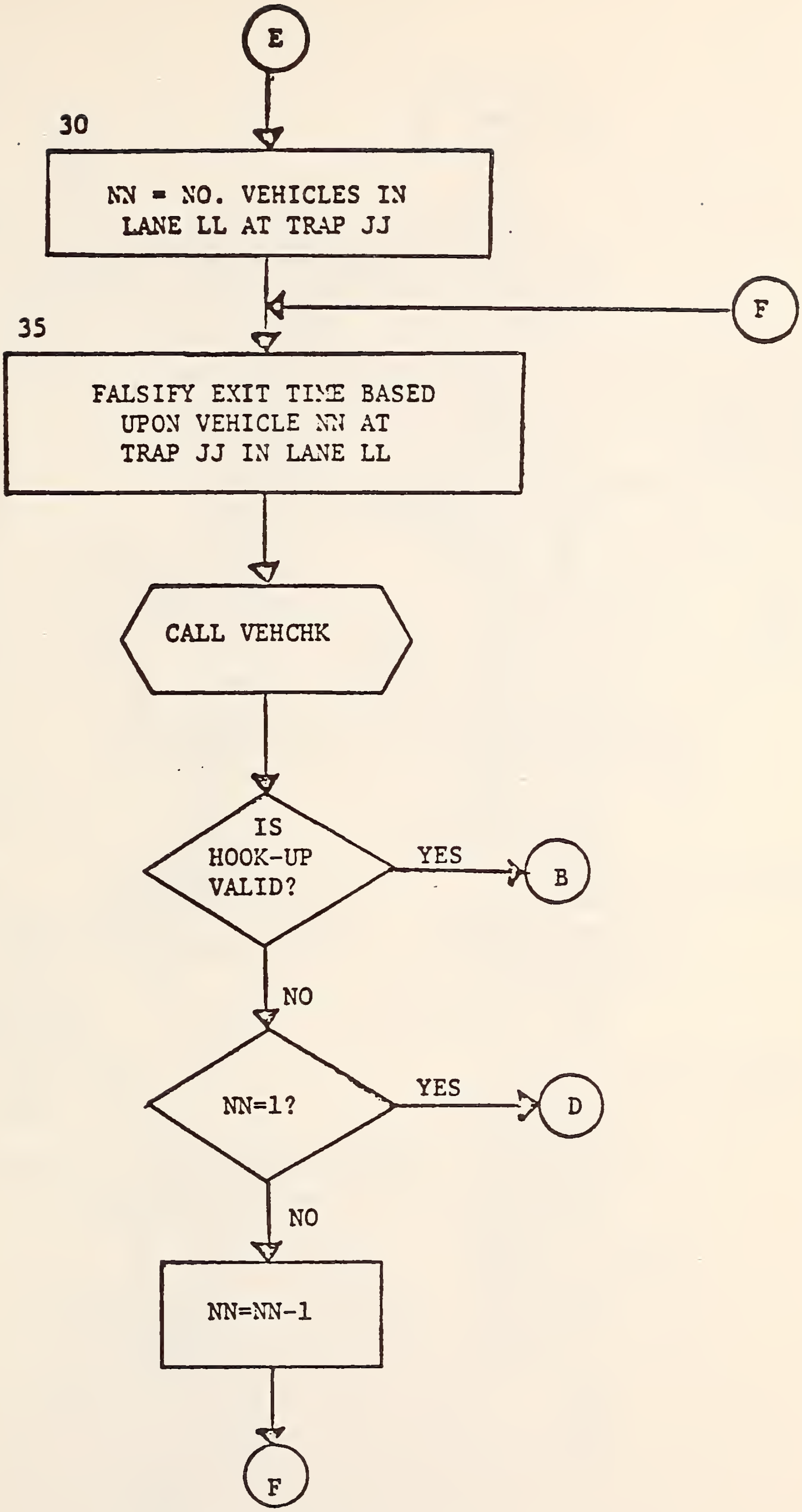

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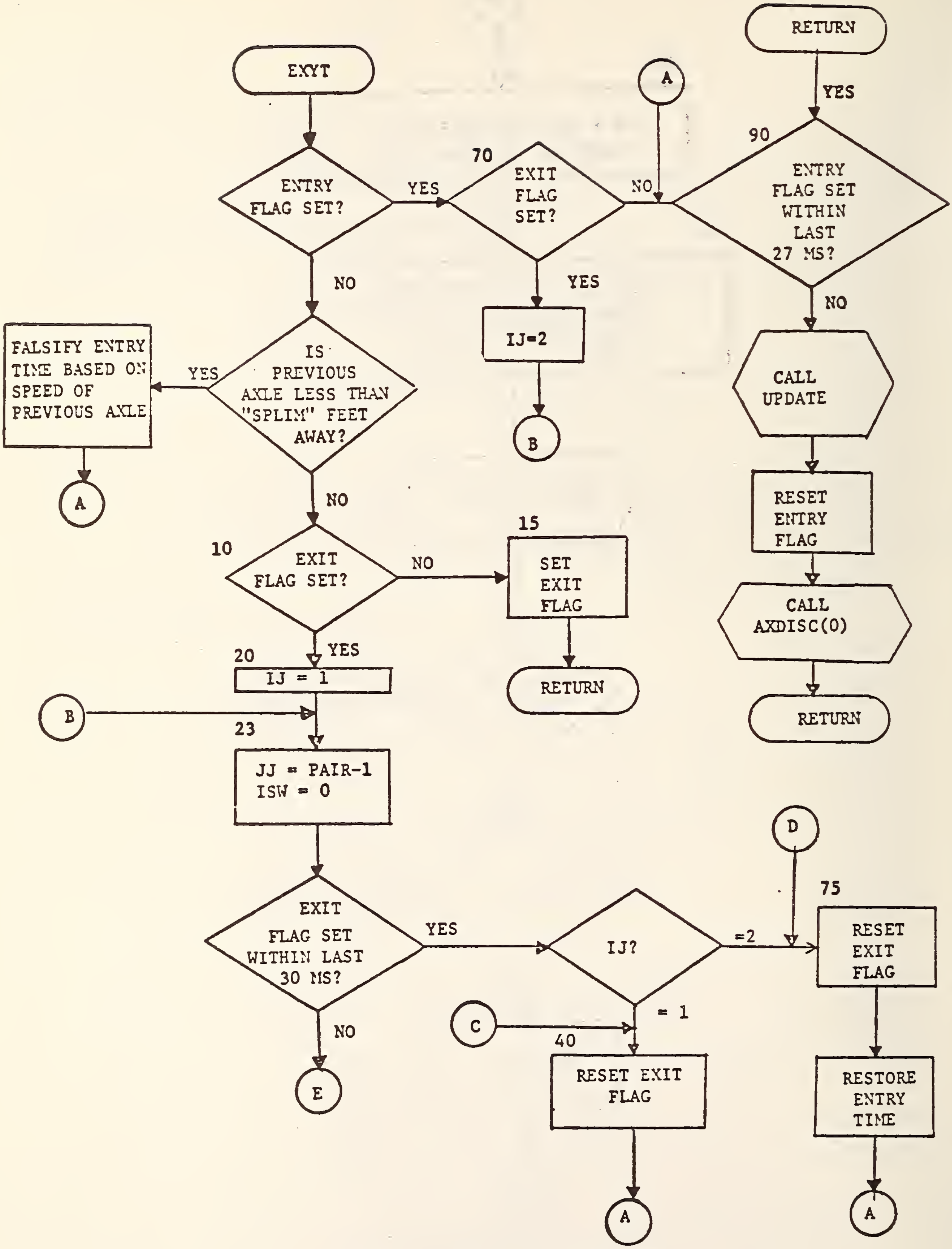

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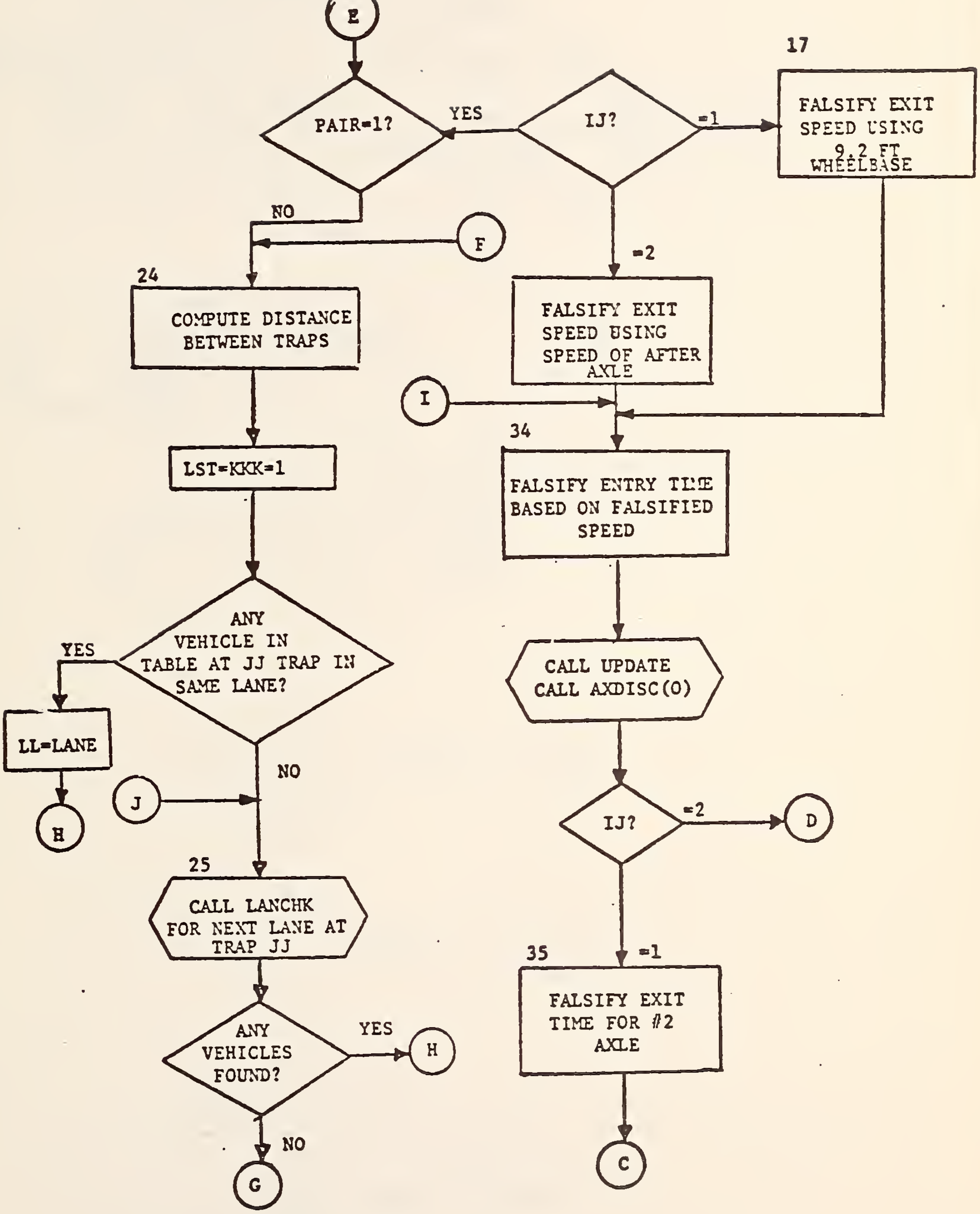

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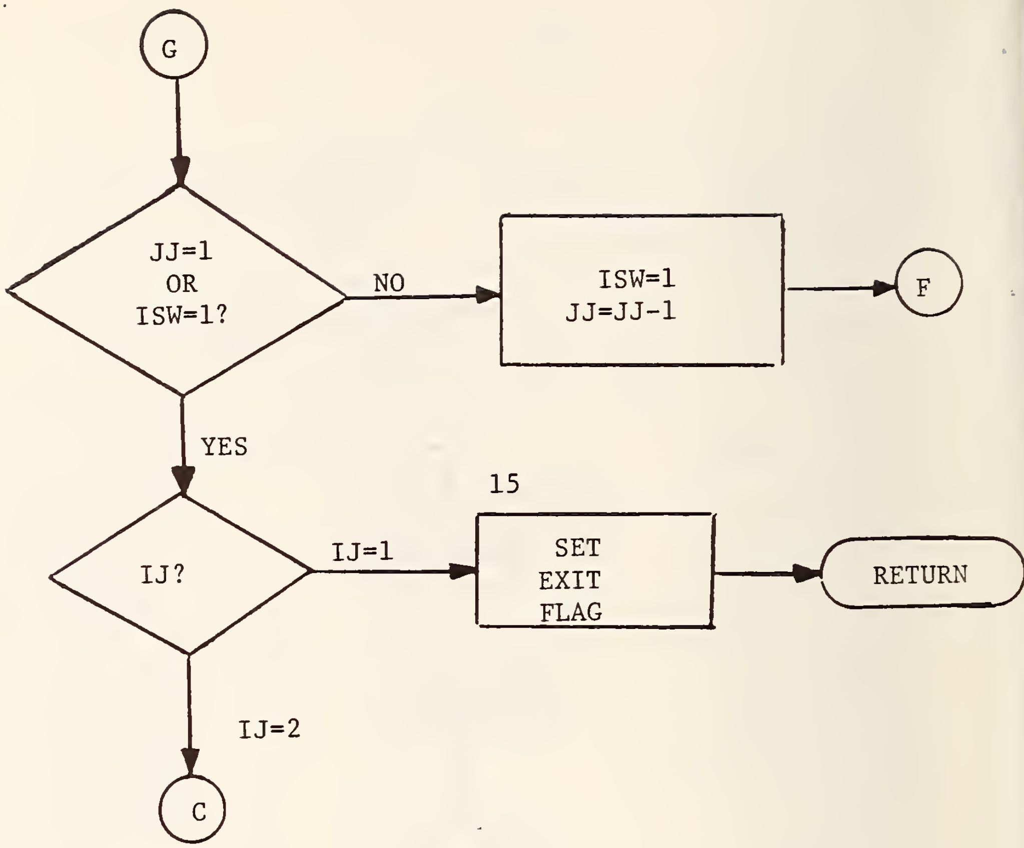

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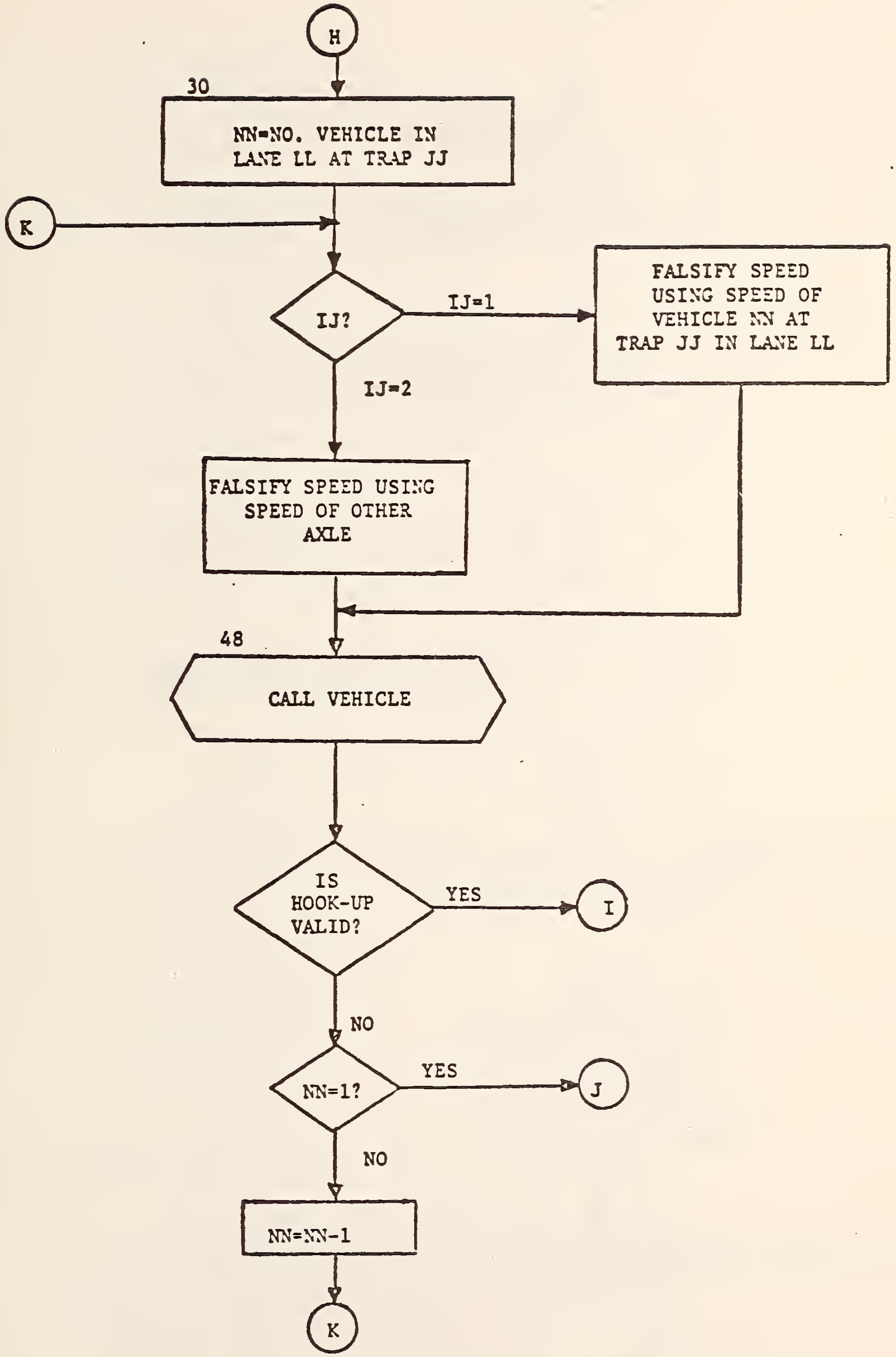
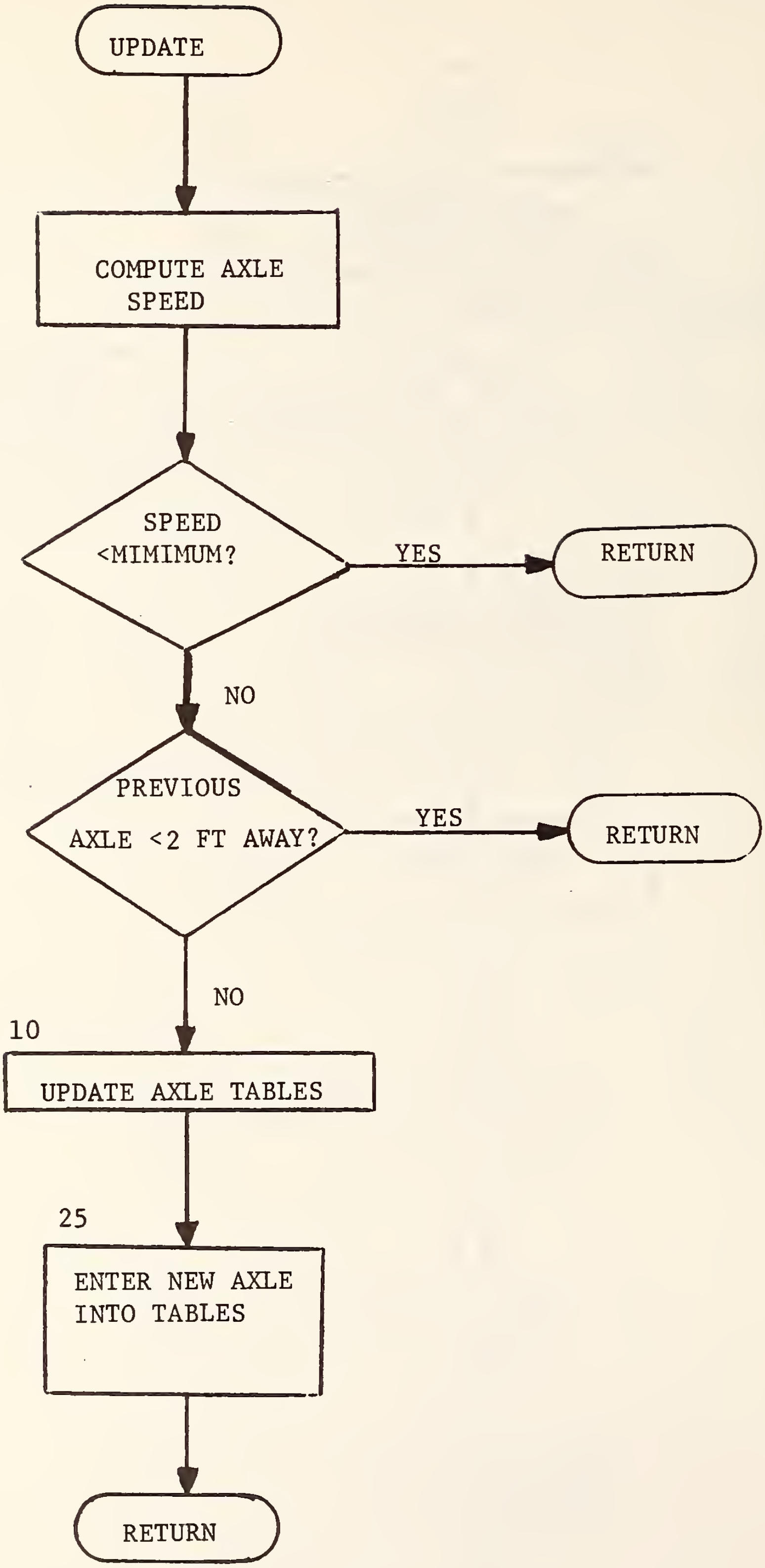
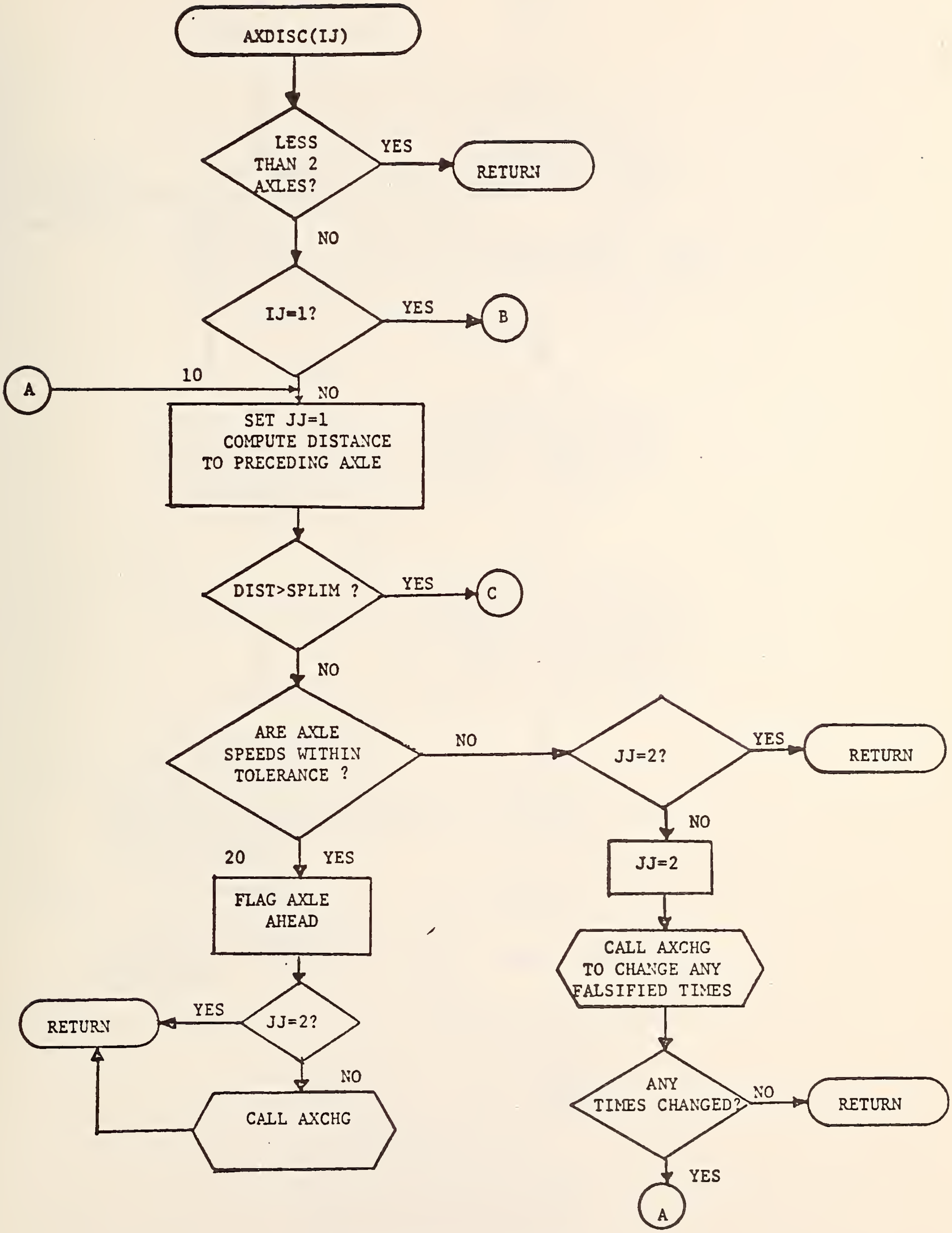


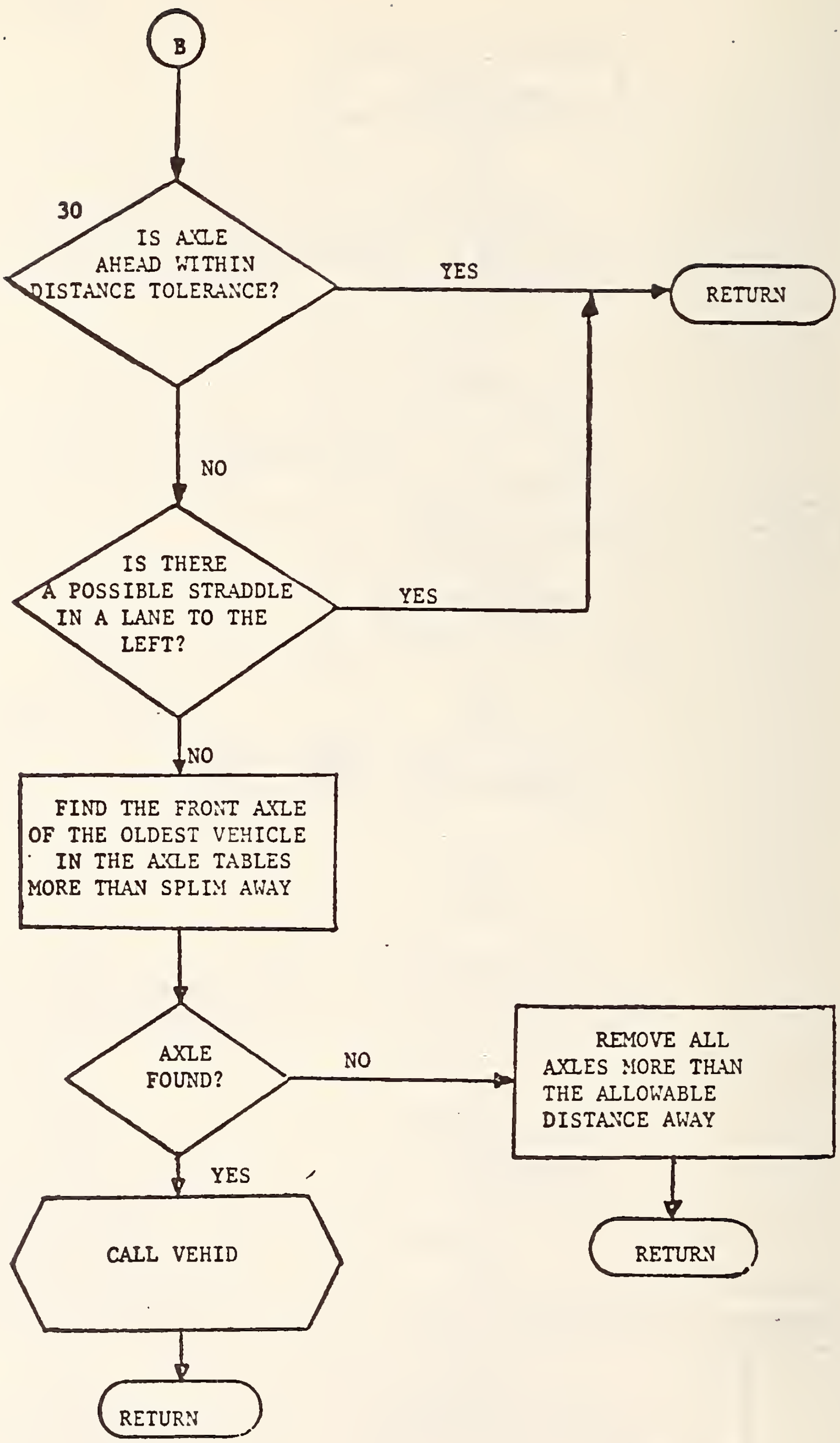
SUBROUTINE EXYT (4 of 4)



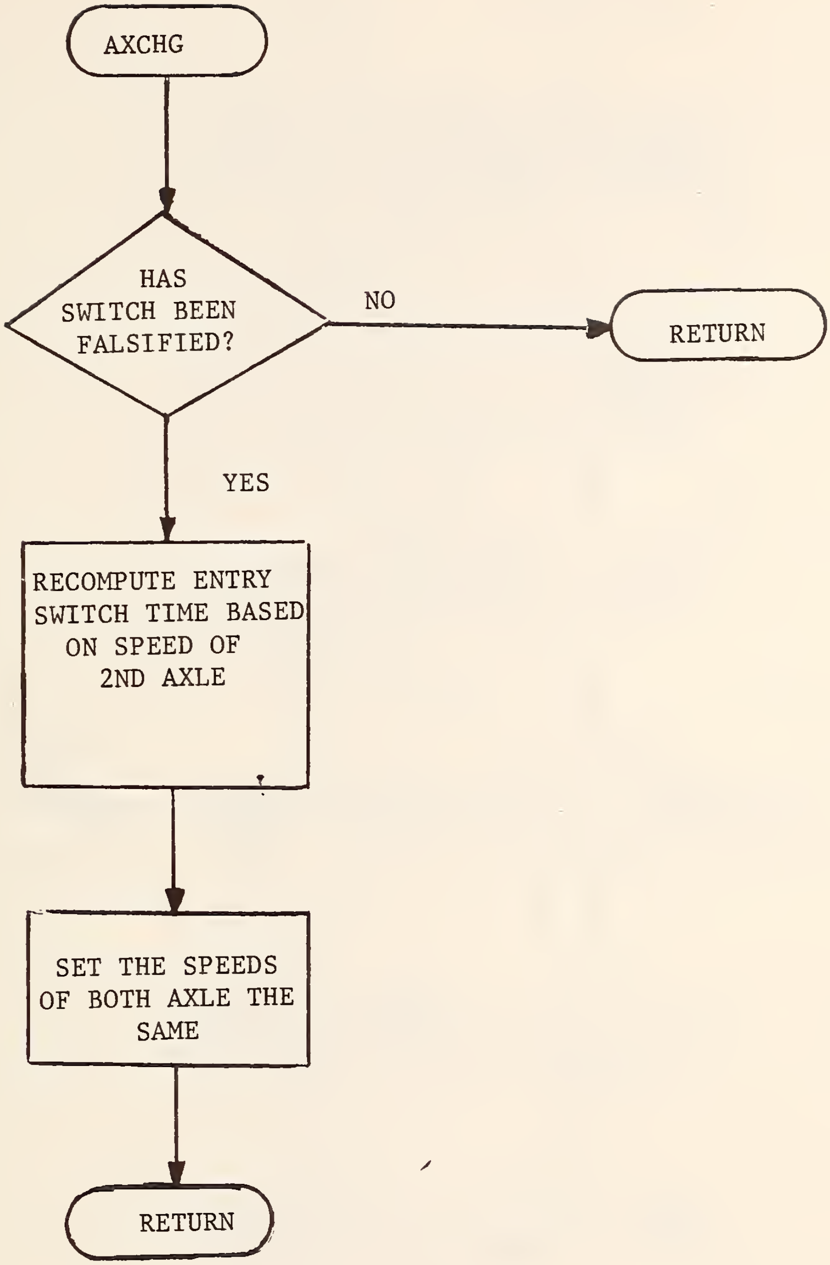
SUBROUTINE UPDATE



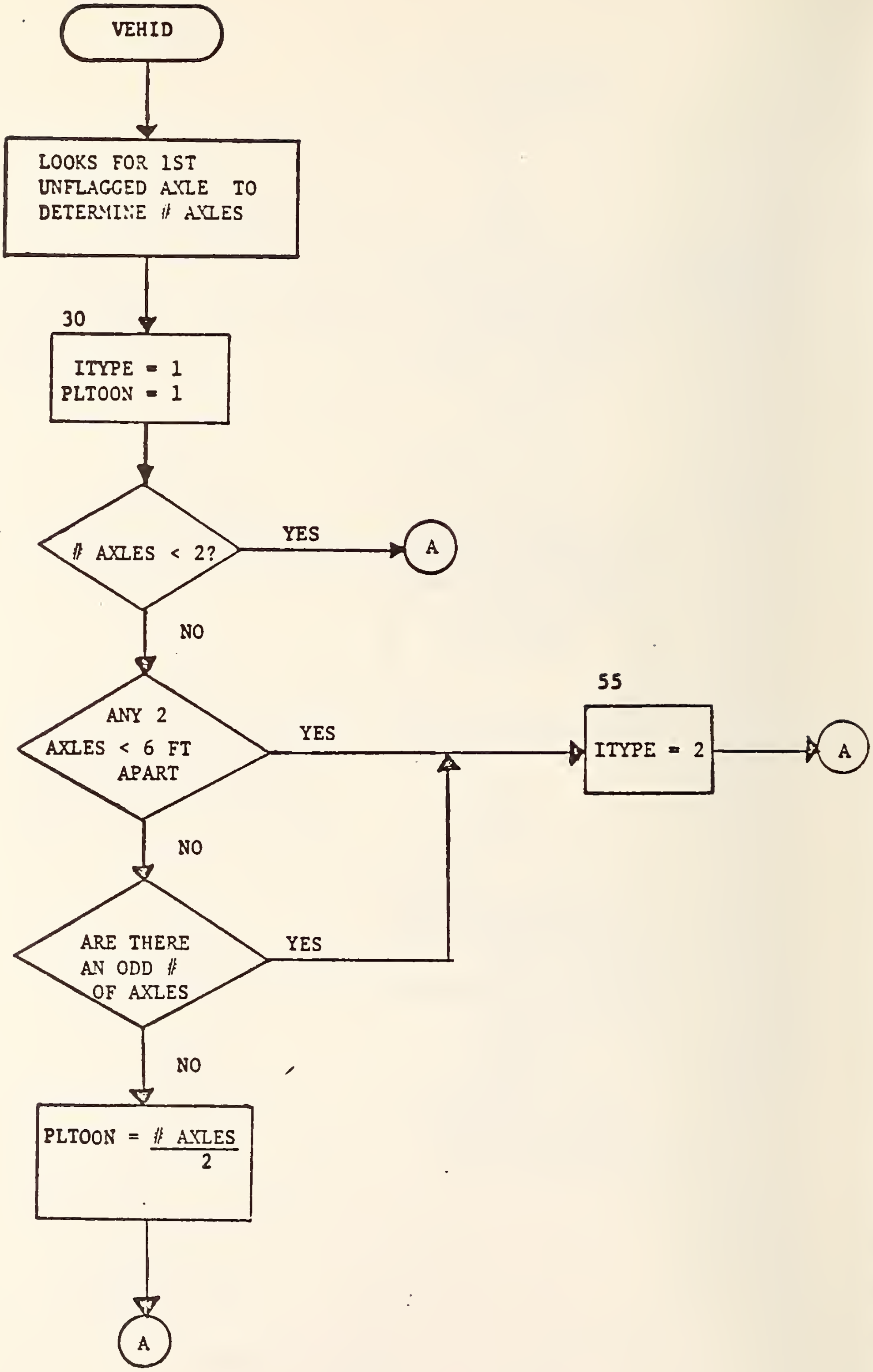
SUBROUTINE AXDISC (1 of 2)



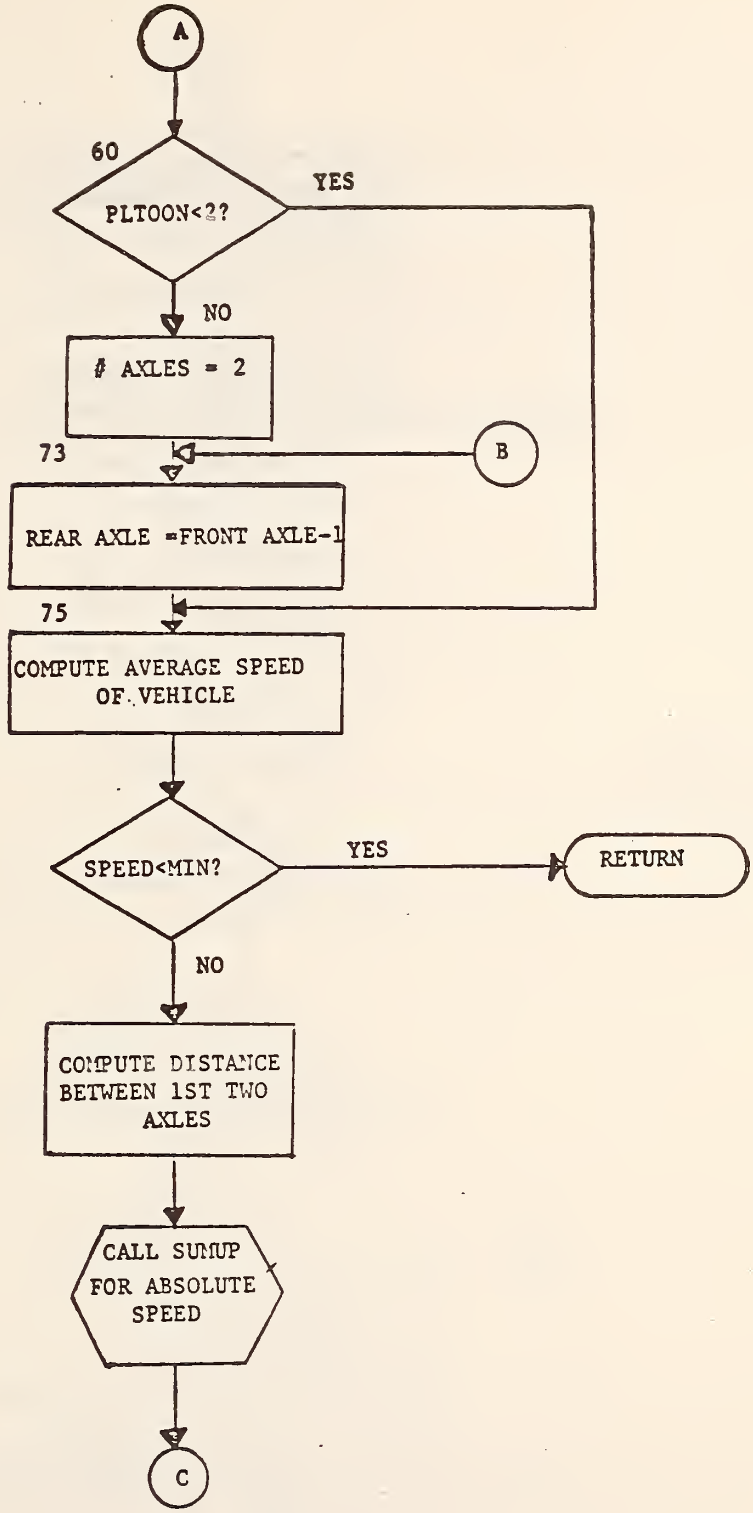
SUBROUTINE AXDISC (2 of 2)



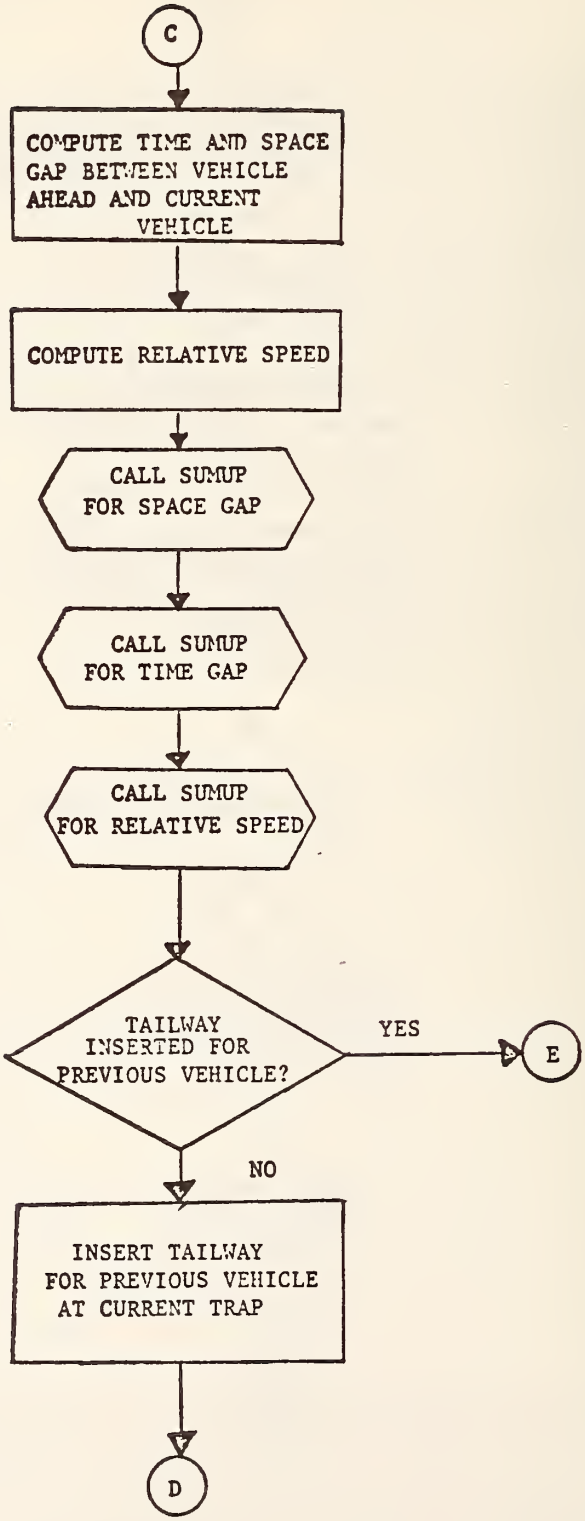
SUBROUTINE AXCHG



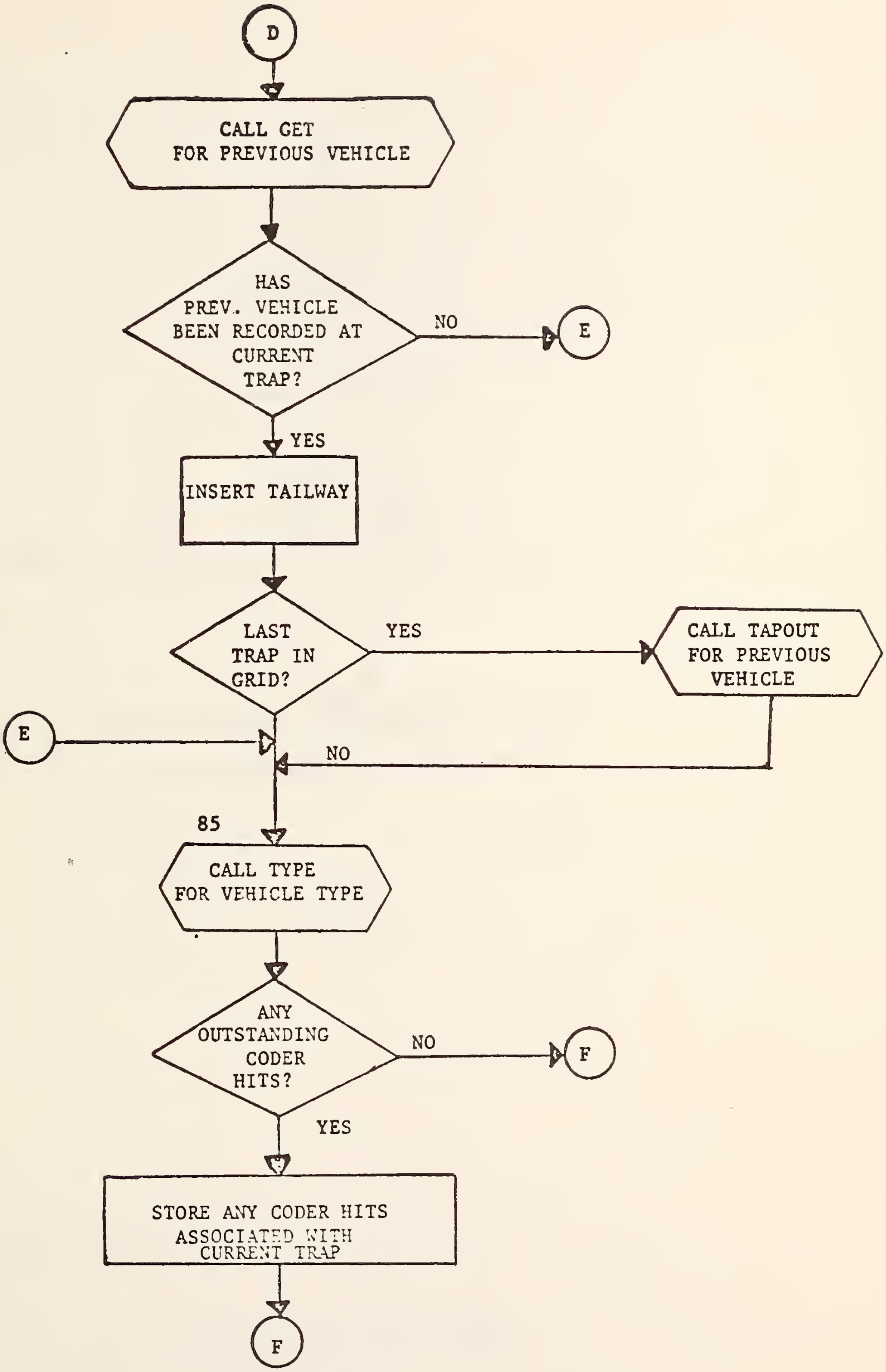
SUBROUTINE VEHID (1 of 5)



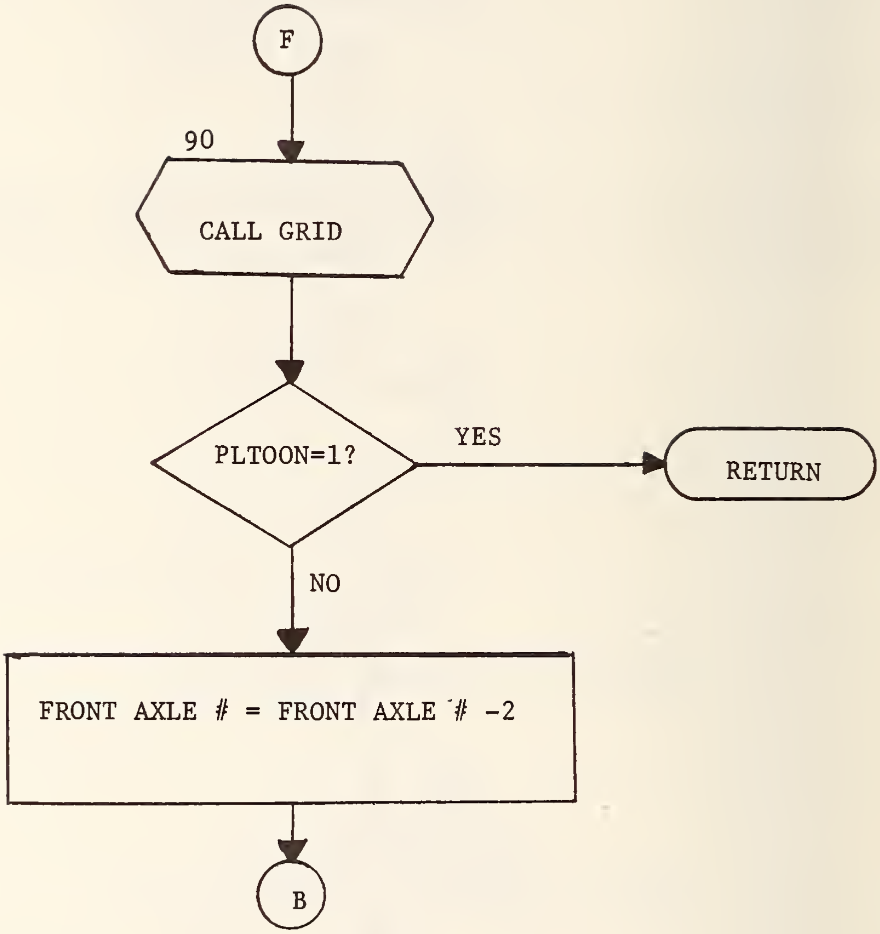
SUBROUTINE VEHID (2 of 5)



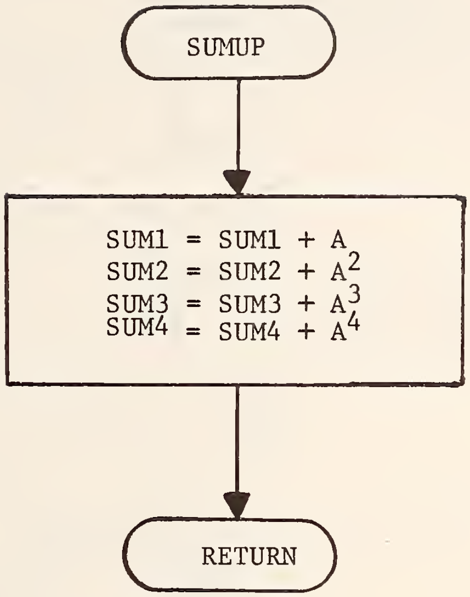
SUBROUTINE VEHID (3 of 5)



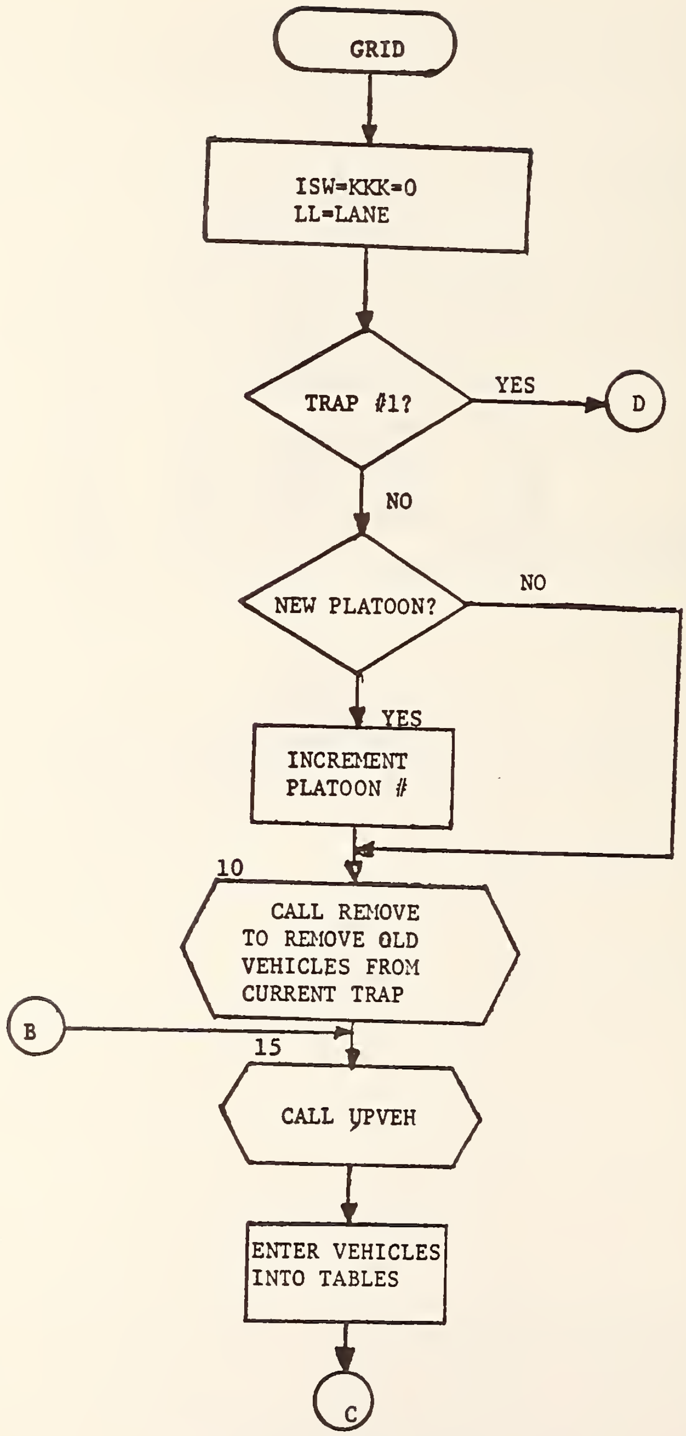
SUBROUTINE VEHID (4 of 5)



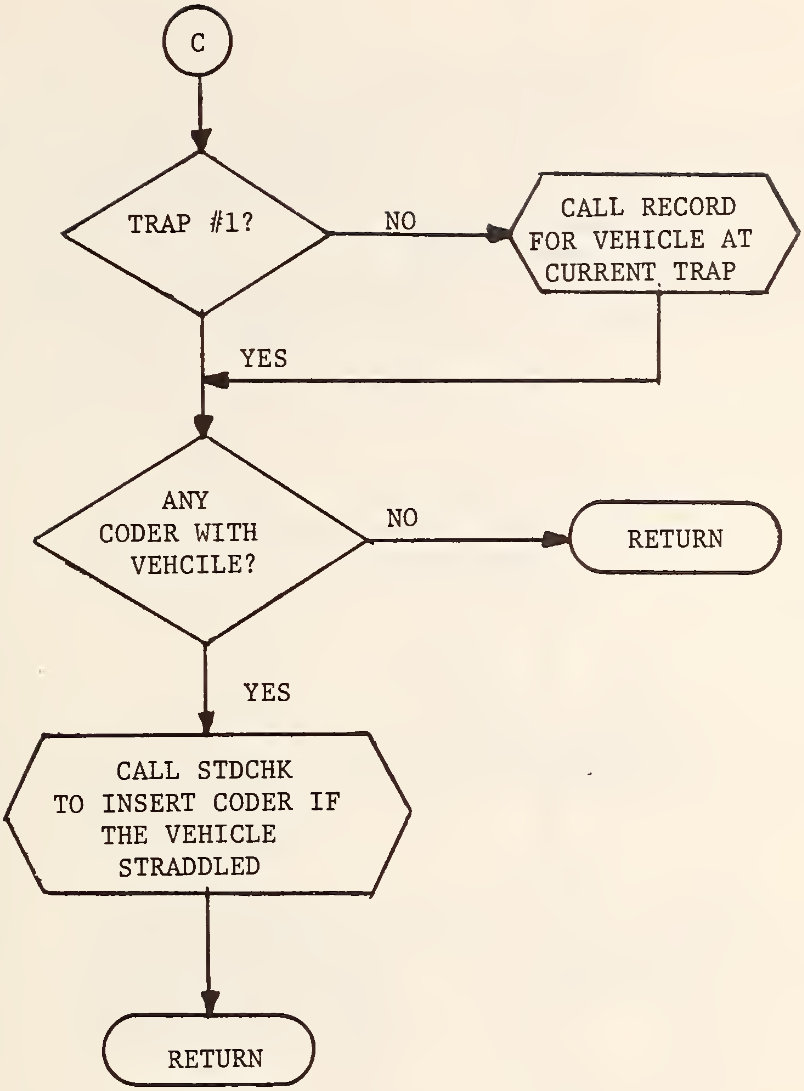
SUBROUTINE VEHID (5 of 5)



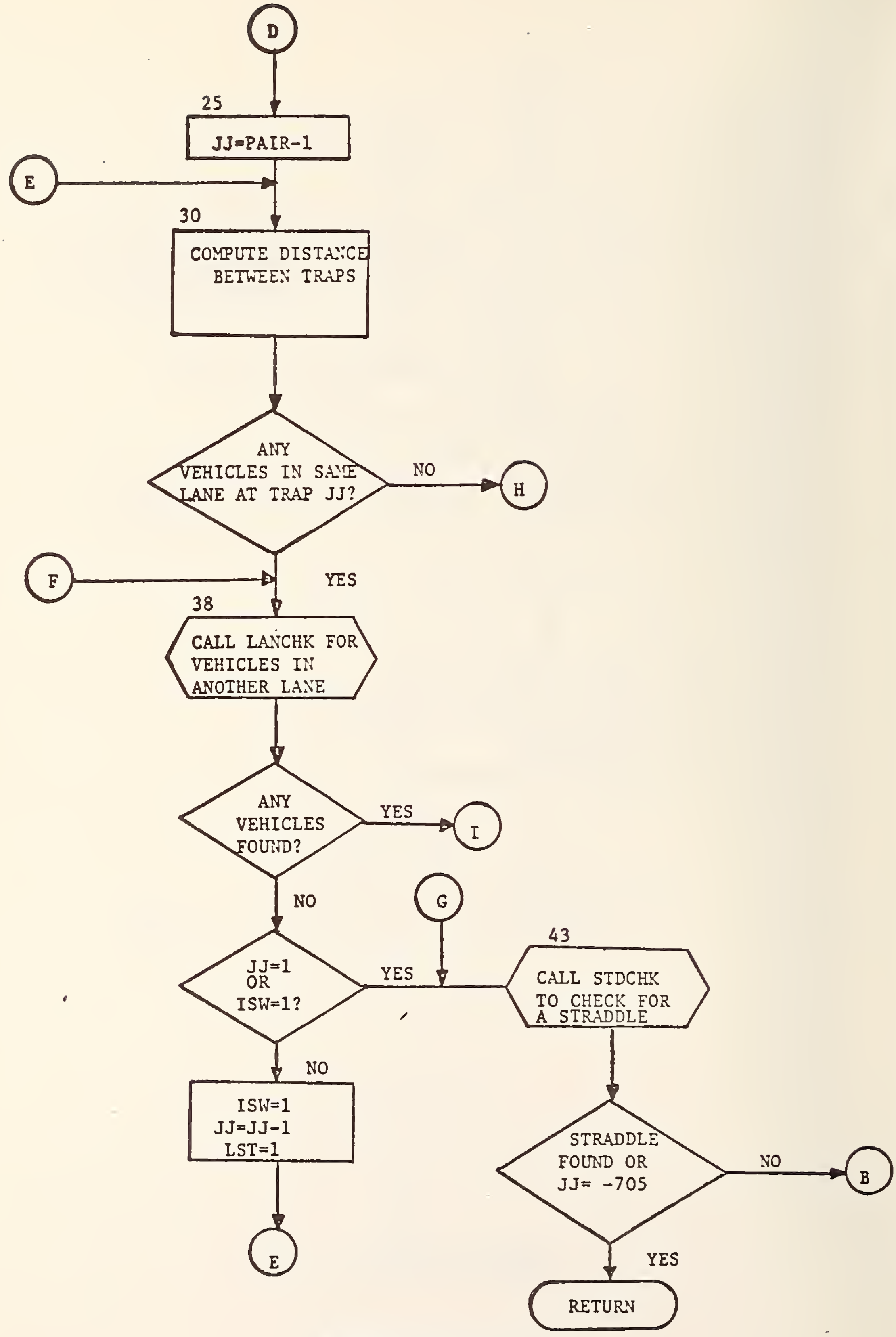
SUBROUTINE SUMUP



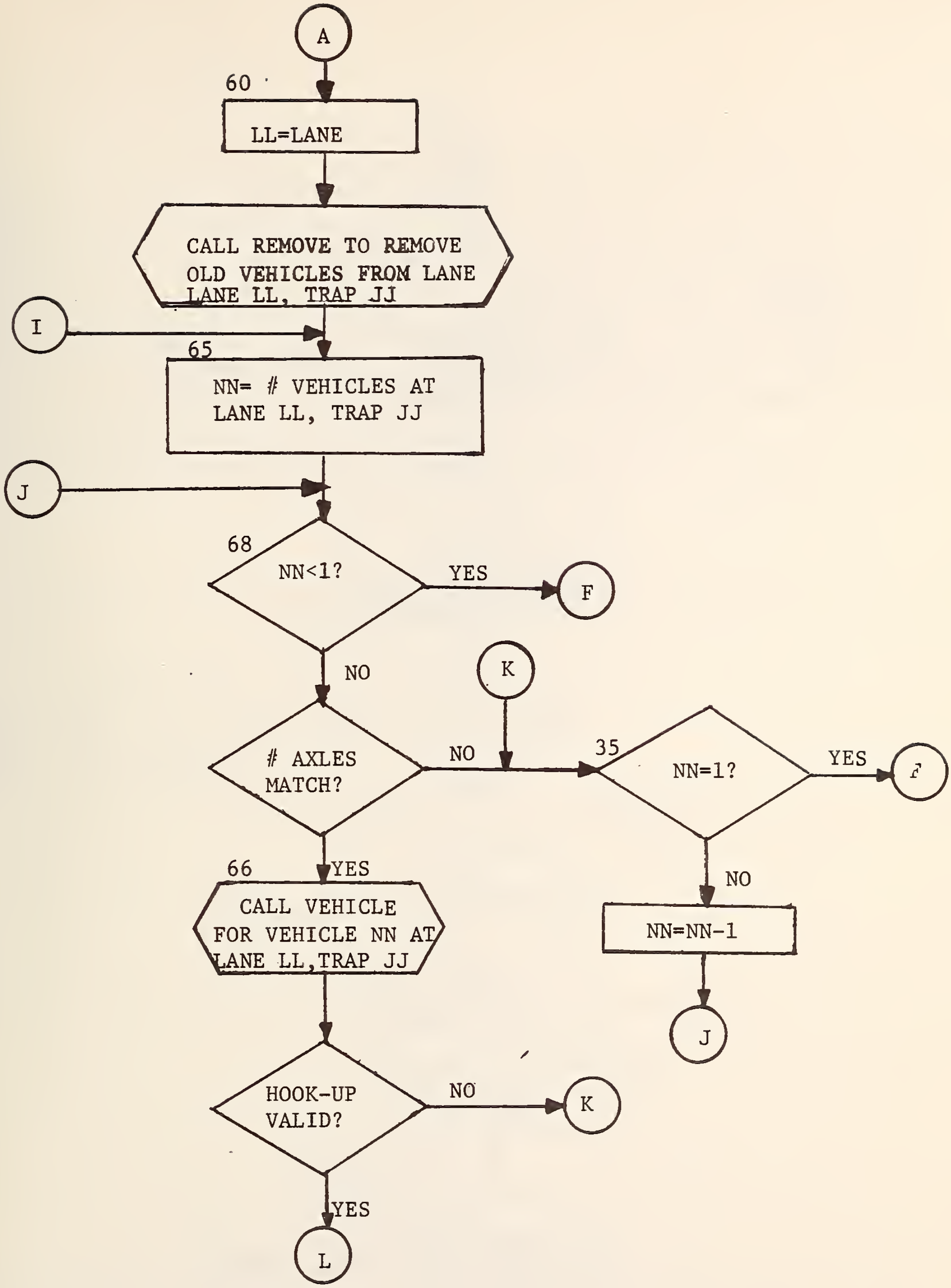
SUBROUTINE GRID (1 of 7)



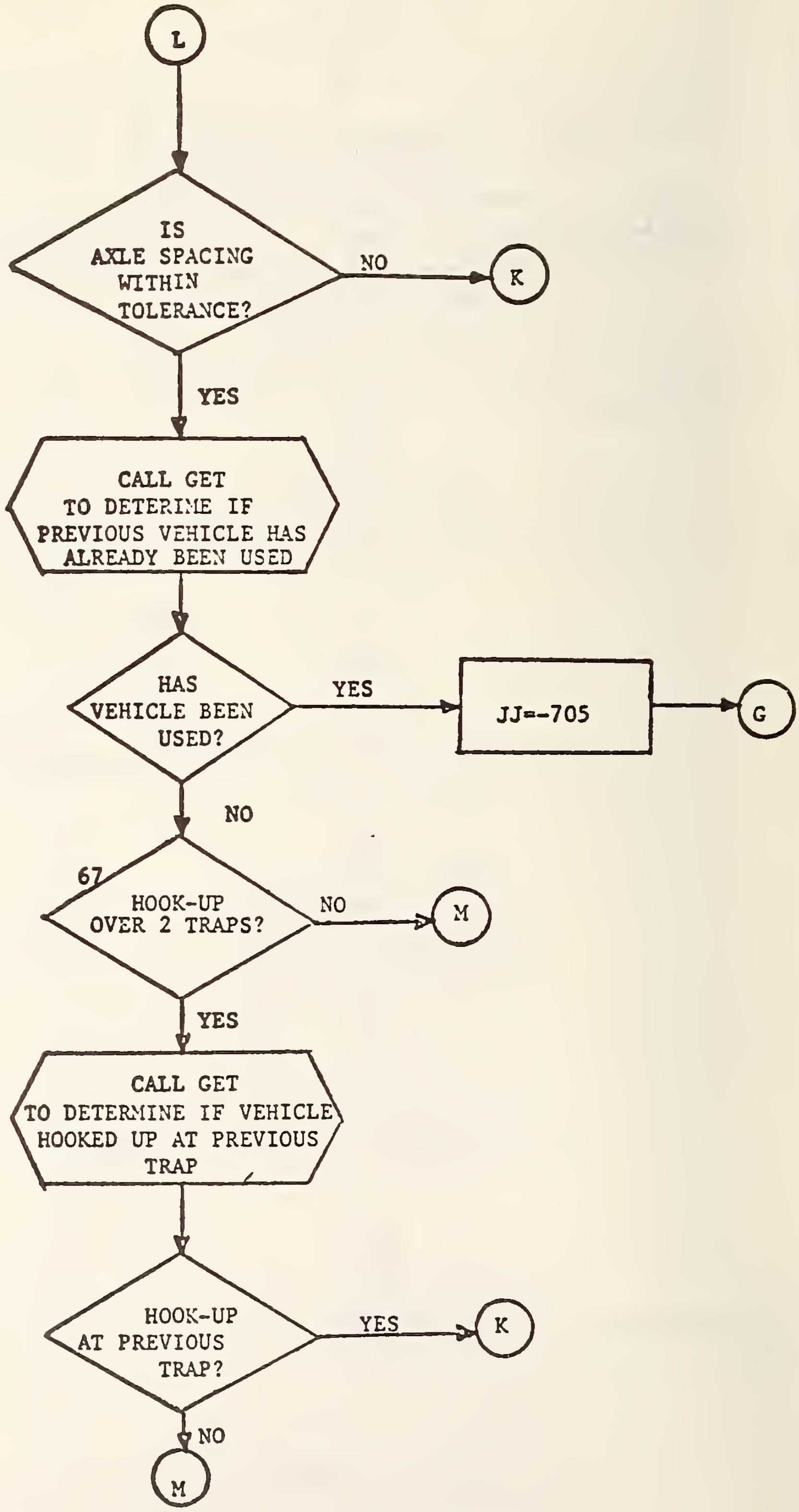
SUBROUTINE GRID (2 of 7)



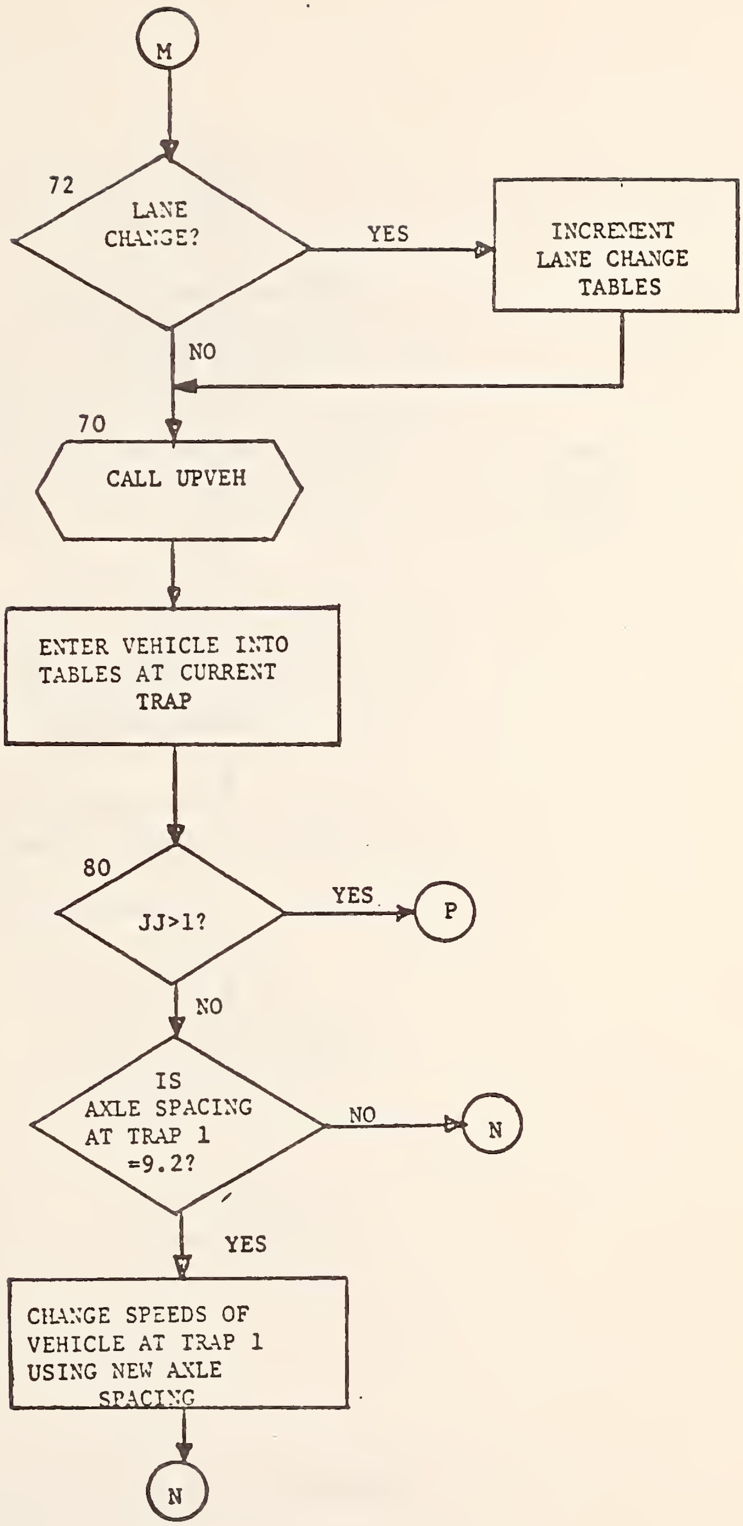
SUBROUTINE GRID (3 of 7)



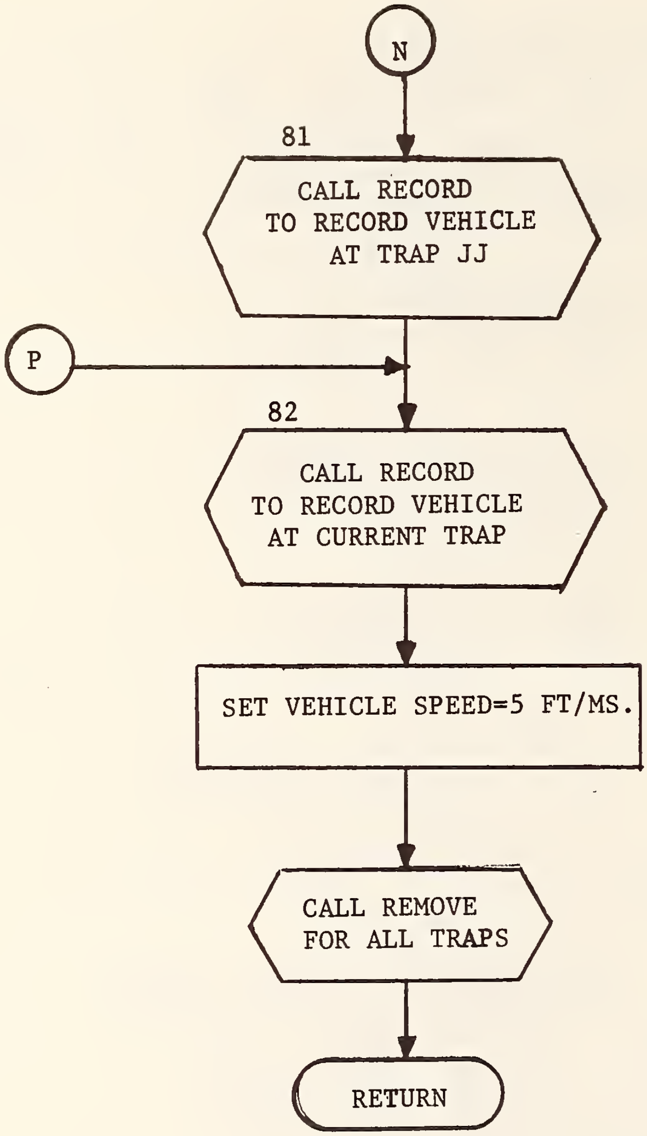
SUBROUTINE GRID (4 of 7)



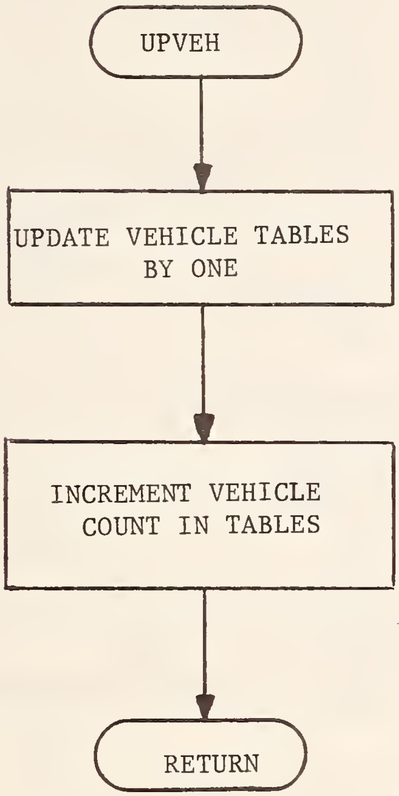
SUBROUTINE GRID (5 of 7)



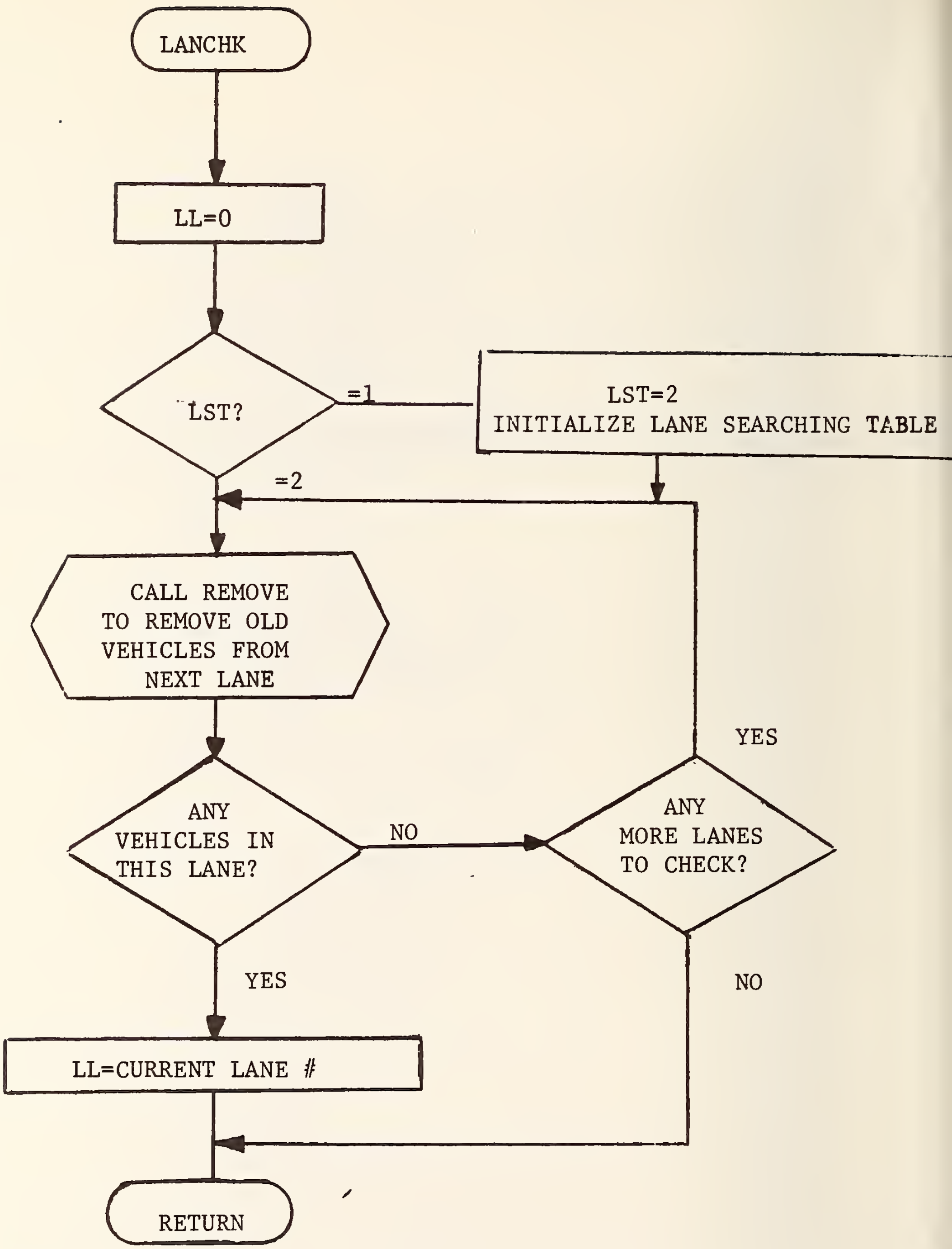
SUBROUTINE GRID (6 of 7)



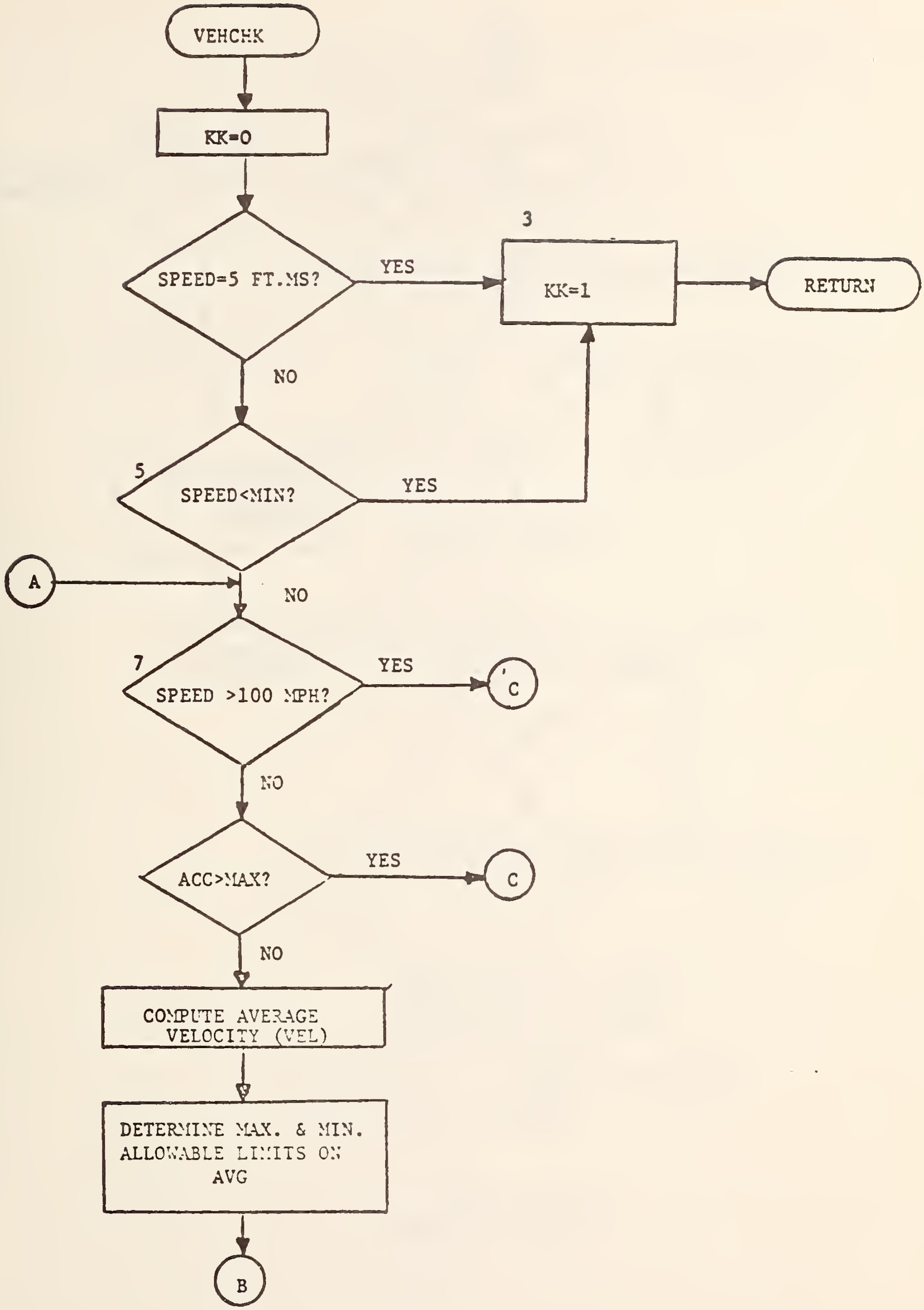
SUBROUTINE GRID (7 of 7)



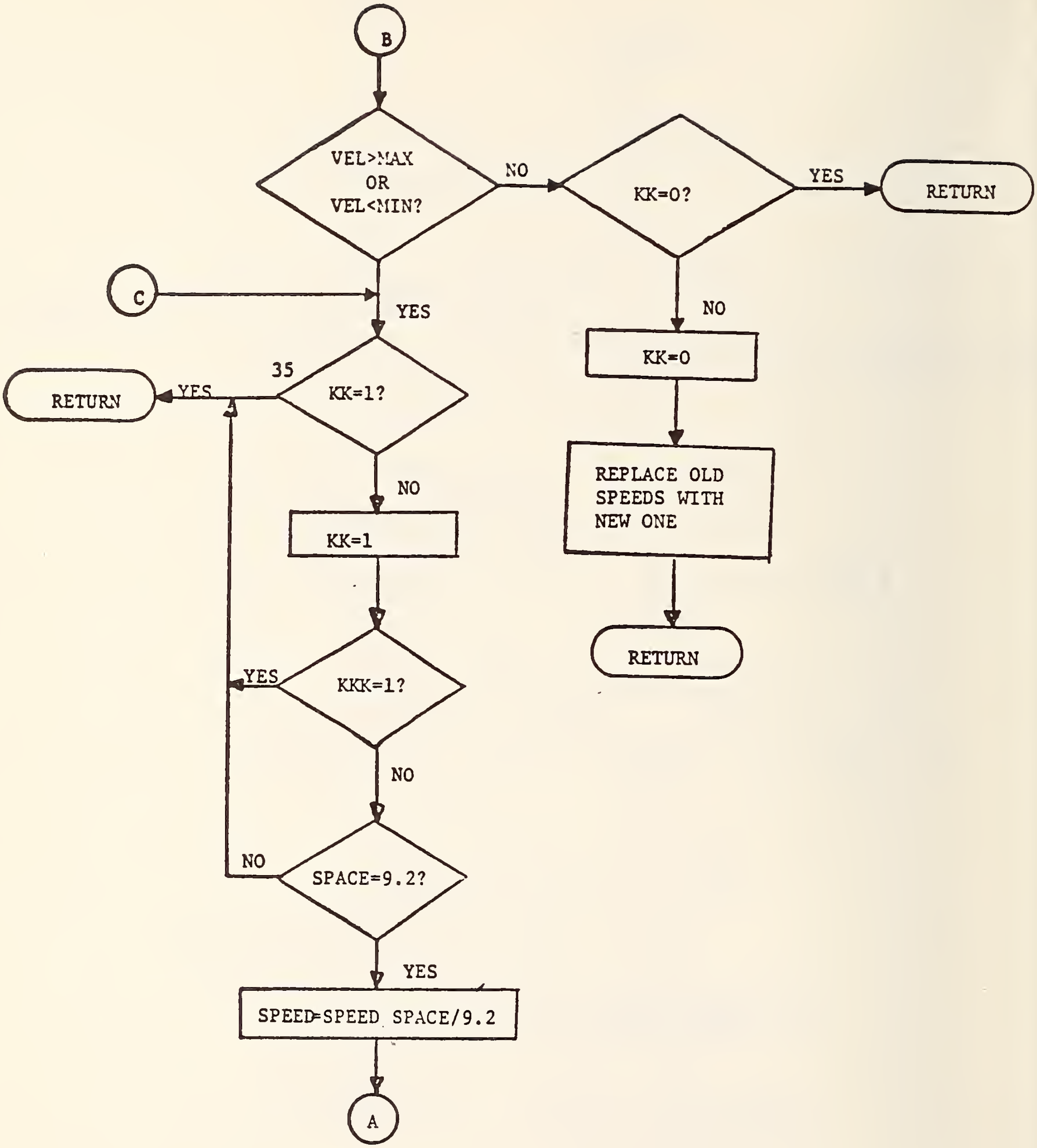
SUBROUTINE UPVEH



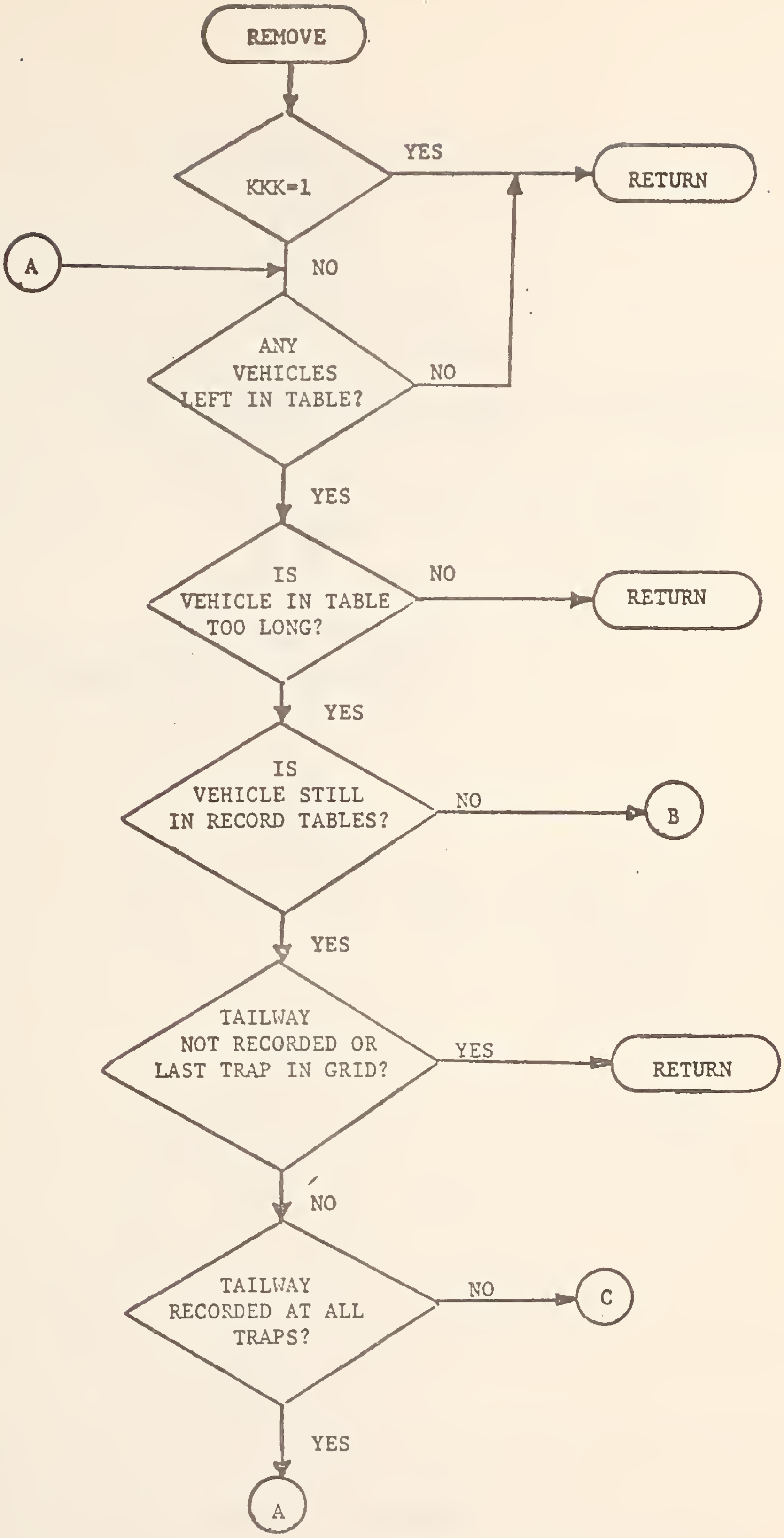
SUBROUTINE LANCHK



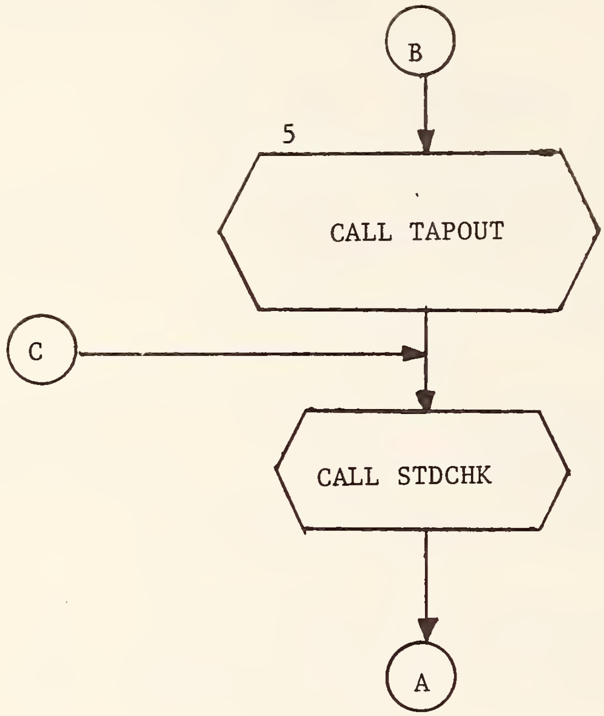
SUBROUTINE VEHCHK (1 of 2)



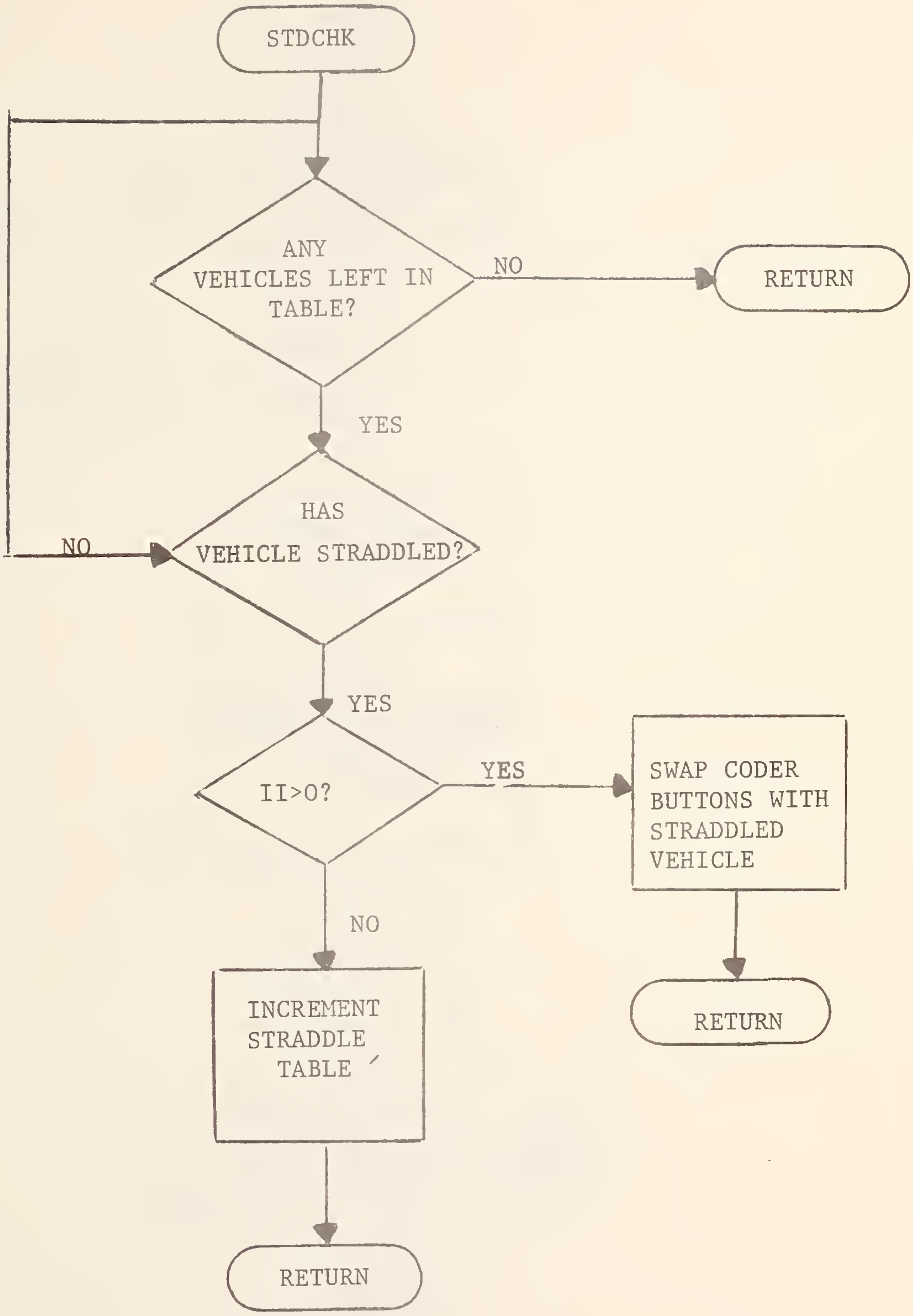
SUBROUTINE VEHCHK (2 of 2)



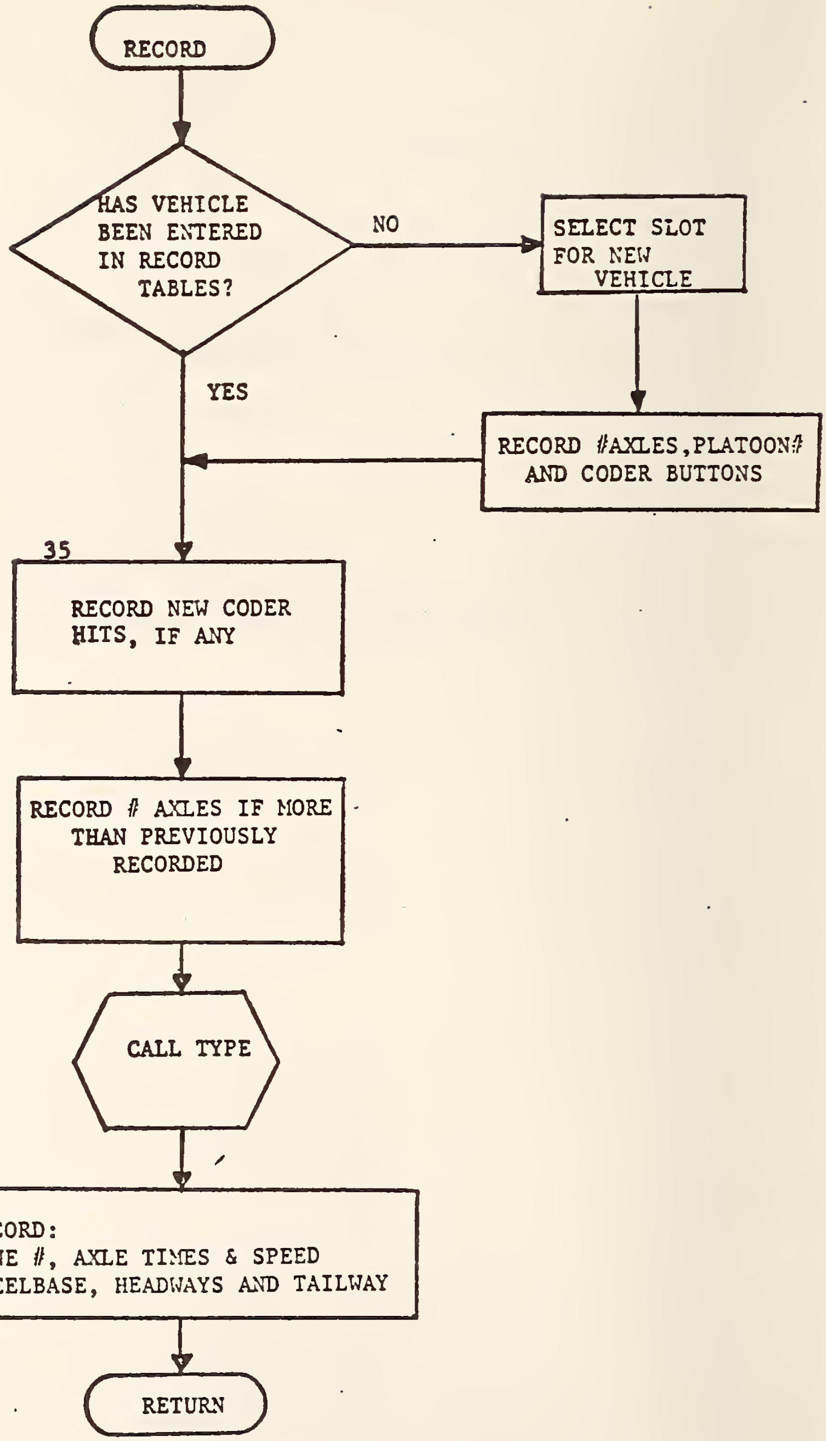
SUBROUTINE REMOVE (1 of 2)



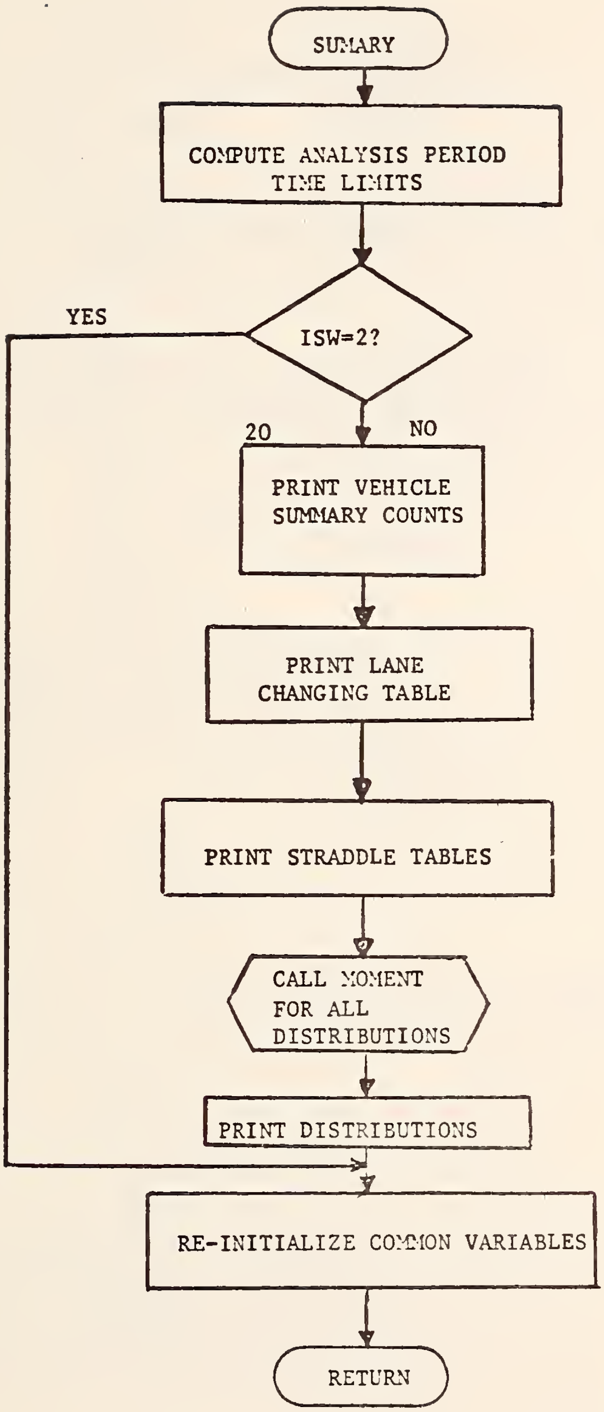
SUBROUTINE REMOVE (2 of 2)



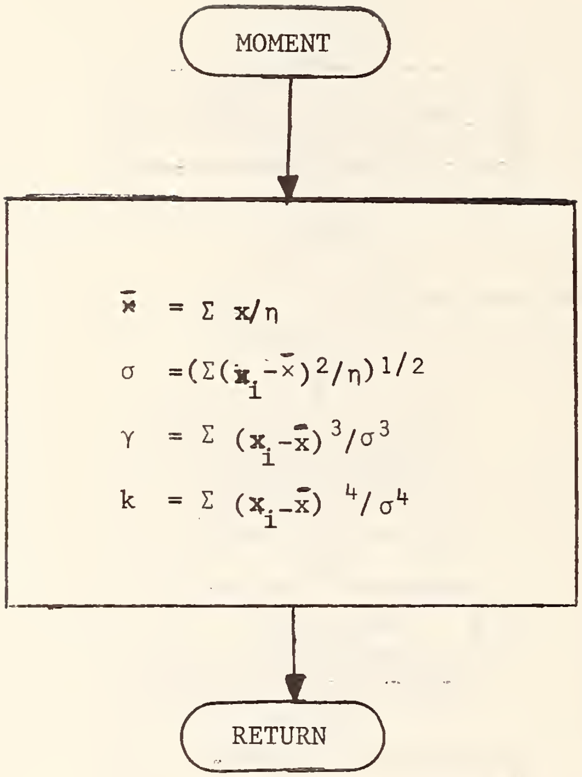
SUBROUTINE STDCHK



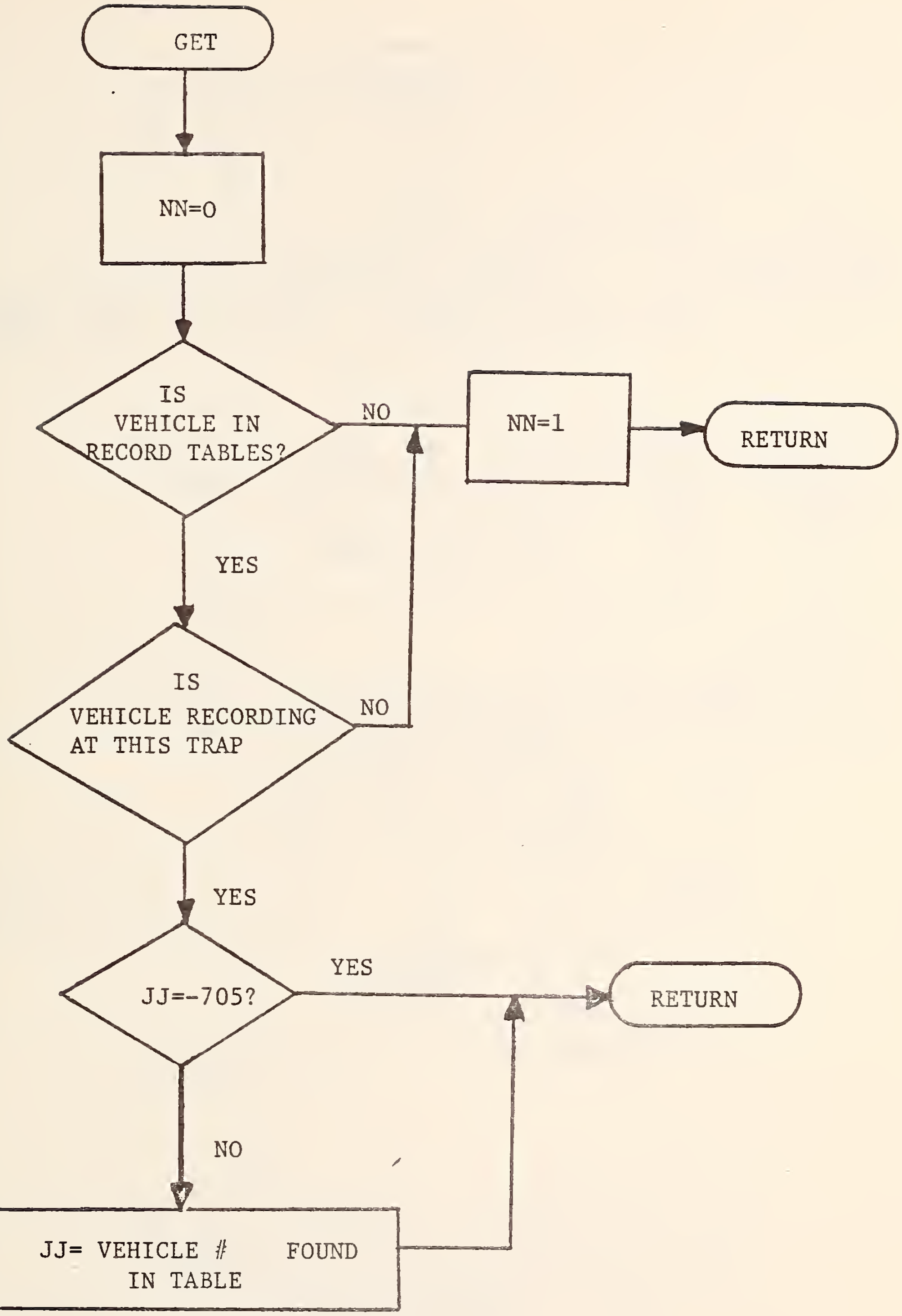
SUBROUTINE RECORD



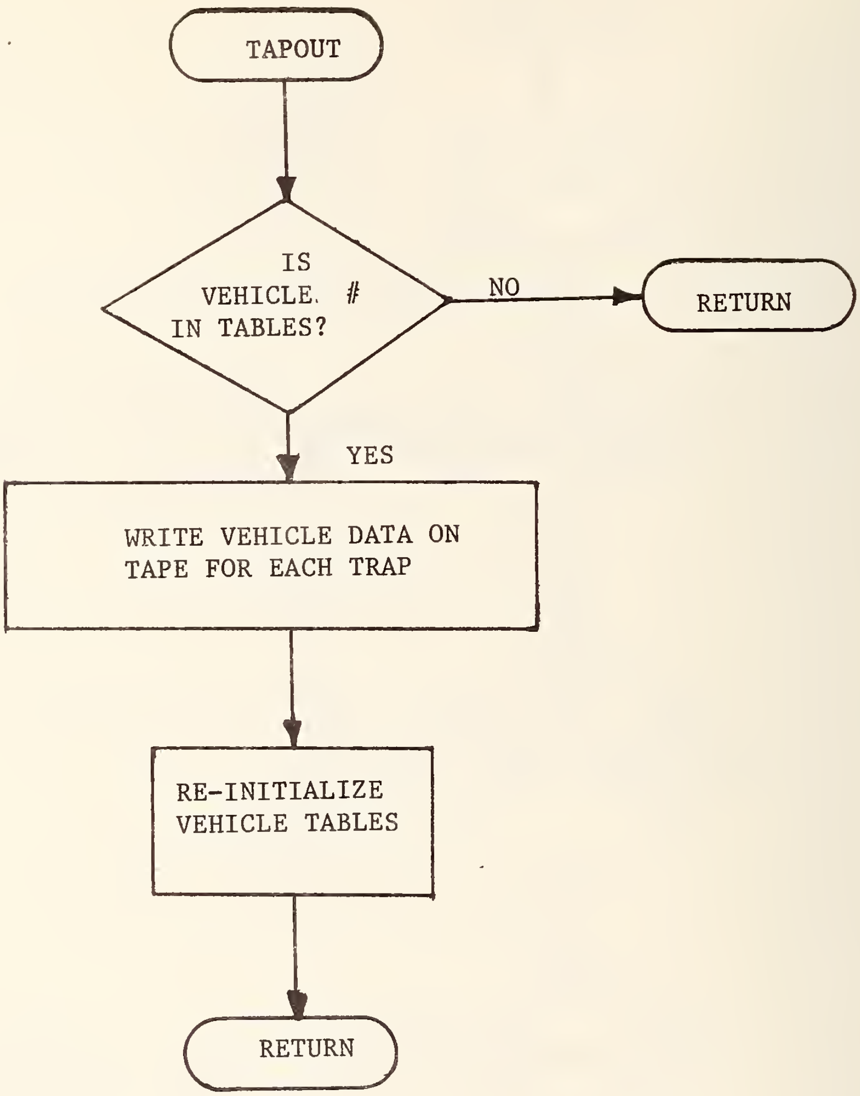
SUBROUTINE SUMARY



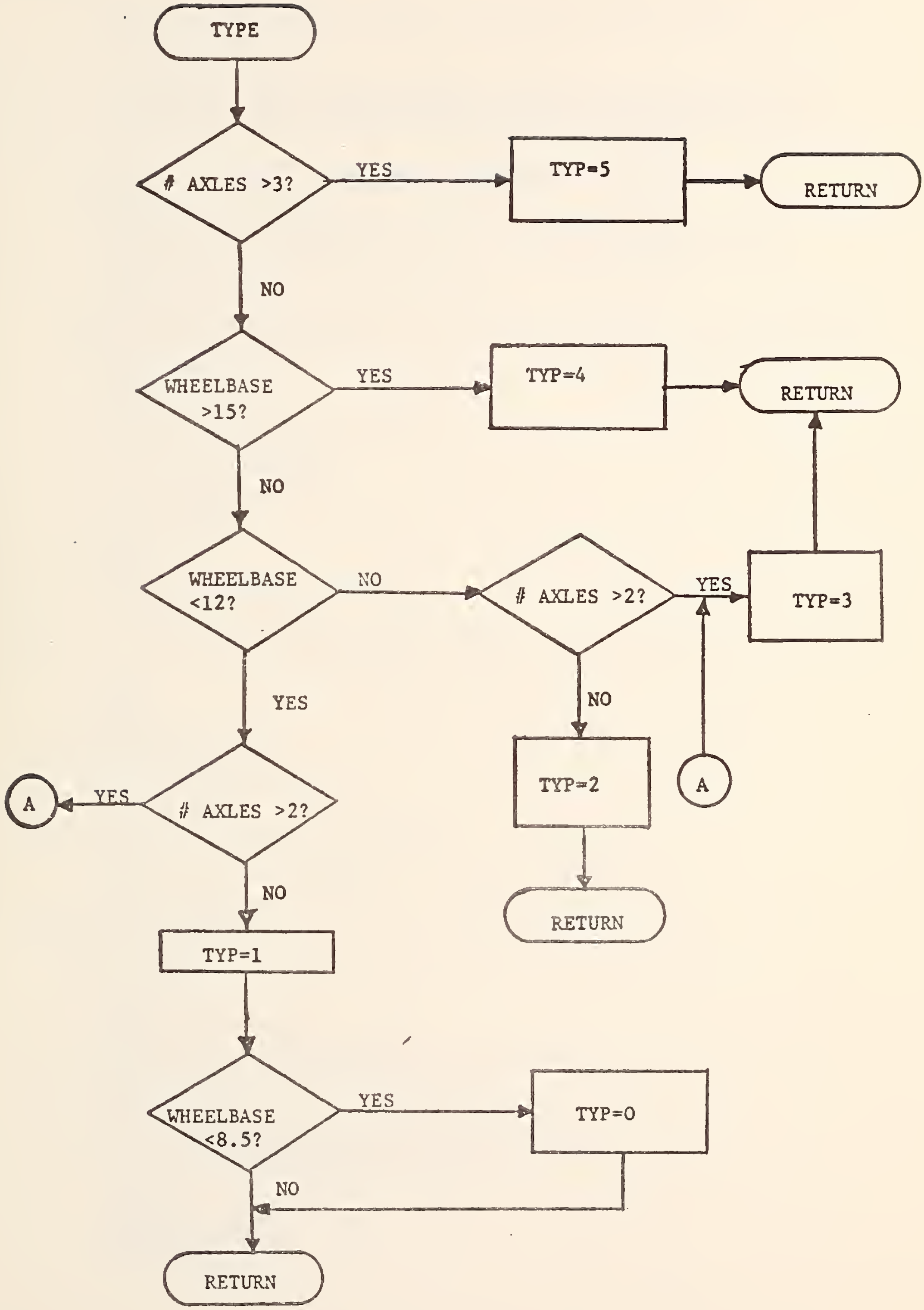
SUBROUTINE MOMENT



SUBRROUTINE GET



SUBROUTINE TAPOUT



SUBROUTINE TYPE

PROGRAM LISTINGS - EDIT

PROGRAM VILATN

```
      PROGRAM VILATN(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,
     $TAPE1=20,TAPE2)
C
C     THIS PROGRAM PREPROCESSES INPUT DATA FROM TAPE1, AND WRITES
C     THE EDITED OUTPUT DATA ON TAPE2.  INPUT DATA ON TAPE1
C     HAS ALREADY BEEN COPIED FROM FIELD TAPES USING AN SDS 930
C
      DIMENSION I(1400),ITM(4200),IDVC(4200),OUT(201)
      DIMENSION INFO (32)
      REAL ITM
      INTEGER FLAGA,FLAGB,SKWD1,SKAR1,SKWD2,SKAR2,SKWD,SLKAR
      INTEGER FLAGC,FLAGD
      INTEGER SVKWD(4200),SVLKAR(4200)
      DIMENSION TM(10)
      COMMON/BLK1/KAR1,KAR2,LKAR,KWD1,KWD2,KWD,ITTM,IDVC,SKAR1,SKAR2,
     $SLKAR,SKWD1,SKWD2,SKWD,I
      COMMON/BLK2/ TCON
      COMMON/BLK3/J
      REAL ITTM(4205)
      EQUIVALENCE (ITTM(6),ITM)
      INTEGER HITS(64)
      DATA HH,IH/100.,100/
      CALL FTNBIN(1,0,DUMMY)
      DO 6 II=1,5
    6 ITTM(II)=0.0
      KKK=3
      TCON=.5
      TLIM=4032.0*TCON
C
C     READ AND WRITE PARAMETERS OF TEST
C
      ICF=1
      ICR=0
      IFLCT=0
    1 READ(5,500) INFO
  500 FORMAT(8A10)
      IF(IFLCT.EQ.0) GO TO 3
      WRITE(6,9567)
 9567 FORMAT(*1SWITCH*,5X,*HITS*//)
      DO 2 J=1,64
      L=J-1
      WRITE(6,9568) L,HITS(J)
 9568 FORMAT(I5,I9)
    2 CONTINUE
    3 DO 4 J=1,64
    4 HITS(J)=0
      TSAVE=-1.0
      WRITE(6,700) INFO
  700 FORMAT(1H1,(1X,8(A10)))
      READ(5,501) ISF,ISR,IEF,IER,IPD,IWF,IPO
  501 FORMAT(7I3)
      WRITE(6,8090)
 8090 FORMAT(1H0,*SF SR EF ER PD WF PO*)
      WRITE(6,501) ISF,ISR,IEF,IER,IPD,IWF,IPO
      IF(ISF.EQ.0) GO TO 15

      IPROC=0
      IF(IWF.EQ.0) GO TO 302
      DO 703 I1=1,201
      OUT(I1)=1H
```

```
  703 CONTINUE
      WRITE(2) INFO
  302 CONTINUE
C
C     READ TEST DATA FROM 556 BPI COPY OF FIELD TAPE
C
      DO 10 K=1,999
      ISW=0
      IF(TSAVE.LT.0.0) ISW=1
      NZC=0
      JM = 1
      KWD = 0
      BUFFERIN(1,1) (I(1),I(1400))
      JU = UNIT(1)
      L= LENGTH(1)
      DO 800 I9=1,4200
      ITM(I9)=0.
      IDVC(I9)=0
  800 CONTINUE
      IF(JU.EQ.0) GO TO 8020
      IF(ICF.LT.ISF) GO TO 8005
      ICR=ICR+1
      IF(ICR.LT.ISR) GO TO 8005
      IPROC=1
      IF(IPO.EQ.0) GO TO 84
C
C     PRINT FIRST TEN WORDS OF INPUT RECORD IN OCTAL
C
      WRITE(6,600) JU,L
  600 FORMAT(1H0,*RECORD STATUS = *,I2,*,NO. OF 10 CHAR. WORDS READ = *
     $,I4)
      L32=10
      IF(IPO.EQ.2) L32=L
    5 WRITE(6,603) (I(J),J=1,L32)
  603 FORMAT(5(2X,O20))
C
C     IF FIRST RECORD SCAN INPUT DATA TO SYNCHRONIZE ON
C     FIRST TIME MARK
C
      LL=0
   84 JM1=KWD+1
      DO 200 II=JM1,L
      DO 200 JJ=1,10
      KK1=MTGET(I(II),JJ)
      KSYNK=SHIFT(KSYNK,6)
      KSYNK=KSYNK.OR.KK1
      KSYNK=KSYNK.AND.262143
      IF(KSYNK.EQ.000001) GO TO 220
  200 CONTINUE
      IF(JM.EQ.1) GO TO 10
      J1=J-1
      GO TO 110
  220 CONTINUE
      IF(JM.NE.1) GO TO 280
      JJ=MOD(10*(II-1)+JJ,3)
      II=1
  280 KWD1=II
      KWD2=II
      KWD = II
      LKAR = JJ
```

```
      NUMZ=0
      MAX=(L*10)/3 + LL
      J=JM-1
      L1J=0
      L1CHAR=0
      L1WD=1
      L3=0
  290 J=J+1
  460 CONTINUE
      CALL GETTIM
   20 CONTINUE
      IF(IDVC(J).EQ.-1) GO TO 450
      NUMZ=0
C
C     DETERMINE IF RESYNCH REQUIRED
C
      JII=1
      SVKWD(J)=KWD
      SVLKAR(J)=LKAR
      IF(ISW.EQ.0) GO TO 90
      IF(ITM(J).LT.ITM(J-1)) GO TO 31
      IF(IDVC(J-1).NE.0) GO TO 100
      IF(ITM(J-1).NE.0.0) GO TO 100
      IF(J.LE.1) GO TO 100
      L1WD=SVKWD(J-1)
      L1CHAR=SVLKAR(J-1)
      L1J=J-1
      GO TO 100
   31 IF(ITM(J).NE.0.0) GO TO 33
      IF(IDVC(J).EQ.0) GO TO 100
C
C        READ NEXT 10 TIMES
C
   33 CALL MEMOVE(KAR1,SKAR1,6)
      JSAVE=J
      KI=0
      IRR=1
      I52=0
      FLAGC=FLAGD=0
      DO 37 KJ=1,10
      J=J+1
   34 CALL GETTIM
      IF(ITM(J).NE.0.0) GO TO 36
      IF(KWD.GE.L) GO TO 39
      IF(IDVC(J).GT.1) GO TO 36
      TM(KJ)=-1.0
      GO TO 38
   36 TM(KJ)=ITM(J)
   38 KI=KJ
   37 CONTINUE
   39 J=JSAVE
      CALL MEMOVE(SKAR1,KAR1,6)
      GO TO(41,73),JII
   41 IF(KI.LT.2) GO TO 45
      DO 42 KJ=2,KI
      IF(TM(KJ).GE.TM(KJ-1)) GO TO 42
      IF(TM(KJ).EQ.-1.0) GO TO 42
      FLAGA=FLAGB=0
      GO TO 60
   42 CONTINUE
```

```
      CALL MEMOVE(TM(1),TM(6),5)
   45 KJ=J-5
      KL=J-2
      KF=0
      DO 48 KK=KJ,KL
      KF=KF+1
   47 TM(KF)=ITM(KK)
      IF(ITM(KK).NE.0.0) GO TO 48
      IF(IDVC(KK).NE.0) GO TO 48
      IF(KF.EQ.1) GO TO 48
      TM(KF)=-1.0
   48 CONTINUE
      KII=1
      TM(5)=ITM(J)
      IF(KI.GT.5) KI=5
      KI=KI+5
      AA=(ITM(J-1)/TCON) + .1
      KI1=AA
      KI2=SHIFT(KI1,-6).AND.77B
      KI1=KI1.AND.77B
      IF(KI1.NE.KI2) GO TO 465
      FLAGD=1
      GO TO 49
  465 AA=(ITM(J)/TCON) + .1
      KI1=AA
      KI2=SHIFT(KI1,-6).AND.77B
      KI1=KI1.AND.77B
      IF(KI1.EQ.KI2) FLAGC=1
   49 CONTINUE
      DO 50 KJ=2,KI
      IF(TM(KJ).GE.TM(KJ-1)) GO TO 50
      IF(TM(KJ).NE.-1.0) GO TO 55
   50 CONTINUE
      GO TO(52,53),KII
   52 CONTINUE
      I52=1
      IF(FLAGD.EQ.0) GO TO 470
      IRR=5
      GO TO 475
  470 IF(FLAGC.EQ.1) GO TO 55
  475 CONTINUE
      IF(J.EQ.1) GO TO 54
      ITM(J-1)=ITM(J)
      IDVC(J-1)=IDVC(J)
      SVKWD(J-1)=SVKWD(J)
      SVLKAR(J-1)=SVLKAR(J)
   53 J=J-1
   54 IF(KII.EQ.2.AND.FLAGC.EQ.1) IRR=5
      WRITE(6,3000) IRR
 3000 FORMAT(*0TYPE*,I3,* RECOVERY*)
      CALL DUMP(I,KWD-10,KWD+9)
      GO TO 100
   55 IF(KII.EQ.2) GO TO 57
      KII=2
      TM(5)=ITM(J-1)
      GO TO 49
   57 IF(I52.EQ.1) GO TO 475
      ITM(J+1)=ITM(J)
      IDVC(J+1)=IDVC(J)
      SVKWD(J+1)=SVKWD(J)
      SVLKAR(J+1)=SVLKAR(J)
      ITM(J)=0.0
      IDVC(J)=0
      J=J+1
      WRITE(6,3001)
```

```
3001 FORMAT(*OTYPE TWO RECOVERY*)
     CALL DUMP(I,KWD-10,KWD+9)
     GO TO 100
  60 LKAR=LKAR-2
     IF(LKAR.GT.0) GO TO 63
     LKAR=LKAR+10
     KWD=KWD-1
     KWD1=KWD2=KWD
  63 CALL GETTIM
     IF(ITM(J).GE.ITM(J-1)) GO TO 70
  65 FLAGA=FLAGA+1
     IF(FLAGA.GE.10) GO TO 81
     LKAR=LKAR-2
     IF(LKAR.GT.0) GO TO 67
     LKAR=LKAR+10
     KWD=KWD-1
     KWD1=KWD2=KWD
  67 CALL GETTIM
     IF(ITM(J).GE.ITM(J-1)) GO TO 70
     IF(J.LE.1) GO TO 81
     J=J-1
     LKAR=SVLKAR(J)
     KWD=SVKWD(J)
     GO TO 60
  70 FLAGB=FLAGB+1
     IF(FLAGB.GE.10) GO TO 81
     JII=2
     GO TO 33
  73 IF(KI.LT.2) GO TO 79
     IJUMP=0
     DO 75 KJ=2,KI
     IF(TM(KJ).EQ.-1.0) GO TO 75
     IF(TM(KJ).LT.TM(KJ-1)) IJUMP=IJUMP+1
     IF(IJUMP.GT.1) GO TO 65
  75 CONTINUE
  79 WRITE(6,3002)
3002 FORMAT(*OTYPE 3 RECOVERY*)
     IF(KWD.EQ.L3) GO TO 81
     CALL DUMP(I,KWD-10,KWD+9)
     IF(TDVC(J).EQ.-1) J=J-1
     L3=KWD
     GO TO 100
  81 WRITE(6,3003)
3003 FORMAT(*OLOOP ENTERED.  MADE TYPE 4 RECOVERY*)
     CALL DUMP(I,KWD-10,KWD+9)
     J1=L1J
     J=L1J
     JM1=L1WD
     JK=L1CHAR+1
     IF(JK.LE.10) GO TO 82
     JK=1
     JM1=JM1+1
  82 DO 85 II=JM1,L
     DO 83 JJ=JK,10
     KK1=MTGET(I(II),JJ)
     KSYNK=SHIFT(KSYNK,6)
     KSYNK=KSYNK.OR.KK1
     KSYNK=KSYNK.AND.262143
     IF(KSYNK.EQ.000001) GO TO 87
  83 CONTINUE
     JK=1
  85 CONTINUE
     GO TO 110
  87 JJ=JJ-3
     IF(JJ.GT.0) GO TO 119
```

```
      JJ=JJ+10
      II=II-1
  119 LKAR=JJ
      KWD=KWD1=KWD2=II
      GO TO 100
  450 NZC=NZC+1
      NUMZ=NUMZ+1
      IF(NUMZ.LT.100) GO TO 460
      J1=J-1
      GO TO 110
   90 CONTINUE
      IF(J.EQ.1) GO TO 100
      IF(IDVC(J).EQ.0) GO TO 95
      IF(ITM(J).GE.ITM(J-1)) GO TO 100
      ITM(J+1)=ITM(J)
      IDVC(J+1)=IDVC(J)
      SVKWD(J+1)=SVKWD(J)
      SVLKAR(J+1)=SVLKAR(J)
      ITM(J)=0.0
      IDVC(J)=0
      J=J+1
      MAX=MAX+1
      NTICK=NTICK+1
      GO TO 100
   95 ISW=1
      IF(NTICK.EQ.ITICK) GO TO 100
      IF(NTICK.LT.ITICK) GO TO 96
      GO TO 280
   96 LL=ITICK-NTICK
      DO 97 J=1,LL
      ITM(J)=0.0
   97 IDVC(J)=0
      JM=LL+1
      GO TO 280
  100 IF(J.LT.MAX) GO TO 290
      J1=MAX
  110 CONTINUE
      IF(J1.LE.0) GO TO 10
      DO 115 II=1,5
      KK=6-II
      LL=J1-II+1
      IF(LL.GT.0) GO TO 113
      ITTM(KK)=0.0
      GO TO 115
  113 ITTM(KK)=ITM(LL)
  115 CONTINUE
      DO 905 IL=1,J1
      ILL=IDVC(IL)+1
      IF(IDVC(IL).NE.0) GO TO 905
      IF(ITM(IL).EQ.0.0) GO TO 905
      IF(IL.GT.1) ITM(IL)=0.0/
  905 HITS(ILL)=HITS(ILL)+1
      IF(IPD.EQ.0) GO TO 611
      IF(IPD.EQ.1) GO TO 607
      KKK=KKK+1
      IF(KKK.LT.IPD) GO TO 611
      KKK=0
  607 CONTINUE
C
C      PRINT VALID DATA IN DECIMAL
C
      WRITE(6,900) NZC,J1,ICF,ICR
  900 FORMAT(1H1,* NUMBER OF ZERO CODES=*,I5,
     $*  NUMBER OF INFORMATION SETS =*,I5,
     $*  FILE NUMBER = *,I3,*  RECORD NUMBER = *,I5)
```

```
      WRITE(6,610) (ITM(J),IDVC(J),J=1,J1)
  610 FORMAT(1H0,/,10(2X,F6.1,2X,I2))
  611 DO 615 NN=2,J1
      IF (IDVC(NN).NE.IDVC(NN-1)) GO TO 615
      IF(ITM(NN).NE.ITM(NN-1)) GO TO 615
      IF (IDVC(NN).EQ.0) GO TO 615
      IF(IDVC(NN-1).NE.IDVC(NN-2)) GO TO 613
      IF(ITM(NN-1).EQ.ITM(NN-2)) GO TO 615
  613 WRITE(6,2003)IDVC(NN)
 2003 FORMAT(* ++++MULTIPLE HITS ON SWITCH *,I4)
  615 CONTINUE
      IF(IWF.EQ.0) GO TO 590
C
C     WRITE( NUMBER OF INFORMATION SETS IN RECORD
C     IF 9999 CHARACTER RECORD INDICATES END OF TAPE
C
      DO 617 J=1,J1
      WRITE(2) (ITM(J),IDVC(J))
  617 CONTINUE
      GO TO 590
 8020 ICF=ICF+1
      ICR=0
      IF(ICF.EQ.IEF.AND.IER.EQ.0) GO TO 300
      GO TO 10
  590 CONTINUE
      DO 30 MM=1,1400
      I(MM) = 0
   30 CONTINUE
      J1 = 0
 8005 IF(ICF.GE.IEF.AND.ICR.GE.IER) GO TO 300
   10 CONTINUE
      WRITE(6,8010)
 8010 FORMAT(1H0,*FILE OR RECORD INPUT PARAMETER INVALID*)
   15 CONTINUE
      IF(IWF.EQ.0) GO TO 301
      WRITE(2) HH,IH
      ENDFILE 2
  301 CONTINUE
      WRITE(6,702) IFLCT
  702 FORMAT(1H1,*NUMBER OF FILES WRITTEN = *,I3)
      STOP
  300 IF(IWF.EQ.0) GO TO 8100
      WRITE(2) HH,IH
      ENDFILE 2
 8100 IFLCT=IFLCT+1
      IF(IPROC.EQ.1) GO TO 1
      WRITE(6,8010)
      GO TO 1
      END
```

FUNCTION MTGET

```
      FUNCTION MTGET(I,J)
      DATA MSK/37777777777777777777B/
C
C     SELECT NEGATIVE VALUES FOR SPECIAL PROCESSING
C
      IF(I.GE.0) GO TO 10
C
C     MASK NEGATIVE SIGN FROM QUANTITY
C
```

```
      I1 = I.AND.MSK
C
C     SHIFT RIGHT TO CHARACTER BEING EXTRACTED
C
      I2 = SHIFT(I1,-(60-6*J))
C
C     MASK AND RETURN EXTRACTED CHARACTER
C     AND REPLACE NEGATIVE BIT AT CORRECT POSITION
C
      MTGET = I2.AND.63
      IF(J.EQ.1) MTGET = MTGET.OR.32
      RETURN
C
C     SHIFT RIGHT TO CHARACTER BEING EXTRACTED
C
   10 I2 = SHIFT(I,-(60-6*J))
C
C     MASK AND RETURN EXTRACTED CHARACTER
C
      MTGET= I2.AND.63
      RETURN
      END
```

SUBROUTINE GETTIM

```
      SUBROUTINE GETTIM
      COMMON/BLK1/KAR1,KAR2,LKAR,KWD1,KWD2,KWD,ITTM,IDVC,SKAR1,SKAR2,
     $SLKAR,SKWD1,SKWD2,SKWD,I
      COMMON/BLK2/ TCON
      DIMENSION I(1400),ITM(4200),IDVC(4200)
      COMMON/BLK3/J
      REAL ITM
      REAL ITTM(4205)
      EGUIVALENCE (ITTM(6),ITM)
      KWD1=KWD2=KWD
  460 KAR1=LKAR+1
      IF(KAR1.LE.10) GO TO 12
      KAR1 = 1
      KWD1 = KWD+1
      KWD2 = KWD1
   12 KAR2 = KAR1+1
      IF(KAR2.LE.10) GO TO 11
      KAR2 = 1
      KWD2 = KWD+1
   11 LKAR=KAR2
      KWD = KWD2
C
C     MOVE THE NEXT TWO CHARACTERS FROM THE INPUT DATA TO THE TIME ARRAY
C     AND CONVERT TO MILLISECONDS
C
      IITM   = (MTGET(I(KWD1),KAR1))*64+MTGET(I(KWD2),KAR2)
      ITM(J)=IITM*TCON
      LKAR = LKAR+1
      KWD1 = KWD2
      IF(LKAR.LE.10) GO TO 20
      LKAR = 1
      KWD = KWD+1
      KWD1 = KWD
      KWD2 = KWD
C
C     MOVE NEXT CHARACTER FROM INPUT DATA TO THE DEVICE CODE ARRAY
C
   20 IDVC(J) = MTGET(I(KWD),LKAR)
      IDVC(J) = IDVC(J) - 1
      RETURN
      END
```

SUBROUTINE DUMP

```
      SUBROUTINE DUMP(I,L,K)
      DIMENSION I(1400)
      IF(L.LT.0) L=1
      WRITE(6,2000) L,K
 2000 FORMAT(2I5)
      WRITE(6,2001) (I(J),J=L,K)
 2001 FORMAT(5(2X,O20))
      RETURN
      END
```

SUBROUTINE MEMOVE

```
      SUBROUTINE MEMOVE(A,B,N)
      DIMENSION A(N),B(N)
      DO 10 I=1,N
   10 B(I)=A(I)
      RETURN
      END
```

PROGRAM LISTINGS - ANALYSIS

```
      PROGRAM DIAGSS(INPUT,OUTPUT,TAPE8,TAPE10,TAPE5=INPUT,TAPE6=OUTPUT)
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $               PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                   NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTROL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      LOGICAL  AXFLAG
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      REAL ITM,INTMS
      DOUBLE PRECISION LTM,KTM,DELTM,TSAVE
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
C
C     THIS IS THE MAIN EXECUTIVE PROGRAM THAT CONTROLS THE PROCESSING
C     OF VILATION SAMPLING DATA
C
      CALL FTNBIN(1,0,DUMMY)
C
C        INITIALIZE COMMON VARIABLES
C
    2 CALL MEMSET(0,D1,7690)
      LTM=0.0
      CC=2016.0
      DELTM=CC
C
      IFST=0
      IFS=1
      CALL BSRD
C
C     READ AND WRITE HEADINS ON TEST DATA
C
      CALL RDATA(ITM,ICD,IX,IFST)
      ISAVE=IX(1)
      WRITE(6,600) (IX(I),I=1,32)
  600 FORMAT(1H1,(1X,8A10))
C
C
C
      READ(5,1002) NPSTRT,NPSTP
 1002 FORMAT(2I2)
      WRITE(6,2002) NPSTRT,NPSTP
 2002 FORMAT(1H0,2I3)
C
C     CONVERT BASE VALUES TO CORRECT UNITS FOR PROCESSING
C
      CALL CONVRT

       KTM=INTMS
       PR=1
       ISW=1
       IF(PR.LT.NPSTRT.OR.PR.GT.NPSTP) ISW=2
```

```
      NPAIR=NDEV/2
C
C     READ TEST DATA
C
    3 CONTINUE
C
C     PROCESS ACCORDING TO DEVICE CODES
C
      TSAVE=TIME
      ICDSAV=ICD
C
      CALL RDATA(ITM,ICD,IA,IFST)
      IF(IX(1).EQ.9999) GO TO 2000
      IF(ICD.LE.0) GO TO 10
      IF(ICD.GT.0) GO TO 15
    5 CALL ERROR(1)
      GO TO 1000
C
C        INCREMENT CLOCK
C
   10 IF(ITM.NE.0.0) GO TO 1000
      TIME=TIME-LTM+DELTM
      LTM=0.0
      GO TO 1000
   15 IF(ITM.LE.CC) GO TO 20
      TIME=TIME+ITM-CC
      LTM=0.0
      GO TO 22
   20 TIME=TIME-LTM+ITM
      LTM=ITM
   22 IF(ICD.NE.ICDSAV) GO TO 24
      IF(TIME-TSAVE.LT.30.00) GO TO 1000
   24 IF(ISW.EQ.2) GO TO 1000
      CALL PROCES
C
C     DETERMINE WHETHER TIME FOR SUMMARY COMPUTATION
C
 1000 IF(TIME.LT.KTM)GO TO 1500
      CALL SUMARY(IFS,ISW)
      PR=PR+1
      ISW=1
      IF(PR.LT.NPSTRT) ISW=2
      IF(PR.GT.NPSTP) GO TO 2001
      IF(PR.GE.NPR) GO TO 2001
      KTM=INTMS*FLOAT(PR)
 1500 GO TO 3
 2000 CALL ERROR(3)
      TIME=TIME+4000.
C
C        CLEAR OUT AXLE AND VEHICLE TABLES
C

      DO 100 PAIR=1,NPAIR
      DO 100 LANE=1,NLANE
      CALL AXDISC(1)
  100 CONTINUE
      DO 105 I=1,L5
      CALL TAPOUT(IVEH(I),NPAIR)
  105 CONTINUE
      IX(1)=ISAVE
      CALL SUMARY(IFS,ISW)
```

```
 2001 CONTINUE
      ENDFILE 10
      WRITE(6,7534)
 7534 FORMAT(1H1)
      GO TO 2
C
      END
```

SUBROUTINE ERROR

```
      SUBROUTINE ERROR(I)
C
C     THIS ROUTINE PRINTS ERROR MESSAGES AS THEY ARE GENERATED
C     BY THE PROGRAM
C
      GO TO(1,2,3),I
    1 WRITE(6,600)
  600 FORMAT(//,1X,*--- NEGATIVE DEVICE CODE ---*)
      GO TO 1000
C   2 WRITE(6,602)
    2 CONTINUE
  602 FORMAT(//,1H0,*---UNRECOGNIZABLE DEVICE CODE ON INPUT DATA---*)
      GO TO 1000
    3 WRITE(6,603)
  603 FORMAT(//,1H0,*---ANALYSIS TERMINATED BY END OF DATA PRIOR TO END
     1OF ANALYSIS PERIOD---*)
 1000 CONTINUE
      RETURN
      END
```

SUBROUTINE BSRD

```
      SUBROUTINE BSRD
      COMMON DI,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $                PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                  NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      INTEGER OUT
      DIMENSION DSPEED(6)
      EQUIVALENCE (DSPEED,RSPD)
      INTEGER EDEV(8,6)
      EQUIVALENCE (EDEV,EVTDEV)
      COMMON/BLK1/KTRC,KOMP
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), INST
      COMMON/BLK5/ NCR,NPOS,PPOS(6),LPOS(6),LCDR(4)
      INTEGER PPOS
      COMMON/BLK8/SLIM(2),STOL(2)
```

```
      COMMON/BLK10/ DSPAIR(8)
      COMMON/BLK12/SMIN
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEAYT,FLTIME,EVTIME
C
C     THIS SUBROUTINE READS THE INPUT DATA CARDS DESCRIBING THE
C     SYSTEM TEST CONFIGURATION
C
      READ(5,600) IHST,KTRC,KDMP
  600 FORMAT(3I1)
      IF(IHST.EQ.9) STOP 7777
      WRITE(6,601) IHST,KTRC,KDMP
  601 FORMAT(1H0,3I1)
      IN=5
      OUT=6
C
C        READ TIME INTERVALS
C
      READ(IN,1011)INTRVL,START,STP
 1011 FORMAT(3(4I1,1X))
      WRITE(OUT,2011)INTRVL,START,STP
 2011 FORMAT(1H0,3(1X,4I1))
C
C        READ GEOMETRY
C
      READ(IN,1003)NLANE,NDEV
      WRITE(OUT,2003) NLANE,NDEV
 2003 FORMAT(1H0,3I6)
 1003 FORMAT(3I2)
      READ(IN,1003) NEVCNT
      WRITE(OUT,2007) NEVCNT
 2007 FORMAT(1H0,2I6)
      IF(NLANE.EQ.0) GO TO 10
      DO 3 J=1,NLANE
      READ(IN,1002) (IDEVCD(L,J),L=1,24)
 1002 FORMAT(24(I2,1X))
      WRITE(OUT,2004) (IDEVCD(L,J),L=1,24)
 2004 FORMAT(1H0,24(I2,2X))
    3 CONTINUE
   10 CONTINUE
      READ(IN,1012) DSPEED
 1012 FORMAT(6F10.2)
      WRITE(OUT,2012) DSPEED
 2012 FORMAT(1H0,6F10.2)
      IF(NEVCNT.EQ.0) GO TO 15
C
C        READ EVENT CODER GEOMETRY
C
      READ(IN,1014) NPOS,(LPOS(I),PPOS(I),I=1,6)
 1014 FORMAT(13I2)
      WRITE(OUT,2014) NPOS,(LPOS(I),PPOS(I),I=1,NPOS)
 2014 FORMAT(1H0,13I2)
      DO 13 J=1,NPOS
      READ(IN,1008) (EDEV(L,J),L=1,8)
 1008 FORMAT(8(I2,1X))
      WRITE(OUT,2008) (EDEV(L,J),L=1,8)
 2008 FORMAT(1H0,8(I2,1X))
   13 CONTINUE
   15 CONTINUE
C
C        READ PARAMETRIC DATA
C
      READ(IN,1010)   RLIM,SPDTOL,PLTTIM,VLIM,ALIM,SPLIM,
     $AXTOL,STDTOL,SLIM,STOL,SMIN
 1010 FORMAT(5E15.8)
```

```
      WRITE(OUT,2010) RLIM,SPDTOL,PLTTIM,VLIM,ALIM,SPLIM,
     $AXTOL,STDTOL,SLIM,STOL,SMIN
 2010 FORMAT(4(1H0,5E20.8/))
C
C        READ DISTANCES BETWEEN TRAPS
C
      READ(IN,1013) DSPAIR
 1013 FORMAT(8F10.0)
      WRITE(OUT,2013) DSPAIR
 2013 FORMAT(1H0,8F10.0)
      NCR=0
      IF(IHST.LT.7) RETURN
      CALL RDRAIL
      RETURN
      END
```

SUBROUTINE CONVRT

```
      SUBROUTINE CONVRT
      COMMON DI,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $              PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                               NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      DIMENSION DSPEED(6)
      EQUIVALENCE (DSPEED,RSPD)
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK7/STM
      COMMON/BLK8/SLIM(2),STOL(2)
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      COMMON/BLK12/SMIN
      COMMON/BLK13/ NSAMP(4,6),ASUM(4,4,6),RSUM(4,4,6),THSUM(4,4,6),
     $SHSUM(4,4,6),NTRACK(6)
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,PLTIME,EVTIME
C
C     THIS SUBROUTINE CONVERTS INPUT PARAMETERS TO CORRECT UNITS FOR
C     PROCESSING
C
      C1=528./360000.
      C2=1./C1
      C3=C2*3600000.
C
C        CONVERT INPUT PARAMETERS FROM MILES HOURS AND SECONDS
C        TO FEET AND MILLISECONDS
C
      DO 5 I=1,2
      STOL(I)=STOL(I)*C1
```

```
    5 SLIM(I)=SLIM(I)*C1
      SMIN=SMIN*C1
      SPDTOL=SPDTOL*C1
      PLTTIM=PLTTIM*1000.0
      VLIM=VLIM*1000.0
      ALIM=ALIM/1.E6
C
C        COMPUTE NUMBER OF ANALYSIS PERIODS AND START AND STOP TIMES
C
      INTMM=(INTRVL(1)*10+INTRVL(2))*3600000
     $+(INTRVL(3)*10+INTRVL(4))*60000
      ISAVE= INTMM
      INTMS=INTMM
      INTMM=(START(1)*10+START(2))*3600000
     $+(START(3)*10+START(4))*60000
      STM=INTMM
      IDET=((STP(1)-START(1))*10+(STP(2)-START(2)))*3600000
     1    +((STP(3)-START(3))*10+(STP(4)-START(4)))*60000
      IF(IDET.LE.0)IDET=IDET+24*3600000
      INTMM= ISAVE
      NPR=IDET/INTMM+1
      IREM=IDET-INTMS*(IDET/INTMS)
      IF(IREM.EQ.0) GO TO 25
      NPR=NPR+1
   25 CONTINUE
C
C        INITIALIZE ALL VEHICLE AND AXLE TABLES
C
      CALL MEMSET(.FALSE.,AXFLAG,408)
      CALL MEMSET(0,NSAMP,414)
      DO 26 I=1,6
      DO 26 J=1,6
      AXENRY(I,J)=-1.0
      PRTIME(I,J)=-1.0
      AXEXYT(I,J)=-1.0
   26 EVTIME(I,J)=-1.0
      TIME=0.0
      CALL MEMSET(0.0,THEAD,816)
      DO 28 I=1,17
      DO 28 J=1,4
      DO 28 K=1,6
   28 AXTIME(I,J,K)=0.0
      CALL MEMSET(0.0,AXSPED,408)
      CALL MEMSET(0,NVEH,76)
      DO 27 I=1,75
      DO 27 J=1,6
   27 INDEX(I,J)=.FALSE.
      LS=75
      VEHLST=-1.0
      DO 35 I=1,4
      A=DSPEED(I)*C1
      DSPEED(I)=0.0
      DO 30 J=1,6
      AXSPED(1,I,J) = A
   30 CONTINUE
   35 CONTINUE
      RETURN
      END
```

SUBROUTINE RDATA

```
      SUBROUTINE RDATA(I,J,K,IFST)
      DIMENSION K(32)
C
C
C
      IF(IFST.GT.0) GO TO 20
C
C        FIRST TIME
C
      READ(8) K
      WRITE(10) K
      IFST=1
      RETURN
   20 READ(8) I,J
      IF(J.EQ.100) GO TO 507
      RETURN
C
C        END OF FILE
C
  507 K(1)=9999
      RETURN
      END
```

SUBROUTINE PROCES

```
      SUBROUTINE PROCES
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $          PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                  NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      INTEGER EDEV(8,6)
      EQUIVALENCE (EDEV,EVTDEV)
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK5/ NCR,NPOS,PPOS(6),LPOS(6),LCDR(4)
      INTEGER PPOS
      COMMON/BLK6/IEVCDR(6,6)
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      DOUBLE PRECISION TSAVE,DET
C
C     DETERMINE IF DEVICE CODE BELONGS TO A DETECTOR PAIR
C
      DO 30 I=1,NDEV
      DO 30 J=1,NLANE
      IF(IDEVCD(I,J).EQ.ICD) GO TO 60
```

```
   30 CONTINUE
C
C     DETERMINE IF DEVICE CODE IS AN EVENT
C
      IF(NEVCNT.EQ.0) GO TO 45
      DO 40 J=1,8
      DO 40 K=1,NPOS
      IF(FDEV(J,K).EQ.ICD) GO TO 50
   40 CONTINUE
   45 CONTINUE
      CALL ERROR(2)
      RETURN
   50 DO 53 I=1,3
      IF(EVTIME(I,K).LT.0.0) GO TO 55
   53 CONTINUE
      GO TO 57
   55 EVTIME(I,K)=TIME
      IEVCDR(I,K)=EDEV(J,K)
      NCR=NCR+1
   57 CONTINUE
      I= 8*(K-1) + J

      IEV(I)=IEV(I) + 1
      RETURN
C
C     VALID DEVICE CODE FOUND
C
   60 DO 65 PAIR=1,NPAIR
      DO 65 LANE=1,NLANE
      IF(AXENRY(LANE,PAIR).LT.0.0) GO TO 65
      IF(AXTIME(1,LANE,PAIR).LT.1.0) GO TO 65
C
C     POSSIBLE 787 COMBINATION
C
      DET=AXENRY(LANE,PAIR) - AXTIME(1,LANE,PAIR)
      DIS=AXSPED(1,LANE,PAIR)*DET
      IF(DIS.GT.SPLIM) GO TO 65
      TLIM=.088*RLIM/AXSPED(1,LANE,PAIR)
      IF(TIME-AXENRY(LANE,PAIR).LT.TLIM) GO TO 65
C
C     FALSIFY EXIT SWITCH
C
      TSAVE=TIME
      TIME=(4.0/AXSPED(1,LANE,PAIR)) + AXENRY(LANE,PAIR)
      IF(TIME.GT.TSAVE) GO TO 63
      CALL EXYT
   63 TIME=TSAVE
   65 CONTINUE
      LANE=J
      PAIR = (I+1)/2
      IF(MOD(I,2).EQ.0) GO TO 70
C
C     ENTRY SWITCH
C
      CALL ENTRE
      GO TO 75
C
C     EXIT SWITCH
C
   70 CALL EXYT
C
```

```
C         CLEAR OUT AXLE TABLES
C
   75 DO 80 PAIR = 1,NPAIR
      DO 80 LANE = 1,NLANE
      CALL AXDISC(1)
   80 CONTINUE
      RETURN
      END
```

SUBROUTINE ENTRE

```
      SUBROUTINE ENTRE
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, TTM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $              PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                     NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK4/KKK
      COMMON/BLK10/ DSPAIR(8)
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      DOUBLE PRECISION TSAVE
      IF(AXENRY(LANE,PAIR).LT.0.0) GO TO 90
      IF(AXTIME(1,LANE,PAIR).LT.1.0) GO TO 10
C
C         ENTRY FLAG ALREADY SET
C
      DIS=AXSPED(1,LANE,PAIR)*(AXENRY(LANE,PAIR)-AXTIME(1,LANE,PAIR))
      IF(DIS.GT.SPLIM) GO TO 10
      FTIME=(4.0/AXSPED(1,LANE,PAIR)) + AXENRY(LANE,PAIR)
      GO TO 40
C
C
   10 JJ=PAIR-1
      ISW=0
      IK=JJ
      IF(TIME-AXENRY(LANE,PAIR).LT.30.0) GO TO 90
      IF(PAIR.GT.1) GO TO 15
C
C         FALSIFY EXIT TIME ASSUMING A 9.2 FT WHEELBASE
C
      SPEED=9.2/(TIME-AXENRY(LANE,PAIR))
      FTIME=(4.0/SPEED)+AXENRY(LANE,PAIR)
      GO TO 40
C
C         COMPUTE DISTANCE BETWEEN TRAPS
C
   15 PAIRDS=0.0
      DO 18 I=JJ,IK
   18 PAIRDS=PAIRDS+DSPAIR(I)
      LST=1
```

```
      KKK=1
      IF(VEHCNT(LANE,JJ).LE.0) GO TO 25
      LL=LANE
      GO TO 30
C
C        CHECK FOR ANY MORE VEHICLES IN THE NEXT LANE
C
   25 CALL LANCHK(LST,LANE,NLANE,JJ,LL,VEHCNT)
      IF(LL.GT.0) GO TO 30
      IF(JJ.EQ.1.OR.ISW.EQ.1) GO TO 90
C
C        TRY 2 TRAPS BACK
C
      ISW=1
      JJ=JJ-1
      GO TO 15
   30 NN=VEHCNT(LL,JJ)
   35 CONTINUE
C
C        CHECK NEXT VEHICLE FOR HOOK-UP
C
      SPEED=AXSPAC(NN,LL,JJ)/(TIME-AXENRY(LANE,PAIR))
      FTIME=(4.0/SPEED) + AXENRY(LANE,PAIR)
      CALL VEHCHK(FTM(NN,LL,JJ),ASPEED(NN,LL,JJ),KK,NN,LL,JJ)
      IF(KK.EQ.0) GO TO 40
      IF(NN.EQ.1) GO TO 25
      NN=NN-1
      GO TO 35
   40 CONTINUE
C
C        ENTER AXLE
C
      TSAVE=TIME
      TIME=FTIME
      CALL EXYT
      TIME=TSAVE
   90 CONTINUE
C
C        SET ENTRY FLAG
C
      AXENRY(LANE,PAIR)=TIME
      RETURN
      END
```

SUBROUTINE EXYT

```
      SUBROUTINE EXYT
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $              PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                   NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
```

```
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK4/ KKK
      COMMON/BLK10/ DSPAIR(8)
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      DOUBLE PRECISION TSAVE,ENSAVE,DIS
C
      IF(AXENRY(LANE,PAIR).GT.0.0) GO TO 70
      IF(AXTIME(1,LANE,PAIR).LT.1.0) GO TO 10
      DIS=AXSPED(1,LANE,PAIR)*(TIME-AXTIME(1,LANE,PAIR))
      IF(DIS.GT.SPLIM) GO TO 10
C
C        USE SPEED OF PREVIOUS AXLE
C
    5 AXENRY(LANE,PAIR)=TIME - (4.0/AXSPED(1,LANE,PAIR))
      GO TO 90
   10 IF(AXEXYT(LANE,PAIR).GT.0.0) GO TO 20
C
C        SET EXIT FLAG
C
   15 AXEXYT(LANE,PAIR)=TIME
      RETURN
C
C        -8-8 CASE
C
   20 IJ=1
   23 JJ=PAIR-1
      ISW=0
      IK=JJ
      IF(TIME-AXEXYT(LANE,PAIR).LT.30.0) GO TO(40,75),IJ
      IF(PAIR.GT.1) GO TO 24
      GO TO(17,18),IJ
C
C        FALSIFY SPEED USING 9.2FT  WHEELBASE
C
   17 SPEED=9.2/(TIME-AXEXYT(LANE,PAIR))
      GO TO 34
   18 IF(TIME.EQ.AXENRY(LANE,PAIR)) GO TO 20
C
C        FALSIFY SPEED USING SPEED OF AFTER AXLE
C
      SPEED=4.0/(TIME-AXENRY(LANE,PAIR))
      GO TO 34
C
C        COMPUTE DISTANCE BETWEEN TRAPS
C
   24 PAIRDS=0.0
      DO 26 I=JJ,IK
   26 PAIRDS=PAIRDS+DSPAIR(I)
      LST=1
      KKK=1
      IF(VEHCNT(LANE,JJ).LE.0) GO TO 25
      LL=LANE
      GO TO 30
   25 CALL LANCHK(LST,LANE,NLANE,JJ,LL,VEHCNT)
      IF(LL.GT.0) GO TO 30
      IF(JJ.EQ.1.OR.ISW.EQ.1) GO TO(15,40),IJ
C
C        TRY 2 TRAPS BACK
C
```

```
      ISW=1
      JJ=JJ-1
      GO TO 24
   30 NN=VEHCNT(LL,JJ)
   32 CONTINUE
C
C        CHECK NEXT VEHICLE FOR HOOK-UP
C
      GO TO (45,43),IJ
   43 IF(TIME.EQ.AXENRY(LANE,PAIR)) GO TO 20
      SPEED=4.0/(TIME-AXENRY(LANE,PAIR))
      GO TO 48
   45 CONTINUE
      SPEED=AXSPAC(NN,LL,JJ)/(TIME-AXEXYT(LANE,PAIR))
   48 CONTINUE
      FTIME=AXEXYT(LANE,PAIR)
      CALL VEHCHK(FTM(NN,LL,JJ),ASPEED(NN,LL,JJ),KK,NN,LL,JJ)
      IF(KK.EQ.0) GO TO 34
      IF(NN.EQ.1) GO TO 25
      NN=NN-1
      GO TO 32
   34 CONTINUE
C
C        ENTER AXLE NO 1
C
      ENSAVE=AXENRY(LANE,PAIR)
      TSAVE=TIME
      AXENRY(LANE,PAIR)=AXEXYT(LANE,PAIR) - (4.0/SPEED)
      TIME=AXEXYT(LANE,PAIR)
      CALL UPDATE
      CALL AXDISC(0)

      TIME=TSAVE
      GO TO(35,75),IJ
   35 AXENRY(LANE,PAIR)=TIME - (4.0/SPEED)
   40 AXEXYT(LANE,PAIR)=-1.0
      GO TO 90
   70 IF(AXEXYT(LANE,PAIR).LT.0.0) GO TO [illegible]
C
C        -878 CASE
C
      IJ=2
      GO TO 23
   75 AXEXYT(LANE,PAIR)=-1.0
      AXENRY(LANE,PAIR)=ENSAVE
   90 IF(TIME-AXENRY(LANE,PAIR).LT.27.) RETURN
C
C        ENTER AXLE
C
      CALL UPDATE
      AXENRY(LANE,PAIR) = -1.0
      CALL AXDISC(0)
      RETURN
      END
```

SUBROUTINE UPDATE

```
      SUBROUTINE UPDATE
      COMMON D1.LANE,TIME,NPR,INTMS,RLIM,SPDTOL.NEVCNT.EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $               PAIR, ITYPE, NFAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                 NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION DET
      COMMON/BLK12/SMIN
C
C        RETURN IF TIMES TOO CLOSE
C
      DET=TIME-AXENRY(LANE,PAIR)
      IF(DET.LE.27.) RETURN
C
C        COMPUTE SPEED
C
      SPD=4.0/DET
      IF(SPD.LT.SMIN) RETURN
      IF(AXTIME(1,LANE,PAIR).LT.1.0) GO TO 10
      DIST=(TIME-AXTIME(1,LANE,PAIR))*AXSPED(1,LANE,PAIR)
      IF(DIST.LT.2.0) RETURN
   10 CONTINUE
      IF(NAXLES(LANE,PAIR).LT.17) GO TO 15
      NAXLES(LANE,PAIR)=NAXLES(LANE,PAIR)-1
      IF(AXFLAG(17,LANE,PAIR)) NFLGAX(LANE,PAIR)=NFLGAX(LANE,PAIR)-1
      WRITE(6,1000)
 1000 FORMAT(* UPDATE TABLE OVERFLOW*)
   15 KK=NAXLES(LANE,PAIR)
      IF(KK.EQ.0) GO TO 25
C
C        UPDATE AXLE TABLES
C
      DO 20 I=1,KK
      L=KK-I+1
      AXTIME(L+1,LANE,PAIR)=AXTIME(L,LANE,PAIR)
      AXFLAG(L+1,LANE,PAIR)=AXFLAG(L,LANE,PAIR)
      AXSPED(L+1,LANE,PAIR)=AXSPED(L,LANE,PAIR)
   20 CONTINUE
C
C     ENTER NEW AXLE
C
   25 AXTIME(1,LANE,PAIR) = TIME
      AXSPED(1,LANE,PAIR) = SPD
      AXFLAG(1,LANE,PAIR) = .FALSE.
      NAXLES(LANE,PAIR) = NAXLES(LANE,PAIR)+1
      RETURN
      END
```

SUBROUTINE AXDISC

```
      SUBROUTINE AXDISC(IJ)
      COMMON U1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $              PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                       NOPLTN,U2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      DOUBLE PRECISION DET
      IF(NAXLES(LANE,PAIR).LT.2) RETURN
      IF(IJ.EQ.1) GO TO 30
      JJ=1
C
C     COMPUTE POSITION OF PRECEEDING AXLE
C
   10 CONTINUE
      DET=TIME-AXTIME(2,LANE,PAIR)
      SPP=AXSPED(2,LANE,PAIR)
      IF(NAXLES(LANE,PAIR).EQ.2) GO TO 15
      IF(.NOT.AXFLAG(3,LANE,PAIR)) GO TO 15
      SPP=(AXSPED(3,LANE,PAIR)+SPP)/2.
   15 DIST=SPP*DET
      IF(DIST.GT.SPLIM) GO TO 40
C
C        NEXT AXLE WITHIN DISTANCE TOLERANCE
C
      SPDIF=ABS(AXSPED(2,LANE,PAIR)-AXSPED(1,LANE,PAIR))
      IF(SPDIF.LT.SPDTOL) GO TO 20
      IF(JJ.EQ.2) RETURN
      JJ=2
      CALL AXCHG(AXTIME(1,LANE,PAIR),AXSPED(1,LANE,PAIR),LL)
      IF(LL.EQ.0) RETURN
      GO TO 10
C
C     SPEEDS MATCH---FLAG AXLE AHEAD
C
   20 AXFLAG(2,LANE,PAIR) = .TRUE.
      NFLGAX(LANE,PAIR) = NFLGAX(LANE,PAIR) + 1
      IF(JJ.EQ.2) RETURN
      CALL AXCHG(AXTIME(1,LANE,PAIR),AXSPED(1,LANE,PAIR),LL)
      RETURN
   30 DET= TIME - AXTIME(1,LANE,PAIR)
      DIST = AXSPED(1,LANE,PAIR)*DET
      IF(DIST.LE.SPLIM) RETURN
C
```

```
C     CHECK IF ANY FLAGGED AXLES GT 30 FT AWAY
C
   40 KK=NAXLES(LANE,PAIR)
      IF(IJ.NE.1)GO TO 45
      IF(LANE.EQ.NLANE) GO TO 45
      IF(NAXLES(LANE+1,PAIR).LT.1) GO TO 45
      DET=AXTIME(1,LANE+1,PAIR) - AXTIME(1,LANE,PAIR)
      IF(DET.GT.0.0) GO TO 45
      IF(DABS(DET).LT..088*STDTOL/AXSPED(1,LANE,PAIR)) RETURN
   45 CONTINUE
      DO 50 I=1,KK
      L=KK-I+1
      IF(.NOT.AXFLAG(L,LANE,PAIR)) GO TO  50
      DET=TIME-AXTIME(L,LANE,PAIR)
      DIST=AXSPED(L,LANE,PAIR)*DET
      IF(DIST.LT.SPLIM) GO TO 50
      FINDEX=L
      GO TO 70
   50 CONTINUE
C
C     REMOVE AXLES GT 30 FT AWAY
C
      DO 60 I=1,KK
      L=KK-I+1
      DET=TIME-AXTIME(L,LANE,PAIR)
      DIST=AXSPED(L,LANE,PAIR)*DET
      IF(DIST.LT.SPLIM) RETURN
      NAXLES(LANE,PAIR)=L-1
      IF(AXFLAG(L,LANE,PAIR)) NFLGAX(LANE,PAIR) = NFLGAX(LANE,PAIR)-1
   60 CONTINUE
      RETURN
   70 CALL VEHID
      RETURN
      END
```

SUBROUTINE AXCHG

```
      SUBROUTINE AXCHG(T,S,J)
      DOUBLE PRECISION T(2),DET,ENT
      DOUBLE PRECISION DTT
      DIMENSION S(2)
C
C        DETERMINE IF SWITCH HAS BEEN FALSIFIED
C
      J=0
      II=T(2)*10.D0
      DET=T(2)*10.D0-II
      IF(DET.EQ.0.D0) RETURN
      II=T(1)*10.D0
      DTT=T(1)*10.D0-II
      IF(DTT.EQ.0.D0) RETURN
C
C        SWITCH HAS BEEN FALSIFIED RE-COMPUTE TIME AND SPEED
C
      J=1
      DET=4.0/S(2)
      S(2)=S(1)
      ENT=T(2)-DET
      T(2)=ENT+4.0/S(2)
      RETURN
      END
```

SUBROUTINE VEHID

```
      SUBROUTINE VEHID
      COMMON D1.LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IFV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $             PAIR, ITYPE, NFAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                     NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK5/ NCR,NPOS,PPOS(6),LPOS(6),LCDR(4)
      INTEGER PPOS
      COMMON/BLK6/IEVCDR(6,6)
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      COMMON/BLK11/ ITYP(75),NPRD(75),NPLTON(75),NAXL(75),NCODE(75),
     $LN(6,75),BFF(9,6,75)
      COMMON/BLK12/SMIN
      COMMON/BLK13/ NSAMP(4,6),ASUM(4,4,6),RSUM(4,4,6),THSUM(4,4,6),
     $SHSUM(4,4,6),NTRACK(6)
      COMMON/BLK14/IPRTYP
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      DOUBLE PRECISION DET
      INTEGER PRTYPE(6,6)
      DATA PRTYPE/36*1/
      SPSAVE=SPEED
C
C        DETERMINE NO OF AXLES
C
      AXCNT = 1
      DO 20 I=1,FINDEX
      L=FINDEX-I+1
      IF(.NOT.AXFLAG(L,LANE,PAIR)) GO TO 30
      AXCNT = AXCNT+1
      NFLGAX(LANE,PAIR)=NFLGAX(LANE,PAIR)-1
   20 CONTINUE
   30 NAXLES(LANE,PAIR)=L-1
      PLTOON = 1
      ITYPE = 1
      IF(AXCNT.LE.2) GO TO 60
C
C        CHECK IF ANY AXLES ARE LESS THAN 6 FEET APART
C
      K=L+1
       DO 40 I=K,FINDEX
       J=FINDEX-I+K
       DET=AXTIME(J-1,LANE,PAIR)-AXTIME(J,LANE,PAIR)
       DIST=(AXSPED(J,LANE,PAIR)+AXSPED(J-1,LANE,PAIR))*DET/2.0
```

```
      IF(DIST.LT.6.0) GO TO 55
   40 CONTINUE
C
C        CHECK IF ODD NO OF AXLES
C
      IF(MOD(AXCNT,2).EQ.1) GO TO 55
      PLTOON=AXCNT/2
      GO TO 60
   55 ITYPE=2
   60 CONTINUE
      IF(PLTOON.LT.2) GO TO 75
      AXCNT=2
   73 L=FINDEX-1
   75 FTIME=AXTIME(FINDEX,LANE,PAIR)
      RTIME=AXTIME(L,LANE,PAIR)
      FSPEED=AXSPED(FINDEX,LANE,PAIR)
      RSPEED=AXSPED(L,LANE,PAIR)
      I2=L+1
C
C        COMPUTE AVERAGE SPEED OF VEHICLE
C
      SPEED=0.0
      DO 77 I=L,FINDEX
      SPEED=SPEED+4.0/AXSPED(I,LANE,PAIR)
      IF(I.EQ.I2) SP1=SPEED
   77 CONTINUE
      SPEED=4.0*FLOAT(FINDEX-L+1)/SPEED
      IF(SPEED.LT.SMIN) GO TO 95
C
C        COMPUTE DISTANCE BETWEEN FRONT 2 AXLES
C
      ARATT=AXTIME(FINDEX-1,LANE,PAIR)
      RAAA=2.0*ARATT
      RBBB=2.0*FTIME
      RCCC=4.0/AXSPED(FINDEX-1,LANE,PAIR)
      RDDD=4.0/FSPEED
      SPACE = (RAAA-RBBB-RCCC+RDDD)*4.0/SP1
      NSAMP(LANE,PAIR)=NSAMP(LANE,PAIR) + 1
C
C        INCREMENT SPEED MOMENTS
C
      CALL SUMUP(C2*SPEED,ASUM(1,LANE,PAIR))
      FLTIME=0.0
      FOLLOW=0.0
      IF(PRTIME(LANE,PAIR).GT.0.0) GO TO 80
      GO TO 85
C
C        INCREMENT RELATIVE SPEED TIME GAP AND SPACE GAP MOMENTS
C
   80 FOLLOW=PRSPED(LANE,PAIR)*(FTIME-PRTIME(LANE,PAIR)) - 10.0
      CALL SUMUP(FOLLOW,SHSUM(1,LANE,PAIR))
      FLTIME=FTIME-PRTIME(LANE,PAIR) - 10.0/PRSPED(LANE,PAIR)
      CALL SUMUP( .001*FLTIME,THSUM(1,LANE,PAIR))
      DELSPD=PRSPED(LANE,PAIR)-SPEED
C
C        INSERT TAILWAY FOR PREVIOUS VEHICLE
C
      CALL SUMUP(C2*DELSPD,RSUM(1,LANE,PAIR))
      IF(TAIL(1,LANE,PAIR).NE.0.0) GO TO 85
      TAIL(1,LANE,PAIR)=FOLLOW
      CALL GET(IDVEH(1,LANE,PAIR),PAIR,NK,JJ)
      IF(NK.EQ.1) GO TO 85
      BFF(9,PAIR,JJ)=FOLLOW
      IF(PAIR.LT.NPAIR) GO TO 85
C
```

```
C         OUTPUT PREVIOUS VEHICLE IF AT LAST TRAP
C
      CALL TAPOUT(IDVEH(1,LANE,PAIR),NPAIR)
C
C         GET VEHICLE TYPE
C
   85 PRTIME(LANE,PAIR)=RTIME
      PRSPED(LANE,PAIR) = SPEED
      IPRTYP=PRTYPE(LANE,PAIR)
      CALL TYPE(SPACE,AXCNT,PRTYPE(LANE,PAIR))
C
C         INSERT ANY OUTSTANDING CODER BUTTON HITS
C
      CALL MEMSET(0,LCDR,4)
      IF(NCR.LT.1) GO TO 90
      L=1
      DO 89 I=1,NPOS
      IF(PAIR.NE.PPOS(I)) GO TO 89
      IF(LANE.NE.LPOS(I)) GO TO 89
      DO 87 K=1,3
      IF(EVTIME(K,I).LT.0.0) GO TO 89
      IF(RTIME.LT.EVTIME(K,I)) GO TO 89
      LCDR(L)=IEVCDR(K,I)
      EVTIME(K,I)=-1.0
      NCR=NCR-1
      IF(L.EQ.4) GO TO 90
      L=L+1
   87 CONTINUE
   89 CONTINUE
   90 CONTINUE
      CALL GRID
      IF(PLTOON.EQ.1) GO TO 95
C
C         PROCESS NEXT VEHICLE IN PLATOON
C
      PLTOON=PLTOON-1
      FINDEX=FINDEX-2
      GO TO 73
   95 SPEED=SPSAVE
      RETURN
      END
```

SUBROUTINE SUMUP

```
      SUBROUTINE SUMUP(A,S)
      DIMENSION S(4)
      B=1.0
      DO 10 I=1,4
      B=B*A
      S(I)=S(I)+B
   10 CONTINUE
      RETURN
      END
```

SUBROUTINE GRID

```
      SUBROUTINE GRID
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IFV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $                 PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                        NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK4/KKK
      COMMON/BLK5/ NCR,NPOS,PPOS(6),LPOS(6),LCDR(4)
      INTEGER PPOS
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      COMMON/BLK10/ DSPAIR(8)
      COMMON/BLK14/IPRTYP
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      ISW=0
      IK=PAIR-1
      KKK=0
      LL = LANE
      LST=1
C
C     CHECK IF ENTERING GRID
C
      IF(PAIR.GT.1) GO TO 25
C
C     CHECK IF NEW PLATOON
C
      IF(VEHLST.LT.0.0) GO TO 5
      IF(FTIME.LT.VEHLST) GO TO 10
      IF(FTIME-VEHLST.LT.PLTTIM) GO TO 10
    5 IPLTN=IPLTN+1
      NOPLTN=NOPLTN+1
C
C     ENTER VEHICLE IN GRID
C
   10 CALL REMOVE (LANE,PAIR)
      VEHLST=FTIME
   15 CALL UPVEH
      NOVEH=NOVEH +1
      IDVEH(1,LANE,PAIR) = NOVEH
      IVTYPE(1,LANE,PAIR) = ITYPE
      IPRD(1,LANE,PAIR) = IPRTYP
      IPLTON(1,LANE,PAIR) = IPLTN
      IAXLE(1,LANE,PAIR) = AXCNT
      FTM(1,LANE,PAIR)=FTIME
```

```
      FSPD(1,LANE,PAIR)=FSPEED
      RTM(1,LANE,PAIR)=RTIME
      RSPD(1,LANE,PAIR) = RSPEED
      ASPEED(1,LANE,PAIR) = SPEED
      AXSPAC(1,LANE,PAIR)=SPACE
      SHEAD(1,LANE,PAIR)=FOLLOW
      THEAD(1,LANE,PAIR)=FLTIME
      ICODE(1,LANE,PAIR)=LCDR(1)
      DO 18 I=2,4
      IF(LCDR(I).EQ.0) GO TO 20
      ICODE(1,LANE,PAIR)=ICODE(1,LANE,PAIR)*100+LCDR(I)
   18 CONTINUE
   20 TAIL(1,LANE,PAIR)=0.0
C
C        RECORD VEHICLE IF NOT AT FIRST TRAP
C
      IF(PAIR.GT.1) CALL RECORD(1,LANE,PAIR)
      IF(ICODE(1,LANE,PAIR).EQ.0) RETURN
      CALL STDCHK(-1,LANE,PAIR)
      RETURN
C     CHEKC FOR VEHICLE AT PREV PAIR, SAME LANE
   25 CONTINUE
      JJ = PAIR-1
C
C        COMPUTE DISTANCE BETWEEN TRAPS
C
   30 PAIRDS=0.0
      DO 32 I=JJ,IK
   32 PAIRDS=PAIRDS+DSPAIR(I)
      IF(VEHCNT(LANE,JJ).GT.0) GO TO 60
      GO TO 38
C     CHECK ANOTHER LANE
   35 IF(NN.EQ.1) GO TO 38
      NN=NN-1
      GO TO 68
   38 CALL LANCHK(LST,LANE,NLANE,JJ,LL,VEHCNT)
      IF(LL.GT.0) GO TO 65
      IF(JJ.EQ.1.OR.ISW.EQ.1) GO TO 43
      ISW=1
      JJ=JJ-1
      LST=1
      GO TO 30
   43 CONTINUE
      NN=VEHCNT(LANE,PAIR) + 1
      FTM(NN,LANE,PAIR) = FTIME
C
C        CHECK FOR STRADDLE
C
      CALL STDCHK(NN,LANE,PAIR)
      IF(NN.EQ.0) RETURN
      IF(JJ.EQ.-705) RETURN
      GO TO 15
   60 LL=LANE
C
C        REMOVE OLD VEHICLES FROM TABLE
C
      CALL REMOVE(LL,JJ)
C
C     CHECK IF SAME VEHICLE
C
   65 NN = VEHCNT(LL,JJ)
C
C     CHECK TYPE ANE NO. AXLES
C
   68 CONTINUE
```

```
      IF(NN.LT.1) GO TO 38
      IF(IAXLE(NN,LL,JJ).EQ.AXCNT) GO TO 66
      II=IABS(IAXLE(NN,LL,JJ)-AXCNT)
      IF(II.GT.1) GO TO 35
   66 CONTINUE
C
C        CHECK VEHICLE DYNAMICS
C
      CALL VEHCHK(FTM(NN,LL,JJ),ASPEED(NN,LL,JJ),KK,NN,LL,JJ)
      IF(KK.EQ.1) GO TO 35
C
C        CHECK AXLE SPACING
C
      A=SPACE - AXSPAC(NN,LL,JJ)
      IF(ABS(A).GT.AXTOL) GO TO 35
      CALL GET(IDVEH(NN,LL,JJ),PAIR,NL,-705)
      IF(NL.EQ.1) GO TO 67
      JJ=-705
      GO TO 43
   67 CONTINUE
      IF(JJ.EQ.PAIR-1) GO TO 72
      CALL GET(IDVEH(NN,LL,JJ),PAIR-1,NL,-705)
      IF(NL.EQ.0) GO TO 35
   72 CONTINUE
C
C     CHECK IF LANE CHANGE
C
      IF(LL.EQ.LANE) GO TO 70
C
C     RECORD LANE CHANGE
C
      IF(IABS(LL-LANE).LT.2) GO TO 69
      IF(PAIR-JJ.EQ.1) GO TO 69
      LI=IABS((LL+LANE)/2)
      LANCHG(LL,LI,PAIR-1)=LANCHG(LL,LI,PAIR-1)+1
      LANCHG(LI,LANE,PAIR)=LANCHG(LI,LANE,PAIR)+1
      GO TO 70
   69 CONTINUE
      LANCHG(LL,LANE,PAIR) = LANCHG(LL,LANE,PAIR) +I
   70 CALL UPVEH
C
C     ENTER VEHICLE AT CURRENT DETECTOR PAIR
C
      IDVEH(1,LANE,PAIR)=IDVEH(NN,LL,JJ)
      IVTYPE(1,LANE,PAIR)=IVTYPE(NN,LL,JJ)
      IPRD(1,LANE,PAIR)=IPRD(NN,LL,JJ)
      IPLTON(1,LANE,PAIR)=IPLTON(NN,LL,JJ)
      IAXLE(1,LANE,PAIR)=IAXLE(NN,LL,JJ)
      FTM(1,LANE,PAIR) = FTIME
      FSPD(1,LANE,PAIR) = FSPEED
      RTM(1,LANE,PAIR) = RTIME
      RSPD(1,LANE,PAIR) = RSPEED
      ASPEED(1,LANE,PAIR) = SPEED
      AXSPAC(1,LANE,PAIR)=SPACE
      SHEAD(1,LANE,PAIR)=FOLLOW
      THEAD(1,LANE,PAIR)=FLTIME
      TAIL(1,LANE,PAIR)=0.0
      IF(LCDR(I).NE.0) GO TO 73
      ICODE(I,LANE,PAIR)=ICODE(NN,LL,JJ)
      GO TO 80
   73 ICODE(1,LANE,PAIR)=ICODE(NN,LL,JJ)*100+LCDR(1)
      DO 74 I=2,4
      IF(LCDR(I).EQ.0) GO TO 80
      ICODE(1,LANE,PAIR)=ICODE(1,LANE,PAIR)*100+LCDR(I)
   74 CONTINUE
```

```
   80 CONTINUE
      IF(JJ.GT.1) GO TO 82
      IF(ABS(AXSPAC(NN,LL,JJ)-9.2).GT..01) GO TO 81
C
C        CHANGE SPEEDS AT TRAP1 IF 9.2 FT WHEELBASE
C
      AXSPAC(NN,LL,JJ)=AXSPAC(1,LANE,PAIR)
      SPEDD=AXSPAC(1,LANE,PAIR)*ASPEED(NN,LL,JJ)/9.2
      FSPD(NN,LL,JJ)=SPEDD
      RSPD(NN,LL,JJ)=SPEDD
      ASPEED(NN,LL,JJ)=SPEDD
   81 CALL RECORD(NN,LL,JJ)
   82 CONTINUE
      CALL RECORD(1,LANE,PAIR)
      IF(NN.NE.VEHCNT(LL,JJ)) GO TO 83
      VEHCNT(LL,JJ)=VEHCNT(LL,JJ) - 1
   83 CONTINUE
      ASPEED(NN,LL,JJ)=5.0
      DO 85 L=1,NLANE
      DO 85 K=1,NPAIR
      CALL REMOVE(L,K)
   85 CONTINUE
      IF(PAIR.LT.NPAIR) RETURN
      VEHCNT(LANE,PAIR)=0
      RETURN
      END
```

SUBROUTINE UPVEH

```
      SUBROUTINE UPVEH
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IFV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $          PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                              NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      L=VEHCNT(LANE,PAIR)
C
C        CHECK TO SEE IF TABLES ARE FULL
C
      IF(L.EQ.0) GO TO 20
      IF(L.LT.17) GO TO 13
      L=16
      VEHCNT(LANE,PAIR) = 16
      WRITE(6,1000) IDVEH(17,LANE,PAIR)
 1000 FORMAT(* UPVEH TABLE OVERFLOW*,I10)
```

```
   13 CONTINUE
      L=L+10
      IF(L.GT.16) L=16
C
C        UPDATE VEHICLE TABLES
C
      DO 15 I=1,L
      K=L-I+1
      IDVEH(K+1,LANE,PAIR)=IDVEH(K,LANE,PAIR)
      IVTYPE(K+1,LANE,PAIR)=IVTYPE(K,LANE,PAIR)
      IPRD(K+1,LANE,PAIR)=IPRD(K,LANE,PAIR)
      IPLTON(K+1,LANE,PAIR)=IPLTON(K,LANE,PAIR)
      IAXLE(K+1,LANE,PAIR)=IAXLE(K,LANE,PAIR)
      FTM(K+1,LANE,PAIR)=FTM(K,LANE,PAIR)
      FSPD(K+1,LANE,PAIR)=FSPD(K,LANE,PAIR)
      RTM(K+1,LANE,PAIR)=RTM(K,LANE,PAIR)
      RSPD(K+1,LANE,PAIR)=RSPD(K,LANE,PAIR)
      ASPEED(K+1,LANE,PAIR)=ASPEED(K,LANE,PAIR)
      AXSPAC(K+1,LANE,PAIR)=AXSPAC(K,LANE,PAIR)
      THEAD(K+1,LANE,PAIR)=THEAD(K,LANE,PAIR)
      SHEAD(K+1,LANE,PAIR)=SHEAD(K,LANE,PAIR)
      ICODE(K+1,LANE,PAIR)=ICODE(K,LANE,PAIR)
      TAIL(K+1,LANE,PAIR)=TAIL(K,LANE,PAIR)
   15 CONTINUE
   20 VEHCNT(LANE,PAIR)=VEHCNT(LANE,PAIR) +1
      RETURN
      END
```

SUBROUTINE LANCHK

```
      SUBROUTINE LANCHK(LST,LANE,NLANE,JJ,LL,VEHCNT)
      INTEGER VEHCNT(6,6)
      DIMENSION LFLG(6),LIST(6)
      DIMENSION LLS(5,6)
      DATA LLS/
     $2,3,4,5,6,
     $1,3,4,5,6,
     $2,4,1,5,6,
     $3,5,2,6,1,
     $4,6,3,2,1,
     $5,4,3,2,1/
      LL=0
C
C        SETUP LANE SEARCHING TABLE
C
   35 GO TO (40,50),LST
   40 LST=2
      DO 45 I=1,5
      LFLG(I)=1
   45 LIST(I)=LLS(I,LANE)
C
C        SEARCH FOR VEHICLES IN EACH LANE IN THE TABLE
C
   50 DO 55 I=1,5
      IF(LFLG(I).LT.0) GO TO 55
      IF(LIST(I).GT.NLANE) GO TO 55
      LFLG(I) = -1
      CALL REMOVE (LIST(I),JJ)
      IF(VEHCNT(LIST(I),JJ).EQ.0) GO TO 55
```

```
      C
      C        POSSIBLE VEHICLES FOUND
      C
            LL=LIST(I)
            RETURN
         55 CONTINUE
            RETURN
            END
```

SUBROUTINE VEHCHK

```
            SUBROUTINE VEHCHK(FTM2,ASPP,KK,N,L,J)
            COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
           $IEV(64),NLANE, NDEV, IDEVCD(24,6), MAXLES(6,6), NFLGAX(6,6),FINDEX
           $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
           $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
           $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
           $                PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
           $,FSPEED, RSPEED,                                      NOPLTN,D2,
           $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
           $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
           $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
           $ISTHDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
           $LANCHG(6,6,6)
            INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
           $HIST3, HIST4, PAIR, AXCNT, VEHCNT
            REAL INTMS, ITM
            LOGICAL  AXFLAG
            COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
           $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
           $ICDR, EVTIME(6,6), IHST
            DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
            COMMON/BLK4/KKK
            COMMON/BLK8/SLIM(2),STOL(2)
            COMMON/BLK12/SMIN
            DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
            DOUBLE PRECISION FTM2,A
            KK=0
            ASP2=ASPP
      C
      C        BYPASS IF VEHICLE ALREADY USED
      C
            IF(ASP2.NE.5.) GO TO 5
          3 KK=1
            RETURN
          5 IF(SPEED.LT.SMIN) GO TO 3
            A=FTIME - FTM2
          7 IF(A.LE.PAIRDS/.146) GO TO 35
            ACC=(SPEED-ASP2)/A
      C
      C        CHECK ACCELERATION
      C
            IF(ABS(ACC).GT.ALIM) GO TO 35
      C
      C        CHECK AVERAGE VELOCITY
      C
            AVG=(SPEED+ASP2)/2.0
            VEL=PAIRDS/A
            XMIN=SPEED
            XMAX=ASP2
            IF(XMIN.LE.XMAX) GO TO 10
            XMAX=SPEED
            XMIN=ASP2
         10 C=XMAX-XMIN
            IF(C.GT.SLIM(2)) GO TO 20
```

```
      I=1
      IF(C.GT.SLIM(1)) I=2
      XMAX=XMAX+STOL(I)
      XMIN=XMIN-STOL(I)
      IF(IHST.NE.7) GO TO 20
      IF(PAIR.NE.6) GO TO 20
      IF(XMIN.GT.0.00136) GO TO 20
      XMIN=0.00136
   20 IF(VEL.LT.XMIN.OR.VEL.GT.XMAX) GO TO 35
      IF(KK.EQ.0) RETURN
      KK=0
C
C        CHANGE SPEEDS IF OLD WHEELBASE EQUAL TO 9.2
C
      FSPD(N,L,J)=ASP2
      RSPD(N,L,J)=ASP2
      ASPEED(N,L,J)=ASP2
      AXSPAC(N,L,J)=SPACE
      RETURN
   35 IF(KK.EQ.1) RETURN
      KK=1
      IF(KKK.EQ.1) RETURN
      IF(ABS(AXSPAC(N,L,J)-9.2).GT..01) RETURN
C
C        CHANGE SPEED AND TRY AGAIN IF WHEELBASE IS EQUAL TO 9.2
C
      ASP2=SPACE*ASP2/9.2
      GO TO 7
      END
```

SUBROUTINE REMOVE

```
      SUBROUTINE REMOVE(L,K)
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $             PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                     NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDH, EVTIME(6,6), IHST
      COMMON/BLK4/KKK
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      COMMON/BLK11/ ITYP(75),NPRD(75),NPLTON(75),NAXL(75),NCODE(75),
     $LN(6,75),PFF(9,6,75)
      COMMON/BLK10/DSPAIR(8)
C
```

```
C          RETURN IF CALL NOT FROM GRID
C
      IF(KKK.EQ.1) RETURN
      IF(VEHCNT(L,K).EQ.0) RETURN
      J=VEHCNT(L,K)
      DO 10 I=1,J
      N=J-I+1
C
C          COMPUTE ALLOWABLE TIME
C
      BUNCHA=VLIM*0.088/ASPEED(N,L,K)
      BUNCHB=BUNCHA*DSPAIR(K)/300.0
C
C          RETURN IF NOT TIME
C
      IF (FTIME-FTM(N,L,K).LT.BUNCHB) RETURN
      CALL GET(IDVEH(N,L,K),K,NN,-705)
      IF(NN.EQ.1) GO TO 5
      IF(TAIL(N,L,K).EQ.0.0) RETURN
      IF(K.EQ.NPAIR) RETURN
      KK=K+1
      CALL GET(IDVEH(N,L,K),KK,NN,-705)
      IF(NN.EQ.0) GO TO 7
      DO 3 JK=KK,NPAIR
      CALL GET(IDVEH(N,L,K),JK,NN,JJ)
      IF(NN.EQ.1) GO TO 3
      IF(HFF(9,JK,JJ).EQ.0.0) GO TO 7
    3 CONTINUE
    5 CONTINUE
      CALL TAPOUT(IDVEH(N,L,K),NPAIR)
    7 CONTINUE
      VEHCNT(L,K) = N-1
      CALL STDCHK(N,L,K)
   10 CONTINUE
      RETURN
      END
```

SUBROUTINE STDCHK

```
      SUBROUTINE STDCHK(II,L,K)
      COMMON DI,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $          PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                              NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
```

```
      DIMENSION ITAB(4,4)
      DATA ITAB/0,2,0,0,1,0,4,0,0,3,0,6,0,0,5,0/
      N=IABS(II)
      DO 5 NN=1,NLANE
      IF(NN.EQ.L) GO TO 5
      IF(IABS(NN-L).NE.I) GO TO 5
      M=VEHCNT(NN,K) + 10
      IF(M.GT.17) M=17
      DO 3 LL=1,M
      IF(ASPEED(LL,NN,K).LT.1.E-4) GO TO 3
      IF(DABS(FTM(N,L,K)-FTM(LL,NN,K)).LT..088*STDTOL/
     $     ASPEED(LL,NN,K)) GO TO 7
    3 CONTINUE
    5 CONTINUE
C
C        NO STRADDLES FOUND
C
      RETURN
    7 CONTINUE
      IF(II.GT.0) GO TO 12
C
C        SWAP CODER HITS
C
      IF(ICODE(LL,NN,K).GT.0) RETURN
      ICODE(LL,NN,K)=ICODE(N,L,K)
      RETURN
C
C        INCREMENT STRADDLE TABLES
C
   12 LL=ITAB(NN,L)
      II=0
   15 ISTRDL(LL,K)=ISTRDL(LL,K)+1
      RETURN
      END
```

SUBROUTINE RECORD

```
      SUBROUTINE RECORD (N,L,J)
      COMMON DI,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $             PAIR, ITYPE, NPAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                  NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      COMMON/BLK11/ ITYP(75),NPRD(75),NPLTON(75),NAXL(75),NCODE(75),
     $LN(6,75),RFF(9,6,75)
```

```
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
C
C        CONVERT UNITS FOR OUTPUT PURPOSES
C
      IF=0
      A             = FSPD(N,L,J)  * C2
      B             = RSPD(N,L,J)  * C2
      C               = ASPEED(N,L,J)  * C2
      THEAD(N,L,J)=THEAD(N,L,J)/1000.0
      IF(PAIR.GT.1) GO TO 15
    1 IF=1
C
C        DETERMINE IF VEHICLE ALREADY IN TABLES
C
      DO 3 I=1,L5
      IF(IVEH(I).EQ.0) GO TO 5
    3 CONTINUE
      STOP 5566
    5 IF(I.GT.NVEH) NVEH=I
      IVEH(I)=IDVEH(N,L,J)
      GO TO 25
   15 IF(NVEH.LT.1) GO TO 1
      DO 20 I=1,NVEH
      IF(IDVEH(N,L,J).EQ.IVEH(I)) GO TO 25
   20 CONTINUE
      GO TO 1
   25 INDEX(I,J)=.TRUE.
      IF(IF.EQ.0) GO TO 35
      ITYP(I)=0
      NPRD(I)=IPRD(N,L,J)
      NPLTON(I)=IPLTON(N,L,J)
      NAXL(I)=IAXLE(N,L,J)
      NCODE(I)=ICODE(N,L,J)
   35 IF(ICODE(N,L,J).NE.0) NCODE(I)=ICODE(N,L,J)
      IF(IAXLE(N,L,J).GT.NAXL(I)) NAXL(I)=IAXLE(N,L,J)
      CALL TYPE(AXSPAC(N,L,J),NAXL(I),II)
      IF(II.GT.ITYP(I)) ITYP(I)=II
      LN(J,I)=L
      BFF(1,J,I)=FTM(N,L,J)
      BFF(2,J,I)=A
      BFF(3,J,I)=RTM(N,L,J)
      BFF(4,J,I)=B
      BFF(5,J,I)=C
      BFF(6,J,I)=AXSPAC(N,L,J)
      BFF(7,J,I)=THEAD(N,L,J)
      BFF(8,J,I)=SHEAD(N,L,J)
      BFF(9,J,I)= TAIL(N,L,J)
C
      M=IVTYPE(N,L,J)
      NCROSS(L,J,M)=NCROSS(L,J,M) +1
      RETURN
      END
```

SUBROUTINE SUMARY

```
      SUBROUTINE SUMARY(IFS,ISW)
      COMMON D1,LANE,TIME,NPR,INTMS,RLIM,SPDTOL,NEVCNT,EVTDEV(64),PR,
     $IEV(64),NLANE, NDEV, IDEVCD(24,6), NAXLES(6,6), NFLGAX(6,6),FINDEX
     $,PLTOON,SPEED, FOLLOW, PRTIME(6,6), PRSPED(6,6), DELSPD, C1, C2,
     $C3, ICD, ITM, START(4), STP(4), INTRVL(4), AXTIME(17,4,6),
     $AXFLAG(17,4,6), AXSPED(17,4,6), AXENRY(6,6),
     $           PAIR, ITYPE, NFAIR, NOVEH, IPLTN, AXCNT, FTIME, RTIME
     $,FSPEED, RSPEED,                                   NOPLTN,D2,
     $NCROSS(6,6,6), IX(80), IDVEH(17,4,6), IVTYPE(17,4,6), IPRD(17,4,6)
     $,IPLTON(17,4,6), IAXLE(17,4,6), FTM(17,4,6), FSPD(17,4,6),
     $RTM(17,4,6), RSPD(17,4,6), ASPEED(17,4,6), VEHCNT(6,6),
     $ISTRDL(6,6), VEHLST, PLTTIM, VLIM, ALIM, PAIRDS, SPLIM,
     $LANCHG(6,6,6)
      INTEGER EVTDEV, PR, FINDEX, PLTOON, START, STP, HIST1, HIST2,
     $HIST3, HIST4, PAIR, AXCNT, VEHCNT
      REAL INTMS, ITM
      LOGICAL  AXFLAG
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      INTEGER FROM(4), TO(4), LIM(4), OUT
      DOUBLE PRECISION TIME,PRTIME,AXTIME,AXENRY,FTIME,RTIME,FTM,RTM
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      COMMON/BLK13/ NSAMP(4,6),ASUM(4,4,6),RSUM(4,4,6),THSUM(4,4,6),
     $SHSUM(4,4,6),NTRACK(6)
      INTEGER TOT(2,6),GRAND
      DATA LIM/0,10,6,10/,ZERO/0.0/
      DATA OUT/6/
      GO TO (1,5), IFS
    1 IFS = 2
      DO 2 J=1,4
      FROM(J) = START(J)
    2 CONTINUE
C
C         COMPUTE ANALYSIS PERIOD TIME INTERVALS
C
    5 CALL MEMSET(0,TO,4)
      DO 15 M=1,4
      K=5-M
      TO(K) = TO(K) + FROM(K) + INTRVL(K)
      IF(TO(K).LT.LIM(K)) GO TO 15
      IF(K.LE.1) GO TO 15
      TO(K) = TO(K) -LIM(K)
      TO(K-1) = TO(K-1)+1
   15 CONTINUE
      IF( TO(1)*10+TO(2).LE.24) GO TO 20
      TO(2) = TO(2)-4
      TO(1) = TO(1)-2
   20 CONTINUE
      IF(ISW.EQ.2) GO TO 55
C
C         PRINT SUMMARY OF VEHICLE TRACKED
C
      WRITE(OUT,2000) (IX(I),I=1,32),FROM,TO
 2000 FORMAT(1H1,30X,26HDIAGRAMMATIC SIGNING STUDY//4(31X,8A10/)/
     $31X,15HANALYSIS PERIOD,2X,4I1,3H - ,4I1///)
      WRITE(OUT,2001) NOPLTN
 2001 FORMAT(1X,25HNO. PLATOONS IDENTIFIED =,I5//)
      CALL MEMSET(0.0,TOT,12)
```

```
      DO 23 I=1,NPAIR
      DO 22 J=1,NLANE
      TOT(1,I)=TOT(1,I) + NCROSS(J,I,1)
      TOT(2,I)=TOT(2,I) + NCROSS(J,I,2)
   22 CONTINUE
   23 CONTINUE
      WRITE(OUT,2002) (L,L=1,6),(I,(((NCROSS(I,J,K),K=1,2),J=1,6)),
     $I=1,NLANE)
 2002 FORMAT(1X,50HNO. VEHICLES (BY TYPE) CROSSING EACH DETECTOR PAIR/
     $1H0,4HLANE,6(6X,4HPAIR,I2,4X)/    7X,6(3X,13HAUTO  NONAUTO)//
     $6(I4,3X,6(I6,I8,2X)/))
      WRITE(OUT,2024) TOT
 2024 FORMAT(/1H ,*TOTALS*,6(I6,I8,2X)//)
      WRITE(OUT,2023) (NTRACK(I),I,I=1,NPAIR)
 2023 FORMAT(1H0,I7,1X,*VEHICLES TRACKED THRU*,I2,1X,*TRAPS*)
      WRITE(OUT,2011)
 2011 FORMAT(1H1)
C
C        PRINT LANE CHANGING SUMMARIES
C
      DO 30 K=2,NPAIR
      J= K-1
      WRITE (OUT,2012) K,J, (L,L=1,NLANE)
 2012 FORMAT(//36H0LANE CHANGES BETWEEN DETECTOR PAIRS,I2,4H AND,I2/10H0
     $FROM LANE,13X,7HTO LANE/15X,6I6)
      WRITE(OUT,2013)
 2013 FORMAT(1H )
      GRAND=0.0
      CALL MEMSET(0,TOT,12)
      DO 24 I=1,NLANE
      DO 24 J=1,NLANE
      TOT(1,I)=TOT(1,I) + LANCHG(I,J,K)
      TOT(2,J)=TOT(2,J) + LANCHG(I,J,K)
      GRAND=GRAND+LANCHG(I,J,K)
   24 CONTINUE
      DO 25 I=1,NLANE
      WRITE(OUT,2014) I,(LANCHG(I,J,K),J=1,NLANE),TOT(1,I)
 2014 FORMAT(I6,9X,7I6)
   25 CONTINUE
      WRITE(OUT,2015) (TOT(2,J),J=1,NLANE),GRAND
 2015 FORMAT(*0TOTALS*,8X,7I6)
   30 CONTINUE
C
C        PRINT SUMMARY OF LANE STRADDLES
C
      WRITE(OUT,2004) (L,(ISTRDL(I,L),I=1,6),L=1,6)
 2004 FORMAT(1H1,14HLANE STRADDLES/5H0PAIR,22X,*VEHICLE ORIENTATION*/
     $15X,*1-2*,5X,*2-1*,5X,*2-3*,5X,*3-2*,5X,*3-4*,5X,*4-3*//
     $6(I4,5X,6I8/))
      IF(NEVCNT.EQ.0) GO TO 35
C

C        PRINT CODER HIT SUMMARIES
C
      WRITE(OUT,2005)

 2005 FORMAT(//15H EVENT COUNTERS/12H0DEVICE CODE,5X, 7HNO HITS//
     $)
      DO 33 I=1,64
      IF(EVTDEV(I).LT.1) GO TO 33
      WRITE(OUT,2003) EVTDEV(I),IEV(I)
 2003 FORMAT(I7,I14)
```

```
   33 CONTINUE
   35 CONTINUE
      IF(IHST.EQ.1) GO TO 55
C
C        COMPUTE AND PRINT DISTRIBUTIONS
C
      DO 50 I=1,NLANE
      DO 50 J=1,NPAIR
      CALL MOMENT(NSAMP(I,J),ASUM(1,I,J))
      N=NSAMP(I,J) - 1
      CALL MOMENT(N,RSUM(1,I,J))
      CALL MOMENT(N,THSUM(1,I,J))
      CALL MOMENT(N,SHSUM(1,I,J))
   50 CONTINUE
      WRITE(OUT,2016)
 2016 FORMAT(1H1,20X,*ABSOLUTE SPEED DISTRIBUTIONS (MPH)*//)
      WRITE(OUT,2017)
 2017 FORMAT(*0LANE*,3X,*PAIR*,4X,*SIZE*,4X,*MEAN*,4X,*STD DEVIATION*,
     $4X,*SKEWNESS*,4X,*KURTOSIS*/)
      DO 70 I=1,NLANE
      WRITE(OUT,2019)
 2019 FORMAT(1H )
      WRITE(OUT,2018) (I,J,NSAMP(I,J),(ASUM(K,I,J),K=1,4),J=1,NPAIR)
 2018 FORMAT(I3,I8,I9,F8.2,F13.2,F14.2,F12.4)
   70 CONTINUE
      DO 75 I=1,NLANE
      DO 75 J=1,NPAIR
   75 NSAMP(I,J)=NSAMP(I,J)-1
      WRITE(OUT,2020)
 2020 FORMAT(1H1,20X,*RELATIVE SPEED DISTRIBUTIONS (MPH)*//)
      WRITE(OUT,2017)
      DO 80 I=1,NLANE
      WRITE(OUT,2019)
      WRITE(OUT,2018) (I,J,NSAMP(I,J),(RSUM(K,I,J),K=1,4),J=1,NPAIR)
   80 CONTINUE
      WRITE(OUT,2021)
 2021 FORMAT(1H1,20X,*TIME HEADWAY DISTRIBUTIONS (SEC)*//)
      WRITE(OUT,2017)
      DO 85 I=1,NLANE
      WRITE(OUT,2019)
      WRITE(OUT,2018) (I,J,NSAMP(I,J),(THSUM(K,I,J),K=1,4),J=1,NPAIR)
   85 CONTINUE
      WRITE(OUT,2022)
 2022 FORMAT(1H1,20X,*SPACE HEADWAY DISTRIBUTIONS (FT)*//)
      WRITE(OUT,2017)
      DO 90 I=1,NLANE
      WRITE(OUT,2019)
      WRITE(OUT,2018) (I,J,NSAMP(I,J),(SHSUM(K,I,J),K=1,4),J=1,NPAIR)
   90 CONTINUE
C
C        RE-INITIALIZE COMMON VARIABLE FOR NEXT ANALYSIS PERIOD
C
   55 NCPLTN=0
      CALL MEMSET(0,LANCHG,216)
      CALL MEMSET(0,ISTRDL,36)
      CALL MEMSET(0,IEV,64)
      CALL MEMSET(0,NCROSS,216)
      CALL MEMSET(0,NSAMP,414)
      DO 60 I=1,4
   60 FROM(I)=TO(I)
      IF(ISW.EQ.2) RETURN
      IF(IHST.GT.6) CALL PNRAIL(NPAIR)
      RETURN
      END
```

SUBROUTINE MOMENT

```
      SUBROUTINE MOMENT(NN,SMM)
      DIMENSION SMM(4)
      DIMENSION SIG(1)
      REAL MU(1)
      DATA NX/1/
      SUM=SMM(1)
      SSQ=SMM(2)
      SCUB=SMM(3)
      SFOR=SMM(4)
      CALL MEMSET(0.0,SMM,4)
      IF(NN.LT.1) RETURN
      SMM(1)=SUM/NN
      MU(1)=SMM(1)
      SSQ=SSQ/NN
      SCUB=SCUB/NN
      SFOR=SFOR/NN
      A=MU(NX)*MU(NX)
      VAR=SSQ-A
      IF(VAR.LT.0.0) GO TO 30
      SMM(2) =SQRT(VAR)
      SIG(1)=SMM(2)
      B=A*MU(NX)
      XX=SCUB-3.0*MU(NX)*SSQ+2.0*B
      IF (VAR.LT.1.E-7) RETURN
      SMM(3)  =XX/(VAR*SIG(NX))
      C=B*MU(NX)
      XX=SFOR-4.0*MU(NX)*SCUB+6.0*A*SSQ-3.0*C
      SMM(4)  =XX/(VAR*VAR)
      RETURN
   30 SMM(2)=SMM(3)=SMM(4)=-1.0
      RETURN
      END
```

SUBROUTINE GET

```
      SUBROUTINE GET(NUM,PAIR,NN,JJ)
      INTEGER PAIR
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      COMMON/BLK11/ ITYP(75),NPRD(75),NPLTON(75),NAXL(75),NCODE(75),
     $LN(6,75),PFF(9,6,75)
      NN=0
      DO 5 I=1,NVEH
      IF(IVEH(I).EQ.NUM) GO TO 10
    5 CONTINUE
    7 NN=1
      RETURN
   10 IF(.NOT.INDEX(I,PAIR)) GO TO 7
      IF(JJ.EQ.-705) RETURN
      JJ=I
      RETURN
      END
```

SUBROUTINE TAPOUT

```
      SUBROUTINE TAPOUT(NUM,NPAIR)
      COMMON/BLK3/ AXEXYT(6,6),FLTIME,SPACE,AXSPAC(17,4,6),
     $THEAD(17,4,6), SHEAD(17,4,6), ICODE(17,4,6), AXTOL, STDTOL,
     $ICDR, EVTIME(6,6), IHST
      COMMON/BLK9/L5,TAIL(17,4,6),BUF(22),NVEH,IVEH(75),INDEX(75,6)
      LOGICAL INDEX
      COMMON/BLK11/ ITYP(75),NPRD(75),NPLTON(75),NAXL(75),NCODE(75),
     $LN(6,75),BFF(9,6,75)
      COMMON/BLK13/ NSAMP(4,6),ASUM(4,4,6),RSUM(4,4,6),THSUM(4,4,6),
     $SHSUM(4,4,6),NTRACK(6)
      DOUBLE PRECISION D1,D2
      COMMON/BLK7/STM
      INTEGER TSEC,SEC
      DOUBLE PRECISION AXEXYT,FLTIME,EVTIME
      DATA BSAVE/305.2345/
C
C        SEARCH FOR VEHICLE IN TABLES
C
      DO 5 I=1,NVEH
      IF(IVEH(I).EQ.NUM) GO TO 10
    5 CONTINUE
      RETURN
   10 IF(NUM.EQ.0) RETURN
      KK=0
C
C        OUTPUT VEHICLE DATA TO TAPE
C
   13 DO 15 J=1,NPAIR
      IF(.NOT.INDEX(I,J)) GO TO 15
      TSEC=(STM+BFF(1,J,I))/1000.
      IHR=TSEC/3600
      TSEC=TSEC-IHR*3600
      MIN=TSEC/60
      SEC=TSEC-MIN*60
      IF(BFF(9,J,I).EQ.0.0) BFF(9,J,I)=BSAVE+11.8734
      BSAVE=BFF(9,J,I)
      WRITE(10)      IVEH(I),ITYP(I),LN(J,I),J,NPRD(I),NPLTON(I),
     $NAXL(I),(BFF(K,J,I),K=1,9),NCODE(I),IHR,MIN,SEC
      KK=KK+1
   15 CONTINUE
   17 IVEH(I)=0
      IF(KK.EQ.0) GO TO 19
      NTRACK(KK)=NTRACK(KK) + 1
      IF(IHST.LT.7) GO TO 19
      IF(KK.NE.NPAIR) GO TO 19
      CALL LPRAIL(I,KK)
   19 CONTINUE
C
C        RE-INITIALIZE TABLES
C
      DO 18 J=1,NPAIR
   18 INDEX(I,J)=.FALSE.
      IF(I.NE.NVEH) RETURN
      IF(NVEH.EQ.1) GO TO 25
      NN=NVEH
       DO 20 K=1,NN
       L=NN-K+1
       IF(IVEH(L).EQ.0) GO TO 20
       NVEH=L
       RETURN
   20  CONTINUE
   25  NVEH=0
       RETURN
       END
```

SUBROUTINE TYPE

```
      SUBROUTINE TYPE(WHEEL,AXLE,TYP)
C     THIS SUBROUTINE DETERMINES THE TYPE OF VEHICLE DETERMINED BY
C     AXLE NUMBER AND WHEEL BASE DISTANCE
      INTEGER AXLE,TYP
      INTEGER C3,C2
      DATA C12/12.0/
      DATA C15/15.0/
      DATA C2/2/
      DATA C3/3/
      IF(AXLE.GT.C3) GO TO 500
      IF(WHEEL.GT.C15) GO TO 400
      IF(WHEEL.LT.C12) GO TO 100
      IF(AXLE.GT.C2) GO TO 300
      GO TO 200
  100 IF(AXLE.GT.C2) GO TO 300
      TYP=1
      IF(WHEEL.LT.8.5) TYP=0
      RETURN
  200 TYP=2
      RETURN
  300 TYP=3
      RETURN
  400 TYP=4
      RETURN
  500 TYP=5
      RETURN
      END
```

SUBROUTINE MEMSET

```
      SUBROUTINE MEMSET(A,B,N)
      DIMENSION B(N)
      DO 10 I=1,N
      B(I) = A
   10 CONTINUE
      RETURN
      END
```

PROGRAM LISTINGS - POST ANALYSIS

```
      PROGRAM DUMDUM(INPUT=130,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,
     $TAPE10,TAPE12)
      COMMON/BLK30/NMAN,HD(8,20),ND(20),TRP(2,40,20),LAN(2,40,20),
     $EXIT(6),IFRN(24),ISLM(20)
      COMMON/BLK31/LN(6),SPD(6),HEAD(6),TAIL(6),WHEEL,JCD,NXL,IEOF,
     $THEAD(6)
      COMMON/BLK32/ITHRU(5,3),IEXIT(5,3),NVL(5,20,3),NH(10,6,6),
     $NHD(10,6,6),ITOT(5,3),IALL(3,3),LC123(2)
      COMMON/BLK33/ NMAT,NSTATE,ZERO,SPBND(20),HDD(2,6,10),TLL(2,6,10),
     $IVT(5,10),LCFN(10),MANV(20,10),IEXTH(10),XMAT(20,20,10),ITR1(10),
     $ITR2(10)
      COMMON/BLK34/HABS(50,4,24),HREL(50,4,24),HTIME(40,4,24),
     $HSPACE(100,4,24),HSIZE(4,24),HSUM(4,4,24),HSMSQ(4,4,24)
      COMMON/BLK35/ IHIST,IHEAD
      COMMON/BLK36/TIME(6,200),NCCUNT(200),SUMVEL(200),PNTR(200),
     $RTIME(6),FTIME(6),IDEN,SPEED(6,200)
      COMMON/BLK37/IPROP,IGORE,IHAZ(10),IPREP(10),ITHMAN(10),IOTHER(10),
     $HD1(4),HD2(4),DATE,BEFAFT,ASPD(4,6),NSZ(4,6),ISW1(6),ISW2(6),
     $ISW3,ISW4,ZALF
      COMMON/BLK38/ IVOL15(4,30),NLANE,I15FLG,VOLHR(4,3,6),
     $ABSPD(20,3,6),SRTIME,DELTIM,TAB4(16,6,4)
      COMMON/BLK39/GRP8(3,8,2),GRP4(3,4,2),SAMP(3,2),DBL(3,2),
     $CONF4(3,4,2),CONF8(3,8,2),ILIM,INCR(4),START(2),STOP(2),STM,TLIM,
     $ITM(2)
      COMMON/BLK40/IPROPT
      LOGICAL FSWTCH
      REAL INCR
      INTEGER PNTR
      INTEGER HABS,HREL,HTIME,HSPACE,HSIZE
      INTEGER XMAN(20)
      INTEGER NMAN,ND,TRP,LAN,EXIT
      DIMENSION ITB(2,2,2),LLB(32)
      DIMENSION AA(4),BB(4)
      INTEGER START,STOP
      DIMENSION T12(1)
      EQUIVALENCE (T12,NMAN)
      NAMELIST/PARAM/NMAN,NMAT,NSTATE,TLIM,INCR,IHIST,IHEAD,IDEN,
     $LABEL,NLANE,IPROPT,I15FLG,
     $SLOWER,
     $IPROP,IGORE,ILCL,IHAZ,IPREP,ITHMAN,IOTHER,ZALF,ILTM
      DATA LABEL,IPROPT,FRNTIM,I15FLG,NLANE,SRTIME/1,0,-1.E10,1,3,0.0/
      DATA ITB,ZALF/7,5,6,3,4,2,1,8,1.96/
      DATA INCR/2.0,2.0,.5,15./
      DATA TLIM/1.0/
      DATA SLOWER/-5.0/
      CALL FTNBIN(1,0,DUMMY)
      ICC=0
      TSAVE=0.0
      IEOF=2
      IHIST=IHEAD=0
      CALL  MEMSET(-1.0,TIME,1200)
      CALL  MEMSET(0.0,NCOUNT,613)
      NCEN=0
      LC123(1)=LC123(2)=0
      READ(5,1002) HD1,HD2,DATE,BEFAFT
 1002 FORMAT(4A10/4A10/A10/A10)
      WRITE(6,2002)HD1,HD2,DATE,BEFAFT
 2002 FORMAT(1H1,4A10/1H ,4A10/1H ,A10/1H ,A10)
      READ(5,PARAM)
```

```
      IF(LABEL.NE.1) GO TO 1
      READ(10) LLB
      WRITE(12) LLB
      WRITE(6,1005) LLB
 1005 FORMAT(1H0///(1X,8A10))
    1 CONTINUE
      WRITE(6,PARAM)
      DO 2 I=1,200
    2 PNTR(I)=I
      IF(ILIM.EQ.0) GO TO 4
      READ(5,1003) ITM
 1003 FORMAT(2I2,1X,2I2)
      WRITE(6,1004) ITM
 1004 FORMAT(1X,2I2,1X,2I2)
      STM=ITM(1)*3600000 + ITM(2)*60000
      DO 3 I=1,ILIM
      READ(5,1003) START,STOP
      WRITE(6,1004) START,STOP
      AA(I)=START(1)*3600000 + START(2)*60000
      BB(I)=STOP(1)*3600000 + STOP(2)*60000
      AA(I)=AA(I)-STM
      BB(I)=BB(I)-STM
    3 CONTINUE
    4 CONTINUE
      CALL RDCARD
      CALL RDXMAT
      IF(IDEN.EQ.0) WRITE(6,1000)
 1000 FORMAT(1H1,8X,*TIME*,5X,*AVG SPEED*,5X,*DENSITY*,5X,*FLOW*/
     $9X,*SEC*,8X,*MPH*,11X,*VPM*,6X,*VPS*/)
    5 CALL RDVEH(TT,IHR,MIN)
      IF(IEOF.NE.1) GO TO 8
   11 DELTIM=(TSAVE-SRTIME)/3.6E6
      WRITE(12) (T12(I),I=1,37238)
      CALL PRVOL
      CALL PRHIST(INCR)
      CALL PRNT
      CALL PRXMAT
      CALL PRPROP(GRP8,CONF8,GRP4,CONF4,SAMP,DBL,2)
      CALL PRPROP(GRP8(1,1,2),CONF8(1,1,2),GRP4(1,1,2),CONF4(1,1,2),
     $SAMP(1,2),DBL(1,2),1)
      CALL PRSMRY
      STOP 7777
    8 CALL TYPE(WHEEL,NXL,IT)
      IF(ILIM.EQ.0) GO TO 7
      DO 6 I=1,ILIM
      IF(TT.GT.BB(I)) GO TO 11
      IF(TT.GE.AA(I)) GO TO 7
    6 CONTINUE
      GO TO 5
    7 CONTINUE
      IF(SRTIME.EQ.0.0) SRTIME=TT
      IF(TT.GT.TSAVE) TSAVE=TT
      DO 12 J=1,6
      IF(LN(J).EQ.0) GO TO 12
      IF(ILCL.EQ.3) LN(J)=LN(J)+1
      L=LN(J)
      II = IT
      IF(IHEAD.NE.0) GO TO 14
      IF(JCD.EQ.0) GO TO 10
      JCD=MOD(JCD,100)
      DO 9 I=1,24
      IF(IFRN(I).LE.0) GO TO 10
      IF(JCD.NE.IFRN(I)) GO TO 9
      II = IT +5
      GO TO 10
```

```
    9 CONTINUE
   10 NH(II,L,J) = NH(II,L,J) +1
      IF(HEAD(J).EQ.0.0) GO TO 12
      IF(THEAD(J).LT.TLIM) NHD(II,L,J) = NHD(II,L,J) + 1
   12 CONTINUE
   14 CONTINUE
      DO 18 I=3,6
      IF(LN(I).NE.0) GO TO 18
      IF(ILCL.NE.3) GO TO 17
      IF(I.EQ.6) GO TO 18
   17 CONTINUE
      IF(LN(I-1).EQ.0) GO TO 5
   18 CONTINUE
      IF(LN(1).NE.0.OR.LN(2).NE.0) GO TO 19
      LN(2)=LN(3)
      J=4
      IF(LN(4).EQ.0) J=5
      CALL INTERP(2,3,J)
      IF(ABS(SPD(2)-SPD(3)).GT.10.0) SPD(2)=SPD(3)
   19 IF(LN(6).NE.0) GO TO 20
      IF(ILCL.NE.3) GO TO 25
      IF(LN(4).EQ.4) GO TO 24
      IF(LN(5).EQ.4) GO TO 25
      LN(6)=1
      SPD(6)=50.0
      THEAD(6)=0.0
      TAIL(6)=3000.
      HEAD(6)=1000.
      IF(LN(5).NE.0) GO TO 20
      LN(5)=1
      SPD(5)=50.
      THEAD(5)=0.
      TAIL(5)=3000.
      HEAD(5)=1000.
      GO TO 20
   24 IF(LN(5).EQ.0) GO TO 5
   25 CONTINUE
      LN(6)=LN(5)
      J=4
      IF(LN(4).EQ.0) J=3
      CALL INTERP(6,J,5)
   20 CONTINUE
      DO 21 I=2,5
      IF(LN(I).NE.0) GO TO 21
      LN(I)=(LN(I-1)+LN(I+1)+1)/2
      CALL INTERP(I,I-1,I+1)
   21 CONTINUE
      IF(LN(1).NE.0) GO TO 27
      LN(1)=LN(2)
      CALL INTERP(1,2,3)
      IF(ABS(SPD(1)-SPD(2)).GT.10.0) SPD(1)=SPD(2)
   27 LC=1
      IF(JCD.EQ.0) GO TO 31
      DO 29 I=1,24
      IF(IFRN(I).LE.0) GO TO 31
      IF(JCD.NE.IFRN(I)) GO TO 29
      LC = 2
      FRNTIM=FTIME(1)
      ICC=ICC+1
      GO TO 31
   29 CONTINUE
   31 L=LN(6)
      FSWTCH=.FALSE.
      IF(ABS(FRNTIM-FTIME(1)).LT.60000.) FSWTCH=.TRUE.
      IF(EXIT(L).LE.0) GO TO 34
```

```
      IXX=1
      IEXIT(IT,3)=IEXIT(IT,3) + 1
      IF(FSWTCH) IEXIT(IT,LC)=IEXIT(IT,LC) + 1
      GO TO 37
   34 ITHRU(IT,3)=ITHRU(IT,3) + 1
      IF(FSWTCH) ITHRU(IT,LC)=ITHRU(IT,LC) + 1
      IXX=2
   37 CALL MEMSET(0,XMAN,20)
      IF(LN(1).EQ.LN(2).AND.LN(2).EQ.LN(3)) GO TO 41
      LC123(IXX)=LC123(IXX)+1
   41 CONTINUE
      KK=KMAN=0
      IF(NMAN.EQ.0) GO TO 51
      DO 50 I=2,6
      DO 45 J=1,NMAN
      II=ISUM(J)
      GO TO(38,38,39),II
   38 IF(II.NE.IXX) GO TO 45
   39 NN=ND(J)
      DO 40 K=1,NN
      IF(TRP(1,K,J).NE.I-1) GO TO 40
      IF(TRP(2,K,J).NE.I) GO TO 40
      IF (LAN(1,K,J).NE.LN(I-1)) GO TO 40
      IF(LAN(2,K,J).NE.LN(I)) GO TO 40
      NVL(IT,J,3)=NVL(IT,J,3) + 1
      IF(FSWTCH) NVL(IT,J,LC)=NVL(IT,J,LC)+1
      KK=KK+1
      XMAN(KK)=J
   40 CONTINUE
   45 CONTINUE
   50 CONTINUE
      KMAN=KK
   51 IF(NMAT.EQ.0) GO TO 105
      DO 100 K=1,NMAT
      IF(IVT(IT,K).EQ.0) GO TO 100
      IF(LCFN(K).EQ.3) GO TO 53
      IF(LCFN(K).NE.LC) GO TO 100
   53 IF(IEXTH(K).EQ.3) GO TO 55
      IF(IEXTH(K).NE.IXX) GO TO 100
   55 IF(KK.EQ.0.AND.MANV(1,K).EQ.2) GO TO 60
      IF(MANV(1,K).EQ.3) GO TO 60
      IF(KK.EQ.0) GO TO 100
      DO 58 I=1,KK
      II=XMAN(KK)
      IF(MANV(II).EQ.1) GO TO 60
   58 CONTINUE
      GO TO 100
   60 DO 65 J=1,6
      IF(HEAD(J).LT.HDD(1,J,K)) GO TO 100
      IF(HEAD(J).GT.HDD(2,J,K)) GO TO 100
      IF(TAIL(J).LT.TLL(1,J,K)) GO TO 100
      IF(TAIL(J).GT.TLL(2,J,K)) GO TO 100
   65 CONTINUE
      I1=ITR1(K)
      I2=ITR2(K)
      CALL STATE(SPD(I1),IS1)
      CALL STATE(SPD(I2),IS2)
      XMAT(IS1,IS2,K)=XMAT(IS1,IS2,K)+1.0
  100 CONTINUE
  105 IF(IHIST.NE.0) GO TO 125
      IF(FSWTCH) GO TO 110
      IF(ICC.GT.5) GO TO 125
      IF(ABS(FRNTIM-FTIME(1)).LT.180000.) GO TO 125
  110 CONTINUE
      J=2*(LC-1) + IXX
```

```
      DO 120 N=1,6
      IF(THEAD(N).EQ.0.0) GO TO 120
      K=4*(N-1) + LN(N)
      HSIZE(J,K)=HSIZE(J,K) + 1
      CALL SUMUP(SPD(N),1,J,K)
      I=SPD(N)/INCR(1)
      CALL ICHK(I,50)
      HABS(I,J,K)=HABS(I,J,K) + 1
      PRSPED=HEAD(N)*.6818181818/THEAD(N)
      DELSPD=PRSPED-SPD(N)
      IF(DELSPD.GT.50.) DELSPD=50.0
      IF(DELSPD.LT.-50.0) DELSPD=-50.0
      CALL SUMUP(DELSPD,2,J,K)
      DELSPD=DELSPD+25.*INCR(2)
      I=DELSPD/INCR(2)
      CALL ICHK(I,50)
      HREL(I,J,K)=HREL(I,J,K) + 1
      CALL SUMUP(THEAD(N),3,J,K)
      I=THEAD(N)/INCR(3)
      CALL ICHK(I,40)
      HTIME(I,J,K)=HTIME(I,J,K) + 1
      CALL SUMUP(HEAD(N),4,J,K)
      I=HEAD(N)/INCR(4)
      CALL ICHK(I,100)
      HSPACE(I,J,K)=HSPACE(I,J,K) + 1
  120 CONTINUE
  125 CONTINUE
      IF(IDEN.EQ.1) GO TO 165
      K=MOD(NDEN,200) + 1
      K=PNTR(K)
      NDEN=NDEN+1
      N=MOD(NDEN,200)+1
      M=PNTR(N)
      IF(TIME(1,M).EQ.-1.0) GO TO 130
      DEN=5280.*NCOUNT(M)/1500.
      VEL=SUMVEL(M)/NCOUNT(M)
      FLOW=NCOUNT(M)*1000./(TIME(6,M)-TIME(1,M))
      TT=TIME(6,M)/1000.
      WRITE(6,1001) TT,VEL,DEN,FLOW
 1001 FORMAT(F13.2,F12.2,F13.2,F10.4)
  130 TIME(1,M)=RTIME(1)
      TIME(6,M)=FTIME(6)
      CALL MEMOVE(RTIME(2),TIME(2,M),4)
      NCOUNT(M)=1
      SUMVEL(M)=SPD(6)
      CALL MEMOVE(SPD,SPEED(1,M),6)
      IF(TIME(1,M).LE.TIME(1,K)) GO TO 135
      CALL ENTER(M,N-199,N-1)
      GO TO 165
  135 I2=N-2
      I1=N-198
      DO 140 II=I1,I2
      LL=I2-II+I1
      LS=LL
      IF(LL.LT.1) LL=LL+200
      KK=PNTR(LL)
      IF(TIME(1,M).GT.TIME(1,KK)) GO TO 145
  140 CONTINUE
  145 CALL ENTER(M,N-199,LS)
      IF(LL.EQ.200) LL=0
      LL=LL+1
      LS=LS+2
      DO 150 I=LS,N
      J=N-I+LS
      L=J-1
```

```
      IF(J.LT.1) J=J+200
      IF(L.LT.1) L=L+200
      PNTR(J)=PNTR(L)
  150 CONTINUE
      PNTR(LL)=M
      DO 155 II=LS,N
      L=II
      IF(L.LT.1) L=L+200
      L=PNTR(L)
      CALL ENTER(L,LL,LL)
  155 CONTINUE
  165 CONTINUE
      IF(IPROP.EQ.1) GO TO 230
      CALL MEMSET(2,ISW1,14)
      ISS1=ISS2=2
      DO 175 J=1,6
      I=LN(J)
      NSZ(I,J)=NSZ(I,J)+1
      ASPD(I,J)=ASPD(I,J)+SPD(J)
      AB=ASPD(I,J)/NSZ(I,J)
      IF(SPD(J)-AB.GT.SLOWER) GO TO 173
      ISW1(J)=1
      ISS1=1
  173 IF(THEAD(J).GT.TLIM) GO TO 175
      ISW2(J)=1
      ISS2=1
  175 CONTINUE
      DO 180 J=2,6
      IF(IABS(LN(J)-LN(J-1)).GT.1) ISW4=1
      IF(J.EQ.2) GO TO 180
      IF(IABS(LN(J)-LN(J-2)).GT.1) ISW4=1
  180 CONTINUE
      DO 225 KK=1,2
      IF(KK.EQ.1) GO TO 168
      IF(ABS(FTIME(1)-FRNTIM).GT.60000.) GO TO 225
      II=1C
      GO TO 170
  168 II=IT
      IF(II.GT.2) II=2
  170 SAMP(II,KK)=SAMP(II,KK)+1.0
      IF(ISW4.EQ.1) DBL(II,KK)=DBL(II,KK)+1.0
      IF(IGORE.EQ.1) GO TO 190
C
C        GORE SET-UP
C
      IF(KMAN.EQ.0) GO TO 210
      DO 185 I=1,10
      IF(IHAZ(I).EQ.0) GO TO 210
      DO 183 J=1,KMAN
      IF( MAN(J).NE.IHAZ(I)) GO TO 183
      ISW3=1
      GO TO 210
  183 CONTINUE
  185 CONTINUE
      GO TO 210
C
C        G-2 SET-UP
C
  190 ISW3=ISW4
      JJ=4
      IF(KMAN.EQ.0) GO TO 208
      DO 195 I=1,10
      IF(IPREP(I).EQ.0) GO TO 196
      DO 193 J=1,KMAN
      IF(XMAN(J).NE.IPREP(I)) GO TO 193
```

```
      JJ=1
      GO TO 208
  193 CONTINUE
  195 CONTINUE
  196 DO 200 I=1,10
      IF(ITHMAN(I).EQ.0) GO TO 201
      DO 198 J=1,KMAN
      IF(XMAN(J).NE.ITHMAN(I)) GO TO 198
      JJ=2
      GO TO 208
  198 CONTINUE
  200 CONTINUE
  201 DO 205 I=1,10
      IF(IOTHER(I).EQ.0) GO TO 208
      DO 203 J=1,KMAN
      IF(XMAN(J).NE.IOTHER(I)) GO TO 208
      JJ=3
      GO TO 208
  203 CONTINUE
  205 CONTINUE
  208 GRP4(II,JJ,KK)=GRP4(II,JJ,KK)+1.0
  210 JJ=ITB(ISS1,ISS2,ISW3)
      GRP8(II,JJ,KK)=GRP8(II,JJ,KK)+1.0
  225 CONTINUE
  230 CONTINUE
      IF(IGORE.EQ.0) GO TO 235
      I2=I3=I4=2
      DO 233 J=2,6
      IF(LN(J).GT.LN(J-1)) I2=1
      IF(LN(J).LT.LN(J-1)) I3=1
  233 CONTINUE
      IADV=1
      IF(I2.EQ.1) IADV=IADV+1
      IF(I3.EQ.1) IADV=IADV+2
  235 J=4*(IHR-8)+(MIN/15)+1
      I=LN(1)
      IVOL15(I,J)=IVOL15(I,J)+4
      JJ=IT
      IF(JJ.GT.2) JJ=2
      DO 250 J=1,6
      I=LN(J)
      VOLHR(I,JJ+1,J)=VOLHR(I,JJ+1,J)+1.0
      K=5*(I-1)+1
      ABSPD(K,I,J)=ABSPD(K,1,J)+1.0
      CALL SUMPP(SPD(J),ABSPD(K+1,1,J))
      IF(ABS(FTIME(1)-FRNTIM).GT.60000.) GO TO 238
      II=LC+1
      ABSPD(K,II,J)=ABSPD(K,II,J)+1.0
      CALL SUMPP(SPD(J),ABSPD(K+1,II,J))
  238 K=4*(I-1)
      II=1
      IF(ISW1(J).EQ.1) II=II+2
      IF(ISW2(J).EQ.1) II=II+1
      IF(IGORE.EQ.1) GO TO 240
      TAB4(K+II,J,IXX)=TAB4(K+II,J,IXX)+1.0
      GO TO 250
  240 IF(IADV.EQ.4) K=0
      TAB4(K+II,J,IADV)=TAB4(K+II,J,IADV)+1.0
  250 CONTINUE
      GO TO 5
      END
```

SUBROUTINE RDCARD

```
      SUBROUTINE RDCARD
C     THIS PROGRAM READS THE INPUT SPECIFICATIONS FOR MANEUVER
C     DEFINITION AND PRINTS OUT A RECORD OF THIS INPUT
      COMMON/BLK30/NMAN,HD(8,20),ND(20),TRP(2,40,20),LAN(2,40,20),
     $EXIT(6),IFRN(24),ISUM(20)
      INTEGER NMAN,ND,TRP,LAN,EXIT
      DIMENSION NAME(3)
      DATA NAME/4HEXIT,4HTHRU,3HALL/
 1000 FORMAT(2I2)
      IF(NMAN.EQ.0) GO TO 170
      DO 50 K=1,NMAN
      READ(5,1001) (HD(I,K),I=1,8)
 1001 FORMAT(8A10)
      READ(5,1000) ND(K),ISUM(K)
      IF(ISUM(K).LT.1) STOP 1001
      NN=ND(K)
      DO 40 J=1,NN
      READ(5,1002) (TRP(II,J,K),II=1,2),(LAN(IJ,J,K),IJ=1,2)
 1002 FORMAT(6I3)
   40 CONTINUE
   50 CONTINUE
      WRITE(6,2000) NMAN
 2000 FORMAT(*1NUMBER OF MANUEVERS REQUESTED=*,I2/)
      DO 150 K=1,NMAN
      II=ISUM(K)
      WRITE(6,2001) K,(HD(KK,K), KK=1,8),NAME(II)
 2001 FORMAT(*0MANUEVER *,I2,* IS *,8A10/* SUMMARIZED FOR*,1X,A4,1X,
     $*VEHICLES*)
      NN=ND(K)
      WRITE(6,2002)
 2002 FORMAT (*0     FROM TRAP  TO TRAP   FROM LANE  TO LANE*)
      DO 140 J=1,NN
      WRITE(6,2003)    (TRP(II,J,K),II=1,2),(LAN(IJ,J,K),IJ=1,2)
 2003 FORMAT(*0 *,2X,3X,I3,6X,I3,9X,I3,6X,I3)
  140 CONTINUE
      WRITE(6,2004)
 2004 FORMAT(*0*,//)
  150 CONTINUE
  170 READ(5,1002) EXIT
      READ(5,1003) IFRN
 1003 FORMAT (24(I2,1X))
      WRITE(6,2005)
 2005 FORMAT(*0EXIT TABLE  LANE  YES/NO*)
      DO 200 L=1,6
      WRITE(6,2006) L,EXIT(L)
 2006 FORMAT(*0*,12X,I3,3X,I3)
  200 CONTINUE
      WRITE(6,2007)
 2007 FORMAT(*0FOREIGN VEHICLE CODER BUTTON NUMBERS*)
      WRITE(6,2008) (IFRN (L),L=1,24)
 2008 FORMAT(*0*,24(I2,1X))
      END
```

SUBROUTINE RDXMAT

```
      SUBROUTINE RDXMAT
      COMMON/BLK33/ NMAT,NSTATE,ZERO,SPBND(20),HDD(2,6,10),TLL(2,6,10),
     $IVT(5,10),LCFN(10),MANV(20,10),IEXTH(10),XMAT(20,20,10),ITR1(10),
     $ITR2(10)
      CALL MEMSET(0.0,XMAT,4000)
 1000 FORMAT(40I2)
      IF(NMAT.EQ.0) RETURN
      ZERO=0.0
      READ(5,1001)(SPBND(I),I=1,NSTATE)
 1001 FORMAT(8F10.0)
      DO 25 I=1,NMAT
      READ(5,1000) LCFN(I),IEXTH(I),ITR1(I),ITR2(I)
      READ(5,1002)(MANV(J,I),J=1,20)
      READ(5,1002) (IVT(J,I),J=1,5)
 1002 FORMAT(80I1)
      READ(5,1003) ((HDD(J,K,I),J=1,2),K=1,6)
      READ(5,1003) ((TLL(J,K,I),J=1,2),K=1,6)
 1003 FORMAT(6F10.0)
   25 CONTINUE
      RETURN
      END
```

SUBROUTINE RDVEH

```
      SUBROUTINE RDVEH(TT,IHR,IMIN)
      COMMON/BLK31/LN(6),SPD(6),HEAD(6),TAIL(6),WHEEL,JCD,NXL,IEOF,
     $THEAD(6)
      COMMON/BLK36/TIME(6,200),NCCUNT(200),SUMVEL(200),PNTR(200),
     $RTIME(6),FTIME(6),ICEN,SPEED(6,200)
      INTEGER PNTR
      DIMENSION IN(20),FN(20),II(20)
      EQUIVALENCE (IN,FN)
      IF(IEOF.NE.2) GO TO 2
      READ(10) II
      IN(1) = II(1)
    2 CONTINUE
      IF(IEOF.EQ.3) GO TO 15
      DO 3 I=1,6
    3 LN(I) = 0
      IEOF=0
      NCNT=0
      WHEEL=0.0
    5 IF(II(1).NE.IN(1)) GO TO 50
      DO 7 I=1,20
    7 IN(I)=II(I)
      J=IN(4)
      JCD=IN(17)
      NXL=IN(7)
      NCNT=NCNT+1
      IF(WHEEL.NE.0.0) GO TO 8
      IHR=IN(18)
      IMIN=IN(19)
      TT=FN(8)
    8 CONTINUE
      WHEEL=WHEEL+FN(13)
      LN(J)=IN(3)
      FTIME(J)=FN(8)
      RTIME(J)=FN(10)
```

```
      SPD(J)=FN(12)
      THEAD(J)=FN(14)
      HEAD(J)=FN(15)
      TAIL(J)=FN(16)
      READ(10) II
      IF(EOF(10)) 10,5
   10 IFOF=3
   50 WHEFL=WHEEL/FLOAT(NCNT)
      IN(1)=I1(1)
      RETURN
   15 IFOF=1
      RETURN
      END
```

SUBROUTINE TYPE

```
      SUBROUTINE TYPE(WHEEL,AXLE,TYP)
C     THIS SUBROUTINE DETERMINES THE TYPE OF VEHICLE DETERMINED BY
C     AXLE NUMBER AND WHEEL BASE DISTANCE
      INTEGER AXLE,TYP
      INTEGER C3,C2
      DATA C12/12.0/
      DATA C15/15.0/
      DATA C2/2/
      DATA C3/3/
      IF(AXLE.GT.C3) GO TO 500
      IF(WHEEL.GT.C15) GO TO 400
      IF(WHEEL.LT.C12) GO TO 100
      IF(AXLE.GT.C2) GO TO 300
      GO TO 200
  100 IF(AXLE.GT.C2) GO TO 300
      TYP=1
      GO TO 900
  200 TYP=2
      GO TO 900
  300 TYP=3
      GO TO 900
  400 TYP=4
      GO TO 900
  500 TYP=5
      GO TO 900
  900 RETURN
      END
```

SUBROUTINE INTERP

```
      SUBROUTINE INTERP(I,J,K)
      COMMON/BLK31/LN(6),SPD(6),HEAD(6),TAIL(6),WHEEL,JCD,NXL,IEOF,
     $THEAD(6)
      COMMON/BLK36/TIME(6,200),NCOUNT(200),SUMVEL(200),PNTR(200),
     $RTIME(6),FTIME(6),IDEN,SPEED(6,200)
      INTEGER PNTR
      SPD(I)=TERPL(I,J,K,SPD(J),SPD(K))
      HEAD(I)=TERPL(I,J,K,HEAD(J),HEAD(K))
      TAIL(I)=TERPL(I,J,K,TAIL(J),TAIL(K))
      THEAD(I)=TERPL(I,J,K,THEAD(J),THEAD(K))
      IF(IDEN.EQ.1) RETURN
      FTIME(I)=TERPL(I,J,K,FTIME(J),FTIME(K))
      RTIME(I)=TERPL(I,J,K,RTIME(J),RTIME(K))
      RETURN
      END
```

FUNCTION TERPL

```
      FUNCTION TERPL(X,X1,X2,Y1,Y2)
      INTEGER X,X1,X2
      TERPL= (Y2-Y1)* (X-X1)/ (X2-X1)' + Y1
      RETURN
      END
```

SUBROUTINE STATE

```
      SUBROUTINE STATE(SPD,IS)
      COMMON/BLK33/ NMAT,NSTATE,ZERO,SPBND(20),HDD(2,6,10),TLL(2,6,10),
     $IVT(5,10),LCFN(10),MANV(20,10),IEXTH(10),XMAT(20,20,10),ITR1(10),
     $ITR2(10)
      DO 20 IS=1,NSTATE
      IF(SPD.GT.SPBND(IS)) GO TO 20
      RETURN
   20 CONTINUE
      IS=NSTATE
      RETURN
      END
```

SUBROUTINE PRHIST

```
      SUBROUTINE PRHIST(INCR)
      COMMON/BLK34/HABS(50,4,24),HREL(50,4,24),HTIME(40,4,24),
     $HSPACE(100,4,24),HSIZE(4,24),HSUM(4,4,24),HSMSQ(4,4,24)
      COMMON/BLK35/ IHIST,IHEAD
      COMMON/BLK40/IPROPT
      INTEGER HABS,HREL,HTIME,HSPACE,HSIZE
      REAL INCR(4)
      DIMENSION NAM(4)
      INTEGER PAIR
      DATA NAM/10HLOCAL/EXIT,10HLOCAL/THRU,10HFORGN/EXIT,10HFORGN/THRU/
      DATA NABS,NREL/8HABSOLUTE,8HRELATIVE/
      DATA ZERO,NSEC,NFT/0.0,5H(SEC),4H(FT)/
      DATA NTM,NSP/4HTIME,5HSPACE/
      DATA I1,I0/1,0/
      IF(IHIST.NE.0) RETURN
      IF(IPROPT.NE.0) RETURN
      DO 5 K=1,24
      DO 5 J=1,4
      IF(HSIZE(J,K).EQ.0) GO TO 5
      DO 3 I=1,4
      HSUM(I,J,K)=HSUM(I,J,K)/HSIZE(J,K)
      A=HSUM(I,J,K)*HSUM(I,J,K)
      HSMSQ(I,J,K)=HSMSQ(I,J,K)/HSIZE(J,K)
      HSMSQ(I,J,K)=SQRT(HSMSQ(I,J,K)-A)
    3 CONTINUE
    5 CONTINUE
      DO 50 LANE=1,4
      DO 50 PAIR=1,6
      K=4*(PAIR-1) + LANE
      IF(HSIZE(1,K).EQ.HSIZE(2,K).AND.HSIZE(1,K).EQ.0) GO TO 50
      RANGE=50.*INCR(1)
      WRITE(6,1000) I1,NABS,LANE,PAIR,ZERO,RANGE,INCR(1)
 1000 FORMAT( I1,A9,*SPEED HISTOGRAMS (MPH)*,8X,*LANE*,I2,3X,*TRAP*,
     $I2,10X,*RANGE*,F7.1,*- *,F5.1,7X,*INCREMENT*,F6.1)
```

```
      DO 10 J=1,4
      WRITE(6,1001) NAM(J),HSIZE(J,K),HSUM(1,J,K),HSMSQ(1,J,K)
 1001 FORMAT(/*0*,A10,* ----- SAMPLE SIZE*,I6,8X,*MEAN*,F8.2,8X,
     $*STD DEVIATION*,F8.2/)
      IF(HSIZE(J,K).EQ.0) GO TO 10
      WRITE(6,1002) (HABS(I,J,K),I=1,50)
 1002 FORMAT(5(20I6/))
   10 CONTINUE
      RANGE=25.*INCR(2)
      RNG=-RANGE
      WRITE(6,1004)
 1004 FORMAT(* *,132(1H-))
      WRITE(6,1000) I0,NREL,LANE,PAIR,RNG,RANGE,INCR(2)
      DO 15 J=1,4
      WRITE(6,1001) NAM(J),HSIZE(J,K),HSUM(2,J,K),HSMSQ(2,J,K)
      IF(HSIZE(J,K).EQ.0) GO TO 15
      WRITE(6,1002) (HREL(I,J,K),I=1,50)
   15 CONTINUE
      RANGE=40.*INCR(3)
       WRITE(6,1003) I1,NTM,NSEC,LANE,PAIR,ZERO,RANGE,INCR(3)
 1003 FORMAT( I1,A6,*HEADWAY HISTOGRAMS *,A5,8X,*LANE*,I2,3X,*TRAP*,
     $I2,10X,*RANGE*,F7.1,*-*,F6.1,7X,*INCREMENT*,F6.1)
      DO 25 J=1,4
      WRITE(6,1001) NAM(J),HSIZE(J,K),HSUM(3,J,K),HSMSQ(3,J,K)
      IF(HSIZE(J,K).EQ.0) GO TO 25
      WRITE(6,1002) (HTIME(I,J,K),I=1,40)
   25 CONTINUE
      RANGE=100.*INCR(4)
      WRITE(6,1004)
       WRITE(6,1003) I0,NSP,NFT,LANE,PAIR,ZERO,RANGE,INCR(4)
      DO 30 J=1,4
      WRITE(6,1001) NAM(J),HSIZE(J,K),HSUM(4,J,K),HSMSQ(4,J,K)
      IF(HSIZE(J,K).EQ.0) GO TO 30
      WRITE(6,1002) (HSPACE(I,J,K),I=1,100)
   30 CONTINUE
   50 CONTINUE
      RETURN
      END
```

SUBROUTINE PRNT

```
      SUBROUTINE PRNT
      COMMON/BLK30/NMAN,HD(8,20),ND(20),TRP(2,40,20),LAN(2,40,20),
     $EXIT(6),IFRN(24),ISUM(20)
      COMMON/BLK32/ITHRU(5,3),IEXIT(5,3),NVL(5,20,3),NH(10,6,6),
     $NHD(10,6,6),ITOT(5,3),IALL(3,3),LC123(2)
      COMMON/BLK35/ IHIST,IHEAD
      COMMON/BLK40/IPROPT
      DIMENSION          HDN(3),CTCT(3,3), TNVL(3)
      INTEGER TNVL
      DATA HDN/5H THRU,7HEXITING,5HTOTAL/
      IF(IHEAD.NE.0) GO TO 22
      IF(IPROPT.NE.0) GO TO 22
      DO 20 I=1,4
      WRITE(6,2000)
 2000 FORMAT(1H1)
      DO 20 J=1,6
      WRITE(6,2001) I,J
 2001 FORMAT(1H,132(1H-)/*0HEADWAY VIOLATIONS---LANE*,I2,3X,*TRAP*,I2/
     $*0VEHICLE*,4X,*TOTAL LOCAL*,2X,*TOTAL FOREIGN*,2X,* TOTAL ALL*,
```

```
     $2X,
     $  *TOTAL LOCAL*,2X,*TOTAL FOREIGN*,2X,* TOTAL ALL*,2X,
     $*LOCAL PCNT*,2X,*FOREIGN PCNT*,2X,*TOTAL PCNT*/
     $*   TYPE   *,4X,* VEHICLES  *,2X,*  VEHICLES   *,2X,*  VEHICLES *,
     $2X, *VIOLATIONS *,2X,* VIOLATIONS *,2X,*VIOLATIONS*,2X,
     $*VIOLATIONS*,2X,* VIOLATIONS *,2X,*VIOLATIONS*)
      NN = KK = INN= IKK= JNN= JKK= 0
      DO 5 K=1,5
      NN=NN+NH(K,I,J)
      KK=KK+NHD(K,I,J)
      IK = K+5
      INN = INN + NH(IK,I,J)
      IKK = IKK + NHD(IK,I,J)
      JNN = NH(K,I,J) + NH(IK,I,J)
      JKK = NHD(K,I,J) + NHD(IK,I,J)
      PER = FPER = TPER = 0.0
      IF(NH(K,I,J).EQ.0) GO TO 3
      PER=FLOAT(NHD(K,I,J))*100.0/FLOAT(NH(K,I,J))
    3 IF(NH(IK,I,J).EQ.0) GO TO 4
      FPER = FLOAT(NHD(IK,I,J)) * 100.0/FLOAT(NH(IK,I,J))
    4 IF (JNN.EQ.0) GO TO 2
      TPER =  FLOAT(JKK) *100.0/ FLOAT(JNN)
    2 WRITE(6,2002) K,NH(K,I,J), NH(IK,I,J), JNN,NHD(K,I,J),
     $NHD(IK,I,J), JKK, PER, FPER, TPER
 2002 FORMAT(I6,I17,I15,I12,I13,I15,I12,F12.2,F14.2,F12.2)
    5 CONTINUE
      PER = FPER = TPER = 0.0
      IF(NN.EQ.0) GO TO 10
      PER=FLOAT(KK)*100.0/FLOAT(NN)
   10 IF(INN.EQ.0) GO TO 11
      FPER = FLOAT(IKK) * 100.0/ FLOAT(INN)
   11 JNN = NN+INN
      JKK = KK + IKK
      IF (JNN.EQ.0) GO TO 12
      TPER = FLOAT(JKK) * 100.0/ FLOAT(JNN)
   12 WRITE(6,2003) NN, INN, JNN, KK, IKK, JKK, PER, FPER, TPER
 2003 FORMAT(*0TOTALS*,I16, I15, I12, I13, I15, I12, F12.2, F14.2,F12.2)
   20 CONTINUE
   22 CONTINUE
      WRITE(6,2000)
      WRITE(6,2005)
 2005 FORMAT(*0*,27X,*LOCAL(BY TYPE)*,22X,*ALL*,19X,*FOREIGN(BY TYPE)*,
     $18X,*ALL*,8X,*GRAND*)
      WRITE(6,2006)
 2006 FORMAT(* *,19X,*1*,8X,*2*,8X,*3*,8X,*4*,8X,*5*,6X,*LOCAL*,8X,
     $*1*,8X,*2*,8X,*3*,8X,*4*,8X,*5*,3X,*FOREIGN*,8X,*TOTAL*)
      DO 25 J=1,5
      ITOT(J,1) = ITHRU(J,1) + IEXIT(J,1)
      ITOT(J,2) = ITHRU(J,2) + IEXIT(J,2)
      ITOT(J,3) = ITHRU(J,3) + IEXIT(J,3)
   25 CONTINUE
      DO 30 I=1,3
      DO 27 J=1,5
      IALL(I,1) = ITHRU(J,I) + IALL(I,1)
      IALL(I,2) = IEXIT(J,I) + IALL(I,2)
      IALL(I,3) = ITOT(J,I) + IALL(I,3)
   27 CONTINUE
   30 CONTINUE
      IL31=IALL(1,1)+IALL(2,1)
      IL32=IALL(1,2)+IALL(2,2)
      IL13=IALL(1,1)+IALL(1,2)
      IL23=IALL(2,1)+IALL(2,2)
      IL33=IL13+IL23
      WRITE(6,2007) HDN(1), (ITHRU(I,1),I=1,5) , IALL(1,1),
     $(ITHRU(J,2),J=1,5), IALL(2,1), IL31
```

```
2007 FORMAT("0*,A7,* VEH *,4(I8,1X), I8, I10, 2X, 4(I8,1X),I8,I10,1X,
    $I12)
     WRITE(6,2007) HDN(2), (IEXIT(I,1),I=1,5), IALL(1,2),
    $(IEXIT(J,2),J=1,5), IALL(2,2), IL32
     WRITE(6,2007) HDN(3), (ITOT(1,1),I=1,5), IL13,
    $(ITOT(J,2),J=1,5), IL23, IL33
     WRITE(6,2016)
2016 FORMAT(///28X,*ALL (BY TYPE)*/20X,*1*,8X,*2*,8X,*3*,8X,*4*,8X,
    $*5*,6X,*TOTAL*)
     WRITE(6,2007) HDN(1), (ITHRU(I,3),I=1,5), IALL(3,1)
     WRITE(6,2007) HDN(2), (IEXIT(I,3),I=1,5), IALL(3,2)
     WRITE(6,2007) HDN(3),  (ITOT(I,3),I=1,5), IALL(3,3)
     CALL MCOMP(IALL(3,1),LC123(2),THR)
     CALL MCOMP(IALL(3,2),LC123(1),EXT)
     WRITE(6,2014)
2014 FORMAT(/////*0SUMMARY OF ALL LANE CHANGES BETWEEN TRAPS 1, 2 AND 3
    $*)
     WRITE(6,2015) THR,EXT
2015 FORMAT(/*0THRU VEHICLE LANE CHANGES PER 1000 THRU VEHICLES*,F7.1/
    $*0EXIT VEHICLE LANE CHANGES PER 1000 EXITING VEHICLES*,F7.1)
     IF(NMAN.EQ.0) GO TO 110
     WRITE(6,2000)
     DO 100 J=1,NMAN
     WRITE(6,2008) J, (HD(I,J),I=1,8)
2008 FORMAT(*0SUMMARY FOR MANUEVER *,I2,*---*,8A10)
     WRITE(6,2009)

2009 FORMAT(*  (PER 1000 VEHICLES)*,/)
     WRITE(6,2010)
2010 FORMAT(*0VEHICLE*,8X,*PER THRU *,19X,*PER EXITING*,16X,
    $*PER TOTAL*)
     WRITE(6,2011)
2011 FORMAT(*   TYPE*,3X,*LOCAL*,1X,*FOREIGN*,2X,*ALL*,8X,*LOCAL*,
    $1X,*FOREIGN*,2X,*ALL*,8X,*LOCAL*,1X,*FOREIGN*,2X,*ALL*)
     DO 90 I=1,5
     DO 82 L=1,3
     IF(I.EQ.1) TNVL(L) = 0.0
     CALL MCOMP(ITOT(I,L), NVL(I,J,L), CTOT(L,3))
     CALL MCOMP (ITHRU(I,L), NVL(I,J,L), CTOT(L,1))
     CALL MCOMP (IEXIT(I,L), NVL(I,J,L), CTOT(L,2))
     TNVL(L) = NVL(I,J,L) + TNVL(L)
  82 CONTINUE
     WRITE(6,2012) I, (CTOT(1,L), CTOT(2,L), CTOT(3,L), L=1,3)
2012 FORMAT(*0*,3X,I2,3X,3(F6.1,1X),5X,3(F6.1,1X),5X,3(F6.1,1X))
  90 CONTINUE
     DO 92 L=1,3
     CALL MCOMP(IALL(L,1) , TNVL(L), CTOT(L,1))
     CALL MCOMP(IALL(L,2) , TNVL(L),  CTOT(L,2))
     CALL MCOMP(IALL(L,3) , TNVL(L),  CTOT(L,3))
  92 CONTINUE
     WRITE(6,2013)     (CTOT(1,L), CTOT(2,L), CTOT(3,L), L=1,3)
2013 FORMAT(*0  ALL* ,3X,3(F6.1,1X),5X,3(F6.1,1X),5X,3(F6.1,1X))
     WRITE(6,2004)
2004 FORMAT(*0*,//)
 100 CONTINUE
     WRITE(6,3000) NVL
3000 FORMAT(5I6)
 110 CONTINUE
     RETURN
     END
```

SUBROUTINE MCOMP

```
      SUBROUTINE MCOMP (ITOT,NVL,CTOT)
      INTEGER ITOT,NVL
      CTOT=0.0
      IF(ITOT.EQ.0) GO TO 10
      CTOT= (FLOAT(NVL)/ FLOAT(ITCT)) * 1000.0
   10 RETURN
      END
```

SUBROUTINE PRXMAT

```
      SUBROUTINE PRXMAT
      COMMON/BLK33/ NMAT,NSTATE,ZERO,SPBND(20),HDD(2,6,10),TLL(2,6,10),
     $IVT(5,10),LCFN(10),MANV(20,10),IEXTH(10),XMAT(20,20,10),ITR1(10),
     $ITR2(10)
      COMMON/BLK40/IPROPT
      DIMENSION NR(20),NAM(6)
      DATA NAM/5HLOCAL,7HFOREIGN,3HALL,4HEXIT,4HTHRU,3HALL/
      IF(NMAT.EQ.0) RETURN
      IF(IPROPT.NE.0) RETURN
      DO 100 K=1,NMAT
      CALL MEMSET(0,NR,20)
      DO 5 J=1,NSTATE
      DO 5 I=1,NSTATE
    5 NR(I)=NR(I)+XMAT(I,J,K)
      DO 10 I=1,NSTATE
      DO 10 J=1,NSTATE
      IF(NR(I).EQ.0) GO TO 10
      XMAT(I,J,K)=XMAT(I,J,K)/NR(I)
   10 CONTINUE
      WRITE(6,1000) K
 1000 FORMAT(*1TRANSITION MATRIX*,I3//* SPEED STATE*,9X,*SPEED RANGE*/)
      WRITE(6,1001) (I,SPBND(I-1),SPBND(I),I=1,NSTATE)
 1001 FORMAT(I7,F19.1,*-*,F5.1)
      J=IEXTH(K)
      I=LCFN(K)
      WRITE(6,1002) NAM(I),NAM(J+3)
 1002 FORMAT(*0LOCAL/FOREIGN = *,A10,10X,*EXIT/THRU = *,A10)
      WRITE(6,1003) (IVT(I,K),I=1,5),ITR1(K),ITR2(K),(MANV(I,K),I=1,20)
 1003 FORMAT(*0VEHICLE TYPES*,5I3/*0FROM TRAP*,I2,* TO TRAP*,I2/
     $*0MANUEVERS*,20I3)
      WRITE(6,1004) ((HDD(I,J,K),I=1,2),J=1,6)
 1004 FORMAT(*0HEADWAY INTERVALS*/6(F6.1,*-*,F6.1,5X))
      WRITE(6,1005) ((TLL(I,J,K),I=1,2),J=1,6)
 1005 FORMAT(*0TAILWAY INTERVALS*/6(F6.1,*-*,F6.1,5X))
      WRITE(6,1006) (I,I=1,NSTATE)
 1006 FORMAT(//12X,20I6//)
      DO 25 I=1,NSTATE
      WRITE(6,1007) NR(I),I,(XMAT(I,J,K),J=1,NSTATE)
 1007 FORMAT(I6,I6,*-*,20F6.3)
   25 CONTINUE
  100 CONTINUE
      RETURN
      END
```

SUBROUTINE PRPROP

```
      SUBROUTINE PRPROP(GRP8,CONF8,GRP4,CONF4,SAMP,DBL,II)
      DIMENSION NM8(2,8),NM4(2,4),NM84(2,2)
      COMMON/BLK37/IPROP,IGORE,IHAZ(10),IPREP(10),ITHMAN(10),IOTHER(10),
     $HD1(4),HD2(4),DATE,BEFAFT,ASPD(4,6),NSZ(4,6),ISW1(6),ISW2(6),
     $ISW3,ISW4,ZALF
      DIMENSION GRP8(3,8),CONF8(3,8),GRP4(3,4),CONF4(3,4),DBL(3),SAMP(3)
      DIMENSION ISAMP(3),NAM(3,2),CONDBL(3)
      DATA NM4/5HPREP.,9HMANUEVERS,7HTHROUGH,9HMANUEVERS,10HOTHER LANE,
     $7HCHANGES,7HNO LANE,7HCHANGES/
      DATA NM8/5HSPEED,10HDIFFERENCE,7HHEADWAY,9HVIOLATION, 1H ,1H ,
     $5H1 + 2,1H ,5H2 + 3,1H ,5H1 + 3,1H ,9H1 + 2 + 3,1H ,
     $6HNORMAL,1H /
      DATA NM84/9HHAZARDOUS,9HMANUEVERS,8HDBL LANE,     7HCHANGES/
      DATA ITEN/9/
      DATA NAM/5HLOCAL,7HFOREIGN,3HALL,5HAUTOS,8HNONAUTOS,3HALL/
      K=IGORE+1
      DO 3 I=1,2
    3 NM8(I,3)=NM84(I,K)
      WRITE(6,1001) HD1,HD2,DATE,BEFAFT
 1001 FORMAT(1H1,29X,4A10/30X,4A10/30X,A10/30X,A10//)
      DBL(3)=DBL(2)+DBL(1)
      SAMP(3)=SAMP(2)+SAMP(1)
      DO 5 J=1,8
      GRP8(3,J)=GRP8(2,J)+GRP8(1,J)
    5 CONTINUE
      DO 10 J=1,4
      GRP4(3,J)=GRP4(2,J)+GRP4(1,J)
   10 CONTINUE
      DO 20 I=1,3
      ISAMP(I)=SAMP(I)
      IF(SAMP(I).EQ.0.0) GO TO 20
      P=DBL(I)=DBL(I)/SAMP(I)
      Q=1.0-P
      CONDBL(I)=ZALF*SQRT(P*Q/SAMP(I))
      DO 15 J=1,8
      P=GRP8(I,J)=GRP8(I,J)/SAMP(I)
      Q=1.0-P
      CONF8(I,J)=ZALF*SQRT(P*Q/SAMP(I))
   15 CONTINUE
   20 CONTINUE
      WRITE(6,1002) (NAM(I,II),I=1,3),ISAMP
 1002 FORMAT(36X,A10,10X,A10,10X,A10/1H0,I39,2I20/)
      IF(IGORE.EQ.0) GO TO 35
      DO 30 I=1,3
      IF(SAMP(I).EQ.0.0) GO TO 30
      DO 25 J=1,4
      P=GRP4(I,J)=GRP4(I,J)/SAMP(I)
      Q=1.0-P
      CONF4(I,J)=ZALF*SQRT(P*Q/SAMP(I))
   25 CONTINUE
   30 CONTINUE
      WRITE(6,1003) (J,NM4(1,J),(GRP4(I,J),I=1,3),NM4(2,J),
     $(CONF4(L,J),L=1,3),J=1,4)
 1003 FORMAT(1H0,I2,*.*,2X,A10,14X,F10.5,2F20.5/6X,A10,14X,F10.5,
     $2F20.5)
      WRITE(6,1004)
 1004 FORMAT(1H ,132(1H-))
   35 WRITE(6,1003) (J,NM8(1,J),(GRP8(I,J),I=1,3),NM8(2,J),
     $(CONF8(L,J),L=1,3),J=1,8)
      IF(IGORE.EQ.0) WRITE(6,1004)
      IF(IGORE.EQ.0)WRITE(6,1003) ITEN,NM84(1,2),DBL,NM84(2,2),CONDBL
      RETURN
      END
```

SUBROUTINE PRVOL

```
      SUBROUTINE PRVOL
      COMMON/BLK37/IPROP,IGORE,IHAZ(10),IPREP(10),ITHMAN(10),IOTHER(10),
     $HD1(4),HD2(4),DATE,BEFAFT,ASPD(4,6),NSZ(4,6),ISW1(6),ISW2(6),
     $ISW3,ISW4,ZALF
      COMMON/BLK38/ IVOL15(4,30),NLANE,I15FLG,VOLHR(4,3,6),
     $ABSPD(20,3,6),SRTIME,DELTIM,TAB4(16,6,4)
      DIMENSION NAM(5)
      DIMENSION ITOT(3,6)
      REAL  PER(4,3,6),TOT(3,6)
      INTEGER HR(2,8),MIN(2,4),IVL(4,3,6),IBS(20,3,6)
      EQUIVALENCE (IBS,ABSPD)
      DATA NAM/4HN    ,4HMEAN,9HSTAND DEV,8HSKEWNESS,8HKURTOSIS/
      DATA TOT/18*0.0/
      DATA HR,MIN/0,8,0,9,1,0,1,1,1,2,1,3,1,4,1,5,4,5,0,0,1,5,3,0/
      IF(I15FLG.EQ.0) GO TO 25
      II=1
      WRITE(6,2000) HD1,HD2,DATE,BEFAFT
 2000 FORMAT(1H1,17X,4A10/18X,4A10/18X,A10/18X,A10)
 2001 FORMAT(1H1,55X,4A10/56X,4A10/56X,A10/56X,A10)
      DO 10 I=1,30
      IF(IVOL15(I,I).NE.0) GO TO 15
   10 CONTINUE
      II=3
   15 CONTINUE
      JJ=II+2
      WRITE(6,2002) (I,I=II,JJ)
 2002 FORMAT(//*0HOURLY VOLUMES BASED ON 15 MINUTE ESTIMATES AT TRAP 1*/
     $/3X,*TIME*,3X,3(6X,*LANE*,I2)/)
      DO 20 I=1,30
      IF(IVOL15(II,I).EQ.0) GO TO 20
      J=I+I
      K=(I-1)/4 + 1
      L=MOD(I,4) + I
      M=(J-1)/4 + I
      N=MOD(J,4) + 1
      WRITE(6,2008) HR(1,K),HR(2,K),MIN(1,L),MIN(2,L),HR(1,M),HR(2,M),
     $ MIN(1,N),MIN(2,N),(IVOL15(KK,I),KK=II,JJ)
 2008 FORMAT(I2,3I1,*-*,4I1,3I12)
   20 CONTINUE
   25 DO 30 J=1,6
      DO 30 I=1,4
   30 VOLHR(I,I,J)=VOLHR(I,2,J)+VOLHR(I,3,J)
      DO 35 I=1,4
      DO 35 J=1,3
      DO 35 K=1,6
      VOLHR(I,J,K)=VOLHR(I,J,K)/DELTIM
   35 TOT(J,K)=TOT(J,K)+VOLHR(I,J,K)
      DO 40 I=I,4
      DO 40 J=1,3
      DO 40 K=1,6
      ITOT(J,K)=TOT(J,K)
      IF(TOT(J,K).EQ.0.0) GO TO 40
      PER(I,J,K)=100.0*VOLHR(I,J,K)/TOT(J,K)
   40 IVL(I,J,K)=VOLHR(I,J,K)
      WRITE(6,2001) HD1,HD2,DATE,BEFAFT
      WRITE(6,2003) (I,I=1,6)
 2003 FORMAT(///21X,6(6X,*TRAP*,I2,7X)/21X,6(13X,*NON-*,2X)/
     $* HOURLY VOLUME*,7X,6(*TOTAL*,2X,*AUTO*,2X,*AUTO*,2X))
      DO 45 I=1,NLANE
      WRITE(6,2004) I,((IVL(I,J,K),J=I,3),K=I,6),
     $((PER(I,M,N),M=1,3),N=I,6)
 2004 FORMAT(*0 LANE*,I2/*  MEAN*,I5X,6(I5,2I6,2X)/
     $*  PERCENT OF TOTAL*,3X,6(F5.1,2F6.1,2X))
```

```
   45 CONTINUE
      WRITE(6,2009) ITOT
 2009 FORMAT(/*0 GRAND TOTAL*,8X,6(I5,2I6,2X))
      DO 55 II=1,NLANE
      I=5*(II-1) + 1
      DO 50 J=1,3
      DO 50 K=1,6
      N=ABSPD(I,J,K)
      IBS(I,J,K)=ABSPD(I,J,K)
      CALL MOMENT(N,ABSPD(I+1,J,K))
   50 CONTINUE
   55 CONTINUE
      WRITE(6,2001) HD1,HD2,DATE,BEFAFT
      WRITE(6,2005) (I,I=1,6)
 2005 FORMAT(///21X,6(6X,*TRAP*,I2,7X)/21X,6(13X,*NON-*,2X)/
     $* ABSOLUTE SPEED*,6X,6(*TOTAL*,1X,*LOCAL*,1X,*LOCAL*,2X))
      DO 65 I=1,NLANE
      L=5*(I-1) + 1
      K=L+4
      WRITE(6,2006) I,NAM(1),((IBS(L,M,N),M=1,3),N=1,6)
 2006 FORMAT(*0 LANE*,I2/4X,A10,7X,6(I5,2I6,2X))
      J=1
      L=L+1
      DO 60 II=L,K
      J=J+1
      WRITE(6,2007) NAM(J),((ABSPD(II,M,N),M=1,3),N=1,6)
 2007 FORMAT(4X,A10,7X,6(F5.2,2F6.2,2X))
   60 CONTINUE
   65 CONTINUE
      RETURN
      END
```

SUBROUTINE PRSMRY

```
      SUBROUTINE PRSMRY
      COMMON/BLK32/ITHRU(5,3),IEXIT(5,3),NVL(5,20,3),NH(10,6,6),
     $NHD(10,6,6),ITOT(5,3),IALL(3,3),LC123(2)
      COMMON/BLK37/IPROP,IGORE,IHAZ(10),IPREP(10),ITHMAN(10),IOTHER(10),
     $HD1(4),HD2(4),DATE,BEFAFT,ASPD(4,6),NSZ(4,6),ISW1(6),ISW2(6),
     $ISW3,ISW4,ZALF
      COMMON/BLK38/ IVOL15(4,30),NLANE,I15FLG,VOLHR(4,3,6),
     $ABSPD(20,3,6),SRTIME,DELTIM,TAB4(16,6,4)
      DIMENSION ISMP(4),CONF(16,6,4),NM1(2),NM2(4),NM3(12,4)
      DIMENSION TOT(4,6,4),CTOT(4,6,4)
      DATA TOT,CTOT/192*0.0/
      DATA NM1/4HEXIT,4HTHRU/
      DATA NM2/1HN,2HHV,2HLS,5HHV+LS/
      DATA NM3/4*1H ,8HVEHICLES,5H  NOT,8HCHANGING,6H LANES,8*1H ,
     $8HVEHICLES,7H MOVING,7H TOWARD,7H MEDIAN,8*1H ,
     $8HVEHICLES,7H MOVING,7H TOWARD,8HSHOULDER,4*1H ,
     $8HVEHICLES,7H MOVING,6H  BOTH,6H  WAYS,8*1H /
      DO 75 II=1,16
      DO 75 J=1,6
      DO 75 K=1,4
      I=(II-1)/4 + 1
      TOT(I,J,K)=TOT(I,J,K)+TAB4(II,J,K)
   75 CONTINUE
      IF(IGORE.EQ.1) GO TO 5
      ISMP(1)=IALL(3,2)
      ISMP(2)=IALL(3,1)
      GO TO 10
    5 CALL MEMSET(IALL(3,3),ISMP,4)
   10 DO 20 K=1,4
```

```
      IF(ISMP(K).EQ.0) GO TO 20
      DO 15 J=1,6
      DO 15 I=1,16
      SS=ISMP(K)
      P=TAB4(I,J,K)=TAB4(I,J,K)/SS
      Q=1.0-P
      CONF(I,J,K)=ZALF*SQRT(P*Q/SS)
   15 CONTINUE
   20 CONTINUE
      DO 85 K=1,4
      IF(ISMP(K).EQ.0) GO TO 85
      DO 80 J=1,6
      DO 80 I=1,4
      SS=ISMP(K)
      P=TOT(I,J,K)=TOT(I,J,K)/SS
      Q=1.0-P
      CTOT(I,J,K)=ZALF*SQRT(P*Q/SS)
   80 CONTINUE
   85 CONTINUE
 2001 FORMAT(1H1,24X,4A10/25X,4A10/25X,A10/25X,A10)
      IF(IGORE.EQ.1) GO TO 50
      DO 35 K=1,2
      WRITE(6,2001) HD1,HD2,DATE,BEFAFT
      WRITE(6,2002) NM1(K),ISMP(K),(II,II=1,6)
 2002 FORMAT(///1X,A5,*TRAFFIC*,9X,22X,*TRAP*/I8,12X,6I8)
      DO 30 KK=1,NLANE
      M=4*(KK-1)+1
      N=M+3
      J=0
      DO 25 I=M,N
      J=J+1
      WRITE(6,2003) KK,NM2(J),(TAB4(I,L,K),L=1,6)
 2003 FORMAT(1H0,I13,1X,A5,2X,6F8.4)
      IF(KK.NE.NLANE) GO TO 23
      IF(J.GT.NLANE) GO TO 23
      WRITE(6,2009) (TOT(J,JJ,K),JJ=1,6)
 2009 FORMAT(1H+,75X,*TOTALS*,2X,6F8.4)
   23 WRITE(6,2008) (CONF(I,LL,K),LL=1,6)
 2008 FORMAT(22X,6F8.4)
      IF(KK.NE.NLANE) GO TO 25
      IF(J.GT.NLANE) GO TO 25
      WRITE(6,2010) J,(CTOT(J,JJ,K),JJ=1,6)
 2010 FORMAT(1H+,75X,*LANE*,I2,2X,6F8.4)
   25 CONTINUE
   30 CONTINUE
   35 CONTINUE
      RETURN
   50 DO 65 K=1,3
      WRITE(6,2001) HD1,HD2,DATE,BEFAFT
      WRITE(6,2004) ISMP(K),(II,II=1,6)
 2004 FORMAT(///I6,17X,6I8)
      DO 60 KK=1,NLANE
      M=4*(KK-1)+1
      N=M+3
      J=0
      DO 55 I=M,N
      J=J+1
      WRITE(6,2005) NM3(I,K),KK,NM2(J),(TAB4(I,L,K),L=1,6)
 2005 FORMAT(1H0,A10,I3,1X,A5,3X,6F8.4)
      IF(KK.NE.NLANE) GO TO 53
      IF(J.GT.NLANE) GO TO 53
      WRITE(6,2009) (TOT(J,JJ,K),JJ=1,6)
   53 WRITE(6,2011) (CONF(I,LL,K),LL=1,6)
 2011 FORMAT(23X,6F8.4)
      IF(KK.NE.NLANE) GO TO 55
```

```
      IF(J.GT.NLANE) GO TO 55
      WRITE(6,2010) J,(CTOT(J,JJ,K),JJ=1,6)
   55 CONTINUE
   60 CONTINUE
   65 CONTINUE
      WRITE(6,2006)
 2006 FORMAT(///)
      DO 70 I=1,4
      WRITE(6,2007) NM3(I,4),NM2(I),(TAB4(I,L,4),L=1,6)
 2007 FORMAT(1H0,A10,*  X*,1X,A5,3X,6F8.4)
      IF(I.NE.4) GO TO 68
      WRITE(6,2009) (TOT(1,JJ,4),JJ=1,6)
   68 WRITE(6,2011) (CONF(I,LL,4),LL=1,6)
      IF(I.NE.4) GO TO 70
      WRITE(6,2012) (CTOT(1,JJ,4),JJ=1,6)
 2012 FORMAT(1H+,75X,*LANE X*,2X,6F8.4)
   70 CONTINUE
      RETURN
      END
```

SUBROUTINE MOMENT

```
      SUBROUTINE MOMENT(NN,SMM)
      DIMENSION SMM(4)
      DIMENSION SIG(1)
      REAL MU(1)
      DATA NX/1/
      SUM=SMM(1)
      SSQ=SMM(2)
      SCUB=SMM(3)
      SFOR=SMM(4)
      CALL MEMSET(0.0,SMM,4)
      IF(NN.LT.1) RETURN
      SMM(1)=SUM/NN
      MU(1)=SMM(1)
      SSQ=SSQ/NN
      SCUB=SCUB/NN
      SFOR=SFOR/NN
      A=MU(NX)*MU(NX)
      VAR=SSQ-A
      IF(VAR.LT.0.0) GO TO 30
      SMM(2) =SQRT(VAR)
      SIG(1)=SMM(2)
      B=A*MU(NX)
      XX=SCUB-3.0*MU(NX)*SSQ+2.0*B
      IF (VAR.LT.1.E-7) RETURN
      SMM(3)  =XX/(VAR*SIG(NX))
      C=B*MU(NX)
      XX=SFOR-4.0*MU(NX)*SCUB+6.0*A*SSQ-3.0*C
      SMM(4) =XX/(VAR*VAR)
      RETURN
   30 SMM(2)=SMM(3)=SMM(4)=-1.0
      RETURN
      END
```

SUBROUTINE SUMUP

```
      SUBROUTINE SUMUP(A,I,J,K)
      COMMON/BLK34/HABS(50,4,24),HREL(50,4,24),HTIME(40,4,24),
     $HSPACE(100,4,24),HSIZE(4,24),HSUM(4,4,24),HSMSQ(4,4,24)
      INTEGER HABS,HREL,HTIME,HSPACE,HSIZE
      HSUM(I,J,K)=HSUM(I,J,K)+A
      HSMSQ(I,J,K)=HSMSQ(I,J,K)+A*A
      RETURN
      END
```

SUBROUTINE SUMPP

```
      SUBROUTINE SUMPP(A,B)
      DIMENSION B(4)
      C=1.0
      DO 10 I=1,4
      C=C*A
   10 B(I)=B(I)+C
      RETURN
      END
```

SUBROUTINE ICHK

```
      SUBROUTINE ICHK(I,N)
      I=I+1
      IF(I.GT.N) I=N
      IF(I.LT.1) I=1
      RETURN
      END
```

SUBROUTINE ENTER

```
      SUBROUTINE ENTER(I,J,K)
      COMMON/BLK36/TIME(6,200),NCOUNT(200),SUMVEL(200),PNTR(200),
     $RTIME(6),FTIME(6),IDEN,SPEED(6,200)
      INTEGER PNTR
      DO 25 L=J,K
      N=L
      IF(N.LT.1) N=N+200
      N=PNTR(N)
      IF(TIME(1,I).GT.TIME(6,N)) GO TO 25
      DO 15 M=2,6
      IF(TIME(M,I).GT.TIME(6,N)) GO TO 20
   15 CONTINUE
      RETURN
   20 M=M-1
      NCOUNT(N)=NCOUNT(N)+1
      SUMVEL(N)=SUMVEL(N)+SPEED(M,I)
   25 CONTINUE
      RETURN
      END
```

SUBROUTINE MEMSET

```
      SUBROUTINE MEMSET(A,B,N)
      DIMENSION B(N)
      DO 10 I=1,N
      B(I) = A
   10 CONTINUE
      RETURN
      END
```

SUBROUTINE MEMOVE

```
      SUBROUTINE MEMOVE(A,B,N)
      DIMENSION A(N),B(N)
      DO 10 I=1,N
   10 B(I)=A(I)
      RETURN
      END
```

APPENDIX B

INTERVIEWER AND MOTORIST QUESTIONNAIRE FORMS
OMB APPROVAL NO. 04-R-2435

Two types of questionnaires were administered to randomly selected motorists. The Interviewer form remained constant for both questionnaire types. There were, however, minor changes made in the motorists' questionnaires depending upon the type of interview administered. For example, question 4 on Form A (Exit/Ramp Interview) was not applicable for Form B (Thruput Interview) and was therefore deleted.

For each questionaire completed by a motorist there was a single form filled in by the interviewer which was then attached to the driver's questionnaire. A copy of this sheet precedes Form A in this appendix.

Interviewer and Motorist Questionnaire Forms
OMB Approval No. 04 R 2435

Diagrammatic Sign Study
BioTechnology, Inc.
Interviewer

GENERAL INSTRUCTIONS

Error Cases

"If you are lost or would like to confirm your route, we will be happy to provide you with directional information on this map (pull out map) but first perhaps you could help us." (Continue with Common Instructions.)

Thru-put and Exit Cases

"Thank you for stopping." (Continue with Common Instructions.)

COMMON INSTRUCTIONS

"We are trying to get information that will help to improve certain features of the Interstate Highway System and we think that motorists know the answers to these problems better than anyone else. We are working under contract to the Federal Highway Administration, the Federal Government agency responsible for the design of the interstate highways and the signs used on them. This study is concerned with signs and we would like to ask you a few questions about the signs you have just seen. The questionnaire is very short. We would very much appreciate your assistance if you can spare a few minutes of your time."

L ______ S ______

Interviewer fill in the following:

18. Sex of respondent [M] [ ] [F] [ ]

19. Location ______________________________

20. Date ______________ 21. Time (to nearest quarter hour) ______________

22. State in which license issued ______________________________

For Exit and Error Cases:

23. Exit respondent should have used ______________________________

____

1. Where did you begin today's trip?
General location (Annandale, . . .Richmond, etc.) ______________________

2. To what area are you traveling?
General location (Ohio, Rockville, etc.) ______________________

3. Have you ever driven this Route before?

Yes [ ] → Approximately how many times?

Less than 5

6 – 10

11 – 20

Over 20

Have you driven this route within the past 30 days? Yes____ No ____

Please go to next page

No [ ] ↓

Please go to next page

A4. Why did you get off here?

- ☐ It's on the way to my destination
- ☐ To turn around because I missed the exit
- ☐ To get further information because I am lost

A5. Did you have any trouble with the signs finding this exit or finding your way along the Freeway to this Exit?

Yes ☐ → Which of the following caused your problem?

- ☐ Sign did not contain proper information
  - → What were you looking for that you did not see?
    - ☐ Name of city or town on route or destination name
    - ☐ Road name
    - ☐ Route number
    - ☐ Cardinal direction (i.e., North, South, etc.)
    - ☐ Exit number
    - ☐ Other (what) ______________________
- ☐ Not enough signs
- ☐ Too many signs in one place
- ☐ Signs poorly placed
- ☐ Signs hard to understand
- ☐ Other (what) ______________________

Please go to Question A6

No ☐ → Go to Question A6

A6. Of the following, indicate your first and second choiceas to what information would have been most useful to you on the interstate signs you have just seen

- ☐ Name of city or town on route or destination name
- ☐ Road name
- ☐ Route number
- ☐ Cardinal direction (i.e., North, South, etc.)
- ☐ Exit number
- ☐ Other (what) ______________________

7. The signs you have just seen are called diagrammatic signs. Have you seen signs like these before?

- Yes ☐ → How often?
  - ☐ once or twice
  - ☐ a few times
  - ☐ many times
  - Where? ______________________
  - ______________________
  - ______________________
  - ______________________
  - Please go to Question 8
- No ☐ → To Question 8

8. What do you think of these signs? ______________________

____

____

____

8A. How much do you think these diagrammatic signs help the average motorist?

- ☐ A lot more help than conventional signs
- ☐ A little more help than conventional sings
- ☐ The same help as conventional signs
- ☐ Less help than conventional signs
- ☐ Much less help than conventional signs

8B. Which kind of sign do <u>you</u> prefer?

- ☐ Conventional signs
- ☐ Diagrammatic signs

A9. Do you have any other comments about the Beltway (Route 495) (and I-270/I-70S, if appropriate) signs?

____

____

____

____

10. Are you using a road map on today's trip?

- ☐ Yes
- ☐ No

11. Why did you choose this particular route rather than another?

- ☐ Shorter
- ☐ Faster
- ☐ Scenic areas
- ☐ Less traffic
- ☐ Most likely not to get lost
- ☐ No particular reason

Other (what) _______________

____

____

____

12. What is the reason that you are traveling today? _______________

____

____

____

We would like some information about the kind of motorists who are helping us. Please tell us . . .

13. Occupation ____________________

14. Age 20–30 ☐ 31–40 ☐ 41–50 ☐ Over 50 ☐

15. About how many miles a year do you drive?

☐ less than 5,000 ☐ 10–15,000

☐ 5–10,000 ☐ over 15,000

16. Where do you live?

Military base

Yes ☐ → Which one? ____________________

No ☐

City ____________ State ____________

17. How long have you lived there? ____________________

1. Where did you begin today's trip?
General location (Annandale, . . .Richmond, etc.) ______________________

2. To what area are you traveling?
General location (Ohio, Rockville, etc.) ______________________

3. Have you ever driven this Route before?

Yes [ ] → Approximately how many times?

Less than 5

6 – 10

11 – 20

Over 20

Have you driven this route within the past 30 days? Yes____ No ____

Please go to next page

No [ ] ↓

Please go to next page

B5. Did you have any trouble with the signs on the Interstate Freeway over the last ten miles before turning off?

- Yes ☐ → Which of the following caused your problem?
  - ☐ Sign did not contain proper information
    - → What were you looking for that you did not see?
      - ☐ Name of city or town on route or destination name
      - ☐ Road name
      - ☐ Route number
      - ☐ Cardinal direction (i.e., North, South, etc.)
      - ☐ Exit number
      - ☐ Other (what) ______________________
  - ☐ Not enough signs
  - ☐ Too many signs in one place
  - ☐ Signs poorly placed
  - ☐ Signs hard to understand
  - ☐ Other (what) ______________________

  Please go to Question B6
- No ☐ → To Question B6

B6. Of the following, indicate your first and second choice as to what information would have been most useful to you on the interstate signs you have just seen

- ☐ Name of city or town on route or destination name
- ☐ Road name
- ☐ Route number
- ☐ Cardinal direction (i.e., North, South, etc.)
- ☐ Exit number
- ☐ Other (what) ______________________

Go to next page

7. The signs you have just seen are called diagrammatic signs. Have you seen signs like these before?

- ☐ Yes → How often?
  - ☐ once or twice
  - ☐ a few times
  - ☐ many times

  Where? ______________________________

  ____

  ____

  ____

  Please go to Question 8

- ☐ No → To Question 8

8. What do you think of these signs? ______________________________

____

____

____

8A. How much do you think these diagrammatic signs help the average motorist?

- ☐ A lot more help than conventional signs
- ☐ A little more help than conventional sings
- ☐ The same help as conventional signs
- ☐ Less help than conventional signs
- ☐ Much less help than conventional signs

8B. Which kind of sign do <u>you</u> prefer?

- ☐ Conventional signs
- ☐ Diagrammatic signs

B9. Do you have any other comments about the Beltway (Route 495) (and I-270/I-70S, if appropriate) signs?

____

____

____

____

10. Are you using a road map on today's trip?

- ☐ Yes
- ☐ No

11. Why did you choose this particular route rather than another?

- ☐ Shorter
- ☐ Faster
- ☐ Scenic areas
- ☐ Less traffic
- ☐ Most likely not to get lost
- ☐ No particular reason

Other (what) ____

____

____

____

12. What is the reason that you are traveling today? ____________________________

____

____

____

We would like some information about the kind of motorists who are helping us. Please tell us . . .

13. Occupation ______________________________

14. Age 20–30 ☐ 31–40 ☐ 41–50 ☐ Over 50 ☐

15. About how many miles a year do you drive?

☐ less than 5,000 ☐ 10–15,000

☐ 5–10,000 ☐ over 15,000

16. Where do you live?

Military base

Yes ☐ → Which one? ______________________________

No ☐

City ____________________ State ______________________________

17. How long have you lived there? ______________________________

APPENDIX C

QUESTIONNAIRE ITEMS BY RESPONDENT CLASS

The tables on the following pages indicate responses to the questionnaire by exit location. The three classes of respondents (exit, selected and thruput) are grouped separately. Within each class, the results are grouped as follows: responses to questions dealing with demographic characteristics of the sample; responses to questions regarding trip and route characteristics: answers to a general inquiry on the Beltway system; and, responses to a general question asking for comments on the diagrammatic signing. The final set includes data only for the After study as the question would have been meaningless in the Before study.

In each of the table cells, there are two numbers. The upper number is the number of respondents choosing the particular answer. The lower number is the percentage which the upper number represents of the column subtotal. "No response," "inconsistent," etc. are not included in the percentages for the table proper. The percentage of these responses is provided separately as a function of the column totals.

The total and percent of total across all interchanges per each class is given in the left-most column. Beneath each of the interchanges listed, there are two columns: the left of the two indicates the results obtained during the Before study; the right column contains data obtained in the After study. The subheading beneath each interchange, at the top of the Before and After data, indicates the date on which the questionnaires were administered (e.g., 10071 under 16 North in the exit respondent class is October 7, 1971 during the Before study). (This two column classification does not occur for the three pages of data on diagrammatic sign comments.)

It will be recalled that exit interviews consist of those drivers who were flagged over at random after exiting at one of six interchanges: 16 North, 16 South, 17 North, 18 East, 18 West and Democracy Boulevard. Responses given by drivers at exit interviews are given first.

Since exit interviewing yielded a small proportion of unfamiliar drivers or motorists with signing difficulty, a selected questionnaire procedure was repeated at three interchanges. At 16 North and 18 West (Before study) or 18 East (After study), only vehicles with license plates other than Maryland, Virginia or the District of Columbia were selected. The second site was switched to 18 East in the After study since it was signed diagrammatically. At 17 North the additional criterion of interviewing only those drivers who had driven the route five times or less was added. The tabulated responses for this class follow the exit respondents.

Thruput respondents were those initially contacted at Dumfries Rest Area on northbound I-95 south of the Capital Beltway whose intended destinations were beyond the interchanges under consideration in this project. Responses of these motorists traveling beyond 18 East on I-495 and beyond Democracy Boulevard on I-70S are presented separately in the tables after the selected exit respondents.

Exit Respondents

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
SEX														
MALE		261	18	26	14	24	18	38	27	27	23	18	9	19
		62.1	54.5	68.4	41.2	55.8	62.1	76.0	65.9	73.0	67.6	50.0	56.3	65.5
FEMALE		159	15	12	20	19	11	12	14	10	11	18	7	10
		37.9	45.5	31.6	58.8	44.2	37.9	24.0	34.1	27.0	32.4	50.0	43.8	34.5
	SUB-TOTAL	420	33	38	34	43	29	50	41	37	34	36	16	29
		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.0
	NO RESPONSE	1	0	0	0	0	0	1	0	0	0	0	0	0
		0.2	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
	TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29
AGE														
LESS THAN 20 YEARS		7	0	0	1	1	0	2	0	1	0	1	0	1
		1.7	0.0	0.0	3.1	2.3	0.0	3.9	0.0	2.7	0.0	2.8	0.0	3.4
20-30 YEARS		143	9	12	9	14	9	16	12	12	16	18	5	11
		34.7	31.0	31.6	28.1	32.6	32.1	31.4	30.8	32.4	47.1	50.0	31.3	37.9
31-40 YEARS		97	8	8	7	11	7	10	11	9	7	8	5	6
		23.5	27.6	21.1	21.9	25.6	25.0	19.6	28.2	24.3	20.6	22.2	31.3	20.7
41-50 YEARS		103	7	8	12	9	8	18	12	8	7	5	3	6
		25.0	24.1	21.1	37.5	20.9	28.6	35.3	30.8	21.6	20.6	13.9	18.8	20.7
OVER 50 YEARS		62	5	10	3	8	4	5	4	7	4	4	3	5
		15.0	17.2	26.3	9.4	18.6	14.3	9.8	10.3	18.9	11.8	11.1	18.8	17.2
	SUB-TOTAL	412	29	38	32	43	28	51	39	37	34	36	16	29
		99.9	99.9	100.1	100.0	100.0	100.0	100.0	100.1	99.9	100.1	100.0	100.2	99.9
	NO RESPONSE	9	4	0	2	0	1	0	2	0	0	0	0	0
		2.1	12.1	0.0	5.9	0.0	3.4	0.0	4.9	0.0	0.0	0.0	0.0	0.0
	TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

OCCUPATION		TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
JOBHOLDER		277	20	23	16	26	17	36	33	27	25	20	13	21
		68.2	74.1	62.2	50.0	61.9	63.0	70.6	86.8	73.0	73.5	55.6	81.3	72.4
MILITARY		9	1	1	0	0	2	3	0	0	0	1	0	1
		2.2	3.7	2.7	0.0	0.0	7.4	5.9	0.0	0.0	0.0	2.8	0.0	3.4
HOUSEWIFE		74	4	7	10	9	8	6	4	4	4	10	3	5
		18.2	14.8	18.9	31.3	21.4	29.6	11.8	10.5	10.8	11.8	27.8	18.8	17.2
STUDENT		36	2	5	4	7	0	5	0	3	5	4	0	1
		8.9	7.4	13.5	12.5	16.7	0.0	9.8	0.0	8.1	14.7	11.1	0.0	3.4
UNEMPLOYED		10	0	1	2	0	0	1	1	3	0	1	0	1
		2.5	0.0	2.7	6.3	0.0	0.0	2.0	2.6	8.1	0.0	2.8	0.0	3.4
	SUB-TOTAL	406	27	37	32	42	27	51	38	37	34	36	16	29
		100.0	100.0	100.0	100.1	100.0	100.0	100.1	99.9	100.0	100.0	100.1	100.1	99.8
	NO RESPONSE	15	6	1	2	1	2	0	3	0	0	0	0	0
		3.6	18.2	2.6	5.9	2.3	6.9	0.0	7.3	0.0	0.0	0.0	0.0	0.0
	TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

RESIDENCE

ALL DISTANCES MEASURED FROM DC

	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
LOCAL - WITHIN 30 MILES AND NOT OR UNKNOWN MILITARY	310	20	31	20	40	18	35	24	30	22	31	13	26
	73.6	60.6	81.6	58.8	93.0	62.1	68.6	58.5	81.1	64.7	86.1	81.3	89.7
LOCAL - WITHIN 30 MILES AND MILITARY	40	4	0	6	0	6	7	7	2	4	2	1	1
	9.5	12.1	0.0	17.6	0.0	20.7	13.7	17.1	5.4	11.8	5.6	6.3	3.4
MORE THAN 30 MILES AND NOT OR UNKNOWN MILITARY	15	1	4	0	0	0	0	3	3	2	1	0	1
	3.6	3.0	10.5	0.0	0.0	0.0	0.0	7.3	8.1	5.9	2.6	0.0	3.4
MORE THAN 30 MILES AND MILITARY	7	1	0	0	0	0	3	2	0	1	0	0	0
	1.7	3.0	0.0	0.0	0.0	0.0	5.9	4.9	0.0	2.9	0.0	0.0	0.0
MD AND VA - DISTANCE UNKNOWN AND NOT OR UNKNOWN MILITARY	2	0	0	1	0	0	0	1	0	0	0	0	0
	0.5	0.0	0.0	2.9	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
MD AND VA - DISTANCE UNKNOWN AND MILITARY	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STATES OTHER THAN MD VA OR DC AND NOT OR UNKNOWN MILITARY	23	1	2	3	1	3	4	2	2	3	1	0	1
	5.5	3.0	5.3	8.8	2.3	10.3	7.8	4.9	5.4	8.8	2.8	0.0	3.4
STATES OTHER THAN MD VA OR DC AND MILITARY	7	1	0	0	0	1	2	0	0	2	1	0	0
	1.7	3.0	0.0	0.0	0.0	3.4	3.9	0.0	0.0	5.9	2.8	0.0	0.0
NO ANSWER AND NOT OR UNKNOWN MILITARY	7	1	1	2	1	0	0	0	0	0	0	2	0
	1.7	3.0	2.6	5.9	2.3	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0
NO ANSWER AND MILITARY	10	4	0	2	1	1	0	2	0	0	0	0	0
	2.4	12.1	0.0	5.9	2.3	3.4	0.0	4.9	0.0	0.0	0.0	0.0	0.0
SUB-TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29
	100.2	99.8	100.0	99.9	99.9	99.9	99.9	100.0	100.0	100.0	100.1	100.1	99.9
NO RESPONSE	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		16 NORTH		16 SOUTH		17 NORTH		18 EAST		18 WEST		DEMOCRACY	
	TOTAL	100771	090772	101471	091472	100771	090772	092371	092872	101471	091472	101571	092872
PERIOD OF RESIDENCE													
LESS THAN 1 MONTH	8	0	1	3	0	1	2	0	0	1	0	0	0
	2.0	0.0	2.6	9.7	0.0	3.6	3.9	0.0	0.0	2.9	0.0	0.0	0.0
1 MONTH TO 6 MONTHS	27	3	2	4	2	0	4	3	2	1	3	1	2
	6.6	10.3	5.3	12.9	4.8	0.0	7.8	7.7	5.4	2.9	8.3	6.3	6.9
7 MONTHS TO 1 YEAR	35	2	5	1	2	5	4	0	5	4	3	2	2
	8.5	6.9	13.2	3.2	4.8	17.9	7.8	0.0	13.5	11.8	8.3	12.5	6.9
MORE THAN 1 YEAR TO 2 YEARS	42	4	1	0	1	3	5	7	2	5	4	3	7
	10.2	13.8	2.6	0.0	2.4	10.7	9.8	17.9	5.4	14.7	11.1	18.8	24.1
MORE THAN 2 YEARS	298	20	29	23	37	19	36	29	28	23	26	10	18
	72.7	69.0	76.3	74.2	88.1	67.9	70.6	74.4	75.7	67.6	72.2	62.5	62.1
SUB-TOTAL	410	29	38	31	42	28	51	39	37	34	36	16	29
	100.0	100.0	100.0	100.0	100.1	100.1	99.9	100.0	100.0	99.9	99.9	100.1	100.0
NO RESPONSE	11	4	0	3	1	1	0	2	0	0	0	0	0
	2.6	12.1	0.0	8.8	2.3	3.4	0.0	4.9	0.0	0.0	0.0	0.0	0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29
MILES DRIVEN PER YEAR													
LESS THAN 5,000	30	1	4	2	4	1	4	0	2	3	6	1	2
	7.3	3.4	10.5	6.3	9.3	3.6	7.8	0.0	5.4	8.8	16.7	6.7	6.9
5,000 - 10,000	84	4	3	9	8	9	9	9	7	8	10	1	7
	20.4	13.8	7.9	28.1	18.6	32.1	17.6	23.1	18.9	23.5	27.8	6.7	24.1
10,000 - 15,000	107	10	8	11	12	11	13	12	7	5	6	6	6
	26.0	34.5	21.1	34.4	27.9	39.3	25.5	30.8	18.9	14.7	16.7	40.0	20.7
MORE THAN 15,000	190	14	23	10	19	7	25	18	21	18	14	7	14
	46.2	48.3	60.5	31.3	44.2	25.0	49.0	46.2	56.8	52.9	38.9	46.7	48.3
SUB-TOTAL	411	29	38	32	43	28	51	39	37	34	36	15	29
	99.9	100.0	100.0	100.1	100.0	100.0	99.9	100.1	100.0	99.9	100.1	100.1	100.0
NO RESPONSE	10	4	0	2	0	1	0	2	0	0	0	1	0
	2.4	12.1	0.0	5.9	0.0	3.4	0.0	4.9	0.0	0.0	0.0	6.3	0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

STATE IN WHICH LICENSE ISSUED	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
GOVERNMENT; NO STATE	2	0	0	0	0	0	0	0	0	1	1	0	0
	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	2.8	0.0	0.0
DISTRICT OF COLUMBIA	21	3	2	3	1	1	3	0	3	2	1	1	1
	5.0	9.1	5.6	8.8	2.3	3.4	5.9	0.0	8.1	6.3	2.8	6.3	3.4
VIRGINIA	100	16	17	1	4	6	10	11	13	0	0	11	11
	24.0	48.5	47.2	2.9	9.3	20.7	19.6	26.8	35.1	0.0	0.0	68.8	37.9
MARYLAND	247	10	13	22	37	17	29	27	19	23	30	4	16
	59.2	30.3	36.1	64.7	86.0	58.6	56.9	65.9	51.4	71.9	83.3	25.0	55.2
OTHER EASTERN STATES	32	3	3	5	1	4	6	1	1	6	1	0	1
	7.7	9.1	8.3	14.7	2.3	13.8	11.8	2.4	2.7	18.8	2.8	0.0	3.4
CENTRAL STATES	7	0	1	1	0	1	2	0	1	0	1	0	0
	1.7	0.0	2.8	2.9	0.0	3.4	3.9	0.0	2.7	0.0	2.8	0.0	0.0
MOUNTAIN STATES	1	1	0	0	0	0	0	0	0	0	0	0	0
	0.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PACIFIC STATES INCLUDING ALASKA AND HAWAII	7	0	0	2	0	0	1	2	0	0	2	0	0
	1.7	0.0	0.0	5.9	0.0	0.0	2.0	4.9	0.0	0.0	5.6	0.0	0.0
FOREIGN	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUB-TOTAL	417	33	36	34	43	29	51	41	37	32	36	16	29
	100.0	100.0	100.0	99.9	99.9	99.9	100.1	100.0	100.0	100.1	100.1	100.1	99.9
NO RESPONSE	4	0	2	0	0	0	0	0	0	2	0	0	0
	1.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

REASON TRAVELING TODAY	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
BUSINESS: RELATED TO OCCUPATION	223 54.0	20 60.6	23 62.2	7 20.6	24 55.8	12 41.4	22 46.8	32 78.0	15 40.5	24 70.6	14 40.0	12 75.0	18 66.7
VACATION OR RECREATION	26 6.3	1 3.0	3 8.1	3 8.8	3 7.0	1 3.4	12 25.5	0 0.0	2 5.4	1 2.9	0 0.0	0 0.0	0 0.0
SHOPPING	51 12.3	4 12.1	3 8.1	5 14.7	4 9.3	4 13.8	7 14.9	3 7.3	5 13.5	2 5.9	10 28.6	2 12.5	2 7.4
TAKING CHILDREN SOMEWHERE	7 1.7	2 6.1	0 0.0	2 5.9	1 2.3	0 0.0	1 2.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 3.7
APPOINTMENT - UNRELATED TO BUSINESS OR CHILDREN	32 7.7	5 15.2	3 8.1	1 2.9	2 4.7	2 6.9	1 2.1	3 7.3	7 18.9	2 5.9	4 11.4	1 6.3	1 3.7
OTHER (SUCH AS VISIT, OR GOING TO SCHOOL)	74 17.9	1 3.0	5 13.5	16 47.1	9 20.9	10 34.5	4 8.5	3 7.3	8 21.6	5 14.7	7 20.0	1 6.3	5 18.5
SUB-TOTAL	413 99.9	33 100.0	37 100.0	34 100.0	43 100.0	29 100.0	47 99.9	41 99.9	37 99.9	34 100.0	35 100.0	16 100.1	27 100.0
NO RESPONSE	6 1.4	0 0.0	1 2.6	0 0.0	0 0.0	0 0.0	2 3.9	0 0.0	0 0.0	0 0.0	1 2.8	0 0.0	2 6.9
MORE THAN ONE ANSWER OR UNDECIPHERABLE	2 0.5	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 3.9	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
TRIP ORIGIN													
WITHIN 30 MILES OF DC	380	32	34	30	40	25	43	39	34	27	33	16	27
	90.7	97.0	89.5	88.2	95.2	86.2	84.3	95.1	94.4	79.4	91.7	100.0	93.1
30 TO 100 MILES OF DC	27	1	4	2	2	2	5	2	1	5	2	0	1
	6.4	3.0	10.5	5.9	4.8	6.9	9.8	4.9	2.8	14.7	5.6	0.0	3.4
MORE THAN 100 MILES FROM DC	12	0	0	2	0	2	3	0	1	2	1	0	1
	2.9	0.0	0.0	5.9	0.0	6.9	5.9	0.0	2.8	5.9	2.8	0.0	3.4
SUB-TOTAL	419	33	38	34	42	29	51	41	36	34	36	16	29
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.0	99.9
NO RESPONSE	1	0	0	0	1	0	0	0	0	0	0	0	0
	0.2	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	420	33	38	34	43	29	51	41	36	34	36	16	29
TRIP DESTINATION													
DC AREA OR WITHIN 30 MILES	397	31	38	31	42	24	41	40	36	33	36	16	29
	94.7	96.9	100.0	91.2	100.0	82.8	80.4	97.6	97.3	97.1	100.0	100.0	100.0
30 TO 100 MILES OF DC	3	0	0	1	0	0	1	1	0	0	0	0	0
	0.7	0.0	0.0	2.9	0.0	0.0	2.0	2.4	0.0	0.0	0.0	0.0	0.0
MORE THAN 100 MILES FROM DC	19	1	0	2	0	5	9	0	1	1	0	0	0
	4.5	3.1	0.0	5.9	0.0	17.2	17.6	0.0	2.7	2.9	0.0	0.0	0.0
SUB-TOTAL	419	32	38	34	42	29	51	41	37	34	36	16	29
	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NO RESPONSE	2	1	0	0	1	0	0	0	0	0	0	0	0
	0.5	3.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
MAPS													
USING MAPS ON TRIP	36 8.7	1 3.1	1 2.7	4 11.8	5 11.6	5 17.2	10 20.4	2 5.0	2 5.4	3 9.1	3 8.6	0 0.0	0 0.0
NOT USING MAPS ON TRIP	377 91.3	31 96.9	36 97.3	30 88.2	38 88.4	24 82.8	39 79.6	38 95.0	35 94.6	30 90.9	32 91.4	16 100.0	28 100.0
SUB-TOTAL	413 100.0	32 100.0	37 100.0	34 100.0	43 100.0	29 100.0	49 100.0	40 100.0	37 100.0	33 100.0	35 100.0	16 100.0	28 100.0
NO RESPONSE	8 1.9	1 3.0	1 2.6	0 0.0	0 0.0	0 0.0	2 3.9	1 2.4	0 0.0	1 2.9	1 2.8	0 0.0	1 3.4
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

REASON FOR SELECTING RCUTE	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
SHORTER	129	13	15	14	13	5	16	9	10	11	9	7	7
	24.7	28.9	33.3	32.6	24.5	13.5	27.6	16.7	20.4	23.9	20.9	36.8	22.6
FASTER	302	24	20	20	35	22	35	32	28	28	31	10	17
	57.7	53.3	44.4	46.5	66.0	59.5	60.3	59.3	57.1	60.9	72.1	52.6	54.8
SCENIC AREAS	11	2	1	0	0	1	2	2	2	1	0	0	0
	2.1	4.4	2.2	0.0	0.0	2.7	3.4	3.7	4.1	2.2	0.0	0.0	0.0
LESS TRAFIC	24	3	5	1	1	2	1	3	3	2	1	1	1
	4.6	6.7	11.1	2.3	1.9	5.4	1.7	5.6	6.1	4.3	2.3	5.3	3.2
MOST LIKELY NOT TO GET LOST	20	2	1	2	1	2	1	4	2	3	1	0	1
	3.8	4.4	2.2	4.7	1.9	5.4	1.7	7.4	4.1	6.5	2.3	0.0	3.2
NO PARTICULAR REASON	9	0	1	2	2	2	0	0	0	1	0	0	1
	1.7	0.0	2.2	4.7	3.8	5.4	0.0	0.0	0.0	2.2	0.0	0.0	3.2
OTHER	28	1	2	4	1	3	3	4	4	0	1	1	4
	5.4	2.2	4.4	9.3	1.9	8.1	5.2	7.4	8.2	0.0	2.3	5.3	12.9
SUB-TOTAL	523	45	45	43	53	37	58	54	49	46	43	19	31
	100.0	99.9	99.8	100.1	100.0	100.0	99.9	100.1	100.0	100.0	99.9	100.0	99.9
NO RESPONSE	734	51	69	59	76	50	95	66	62	56	65	29	56
	54.4	47.2	57.0	53.6	55.1	52.6	58.6	50.0	51.7	50.5	57.0	56.9	63.6
MORE THAN THREE ANSWERS	2	1	0	0	0	0	0	1	0	0	0	0	0
	0.1	0.9	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
MORE THAN ONE ANSWER	91	11	7	8	9	8	9	11	9	9	6	3	1
	6.7	10.2	5.8	7.3	6.5	8.4	5.6	8.3	7.5	8.1	5.3	5.9	1.1
TOTAL	1350	108	121	110	138	95	162	132	120	111	114	51	88

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		16 NORTH		16 SOUTH		17 NORTH		18 EAST		18 WEST		DEMOCRACY	
	TOTAL	100771	090772	101471	091472	100771	090772	092371	092872	101471	091472	101571	092872
ROUTE FAMILIARITY													
DRIVEN ROUTE BEFORE													
5 TIMES OR LESS WITHIN LAST 30 DAYS	15	1	1	1	0	1	4	3	1	2	1	0	0
	3.7	3.3	2.7	3.0	0.0	3.4	8.0	7.9	2.7	6.1	2.9	0.0	0.0
5 TIMES OR LESS NOT WITHIN LAST 30 DAYS	19	0	2	1	2	2	3	1	4	3	0	0	1
	4.7	0.0	5.4	3.0	4.7	6.9	6.0	2.6	10.8	9.1	0.0	0.0	3.7
6 - 10 TIMES WITHIN LAST 30 DAYS	12	1	1	0	1	1	0	3	0	1	2	0	2
	2.9	3.3	2.7	0.0	2.3	3.4	0.0	7.9	0.0	3.0	5.7	0.0	7.4
6 - 10 TIMES NOT WITHIN LAST 30 DAYS	9	0	0	2	0	2	2	1	1	0	0	1	0
	2.2	0.0	0.0	6.1	0.0	6.9	4.0	2.6	2.7	0.0	0.0	6.7	0.0
11 - 20 TIMES WITHIN LAST 30 DAYS	14	3	1	1	0	0	0	2	2	3	2	0	0
	3.4	10.0	2.7	3.0	0.0	0.0	0.0	5.3	5.4	9.1	5.7	0.0	0.0
11 - 20 TIMES NOT WITHIN LAST 30 DAYS	6	1	0	0	0	1	0	1	1	1	0	0	1
	1.5	3.3	0.0	0.0	0.0	3.4	0.0	2.6	2.7	3.0	0.0	0.0	3.7
21 TIMES OR MORE WITHIN LAST 30 DAYS	294	22	27	23	37	19	33	23	27	21	27	12	23
	72.2	73.3	73.0	69.7	86.0	65.5	66.0	60.5	73.0	63.6	77.1	80.0	85.2
21 TIMES OR MORE NOT WITHIN LAST 30 DAYS	20	2	3	2	1	0	3	3	0	1	3	2	0
	4.9	6.7	8.1	6.1	2.3	0.0	6.0	7.9	0.0	3.0	8.6	13.3	0.0
NOT DRIVEN ROUTE BEFORE	18	0	2	3	2	3	5	1	1	1	0	0	0
	4.4	0.0	5.4	9.1	4.7	10.3	10.0	2.6	2.7	3.0	0.0	0.0	0.0
SUB-TOTAL	407	30	37	33	43	29	50	38	37	33	35	15	27
	99.9	99.9	100.0	100.0	100.0	99.8	100.0	99.9	100.0	99.9	100.0	100.0	100.0
NO RESPONSE	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INCOMPLETE	12	2	1	1	0	0	1	2	0	1	1	1	2
	2.9	6.1	2.6	2.9	0.0	0.0	2.0	4.9	0.0	2.9	2.8	6.3	6.9
INCONSISTENT	2	1	0	0	0	0	0	1	0	0	0	0	0
	0.5	3.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
TROUBLE WITH SIGNS														
YES		19 4.6	3 9.4	2 5.6	3 9.1	1 2.4	3 11.1	0 0.0	2 5.1	1 2.7	1 3.0	0 0.0	2 12.5	1 3.4
NO		391 95.4	29 90.6	34 94.4	30 90.9	41 97.6	24 88.9	50 100.0	37 94.9	36 97.3	32 97.0	36 100.0	14 87.5	28 96.6
	SUB-TOTAL	410 100.0	32 100.0	36 100.0	33 100.0	42 100.0	27 100.0	50 100.0	39 100.0	37 100.0	33 100.0	36 100.0	16 100.0	29 100.0
	NO RESPONSE	2 0.5	0 0.0	1 2.6	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 2.9	0 0.0	0 0.0	0 0.0
	INCOMPLETE	8 1.9	0 0.0	1 2.6	1 2.9	1 2.3	2 6.9	1 2.0	2 4.9	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
	INCONSISTENT	1 0.2	1 3.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
	TOTAL	421	33	38	34	43	29	51	41	37	34	36	16	29

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

TROUBLE WITH SIGNS WAS	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 052872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 052872
SIGN DID NOT CONTAIN PROPER INFORMATION	15	3	2	0	1	2	0	2	1	1	0	2	1
	44.1	50.0	66.7	0.0	100.0	33.3	0.0	66.7	50.0	100.0	0.0	40.0	100.0
NOT ENOUGH SIGNS	5	2	0	2	0	0	0	1	0	0	0	0	0
	14.7	33.3	0.0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0
TOO MANY SIGNS IN ONE PLACE	1	0	0	0	0	1	0	0	0	0	0	0	0
	2.9	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SIGNS WERE POORLY PLACED	3	1	0	1	0	1	0	0	0	0	0	0	0
	8.8	16.7	0.0	16.7	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SIGNS HARD TO UNDERSTAND	7	0	1	2	0	2	0	0	0	0	0	2	0
	20.6	0.0	33.3	33.3	0.0	33.3	0.0	0.0	0.0	0.0	0.0	40.0	0.0
OTHER	3	0	0	1	0	0	0	0	1	0	0	1	0
	8.8	0.0	0.0	16.7	0.0	0.0	0.0	0.0	50.0	0.0	0.0	20.0	0.0
SUB-TOTAL	34	6	3	6	1	6	0	3	2	1	0	5	1
	99.9	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	0.0	100.0	100.0
NO RESPONSE	42	6	5	6	3	6	0	5	2	3	0	3	3
	47.7	40.0	55.6	42.9	75.0	42.9	0.0	55.6	40.0	75.0	0.0	30.0	75.0
MORE THAN FOUR ANSWERS	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MORE THAN ONE ANSWER	12	3	1	2	0	2	0	1	1	0	0	2	0
	13.6	20.0	11.1	14.3	0.0	14.3	0.0	11.1	20.0	0.0	0.0	20.0	0.0
TOTAL	88	15	9	14	4	14	0	9	5	4	0	10	4

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		16 NORTH		16 SOUTH		17 NORTH		18 EAST		18 WEST		DEMOCRACY	
	TOTAL	100771	090772	101471	091472	100771	090772	092371	092872	101471	091472	101571	092872
SIGN DID NOT CONTAIN PROPER INFORMATION													
INFORMATION SOUGHT:													
NAME OF CITY, TOWN OR DESTINATION	6 30.0	1 25.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 50.0	1 100.0	0 0.0	2 100.0	1 100.0
ROAD NAME	4 20.0	1 25.0	0 0.0	0 0.0	1 100.0	0 0.0	0 0.0	1 33.3	1 50.0	0 0.0	0 0.0	0 0.0	0 0.0
ROUTE NUMBER	4 20.0	1 25.0	1 50.0	0 0.0	0 0.0	1 25.0	0 0.0	1 33.3	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
CARDINAL DIRECTION (E.G., NORTH)	2 10.0	1 25.0	0 0.0	0 0.0	0 0.0	1 25.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
EXIT NUMBER	1 5.0	0 0.0	0 0.0	0 0.0	0 0.0	1 25.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
OTHER	3 15.0	0 0.0	1 50.0	0 0.0	0 0.0	1 25.0	0 0.0	1 33.3	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
SUB-TOTAL	20 100.0	4 100.0	2 100.0	0 0.0	1 100.0	4 100.0	0 0.0	3 99.9	2 100.0	1 100.0	0 0.0	2 100.0	1 100.0
NO RESPONSE	25 49.0	5 50.0	4 66.7	0 0.0	2 66.7	2 28.6	0 0.0	3 42.9	1 25.0	2 66.7	0 0.0	4 66.7	2 66.7
MORE THAN THREE ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	6 11.8	1 10.0	0 0.0	2 100.0	0 0.0	1 14.3	0 0.0	1 14.3	1 25.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	51	10	6	2	3	7	0	7	4	3	0	6	3

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

INFORMATION WHICH WOULD HAVE BEEN MOST USEFUL ON INTERSTATE SIGNS JUST SEEN

	TOTAL	16 NORTH		16 SOUTH		17 NORTH		18 EAST		18 WEST		DEMOCRACY	
		100771	090772	101471	091472	100771	090772	092371	092872	101471	091472	101571	092872
NAME OF CITY TOWN OR DESTINATION	264	15	25	18	26	20	39	22	26	20	27	10	16
	36.1	36.6	38.5	38.3	28.6	41.7	38.2	31.9	38.2	41.7	37.5	45.5	27.6
ROAD NAME	176	9	18	16	24	7	21	17	14	10	20	3	17
	24.1	22.0	27.7	34.0	26.4	14.6	20.6	24.6	20.6	20.8	27.8	13.6	29.3
ROUTE NUMBER	142	6	11	7	23	11	28	10	13	7	13	5	8
	19.4	14.6	16.9	14.9	25.3	22.9	27.5	14.5	19.1	14.6	16.1	22.7	13.8
CARDINAL DIRECTION (E.G., NORTH)	63	3	4	2	7	5	7	8	8	3	7	1	8
	8.6	7.3	6.2	4.3	7.7	10.4	6.9	11.6	11.8	6.3	9.7	4.5	13.8
EXIT NUMBER	74	6	7	4	11	3	7	9	7	7	5	1	7
	10.1	14.6	10.8	8.5	12.1	6.3	6.9	13.0	10.3	14.6	6.9	4.5	12.1
OTHER	12	2	0	0	0	2	0	3	0	1	0	2	2
	1.6	4.9	0.0	0.0	0.0	4.2	0.0	4.3	0.0	2.1	0.0	9.1	3.4
SUB-TOTAL	731	41	65	47	91	48	102	69	68	48	72	22	58
	99.9	100.0	100.1	100.0	100.1	100.1	100.1	99.9	100.0	100.1	100.0	99.9	100.0
NO RESPONSE	511	52	43	49	38	39	51	54	40	54	36	26	29
	32.5	46.8	30.3	40.8	22.4	36.8	25.5	35.8	28.4	45.0	25.4	48.1	25.2
MORE THAN THREE ANSWERS	7	2	2	2	0	0	0	0	1	0	0	0	0
	0.4	1.8	1.4	1.7	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
MORE THAN ONE ANSWER	323	16	32	22	41	19	47	28	32	18	34	6	28
	20.5	14.4	22.5	18.3	24.1	17.9	23.5	18.5	22.7	15.0	23.9	11.1	24.3
TOTAL	1572	111	142	120	170	106	200	151	141	120	142	54	115

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

	TOTAL	16 NORTH 100771	16 NORTH 090772	16 SOUTH 101471	16 SOUTH 091472	17 NORTH 100771	17 NORTH 090772	18 EAST 092371	18 EAST 092872	18 WEST 101471	18 WEST 091472	DEMOCRACY 101571	DEMOCRACY 092872
ADDITIONAL COMMENTS													
FAVORABLE COMMENTS ON BELTWAY / I-70S	73	2	12	2	7	3	10	8	4	5	8	1	11
	20.6	8.0	42.9	8.3	18.4	14.3	25.0	21.1	12.5	16.7	22.9	7.7	35.5
FAVORABLE COMMENTS ON OTHER ROADS	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNFAVORABLE COMMENTS ON BELTWAY / I-70S	187	12	8	17	19	16	11	25	19	18	20	10	12
	52.7	48.0	28.6	70.8	50.0	76.2	27.5	65.8	59.4	60.0	57.1	76.9	38.7
UNFAVORABLE COMMENTS ON OTHER ROADS	12	0	1	2	1	0	1	0	4	1	0	1	1
	3.4	0.0	3.6	8.3	2.6	0.0	2.5	0.0	12.5	3.3	0.0	7.7	3.2
UNDECIPHERABLE OR NO COMMENT	83	11	7	3	11	2	18	5	5	6	7	1	7
	23.4	44.0	25.0	12.5	28.9	9.5	45.0	13.2	15.6	20.0	20.0	7.7	22.6
SUB-TOTAL	355	25	28	24	38	21	40	38	32	30	35	13	31
	100.1	100.0	100.1	99.9	99.9	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0
NO RESPONSE	908	74	86	78	91	66	113	85	79	72	73	35	56
	71.9	74.7	75.4	76.5	70.5	75.9	73.9	69.1	71.2	70.6	67.6	72.9	64.4
TOTAL	1263	99	114	102	129	87	153	123	111	102	108	48	87
FAVORABLE COMMENTS ON BELTWAY / I-70S													
NONSPECIFIC	43	0	7	1	4	2	7	3	1	5	7	1	5
	58.9	0.0	58.3	50.0	57.1	66.7	70.0	37.5	25.0	100.0	87.5	100.0	45.5
GUIDE SIGNS	26	2	5	1	2	1	1	5	3	0	1	0	5
	35.6	100.0	41.7	50.0	28.6	33.3	10.0	62.5	75.0	0.0	12.5	0.0	45.5
OTHER	4	0	0	0	1	0	2	0	0	0	0	0	1
	5.5	0.0	0.0	0.0	14.3	0.0	20.0	0.0	0.0	0.0	0.0	0.0	9.1
SUB-TOTAL	73	2	12	2	7	3	10	8	4	5	8	1	11
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1
NO RESPONSE	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	73	2	12	2	7	3	10	8	4	5	8	1	11

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		16 NORTH		16 SOUTH		17 NORTH		18 EAST		18 WEST		DEMOCRACY	
	TOTAL	100771	090772	101471	091472	100771	090772	092371	092872	101471	091472	101571	092872
FAVORABLE COMMENTS ON OTHER ROADS													
NONSPECIFIC	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
SIGNS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
OTHER	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
SUB-TOTAL	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0

QUESTION ANALYSIS
TRAFFIC SURVEY

EXIT RESPONDENTS: RESPONSES BY EXIT LOCATION

		16 NORTH		16 SOUTH		17 NORTH		18 EAST		18 WEST		DEMOCRACY	
	TOTAL	100771	090772	101471	091472	100771	090772	092371	092872	101471	091472	101571	092872
UNFAVORABLE COMMENTS ON BELTWAY / I-70S													
NONSPECIFIC	9	0	0	1	C	C	0	3	3	0	1	0	1
	4.8	0.0	0.0	5.9	0.0	0.C	0.0	12.0	15.8	C.0	5.0	0.0	8.3
GUIDE SIGNS INADEQUATE IN: PHYSICAL ASPECTS	4	C	C	1	1	C	0	1	0	0	0	1	0
	2.1	0.0	0.0	5.9	5.3	0.C	0.0	4.0	C.0	C.0	C.0	10.0	0.0
SIGN MESSAGE NONSPECIFIC	20	1	1	2	1	5	2	2	C	3	2	0	1
	10.7	8.3	12.5	11.8	5.3	31.3	18.2	8.0	0.C	16.7	10.0	0.0	8.3
SIGN MESSAGE SHOULD HAVE PLACE NAME	21	4	1	2	0	1	1	5	1	0	4	1	1
	11.2	33.3	12.5	11.8	0.0	6.3	9.1	20.0	5.3	0.0	20.0	10.0	8.3
SIGN MESSAGE SHOULD HAVE OTHER NAME	31	3	1	3	2	3	1	1	3	2	5	2	5
	16.6	25.0	12.5	17.6	10.5	18.8	9.1	4.0	15.8	11.1	25.0	20.0	41.7
LOCATION AND/OR QUANTITY	32	4	1	0	6	5	3	4	2	0	4	1	2
	17.1	33.3	12.5	0.0	31.6	31.3	27.3	16.0	10.5	0.0	20.0	10.0	16.7
HIGHWAY GEOMETRY	44	C	3	5	5	1	3	6	6	7	3	4	1
	23.5	0.0	37.5	29.4	26.3	6.3	27.3	24.0	31.6	38.9	15.0	40.0	8.3
SPEED, VOLUME, OR TRAFFIC BEHAVIOR	19	0	1	3	4	C	1	2	3	4	0	1	0
	10.2	0.0	12.5	17.6	21.1	0.0	9.1	8.0	15.8	22.2	C.0	10.0	0.0
OTHER (E.G., SERVICE OTHER SIGNS)	7	0	0	0	0	1	0	1	1	2	1	0	1
	3.7	0.0	C.0	0.0	0.0	6.3	0.0	4.0	5.3	11.1	5.0	0.0	8.3
SUB-TOTAL	187	12	8	17	19	16	11	25	19	18	20	10	12
	99.9	99.9	100.0	100.C	100.1	100.3	100.1	100.0	100.1	10C.C	100.0	100.0	99.9
NO RESPONSE	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.C	0.0	C.0	C.C	C.0	0.0	0.0	0.0
TOTAL	187	12	8	17	19	16	11	25	19	18	20	10	12

Question Analysis
Traffic Survey
Exit Respondents: Responses by Destination

Diagrammatic Sign Comments	Total	16 North 090772	16 South 091472	17 North 090772	18 East 092872	18 West 091472	Democracy 092872
Favorable concerning diagrammatics	287	42	41	53	42	36	73
	88.6	93.3	78.8	98.1	84.0	97.3	84.9
Favorable - signs elsewhere on Beltway / other roads	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unfavorable concerning diagrammatics	34	2	9	1	8	1	13
	10.5	4.4	17.3	1.9	16.0	2.7	15.1
Unfavorable - signs elsewhere on Beltway / other roads	3	1	2	0	0	0	0
	0.9	2.2	3.8	0.0	0.0	0.0	0.0
Subtotal	324	45	52	54	50	37	86
	100.0	99.9	99.9	100.0	100.0	100.0	100.0
No Response	480	69	77	99	61	71	103
	59.7	60.5	59.7	64.7	55.0	65.7	54.5
Total	804	114	129	153	111	108	189

Question Analysis
Traffic Survey
Exit Respondents: Responses by Destination

Favorable Comments Concerning Diagrammatic Signs	Total	16 North 090772	16 South 091472	17 North 090772	18 East 092872	18 West 091472	Democracy 092872
Generally Good	201 70.0	31 73.8	31 75.6	44 83.0	25 59.5	26 72.2	44 60.3
Better than Previous Signs	15 5.2	3 7.1	3 7.3	2 3.8	2 4.8	0 0.0	5 6.8
Faster to Read/React to	6 2.1	0 0.0	1 2.4	0 0.0	1 2.4	0 0.0	4 5.5
Clear, Legible, Informative, Etc.	29 10.1	5 11.9	4 9.8	3 5.7	6 14.3	1 2.8	10 13.7
Provide Directional Guidance	9 3.1	0 0.0	0 0.0	2 3.8	2 4.8	2 5.6	3 4.1
Specific Comment on Graphic	7 2.4	1 2.4	0 0.0	2 3.8	2 4.8	2 5.6	0 0.0
Aid Lane Positioning	2 0.7	0 0.0	0 0.0	0 0.0	0 0.0	2 5.6	0 0.0
Aid Unfamiliar / Inexperienced Driver	5 1.7	1 2.4	1 2.4	0 0.0	1 2.4	1 2.8	1 1.4
Other Comment	13 4.5	1 2.4	1 2.4	0 0.0	3 7.1	2 5.6	6 8.2
Subtotal	287 99.8	42 100.0	41 99.9	53 100.1	42 100.1	36 100.2	73 100.0
Total	287	42	41	53	42	36	73

Question Analysis
Traffic Survey
Exit Respondents: Responses by Destination

Unfavorable Comments Concerning Diagrammatic Signs	Total	16 North 090772	16 South 091472	17 North 090772	18 East 092872	18 West 091472	Democracy 092872
Generally Bad	2 5.9	0 0.0	0 0.0	0 0.0	1 12.5	0 0.0	1 7.7
Worse than Previous Signs	3 8.8	1 50.0	1 11.1	0 0.0	0 0.0	0 0.0	1 7.7
Slower to Read/React to	4 11.8	0 0.0	1 11.1	0 0.0	2 25.0	0 0.0	1 7.7
Confusing, Unclear, too much Information, etc.	13 38.2	1 50.0	4 44.4	1 100.0	3 37.5	1 100.0	3 23.1
Does not Provide Directional Guidance	2 5.9	0 0.0	0 0.0	0 0.0	1 12.5	0 0.0	1 7.7
Specific Comment on Graphic	4 11.8	0 0.0	2 22.2	0 0.0	0 0.0	0 0.0	2 15.4
Does not Aid Lane Positioning	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Does not Aid Unfamiliar / Inexperienced Driver	2 5.9	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 15.4
Other Comment	4 11.8	0 0.0	1 11.1	0 0.0	1 12.5	0 0.0	2 15.4
Subtotal	34 100.1	2 100.0	9 99.9	1 100.0	8 100.0	1 100.0	13 100.1
Total	34	2	9	1	8	1	13

Selected Exit Respondents

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
SEX									
MALE	82 72.6	37 72.5	45 72.6	9 64.3	6 60.0	9 56.3	25 80.6	19 90.5	14 66.7
FEMALE	31 27.4	14 27.5	17 27.4	5 35.7	4 40.0	7 43.8	6 19.4	2 9.5	7 33.3
SUB-TOTAL	113 100.0	51 100.0	62 100.0	14 100.0	10 100.0	16 100.1	31 100.0	21 100.0	21 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	113	51	62	14	10	16	31	21	21
AGE									
LESS THAN 20 YEARS	1 0.9	1 2.0	0 0.0	1 7.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
20-30 YEARS	46 40.7	17 33.3	29 46.8	5 35.7	3 30.0	5 31.3	18 58.1	7 33.3	8 38.1
31-40 YEARS	24 21.2	10 19.6	14 22.6	2 14.3	4 40.0	5 31.3	8 25.8	3 14.3	2 9.5
41-50 YEARS	17 15.0	10 19.6	7 11.3	3 21.4	1 10.0	1 6.3	3 9.7	6 28.6	3 14.3
OVER 50 YEARS	25 22.1	13 25.5	12 19.4	3 21.4	2 20.0	5 31.3	2 6.5	5 23.8	8 38.1
SUB-TOTAL	113 99.9	51 100.0	62 100.1	14 99.9	10 100.0	16 100.2	31 100.1	21 100.0	21 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

OCCUPATION		TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
JOBHOLDER		70 63.6	31 62.0	39 65.0	6 42.9	6 60.0	8 53.3	20 66.7	17 81.0	13 65.0
MILITARY		11 10.0	2 4.0	9 15.0	0 0.0	0 0.0	0 0.0	4 13.3	2 9.5	5 25.0
HOUSEWIFE		14 12.7	9 18.0	5 8.3	5 35.7	2 20.0	4 26.7	2 6.7	0 0.0	1 5.0
STUDENT		5 4.5	1 2.0	4 6.7	0 0.0	2 20.0	1 6.7	2 6.7	0 0.0	0 0.0
UNEMPLOYED		10 9.1	7 14.0	3 5.0	3 21.4	0 0.0	2 13.3	2 6.7	2 9.5	1 5.0
	SUB-TOTAL	110 99.9	50 100.0	60 100.0	14 100.0	10 100.0	15 100.0	30 100.1	21 100.0	20 100.0
	NO RESPONSE	3 2.7	1 2.0	2 3.2	0 0.0	0 0.0	1 6.3	1 3.2	0 0.0	1 4.8
	TOTAL	113	51	62	14	10	16	31	21	21

CLESTICN ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPCNCENTS: RESPCNSES BY CESTINATICN

	TOTAL	SUB TOTAL 71	72	16 NCRTH 102171	100572	18 W 102271	18 E 092972	17 NCRTH 102171	100572
RESICENCE									
ALL DISTANCES MEASURED FROM DC									
LCCAL - WITHIN 30 MILES	31	12	19	5	3	7	15	0	1
AND NOT CR UNKNCWN MILITARY	27.4	23.5	3C.6	35.7	30.0	43.8	48.4	C.C	4.8
LCCAL - WITHIN 30 MILES	9	8	1	2	1	3	0	3	C
AND MILITARY	8.0	15.7	1.6	14.3	10.C	18.8	0.0	14.3	C.0
MCRE THAN 30 MILES	0	0	C	C	0	C	0	0	C
AND NOT CR UNKNCWN MILITARY	0.0	0.0	0.C	0.0	C.0	0.C	0.0	0.0	0.0
MCRE THAN 30 MILES	5	0	5	0	C	C	3	C	2
AND MILITARY	4.4	0.0	8.1	0.0	0.0	0.C	9.7	C.0	9.5
MC AND VA - CISTANCE UNKNCWN	1	1	C	1	0	C	0	0	C
AND NOT CR UNKNCWN MILITARY	0.9	2.0	0.0	7.1	0.0	0.C	0.0	C.C	0.C
MC AND VA - CISTANCE UNKNCWN	0	C	C	0	0	C	0	C	C
AND MILITARY	0.0	0.0	C.C	0.0	C.0	C.C	0.0	0.0	C.C
STATES OTHER THAN MC VA CR DC	55	21	34	4	6	5	12	12	16
AND NOT CR UNKNCWN MILITARY	48.7	41.2	54.8	28.6	60.0	31.3	38.7	57.1	76.2
STATES OTHER THAN MC VA CR DC	11	8	3	1	0	1	1	6	2
AND MILITARY	9.7	15.7	4.8	7.1	0.0	6.3	3.2	28.6	9.5
NC ANSWER	0	0	C	C	0	C	0	0	C
AND NOT CR UNKNCWN MILITARY	0.0	0.0	0.C	C.0	0.0	C.C	0.0	C.C	C.C
NC ANSWER	1	1	C	1	0	0	0	0	C
AND MILITARY	0.9	2.C	C.C	7.1	0.C	C.C	0.0	C.0	0.0
SUB-TOTAL	113	51	62	14	10	16	31	21	21
	100.C	100.1	99.9	99.9	100.0	10C.2	100.0	100.C	10C.0
NC RESPCNSE	0	0	C	C	0	C	C	C	C
	C.0	0.0	0.C	0.0	0.0	C.C	0.0	C.0	0.0
TCTAL	113	51	62	14	1C	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
PERIOD OF RESIDENCE									
LESS THAN 1 MONTH	9	4	5	1	1	3	3	0	1
	8.2	8.3	8.1	7.7	10.0	20.0	9.7	0.0	4.8
1 MONTH TO 6 MONTHS	17	6	11	3	1	1	9	2	1
	15.5	12.5	17.7	23.1	10.0	6.7	29.0	10.0	4.8
7 MONTHS TO 1 YEAR	10	4	6	1	1	1	3	2	2
	9.1	8.3	9.7	7.7	10.0	6.7	9.7	10.0	9.5
MORE THAN 1 YEAR TO 2 YEARS	9	4	5	0	0	3	3	1	2
	8.2	8.3	8.1	0.0	0.0	20.0	9.7	5.0	9.5
MORE THAN 2 YEARS	65	30	35	8	7	7	13	15	15
	59.1	62.5	56.5	61.5	70.0	46.7	41.9	75.0	71.4
SUB-TOTAL	110	48	62	13	10	15	31	20	21
	100.1	99.9	100.1	100.0	100.0	100.1	100.0	100.0	100.0
NO RESPONSE	3	3	0	1	0	1	0	1	0
	2.7	5.9	0.0	7.1	0.0	6.3	0.0	4.8	0.0
TOTAL	113	51	62	14	10	16	31	21	21
MILES DRIVEN PER YEAR									
LESS THAN 5,000	9	4	5	3	1	0	2	1	2
	8.0	7.8	8.1	21.4	10.0	0.0	6.5	4.8	9.5
5,000 - 10,000	27	12	15	3	1	5	8	4	6
	23.9	23.5	24.2	21.4	10.0	31.3	25.8	19.0	28.6
10,000 - 15,000	34	14	20	3	3	3	12	8	5
	30.1	27.5	32.3	21.4	30.0	18.8	38.7	38.1	23.8
MORE THAN 15,000	43	21	22	5	5	8	9	8	8
	38.1	41.2	35.5	35.7	50.0	50.0	29.0	38.1	38.1
SUB-TOTAL	113	51	62	14	10	16	31	21	21
	100.1	100.0	100.1	99.9	100.0	100.1	100.0	100.0	100.0
NO RESPONSE	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

STATE IN WHICH LICENSE ISSUED	TOTAL	SUB TOTAL 71	72	16 NORTH 102171	100572	18 W 102271	18 E 092972	17 NORTH 102171	100572
GOVERNMENT: NO STATE	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DISTRICT OF COLUMBIA	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VIRGINIA	2	0	2	0	0	0	2	0	0
	1.8	0.0	3.2	0.0	0.0	0.0	6.5	0.0	0.0
MARYLAND	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER EASTERN STATES	84	43	41	10	8	14	20	19	13
	74.3	84.3	66.1	71.4	80.0	87.5	64.5	90.5	61.9
CENTRAL STATES	20	3	17	2	2	0	7	1	8
	17.7	5.9	27.4	14.3	20.0	0.0	22.6	4.8	38.1
MOUNTAIN STATES	1	1	0	0	0	0	0	1	0
	0.9	2.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0
PACIFIC STATES INCLUDING ALASKA AND HAWAII	4	3	1	2	0	1	1	0	0
	3.5	5.9	1.6	14.3	0.0	6.3	3.2	0.0	0.0
FOREIGN	2	1	1	0	0	1	1	0	0
	1.8	2.0	1.6	0.0	0.0	6.3	3.2	0.0	0.0
SUB-TOTAL	113	51	62	14	10	16	31	21	21
	100.0	100.1	99.9	100.0	100.0	100.1	100.0	100.1	100.0
NO RESPONSE	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

REASON TRAVELING TODAY	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
BUSINESS: RELATED TO OCCUPATION	37 33.9	15 31.3	22 36.1	4 28.6	5 50.0	6 37.5	14 46.7	5 27.8	3 14.3
VACATION OR RECREATION	22 20.2	10 20.8	12 19.7	1 7.1	1 10.0	4 25.0	2 6.7	5 27.8	9 42.9
SHOPPING	4 3.7	2 4.2	2 3.3	1 7.1	0 0.0	1 6.3	2 6.7	0 0.0	0 0.0
TAKING CHILDREN SOMEWHERE	3 2.8	3 6.3	0 0.0	2 14.3	0 0.0	1 6.3	0 0.0	0 0.0	0 0.0
APPOINTMENT - UNRELATED TO BUSINESS OR CHILDREN	6 5.5	0 0.0	6 9.8	0 0.0	0 0.0	0 0.0	6 20.0	0 0.0	0 0.0
OTHER (SUCH AS VISIT, OR GOING TO SCHOOL)	37 33.9	18 37.5	19 31.1	6 42.9	4 40.0	4 25.0	6 20.0	8 44.4	9 42.9
SUB-TOTAL	109 100.0	48 100.1	61 100.0	14 100.0	10 100.0	16 100.1	30 100.1	18 100.0	21 100.1
NO RESPONSE	2 1.8	2 3.9	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 9.5	0 0.0
MORE THAN ONE ANSWER OR UNDECIPHERABLE	2 1.8	1 2.0	1 1.6	0 0.0	0 0.0	0 0.0	1 3.2	1 4.8	0 0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	16 W 102271	16 E 052972	17 NORTH 102171	17 NORTH 100572
TRIP ORIGIN									
WITHIN 30 MILES OF DC	88 77.9	41 80.4	47 75.8	13 92.9	10 100.0	15 93.8	27 87.1	13 61.9	10 47.6
30 TO 100 MILES OF DC	8 7.1	1 2.0	7 11.3	1 7.1	0 0.0	0 0.0	3 9.7	0 0.0	4 19.0
MORE THAN 100 MILES FROM DC	17 15.0	9 17.6	8 12.9	0 0.0	0 0.0	1 6.3	1 3.2	8 38.1	7 33.3
SUB-TOTAL	113 100.0	51 100.0	62 100.0	14 100.0	10 100.0	16 100.1	31 100.0	21 100.0	21 99.9
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	113	51	62	14	10	16	31	21	21
TRIP DESTINATION									
DC AREA OR WITHIN 30 MILES	67 59.3	33 64.7	34 54.8	14 100.0	8 80.0	15 93.8	26 83.9	4 19.0	0 0.0
30 TO 100 MILES OF DC	3 2.7	2 3.9	1 1.6	0 0.0	0 0.0	0 0.0	0 0.0	2 9.5	1 4.8
MORE THAN 100 MILES FROM DC	43 38.1	16 31.4	27 43.5	0 0.0	2 20.0	1 6.3	5 16.1	15 71.4	20 95.2
SUB-TOTAL	113 100.1	51 100.0	62 99.9	14 100.0	10 100.0	16 100.1	31 100.0	21 99.9	21 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
MAPS									
USING MAPS ON TRIP	43 39.1	17 35.4	26 41.9	3 23.1	1 10.0	2 12.5	9 29.0	12 63.2	16 76.2
NOT USING MAPS ON TRIP	67 60.9	31 64.6	36 58.1	10 76.9	9 90.0	14 87.5	22 71.0	7 36.8	5 23.8
SUB-TOTAL	110 100.0	48 100.0	62 100.0	13 100.0	10 100.0	16 100.0	31 100.0	19 100.0	21 100.0
NO RESPONSE	3 2.7	3 5.9	0 0.0	1 7.1	0 0.0	0 0.0	0 0.0	2 9.5	0 0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

REASON FOR SELECTING ROUTE	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
SHORTER	39 27.7	21 32.3	18 23.7	4 23.5	3 27.3	7 35.0	9 21.4	10 35.7	6 26.1
FASTER	62 44.0	27 41.5	35 46.1	5 29.4	6 54.5	11 55.0	18 42.9	11 39.3	11 47.8
SCENIC AREAS	6 4.3	3 4.6	3 3.9	1 5.9	0 0.0	0 0.0	3 7.1	2 7.1	0 0.0
LESS TRAFIC	7 5.0	4 6.2	3 3.9	2 11.8	0 0.0	0 0.0	3 7.1	2 7.1	0 0.0
MOST LIKELY NOT TO GET LOST	13 9.2	5 7.7	8 10.5	2 11.8	0 0.0	1 5.0	6 14.3	2 7.1	2 8.7
NO PARTICULAR REASON	2 1.4	0 0.0	2 2.6	0 0.0	1 9.1	0 0.0	0 0.0	0 0.0	1 4.3
OTHER	12 8.5	5 7.7	7 9.2	3 17.6	1 9.1	1 5.0	3 7.1	1 3.6	3 13.0
SUB-TOTAL	141 100.1	65 100.0	76 99.9	17 100.0	11 100.0	20 100.0	42 99.9	28 99.9	23 99.9
NO RESPONSE	192 53.0	82 49.7	110 55.8	25 55.6	19 61.3	25 48.1	51 50.5	32 47.1	40 61.5
MORE THAN THREE ANSWERS	2 0.6	2 1.2	0 0.0	0 0.0	0 0.0	1 1.9	0 0.0	1 1.5	0 0.0
MORE THAN ONE ANSWER	27 7.5	16 9.7	11 5.6	3 6.7	1 3.2	6 11.5	8 7.9	7 10.3	2 3.1
TOTAL	362	165	197	45	31	52	101	68	65

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
ROUTE FAMILIARITY									
DRIVEN ROUTE BEFORE									
5 TIMES OR LESS WITHIN LAST 30 DAYS	16	8	8	1	2	0	4	7	2
	15.2	17.8	13.3	7.1	20.0	0.0	13.8	46.7	9.5
5 TIMES OR LESS NOT WITHIN LAST 30 DAYS	16	8	8	1	0	2	2	5	6
	15.2	17.8	13.3	7.1	0.0	12.5	6.9	33.3	28.6
6 - 10 TIMES WITHIN LAST 30 DAYS	4	3	1	2	0	1	1	0	0
	3.8	6.7	1.7	14.3	0.0	6.3	3.4	0.0	0.0
6 - 10 TIMES NOT WITHIN LAST 30 DAYS	5	0	5	0	0	0	2	0	3
	4.8	0.0	8.3	0.0	0.0	0.0	6.9	0.0	14.3
11 - 20 TIMES WITHIN LAST 30 DAYS	2	0	2	0	0	0	2	0	0
	1.9	0.0	3.3	0.0	0.0	0.0	6.9	0.0	0.0
11 - 20 TIMES NOT WITHIN LAST 30 DAYS	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21 TIMES OR MORE WITHIN LAST 30 DAYS	29	17	12	6	3	11	9	0	0
	27.6	37.8	20.0	42.9	30.0	68.8	31.0	0.0	0.0
21 TIMES OR MORE NOT WITHIN LAST 30 DAYS	3	1	2	0	2	1	0	0	0
	2.9	2.2	3.3	0.0	20.0	6.3	0.0	0.0	0.0
NOT DRIVEN ROUTE BEFORE	30	8	22	4	3	1	9	3	10
	28.6	17.8	36.7	28.6	30.0	6.3	31.0	20.0	47.6
SUB-TOTAL	105	45	60	14	10	16	29	15	21
	100.0	100.1	99.9	100.0	100.0	100.2	99.9	100.0	100.0
NO RESPONSE	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INCOMPLETE	7	5	2	0	0	0	2	5	0
	6.3	10.0	3.2	0.0	0.0	0.0	6.5	25.0	0.0
INCONSISTENT	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	112	50	62	14	10	16	31	20	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

TROUBLE WITH SIGNS

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
YES	13	3	10	0	1	1	2	2	7
	12.9	6.8	17.5	0.0	11.1	6.7	6.9	11.8	36.8
NO	88	41	47	12	8	14	27	15	12
	87.1	93.2	82.5	100.0	88.9	93.3	93.1	88.2	63.2
SUB-TOTAL	101	44	57	12	9	15	29	17	19
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NO RESPONSE	3	3	0	1	0	1	0	1	0
	2.7	5.9	0.0	7.1	0.0	6.3	0.0	4.8	0.0
INCOMPLETE	9	4	5	1	1	0	2	3	2
	8.0	7.8	8.1	7.1	10.0	0.0	6.5	14.3	9.5
INCONSISTENT	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	113	51	62	14	10	16	31	21	21

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

TROUBLE WITH SIGNS WAS	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	16 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
SIGN DID NOT CONTAIN PROPER INFORMATION	12 54.5	2 50.0	10 55.6	0 0.0	1 100.0	1 100.0	2 50.0	1 33.3	7 53.8
NOT ENOUGH SIGNS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOO MANY SIGNS IN ONE PLACE	2 9.1	0 0.0	2 11.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 15.4
SIGNS WERE POORLY PLACED	2 9.1	1 25.0	1 5.6	0 0.0	0 0.0	0 0.0	0 0.0	1 33.3	1 7.7
SIGNS HARD TO UNDERSTAND	5 22.7	1 25.0	4 22.2	0 0.0	0 0.0	0 0.0	1 25.0	1 33.3	3 23.1
OTHER	1 4.5	0 0.0	1 5.6	0 0.0	0 0.0	0 0.0	1 25.0	0 0.0	0 0.0
SUB-TOTAL	22 99.9	4 100.0	18 100.1	0 0.0	1 100.0	1 100.0	4 100.0	3 99.9	13 100.0
NO RESPONSE	30 50.8	8 61.5	22 47.8	0 0.0	3 75.0	3 75.0	4 40.0	5 55.6	15 46.9
MORE THAN FOUR ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	7 11.9	1 7.7	6 13.0	0 0.0	0 0.0	0 0.0	2 20.0	1 11.1	4 12.5
TOTAL	59	13	46	0	4	4	10	9	32

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
SIGN DID NOT CONTAIN PROPER INFORMATION									
INFORMATION SOUGHT:									
NAME OF CITY, TOWN OR DESTINATION	3 20.0	0 0.0	3 25.0	0 0.0	0 0.0	0 0.0	1 33.3	0 0.0	2 25.0
ROAD NAME	2 13.3	1 33.3	1 8.3	0 0.0	0 0.0	1 100.0	1 33.3	0 0.0	0 0.0
ROUTE NUMBER	1 6.7	0 0.0	1 8.3	0 0.0	0 0.0	0 0.0	1 33.3	0 0.0	0 0.0
CARDINAL DIRECTION (E.G., NORTH)	6 40.0	1 33.3	5 41.7	0 0.0	1 100.0	0 0.0	0 0.0	1 50.0	4 50.0
EXIT NUMBER	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
OTHER	3 20.0	1 33.3	2 16.7	0 0.0	0 0.0	0 0.0	0 0.0	1 50.0	2 25.0
SUB-TOTAL	15 100.0	3 99.9	12 100.0	0 0.0	1 100.0	1 100.0	3 99.9	2 100.0	8 100.0
NO RESPONSE	21 53.8	3 42.9	18 56.3	0 0.0	2 66.7	2 66.7	3 42.9	1 25.0	13 59.1
MORE THAN THREE ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	3 7.7	1 14.3	2 6.3	0 0.0	0 0.0	0 0.0	1 14.3	1 25.0	1 4.5
TOTAL	39	7	32	0	3	3	7	4	22

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

INFORMATION WHICH WOULD HAVE BEEN MOST USEFUL ON INTERSTATE SIGNS JUST SEEN	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
NAME OF CITY TOWN OR DESTINATION	58 31.9	27 36.5	31 28.7	8 36.4	4 21.1	9 36.0	16 31.4	10 37.0	11 28.9
ROAD NAME	31 17.0	14 18.9	17 15.7	5 22.7	3 15.8	5 20.0	13 25.5	4 14.8	1 2.6
ROUTE NUMBER	44 24.2	15 20.3	29 26.9	4 18.2	4 21.1	5 20.0	13 25.5	6 22.2	12 31.6
CARDINAL DIRECTION (E.G., NORTH)	29 15.9	8 10.8	21 19.4	1 4.5	4 21.1	4 16.0	4 7.8	3 11.1	13 34.2
EXIT NUMBER	15 8.2	7 9.5	8 7.4	2 9.1	4 21.1	2 8.0	3 5.9	3 11.1	1 2.6
OTHER	5 2.7	3 4.1	2 1.9	2 9.1	0 0.0	0 0.0	2 3.9	1 3.7	0 0.0
SUB-TOTAL	182 99.9	74 100.1	108 100.0	22 100.0	19 100.2	25 100.0	51 100.0	27 99.9	38 99.9
NO RESPONSE	157 38.5	79 43.9	78 34.2	20 40.0	11 29.7	23 41.1	42 37.2	36 48.6	25 32.1
MORE THAN THREE ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	69 16.9	27 15.0	42 18.4	8 16.0	7 18.9	8 14.3	20 17.7	11 14.9	15 19.2
TOTAL	408	180	228	50	37	56	113	74	78

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	18 W 102271	18 E 092972	17 NORTH 102171	17 NORTH 100572
ADDITIONAL COMMENTS									
FAVORABLE COMMENTS ON BELTWAY / I-70S	25 27.5	15 32.6	10 22.2	4 26.7	0 0.0	4 30.8	6 26.1	7 38.9	4 22.2
FAVORABLE COMMENTS ON OTHER ROADS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
UNFAVORABLE COMMENTS ON BELTWAY / I-70S	32 35.2	15 32.6	17 37.8	9 60.0	2 50.0	3 23.1	7 30.4	3 16.7	8 44.4
UNFAVORABLE COMMENTS ON OTHER ROADS	1 1.1	0 0.0	1 2.2	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 5.6
UNDECIPHERABLE OR NO COMMENT	33 36.3	16 34.8	17 37.8	2 13.3	2 50.0	6 46.2	10 43.5	8 44.4	5 27.8
SUB-TOTAL	91 100.1	46 100.0	45 100.0	15 100.0	4 100.0	13 100.1	23 100.0	18 100.0	18 100.0
NO RESPONSE	248 73.2	107 69.9	141 75.8	27 64.3	26 86.7	35 72.9	70 75.3	45 71.4	45 71.4
TOTAL	339	153	186	42	30	48	93	63	63
FAVORABLE COMMENTS ON BELTWAY / I-70S									
NONSPECIFIC	6 24.0	2 13.3	4 40.0	1 25.0	0 0.0	1 25.0	2 33.3	0 0.0	2 50.0
GUIDE SIGNS	16 64.0	10 66.7	6 60.0	3 75.0	0 0.0	3 75.0	4 66.7	4 57.1	2 50.0
OTHER	3 12.0	3 20.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	3 42.9	0 0.0
SUB-TOTAL	25 100.0	15 100.0	10 100.0	4 100.0	0 0.0	4 100.0	6 100.0	7 100.0	4 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	25	15	10	4	0	4	6	7	4

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	72	16 NORTH 102171	100572	18 W 102271	18 E 092972	17 NORTH 102171	100572
FAVORABLE COMMENTS ON OTHER ROADS									
NONSPECIFIC	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
SIGNS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
OTHER	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
SUB-TOTAL	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	0	0	0	0	0	0	0	0	0

QUESTION ANALYSIS
TRAFFIC SURVEY

SELECTED EXIT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL 71	SUB TOTAL 72	16 NORTH 102171	16 NORTH 100572	16 W 102271	16 E 092972	17 NORTH 102171	17 NORTH 100572
UNFAVORABLE COMMENTS ON BELTWAY / I-70S									
NONSPECIFIC	2	1	1	1	0	0	0	0	1
	6.3	6.7	5.9	11.1	0.0	0.0	0.0	0.0	12.5
GUIDE SIGNS INADEQUATE IN: PHYSICAL ASPECTS	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SIGN MESSAGE NONSPECIFIC	5	0	5	0	1	0	4	0	0
	15.6	0.0	29.4	0.0	50.0	0.0	57.1	0.0	0.0
SIGN MESSAGE SHOULD HAVE PLACE NAME	6	5	1	2	0	2	0	1	1
	18.8	33.3	5.9	22.2	0.0	66.7	0.0	33.3	12.5
SIGN MESSAGE SHOULD HAVE OTHER NAME	5	3	2	1	0	1	1	1	1
	15.6	20.0	11.8	11.1	0.0	33.3	14.3	33.3	12.5
LOCATION AND/OR QUANTITY	10	4	6	3	1	0	1	1	4
	31.3	26.7	35.3	33.3	50.0	0.0	14.3	33.3	50.0
HIGHWAY GEOMETRY	2	0	2	0	0	0	1	0	1
	6.3	0.0	11.8	0.0	0.0	0.0	14.3	0.0	12.5
SPEED, VOLUME, OR TRAFFIC BEHAVIOR	1	1	0	1	0	0	0	0	0
	3.1	6.7	0.0	11.1	0.0	0.0	0.0	0.0	0.0
OTHER (E.G., SERVICE OTHER SIGNS)	1	1	0	1	0	0	0	0	0
	3.1	6.7	0.0	11.1	0.0	0.0	0.0	0.0	0.0
SUB-TOTAL	32	15	17	9	2	3	7	3	8
	100.1	100.1	100.1	99.9	100.0	100.0	100.0	99.9	100.0
NO RESPONSE	0	0	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	32	15	17	9	2	3	7	3	8

Question Analysis
Traffic Survey
Selected Exit Respondents: Responses by Destination

	Total	16 North 100572	18 East 092972	17 North 100572
Diagrammatic Sign Comments				
Favorable concerning diagrammatics	73 83.0	14 100.0	38 84.4	21 72.4
Favorable - signs elsewhere on Beltway / other roads	0 0.0	0 0.0	0 0.0	0 0.0
Unfavorable concerning diagrammatics	14 15.9	0 0.0	6 13.3	8 27.6
Unfavorable - signs elsewhere on Beltway / other roads	1 1.1	0 0.0	1 2.2	0 0.0
Subtotal	88 100.0	14 100.0	45 99.9	29 100.0
No response	98 52.7	16 53.3	48 51.6	34 54.0
Total	186	30	93	63

Question Analysis
Traffic Survey
Selected Exit Respondents: Responses by Destination

	Total	16 North 100572	18 East 092972	17 North 100572
Favorable Comments Concerning Diagrammatic Signs				
Generally Good	46	10	23	13
	63.0	71.4	60.5	61.9
Better than Previous Signs	3	0	2	1
	4.1	0.0	5.3	4.8
Faster to Read/React to	0	0	0	0
	0.0	0.0	0.0	0.0
Clear, Legible, Informative, Etc.	7	1	5	1
	9.6	7.1	13.2	4.8
Provide Directional Guidance	1	0	1	0
	1.4	0.0	2.6	0.0
Specific Comment on Graphic	2	0	1	1
	2.7	0.0	2.6	4.8
Aid Lane Positioning	2	0	2	0
	2.7	0.0	5.3	0.0
Aid Non-familiar/Inexperienced Driver	4	1	0	3
	5.5	7.1	0.0	14.3
Other Comment	8	2	4	2
	11.0	14.3	10.5	9.5
Subtotal	73	14	38	21
	100.0	99.9	100.0	100.1
Total	73	14	38	21

Question Analysis
Traffic Survey
Selected Exit Respondents: Responses by Destination

	Total	16 North 100572	18 East 092972	17 North 100572
Unfavorable Comments Concerning Diagrammatic Signs				
Generally Bad	3 21.4	0 0.0	1 16.7	2 25.0
Worse than Previous Signs	0 0.0	0 0.0	0 0.0	0 0.0
Slower to Read/React to	2 14.3	0 0.0	1 16.7	1 12.5
Confusing, Unclear, too much Information	2 14.3	0 0.0	0 0.0	2 25.0
Does not provide Directional Guidance	0 0.0	0 0.0	0 0.0	0 0.0
Specific Comment on Graphic	1 7.1	0 0.0	0 0.0	1 12.5
Does not Aid Lane Positioning	3 21.4	0 0.0	1 16.7	2 25.0
Does not aid Unfamiliar / Inexperienced Driver	1 7.1	0 0.0	1 16.7	0 0.0
Other Comment	2 14.3	0 0.0	2 33.3	0 0.0
Subtotal	14 99.9	0 0.0	6 100.1	8 100.0
Total	14	0	6	8

Thruput Respondents

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 CONNECT. BEFORE	495 CONNECT. AFTER	70S CONNECT. BEFORE	70S CONNECT. AFTER
SEX							
MALE	91 83.5	43 97.7	48 73.8	17 100.0	22 78.6	26 96.3	26 70.3
FEMALE	18 16.5	1 2.3	17 26.2	0 0.0	6 21.4	1 3.7	11 29.7
SUB-TOTAL	109 100.0	44 100.0	65 100.0	17 100.0	28 100.0	27 100.0	37 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37
AGE							
LESS THAN 20 YEARS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
20-30 YEARS	47 43.1	19 43.2	28 43.1	8 47.1	12 42.9	11 40.7	16 43.2
31-40 YEARS	18 16.5	7 15.9	11 16.9	2 11.8	5 17.9	5 18.5	6 16.2
41-50 YEARS	19 17.4	11 25.0	8 12.3	4 23.5	2 7.1	7 25.9	6 16.2
OVER 50 YEARS	25 22.9	7 15.9	18 27.7	3 17.6	9 32.1	4 14.8	9 24.3
SUB-TOTAL	109 99.9	44 100.0	65 100.0	17 100.0	28 100.0	27 99.9	37 99.9
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESFCNCENTS: RESPONSES BY CESTINATION

OCCUPATION		TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 ECCNNECT. BEFORE	495 ECCNNECT. AFTER	70S ECONNECT. BEFORE	70S ECONNECT. AFTER
JOBHCLDER		64 58.7	24 54.5	4C 61.5	11 64.7	16 57.1	13 48.1	24 64.9
MILITARY		23 21.1	14 31.8	9 13.8	3 17.6	3 10.7	11 40.7	6 16.2
HOUSEWIFE		2 1.8	0 0.0	2 3.1	0 0.0	1 3.6	C 0.C	1 2.7
STUDENT		9 8.3	3 6.8	6 9.2	3 17.6	3 10.7	C 0.C	3 8.1
UNEMPLOYED		11 10.1	3 6.8	8 12.3	0 0.0	5 17.9	3 11.1	3 8.1
	SLB-TOTAL	109 100.0	44 99.9	65 99.9	17 99.9	28 100.0	27 99.9	37 100.0
	NO RESPONSE	0 0.0	0 0.0	0 0.C	0 0.0	0 0.0	C 0.0	0 0.0
	TCTAL	109	44	65	17	28	27	37

CUESTICN ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPCNCENTS: RESPCNSES BY CESTINATION

RESIDENCE	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 CCNNECT. BEFORE	I495 CCNNECT. AFTER	I70S CCNNECT. BEFORE	I70S CCNNECT. AFTER
ALL DISTANCES MEASURED FROM DC							
LCCAL - WITHIN 30 MILES AND NOT OR UNKNCWN MILITARY	7 6.4	2 4.5	5 7.7	2 11.8	4 14.3	C 0.0	1 2.7
LCCAL - WITHIN 30 MILES AND MILITARY	1 0.9	0 0.0	1 1.5	0 0.0	1 3.6	0 0.C	0 0.0
MCRE THAN 30 MILES AND NOT OR UNKNCWN MILITARY	27 24.8	12 27.3	15 23.1	5 29.4	5 17.9	7 25.9	10 27.0
MCRE THAN 30 MILES AND MILITARY	11 10.1	6 13.6	5 7.7	1 5.9	1 3.6	5 18.5	4 10.8
MD AND VA - CISTANCE UNKNOWN AND NOT CR UNKNOWN MILITARY	0 0.0	0 0.0	0 0.C	C 0.0	0 0.0	0 0.0	0 0.0
MC AND VA - CISTANCE UNKNOWN AND MILITARY	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C C.C	0 0.0
STATES OTHER THAN MC VA OR DC AND NCT OR UNKNCWN MILITARY	47 43.1	14 31.8	33 50.8	4 23.5	14 50.0	1C 37.C	19 51.4
STATES OTHER THAN MC VA OR DC AND MILITARY	16 14.7	10 22.7	6 9.2	5 29.4	3 10.7	5 18.5	3 8.1
NC ANSWER AND NOT OR UNKNCWN MILITARY	0 0.0	0 0.0	0 0.C	0 0.0	0 0.0	C 0.C	0 0.0
NO ANSWER AND MILITARY	0 0.0	0 0.0	0 0.0	C 0.0	0 0.0	0 0.C	0 0.0
SUB-TOTAL	109 100.0	44 99.9	65 1C0.C	17 100.0	28 100.1	27 99.9	37 100.0
NC RESPONSE	0 0.0	0 0.0	C C.0	0 0.0	0 0.0	C C.0	0 0.0
TCTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 &CONNECT. BEFORE	495 &CONNECT. AFTER	70S &CONNECT. BEFORE	70S &CONNECT. AFTER
PERIOD OF RESIDENCE							
LESS THAN 1 MONTH	3 2.8	1 2.3	2 3.1	1 5.9	1 3.6	0 0.0	1 2.7
1 MONTH TO 6 MONTHS	8 7.4	4 9.3	4 6.2	2 11.8	1 3.6	2 7.7	3 8.1
7 MONTHS TO 1 YEAR	10 9.3	1 2.3	9 13.8	0 0.0	3 10.7	1 3.8	6 16.2
MORE THAN 1 YEAR TO 2 YEARS	12 11.1	6 14.0	6 9.2	3 17.6	3 10.7	3 11.5	3 8.1
MORE THAN 2 YEARS	75 69.4	31 72.1	44 67.7	11 64.7	20 71.4	20 76.9	24 64.9
SUB-TOTAL	108 100.0	43 100.0	65 100.0	17 100.0	28 100.0	26 99.9	37 100.0
NO RESPONSE	1 0.9	1 2.3	0 0.0	0 0.0	0 0.0	1 3.7	0 0.0
TOTAL	109	44	65	17	28	27	37
MILES DRIVEN PER YEAR							
LESS THAN 5,000	3 2.8	1 2.3	2 3.1	0 0.0	0 0.0	1 3.7	2 5.4
5,000 - 10,000	18 16.5	5 11.4	13 20.0	2 11.8	5 17.9	3 11.1	8 21.6
10,000 - 15,000	38 34.9	15 34.1	23 35.4	5 29.4	11 39.3	10 37.0	12 32.4
MORE THAN 15,000	50 45.9	23 52.3	27 41.5	10 58.8	12 42.9	13 48.1	15 40.5
SUB-TOTAL	109 100.1	44 100.1	65 100.0	17 100.0	28 100.1	27 99.9	37 99.9
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37

QUESTICN ANALYSIS
TRAFFIC SURVEY

THRU-PLT RESPCNCENTS: RESPCNSES BY CESTINATION

STATE IN WHICH LICENSE ISSUED	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 CCNNECT. BEFORE	I495 CCNNECT. AFTER	I70S CONNECT. BEFORE	I70S CONNECT. AFTER
GOVERNMENT; NO STATE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.C	0 0.0
DISTRICT OF CCLUMBIA	0 0.0	0 0.0	0 C.0	0 0.0	0 0.0	C 0.0	0 0.0
VIRGINIA	24 22.0	9 2C.5	15 23.1	6 35.3	5 17.9	3 11.1	10 27.0
MARYLAND	9 8.3	4 9.1	5 7.7	2 11.8	5 17.9	2 7.4	0 0.0
OTHER EASTERN STATES	61 56.0	25 56.8	36 55.4	7 41.2	17 60.7	18 66.7	19 51.4
CENTRAL STATES	12 11.0	5 11.4	7 10.8	1 5.9	1 3.6	4 14.E	6 16.2
MOUNTAIN STATES	1 C.9	1 2.3	0 0.0	1 5.9	C 0.0	C 0.0	0 0.0
PACIFIC STATES INCLUDING ALASKA ANC HAWAII	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
FOREIGN	2 1.8	0 0.0	2 3.1	0 0.C	0 0.0	0 0.C	2 5.4
SLB-TOTAL	109 100.0	44 100.1	65 10C.1	17 100.1	28 100.1	27 100.C	37 100.0
NC RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
TCTAL	109	44	65	17	28	27	37

QUESTICN ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPCNDENTS: RESPCNSES BY CESTINATION

REASON TRAVELING TODAY	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 CCNNECT. BEFORE	495 CCNNECT. AFTER	70S CONNECT. BEFORE	70S CONNECT. AFTER
BUSINESS: RELATED TO OCCUPATION	20 18.3	7 15.9	13 20.0	5 29.4	7 25.0	2 7.4	6 16.2
VACATION OR RECREATION	50 45.9	16 36.4	34 52.3	8 47.1	12 42.9	8 29.6	22 59.5
SHOPPING	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TAKING CHILDREN SOMEWHERE	1 0.9	1 2.3	0 0.0	1 5.9	C 0.0	C 0.C	0 0.0
APPOINTMENT - UNRELATED TO BUSINESS OR CHILDREN	1 0.9	0 0.0	1 1.5	0 0.0	1 3.6	0 0.0	0 0.0
OTHER (SUCH AS VISIT, OR GOING TO SCHOOL)	37 33.9	2C 45.5	17 26.2	3 17.6	8 28.6	17 63.0	9 24.3
SUB-TOTAL	109 99.9	44 100.1	65 100.0	17 100.0	28 100.1	27 100.C	37 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
MORE THAN ONE ANSWER OR UNDECIPHERABLE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
TOTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 &CONNECT. BEFORE	495 &CONNECT. AFTER	70S &CONNECT. BEFORE	70S &CONNECT. AFTER
TRIP ORIGIN							
WITHIN 30 MILES OF DC	5 4.6	1 2.3	4 6.2	0 0.0	4 14.3	1 3.7	0 0.0
30 TO 100 MILES OF DC	3 2.8	3 7.0	0 0.0	2 12.5	0 0.0	1 3.7	0 0.0
MORE THAN 100 MILES FROM DC	100 92.6	39 90.7	61 93.8	14 87.5	24 85.7	25 92.6	37 100.0
SUB-TOTAL	108 100.0	43 100.0	65 100.0	16 100.0	28 100.0	27 100.0	37 100.0
NO RESPONSE	1 0.9	1 2.3	0 0.0	1 5.9	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37
TRIP DESTINATION							
DC AREA OR WITHIN 30 MILES	16 14.7	4 9.1	12 18.5	3 17.6	7 25.0	1 3.7	5 13.5
30 TO 100 MILES OF DC	13 11.9	7 15.9	6 9.2	2 11.8	3 10.7	5 18.5	3 8.1
MORE THAN 100 MILES FROM DC	80 73.4	33 75.0	47 72.3	12 70.6	18 64.3	21 77.8	29 78.4
SUB-TOTAL	109 100.0	44 100.0	65 100.0	17 100.0	28 100.0	27 100.0	37 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

MAPS

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 &CONNECT. BEFORE	I495 &CONNECT. AFTER	I70S &CONNECT. BEFORE	I70S &CONNECT. AFTER
USING MAPS ON TRIP	60	24	36	11	19	13	17
	55.0	54.5	55.4	64.7	67.9	48.1	45.9
NOT USING MAPS ON TRIP	49	20	29	6	9	14	20
	45.0	45.5	44.6	35.3	32.1	51.9	54.1
SUB-TOTAL	109	44	65	17	28	27	37
	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NO RESPONSE	0	0	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PLT RESPONDENTS: , RESPONSES BY DESTINATION

REASON FOR SELECTING ROUTE	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 &CONNECT. BEFORE	I495 &CONNECT. AFTER	I70S &CONNECT. BEFORE	I70S &CONNECT. AFTER
SHORTER	31 20.5	10 16.7	21 23.1	0 0.0	8 20.0	10 25.0	13 25.5
FASTER	77 51.0	31 51.7	46 50.5	10 50.0	19 47.5	21 52.5	27 52.9
SCENIC AREAS	2 1.3	0 0.0	2 2.2	0 0.0	1 2.5	0 0.0	1 2.0
LESS TRAFIC	13 8.6	7 11.7	6 6.6	2 10.0	6 15.0	5 12.5	0 0.0
MOST LIKELY NOT TO GET LOST	12 7.9	4 6.7	8 8.8	3 15.0	5 12.5	1 2.5	3 5.9
NO PARTICULAR REASON	4 2.6	1 1.7	3 3.3	1 5.0	0 0.0	0 0.0	3 5.9
OTHER	12 7.9	7 11.7	5 5.5	4 20.0	1 2.5	3 7.5	4 7.8
SUB-TOTAL	151 99.8	60 100.2	91 100.0	20 100.0	40 100.0	40 100.0	51 100.0
NO RESPONSE	176 48.9	72 50.3	104 47.9	31 58.5	44 46.3	41 45.6	60 49.2
MORE THAN THREE ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	33 9.2	11 7.7	22 10.1	2 3.8	11 11.6	9 10.0	11 9.0
TOTAL	360	143	217	53	95	90	122

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

		SUB TOTAL		I495 CONNECT.		I70S CONNECT.	
	TOTAL	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER
ROUTE FAMILIARITY							
DRIVEN ROUTE BEFORE							
5 TIMES OR LESS WITHIN LAST 30 DAYS	7 6.6	1 2.4	6 9.2	1 6.7	3 10.7	0 0.0	3 8.1
5 TIMES OR LESS NOT WITHIN LAST 30 DAYS	21 19.8	7 17.1	14 21.5	0 0.0	7 25.0	7 26.9	7 18.9
6 - 10 TIMES WITHIN LAST 30 DAYS	7 6.6	2 4.9	5 7.7	1 6.7	0 0.0	1 3.8	5 13.5
6 - 10 TIMES NOT WITHIN LAST 30 DAYS	11 10.4	3 7.3	8 12.3	2 13.3	1 3.6	1 3.8	7 18.9
11 - 20 TIMES WITHIN LAST 30 DAYS	6 5.7	3 7.3	3 4.6	2 13.3	2 7.1	1 3.8	1 2.7
11 - 20 TIMES NOT WITHIN LAST 30 DAYS	5 4.7	2 4.9	3 4.6	1 6.7	1 3.6	1 3.8	2 5.4
21 TIMES OR MORE WITHIN LAST 30 DAYS	17 16.0	8 19.5	9 13.8	2 13.3	6 21.4	6 23.1	3 8.1
21 TIMES OR MORE NOT WITHIN LAST 30 DAYS	6 5.7	3 7.3	3 4.6	0 0.0	0 0.0	3 11.5	3 8.1
NOT DRIVEN ROUTE BEFORE	26 24.5	12 29.3	14 21.5	6 40.0	8 28.6	6 23.1	6 16.2
SUB-TOTAL	106 100.0	41 100.0	65 99.8	15 100.0	28 100.0	26 99.8	37 99.9
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
INCOMPLETE	3 2.8	3 6.8	0 0.0	2 11.8	0 0.0	1 3.7	0 0.0
INCONSISTENT	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 &CONNECT. BEFORE	495 &CONNECT. AFTER	70S &CONNECT. BEFORE	70S &CONNECT. AFTER
TROUBLE WITH SIGNS							
YES	10 10.2	5 13.5	5 8.2	2 14.3	3 10.7	3 13.0	2 6.1
NO	88 89.8	32 86.5	56 91.8	12 85.7	25 89.3	20 87.0	31 93.9
SUB-TOTAL	98 100.0	37 100.0	61 100.0	14 100.0	28 100.0	23 100.0	33 100.0
NO RESPONSE	1 0.9	0 0.0	1 1.5	0 0.0	0 0.0	0 0.0	1 2.7
INCOMPLETE	10 9.2	7 15.9	3 4.6	3 17.6	0 0.0	4 14.8	3 8.1
INCONSISTENT	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	109	44	65	17	28	27	37

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

TROUBLE WITH SIGNS WAS	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 &CONNECT. BEFORE	495 &CONNECT. AFTER	70S &CONNECT. BEFORE	70S &CONNECT. AFTER
SIGN DID NOT CONTAIN PROPER INFORMATION	9 37.5	4 30.8	5 45.5	1 16.7	3 42.9	3 42.9	2 50.0
NOT ENOUGH SIGNS	1 4.2	0 0.0	1 9.1	0 0.0	1 14.3	0 0.0	0 0.0
TOO MANY SIGNS IN ONE PLACE	5 20.8	3 23.1	2 18.2	2 33.3	1 14.3	1 14.3	1 25.0
SIGNS WERE POORLY PLACED	2 8.3	1 7.7	1 9.1	0 0.0	1 14.3	1 14.3	0 0.0
SIGNS HARD TO UNDERSTAND	5 20.8	3 23.1	2 18.2	2 33.3	1 14.3	1 14.3	1 25.0
OTHER	2 8.3	2 15.4	0 0.0	1 16.7	0 0.0	1 14.3	0 0.0
SUB-TOTAL	24 99.9	13 100.1	11 100.1	6 100.0	7 100.1	7 100.1	4 100.0
NO RESPONSE	16 32.0	7 28.0	9 36.0	2 20.0	5 33.3	5 33.3	4 40.0
MORE THAN FOUR ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	10 20.0	5 20.0	5 20.0	2 20.0	3 20.0	3 20.0	2 20.0
TOTAL	50	25	25	10	15	15	10

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	495 CONNECT. BEFORE	495 CONNECT. AFTER	70S CONNECT. BEFORE	70S CONNECT. AFTER
SIGN DID NOT CONTAIN PROPER INFORMATION							
INFORMATION SOUGHT:							
NAME OF CITY, TOWN OR DESTINATION	2 14.3	1 14.3	1 14.3	1 33.3	1 25.0	0 0.0	0 0.0
ROAD NAME	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
ROUTE NUMBER	4 28.6	2 28.6	2 28.6	1 33.3	1 25.0	1 25.0	1 33.3
CARDINAL DIRECTION (E.G., NORTH)	7 50.0	4 57.1	3 42.9	1 33.3	1 25.0	3 75.0	2 66.7
EXIT NUMBER	1 7.1	0 0.0	1 14.3	0 0.0	1 25.0	0 0.0	0 0.0
OTHER	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
SUB-TOTAL	14 100.0	7 100.0	7 100.1	3 99.9	4 100.0	4 100.0	3 100.0
NO RESPONSE	13 41.9	5 35.7	8 47.1	0 0.0	5 50.0	5 50.0	3 42.9
MORE THAN THREE ANSWERS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	4 12.9	2 14.3	2 11.8	1 25.0	1 10.0	1 10.0	1 14.3
TOTAL	31	14	17	4	10	10	7

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

INFORMATION WHICH WOULD HAVE BEEN MOST USEFUL ON INTERSTATE SIGNS JUST SEEN	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 &CONNECT. BEFORE	I495 &CONNECT. AFTER	I70S &CONNECT. BEFORE	I70S &CONNECT. AFTER
NAME OF CITY TOWN OR DESTINATION	57 28.1	23 28.4	34 27.9	7 20.6	13 29.5	16 34.0	21 26.9
ROAD NAME	18 8.9	6 7.4	12 9.8	4 11.8	4 9.1	2 4.3	8 10.3
ROUTE NUMBER	62 30.5	23 28.4	39 32.0	11 32.4	12 27.3	12 25.5	27 34.6
CARDINAL DIRECTION (E.G., NORTH)	39 19.2	16 19.8	23 18.9	5 14.7	9 20.5	11 23.4	14 17.9
EXIT NUMBER	20 9.9	8 9.9	12 9.8	5 14.7	5 11.4	3 6.4	7 9.0
OTHER	7 3.4	5 6.2	2 1.6	2 5.9	1 2.3	3 6.4	1 1.3
SUB-TOTAL	203 100.0	81 100.1	122 100.0	34 100.1	44 100.1	47 100.0	78 100.0
NO RESPONSE	121 29.2	51 30.7	70 28.2	17 25.4	37 37.0	34 34.3	33 22.3
MORE THAN THREE ANSWERS	1 0.2	0 0.0	1 0.4	0 0.0	1 1.0	0 0.0	0 0.0
MORE THAN ONE ANSWER	89 21.5	34 20.5	55 22.2	16 23.9	18 18.0	18 18.2	37 25.0
TOTAL	414	166	248	67	100	99	148

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 &CONNECT. BEFORE	I495 &CONNECT. AFTER	I70S &CONNECT. BEFORE	I70S &CONNECT. AFTER
ADDITIONAL COMMENTS							
FAVORABLE COMMENTS ON BELTWAY / I-70S	17 13.9	8 18.6	9 11.4	5 27.8	3 8.6	3 12.0	6 13.6
FAVORABLE COMMENTS ON OTHER ROADS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
UNFAVORABLE COMMENTS ON BELTWAY / I-70S	73 59.8	20 46.5	53 67.1	7 38.9	28 80.0	13 52.0	25 56.8
UNFAVORABLE COMMENTS ON OTHER ROADS	5 4.1	3 7.0	2 2.5	2 11.1	0 0.0	1 4.0	2 4.5
UNDECIPHERABLE OR NO COMMENT	27 22.1	12 27.9	15 19.0	4 22.2	4 11.4	8 32.0	11 25.0
SUB-TOTAL	122 99.9	43 100.0	79 100.0	18 100.0	35 100.0	25 100.0	44 99.9
NO RESPONSE	204 62.6	88 67.2	116 59.5	33 64.7	49 58.3	55 68.8	67 60.4
TOTAL	326	131	195	51	84	80	111
FAVORABLE COMMENTS ON BELTWAY / I-70S							
NONSPECIFIC	4 23.5	0 0.0	4 44.4	0 0.0	2 66.7	0 0.0	2 33.3
GUIDE SIGNS	10 58.8	7 87.5	3 33.3	5 100.0	1 33.3	2 66.7	2 33.3
OTHER	3 17.6	1 12.5	2 22.2	0 0.0	0 0.0	1 33.3	2 33.3
SUB-TOTAL	17 99.9	8 100.0	9 99.9	5 100.0	3 100.0	3 100.0	6 99.9
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	17	8	9	5	3	3	6

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY CESTINATION

		SUB TOTAL		495 ECCNNECT.		70S ECONNECT.	
	TOTAL	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER
FAVORABLE CCMMENTS ON OTHER ROADS							
NCNSPECIFIC	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
SIGNS	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.0	0 0.0
OTHER	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.C	0 0.0
SUB-TOTAL	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
NC RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
TCTAL	0	0	0	0	0	0	0

QUESTION ANALYSIS
TRAFFIC SURVEY

THRU-PUT RESPONDENTS: RESPONSES BY DESTINATION

	TOTAL	SUB TOTAL BEFORE	SUB TOTAL AFTER	I495 &CONNECT. BEFORE	I495 &CONNECT. AFTER	I70S &CONNECT. BEFORE	I70S &CONNECT. AFTER
UNFAVORABLE COMMENTS ON BELTWAY / I-70S							
NONSPECIFIC	1 1.4	0 0.0	1 1.9	0 0.0	1 3.6	C 0.0	0 0.0
GUIDE SIGNS INADEQUATE IN: PHYSICAL ASPECTS	1 1.4	0 0.0	1 1.9	0 0.0	0 0.0	C 0.0	1 4.0
SIGN MESSAGE NONSPECIFIC	7 9.6	2 10.0	5 9.4	1 14.3	2 7.1	1 7.7	3 12.0
SIGN MESSAGE SHOULD HAVE PLACE NAME	5 6.8	2 10.0	3 5.7	0 0.0	1 3.6	2 15.4	2 8.0
SIGN MESSAGE SHOULD HAVE OTHER NAME	14 19.2	4 20.0	10 18.9	2 28.6	7 25.0	2 15.4	3 12.0
LOCATION AND/OR QUANTITY	17 23.3	6 30.0	11 20.8	1 14.3	8 28.6	5 38.5	3 12.0
HIGHWAY GEOMETRY	13 17.8	1 5.0	12 22.6	0 0.0	5 17.9	1 7.7	7 28.0
SPEED, VOLUME, OR TRAFFIC BEHAVIOR	10 13.7	3 15.0	7 13.2	2 28.6	4 14.3	1 7.7	3 12.0
OTHER (E.G., SERVICE OTHER SIGNS)	5 6.8	2 10.0	3 5.7	1 14.3	0 0.0	1 7.7	3 12.0
SUB-TOTAL	73 100.0	20 100.C	53 100.1	7 100.1	28 100.1	13 100.1	25 100.0
NO RESPONSE	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	C 0.C	0 0.0
TOTAL	73	20	53	7	28	13	25

Question Analysis
Traffic Survey
Thruput Respondents: Responses by Destination

Diagrammatic Sign Comments	Total	I-495 & Connecting	I-70S & Connecting
Favorable concerning diagrammatics	83 92.2	33 82.5	50 100.0
Favorable - signs elsewhere on Beltway / other roads	0 0.0	0 0.0	0 0.0
Unfavorable concerning diagrammatics	6 6.7	6 15.0	0 0.0
Unfavorable - signs elsewhere on Beltway / other roads	1 1.1	1 2.5	0 0.0
Subtotal	90 100.0	40 100.0	50 100.0
No response	105 55.3	44 52.4	61 55.0
Total	195	84	111

Question Analysis
Traffic Survey
Thruput Respondents: Responses by Destination

Favorable Comments Concerning Diagrammatic Signs	Total	I-495 & Connecting	I-70S & Connecting
Generally Good	49 59.0	16 48.5	33 66.0
Better than Previous Signs	5 6.0	3 9.1	2 4.0
Faster to Read/React to	1 1.2	1 3.0	0 0.0
Clear, Legible, Informative, Etc.	10 12.0	5 15.2	5 10.0
Provide Directional Guidance	8 9.6	5 15.2	3 6.0
Specific Comment on Graphic	2 2.4	0 0.0	2 4.0
Aid Lane Positioning	4 4.8	2 6.1	2 4.0
Aid Nonfamiliar / Inexperienced Driver	2 2.4	1 3.0	1 2.0
Other Comment	2 2.4	0 0.0	2 4.0
Subtotal	83 99.8	33 100.1	50 100.0
Total	83	33	50

Question Analysis
Traffic Survey
Thruput Respondents: Responses by Destination

Unfavorable Comments Concerning Diagrammatic Signs	Total	I-495 & Connecting	I-70S & Connecting
Generally Bad	1 16.7	1 16.7	0 0.0
Worse than Previous Signs	1 16.7	1 16.7	0 0.0
Slower to Read/React to	0 0.0	0 0.0	0 0.0
Confusing, Unclear, too much Information, Etc.	2 33.3	2 33.3	0 0.0
Does not Provide Directional Guidance	0 0.0	0 0.0	0 0.0
Specific Comment on Graphic	0 0.0	0 0.0	0 0.0
Does not Aid Lane Positioning	0 0.0	0 0.0	0 0.0
Does not Aid Unfamiliar / Inexperienced Driver	0 0.0	0 0.0	0 0.0
Other Comment	2 33.3	2 33.3	0 0.0
Subtotal	6 100.0	6 100.0	0 0.0
Total	6	6	0

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